GEORGIA’S AQUIFER SYSTEMS

Most of the Earth’s surface is underlain by groundwater, which collects in pores and cracks in rocks. Layers of rock that can produce water when pumped are referred to as aquifers. The reliability and productivity of groundwater aquifers depend on a wide variety of variables, including how easily water can pass through the rocks (permeability), the size and number of openings in the rock (porosity), the rate of leakage from adjacent geologic units, and the rate at which the water in the rocks is replenished in the rock (porosity), the rate of leakage from adjacent geologic units, and the rate at which the water in the rocks is replenished by precipitation and its connections to surface water sources and recharge areas. Aquifers can be confined, meaning they lie under impermeable geologic layers which prevent infiltration by water from the surface except in isolated recharge zones. Unconfined aquifers are not separated from the surface by these confining units and are more likely to fluctuate in response to precipitation or drought and are more susceptible to contamination from the surface.

Paleozoic Aquifers
Limestone in the Valley and Ridge and Appalachian Plateau provinces contains a widely variable system of disconnected aquifers that are very close to the ground surface. In many areas, these aquifers can be highly productive, yielding thousands of gallons per minute (gpm).

These aquifers are small and disconnected, and large amounts of pumping can cause significant drops in groundwater levels. Because of their proximity to the surface, groundwater levels are often strongly affected by drought conditions, and groundwater pumping can have a direct impact on stream flows in the Coosa River Basin. When groundwater levels are drawn down because of drought or groundwater withdrawals, sinkholes may develop.

Crystalline Rock Aquifers
Most of the Piedmont and Blue Ridge portions of the state are underlain by crystalline rock aquifers, which do not yield sufficient water to support municipal uses except for some small cities. The large cities across this region, including the bulk of the metropolitan Atlanta area, rely on surface water. These aquifers are unconfined, and groundwater levels vary considerably in response to rainfall.

Cretaceous Aquifers
The Cretaceous aquifer system runs across the state directly adjacent to the Fall Line, the northern edge of the Coastal Plain. This aquifer system comprises the Providence aquifer in southwest Georgia and the Dublin - Midville aquifers in east-central Georgia. Most parts of the aquifer are prolific water producers and can yield a typical range of 50 to 1200 gpm. Pumping from portions of the Cretaceous aquifer can have direct impact on stream flows in several river basins.

Claiborne Aquifer
The Claiborne is located in the southwest part of the state, where it is heavily used for water supply. The Claiborne is also used for industrial and municipal supply in Dougherty, Crisp and Dooly counties, and provides irrigation water for the northern part of the Dougherty Plain. Groundwater levels fluctuate throughout the year.

Gordon Aquifer
The Gordon aquifer is also a significant source of water for municipal supply, industrial, and agricultural use in east-central Georgia. Levels of water in the Gordon fluctuate throughout the year and are influenced by precipitation levels.

Clayton Aquifer
The Clayton aquifer underlies part of the southwestern corner of the state, near the city of Albany. The aquifer stretches under portions of the Chattahoochee and Flint river basins and lies under the Claiborne aquifer. Though the aquifer is relatively small, it serves as a major source of water for irrigation and municipal supply, and it is able to produce a typical range of 250 to 600 gallons per minute.

The Clayton aquifer refills slowly, and extensive pumping has had a significant effect on groundwater levels. Levels have declined since the first supply wells were installed, but have declined steeply as irrigation in the area has grown. Because the aquifer is replenished so slowly, groundwater levels would not recover even if changes were made in withdrawal volumes. A moratorium was placed on new groundwater withdrawal permits in the mid-1990s.

Brunswick Aquifers
The upper and lower Brunswick aquifers are found under a large portion of the southeastern corner of Georgia. Across their reach, the aquifers overlie the highly productive Floridan aquifer. The Brunswick aquifers can produce as much as 180 gpm, but typical yields are in the range of 10 to 30 gpm.

The Brunswick aquifers have historically served as supplementary water sources for the Brunswick and Savannah metropolitan areas. However, as restrictions are placed on pumping water from the Floridan aquifer due to saltwater intrusion, more industries and municipalities may turn to wells that tap the Brunswick aquifers.
Floridan Aquifer

The Floridan Aquifer underlies a significant portion of Georgia’s coastal plain, as well as areas of South Carolina, Alabama, Mississippi and the entire state of Florida. The 100,000 square mile aquifer is one of the most productive in the world, and the principle source of groundwater in Georgia. In Georgia, the Floridan Aquifer system is divided into the Upper Floridan and the Lower Floridan.

The northern edge of the aquifer is the thinnest. Toward the southeast, it thickens to a maximum of 1700 ft. The aquifer system is generally confined, but is semi-confined near Valdosta and in areas in the Dougherty Plain. The aquifer has significant hydrologic connection to the surface waters of the Chattahoochee and Flint river basins, and groundwater levels have an effect on stream flows. The Floridan aquifer has been used to supply municipal water for more than 100 years. However, the amount of water used has increased notably due to the expansion of irrigation, population, industry, and mining.

In recent years, cities and industries in the coastal area have pumped less water from the Floridan aquifer as they have become more efficient and moved towards surface water sources. The population in the area is growing quickly, however, and water needs in the coastal area will likely increase.

Deep cones of depression have formed in the aquifer in the areas surrounding Brunswick, Savannah, Jesup, Riceboro, and St. Marys as well as some neighboring areas in South Carolina and Florida. Over time, saltwater has begun to intrude into the aquifer from the ocean in the Savannah area and from a deep pool of salt water in the Brunswick area. Some wells in Brunswick and near Hilton Head had to be abandoned due to high salt content. The cone of depression in St. Marys recovered after pumping was greatly reduced.

EPD suspended new groundwater withdrawal permitting for a period of time in the coastal area. Recently, the EPD has implemented a new strategy to reduce the amount of water withdrawn from the Upper Floridan aquifer with Chatham and Effingham counties by mandating more aggressive conservation practices across all water use sectors and encouraging the reuse of highly treated wastewater.

The heavy agricultural use of the aquifer in the southwestern part of the state, especially the 15-county area known as the Dougherty Plain, has caused groundwater levels to decline in some places. This part of the Floridan aquifer has a hydrologic connection with the surface waters, meaning that withdrawals from groundwater wells can affect the level of streams and rivers in both the lower Flint and Chattahoochee river basins. Water levels are also declining in Tift and Cook counties in south central Georgia. The 2006 Flint River Basin Regional Water Development and Conservation Plan is an attempt to address this issue, among others.

Surficial Aquifers

Shallow surficial aquifers exist throughout the state, principally in the Coastal Plain. Theses aquifers are generally unconfined, and water levels generally rise quickly during wet periods but can drop considerably during periods of drought. Pumping in these aquifers can have significant impact on the flows in surface water.

These aquifers are used locally for domestic supply and livestock operations. As part of the concerted effort to reduce the amount of water withdrawn from the Floridan aquifer, surficial aquifers in the coastal region have been considered as a possible supplemental supply.

### WITHDRAWALS IN MILLIONS OF GALLONS PER DAY (2000)

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* Data not available
SOURCES


Georgia Dept. of Natural Resources Coastal Resources Division. The Condition of Georgia’s estuarine and coastal habitats 2000-2001 interim report. Report number 001.


Georgia Environmental Protection Division (2006). Draft Georgia 2006 305(b)/303(d) list documents.


