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CENTER FOR INTERNATIONAL STUDIES



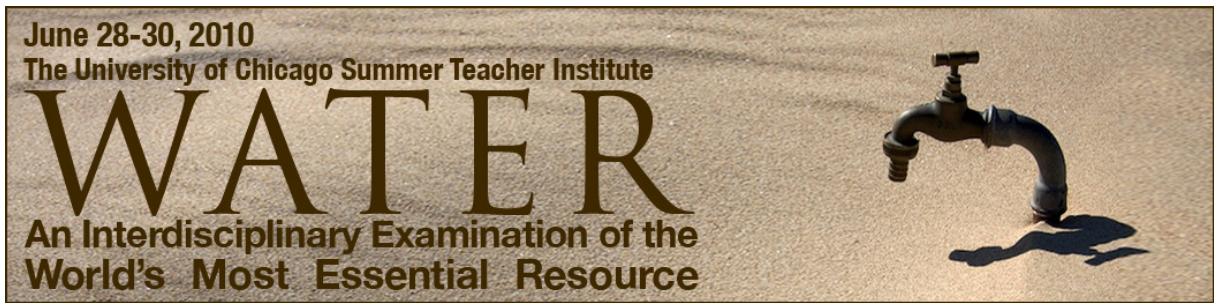
## Global Lessons

The University of Chicago Center for International Studies presents *Global Lessons* as part of its commitment to providing educational resources for K-12 educators. These materials offer thematic international & area studies content on topics including culture, economics, politics, history, and environmental issues. With *Global Lessons*, CIS aims to provide classroom materials that will not only help to expose students to global issues, but also to empower them to think critically about their role as global citizens.

### **Water: An Interdisciplinary Examination of the World's Most Essential Resource**

#### **Global Water Scarcity**

**The University of Chicago  
Center for International Studies**



The Center for International Studies' Summer Teacher Institute, "Water: An Interdisciplinary Examination of the World's Most Essential Resource," was held on the University of Chicago campus from June 28-30, 2010. In addition, a curriculum development workshop was hosted on July 1<sup>st</sup> and an optional field trip to the Stickney Water Reclamation Plant and the Chicago Center for Green Technology took place on July 2<sup>nd</sup>.

The Institute provided an in-depth and multifaceted review of global water issues, as well as those that specifically affect the Great Lakes region. Daily topics addressed included: water issues in politics, effective water management, impacts of dams, water scarcity, sanitation, agriculture, and economics.

Thirteen professors, researchers, environmental engineers, and civic leaders from the University of Chicago and other educational institutions from around the world, spoke each day. Sixty elementary, high school, and college teachers from thirty-eight Illinois schools, as well as 20 other education-stakeholders attended the Institute.

The Institute was cosponsored by the University of Chicago Center for International Studies, the Center for East Asian Studies, the Center for Middle Eastern Studies, the Center for East European and Russian Eurasian Studies, the South Asia Language and Area Resource Center, and the Center for Latin American Studies.

The following lesson was created by Jill Krynski, Honors Biology and Environmental Science Teacher at Bloom High School, and edited by Jamie Bender, Outreach Coordinator for the Center for International Studies at the University of Chicago. The lesson is based on speakers' presentations at the Institute.

For more information on the Center for International Studies, additional resources and classroom lessons developed based on this Institute, and to download resources from other events, please visit the Center's website: <http://cis.uchicago.edu/>



# Global Water Scarcity

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**Lesson Overview:** Students will learn about and experience the concept of scarcity. They will be exposed to the global water scarcity problem, its causes, and some solutions. Students will examine the Earth's distribution of water. They will calculate their own personal water use and consider ways to conserve water. This lesson is based on information presented at the 2010 University of Chicago Teacher Institute, "Water: An Interdisciplinary Examination of the World's Most Essential Resource."

**Written By:** Jill Krynski, Honors Biology and Environmental Science Teacher, Bloom High School

**Subject(s):** Biology, Environmental Science, Social Studies, Geography

**Suggested Grade Level(s):** Middle School and High School

**Time Duration:** 4 hours

## **IL Learning Standards Addressed:**

### Science

12.B.4b Simulate and analyze factors that influence the size and stability of populations within ecosystems (e.g., birth rate, death rate, predation, migration patterns).

12.E.5 Analyze the processes involved in naturally occurring short-term and long-term Earth events (e.g., floods, ice ages, temperature, sea-level fluctuations).

13.B.4c Analyze ways that resource management and technology can be used to accommodate population trends.

13.B.4d Analyze local examples of resource use, technology use or conservation programs; document findings; and make recommendations for improvements.

### Geography

17.B.3a Explain how physical processes including climate, plate tectonics, erosion, soil formation, water cycle, and circulation patterns in the ocean shape patterns in the environment and influence availability and quality of natural resources.

17.C.3b Explain how patterns of resources are used throughout the world.

17.D.3b Explain how interactions of geographic factors have shaped present conditions.

### Economics

15.B.4b Analyze the impact of current events (e.g., weather/natural disasters, wars) on consumer prices.

15.D.4b Describe the relationships between the availability and price of a nation's resources and its comparative advantage in relation to other nations

15.E.4b Describe social and environmental benefits and consequences of production and consumption.

### English

5.C.4a Plan, compose, edit and revise information (e.g., brochures, formal reports, proposals, research summaries, analyses, editorials, articles, overheads, multimedia displays) for presentation to an audience.

3.A.4 Use standard English to edit documents for clarity, subject/verb agreement, adverb and adjective agreement and verb tense; proofread for spelling, capitalization and punctuation; and ensure that documents are formatted in final form for submission and/or publication.

3.C.4a Write for real or potentially real situations in academic, professional and civic contexts (e.g., college applications, job applications, business letters, petitions).

### **Objectives:**

#### *Students will*

- Define scarcity
- Understand the global problem of water scarcity
- Discuss the causes of water scarcity
- Describe some of the solutions
- Visualize how much water is available to humans
- Explain the importance of water
- Understand how to conserve water

### **Materials:**

- Paper lunch bags for all students
- Paper grocery bags
- 1 paper grocery bag filled with popcorn
- Global Water Scarcity PowerPoint Notes
- Blue and green colored pencils or markers
- Internet to access Water Calculator at <http://watercalculator.fieldmuseum.org/>
- One sheet of blank 8 x 11 paper, per student
- Several 5 gallon paint buckets
- Water

## Activities and Procedures:

### 1. Opening Activity

- Fill 1 paper grocery bag with popcorn, fold it closed
- Open 2 more bags, but do not put popcorn in them, fold them closed.
- Give each student an empty paper lunch bag as they enter class.
- Call up a few students at a time. Tell them to bring their bags and fill them with as much popcorn as they would like.
- When the first bag is empty, the students will think they can open the other grocery bags, but they will soon notice that there is no more popcorn.

### 2. Discussion Questions

- Ask all students to sit down to talk about what just happened. The following are some questions to facilitate the discussion:
  - Why are some students angry?
  - Describe the 'problem' that you just encountered.
  - What does the term scarcity mean? (*Insufficiency of amount or supply; Shortage*)
  - Ask students to think about a time in their life when they experienced scarcity or observed it. Write examples on the board.
  - Discuss some of our natural resources that are scarce or will be scarce in the future. (*water, land, trees, oil, coal, gold, air*)
  - Who has rights to these resources?
  - Who decides who gets these resources (allocation)? What is fair?

### 3. Visualizing Scarcity

- Give each student a blank piece of paper
- Tell them they need to visually represent the idea of scarcity on their paper.
- Have students choose one of the following methods of visual representation:
  - Draw a picture (no words are allowed).
  - Create a metaphor.
  - Find a picture in a magazine and explain how it represents the idea of scarcity.
  - Choose a song that represents scarcity.
- Ask students to share their ideas with 2 other students.

### 4. Water Scarcity Lecture Notes

- Use the Global Water Scarcity Notes Handout, found at the end of this lesson. The handout accompanies the Global Water Scarcity PowerPoint.
- Give each student a copy of the handout to fill in during the lecture.

### 5. Water Distribution and Conservation Activity

- Give each student a copy of the Water Distribution and Conservation Activity handout.
- Instruct students to read the introduction and answer the questions on the handout.
  - Discuss the answers to the questions.
- Have students complete the two bar graphs.
  - Discuss the graphs and questions that follow.
- Online Water Calculator
  - Have students go to a computer with internet access.
  - Go to <http://watercalculator.fieldmuseum.org/>
  - Click on How Much Water Do You Use?
  - Have students complete the questions to learn about their own water footprint.
- Have students create their own brochure to promote water conservation.

## 6. Conclusion

- Have students take turns carrying water in the 5 gallon buckets.
  - Students should walk outside, the halls, or the school track for at least 2 minutes (more time is better).
  - When one group is done, switch groups until everybody has had a turn carrying the bucket.
- Reflection Activity
  - Ask students to reflect on their experience and the water scarcity issue.
  - Have students write a one page reflection on what they have learned.
  - The following are guiding questions to help your students write their reflection paper:
    1. How did it feel to carry the bucket?
    2. Is there an easier way to carry the water?
    3. What would it be like to have to get water each day from miles away?
    4. How would your life be different if you had to walk at least 1 mile each day to get water?
    5. If the water company shut off your water, where would you get water?
    6. Do you think Americans take water for granted?
    7. Describe why water is such a valuable resource.
    8. What should governments, corporations, farmers, and people be doing about the water scarcity problem?

## **Assessments:**

- Scarcity Visualization Activity
- Global Water Scarcity PowerPoint Notes
- Water Distribution and Conservation Activity

## **Adaptations**

- Substitute popcorn with any snack or other desirable item.
- If you do not have access to an LCD projector, print out the PPT slides and write the notes on the board or overhead projector.
- Post the Global Water Scarcity PowerPoint Notes on a web page and have students use personal computers to fill in the blanks.
- Students can do other projects instead of a brochure – children's book, short story, poem, rap, etc.

## **Extra Credit/Additional Resources:**

- National Geographic April 2010 – Special Issue “Water Our Thirsty World”
- World Health Organization – Water Scarcity  
<http://www.who.int/features/factfiles/water/en/>
- The Water Project – [http://thewaterproject.org/water\\_scarcity.asp](http://thewaterproject.org/water_scarcity.asp)
- United Nations Water – <http://www.unwater.org/flashindex.html>  
<http://www.un.org/waterforlifedecade/>

Name \_\_\_\_\_ Date \_\_\_\_\_ Period \_\_\_\_\_

## Global Water Scarcity Notes

Water and Life	<ul style="list-style-type: none"> <li>Water is a _____ - more important than oil.</li> <li>All life forms depend on water.</li> <li>If we don't make efforts to _____, _____, and _____ this valuable resource, we may be putting all living beings at risk.</li> </ul>
Water and Economics	<ul style="list-style-type: none"> <li>Every industry from _____, _____ and industrial manufacturing to beverage, apparel, and _____ relies on water to grow and ultimately sustain their business.</li> <li>The United States' _____ runs on water.</li> </ul>
Water Scarcity	<ul style="list-style-type: none"> <li>Water scarcity describes the relationship between the _____ for clean, freshwater versus the _____.</li> <li>According to the World Health Organization, _____ people live where water is physically scarce or unsafe.</li> </ul>
Lack of Water	<p>The lack of water kills more humans around the world than:</p> <ul style="list-style-type: none"> <li>_____</li> <li>_____</li> <li>And all _____ combined.</li> </ul>
Water Facts – <a href="http://www.reuters.com">www.reuters.com</a>	<ul style="list-style-type: none"> <li>There are 1.4 billion cubic kilometers of water on the planet but almost _____ is salt water.</li> <li>Most freshwater is locked up in _____ or _____, leaving only a fraction available for human consumption or use.</li> <li>Most experts believe there is still enough water to go around, but its _____ is very uneven.</li> <li>North Americans have access to over _____ cubic meters per person per year</li> <li>The poorest African countries have less than _____ cubic meters per person per year</li> </ul>



Water Facts (cont.)	<ul style="list-style-type: none"> <li>• Wealthy but water-scarce countries such as Saudi Arabia can afford expensive _____, but poor ones cannot.</li> </ul>
According to the World Water Council	<ul style="list-style-type: none"> <li>• Agriculture accounts for _____ of human water consumption.</li> <li>• Industry accounts for _____.</li> <li>• Domestic households account for _____.</li> <li>• About _____ evaporates from man-made reservoirs.</li> </ul>
Water Scarcity in the United States	<ul style="list-style-type: none"> <li>• The Southwest was home to 14 of the 25 fastest-growing American cities with populations over _____ between 2006 and 2007, according to the U.S. Census Bureau.</li> </ul>
Northern California	<ul style="list-style-type: none"> <li>• Depends on the _____ River and _____ River for water needs</li> <li>• Both rivers are dangerously _____</li> <li>• Due to 5 consecutive years of _____</li> </ul>
Southern California	<ul style="list-style-type: none"> <li>• Residents get 30% freshwater from _____ and 70% is _____</li> <li>• Ground water sources are _____ rapidly</li> <li>• The remainder is _____ from the Owens Valley, the Colorado River, and the State Water Project.</li> <li>• The population continues to _____, while water sources _____</li> </ul>
Nevada	<ul style="list-style-type: none"> <li>• _____ is the main source of water.</li> <li>• It receives water from the _____.</li> <li>• Water levels are falling fast – estimated to be dry in _____.</li> </ul>
Colorado River	<ul style="list-style-type: none"> <li>• _____ people from _____ states depend on the Colorado's waters</li> <li>• California, Nevada, Arizona, Colorado</li> <li>• Depends on mountain _____ and spring _____ to replenish each year</li> <li>• Due to climate change, increasing populations, _____, and dams – this river could dry up!</li> </ul>

Ogallala Aquifer	<ul style="list-style-type: none"> <li>• _____ water source</li> <li>• Deep below eight states including: Texas, New Mexico, Oklahoma, Kansas, Colorado, Wyoming, Nebraska and South Dakota.</li> <li>• The Ogallala will run out of water in 30-40 years</li> </ul>
Tri-State Water Fight	<ul style="list-style-type: none"> <li>• Georgia, Alabama and Florida have been bickering over a reservoir at _____, north of _____.</li> <li>• Georgia believes it deserves the water.</li> <li>• Alabama and Florida say it is needed downstream.</li> </ul>
The Great Lakes	<ul style="list-style-type: none"> <li>• Supply water to Illinois, Indiana, Wisconsin, Michigan, Ohio, New York, and Canada</li> <li>• Researchers in Michigan report new evidence that _____ in the Great Lakes, which are near record low levels, may be _____ due to global warming.</li> </ul>
Why is Water Becoming Scarce?	<ul style="list-style-type: none"> <li>• The human _____ continues to _____.</li> <li>• More people means more _____ is needed to feed them.</li> <li>• _____ uses tons of water.</li> <li>• More people use more water for daily use</li> <li>• Humans are _____ water sources to meet these demands</li> <li>• _____ is intensifying the movement of water on, above, and below the Earth</li> <li>• This means _____ and floods will be more frequent, more severe and more widespread</li> <li>• Water is _____ around the globe unevenly.</li> <li>• Glaciers are melting, causing river flows to decrease in the Spring</li> </ul>
Mismanagement of Water	<ul style="list-style-type: none"> <li>• Cities around the _____ are mismanaging their water distribution systems</li> </ul> <p>For example,</p> <ul style="list-style-type: none"> <li>• Some cities do not distribute water _____</li> <li>• The _____ do not have access to water</li> <li>• Some cities do not _____ or treat their water supplies</li> </ul>

Mismanagement of Water (cont.)	<ul style="list-style-type: none"> <li>• In developed countries, old water _____ are broken and not maintained, pipes leak</li> <li>• Villagers of the developing world often must _____ down to a stream.</li> <li>• The walk can be _____ below their village or up to a spring.</li> <li>• They have to walk back to their village _____ containers up steeps and dangerous hillsides.</li> </ul>
Privatization of Water	<ul style="list-style-type: none"> <li>• Many undeveloped communities have _____, unsafe water.</li> <li>• _____ – bottled water companies are pumping water sources dry.</li> </ul>
Growing Population	<ul style="list-style-type: none"> <li>• There are _____ people on Earth.</li> <li>• That number is estimated to double by 2050.</li> <li>• Where will humans and other organisms get freshwater?</li> <li>• Will there be enough food?</li> <li>• It is estimated there will be global food, water, and energy shortages by 2030!</li> </ul>
The Green Revolution	<ul style="list-style-type: none"> <li>• The term Green Revolution was coined in the 1960's to end world hunger.</li> <li>• Scientists developed _____ crop seeds.</li> <li>• They were successful in growing more food.</li> <li>• These _____ use much more water than the crops they replaced.</li> <li>• Instead of running out of land, we are now running out of water.</li> </ul>
Agricultural Use of Water	<ul style="list-style-type: none"> <li>• 70% of the freshwater used throughout the world is used to _____.</li> <li>• In the 1970's the construction of _____ dramatically increased.</li> <li>• An increase in irrigation development guarantees an _____ production in many countries.</li> <li>• Irrigation allows the land that does not receive enough precipitation annually to become land that can be used for _____ agriculture.</li> </ul>
China	<ul style="list-style-type: none"> <li>• China has a population of 1.26 billion people (and quickly increasing).</li> </ul>

China (cont.)	<ul style="list-style-type: none"> <li>• In Northern China the water table is _____ one meter per year due to over pumping.</li> <li>• They are now diverting water from agriculture and _____ are going out of business.</li> <li>• Rivers are polluted in China.</li> </ul>
India	<ul style="list-style-type: none"> <li>• They irrigate to produce rice and wheat.</li> <li>• Major aquifers are being _____.</li> <li>• The soil is growing saltier through _____ with irrigation water.</li> <li>• Water levels are dangerously _____.</li> </ul>
Israel	<ul style="list-style-type: none"> <li>• Israel has had 4 consecutive years of _____.</li> <li>• Over pumping of aquifers along the coast is _____ drinking water with seawater.</li> <li>• Due to the shortage, water allocations for agriculture had to be reduced drastically causing a reduction in the agricultural productivity.</li> </ul>
Egypt	<ul style="list-style-type: none"> <li>• Egypt gets essentially no rainfall.</li> <li>• All agriculture is irrigated by seasonal floods from the _____.</li> <li>• The country is facing future water shortages.</li> <li>• Currently engaged in water disputes with surrounding countries.</li> </ul>
Uzbekistan	<ul style="list-style-type: none"> <li>• Uzbekistan is the 2<sup>nd</sup> biggest cotton exporter in the world.</li> <li>• So much water was used to grow cotton that the Aral Sea dried up.</li> </ul>
Climate Change	<ul style="list-style-type: none"> <li>• Increased temperatures will change global _____ patterns and increase water _____.</li> <li>• The subtropics and mid-latitudes will suffer from _____, such as California, Southern Europe, Southwest USA, Northern China, Southeast China, Northern India, the Gulf Coast and most of Florida the middle part of South America much of Australia and coastal South Africa.</li> <li>• Glaciers and snow capped mountains store rain waters that can account for up to _____ of the spring and fall river flows.</li> <li>• Climate change is causing global glaciers and snowcaps to _____.</li> </ul>

Climate Change (cont.)	<ul style="list-style-type: none"> <li>Smaller glaciers means there will be _____ stored to supply major regions of China, India, Pakistan and the western U.S.</li> </ul>
Bolivia	<ul style="list-style-type: none"> <li>The Chacaltaya _____ provides drinking water to _____ people in the cities of El Alto and La Paz.</li> <li>This glacier has lost _____ of its area in the last 20 years</li> <li>When the glacier is gone, the water will be gone</li> </ul>
Climate Change	<ul style="list-style-type: none"> <li>Climate Change results in more extreme weather.</li> <li>It also results in more _____ in some places and _____ in other places.</li> <li>Current water treatment plants and distribution systems will not be able to withstand these extremes.</li> </ul>
South Asia	<ul style="list-style-type: none"> <li>South Asia includes: Bangladesh, India, Nepal, and Pakistan.</li> <li>Harsh summer monsoons have caused severe _____.</li> <li>More than 20 million people have been displaced.</li> <li>The water has been _____ – carrying _____ like diarrhea, malaria, and various skin ailments.</li> </ul>
Water Management	<ul style="list-style-type: none"> <li>Communities need to manage their water sources.</li> <li>They should monitor water levels, water _____, and _____ their water supplies.</li> <li>All people should have access to _____ for drinking, cleaning, cooking, and bathing.</li> <li>There must be a distribution system.</li> <li>There must be a means of water _____ and _____.</li> <li>In many places governments or private water companies are mismanaging water sources.</li> </ul>
Pakistan	<ul style="list-style-type: none"> <li>Lacks _____ drinking water.</li> <li>Poor _____ and _____ practices cause waterborne diseases and illness.</li> <li>People have to walk great _____ to get their water.</li> <li>They cannot work and make money while they are fetching water.</li> </ul>

Kenya, Africa	<ul style="list-style-type: none"> <li>• Lack of safe drinking water causes many severe problems including _____, _____ and _____.</li> <li>• In rural Kenya, young women often walk as far as 10 miles to collect water from polluted, hand-dug wells, full of parasites and bacteria.</li> </ul>
Privatization	<ul style="list-style-type: none"> <li>• Large corporations are buying publicly owned water systems in many countries.</li> <li>• They pump water from these regions, bottle it, sell it back to the people, or transport it.</li> </ul>
South America - Bolivia	<p>The Cochabamba Water Revolt</p> <ul style="list-style-type: none"> <li>• <i>Describe the revolt in your own words after you see all the slides.</i></li> </ul>
What Can We Do?	<ul style="list-style-type: none"> <li>• Slow the demand for future water by _____ our population.</li> <li>• _____ freshwater.</li> <li>• _____ treatment for contaminated water.</li> <li>• _____ agriculture – (water footprint).</li> <li>• _____</li> </ul>
Decrease Population	<ul style="list-style-type: none"> <li>• _____ was a best-selling book written by Paul Ehrlich in 1968.</li> <li>• It warned of the mass starvation of humans in 1970s and 1980s due to overpopulation and advocated immediate action to limit population growth.</li> <li>• This decrease in population has not occurred.</li> </ul>

Family Planning	<ul style="list-style-type: none"> <li>• _____ people about when to have children and educating people on how to use _____.</li> <li>• In many developing countries, contraceptives and family planning methods are _____.</li> <li>• Quite often, women become pregnant because of a lack of access to the appropriate information and resources.</li> </ul>
Solar Water Decontamination	<ul style="list-style-type: none"> <li>• The sun kills _____ in water (water borne diseases).</li> <li>• It is used by households in developing countries where safe drinking water is scarce.</li> <li>• People fill plastic bottles with water and leave them in sunlight, where the UV radiation and increased water temperature kill the bacteria within six hours.</li> </ul>
Desalination	<ul style="list-style-type: none"> <li>• The process of removing _____ from seawater to make freshwater.</li> <li>• This process is expensive, but still done in several places around the world.</li> </ul>
Water Footprint	<ul style="list-style-type: none"> <li>• The amount of water required to produce 1 unit of a product.</li> </ul>
Reduce Water Intensive Crops	<ul style="list-style-type: none"> <li>• Water intensive _____ have a large water footprint.</li> <li>• Rice, cotton, sugar cane, and corn are _____ crops.</li> <li>• Places with little water should not farm these crops.</li> <li>• _____ can be beneficial to water scarce counties.</li> </ul>
Virtual Water	<ul style="list-style-type: none"> <li>• Virtual water is the water footprint of a product that is produced in one country and exported to another country.</li> <li>• Trade in virtual water allows water scarce countries to import high water consuming products while exporting low water consuming products.</li> </ul>

Name\_\_\_\_\_ Date\_\_\_\_\_ Period\_\_\_\_\_

## Water Distribution and Conservation Activity

*Read the information below (from Geography for Kids, [kidsgeo.com](http://kidsgeo.com)) and answer the questions that follow.*

### What Is Water?

Water is a basic molecule made up of two hydrogen atoms, and one oxygen atom. When these three atoms come together, they form a strong bond that is difficult to break. The strength of this bond keeps a water molecule together for millions and even billions of years.

Water is one of the most common substances on the Earth. Covering over 70% of the surface of the Earth, it is easy to find. Even in a desert, it is not hard to find water if you know where to look.

Scientists believe that the amount of water on Earth does not change over time. In other words, the amount of water that is on the Earth today is the same amount that was on the Earth during the reign of the dinosaurs.

Some of the Earth's water supply is temporarily locked up inside the cells of living organisms. Some organisms are made up of 95% water, while almost all are more than half water.

### The Earth's Oceans

Because most of the Earth's water is found in the oceans, in order to understand the hydrosphere, we must understand these massive bodies of water.

The ocean contains a soup of the many different minerals found across the surface of the Earth, all dissolved into the water. These minerals make up about 3.5% of the total volume of the Earth's oceans.

By far, the most common mineral found dissolved in sea water, is **salt**. Because salt is the most common mineral in the waters of the oceans, it is no surprise that the ocean tastes salty.

The amount of salt dissolved in the waters of the Earth's oceans, or the salinity of the oceans, can vary greatly from location to location. This salinity is dependent on two important factors. Firstly, the amount of evaporation taking place, and secondly, the amount of fresh water being added.

As water evaporates, it leaves the salts and other minerals behind. This causes the water left behind to be more salty. As fresh water is added, either via rivers, or via rainfall, the salinity of the ocean in a particular location is decreased.



## **The Earth's Ice**

Second only to the ocean in the amount of water storage, the ice on the Earth contains more than 2x the water that is in ground water, lakes, and streams. It has been estimated that there is enough water locked up in the form of ice to sustain all the rivers and streams of the Earth for nearly 1,000 years.

This ice is found around both the North, and South poles, and is always fresh. This is because, regardless of whether it formed by freezing rain, or sea water, the salt is not taken into the ice crystals as they form.

In addition to the vast ice caps found at the top and bottom of the Earth, there are also vast amounts of frozen water underground. This frozen soil is known as permafrost, and is found in Canada, Alaska, and Siberia.

## **Surface Water**

Water found on the surface of continents and islands are referred to as surface water. Surface water makes up only one fourth of one percent or 0.25% of the total water found on Earth. This water is found in rivers, streams, lakes, springs, and swamps, and is extremely important to the lives of all land dwelling animals, including humans.

### **Lakes**

Lakes contain about 90% of all the surface water found on Earth (not including oceans). Lakes form when water finds its way into a basin. In order to continue existing, lakes must have a continual source of new water, otherwise they will eventually dry up.

Most lakes contain fresh water. However, in some cases, the water found in a lake can become salty, just like the ocean. This happens when a lake does not have a stream, either above ground, or underground draining water away from it. As water enters a lake, it carries minerals with it. As this water dissolves, it leaves the minerals behind.

Most lakes only last a few thousand years, and then disappear. This is because as streams and rivers carry water into the lake, they also carry sediment. This sediment slowly fills the lakes, causing them to become shallower. At the same time outbound streams cut deeper and deeper channels, causing the lakes to drain more quickly.

Many lakes, are manmade. These are referred to as reservoirs. Reservoirs allow cities and nations to store water for later use. Most of these reservoirs are small in size, but some are very large, spanning several hundred miles.

### **Swamps**

A swamp is similar to a lake but it is much shallower. Swamps are covered with water, but this water is shallow enough to allow plants to grow, reaching the surface. Swamps are generally dominated by water tolerant trees.

Marshes are similar to swamps, but instead of trees, they are dominated by grasses and reeds. They are generally rich with life, harboring many kinds of frogs, turtles, fish, and bird life.

## **Rivers And Streams**

Geographers generally refer to all rivers and streams as streams, regardless of their size. Streams have an important job. They drain the landscape and move water and minerals towards the Earth's oceans.

## **Underground Water**

Locked deep below the surface of the Earth, are billions of gallons of water. Almost anywhere on Earth, it is possible to dig down, and find a supply of fresh drinkable water. Almost all of this water was deposited over millions of years by the many rain and snow storms that have visited the surface of the Earth.

Most ground water lies within ½ mile of the surface of the Earth. However, scientists have found water at more than six miles below the Earth's surface.

## **Water Distribution and Conservation Questions**

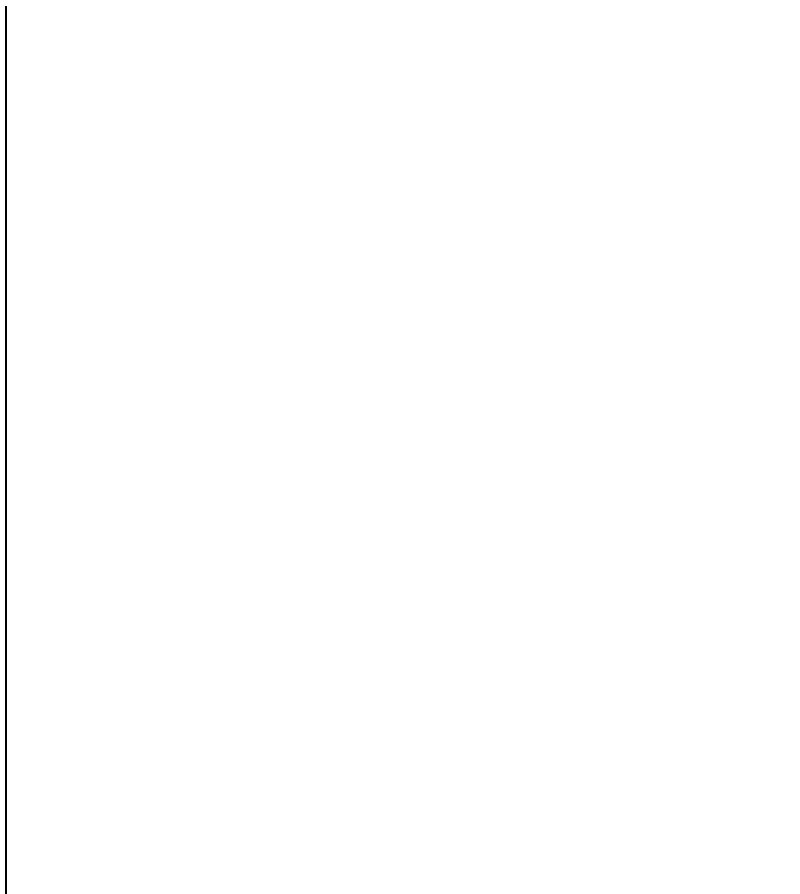
1. Does the amount of water available on Earth change over time? Explain.
2. Describe the contents of ocean water.
3. How much water is stored as ice?
4. Why is ice always freshwater?
5. What is permafrost?
6. What percent of all water on Earth is found on the surface?
7. Describe the different types of surface water.
8. What keeps lakes from drying up?
9. How might a lake become salty?
10. Describe the similarities and differences between a swamp and a marsh.
11. What is the job of streams?
12. What is groundwater?

**Use the data tables below to create bar graphs on the Earth's Water Distribution.**

*On all graphs, be sure to include a title, and label and number your x and y axes. Use green to represent salt water and blue to represent freshwater.*

Create a bar graph comparing Earth's salt water to freshwater.

Location of Water on Earth	% of total water
Oceans, Seas, & Bays (salt)	96.5
Glaciers, ice caps, surface water, groundwater (fresh)	3.5%

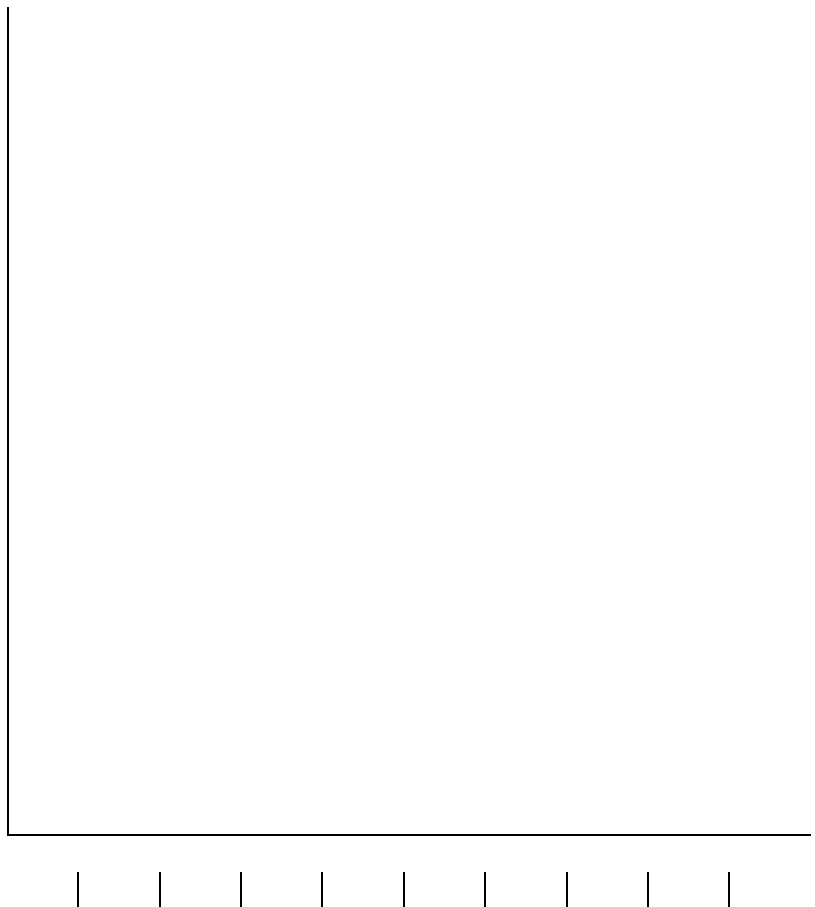


13. Using the graph you constructed above, describe the salt water to fresh water ratio.

14. Explain your thoughts on the availability of freshwater compared to the number of people on Earth.

Location of FRESH Water on Earth	% of total water
Ice caps, Glaciers, & Permanent Snow (fresh)	1.74
Fresh Ground water (fresh)	0.76
Soil Moisture(fresh)	0.001
Ground Ice & Permafrost(fresh)	0.022
Fresh Lakes (fresh)	0.007
Atmosphere (fresh)	0.001
Swamp Water (fresh)	0.0008
Rivers (fresh)	0.0002
Biological Water- inside organisms (fresh)	0.0001

Create a bar graph below illustrating the distribution of freshwater.



15. If there is only 3.5% of freshwater available on Earth for all life forms to share, what surprises you most about this graph?

Name \_\_\_\_\_ Period \_\_\_\_\_ Date \_\_\_\_\_

## **Water Calculator Worksheet**

### **How Much Water Do You Use?**

**Visit:** <http://watercalculator.fieldmuseum.org/watercalculator>

#### **Enter the Kitchen**

1. Describe the Water-Saving Tip: Kitchen Sink
  
  
  
  
  
2. Describe Water-Saving Tip: Garbage Disposal

#### **Enter the Bathroom**

3. Describe NICEF Fact:
  
  
  
  
  
4. Describe Water-Saving Tip: Bathroom Sink
  
  
  
  
  
5. Describe the shower Fact
  
  
  
  
  
6. Describe Water-Saving Tip: Shower

7. Describe the toilet Fact

8. Describe the Water-Saving Tips:

**Enter the Garden**

9. Describe Water-Saving Tip: Garden

10. Describe Water-Saving Tip: Plants

11. Describe Water-Saving Tip: Rain Barrels

13. Describe Water-Saving Tip: Landscaping

14. Describe Water-Saving Tip: Lawn

15. Describe your results:

## Global Water Scarcity Notes – ANSWER KEY

Water and Life	<ul style="list-style-type: none"> <li>Water is a <b>vital resource</b>- more important than oil.</li> <li>All life forms depend on water.</li> <li>If we don't make efforts to <b>conserve, protect, and restore</b> this valuable resource, we may be putting all living beings at risk.</li> </ul>
Water and Economics	<ul style="list-style-type: none"> <li>Every industry from <b>agriculture, electric power</b>, and industrial manufacturing to beverage, apparel, and <b>tourism</b> relies on water to grow and ultimately sustain their business.</li> <li>The United States' <b>economy</b> runs on water.</li> </ul>
Water Scarcity	<ul style="list-style-type: none"> <li>Water scarcity describes the relationship between <b>the need for</b> clean, freshwater versus the <b>amount available</b>.</li> <li>According to the World Health Organization, <b>1 out of 3</b> people live where water is physically scarce or unsafe.</li> </ul>
Lack of Water	<p>The lack of water kills more humans around the world than:</p> <ul style="list-style-type: none"> <li><b>AIDS</b></li> <li><b>Malaria</b></li> <li>And all <b>wars</b> combined</li> </ul>
Water Facts – <a href="http://www.reuters.com">www.reuters.com</a>	<ul style="list-style-type: none"> <li>There are 1.4 billion cubic kilometers of water on the planet but almost <b>97%</b> is salt water.</li> <li>Most freshwater is locked up in <b>glaciers or deep underground</b>, leaving only a fraction available for human consumption or use.</li> <li>Most experts believe there is still enough water to go around, but its <b>distribution</b> is very uneven.</li> <li>North Americans have access to over <b>6,000</b> cubic meters per person per year</li> <li>The poorest African countries have less than <b>700 cubic</b> meters per person per year</li> <li>Wealthy but water-scarce countries such as Saudi Arabia can afford expensive <b>desalination</b>, but poor ones cannot.</li> </ul>
According to the World Water Council	<ul style="list-style-type: none"> <li>Agriculture accounts for <b>66%</b> of human water consumption.</li> <li>Industry accounts for <b>20%</b>.</li> <li>Domestic households account for <b>10%</b>.</li> <li>About <b>4%</b> evaporates from man-made reservoirs.</li> </ul>



Water Scarcity in the United States	<ul style="list-style-type: none"> <li>The Southwest was home to 14 of the 25 fastest-growing American cities with populations over <b>100,000</b> between 2006 and 2007, according to the U.S. Census Bureau.</li> </ul>
Northern California	<ul style="list-style-type: none"> <li>Depends on the <b>Sacramento</b> River and <b>San Joaquin</b> River for water needs</li> <li>Both rivers are dangerously <b>low</b>.</li> <li>Due to 5 consecutive years of <b>drought</b>.</li> </ul>
Southern California	<ul style="list-style-type: none"> <li>Residents get 30% freshwater from groundwater and 70% is <b>imported</b>.</li> <li>Ground water sources are <b>depleting</b> rapidly.</li> <li>The remainder is <b>imported</b> from the Owens Valley, the Colorado River, and the State Water Project.</li> <li>The population continues to <b>rise</b>, while water sources <b>decrease</b>.</li> </ul>
Nevada	<ul style="list-style-type: none"> <li><b>Lake Mead</b> is the main source of water.</li> <li>It receives water from the <b>Colorado River</b>.</li> <li>Water levels are falling fast – estimated to be dry in <b>2021</b>.</li> </ul>
Colorado River	<ul style="list-style-type: none"> <li><b>17 million</b> people from <b>four</b> states depend on the Colorado's waters</li> <li>California, Nevada, Arizona, Colorado</li> <li>Depends on mountain <b>snowpack</b> and spring <b>runoff</b> to replenish each year</li> <li>Due to climate change, increasing populations, <b>agriculture</b>, and dams – this river could dry up!</li> </ul>
Ogallala Aquifer	<ul style="list-style-type: none"> <li><b>Underground</b> water source</li> <li>Deep below eight states including: Texas, New Mexico, Oklahoma, Kansas, Colorado, Wyoming, Nebraska and South Dakota.</li> <li>The Ogallala will run out of water in 30-40 years</li> </ul>
Tri-State Water Fight	<ul style="list-style-type: none"> <li>Georgia, Alabama and Florida have been bickering over a reservoir at <b>Lake Lanier</b>, north of <b>Atlanta</b>.</li> <li>Georgia believes it deserves the water.</li> <li>Alabama and Florida say it is needed downstream.</li> </ul>
The Great Lakes	<ul style="list-style-type: none"> <li>Supply water to Illinois, Indiana, Wisconsin, Michigan, Ohio, New York, and Canada</li> <li>Researchers in Michigan report new evidence that <b>water levels</b> in the Great Lakes, which are near record low levels, may be <b>shrinking</b> due to global warming.</li> </ul>

Why is Water Becoming Scarce?	<ul style="list-style-type: none"> <li>• The human <b>population</b> continues to increase</li> <li>• More people means more <b>food</b> is needed to feed them</li> <li>• <b>Agriculture</b> uses tons of water for irrigation</li> <li>• More people use more water for daily use</li> <li>• Humans are <b>over pumping</b> water sources to meet these demands</li> <li>• <b>Climate change</b> is intensifying the movement of water on, above, and below the Earth</li> <li>• This means <b>droughts</b> and floods will be more frequent, more severe and more widespread.</li> <li>• Water is being <b>redistributed</b> around the globe unevenly</li> <li>• Glaciers are melting, causing river flows to decrease in the Spring</li> </ul>
Mismanagement of Water	<ul style="list-style-type: none"> <li>• Cities around the <b>world</b> are mismanaging their water distribution systems</li> </ul> <p>For example,</p> <ul style="list-style-type: none"> <li>• Some cities do not distribute water <b>equally</b></li> <li>• The <b>poor</b> do not have access to water</li> <li>• Some cities do not <b>clean</b> or treat their water supplies</li> <li>• In developed countries, old water <b>infrastructures</b> are broken and not maintained, pipes leak</li> <li>• Villagers of the developing world often must <b>walk</b> down to a stream</li> <li>• The walk can be <b>several miles</b> below their village or up to a spring</li> <li>• They have to walk back to their village <b>carrying water-filled</b> containers up steep and dangerous hillsides.</li> </ul>
Privatization of Water	<ul style="list-style-type: none"> <li>• Many undeveloped communities have <b>contaminated</b>, unsafe water</li> <li>• <b>Privatization</b> – bottled water companies are pumping water sources dry</li> </ul>
Growing Population	<ul style="list-style-type: none"> <li>• There are <b>6.6 billion</b> people on Earth</li> <li>• That number is estimated to double by 2050</li> <li>• Where will humans and other organisms get freshwater?</li> <li>• Will there be enough food?</li> <li>• It is estimated there will be global food, water, and energy shortages by 2030!</li> </ul>
The Green	<ul style="list-style-type: none"> <li>• The term Green Revolution was coined in the 1960s to end world</li> </ul>

Revolution	<p>hunger</p> <ul style="list-style-type: none"> <li>• Scientists developed <b>genetically modified</b> crop seeds</li> <li>• They were successful in growing more food</li> <li>• These “<b>super-crops</b>” use much more water than the crops they replaced</li> <li>• Instead of running out of land, we are now running out of water</li> </ul>
Agricultural Use of Water	<ul style="list-style-type: none"> <li>• 70% of the freshwater used throughout the world is used to irrigate crops.</li> <li>• In the 1970’s the construction <b>of irrigation systems</b> dramatically increased.</li> <li>• An increase in irrigation development guarantees an <b>increase in crop</b> production in many countries.</li> <li>• Irrigation allows the land that does not receive enough precipitation annually to become land that can be used for productive agriculture.</li> </ul>
China	<ul style="list-style-type: none"> <li>• China has a population of 1.26 billion people (and quickly growing).</li> <li>• In Northern China the water table is <b>dropping</b> one meter per year due to over pumping.</li> <li>• They are now diverting water from agriculture and <b>farmers</b> are going out of business.</li> <li>• Rivers are polluted in China</li> </ul>
India	<ul style="list-style-type: none"> <li>• They irrigate to produce rice and wheat.</li> <li>• Major aquifers are being <b>over pumped</b>.</li> <li>• The soil is growing saltier through <b>contamination</b> with irrigation water.</li> <li>• Water levels are dangerously <b>low</b>.</li> </ul>
Israel	<ul style="list-style-type: none"> <li>• Israel has had 4 consecutive years of <b>drought</b>.</li> <li>• Over pumping of aquifers along the coast is <b>polluting</b> drinking water with seawater.</li> <li>• Due to the shortage, water allocations for agriculture had to be reduced drastically causing a reduction in the agricultural productivity</li> </ul>
Egypt	<ul style="list-style-type: none"> <li>• Egypt gets essentially no rainfall.</li> <li>• All agriculture is irrigated by seasonal floods from the <b>Nile River</b></li> <li>• The country is facing future water shortages</li> <li>• Currently engaged in water disputes with surrounding countries</li> </ul>
Uzbekistan	<ul style="list-style-type: none"> <li>• Uzbekistan is the 2<sup>nd</sup> biggest cotton exporter in the world.</li> </ul>

	<ul style="list-style-type: none"> <li>• So much water was used to grow cotton that the Aral Sea dried up.</li> </ul>
Climate Change	<ul style="list-style-type: none"> <li>• Increased temperatures will change global <b>precipitation</b> patterns and will increase water <b>shortages</b>.</li> <li>• The subtropics and mid-latitudes will suffer from <b>droughts</b> such as California, Southern Europe, Southwest USA, Northern China, Southeast China, Northern India, the Gulf Coast and most of Florida the middle part of South America much of Australia and coastal South Africa</li> <li>• Glaciers and snow capped mountains store rain waters that can account for up to <b>70%</b> of the spring and fall river flows</li> <li>• Climate change is causing global glaciers and snowcaps to <b>melt</b>.</li> <li>• Smaller glaciers means there will be <b>less water</b> stored to supply major regions of China, India, Pakistan and the western U.S.</li> </ul>
Bolivia	<ul style="list-style-type: none"> <li>• The Chacaltaya <b>Glacier</b> provides drinking water to <b>2 million</b> people in the cities of El Alto and La Paz.</li> <li>• This glacier has lost <b>80%</b> of its area in the last 20 years</li> <li>• When the glacier is gone, the water will be gone</li> </ul>
Climate Change	<ul style="list-style-type: none"> <li>• Climate change results in more extreme weather.</li> <li>• It also results in more droughts in some places and <b>floods</b> in other places.</li> <li>• Current water treatment plants and distribution systems will not be able to withstand these extremes</li> </ul>
South Asia	<ul style="list-style-type: none"> <li>• South Asia includes: Bangladesh, India, Nepal, and Pakistan</li> <li>• Harsh summer monsoons have caused severe <b>flooding</b>.</li> <li>• More than 20 million people have been displaced</li> <li>• The water has been <b>contaminated</b> – carrying <b>diseases</b> like diarrhea, malaria, and various skin ailments</li> </ul>
Water Management	<ul style="list-style-type: none"> <li>• Communities need to manage their water sources</li> <li>• They should monitor water levels, water <b>quality</b>, and <b>protect</b> their water supplies</li> <li>• All people should have access to <b>clean water</b> for drinking, cleaning, cooking, and bathing.</li> <li>• There must be a distribution system</li> <li>• There must be a means of water <b>sanitation</b> and <b>treatment</b>.</li> <li>• In many places governments or private water companies are</li> </ul>

	mismanaging water sources.
Pakistan	<ul style="list-style-type: none"> <li>• Lacks <b>safe, clean</b> drinking water</li> <li>• Poor <b>hygiene</b> and <b>sanitation</b> practices cause waterborne diseases and illness</li> <li>• People have to walk great <b>distances</b> to get their water.</li> <li>• They cannot work and make money while they are fetching water.</li> </ul>
Kenya, Africa	<ul style="list-style-type: none"> <li>• Lack of safe drinking water causes many severe problems including <b>dehydration, starvation and disease</b>.</li> <li>• In rural Kenya, young women often walk as far as 10 miles to collect water from polluted, dirty, hand-dug wells, full of parasites <b>and</b> bacteria.</li> </ul>
Privatization	<ul style="list-style-type: none"> <li>• Large corporations are buying publicly owned water systems in many countries.</li> <li>• They pump water from these regions, bottle it, sell it back to the people, or transport it.</li> </ul>
South America - Bolivia	<p>The Cochabamba Water Revolt</p> <p>1999 – Public water system was leased for 40 years to the Bechtel Water Company</p> <ul style="list-style-type: none"> <li>• The World Bank directly threatened to withhold \$600 million in international debt relief if Bolivia didn't privatize Cochabamba's public water system</li> <li>• Soon after Bechtel took over the water services in Cochabamba,</li> <li>• The monthly water bill reached \$20 in a city where the minimum wage is less than \$100 a month.</li> <li>• These increases forced some of the poorest families to literally choose between food and water</li> <li>• (\$20 is nearly the cost of feeding a family of five for two weeks).</li> <li>• In response to these price increases, an alliance of the citizens of Cochabamba called The Coalition in Defense of Water and Life was formed in January 2000.</li> <li>• Through mass mobilization, the alliance shut down the city for four days.</li> <li>• Within a month of this, millions of Bolivians marched to Cochabamba and held a held a general strike, stopping all transportation.</li> <li>• The protesters then issued the Cochabamba Declaration, which called for the protection of universal water rights for all citizens.</li> </ul>

	<ul style="list-style-type: none"> <li>• In response to this, the Bolivian government promised to reverse the price hike.</li> <li>• They never did.</li> <li>• In February 2000, The Coalition organized a peaceful march</li> <li>• Demanding the retraction of the Drinking Water and Sanitation Law, the termination of the water contract, the participation of citizens in creating a water resource law, and the cancellation of ordinances allowing privatization.</li> <li>• These demands were strongly rejected by the government.</li> <li>• The following April, the government declared martial law to try and silence the water protests.</li> <li>• Activists were arrested, protesters were killed, and the media was censored.</li> <li>• After only a day of martial law, three protesters had been killed, including a 17-year old boy who was shot in the head by soldiers in Cochabamba.</li> <li>• Over 30 people had been injured through conflicts with the military and the leaders had been jailed</li> <li>• Some were flown to a remote location in the jungle of Bolivia</li> <li>• The people finally won on April 10, 2000 when Bechtel left Bolivia and the government was forced to revoke its water privatization legislation.</li> <li>• The water company Servico Municipal del Aqua Potable y Alcantarillado (SEMAPO) along with the debts, was handed over to the workers and the people.</li> </ul>
What Can We Do?	<ul style="list-style-type: none"> <li>• Slow the demand for future water by <b>decreasing</b> our population</li> <li>• <b>Conserve</b> freshwater</li> <li>• <b>UV</b> treatment for contaminated water</li> <li>• <b>Smart</b> agriculture – (water footprint)</li> <li>• <b>Desalinization</b></li> </ul>
Decrease Population	<ul style="list-style-type: none"> <li>• <b>The Population Bomb</b> was a best-selling book written by Paul Ehrlich in 1968.</li> <li>• It warned of the mass starvation of humans in 1970s and 1980s due to overpopulation and advocated immediate action to limit population</li> </ul>

	<p>growth</p> <ul style="list-style-type: none"> <li>• This decrease in population has not occurred.</li> </ul>
Family Planning	<ul style="list-style-type: none"> <li>• <b>Educating</b> people about when to have children and educating people on how to use <b>birth control</b></li> <li>• In many developing countries, contraceptives and family planning methods are <b>prohibited</b>.</li> <li>• Quite often, women become pregnant because of a lack of access to the appropriate information and resources.</li> </ul>
Solar Water Decontamination	<ul style="list-style-type: none"> <li>• The sun kills <b>bacteria</b> in water (water borne diseases).</li> <li>• It is used by households in developing countries where safe drinking water is scarce.</li> <li>• People fill plastic bottles with water and leave them in sunlight, where the UV radiation and increased water temperature kill the bacteria within six hours.</li> </ul>
Desalination	<ul style="list-style-type: none"> <li>• The process of removing <b>salt and minerals</b> from seawater to make freshwater</li> <li>• This process is very expensive, but still done in several places around the world.</li> </ul>
Water Footprint	<ul style="list-style-type: none"> <li>• The amount of water required to produce 1 unit of a product.</li> </ul>
Reduce Water Intensive Crops	<ul style="list-style-type: none"> <li>• Water intensive <b>crops</b> have a large water footprint</li> <li>• Rice, cotton, sugar cane, and corn are <b>thirsty</b> crops</li> <li>• Places with little water should not farm these crops</li> <li>• <b>Virtual water trade</b> can be beneficial to water scarce counties</li> </ul>
Virtual Water	<ul style="list-style-type: none"> <li>• Virtual water is the water footprint of a product that is produced in one country and exported to another country.</li> <li>• Trade in virtual water allows water scarce countries to import high water consuming products while exporting low water consuming products.</li> </ul>

## Water Distribution and Conservation Questions – ANSWER KEY

1. Does the amount of water available on Earth change over time? Explain.

Water does NOT change over time. It gets redistributed. The water we have today is the same water the dinosaurs had. Water gets recycled over and over.

2. Describe the contents of ocean water.

The ocean is a mixture of many minerals mixed with water. Salt is the most common mineral.

3. How much water is stored as ice?

There is more frozen water than water in all the lakes, rivers, and streams in the world combined.

4. Why is ice always freshwater?

Salt does not get taken into the ice crystals.

5. What is permafrost?

Permafrost is frozen soil.

6. What percent of all water on Earth is found on the surface?

0.25% of water is found on the surface.

7. Describe the different types of surface water.

Surface water is found in rivers, streams, lakes, springs, and swamps, and is extremely important to the lives of all land dwelling animals, including humans.

8. What keeps lakes from drying up?

Flowing water moves into the lake.

9. How might a lake become salty?

Lakes become salty when they do not have underground or above ground streams to move the minerals out.

10. Describe the similarities and differences between a swamp and a marsh.

Both are covered with water and plants. Both have diverse forms of life.

Swamps are shallower and contain trees.

Marshes are deep, and have grass and reeds instead of trees.



11. What is the job of streams?

Drain the landscape and move minerals.

12. What is groundwater?

Freshwater below the Earth.

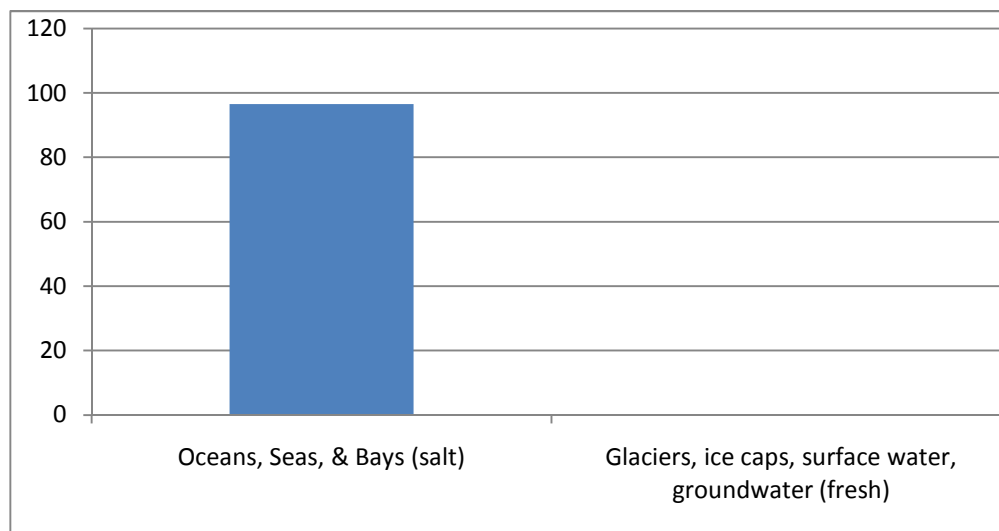
**Use the data tables below to create bar graphs on the Earth's Water Distribution.**

*On all graphs, be sure to include a title, and label and number your x and y axes. Use green to represent salt water and blue to represent freshwater.*

Create a bar graph comparing Earth's salt water to freshwater.

Location of Water on Earth	% of total water
Oceans, Seas, & Bays (salt)	96.5
Glaciers, ice caps, surface water, groundwater (fresh)	3.5%

Location of Water on the Earth



13. Looking at the graph, compare the salt water to fresh water ratio.

96.5 : 3.5

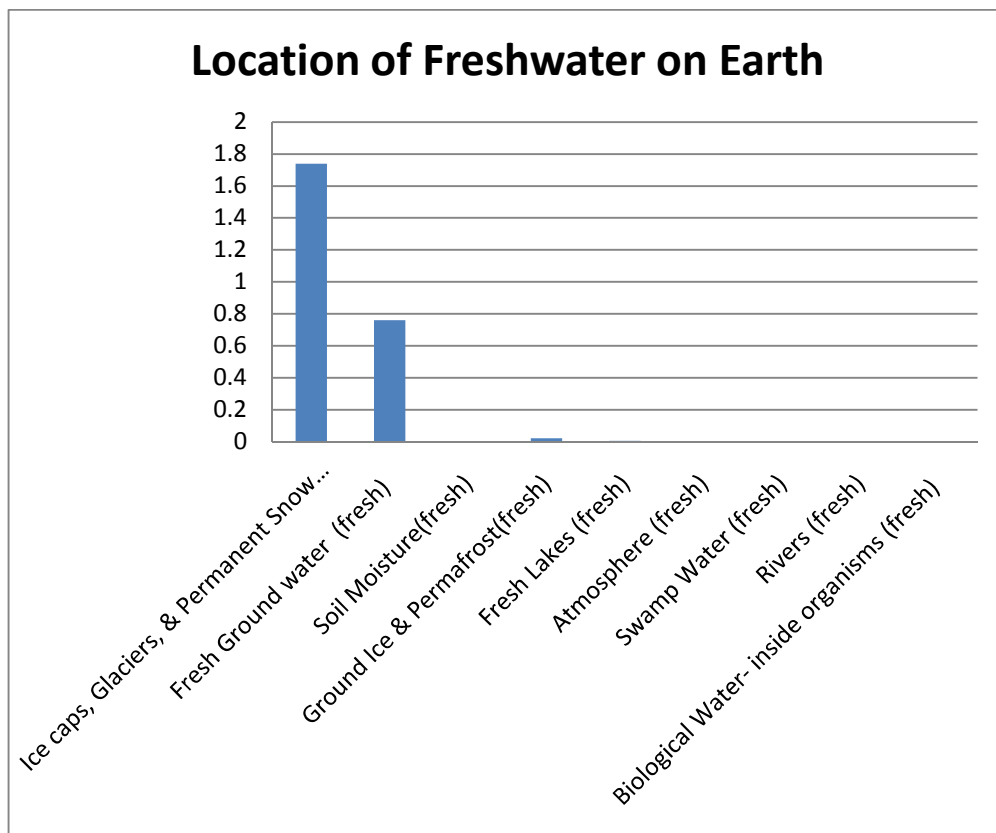
28 parts salt water : 1 part freshwater

14. Explain your thoughts on the availability of freshwater compared to the number of people on Earth.

Location of FRESH Water on Earth	% of total water
Ice caps, Glaciers, & Permanent Snow (fresh)	1.74
Fresh Ground water (fresh)	0.76
Soil Moisture(fresh)	0.001
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Fresh Lakes (fresh)	0.007
Atmosphere (fresh)	0.001
Swamp Water (fresh)	0.0008
Rivers (fresh)	0.0002
Biological Water- inside organisms (fresh)	0.0001

There is very little freshwater that all living organisms on Earth must share. We must conserve it.

Create a bar graph below illustrating the distribution of freshwater.



16. If there is only 3.5% of freshwater available on Earth for all life forms to share, what surprises you most about this graph? **Accept all logical answers.**

Name\_\_\_\_\_ Period\_\_\_\_\_ Date\_\_\_\_\_

## Water Calculator Worksheet

### How Much Water Do You Use?

Visit: <http://watercalculator.fieldmuseum.org/watercalculator>

#### Enter the Kitchen

1. Describe the Water-Saving Tip: Kitchen Sink

Kitchen Sink: What can you do with cold faucet water? Try washing things that don't require hot water, like water glasses.

Cold water is also a good trick for getting cheese off of graters; hot water makes it melt and stick.

2. Describe Water-Saving Tip: Garbage Disposal

Garbage Disposal: Toss large food items in the trash or compost vegetable scraps when you can. Reducing what goes down the garbage disposal saves water and energy.

#### Enter the Bathroom

3. Describe NICEF Fact:

The average person living in a region without access to clean drinking water uses less than 3 gallons per day, the same amount used while brushing your teeth.

4. Describe Water-Saving Tip: Bathroom Sink

Bathroom Sink: Turn off the faucet while brushing and save up to 2.5 gallons per brush. Never let the tap run unnecessarily.

5. Describe the shower Fact

A typical showerhead discharges up to 10 gallons of water per minute.

## 6. Describe Water-Saving Tip: Shower

Shower: Try to take shorter showers, and jump under the water as soon as it's a comfortable temperature!

Low-flow faucets and water-reducing aerators (also known as sparkler plates) can reduce your water usage by 50%. Get one installed and watch your water bills decrease!

## 7. Describe the toilet Fact

The average flush uses 5 gallons. Older toilets can use up to 15 gallons per flush! Put it in perspective: If you had 5 gallons of paint, you could paint a typical two-car garage with two coats of paint.

## 8. Describe the Water-Saving Tips:

Toilet: Flush only when you have to! If you can, consider upgrading old toilets to newer low-volume or dual flush models that can use as little as a half gallon per flush.

Did you know that it takes energy to clean dirty water? It takes even more energy to clean toxic water. Check out our Water Tips (Before the Faucet, After the Flush) to learn how to properly dispose of your hazardous materials and keep the waterways in Illinois clean.

## Enter the Garden

## 9. Describe Water-Saving Tip: Garden

Garden: Rain water is nitrogen rich and better for plants than hose water. A 1-inch rainstorm is enough water for your vegetable garden per week. Chicago gets 33 inches of rain per year, so water your garden only when needed.

## 10. Describe Water-Saving Tip: Plants

Plants: Plant native or "no-mow" grasses: they require no extra watering!

## 11. Describe Water-Saving Tip: Rain Barrels

Rain Barrels: As much as 650 gallons of water runs off a roof during a 1-inch rainstorm. 650 gallons will fill up 12 rain barrels! So, disconnect your downspouts, install rain barrels, and keep this water from literally going "down the drain."

13. Describe Water-Saving Tip: Landscaping

Landscaping: Gardens and landscaping require a lot of water! Luckily, Chicagoland gets enough rain per year to water the average garden. Also, just about any landscaping is better than impermeable paving that diverts rain directly to sewer pipes and contributes to flooding Click here to learn about porous concrete and other permeable pavement options.

14. Describe Water-Saving Tip: Lawn

Lawn: Other than over-fertilizing, over-watering is the most common mistake with lawn care. This wastes thousands of gallons and dollars annually. Typical lawns require 1.5 inches (or 10 gallons) per week per square foot, so get yourself a rain gauge and only water if you don't get enough rain.

15. Describe your results:

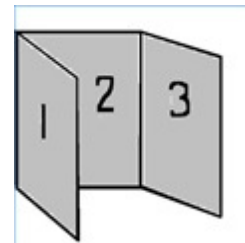
Answers will vary.

## Creating a Water Conservation Brochure

Your assignment is to create a brochure for kids to teach them about the importance of water and ways to conserve water at home. Be sure your brochure educates, explains, or instructs. The brochure is not an in depth study of a topic but it should give enough information that the reader can understand why it is important to conserve water and ways to do it.

### Procedure:

1. Divide a piece of blank paper into 3 sections, as shown here.
2. Place the paper brochure on a table with a landscape orientation, making sure the first panel is facing down on the left side.
3. Fold section 3 onto section 2 until the overlapping portion is slightly narrower than the non-overlapping portion of section 1. Crease the fold on the right side of the pamphlet.
4. Unfold the right side of the brochure. Fold section 1 over until the left edge is adjacent to the crease made in Step 2. Crease the fold on the left side of the pamphlet.
5. Unfold the left and re-fold section 3. Re-fold section 1 on top of the right to complete the process.



**Brochures have 6 pages. Include the information described below on each page to get full credit.**

1 <sup>st</sup> Page	Back page	Front Page	2 <sup>st</sup> page	3 <sup>rd</sup> page	4 <sup>th</sup> page
-Water conservation tip or fact -Colored graphic	Anything Interesting	-Title -Your name -Colored graphic	-Water conservation tip or fact -Colored graphic	- Water conservation tip or fact -Colored graphic	- Water conservation tip or fact -Colored graphic

### RUBRIC

CATEGORY	(4) Excellent	(3) Good	(2) Almost	(1) Not Yet
<b>Attractiveness &amp; Organization</b>	The brochure has attractive formatting, is in point form and has very well organized information.	The brochure has attractive formatting, is in point form and has organized information.	The brochure has adequate formatting, is in point form and is somewhat organized.	The brochure's formatting and organization of material are confusing to the reader. Information is not in point form.
<b>Content - Accuracy</b>	The brochure has all of the required information and some additional information.	The brochure has all of the required information.	The brochure has half of the required information.	The brochure has little of the required information.
<b>Mechanics:</b> Spelling Sentence Form Grammar Punctuation Capitalization	All of the writing is in complete sentences. Capitalization, punctuation and spelling are correct throughout the brochure.	Most of the writing is in complete sentences. Most of the capitalization, punctuation and spelling are correct throughout the brochure.	Only about half of the writing is in complete sentences. Some of the capitalization, punctuation and spelling are correct throughout the brochure.	Much of the writing is not in complete sentences. Much of the capitalization, punctuation and spelling is not correct throughout the brochure.
<b>Graphics/Pictures</b>	Five neatly colored graphics are included and go well with the text.	Three neatly colored graphics are included and go well with the text.	Two graphics are included but do not always go well with the text. Graphics may or may not be colored or neat.	Less than two graphics are used and may or may not go with the text. Graphics may or may not be colored or neat.

