

SEMICONSOLIDATED SAND AQUIFERS—Continued

Recharge to the regional aquifers is from precipitation that falls on inland, topographically high aquifer outcrop areas. A map of the potentiometric surface of the Pearl River aquifer (fig. 16) shows that in outcrop areas, where unconfined conditions exist, the water moves from high altitudes toward streams. As the water moves coastward, down the hydraulic gradient (slope of the potentiometric surface), it becomes confined and the potentiometric surface becomes smoother, in contrast to its highly irregular shape in updip areas. Water in the aquifer moves along short flow paths in and near outcrop areas and along longer, regional flow paths in downgradient areas. The Pearl River aquifer grades into carbonate rocks of the Floridan aquifer system in southern Alabama, southern Georgia and southeastern South Carolina (fig. 15), and into clastic beds of the Mississippi embayment aquifer system in southwestern Mississippi.

The potentiometric surface of the Chattahoochee River aquifer (fig. 17) resembles that of the Pearl River aquifer. The contours are irregular in outcrop areas, reflecting the influence of incised streams between high-altitude recharge areas. In the confined part of the aquifer, water moves along gentler hydraulic gradients and generally down the dip of the beds. The updip limit of this aquifer in Mississippi, Alabama, and Georgia is the area in which the sands that comprise the aquifer change to clays.

Although movement of water in the outcrop areas of the Black Warrior aquifer is similar to that of the shallower aquifers in the aquifer system, water in the confined parts of the aquifer moves differently. As shown by the flow-direction arrows in figure 18, important components of flow in the deep, confined parts of the aquifer are parallel to the outcrop belt of the aquifer in Mississippi and are coast-parallel in South Carolina. The water also moves along extremely long flow paths toward deeply entrenched regional drains such as the Tombigbee, the Alabama, and the Chattahoochee Rivers once it enters the confined parts of the aquifer. The updip limit of ground-water movement in the Black Warrior River aquifer is defined as the point at which the aquifer contains water having dissolved-solids concentrations of 10,000 milligrams per liter. Although permeable sediments equivalent to this aquifer extend to the Gulf and Atlantic Coasts, little ground-

water movement is thought to occur downdip of the 10,000 milligrams per liter dissolved-solids line. Coastal plain aquifers commonly contain unflushed saline water in their deep, downdip parts.

The general movement of water in the southeastern Coastal Plain is summarized in figure 19, which represents conditions in southeastern Georgia. The figure shows the relation between the Southeastern Coastal Plain aquifer system and the carbonate rocks of the Floridan aquifer system. Water enters the Pearl River aquifer where it crops out adjacent to the crystalline rocks that form the base of the Southeastern Coastal Plain aquifer system. Some of the water moves coastward in the clastic sediments of the Pearl River aquifer and laterally into the Floridan aquifer system where sands change to limestone; some water moves downward into the Chattahoochee River aquifer from the Pearl River aquifer where the two are in contact. The Black Warrior River aquifer is recharged in this area only by downward leakage across the confining unit that completely overlies it. Where the Chattahoochee River and the Black Warrior River aquifers are confined, water moves laterally through the aquifers. Near the coast, flow is blocked either by an increase in the amount of clay in the aquifer (Chattahoochee River aquifer) or by stagnant saline water (Black Warrior River aquifer). The flow becomes predominantly vertical as the water leaks upward to shallower aquifers or to the ocean. Water leaks downward from the Floridan aquifer system to the Southeastern Coastal Plain aquifer system, or leaks in the opposite (upward) direction, depending on the direction of decreasing hydraulic head between the two aquifer systems. The horizontal flow arrow shown in the Black Warrior River aquifer near the right side of the figure represents the coast-parallel direction of flow in this aquifer.

Other semiconsolidated sand aquifers are grouped into extensive aquifer systems as shown in figure 4. The Northern Atlantic Coastal Plain aquifer system extends from North Carolina through Long Island, New York, and locally contains as many as 10 aquifers. The Mississippi Embayment aquifer system consists of six aquifers, five of which are equivalent to aquifers in the Texas coastal uplands aquifer system to the west. The coastal lowlands aquifer system contains five thick, extensive permeable zones.

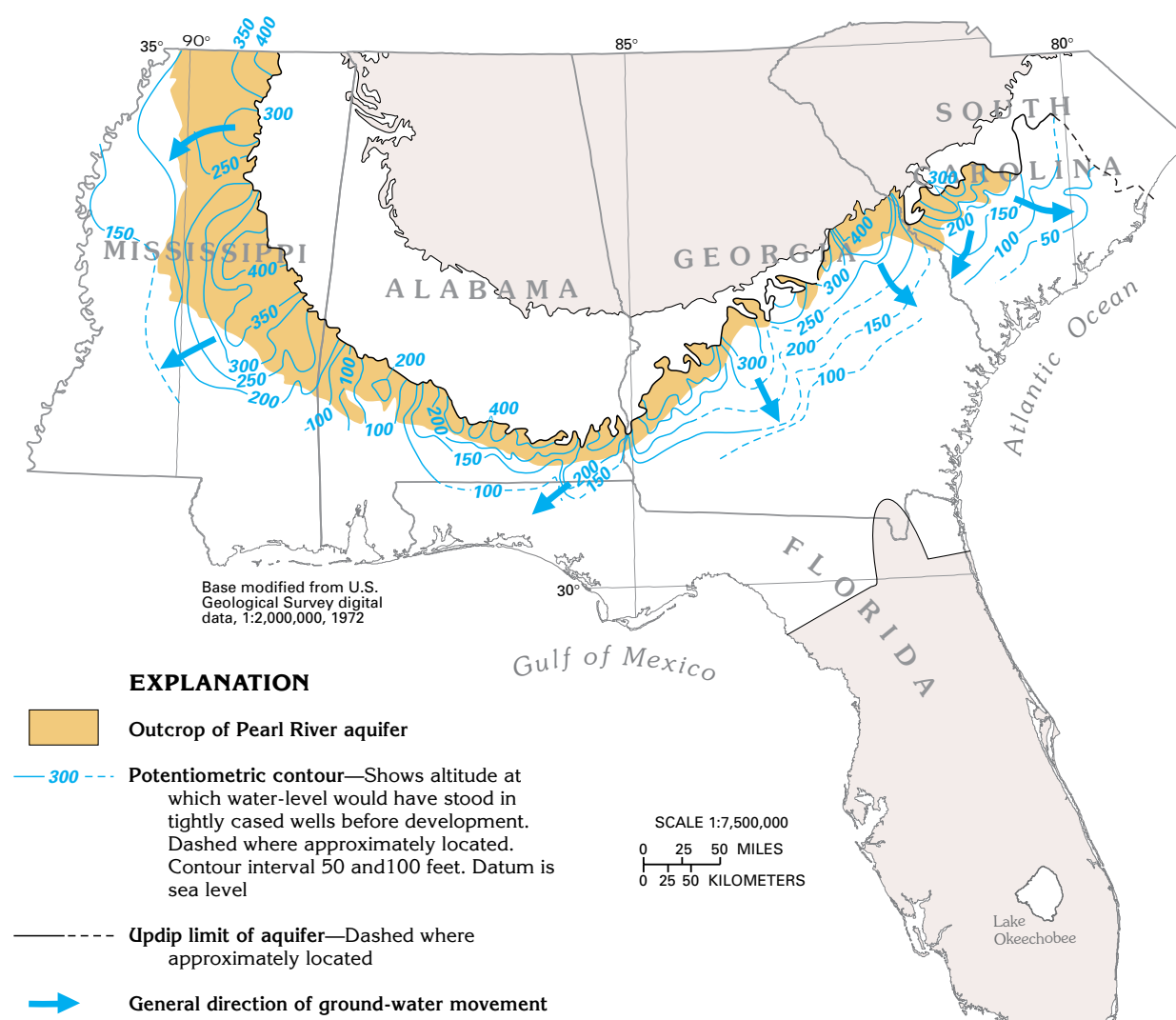


Figure 16. Water enters the Pearl River aquifer in topographically high outcrop areas and mostly moves toward major streams, where it discharges. Some water moves down the hydraulic gradient of the aquifer to become part of a deep, regional, confined ground-water flow system.

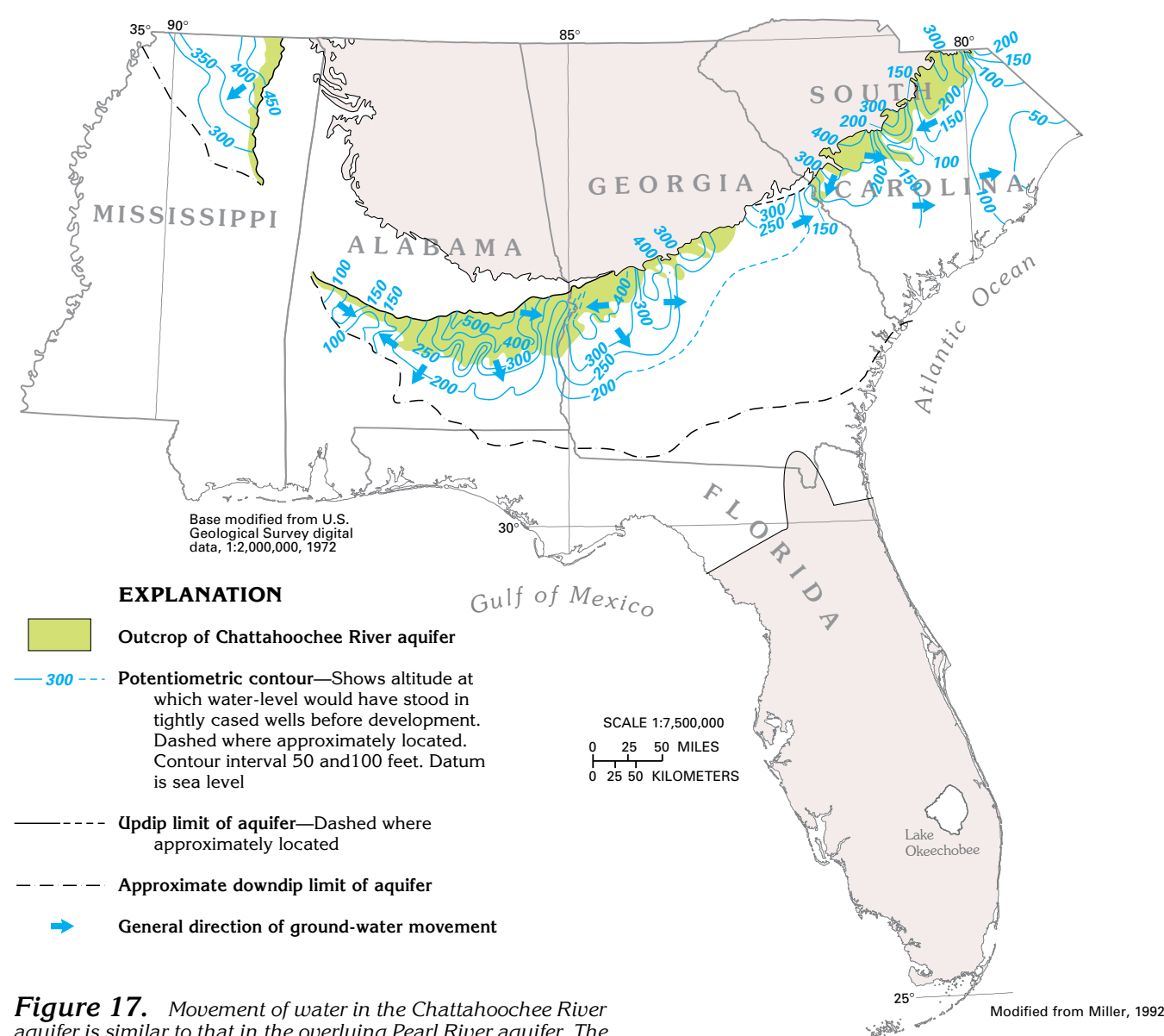


Figure 17. Movement of water in the Chattahoochee River aquifer is similar to that in the overlying Pearl River aquifer. The updip limit of the Chattahoochee River aquifer is marked by a facies change from permeable sand to almost impermeable clay in a coastward direction.

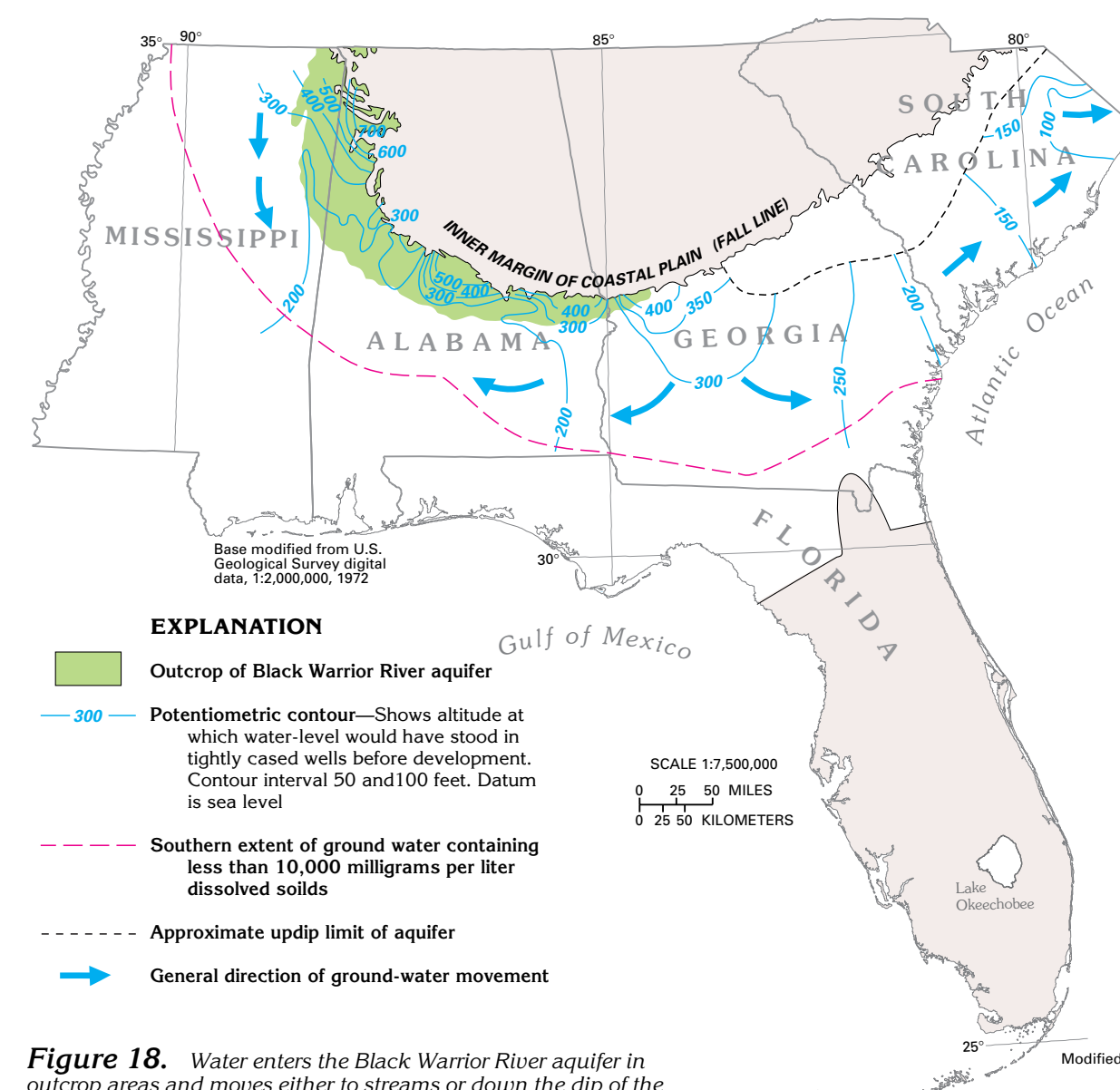


Figure 18. Water enters the Black Warrior River aquifer in outcrop areas and moves either to streams or down the dip of the aquifer. In confined areas, however, the water moves parallel to the outcrop bands or to the Atlantic coastline. Movement is along extremely long flow paths and the water eventually discharges to deeply entrenched rivers.

- EXPLANATION**
- Surficial aquifer system
 - Floridan aquifer system
 - Aquifers in Southeastern Coastal Plain aquifer system
 - Confining units in Southeastern Coastal Plain aquifer system
 - Freshwater-saltwater interface
 - General direction of ground-water movement

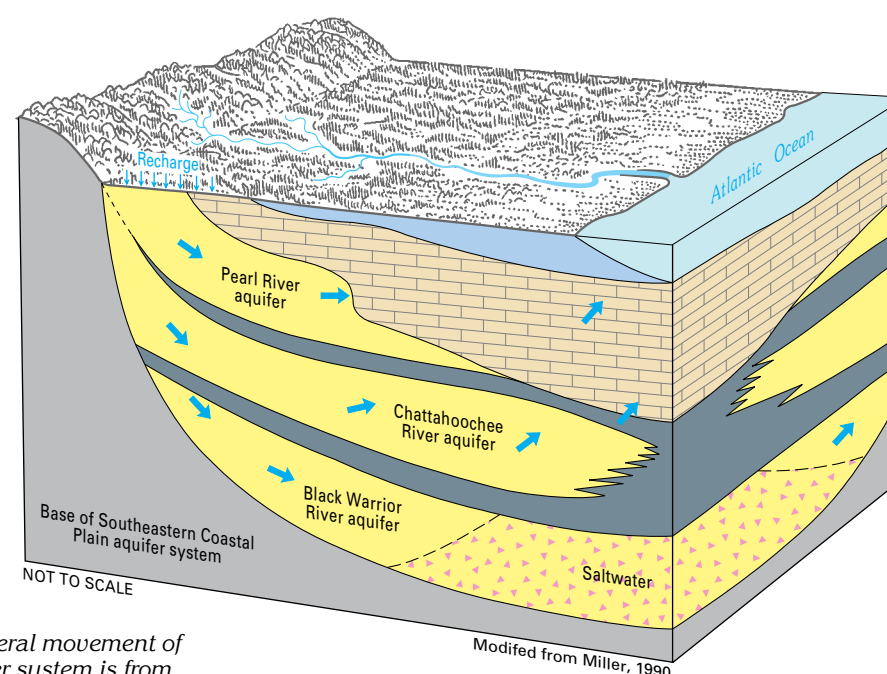


Figure 19. In southeast Georgia, the general movement of water in the Southeastern Coastal Plain aquifer system is from outcrop recharge areas down the hydraulic gradient of the aquifers until the water discharges upward to the overlying Floridan aquifer system. The downdip extent of flow is limited either by a marked decrease in permeability in the Chattahoochee River aquifer or by stagnant saline water in the Black Warrior River aquifer.