

Water Connections

www.ksagclassroom.org

Grade Level: 6-8, 9-12

Academic Area(s): Science, Social Studies, Language Arts

Topic(s): Earth Science, Geography, Public Speaking



Rev. August/2017

Overview:

Water use and conservation is a critical piece of Kansas agriculture. In this activity, students will learn about various water uses and will create a “water web” to illustrate their dependence on water and the interdependence among water users, producers and the worldwide population.

Objectives:

The student will be able to:

1. Distinguish between consumptive and non-consumptive uses of water.
2. Illustrate different water uses in a community.
3. Appraise the complexity of resolving water shortages among interdependent community water users.

Background Information and Facts:

Water is essential to all known forms of life. Humans require access to water that does not contain impurities, such as high amounts of salt minerals. Virtually all human uses require freshwater.

Water resources are sources of water that are useful or potentially useful to all living things. Over 90 percent of the United States’ freshwater is stored underground. In Kansas, freshwater is obtained from both groundwater (57%) and surface water (43%) resources.

Groundwater is water stored underground in a body of rock or other materials called an aquifer. In some areas, including parts of Kansas, groundwater is the only reliable source of large volumes of water. Overall, Kansans rely on groundwater for 85% of their water needs.

Surface water is water that flows across the surface of the land or is stored in a river, lake or freshwater wetland. The total quantity of water available in a surface water system depends on several factors including the storage capacity in lakes, wetlands and constructed storage areas; the physical characteristics of the land’s surface in the watershed;

Contents:

- Activity 1 - Water Connections

Handouts:

- Water User Descriptions
- Water Footprint

Estimated Teaching Time:

- Activity 1: 30 Minutes



the timing of precipitation, and the local climate, which affects the rate of evaporation. Through infiltration, surface water becomes groundwater.

Eastern and western Kansas differ greatly in the reliance of groundwater. In the western two-thirds of the state, where there is usually less precipitation, relatively abundant groundwater resources provide most of the water. Groundwater resources are more limited in the eastern third of the state; however, precipitation and surface water are more abundant there.

Water Uses:

Uses of water can be categorized as consumptive or non-consumptive (sometimes called renewable). A use of water is consumptive if it is not immediately available for another use. Water incorporated into a product, such as an agricultural crop is considered a consumptive use. A source of water that can be treated and used again as surface water, such as waste treated in a municipal wastewater treatment system, is generally considered a non-consumptive use of the water.

There are several ways in which water is used in agriculture. A common use is irrigation. In Kansas, irrigation makes it possible to produce the agricultural products that supply the world with food and fiber. As populations increase, along with the demand for more food, agricultural producers are working to produce more food with less water.

An estimated 15% of water use worldwide is for industrial purposes, including power plants, oil refineries, chemical processes and manufacturing plants.

Water is also a critical need for household purposes including drinking water, bathing, cooking, sanitation and gardening. Household purposes account for about 15% of the water used worldwide. Water fit for human consumption is called drinking or "potable" water. In the United States, groundwater sources supply an estimated 51% of the drinking water for the U.S. population and account for an estimated 99% of the rural population's drinking water (U.S. Geological Survey).

Water is also used for recreational purposes including swimming, fishing, camping, bird watching, hunting, boating and other water sports. Recreational use is a much smaller percentage but is growing. Most of the lakes and reservoirs in Kansas provide water for recreational use.

It is important and essential to conserve water to assure a long-term supply of water for Kansans. State water agencies including the Kansas Department of Agriculture and the Kansas Water Office cooperatively review water conservation plans for municipal, irrigation and industrial users.

Important Facts:

Water covers nearly 70% of the Earth's surface.

Less than 3% of the Earth's water is freshwater.

70% of water use worldwide is used for irrigation.

Groundwater provides 37% of the water used for agricultural purposes.

The average American uses 100 gallons of water each day.

Over 40% more water is used than needed to carry out cooking, washing, flushing, watering and other tasks.

The largest use of household water is to flush the toilet.



Aquifer: a natural underground storage area for water.

Consumptive Use: a water use that prevents the water from being immediately available for another use.

Groundwater: underground water that is generally found in the pore spaces of rocks or sediments.

Irrigation: the intentional application of water to the soil, usually for the purpose of crop production.

Non-consumptive Use: a source of water that can be treated and used again as surface water.

Potable: a term used to describe water that is safe to drink.

Surface water: water that flows across the surface of the land or is stored in a river, lake, or freshwater wetland.

Water: a colorless, odorless, transparent liquid consisting of two parts hydrogen and one part oxygen, H₂O or hydrogen hydroxide.

Water Conservation: the wise and intelligent use of water in a way that assures its continuing availability to future generations.

Watershed: a sloping area of land that collects, directs, controls and discharges the flow of rainwater into a river, river system, or body of water.



Agricultural:

Crop Farmer – Uses water to irrigate crops and to spray herbicides, pesticides and fertilizers.

Cattle Rancher – Uses water to grow food and provide drinking water for cattle. Also uses water to clean barns, water tanks and feed bunks.

Swine Farmer - Uses water to grow food and provide drinking water for swine. Also uses water to clean barns, waterers, feeders and to transport waste.

Vegetable Producer - Uses water to irrigate vegetables.

Mining:

Mining Company – Uses water to gather raw materials such as coal, gold, iron, copper, gravel and sand.

Sand & Gravel Company – Uses water to wash the raw materials before being made into cement.

Arboriculture:

Forester – Manages the growth and health of trees and uses water to prevent forest fires.

Logging Company – Uses water to transport and store logs on rivers and lakes.

Transportation:

Ship Crews – Uses water to haul materials like logs, oil, processed food and vehicles across bodies of water like rivers, oceans and lakes via barges pushed by tugboats.

Car Owner - Uses water to wash cars and as a coolant.

Shipping Company - Uses water bodies like rivers, oceans and lakes to transport materials like grain, oil, manufactured goods and vehicles.

Industrial:

Steel Producer – Uses water to process iron ore into steel.

Textile Manufacturer- Uses water to wash and process raw materials such as wool, cotton and mohair. Water is also used in the dye to color fabric.

Ethanol Producer - Uses water during fermentation and distillation processes to turn corn or grain sorghum into fuel.

Energy Company – Uses water to move coal through pipelines to distant power plants.

Community:

Firefighter - Uses water to clean the firehouse and fire trucks. Also uses water to put out fires.

Nurse - Uses water to clean utensils and hands often.

Restaurant Owner - Serves water and ice to patrons. Also uses water to clean dishes and cook meals, as well as ice to protect cold foods on the salad bar.

Recreational:

Swimmer - Uses water for pleasure or in a competitive sport.

Fisher - Uses water to catch fish for food or fun.

Water Theme Park Owner - Uses water to entertain people on hot summer days.

Wildlife:

Mammals - Animals like beavers, muskrats and otters live in and near waterways. Water is critical to the growth and survival of all animals.

Fish - Trout, catfish, walleye and other fish live in water and eat organisms that live in water.

Insects - Aquatic insects are a food source for many other organisms.

Birds - Uses water for maintaining body temperature and nests near water.

Water Users not limited to this list



Water footprint for various agricultural products based on global water use averages (National Geographic, 2010).

Animal/Meat Products	Gallons of Water per Pound of Product	Food	Gallons of Water per Serving Size
Beef	1,857	1 hamburger	634
Pork	756	1 glass of milk	53
Chicken	469	1 cup of coffee	37
Sausage	1,382	1 glass of wine	32
Processed Cheese	589	1 glass of beer	20
Eggs	400	1 cup of tea	9
Fresh Cheese	371		
Yogurt	138		
Fruits/Vegetables	Gallons of Water per Pound of Product	Fruits/Vegetables	Gallons of Water per Pound of Product
Figs	379	Oranges	55
Plums	193	Strawberries	33
Cherries	185	Beans	43
Bananas	103	Potatoes	31
Apples	84	Eggplants	25
Grapes	78	Avocados	154
Corn	109		
Manufactured Goods		Gallons of Water per Product Item	
1 pair of blue jeans		2,900	
1 cotton bed sheet		2,800	
1 cotton t-shirt		766	



Preparation:

Create the water user necklaces using the water user descriptions provided (Water Users Handout), index cards and yarn. Write the name or type of water user on one side and the description of how water is used by that person or business on the other. (Alternative: you may include this as part of the activity by assigning each student a water user and asking them to research how water is used and write their own description.)

Tie individual strands of yarn to the ring or roll of duct tape. If the group is larger than 15 students, create two rings. It is suggested to clear a space in the classroom or go outside if permissible to ensure enough room for the activity.

Procedures:

1. Using the background information, discuss with students the various sources and uses of water.
2. Give each student a water user necklace. Ask them to familiarize themselves with the type of water user they've been assigned.
3. Each student should hold onto one of the strands of yarn attached to the ring. Instruct students to hold onto the very end of the string throughout the entire activity.
4. Fill a cup with water and place in the middle of the ring. The cup will represent the water source.
5. Each student will share what type of water user they represent and how they use water.
6. Have several students pull on the strands to demonstrate what happens when one or several users put pressure on the water source. Discuss how that affects other water users.
7. Place an empty cup on the floor below the full cup. Working together, students should pour water from the full cup into the empty cup below. Discuss the importance of water users working together and communicating to conserve water resources.
8. Replace the cup of water with a marker tied to the ring or tape roll. Place a poster board or large piece of paper on the floor below. Have students discuss a word that encompasses water use and conservation and work together to write that word on the poster below.

Materials:

- Ball of string or yarn (cut one, four to six-foot length of string for each student)
- Quilting ring or roll of duct tape
- Plastic cups – 2
- Index cards
- Markers
- Poster board or large piece of paper
- Water





Extensions:

Water Users: Have students research water footprints. They can keep a log of water they use in the shower, washing clothes and dishes, making ice or brushing teeth.

Recommended Resources:

Kansas Foundation for Agriculture in the Classroom (KFAC):

www.ksagclassroom.org

Look for other lesson plans, resource materials and teacher training opportunities!

Educator's Guide:

Exploring Kansas Natural Resources - Unit 6: Water

"Awesome Aqua" Kids Connection Magazine

<http://www.ksagclassroom.org/files/waterissue.pdf>

Other resources/websites:

Drinking Water for Kids:

U.S. Environmental Protection Agency

www.epa.gov/safewater/kids/index.html

H2Ouse Water Saver Home:

California Urban Water Conservation Council

www.h2ouse.org

Kansas Water Office:

www.kwo.org

Water Science for Schools:

U.S. Geological Survey

<http://ga.water.usgs.gov/edu/index.html>

WaterWise Resource Action Program:

www.getwise.org

U.S. Environmental Protection Agency:

<https://www.epa.gov/environmental-topics/water-topics>