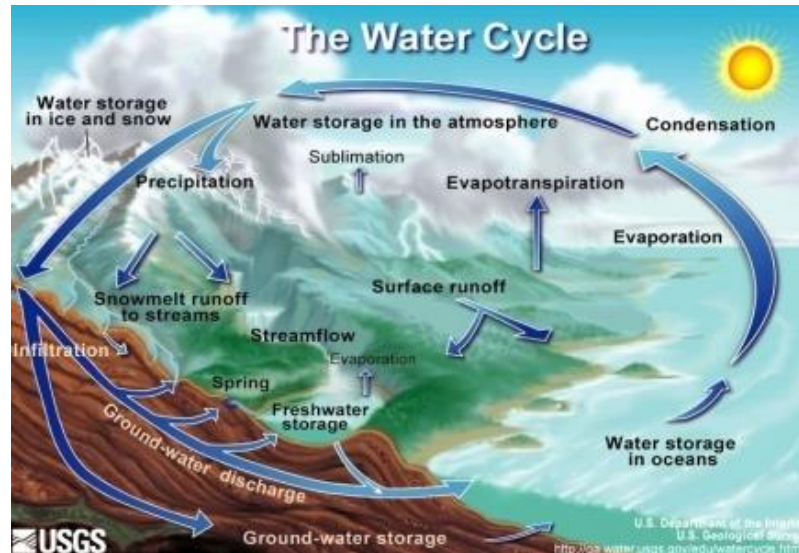


Water Resources of the United States

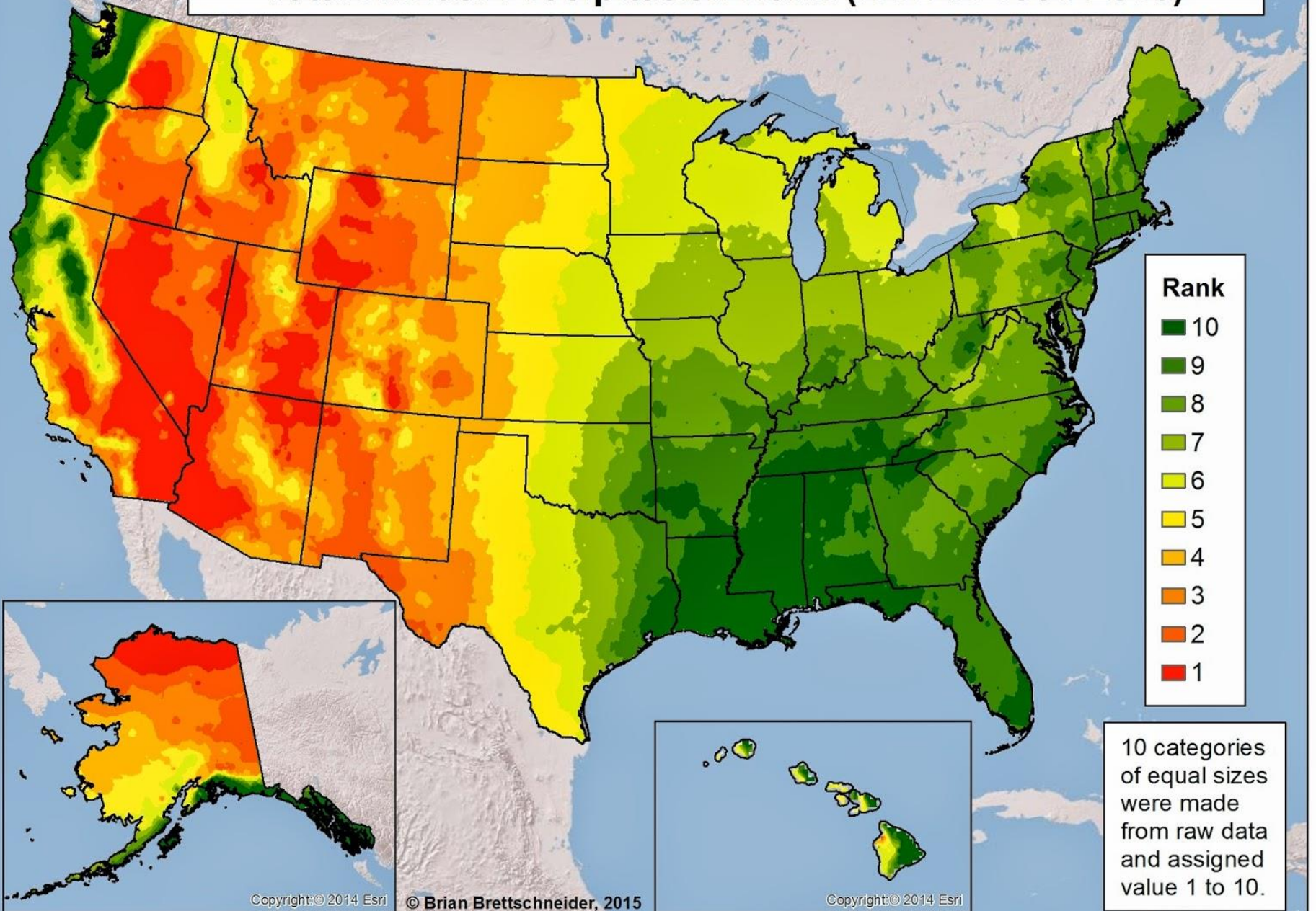
James Cruise and Lee Ellenburg

Earth System Science Center

University of Alabama in Huntsville



Total Annual Precipitation Rank (NCDC: 1981-2010)



Rank

- 10
- 9
- 8
- 7
- 6
- 5
- 4
- 3
- 2
- 1

10 categories of equal sizes were made from raw data and assigned value 1 to 10.

National Forest Service Water Supply Stress Index Model

$$\text{WASSI} = \frac{\text{Total Water Demand}}{\text{Water Supply}}$$

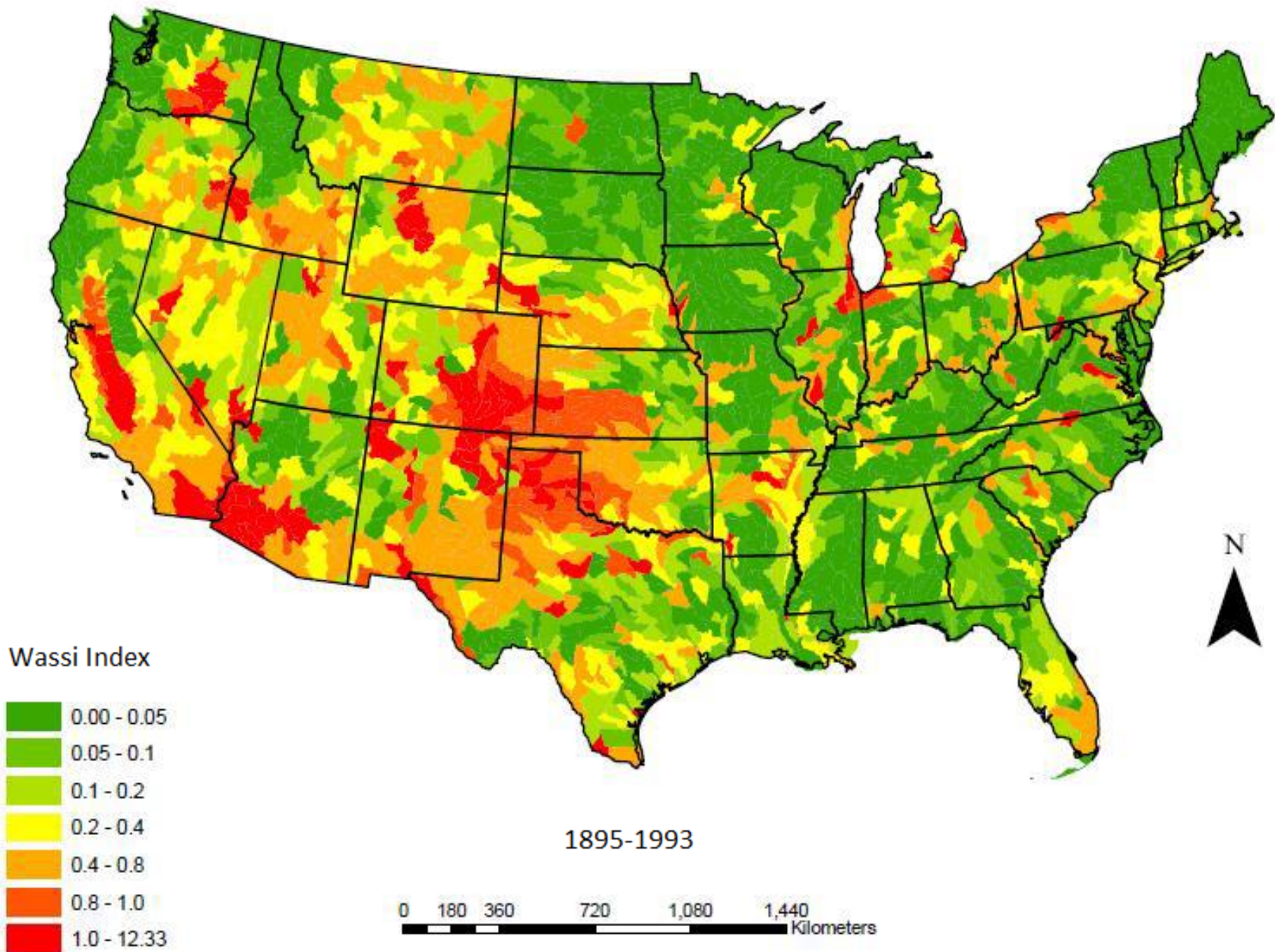
Water Demand is sum of uses from 7 private sectors plus public use

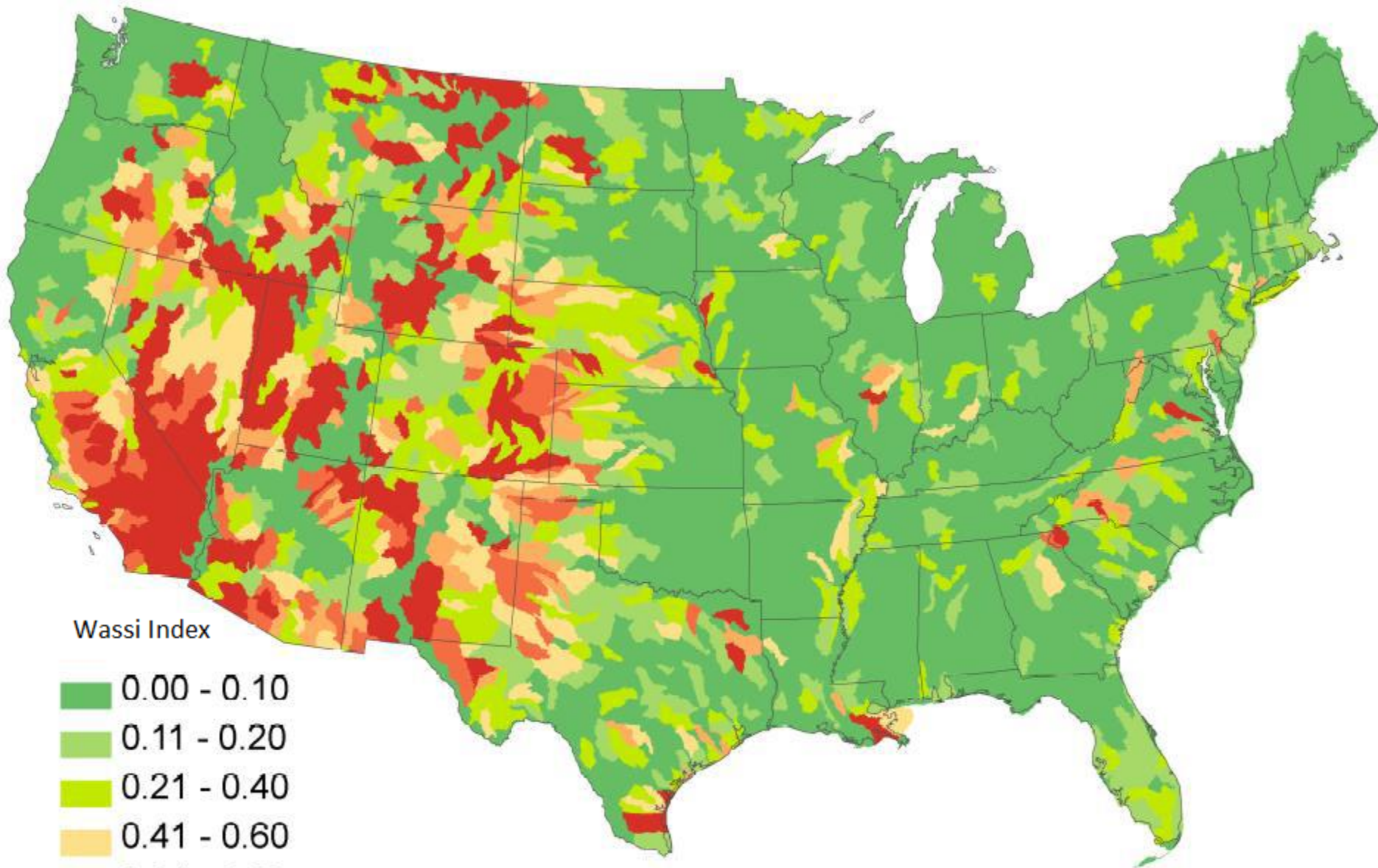
Water Supply is computed from the hydrologic model plus groundwater supplies plus return flows

Return flows are taken as percentages of withdrawals for the use sectors

Water Demand Sectors and Return Flow Percentages

	Return %
Domestic	>80
Industrial	>65
Irrigation	0
Livestock	0
Mining	>95
Thermopower	>95
Aquaculture	0
Public Supply	>70

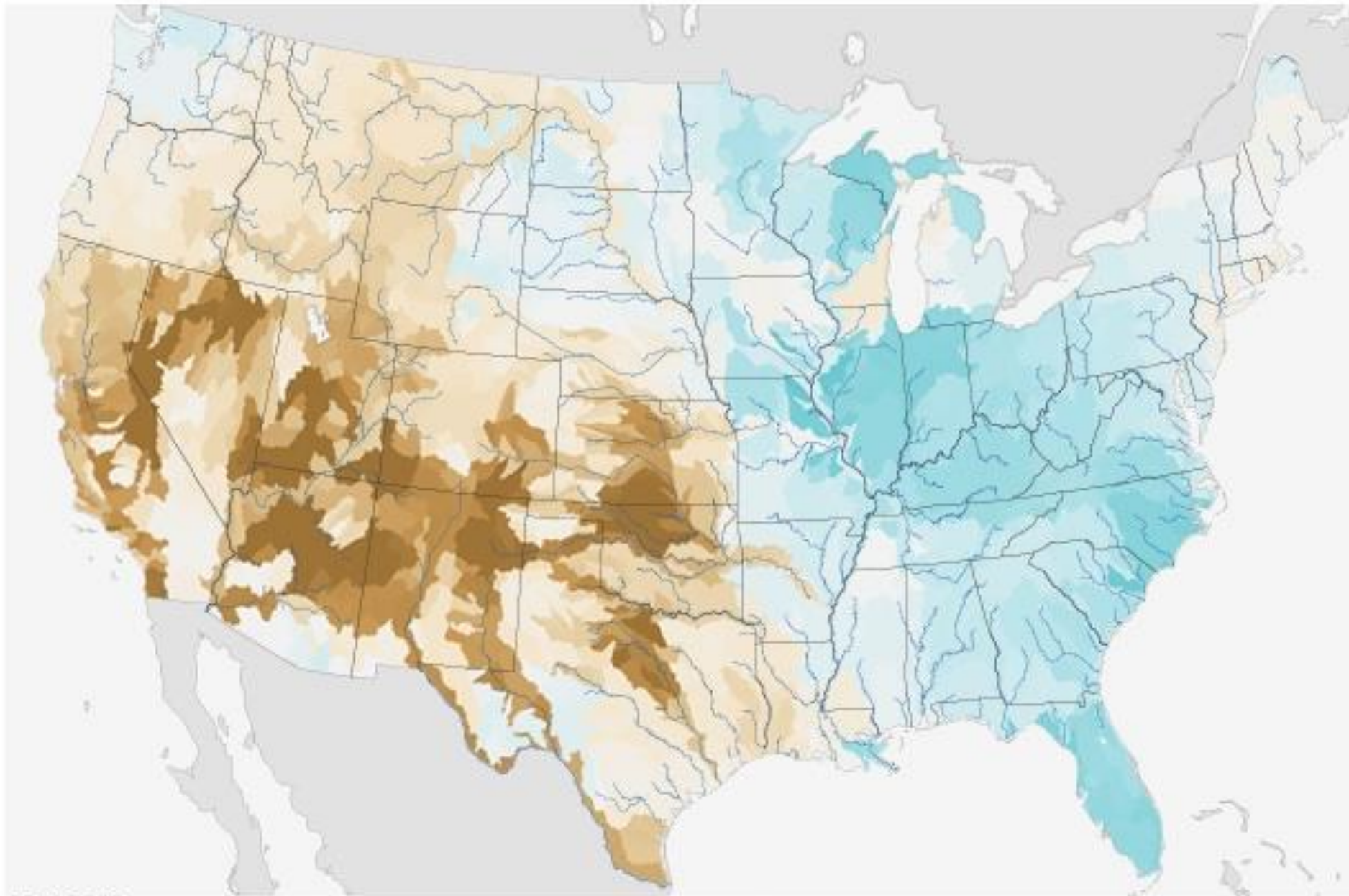




Wassi Index

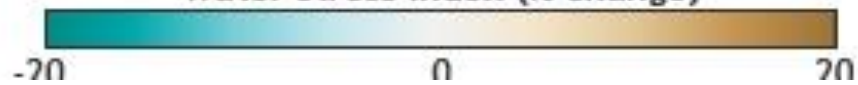
- 0.00 - 0.10
- 0.11 - 0.20
- 0.21 - 0.40
- 0.41 - 0.60
- 0.61 - 0.80
- 0.81 - 1.00
- >1.00

1981-2000



2041-2060 compared
to 1900-1970

Water stress index (% change)



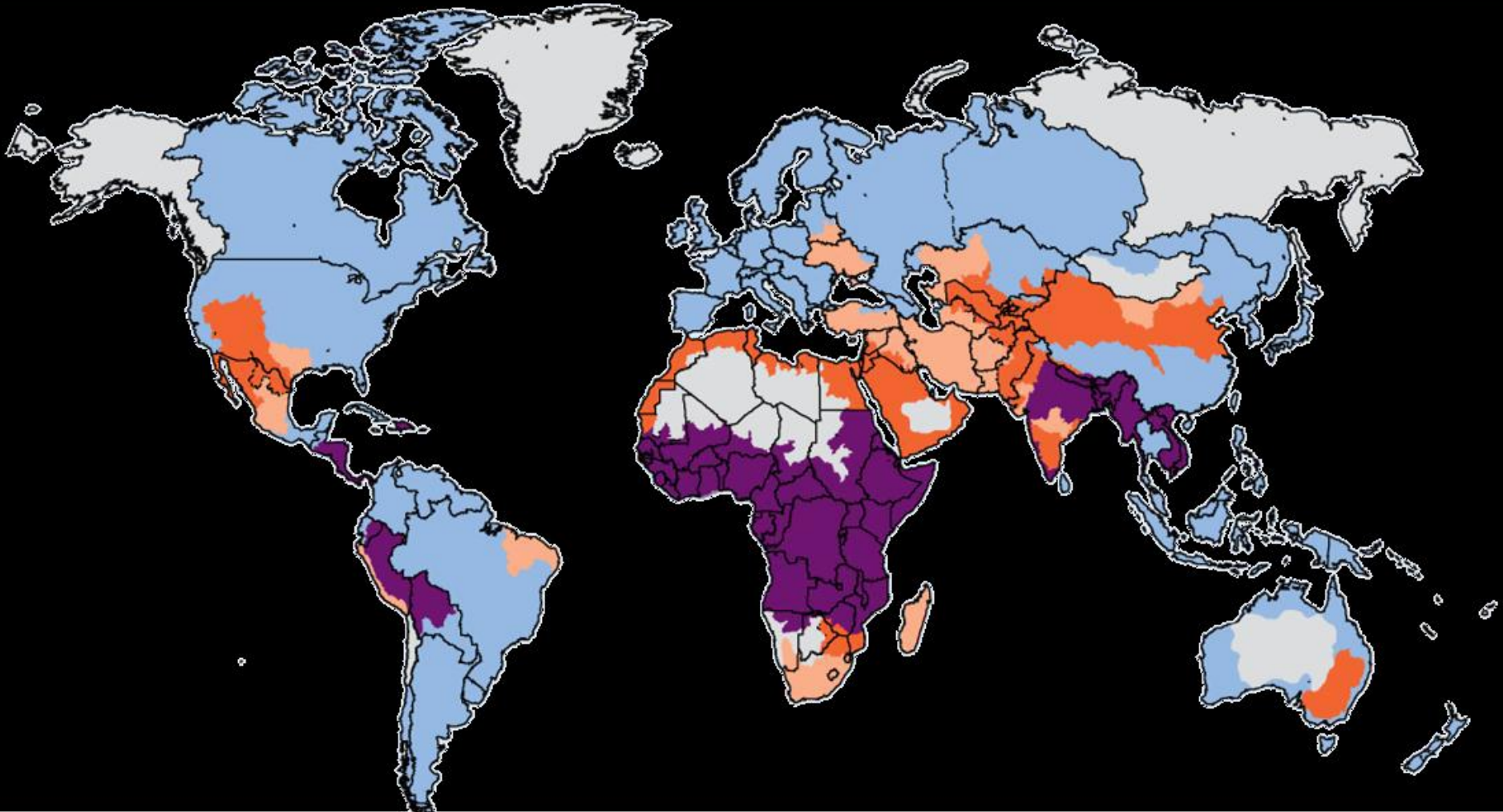
Little or no water scarcity

Approaching physical water scarcity

Not estimated

Physical water scarcity

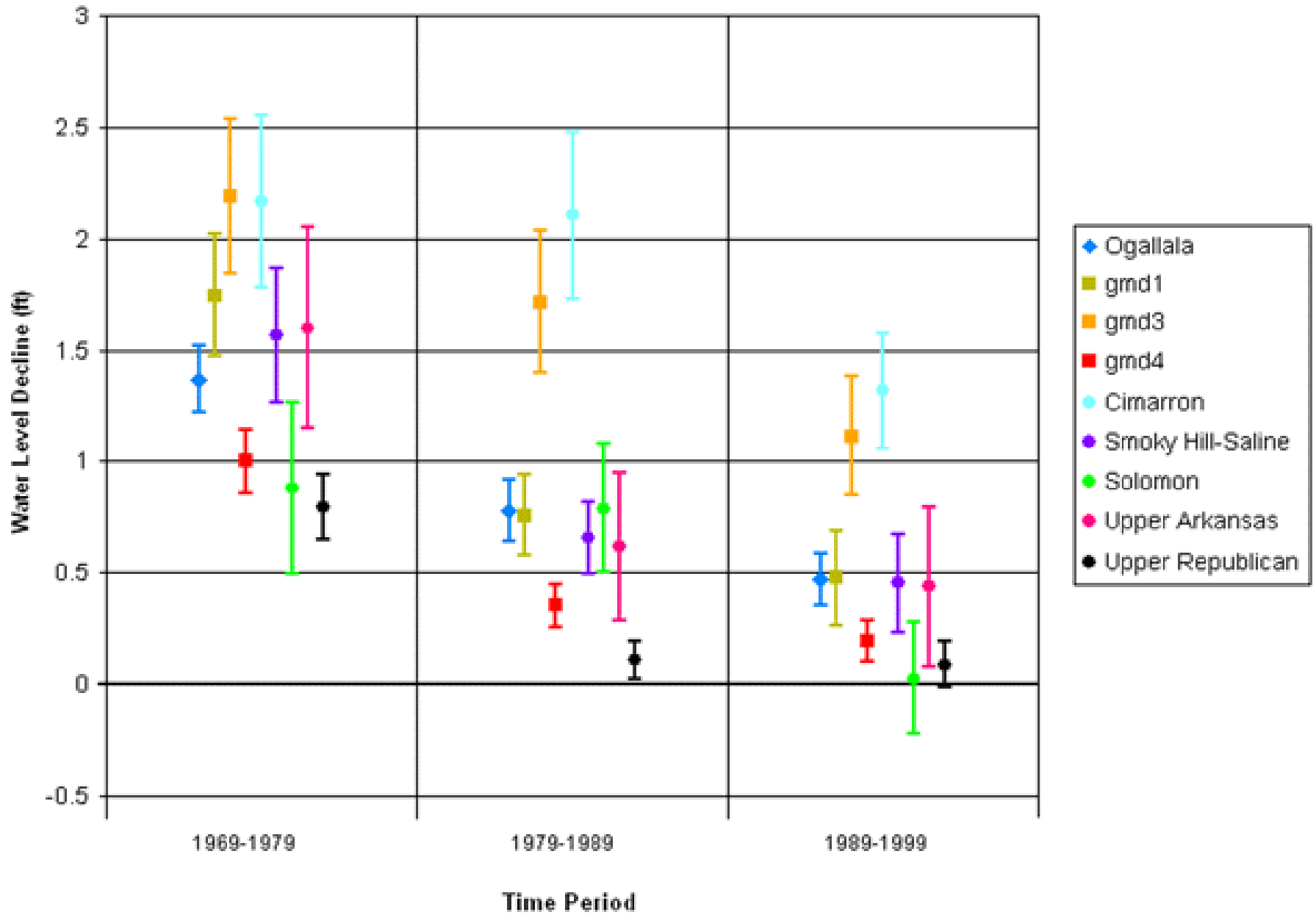
Economic water scarcity



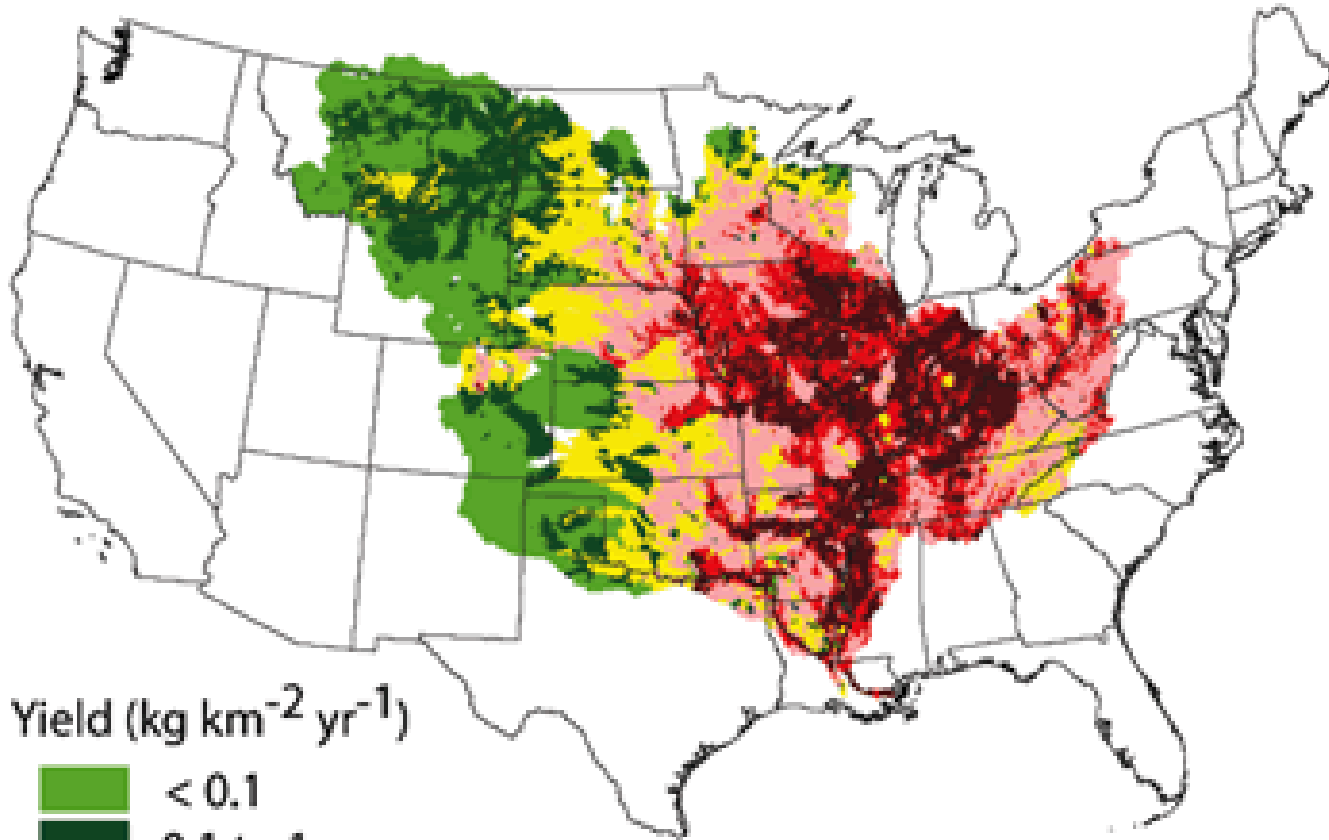
Map of US Aquifers



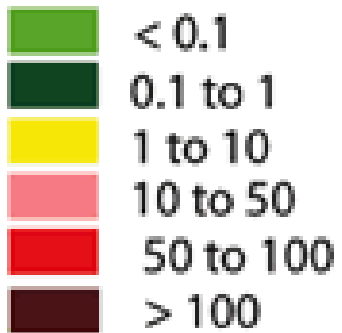
RATE OF DECLINE (HIGH PLAINS AQUIFER)



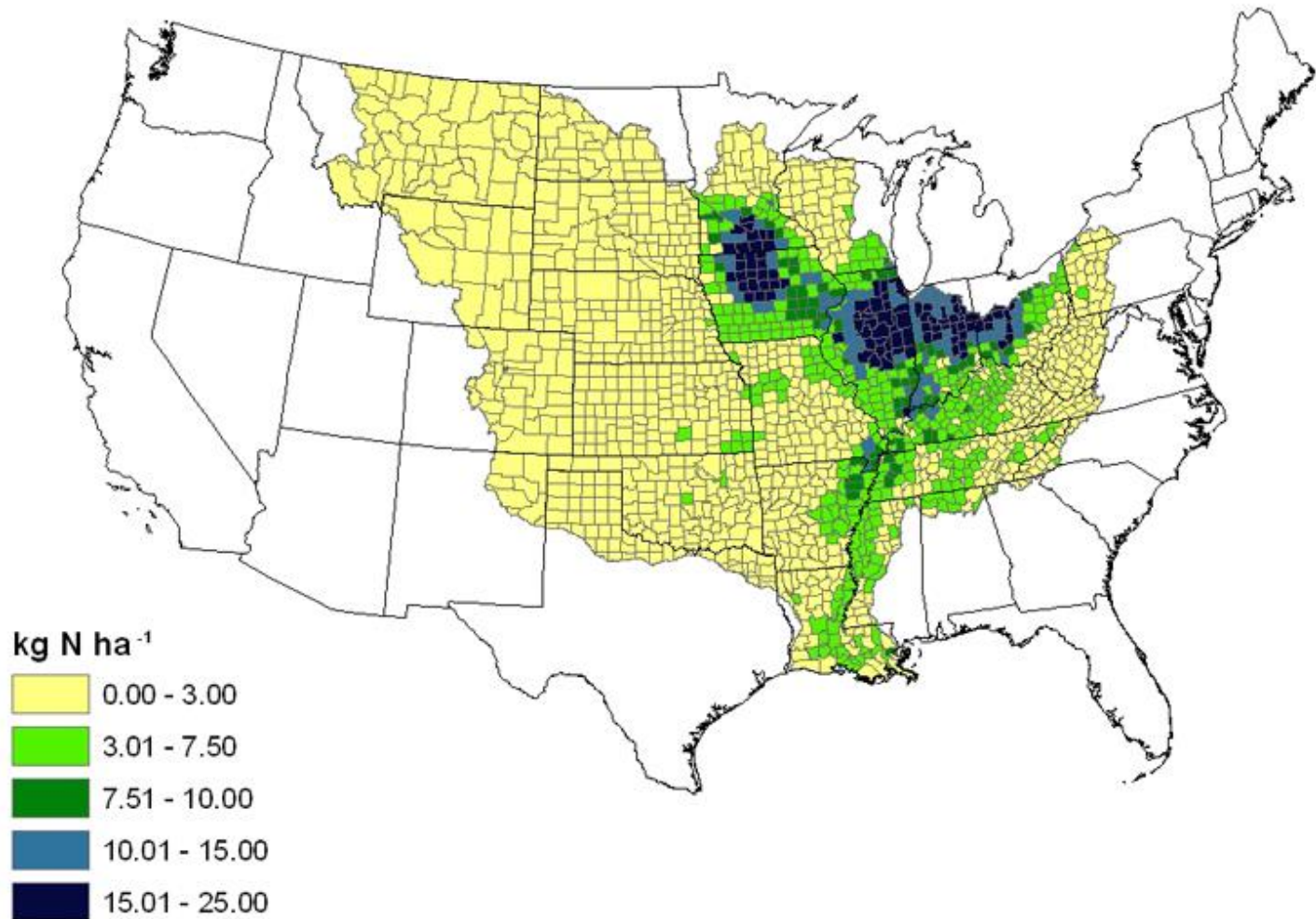
Average Nutrient Yield 2008



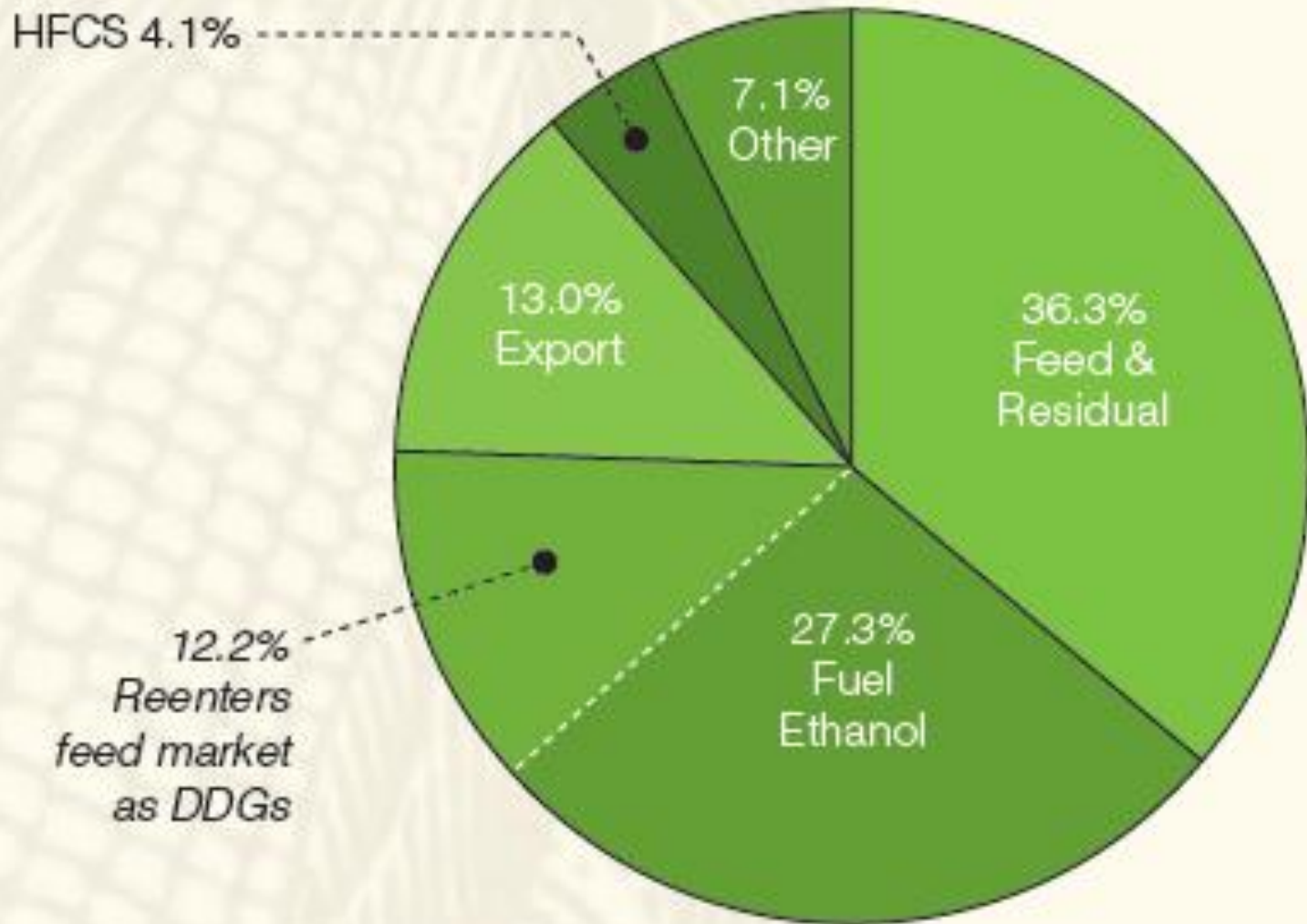
Yield (kg km⁻² yr⁻¹)



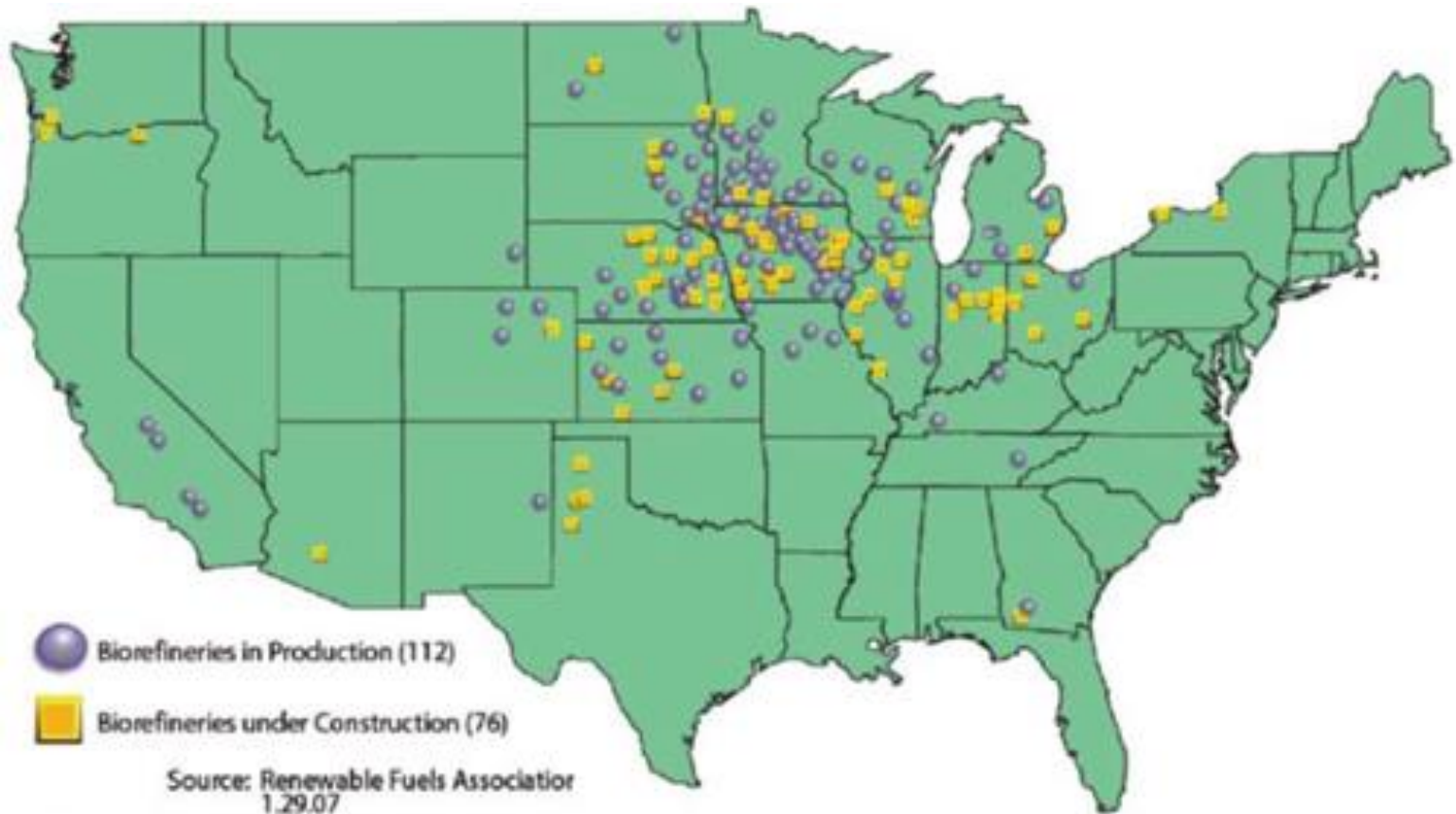
Nitrogen Yield from Tiled Fields



U.S. CORN USAGE BY SEGMENT, 2011

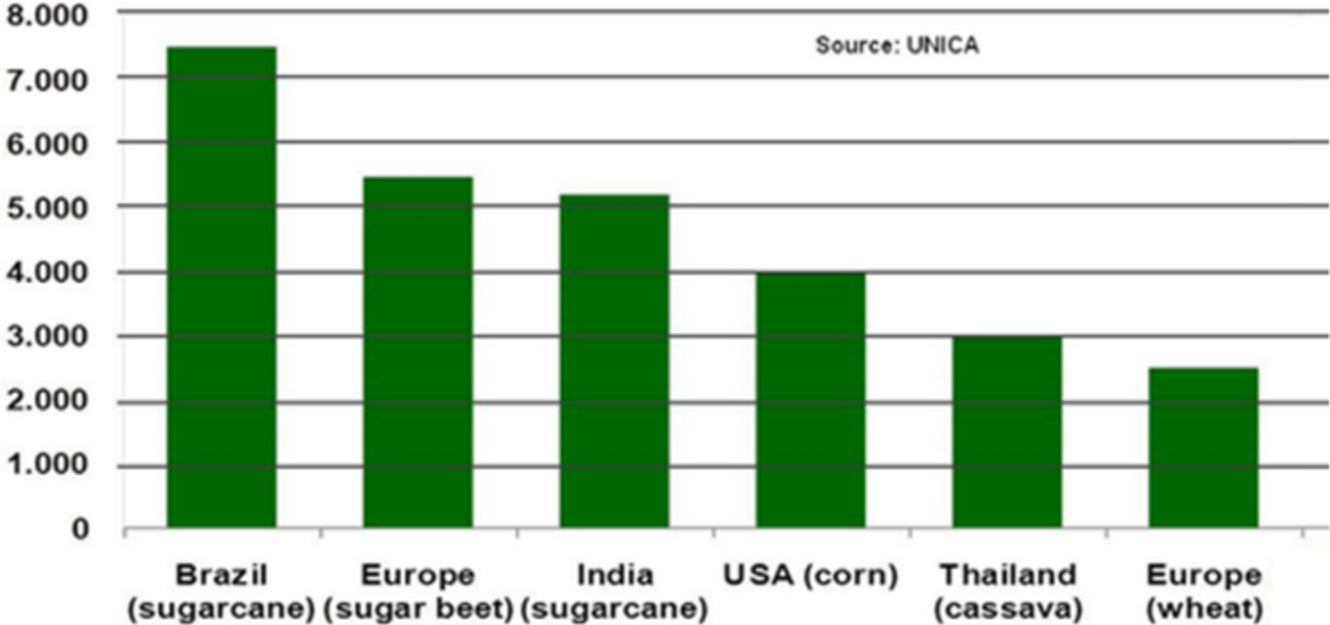


Ethanol Plant Locations



Benchmarking Ethanol Productivity

(liters/ha)

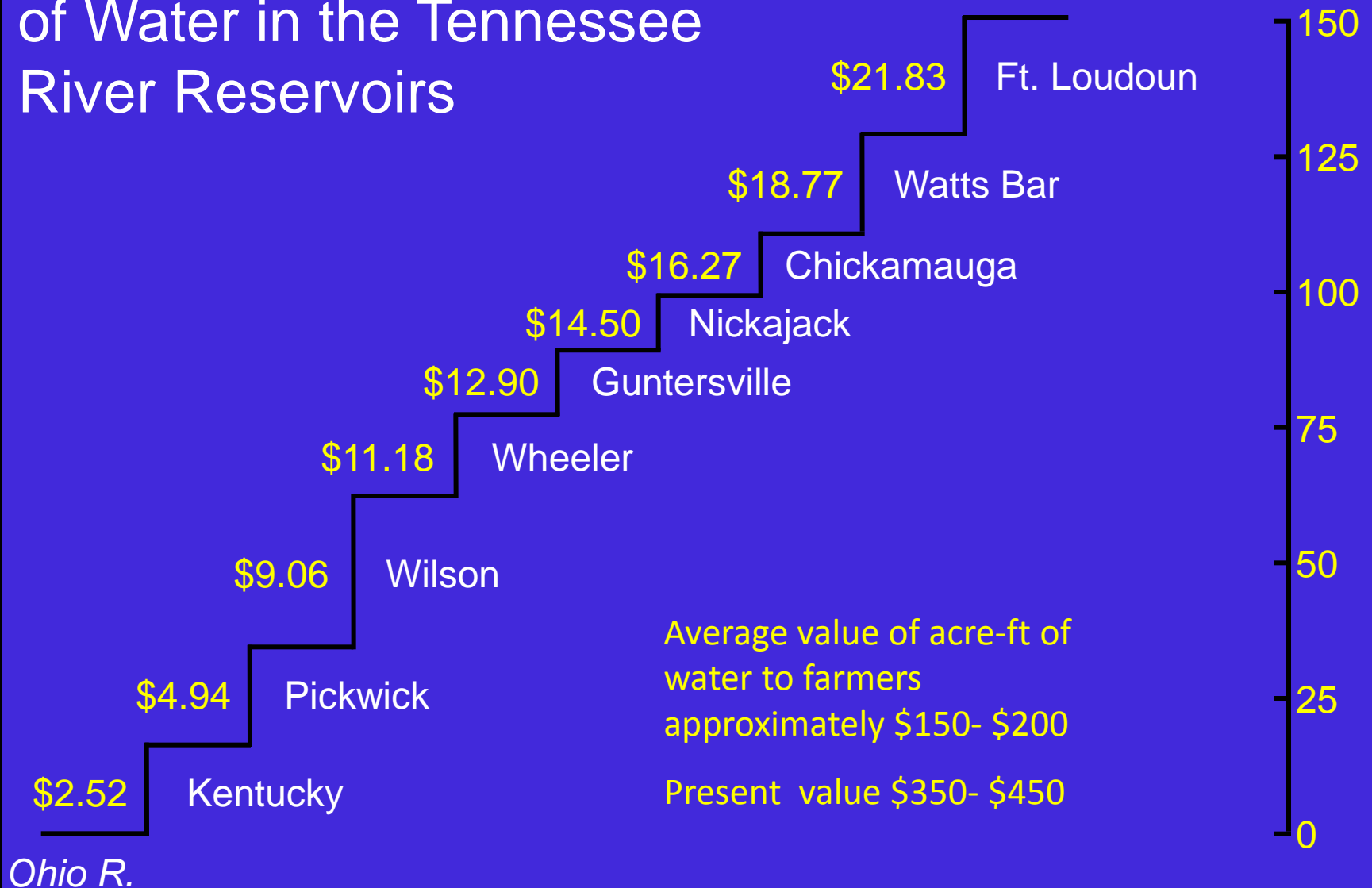


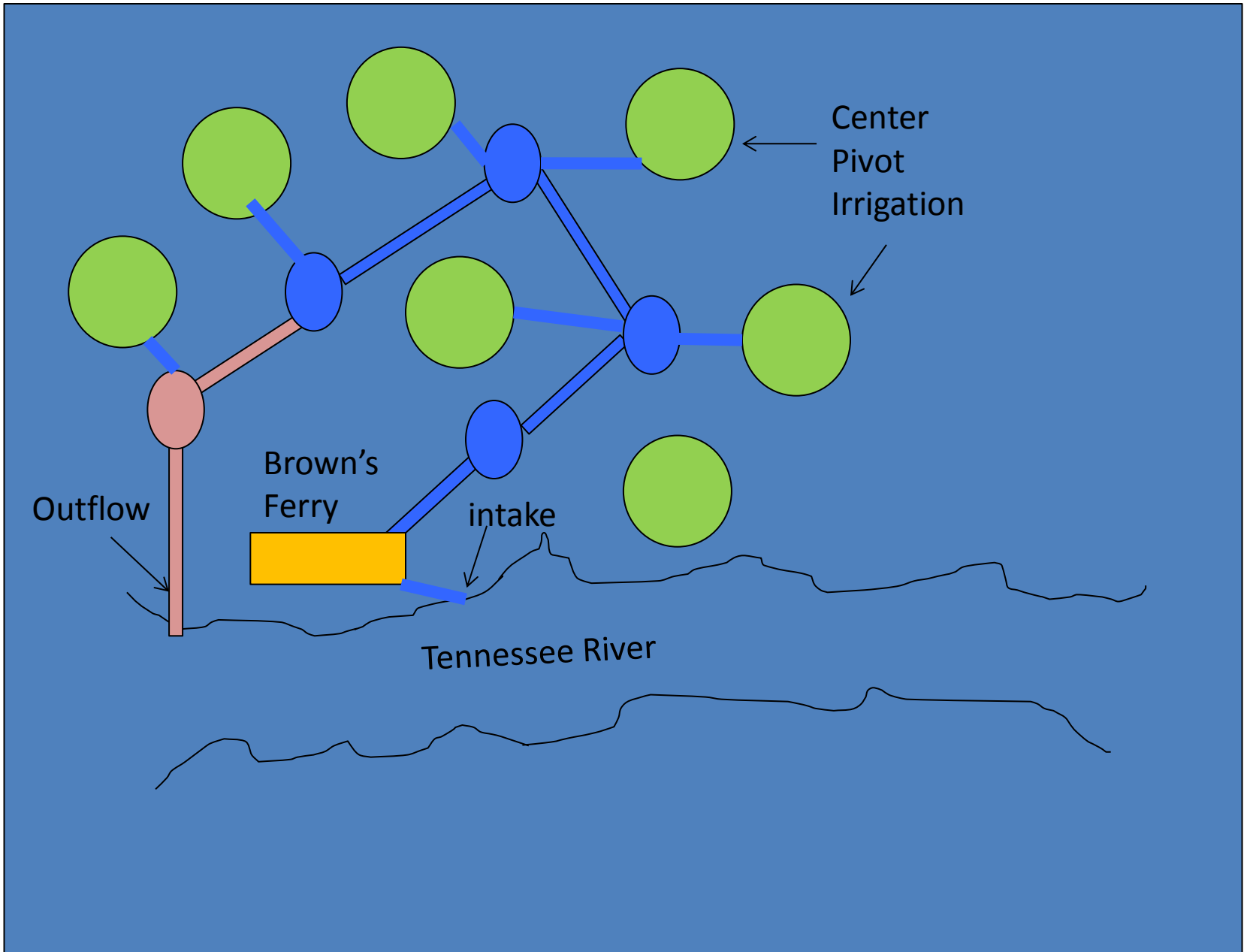
Electric Power Production in the Southern US

State	Conventional Hydro MWh	Total MWh	Total Renewables MWh	Hydro as a % of total	Hydro as a % of renewable	Powered & Non-powered Dams
Alabama	12,646,761	150,408,400	15,895,760	8.41%	79.56%	2,228
Arkansas	2,708,798	60,493,940	4,362,800	4.48%	62.09%	1,229
Delaware	–	7,615,925	122,000	0.0%	0.0%	86
District of Columbia	–	60,215	–	0.0%	–	0
Florida	197,626	219,724,500	4,815,630	0.09%	4.10%	892
Georgia	3,418,902	120,976,100	7,027,900	2.83%	48.65%	4,606
Kentucky	3,365,668	89,934,690	3,692,667	3.74%	91.14%	1,050
Louisiana	1,044,561	101,378,800	3,566,560	1.03%	29.29%	557
Maryland	1,531,447	35,487,420	2,465,450	4.32%	62.12%	340
Mississippi	–	52,890,100	1,509,190	0.0%	0.0%	3,533
North Carolina	6,433,282	124,921,700	9,380,280	5.15%	68.58%	3,382
Oklahoma	2,126,311	73,576,310	13,346,310	2.89%	15.93%	4,755
South Carolina	2,799,604	94,919,260	4,759,600	2.95%	58.82%	2,421
Tennessee	11,737,163	78,669,450	12,819,160	14.92%	91.56%	1,215
Texas	1,185,525	433,525,500	38,969,530	0.27%	3.04%	7,170
Virginia	1,424,788	77,184,920	4,269,790	1.85%	33.37%	1,642
West Virginia	1,717,117	75,927,320	3,119,120	2.26%	55.05%	562

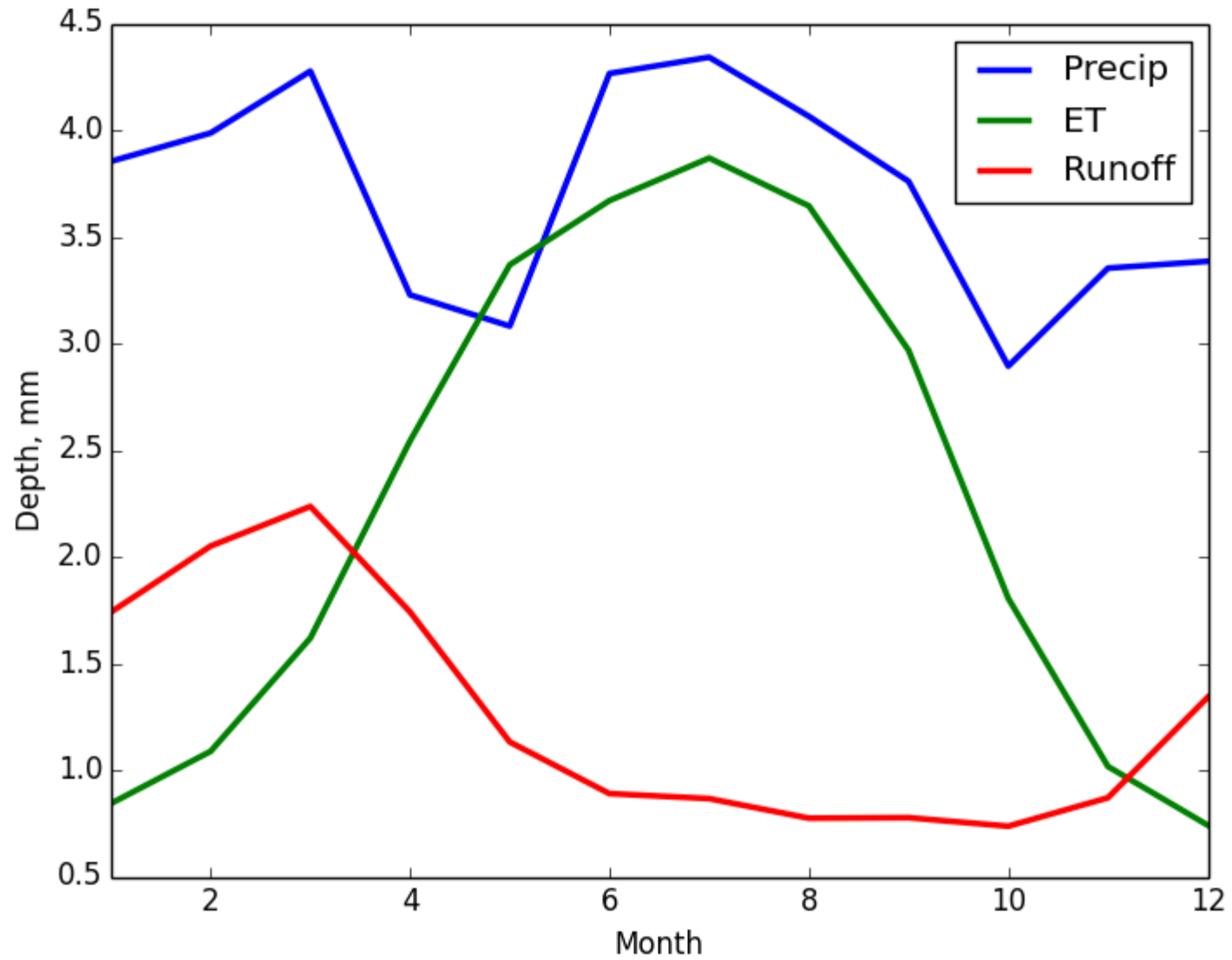
Wholesale Value of an Acre-Foot of Water in the Tennessee River Reservoirs

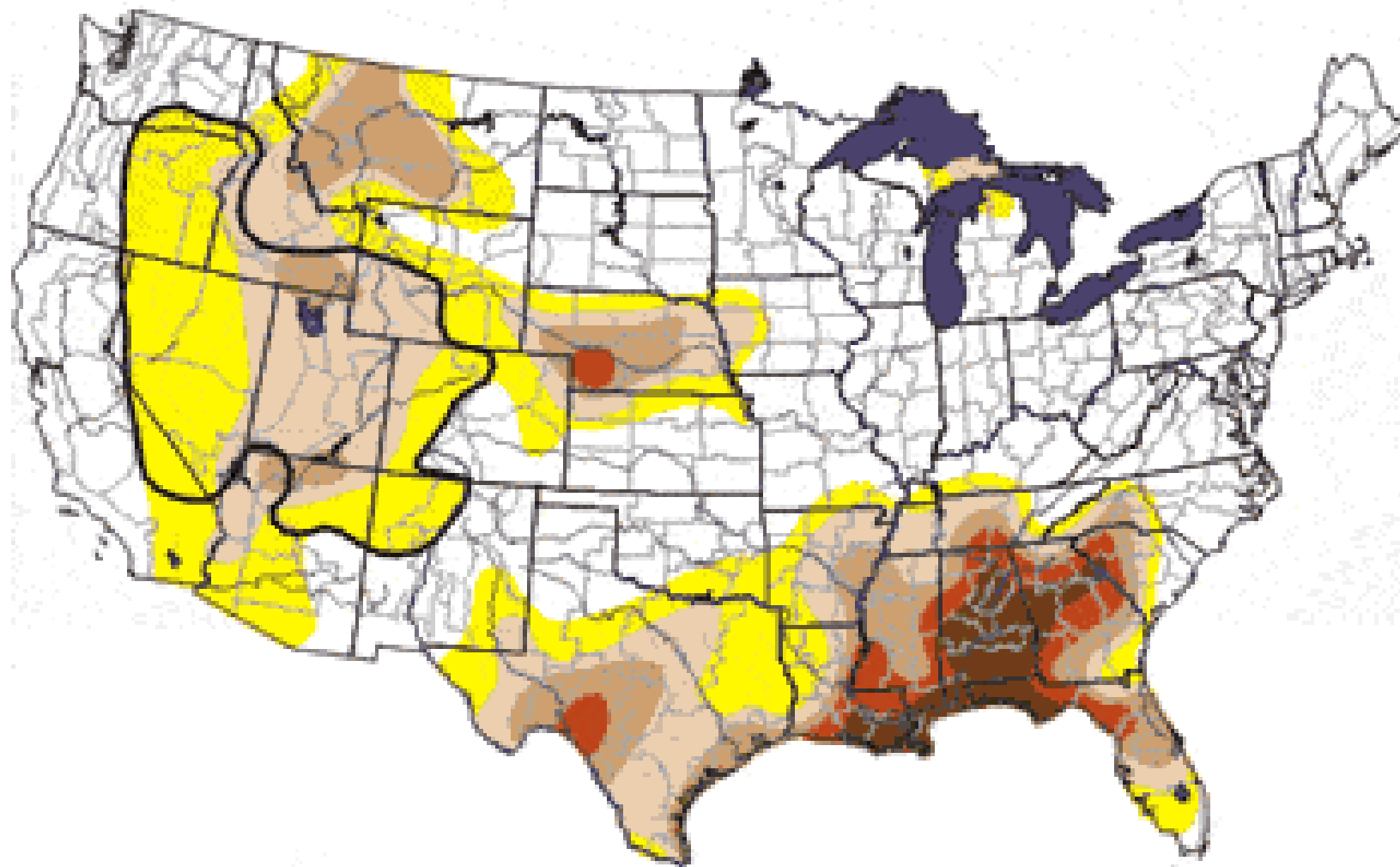
Meters Above Ohio River





Climate and Hydrology of the Southeastern US



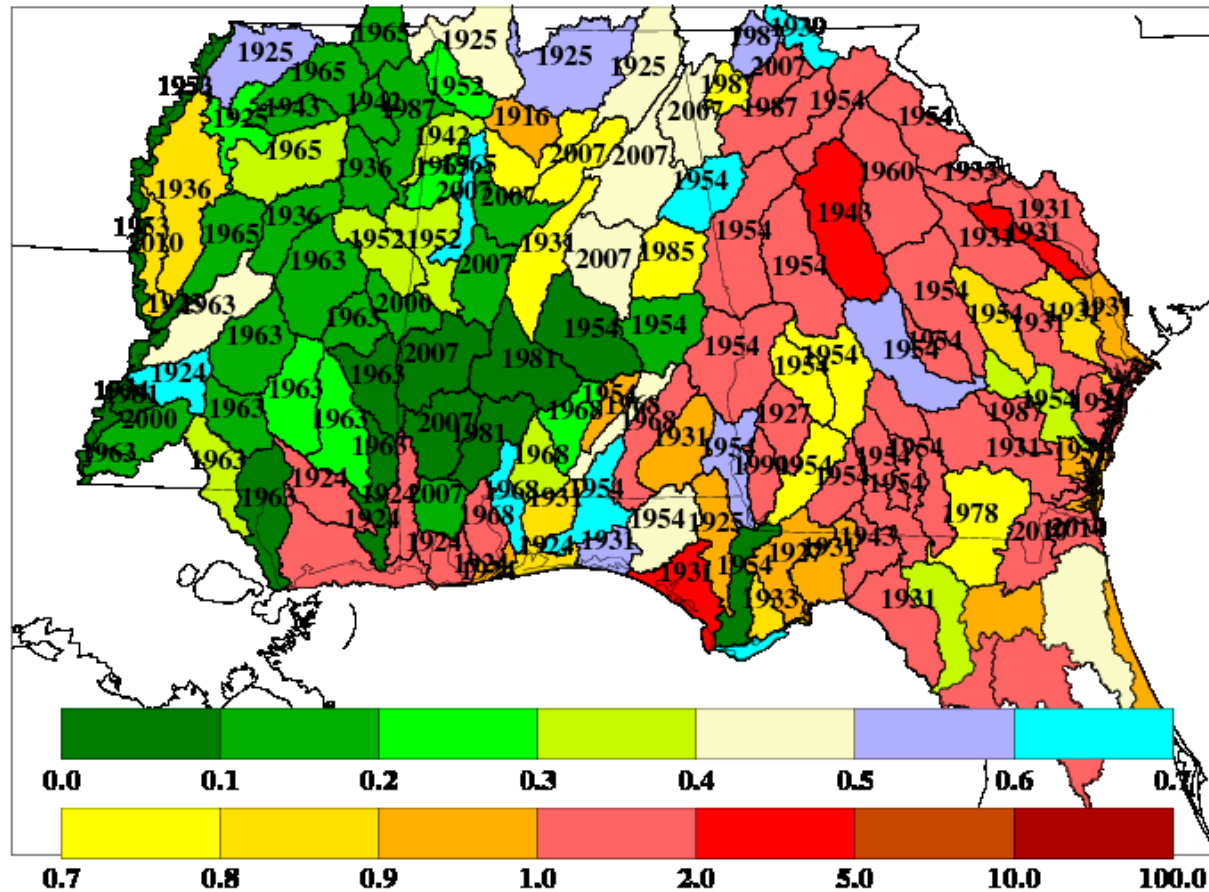


Exceptional Drought

Abnormally Dry



Maximum WASSI 1915-2011



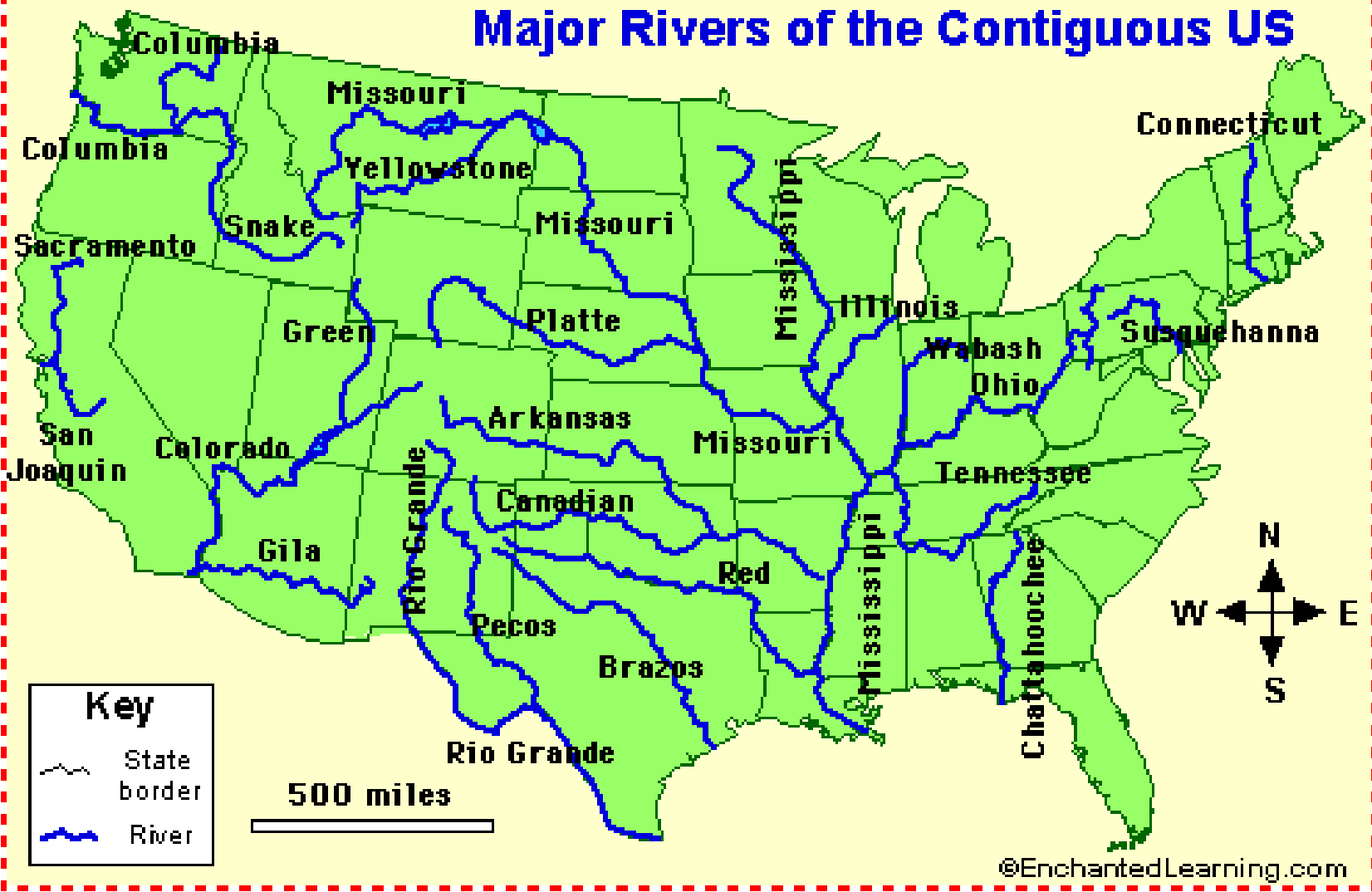
Water Conflicts- ACF



Lake Lanier September 2011



Major Rivers of the Contiguous US



River Flows Are Huge in SE Compared to West



Colorado River – Glen Canyon 10 million acre-ft/yr

Tennessee –Huntsville 30 million acre-ft/yr

Tombigbee River - Coffeeville 19 million acre-ft/yr

Alabama River -Monroeville 24 million acre-ft/yr

Apalachicola – Blountstown 16 million acre-ft/yr

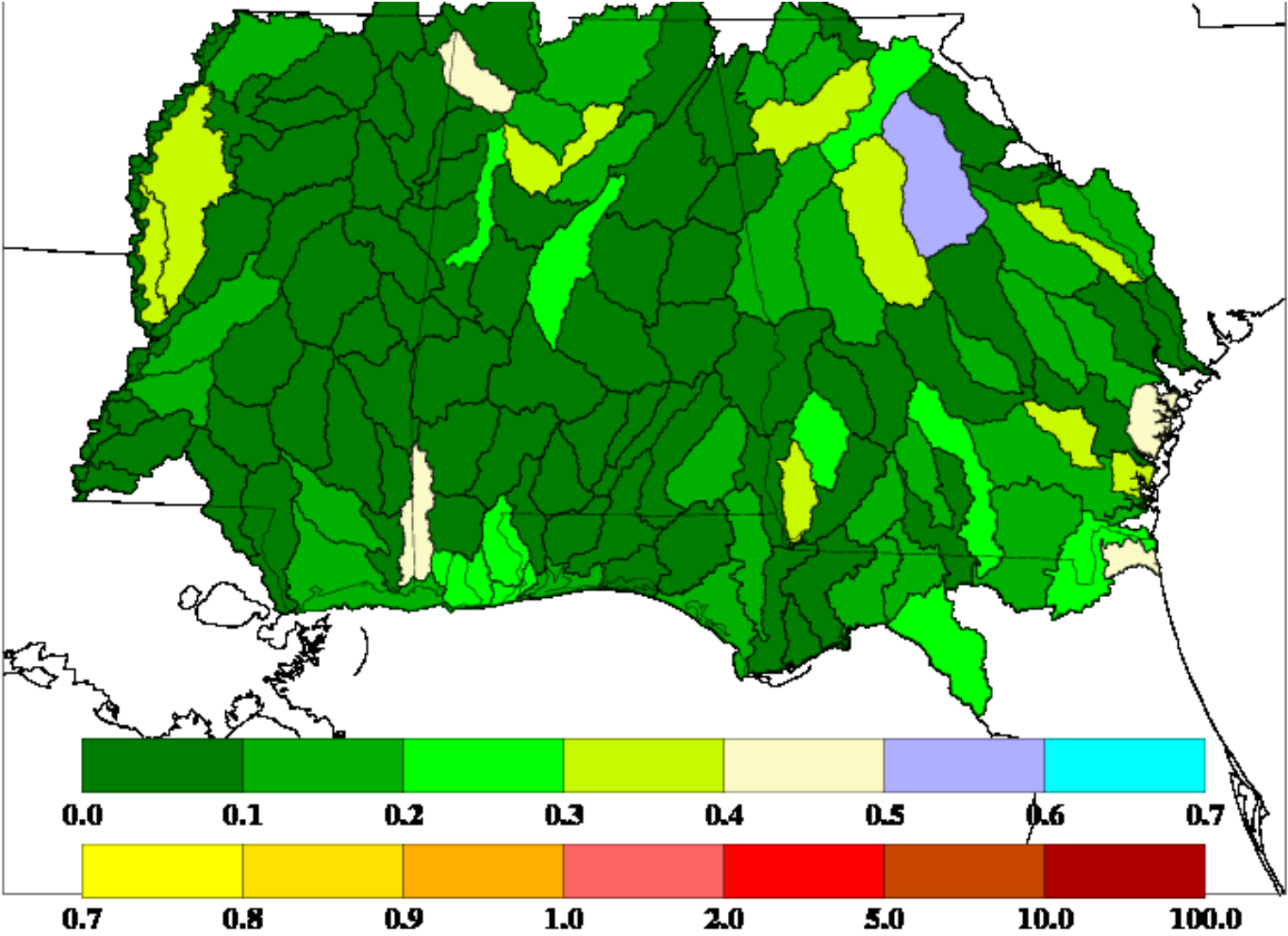
Major Basins Annual Flow

Basin	Avg Q (cfs)	Ac-Ft
Tennessee	52599	38,079,937
Tombigbee	29384	2,127,304
Blackwarrior	9583	6,937,775
Cahaba	2765	2,001,769
Coosa	15946	11,544,377
Tallapoosa	5530	4,003,537
Chattahochee	10536	7,627,716
Choctawhatchee	932	674,737
Conecuh	2980	2,157,421
Alabama	31450	22,768,760

Major Basins Seasonal Flow (Jan-March)

• Basin	Mean Q	CV	Ac-Ft	% Annual
• Tennessee	82775	0.33	14776363	39
• Tombigbee	55665	0.38	9936892	46.9
• Blackwarrior	17376	0.41	3101831	45
• Cahaba	5178	0.37	924337	45.5
• Coosa	28138	0.36	5022981	43
• Tallapoosa	8970	0.64	1601256	44.8
• Chattahoochee	16937	0.46	3023464	40
• Choctawhatchee	1575	0.39	281157	42
• Conecuh	4380	0.43	781884	36
• Alabama	54802	0.41	9782836	44.5

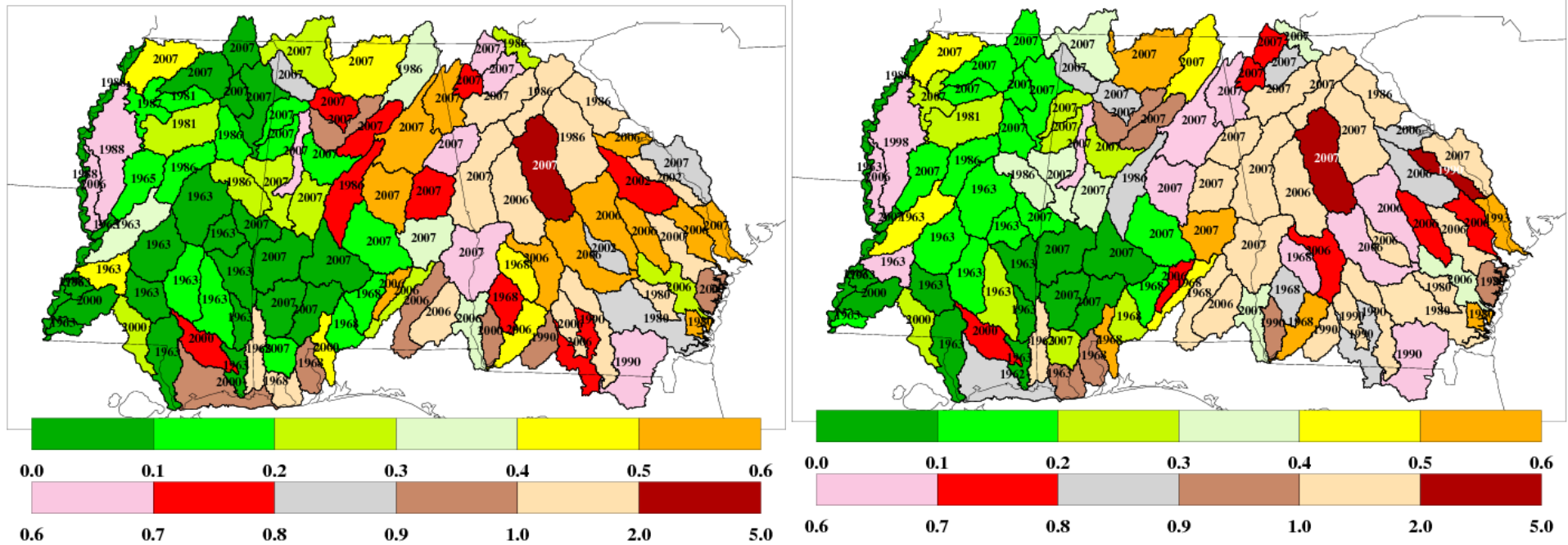
Average WaSSI 1951-2010



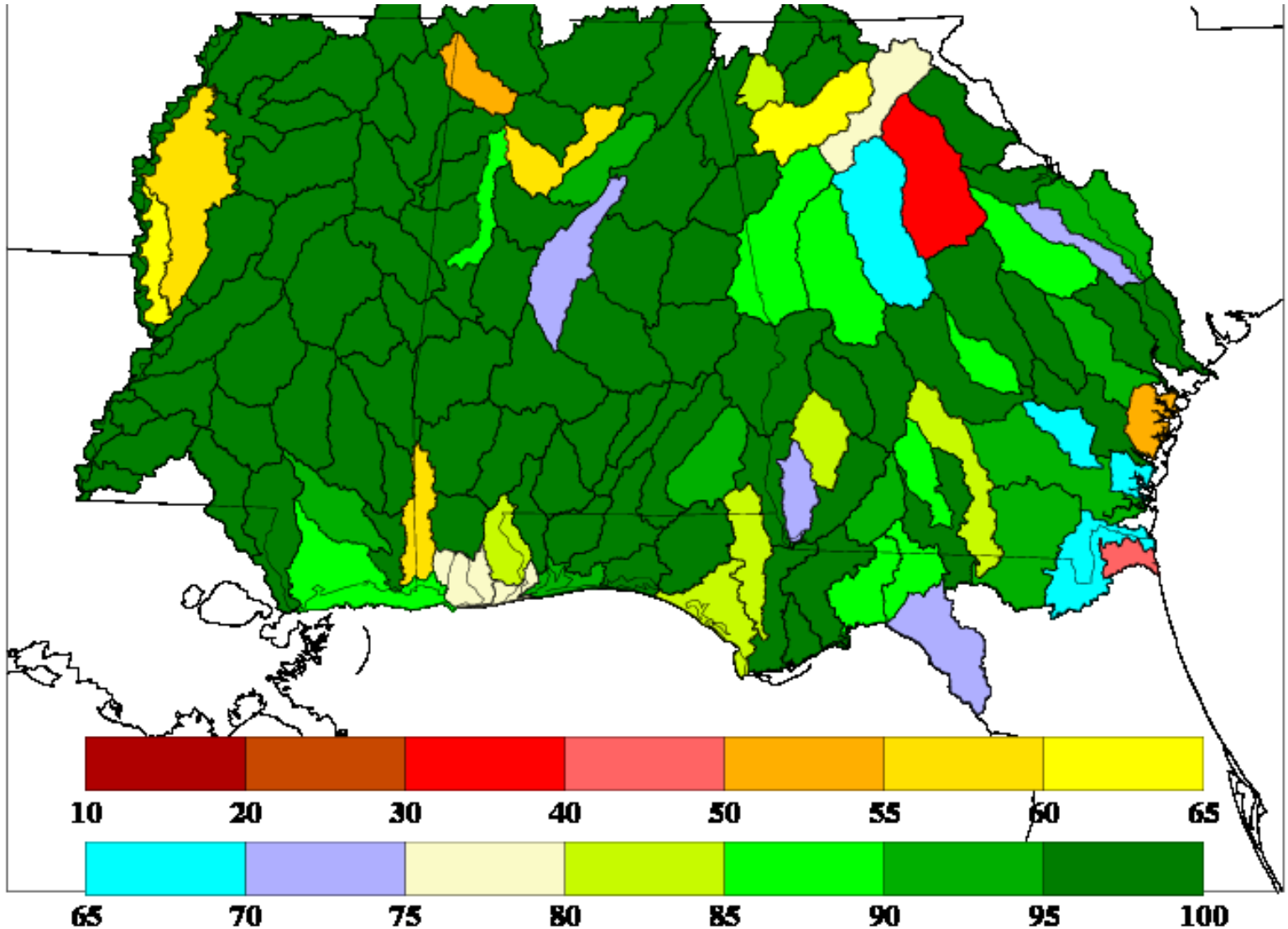
Southeastern Irrigation 2007

State	Irrigated Acres	% of Cultivated Land
GA	1 million	10
FL	1.5 Million	16.80%
MS	1.4 Million	11.90%
AL	112000	1.20%

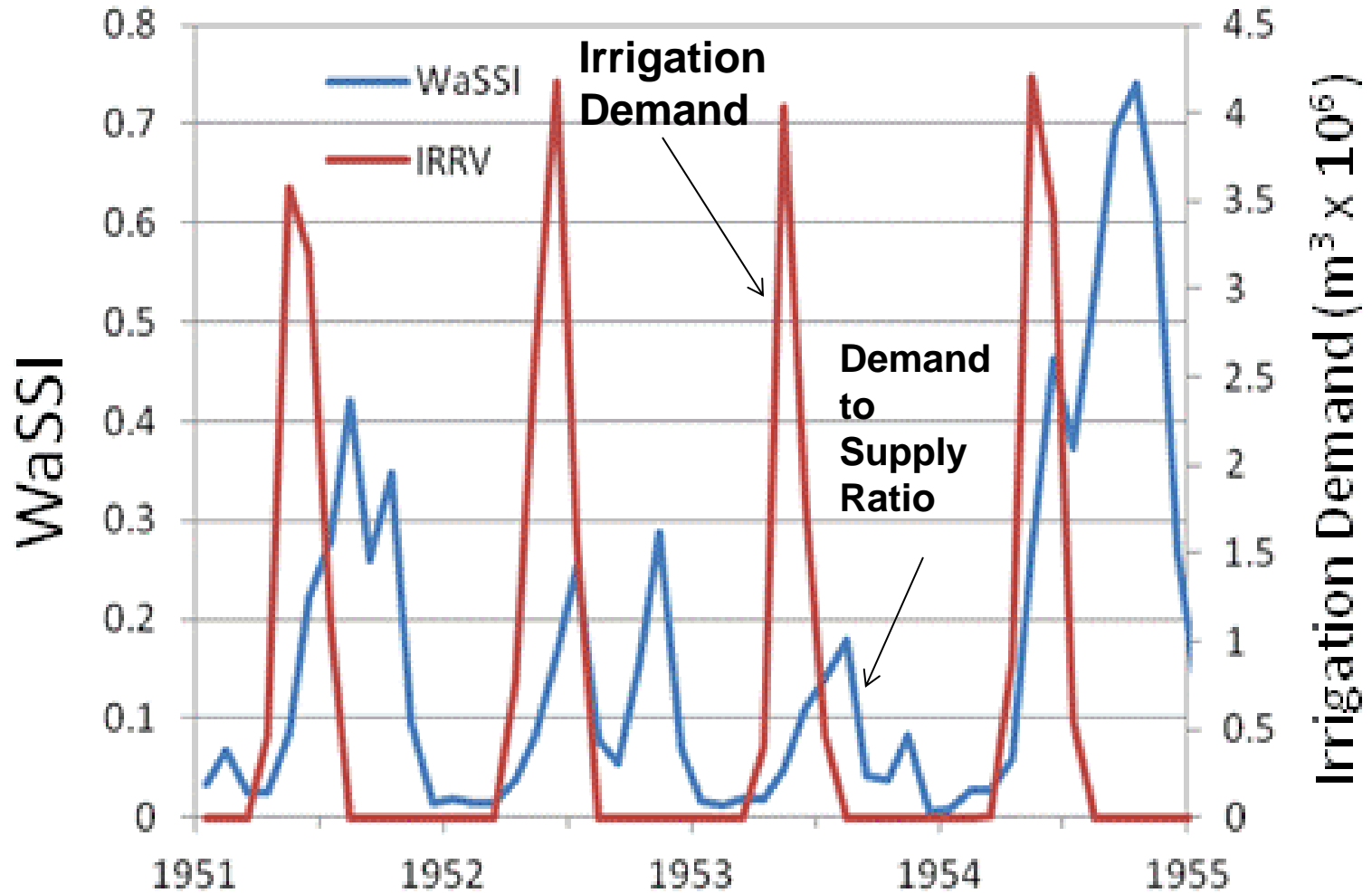
Figure 9. Maximum August WASSI (a) and September WASSI (b) 1961-2007



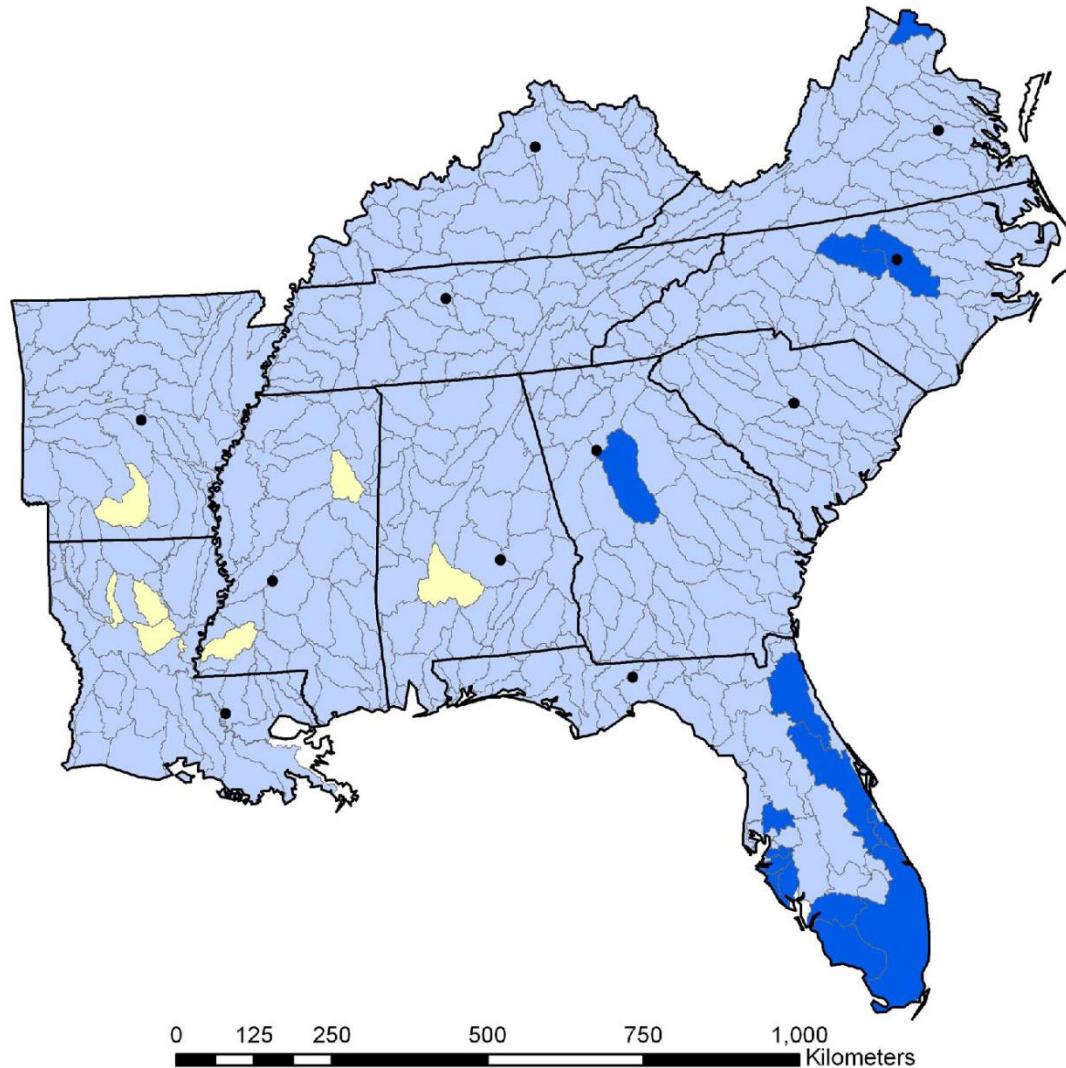
% Time WaSSI Less Than .4 (1951-2010)



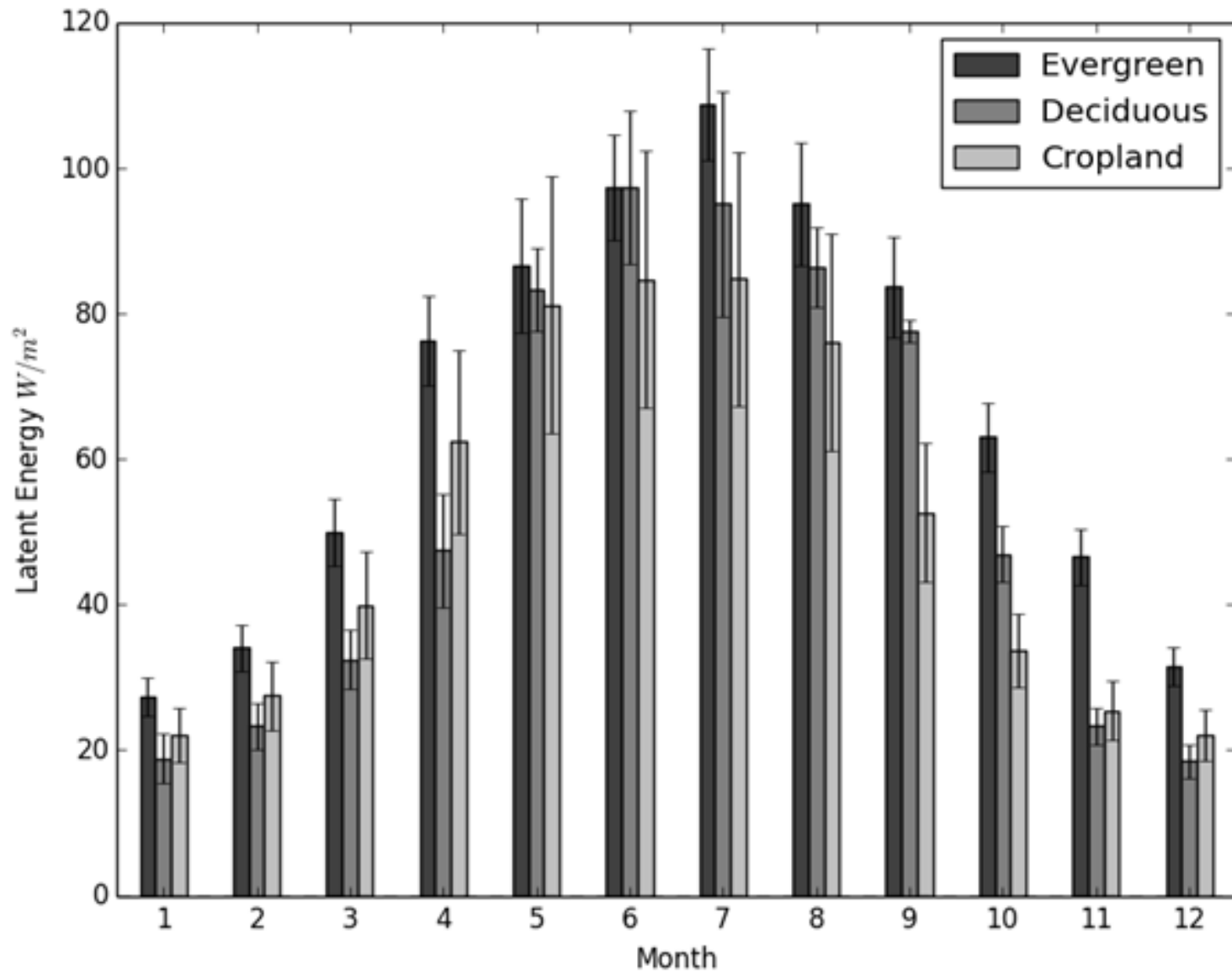
Is water available for irrigation during times when crops need water?



Percent Change In Water Supply Stress Index Landuse/Landcover Change 2020



Latent Energy Fluxes from Land Covers in the SE

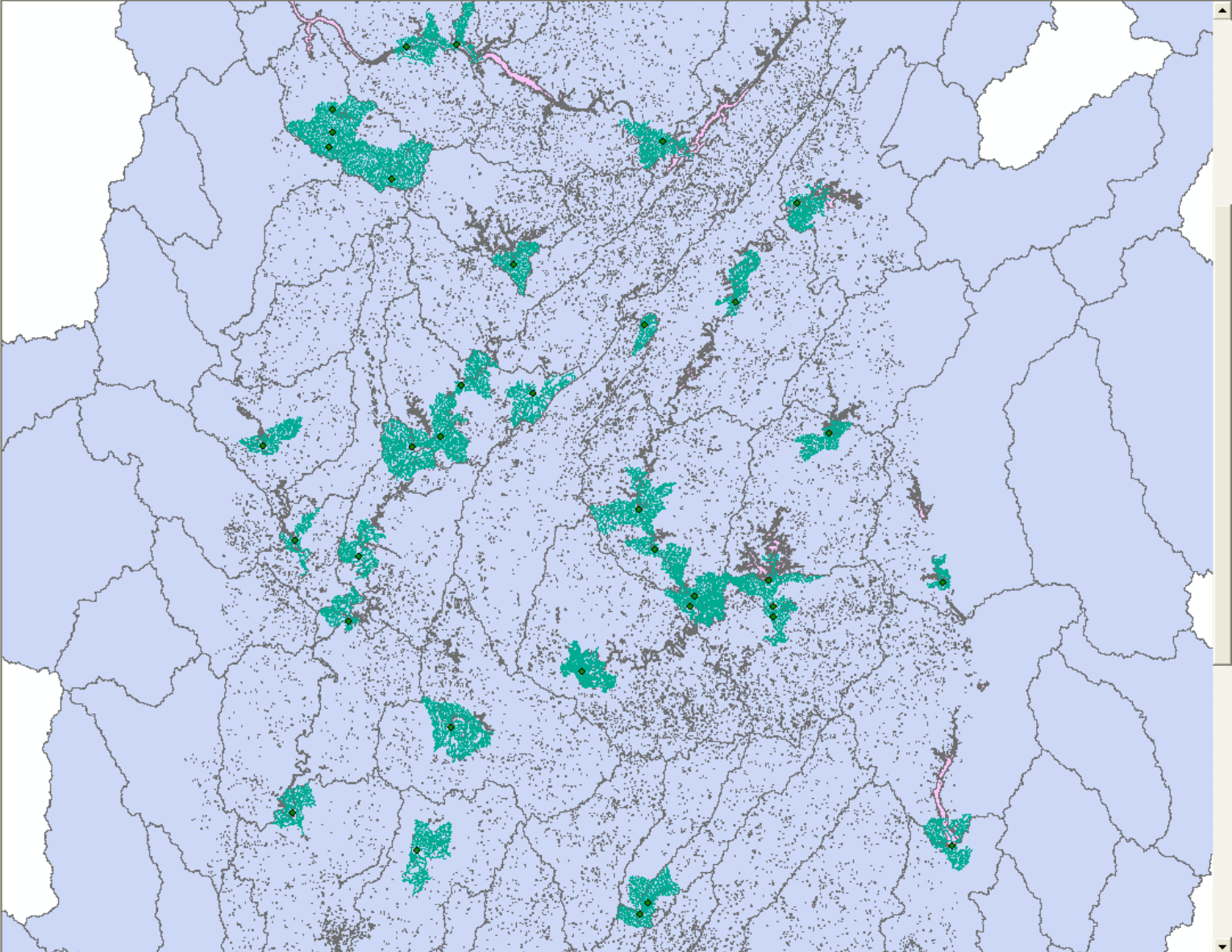


Issues

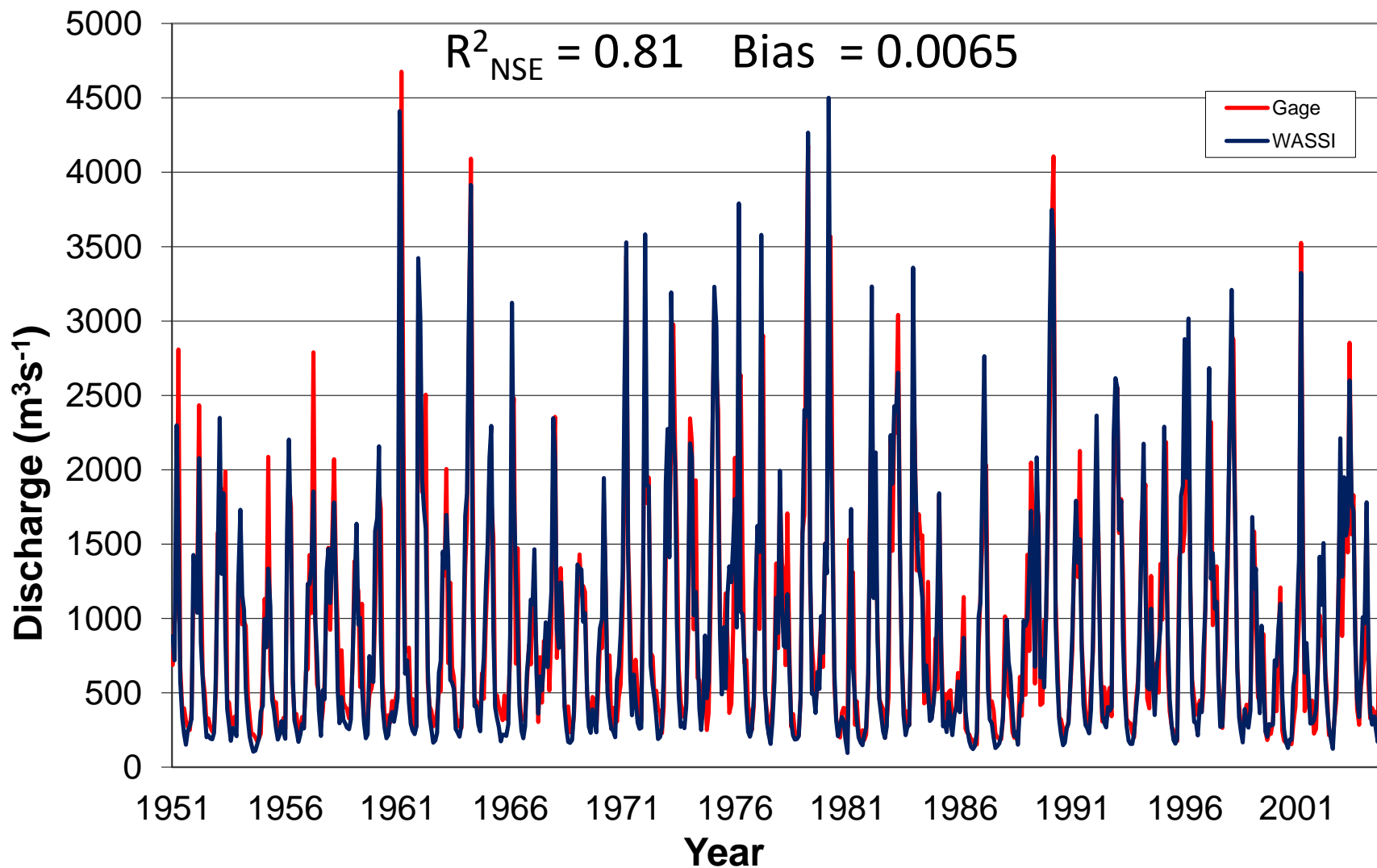
- Reservoir Storage
- Groundwater-Surface Water Interactions

Layers

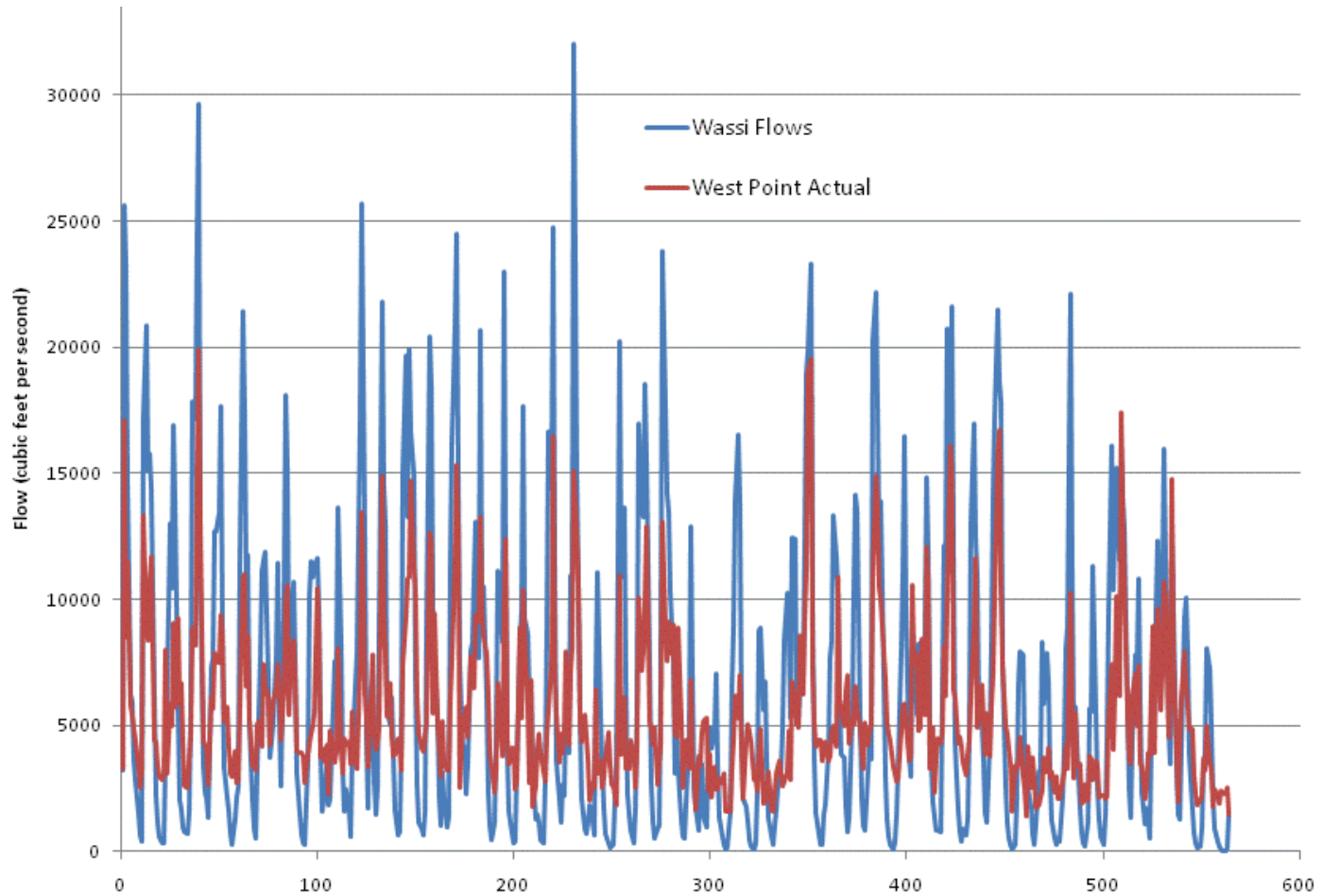
- DamLocations
- Flowlines
- NHDLineDamWeir
- SelectedHUCLines
- all_waterbodies
- AL8digitHUC



Alabama River at Claiborne L&D: 1951-2010



Monthly Streamflow Chattahoochee R. at West Point, GA



Choctawatchee R. at Caryville, FL

