WATER QUALITY

DETECTIVES

AFTER SCHOOL PROGRAM

BROUGHT TO YOU BY THE CALIFORNIA WATER BOARDS

Erase the Waste

INTRODUCTION

WATER QUALITY DETECTIVES LESSON PLANS

WATER QUALITY DETECTIVES WORKBOOK

SERVICE LEARNING PROJECT IDEAS

State Water Resources Control Board

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Arnold Schwarzenegger
Governor

Dear After School Provider:

We would like to help educate your students about a major environmental and public health issue now facing California: polluted runoff. The pollution is created when trash and everything else left on ground is washed or thrown into stormdrains. Unlike the sewer system, where contaminated water flows through treatment plants, stormwater runoff is carried untreated by stormdrains directly into local creeks, rivers, and the ocean. The stormwater pollution is creating unhealthy waterways and growing environmental problems for local communities.

The California Water Boards, local agencies, and others are working hard to reduce polluted runoff and its harmful effects. Public education is one important way to reach that goal, along with cleaning up problem sites, and requiring public and private entities – including after school programs – to become involved in reducing polluted stormwater runoff. To this end, we are asking after school providers and their students to become involved in helping to restore and protect California's water quality.

The Water Boards are comprised of the State Water Resources Control Board in Sacramento and nine regional water boards throughout the state. The boards serve collectively as the state agency responsible for ensuring the quality of California's water. Toward this end, the Water Boards have developed the enclosed water quality units of study specifically for upper elementary/middle school grade levels. These instructional tools use the educational process known as "service learning," integrating inquiry-based learning with real-world, hands-on experiences. The lessons aim to improve the water running off of school/facility locations and from adjacent communities. Called the Water Quality Detectives After School Program, the activities were designed to increase students' awareness of polluted runoff and how it impacts local waterways and the environment.

Additionally, the Water Boards created the Water Quality Service Learning Program, a school-based water quality program, specifically for 4th – 6th grade levels, and a Web-based learning tool, featuring an online mentor. Log onto www.waterlessons.org for additional resources and support.

It is our goal to offer every after school program student in California the opportunity to learn about local environmental science issues and, more importantly, to take an active role in improving local waterways. We believe our Water Quality Detectives After School Program – an unprecedented effort in California – can help achieve that. It is with this hope that we offer you this guide. With your involvement, we can help youth become environmental stewards and ensure cleaner and healthier California waterways for years to come.

Sincerely,

Tam M. Doduc

Tam M. Doduc, Chair

INTRODUCTION

WHAT IS SERVICE LEARNING?

Service learning, as defined by the National Service Learning Partnership, "is a teaching method that engages young people in solving problems within their schools and communities as part of their academic studies or other types of intentional learning activities. Service learning helps students master important curriculum content by making meaningful connections between what they are studying and its many applications. Service learning also helps young people develop a range of service skills, from acts of kindness and caring, to community stewardship, to civic action."

Service learning differs from community service in that service learning includes a learning component and is student-driven, rather than project-driven by an adult organizer. Examples of service learning:

- Students create a trash reduction campaign after studying the cause of trash and its effect on the water quality of a local body of water and the water cycle.

- Students present posters and presentations to younger students after discovering the impact water runoff at their facility has on living organisms.

The Water Quality Detectives After School Program incorporates key elements of quality service learning, including: integrated learning, service to the community, collaboration, student voice, civic responsibility, reflection, and evaluation.

KEY ELEMENTS OF QUALITY SERVICE LEARNING

Ideally, when developing a quality service learning project, all of the following key elements should be included:

1. INTEGRATED LEARNING

Service learning projects support the learning objectives of the after school program and vice versa.

2. SERVICE TO THE COMMUNITY

Service learning projects bring together students, program providers, and community partners to provide meaningful service that meets community needs.

3. COLLABORATION

A quality service learning project incorporates many partners ("stakeholders") in its design and implementation, including students, parents, community-based organizations, program providers, and service recipients. All partners benefit from the project and contribute to its planning and implementation.

4. STUDENT VOICE

Students participate actively in every step of the project, including identifying community needs and issues, choosing and planning the project, reflecting on it at each stage, evaluating it, and, most importantly, celebrating its success to reinforce a "job well done."

5. CIVIC RESPONSIBILITY

By participating in a service learning project, young people learn that they can have a positive effect on their community and that their voice counts.

6. REFLECTION

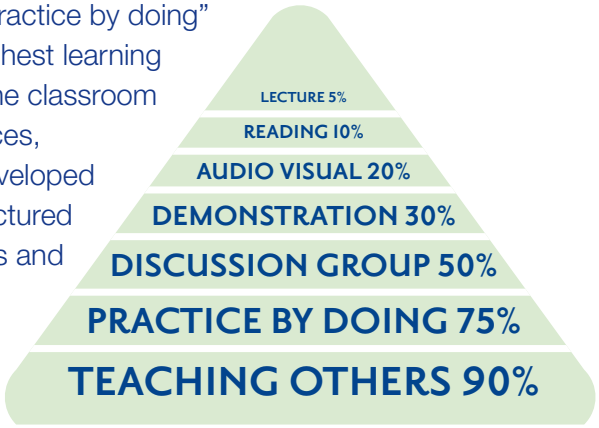
Service learning incorporates important reflection time before, during, and after the project to draw links between the social and personal aspects of the project.

7. EVALUATION

Evaluation conducted by all partners, including the students, program providers, and communities, measures progress towards the learning and service goals of the project.

WHY IS SERVICE LEARNING MORE EFFECTIVE?

Service learning primarily uses the methods of "practice by doing" and "teaching others," both of which yield the highest learning retention rates. By integrating what's learned in the classroom with outside-the-classroom community experiences, students retain more. "The Learning Pyramid" developed by the NTL Institute of Alexandria, Virginia and pictured here, shows various curriculum teaching methods and the learning retention rates resulting from each method.



AVERAGE LEARNING RETENTION RATES

STUDIES SHOW THAT SERVICE LEARNING AND AFTER SCHOOL PROGRAMS ARE A WINNING COMBINATION

Reports have shown that compared to youth across California, youth involved in after school programs with service learning components reported higher levels of cooperation, teamwork, respect for others, and conflict resolution. Some after school programs were able to measure academic improvement, including increased grade point averages and higher test scores.

The reports were conducted by Youth Service California (YSCal), funded through a grant from the Governor's Office on Service and Volunteerism (GO SERV) and the Corporation for National and Community Service. YSCal established seven after school programs distributed throughout California. Called the California After School Service Learning Initiative, they demonstrated that service learning can contribute significantly to the achievement of youth in after school programs.

THE TIME TO ACT IS NOW

It is against the backdrop of these promising service learning studies that the California Water Boards decided to bring integrated environmental learning to after school providers in California. We believe that this will not only result in higher student achievement, but also result in cleaner, healthier California waterways in the future. The time to act is now.

OVERVIEW

At the beginning of the Water Quality Detectives Program, students are invited to be detectives in search of the mystery of where and how water is polluted. As part of their first assignment, students hone their observation skills in preparation of the "site investigation." The site investigation has students observing their facility/school grounds – mapping where water comes from, where it goes, any pollution left on the ground, and more. Based on their observations, discussions, and their review of a one-page information sheet focused on water quality, students develop ideas about what might be happening on their site. Next, students use maps to determine where the nearest body of water is to the study site while learning about watersheds and the impact of pollution.

While collecting data, students continue to build content knowledge and context before reflecting on what they have learned and share their thoughts through the choice of a PowerPoint presentation, poster, news article, or other idea.

In the final step of the Water Quality Detectives Program students use their reflections to make informed choices and develop a service project to help their community. Students use their workbooks to guide them through project development and follow through.

Feel free to adapt the activities as needed and develop plans that match yours and your students' needs.

ADVANCE PREPARATION

WATER QUALITY INFORMATION

Gather information that will help you and your students' understanding of local issues of water quality. Consult the California Water Boards at www.swrcb.ca.gov, the California Environmental Protection Agency at www.epa.gov/water or www.epa.gov/surf, your local regional water board (listings are available at www.swrcb.ca.gov), or other environmental groups.

STUDENT WORKBOOKS

Pages for the Water Quality Detectives Workbook are provided. Create a workbook for each student by photocopying pages and inserting them into a notebook, placing them in a folder, or stapling them together with a tagboard or construction paper cover. These workbooks will be used by the students through each step of the program.

FACILITY/SCHOOL MAP

For the Site Investigation activity (Part 2), photocopy an outside map of your facility. Enlarge it as much as possible, and divide it into different areas. Schools usually have a map of their campus that can be used, but be sure to white out or cover any unnecessary information before photocopying. A simple, hand drawn map can be used as well. The map should indicate major buildings, walkways, driveways, eating areas, etc.

AREA MAPS

For the What is a Watershed? activity (Part 4), gather maps of the area that show where rivers and other bodies of water are located. Maps that show the route water takes to either the ocean or another large body of water are ideal. Local street maps and Thomas Guides are good choices. Photocopy, if necessary, to give each student group their own maps to investigate.

FIELD TRIP

If possible, plan a field trip to enhance the program. Identify a site where polluted runoff enters the closest body of water or a part of the waterway that demonstrates human impact. This will help students make the connection between what they are learning and the water quality in the community.

Be sure the site is easily accessible and safe for students. Contact a resource professional familiar with water quality issues in your area to help or provide a guide to answer questions.

You may find sites within walking distance from your facility/school. If not, seek the help of staff responsible for local areas. Most communities have city and county park districts, as well as various governmental agencies that can assist you.

WATER QUALITY DETECTIVES

PART I – 60 minutes

OVERVIEW

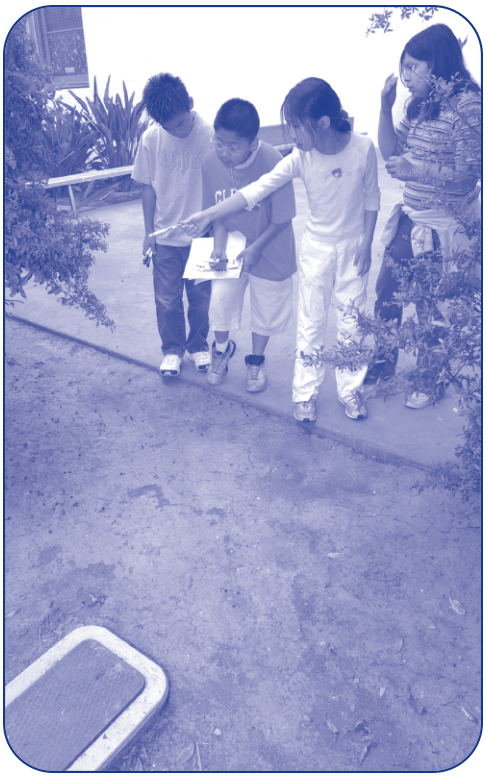
Students are introduced to the program as they receive their Water Quality Detectives Workbook and go over the "case" they are to solve. They will learn water quality code words and make predictions about what they think they will find, discover, and solve. An observation game teaches them the need for good observation skills to be a water quality detective.

PROCEDURE

1. Congratulate students for taking on this mission, and becoming water quality detectives. Explain that as part of this program they will learn how to observe, investigate, analyze, and come up with solutions to a potential problem in their community.
2. Ask students what the term "water quality" means. After getting responses, confirm that it refers to whether water is suitable or not if used for drinking, swimming, farming, fish production, or industrial processes. Specific levels of pollutants that make water harmful for these uses, determine poor water quality.
3. Explain that a Water Quality Detective is someone who is in search of clues about what may contribute to poor water quality in their community. Every time water quality detectives get together they will receive a new assignment that will lead them to solve the case.
4. Pass out a Water Quality Detectives Workbook to each student. Go through the first page that explains the "mission."

MATERIALS

- Water Quality Detectives Workbook – 1 per student
- Pen/pencil – 1 per student
- 12 – 15 easily recognizable objects such as pen, book, keys, shoe, pine cone, feather, rock, leaf, etc.
- Cloth large enough to cover objects
- Blindfold/bandanna – 1 per student pair



5. Go through the water quality code words and discuss the definitions. These are words they will learn and use that will help them accomplish their mission.
6. In their workbook, ask students to predict what they think they will discover the quality of water in their community.
7. Explain to students that in order to be good detectives they will need to have good observation skills. Discuss what being observant means: to pay attention; to notice things and be alert; even to take notes about a particular thing that they are investigating.
8. Invite the students to try out their observation skills. Explain to them that you have several objects under the cloth on the table. You are going to lift the cloth and give them one minute to look at what is there. You will then cover the objects again and they are to write in their workbook all the items they can remember.
9. After one round of the game, share the number of items under the cloth. Did they get them all?
10. Tell the students they will have another chance, but this time they get to use all their senses (touch, smell, and sound) except sight. Arrange students in pairs. One of the partners will be blindfolded (or have eyes closed) while the other hands their partner the different objects. Allow the partner to touch, smell, and listen to the object. Have the partners switch roles after all the items have been rotated around the class.
11. Place the objects under the cloth. Again, have students write down all the items they can remember. Compare their list to the prior list.

WRAP-UP

1. Discuss with students their observations and ask the following guided questions:
   a. Did you remember more items the second time? Why?
   b. How do you think the use of all your senses helps you to be more observant?
2. In their workbook, have students reflect on what they learned about observation.

ANTICIPATION

1. Use the following phrase to help your students anticipate the next lesson:
   "Next time, you will receive your first assignment, and use your observation skills to look for clues!"

SITE INVESTIGATION

PART 2 – 60 minutes

PART 2

OVERVIEW

Student teams are given maps of the site they are to investigate. Students follow the guidelines in their Water Quality Detectives Workbooks to make water related observations and indicate their findings on the map and in their workbooks.

HELPFUL HINTS

- Plan ahead for proper adult supervision for each group of students "mapping" around the area.
- Outline a walking route around the area to help point out key items pertaining to the questions on the Site Investigation (rain gutters, drains, etc.), and any safety hazards.
- If necessary, take time to orient students on how to read a map of the area from a "birds eye view." It is essential that students are able to read their map.
- Depending on the students and the site, you may choose to facilitate the activity as one group – going from location to location – rather than in separate student groups.

MATERIALS

- Water Quality Detectives Workbook
- Map of site to be investigated – photocopy a map of the outside area where students will be conducting the investigation. Enlarge the map as much as possible, and divide it into different areas.
- Green, blue, purple, black, and red markers or colored pencils – 1 set per group

ASSIGNMENT

1. Pass out the students' Water Quality Detectives Workbooks. Go over Assignment #1 with students.
2. Explain to the students that their first assignment is to do detective work to investigate different areas of their facility/school to find out where water can get in the ground, sources of water, where it travels, where there is trash and other harmful items on the ground, and finally, where water is wasted.
3. Go through the water quality code words and discuss the definitions. Explain that they will be using these words today.

4. Pass out markers/colored pencils and maps of the site. Explain to students that they will use their maps to mark what they find.
5. Have students find Assigment #1 (Site Investigation) in their workbook. Go through the worksheet and demonstrate what the student groups will be looking for and how to mark their map.
6. Help student groups read their map and familiarize themselves with their designated area.
7. As a group, walk to one area to point out examples of what they will be looking for and how they should mark these items on their map, including drains, rain gutters, and anything else that may not be familiar.
8. Give groups a deadline before sending them to their different locations.

WRAP-UP

1. When students return to the meeting area, discuss their detective work and go over what was found using the following guided questions:
   a. In what places can water get into the ground?
   b. What sources of water did you find?
   c. In what places does water travel?
   d. What kind of trash or other harmful items did you find?
   e. In what areas is water wasted?

2. In their workbook, have students reflect on what they observed and how it might relate to water quality.

ANTICIPATION

1. Use the following phrase to help your students anticipate the next lesson:
   “Next time, we will analyze the clues and go deeper into solving “how” water is being polluted.”

WHAT IS THE QUALITY OF YOUR WATER?

PART 3 – 60 minutes

OVERVIEW

Students put their individual maps together to create one large map of the site to review the sources of water, where water gets into the land, where it flows, where it is wasted, and where trash and other harmful items can be found.

HELPFUL HINTS

- When reading News Flash!, have students use a marker to highlight or underline key points or information they think is important.
- After reading News Flash!, set up a demonstration with water, trash, and a concrete surface to show students how water carries trash.

MATERIALS

- Water Quality Detectives Workbook
- Investigation maps of site
- Tape
- Markers

ASSIGNMENT

1. Pass out the students' Water Quality Detectives Workbooks. Go over Assignment #2 and code words for the day.
2. Remind students what they did in their last assignment. Explain that their next assignment is to analyze what they learned about the investigated area.
3. Take each of the map sections and tape them together to make one complete map of the investigation area. Affix to a wall or white board.
4. Discuss their detective work and go over what was found, pointing out that:
   a. Water comes from many sources, including rain.
   b. Water travels over concrete surfaces and into gutters, drains, and the street.
   c. Water that travels into dirt, grass, and garden areas is usually able to seep into the ground.
   d. Water can be wasted when it floods or when used to hose down concrete.
   e. Trash and other harmful items can be found on the ground.

5. Have each student read the first News Flash! in their workbook.
6. Have student groups discuss what they read and the ways in which it relates to what they observed about the investigated area. Each group can report their main points to the class as part of a group discussion.

WRAP-UP

1. Re-look at the site map and discuss with students the clues they found. As you go through the following questions, circle the areas on the map that may need further investigating.
   a. Did we find trash at our site?
   b. Where did it come from?
   c. Where will it go?
   d. If it isn't in a trash can what is going to happen to it?
   e. How does wasted water flowing over hard surfaces impact the plants, fish, and animals living in local rivers and streams?
   f. Is the trash we found harmful to our water and the environment?
2. In their workbook, have students reflect on what they think may be the greatest problem to water quality at their site.

ANTICIPATION

1. Use the following phrase to help your students anticipate the next lesson:
   "Next week's assignment will use maps to get us closer to solving the case."

WHAT IS A WATERSHED?

PART 4 – 60 minutes

OVERVIEW

Students read the one-page information sheet in their workbook about watersheds. Using local maps, students locate the closest body of water to their site, and based on what they learn, students think about the route water takes from their site to the nearest body of water and how it may be impacted.

HELPFUL HINTS

- When reading News Flash!, have students use a marker to highlight or underline key points or information they think is important.

MATERIALS

- Water Quality Detectives Workbook
- Local maps – 1 per student group
- Pencils/Markers

ASSIGNMENT

1. Pass out the students' Water Quality Detectives Workbooks. Go over Assignment #3 and the code words for the day.
2. Remind students what they did in their last assignment. Explain that their next assignment is to investigate what waterway may be affected by what they found at their site.
3. Have each student read the second News Flash! in their workbook.
4. Have student groups discuss what they read and the ways in which it relates to what they observed in the investigated area. Each group can report their main points to the class as part of a group discussion. Discuss:
   a. The living and non-living components of a watershed.
   b. How water travels from higher areas to lower areas.
   c. In what ways is clean water essential to the health of the living components of a watershed?

(continued) ▸

   d. Water that travels over hard surfaces carries everything with it into the nearest body of water.
   e. How does land pollution affect the non-living components of a watershed?
   f. How does this affect the living components of a watershed?
   g. Where is the water going that travels from our site?
5. Pass out city maps of the area, specifically those that include the location of the facility/school, and the closest body of water to the site.
6. Ask the student groups what they can find on a map – streets, cities, etc. Explain that maps can also show rivers, creeks, and other waterways.
7. Have students investigate the maps and locate the waterway closest to their facility/school and, if possible, trace its path from origin to end.
8. Have students investigate how they think water travels from their site to the body of water.
   a. Underground stormdrains?
   b. Street gutters?
   c. Any other way?

WRAP-UP

1. Discuss with students their detective work and go over what they found using the following guided questions:
   a. How do you think what we found during the site investigation affects the waterway closest to this site?
   b. What are some questions you have, or what more would you like to find out? Examples:
      i. Are there any groups in the area involved with water quality?
      ii. Does the trash we found at our site make its way to the waterway?
      iii. Where does the trash come from and can we eliminate it from its source?
2. In their workbook, have students reflect on whether or not they think their site has an impact on the closest body of water and any questions they have.

ANTICIPATION

1. Use the following phrase to help your students anticipate the next lesson:
   "Next week's assignment will be to go deeper into solving some of these questions."

INVESTIGATE FURTHER

PART 5 – 60 minutes

OVERVIEW

Depending on the resources of the facility/school, and information about local water issues, students find out more about what is happening in their community – either through Internet access, local experts, local articles, etc. A planned field trip is ideal.

ASSIGNMENT

1. Pass out the students' Water Quality Detectives Workbooks. Go over Assignment #4.
2. Remind students what they did in their last assignment. Explain that their next assignment is to investigate further to find out more about water quality issues in their community.
3. Provide students with a variety of options to do their detective work:
   a. Computers
   b. Local articles or studies
   c. Guest speaker from local government, such as a stormwater manager, someone from the department of public works, or someone from an environmental or other non-profit group
4. Have students keep a record of their findings in their workbooks.

MATERIALS

- Water Quality Detectives Workbook
- Local information, Web sites, etc. that would help students find out about local water quality issues existing in their community.

WRAP-UP

1. Discuss with students their detective work and go over their mission to see if they solved the mystery:
   a. What clues about water quality did we find at our site?
   b. How does water become polluted?
   c. Where does water come from in our community?
   d. Where does water go in our community?
   e. How did our site discoveries contribute to water quality in our community?

2. In their workbook, have students reflect on what they can do at their site or in their community to improve water quality.

ANTICIPATION

1. Use the following phrase to help your students anticipate the next lesson:
   "Next week we'll get creative and share what we have learned with others."

REFLECTION

PART 6 – 60 minutes

OVERVIEW

Students choose a way to share what they have learned about water quality issues. They connect their investigations to their own activities at the facility/school and the community. Reflections can be in the form of a PowerPoint presentation, poster, poem, news article, etc.

HELPFUL HINTS

- The goal is for students to reflect on what they have observed and learned, and share their thoughts about it. Reflection is an important part of the service learning process.
- Help students to formulate ideas and include the results of their investigations, how the results link to water quality, and one thing that they can do to improve water quality at their facility/school or in their community.

MATERIALS

- Water Quality Detectives Workbook
- Supplies as needed: poster paper, computer.

PROCEDURE

1. Pass out the students' Water Quality Detectives Workbooks. Go over Assignment #5.
2. As a class, have students reflect on what they have learned using the following guided questions.
   a. What did you learn from your experience?
   b. How did your conclusions differ from your prediction?
   c. How can your knowledge about water help you make good choices about water quality?
   d. Why is clean water important?
   e. How can you improve water quality at your school or in your community?

3. Have students decide on a way to present their thoughts on water quality and solutions. Give guidelines to include information on how their investigations and the evidence they collected influenced their ideas about water quality. Ideas include:

   a. PowerPoint presentation

   b. Poster

   c. Poem

   d. News article for local paper or newsletter

   e. Information booklet

WRAP-UP

1. Invite students to present their reflections to the class and share their ideas to improve water quality.

ANTICIPATION

1. Use the following phrase to help your students anticipate the next lesson:
   "Next week we'll use our ideas to improve water quality and come up with a project we can do together."

SETTING UP A SERVICE LEARNING PROJECT

PART 7 – Two to three 45-minute planning sessions
Project length determined by project

OVERVIEW

Following the instructions in their Water Quality Detectives Workbooks, students work together to plan and carry out a water quality community service project.

HELPFUL HINTS

- Student voice is an important component of service learning. However, to save time, you may want to determine what projects might work best for your class to help guide student discussions. A list of project ideas is provided.
- Invite the school prinicpal or facilities manager to hear the students' ideas and to show support.

MATERIALS

- Water Quality Detectives Workbook
- Chart paper
- Mural paper
- Markers

PROCEDURE

1. Pass out the students' Water Quality Detectives Workbooks. Go over Assignment #6.
2. Explain to students that the last part of their mission was to "take action." Use the students' reflection pieces to begin a discussion that leads to planning a service learning project, and how these efforts may help resolve a water quality problem at their facility/school or in their community.
3. Using the worksheets in their workbooks, have student groups follow the guidelines to list the problems they found and ideas that might resolve the problems. Have groups share their findings as you list them on the board/chart paper. As one group, pick the top three ideas.
4. Have students fill out one Look Closer worksheet for each of the top three ideas. Have them share their findings and decide which one seems most practical and most exciting to them. Using the worksheet, have students develop possible names for their project. As one group, decide or vote on a final name.
5. Have student groups use the worksheets to brainstorm the tasks necessary to implement their project.

6. Help students organize the tasks. Use a large sheet of mural paper and organize the tasks using a technique called webbing:
   a. Place the name of the project in the center and circle it.
   b. Write each suggested task, circle it, then connect it to the center.
   c. Tasks associated with these main tasks should be circled and connected to the task.
7. As a class, use the worksheet to assign tasks.
8. Have students use the Get Support For Your Project worksheet to brainstorm who might be able to support the project or provide helpful ideas or resources.
9. Help students follow the task list to implement their project.

CELEBRATE AND EVALUATE

PART 8 – 60 minutes

OVERVIEW

The program wraps up with a letter to the California Water Boards describing what the students learned, the project they accomplished, and how they evaluated their project. Finally, students celebrate their detective work and receive a certificate for accomplishing their mission.

HELPFUL HINTS

- Have students display all of their work in an open house format for others to see.
- Invite parents and community members to the celebration.

MATERIALS

- Water Quality Detectives Workbook
- Letter writing materials
- Signed student certificate – 1 per student
- Supplies for celebrating

PROCEDURE

1. Pass out the students' Water Quality Detectives Workbooks. Go over Assignment #7.
2. As one group or individually, have students write to the California Water Boards about their project and its success. Address letters to:

   Public Affairs Office
   California Water Boards
   1001 I Street
   P.O. Box 100
   Sacramento, CA, 95812
   info@waterboards.ca.gov

3. Pass out certificates of accomplishment to each student.
4. Celebrate! Work with the students to come up with celebration ideas, such as a pizza party, picnic, or ice cream social. Or, make t-shirts with a catchy motivational slogan on the back (e.g. "We made a difference!") for everyone who participated.

WRAP UP

1. Have students evaluate their project by answering the following questions in their workbook:
   a. What were the most successful parts of the project?
   b. What was the least successful part?
   c. What did you learn from your experience?
   d. What would you do differently next time and why?
   e. Who or what was influenced by your action?
   f. Would you like to get involved in another environmental service project? If yes, what would it be? If no, why not?

MISSION ACCOMPLISHED!

Congratulations!

Name of student

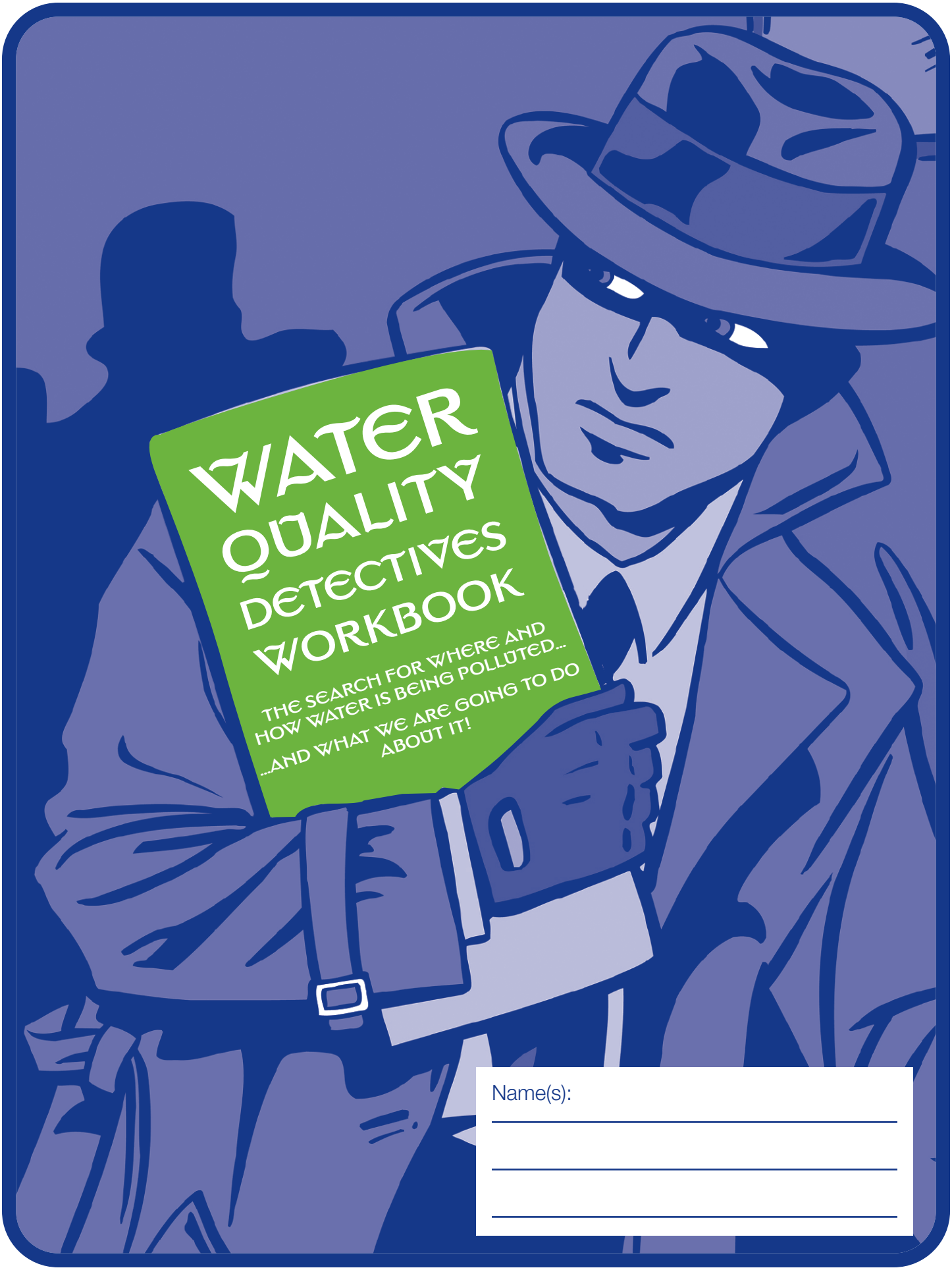
is an official

WATER QUALITY DETECTIVE

Signed Date

CALIFORNIA Water Boards

Erase the waste


WATER QUALITY DETECTIVES WORKBOOK
THE SEARCH FOR WHERE AND HOW WATER IS BEING POLLUTED...
...AND WHAT WE ARE GOING TO DO ABOUT IT!

Name(s): _____

_____

_____

WATER QUALITY DETECTIVES

The search for where and how water is being polluted…
and what we are going to do about it!

YOUR MISSION:

1. **Look for clues about water quality at your site.**
2. **Solve the mystery of how water becomes polluted.**
3. **Solve the mystery of where water comes from and where it goes in your community.**
4. **Investigate how the clues you find are linked to the quality of water in your community.**
5. **Take action!**

CODE WORDS

1. **Freshwater** – Water that is not salty.
2. **Investigation** – The process of using inquiry and examination to gather facts and information in order to solve a problem or answer a question.
3. **Water Pollution** – The addition of any substance that has a negative effect on water and the living things that depend on water.

PREDICTION

What do you predict you will find out about the quality of water in your community?

_____

_____

_____

REFLECTION

What did you learn about observation?

_____

_____

_____

MY OBSERVATIONS

Round 1:

Round 2:

ASSIGNMENT #1

SITE INVESTIGATION

Use your detective skills to investigate your site and find:

1. Places where water can get into the ground

2. Sources of water

3. Where water travels

4. Where there is trash and other harmful items on the ground

5. Where water is wasted

CODE WORDS

1. **Catch Basin –** The opening in a curb or gutter that catches water and directs it to stormdrains.
2. **Downspout –** A vertical pipe used to drain water from a roof.
3. **Gutter –** A channel for draining off water.
4. **Rain gutter –** A channel along the roof that collects and carries away rainwater.

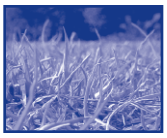
REFLECTION

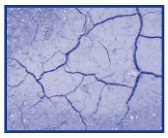
What did you observe and how do you think it relates to water quality?

SITE INVESTIGATION

In your designated area, observe what's around you. Use the colored markers/pencils to mark these observations on your map.

1. **Look for places where water can get into the ground.**
   Use green dots ::: to show these places on your map.


☐ grass


☐ bare dirt


☐ gardens


☐ tree wells

What other places did you find? _____

2. **Look for sources of water.**
   Use a blue waterdrop ♦ to show these places on your map.


☐ faucets


☐ drinking fountains

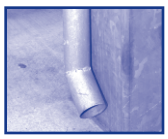

☐ sprinklers


☐ hoses

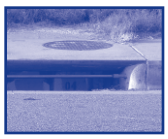
What other sources did you find?_____

3. **Look for places where water travels.**
   Use a purple square ■ to show these places on your map.


☐ gutters

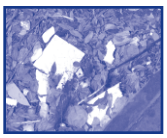

☐ down spout


☐ drain

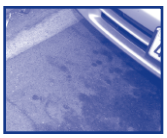

☐ catch basin

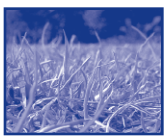
What other places did you find? _____

4. **Look for trash and other things that could be harmful to water.**
   Use a red X to show these items on your map.


☐ lunch trash


☐ candy wrappers

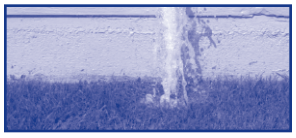

☐ motor oil


☐ lawn/field care products

What kinds of trash and other harmful items did you find in your area? _____

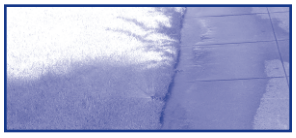
_____

5. Look for areas where water is wasted.
Use a black star ★ to show these areas on your map.



☐ leaky faucets and sprinklers

☐ clogged drains



☐ water sprayed on concrete

What other areas did you find?_____

ASSIGNMENT #2

WHAT IS THE QUALITY OF YOUR WATER?

Use your detective skills to investigate your site and find:

1. **What might cause problems to water quality at your site?**

2. **Where are the problems to water quality at your site ?**

CODE WORDS

1. **Fertilizer** – Nutrients used by plants for growth.
2. **Groundwater** – The freshwater that fills the cracks and pores beneath the earth's surface, which supply wells and springs.
3. **Hazardous Waste** – Products that contain chemicals that are harmful to humans and the land. These include house paint, cleaning products, insect poison, and fertilizers.
4. **Land Pollution** – The trash dropped on the land, such as gum, food wrappers, cans, paper, and plastic bags. It also includes pet waste and oil dripped from cars.
5. **Pesticide** – Chemicals used to kill pests. Pests may include ants, termites, mice, rats, and agricultural pests.
6. **Stormdrain** – Above ground or below ground pipes and channels that transport stormwater to the ocean to prevent flooding.

REFLECTION

What may cause the greatest problem to water quality at your site?

NEWS FLASH!

Did you know that almost every living thing on Earth needs and depends on its environment for survival? People, plants, animals, and other living organisms live and interact with each other as part of a community. Every member of that community interacts with its physical environment. Together, a community and its physical environment make up an ecosystem.

The health of an ecosystem affects the ability of people, plants, and animals to survive. The environment of California has 200,000 miles of rivers and streams, 1,100 miles of coastline, more than 10,000 lakes, and more than 1 million acres of bays and estuaries.

Unfortunately, most of these rivers and other water environments have become polluted. For example, when it rains in cities, rainwater picks up many materials that have been left on the ground, including car oil, car grease, garden pesticides, pet droppings, and most of all, trash! All this "land pollution" gets carried by the rainwater into a water or "stormdrain" system that leads to streams and rivers. Even when it is not raining, wasted water from hoses, sprinklers, and faucets send polluted water into drains that lead to streams and rivers.

How does this affect the living organisms that live there?

Rainwater seeping into the soil or washing off hard surfaces can carry harmful chemicals such as garden fertilizers, pesticides, and hazardous wastes such as paint that is left on the ground. These toxic substances pollute groundwater or wash into streams, rivers, and lakes harming the living organisms that live there.

How does this affect our need for healthy drinking water?

The everyday activities of people have an impact on our water ecosystems. Whether we are wasting water, creating more trash instead of recycling, or simply leaving toxic substances on the ground, our actions determine the quality of our water.

Think about the following questions:

- Do you remember the last time you saw trash on the ground? Where did it come from? Where will it go? If it isn't in a trashcan, what is going to happen to it?
- What about the wasted water? How does extra water that flows over hard surfaces impact the organisms living in local rivers and streams?
- How is the quality of the rivers and streams in your area? Think about this when you see trash on the ground or water rushing into the street. Is it harmful to our water and environment?

ASSIGNMENT #3

WHAT IS A WATERSHED?

Use your detective skills to investigate and find out:

1. **What is the nearest body of water to your site?**

2. **Where does water in your community come from?**

3. **Where does water in your community go?**

CODE WORDS

1. **Pollution** – A change in the environment that negatively affects living things.
2. **Runoff** – Water that flows over the ground because it cannot seep into the soil, evaporate, or transpire through plants. It finds its way into streams and rivers as surface flow, and may pick-up contaminantes, such as trash and fertilizer, along the way.
3. **Watershed** – The land area that directs water to a drainage or river system.

REFLECTION

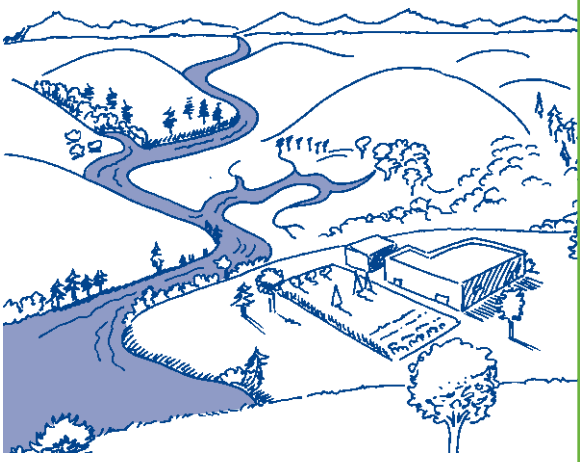
Do you think our site impacts the closest body of water? Why or why not?

What questions do you have?

NEWS FLASH!

Your community, whether it is in a city or rural town, is part of a watershed. A watershed is the land area that directs water to a drainage system or river. It helps supply water to our community by allowing it to seep into the ground or channel it into streams, rivers, and other bodies of water. Gravity moves water through the watershed from higher to lower areas.

A watershed includes living components such as people, wildlife, plants, and insects; as well as non-living components, including rock, soil, water, and air. Both components belong to the environment of a watershed community.



Look around. What are the living and non-living components of your watershed?

Your watershed directs water into another system of living and non-living components – a water ecosystem. It is the non-living components that make up the environment for the living organisms – water, sunlight, rocks, soil, and air – and allow them to survive. Without these non-living components, living organisms would not survive.

Humans depend on the services of a water ecosystem. Water ecosystems provide us with water, food, recreation, and more. Humans are responsible for protecting these ecosystems. However, pollution can harm these ecosystems and damage their ability not only to provide us with goods, but also maintain the balance of a functioning ecosystem.

For example, large rivers in California such as the Sacramento, American, Feather, and lower San Joaquin provide major fish spawning habitats for salmon, steelhead trout, and striped bass. Young fish depend on small invertebrates – mostly insects and tiny shrimp – for food. When "land pollution," field pesticides, and erosion from construction sites, run off through a watershed and enter streams and rivers, they kill or seriously harm these food sources and the young fish. These sources of contamination decrease the amount of oxygen the fish have to breathe, reduce the amount of sunlight used to grow the plants they need for food, and finally, cover the available rocks and soil the fish need to lay and cover their eggs. Every non-living component is impacted by this contamination and therefore impacts the living components.

Where is the water from your schoolyard going? To a nearby river, stream, lake or ocean? The watersheds of most cities and school grounds contain up to 90 percent hard surfaces such as rooftops, concrete playgrounds, streets, and parking lots where water collects quickly and runs off into the street. This not only prevents water from seeping into the ground to replenish underground supplies of fresh water but sends "land pollution" directly into our rivers and the ocean.

Think about the following questions:

- What are you observing during your data collection? Do hard surfaces have an impact?
- What about the "land pollution?" What impact on your local water ecosystem do you think it may have?

ASSIGNMENT #4

INVESTIGATE FURTHER

Use your detective skills to investigate and find out:

1. **What issues of water quality are specific to our area?**

2. **Are any groups in the community involved with water quality?**

3. **What other questions do you have, or what do you want to find out?**

REFLECTION

What do you think you can do at our site or in our community that can help water quality?

What did you find out about water quality issues in your community?

ASSIGNMENT #5

REFLECTION

Using your detective skills what did you find out?

1. **What did you learn from your experience?**

2. **How did your conclusions differ from your prediction?**

3. **How can your knowledge about water help you make good choices about water quality?**

4. **Why is clean fresh water important?**

5. **What is an idea you have for improving water quality at your school or in your community?**

Let others know what you found out about water quality. Choose a way to express your ideas:

1. PowerPoint presentation
2. Poster
3. Poem
4. News article
5. Information booklet
6. What is an idea that YOU have?

ASSIGNMENT #6

WATER QUALITY PROJECT

Use what you have learned to take action:

Come up with a project that will help the water quality at your site or in your community.

PROJECT IDEAS

Identify and choose a project that will help improve the water quality on your campus or in your neighborhood.

Be creative! Projects can be as easy as making posters to tell other students or people in your neighborhood to keep trash off the ground. Or, you can do more by creating a trash reduction program at your site. The water quality project is up to you. You have the power to create change!

SO, WHICH PROJECT SHOULD YOU DO?

Follow the instructions to complete the worksheet below to help you decide.

1. **What problem areas did you find at your site or in your community? (Hint: Where were there red X's on your site map?) List them on the chart.**
2. **What can be done to teach others about the problems? What can be done to eliminate or reduce the problems? List these ideas next to each of the problems.**

Problem Areas We Found	Solution Ideas

LOOK CLOSER

Look at each idea carefully. Use the worksheets below to explore the top three ideas by answering the questions below for each one. If you are unable to answer any of the questions, you may need to do some research to find the answer.

WATER QUALITY PROJECT IDEA #1:

1. **How would this project help the water quality at our site or in our neighborhood?**

2. **Are there others working on this problem? The Facility/School? Businesses? Organizations?**

3. **What resources or help are needed to complete this project (money, skills, time, tools, etc.)?**

4. **Can we accomplish the project in the amount of time we have to do it?**

5. **How will we know if our solution worked?**

WATER QUALITY PROJECT IDEA #2:

1. **How would this project help the water quality at our site or in our neighborhood?**

2. **Are there others working on this problem? The Facility/School? Businesses? Organizations?**

3. **What resources or help are needed to complete this project (money, skills, time, tools, etc.)?**

4. **Can we accomplish the project in the amount of time we have to do it?**

5. **How will we know if our solution worked?**

WATER QUALITY PROJECT IDEA #3:

1. **How would this project help the water quality at our site or in our neighborhood?**

2. **Are there others working on this problem? The Facility/School? Businesses? Organizations?**

3. **What resources or help are needed to complete this project (money, skills, time, tools, etc.)?**

4. **Can we accomplish the project in the amount of time we have to do it?**

5. **How will we know if our solution worked?**

WHICH PROJECT SHOULD WE CHOOSE?

Look at the different project ideas. Based on the questions you answered, select the best water quality project that you can do and that will make a difference at your site or in the community.

Once you have decided, choose a name for your project.

Possible project names:

Discuss these suggested project names with the rest of your class or group. Take a vote on which name to use.

WHAT TASKS ARE INVOLVED?

Use the space below to list all the steps you can think of to complete your project. Will you need further research? Do you need to contact other people to help you? Also, remember that you will need to work with your teacher to get approval. All these things should be included on your task list.

List of tasks:

ORGANIZE YOUR TASKS

1. **Use the task list you filled out to organize your tasks:**
   a. Group together similar tasks.
   b. Put the tasks in order of when they need to be completed.
   c. Write who is responsible for each task.

2. **Fill out the worksheet below to help you follow-up and make sure tasks get completed.**

Name of Project: _____

Task	Person(s) responsible	Additional Information

GET SUPPORT FOR YOUR PROJECT

Tell others about your project and get their support.

Can you and others in your group make a presentation about your project? Who can you invite? How about the supervisor, other staff, parents, and members of the local community?

List below those people who would be interested in knowing about your project and especially those who can help you:

Names	**How To Contact Them**

For your presentation, tell your audience what you have learned about the environment and about the information you obtained while conducting your site investigation. Share what you have learned and why it is important. Then, explain your water quality project. They may have ideas or resources to help you. More importantly, tell them how they can help!

NOW GO DO IT!

Use this page to keep notes about how your project is going, and things you want to remember.

ASSIGNMENT #7

YOU MADE IT ~ A DIFFERENCE, THAT IS!

The California Water Boards encourage students to get involved. They would love to hear from you about your water quality project and what you accomplished.

1. Please write or email them at the addresses below.

Public Affairs Office
California Water Boards
1001 I Street
P.O. Box 100
Sacramento, CA, 95812
info@waterboards.ca.gov

EVALUATE YOUR PROJECT

1. **What were the most successful parts of the project?** _____

2. **What was the least successful part?** _____

3. **What did you learn from your experience?** _____

4. **What would you do differently next time and why?** _____

5. **Who or what was influenced by your actions?** _____

6. **Would you like to get involved in another environmental service project like this? Explain why or why not.**

¡MISIÓN CUMPLIDA!

¡Felicidades!

Nombre del alumno

es un

DETECTIVE OFICIAL DE LA CALIDAD DEL AGUA

Firma

Fecha

CALIFORNIA Water Boards

Elimina los Desperdicios
Tu Vecindario Cuenta


LIBRO DE TRABAJO DE LOS DETECTIVES DE LA CALIDAD DEL AGUA
LA BÚSQUEDA DE DÓNDE Y CÓMO SE CONTAMINA EL AGUA...
...¡Y QUE VAMOS A HACER AL RESPECTO!

Nombre(s):

_____

_____

_____

DETECTIVES DE LA CALIDAD DEL AGUA

La búsqueda de dónde y cómo el agua se contamina...
y ¡qué vamos a hacer al respecto!

TU MISIÓN:

1. **Buscar pistas sobre la calidad del agua en tu lugar.**
2. **Resolver el misterio de cómo se contamina el agua.**
3. **Resolver el misterio de dónde proviene el agua y a dónde va en tu comunidad.**
4. **Investigar cómo las pistas que encuentres están relacionadas con la calidad del agua en tu comunidad.**
5. **¡Actúar!**

PALABRAS EN CÓDIGO

1. **Agua dulce:** agua que no es salada.
2. **Investigación:** El proceso de hacer preguntas y realizar exámenes para recolectar información con el propósito de resolver un problema o responder a una pregunta.
3. **Contaminación del agua:** El agregado de cualquier sustancia que tiene un efecto negativo en el agua y en los seres vivientes que dependen del agua.

PREDICCIÓN

¿Cuál es tu predicción sobre lo que descubrirás sobre la calidad del agua en tu comunidad?

_____

_____

_____

REFLEXIÓN

¿Qué aprendiste sobre tu observación?

_____

_____

MIS OBSERVACIONES

1er Ronda:

2nda Ronda:

1ER TRABAJO

INVESTIGACIÓN DEL LUGAR

Usa tus habilidades de detective para investigar tu lugar y descubrir:

1. **Lugares por donde al agua pasa el suelo**

2. **Las diferentes fuentes de agua**

3. **Lugares por donde viaja el agua**

4. **Lugares donde hay basura y otros elementos dañinos en el suelo**

5. **Lugares donde se desperdicia el agua**

PALABRAS EN CÓDIGO

1. **Cisterna de desagüe:** abertura en una acera o canaleta que atrapa el agua y la envía a los drenajes de aguas lluvias.
2. **Desagüe o tuberías por donde baja el agua:** pipa o caño vertical utilizado para escurrir agua de un techo.
3. **Desagüe:** un canal por donde se escurre el agua.
4. **Desagüe pluvial:** Un canal que se extiende a lo largo de los techos que recoge y se lleva el agua de lluvia.

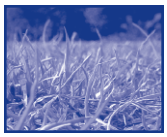
REFLEXIÓN

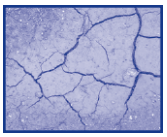
¿Qué observaste y cómo crees que se relaciona con la calidad del agua?

INSPECCIÓN DEL LUGAR

En tu área designada, observa todo lo que está a tu alrededor. Utiliza los marcadores/lápices de colores para marcar estas observaciones en tu mapa.

1. **Busca aquellos lugares en donde el agua puede pasar al suelo.**
   Usa puntos verdes ::: para marcar estos lugares en tu mapa.


☐ pasto


☐ tierra


☐ jardines


☐ alcorques

¿Qué otros lugares encontraste? _____

2. **Busca las fuentes de agua.**
   Utiliza una gota de agua azul 💧 para mostrar estos lugares en tu mapa.


☐ Grifos o llaves de agua


☐ bebederos

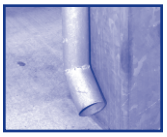

☐ rociadores


☐ mangueras

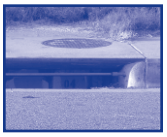
¿Qué fuentes encontraste? _____

3. **Busca aquellos lugares por donde el agua viaja.**
   Utiliza un cuadro violeta ■ para mostrar estos lugares en tu mapa.


☐ desagües

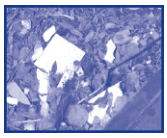

☐ tuberías


☐ cañerías de descarga

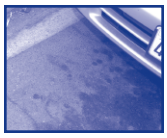

☐ cisterna de desagüe

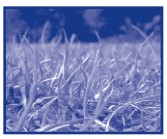
¿Qué otros lugares encontraste? _____

4. **Busca la basura y otras cosas que podrían ser dañinas para el agua.**
   Utiliza una X roja para mostrar estas cosas en tu mapa.


☐ basura de productos/ envoltura de comida


☐ envolturas de golosinas

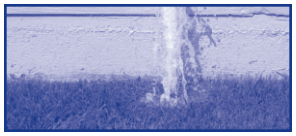

☐ aceite de automóviles


☐ parques/jardines

¿Qué otros tipos de basura y elementos dañinos encontraste en tu área? _____

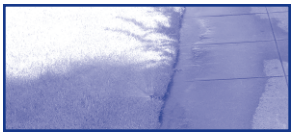
_____

5. Busca aquellas áreas en donde se desperdicia el agua. Utiliza una estrella negra ★ para mostrar estas zonas en tu mapa.



☐ Grifos/llaves de agua y rociadores que gotean

☐ desagües tapados



☐ agua derramada sobre el concreto

¿Qué otras áreas encontraste? _____

6. Escribe una pregunta que tengas con respecto a lo que observaste.

_____

_____

2NDO TRABAJO

¿CUÁL ES LA CALIDAD DE TU AGUA?

Usa tus habilidades de detective para investigar tu lugar y descubrir:

1. **¿Qué es lo que podría causar problemas en la calidad del agua en tu lugar?**

2. **¿En donde existen los problemas que afectan la calidad del agua en tu lugar?**

PALABRAS EN CÓDIGO

1. **Fertilizante:** Nutrientes que usan las plantas para crecer.
2. **Aguas subterráneas:** El agua dulce que llena las resquebraduras y poros debajo de la superficie de la tierra que abastece los pozos y manantiales.
3. **Desechos peligrosos:** Productos que contienen sustancias químicas que son dañinas para los humanos y la tierra. Por ejemplo, la pintura para casas, los productos de limpieza, el veneno contra insectos y los fertilizantes.
4. **Contaminación de la tierra:** La basura arrojada en la tierra, como la goma de mascar, las envolturas y paquetes de los alimentos, latas, papel y bolsas de plástico. También se incluyen aquí el desecho de las mascotas y el aceite de los automóviles.

5. **Pesticidas:** Químicos que se utilizan para combatir pestes. Algunos ejemplos son las hormigas, termitas, ratas, ratones y las pestes de los cultivos.
6. **Desagües de agua de lluvia:** Pipas o caños y canales a nivel del suelo o subterráneos que transportan el agua de lluvia al océano para evitar las inundaciones.

REFLEXIÓN

¿Qué podría causar el problema mas grave que afecte la calidad de agua en tu lugar?

¡NOTICIAS DE ÚLTIMA HORA!

¿Sabías que casi todas las cosas que tienen vida en la tierra necesitan y dependen de su medio ambiente para sobrevivir? Las personas, plantas, animales y otros organismos vivos viven e interactúan entre sí como parte de una comunidad. Cada miembro de dicha comunidad interactúa con su medio ambiente. Una comunidad junto con su medio ambiente constituye un ecosistema.

La salud de un ecosistema afecta la capacidad para sobrevivir de las personas, plantas y animales. El medio ambiente de California tiene 200,000 millas de ríos y arroyos, 1,100 millas de costa marítima, más de 10,000 lagos y más de un millón de acres de bahías y estuarios.

Lamentablemente, la mayoría de estos ríos y otros medio ambientes acuáticos se han contaminado. Por ejemplo, cuando llueve en las ciudades, el agua de la lluvia arrastra muchas cosas que se han quedado en el suelo, tales como el aceite y grasa de los autos, los pesticidas del jardín, el excremento de las mascotas, y sobre todo ¡la basura! Toda esta "contaminación de la tierra" es arrastrada por el agua de lluvia hacia los sistemas de drenaje de aguas lluvias que luego es depositada en los arroyos y ríos. Aún cuando no llueve, el agua derramada de las mangueras, rociadores y grifos lleva el agua contaminada a las cañerías que van a los arroyos y ríos.

¿Cómo afecta esto a los organismos vivos que viven allí?

El agua de lluvia que se escurre en el suelo o que lava las superficies duras puede llevar químicos peligrosos como los fertilizantes de jardín, pesticidas y desechos peligrosos como la pintura que fue dejada en el suelo. Estas sustancias tóxicas contaminan el agua subterránea o llegan hasta los arroyos, ríos y lagos y dañan a los organismos vivos que viven allí.

¿Cómo afecta esto a nuestra necesidad de tener agua saludable para beber?

Las actividades diarias de las personas tienen un impacto en nuestros ecosistemas acuáticos. Ya sea al derrochar agua, crear más basura en lugar de reciclarla o simplemente dejar sustancias tóxicas en el suelo, nuestras acciones determinan la calidad de nuestra agua.

Piensa sobre las siguientes preguntas:

- ¿Recuerdas la última vez que viste basura en el suelo? ¿De dónde vino? ¿Adónde irá? Si no está en un bote de basura, ¿qué ira a pasar con esta basura?
- ¿Y el agua desperdiciada? ¿Cómo afecta esa agua adicional que corre por las superficies a los organismos que viven en los ríos y arroyos de la zona?
- ¿Cómo es la calidad de los ríos y arroyos en tu zona? Piensa en esto cuando veas basura en el suelo o agua que corre por las calles. ¿Es esto dañino para nuestras aguas y medio ambiente?

3ER TRABAJO

¿QUÉ ES UNA CUENCA DE AGUA?

Usa tus habilidades de detective para investigar y descubrir:

1. **¿Cuál es la masa de agua más cercana a tu lugar?**

2. **¿De dónde proviene el agua de tu comunidad?**

3. **¿Adónde va el agua de tu comunidad?**

PALABRAS EN CÓDIGO

1. **Contaminación:** un cambio en el medio ambiente que afecta de modo negativo a los seres vivientes.
2. **Escurrimiento:** agua que fluye sobre el suelo que no puede ser absorbida por la tierra, no se evapora ni es transpirada por las plantas. Esta agua encuentra su camino para llegar a los ríos y arroyos como un flujo de agua superficial y puede recoger contaminantes a su paso tales como la basura y fertilizantes.
3. **Cuenca de agua:** la superficie del terreno que lleva el agua a un sistema de drenaje o un río.

REFLEXIÓN

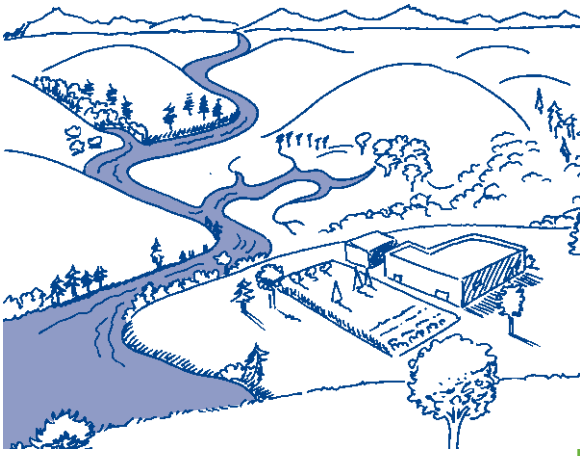
¿Crees que nuestro lugar tiene un impacto en la masa de agua más cercana? ¿Por qué o por qué no?

¿Qué preguntas tienes?

¡NOTICIAS DE ULTIMA HORA!

Tu comunidad, ya sea una ciudad o un pueblo rural, es parte de una cuenca de agua. Una cuenca de agua es la superficie del terreno que lleva el agua a un sistema de drenaje o un río. Ayuda a proveer agua a nuestra comunidad al permitir que se escurra en el suelo o que llegue por canales hasta los arroyos, ríos y otras masas de agua. La gravedad mueve el agua a través de la cuenca de agua desde las áreas más altas a las más bajas. Una cuenca de agua incluye a los componentes vivos (bióticos) como las personas, la vida silvestre, las plantas y los insectos así como los componentes no vivos (abióticos), que son las rocas, el suelo, el agua y el aire. Ambos componentes pertenecen al medio ambiente de una comunidad de una cuenca de agua.

Mira a tu alrededor. ¿Cuáles son los componentes vivos y no vivos de tu cuenca de agua?



Tu cuenca de agua lleva el agua a otro sistema de componentes vivos y no vivos: un ecosistema acuático. Los componentes no vivos son los que constituyen el medio ambiente para los organismos vivos: agua, luz del sol, rocas, suelo y aire: y les permite sobrevivir. Sin estos componentes sin vida, los organismos vivos no sobrevivirían.

Los humanos dependen de los servicios de un ecosistema acuático. Los ecosistemas acuáticos nos brindan agua, alimentos, recreación y mucho más. Los humanos son responsables de proteger estos ecosistemas. Sin embargo, la contaminación puede dañar a estos ecosistemas y su capacidad para proveernos de cosas, y para mantener el equilibrio de un ecosistema en funcionamiento.

Por ejemplo, los grandes ríos de California como el Sacramento, American, Feather y el San Joaquín son un hábitat importante para el desove del salmón, la trucha arco iris y la lobina rayada. Los peces jóvenes dependen de los invertebrados pequeños para su alimentación, principalmente de los insectos y pequeños camarones. Cuando la “contaminación de la tierra”, los pesticidas del campo y la erosión de los lugares de construcción se escurren a través de una cuenca de agua e ingresan a los arroyos y los ríos, matan o dañan gravemente a estas fuentes de alimento y a los peces jóvenes. Estas fuentes de contaminación disminuyen la cantidad de oxígeno que los peces tienen para respirar, reducen la cantidad de luz solar que sirve para alimentar a las plantas que ellos necesitan como alimento y finalmente cubren las rocas y suelo disponibles que los peces necesitan para poner sus huevos y cubrirlos. Cada componente no vivo recibe un impacto de esta contaminación y por lo tanto tiene un impacto en los componentes vivos.

¿Adónde va el agua del patio de tú escuela? ¿A un río cercano, arroyo, lago o al océano? Las cuencas de agua de la mayoría de las ciudades y patios de las escuelas contienen hasta un 90 por ciento de superficies duras tales como los techos, áreas de juego de concreto, calles y estacionamientos en los que el agua se recolecta rápidamente y corre por las calles. Esto no sólo impide que el agua se escurra en el suelo para reabastecer las provisiones subterráneas de agua dulce, sino que también envía la “contaminación de la tierra” directamente a nuestros ríos y al océano.

Piensa sobre las siguientes preguntas:

- ¿Qué estás observando durante la recolección de datos? ¿Tienen un impacto las superficies duras?
- ¿Qué sucede con la “contaminación de la tierra”? ¿Qué impacto crees tú que pueden tener las superficies duras en el ecosistema local de agua?

4TO TRABAJO

INVESTIGA AÚN MÁS

Usa tus habilidades de detective para investigar y descubrir:

1. **¿Qué temas relacionados con la calidad del agua son específicos de tu lugar?**

2. **¿Hay algún grupo en la comunidad que esté involucrado con la calidad del agua?**

3. **¿Qué otras preguntas tienes, o qué quieres descubrir?**

REFLEXIÓN

¿Qué crees que puedes hacer en tu lugar o en nuestra comunidad que puede mejorar la calidad del agua?

¿Qué has descubierto con respecto a la calidad del agua en tu comunidad?

5TO TRABAJO

REFLEXIÓN

¿Qué descubriste usando tus habilidades de detective?

1. **¿Qué aprendiste de tu experiencia?**

2. **¿En qué forma fueron diferentes tus conclusiones de tus predicciones?**

3. **¿Cómo puede tu conocimiento sobre el agua ayudarte a hacer buenas elecciones con respecto a la calidad del agua?**

4. **¿Por qué es importante el agua dulce limpia?**

5. **¿Qué ideas tienes para mejorar la calidad del agua en tu escuela o en tu comunidad?**

Comparte con los demás qué descubriste con respecto a la calidad del agua. Elige un modo de expresar tus ideas:

1. Presentación de PowerPoint
2. Poster o Cartel
3. Poema
4. Artículos de información periodística
5. Folleto informativo
6. ¿Cuál es TU propia idea?

6TO TRABAJO

PROYECTO DE LA CALIDAD DEL AGUA

Utiliza lo que has aprendido para realizar una acción.

Presenta un proyecto para ayudar a mejorar la calidad del agua en tu lugar o comunidad.

IDEAS PARA EL PROYECTO

Identifica y elige un proyecto que te ayude a mejorar la calidad del agua en el terreno de tu lugar o en tu vecindario.

¡Sé creativo! Los proyectos pueden ser tan simples como crear carteles para decirles a los otros estudiantes o personas en tu vecindario que no deben dejar basura en el suelo. O pueden ser más complejos, como crear un programa de reducción de los desechos en tu lugar. El proyecto sobre la calidad del agua que elijas, dependerá de ti. ¡Tú tienes el poder de crear el cambio!

ENTONCES, ¿QUÉ PROYECTO DEBERÍAS HACER?

Sigue las instrucciones para completar la hoja de trabajo a continuación para que te ayuden a decidir.

1. **¿Qué áreas de problemas encontraste en tu lugar o en tu vecindario? Sugerencia: (¿Dónde estaban las cruces rojas en el mapa de tu lugar?) Enuméralas en el cuadro.**
2. **¿Qué se puede hacer para enseñarle a otros sobre estos problemas? ¿Qué se puede hacer para eliminar o reducir los problemas? Haz una lista de las ideas al lado de cada uno de los problemas.**

Áreas problemáticas que encontramos	**Ideas de soluciones**

MIRA MÁS DE CERCA

Considera cada idea cuidadosamente. Usa las hojas de trabajo a continuación para explorar las tres ideas principales y responde a las preguntas a continuación para cada una de ellas. Si no puedes responder a ninguna de las preguntas, es posible que debas investigar un poco más la respuesta.

IDEA DEL PROYECTO SOBRE LA CALIDAD DEL AGUA Nº 1:

1. **¿Cómo ayudaría este proyecto a mejorar la calidad del agua en nuestro lugar o en nuestro vecindario?**

2. **¿Hay otras personas trabajando en este problema? ¿Las instalaciónes? ¿Empresas? ¿Organizaciones?**

3. **¿Qué recursos o ayuda son necesarios para completar este proyecto (dinero, habilidades, tiempo, herramientas, etc.)?**

4. **¿Podemos lograr el proyecto en la cantidad de tiempo que tenemos para hacerlo?**

5. **¿Cómo sabremos si nuestra solución funcionó?**

IDEA DEL PROYECTO SOBRE LA CALIDAD DEL AGUA Nº 2:

1. **¿Cómo ayudaría este proyecto a mejorar la calidad del agua en nuestro lugar o en nuestro vecindario?**

2. **¿Hay otras personas trabajando en este problema? ¿Las instalaciónes? ¿Empresas? ¿Organizaciones?**

3. **¿Qué recursos o ayuda son necesarios para completar este proyecto (dinero, habilidades, tiempo, herramientas, etc.)?**

4. **¿Podemos lograr el proyecto en la cantidad de tiempo que tenemos para hacerlo?**

5. **¿Cómo sabremos si nuestra solución funcionó?**

IDEA DEL PROYECTO SOBRE LA CALIDAD DEL AGUA Nº 3:

1. **¿Cómo ayudaría este proyecto a mejorar la calidad del agua en nuestro lugar o en nuestro vecindario?**

2. **¿Hay otras personas trabajando en este problema? ¿Las instalaciónes? ¿Empresas? ¿Organizaciones?**

3. **¿Qué recursos o ayuda son necesarios para completar este proyecto (dinero, habilidades, tiempo, herramientas, etc.)?**

4. **¿Podemos lograr el proyecto en la cantidad de tiempo que tenemos para hacerlo?**

5. **¿Cómo sabremos si nuestra solución funcionó?**

¿QUÉ PROYECTO DEBERÍAMOS ELEGIR?

Mira las distintas ideas de tu proyecto. Según las respuestas que hayas dado, selecciona el mejor proyecto sobre la calidad del agua que puedas hacer y que pienses hará una diferencia en tu lugar o vecindario.

Una vez que hayas decidido, elige un nombre para tu proyecto.

Nombres posibles para el proyecto:

Habla sobre estos posibles nombres de los proyectos con tu clase o grupo.
Realiza una votación para elegir el nombre.

¿QUÉ TAREAS DEBERÁN REALIZARSE?

Usa el espacio a continuación para enumerar todos los pasos en los que puedas pensar para completar tu proyecto. ¿Necesitarás más información? ¿Necesitas comunicarte con otras personas para que te ayuden? Además, recuerda que necesitarás trabajar con tu maestro o maestra para recibir aprobación. Todas esas cosas deberían estar incluidas en tu lista de tareas.

Lista de tareas:

ORGANIZA TUS TAREAS Y CREA UN PLAZO DE FINALIZACIÓN

1. **Utiliza la lista de tareas que hiciste para organizar tus tareas:**
   a. Agrupa las tareas similares.
   b. Ordena las tareas según el momento en que deban realizarse.
   c. Escribe quién es responsable de cada tarea.

2. **Completa la hoja de trabajo a continuación para poder hacer un seguimiento y asegurarte que las tareas se realicen.**

Nombre del proyecto: _____

Tarea	Persona(s) responsable	Información adicional

BUSCA APOYO PARA TU PROYECTO

Diles a los demás sobre tu proyecto y busca su apoyo.

¿Puedes tú y tus compañeros de grupo hacer una presentación del proyecto? ¿A quiénes pueden invitar? Por ejemplo, el personal de mantenimiento, los padres y los miembros de la comunidad local.

Haz una lista a continuación de todas aquellas personas que podrían estar interesadas en conocer tu proyecto, especialmente aquellos que pueden ayudarte:

Nombres	**Cómo comunicarse con ellos**

Para tu presentación, dile a tu audiencia sobre lo que has aprendido sobre el medio ambiente y sobre la información que obtuviste mientras llevabas a cabo la revisión e investigación del lugar. Comparte lo que has aprendido y describe por qué es importante. Luego, explica tu proyecto de la calidad del agua. Ellos pueden tener ideas o recursos para ayudarte. Diles cómo pueden ayudarte.

¡AHORA VE A HACERLO!

Utiliza esta página para tomar nota sobre el progreso de tu proyecto y las cosas que deseas recordar.

7TO TRABAJO

LO HAS LOGRADO: ¡HAS HECHO UNA DIFERENCIA!

California Water Boards desea que los estudiantes se comprometan. Nos encantaría tener noticias tuyas, sobre tu proyecto de la calidad del agua y sobre lo que has logrado.

1. Por favor escribe o envíanos un correo electrónico a las siguientes direcciones:

Public Affairs Office
California Water Boards
1001 I Street
P.O. Box 100
Sacramento, CA, 95812
info@waterboards.ca.gov

EVALÚA TU PROYECTO

1. **¿Cuáles fueron las partes más exitosas del proyecto?**_____

2. **¿Cuál fue la parte menos exitosa?** _____

3. **¿Qué aprendiste de tu experiencia?** _____

4. **¿Qué harías de modo diferente la próxima vez y por qué?** _____

5. **¿Quiénes o qué fue influenciado por tus acciones?** _____

6. **¿Deseas comprometerte en otro proyecto de servicio ambiental como este? Explica por qué o por qué no**

WATER QUALITY SERVICE LEARNING PROJECT IDEAS

ON-SITE PROJECT IDEAS

- Pick up and analyze trash. Where is the trash coming from? What trash can be recycled and what cannot? What is the most common trash item? What can be done to eliminate the source of this trash (i.e., If the majority of the trash is plastic straw wrappers, can we do a campaign to reduce juice box use and bring a thermos instead)?
- Organize a student litter patrol to make sure trash is kept in trashcans and not left on the ground, particularly after snacks and lunches. Make posters to remind all students to reduce litter.
- Start a recycling program for paper, cans, glass, etc. At the campaign start, check the amount of large trash bins filled each week by the school or site, and then create a measurable goal to monitor and reduce that amount each month. Students may separate, weigh and recycle trash for cash, and generate money for site activities.
- Make posters on good water quality management tips and post them in classrooms and sites around the community. Create a way to measure the effectiveness of the posters.
- Work with facility managers to remove concrete and add more trees/grass areas/a garden to your campus to absorb water and prevent it from flowing into stormdrains.
- Organize a water conservation campaign to reduce the amount of water used at your site. At the beginning of the campaign, check the amount of water used by the facility, and then create a measurable goal to monitor and reduce the amount each month.
- Reduce the water runoff from pavement by landscaping an area using native trees, shrubs, flowers, and grasses that do not require a lot of water.
- Hard soil doesn't absorb runoff. Improve soil quality at the site by using mulch or another alternative such as ground cover in key areas. Monitor the results of your work.
- Teach other students, teachers, administrators, parents, residents, and businesses about the school or facility watershed. Design a "watershed tour" of the campus or facility. This could include: what a watershed is, components of a watershed, where water is coming from, and where it is going, etc.

COMMUNITY PROJECT IDEAS ▸

COMMUNITY PROJECT IDEAS

- If water quality problems are the result of off-campus/facility practices, write a letter to the director, principal, mayor, and/or city representative to provide ideas about resolving the problem. Follow-up with them to see what can be done to address the problem.
- Pick up and analyze trash. Where is the trash coming from? What trash can be recycled and what cannot? What is the most common trash item? What can be done to eliminate the source of this trash (i.e. if the majority of the trash is plastic bags, can we do a campaign to reduce plastic bag use and use canvas bags instead)?
- Find out about a watershed project (e.g., citizen's water quality monitoring project, stream, or beach clean-up) in the community. Join your family or group in supporting and volunteering for these events.
- Design and distribute flyers or brochures about the ways community members can help improve water quality. Create a way to measure the impact of flyers and brochures distributed.
- Adopt a stream, river, or local park. Clean up a portion and help maintain it. Figure out where the main sources of trash and pollution originate from and work to alleviate the problem.
- Stencil signs next to stormdrains warning people not to dump litter or other items into stormdrains (this will likely require permission by the local governing jurisdiction).

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Erase the Waste

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