WATER: The Resource That Gets Used & Used & Used for Everything!

MINING START

LUMBER

RECREATION

HYDROELECTRIC POWER

PUBLIC SUPPLY

HERBERT Hotel

COMMERCIAL

Reid's GAS

Sally's DELI

PUMP

AGRICULTURE

CATFISH FARMS

NATURE'S NEEDS

WASTE-WATER TREATMENT

PUMP HOUSE

DOMESTIC

FEED LINE 35

YOUR SCHOOL

TRANSPORTATION

BAIT

STREAM GAGING STATION

THERMO-ELECTRIC POWER

COOLING TOWER

INDUSTRIAL

Jones' Steel & Iron

WATER STORAGE

FINISH

Water Table

Aquifer

Water Resource Education

U.S. DEPARTMENT OF THE INTERIOR — MARCH 3, 1849

UNITED STATES GEOLOGICAL SURVEY

GRADE SCHOOL

Water truly is a resource that gets used and used for everything. The same water can be utilized many times. This poster depicts 12 water uses which are labeled in bold red letters, beginning with mining and ending with transportation. Withdrawals (water removed from the river or ground), distribution, and returns (water returned to the river or ground) are depicted by the blue arrows. The poster is folded into 8 1/2" x 11" panels; front and back panels can easily be photocopied.

From the mountains, the river flows through a reservoir and past urban, rural, and industrial settings in which various uses of water are depicted. Water is available from surface sources—rivers, ponds, and lakes— and from ground-water sources called aquifers.

Recreation, Hydroelectric Power generation, Nature's Needs, and Transportation are instream uses, which means that the water remains in the river. Consequently, very little water is consumed. The water can be reused farther downstream. Mining, Public Supply, Commercial, Domestic, Wastewater Treatment, Agriculture, Thermoelectric Power generation, and Industrial are offstream uses, which means that the water is withdrawn from a source such as the river or ground. But only a part of the water withdrawn is actually consumed, so the remaining part is returned to the river or ground and can be used again (See Pie Charts). Different offstream uses consume different proportions of the water they withdraw (See Pie Charts).

INSTREAM USE

Recreation

Water is used for recreational activities such as boating, rafting, kayaking, swimming, and fishing.

Hydroelectric Power

Hydroelectric powerplants use water to generate electricity. Falling water turns the plant's turbine generators.

Nature's Needs

Water is necessary to maintain life on our planet. Water supports all forms of life. Water forms and cleans stream and river channels. It surrounds and supports life in streams, rivers, lakes, and reservoirs. Nature's Needs include wetland communities, stream habitats, and fish reproduction.

Transportation

Water provides a means for transporting goods and materials. Many rivers in the United States serve as major transportation networks.

OFFSTREAM USE

Public Supply

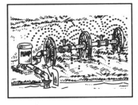
Public-supply use refers to water withdrawn by public and private suppliers and delivered to a variety of consumers for domestic, commercial, and industrial uses and thermoelectric power generation.

Domestic and Commercial

A subcategory of Public Supply is domestic and commercial water use. Domestic water use is for normal household purposes such as drinking; cooking; bathing; washing clothes, dishes and cars; and watering lawns and gardens. Commercial water use is for schools, hotels, motels, restaurants, office buildings, retail and other commercial facilities, and civilian and military institutions. Domestic and commercial water uses are similar in that both are largely dependent on public water supplies and the resulting wastewater is disposed of largely through communal sewer systems. Moreover, both are concentrated in urban and suburban areas.

Wastewater Treatment

The wastewater resulting from domestic, commercial, and industrial uses is cleaned at wastewater-treatment facilities and returned to a water source. Cleaning and returning water to be reused is an important concept in water use.



Agriculture

In agriculture, water is used for irrigation and livestock. Irrigation includes the water people put on fields, trees, crops, pastures, and golf courses. In raising livestock, water is used for livestock drinking water, dairy operations, and fish farming (aquaculture).

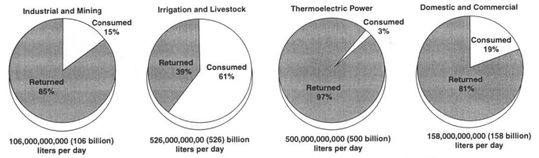
Thermoelectric Power

Thermoelectric power is the production of electricity by steam using fossil fuel, nuclear, or geothermal energy. Water is used primarily for cooling, so very little is consumed.

Industrial and Mining

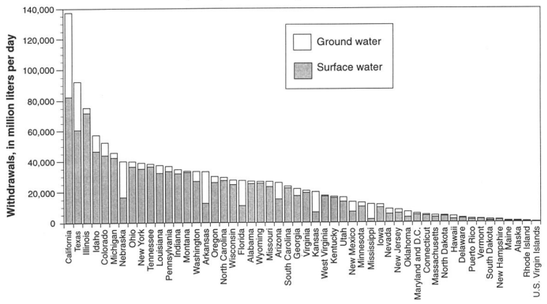
Industries use water for manufacturing. The largest water-using industries in the United States include those that manufacture steel and other metals, chemicals and chemical products, paper and paper products, and refine petroleum. Before petroleum is refined, it must be mined, and this process also requires water. The mining of minerals also requires water for such steps as milling and washing.

HOW WATER WAS USED DURING 1995



The portion labeled consumed cannot be immediately used again. The portion labeled returned is available to be used again. The volumes listed are daily values for the entire United States of America.

Freshwater withdrawals in the United States in 1995
(Listed by State in descending order of total withdrawals)



SUMMARY OF FRESHWATER WITHDRAWALS, 1995, RANKED BY TOTAL
(Withdrawals might not add to totals because of independent rounding. Withdrawals in million liters per day. Values in [ ] show rank order of State by withdrawal type).

State	Total withdrawals	Rank	Surface-water withdrawals	Rank	Ground-water withdrawals	Rank
California	137,000	[1]	82,500	[1]	54,900	[1]
Texas	92,300	[2]	60,600	[3]	31,700	[2]
Illinois	75,400	[3]	71,900	[2]	3,510	[18]
Idaho	57,300	[4]	46,600	[4]	10,700	[8]
Colorado	52,400	[5]	43,900	[5]	8,550	[10]
Michigan	45,600	[6]	42,400	[6]	3,250	[22]
Nebraska	40,000	[7]	16,500	[25]	23,500	[3]
Ohio	39,800	[8]	36,400	[8]	3,420	[19]
New York	38,900	[9]	35,100	[9]	3,820	[16]
Tennessee	38,200	[10]	36,500	[7]	1,650	[33]
Louisiana	37,300	[11]	32,200	[12]	5,110	[13]
Pennsylvania	36,700	[12]	33,400	[10]	3,260	[21]
Indiana	34,600	[13]	31,900	[13]	2,680	[27]
Montana	33,500	[14]	32,700	[11]	772	[40]
Washington	33,400	[15]	26,700	[15]	6,660	[11]
Arkansas	33,200	[16]	12,500	[29]	20,700	[4]
Oregon	30,000	[17]	26,000	[16]	3,970	[15]
North Carolina	29,300	[18]	27,300	[14]	2,030	[29]
Wisconsin	27,500	[19]	24,600	[19]	2,870	[25]
Florida	27,300	[20]	10,900	[30]	16,400	[5]
Alabama	26,800	[21]	25,200	[18]	1,650	[32]
Wyoming	26,600	[22]	25,400	[17]	1,200	[37]
Missouri	26,600	[23]	23,200	[20]	3,370	[20]
Arizona	25,800	[24]	15,100	[27]	10,700	[7]
South Carolina	23,500	[25]	22,300	[21]	1,220	[36]
Georgia	21,800	[26]	17,300	[23]	4,500	[14]
Virginia	20,700	[27]	19,300	[22]	1,360	[34]
Kansas	19,800	[28]	6,510	[34]	13,300	[6]
West Virginia	17,500	[29]	16,900	[24]	553	[44]
Kentucky	16,800	[30]	15,900	[26]	855	[39]
Utah	16,300	[31]	13,400	[28]	2,940	[24]
New Mexico	13,200	[32]	6,810	[33]	6,430	[12]
Minnesota	12,800	[33]	10,100	[31]	2,700	[26]
Mississippi	11,700	[34]	1,900	[44]	9,800	[9]
Iowa	11,500	[35]	9,500	[32]	2,000	[30]
Nevada	8,540	[36]	5,300	[36]	3,240	[23]
New Jersey	8,100	[37]	5,900	[35]	2,200	[28]
Oklahoma	6,740	[38]	3,110	[40]	3,630	[17]
Maryland and D.C.	5,550	[39]	4,620	[37]	931	[38]
Connecticut	4,830	[40]	4,200	[38]	628	[42]
Massachusetts	4,340	[41]	3,010	[41]	1,330	[35]
North Dakota	4,250	[42]	3,790	[39]	462	[45]
Hawaii	3,830	[43]	1,880	[45]	1,950	[31]
Delaware	2,850	[44]	2,430	[42]	416	[46]
Puerto Rico	2,190	[45]	1,600	[46]	587	[43]
Vermont	2,140	[46]	1,950	[43]	189	[50]
South Dakota	1,740	[47]	1,030	[48]	708	[41]
New Hampshire	1,690	[48]	1,380	[47]	307	[47]
Maine	837	[49]	534	[50]	303	[48]
Alaska	803	[50]	583	[49]	220	[49]
Rhode Island	515	[51]	413	[51]	102	[51]
U.S. Virgin Islands	44	[52]	42	[52]	2	[52]
Total	1,290,000		1,001,000		289,000	

Source: Estimated Use of Water in the United States in 1995, U.S. Geological Survey Circular 1200.

Poster Series

This poster is part of a series of water-resources education posters developed through the U.S. Geological Survey's Water-Resources Education Initiative, a cooperative effort between public and private education interests. Partners in the program include the U.S. Geological Survey, Bureau of Reclamation, and the U.S. Fish and Wildlife Service of the U.S. Department of the Interior; the National Oceanic and Atmospheric Administration; the U.S. Environmental Protection Agency; the U.S. Army Corps of Engineers; the Nebraska Groundwater Foundation; and the National Science Teachers Association.

The other posters in the series are entitled "How Do We Treat Our Wastewater?", "Wetlands: Water, Wildlife, Plants, & People!", "Ground Water: The Hidden Resource!", "Water Quality: Potential Sources of Pollution", "Navigation: Traveling the Water Highways!", "Hazardous Waste: Cleanup and Prevention", "Watersheds: Where We Live", and "Oceans—Coastal Hazards: Hurricanes, Tsunamis, Coastal Erosion." The posters in the series are designed to be joined to create a large wall mural. A schematic of the wall mural is displayed on this panel. The gray shaded spaces represent the posters listed above. The black shaded space represents this poster.

OCEANS	WATERSHEDS	HAZARDOUS WASTE
WETLANDS	WATER USE	WASTEWATER TREATMENT
NAVIGATION	GROUND WATER	WATER QUALITY

Water-resources topics of the posters are drawn in a cartoon format by the same cartoonist. Posters are available in color or black and white. The reverse sides of the color posters contain educational activities: one version for children in grades 3–5 and the other for children in grades 6–8. The black-and-white posters are intended for coloring by children in grades K-2.

ORDERING INFORMATION

Copies of the posters in the series (see Poster Series Panel) can be obtained at no cost from the U.S. Geological Survey. Write to the address below and specify the poster title(s) and grade level(s) desired. A limited number of color and black-and-white posters entitled "Water: The Resource That Gets Used & Used & Used for Everything!" also are available in Spanish by writing to the address below.

U.S. Geological Survey
Information Services
P.O. Box 25286
Denver Federal Center
Denver, CO 80225
Telephone: 1-800-435-7627

WATER DISTRIBUTION DEMONSTRATION

INTRODUCTION

Humans must have freshwater to live. But about 97 percent of the Earth's water is too salty to use. The remaining 3 percent is freshwater, but most of it is in polar icecaps, remote glaciers, and icebergs and is not easily accessible. Accessible freshwater, therefore, comes from streams, lakes, and underground sources. These sources represent less than one-half of 1 percent of all water on Earth. If all the water on Earth equals 100 percent, then the following table shows the breakdown representing each type.

Earth's Total Water Supply (percent)		Earth's Total Freshwater Supply (percent)	
Oceans (saltwater)	97.2	Icecaps and glaciers	2.15
Freshwater	2.5	Ground water	.31
Saline ground water**	.31	Surface water	.01
Saline lakes and inland seas	.008	Air and soil	.006
Total Water on Earth	100.0*	Total Freshwater on Earth	2.5*

*rounded
**Ground water located greater than 1/2 mile below the Earth's surface. Source-Nace, Water of the World, USGS, 1884

OBJECTIVES

After the demonstration, students will:

1. Know the distribution of Earth's water.
2. Be able to name the sources of freshwater on Earth (icecaps and glaciers, ground water, surface water, atmospheric water vapor, and soil moisture).

MATERIALS

Two 1,000-milliliter (mL) graduated cylinders, four 100-mL graduated cylinders, one medicine dropper, food coloring.

TEACHER PREPARATION

If two 1,000-mL graduated cylinders are not available, other clear containers can be used. If you have access to laboratory glassware, fifteen 100-mL graduated cylinders will work. Ten cylinders will hold 975 mL of saltwater, while the remaining five graduated cylinders will hold freshwater. A clear plastic jug holding 1 liter (soft drink container) of colored water can be used. Other clear glasses or jars can hold the smaller divisions. The following table shows the distribution of water for this demonstration.

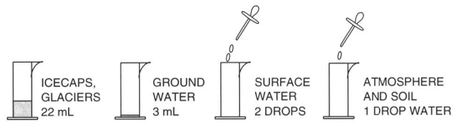
Earth's Total Water Supply (milliliter)		Earth's Total Freshwater Supply (milliliter)	
Ocean (saltwater)	975	Icecaps and glaciers	22
Freshwater	25	Ground water	3
		Drops surface water	*2
		Drop water in air and soil	*1
Total Water on Earth	1,000	Total Freshwater on Earth	25

l liter = 1,000 milliliter
*13 drops = 1 milliliter

PROCEDURE

1. Fill one 1,000-mL graduated cylinder with colored water to the 1,000-mL line. Tell the students that this represents the Earth's entire supply of water. Pour 25 mL of the total water into a second 1,000-mL graduated cylinder. The 25 mL of water represents the Earth's total freshwater supply. The remaining 975 mL of water is saltwater that occurs primarily in oceans.

2. Divide the 25 mL of freshwater by pouring into smaller containers; 22 mL for icecaps and glaciers, 3 mL for ground water, 2 drops for surface water, and 1 drop for the water in the atmosphere and soil.



3. List the percentages of Earth's water on the chalkboard or overhead projector. Refer to these numbers as you continue.

Interpretive Questions

As the students examine and compare the different volumes of water in the graduated cylinders, ask the following questions:

1. Which of the four freshwater graduated cylinders represents the most freshwater on Earth?
ANSWER: 22 mL, representing icecaps and glaciers.

2. Is this a source of freshwater commonly used by humans for drinking, watering the lawn, cleaning, etc.? Explain.
ANSWER: No, icecaps and glaciers are usually too far away from population centers.

3. Approximately what percentage of the Earth's freshwater is ground water?
ANSWER: 3 mL/28 mL x 100 = 22% ground water.

4. Where is most of Earth's water found?
ANSWER: Oceans.

5. Can cities such as San Francisco, Miami, and New York City, which are near oceans, use the water from the oceans for households and industry? Explain.
ANSWER: No, the ocean water contains salts that are harmful to humans, kill plants, and corrode metals.

6. Can the salts be removed from water? Why isn't this commonly done?
ANSWER: Yes, but the desalinization process is very expensive.

7. Why is the little bit of water in the atmosphere important to plants, animals, and humans?
ANSWER: Water in the atmosphere is carried inland in the form of rain, snow, sleet. and hail which supply freshwater sources such as lakes, streams, and ground water.

DEFINITIONS

Aquaculture - Farming of organisms that live in the water, such as fish, shellfish, and algae.
Aquifer - An underground layer of porous or fractured rock filled with water that is the source of water to a well or spring.
Consumed - That part of water withdrawals that is evaporated, stored in food, drunk by people or animals, or somehow removed from the local environment.
Ground water - Underground water that moves through porous or fractured rocks and soils, supplying water to wells and springs.
Instream use - The use of water that does not require removing water from a river, stream, lake, pond, or surface-water source. Instream use generally consumes very little water.
Offstream use - Water removed or taken from a ground- or surface-water source. Offstream uses usually consume water, reducing the amount available for other uses.
Return flow - Water that is not consumed, but is returned to a surface- or ground-water source, and available for reuse.
Surface water - Water that is on the Earth's surface, such as in rivers, streams, reservoirs, lakes, and ponds.
Water table - The top of the water within an aquifer.
Withdrawal - Water removed from the ground- or a surface-water source for use.

ACKNOWLEDGMENTS

The following individuals contributed to the development of this poster:

Project Chief, Principal Author, and Layout: Stephen Vandas, U.S. Geological Survey, Denver, Colorado

Artwork: Frank Farrar, Frank Farrar Graphics, Denver, Colorado, under contract to the American Water Resources Association

U.S. GEOLOGICAL SURVEY

The U.S. Geological Survey (USGS) is the Nation's principal earth-science information and research agency. The USGS monitors the quantity, quality, and use of the Nation's water resources, assesses onshore and offshore energy and mineral resources, conducts research in earth hazards, manages the Nation's civilian mapping program, and applies new technologies to the study of the Earth. Providing the scientific information necessary to answer questions related to earth science is the primary mission of the USGS. This scientific information is available to any interested individual or organization.

U.S. DEPARTMENT OF THE INTERIOR

As the Nation's principal conservation agency, the U.S. Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This responsibility includes fostering the wise use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to ensure that their development is in the best interest of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in island territories under United States administration.

MIDDLE SCHOOL