



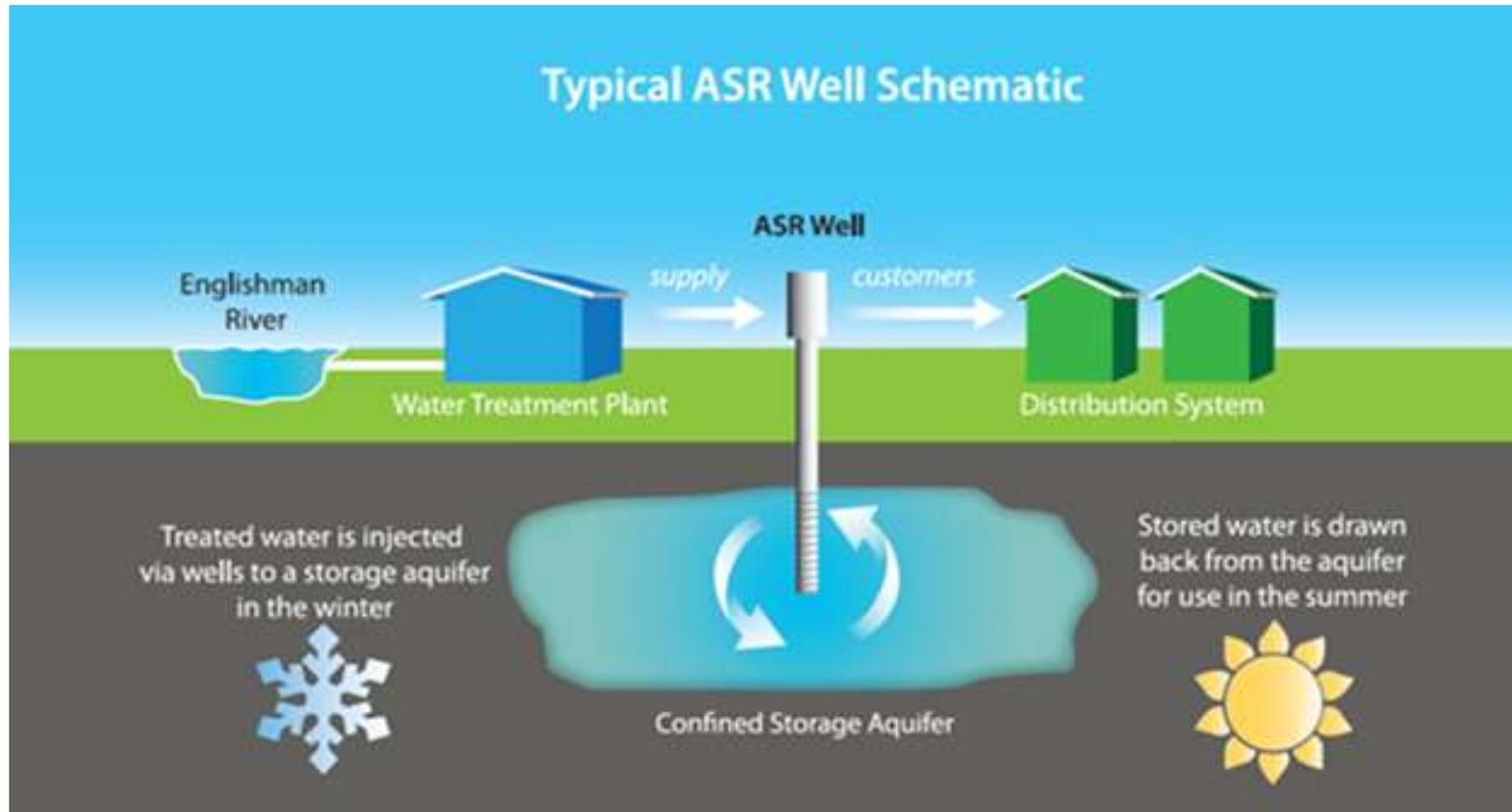
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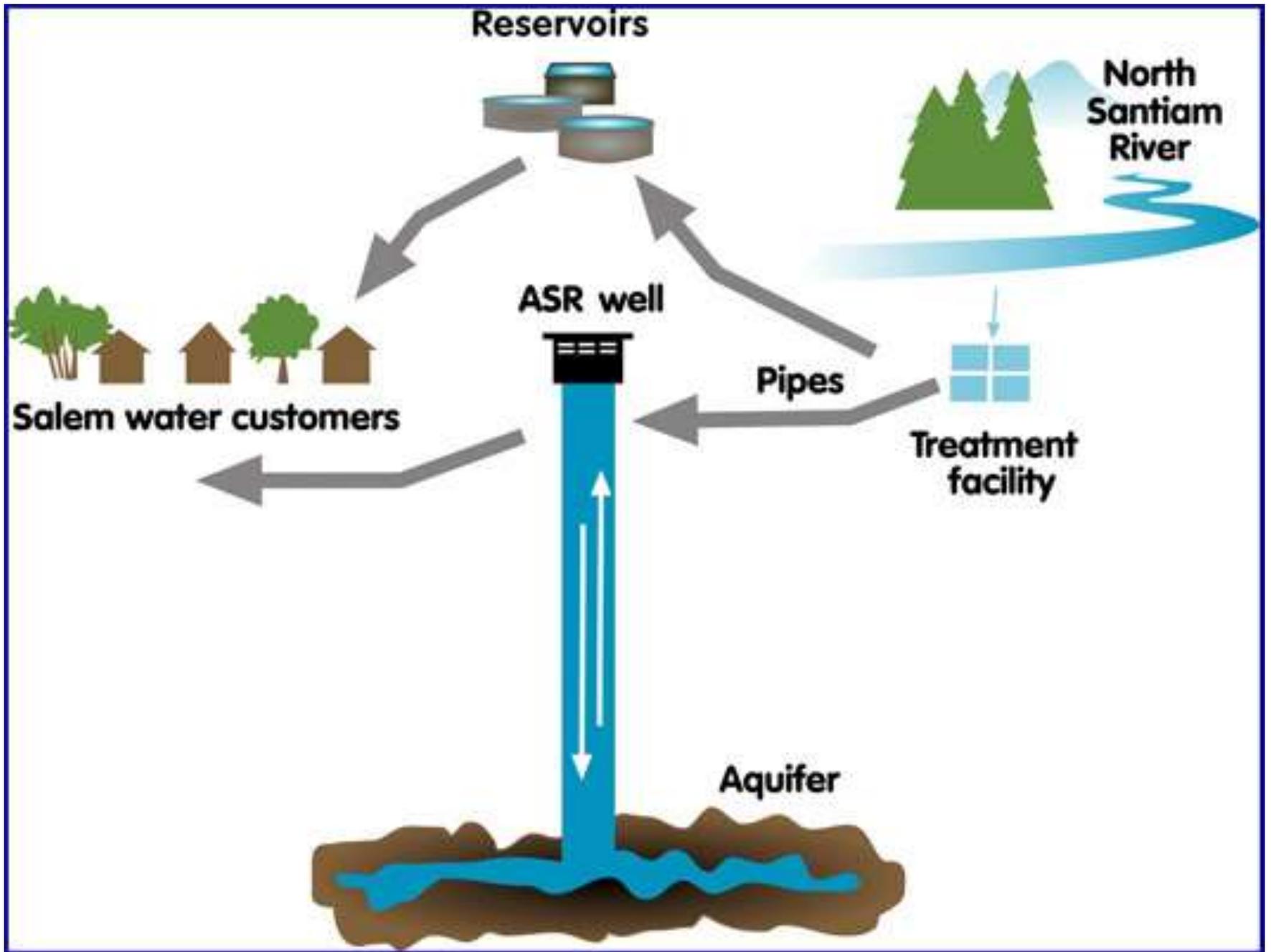
Aquifer Storage and Recovery in Alabama

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Aquifer Storage and Recovery (ASR)





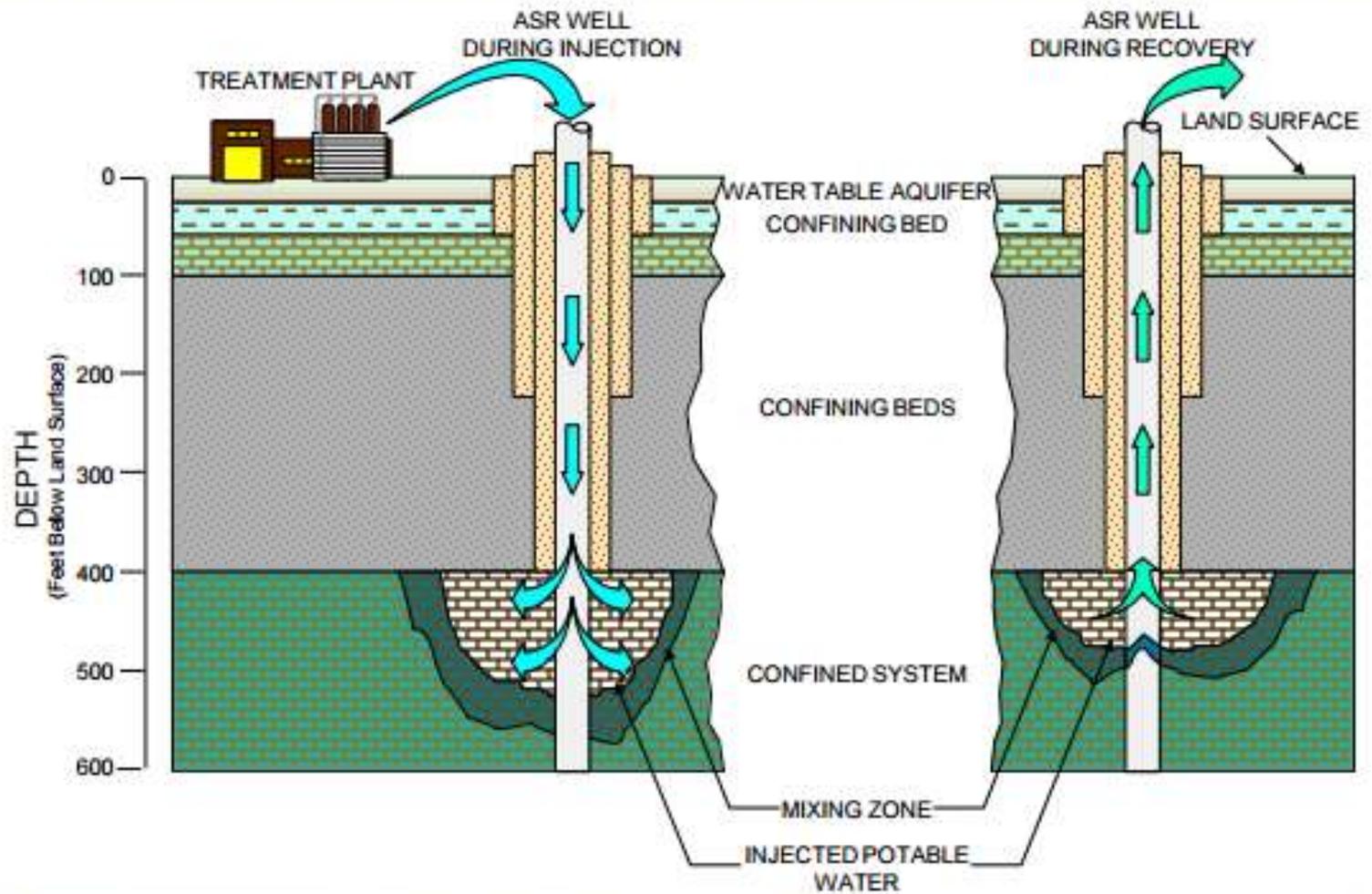


Figure 1. Aquifer storage and recovery concept.

The EMC has approved new regulations that allow ADEM to...

- issue operational permits for Aquifer Storage and Recovery. ASR wells are regulated as Class V wells under the Underground Injection Control Program of ADEM (335-6-8);

- issue permits for testing ASR sites (cycle-testing) (335-6-8);

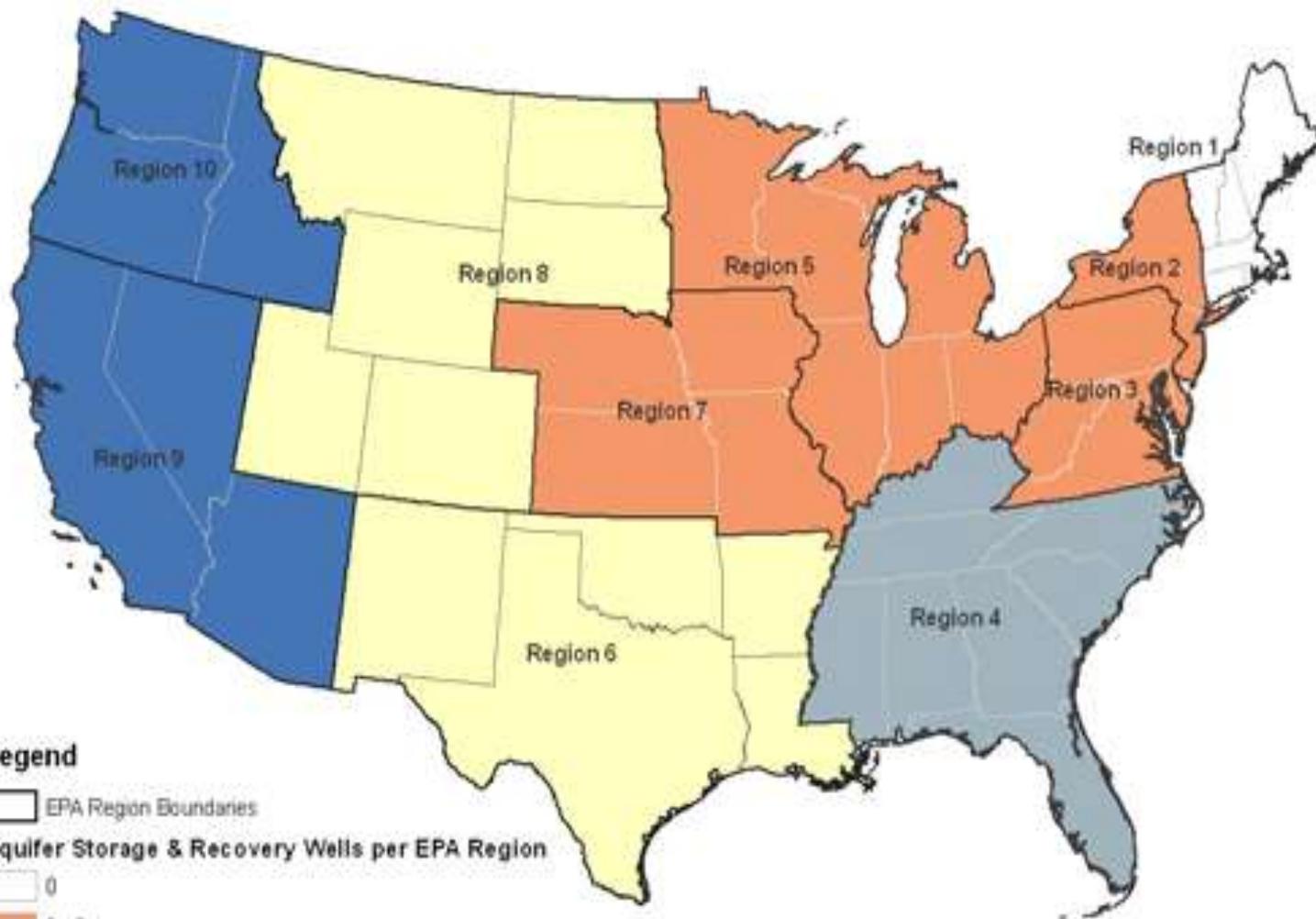
- issue permits for reusing water (335-6-20).

Potential Benefits to ASR

- In theory, ASR may reduce the need to construct large and expensive surface reservoirs, that lose water to evaporation.
- ASR may stabilize or reverse water levels in an aquifer that are declining from heavy pumping.

Devil is in the Details





Legend

□ EPA Region Boundaries

Aquifer Storage & Recovery Wells per EPA Region

- 0
- 2 - 9
- 42 - 58
- 124
- 139 - 155

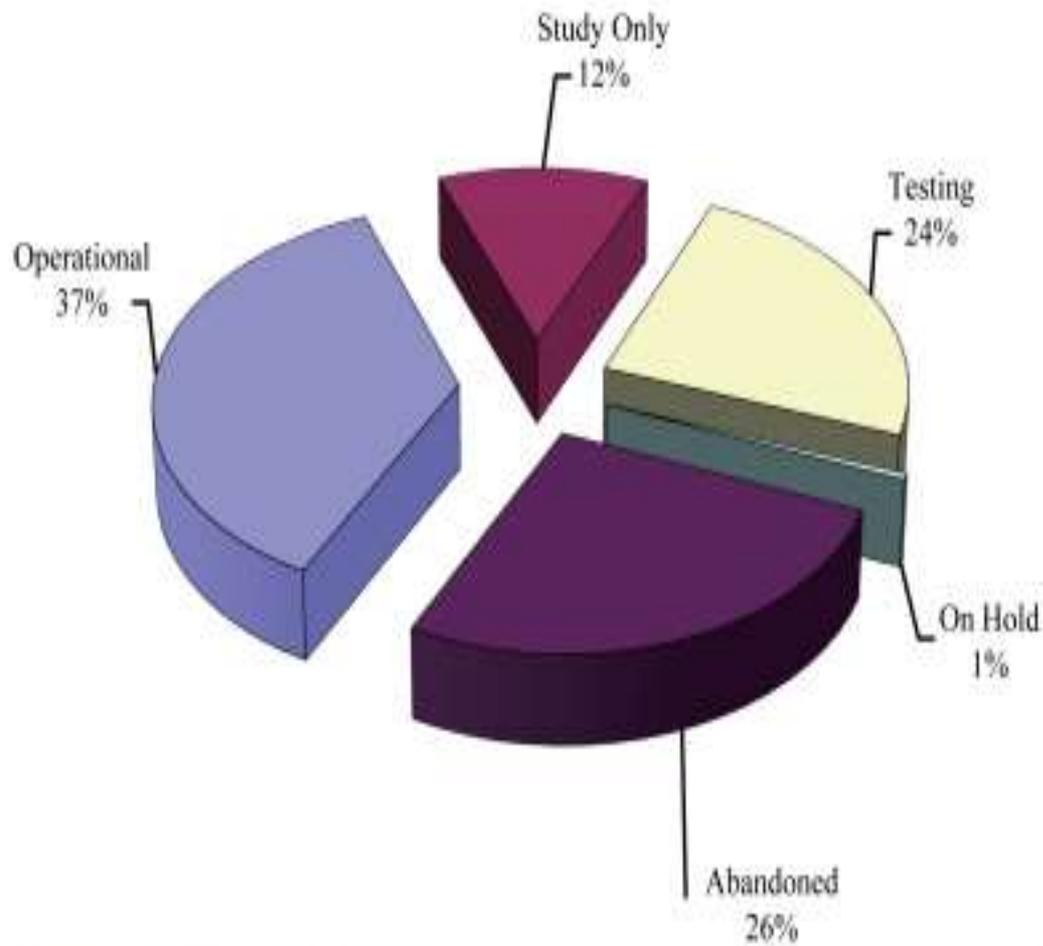


Figure 2. Status of ASR project sites.

Frederick Bloetscher, Ph.D., P.E., Chi Ho Sham, Ph.D., Joseph J. Danko III, and Samuel Ratick, Ph.D., "Lessons Learned from Aquifer Storage and Recovery (ASR) Systems in the United States," Journal of Water Resource and Protection 6 (November 2014).

Potential Dangers

- Pathogens may be introduced into an aquifer if injectate is not disinfected.
- “In states which allow injection of raw water and treated effluent under state regulations, the fate of microbes and viruses in the aquifer after injection becomes particularly relevant.” – EPA
- This causes clogging in the wellscreen or risks to public health from contamination of the aquifer.

Thankfully, ADEM requires...

- Applicant has to show:
 - Proposed injection well will not cause the exceedance of a primary or secondary drinking water regulation
 - Can not render the groundwater unsafe or objectionable for human consumption
 - Can not result in a water of the state failing to meet applicable water quality criteria

(ADEM has said that any be injectate must meet a primary drinking water standard.)

Potential Dangers

- DISINFECTION BY-PRODUCTS

EPA: “If water is disinfected prior to injection, the possibility of disinfection by-products (DBPs) forming in situ increases.”

Presence of DBPs have stalled several ASR projects in WA, CA, and NC.

Potential Dangers

- Injected water could unleash hazardous compounds. (geochemical reactions)
- “Injected water has been known to cause the dissolution of metals such as arsenic, manganese, and iron from the surrounding geologic formation.”

<http://water.epa.gov/type/groundwater/uic/aquiferrecharge.cfm>

EXAMPLES

- Some Floridan aquifer wells have released arsenic from limestone formations. Others have released nickel and uranium.
- WA and OR aquifers have released radon.
- Eastern Municipal Water District in California reported high levels of mercury in the recovered water.
- Monmouth County, NJ reported levels of iron that exceeded secondary drinking water standards in the recovered water as a result of oxidation within the aquifer.

For a decade, between 1999 and 2009, the GA General Assembly repeatedly banned ASR in the Georgia coastal region to protect drinking water. The moratorium expired in 2014.

On a positive note...

ADEM requires a permit for cycle-testing.

Water-quality analyses are performed during cycle tests primarily to assess performance and also to ensure that recovered water meets state and federal drinking-water quality criteria.

However, does the ASR rule create the illusion of the right to water?

The rule specifies that a permitted ASR well does not convey any property rights, or any exclusive privilege to the water. However, the permit does not specify this.

The Permittee may think he owns the water.

Many ASR systems have over 100 million gallons of water invested. A 5 cycle test program could take 2-3 years. It could cost millions or in the case of a site in Georgia, a billion dollars.

ADEM has suggested that municipalities could install institutional controls that prevent others from using the site as a drinking water site... “A local government also could choose to prohibit the installation of private wells if the quality of the stored water exceeded drinking water standards.”

Landowners around the ASR site are not required to be notified.

Most importantly...

- Much of this water that would be injected would naturally go to streams. Alabama has no instream flow policy to protect the biological, chemical, and physical integrity of its rivers.



THE WATER CYCLE



The water cycle is continuous circulation of water between the earth and the atmosphere, powered by the sun and gravity. Water from vegetation, soils and the oceans rises as water vapor to the atmosphere and condenses. Gravity brings rainfall to the earth where it filters through to groundwater or flows via waterways to the bay. Human uses of water include storage in dams, irrigation, domestic, and industrial use.

Water Cycle original image created by www.healthywaterways.org Minor edits made by Water Quality Control Division, CDPHE, 2012

These regulations put the cart before the horse. Now, a state water management plan is needed to resolve any potential future conflicts.





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