

## Exploring Aquifers Lesson Four: “Water Uses of Aquifers”

**Academic Questions:** Who uses aquifer water?

What human activities depend on water in an aquifer?

What plant and animal species rely on aquifers?

How does groundwater compare with surface water for use?

**Objective(s):**

- To understand the importance of aquifers to living things
- To understand the importance of aquifers to the water supply of Texas

**Key Terms:** aquifer, municipal use

[Click here for definitions to Exploring Aquifers vocabulary.](#)

**Process (Activities):**

1. Begin by brainstorming to create a list of the different ways groundwater is used. Be sure that you are careful to phrase the question in such a way as to include non-human uses of the aquifer. Once students have completed their list, check to see if it included the following human uses: manufacturing, livestock, mining, municipal uses, power generation, and crop irrigation. Ask students which of these six different areas use the largest amount of water. (More than 75% of the pumped ground water was used for crop irrigation, while only 17% was used for municipal purposes.)
2. Ask students to create two graphs of the following 1992 data of groundwater usage patterns. (Note: Groundwater use is best graphed as a pie chart, and the percentage of water usage by type is best graphed as a bar chart.)

### 1992 Groundwater Uses

3.5% for manufacturing

1.9% for livestock

1.8% for mining

16.8% for municipal usage

.6% for power generation

75.4% for crop irrigation

### Percentage of Water Use of Groundwater Verses Surface Water

Manufacturing

20% groundwater

80% surface water

Livestock

40% groundwater

60% surface water

Mining

65% groundwater

35% surface water

Municipal Uses

40% groundwater

60% surface water

Power Generation

20% groundwater

---

80% surface water  
Crop Irrigation  
70% groundwater  
30% surface water

3. Divide students into small Internet research groups to explore how these different human activities use groundwater. You may choose to assign each group a different groundwater use. Students should record their findings on a note card. Each note card should contain the following information:
  - a. General description of the activity
  - b. General description of how the activity uses ground water
  - c. The amount of groundwater used annually by this activity
  - d. Where in Texas is groundwater used for this activity
4. Once students have explored how humans are dependant on groundwater, introduce the importance of groundwater to other living things. Ask students to review their original groundwater uses brainstorm list and circle all the uses that were not directly related to human activities. If no items can be circled, lead a discussion exploring how other living things might be dependent on aquifer water.
5. Once again, divide students into small Internet research groups to explore the different non-human living things that rely on Texas aquifers. You may choose to assign each group a specific aquifer. Students should be sure to consider both the underground habitats and the surface water habitats that are directly reliant on the aquifer. This is particularly important for the group researching the Edwards aquifer, whose underground passages are home to many colorless, eyeless endangered species.

The Edwards Aquifer Research and Data Center web site has good information on these and other species dependant on the Edwards aquifer:

<http://www.eardc.swt.edu/EndangeredSpecies.html>.

In addition, the Cyberways and Waterways website has a page of links on Aquifers and Recharge Zones:

<http://4cw3.com/en/realWorldIssues/issues/index.xml?show=Aquifer+and+Recharge+Zones>

6. Ask students to create a note card on each species found to depend on a Texas aquifer. Each note card should contain the following information:
  - a. General Physical Characteristics
  - b. Habitat and Food Source
  - c. Geographic Range or Distribution

**Product/Application:** Ask students to make a brief presentation on their findings to the class and create an information pamphlet of how many living things are dependent on the aquifers of Texas.

**Assessment/Evaluation:** Ask students to explain which human use of the aquifer is most dependent on aquifer water. Ask students to discuss the relationships or connections between human use of the aquifer and other species dependency on aquifers.

**Resources:**

The Cyberways and Waterways web site has a page of links on Aquifers and Recharge Zones:

This curriculum was developed with education grant funds through the Texas Education Agency for nonprofit educational uses and cannot be sold or used for profit in any way.

---

<http://4cw3.com/en/realWorldIssues/issues/index.xml?show=Aquifer+and+Recharge+Zones>

EPA Safe Water, and MTBE detection:

<http://www.epa.gov/safewater/imagesrtp/ogwdwus.gif>

Municipal Water Demand Projections:1990-2050 Water demand projections in acre feet by region with figures for counties, places, and county-other

<http://www.twdb.state.tx.us/data/popwaterdemand/popwaterdemandmain.htm#totals>

LSU Ag Center's slide show of water uses and legislation

<http://www.agctr.lsu.edu/lawater/ppt/Ronkaiser/sld002.htm>

**Time Frame:** Two 45-minute class periods

**Grade Level:** 6<sup>th</sup>-12<sup>th</sup>

**TEKS Correlation:**

**Science**

Grade 6: 6.1, 6.2, 6.3, 6.4

Grade 7: 7.1, 7.2, 7.3, 7.47.5,

Grade 8: 8.1, 8.2, 8.3, 8.4, 8.12, 8.14

Aquatic Science: (b)1, 4.B, 5.A,D, 8.A,B,C,D

Environmental Science: (b)1 5.B,E,F

Geology, Meteorology, and Oceanography: (b)1, 10A,B

**Mathematics**

Grade 6: 6.1, 6.8, 6.11, 6.12, 6.13

Grade 7: 7.3, 7.4, 7.9, 7.13, 7.14, 7.15

Grade 8: 8.14, 8.15

Geometry: 6

Precalculus: 2

**Technology Applications**

Grades 6 –8: 2, 4, 5, 6, 7, 8

**Social Studies**

Grade 6: 6.7, 6.20, 6.21, 6.22, 6.23

Grade 7: 7.21, 7.22, 7.23

Grade 8: 8.10, 8.30, 8.31, 8.32

**English**

Grade 6: 6.1, 6.2, 6.5, 6.13, 6.17, 6.20, 6.22, 6/24

Grade 7: 7.1, 7.2, 7.5, 7.13, 7.17, 7.20, 7.22, 7.24

Grade 8: 8.1, 8.2, 8.5, 8.7, 8.10, 8.13, 8.17, 8.18, 8.20, 8.22, 8.24

English I: 1, 4, 6, 8, 13, 15, 16, 21

English II: 1, 4, 6, 7, 8, 13, 15, 16, 21