

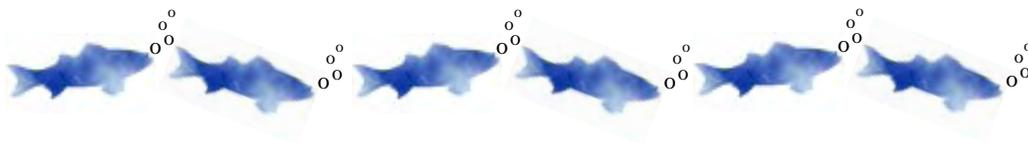
The Clear Blue Line

Water Quality in the Las Vegas Valley

Teacher's Guide



A Supplemental Publication to
"The Clear Blue Line" Video



Prepared by the Conservation District of Southern Nevada

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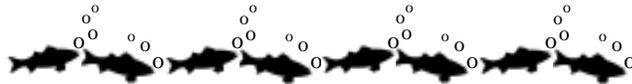
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How to Use This Guide

This Teacher Guide supplements The Clear Blue Line: Water Quality in the Las Vegas Valley video by expanding on facts and concepts presented in the video. The Classroom Lessons are divided into three main sections. Section I addresses Water Pollution Prevention and Conservation, Section II addresses Pollution Prevention in Schools, and Section III addresses Household Hazardous Wastes. Each section begins with information about the issue followed by what students can do to address the issue. Each section contains a lesson plan with assigned classroom activities. Academic goals to consider are also included. A Trivia Quiz, Glossary, Acronyms, and Websites of Interest are included in the back of the Guide. Words defined in the Glossary are in bold type the first time they appear in the text. "The Clear Blue Line" is targeted towards junior high school students, although it is also appropriate for high school audiences and community residents.



Mission Statement

"The Clear Blue Line" video package was designed to create community awareness and increase responsibility of our water resources by providing information about water quality protection.

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Table of Contents



	Acknowledgments	i
	How to Use This Guide	i
	Mission Statement	i
	Table of Contents	ii
SECTION I:	Water Pollution Prevention and Conservation	1
	Activity No. 1 - Earth's Water Distribution	3
	Activity No. 2 - Pollution Flow Chart	4
	Activity No.3 - Water Watchers	5
SECTION II:	Pollution Prevention in Schools	6
	Activity No. 1 - Pre-Survey: School P2 Surveyors	8
	Activity No. 2 - Survey: P2 Inspection	8
	Activity No. 3 - Post-Survey: P2 Action!	9
SECTION III:	Household Hazardous Waste	11
	Activity No. 1 - Household Hazardous Waste Quiz	13
	Activity No. 2 - Know Your Labels	14
	Activity No. 3 - A Less Toxic Alternative	14
	Trivia Quiz	15
	Academic Goals	17
	Glossary	19
	Acronyms	20
	Websites of Interest ...	20



SECTION I: WATER POLLUTION PREVENTION AND CONSERVATION

How do we use water?

Water is a resource that has many uses, including recreational, transportation, hydroelectric power, agricultural, domestic, industrial, and commercial uses. Water also supports all forms of life and affects our health, lifestyle, and economic well-being. As individuals, we use water for sanitation, drinking, and many other human needs, and we pay for the public water utilities that provide water.

Examples of the amount of water used by an individual during everyday activities are shown below (compare the gallons to a gallon of milk):

- ◆ To flush a toilet ... 5 to 7 gallons
- ◆ To run a dishwasher ... 15 to 25 gallons
- ◆ To wash dishes by hand ... 20 gallons
- ◆ To water a small lawn ... 35 gallons
- ◆ To take a shower ... 25 to 50 gallons
- ◆ To take a bath ... 50 gallons
- ◆ To wash a small load of clothes ... 35 gallons
- ◆ To brush teeth (running water continuously) ... 2 - 5 gallons

The average American uses 140 to 160 gallons of water per day!



Although more than three quarters of the earth's surface is made up of water, only 2.8 percent of the Earth's water is available for human consumption. The other 97.2 percent is in the oceans; however, this water is too salty to use for most purposes, and the salt is very costly to remove. Most of the Earth's fresh water is frozen in polar ice caps, icebergs, and glaciers.

Why are water pollution prevention and conservation important?

Although water flows from our faucets throughout the day, we often take the amount of fresh water available on Earth for granted. As the world's population increases, water consumption increases. Preventing water pollution and conserving water are important to ensure a continuing abundance of water that is safe to use for ourselves and future generations.

Water pollution

Water pollution is any contamination of water that reduces its usefulness to humans and other organisms in nature. **Pollutants** such as herbicides, pesticides, fertilizers, and hazardous chemicals can make their way into our water supply. Naturally occurring contamination such as sediment from erosion is considered a contaminant. When our water supply is contaminated, it is a threat to human, animal, and plant health unless it goes through a purification procedure.

In the Las Vegas Valley about 85% of drinking water comes from Lake Mead on the Colorado River. It is treated to meet the standards of the Safe Drinking Water Act. Surface water, such as lakes and rivers, are regulated by the Clean Water Act. Both the Safe Drinking Water Act and the Clean Water Act are administered by the U.S. Environmental Protection Agency.

There are many elements that determine surface water quality in our watershed including soil, geologic formations and terrain, vegetation, **precipitation** and runoff, and human activities. Examples of pollution and its effects on water bodies are listed below.

- ◆ Pollutants can come from a specific source such as a pipe that discharges used water or other material from a factory or business into a water body. Such discharges can harm the aquatic **ecosystem**. These are known as **point source pollutants**.
- ◆ Pollutants can also come from large areas such as agricultural fields that have been covered with fertilizer or pesticides. Fertilizer and pesticide residues can run off or seep into waterways and washes or seep into soil, contaminating underlying **groundwater**. These pollutants are known as **non-point source pollutants**.

- ◆ Other non-point source pollutants come from lawns, gardens, driveways, parking lots, sidewalks, and roads. Rainwater or melted snow can transfer materials such as oil, litter, fertilizers, and pesticides into **stormdrain** inlets found on the streets. The stormdrain transports this polluted water to nearby washes that collect and drain into the Las Vegas Wash. Less than 2% of the water in Lake Mead comes from the Las Vegas Wash.
- ◆ Harmful levels of pollutants can contaminate our drinking water, reduce oxygen levels, accumulate in the tissue of fish, and reduce the beauty of the water.

Water conservation

As the population increases, more water is used and more water is wasted. In some areas of the country, especially in the western states, water shortages can occur due to limited supply. In southern Nevada we rely on both groundwater and the Colorado River for our municipal supply.

How can you help prevent pollution?

It may be difficult to imagine that one person can make a difference in protecting and conserving fresh water supplies on this planet, but each individual can help the **environment**. The following **Pollution Prevention (P2)** related concepts can help you protect water from pollution, conserve water by reducing the amount of water you use, and save money:

P2 Principle One: Changing What You Use

- ◆ Replace showerheads and faucet aerators with water efficient models.
- ◆ Use a water-filled milk jug or plastic bottle in your toilet tank to displace water; this allows your toilet to operate using less water, or use a low-flow toilet flapper.
- ◆ Choose nonphosphate or low phosphate detergents in your dishwasher or clothes washer. High phosphate levels in water habitats can harm fish and other wildlife.
- ◆ Use a broom to clean your driveway. Do not sweep debris into the street or stormdrain.
- ◆ Use a commercial car wash that pretreats their water prior to sending it to the sanitary sewer.
- ◆ Use drought tolerant plants in your yard and garden that require less water.

P2 Principle Two: Changing What You Do

- ◆ Do not let the water run while brushing your teeth or washing your face.
- ◆ Do not leave the water running if you wash dishes by hand.
- ◆ Rinse all your dishes at once by using a dish rack placed in the sink.
- ◆ Only run your dishwasher and washing machine when they are full.
- ◆ Do not throw in the trash, pour down the drain, or dump on the ground paint, antifreeze, motor oil, and other **household hazardous wastes**.
- ◆ Dispose of tissues, dead insects, and other waste in a trashcan rather than a toilet.
- ◆ Plant native plants to minimize the need for herbicides, pesticides, and fertilizers.
- ◆ Do not dump used motor oil on the ground or into stormdrains; throwing motor oil in the trash is illegal. Recycling centers and many service stations accept used motor oil for recycling.

P2 Principle Three: Improving your housekeeping

- ◆ Fix leaks by replacing faucet washers and toilet flappers as needed. A slow drip or leak can easily waste more than 100 gallons of water a week.
- ◆ Put all litter in trashcans so it does not get washed into stormdrains and washes.
- ◆ Clean up after your pets.



P2 Principle Four: Educating yourself and others

- ◆ Teach your community about the effects of dumping waste down drains and into waterways.
- ◆ Encourage your neighbors, family, and friends to install low flow water fixtures.



LESSON PLAN

This lesson plan provides guidance and activities to help you meet the following goals:

- ◆ Describe water uses and sources
- ◆ Explain why water conservation is important
- ◆ Explain how pollution prevention concepts can be used to conserve water and prevent pollution

How do we use water?

Begin the lesson by discussing the importance of water.

- ◆ Ask the students to identify how they used water during the past week at home and at school. Sum the amount of water used by referring to the average quantities shown at the beginning of Section I (page 1).
- ◆ Review the list of percentages on Earth's total and fresh water supply to demonstrate our limited water resources (below).
- ◆ After the students have discussed individual water uses, ask them to identify water uses outside of the home and school [examples include agriculture, lawn irrigation, fishing, industrial uses (a good example is mining), power generation, and transportation.]

Activity No. 1 - Earth's Water Distribution

Objectives: Students should understand the distribution of Earth's water and be able to name sources of fresh water on Earth.

Time Length: Approximately 15 minutes

Materials Needed: One copy of the pie chart below of Earth's total water supply, one 1,000-milliliter (mL) graduated cylinder, five 100-mL graduated cylinders, one medicine dropper, and food coloring. Use the table below to determine the distribution of water for this demonstration.

Earth's Total Water Supply (milliliters)



Earth's Total Fresh Water Supply (milliliters)



* 3 drops = 1 milliliter

1 liter = 1,000 milliliters

Activity:

- ◆ Ask the students to estimate how much fresh water is available on Earth and where the fresh water comes from. Explain that you are going to demonstrate the actual distribution of the Earth's fresh water.
- ◆ Fill one 1,000-mL graduated cylinder with colored water to the 1,000-mL line. This represents the Earth's entire water supply.
- ◆ Pour 28 mL of the water into a 100-mL graduated cylinder. This represents the Earth's total fresh water supply. The water remaining in the first cylinder (972 mL) represents salt water.

- ◆ Divide the 28 mL of fresh water into smaller containers. Use the amounts shown in the table.
- ◆ Explain to the students that the cylinder containing 972 mL of water represents the salt water that we cannot drink without a costly procedure to remove the salt.
- ◆ Ask the students which fresh water graduated cylinder represents the most fresh water on Earth (answer is the 23 mL cylinder representing icecaps and glaciers). Ask if this source of fresh water is commonly used by humans.
- ◆ Explain to the students that Las Vegas gets most of its drinking water from surface water (Lake Mead on the Colorado River) and some from groundwater (**aquifers**).



Why is water pollution prevention and conservation important?

Now that the students have an idea of where water comes from and how much of this valuable resource is used in our daily lives, discuss why water conservation is important.

- ◆ Explain to the students that in order to assure water is safe to use for ourselves and future generations we must prevent water pollution and conserve the fresh water that is available.
- ◆ Based on the information provided on water pollution, explain sources of pollutants and possible ways that pollution can enter our fresh water supply.

Activity No. 2 - Pollution Flow Chart

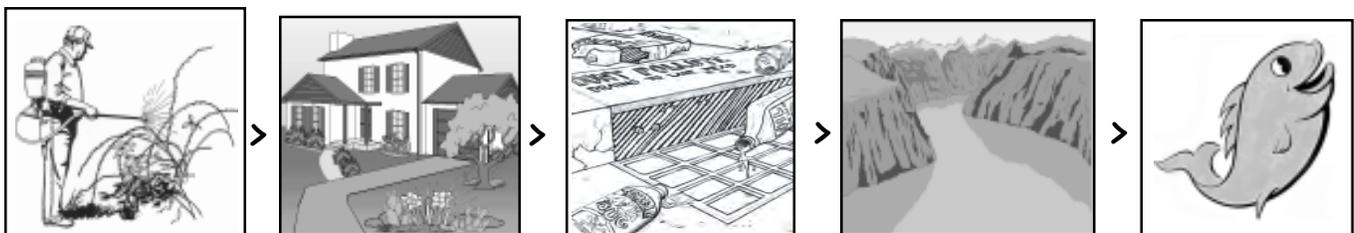
Objectives: Students should understand the sources of pollution and how pollution can be a threat to our water supply.

Time Length: Approximately 20 minutes

Materials Needed: Paper and pencil for each student

Activity:

- ◆ Divide the class into groups and have each group identify at least five types of pollutants and their sources (examples: bacteria from pet waste, herbicides, pesticides, and fertilizers from lawns, oil from cars, and phosphate from detergents).
- ◆ On a sheet of paper, have each group write the sources (for example, a road) in boxes. Then have them draw arrows that show the pollutant (for example, pet waste) moving toward a potential pathway (for example, a stormdrain). More than one line may apply to each pollutant because the pollutants may end up in several places (for example, pesticides can be washed down drains and also seep into the ground and contaminate aquifers).
- ◆ Have each group also create boxes for the potential pollution receptors (for example, fish and people) and connect them with arrows to the original sources and potential contaminants. The pictures should all connect to form a pollution flow chart.



Humans >>>

Lawn >>>

Stormdrain >>>

Lake >>>

Fish

- ◆ After each group has shared their ideas with the class, have the students discuss ways of eliminating pollution from potential sources. Examples include picking up pet waste; disposing of hazardous waste properly; not pouring antifreeze, oil, or paint down drains; and eliminating the use of herbicides, pesticides, and fertilizers on your lawn.

How can you help prevent pollution?

Based on the information provided, discuss how the four P2 principles described on page 2 can be used to help conserve water and prevent water pollution.

- ◆ Keep this discussion interactive. Ask students for ideas to conserve water in the home and at school and how to prevent water pollution.
- ◆ Emphasize that small or individual actions to conserve water add up and can result in many gallons of water and money saved.

Activity No.3 - Water Watchers

Objectives: Students should be able to develop water conservation tips on their own and pass on the information to family, friends, and neighbors

Time Length: A 5-minute brief explanation of homework assignment to students; about 25 minutes in class the following day or week

Materials Needed: Student journal, poster board or cardboard, and markers or colored pencils

Activity:

- ◆ Assign the students to observe water uses of family, friends, and neighbors. Students will record observations in their journals of all the water uses and how long their family, friends, or neighbors used the water. For example, if a student's neighbor is watering a lawn, have the student record who used the water, how the water is used, and for how long. Other actions to observe include a family member using the washing machine or brushing his or her teeth.
- ◆ After students have recorded the water uses they observed in class, divide the students into groups and have each group discuss their observations. Ask each group to come up with alternatives or conservation tips for each water use.
- ◆ Have each group create a poster that represents all of their ideas.
- ◆ Pin up the posters created so that the entire class can discuss new ideas. Hang the posters in the classroom so that the alternatives become familiar to the students.
- ◆ Have students report back to the people they observed with alternatives and conservation tips.

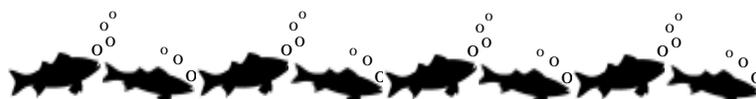


Method of Evaluation/Assignment

In addition to Activity No. 3, have students write the following questions in their journals:

- ◆ What water conservation tips were developed in class?
- ◆ Are you practicing the water conservation tips developed in class?
- ◆ Are you dumping or throwing anything away that could potentially pollute our water?
- ◆ If you are, what safer disposal methods could you use?
- ◆ What water conservation tips can be used at school?

Students should answer these questions with the help of family and friends and write the answers in their journals.



SECTION II: POLLUTION PREVENTION IN SCHOOLS

Why P2 in schools?

The following lesson plans offer pollution prevention (P2) concepts and how they apply to energy conservation, water pollution prevention and water conservation, pesticide use reduction, and household hazardous wastes reduction. They describe how household activities can generate pollutants and waste.



At school, the combination of more people and more activities generates a greater quantity and variety of pollutants and waste. Students, administrative staff, teachers, and janitors all consume energy and water and possibly use hazardous materials and pesticides. Therefore, schools are a good place to implement P2 concepts to reduce or eliminate the generation of pollutants and wastes that, if mismanaged, can be potentially harmful to human health and the environment.

Where is waste in schools generated?

Activities and areas throughout the school that generate pollutants and wastes are described below.

- ◆ Energy is consumed through lighting, office machine use, heating and cooling, and transportation to and from school.
- ◆ Hazardous materials that can become waste include **caustic** or acidic cleaners (such as drain and toilet bowl cleaners), aerosol cans, paints, and other chemicals present in science laboratories and classes, science storerooms, art classrooms, and custodial closets.
- ◆ Pesticides are used on school grounds and in kitchens, locker rooms, and classrooms.
- ◆ Water is used in bathrooms, kitchens, locker rooms, and classroom sinks. Water pollution can be generated from many materials used at school; for example, fertilizer used on the fields or pesticides used on school grounds.

How Can Your School Prevent Pollution?

In order for your school to reduce or eliminate the amount of pollutants and waste it generates, an attitude of "less is better" should be adopted. All students, teachers, administrative staff, and janitors must ask themselves, "Is there a different way to do this that generates less waste or uses safer materials?"

The following is a combination of P2 concepts that can help your school prevent health hazards, create less environmental pollution, and save money. Some of the P2 concepts presented below can be completed individually or in groups, but some of the P2 tips will require working with the janitor, principal, or other faculty members to make sure they are implemented.

Water Pollution Prevention and Conservation

Some wastes improperly disposed of at schools can pollute water. By taking steps to reduce water pollution, your school can help reduce the pollution in our drinking water sources and protect aquatic ecosystems. By conserving water, your school can save money.

- ◆ Fix leaks in faucets and pipes.
- ◆ Practice water-efficient landscaping. When school grounds must be watered, watering should be done in the morning or evening so water will soak into root systems and not be lost to evaporation. Don't water on rainy or windy days.
- ◆ Use a minimal amount of fertilizers on school grounds or try finding natural alternatives to fertilizing. Fertilizers can migrate into water bodies and harm aquatic ecosystems.
- ◆ Do not pour hazardous materials, such as science class chemicals down the drain because they can eventually be released into drinking water sources.
- ◆ Dispose of all litter in trash cans so that the litter does not get washed into nearby stormdrains.
- ◆ Reducing or eliminating the generation of hazardous waste creates a more healthy atmosphere for school occupants and the surrounding environment.

- ◆ Use safer alternatives to hazardous materials. For example, use detergent-based cleaners instead of caustics, which are corrosive, and water-based cleaners instead of toxic solvents. More alternatives are presented in the "Household Hazardous Waste Reduction" fact sheet.
- ◆ Store chemicals and hazardous wastes properly in science storerooms, art classrooms, and custodial closets to avoid unauthorized use or spills.
- ◆ Purchase only the needed amounts of chemical supplies to avoid disposing of extra, unused materials.
- ◆ Try alternatives to products labeled with the words "Danger," "Warning," or "Caution." For example, buy a safe bleach product that does not have a label that reads "Danger."
- ◆ Use the least amount of product needed to complete the job.
- ◆ Do not mix chemicals and hazardous wastes with everyday trash, or dump them on the ground.



Pesticide Reduction

Pesticides are used on school grounds to protect students and employees and the school's appearance from pests. However, pesticides can cause possible health hazards for school occupants and contribute to environmental pollution. The best P2 option is to prevent a pest problem from occurring. If your school already has a pest problem, the best P2 option is to control pests without using pesticides.

- ◆ Use non-chemical pest control methods such as swatters for insects and traps for mice.
- ◆ Keep lockers and the building clean and dry so that the school building is unattractive to pests.
- ◆ Plant native flora which do not require chemical upkeep. Ask a local nursery if they will work with you to provide native plants on school grounds.
- ◆ Encourage employees or contractors to use integrated pest management.

If pesticides must be used:

- ◆ Only spray pesticides when children are not present at school.
- ◆ Follow pesticide label instructions and wear protective equipment such as gloves and a facemask. The person applying pesticides should be a registered technician or certified applicator.
- ◆ Do not purchase excess pesticides.
- ◆ Store pesticides in a secure place.
- ◆ Do not (1) mix pesticides with everyday trash, (2) wash them down the drain, or (3) dump them on the ground.



LESSON PLAN

This lesson plan provides guidance and activities that will help teachers meet the following goals:

- ◆ Explain where waste and pollutants are generated in your school
- ◆ Conduct a P2 survey of the school
- ◆ Develop a list of alternative products and conservation measures that can be used at your school
- ◆ Apply P2 principles in your school

This lesson plan contains three comprehensive activities divided into pre-survey, survey, and post-survey stages. These activities allow a class to (1) research the waste and pollutants generated by a school, (2) conduct a P2 survey of the school, and (3) evaluate survey results and implement P2 at the school. The instructor should conduct the activities using an adequate amount of time to obtain information and to attain the necessary goals. The outcome of this lesson plan requires individual and group efforts by the students.

Why is P2 important at school?

- ◆ Begin the lesson by talking with the students about the wastes and pollutants generated at home that are identified in the video.
- ◆ Explain to the students that many sources of wastes and pollutants in homes are also present in schools.
- ◆ Explain to the students that teachers, staff members, administrators, and students all contribute to

the consumption of resources and use of products that generate waste at the school every day. For example, when a student leaves the light on in an unused classroom, the energy used by the light bulb could have been produced from the burning of fossil fuels (natural resources that cannot be replenished, such as oil and gas), thereby contributing to air pollution.

Activity No. 1 - Pre-Survey: School P2 Surveyors

Objective: Students should understand how to prepare a survey to find where wastes and pollutants are generated at your school.

Time Length: 60 minutes; some survey groups may need to make a 30-minute appointment with the principal or janitor before the survey.

Materials Needed: A student journal, pencil, list of P2 Principles, and the "School P2 Surveyors Worksheet" for each student.

Activity:

- ◆ Divide the class into three teams: the Pesticides Survey Team, Water Survey Team, and Hazardous Materials Survey Team.
- ◆ Explain to the students that each team is going to prepare a list to help the team conduct a school survey in the area of their assigned topic. The "School P2 Surveyors" attachment can help guide each team through the next steps in the activities.
- ◆ Ask the teams to make two columns in their student journal headed "What and Where?" and "P2 Questions."
- ◆ In the first column, have the teams write down what or how the team's focus topic is used or generated and where it can be found in the school.
- ◆ In the second column, have each student write questions in their journals formulated from the P2 concepts given in this fact sheet and the other fact sheet addressing the team's focus topic. These questions should guide the students in identifying P2 already occurring in school and new P2 opportunities during their survey. The questions can also be used to interview other students, teachers, staff, and administrators. A few examples are provided below.

Activity No. 2 - Survey: P2 Inspection

Objective: Students should understand how to conduct a walking P2 survey at your school.

Time Length: 90 minutes

Materials Needed: A student journal, pencil, and copy of the "School P2 Surveyors" attachment for each student.

Activity:

- ◆ Under adult supervision, have the teams use the survey list developed in Activity No. 1 and conduct a walking survey of the school in areas where their assigned topic is found.
- ◆ While the team is inspecting the area where their resource or waste is found, have the students check it off in their journals. Also write down new things found that the teams did not write down in Activity No. 1.
- ◆ During the survey, have the students try to answer the questions they developed during Activity No. 1 and have them write down any additional observations.

Student Journal - Hazardous Waste Survey List

Example Hazardous Waste Entries:

Floor and bathroom cleaner in custodian closet

Lead paint in art classroom

Formaldehyde in science lab

Example P2 Question: What types of cleaners are used on the floors?

Answer: The janitor said detergent-based cleaners are used on the floors instead of caustics.

Example Additional Observation:

An open bag of fertilizer was found in the custodian closet and had spilled on the floor.

How Can You Help Prevent Pollution?

- ◆ Explain to the students that implementing P2 concepts in the school can prevent health hazards to all occupants, reduce environmental pollution, and save money.
- ◆ For example, if alternatives to pesticides were used to control pests the school would be reducing the potential of health hazards to people and the environment.
- ◆ Explain to the students that implementing P2 concepts in school is an individual and group effort but also may require administrative action. For example, some actions cost money; therefore, the principal or other administrative staff must get involved.

Activity No. 3 - Post-Survey: P2 Action!

Objectives: Students should identify P2 options and ideas that can be implemented in your school.

Time Length: 90 minutes

Materials Needed: A student journal, piece of paper, and pencil for each student.

Activity:

- ◆ Have each survey team discuss P2 principles for their assigned topic that are already implemented in the school. For example, the Pesticides Survey Team may have discovered that mechanical traps are used instead of pesticides to trap mice.
- ◆ Have each team analyze the rest of their surveys and select one area that needs the most improvement. For example, the Water Survey Team may decide that the school is wasting a large amount of water by irrigating the ballfields during rain storms.
- ◆ Once a focus has been decided upon, have each team brainstorm to come up with appropriate P2 ideas for the school according to their assigned topic. For example, the Water Survey Team may suggest that the school should replace some bathroom water fixtures to stop leaks.
- ◆ Have each team present their ideas to the rest of the class.
- ◆ Have each team write down the final environmental problem they have decided to focus on and the P2 idea/solution they recommend in a letter to the principal.
- ◆ A few days after the class has sent the letters, make an appointment for the principal to visit the class to discuss the possibilities of implementing the different P2 concepts proposed by each group.



Method of Evaluation/Assignment

Have the students write down the following questions in their journals:

- ◆ What P2 concepts are you practicing at school?
- ◆ If you have persuaded your principal to consider the P2 ideas you presented, have they been implemented at the school? Why or Why not?
- ◆ Do you notice a change in "attitude" about the generation of pollutants and wastes among the occupants of your school?
- ◆ To evaluate the impact of the P2 activities, students should ask these questions again 3 to 6 months after the lesson plan has been completed.

School P2 Surveyors Worksheet

Water Survey Team

Goal: To evaluate the habits and practices of water use in the school so that the team can identify problem areas and opportunities for water conservation and P2



Areas to conduct survey: Cafeteria kitchen, bathrooms, locker rooms, and classes with sinks

Guidelines:

- ◆ Make an appointment with the school custodian and kitchen crew to ask some of the questions developed in class.
- ◆ Observe the water consumption patterns of all school occupants. For example, observe how long the bathroom sink is left on while someone is washing his or her hands.
- ◆ Observe what people pour down water fountains, sinks, and stormdrains outside your school.

Hazardous Materials Survey Team

Goal: To inventory hazardous material use in your school so that the team can identify safer alternatives

Areas to conduct survey: Science laboratories and storerooms, classrooms, custodial closets, and art classrooms

Guidelines:

- ◆ Make an appointment with the custodian to ask questions developed in class and to assess the custodial closet. Also make an appointment to interview the science and art teachers. Look for products that are flammable, corrosive, toxic, or **reactive**.
- ◆ Try to identify typical hazardous wastes generated when hazardous materials are used, such as bathroom cleaners, pesticides, and formaldehyde used to preserve specimens in biology rooms.
- ◆ In art classrooms, look for solvents such as rubber cement and permanent markers, and look on labels to find lead in paints (lead paint can also be found on playground equipment), clays, and glazes.

Pesticides Survey Team

Goal: To evaluate pesticide use at the school so that the team can identify ways to minimize pesticide use and protect school occupants from unnecessary exposure

Areas to conduct survey: Kitchen, locker rooms, custodial closets, and lawns or other outdoor areas

Guidelines:

- ◆ Make an appointment with the maintenance supervisor or custodian to find out what type of pesticide management plan the school currently implements. For example, the school may have a pesticides contractor or the school custodian may be responsible for the school grounds.
- ◆ Make an appointment with the person that controls the pesticides used on school grounds to ask questions developed in class. For example, you could ask if chemical pesticides are used at school and if so, how they are stored.
- ◆ While inspecting the school, write down the types of pests present. There may be alternatives to pesticides used to control these pests.



SECTION III: HOUSEHOLD HAZARDOUS WASTE

What is Household Hazardous Waste?

If you walk around your garage, kitchen, bathroom, or workshop, you'll probably find hazardous materials or products you and your family use every day. Hazardous materials that can no longer be used become household hazardous waste (HHW). HHW includes hazardous materials such as household cleaners, paints, paint thinners, motor oils, gasoline, and pesticides. HHW may pose a threat to human health or the environment if it is not disposed of properly. HHW poses a threat because it exhibits one or more of the following characteristics:

Toxic: Poisonous materials like pesticides and expired medicines can harm various organs when swallowed, inhaled, or absorbed through the skin. Some toxic materials can also cause cancer.

Corrosive: Materials like battery acid and bleach can dissolve other materials, including metals. Corrosive materials can cause severe burns to skin, eyes, and other tissues.

Ignitable: Flammable materials like gasoline and paint thinner catch fire very easily, sometimes with just a little extra heat or a small spark. Ignited materials can cause severe burns.

Reactive: Unstable materials can explode or give off poisonous gases when mixed with water or other materials (for example, mixing bleach and ammonia).

Typically, about 1 percent of all waste generated in the average American household is hazardous. The average household generates about 30 pounds (about the weight of a medium-sized dog) of HHW per year, for an annual national total of about 1.6 million tons. The types and percentages of HHW in our daily garbage are shown below:

- ◆ Household maintenance items (paint, thinners, glues) 36.6%
- ◆ Household batteries 18.6%
- ◆ Personal care products (nail polish and remover, hair spray) 12.1%
- ◆ Cleaners 11.5%
- ◆ Automotive-maintenance products (grease, oil) 10.5%
- ◆ Pesticides, pet supplies, and fertilizers 4.1%
- ◆ Hobbies/Other (pool chemicals, lighter fluid) 3.4%
- ◆ Pharmaceuticals 3.2%



Why is Household Hazardous Waste reduction so important?

Hazardous materials are found in almost every home. We use products like the ones in the pie chart in our cars, yards, and even on ourselves. HHW and other hazardous materials that are not handled properly at home can be dangerous, especially to young children and pets. In addition, when HHW is not disposed of properly, it can be dangerous for people and the environment. For example, if HHW is combined with your household trash, trash haulers or sanitation workers can be injured from explosions, fumes, or fires. If HHW is dumped on the ground or poured into stormdrains, storm water can carry it into washes that drain to Las Vegas Wash. Many metropolitan areas, including the Las Vegas Valley, get their drinking water from the Colorado River. In other cases, HHW may seep down through the ground until it reaches aquifers, which are underground sources of water for residents that get their drinking water from wells. When the aquifers get polluted, the water may no longer be drinkable, or it may be more difficult to treat water to safe drinking levels. Plants and animals that live in or near the washes and Lake Mead can also be harmed from HHW in the water.

How can you help prevent pollution?

Neighborhood collection days allow HHW to be disposed of properly. However, the key is to prevent HHW generation in the first place. The best way to do this is to use non-hazardous products, but there are other ways to reduce HHW.

The following four P2 concepts can help you evaluate your household practices and identify ways to reduce the impact of HHW from your home:

P2 Principle One: Changing what you use

- ◆ Read labels on the products you use and ask yourself, "Do I really need to use this product?" Safer alternatives may exist. For example, you could use water-based (latex) paint instead of oil-based paint, compost instead of chemical fertilizers, cedar chips instead of mothballs, or boric acid instead of commercial ant and roach killers.

P2 Principle Two: Changing What You Do

- ◆ Think about what you do in your home that generates HHW and ask yourself, "Is there a safer way I can be doing this?" For example, you could use sandpaper or a heat gun instead of chemical paint strippers, or a plunger instead of a chemical drain cleaner.
- ◆ If you must use hazardous products, read and follow the specific instructions on labels. Most products provide instructions for use and proper disposal.
- ◆ Buy hazardous products only in the quantity you need and use the product up entirely; consider how you will dispose of unused portions of a hazardous product before you purchase it.
- ◆ Make sure you don't use too much of a product. More is not necessarily better. In fact, using more material than necessary costs you money and may be more hazardous for you or the environment.
- ◆ If they are still in useable condition, reuse hazardous products and recycle what can no longer be used. You can also share hazardous products you cannot use with a responsible friend or neighbor that needs the products.



P2 Principle Three: Improving Your Housekeeping

- ◆ Store hazardous products according to the instructions on labels.
- ◆ Unless the containers are leaking, always keep hazardous products in their original containers. The containers are designed specifically for the products.
- ◆ Immediately clean up any spills or leaks according to the instructions on labels.
- ◆ Make sure the containers always have readable labels. If a label comes off or can no longer be read, make a new label with a permanent marker.

P2 Principle Four: Educating Yourself and Others

- ◆ Share your knowledge and ideas regarding HHW reduction with your family and friends.
- ◆ Read and learn more about other alternatives to using hazardous products.

LESSON PLAN

The following lesson plan provides guidance and activities that will help you meet the following goals:

- ◆ Define household hazardous waste (HHW) and name its four characteristics
- ◆ Explain why HHW reduction is important, particularly how it affects people and the environment
- ◆ Explain how P2 concepts can be used to reduce HHW

What is Household Hazardous Waste?

Begin the lesson by asking students, "What is hazardous waste?"

- ◆ Explain that industries produce hazardous products that we use in our everyday lives. In turn, households that use these products may dispose of them as HHW.
- ◆ Ask the students to name some of the hazardous products that we use in our everyday lives (examples include gasoline; oil; paints and thinners; bathroom, kitchen, and drain cleaners; and pesticides). Based on the information provided, explain the four HHW characteristics (toxic, corrosive, ignitable, reactive).

- ◆ Provide an opportunity for interactive discussion in which you ask students to define and give examples of wastes that exhibit each characteristic or property.
- ◆ When explaining the "toxic" characteristic, explain that products and wastes may be more hazardous to other living things than to people and that the dose of a toxic waste (that is, how much you take in), as well as how you are exposed to it (for example, swallowed, breathed, or absorbed through the skin), determines the danger. Give medicine as an example: the recommended dose is good for you, but too much can be harmful. Review the list of types of HHW in our daily garbage.
- ◆ Explain that although a single household may generate much less waste than a factory, there are millions of households across the United States and almost all of them generate HHW.

Activity No. 1 - Household Hazardous Waste Quiz

Objectives: Students should understand four types of hazardous characteristics: toxic, corrosive, ignitable, and reactive and know the types of products to which they apply.



Time Length: About 15 minutes

Materials Needed: One copy of attached "Household Hazardous Waste Quiz" for each student.

Activity:

- ◆ Distribute and allow students 5 to 10 minutes to complete the "Household Hazardous Waste Quiz."
- ◆ Clarify that the items listed may exhibit more than one hazardous characteristic.
- ◆ Discuss the students' answers, making sure they understand the four characteristics of HHW.

Why is Household Hazardous Waste reduction important?

Based on the information provided, discuss why HHW reduction is important.

- ◆ Emphasize that improperly managing HHW can affect people and the environment, just like improperly managing industrial hazardous waste.
- ◆ Use the example of an oil tanker spill contaminating the ocean. Just as with a tanker spill, dumping used oil into a storm drain can pollute local water sources. In fact, a 1-quart can of oil can create a 2- acre oil slick, which is about the size of two football fields.

How can you help prevent pollution?

Based on the information provided, discuss how the four P2 concepts described earlier can be used to evaluate household practices and identify ways to reduce HHW in your home.

- ◆ Keep this discussion interactive—ask students for other ideas, including ways they can reduce their own use of products that can become HHW (for example, buying rechargeable batteries for games and radios).
- ◆ Emphasize that not using hazardous products or "changing what you use," although not always the easiest way to do something (it may require more time and "elbow grease"), is the best way to reduce household hazardous waste. However, if you must use a hazardous product, other P2 concepts can also help you reduce HHW.
- ◆ Review the following non- or less-toxic alternatives to using hazardous products, and ask students for other ideas about alternatives. Ask students to write these alternatives in their journals:

Kitchen and Bathroom Cleaner

- Mix vinegar with salt and water for a good surface cleaner.

Drain Cleaner

- Use vinegar and baking soda followed by boiling water.

Tub/Tile Cleaner

- For bathroom tiles, mix baking soda with non-chlorine bleach to form a paste. Apply with a brush, let dry, and wipe with a clean cloth.

Air Fresheners

- For room odors, set out a few drops of vanilla or peppermint extract in a dish; use aromatic herbs, incense, or potpourri.
- For carpet odors, sprinkle with baking soda and vacuum.

Roach Deterrent

- Sprinkle cracks and dark places with technical grade boric acid or borax. Keep out of reach of children or pets.



Ant Deterrent

- Wash countertops, cabinets, and floor with equal parts of vinegar and water to deter ants.

Activity No. 2 - Know Your Labels

Objectives: Students should be able to find information on labels about the characteristics and proper use of household hazardous products and understand that properly using products is an important element of P2.

Time Length: About 15 minutes

Materials Needed: A variety of labeled containers (preferably empty) of hazardous household products from your home. An unlabeled, clear-glass jar containing maple syrup or molasses.

Activity:

- ◆ Display containers and have students read the container labels that identify "WARNINGS" and "DIRECTIONS" to the rest of the class.
- ◆ From these labels, have students determine which of the four hazardous characteristics apply to these products and how to use them.
- ◆ Show students the unlabeled, clear-glass jar containing maple syrup or molasses and ask students to identify possible contents (looks like maple syrup, but could it be motor oil?). This shows the importance of keeping hazardous materials in their original containers.

Activity No. 3 - A Less Toxic Alternative

Objective: Students should be able to understand the benefits of using a less toxic alternative product.

Time Length: About 10 minutes

Materials Needed: Lemon juice, water, one-quart spray container, commercial window cleaning product (with ammonia, alcohol, solvent, or other toxic constituent), newspaper.

Activity:

- ◆ Select a student to mix 1 tablespoon lemon juice with 1 quart of water in the container.
- ◆ Have two other students apply the commercial window product and less toxic alternative to different windows in the classroom. Wipe windows clean using the newspaper and about the same level of effort.
- ◆ In an interactive discussion, have other students evaluate the effectiveness of the two cleaning products (Is the alternative just as effective? If not, what can be done to improve its effectiveness?).
- ◆ Have students identify the pros and cons of using each cleaning product (for example, the less toxic alternative takes time to mix and may require more effort, but is safer for you and the environment; the less toxic alternative is also less expensive).
- ◆ Note that using newspaper to clean windows is just as effective as using paper towels, but is less wasteful because it reuses a product that is already recycled.



Method of Evaluation/Assignment

Have students write the following questions in their journals:

- ◆ What hazardous products are used in your home?
- ◆ Are your hazardous products in their original containers, with labels?
- ◆ Do you read and follow directions on labels?
- ◆ Are your hazardous products stored in a safe place?
- ◆ Are you using any safer alternatives to hazardous products?
- ◆ If not, what safer alternatives could you be using?
- ◆ How is HHW disposed of at your home?

Using these questions, students should conduct a "home audit" with their families and write the results in their journals.

Household Hazardous Waste Quiz

The following is a list of common household products/materials. If disposed of, they may be considered household hazardous wastes. Identify the hazardous characteristic(s) for each of the materials listed.

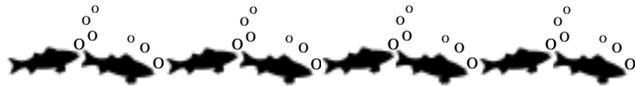
Write "I" for ignitable, "C" for corrosive, "T" for toxic, "R" for reactive, or "N" for none of the above.

[Note: more than one answer may be correct.]

- | | | |
|------------------------|-----------------------|-------------------|
| 1. Bleach | 6. Drain Cleaner | 11. Lighter Fluid |
| 2. Gasoline | 7. Ant & Roach Killer | 12. Latex Paint |
| 3. Oil-Based Paint | 8. Baking Soda | 13. Weed Killer |
| 4. Aspirin | 9. Oven Cleaner | 14. Antifreeze |
| 5. Nail Polish Remover | 10. Batteries | 15. Paint Thinner |

Household Hazardous Waste Quiz Answer Key

1. Bleach - C, T, R; 2. Gasoline - I, T; 3. Oil-Based Paint - I, T; 4. Aspirin - N; 5. Nail Polish Remover - I, T; 6. Drain Cleaner - C, T, R; 7. Ant & Roach Killer - T; 8. Baking Soda - N; 9. Oven Cleaner - C, T, R; 10. Batteries - C, T, R; 11. Lighter Fluid - I, T; 12. Latex Paint - T; 13. Weed Killer - T; 14. Antifreeze - T; 15. Paint Thinner - I, T



Trivia Quiz

1. What type of water pollution has a definite known origin?
 - a. point source
 - b. highly saline water
 - c. non-point source
 - d. water from rivers and streams
 - e. all of the above
2. Of the following, which can be water pollutants?
 - a. soil
 - b. fertilizer
 - c. stormwater
 - d. pet waste
 - e. all of the above



3. What is the best way to prevent non-point source water pollution?
 - a. don't swim
 - b. practice P2 principles
 - c. carpool
 - d. take showers instead of baths

4. Which federal agency is tasked with assuring our water quality?
 - a. Environmental Protection Agency
 - b. Food and Drug Administration
 - c. Federal Aviation Authority
 - d. National Oceanic and Atmospheric Administration

5. How many gallons of water can just 1 drop of oil contaminate?
 - a. 5,000
 - b. 8
 - c. 255
 - d. $\frac{1}{2}$
 - e. None of the above

6. Which federal law regulates our rivers and streams?
 - a. Safe Drinking Water Act
 - b. Endangered Species Act
 - c. Clean Water Act
 - d. National Environmental Protection Act

7. What determines the surface water quality in our watershed?
 - a. soil, geologic formations and terrain
 - b. vegetation
 - c. precipitation and run-off
 - d. human activities
 - e. all of the above

8. The Las Vegas Wash contributes about _____ % of the inflow to Lake Mead.
 - a. 50
 - b. 8
 - c. 25
 - d. 2
 - e. none of the above

9. What contributes to non-point source water pollution?
 - a. urban run-off
 - b. lawn over watering
 - c. stormwater
 - d. shower drainage
 - e. a, b and c above

10. The Earth's total water supply breaks down as follows:
 - a. 21% ocean (saltwater) to 79% fresh water
 - b. 50% ocean (saltwater) to 50% fresh water
 - c. 66.3% ocean (saltwater) to 33.7% fresh water
 - d. 97.2% ocean (saltwater) to 2.8% fresh water

11. An aquifer is:
- a natural surface water **reservoir**
 - a retention facility for storage of stormwater
 - a geological formation containing water, especially one that supplies water for wells and springs
 - a drinking water distribution system

Answers: 1. A, 2. E, 3. B, 4. A, 5. A, 6. C, 7. E, 8. D, 9. E, 10. D, and 11. C.



Section I: Water Pollution and Conservation

6th Grade

- ☞ Have a working knowledge of the processes of scientific inquiry and technological design to investigate questions, conduct experiments and solve problems.
- ☞ Design and safely conduct scientific investigations to answer questions and test the validity of predictions: making observations, describing procedures, organizing data, drawing conclusions, and interpreting results.
- ☞ Demonstrate skill in using scientific instruments and technology to obtain different levels of precision.
- ☞ Identify patterns and relationships that suggest a cause and effect or support inferences and hypotheses.
- ☞ Evaluate the validity of an argument through presentation of data.
- ☞ Have a working knowledge of the relationships among science, technology, and society in historical context.
- ☞ Demonstrate an understanding of the need for protecting, conserving, and efficiently utilizing renewable and nonrenewable natural resources.

7th Grade

- ☞ Have a knowledge of the relationships among science, technology, and society in historical context.
- ☞ Evaluate implications of technology for societies, vocations, economies, and the environment including trade-offs, intended benefits, unintended consequences, and constraints.
- ☞ Demonstrate the use of scientific instruments and technology for various purposes and levels of precision.
- ☞ Demonstrate and evaluate civic responsibility by participating in community conservation activities.
- ☞ Evaluate conservation practices and their effect on natural resources and the local economy.

8th Grade

- ☞ Have a working knowledge of the relationships among science, technology, and society in historical context.
- ☞ Evaluate implications of technology for societies, vocations, economies, and the environment including trade-offs, intended benefits, unintended consequences, and constraints.
- ☞ Demonstrate the uses of scientific instruments for various purposes and levels of precision.
- ☞ Demonstrate and evaluate civic responsibility by participating in community conservation activities.
- ☞ Develop a personal environmental impact statement and institute a conservation strategy.

Section II: Pollution Prevention In Schools

6th Grade

- ☞ Have a working knowledge of the process of scientific inquiry and technological design to investigate questions, conduct experiments and solve problems.
- ☞ Design and safely conduct scientific investigations to answer questions and test the validity of predictions: making observations, organizing data, drawing reasonable conclusions, and interpreting results.
- ☞ Demonstrate skill in using scientific instruments and technology to obtain different levels of precision.
- ☞ Have a working knowledge of the relationships among science, technology, and society in historical context.
- ☞ Demonstrate an understanding of the need for protecting, conserving, and efficiently utilizing renewable and nonrenewable natural resources.
- ☞ Identify opportunities for energy conservation at home, in school, and in the community.

7th Grade

- ☛ Have a working knowledge of the process of scientific inquiry and technological design to investigate questions, conduct experiments and solve problems.
- ☛ Know and apply the concepts, principles, and processes of technological design.
- ☛ Identify a real-world problem, propose a technological solution, implement the proposed solution, modify as needed, evaluate, and produce a report of the process.
- ☛ Have a working knowledge of the relationships among science, technology, and society in historical and contemporary contexts.
- ☛ Demonstrate and evaluate civic responsibility by participating in community conservation activities.
- ☛ Develop a personal environmental impact statement and institute a conservation strategy and develop a plan for increased efficiency.

8th Grade

- ☛ Have a working knowledge of the processes of scientific inquiry and technological design to investigate questions, conduct experiments and solve problems.
- ☛ Know and apply the concepts, principles, and processes of technological design.
- ☛ Compare and contrast solutions to a problem, considering factors such as available materials, tools, cost-effectiveness, and safety.
- ☛ Report in a public forum the relative success of a design based on test results and criteria.
- ☛ Have a working knowledge of the relationships among science, technology and society in historical and contemporary contexts.
- ☛ Demonstrate and evaluate civic responsibility by participating in school, home and community conservation activities.
- ☛ Develop a personal environmental impact statement and institute a conservation strategy.

Section III: Household Hazardous Waste Reduction

6th Grade

- ☛ Have a working knowledge of the relationships among science, technology, and society in historical and contemporary contexts.
- ☛ Demonstrate an understanding of the need for protecting, conserving, and efficiently utilizing renewable and nonrenewable natural resources.

7th Grade

- ☛ Have a working knowledge of the process of scientific inquiry and technological design to investigate questions, conduct experiments and solve problems.
- ☛ Know and apply the concepts, principles, and processes of technological design.
- ☛ Use appropriate vocabulary to describe science phenomena and instruments.
- ☛ Have a working knowledge of the relationships among science, technology, and society in historical context.
- ☛ Demonstrate and evaluate civic responsibility by participating in school, home, and community conservation activities.
- ☛ Develop a personal environmental impact statement and institute a conservation strategy and develop a plan for increased efficiency.

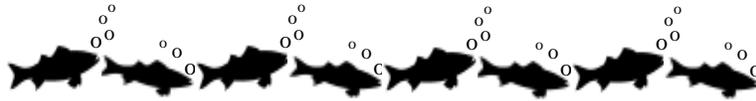
8th Grade

- ☛ Have a working knowledge of the processes of scientific inquiry and technological design to investigate questions, conduct experiments and solve problems.
- ☛ Know and apply the concepts, principles, and processes of technological design.
- ☛ Use appropriate vocabulary to describe science phenomena and instruments.
- ☛ Have a working knowledge of the relationships among science, technology, and society in historical context.
- ☛ Evaluate implications of technology for societies, vocations, economies, and the environment including trade-offs, intended benefits, unintended consequences, and constraints.
- ☛ Analyze how the introduction of new technology has affected or could affect human activity.

Glossary

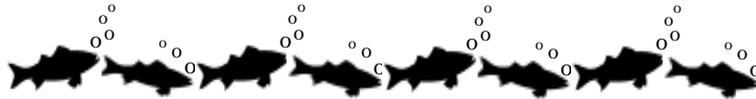
Aquifer	Underground beds or layers of earth, gravel, or porous stone that yields water.
Bacteria	A unicellular microorganism existing as either free-living organisms or parasites.
Caustic	Capable of burning, corroding, dissolving, or eating away by chemical action.
Conservation	Preservation from loss, damage, or neglect. Increasing supply by reducing demand.
Dewatering	Pumping of undesired water from a shallow groundwater source.
Ecosystem	An ecological community together with its environment functioning as a unit.
Environment	The combination of external physical, chemical and biotic factors affecting the growth and development of an organism or ecological community.
Groundwater	Water beneath the earth's surface, often between saturated soil and rock, that supplies wells and springs.
Household hazardous wastes	Products found in a typical household generally used for cleaning.
Hydrologic cycle	The cycle of evaporation and condensation that controls the distribution of the Earth's water as it evaporates from bodies of water, condenses, precipitates, and returns to those bodies of water.
Ignitable	Flammable materials like gasoline and paint thinner that catch fire very easily, sometimes with just a little extra heat or a small spark.
Organism	A system regarded as analogous to a living body, such as a plant or animal.
Municipal water supply	Water treatment, conveyance and service provided by a local government agency.
Non point source pollutants	Pollutants entering a waterway or water body from an unknown or dispersed origin.
Point source pollutants	Pollutants entering a waterway or water body from a known origin and thus treated.
Pollutant	Substance that contaminates the environment.
Pollution prevention	Concepts that can protect water from pollution and conserve water by reducing the amount of water use.
Precipitation	Any form of water such as rain, snow, sleet, or hail that falls to the earth's surface.
Purification	To clean or rid of impurities and pollutants.
Reactive	Unstable materials can explode or give off poisonous gases when mixed with water or other materials.

- Reservoir** A natural or artificial pond or lake used for storage and regulation of water.
- Sanitary sewer system** A conveyance system to carry wastewater from residences, commercial and industrial developments for treatment at a wastewater treatment facility.
- Stormdrain** A conveyance system to carry stormwater and urban runoff from built areas.
- Toxic** Poisonous materials like pesticides and expired medicines can harm various organs when swallowed, inhaled, or absorbed through the skin. Some toxic materials can also cause cancer.
- Urban runoff** Typically non-point source polluted water originating in the urban environment from over irrigation and dewatering.



Acronyms

- BMP** Best Management Practices
CDSN Conservation District of Southern Nevada
CWA Clean Water Act
EPA Environmental Protection Agency
HHW Household Hazardous Waste
MGD Million Gallons per Day
NDEP Nevada Division of Environmental Protection
NPS Non Point Source
NPDES National Pollutant Discharge Elimination System
P2 Pollution Prevention
SDWA Safe Drinking Water Act
SNWA Southern Nevada Water Authority
SNWS Southern Nevada Water System



Websites of Interest

- www.cdsn.org
www.lvwd.com
www.snwa.com
www.lvwash.org
www.epa.gov





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