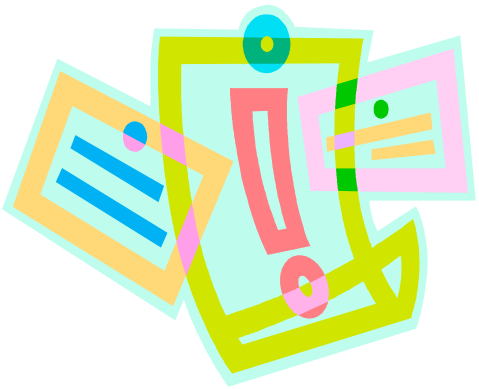
Pollution, the Water Cycle & You

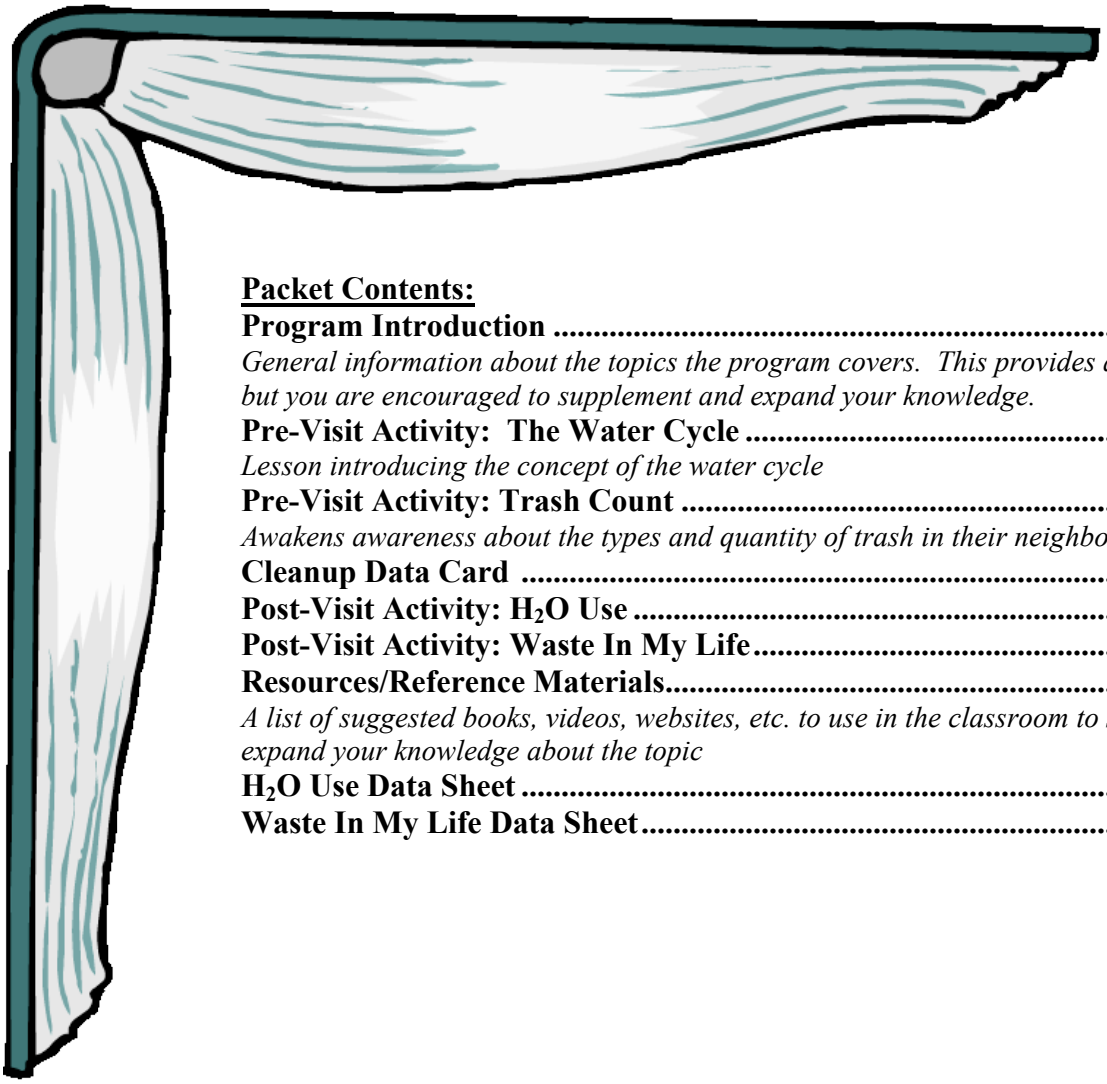
Teacher Packet

5th Grade



Notes for the teacher:

Thank you for picking the Santa Monica Pier Aquarium as your field trip destination! We are very excited that you will be visiting our facility. This packet was developed to help you, as the classroom teacher, and your students get the most out of your visit. Enclosed in this packet, you will find information and activities that correlate to the program you will be attending with your class. You are encouraged to complete as many of the activities as you can as they will help your students gain a better mastery of the California State Standards.

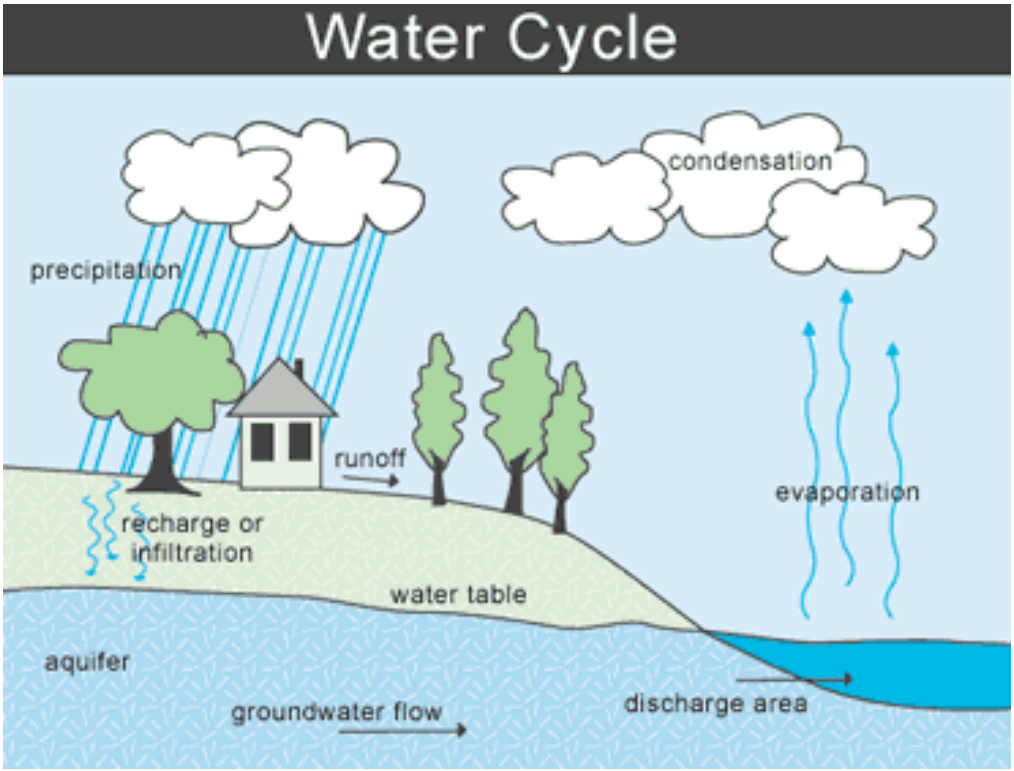


Packet Contents:

Program Introduction for the Classroom Teacher

Pollution is the contamination of air, water, or soil by substances that are harmful to living organisms.[1] For hundreds of years, people carelessly threw trash and various other pollutants into the ocean. The belief was that the ocean was large enough to hold and process the massive amounts of pollution that were being dumped into it every day. However, today we understand that the world's ocean is not immune to our actions and is in desperate need of our attention. Every year plastics, oil, trash, chemicals and sewage are dumped into the sea. These pollutants can be traced to a wide range of sources such as oil drilling, shipping, urban runoff, sewage treatment and agriculture, to name a few. The results of these actions can be dangerous to the vast marine life that inhabits the ocean, and to all of us that rely on this amazing natural resource for food, oxygen and recreation.

While our planet is predominantly covered by water, around 72%, very little of it is suitable for human consumption. After oxygen, clean, fresh water is the most important substance for human survival and we need to consume it at least every three days in order to live. Only .003% of all the water on Earth is potable, or suitable for humans to drink. This potable water has been cycling around our planet from the Ocean, to the atmosphere (via evaporation), where it condenses into clouds and is moved by the wind to other parts of the planet. This moisture will then be released as precipitation, rain or snow depending upon the temperature, and make its way back to the ocean through a vast network of streams, rivers and underground aquifers.



http://www.ci.gresham.or.us/departments/des/stormwater/public_education/hydro_cycle2.gif

Here in Southern California, we predominantly obtain our water from snowmelt that has its origins hundreds of miles north in the high mountains of the Sierra. This water is transported to Los Angeles and other Southern Californian cities via a network of aqueducts. What happens if we receive less snow in the winter? What happens if the weather warms and the snow melts too early? Southern California receives very little water as rainfall, yet the tens of million people who call it home rely upon water every day, not only to drink, but also to bathe, brush our teeth, wash our clothes as well as to flush our toilets. So if we are not careful, we may find ourselves in a crisis due to a lack of fresh water. To find out where your community receives its water go to **http://www.water-ed.org/watersources/** .

While we may use water for our survival, we also use the water in our oceans for recreation and as a place to catch food for our tables. As more and more pollutants enter our waterways, they are carried to the ocean where they not only impact the organisms that live there, but also the humans that use it to swim, surf and dive. Our water resources are polluted from two primary sources, sewage and urban runoff.

Disposing of sewage is a major problem in cities all over the world. Domestic sewage is defined as wastewater from city buildings and homes, while industrial sewage defines waste from factories and manufacturing plants. Anything that passes down your drain or toilet will make its way to the sewage treatment plant. Numerous countries have laws stating that treatment must occur before this sewage is discharged into the ocean. The first stage of this treatment is when the sewage is screened to remove solids and allowed to sit so that suspended particles will settle out or rise to the top. The floating and sinking solids are then easily removed. This solid organic matter sometimes undergoes further treatment and the sludge, or semi-liquid sewage is then disposed of into landfills, composted, or spread on farmland as a nutrient-rich fertilizer for plants not consumed by humans. A secondary stage of treatment, where bacteria are added, helps remove many of the harmful pathogens still present in the sewage. Tertiary treatment can be used to further treat the water, and can be done by artificially filtering the water or allowing water to naturally filter through a wetland or marsh. Chemical addition, or other forms of disinfection such as ozone, UV irradiation or osmosis may be included in quaternary treatment to further the purification process. Advanced treatment of sewage can result in water that is then used for irrigation or even drinking water. Many communities discharge treated sewage into the sea, or into the rivers that empty into the sea. However, untreated sewage does enter the ocean environment from sewage spills and leaks within the system.

The impacts of sewage pose serious health hazards because sewage contains viruses and bacteria that can cause disease and illnesses. Filter feeding animals such as mussels, oysters and clams that have been subjected to sewage can be harmful to humans that ingest them. Also, swimming in areas that contain sewage pollution can cause people to become sick from swallowing the contaminated water or to develop eye and ear infections or skin rashes just from contact with the water. This contamination is often undetectable by sight or smell, and must be located through water quality testing. To find out if the water at your beach is safe to swim in, Heal the Bay has created the Beach Report Card or BRC©. The BRC© takes the water quality test results for the entire state and converts them into an easy to understand letter grade A through F, where A stands for clean water. The BRC can be found at www.healthebay.org

Furthermore, chemicals in sewage are often not removed in treatment and therefore can be toxic to aquatic life. Our sewage treatment systems are designed to only cleanse the wastewater of solids and harmful bacteria. Household cleaners and other common chemicals are not removed by the system and are thus expelled into the environment as a pollutant. Many of these household chemicals may even disrupt the delicate processes of the secondary treatment phase, reducing the systems beneficial bacteria levels, leading to the release of harmful fecal bacteria. Other chemicals that pass through the system untreated are the wide variety of prescription drugs like antidepressants, further contaminating our water and adversely affecting the life within.

Not only is it unsafe for humans to swim in the ocean when sewage is present, but it also impacts marine organisms by depleting oxygen levels. When sewage enters the water, it carries with it large quantities of nutrients. The nutrients stimulate rapid algal growth, known as an algal bloom. Eventually, when the algae die off, bacteria that break down the algae use up dissolved oxygen in the ocean. This results in less oxygen for other marine organisms that then suffocate and die if they are unable to relocate. Sewage sensitive marine life such as fish, echinoderms and small crustaceans can also suffer fin rot, tumors, and bioaccumulation of toxins. Bioaccumulation of toxins has begun to pose a major health issue in many of our most sought after seafood choices. As organisms come into contact and consume chemicals such as DDT (Dichloro-Diphenyl-Trichloroethane) they are incorporated into their flesh and fats. When other organisms higher up the food chain consume these DDT laden organisms, the DDT accumulates in their flesh and will increase with each level of the food chain. Humans tend to consume fishes that are higher in the food chain and therefore heavily loaded with these toxins. In recent years, mercury poisoning has begun to pose a major problem for many people that rely upon seafood as their primary source of protein. Mercury poisoning can lead to health issues including immune and reproductive system failure, nervous system damage, decreased vision and hearing as well as corrosion of skin and mucus membranes. The mercury enters our ocean from the burning of coal in power plants and can only be remedied by reducing the amount of coal we burn to generate electricity. Many of the impacts of sewage in the ocean can be remedied by improved sewage treatment.

While most people are under the impression that the majority of the pollution on our beaches and in our oceans was put there by beach and ocean-based sources, the reality is 80% of all marine debris originates inland and is carried to the ocean through a massive network of stormdrains as urban runoff. Runoff is all the water that moves across the surface of the land as it makes its way to a stream, river or ocean. Urban runoff is when this runoff occurs in an urban setting, moving across sidewalks, roads and other man made structures. Any type pollution that you see on the side of the road and within our city will one day make its way to the ocean via a network of underground pipes and above ground channels if it is not cleaned up.

The Los Angeles storm drain system is crucial for the proper function of our vast city. In the 1930's Los Angeles was constantly being flooded during rain events. We slowly covered more and more of the Los Angeles basin with cement in the form of roads, parking lots and buildings. When it rained the water could not percolate, or penetrate the ground, as cement is impermeable. To combat this problem city engineers created a vast network of stormdrains that would carry the storm water off the streets and transport it to the ocean via the network of pipes and channels. While this may have solved the problem of flooding, it has also created a terrible issue of fast tracking various types of pollution to the ocean with every rain event.

Los Angeles is about 412 square miles in size, and much of it is covered with an impermeable surface. There are also over 11 million people living within this space, creating pollution and waste every single day. While some of us are good at keeping our pollution in the proper place, many of us are not. A plastic bottle, a discarded apple core, even your dog's fecal waste can make its way to our ocean if not discarded in the correct manner. Each type of pollution has its own impact upon the environment and subsists for different lengths of time. While an apple core may last a few months in the ocean, a plastic bottle can persist for 450 years before it breaks down in the marine environment. In fact there is so much plastic debris that has entered the Pacific Ocean, that it has created a floating mass of plastic more than two times the size of Texas and weighing 3.5 million tons!

For many, this trash is out of sight and therefore out of mind. Despite being thousands of miles from shore this waste is not without its victims. Marine life and birds consume or become entangled in the debris leading to their demise. For every one pound of life collected in the north central Pacific, six pounds of plastic were collected as well. Every year countless plastic bags and balloons make their way into the ocean where they mimic sea jellies and other marine life. The plastic bags and balloons are then consumed by other organisms such as dolphins and sea turtles, leading to sickness and even death.

With so many different pollutants in our environment, what can we do to limit them from entering our water? Some solutions are simple and some are more complex. By placing all of our trash and waste into trash cans or recycling bins, we can eliminate a massive amount of marine debris. By picking up after our pets, we can curb the harmful pathogens that enter our oceans making both people and marine life sick. Maintaining our cars so that oil does not drip onto our streets then make its way into our oceans via storm drains, is another simple way to keep our environment clean and healthy. Education is the most vital step to keeping our environment clean. Many people have a major disconnect with nature and their relation to it, yet by educating people about how they use and rely upon our planet for survival we can help reconnect them with their environment and provide them with the needed motivation to keep it clean. Some of the more complex measures needed to change our impact on the environment involve motivating institutional change throughout our society. We need to encourage our government to hold industry accountable for their waste discharge, for the proper cleanup in case of an oil or pollution spill, or other environmental disaster. There are many technological solutions as well that can be implemented such as more storm water diversions to the sewage system and, more thorough maintenance of our storm drain and sewage systems.

It is important to remember that we are just one of the hundreds of millions of species that call this planet home, yet we are the only one that is polluting it. While cleaning all of this up may seem like a daunting task, we must also remember that we are the only species capable of doing so.

[1] "pollution." The American Heritage® Science Dictionary Copyright © 2005 by Houghton Mifflin Company.

Pre-Visit Activity: The Water Cycle

Level
5th Grade

Abstract
This activity will introduce the students to the water cycle and its different components. Furthermore, it will give the students a sense of where their water originates and how it gets to their community.

Objectives
Students will be able to:
- Explain the water cycle
- Identify the source of our local water
- Define precipitation, evaporation, condensation and water cycle

Targeted Standard(s)
California Science Standards, Grade 5
3. *Water on Earth moves between oceans and land through the process of evaporation and condensation. As a basis for understanding this concept:*

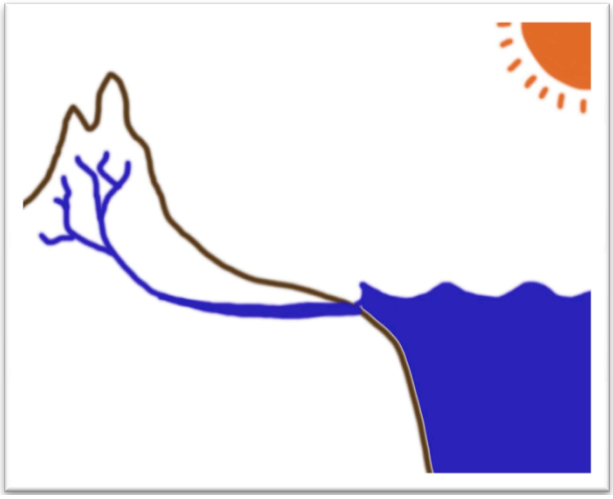
b. Students know when liquid water evaporates, it turns into water vapor in the air and can reappear as a liquid when cooled or as a solid if cooled below the freezing point of water.
c. Students know water vapor in the air moves from one place to another and can go from fog or clouds, which are tiny droplets of water or ice, and can fall to Earth as rain, hail, sleet, or snow.
e. Students know the origin of the water used by their local communities.

Environmental Principles & Concepts (EEI) corresponding learning objectives:
- *Describe the roles of evaporation, liquefaction and freezing in the water cycle.*
- *Identify the role of precipitation (rain, hail, sleet, or snow) in terrestrial, freshwater, coastal and marine ecosystems.*
- *Provide examples of how humans and human communities directly and indirectly depend on precipitation (rain, hail, sleet, or snow) and the water cycle.*
- *Identify sources of freshwater in their local communities.*
- *Describe the process by which water is supplied to students' homes and their community.*

Materials
- Dry erase board
- Dry erase pens (preferably in a variety of colors)
- Computer with internet access
- Water Source Map

Time Allotment
20 minutes

Procedure
1. Before class go to **http://www.water-ed.org/watersources/** and select the city/town you are located in. This will tell you where your area receives its water from (Central Valley project, State Water Project, Colorado River, Other Systems, Groundwater or Local Streams and Reservoirs). Print out the page with the list of sources and their descriptions.
2. Prior to the students arrival have a drawing on the board as shown.



3. Ask the students where the water they use to drink, shower, flush their toilets and brush their teeth comes from?
4. Explain to them that the water they use comes from far away up in the surrounding mountains. *Point to the mountain in the picture.*
5. Ask the students how the water got here from the mountains?
6. Explain to the students that the water runs off the mountain through streams, that lead into rivers that in turn flow here to Los Angeles. (We have built aquaducts to help carry the water to our cities and water treatment plants in the place of natural rivers.) *Point to the river in the picture.*
7. Well if the water came from the top of mountains, how did the water get there?
    a. Target answer: Rain and Snow (**Precipitation**)
8. Ask the students where the rain and snow came from?
    a. Target answer: Clouds - *Draw clouds over the mountain with rain falling.*
9. Ask the students where the clouds came from?
10. Explain to the students that the hot sun shines down upon the oceans, causing the ocean water to evaporate. **Evaporation** is the process where a liquid will turn into a vapor when energy is applied to it (think about a cup of hot tea). *Draw arrows up from the ocean and then draw a cloud over the ocean.*
11. Explain to the students that as the water vapor cools it **condenses**, forming clouds. These clouds are then moved around the planet by wind. *Draw an arrow from the cloud over the ocean to the cloud over the mountain.*
12. Under certain conditions the clouds will release their moisture (precipitate) as rain or snow, depending upon the temperature.
13. This is the water cycle.
14. Discuss with the students that this process has been going on for millions of years.
15. Explain to the students that there are many more people here in Southern California than the natural water can support. So where do we get the extra water from? Lets find out!
16. Have the students identify and read about where their water comes from and locate it on the map.

Evaluation

Begin a discussion about the difficulty and problems regarding the transport of water from so far. Some points to focus on include:

a. Moving water uphill over the surrounding mountains.
b. Natural and human induced disruptions to the supply (earthquake, pollution spill)

Vocabulary

- **Precipitation:** When cloud particles become too heavy they release their moisture as rain, sleet, snow or hail.
- **Evaporation:** Evaporation is the process by which water is converted from its liquid form to its vapor form and thus transferred from land and water masses to the atmosphere.
- **Condensation:** Condensation is the change of water from its gaseous form (water vapor) into liquid water. Condensation generally occurs in the atmosphere when warm air rises, cools and looses its capacity to hold water vapor.

Water Source Map

http://www.centralbasin.org/slideshows/mapCaliforniaAqueduct.gif

Pre-Visit Activity: Trash Count

Level
5th Grade

Abstract
In this activity, students will be asked to look for trash that can be found around their school and neighborhood. By collecting and counting the different types of trash, they will become aware of the quantity of each type of trash, provide the service of cleaning their local area, and be asked to formulate possible solutions to the trash problems in their community.

Objectives
Students will be able to:
- Define and give examples of trash
- Categorize and sort objects according to similar and differing properties
- Quantify the amount of each type of trash collected
- Construct a visual representation, ie. picture, graph, chart, etc., of the amount of each type of trash collected
- Discuss ways to reduce trash in the community

Targeted Standard(s)
California Math Standard, 5th Grade
1.0 Statistics, Data Analysis, and Probability: *Students display, analyze, compare, and interpret different data sets, including data sets of different sizes:*

1.2 *Organize and display single-variable data in appropriate graphs and representations (e.g., histogram, circle graphs) and explain which types of graphs are appropriate for various data sets.*

Materials
- Glove, one per student
- Trash bag, one per 3-5 students
- Data Card, one per 3-5 students
- Clipboard, paper and pencil for recording other data
- Posterboard and art-related materials for constructing graphs and drawings

Time Allotment
(2) 45 min class periods

Procedure
1. Explain to the students that today you are taking them outside to become familiar with their environment.
2. Ask them to describe what they see around them (what components make up their community?)
3. Awaken students enthusiasm for the cleanup by asking them to spot trash.
4. Don't have the students pick up trash yet! Once you have established that there is trash, ask how it looks. Does it look good? Ugly?
5. Ask the students how they think the trash got to where it is?
    a. Target answer: people litter.
6. Ask the students where they think the trash should go and what we can do to help? Help them to decide that a cleanup would help out with the problem.
7. Introduce the cleanup project.
    a) Go over safety rules:

i) Wear one glove at all times.
ii) Do not pick up sharp items, needles, or unfamiliar items (tell the teacher). The teacher should pick up these items carefully, only if he/she feels safe doing so.
iii) Do not pick up dead organisms (tell the teacher). The teacher should pick up these items carefully, only if he/she feels safe doing so.

b) Break students into groups of 3 to 5 people.
c) Explain that each student will have an important job such as: trash bag keeper, data collector, lead trash grabber, trash grabbers, etc. Be sure to explain jobs fully, such as data collector, by telling students exactly what you want them to do.
d) Designate boundaries and time allotted (time frame dependant on class length and teacher preference.)

8. Pass out cleanup materials. Each student gets only one glove (not two) to minimize the waste we produce and still be safe. Each group gets a trash bag and a data card.
9. Have the students pick up trash and mark the trash found on the data card.
10. Have the students add up the data card for each kind of trash.
11. Make sure all trash is in trash bags and have students dispose of it properly.
12. Have students create a grid, chart, graph, or other visual representation of their data.
13. Have students draw conclusions based on their data. Which kinds of trash did they find the most of?
14. Have students generate solutions to the problem of excessive trash in the environment. If they are having difficulty, offer some solutions such as not littering!

Evaluation/Assessment

Have students create a visual representation of the data, interpret results, and draw conclusions by analyzing their picture, chart or graph. Based upon their information have the students offer solutions to the problem of pollution by verbally explaining them, writing them down, or drawing a picture.

CLEANUP DATA CARD

Heal the Bay®
www.healthebay.org

Group Name: _____

Beach/Site: _____

Today's Date: Month _____ Day _____ Year _____

Keep a count of your items using tally marks.
When you are finished, enter the item total in the box.

Example: 8 **Plastic Beverage Bottles** 𝍸 III

Do not write words such as "Lots" or "Many."
Only numbers of items can be used.

- Remember to pick up even small pieces of trash, which animals often mistake for food.
- **DO NOT** pick up any sharp objects (broken glass), dead animals or anything that looks like it comes from a hospital (syringes or needles).
- Leave natural debris (kelp, driftwood, shells) on the beach; it is part of the ecosystem we are protecting.

RECYCLABLE ITEMS

ONLY THE FOLLOWING ITEMS SHOULD BE PLACED IN THE RECYCLE BAG.

- ☐ **Plastic Beverage Bottles** _____
- ☐ **Glass Beverage Bottles** _____
- ☐ **Aluminum Soda Cans** _____

PLASTIC ITEMS

- ☐ **Plastic Bags** (grocery, shopping, trash) _____
- ☐ **Plastic Snack Bags** (chips) _____
- ☐ **Plastic Wrappers** (candy) _____
- ☐ **Plastic Fast Food** (cups, lids, plates, utensils) _____
- ☐ **Plastic Bottle Caps/Rings** _____
- ☐ **6-Pack Rings** _____
- ☐ **Newspaper Ties, Strapping Bands** _____
- ☐ **Plastic Straws, Stirrers** _____
- ☐ **Fishing Line, Nets, Lures, Floats** _____
- ☐ **Plastic Motor Oil Bottle** _____
- ☐ **Balloons/Ribbons** _____
- ☐ **Plastic Pieces** _____

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- ☐ **Plastic Pieces** _____

STYROFOAM ITEMS (Foamed Plastic)

- ☐ Foam Peanuts (Styrofoam packaging)
- ☐ Fast Food Containers, Cups, Plates
- ☐ Styrofoam Pieces

SMOKING RELATED ITEMS

- ☐ Cigarette Butts
- ☐ Cigar Tips
- ☐ Disposable Lighters

PAPER ITEMS

- ☐ Paper Bags
- ☐ Cardboard, Newspapers, Magazines
- ☐ Fast Food Containers, Cups, Plates

METAL ITEMS

- ☐ Metal Lids, Caps, Pulls
- ☐ Batteries

MEDICAL AND PERSONAL HYGIENE

DO NOT PICK UP THE FOLLOWING ITEMS. NOTIFY A LIFEGUARD OR GROUP LEADER.

- ☐ Syringes, Needles
- ☐ Diapers
- ☐ Condoms
- ☐ Tampons, Tampon Applicators
- ☐ Band Aids, Bandages

Thank You.

The data you have collected will be used for educational, scientific and legislative purposes to help make Southern California Coastal waters safe and healthy for people and marine life.

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Post Visit Activity: H_2O Use

Level
5th grade

Abstract
Through the use of self-examination, students will understand how much water they use on a weekly basis. Following a class discussion of what measures students can perform to reduce water usage, they will repeat the self-examination in the hopes of cutting usage of water by as much as possible.

Objectives
Students will be able to:

- Examine the different ways that they use water in the home
- Identify how much water is actually used for various activities
- Quantify their approximate water usage at home
- Recognize ways that they can cut down on water usage in their own home

Targeted Standard(s)
California Math Standard, Grade 5
Statistics, Data Analysis, and Probability
Students display, analyze, compare, and interpret different data sets, including data sets of different sizes:

1.2 Organize and display single-variable data in appropriate graphs and representations (e.g., histogram, circle graphs) and explain which types of graphs are appropriate for various data sets.

California Science Standards, Grade 5
Water on Earth moves between oceans and land through the process of evaporation and condensation. As a basis for understanding this concept:

d. Students know that the amount of fresh water located in rivers, lakes, underground sources, and glaciers is limited and that its availability can be extended by recycling and decreasing the use of water.
e. Students know the origin of the water used by their local communities.

Environmental Principles & Concepts (EEI) corresponding learning objectives:

- Describe the ways in which humans, human communities and their practices use water.
- Provide examples of how water use can be decreased by humans and human communities.
- Describe the ways in which humans use water in their local community.

Materials

- Copies of the H_2O Use Data Sheet
- Dry erase board and pens
- Gallon jug of water (can be empty)

Time Allotment
3 class periods + 2 weeks of personal observation

Procedure

1. Ask the students to name all of the ways they use water in a typical day. List them on the board. Show the students a gallon jug of water and ask them to estimate how many gallons they use in a day and record their answers.

2. Tell the students that they are going to be looking at how much water they use over the course of a week.
3. Tell them that over the next seven days they are to keep track of the ways they use water by noting them on the H_2O Use Data Sheet. Example, one student might flush the toilet 28 times, wash their hands 32 times, brush their teeth 23 times, etc. Ask them to also record uses of water that they may not have listed on the data sheet such as filling a fish tank.
4. After students have completed their data sheet, lead a discussion about the class's findings.
    - How much water did you estimate you personally used in the seven day period?
    - People in the US on average use 700-1120 gallons of water per person per week. How does your use compare with this average?
    - Are you surprised at how much water you use?
    - Imagine you did not have plumbing in your house, that you had to carry water from a well. Would this change the amount of water you used? How do you think your water use would be different?
    - What simple, routine steps could you take to reduce the amount of water used in a week?
5. Discuss with students ways that they can reduce their water usage over the course of a week. For example: Turning off water when brushing teeth, letting the toilet "mellow" if it's yellow, etc.
6. Now that you have covered some ways to conserve water, have students log their water use for another 7 days, this time trying out as many water-saving methods as they can. *As a motivator hold a competition to see which student can reduce their water usage the most.
7. Ask students to calculate their water usage and compare the two weeks. Have them make note of how their water reduction measures worked.
8. Have students graph their water usage in the first 7 day period compared with the second 7 day period.
9. Lead a discussion about the results:
    - How much did your water consumption change from the first seven day period?
    - What were the biggest reasons for the change?
    - For which tasks was it easier to save water?
    - For which tasks was it hard to reduce water?
    - If you were only allowed 175 gallons of water per week, how would you use your 175 gallons? How would you cut back?
    - Will you continue any of your water saving activities in the future? Why or why not?

Evaluation

Have a discussion based on the questions below**.**

Discussion:	Possible Responses:
Where does our water come from?	Most students may think that water comes from a faucet but where does it really come from? What is your water source?
What happens to water that goes down the drain?	Concept of water treatment, septic tanks, Pollution.
Why is water important to people?	It is the source of all life and clean, drinkable water is limited.
Why do you think we should be concerned about water?	Awareness of pollution and water usage issues.
What water saving ideas did you learn?	Opportunities for taking personal responsibility for saving water.

Post Visit Activity: Waste in My Life

Level
5th grade

Abstract
Through the use of self-examination, students will understand how much waste they generate on a daily basis. Following a class discussion of what measures students can perform to reduce waste, they will repeat the self-examination in the hope of cutting waste by as much as possible.

Objective
Students will be able to:

- Identify the different types of products they use and the trash they generate
- Assess what types of trash are most prevalent in their lives
- Recognize ways that they can cut down on trash in their own home

Targeted Standard(s)
California Math Standard, 5th grade
Statistics, Data Analysis, and Probability
Students display, analyze, compare, and interpret different data sets, including data sets of different sizes:

1.2 Organize and display single-variable data in appropriate graphs and representations (e.g., histogram, circle graphs) and explain which types of graphs are appropriate for various data sets.

Materials

- Copies of the Waste In My Life data sheet (one per student)

Time Allotment
3 x 35 minute class periods & 2 take home exercises

Procedure

1. *Day 1*: Tell the students that we are going to walk ourselves through a typical day to look at what types of waste we generate.
2. Begin by telling the students that they have just woken up and that they are going to the kitchen for breakfast. What kind of trash does breakfast produce? Empty plastic milk jug, empty cardboard box, paper towel, etc.
3. After the class has walked through an entire day of listing the waste they might create in a single day, tell them that they are going to monitor their actual trash production throughout the course of a day.
4. Pass out Waste In My Life data sheet.
5. Each student must fill out the data sheet with all the trash that they generate over the course of a day. Have the students count each item as one unit
6. *Day 2*: As a class, generate a graph based on they types and the quantities of waste they cumulatively generate throughout a day. What was the most?
7. Referring to the graph, discuss as a class ways in which we can reduce our waste (use reusable flatware, plates and cups, etc).
8. On another day, have the students monitor their waste while trying to reduce the amount of waste they generate.
9. *Day 3*: Repeat step 6.

Evaluation
Discuss with the class where they were able to reduce their trash production during the second day of personal waste use observation. Discuss with the class where their trash production was not reduced and why they think this might be. Were some items easy to reduce and others more difficult? Why?

Are there any alternatives to some of their waste items that they could implement in the future?

Resources & Reference Materials

Reference & Activity Books

Donald, Rhonda Lucas. *Water Pollution*. Children's Press. 2002. **ISBN:** 978-0516273570

Donald, Rhonda Lucas. *Recycling*. Children's Press. 2002. **ISBN:** 978-0516273563

On-line Resources

http://www.umich.edu/~gs265/society/waterpollution.htm
A great detailed site for information on water pollution

http://edtech.kennesaw.edu/web/pollute.html
Site that includes lesson plans and activities, as well as great background on a number of issues

http://tiki.oneworld.net/pollution/pollution_home.html
Site geard for children with activities and games about pollution

http://www.geocities.com/RainForest/5161/site_map.htm
good site for water pollution and wastewater treatment

http://techalive.mtu.edu/meec/module01/Thehydrologiccycle.htm
great site for information on the water cycle

http://www.water-ed.org/watersources/
resource to locate your communities source for potable water

http://ga.water.usgs.gov/edu/wateruse.html
USGS water usage website. How waster in the United States is allocated and used

http://www.h2ouse.org/
great resource on what you can do in your home to increase water efficiency

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This project is made possible by a grant from the U.S. Institute of Museum and Library Services.