Summary of Sustainable Yield Results in Prioritized Aquifers

This synopsis document presents the results of an assessment of the availability of groundwater resources in select prioritized aquifers of Georgia. The assessment work was completed to support the development of Regional Water Development and Conservation Plans (Regional Plans) as called for by the Georgia Comprehensive State-wide Water Management Plan (Water Plan). This section presents a summary of the results of the modeling effort. Subsequent sections of this synopsis provide background information and more detail on the assessments of individual aquifers. A report was also produced providing more detailed information on each modeling effort, including model development, calibration, and sustainable yield analysis.

Figure S-1 presents the location of aquifers in the State of Georgia prioritized for determination of sustainable yield (see Section 2.1 for definition of Sustainable Yield):

- Upper Floridan aquifer in the Dougherty Plain;
- Upper Floridan aquifer in south-central Georgia;
- Upper Floridan aquifer in south-central Georgia and the eastern Coastal Plain of Georgia;
- Cretaceous aquifer between Macon, Georgia and Augusta, Georgia;
- Claiborne aquifer
- Paleozoic rock aquifers in the Northwestern Georgia Valley and Ridge System; and
- Crystalline Rock aquifers in the Piedmont and Blue Ridge Provinces (water budgets only).

Sustainable yield modeling for the Upper Floridan aquifer in the Dougherty Plain of southwestern Georgia was performed using the existing U.S. Geological Survey (USGS) numerical model of the Dougherty Plain Upper Floridan aquifer. Sustainable yield modeling for other prioritized aquifers in the Coastal Plain of Georgia (the Upper Floridan aquifer in south-central Georgia and the eastern Coastal Plain of Georgia, the Cretaceous aquifer, and the Claiborne aquifer) was performed using a regional numerical model that included all of the aquifers. Sustainable yield modeling for the Paleozoic rock aquifer was performed using a numerical model of a study basin in northwestern Georgia. Sustainable yield of the crystalline rock aquifer was determined using water budgets developed for basins in the Piedmont and Blue Ridge provinces of Georgia.

Sustainable yields were determined using numerical model simulations with various combinations of withdrawals from existing wells and, where applicable, from hypothetical new wells. Results of the simulations therefore indicated a range of

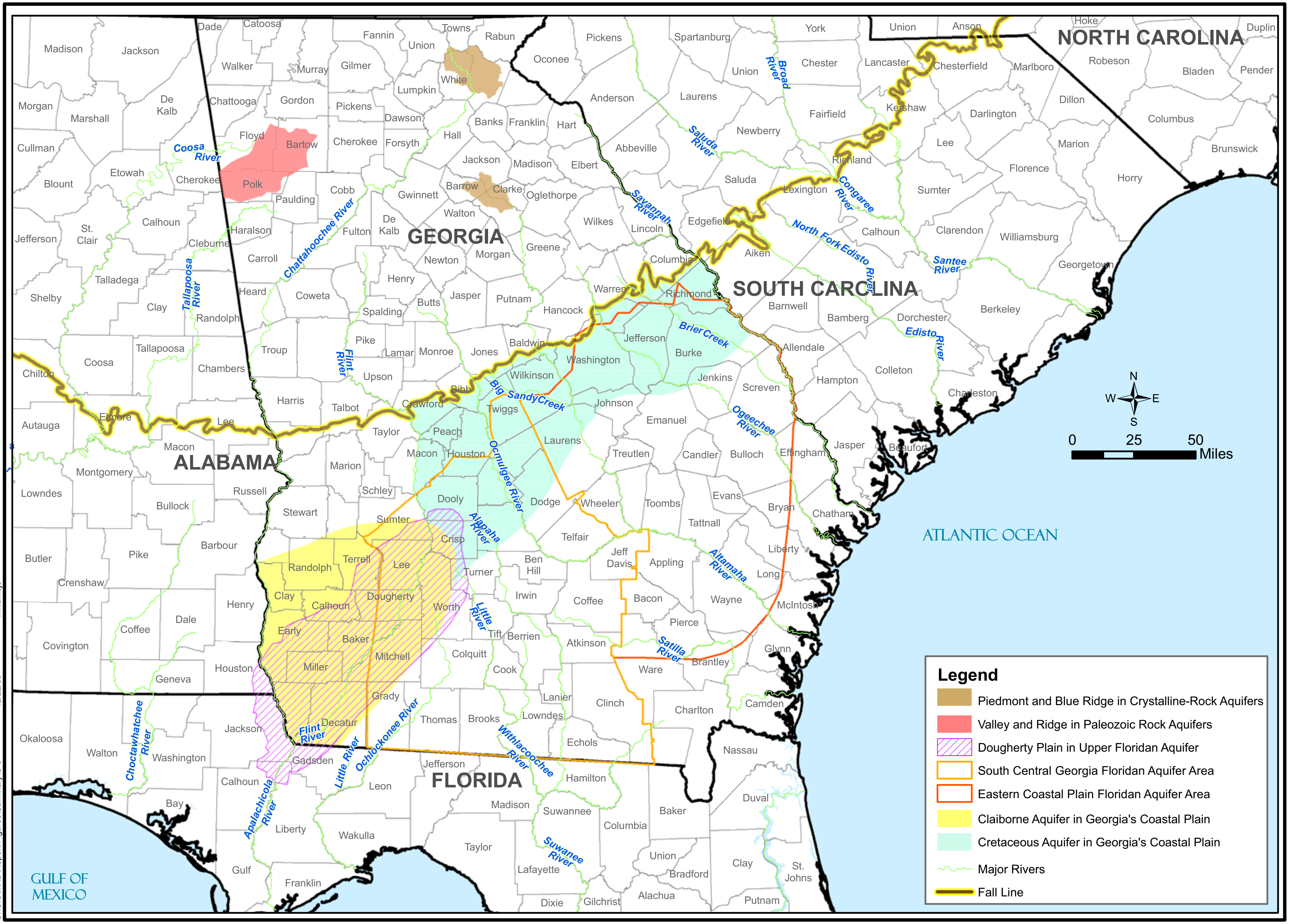

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Figure S-1
Location of the High Prioritized Aquifers Selected for Study

sustainable yield for each prioritized aquifer. **Table S-1** presents the ranges of sustainable yields of Coastal Plain and Paleozoic rock aquifers that were modeled numerically. **Table S-2** presents the range of sustainable yields of the crystalline rock aquifer. Sustainable yields in Table S-2 are presented for the entire basin and are normalized for the area of the basin.

The regional Coastal Plain model included estimated current withdrawals from the portions of aquifers in Alabama, Florida, and South Carolina that were within the regional model boundary. Sustainable yield simulations did not include increased withdrawals from the portions of aquifers in Alabama, Florida, and South Carolina. Withdrawals were increased only within the prioritized aquifers in Georgia to determine sustainable yield ranges.

Baseline withdrawals were determined for some of the prioritized aquifers and are presented in Tables S-1 and S-2. Baseline withdrawals were estimated on actual current withdrawals, not permitted capacities. Municipal and industrial withdrawals were obtained from data reported to Georgia EPD by permittees. Unpermitted domestic and commercial withdrawals (estimated by the USGS to have been about 12 percent of total state-wide groundwater use during 2005) were estimated from USGS data and county records. Agricultural withdrawals were estimated using a combination of USGS and Georgia EPD data.

Sustainable yields for prioritized aquifers in the regional Coastal Plain model were determined by zooming into the aquifer areas within the regional model boundary. The modeling indicated that increasing withdrawals from one prioritized aquifer would increase recharge from other aquifers. Therefore, the total range of sustainable yield with simultaneous withdrawals from all prioritized aquifers was less than the total range of sustainable yield with only individual aquifer withdrawals. Table S-1 presents the totals of sustainable yields of prioritized aquifers with withdrawals modeled individually and simultaneously.

In addition to the above estimated ranges of sustainable yield, a number of other observations can be drawn from this groundwater resources assessment:

- There are relatively large quantities of additional groundwater available above existing withdrawals before the sustainable yields of prioritized aquifers in the regional Coastal Plain model are reached (based on the selected sustainable yield criteria of allowable groundwater drawdown from current conditions of 30 feet or less and streamflow reductions from current conditions of 40 percent or less).

- There are smaller amounts of additional groundwater available from the Paleozoic-rock aquifer in the northwestern Georgia study basin and from the crystalline-rock aquifer in the Piedmont and Blue Ridge.

- A combination of increasing withdrawals from existing and hypothetical new wells results in the highest range of sustainable yield in the Upper Floridan aquifer and the Claiborne aquifer.

Table S-1
Sustainable Yield Estimates Using Numerical Models

Aquifer	Modeled Sustainable Yield (mgd)		Baseline Groundwater Withdrawal (mgd)
	Minimum	Maximum	
Upper Floridan Aquifer in Dougherty Plain[1]	237	328	157
Upper Floridan Aquifer in South-Central Georgia	622	836	329
Upper Floridan Aquifer in South-Central Georgia & Eastern Coastal Plain	868	982	475
Claiborne Aquifer	100	250	67
Cretaceous Aquifer	198	201	124
South-Central Georgia & Eastern Coastal Plain Upper Floridan & Claiborne & Cretaceous Aquifer Withdrawing Separately	1,166	1,433	667
South-Central Georgia & Eastern Coastal Plain Upper Floridan & Claiborne & Cretaceous Aquifer Withdrawing Together	1,066	1,229	667
Paleozoic-Rock Aquifer in Northwestern Georgia Valley and Ridge	27	70	15

[1] October 1999 Baseline Withdrawal

Table S-2
Sustainable Yield Estimates Using Water Budget Models

Aquifer	Current Groundwater Consumption (mgd)	Basin Sustainable Yield[1] (mgd)		Area Normalized Sustainable Yield[1] (mgd/mi^2)	
		Minimum	Maximum	Minimum	Maximum
Crystalline Rock Aquifer in Piedmont	1.2	1.6	7.9	0.010	0.049
Crystalline Rock Aquifer in Blue Ridge	2.4	19.9	99.5	0.063	0.316

[1] Based on Mid-level (50%) Steamflow Reduction Category. See Section 3.2 for Details.

- Increasing withdrawals from existing wells in the Cretaceous aquifer results in the highest range of sustainable yield for this aquifer. The addition of hypothetical new wells does not increase the range of sustainable yield of this aquifer.

- Because the total range of sustainable yield of prioritized aquifers in the regional Coastal Plain model with simultaneous withdrawals from all prioritized aquifers would be less than the total range with individual aquifer withdrawals, the selection of which aquifers will be utilized for future water supply should be evaluated when planning for use of the sustainable yield from an individual aquifer.

- As withdrawals are increased, groundwater will initially come from storage until steady state conditions are reached at a new equilibrium of recharge, withdrawals, and natural discharges. Sources of recharge can include leakage from other aquifers and geologic units, recharge from surface waters, and rainfall. Transient modeling indicated that it may take up to 40 years of withdrawals within the ranges of sustainable yields for aquifers to reach new equilibriums.