# AQUIFER STORAGE & RECOVERY (ASR) | Regional Study

FACTS & INFORMATION

**APRIL 2015**

As part of the Comprehensive Everglades Restoration Plan (CERP), it was estimated that up to 333 wells could store water underground for the Everglades and natural systems. These wells, known as Aquifer Storage and Recovery (ASR) wells, are part of a system to take surplus fresh surface water, treat it as required for permit compliance, and then store it in the Floridan Aquifer System (FAS) for subsequent recovery during dry periods. ASR technology offers the potential to store and supply large volumes of water beneath a relatively small surface footprint. The ASR Regional Study was developed by the U.S. Army Corps of Engineers (USACE) and the South Florida Water Management District (SFWMD) to reduce uncertainties of ASR implementation on hydrological, ecological, and geotechnical conditions in the Greater Everglades.

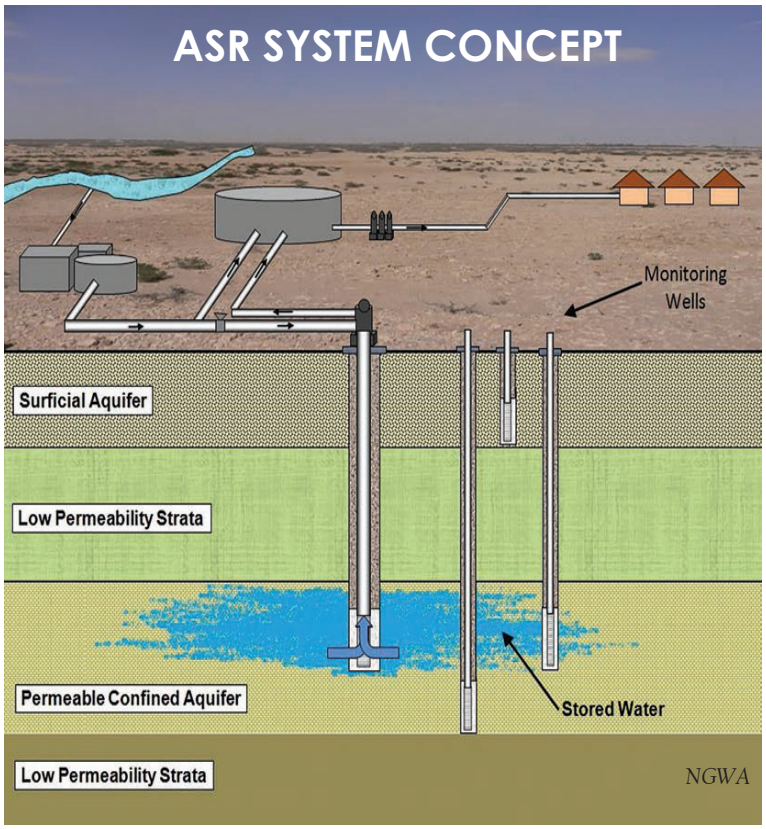
## STUDY OVERVIEW

The proposed scale of ASR for water storage in south Florida under CERP was unprecedented. To address technical uncertainties, a multi-agency, multi-disciplinary team of scientists and engineers formulated and completed numerous investigations on state-owned land in south Florida. In tandem with these investigations, the USACE and SFWMD constructed and tested two ASR pilot facilities adjacent to Lake Okeechobee and the Hillsboro Canal to determine site-specific feasibility of ASR system permitting, design and operations. Additionally, the National Research Council provided input and review on the proposed evaluation methodologies and the draft regional study.

The ASR Regional Study documents the results of over a decade's worth of scientific and engineering investigations and the results of the report will serve as a technical guide when considering ASR as part of future Everglades restoration efforts.

The report consists of four main areas:

- A hydrogeologic framework to define the regional extent of storage zones, confining units, and groundwater quality in the FAS.
- An evaluation of surface and groundwater quality changes that occur during ASR cycle testing.
- Groundwater flow and transport simulations to evaluate hydrologic changes in the FAS from regional-scale ASR implementation. Specifically, the locations and numbers of ASR wells that can be constructed without exceeding hydraulic and regulatory constraints.
- Studies to evaluate recovered water, which is incorporated into an ecological risk assessment for the Greater Everglades ecosystem.




The study investigates the feasibility of regional-scale ASR, using state-of-the-art methods and models. These investigations were performed in collaboration with the SFWMD, U.S. Geological Survey, Florida Department of Environmental Protection, U.S. Environmental Protection Agency, and U.S. Fish and Wildlife Service.

## KEY FINDINGS

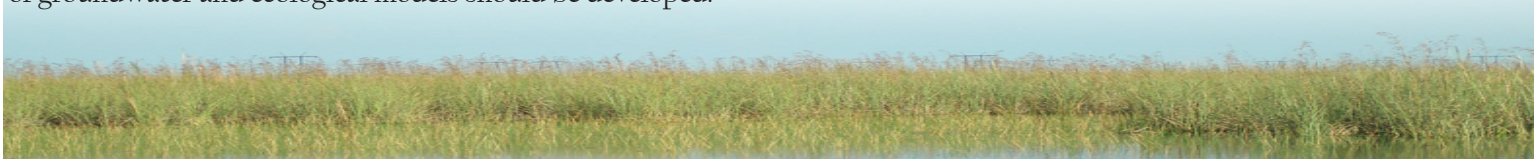
- Phased implementation of regional-scale ASR is feasible and can provide beneficial water storage and availability for Everglades restoration efforts.
- Groundwater modeling indicates that the overall number of ASR wells should be reduced from 333 wells to approximately 140 wells, to avoid adverse effects to the aquifer, groundwater and existing users.
- ASR systems should be located adjacent to large, flowing water bodies to provide sufficient water availability. These locations provide flexibility to comply with regulatory requirements.
- Implementation of ASR systems should proceed in a phased approach, including expansion and continued testing of pilot facilities and construction of new ASR systems.
- The potential for rock fracturing and land subsidence resulting from ASR is low if ASR wells are spaced at a safe distance from each other and pumping pressures are kept low.
- An extensive hydrogeologic, water quality and ecological monitoring network has been established to observe the current state of the system and detect any changes that might take place as a result of future ASR implementation.
- Testing of recovered water from the ASR pilot projects did not reveal geochemical reactions that would degrade surface water quality on recovery. Arsenic mobilization was observed during early cycle testing; however, it attenuated over time as the storage zone was conditioned.
- ASR storage zones should be conditioned with successive cycles of operation with rigorous monitoring to ensure regulatory compliance.
- Water recovered from the ASR pilot projects did not result in any quantifiable acute or chronic toxicological effects, with the exception of a limited inhibition of reproduction of water fleas, which should be verified by additional testing.
- Surface water in south Florida was generally suitable for subsurface storage at ASR systems. However, the presence of bacteria in surface water requires treatment prior to recharge in the aquifer for regulatory compliance. Evaluations of newer disinfection and filtration technologies are merited.
- ASR systems located north of Lake Okeechobee can achieve upwards of 100 percent recoverability of stored water. Conversely, the brackish quality of the FAS south of Lake Okeechobee will require successive cycles to achieve similar recoverability.

## PATH FORWARD

The Draft ASR Regional Study is currently being peer-reviewed by the National Research Council. It is anticipated that the Final ASR Regional Study will be released by summer 2015.

The ASR Regional Study documents the results of over a decade's worth of scientific and engineering investigations and the results of the report will serve as a technical guide when considering ASR implementation as part of future Everglades restoration efforts.

Based on the study's findings, phased implementation of regional-scale ASR is feasible and it is recommended that projects in the planning phase consider incorporating ASR into alternatives, or as an aspect of planning alternatives, in conjunction with a reservoir. Additionally, if future ASR systems are implemented, they should proceed in a phased approach and new iterations of groundwater and ecological models should be developed.



## FOR MORE INFORMATION

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http://bit.ly/ASR_RegionalStudy