

GROUNDWATER IN ALABAMA

Ann Compton Arnold, P. G.

Hydrogeologist

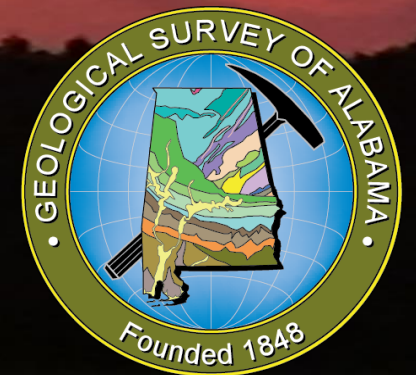
Geological Survey of Alabama

205.247.3618

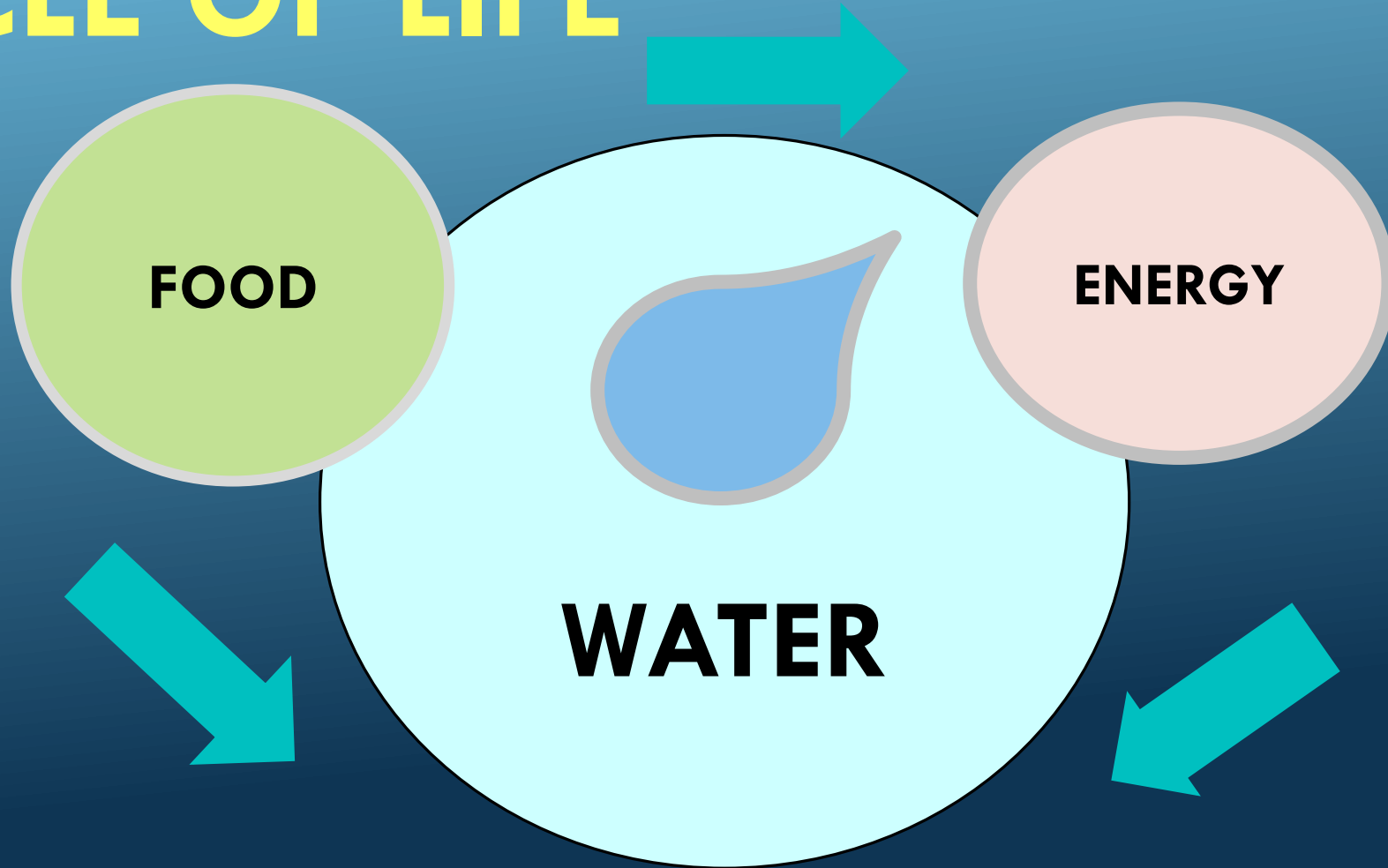
aarnold@gsa.state.al.us

www.gsa.state.al.us

USGS National Ground Water Monitoring Network



CIRCLE OF LIFE



COMPETITION for RESOURCES: Need to Collaborate and Build Consensus

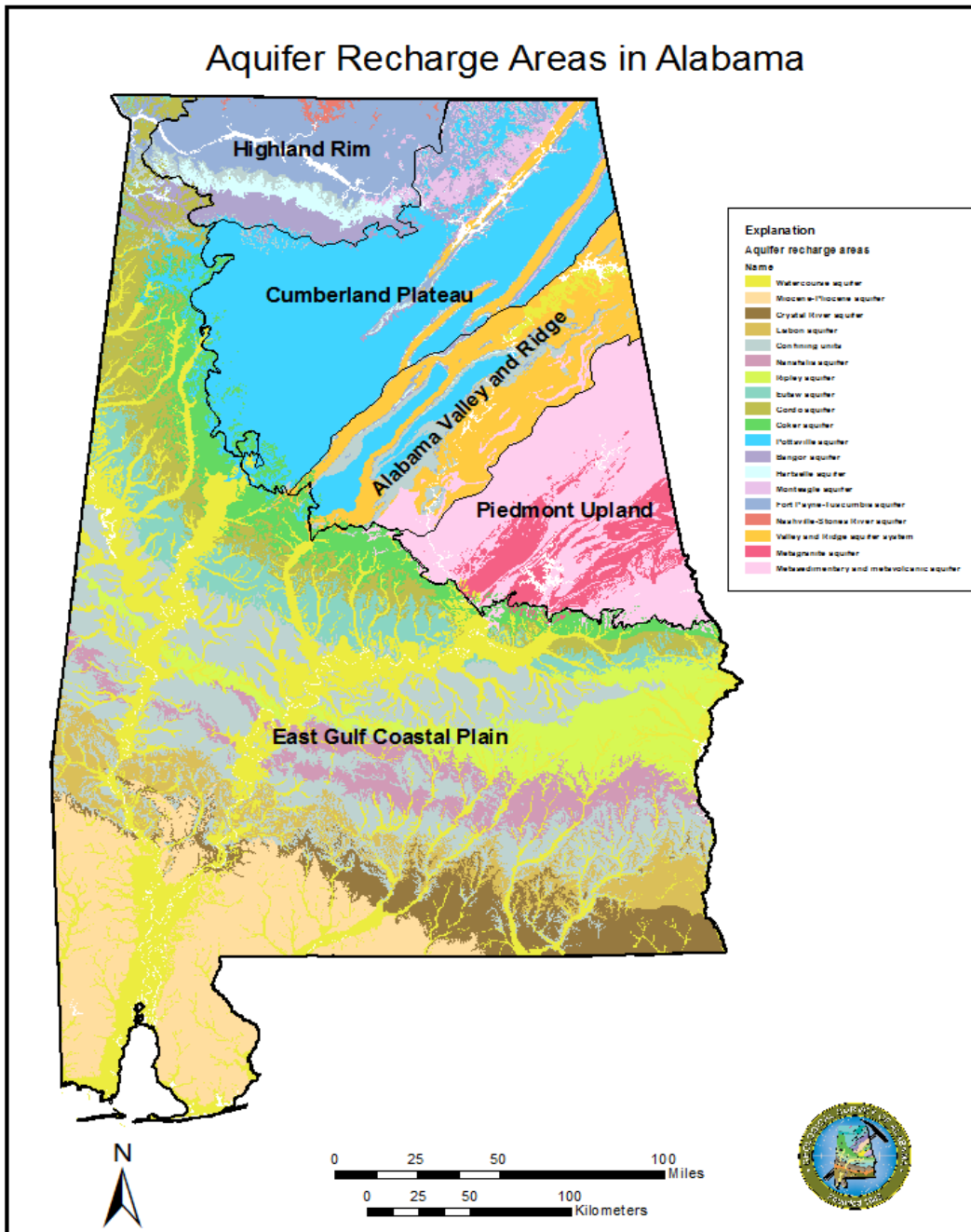
ALABAMA GEOLOGY

Alabama geology controls hydrologic flow regimes.

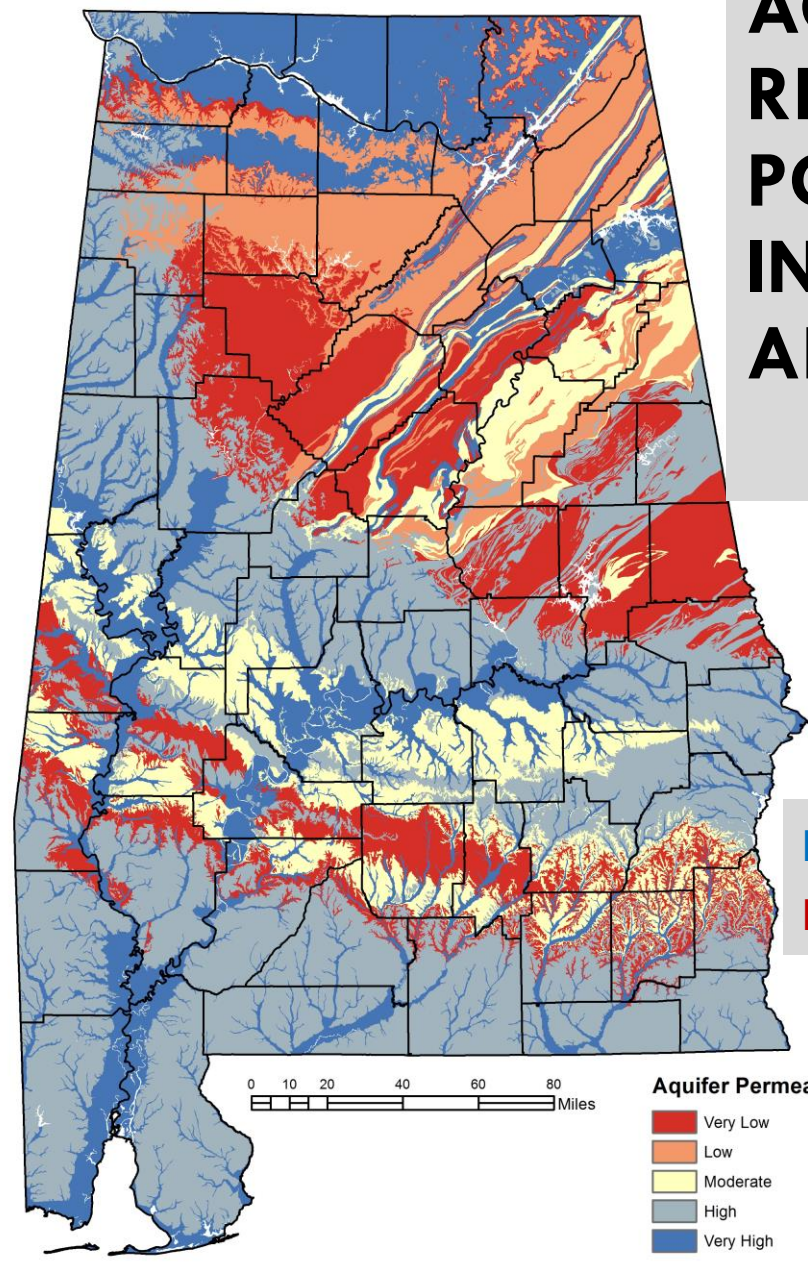
Alabama is divided into several **distinctive**

5 MAJOR GEOLOGIC PROVINCES in Alabama

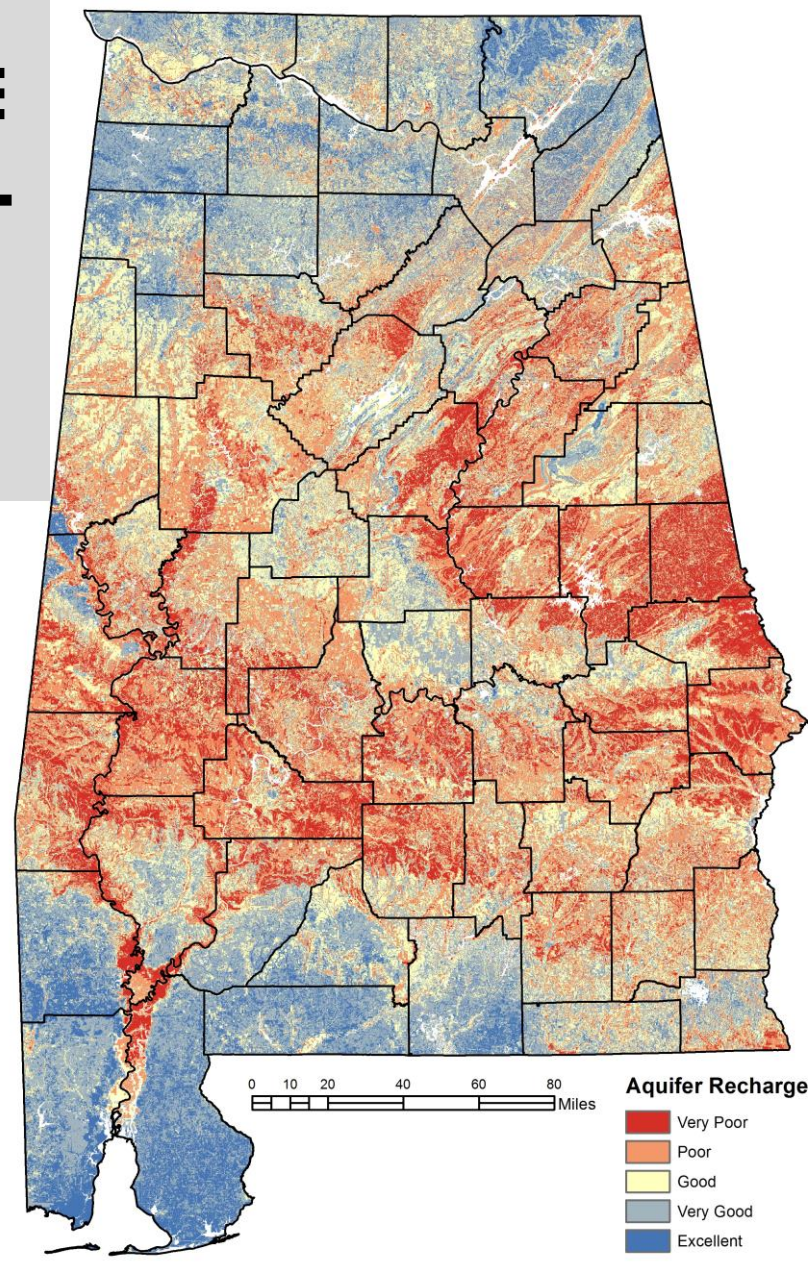
- **EAST GULF COASTAL PLAIN** (Cretaceous-Tertiary Sedimentary rocks); large Unconfined & Confined aquifers
- **PIEDMONT UPLAND** (Crystalline & Metamorphic Rocks: Paleozoic, some Precambrian); ***Surface Water primary**
- **VALLEY & RIDGE** (Paleozoic folded, faulted sedimentary rocks); Aquifers mostly in limestone units
- **CUMBERLAND PLATEAU** (Paleozoic sedimentary rocks); ***Surface Water primary**
- **HIGHLAND RIM** (Paleozoic limestone); **Karstic** conduit Unconfined prolific aquifers (hit or miss); ***Strong surface water - groundwater interconnection**



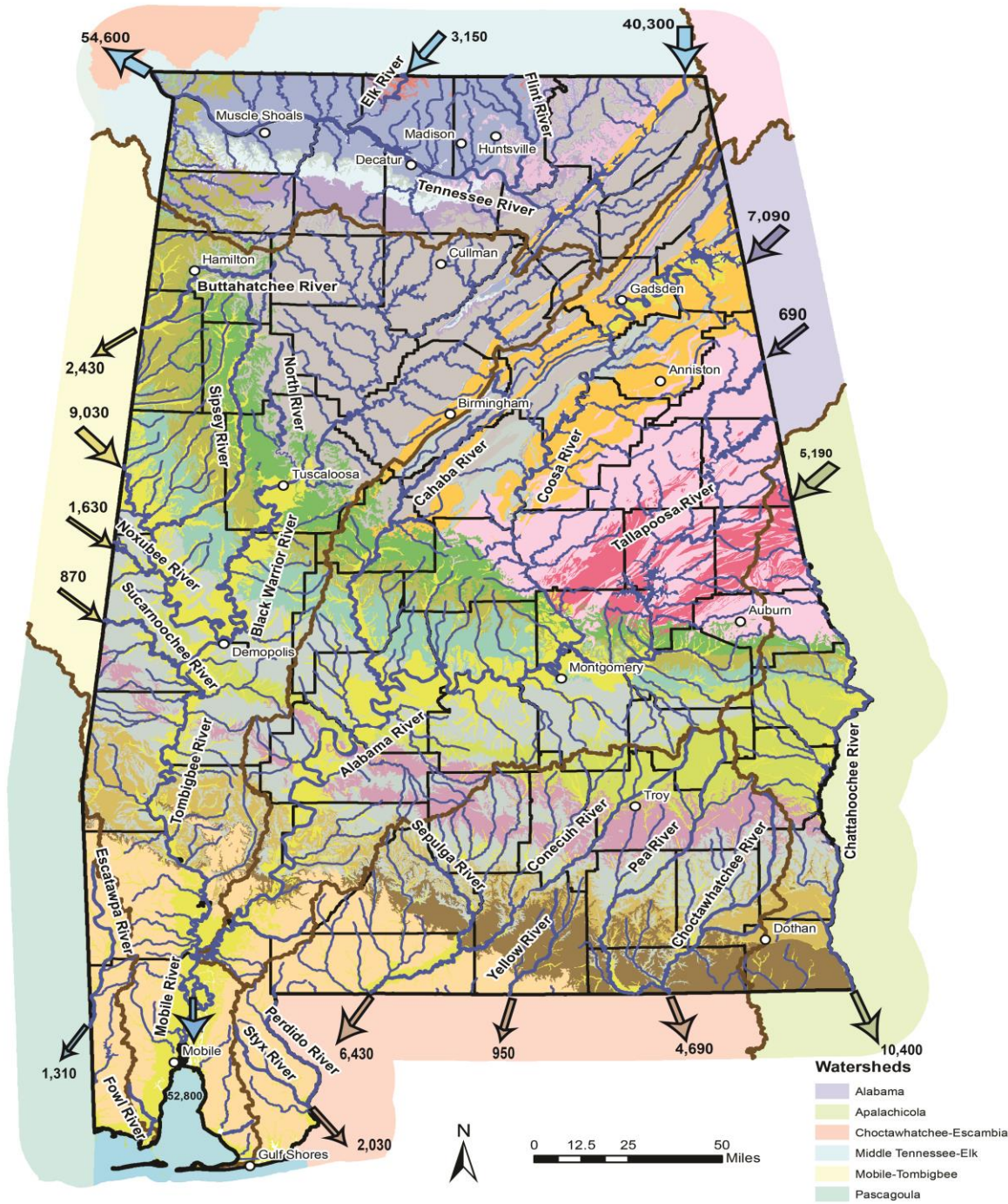
AQUIFER RECHARGE POTENTIAL IN ALABAMA



BLUE = HIGH
RED = LOW



Rivers in Alabama



IS Alabama Wet enough?

Annually, about 19.5 T gallons flows across AL landscape from precipitation; 14 T gallons flows into rivers from surrounding states.

Average Rainfall across state 56 inches per year

14 Major River Systems in AL 132,000+ miles of river;
4 originate in the state (SE)

Water is for Drinking !

Surface Water in AL provides...

66% of Public Supply: 552 MGD or 205 BGY

Groundwater in AL provides...

34% of Public Supply: 328 MGD or 120 BGY

100% of self-supplied by rural wells 38 MGD or 14 BGY

Population Trends at "level growth"

YE2010 4.73 M YE2030 5.08 M YE2040 5.256 M

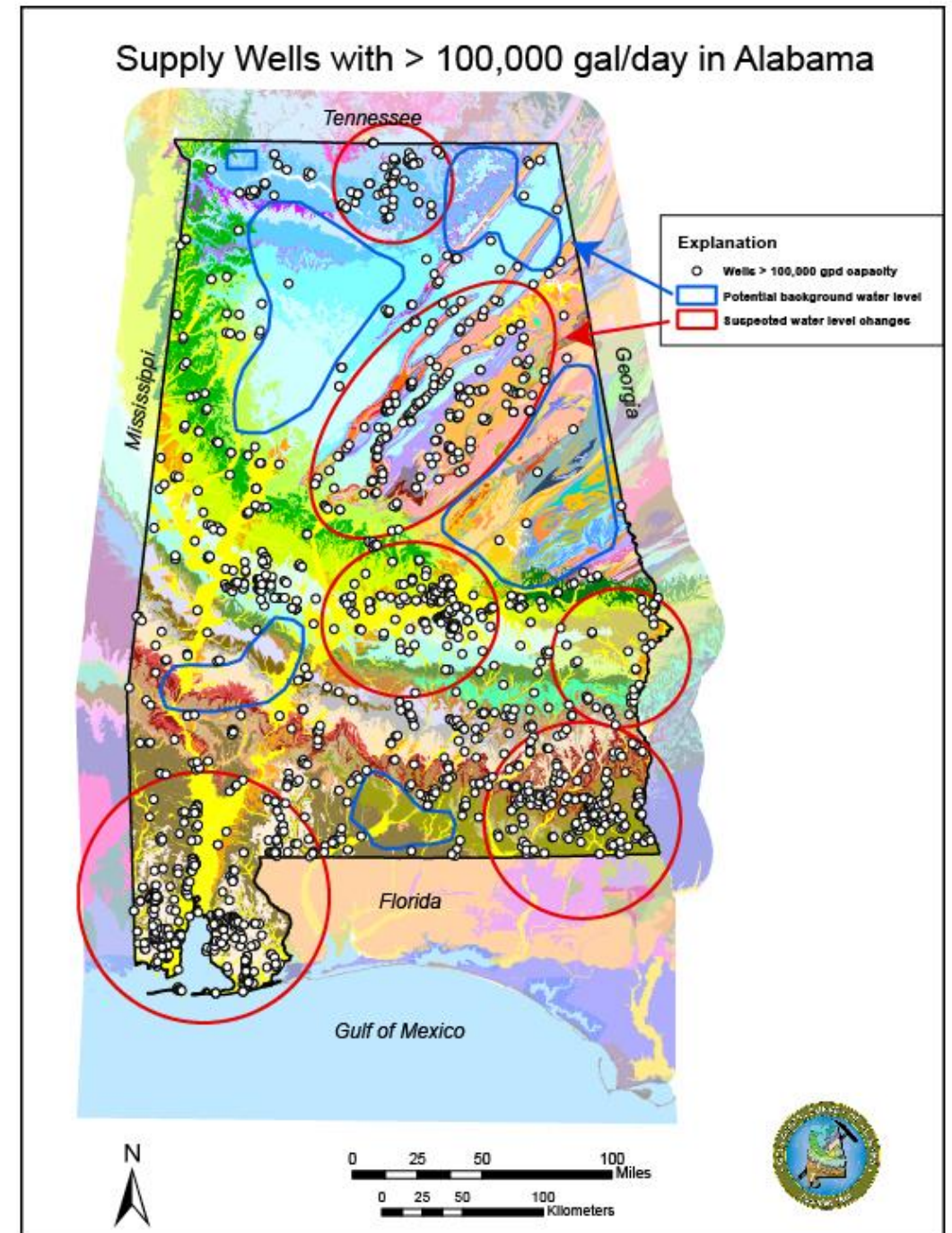
(estimates from "Water Resources in AL" 2008; AOWR 2010)

Site selection for groundwater monitoring to evaluate USE:

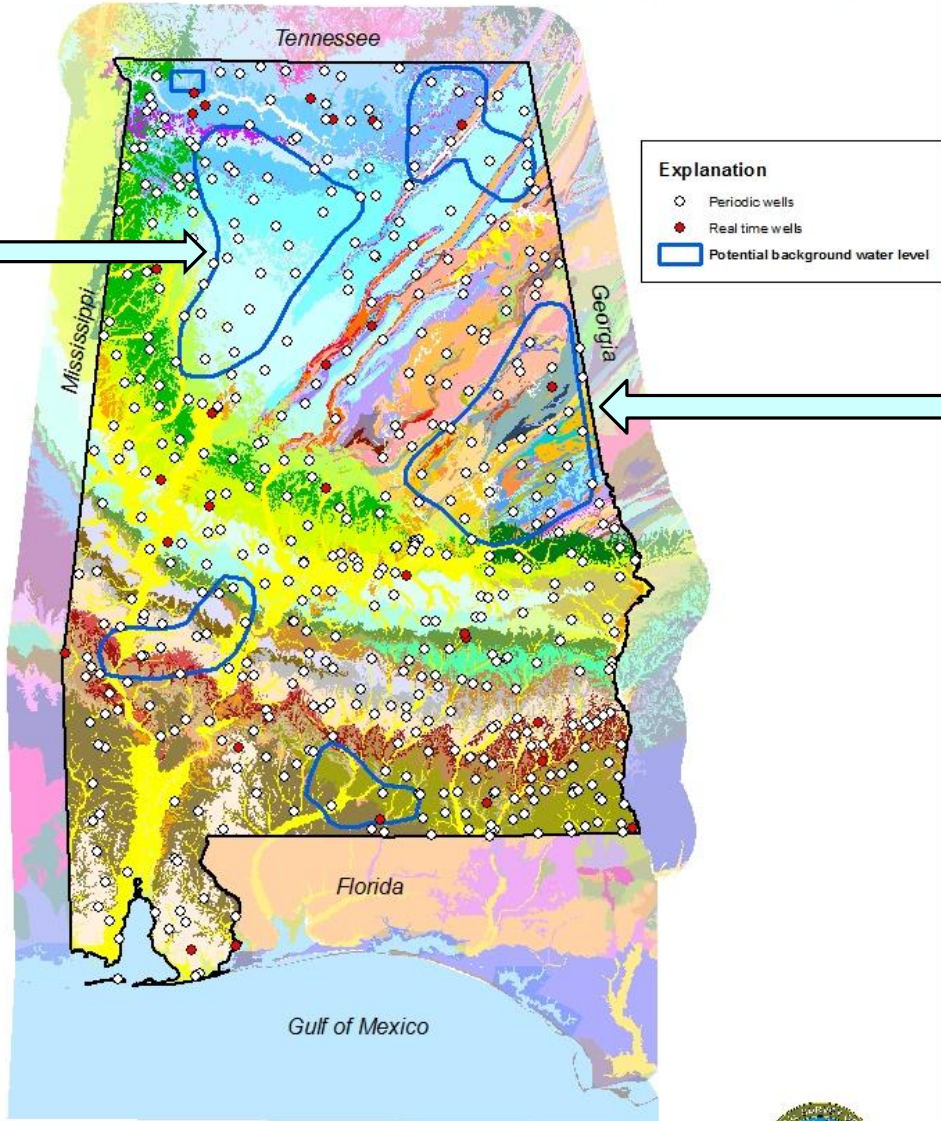
Evaluate groundwater use and assess current monitoring wells.

Red Circles: Areas of potential impact due to groundwater withdrawal.

Blue Polygons: Potential Background Areas, with less anthropogenic influence due to groundwater withdrawal.



Periodic and Real Time Monitoring Wells in Alabama



2 Groundwater Monitoring Networks:

PERIODIC (Spring & Fall)
REAL-TIME (Continuous)

BACKGROUND Observation Wells
Not likely influenced by GW Pumping

Piedmont and Plateau provinces are not prolific groundwater producing regions.

Rely on surface water sources.

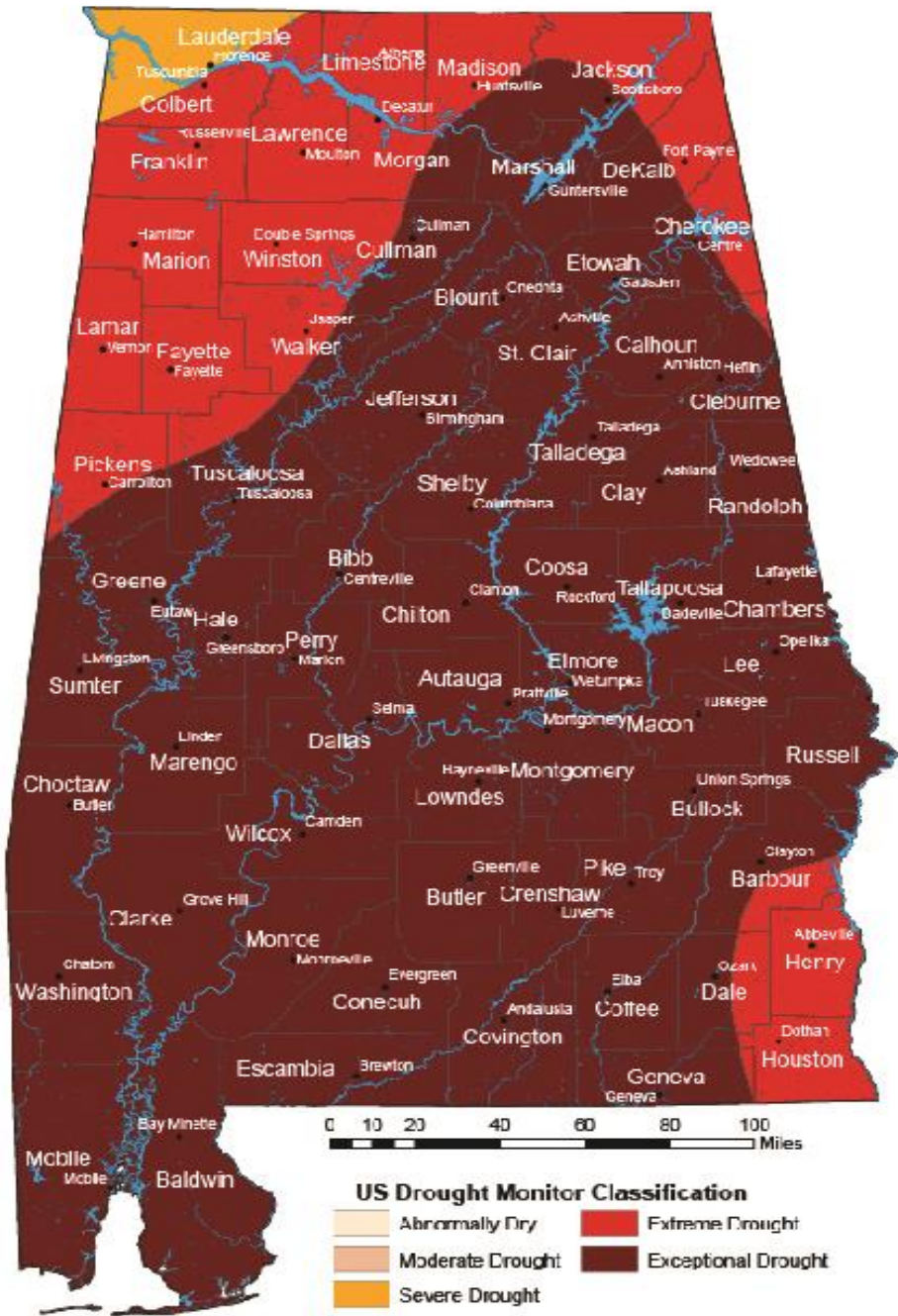
GROUNDWATER MONITORING NETWORK GOALS:

PRIMARY OBJECTIVE: PUT **ALL OF OUR ONGOING WATER MANAGEMENT INFORMATION INTO A SPATIALLY RELATED ONLINE DATABASE**, to address public inquiries, resource planning, climatic events, and future USE needs with a comprehensive approach.

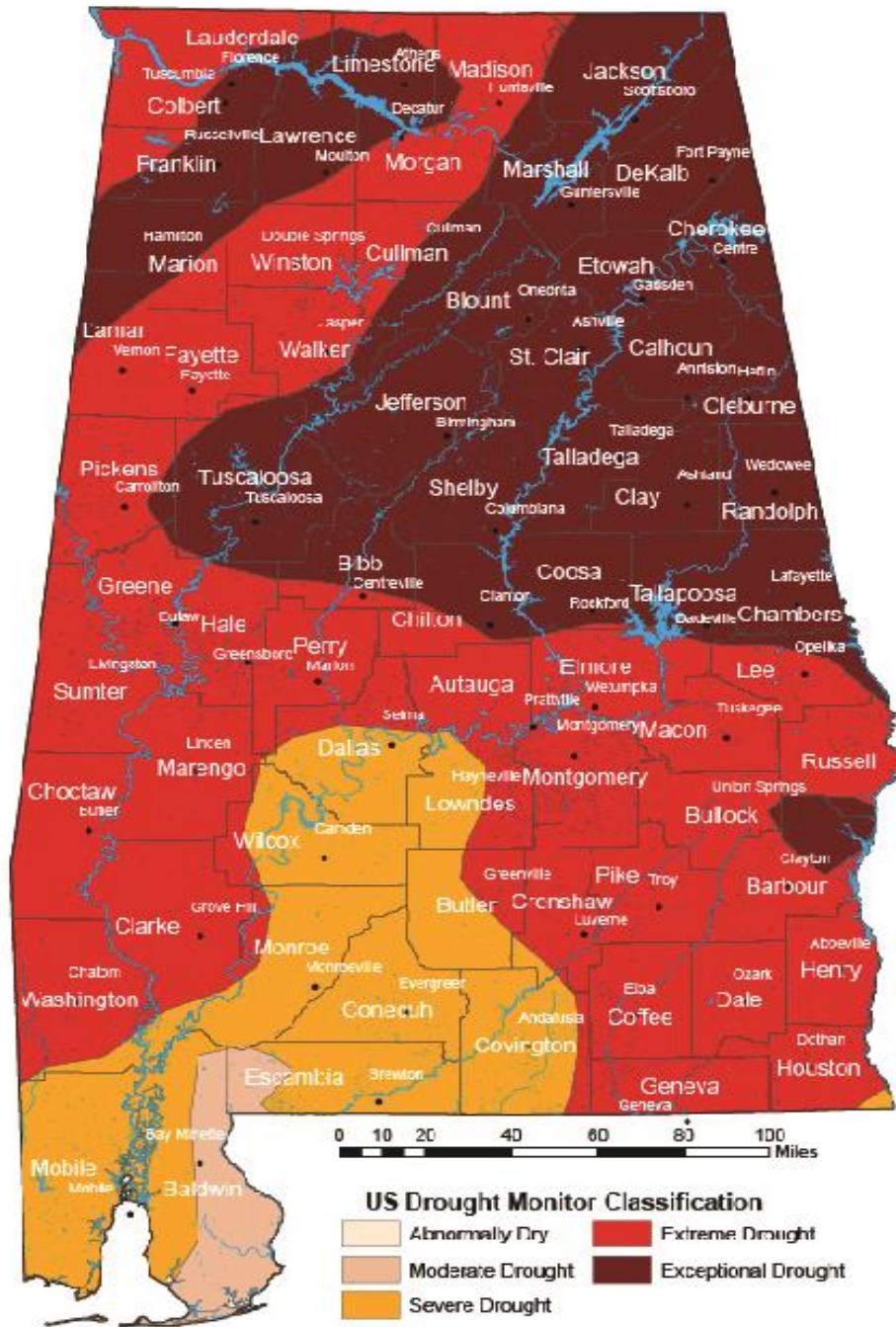
- **PROVIDE SCIENTIFIC BASIS FOR SOUND STATE WATER POLICY**
- **TO ASSIST WITH STATE-WIDE WATER BUDGET, DEVELOPING ALABAMA WATER PLAN**
- **BETTER WELL-SPACING** for irrigation & municipalities, based on geologic province
- **DROUGHT MONITORING WELLS:** Shallow
- **VARIOUS SPECIAL PROJECTS:** Irrigation, beach oil spill impact or saltwater intrusion



Year 2000 Drought

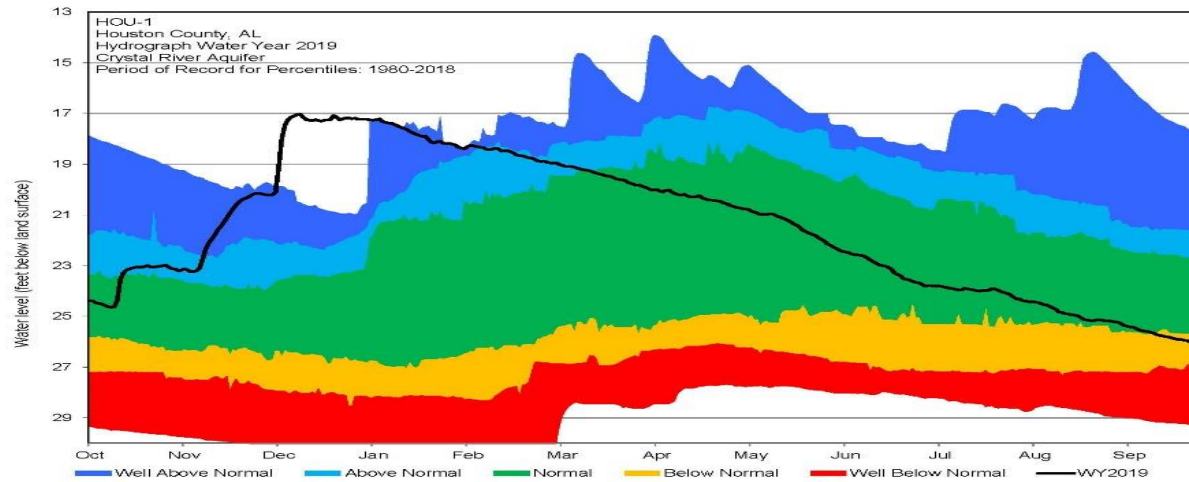
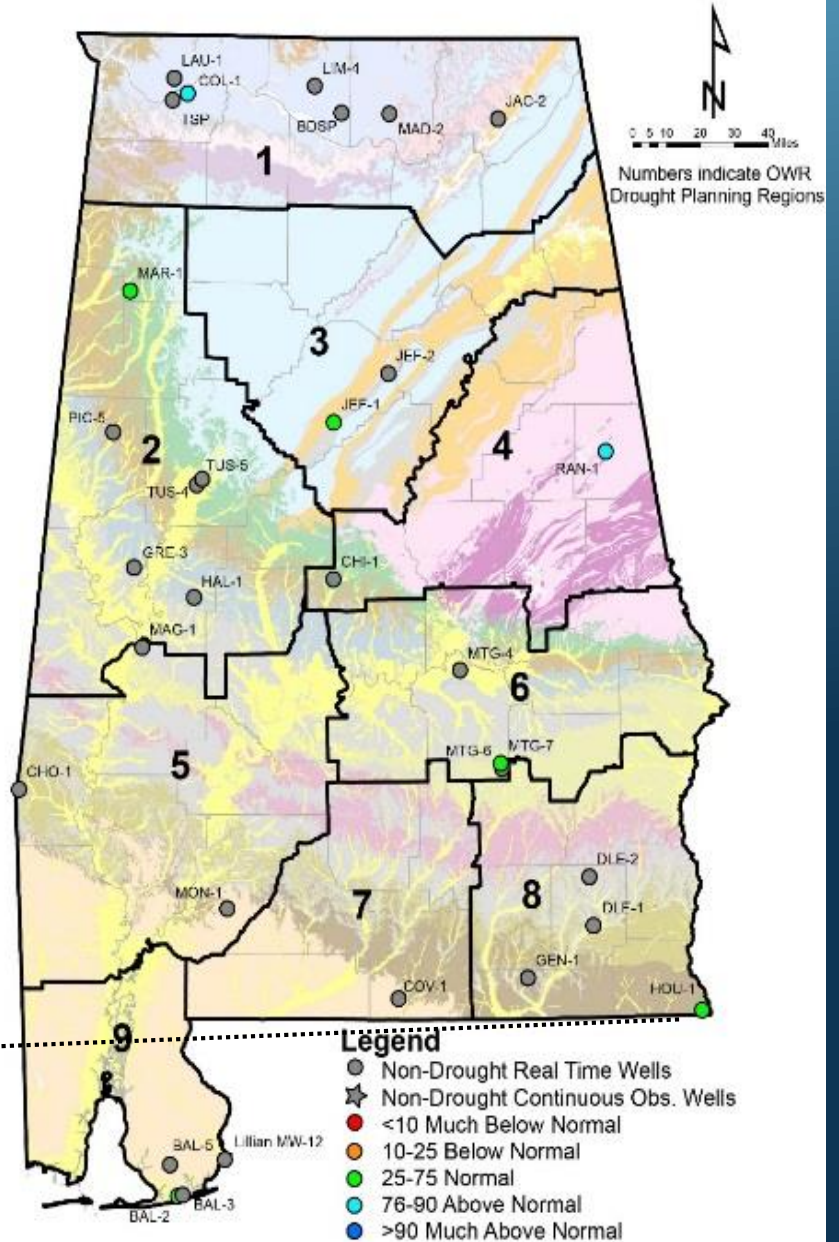
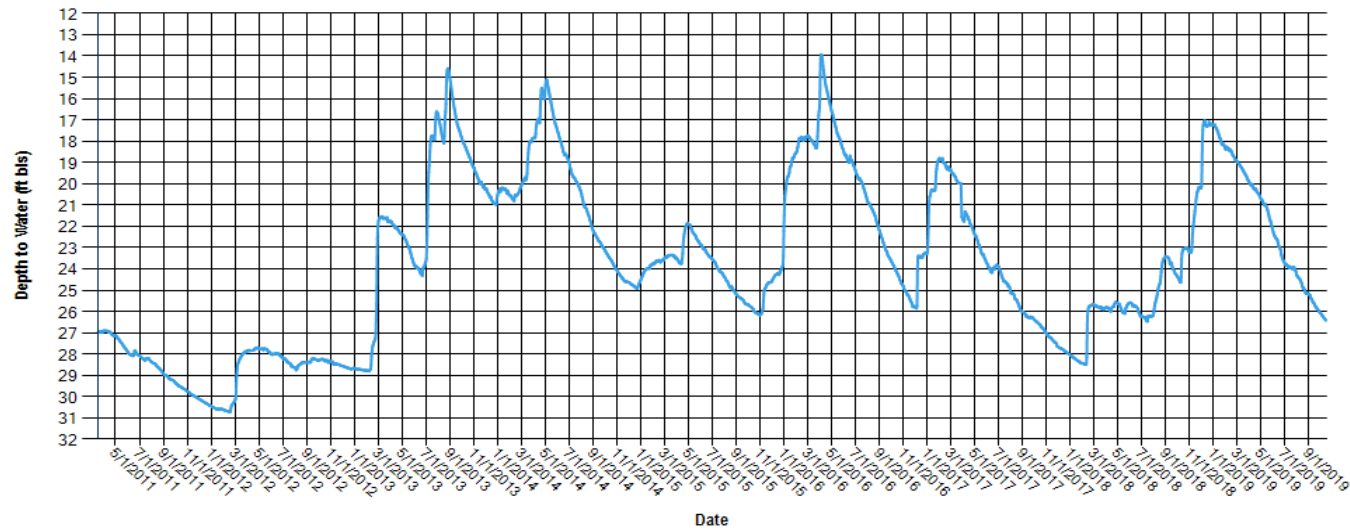


Year 2016 Drought



AL DROUGHT PLANNING REGION 8

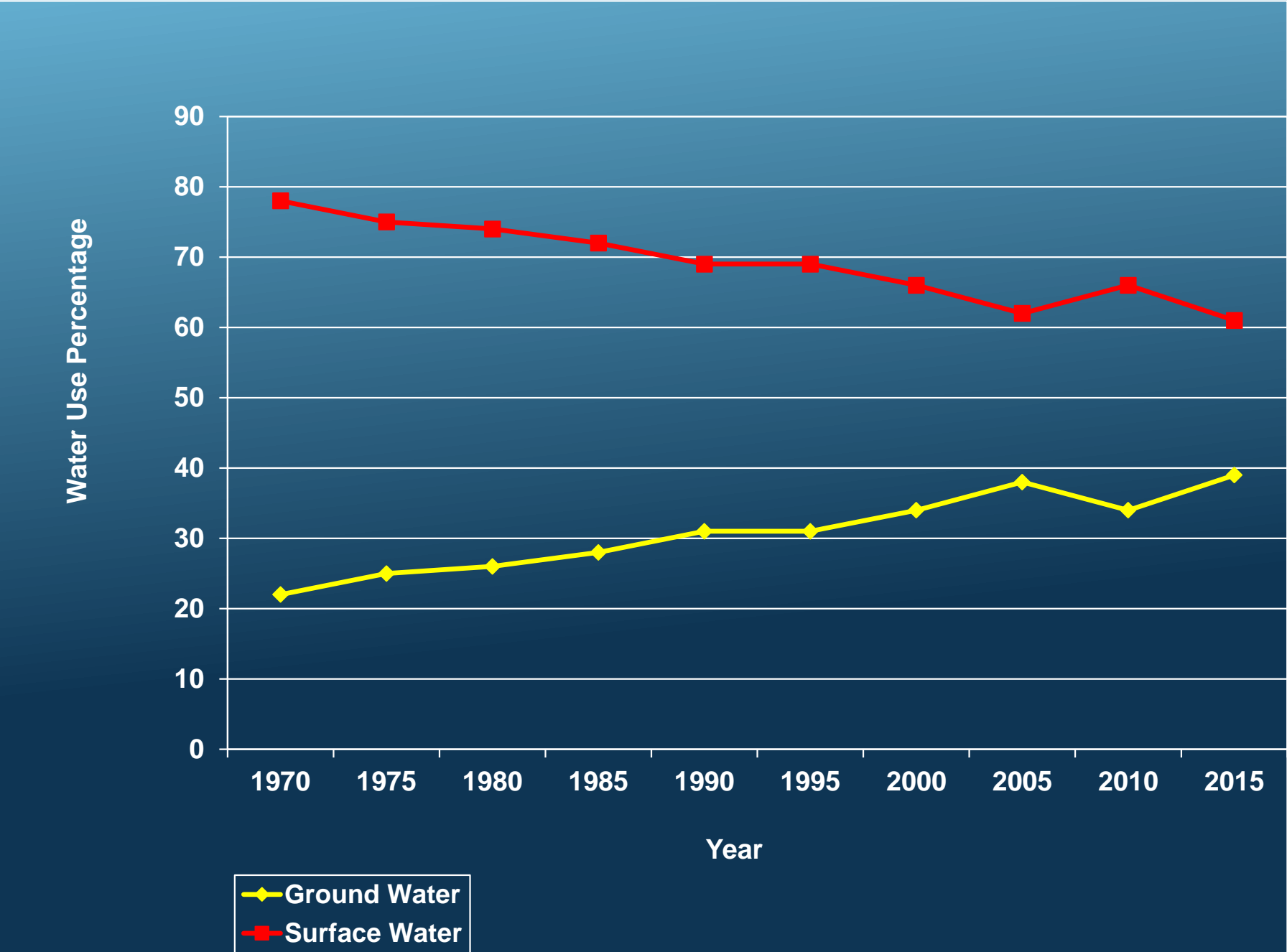
Houston 1



Ground- and Surface-Water Use Percentages of Total Public Water Supply Use



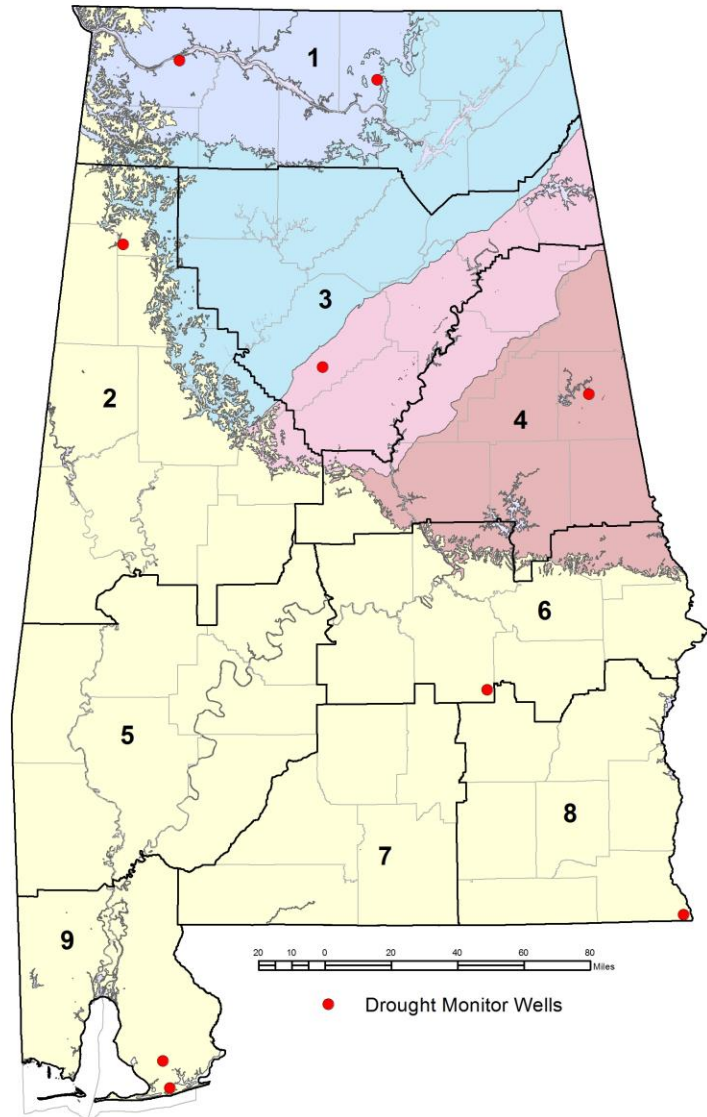
Sources of water-use data,
GSA, AOWR, USGS



“DROUGHT IN ALABAMA IS NOT A WATER SUPPLY PROBLEM. IT IS A WATER MANAGEMENT PROBLEM.”

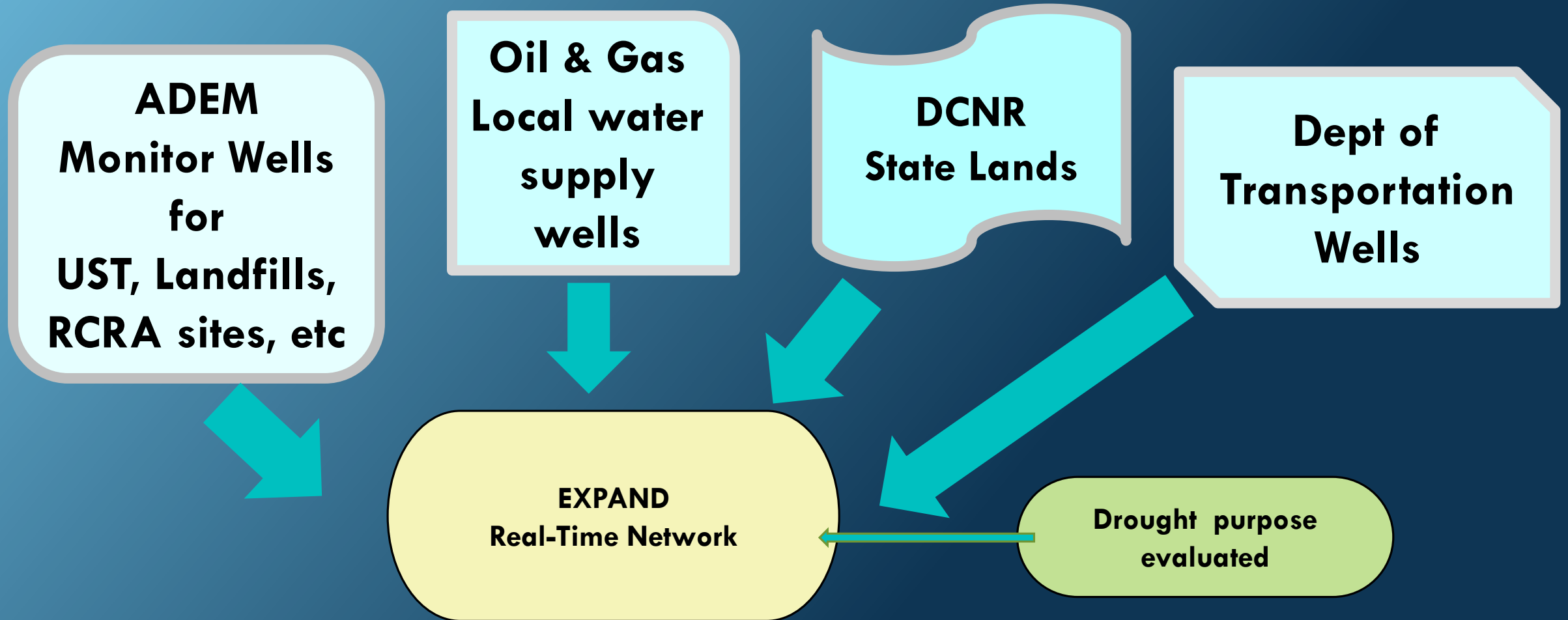
-Marlon Cook, retired GSA Groundwater Program Director

- Alabama has one water management district in southeast part of state.
- Alabama needs to create legislation to become a regulated riparian state.
- GSA’s GAP goal is to build & communicate the science to support informed **science-based** policy-making.



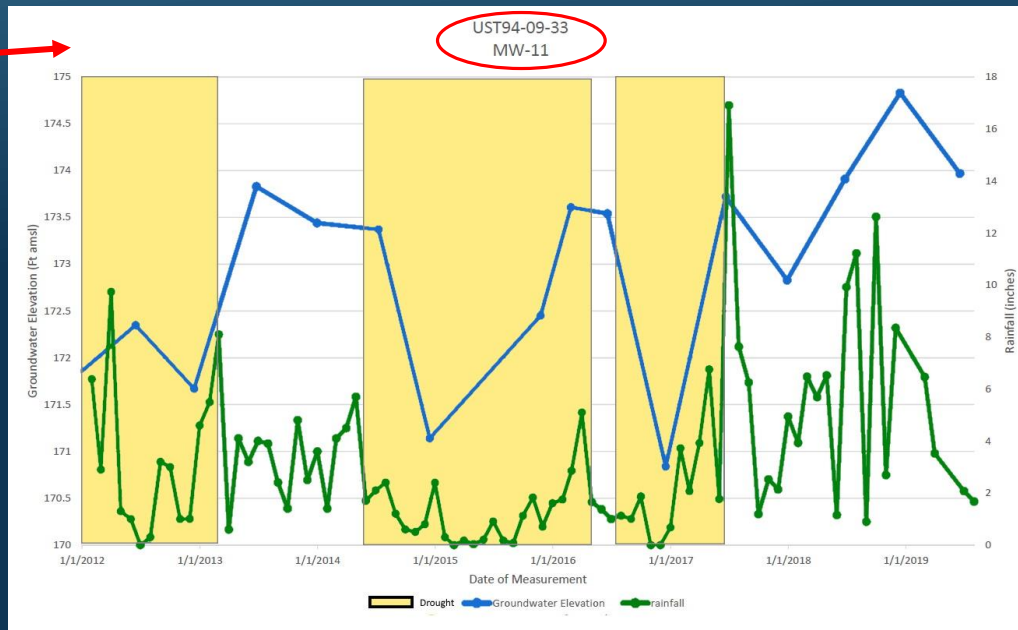
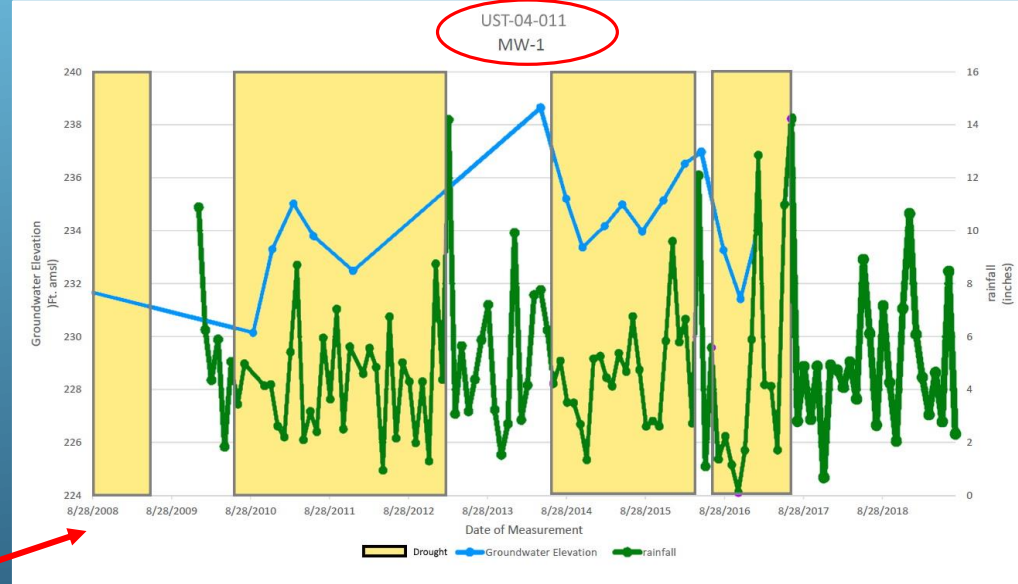
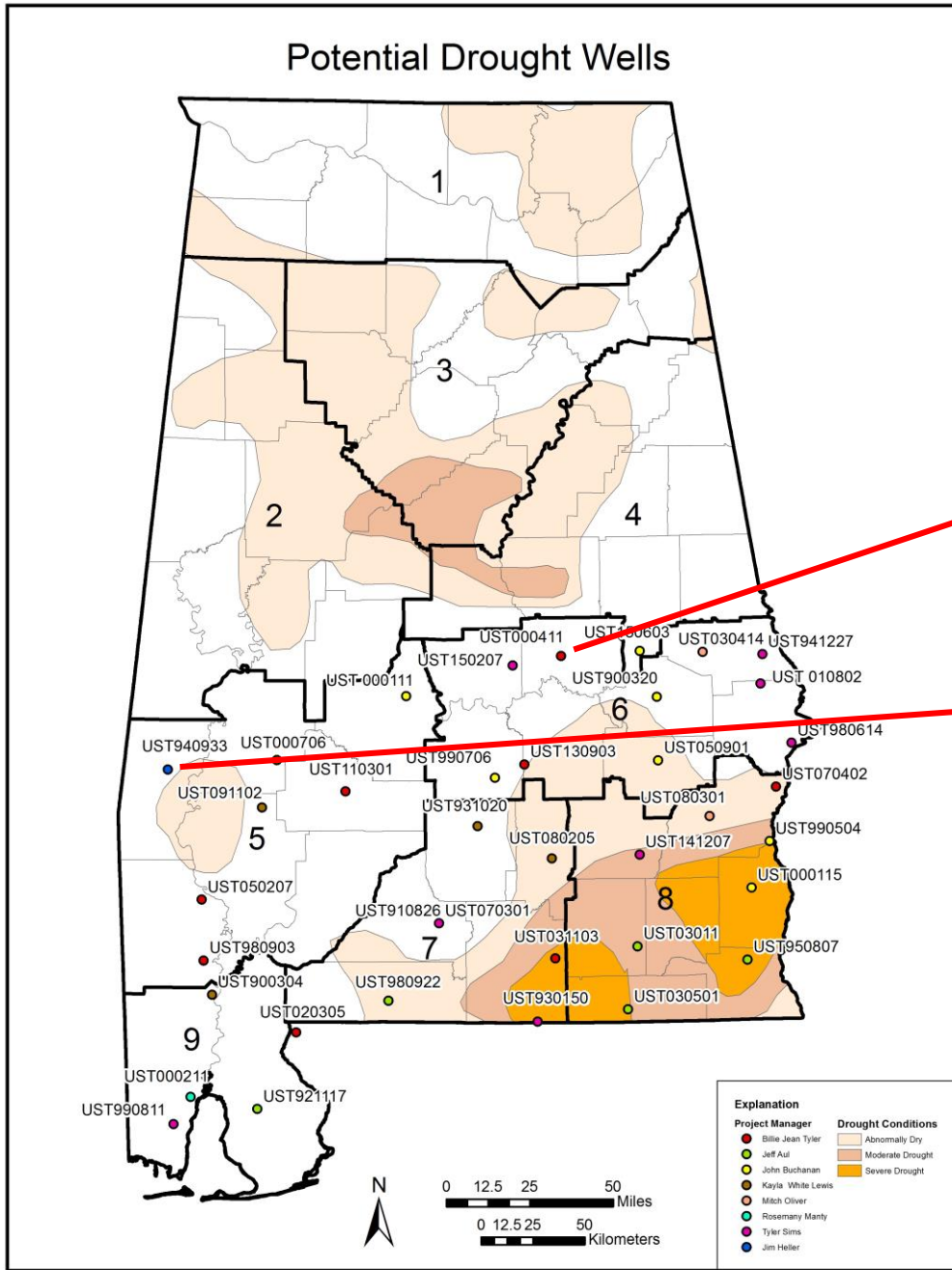
Shallow wells that monitor first encountered groundwater for drought purposes are **LACKING** in southern half of State:
Drought Regions 2, 5, 7, 8

LOOKING FOR SELECT WELLS/DATA ON PUBLIC LANDS TO EXPAND REAL-TIME NETWORK



AL Real-Time Wells: more frequent measurements (daily averages) over a longer term, Assess shorter-term affects, seasonal variation, and long-term TRENDS

Potential Drought Wells



**ADEM
UST
Wells:
public
data**

HYDROGRAPHS

- Long-term hydrographs of monitoring wells indicate water level fluctuations: **important for distinguishing Suspected or Documented CHANGES from BACKGROUND levels.**
- Fluctuations can be **caused** by groundwater withdrawals, land use change (restrict recharge), weather or climate variations.
- Well Hydrographs **in & downdip of recharge area** help show relationship between unconfined and confined aquifers; also Recharge and Storage of the confined aquifer.

NGWMN PLANS ARE BIG FOR 2019... AND BEYOND

- Currently GSA operates 32 Real-Time monitoring wells across Alabama
- Plan to add 5 more continuously measured wells (FY 2019/20).
- Data linked to online hydrographs, transmitted to office daily
- Existing data available to USGS National Ground Water Monitoring Network



WRAP UP

- Alabama has water: rainfall, rivers. VARIABILITY is the issue.
- AL **needs to plan** for extreme climate fluctuations.
- **Drought and flood** are big water issues **to manage**.
- In times of drought (water need), people will pump more, draining both surface and groundwater, which are **interconnected**.
- **Water Scarcity is an issue that WILL GROW** with POPULATION GROWTH. Competition for use. **Planning and POLICY are key.**
- **PEOPLE don't PLAN to FAIL... They fail to PLAN !**

**The grass is NOT Greener on the other side of the fence,
the grass is GREENER where you WATER it.**





THANK YOU

QUESTIONS ?