FSPPC100

DIVISION OF AGRICULTURE
RESEARCH & EXTENSION
University of Arkansas System

PUBLIC POLICY Center

Arkansas Water Primer Series:

Water Basics

August 2017

Introduction

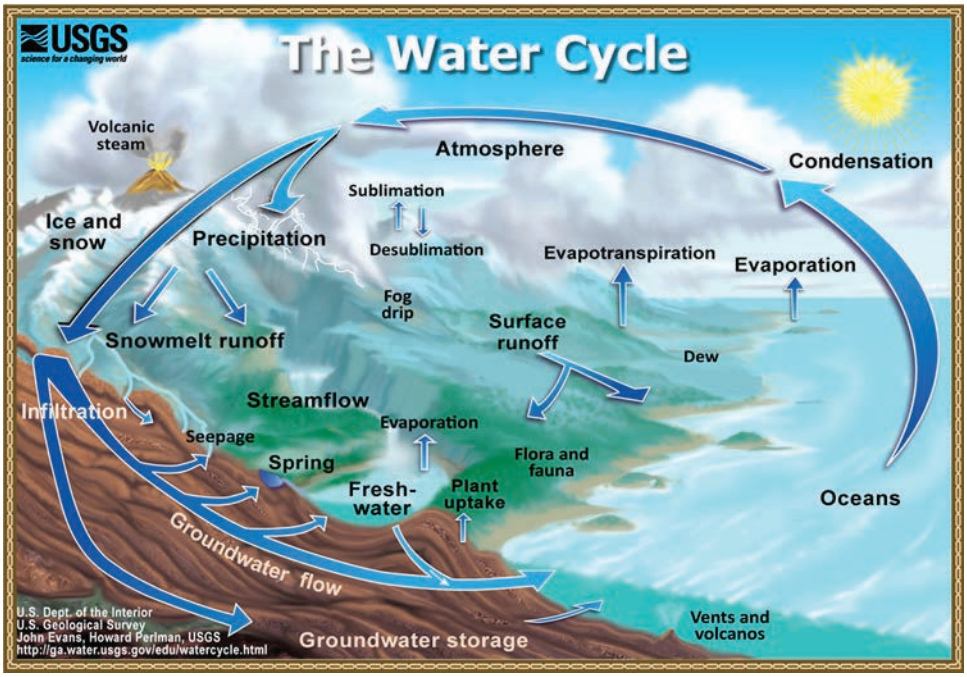
Water is a finite, non-renewable resource. Although water covers approximately 75 percent of the Earth's surface, only 3 percent is fresh water that can be consumed and used. Of that fresh water, two-thirds is frozen in glaciers, polar ice caps and icebergs. It is vital that citizens and policy makers understand the importance of water and how to ensure its use for future generations.

An overview of water, where it comes from and how it's used is fundamental to understanding how and why water policies, laws and regulations have been established. It is also key to the development of proper water resource management tools.

The Hydrologic Cycle

The water we use today is the same water that has been used for millions of years. It is continuously circulating and being recycled through a process called the hydrologic cycle. There are five processes at work in the cycle:

- Evaporation from the Earth's surface and evapotranspiration from plants that introduce water into the atmosphere
- Condensation of water vapor
- Precipitation
- Infiltration – water that seeps into the ground
- Runoff – water that ends up in waterbodies, including streams, rivers, lakes and oceans



The hydrologic cycle controls the amount of water available for use and where. All of the processes influence water availability at a specific location at a particular point in time. The speed with which water moves among stages in the cycle and the amount of time it spends in storage at any stage affect water availability.

Population increases, rising living standards and industrial and economic growth are contributing to changes in the hydrologic cycle. Not only is the world using more water, it is discharging more wastewater. Urbanization and poor irrigation practices are also factors that influence the availability of usable water. These variables are among the many that affect the amount of usable surface and groundwater.

Understanding Surface Water

Surface water is the most visible part of the hydrologic cycle. It refers to bodies of water above the ground such as streams, rivers, lakes and reservoirs. The bulk of surface water is naturally replenished by precipitation such as rain and snow. Approximately 30 percent of surface water comes from groundwater percolating up to the top. Surface water is lost through discharge to the oceans, evaporation, evapotranspiration and sub-surface seepage.

The Importance of Surface Water

Surface water is the largest source of fresh water. Streams and reservoirs supply approximately 50 percent of the nation's drinking water, primarily in urban areas, according to the U.S. Geological Survey. Streams, reservoirs, lakes and downstream estuaries are also vital aquatic ecosystems that provide important environmental and economic benefits.

*A **drainage basin** is a geographical area which contributes surface water runoff to a particular point. There are five major drainage basins within Arkansas. The principal rivers in these drainage basins are:*

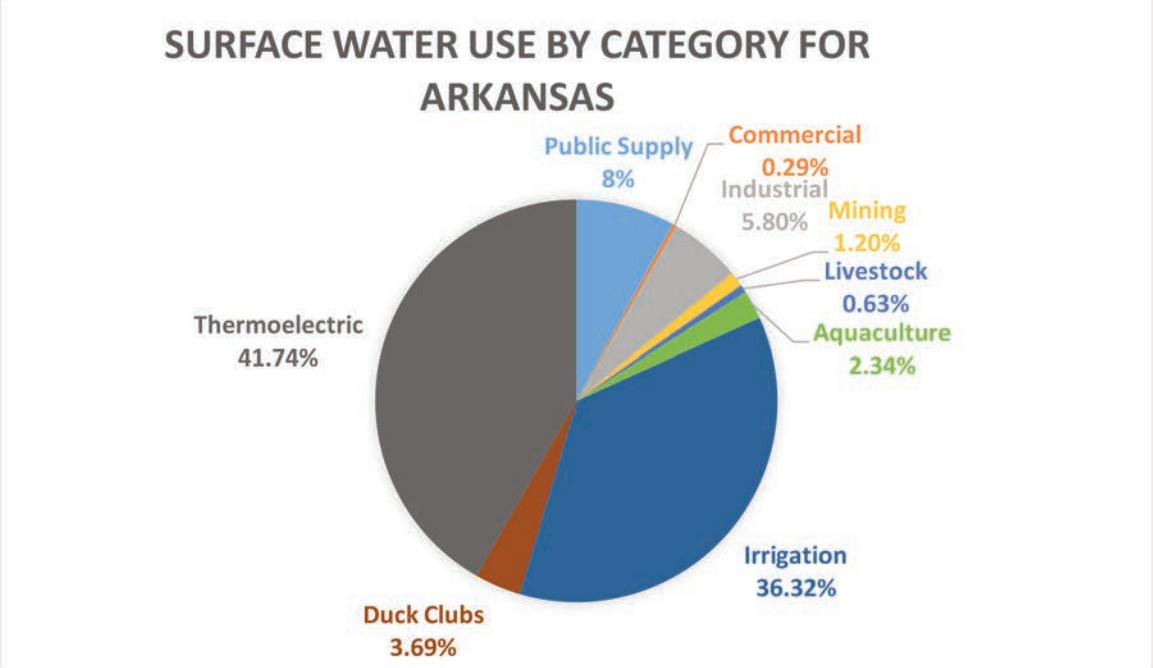
- *Mississippi – St. Francis*
- *White – Cache*
- *Arkansas*
- *Ouachita*
- *Red*

Surface water is abundant in Arkansas. According to the 2014 Arkansas Water Plan, more than 92 million acre-feet of water flows through the state's major river basins each year. However, supply fluctuates depending on the season, so there are times when supply is low and demand is high.

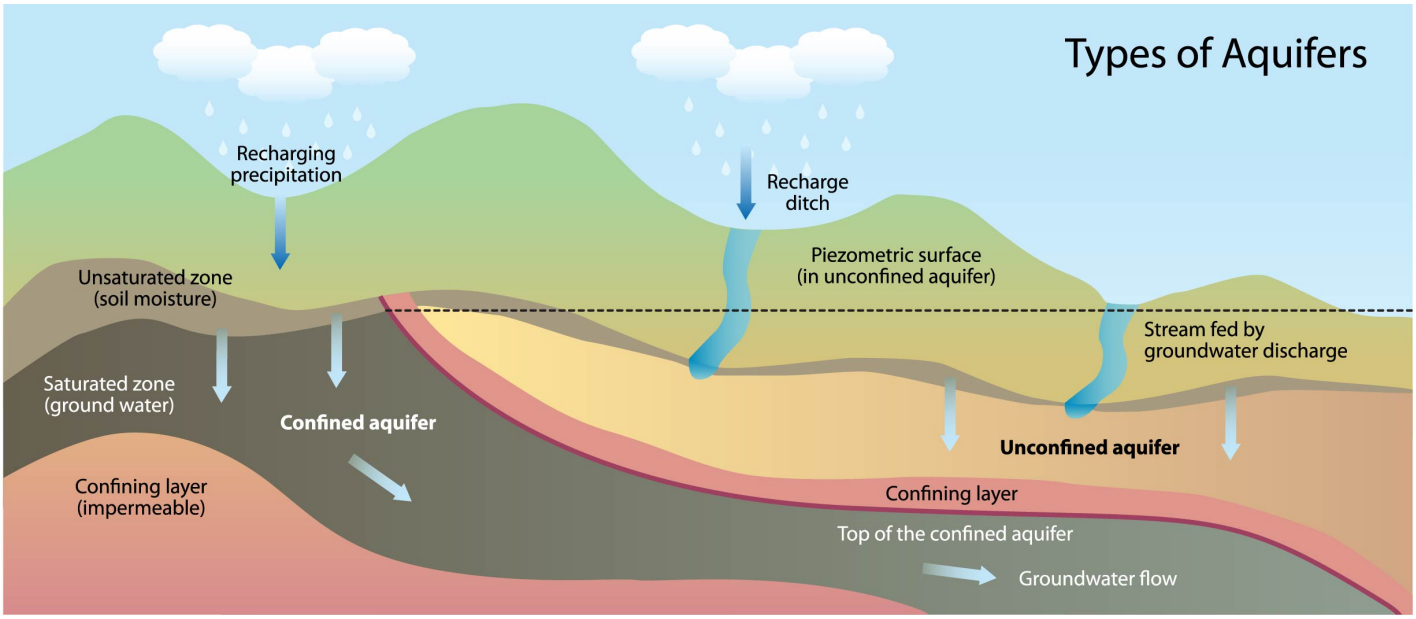
Almost 4 billion gallons of surface water are used in Arkansas daily, with most of the water going toward irrigating crops, thermoelectric power generation and municipal water supplies. Many of the large-population counties rely on surface water for drinking water supplies.

Understanding Groundwater

Water stored below the Earth's surface is called groundwater. The water is the result of past precipitation or from seepage that infiltrated downward from surface waterbodies. Where water infiltrates the



Source: U.S. Geological Survey, Estimated Water Use in Arkansas 2010



ground, gravity pulls the water down through the pores until it reaches a depth where all of the spaces are filled with water. At this point, the soil or rock becomes saturated. The upper surface of this saturated layer is called the water table.

The water table is not always at the same depth below the land surface. During periods of high precipitation, the water table can rise. Conversely, during periods of low precipitation and high groundwater use, the water table can fall.

Groundwater is found in aquifers, which consist of relatively porous layers of rock, sand or gravel below the water table where water can easily move. In areas where aquifers are shallow enough and penetrable, wells are drilled and water is pumped out.

There are two types of aquifers. Unconfined aquifers are found close to the surface, with the water table acting as the upper boundary for the aquifer. Water must be pumped out in wells accessing these types of aquifers.

Confined aquifers are found deep below the surface and are enclosed by impermeable layers of rock or impermeable materials such as clay. Because of the impermeable layers above and below, water in a confined aquifer is normally under pressure and can cause the water level in a well to rise above the water table. If the water rises above the ground surface, it is designated as a flowing artesian well.

In the hydrologic cycle, aquifers act as a storage facility and filter for water. When water enters an aquifer through seepage, this is called recharge. Later in the cycle, when water moves from an aquifer and enters a stream or lake, the water is called groundwater discharge.

In Arkansas, groundwater typically discharges from aquifers to replenish rivers, lakes or wetlands. An aquifer may receive recharge from these sources, an overlying aquifer or, more commonly, from precipitation followed by infiltration. The recharge zone is an area either at the surface or below ground that provides water to an aquifer. Because surface and groundwater flow paths are not the same, a recharge zone may encompass one or more watersheds.

The Importance of Groundwater

Groundwater is an important resource. It replenishes Arkansas' streams, rivers and habitat. It is also an important source of fresh water for drinking, irrigation and industry. Groundwater serves as a source for more public water systems than surface waterbodies, according to the U.S. Environmental Protection Agency.

In Arkansas, 71 percent of statewide water demand is supplied from groundwater sources, according to the Arkansas Water Plan. Arkansas is the second-largest user of groundwater in the U.S., behind only California,

- The average Arkansan uses 155 gallons of water each day.
- Dairy cattle require 30 gallons of water per day.
- What is poured on the ground today can end up in the drinking supply many years later.

Source:
U.S. Geological Survey

according to 2010 U.S. Geological Survey data. This is significant considering California is the most populous state in the country. Nearly 95 percent of the groundwater withdrawals in Arkansas are used for irrigation.

A majority of the groundwater consumption in Arkansas comes from two major aquifers – the Mississippi River Valley alluvial aquifer (the Alluvial Aquifer) and the Sparta-Memphis Aquifer. The Alluvial Aquifer is the most productive aquifer within Arkansas. It provides most of Arkansas' groundwater used for irrigation and fish farming; the Sparta-Memphis Aquifer provides most of the groundwater for industry and public supply.

Critical groundwater areas in eastern Arkansas continue to experience declining groundwater areas, according to the state water plan, which estimated a groundwater gap as large as 7 million acre-feet per year is projected for 2050. The report recommended conservation measures to reduce the projected groundwater gap. The Arkansas Water Plan can be found at http://www.arwaterplan.arkansas.gov.

Additional Resource

Fact Sheet FSPPC109 – *Glossary of Water-Related Terms* – contains a comprehensive list of terms used in the Arkansas Water Primer Fact Sheet Series.

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