



# MANAGED AQUIFER RECHARGE (MAR) AND USACE: ENGAGING PLANNERS

Will Logan  
Director, International Center for Integrated  
Water Resources Management  
Institute for Water Resources  
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US Army Corps  
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Water Resources

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Managed Aquifer Recharge and the  
U.S. Army Corps of Engineers:  
Water Security through Resilience

2020-WP-01

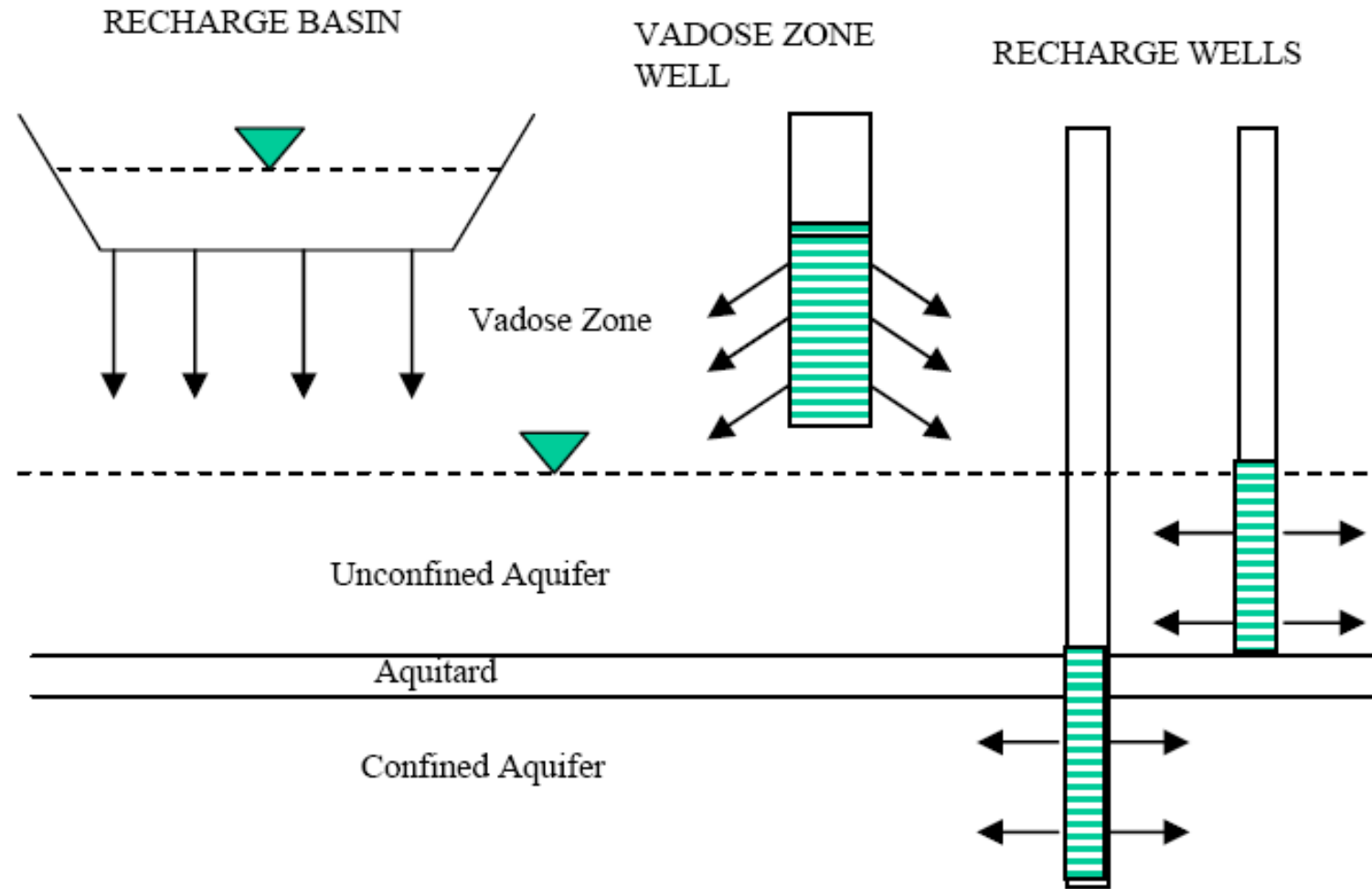


www.iwr.usace.army.mil



# WHAT IS MAR AND WHY SHOULD PLANNERS CARE?

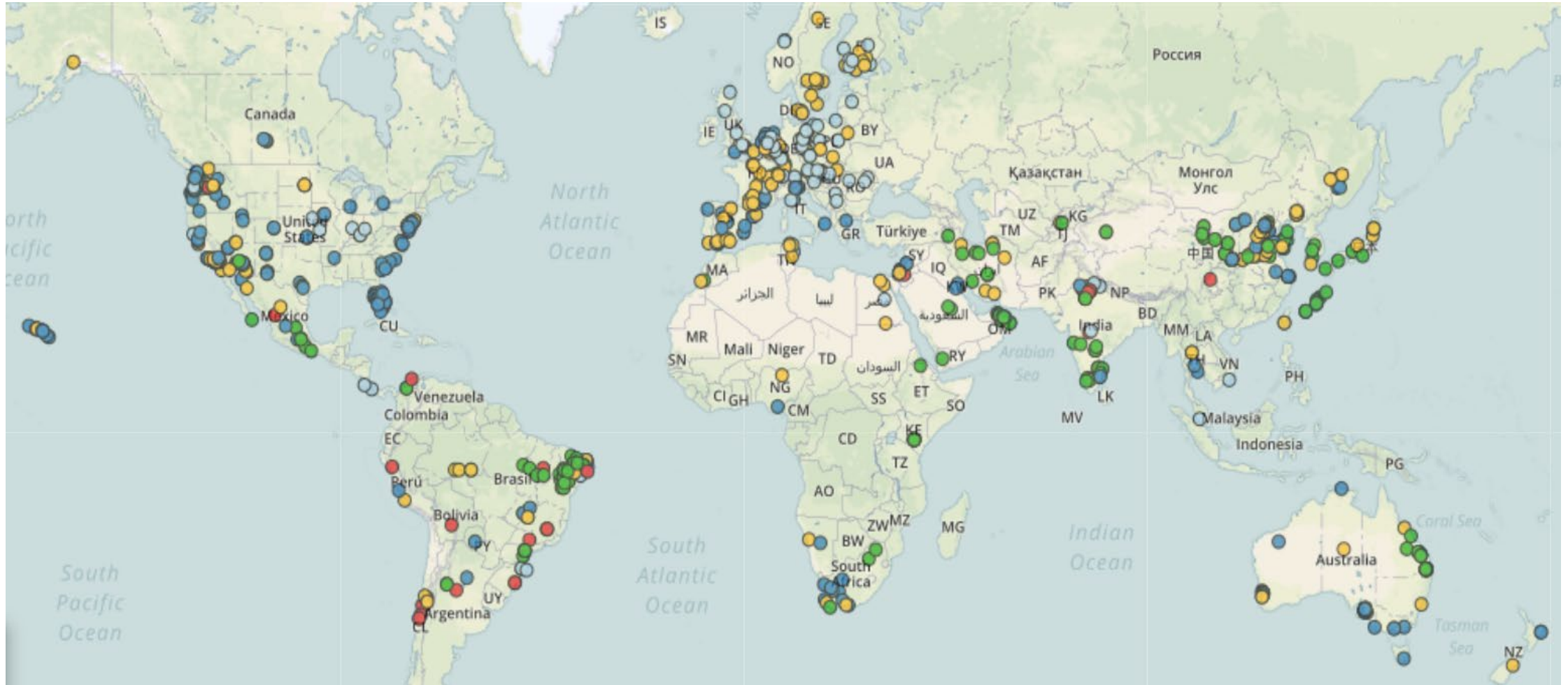
# PRINCIPAL METHODS OF AQUIFER RECHARGE



Also dry washes, ephemeral stream beds, alluvial fans...



# MAR USE IS NO LONGER “EXPERIMENTAL”: 1200 LOCATIONS, 50 COUNTRIES



Global MAR Inventory. Source: IGRAC (under UNESCO’s auspices)  
(<https://ggis.un-igrac.org/ggis-viewer/viewer/globalmar/public/default>)



# MOTIVATIONS FOR MAR

- **Pressure on freshwater supplies** to meet anticipated needs
  - Desalination, water recycling
  - Conservation, improving water efficiency
- Need for **short- to long-term storage** of water during times of abundance and recovering that water in times of need (e.g., drought)
- **New opportunities for above-ground storage are limited**
  - Large footprints, best sites have been taken
- **Disadvantages of above-ground storage**
  - Evaporative losses (limits long-term storage), ecological impacts (connectivity, altered flow regimes), and sediment accumulation (“unplanned obsolescence”)
- Increased interest in storing water underground as part of a larger water management strategy (**conjunctive use, IWRM**)





# INTERSECTIONS OF MAR AND USACE (AND OUR PARTNERS): RESILIENCE AND SUSTAINABILITY

- **Flood mitigation** – Groundwater recharge, often in tandem with surface storage, can dampen the flood peak by recharging stormwater while reducing risk of later water deficits that might be exacerbated reservoir releases. They can simultaneously help recharge overexploited aquifers.
- **Multi-year drought planning and management** – evaporative losses are minimized, whereas evaporation from reservoirs can severely limit their utility for multi-year storage.
- **Reservoir management** - Seasonal needs for hydropower or downstream ecosystems can produce reservoir level changes that may be undesirable from ecological or recreational perspectives (e.g., Lake Okeechobee). MAR can minimize these changes.
- **Infrastructure** – Smaller or fewer dams may be needed if MAR can be used in conjunction with surface storage.



**HAS USACE BEEN DOING MAR?**



## **Congressional Research Service (2020) noted the relative lack of groundwater vs. surface water at USACE and other agencies**

“USACE authorities...do not restrict nonfederal entities from using water stored or released from USACE reservoirs for groundwater recharge.

“Historically, the federal government...has played a prominent role in constructing infrastructure related to surface water resource management.

“At the same time, the federal government has played a comparatively smaller role in creating infrastructure to develop groundwater storage...

“The reasons...are complex, tied to the long and complicated history of common law water rights, state water law, legal adjudication, federal deference to states...”





# LAKE OKEECHOBEE WATERSHED RESTORATION PROJECT RECOMMENDED PLAN FEATURES



Figure 1-1. Lake Okeechobee Watershed Restoration Project Recommended Plan features

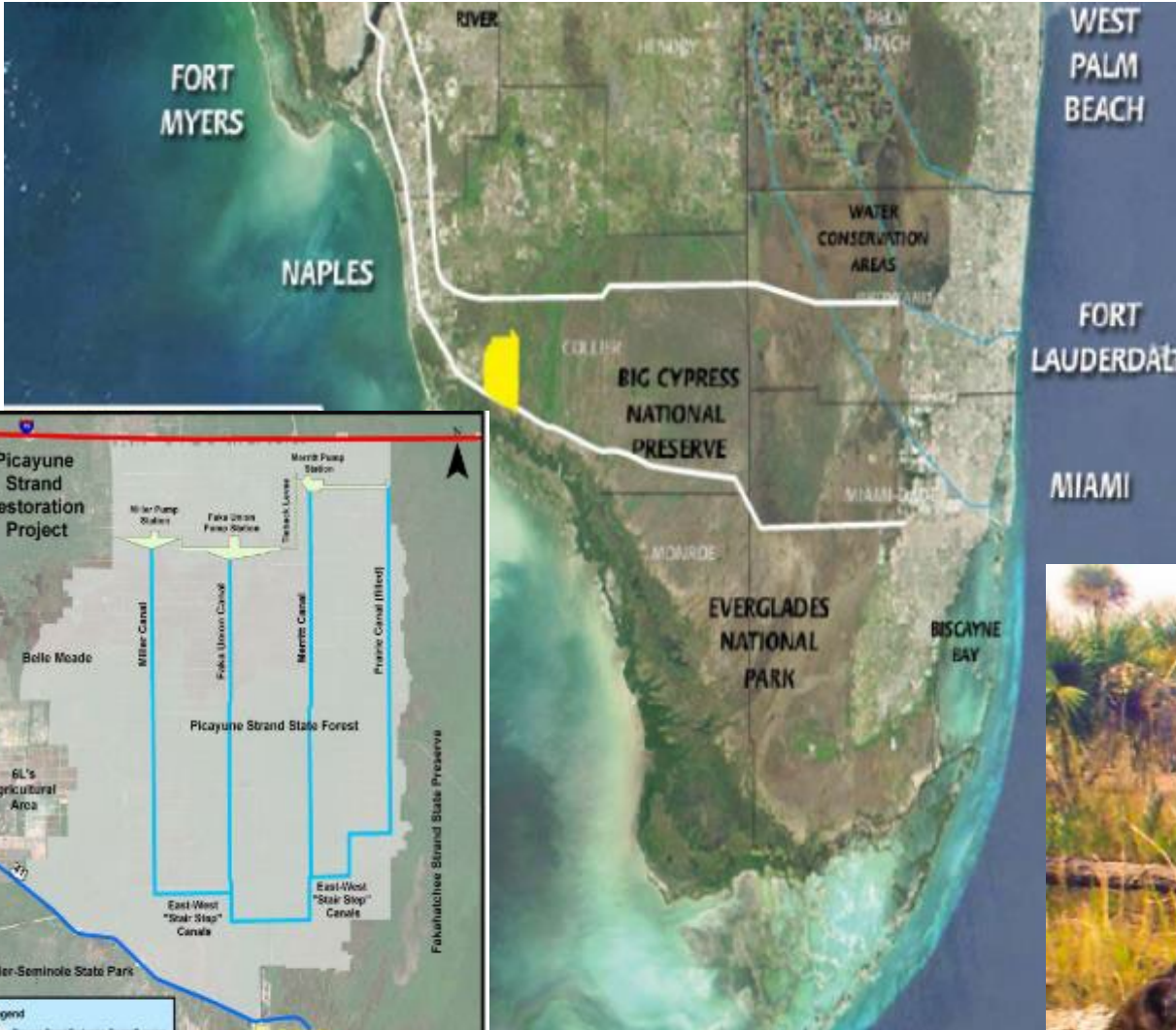




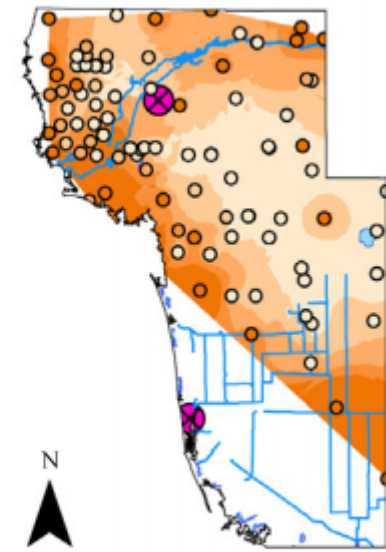
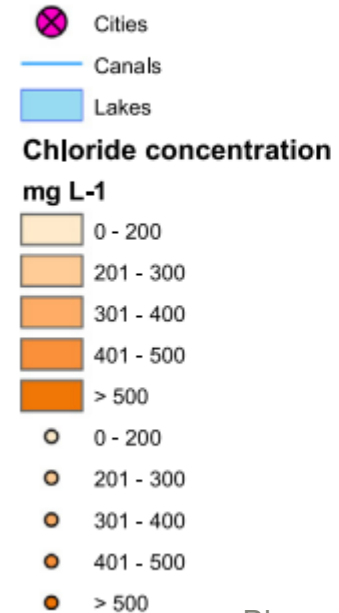
# PICAYUNE STRAND RECHARGE & RESTORATION PROJECT

## Project Purpose and Benefits:

- Protect water supply and prevent saltwater intrusion
- Restore & enhance habitat for fish & wildlife, incl. endangered species
- Maintain flood protection



1985 - Deep



Blanco et al 2013

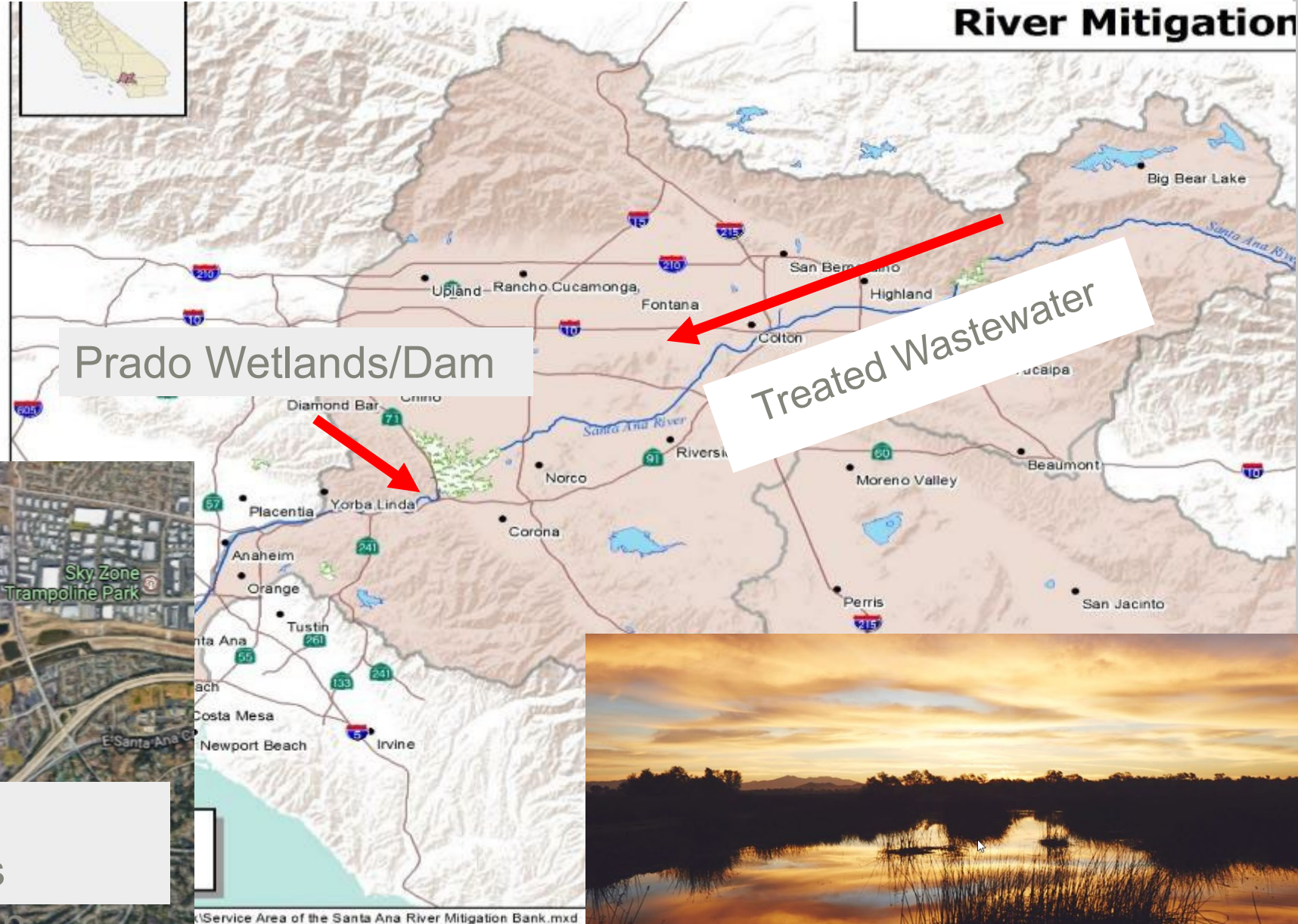




# SANTA ANA RIVER BASIN, SOUTHERN CAL.



Purposes: Water Supply & Drought Management in conjunction with Flood Risk Management, & Ecosystem Restoration

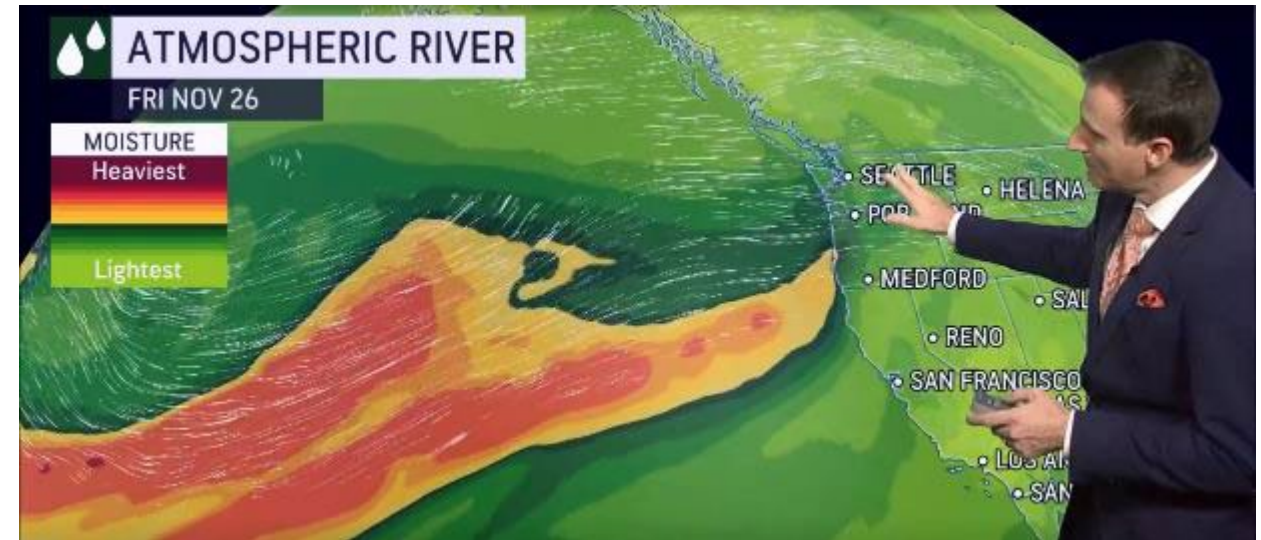




# Russian River Watershed



# Lake Mendocino/Russian River Northern California

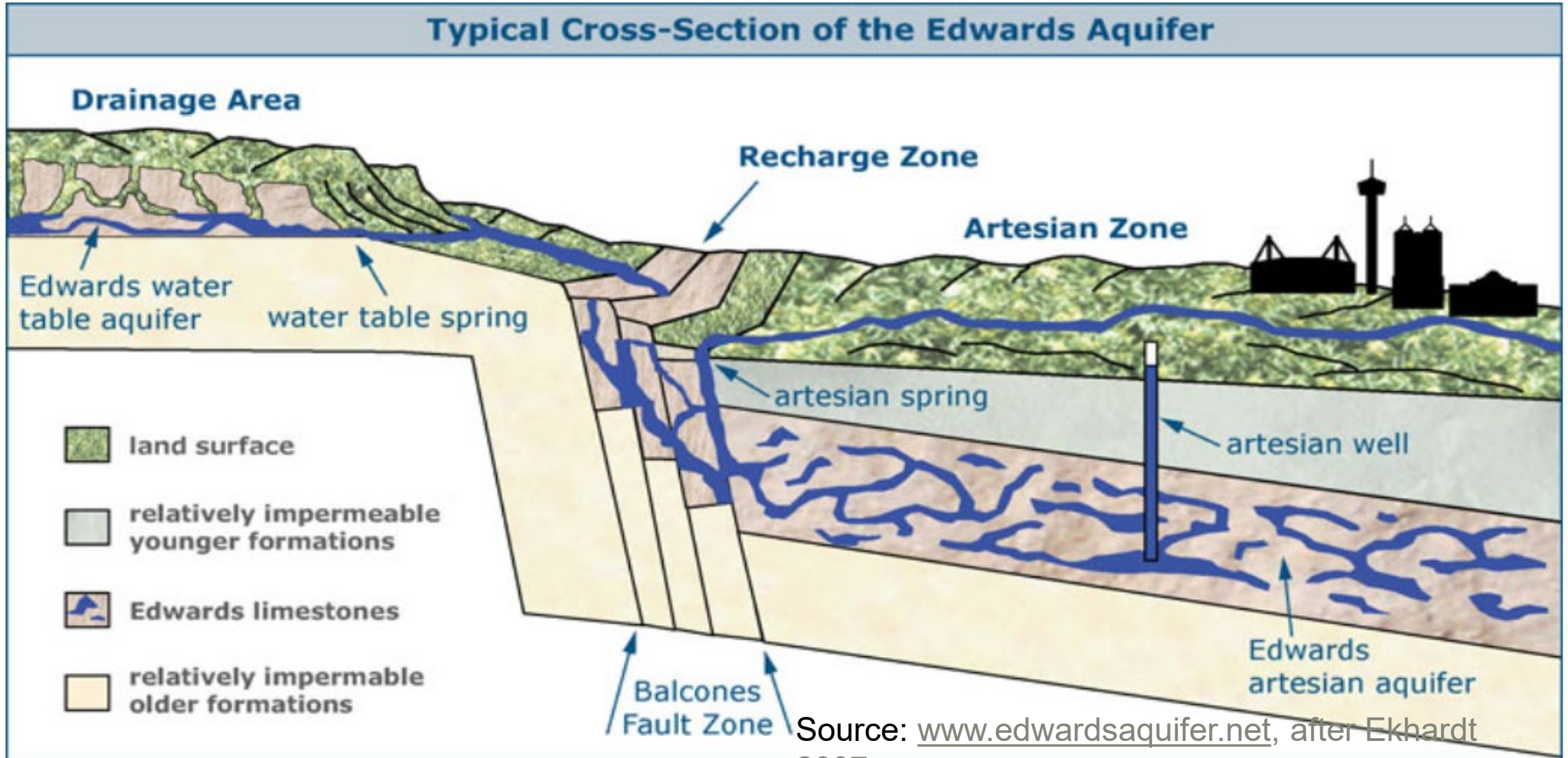


USACE is testing “Forecast Informed Reservoir Operations” (FIRO) for Lake Mendocino reservoir

Lower Russian River: FIRO + ASR will increase available water for agriculture and M&I, and to prevent seawater intrusion



# CENTRAL TEXAS



Source: [www.edwardsaquifer.net](http://www.edwardsaquifer.net), after Ekhardt 2007



# COMBINATION FLOOD CONTROL AND MAR DAMS

Dam sites near the Edwards Aquifer recharge zone for with a primary purpose of flood control but a secondary goal of recharging the aquifer.

This dual purpose was discovered by accident in the case of a reservoir which while *“constructed [in 1913] and operated for irrigation purposes became virtually ineffective during periods of moderate to severe drought because of leakage.”*

Source:

[www.edwardsaquifer.org](http://www.edwardsaquifer.org)





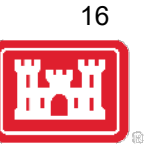




## USACE HAS SOME PREVIOUS AUTHORITIES TO DO MAR

Project-Specific: First large-scale, *project-specific* authorization for MAR (ASR): **WRDA 2000**, for Everglades Restoration. Seven of the 68 original projects involved MAR—a watershed moment.

Regional: **WRDA 2007**—The Secretary may participate with non-Federal and nonprofit entities to address issues on managing groundwater as a sustainable resource *throughout the Upper Mississippi Embayment region* (TN, AR & MS)





# WRDA 2016 AUTHORIZATIONS

## Section 1116

- ❖ Authorized to evaluate and carry out *water supply conservation measures* in states which declared a drought emergency in 2016.
- ❖ **Includes “ground water replenishment” and ASR.**
- ❖ Non-federal interest has to pay the separable costs.

## Section 1118

- ❖ Authorized to review proposals from a non-federal interest to *increase the quantity of available supplies* at a project.
- ❖ **Includes diverting released water for recharge, including ASR.**
- ❖ Non-federal interest has to pay the separable costs.

## (Section 1117)

- ❖ In the same states as for 1116, authorized to prioritize *updating water control manuals for seasonal operations* for water conservation/supply.



# WRDA 2022, SEC. 8108

## “MANAGED AQUIFER RECHARGE STUDY AND WORKING GROUP”

### (a) **ASSESSMENT.**—

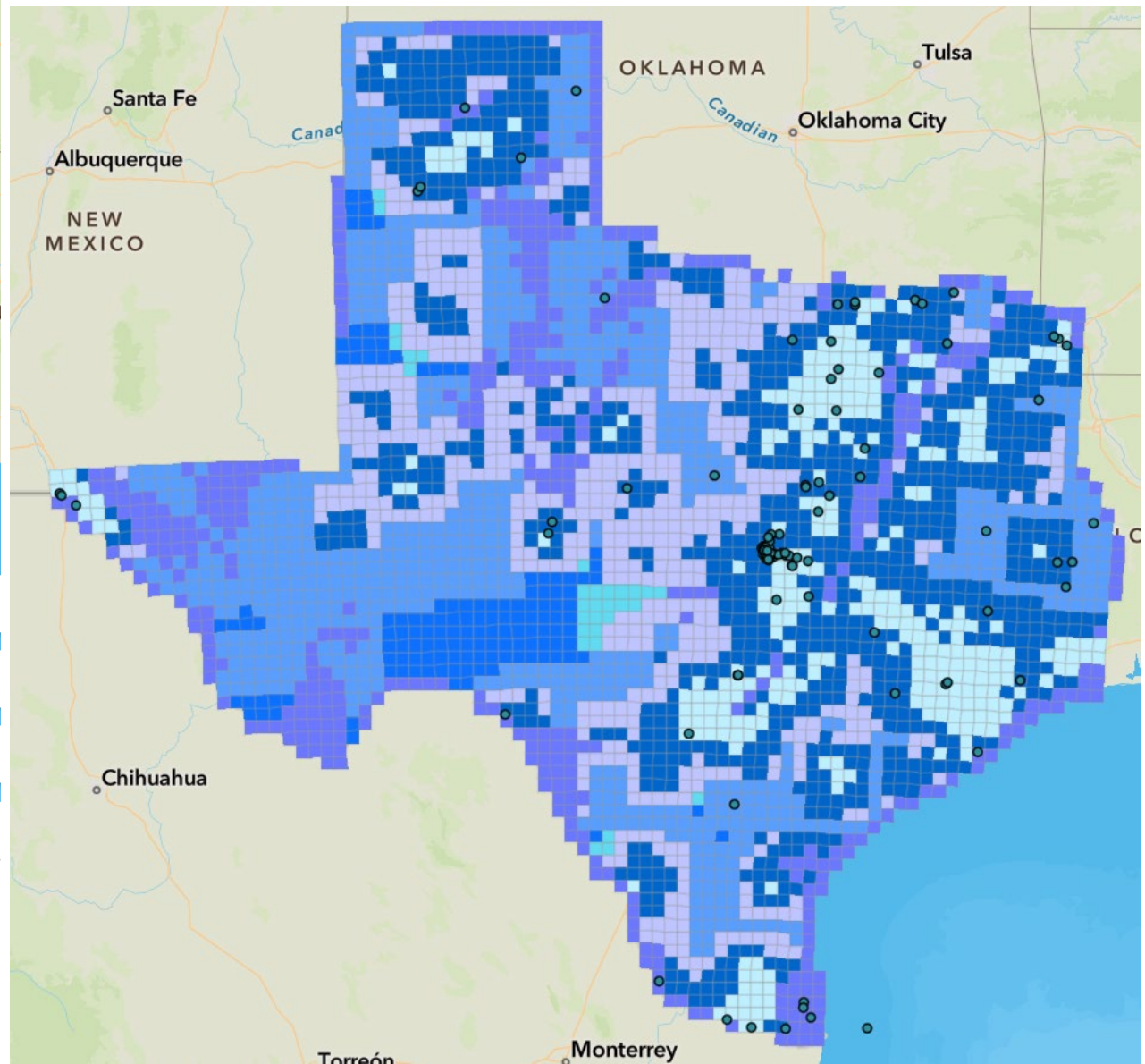
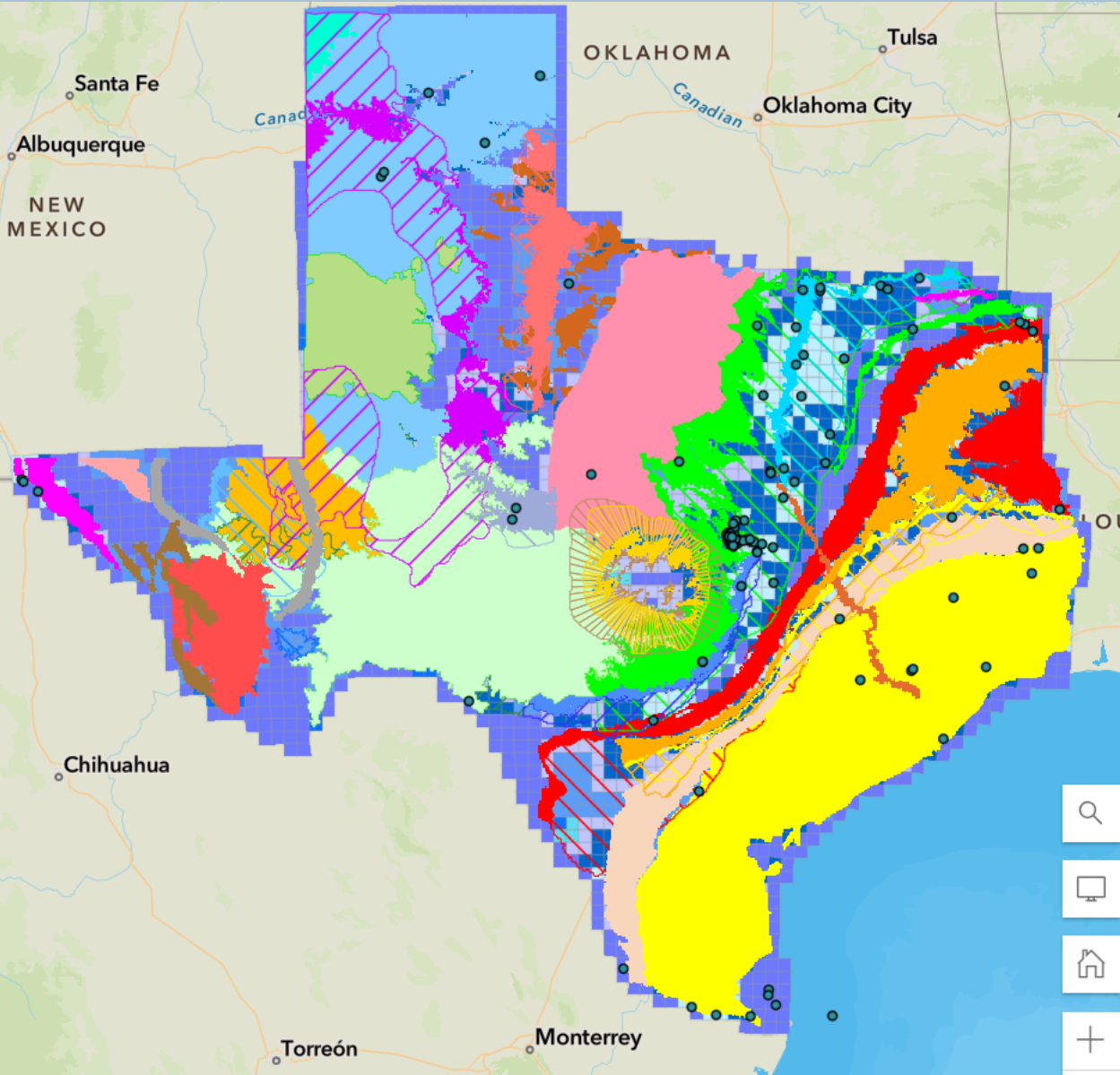
(1) **IN GENERAL.**—The Secretary shall, in consultation with applicable non-Federal interests, conduct a **national assessment** of carrying out [MAR] projects to address drought, water resiliency, and aquifer depletion **at authorized water resources development projects.**

(2) **REQUIREMENTS.**—...the Secretary shall—

(A) assess and identify opportunities to support non-Federal interests, including Tribal communities, in carrying out [MAR] projects; and

(B) assess preliminarily local hydrogeologic conditions relevant [MAR] projects.

(3) **COORDINATION.**—... the Secretary shall coordinate, as appropriate, with the heads of other Federal agencies, States, regional governmental agencies, units of local government, experts in managed aquifer recharge, and Tribes.





# WRDA 2022, SEC. 8108

## **(b) FEASIBILITY STUDIES.—**

- (1) **AUTHORIZATION.**—The Secretary is authorized to carry out feasibility studies, at the request of a non-Federal interest, of [MAR] projects in areas that are experiencing, or have recently experienced, prolonged drought conditions, aquifer depletion, or water supply scarcity.
- (2) **LIMITATION.**—The Secretary may carry out not more than 10 feasibility studies...
- (3) **USE OF INFORMATION.**—The Secretary shall, to the maximum extent practicable, use information gathered from the assessment conducted under subsection (a) in identifying and selecting feasibility studies to carry out under this subsection.
- (4) **COST SHARE.**—The Federal share...shall be 90 percent.





# WRDA 2022, SEC. 8108



## **(c) WORKING GROUP.—**

- (1) **IN GENERAL.**—Not later than 180 days after...the enactment of this Act, the Secretary shall establish a [MAR] working group made up of subject matter experts within [USACE] and relevant non-Federal stakeholders.
- (2) **COMPOSITION.**—[expertise in water supply storage, regional water supply in drought; groundwater protection, water quality; ASR wells; recharge dams; hydrogeology; conjunctive use, and agricultural water resources].
- (3) **DUTIES.**—
  - (A) advise the Secretary regarding [the assessment and any feasibility studies];
  - (B) assist USACE offices...with raising awareness of non-Federal interests of the potential benefits of carrying out managed aquifer recharge projects; and
  - (C) assist with ... the report required to be submitted under subsection (d).



## WRDA 2022, SEC. 8108

- (d) **REPORT TO CONGRESS.**—[Within 2 years], the Secretary shall submit [to Congress] a report...that includes—
- (1) the results of the assessment...and any feasibility studies... including data collected...and any recommendations on [MAR] opportunities for non-Federal interests, States, local govts, & Tribes;
  - (2) a status update on the implementation of the recommendations included in the [2020 report on MAR & USACE];
  - (3) And an evaluation of the benefits of creating a new or modifying an existing planning center of expertise for MAR and identify potential locations for such a center of expertise, if feasible.





## NOW WHAT? – THE CAVEATS

We're making good progress on implementation guidance for 8108, but...

The working group will need many months to put together. It will be a “FACA” Committee, which would involve formal processes. Actions that require the working group's input may not happen immediately.

MAR “Feasibility studies” need funding, of which there wasn't any in the appropriations bill. Perhaps we can get funding in the next bill.



# NOW WHAT? – MOVING FORWARD

We can discuss and informally map out potential opportunities.

There may or may not ever be, a USACE “MAR Program” or a MAR CX. It will be viewed as a water management tool. We may develop a community of practice.

USACE Programs & authorities already exist that planners can tap fairly quickly:

- Planning Assistance to States
- Flood Plain Management Services
- Environmental Infrastructure Program
- Tribal Partnership Program...

The USACE/Partner cost-sharing ratios vary but can be favorable.



# SUMMARY

- Congress wants us to do more MAR.
- New authorities are bringing new MAR opportunities—for USACE and for its partners.
- Some of these opportunities may take time to develop.
- But there are opportunities to start fairly quickly through existing programs.
- Don't be surprised if someone calls you about this; word is getting around...

