



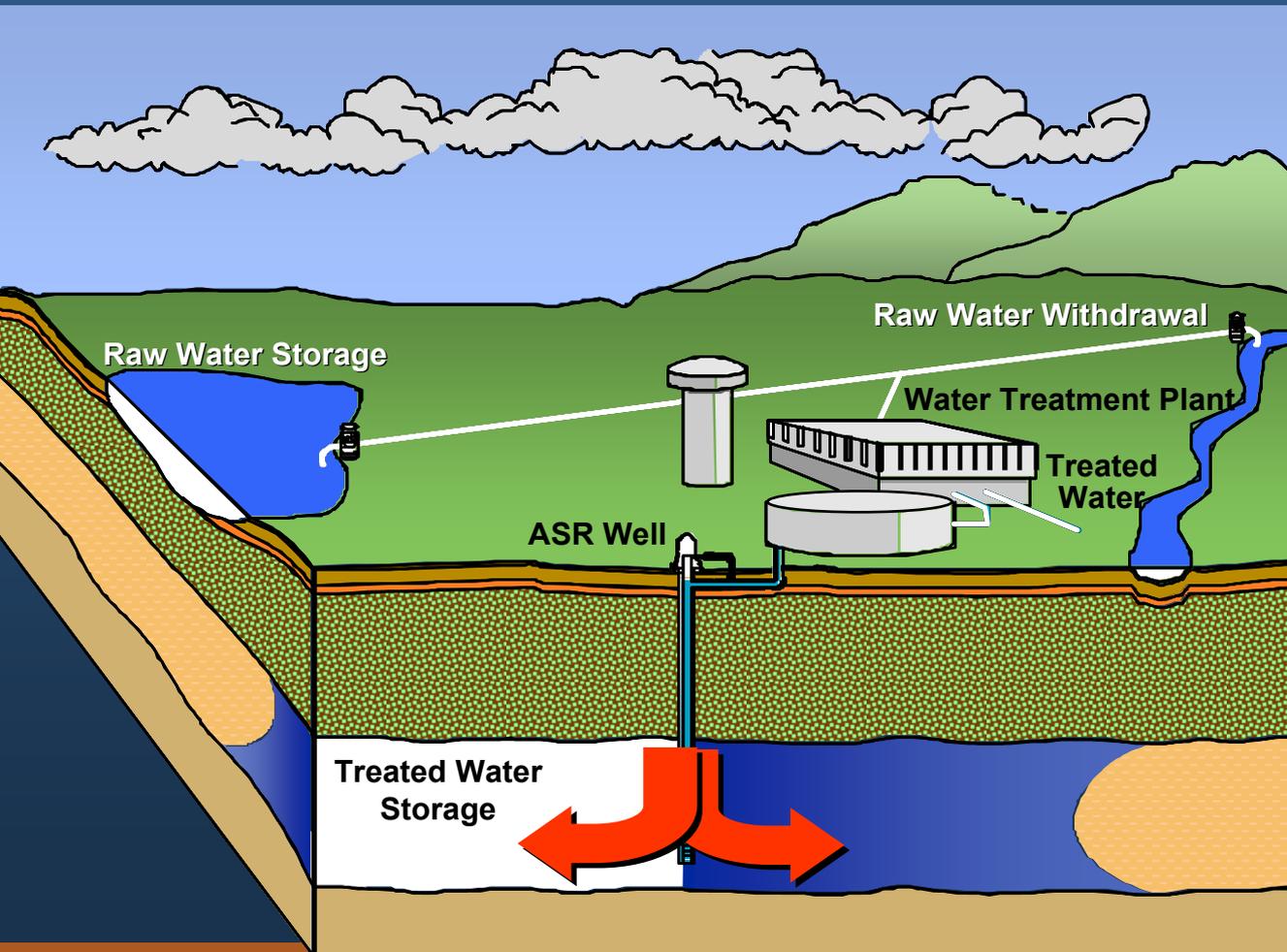
Aquifer Storage and Recovery (ASR) in the Comprehensive Everglades Restoration Plan (CERP)

*Working Group Meeting
April 19, 2005*



sfwmd.gov

Reservoirs and ASR wells will be operated in tandem, capturing water from rainfall events, then gradually pumping it into adjacent ASR wells before the next rainfall event



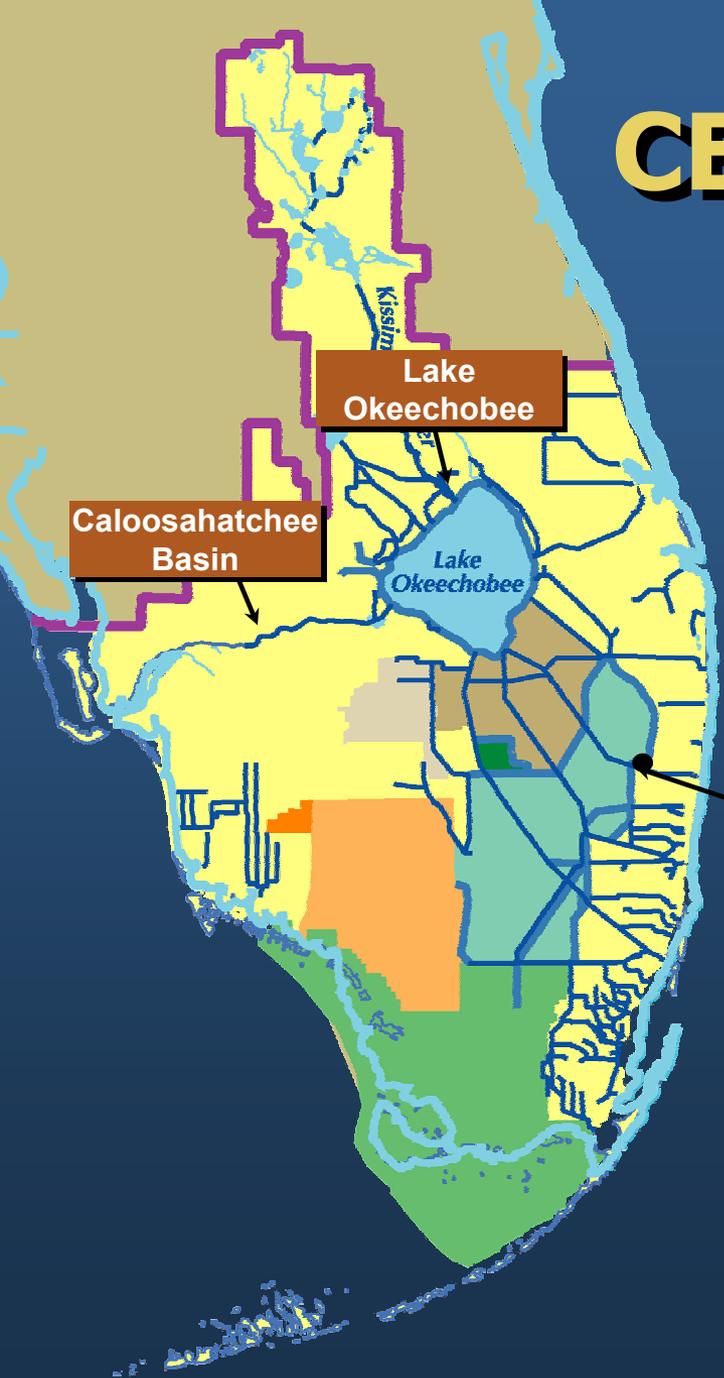
CERP ASR Capacity Correlates with Basin-Specific Water Availability



<u>Site</u>	<u>Capacity (mgd)</u>
Lake Okeechobee	1,000
Caloosahatchee	220
L-8 Basin	50
C-51 Basin	170
Central PBC	75
Hillsboro	150
TOTAL	1,665

Note mgd = million gallons per day

CERP ASR Pilot Projects



<u>Site</u>	<u>ASR Wells</u>
Lake Okeechobee	4 *
Hillsboro	1
Caloosahatchee	1

Notes

* Port Mayaca site will be a 3-well cluster
Each well assumed to be 5 mgd capacity

Hillsboro



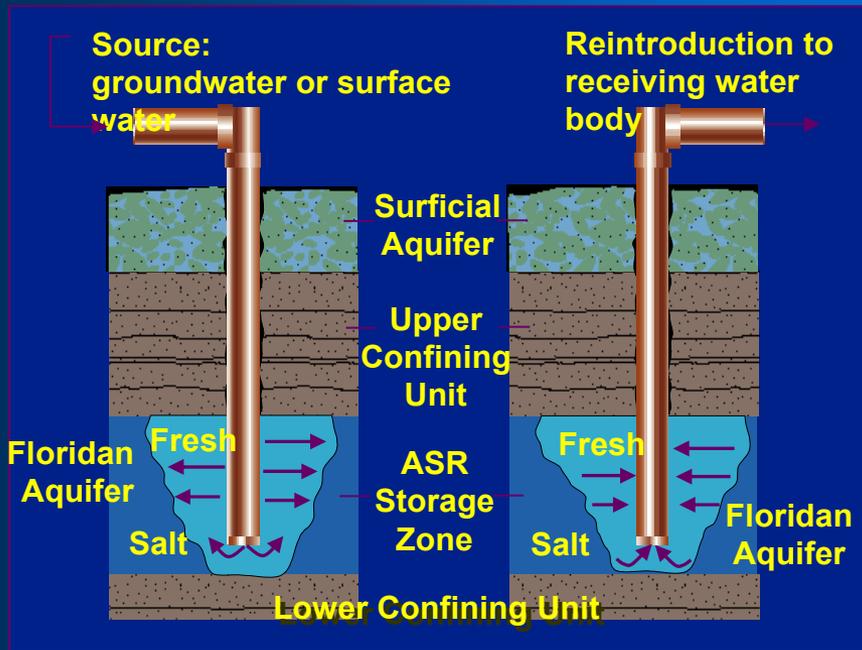
ASR Issues

- **Source-water quality characterization**
- **Characterize regional hydrogeology**
- **Critical pressure for rock fracturing**
- **Regional changes in head and flow**
- **Water quality changes in aquifer during storage and movement**
- **Relationship between storage interval, recovery rates, and recharge volume**
- **Ecological effects of ASR (e.g., mercury bioaccumulation potential)**

Implementation Strategy

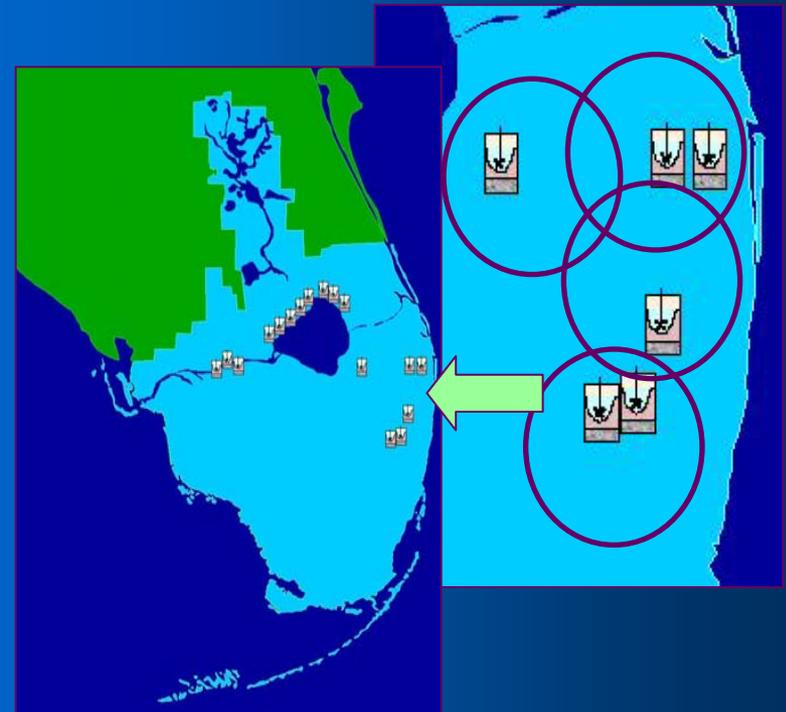
Addressing Uncertainties

ASR Pilot Projects



- local/site concerns

ASR Regional Study



- regional concerns



Pilot Projects Update

- **Source-Water Quality Characterization**
 - Four quarters of samples collected plus some storm event samples
 - Coliform bacteria present; no protozoa encountered
 - Secondary standard MCL exceedances include aluminum, iron, odor, and color
 - Background dissolved oxygen (DO) levels 1.5 to 4.7 mg/L (below Class III Standard of 5.0 mg/l)



Pilot Projects Update (cont'd)

- **Pilot Project Design Report (PPDR) and Environmental Impact Statement (EIS)**
 - Completed December 2004
 - Awaiting approvals
- **Design & Permitting Being Finalized**
 - Primary design objectives are to minimize potential for aquifer plugging, disinfect water to meet regulatory standards prior to well recharge, and oxygenate recovered water prior to return to canal



Lake Okeechobee ASR Pilot Project

■ Cluster Site at Port Mayaca

- Multiple wells allow for better understanding of aquifer interaction to assist in design of future clusters in full-scale project
- For Cycle 1, recharge in one ASR well and monitor in other ASR wells and monitor wells
- Exploratory Well Installed; ASR zone from 800 to 1,040 feet below land surface (bls); 5 mgd capacity

■ Kissimmee Site

- Fish spawning (e.g., bass) occurs in spring, so intake designs should minimize fish entrainment and impingement
- Exploratory Well completed from 562 to 780 feet bls (5 mgd capacity)



Caloosahatchee River ASR Pilot Project

- **Exploratory Well indicated sandy nature of the Floridan aquifer system at the site**
- **This will likely result in reduced ASR well capacity (3 mgd vs. CERP assumption of 5 mgd)**
- **Additional data required to evaluate need for well screen**
- **Design (90%) of surface facilities on hold pending receipt of additional well data**
- **Coordinating with Acceler8 C-43 Reservoir team regarding proposed reservoir footprint**



Hillsboro ASR Pilot Project

- Exploratory Well and Monitor Well previously Installed
 - ASR zone is 1,000 to 1,200 feet deep
 - 5 mgd recovery capacity
- Bid documents for surface facilities prepared and solicitation underway
- Design includes intake/discharge structure, screen filters, ultraviolet (UV) light disinfection, pumps, etc.
- UIC and CERPRA permits scheduled for May 2005 receipt
- SFWMD funding in advance of PCA



ASR Regional Study

■ Purpose

- Collect additional data and conduct further analyses (including groundwater modeling) to evaluate the performance of the regional, 333-well CERP ASR Program, and its impacts on the environment and existing users

■ Status

- Many tasks underway

■ Relation to Pilot Projects

- Dependent on pilot projects to provide field data to conduct regional analyses



ASR Regional Study

■ Major Tasks

- Well drilling and testing - infill locations and at operational facilities
- Tracer tests - density effects, dispersivity values for regional model
- Literature search and database compilation
- Subsurface water/rock/microorganisms interaction/fate studies
- Groundwater-level monitoring
- Environmental characterization – bioassays, mesocosm analyses, and organism/water quality modeling



ASR Regional Study

- **Major Tasks** *(continued)*
 - **Ecological risk assessments - ecotoxicological impacts**
 - **Groundwater modeling - regional and high-resolution local scales**
 - **Engineering and Geotechnical studies - core analysis, stratigraphy**
 - **Geophysical surveys - tomography, borehole logs, fracture trace, seismic reflection**
 - **Groundwater quality monitoring**
 - **Integration of pilot project results**

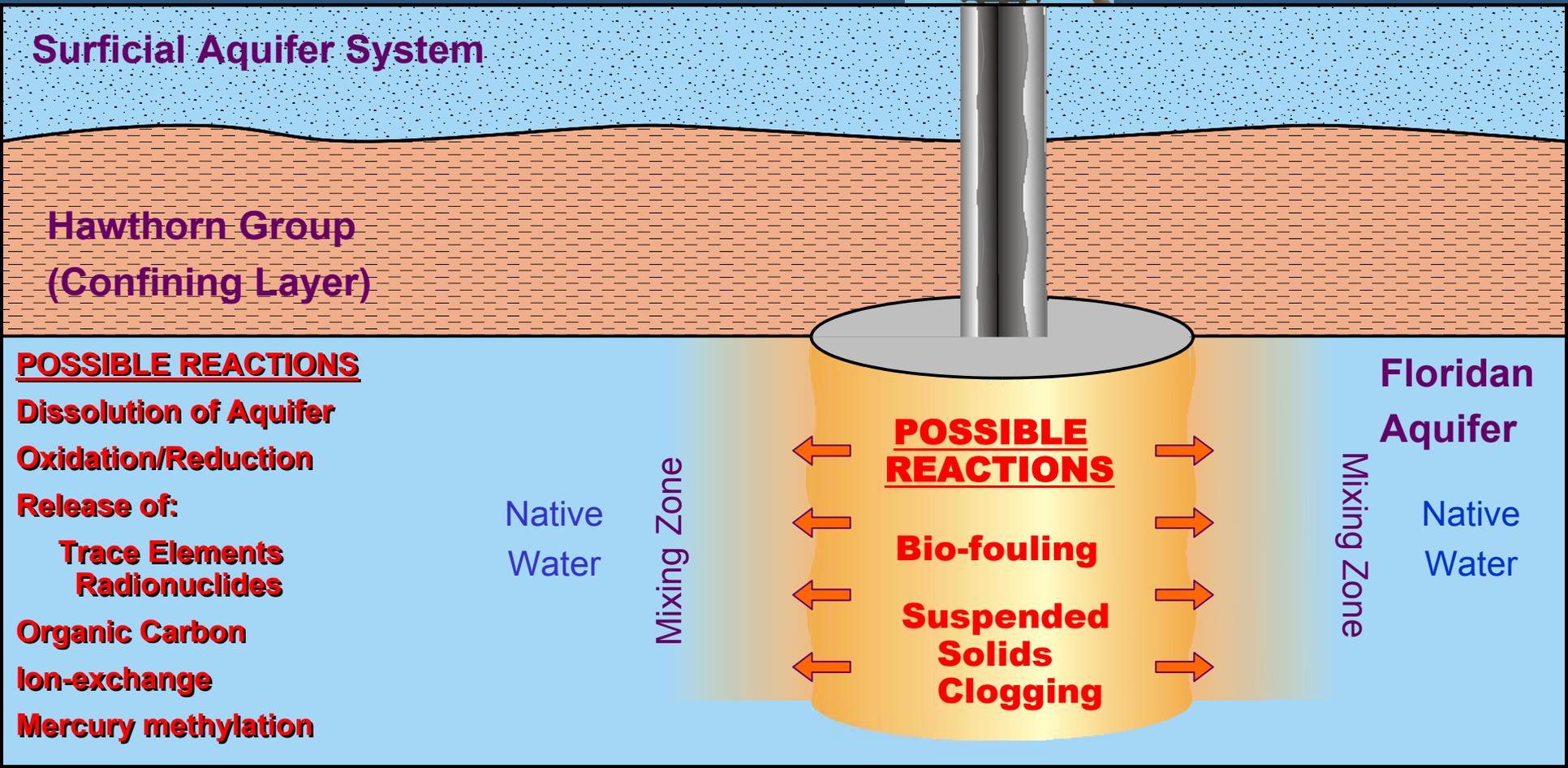


ASR Regional Study

■ Tasks Completed

- Preliminary Hydrogeologic Framework**
- Field Data Collection Plan**
- Literature search and database compilation**
- Baseline ecological, surface-water quality, and groundwater-level and groundwater quality monitoring (ongoing)**
- Seismic Stratigraphy near Lake Okeechobee**
- Pressure-induced changes and engineering considerations memorandum**
- Geochemical Literature Review**

Geochemical Reactions



CERP ASR Pilot Projects

■ Near-Future Tasks

- Complete Designs at all three pilot projects & Receive Permits
- Receive Record of Decision (ROD) for Environmental Impact Statement
- Conduct bidding for Hillsboro ASR Pilot Project (April 2005)
- Award Construction Contract at Hillsboro ASR Pilot Project (July 2005)





CERP ASR Pilot Projects

Milestones:

	<u>LO</u>	<u>Hillsboro</u>	<u>Caloosahatchee</u>
PMP	3/01	3/01	2/02
PPDR	10/04	10/04	10/04
PCA	12/05	12/05	12/05
CONS	3/06	7/05	9/06
Testing	3/09	3/09	3/09
TDR	9/09	9/09	9/09

Notes: LO = Lake Okeechobee; PMP = Project Management Plan; PPDR = Pilot Project Design Report; PCA = Project Cooperation Agreement; CONS = Construction; TDR = Technical Data Report



ASR Regional Study

Near-Future Tasks

- **Finalize procurement of drilling contractors to install test and monitor wells**
- **Install data loggers in existing and new Floridan wells to support model calibration**
- **Collect background WQ, fish, and invertebrate sampling and analysis; upstream and downstream of ASR sites**
- **Ecotoxicological Study, Phase I**
- **Regional Groundwater Modeling, Phase I**
- **Geochemical Analysis of Rock Cores**
- **Well Siting Analysis**