

Unit 1

Objectives

In this unit, students will

- understand the distribution of global water resources and the movement of water through the hydrologic cycle;
- estimate the volume of water contained in the three largest water reservoirs;
- explore technologies used to extract water resources; and
- relate how climatic changes would alter the distribution of water and impact the global population.

Finding web resources

See the Saguario Project web page for a list and explanation of the Internet resources mentioned here.

<http://saguaro.geo.arizona.edu/ewr/>

Instructions and resources

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In this unit, students investigate the location, size, and accessibility of the major reservoirs that compose the global water supply. We suggest completing all of the activities sequentially. The core of the unit is the activities in which students manipulate data using ArcView (1.2 and 1.4). Below, we provide tips for guiding each activity as well as additional relevant resources. See the Saguario Project web page for a list and explanation of the resources discussed below.

1.1 – Global water sources (Engage)

In this activity, students discuss their prior knowledge and conceptions about the global water supply. Specifically, they are asked to list global water reservoirs and generate predictions regarding the size and accessibility of each. They must also speculate on how these reservoirs are used and the challenges of maintaining a safe water supply in their community. This activity provides the foundation for an in-depth exploration of global water reservoirs in later activities.

To emphasize the human dimension of water resource issues as an alternative or extension to this activity, students can use Internet sites provided by the World Health Organization and UNICEF to investigate water-borne diseases and the countries and populations that are most affected by them.

1.2 – Measuring global water (Explore)

Students learn about water stored in liquid, solid, and gaseous states as they investigate three important global water reservoirs: the oceans, ice caps, and atmosphere. Using ArcView to explore real data, students estimate the volume of water held in those and other smaller reservoirs.

As an extension to this activity, students can research issues surrounding global water scarcity and identify those nations that are facing imminent water shortages using web sites provided by the U.N. Environmental Program, John Hopkins University, and ITT Industries.

1.3 – Utilizing global water reservoirs (Explain)

Through concise readings, students gain a more complete understanding of the hydrologic cycle and are provided with explanations of technologies that might be used to obtain fresh water from the oceans, ice caps, and atmosphere.

As an extension to this activity, students can research methods of desalinating sea water, harvesting fog water and precipitation, or obtaining water from icebergs using web sites provided by the University of Hawaii, the International Desalination Program, Centre for Science and Environment, and Iceberg Industries.

1.4 – What if the ice caps melted? (Elaborate)

To examine the potential impact of global warming, students use ArcView to assess how changes in sea level resulting from the melting of polar ice caps would impact humans. Students visualize how densely populated coastal areas and croplands in the U.S. become submerged and calculate the percentage of the global population affected. Students will need their answers from Activity 1.2 to perform several calculations in this activity.

As an extension to this activity, students can use the Internet to investigate recent research regarding the causes and magnitude of global warming as well as the economic, environmental, and societal consequences. Who is currently affected? Who is likely to be affected in the future? What are the solutions or ways to slow global warming? The U.S. Environmental Protection Agency (EPA) and Changing Climate web sites provide basic information and are good starting points. Because global warming is a controversial topic where the opinions of experts differ, this subject presents an excellent opportunity for students to conduct a debate that reconstructs the controversy and differing opinions on the causes and importance of global warming trends.

1.5 – Comparing major reservoirs (Evaluate)

As a culminating activity, students are asked to assess the practicality of using the oceans, ice caps, and atmosphere as sources of drinking water, using the CIA World Factbook web site to identify countries that could feasibly use these reservoirs. Students may also use data contained in the Exploring Water Resources ArcView project files or other reference sources to complete this activity.

Students may use the CIA World Factbook as a starting point to investigate the water management issues that other nations face.

Additional notes

This unit focuses more on water availability than water quality, which is best taught by conducting an in-class experiment or demonstration. If you are interested in augmenting this unit with more information or lessons on water quality, the Global Rivers Environmental Education Network (GREEN), Project Wet, Rivernetnetwork, Environment Canada, and EPA web sites provide both teacher and student resources on measuring water quality, monitoring water quality in the field, finding existing data on water quality, and locating additional resources.