

Unit 4

Unit 4 objectives

In this unit, students will

- identify challenges regarding the use and management of water resources in arid environments;
- understand the characteristics of an aquifer and the physical and societal effects of ground water removal;
- conduct studies of ground water use, aquifer recharge, and the physical and economic impacts of ground water withdrawal; and
- examine potential conservation strategies and develop a plan to address future water needs.

Finding web resources

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

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

Instructions and resources

Unlike previous units, the activities in this unit constitute a local case study of the challenges of obtaining water as well as the economic and environmental consequences of ground water removal in Tucson, Arizona. Students will explore precipitation, surface flow, and recharge; examine water use statistics and conservation measures; and develop a plan to help Tucson manage its impending water crises. The following is an overview of each activity including useful teaching tips, extensions, and resources.

4.1 – Living in a desert (Engage)

This activity was designed to introduce students to the challenges of managing water resources in desert cities and the specific situation in Tucson, Arizona, a city in the Sonoran Desert of the southwestern United States. However, it would be useful to provide students with an introduction to Tucson geography. Arizona Water Resource Research Center and City of Tucson web sites are excellent sources of information about the Tucson region.

As an extension or alternate activity, students could investigate the issues surrounding desertification of arable land around the globe using the Smithsonian Institution/United Nations Environmental Programme and the United Nations Convention to Combat Desertification web sites.

4.2 – Water in the balance (Explore)

Students investigate data on precipitation, stream discharge, and aquifer recharge. They examine how precipitation, population growth, and water usage interact and influence the amount of water removed and recharged to the Tucson Basin aquifer.

Students may wish to explore the water balance in their region by obtaining information about precipitation, water use, and recharge. These resources can typically be obtained from the city or local water provider.

4.3 – The Tucson Basin aquifer (Explain)

Students learn about the composition and structure of aquifers. They are introduced to the potential physical and economic consequences of ground water removal.

4.4 – Impacts of ground water pumping (Elaborate)

Students examine the current and predicted environmental and economic consequences of withdrawing more ground water than is recharged to the Tucson Basin aquifer. Additional resources including graphs and photographs of land subsidence associated with ground water removal across the United States can be found on United States Geological Survey web sites.

4.5 – Conserving water (Elaborate)

Students investigate the amount of water used in daily activities, the cost of water, and the feasibility of harvesting rainwater to meet some of Tucson’s water needs. You may want to discuss or investigate population growth and water use in your area to illustrate to students that water issues are not unique to Tucson and other desert cities. As an extension activity, students can design and determine the cost of installing water catchment devices in their home or educational institution and evaluate the amount of water and money that could be saved if these devices were implemented.

4.6 – The voice of conservation (Evaluate)

In this open-ended investigation, students use knowledge gained in the activity to develop a conservation plan that addresses various aspects of Tucson’s water supply problem. As an extension or alternative activity, students could develop a plan for their city or educational institution.