

# THE WATER EFFECT

TEACHER TRAINING TOOLKIT



PRESENTED BY

The  
Ecology  
Center





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# **TABLE OF CONTENTS**

<b>LESSON 1: THE WATER EFFECT</b>	<b>3</b>
Handout 1: All About Water	5
Handout 2: 5 Things to Know About Water in the World	6
Handout 3: Global Water Footprint	7
Handout 4: Personal Water Audit	8
<b>LESSON 2: YOUR WATER FOOTPRINT</b>	<b>9</b>
Handout 1: "Water Footprint" Defined	11
Handout 1: Teacher Key "Water Footprint" Defined	12
Handout 2: Analysis: "Water Footprint" Defined	13
<b>LESSON 3: FROM DROUGHT TO ABUNDANCE - SOUTHERN CALIFORNIA RAINFALL</b>	<b>14</b>
Handout 1: What is a Watershed & Drought	19
Handout 2: Rainwater Analysis	22
Handout 3: Build Your Own Rain Gauge	24
Handout 4: Calculate Your Catchment	25
<b>CUT YOUR USE IN HALF – 10 WATER-SAVING SOLUTIONS</b>	<b>26</b>
<b>TEACHER TRAINING ACTIVITY: WATER FOOTPRINTING PAVERS</b>	<b>27</b>
<b>TEACHER TRAINING ACTIVITY: RAIN BARREL INSTALLATION</b>	<b>28</b>

**LESSON 1**

**THE WATER EFFECT**

**OVERVIEW**

This lesson is all about water literacy. The more you know about water, the more you can share with others, and the easier saving water becomes.

**OBJECTIVES**

- Understand that fresh water is a limited resource
- Know that only 3% of the water on the planet is fresh water
- Analyze inequitable water consumption throughout the world, noting patterns between between water consumption and poverty versus wealth
- Begin evaluating personal water consumption

**GRADE LEVEL: 9-12**

**CALIFORNIA CONTENT STANDARDS**

- BIOLOGY/LIFE SCIENCE B/LS.6 – Stability in an ecosystem
- ENGLISH LANGUAGE ARTS - RI.10-12.7: Integration of Knowledge and Ideas - Integrate and evaluate multiple sources of information presented in different media or formats (e.g. visually, quantitatively) as well as in words in order to address a question or solve a problem.
- MATHEMATICS - A. REI.9-12 Reasoning with Equations and Inequalities - Represent and solve equations and inequalities graphically
- U.S. HISTORY AND GEOGRAPHY - 11.11: Continuity and Change in the Twentieth Century -Students analyze the major social problems and domestic policies issues in contemporary American society.

**MULTIMEDIA RESOURCES**

“Shocking Facts About Water” Video <https://www.youtube.com/watch?v=PjSUG6JsLYw>.

**MATERIALS**

- Handout #1 “All About About Water True/False”
- Handout #2 “5 Things to Know About Water in the World”
- Handout #3 “Global Water Footprint”
- Handout #4 “Personal Water Audit”

**RECOMMENDED TIME: 1 CLASS PERIOD**



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## HOOK

In groups, have students list all the ways that humans use water for 2 minutes. Tally up which group brainstormed the most uses and have students share out, focusing the discussion on water importance.

## INTRODUCTION TO NEW MATERIAL

1. Handout #1: Play the video “Shocking Facts About Water”  
<https://www.youtube.com/watch?v=PjSUG6JsLYw>  
As students watch, they should complete the true/false questions.
2. Handout #2: Share the 5 things to know about water in the world
  - a. Most of the earth’s surface is covered with water, spanning 70% of the Earth’s surface.
  - b. We have limited fresh water: 97% of the water on the planet is salt water. The remaining 3% is fresh water, but over 2/3 of that is unusable—locked away in glaciers and ice caps. The last 1/3 is available for us to use, just 1% of the Earth’s total.
  - c. Water is distributed unequally across the world. The average American uses 1,800 gallons of water per day. People in the world’s poorest countries survive on less than 5 gallons a day. 1 in 6 people do not have access to clean water.
  - d. Most people use too much. Water consumption has increased 7 times in the past 100 years, and doubled in the past 20.
  - e. We can use less water by using it better. There are simple things we can do every day to ensure an abundance of fresh clean water for the future. About 30-60% of potable home water is used on landscape watering, for example. Let’s do better!

## GLOBAL WATER FOOTPRINT ANALYSIS

Have students examine the map of water use per capita (Handout #3), answer, and discuss the corresponding questions. **BOTTOM LINE:** If we all used water like the US did, we would need at least 2 Earths to sustain our lifestyle. To maintain earth’s water in a sustainable way, our usage would need to hover around 950 gallons per person, per day.

## HOMEWORK

Handout #4 - Have students conduct an audit of their water use over a period of 72 hours.

**HANDOUT 1**

**ALL ABOUT WATER**

**DIRECTIONS**

Watch the video “Shocking Facts about Water” carefully, and take the true/false quiz:

1. **True/False:** More than 25% of bottled water comes from the same place as tap water
2. **True/False:** 97% of the earth’s water is fresh water
3. **True/False:** In a day, Europeans use 100 gallons of water
4. **True/False:** 40 billion gallons are used in the U.S. per day
5. **True/False:** Drinking 8 water bottles a day will cost \$1400 over a year
6. **True/False:** In a day, Americans use 50 gallons of water
7. **True/False:** 68.7% of earth’s fresh water is unusable
8. **True/False:** 35 million gallons are leaked in the NYC water supply system
9. **True/False:** It takes 1000 gallons of water to make one gallon of milk
10. **True/False:** It takes 64 gallons to make one burger

HANDOUT 2

5 THINGS TO KNOW ABOUT WATER IN THE WORLD

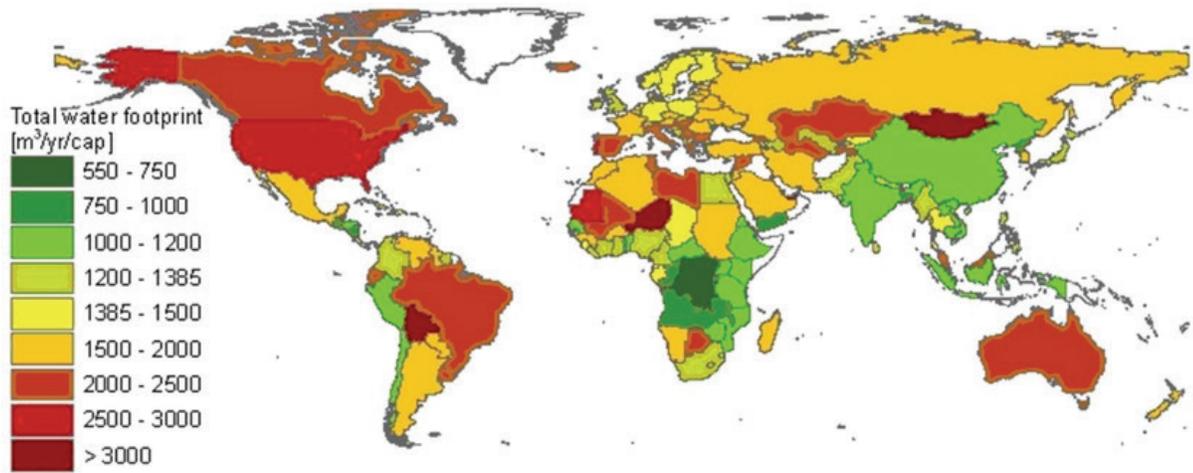
1. Most of the earth's surface is covered with water, **spanning 70% of the Earth's surface.**
2. **We have limited fresh water:** 97% of the water on the planet is salt water. The remaining 3% is fresh water, but over 2/3 of that is unusable—locked away in glaciers and ice caps. The last 1/3 is available for us to use, just 1% of the Earth's total.
3. **Water is distributed unequally across the world.** The average American uses 1,800 gallons of water per day. People in the world's poorest countries survive on less than 5 gallons a day. 1 in 6 people do not have access to clean water.
4. **Most people use too much.** Water consumption has increased 7 times in the past 100 years, and doubled in the past 20.
5. **We can use less water by using it better.** There are simple things we can do every day to ensure an abundance of fresh clean water for the future. About 30-60% of potable home water is used on landscape watering, for example. Let's do better!

# HANDOUT 3

## GLOBAL WATER FOOTPRINT

### DIRECTIONS

Examine the below map of water usage per year/per capita across the world and then answer the corresponding questions.



1. Look at the countries with the highest and lowest water footprints. What's surprising?
  
2. What do the countries with similar footprints have in common?
  
3. Brainstorm and be prepared to discuss:
  - a. Should everyone be able to use the same amount of water each day? Why or why not?
  
  - b. If we all used the highest number of gallons as some on the map do, what do you predict our world water situation would look like?



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# HANDOUT 4 PERSONAL WATER AUDIT

## DIRECTIONS

Over the next 72 hours, track your water usage using the below worksheet.

	DAY 1	DAY 2	DAY 3	TOTALS
LIGHTS ON (HOURS)	(hours) X 4 = gallons	(hours) X 4 = gallons	(hours) X 4 = gallons	
MILES DRIVEN	(fuel efficiency) ÷ (miles driven) X 1.75 = gallons	(fuel efficiency) ÷ (miles driven) X 1.75 = gallons	(fuel efficiency) ÷ (miles driven) X 1.75 = gallons	
SHOWER MINUTES	(minutes) X 4 = gallons	(minutes) X 4 = gallons	(minutes) X 4 = gallons	
FAUCET MINUTES	(minutes) X 4 = gallons	(minutes) X 4 = gallons	(minutes) X 4 = gallons	
TOILET FLUSHES	(flushes/day) X 3 = gallons	(flushes/day) X 3 = gallons	(flushes/day) X 3 = gallons	
MEAT MEALS	(meat meals) X 436 = gallons	(meat meals) X 436 = gallons	(meat meals) X 436 = gallons	
VEGGIE MEALS	(veg meals) X 100 = gallons	(veg meals) X 100 = gallons	(veg meals) X 100 = gallons	
LAUNDRY LOADS	(# of loads) X 40, 27 or 14 depending on machine* = gallons	(# of loads) X 40, 27 or 14 depending on machine* = gallons	(# of loads) X 40, 27 or 14 depending on machine* = gallons	
TOTAL GALLONS				

\*Laundry conversion:

40 gallons = older top loading machines, 27 gallons = newer models, 14 gallons = Energy star washers

## LESSON 2

# YOUR WATER FOOTPRINT

### OVERVIEW

This lesson is all about water awareness. Doing a simple water audit creates a baseline awareness of the kinds of activities that use water and the amount of water we use every day.

### OBJECTIVES

- Become aware of daily activities and products that consume water
- Identify the difference between direct and indirect water consumption
- Understand personal and societal changes that will reduce U.S. water use

### GRADE LEVEL: 9-12

### CALIFORNIA CONTENT STANDARDS

- BIOLOGY/LIFE SCIENCE B/LS.6 – Stability in an ecosystem
- ENGLISH LANGUAGE ARTS - RI.10-12.7: Integration of Knowledge and Ideas - Integrate and evaluate multiple sources of information presented in different media or formats (e.g. visually, quantitatively) as well as in words in order to address a question or solve a problem.
- MATHEMATICS - A. REI.9-12 Reasoning with Equations and Inequalities - Represent and solve equations and inequalities graphically
- U.S. HISTORY AND GEOGRAPHY - 11.11: Continuity and Change in the Twentieth Century -Students analyze the major social problems and domestic policies issues in contemporary American society.

### MULTIMEDIA RESOURCES

- “How Much Water Do We Really Use Everyday?” Video  
<https://www.youtube.com/watch?v=On9WRrFHVjY>

### MATERIALS

- 4 signs – (Less than 1000, 1000-2000, 2000-3000, 3000+)
- Handout #1 “Water Footprint Defined”
- Handout #2 “Analysis: Water Footprint Defined”

### RECOMMENDED TIME: 1 CLASS PERIOD

## HOOK

### 4 Corners on Water Audit

Hang a sign in each corner of the room (Less than 1000, 1000-2000, 2000-3000, 3000+) and ask students to go to the corner that best reflects the results of their 72 hour water audit. Use the student info gathered to drive a discussion about water usage; were students surprised by the amount of water they used? What activity used the most water? How do their findings compare with the average American's use (1,800 gallons/day) and the global sustainable level (950 gallons/day)?

## INTRODUCTION TO NEW MATERIAL

Show students the video "How Much Water Do We Really Use Everyday?" (<https://www.youtube.com/watch?v=On9WRrFHVjY>). After watching the video, ask students to attempt to define "direct use" versus "indirect use", examples, and solutions using Handout #1. Guide students toward the correct definitions, and have them compare their definitions with the actual ones.

## HOMEWORK

Handout #2 – Student answer questions to analyze types of water consumption and management.

## ADDITIONAL RESOURCES

### Water Footprinting Basics

<http://theecologycenter.org/resources/water-footprinting-basics>

### Quick water footprint calculator

<http://waterfootprint.org/en/resources/interactive-tools/personal-water-footprint-calculator/>

### Extended water footprint calculator

<http://waterfootprint.org/en/resources/interactive-tools/personal-water-footprint-calculator/personal-calculator-extended/>

**HANDOUT 1**

**“WATER FOOTPRINT” DEFINED**

**Water Footprint:** the total amount of water required to make goods and services we consume.

DIRECT USE	INDIRECT USE
DEFINITION	DEFINITION
EXAMPLES	EXAMPLES
SOLUTIONS	SOLUTIONS

**HANDOUT 1: TEACHER KEY**  
**"WATER FOOTPRINT" DEFINED**

**Water Footprint:** the total amount of water required to make goods and services we consume.

DIRECT USE	INDIRECT USE
<p>DEFINITION</p> <p>Visible water, or the water that we can physically see each day</p>	<p>DEFINITION</p> <p>Invisible water, or the water spent on the goods and services we consume, mostly before they make it to us.</p> <p>Indirect water use represents 90% of America's water use</p>
<p>EXAMPLES</p> <p>Toilet flushes</p> <p>Showers</p> <p>Laundry</p> <p>Outdoor watering</p>	<p>EXAMPLES</p> <p>Clothing</p> <p>Electronics</p> <p>Energy</p> <p>Agriculture</p> <p>Transportation</p> <p>Packaging</p>
<p>SOLUTIONS</p> <p>Rainwater catchment</p> <p>Use a bucket</p> <p>Remove your lawn</p> <p>Change habits</p> <p>Brick in toilet</p> <p>Grey water</p>	<p>SOLUTIONS</p> <p>Eat less meat</p> <p>Letter to Congressperson</p> <p>Carpool, ride bikes, take the train</p> <p>Encourage companies to disclose water footprint and sustainability of products</p> <p>Grow your own food</p> <p>Use reusable water bottles/glassware</p> <p>Use less energy</p>

**HANDOUT 2**

**ANALYSIS: "WATER FOOTPRINT" DEFINED**

1. What is "visible" versus "invisible" water consumption? Which type is responsible for the majority of water consumption?
2. If you were a lawmaker, would you consider passing legislation regarding water footprints? What would they be and how would you enforce them?
3. In your opinion, Which type of water consumption is more difficult to reduce? Why?
4. Imagine you are working for the United Nations Public relations department. You are charged with influencing teenagers around the world to care about reducing water consumption. How would you do this?
5. What shocked you the most about your own water usage?

## LESSON 3: FROM DROUGHT TO ABUNDANCE -

## SOUTHERN CALIFORNIA RAINFALL

### OVERVIEW

This lesson is all about our water community and how we can take steps to achieve abundance in our arid climate. Every choice we make affects the quality of our watershed. When we know what makes up our watershed and how it is connected, we can take action to keep it healthy and abundant. A clean watershed means a clean ocean.

### OBJECTIVES

- Identify the need for water conservation due to limited fresh water supply
- Understand that clean watersheds are essential for human and ecosystem health
- Increase awareness of the severity of the California drought and corresponding landscape changes
- Explore methods for creating more fresh water through rainfall collection and greywater

### GRADE LEVEL: 9-12

### CALIFORNIA CONTENT STANDARDS

#### BIOLOGY/LIFE SCIENCE

- B/LS.6 – Stability in an ecosystem-
- 6.b: Analyze changes in an ecosystem resulting from changes in climate, human activity, introduction of nonnative species, or changes in population size.
- 6.d: Know how water, carbon, and nitrogen cycle between abiotic resources and organic matter in the ecosystem and how oxygen cycles through photosynthesis and respiration

#### ENGLISH LANGUAGE ARTS

- SL.9-12.2 Comprehension and Collaboration - Integrate multiple sources of information presented in diverse formats and media (e.g. visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data
- W.9-12.7: Research to Build and Present Knowledge- Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation
- RI.10-12.7: Integration of Knowledge and Ideas - Integrate and evaluate multiple sources of information presented in different media or formats (e.g. visually, quantitatively) as well as in words in order to address a question or solve a problem.
- W.9-10.1 – Text Types and Purposes: Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

#### MATHEMATICS

- F-IF.7: Interpreting Function - Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
- A. REI.9-12 Reasoning with Equations and Inequalities - Represent and solve equations and inequalities graphically

#### SOCIAL SCIENCE

- U.S. History and Geography 11.11: Continuity and Change in the Twentieth Century -Students analyze the major social problems and domestic policies issues in contemporary American society.
- 11.11e: Trace the impact of, need for, and controversies associated with environmental conservation, expansion of the national park system, and the development of environmental protection laws, with particular attention to the interaction between environmental protection advocates and property rights advocates.

#### MULTIMEDIA RESOURCES

- "Watersheds 101" Video <https://www.youtube.com/watch?v=ofTdgIXriug>
- California drought GIFS:  
[http://www.huffingtonpost.com/2014/09/18/california-drought-gifs\\_n\\_5843534.html](http://www.huffingtonpost.com/2014/09/18/california-drought-gifs_n_5843534.html)
- California Department of Water Resources California Data Exchange Center  
<http://cdec.water.ca.gov/cgi-progs/reports/PRECIPOUT>
- Evolve / Issue 08 / Water Wise <http://issuu.com/theecologycenter/docs/evolve08>
- Why You Should Harvest the Rain  
<http://theecologycenter.org/resources/why-you-should-harvest-the-rain>
- Rob Machado – Raincatcher <https://www.youtube.com/watch?v=7gGnZvwK7lo>
- 10 Ways a Bucket Saves Water  
<http://theecologycenter.org/resources/10-ways-a-bucket-saves-water>

#### MATERIALS

- Aluminum foil
- Food coloring
- Pan
- Spray bottle of water
- Computers
- Speakers
- Wide-mouth jars
- Handout 1 "Grounding the Issue: What is a Watershed & Drought?"
- Handout 2 "Rainwater analysis"
- Handout 3 "Build Your Own Rain Gauge"
- Handout 4 "Calculate Your Catchment"

## RECOMMENDED TIME: 3-4 CLASS PERIODS

### HOOK:

#### Create Your Own Watershed:

In groups, have students create their own watershed using aluminum foil crinkled into mountains and valleys in a pan, with a channel leading to a bucket (the ocean). Instruct students to use a spray bottle of water to simulate rainfall and see what happens - all water eventually ends up in the ocean. Next, put one drop of food coloring (representing chemicals or fertilizers) on each group's "watershed" and ask students to make it "rain" again. Facilitate student group discussion of the following:

1. How is the watershed interconnected?
2. Where does all the water eventually end up?
3. Why is important to keep our watershed clean?

### PART 1: WATERSHEDS

Distribute Handout #1 and share the information about watersheds. Share video "Watersheds 101" (<https://www.youtube.com/watch?v=ofTdgIXriug>) and discuss the following questions with students:

1. When you turn on the faucet, where does that water come from?
2. What would happen if our watershed was contaminated? How can we keep our watershed clean?

### PART 2: DROUGHT

Show students the California drought GIFs found here:

[http://www.huffingtonpost.com/2014/09/18/california-drought-gifs\\_n\\_5843534.html](http://www.huffingtonpost.com/2014/09/18/california-drought-gifs_n_5843534.html)

and ask students to brainstorm the following in small groups:

1. How did the landscape change over time?
2. Do you think the landscape dried up faster or slower over the last 3 years than usual? Why?
3. Have students personally noticed any changes in the California landscape (including their own backyards!) in the last few years? Which ones?
4. What are the implications of the current drought on water management?
5. Next, share information on Handout #1 (Part 2) with students, narrowing the focus in on California's water supply and water treatment methods.

#### OPTIONAL – CLASS DEBATE:

Inspired by the old, or captivated by the new? Hold a class debate on water catchment methods for your community. Ask one side to represent desalination and the other to represent earthworks and other ancient rain catchment technologies.

### **PART 3: CALIFORNIA RAINFALL**

Direct students to log on to the California Department of Water Resources California Data Exchange Center <http://cdec.water.ca.gov/cgi-progs/reports/PRECIPOUT> to view California's rainfall by area, month, and year and complete Handout #2.

### **PART 4: GET BARRELED**

1. Shift the conversation away from the problem and toward solutions by showing students the video "Rob Machado – Raincatcher" about capturing and reusing rainwater during the California drought. Discuss the benefits of rainwater catchment – How do they go beyond water conservation? What does it do for the health of a watershed? Refer to "Why You Should Harvest the Rain" and "Evolve / Issue 08 / Water Wise" for additional information. Review information on Handout #1 (Part 3).
2. Have students build their own rain gauge – Handout #3
3. Using Handout #4 and the data collected from the California Department of Water Resources California Data Exchange Center in Part 3, have students calculate how much water – and money – their school could save by harvesting rainwater.

### **PART 5: BUSINESS LETTER**

Based on independent research and information presented throughout the lesson, have students choose one of the below prompts and craft a persuasive business letter.

1. Write a letter to your Congressperson or Principal persuading them to subsidize or adopt rainwater catchment in your local area.
2. Write a business letter to your parent/guardian persuading them to adopt one of the drought solutions.

### **PART 6: DESIGN CHALLENGE**

Research rain harvesting techniques old and new. See how people who have lived in arid areas of the world such as parts of Egypt, India, Africa, or the American Southwest have harvested and managed water for hundreds or thousands of years. Are there any solutions that you could apply to your school or home? Sketch it out and share it with your class.

### **EXTENSION ACTIVITIES**

#### **ENGLISH LANGUAGE ARTS**

- Write a 60 second elevator pitch on the importance of water conservation and what an everyday person could do to help
- Use the elements of persuasion (ethos, pathos, logos) to create an ad campaign for water conservation

- Conduct a socratic seminar using one of the articles included in this packet. Some questions may include:
  - a. Is desalinization a viable solution to California's water crisis?
  - b. Should government impose water restrictions?
  - c. Should companies be required to disclose their water footprint?
  - d. Can rain barrels provide a viable solution to California's water crisis?
  - e. Are teenagers too apathetic about environmental issues?

#### SCIENCE

- Conduct an experiment to measure contamination in school water faucet
- Design a water filtration system
- Determine the impact of population growth on water use and predict what will happen to water consumption 5, 10 and 50 years from now if no changes are made

#### SOCIAL STUDIES

- Debate the role of government policy in environmental issues, specifically in water restriction. Cite historical environmental policies – what's worked? What has not?
- California Governor Jerry Brown issued an executive order mandating water restrictions for the first time in the state's history. Research and discuss the details of this mandate as well as pros and cons of its implementation.

#### MATH

- Develop a linear equation based on your rain gauge to determine amount of rain solved over x months. Graph.

#### ART

- Create an ad campaign to promote water conservation in the style of a famous artist or a particular artistic style.

## HANDOUT 1

# WHAT IS A WATERSHED & DROUGHT?

### VOCABULARY

**Drought:** A deficiency in precipitation over an extended period, usually a season or more, resulting in a water shortage causing adverse impacts on vegetation, animals, and/or people. It is a normal, recurrent feature of climate that occurs in virtually ALL climate zones, from wet to dry.

**Grey water:** Any water left over from your daily household chores such as laundry, dishes, hand washing, and showering. Dish, shower, sink, and laundry water comprise 50-80% of residential "waste" water. This may be reused for other purposes, especially landscape irrigation.

**Ecosystem:** A biological community of interacting organisms and their physical environment.

**Aqueduct:** An artificial channel for conveying water, typically in the form of a bridge supported by tall columns across a valley.

**Watershed:** An area in which a community's water connect to join a larger body of water, such as a river, lake, or ocean.

**Water Cycle:** The cycle of processes by which water circulates between the earth's oceans, atmosphere, and land, involving precipitation as rain and snow, drainage in streams and rivers, and return to the atmosphere by evaporation.

### PART 1: WATERSHEDS

A watershed is an area in which a community's water connect to join a larger body of water, such as a river, lake, or ocean.

#### It's like a giant bathtub!

- The hills and mountains that surround your community act as the tub basin, holding water in
- The rivers, lakes, and oceans in your community acts as the drains, releasing the water, which eventually leads to the ocean.

#### Why is a watershed important?

- All of our water eventually flows to the same place – the ocean! As a result, any chemicals, fertilizers, or other pollutants we use will impact the health of our community and ecosystem.
- We can keep our watershed clean by:
  - a. Collecting rainwater to prevent harmful run-off and pollution from reaching the ocean
  - b. Using non-toxic products whenever possible
  - c. Carefully storing and disposing of household cleaners, chemicals, and oils
  - d. Keeping our land free of litter
  - e. Always picking up pet waste

## PART 2: DROUGHT

So how do we get our water in Southern California?

- Most of our water travels to us via a 300 mile long aqueduct connected to the Colorado River.

How is water treated once it's used and goes down the drain?

1. **Commercial Water Treatment:** Once water flows down the drain it travels to a wastewater treatment plant, which does the following:
  - a. Preliminary treatment. Screens remove the largest impurities, a grit removal device forces smaller impurities to sink to the bottom.
  - b. Primary treatment. In sedimentation tanks, heavy particles will sink to the bottom and lighter ones will float.
  - c. Secondary treatment. Microorganisms are added to feed on organic material and remove impurities.
  - d. Disinfection process. Harmful pathogens are killed off with disinfectants such as chlorine.
2. **Desalination:** The process of removing the salt and purifying ocean water so it can be used and consumed by the public. Although this may seem like a simple solution, here are some challenges:
  - a. Cost: approximately \$2,000 per acre-foot. Plants are also very expensive to build. The plant currently being constructed in Carlsbad, CA will cost 1 billion dollars and will provide 7% of San Diego's water supply.
  - b. Energy: It will take 38 megawatts, which is enough to power 28,500 homes, to desalinate the amount most plants process in a day.
  - c. Environmental Impact: The pipes that draw water from the ocean often take in marine organisms that die once they hit the filtration screens. Desalination filters seawater through fine-pored membranes, which creates a salt-concentrated byproduct known as brine. Brine is released back into the ocean, which can cause harmful changes to the water's composition.

What is California's drought all about?

- California is currently experiencing an extreme drought as a result of low precipitation in 2012, record low precipitation in 2013 and a very dry 2014.
- However, contrary to popular belief it DOES rain in SoCal, and the way we manage that water may help offset the drought.
- Drought conditions have resulted in extremely low precipitation and snowpacks at only 5% of their average levels. However, even during the driest years in recorded history, it still does rain in Orange County. Just an inch of rainfall on an average OC house can yield 1800 gallons of water. If rainwater catchment was utilized throughout the county, it could significantly reduce the region's water needs.

## PART 3: SOLUTIONS

### What can we do about it?

We can recycle water infinitely. Two simple ways to do so at home are:

- Collecting precious rainfall
- Reusing greywater

### Why capture rain?

Our short rainy season can make a big impact. Harvesting rainwater is an easy and gratifying way to save some of that winter abundance for later use in your gardens, toilet tanks, and more. It also prevents harmful run-off and pollution from reaching the ocean.

### Just how much water will you save by harvesting the rain?

- A 3,000 sq. ft. roof (the average roof size of an OC house)= 1,860 gallons from 1" of rainfall
- In 2014, Southern California received 7-8" of rain
- Each home could save around 14,000 gallons of water in a year

### What is greywater?

Greywater is any water left over from your daily household chores such as laundry, dishes, hand washing, and showering. It contains biodegradable soaps, food particles, and even human hair and skin cells, so it must be used immediately. Greywater is ideal for garden and orchard irrigation.

**HANDOUT 2**  
**RAINWATER ANALYSIS**

Use the California Department of Water Resources California Data Exchange Center (<http://cdec.water.ca.gov/cgi-progs/reports/PRECIPOUT>) to answer the following questions.

1. Rainfall in Laguna Beach (LGB) so far this year: \_\_\_\_\_
  
2. Which water station has received the most rainfall this year? Why do you think that is?

4. Graph the monthly precipitation at the Laguna Beach (LGB) station below:

4.00										
3.50										
3.00										
2.50										
2.00										
1.50										
1.00										
0.50										
0.25										
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL

5. Based on the graph above, answer the following questions:
  - Which month received the most rainfall?
  
  - Which month received the least rainfall?



[www.TheWaterEffect.one](http://www.TheWaterEffect.one)

## SOLUTION STATION

1. Research the potential uses for collected rainwater using any resources at your disposal. How would YOU use recycled rainwater in your home?
2. How many gallons of rain did the average OC house rooftop collect in 2014?
3. Should the government create laws to regulate water usage? Why or why not? (BONUS: How would they enforce the laws?)
4. Recycled rainwater doesn't have to end in a barrel – how would you divert rainwater to maximize it's impact?

## HANDOUT 3

# BUILD YOUR OWN RAIN GAUGE

### TOOLS & MATERIALS

- large, wide-mouth jar
- ruler
- journal
- trowel

**COST:** \$2

**TIME:** 10 MINUTES + WAIT FOR RAIN

1. It costs almost nothing to build this useful tool. Find an unused wide-mouth glass jar from home. The glass is sturdier than a plastic bottle and won't leach harmful chemicals into the soil.
2. To anchor the jar, dig a small hole and bury the bottom half. Pack the dirt around it to stabilize the jar.
3. After it rains you can measure the rainfall with the help of a ruler. When you're done, empty the nutrient-rich water on a thirsty garden plant and re-bury it for the next rain.
4. Using a journal, keep a record of how much rain you received in a season.

**HANDOUT 4**

**CALCULATE YOUR CATCHMENT**

Every drop counts! Kick-start your community's water saving by imagining a world of water catchment off every building.

**ACTIVITY**

Using the square footage of your school's campus, you can calculate how much water—and money—your school could save by harvesting rainwater. Use the formula:

**Catchment area (ft<sup>2</sup>) x rainfall (inches) x .623 (conversion factor) = Harvested Water in gallons**

1. Start with a room. The area of the room you're sitting in is equal to the area of the roof above it. How much rain could you harvest from the roof over your classroom alone?
  
  
  
  
  
  
  
  
  
  
2. Expand your calculations to include other parts of the school. Remember to add any roof overhangs to your total catchment area.
  - a. Total square footage of school: \_\_\_\_\_
  - b. Potential harvested water with 1 inch of rain: \_\_\_\_\_
  
  
  
  
  
  
  
  
  
  
3. Using the information you gathered from your "Rainwater Analysis" (Handout 2), how much rainwater would your school have captured in December 2014?
  
  
  
  
  
  
  
  
  
  
4. How much water could you save in a year from the rainfall off your roof alone? What could you do with it? Where could you store it?
  
  
  
  
  
  
  
  
  
  
5. How much money could your school save? What could you do with that money?

**CUT YOUR USE IN HALF**

**10 WATER-SAVING SOLUTIONS**

1. **Go Reusable - 6 gallons / plastic bottle** - Ditch disposables! Start with your water bottle - eliminate plastic waste and save 6 gallons every time you fill up.
2. **Use a Bucket - 5 gallons / bucket** - Keep precious drops from going down the drain. Capture and recycle water from your shower as it heats up, dish-washing, and more. Save 5-10 gallons with each fill.
3. **Purchase with Purpose - 100's gallons / day** - Choose quality over quantity to save water and stop feeding landfills. Give old things new life. Repurpose, recycle, and reuse to save.
4. **Eat Less Meat - 3000 gallons / week** - Take a step down the food chain and save. Swapping green for red just a couple times a week saves thousands of gallons of water.
5. **Grow Your Own - 150 gallons / day** - When you buy organic or grow your own at home, you keep harmful pesticides out of our waterways. Supporting local farmers reduces the water necessary to transport, process, and store food.
6. **Harvest the Rain - 55 gallons / rainfall** - When that precious California rain comes, take advantage. Gather the drops in containers or rain gardens -- reduce runoff and keep post-storm beaches clean.
7. **Brick It - 2 gallons / day** - Displace the tank. Put a brick or sand-filled bottle in your toilet tank to eliminate ½ gallon per flush.
8. **Ditch the Lawn - 150 gallons / day** - By installing a native garden in the place of a lawn, you'll cut your water use, reduce runoff, and eliminate the need for synthetic fertilizers.
9. **Power Down - 5 gallons / day** - Flip the switch. Replace inefficient household bulbs with CFLs and LEDs and turn off unnecessary electronics. One day of typical household energy uses 4-5 gallons
10. **Don't Run - 8 gallons / day** - A typical faucet runs 2-4 gallons per minute. Turn off the tap when brushing your teeth, shaving, soaping up, or washing dishes. Take it further and install a low-flow faucet or aerator. See how little water you need to get the job done.

**Take it further! Visit [TheWaterEffect.one](http://TheWaterEffect.one) and follow @TheWaterEffect for monthly campaigns and contests oriented around these 10 solutions. Implementing them all can cut your water use in HALF! Share the creative ways you have found to decrease your water footprint using #TheWaterEffect. Join the movement to rethink water.**

**TEACHER TRAINING ACTIVITIES**  
**WATER FOOTPRINTING PAVERS**

How many gallons is your daily water footprint?

**DIRECTIONS**

School's out for the day! How will you unwind? Follow the blue water pavers and choose how to spend your afternoon. Find and circle one choice from each pair below. Use the numbers on the pavers to fill in the number of gallons you used. At the end, add up your total to see what kind of weekend you've earned!

1. You're just off the school bus, and it's hot outside! Would you like:  
 a glass of water or a can of soda? # of gallons: \_\_\_\_\_
2. You need to wash your hands. While you're washing, do you:  
 turn the tap off or leave it running? # of gallons: \_\_\_\_\_
3. It's snack time! Do you choose:  
 an apple or a bag of potato chips? # of gallons: \_\_\_\_\_
4. Your friends are here! Do you:  
 play outside or watch TV? # of gallons: \_\_\_\_\_
5. You're feeling a little dehydrated and need some water. Do you choose:  
 a reusable bottle or a plastic bottle? # of gallons: \_\_\_\_\_
6. Time to clean up! Do you change into:  
 a recycled t-shirt or a new cotton tee? # of gallons: \_\_\_\_\_
7. Dinner time! Do you eat:  
 a veggie burrito or a hamburger? # of gallons: \_\_\_\_\_
8. You have homework. Do you write it on:  
 recycled paper or brand new paper? # of gallons: \_\_\_\_\_
9. How many gallons did you use? TOTAL: \_\_\_\_\_

**0-300 gallons:** Nice job saving water! Take a day off from school tomorrow and go to the beach!

**301-500 gallons:** You saved some water, good work! You get to have a sleepover this weekend!

**501-1,000 gallons:** Maybe you'll make some smarter water choices next time. You can still pick your favorite dessert tonight!

**1,001-2,000 gallons:** Oh no! Are you sure about your water choices? What can you do differently next time to enjoy a treat?

# TEACHER TRAINING ACTIVITIES

## RAIN BARREL INSTALLATION

Harvesting rainwater reduces storm water runoff and provides high quality, mineral-rich, and free water. Garden plants especially love rainwater. All you need is a roof and a gutter, and you can harvest the rain practically anywhere!

### MATERIALS AND TOOLS

- 55 Gallon barrel
- Bulkhead set
- Harden faucet
- 1 Piece of mesh or window screen
- Elbow fitting (optional)
- Hole saw or sabre saw

**COST: \$50**

**TIME: 1 HOUR**

### INSTRUCTIONS

1. Purchase a clean, 55-gallon, food-grade plastic barrel. Do not use a used barrel or one you retrieved from the dump.
2. Cut a hole the size of your downspout into the top of the barrel or lid. A hole saw or sabre saw will do the trick.
3. Affix a piece of mesh or window screen over the hole in the lid to prevent debris or critters from falling in. If needed, you can attach a 45o elbow to the end of your downspout to reach your barrel.
4. Unscrew the bulkhead and place the threaded stem against the outside of the barrel about 4-6" above the ground.
5. Trace around the stem, and cut out the traced hole.
6. Place one of the rubber gaskets on the stem and push it through the hole so that the base of the stem and rubber gasket are still on the inside of the barrel. The stem should fit snugly.
7. Slide the second gasket onto the stem that is now protruding out from the barrel. Next, screw the washer onto the stem.
8. Tighten it down against the gasket, but avoid over tightening. You can now thread a garden faucet into the bulkhead, and affix a hose.
9. Place the rainbarrel on a sturdy, flat surface, such as short pillars made from bricks, to let gravity do the work for you.