Project Learning Tree®

GREENSCHOOLS
FOR EARLY CHILDHOOD

Water Investigation

PLT GreenSchools

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First Edition

Introduction

Overview
The Water Investigation will help you assess water usage at your early childhood center. You'll see how various water conservation practices can be used to save water, help the environment, and reduce water bills. Early learners will be able to help complete parts of the investigation with the aid of adult leaders.

Early Childhood Learning Objectives
- Develop an understanding of how water is used at the center, both indoors and outdoors.
- Develop a basic understanding of how water may be wasted at the center.
- Develop a basic understanding of the importance of water conservation.
- Develop actions for conserving water.

Word Bank
Freshwater, watershed, contaminate, native plant

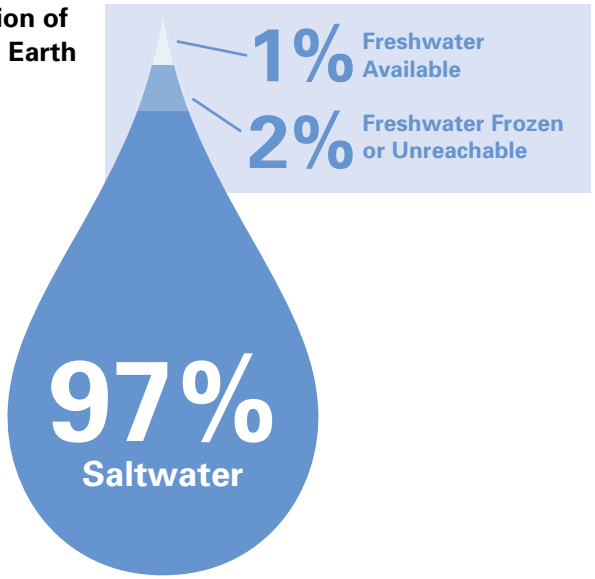
Related PLT Education Activity
The following PLT activity can be used to supplement this Investigation.

PreK-8 Environmental Education Activity Guide
Activity 36 – Pollution Search – Part B: Cat with an Attitude. Through a reading of *The Cat in the Hat*, young students learn about pollution and discuss what they can do to make their world a cleaner, safer, and healthier place.

Background for Educators

The United States uses over 400 billion gallons of water each day. This is an enormous amount, especially when you consider that less than 1 percent of the water on Earth is freshwater available for use. The remainder of the Earth's water is either in our oceans (97 percent) or locked up in polar ice caps, glaciers, or too far underground to be extracted (2 percent).

Distribution of Water on Earth



Because water is essential to life's processes, water consumption will continue to be an important issue for generations to come. Although water delivery and treatment systems are sophisticated in many countries, the Earth's population continues to grow, placing ever-increasing demands on water supplies. Every day, the average American family uses about 552 gallons of water.

Conserving water and preventing water pollution are critical to ensuring that we all have an adequate supply of usable water. Learning to use water wisely will help protect the quantity and quality of our water resources. Wise water use can also help people save money on water, sewer, and energy costs.

Solving our water conservation issues brings together the fields of science, technology, engineering, math, sociology, political science, and health. A more educated and informed citizenry knows the importance of responsible water use and may be able to come up with better solutions to our water consumption problems. The role of educators is fundamental to this process.

Introduction

Why Study Water at Early Childhood Centers?

Even at an early age, children can appreciate why water is important and why it's important to conserve it. Young children can understand that we need clean water for:

- Drinking,
- Washing, and
- Growing and preparing food

In addition, children can be a powerful influence on the family. They can bring the ideas they learn at school to their homes and help their families save water too.

Forest to Faucet

Although you may not think about it when you turn on a faucet, the water you use each day probably originated in a forest. In fact, almost 80 percent of U.S. freshwater resources originate in forests, and some 180 million people directly depend on forests for their drinking water. (Sources: http://www.srs.fs.usda.gov/research/fish-and-wildlife/ and www.fs.fed.us/openspace/fote/fote-6-9-05.pdf) Forests help maintain freshwater supplies by absorbing rainfall, cooling and cleansing water, slowing storm runoff, and refilling underground aquifers.

Many communities attempt to use technology—at great expense—to replace some of the ecosystem services that are provided by forests at little or no cost. For example, billions of dollars have been invested in the construction and upgrade of water treatment plants to clean public water supplies that have been degraded by pollution. U.S. water utilities spend 19 times more on water treatment chemicals annually than the federal government invests in protecting lakes and rivers from pollution by conserving forest land. (Source: http://forestsforwatersheds.org/forests-and-drinking-water/) Hence, it is vitally important that we protect our forests and watersheds.

A watershed is the land area that drains water and sediment into a particular body of water. Watersheds cross city, state, and national boundaries, a fact that has implications for the management of forests and other landscapes. Our actions can affect the quality of the water in the watershed. Even though not all of us live within forested areas, every one of us lives within a watershed.

To learn more about why conserving water at your center is important and to see how other GreenSchools across the country are taking action, watch PLT's short videos Investigating Water and GreenSchools in Action: Water. These videos are available on PLT's YouTube channel: https://www.youtube.com/user/ProjectLearningTree.

Water Investigation Terminology

The following definitions may be useful to adult leaders as they conduct the Investigation. The terms preceded by the Word Bank logo WB are terms that you may want to introduce to young learners.

Aquifer
An underground layer of porous, water-saturated sand, gravel, or bedrock from which water can be extracted.

WB **Contaminant**
A substance that makes something impure or unclean. For example, bacteria contaminates drinking water.

Ecosystem services
The services that humans derive from environmental functions, such as oxygen production, photosynthesis, and water purification.

WB **Freshwater**
Water that is not salty, typically defined as water having a salt concentration of less than 1%.

Glacier
A flowing body of ice, formed in a region where the amount of snowfall exceeds the amount that melts.

WB **Native plant**
A plant that occurs naturally in an area or habitat.

Rain barrel
A system that collects and stores rainwater from a roof that would otherwise be lost to runoff. The collected water may be used later to water lawns and gardens.

Runoff
Surface water that flows downhill due to gravity.

WB **Watershed**
The land area that drains water and sediment into a particular body of water.

Getting Ready

Use the following checklist as you complete each part of the Investigation:

- ☐ Review the *PLT GreenSchools for Early Childhood Educator Guide* and obtain any necessary permissions.
- ☐ Gather the following documents and supplies to complete the Water Investigation:
  - Billing statements from the early childhood center's water provider for one year.
  - An annual drinking water quality report.
  - Any written policies related to water management or conservation for the center.
- ☐ Introduce the theme to your children.
- ☐ Conduct the Water Investigation.
- ☐ Assess your results and take action.

Introduce the Theme

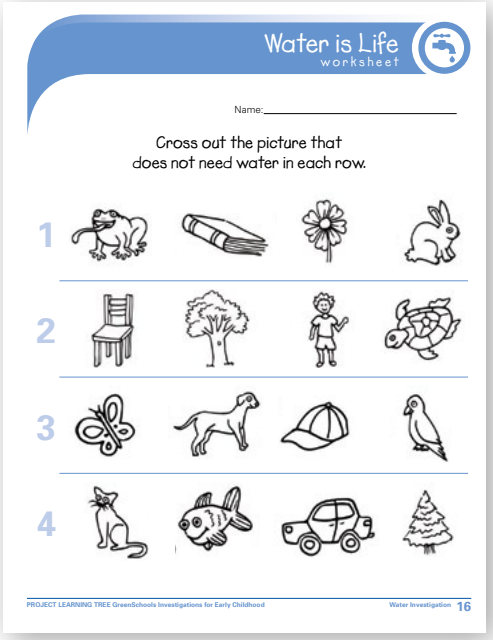
1 Reading Connections

The following are some books that may be used to introduce the topics of water and water conservation to young children:

- *Our Earth: Saving Water* by Peggy Hock. Children's Press, 2008. ISBN-10: 0531204367.
- *Saving Water (Help the Environment)* by Charlotte Guillain. Heinemann Help the Environment Series, 2008. ISBN-10: 1432908928.
- *The Drop Goes Plop: A First Look at the Water Cycle (Little Bees Series)* by Sam Godwin. Hodder Wayland, 1998. ISBN-10: 075002495X.
- *Why Should I Save Water?* by Jen Green and Mike Gordon. Barron's Educational Series, 2005. ISBN-10: 0764131575.

2 Early Learner Worksheet

Have each child complete the "Water is Life" worksheet, available on page 16. Go over the correct answers with your children, discussing why all living things need water.


Water is Life
worksheet

Name:_____

Cross out the picture that does not need water in each row.

1
2
3
4

PROJECT LEARNING TREE GreenSchools Investigations for Early Childhood Water Investigation 16

Conduct the Water Investigation

Name(s):_____ Date:_____

Directions: Adult leaders should complete this questionnaire, involving their students in the Early Childhood Engagement activities.

Part I Water Source, Quality, and Cost

1. In which watershed is your early childhood center located? You can use the following U.S. EPA website to locate your watershed: http://cfpub.epa.gov/surf/locate/index.cfm.

EARLY CHILDHOOD engagement

Show children on a map where their early childhood center is located and point out nearby bodies of water. You can also point out the source of their drinking water.

2. What is the name and the approximate distance of the closest body of water to the early childhood center? (For example, stream, river, lake, aquifer)

3. What is the source of the drinking water supply for the early childhood center?
   - ☐ Municipal water supply
   - ☐ Private well

4. If the drinking water comes from a municipal supply, what is its source?
   - ☐ Groundwater (well, aquifer)
   - ☐ Surface water (lake, river, reservoir)

5. Where does used water go (wastewater)?
   - ☐ Municipal sewer system; name: _____
   - ☐ Onsite septic system and drainage field
   - ☐ Holding tank

Conduct the Water Investigation

6. If the drinking water comes from a private well, who monitors and tests the water quality? How often is the water quality tested?

7. If the drinking water comes from a municipal supply, what is the name of the supplier? How often is the water quality tested?

8. Using water bills from the last year, record the following information:

   a. Water bill year: _____
   b. Amount of water the early childhood center used that year: _____
   c. Cost of water for that year $_____

9. Complete the **Water Quality Test Results Chart** on page 7. If your early childhood center's water comes from a municipal supply, there should be a publicly available water quality report. The reports are often mailed to customers and made available at the supplier's website. If the water comes from a well, routine water quality tests should be performed and the test results should be available from the testing lab.

Conduct the Water Investigation

WATER QUALITY TEST RESULTS CHART		
Directions: Using your water quality report, list the contaminants for which the water was tested, note whether each contaminant was detected, and note whether the contaminant exceeded action levels.		
Typical contaminants on water quality reports	**Was the contaminant detected? Yes or No?**	**Was the action level set for the contaminant exceeded, causing a violation? Yes or No?**
E. coli bacteria		
Coliform bacteria		
Arsenic		
Barium		
Cadmium		
Chromium		
Copper		
Cyanide		
Disinfection byproduct		
Fluoride		
Lead		
Nitrate		
Nitrite		
Selenium		
Other:		
Other:		

10. Brainstorm and record a list of ways that your early childhood center could improve its drinking water. (For example, installing water filters.)

Conduct the Water Investigation

Part II Water Devices

Directions: Adult leaders should complete this section, involving their students in the Early Childhood Engagement activities.

EARLY CHILDHOOD engagement

Take your children on a guided discovery tour of your bathroom(s), classroom(s), hallway(s), and any other locations that have faucets, water fountains, or toilets. Have them determine whether the faucet(s) in the bathroom operates manually or automatically. Then count the total number of faucets and determine how many are leaking. Have your children complete the "How Many Faucets?" worksheet found on page 15. Discuss with them why it is important to fix leaky faucets. Ask them whether they know any other ways to save water at school or at home.

1. Complete the **Water Devices Chart** below.

WATER DEVICES CHART

Directions: Write the number of water devices found in each room and indicate whether the device is operated automatically (A) or manually (M). Also note the number of leaking devices.

Automatic (A): Equipment may turn on and off when movement sensors are activated or may turn on with a push and then automatically turn off after a certain amount of time.

Manual (M): Equipment must be physically turned on and off by user.

Location (Record the location and room name.)	**Faucets** (Record how many faucets are in each room, whether they are automatic or manual, and how many leak.)			**Water Fountains** (Record the number of fountains, whether they are automatic or manual, and how many leak.)			**Toilets/Urinals** (Record how many toilets/ urinals are in each room, whether they are automatic or manual, and how many leak.)		
	Total #	A or M	# Leaking	Total #	A or M	# Leaking	Total #	A or M	# Leaking

Conduct the Water Investigation

2. How many faucets total are leaking? _____

3. How many water fountains total are leaking? _____

4. How many toilets or urinals total are leaking? _____

5. On average, how much water do the toilets use per flush? (Ask members of your center's maintenance staff to help you find this information. The amount may be noted on the toilets. Water-saving toilets use about 1.6 gallons or less per flush.)

   - ☐ > 5 gallons
   - ☐ 3–5 gallons
   - ☐ 1–2 gallons
   - ☐ < 1 gallon

6. Brainstorm and then record a list of ways that your early childhood center could conserve water and improve the water-using fixtures.

Some Signs of a Leaking Toilet

- Sounds of running water or a faint hissing or trickling noise that occurs even when a toilet has not been flushed.
- The need to jiggle the toilet handle to make it stop running.
- Water trickling down the sides of the toilet bowl long after it's been flushed.

Some Signs of a Leaking Urinal

- Water running after the flush is complete.
- Water leaking from the edge of the urinal on the wall.

Conduct the Water Investigation

Part III Water Usage on Early Childhood Center Grounds

Directions: Adult leaders should complete this section, involving their students in the Early Childhood Engagement activities.

1. How many water faucets are located outside the building?

   _____

   How many of them leak? _____

2. How many water hoses are located outside the building?

   _____

   How many of them leak? _____

EARLY CHILDHOOD engagement

Take your children on a guided discovery walk around the outside of the building to look for ways that water is used. Children can look for water faucets, water hoses, bird baths, and so forth. Depending on their age, the children can help answer some of the questions.

3. Does your building have gutters and/or downspouts?

   ☐ Yes ☐ No

   If yes, is this water collected and reused? (For example, rain runoff from the roof can be collected in a rain barrel to water flowers or a garden later. Make sure rain barrels are covered for the safety of children and to keep out animals.) ☐ Yes ☐ No

4. Where does water go that runs off the roof, parking lots, and grounds? (Check all that apply.)

   ☐ Storm drain
   ☐ Rain garden
   ☐ Drainage ditch
   ☐ Recessed grassy areas
   ☐ Retention pond
   ☐ Natural pond, stream, or wetland

5. Do staff use hoses to wash sidewalks and parking areas? (Sweeping areas clean with brooms saves water.)

   ☐ Yes ☐ No

6. Does your center have a plan for managing and reducing runoff from roofs, sidewalks, pavement, and other impervious surfaces?

   ☐ Yes ☐ No

Conduct the Water Investigation

7. Are lawns and playgrounds managed in a way that conserves water?

   ☐ Yes ☐ No

8. Brainstorm and then record a list of ways that your early childhood center could improve water conservation on its grounds.

TIPS FOR WATERING GREEN SPACES EFFICIENTLY

- Water only as much as is necessary.
- Water during the cooler parts of the day to minimize evaporation loss.
- Direct water onto green areas and not onto parking lots, sidewalks, or streets.
- Check the irrigation system regularly for leaks, faulty valves, and other malfunctions that waste water.
- Adjust the watering schedule to reflect seasonal changes in temperature, humidity, and rainfall.
- Use an efficient watering system, such as drip or soaker hoses, to minimize water loss through evaporation or runoff.
- Equip an automatic irrigation system with a soil moisture sensor or a rain sensor so the system shuts off when it's not needed.
- Pick the irrigation system that is most appropriate for the job and uses the least amount of water. A garden hose or portable sprinkler system works well for small areas; a drip irrigation system or soaker hoses allow water to be directed onto specific plants and areas; an automatic sprinkler system works well for large areas.

Taking Action

Complete the **Water Action Plan** on the next page. You can engage young children by creating a **Classroom Action Book** on saving water.

EARLY CHILDHOOD engagement

Classroom Action Book

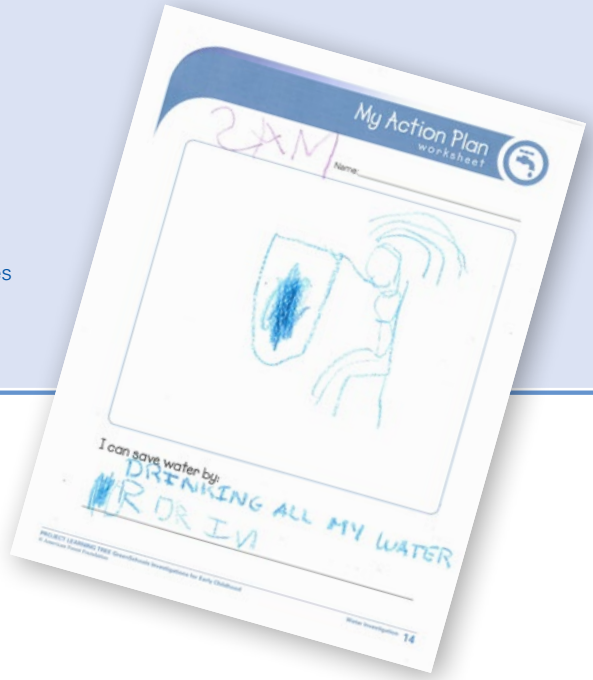
Your learners can create a classroom book filled with simple ways to save water. A template for making the book that highlights their art and ideas is provided on page 14.

Directions: Have children draw a picture of how they can save water. Alternatively, provide a variety of pictures for them to cut out and use. Have the children paste their picture to their **My Action Plan** worksheet. Then write, or help the children write, their responses to the prompt. Each child can contribute one page and then the pages can be combined into a book.

The finished book can be shared in the classroom or scanned and uploaded on a website so that it can be shared with other classes and family members. In addition, please share your book with PLT at information@plt.org or via our **PLT Facebook Page**. The book is a wonderful way to capture what the children have learned from this Investigation.

Before children begin working on their pages, review some of the things they discovered from this Investigation that might be appropriate for the book. Some ideas include:

- Turn off faucets when soaping hands.
- Turn off faucets when brushing teeth.
- Fix leaky faucets.
- Use a broom, not a hose, to clean sidewalks.
- Plant native plants that need less watering.
- Water lawns during the cooler parts of the day (this minimizes water evaporation loss).



Taking Action

Water Action Plan

Directions: Review the list of ideas for improving water quality and conservation that you brainstormed for each part of this Investigation. Prioritize the ideas and decide on a few action projects to do.

List action project ideas for each part of the Water Investigation:

Water Source, Quality, and Cost

Water Devices

Water Usage on Early Childhood Center Grounds

EARLY CHILDHOOD engagement

Encourage your children to discuss questions such as: Why is it important to save water? How can we save water?

Water Action Project Ideas

Here are just a few ideas to help get you started. You can check out what other PLT GreenSchools are doing by watching PLT's short video GreenSchools in Action: Water (available on PLT's YouTube channel at https://www.youtube.com/user/ProjectLearningTree) and by reading stories posted at https://www.plt.org/project-learning-tree-greenschools-stories.

- Install signs in all restrooms encouraging water conservation.
- Work with administrators to install low-flow faucets, toilet tanks, and shower heads.
- Work with administrators to install automatic or motion sensor faucets to reduce water waste.
- Investigate and repair leaking fixtures.
- Use mulch around plants and gardens to conserve water.
- Plant native vegetation that is adapted to local rainfall amounts and climate, as these plants require less watering.
- Build a rain garden to improve the health of your local watershed.
- Clean sidewalks and parking lots by sweeping instead of using running water.

My Action Plan
worksheet

Name:_____

I can save water by:

_____

How Many Faucets?
worksheet

Name:_____

How many of each do you see?

Circle the correct number.

Manual Faucet

0 1 2 3 4 5 6

Automatic Faucet

0 1 2 3 4 5 6

How many are leaking?

Circle the correct number.

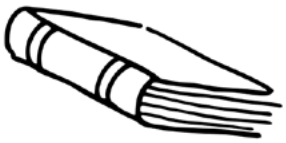
0 1 2 3 4 5 6

Water is Life
worksheet

Name:_____

Cross out the picture that
does not need water in each row.

1

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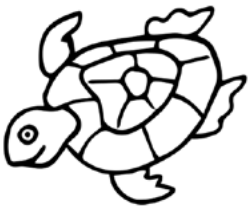

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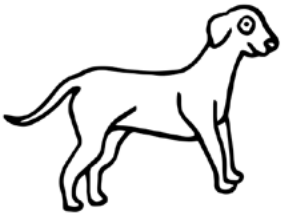

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