INVESTIGATION

11

National *and* Local Water Use

Project

PURPOSE

- Use the Internet to gather and interpret water use data at the national, state, and local levels
- Analyze water use patterns over time to compare consumption levels with local rainfall

Materials

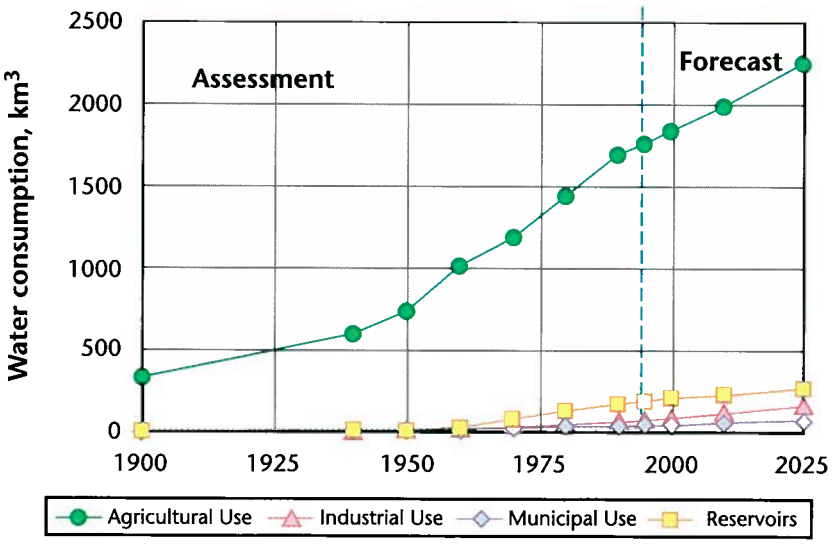
- topographic and other maps of your local water supply area

INTRODUCTION

Worldwide, fresh water use is increasing. This trend is because the human population is growing and, as the world becomes more industrialized, humans' per capita use is also on the increase. A United Nations publication reports that global water use over the 20th century grew twice as fast as the human population. Water use in the United States also has increased faster than its population.

Fig. 11-1

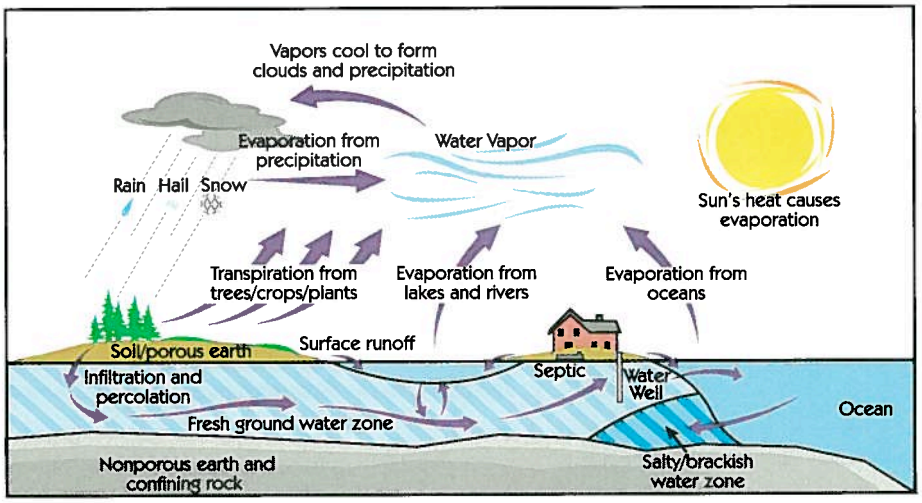
Global Water Consumption By Type of Use



Water falls to Earth as precipitation, where it can either evaporate, run off the surface, or percolate down into the soil to become groundwater, as shown in the illustration of the **hydrologic cycle**. Our land-use decisions play a large role in where the water goes after it hits Earth. In urban areas nearly half of the water becomes runoff, mostly through storm sewers. This water usually cannot be used by humans as it makes its way back to the sea. But in undeveloped areas, at least 50% of the water recharges underground aquifers. As urban regions expand and become more populous, the amount of available water decreases.

Fig. 11-2

The Hydrologic Cycle



PART I: NATIONAL ANALYSIS

Access data from the following Web site:

http://wwwga.usgs.gov/edu/tables/dltotal.html

From the data table of "Total Water Use in the U.S.," calculate the per capita use of fresh water for each state. (*Take note of units*: Population is given in thousands and water use in millions of gallons.)

1. Per capita, what are the ten states that use the most water and the ten states that use the least water?

2. Look for patterns in the total water use of the states compared to their populations.

a. Why do you think some of the states are such high water consumers?

b. What industries account for such high levels of use?

c. Where do these high-use states rank in terms of total population?

3. Determine the location of states with lower per capita use.

a. Why is their water use so much lower?

b. How do these lower-use states rank in population size?

4. Look for patterns in your findings for Questions 2 and 3.

a. What do the patterns tell about water use in differing parts of the country?

b. What are three examples of conflicts that arise over competition for water?

5. Determine which states use more ground water than surface water.

a. How do their aquifers get recharged?

b. Does the recharge rate keep up with the rate of use?

c. Give two potential reasons for aquifer resources being diminished, based on their geographic location and annual rainfall.

6. Find which states are in drier parts of the U.S.

   a. Which of these states use more surface water?

   b. How is such surface water use possible? Where does this water come from? How is it stored?

PART II: STATE ANALYSIS

In this part you will research how water use matches the water supply for your own state. You may search for reservoir or ground water levels on your state Web site or, as an alternative, access the United States Geologic Survey site and select your state there: http://water.usgs.gov/

1. Analyze how the water level has changed over time.

   a. What seasonal patterns do you observe, if any?

   b. If there are patterns in the water levels, why do they occur?

Your state university, Geologic Survey, Department of Environmental Protection or Division of Natural Resources has Web sites with rainfall data for your state or region.

2. Evaluate the average rainfall in your state, region, or city over the last 50 to 100 years.

   a. Is there an overall trend or has the pattern been somewhat random? Explain.

   b. How do the last five years fit into the pattern?

c. How do the data relate to the average temperature? Is there a relationship?

d. How do the patterns of El Niño and La Niña fit with these data?

PART III: LOCAL ANALYSIS

In this part of the project you will investigate where the water you consume comes from. If it is mostly surface water, it will most likely be collected in reservoirs. If you have well water, you will need to locate the recharge areas.

1. On topographic maps of your region, draw your watershed. If you have well water, draw in the region that feeds the recharge areas. Calculate the approximate area in square miles and then convert this to square feet ($1\ mi^2 = 2.79 \times 10^7\ ft^2$).

a. You can approximate the amount of rainfall a watershed collects in a year by multiplying the surface area by the depth of the yearly rainfall total. (*Watch your units:* Above, you calculated surface area in square feet.) Now calculate the volume of water collected, in cubic feet, by your watershed. Multiply the surface area by the yearly average rainfall.

b. If $1\ ft^3$ of water equals 7.5 gal, how many gallons of water fall in your watershed in an average year?

2. Not all water from rainfall is stored where it can be used by people. Some evaporates directly or through the vegetation, and more is drawn off through storm sewers. The portion that percolates into the ground to be taken up through wells or that collects in reservoirs depends on what occupies the land. Local maps of your area may be helpful for the questions that follow.

a. The average American uses about 100 gallons of water per day. Using population figures for your watershed, what is the daily water consumption in gallons?

b. What is the yearly consumption of water in your watershed?

c. For the sake of this exercise, assume that 50% of the annual rainfall is available for use. Does your watershed produce enough water to replace what is consumed? How great is the surplus or deficit?

3. Make an analysis of how the water gets to the reservoirs in your area and over what terrain the water passes.

a. Describe the land use in your watershed. Estimate how much of the land is covered by vegetation, wetlands, commercial and industrial areas, and housing.

b. As the water travels through the watershed, what are some of the threats to its safety based on land use?

4. How is your water treated for public use? How is it distributed?

5. List and describe five ways communities can encourage water conservation.