Climate, Policy, and Water Availability: The Future of Irrigation in Alabama

2016 ADEM Nonpoint Source Conference

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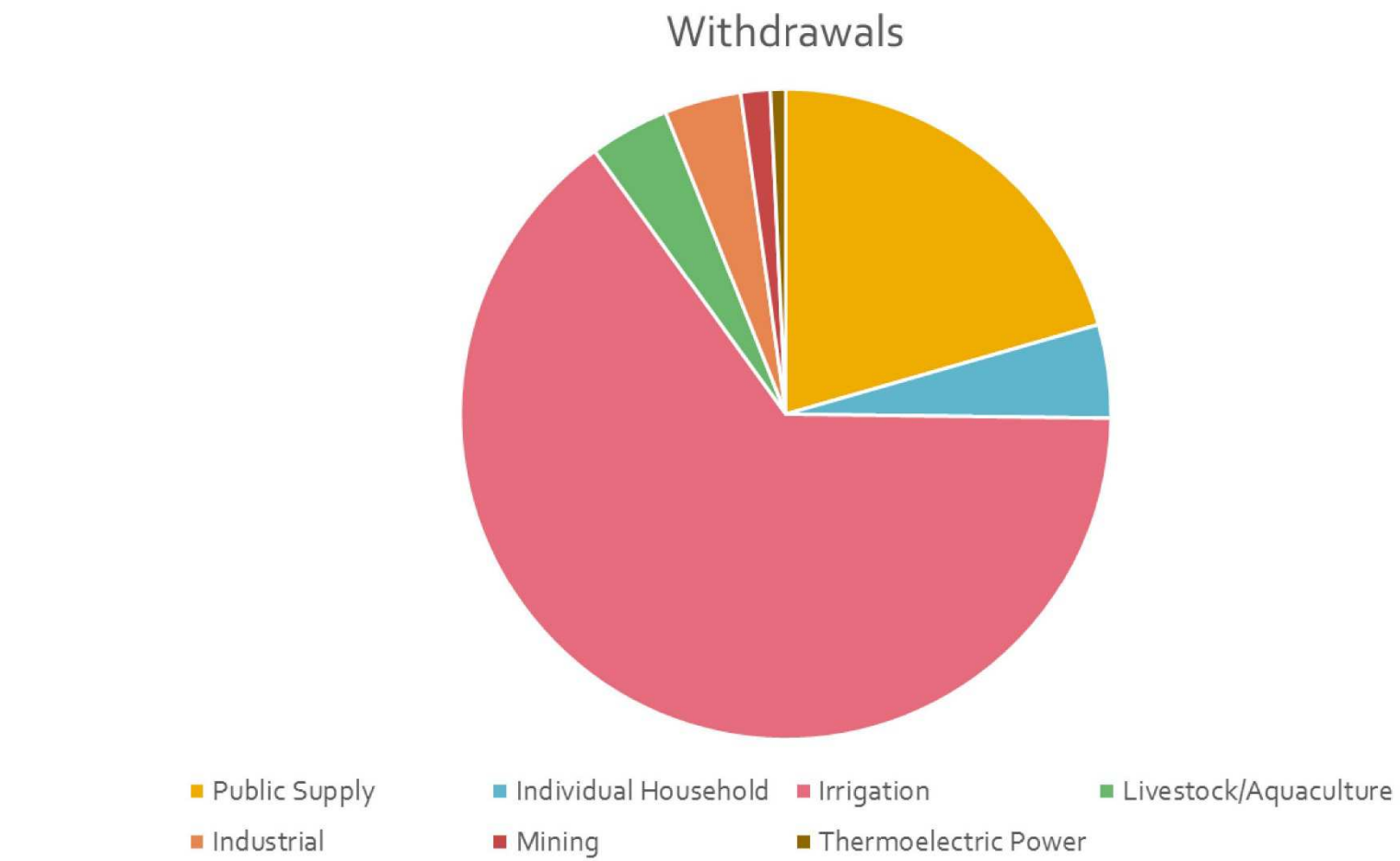
Irrigation: The National Perspective

76 billion gallons per day



Source: US Geological Survey's Estimated Use of Water: 2010

Groundwater Sourced Irrigation

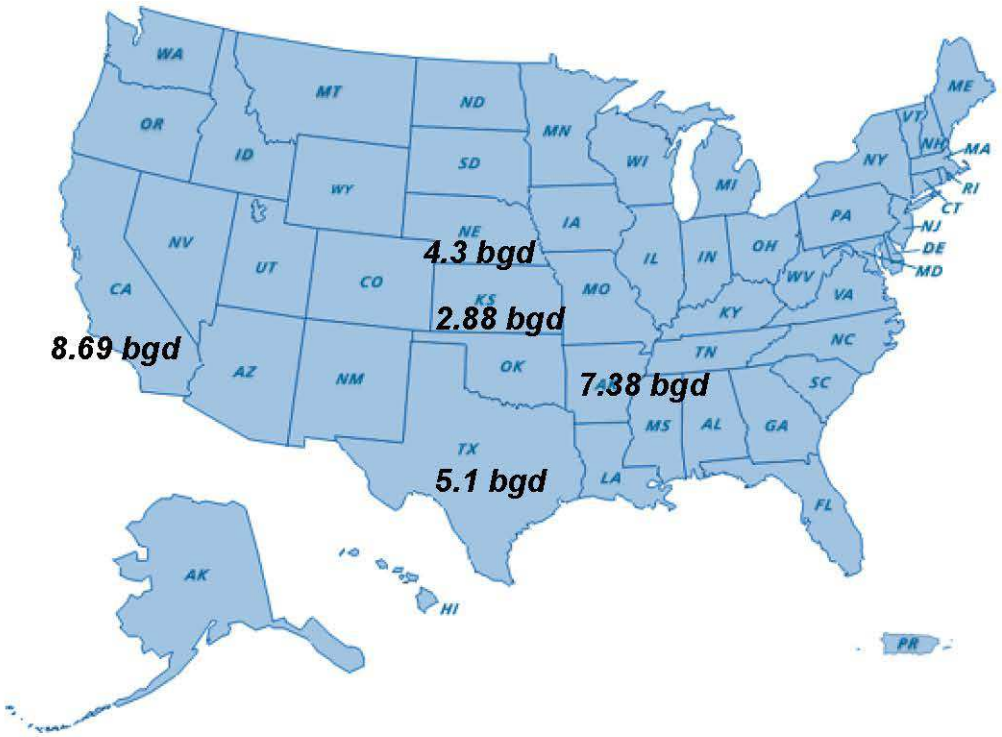
- 49.5 bgd – largest withdrawal sector
- 65.1% of total groundwater extraction
- 38.4% of total irrigation water use
- 476,000 irrigation wells serving 121,000 farms

Irrigation wells

	1998	2003	2008	2013
# of wells	374,956	374,806	407,913	475,796
Avg. well depth	238′	238′	243′	229′
Avg. depth to groundwater	93′	97′	100′	90′
Avg. pump capacity	844 gpm	819 gpm	779 gpm	722 gpm
Acres irrigated by groundwater	32,222,665	32,342,820	26,855,810	27,182,385
BGD withdrawn for irrigation	49.05 BGD (1995)	50.04 BGD (2000)	53.5 BGD (2005)	49.5 BGB (2010)

Source: US Dept. of Agriculture and US Census *Farm and Ranch Irrigation Survey*

Top 5 states: groundwater use for irrigation



Source: US Geological Survey's *Estimated Use of Water: 2010*, November 2014

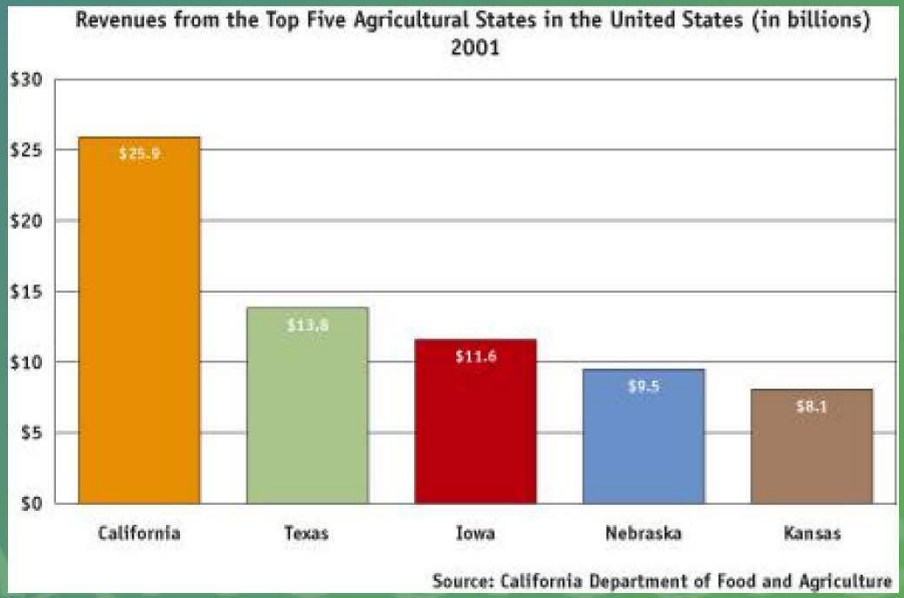
Western Agriculture

Before

The Central Valley is an arid region with little natural precipitation or water resources.

Yet it became one of the most productive agricultural regions in the world.

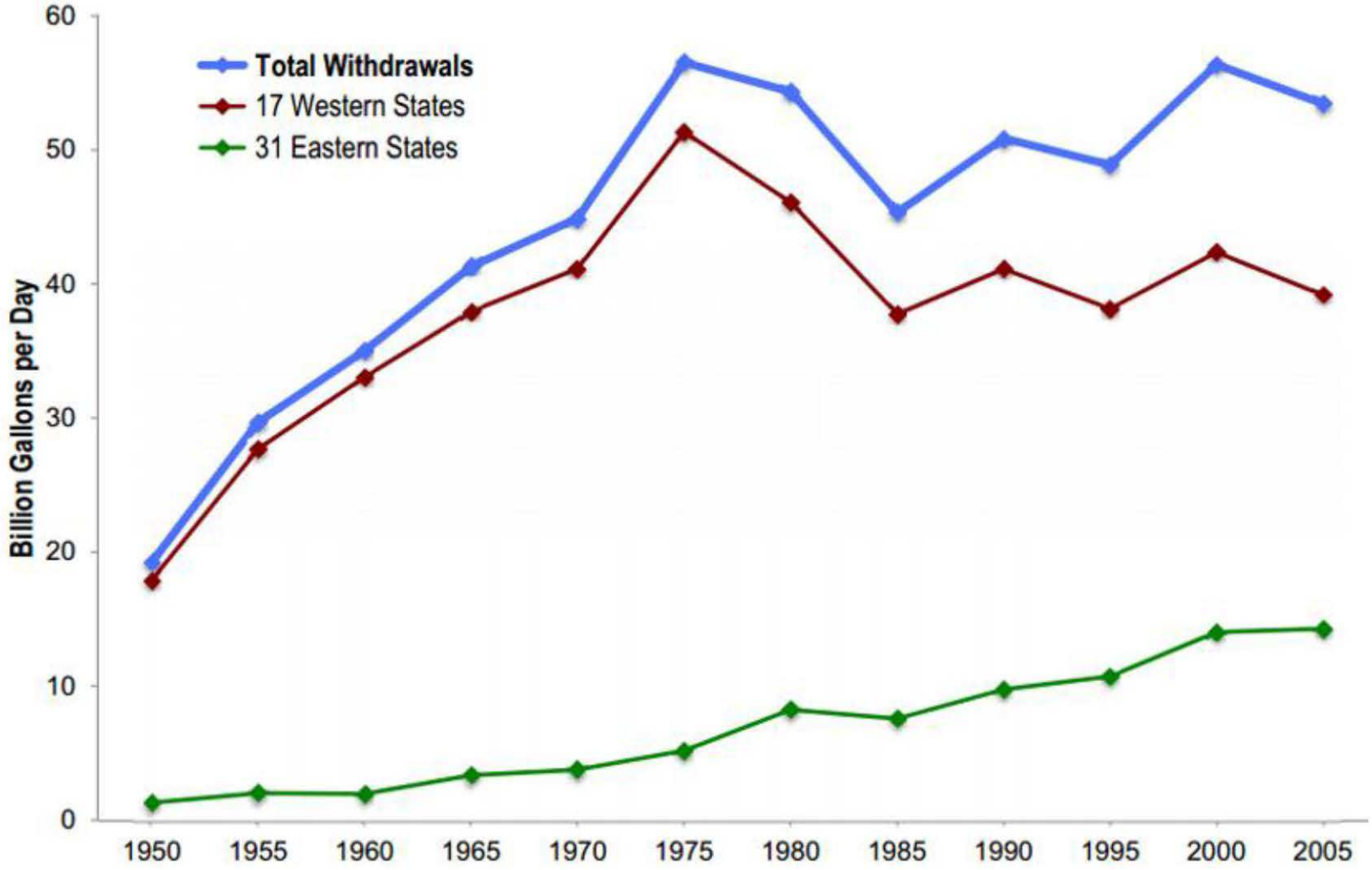
After

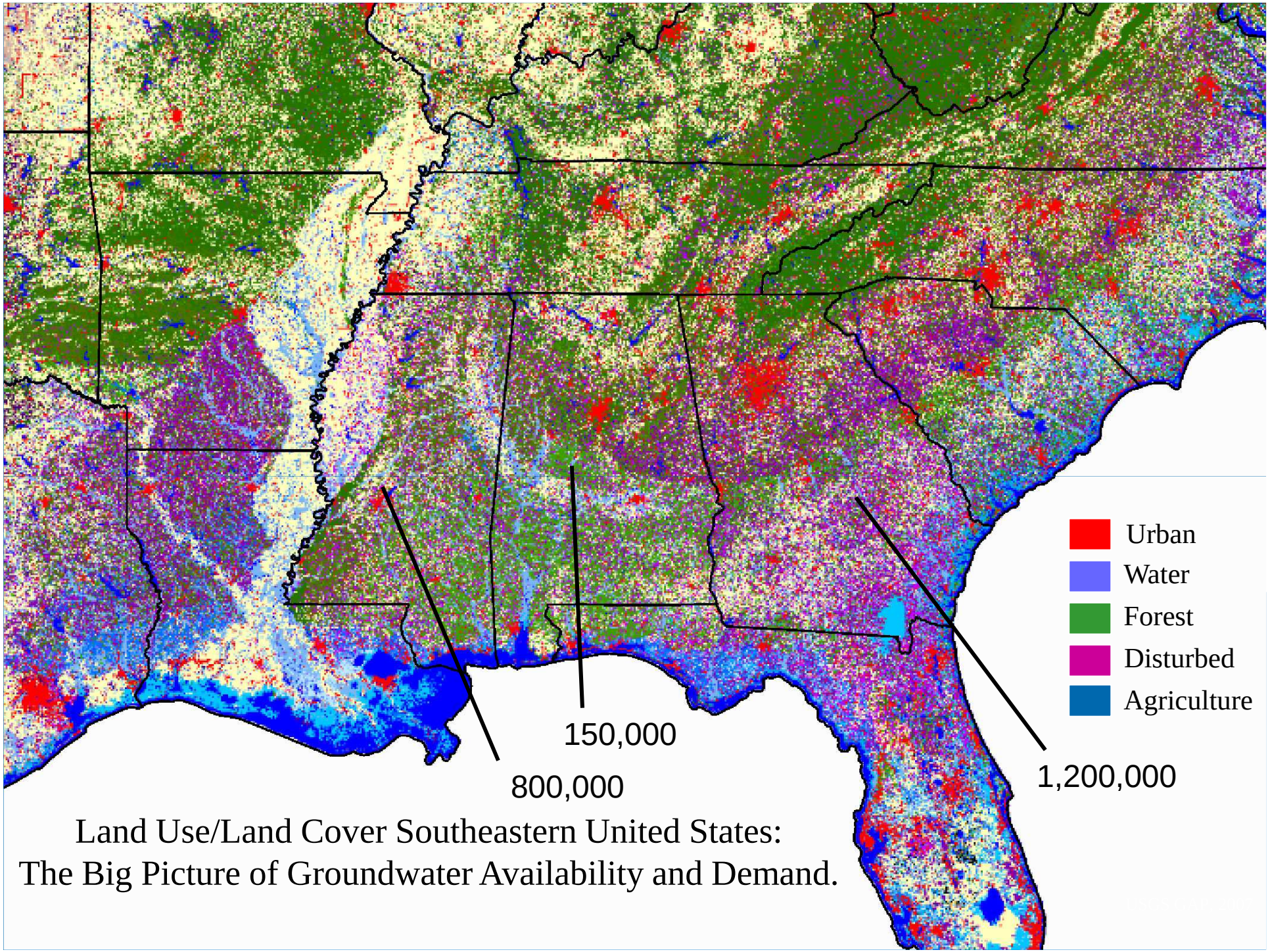


Southeastern Irrigation

Groundwater withdrawals for irrigation

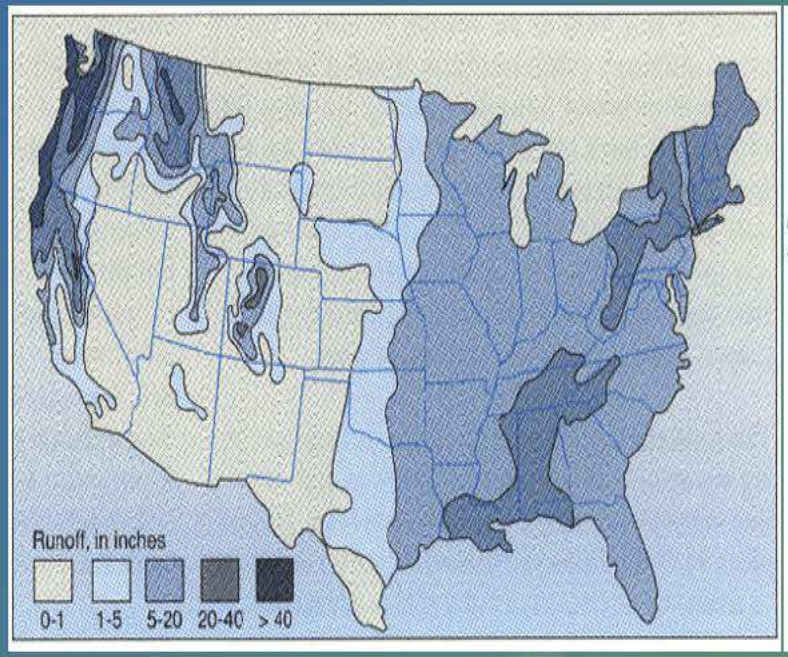
Is the west running out of water?



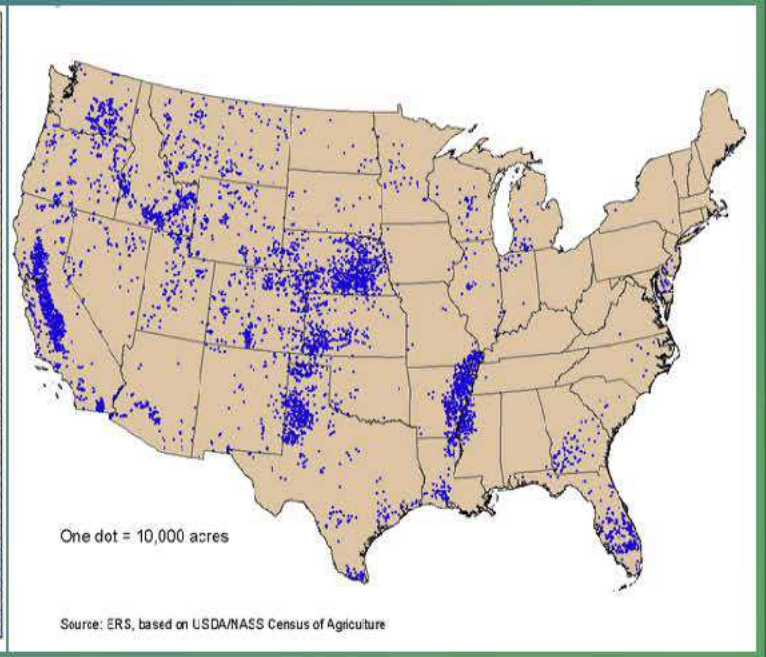


Land Use/Land Cover Southeastern United States:
The Big Picture of Groundwater Availability and Demand.

It is ironic that Alabama has lost its row crop agriculture in large part because of a lack of water



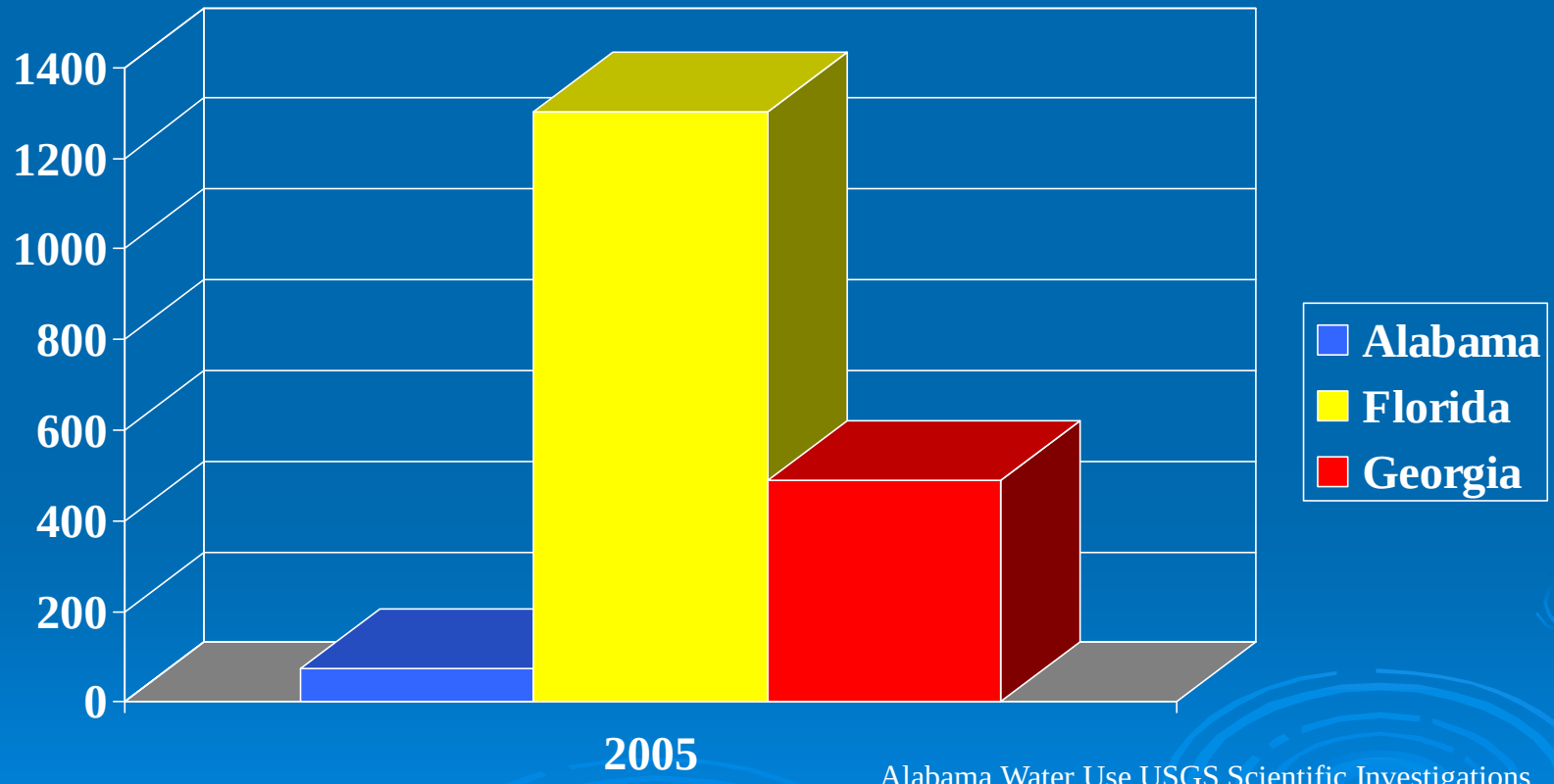
Water Run-off



Irrigated Acreage

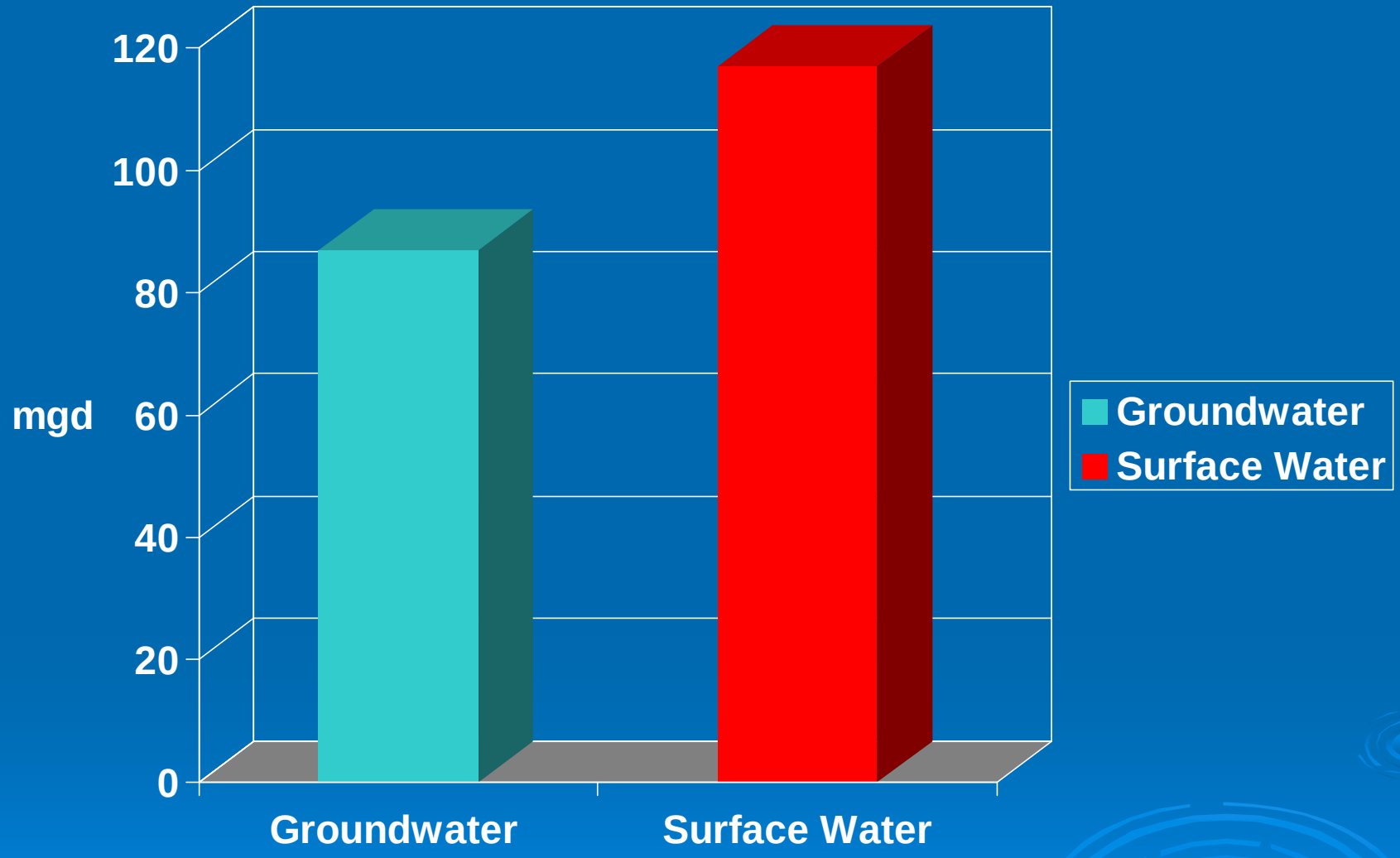
Southeastern Irrigation

Irrigation from Groundwater Sources, 2005 (mgd)



Alabama Water Use USGS Scientific Investigations Report 2009-5163
Florida Department of Environmental Protection and Florida Water Management Districts, 2008
Georgia Environmental Protection Division, 2009

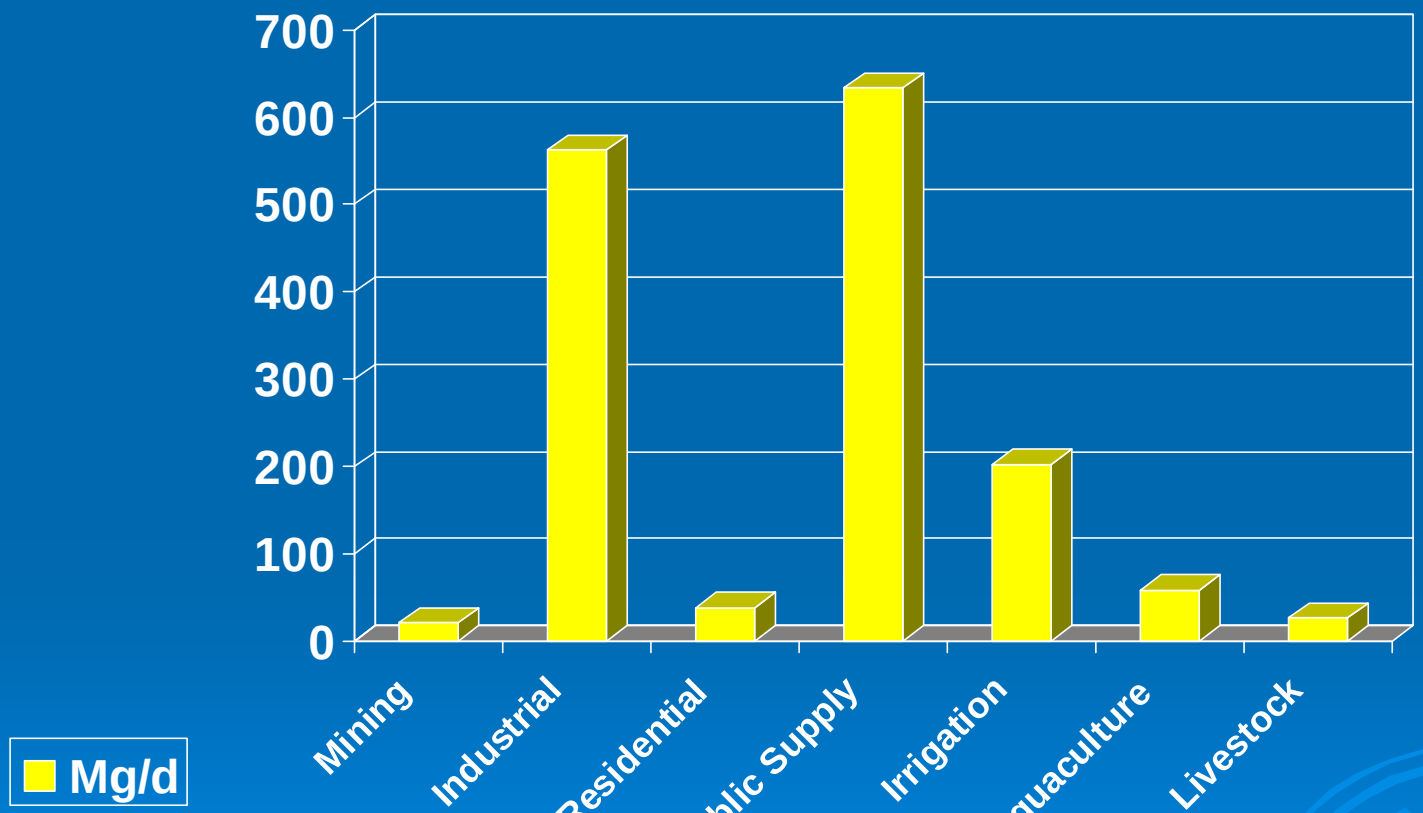
2010 Alabama Irrigation Water Use 202 mgd



Sources of water-use data,

OWR Estimated Use of Water in Alabama 2010

Alabama Water Use, 2010



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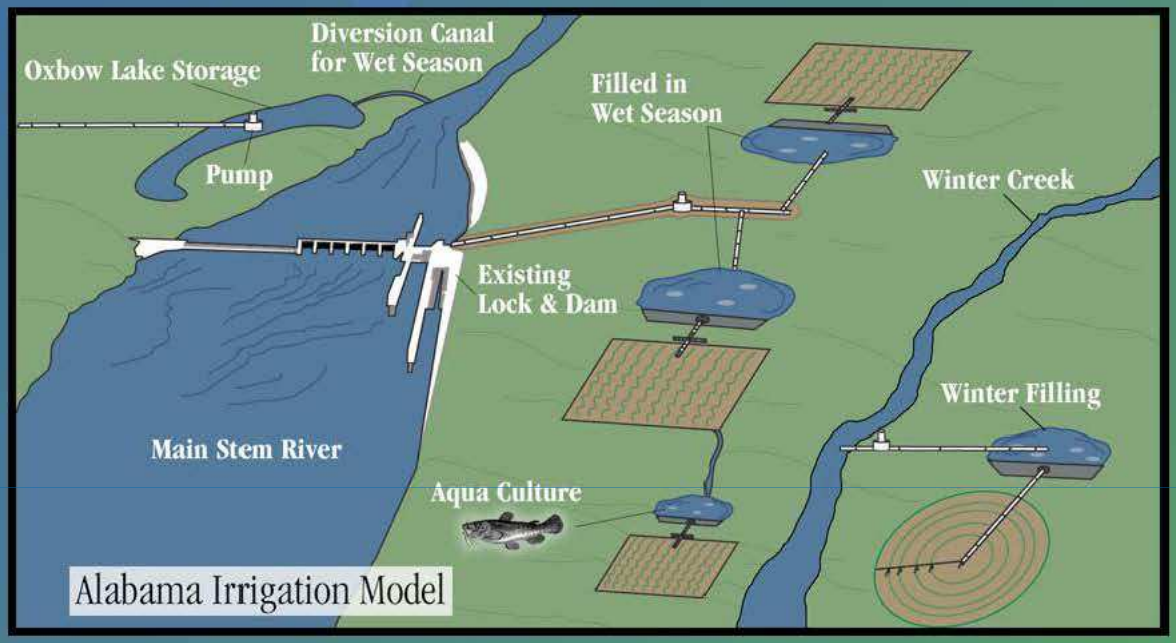
Potential Surface-Water Sourced Irrigation

Alabama Irrigation



Farmers would fill off-stream, on-farm ponds during the wet, winter season.

The ponds would be used to irrigated crops during the dry, summer growing season.

Potential Irrigated Acres in Alabama

Tennessee –430,000 acres

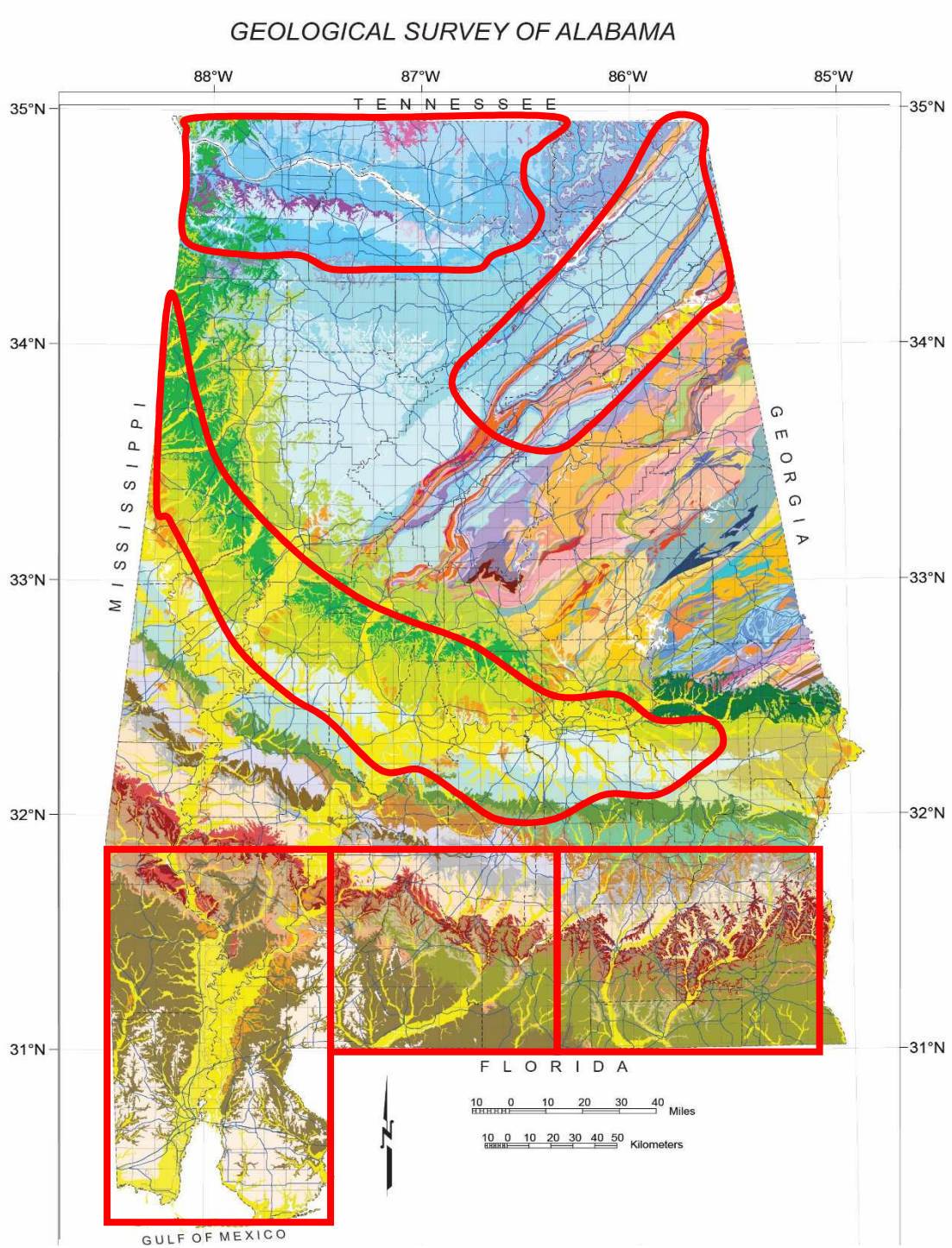
Tombigbee River – 258,816 acres

Alabama River - 385,472 acres

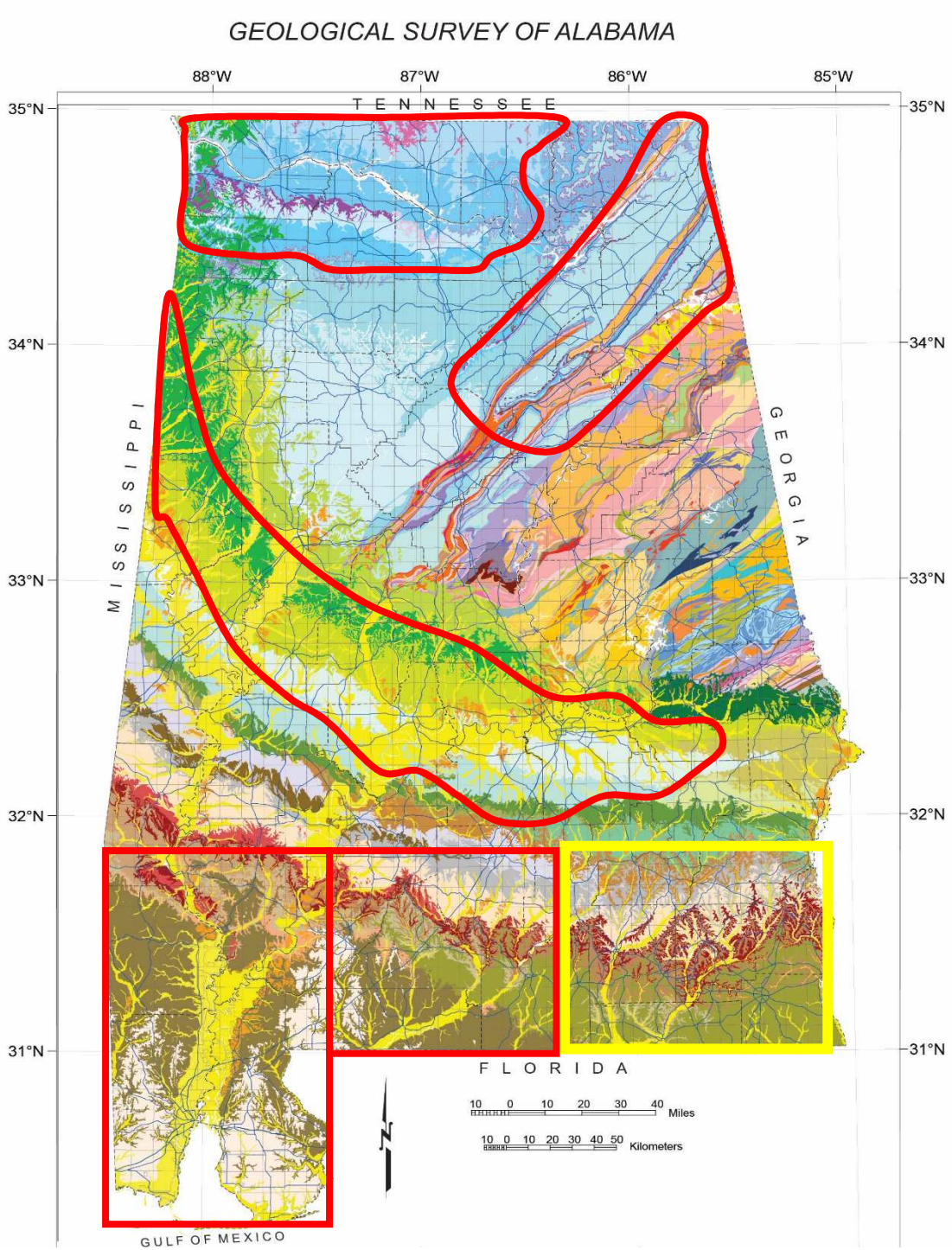
Southeastern Irrigation

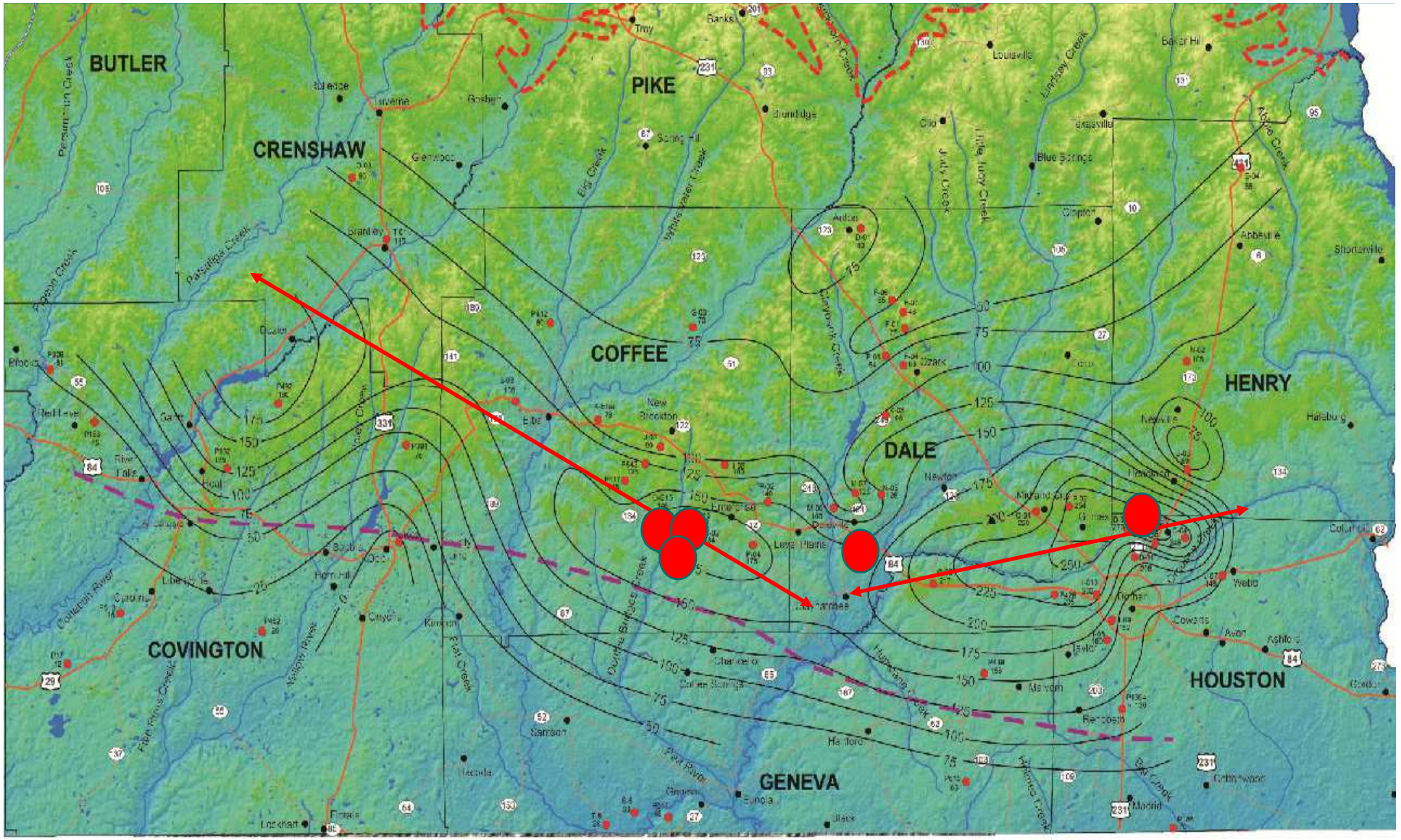

Potential Groundwater
Sourced Irrigation

Alabama Groundwater For Large-Scale Irrigation



Southeast Alabama Groundwater For Large-Scale Irrigation





Clayton Aquifer

Explanation

Economics of Irrigation Sources

Surface Water

- Construction cost for an upland irrigation impoundment was not available.

Groundwater

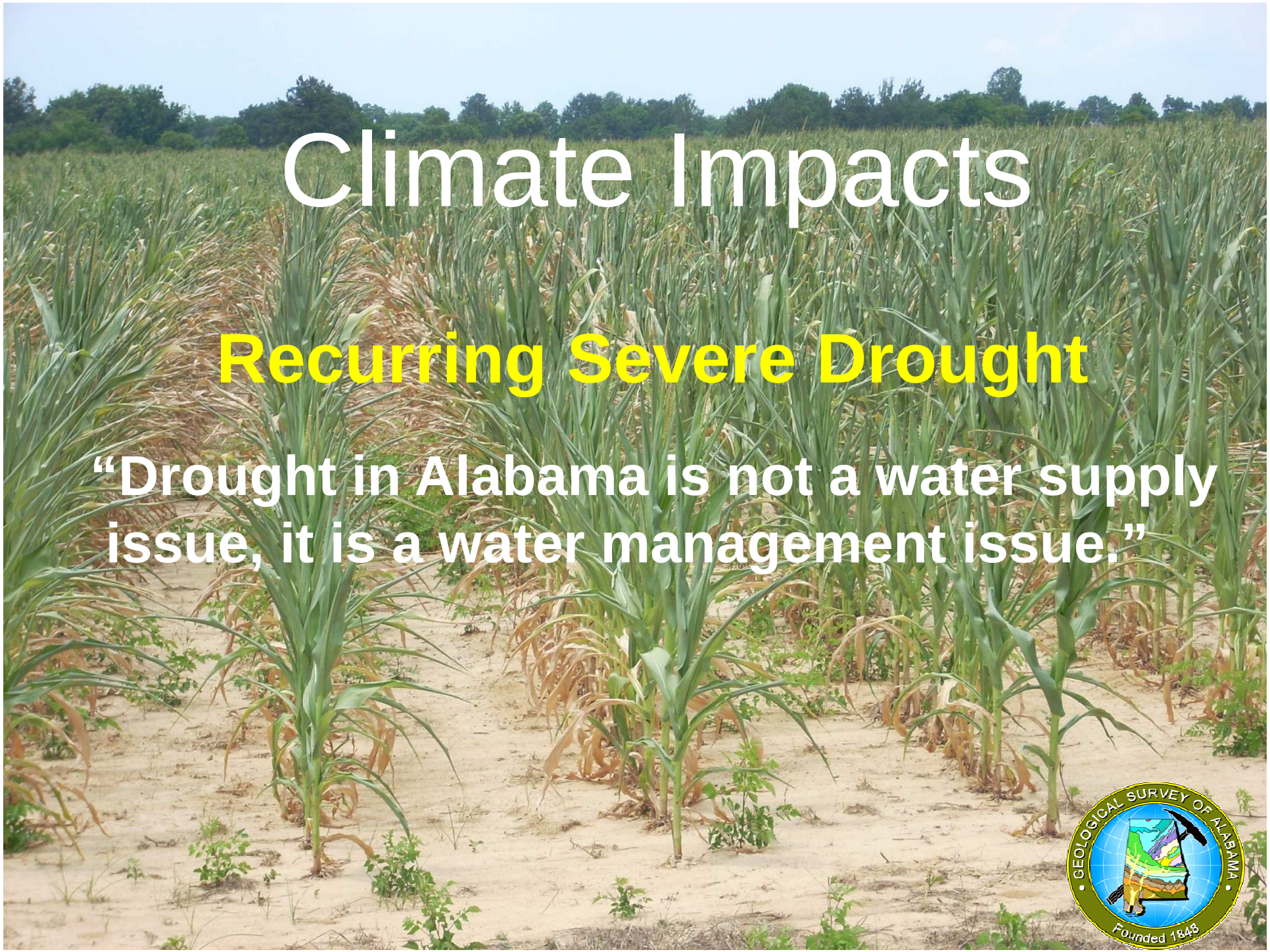
- Construction cost for irrigation wells capable of supplying a center pivot irrigation system:

North Alabama paleozoic carbonate well:

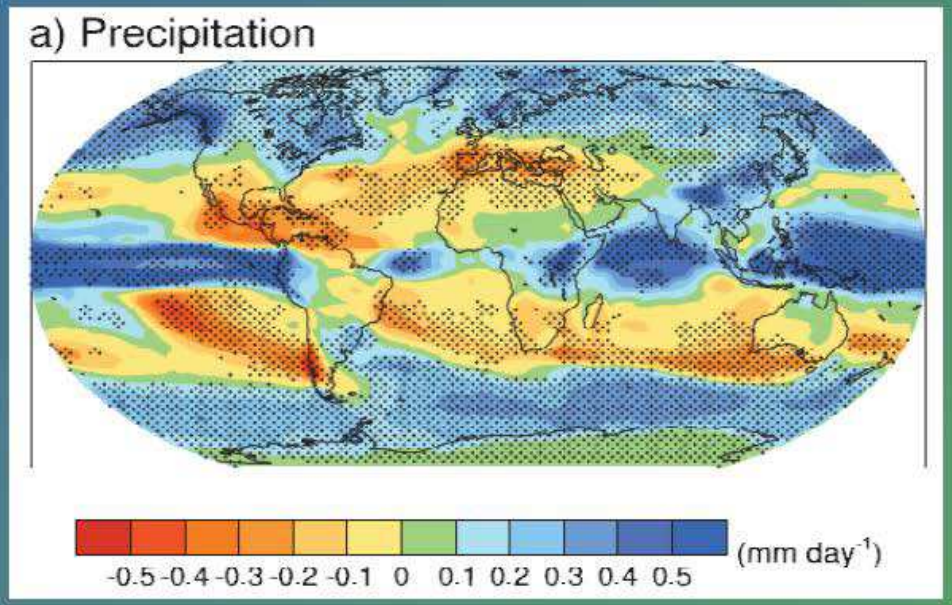
$58,000.00

Black Belt Cretaceous well: $150,000.00

Southeast Alabama Tertiary well: $59,000.00 to $130,000.00


Climate Impacts
Recurring Severe Drought
“Drought in Alabama is not a water supply issue, it is a water management issue.”
GEOLOGICAL SURVEY OF ALABAMA
Founded 1848

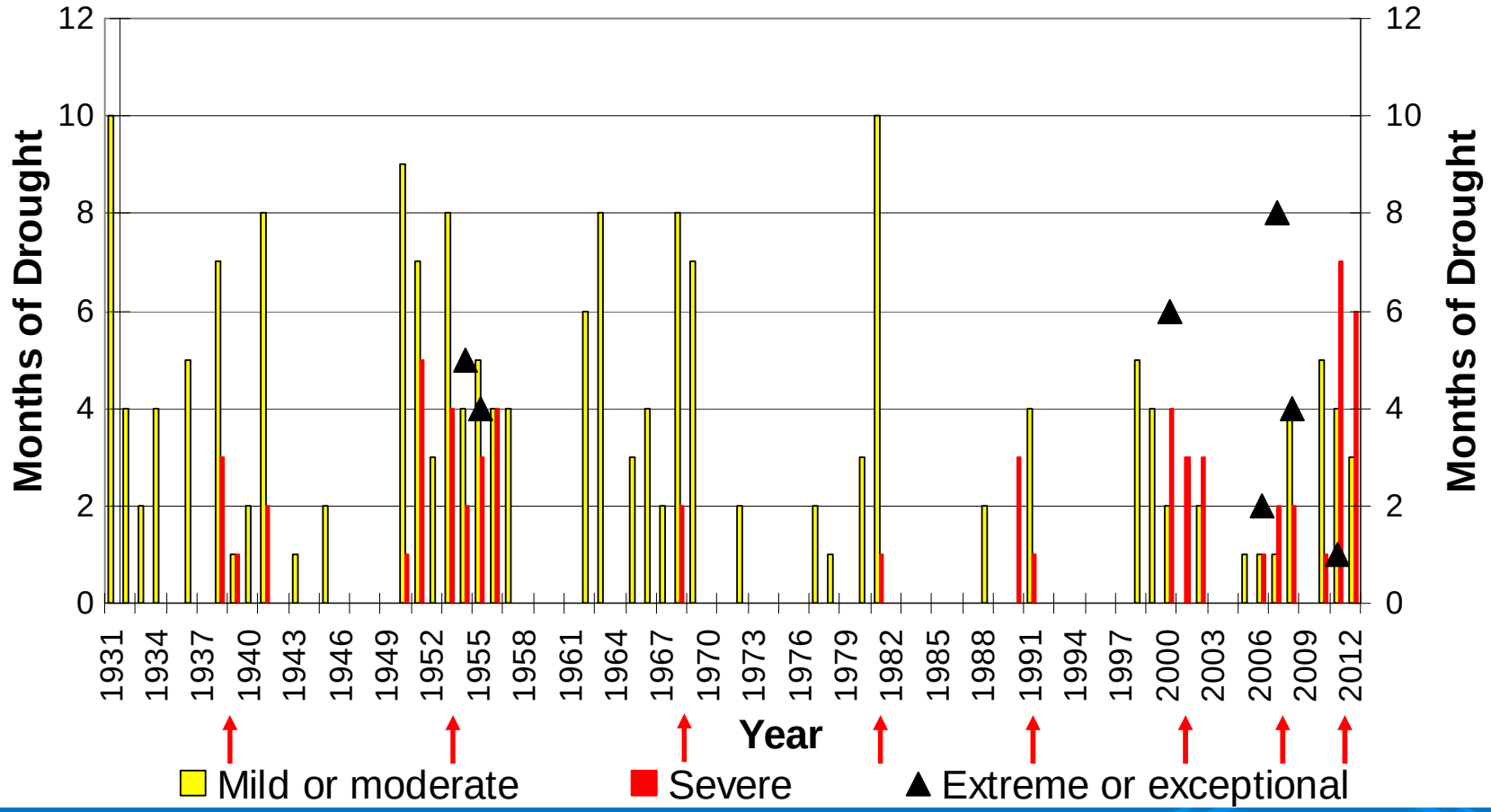
Climate models predict drying in the Southern High Plains and Southwest but no change or an increase in precipitation in the Southeast



According to Eike Luedeling, an expert in plant sciences at the University of California-Davis, higher temperatures and extended drought will likely **decimate the state's $10 billion fruit and nut industry**.

Southeastern Irrigation

Occurance of Drought in Alabama 1931-2012



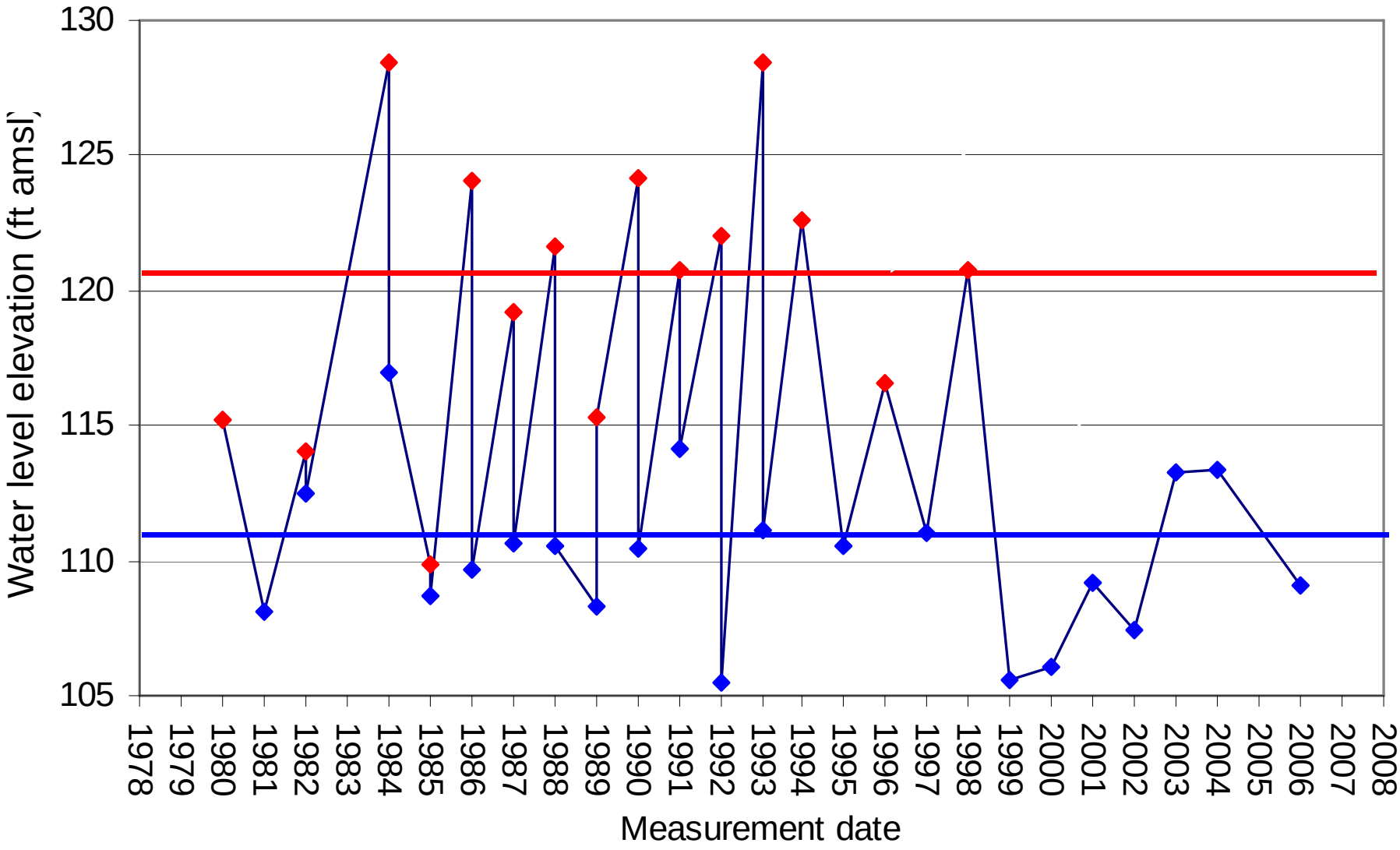
Alabama Water Resource Management and Policy Development

Water resources should be managed in a sustainable manner to support the State's economy, to protect natural systems by maintaining a safe yield and to enhance the quality of life for all citizens.

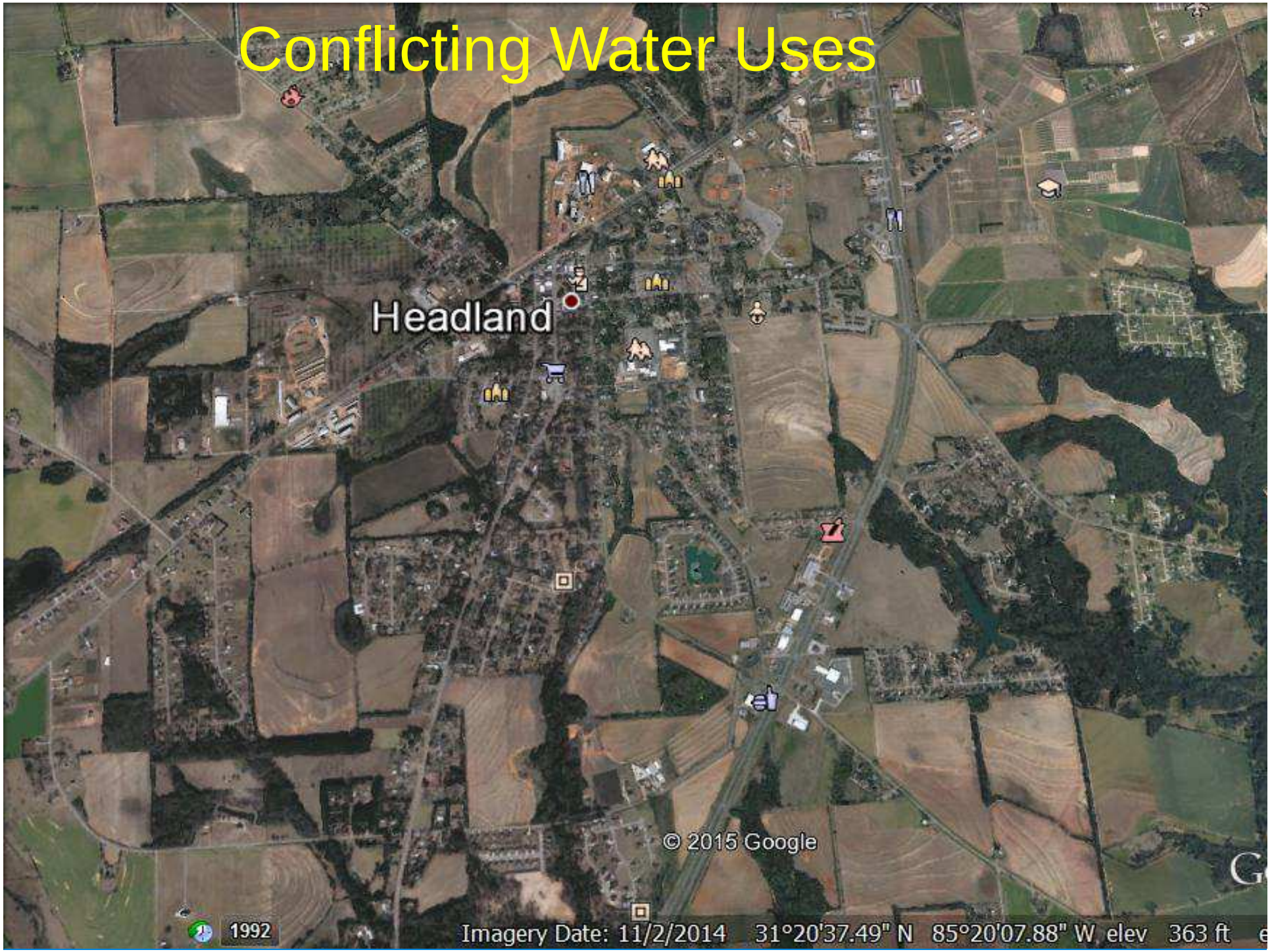
Benefits of Water Resource Sustainability

- Plentiful public water supply
- Sustained and maximized agricultural yields
- Adequate industrial process water
- Waste water assimilation and treatment
- Economic growth
- Habitat and species support
- Quality of life

Hydrograph of Crystal River aquifer irrigation well X-2, Houston County, Alabama.



Conflicting Water Uses



Well capture zone and spacing data for southeast Alabama aquifers

Aquifer	Range of residual drawdown (feet)	Average capture zone area (mi^2)	Optimum well spacing (miles)	
			Along strike of hydraulic gradient direction	Up or down gradient direction
Gordo	0-154	1.9	1.5	2.0
Ripley	0-149	2.6	1.0	2.5
Clayton	0-204	2.0	1.0	2.0
Nanafalia	0-189	1.2	1.0	2.0
Tallahatta	1-119	0.5	1.0	1.5
Tuscahoma	31-119	3.5	1.5	2.5
Lisbon	0-33	0.6	1.0	1.0
Crystal River	0-27	1.0	1.0	1.0

Impacts of Increased Irrigation

- Sustainable, maximized agricultural yields.
- Positive economic impact.
- Increased possibility of water conflicts.
- Necessity for adequate water resource management.
- Increased nonpoint source contaminant sources.
- Potential for negative impacts on species and habitats.


QUESTIONS?