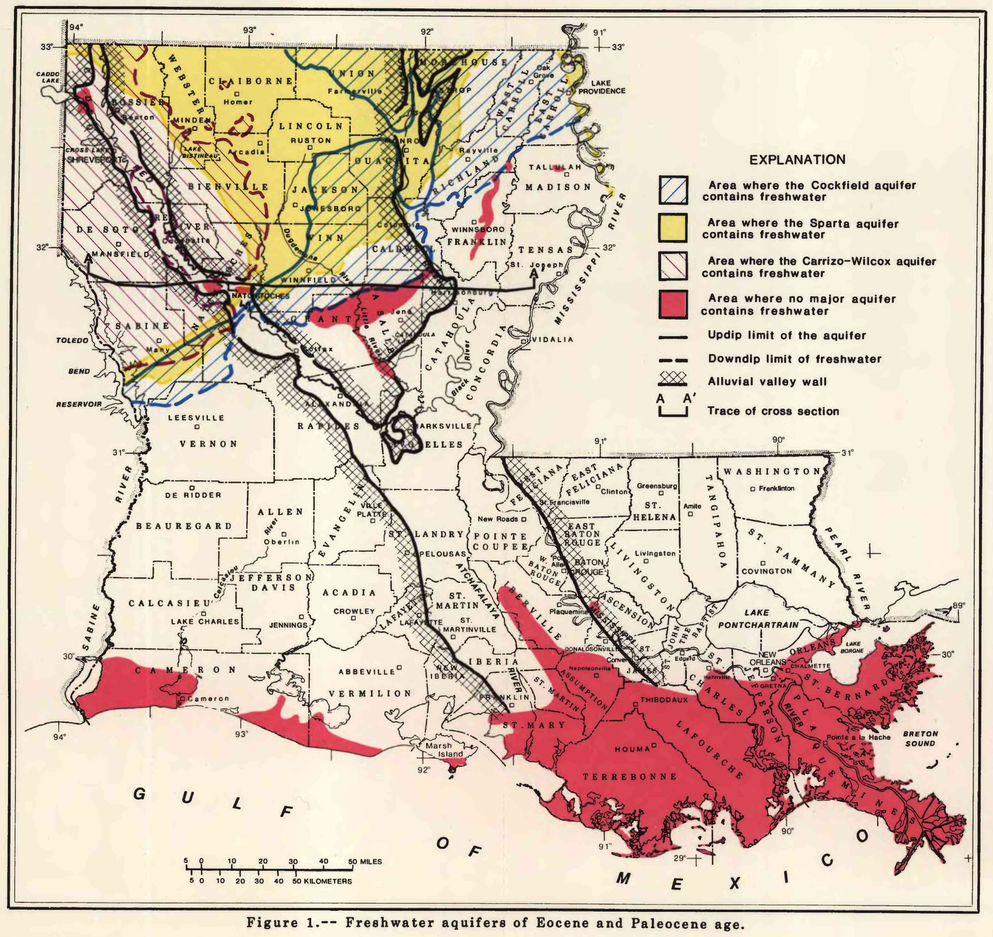

Figure 1.-- Freshwater aquifers of Eocene and Paleocene age.

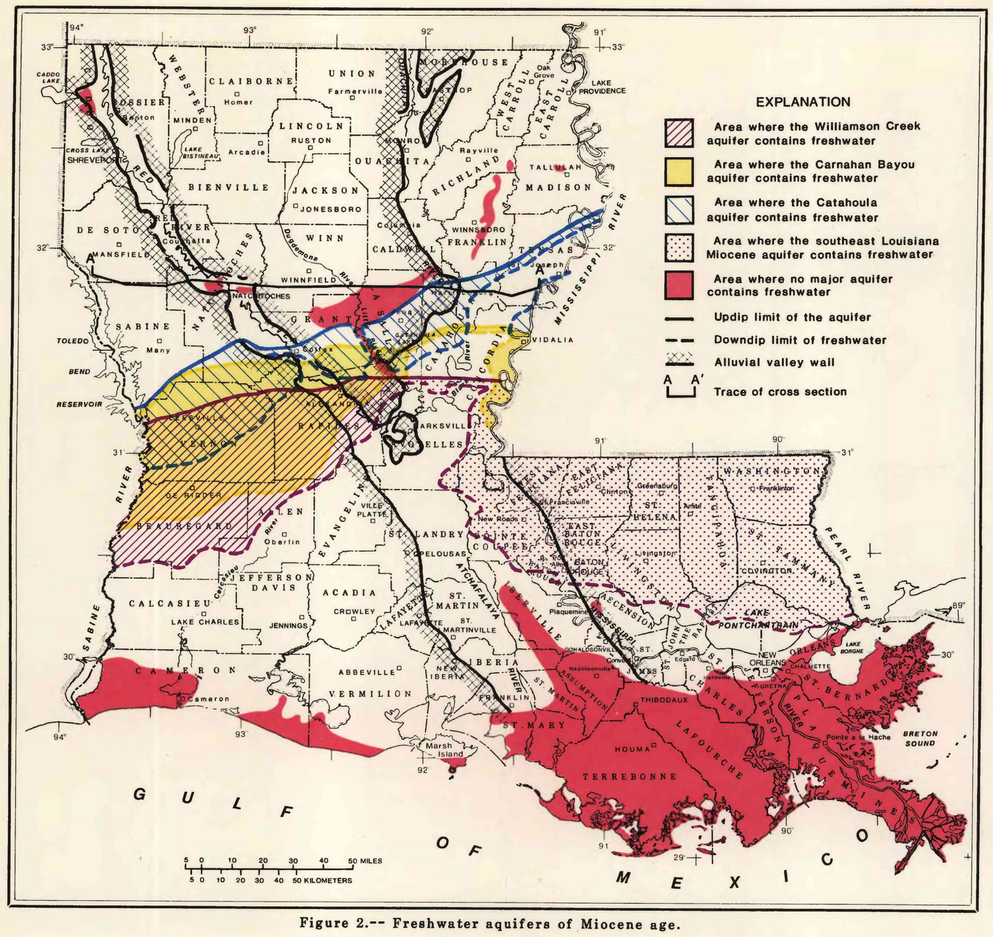

Figure 2.-- Freshwater aquifers of Miocene age.

LOUISIANA HYDROLOGIC ATLAS MAP NO. 2 :
AREAL EXTENT OF FRESHWATER IN MAJOR AQUIFERS OF LOUISIANA

By
Charles W. Smoot
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INTRODUCTION

An abundant ground-water supply is available in Louisiana to meet present and many projected needs. However, this resource is not uniformly distributed--in many areas, ground-water supplies are adequate to meet the needs of large industries; in other areas, supplies are not adequate for even domestic needs. This report summarizes the general areal availability of freshwater in the major aquifers in Louisiana. In this report, freshwater is defined as water which contains a chloride concentration of less than 250 mg/L (milligrams per liter). The occurrence of freshwater was determined from chemical analyses of samples from wells and by the interpretation of electrical logs of test holes and oil and gas wells.

This report was prepared in cooperation with the Louisiana Department of Transportation and Development, Office of Public Works.

OCCURRENCE OF FRESH GROUND WATER

Fourteen major aquifers, ranging in age from Pleistocene to Paleocene, are identified in this report. An aquifer is a formation, a group of formations, or part of a formation that contains sufficient saturated permeable material to yield significant quantities of water to wells and springs (Lohman and others, 1972, p. 2). The aquifers are composed of unconsolidated sand or sand and gravel. Some investigators have combined two or more major aquifers into one aquifer, and others have divided one major aquifer into smaller aquifers. For example, the Carnahan Bayou and Williamson Creek aquifers in the Carnahan Bayou and Williamson Creek Members of the Fleming Formation have been combined by Turcan and others (1966, p. D235) and Whitfield (1975, p. 7) into the Jasper aquifer. The Carrizo and Wilcox aquifers in the Carrizo Sand and Wilcox Group have been combined by Ryals (1980) into one unit, the Wilcox-Carrizo aquifer. In this report, the Carrizo and Wilcox aquifers are referred to as the Carrizo-Wilcox aquifer system. The northern Louisiana terrace aquifer includes, in order of decreasing age, terraces of the Williana, Bentley, Montgomery, and Prairie Formations (Snider and Sanford, 1981, p. 6). The major aquifer systems of southeastern Louisiana have been subdivided into many local aquifers. Thick clay units generally separate the major aquifers by forming confining beds that restrict the vertical movement of water. The geohydrologic column (table 1) shows the stratigraphic relation of major aquifers and confining beds.

A west-east geohydrologic section A-A' also shows the stratigraphic relation of major aquifers and confining beds (fig. 4; location of section is shown in figs. 1-3). This cross section also illustrates saltwater ridges beneath the Red River and Mississippi River alluvial valleys.

The depth of occurrence of fresh ground water in Louisiana is variable (table 2). In some areas in the northwestern part of the State, freshwater occurs only to depths of 100 ft below sea level or less. Elsewhere, in two regional areas of Louisiana, freshwater in aquifers occur to depths greater than 3,000 ft below sea level. The first regional area is in southeastern Vernon, southwestern Rapides, and northern Beauregard Parishes. The second regional area is in southeastern East Baton Rouge, southern Livingston, southern Washington, southern Tangipahoa, and St. Tammany Parishes.

The aquifers have been mapped to show their areal extent from the outcrop or subcrop to the downdip limit of freshwater (figs. 1-3). In the northern part of the State, the aquifers generally dip to the south and east from a high in northwestern Louisiana and are overlain by progressively younger aquifers as indicated in table 1. Water in each aquifer becomes saline downdip, but in most areas an overlying (younger) aquifer contains freshwater. In some places, as many as four major aquifers contain freshwater; in a few places, none of the major aquifers contains freshwater.

In the southwestern part of the State, the Chicot aquifer (fig. 3) is the most areally extensive source of freshwater, and in the northern part of southwestern Louisiana, the underlying Evangeline aquifer (fig. 3) also contains freshwater. In most of the area, these aquifers dip to the southeast.

East of the Mississippi River, the southeast Louisiana Pleistocene aquifer (fig. 3) is the most areally extensive source of freshwater. The southeast Louisiana Pliocene and the southeast Louisiana Miocene underlie the southeast Louisiana Pleistocene aquifer and yield large amounts of freshwater. The deepest occurrence of freshwater east of the Mississippi River is in the southeast Louisiana Miocene aquifer (fig. 2), in southeastern Tangipahoa Parish and southwestern St. Tammany Parish. In most of this area, these aquifers dip to the south. The youngest aquifers occur along the coast and where southeast Louisiana Pleistocene and the undifferentiated alluvial aquifers overlie the older aquifers.

Figure 1 shows the areal extent of freshwater in the aquifers of Eocene and Paleocene age. The Carrizo-Wilcox aquifer system contains freshwater along the western part of the northern half of the State. However, in the southern part of Rosclair and Caddo Parishes beneath the Red River Valley, the Carrizo-Wilcox aquifer system generally does not contain freshwater.

The Sparta aquifer in the Sparta Sand contains freshwater in three areas in northern Louisiana: (1) a large area in north-central Louisiana, (2) a narrow band through Sabine and Natchitoches Parishes, and (3) along the Mississippi River in northeastern Louisiana where it extends a short distance into Louisiana from Mississippi. The large central area is separated from the other areas by saltwater ridges in the Sparta aquifer under the Red River Valley and the Mississippi River valley.

The Cockfield aquifer in the Cockfield Formation contains freshwater in the northeastern part of the State and in a diagonal band that becomes progressively narrower across the State in a southwesterly direction. Saltwater ridges in the Cockfield aquifer under the Red River Valley and east of the Ouachita River divide the freshwater-bearing part of the Cockfield into three areas.

Figure 2 shows the areal extent of freshwater in the aquifers of Miocene age. A saltwater ridge under the Mississippi River valley divides the freshwater-bearing Catahoula, Carnahan Bayou, and Williamson Creek aquifers into large areas to the west and to the east of the Mississippi River valley. The Catahoula, Carnahan Bayou, and Williamson Creek aquifers extend from the western edge of the State northeasterly through the central part of the State. Freshwater from equivalent Miocene deposits in Mississippi extends a short distance into Louisiana along the Mississippi River in eastern Tensas, Concordia, and Avoyelles Parishes. West of the Mississippi River valley, saltwater ridges in the Catahoula aquifer (Catahoula Formation) under the Red River Valley and Little River divide the Catahoula aquifer into three freshwater-bearing areas. Also, the saltwater ridge in the Carnahan Bayou aquifer under the Little River divides the Carnahan Bayou aquifer into two freshwater-bearing areas. In the southeastern part of the State, Miocene deposits are mapped as one aquifer--the southeast Louisiana Miocene aquifer. In most of southeastern Louisiana, the southeast Louisiana Miocene aquifer is equivalent to the Williamson Creek aquifer. However, the deeper southeast Louisiana Miocene sands along the northern edge of southeastern Louisiana is equivalent to the Carnahan Bayou aquifer.

Figure 3 shows the areal extent of freshwater in the aquifers of Pleistocene and Pliocene age. The Evangeline aquifer extends beneath most of the northern part of southwestern Louisiana and is overlain by the Chicot aquifer. The southeast Louisiana Pliocene aquifer, equivalent to the Evangeline aquifer, underlies the northern part of southeastern Louisiana and is overlain by the southeast Louisiana Pleistocene aquifer, which is equivalent to the Chicot aquifer. Freshwater in the Evangeline and Chicot aquifers is separated from freshwater in the southeast Louisiana Pliocene and southeast Louisiana Pleistocene aquifers by a saltwater ridge in the Evangeline and Chicot aquifers under the western side of the Mississippi River valley.

The major alluvial aquifers of Pleistocene age within the State were deposited in channels cut into deposits by the Mississippi River system and the Red River. Although in some areas the alluvial aquifers contain very hard water exceeding 1,000 mg/L of dissolved solids, the chloride concentration is less than 250 mg/L and, thus, is mapped as freshwater. The northern Louisiana terrace aquifer of Pleistocene age is distributed in a discontinuous band along the northeastern side of the Red River Valley and along the western edge of the Mississippi River valley.

Areas where no major aquifer contains freshwater are shown in figures 1-3 from the coastal marsh and delta area east of New Orleans to the western side of the Atchafalaya River basin and in some coastal areas in southwestern Louisiana; however, locally discontinuous, shallow sand beds supply freshwater. None of the major aquifers contains freshwater in northern Louisiana where the Vicksburg and Jackson Groups crop out and the underlying Cockfield aquifer (Cockfield Formation) contains saline water. The Carrizo-Wilcox aquifer system does not contain freshwater in areas where there are no significant sand beds. Also, no freshwater is available along the saltwater ridge in the Catahoula and Carnahan Bayou aquifers beneath the lower Little River basin and in some saltwater anomalies within the Red River and Mississippi River alluvial aquifers.

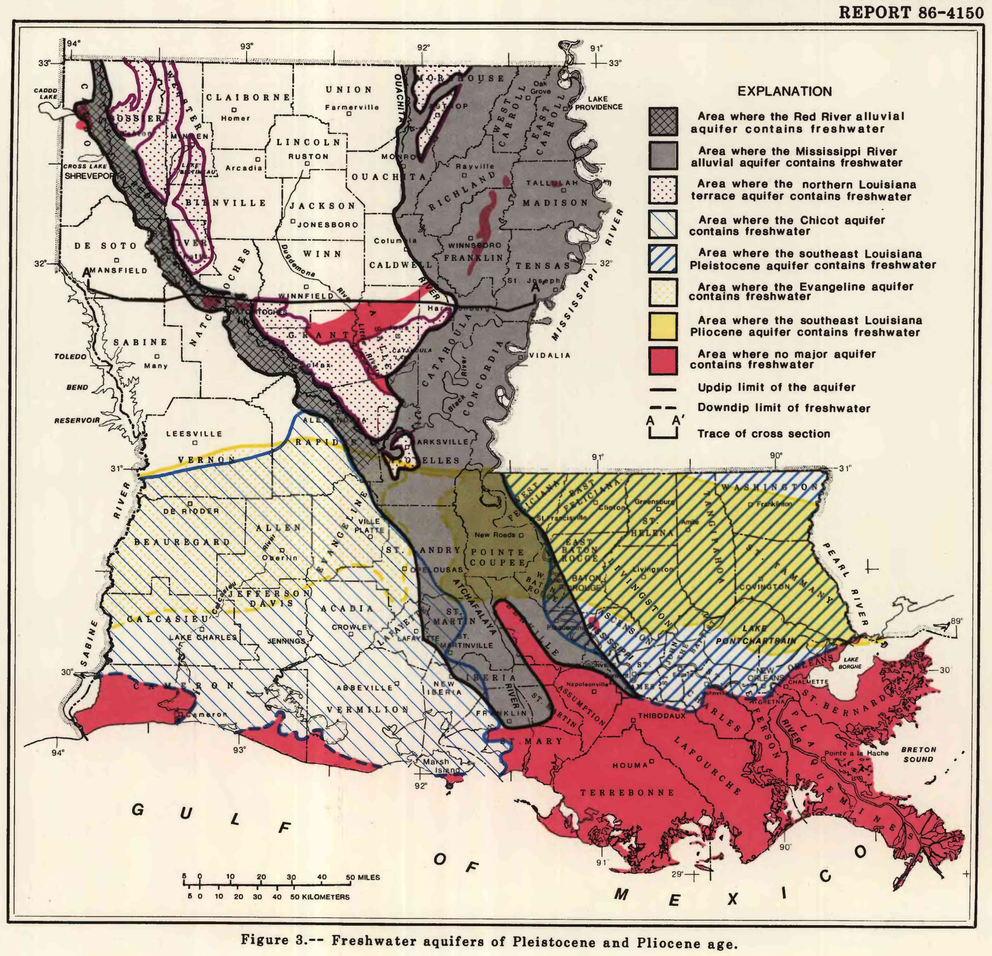

Figure 3.-- Freshwater aquifers of Pleistocene and Pliocene age.

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Table 1.--Geohydrologic column

Epoch	Northern and southwestern Louisiana: Aquifer	Northern and southwestern Louisiana: Confining bed	Southeastern Louisiana: Aquifer
Pleistocene	Red River alluvial Mississippi River alluvial		Mississippi River alluvial
	Northern Louisiana terrace Chicot		Southeast Louisiana Pleistocene
Pliocene	Evangeline		Southeast Louisiana Pliocene
Miocene	Jasper: Williamson Creek	Castor Creek	Southeast Louisiana Miocene
		Dough Hills	
	Jasper: Carnahan Bayou		
	Catahoula	Lena	
Oligocene		Vicksburg	
Eocene	Cockfield	Jackson	No freshwater occurs in deposits older than Miocene in southeastern Louisiana
		Cook Mountain	
	Sparta	Cane River	
	Carrizo-Wilcox		
Paleocene		Midway	

Table 2.--Thickness, depth, and yield of wells in the major freshwater aquifers in Louisiana

Aquifer (from youngest to oldest)	Thickness of freshwater interval (feet)	Maximum depth of occurrence of freshwater (feet above (+) or below (-) sea level)	Yield of wells (gallons per minute)
Red River alluvial	50- 200	+20 to -160	500-2,800
Mississippi River alluvial	50- 500	-20 to -500	1,000-4,000
Northern Louisiana terrace	50- 150	+100 to -100	100-1,700
Chicot	50-1,050	+100 to -1,000	500-4,000
Southeast Louisiana Pleistocene	50-1,100	+350 to -1,100	250-3,500
Evangeline	50-1,900	+150 to -2,250	200-1,000
Southeast Louisiana Pliocene	50-1,500	0 to -2,500	200-4,000
Williamson Creek	50-1,250	+175 to -2,450	200-1,200
Carnahan Bayou	100-1,100	+250 to -3,300	200-1,100
Catahoula	50- 450	+250 to -2,200	50- 400
Southeast Louisiana Miocene	1,600-2,350	-500 to -3,200	200-3,400
Cockfield	50- 600	+200 to -2,150	50- 500
Sparta	50- 700	+200 to -1,700	100-1,800
Carrizo-Wilcox	50- 850	+200 to -1,100	30- 100

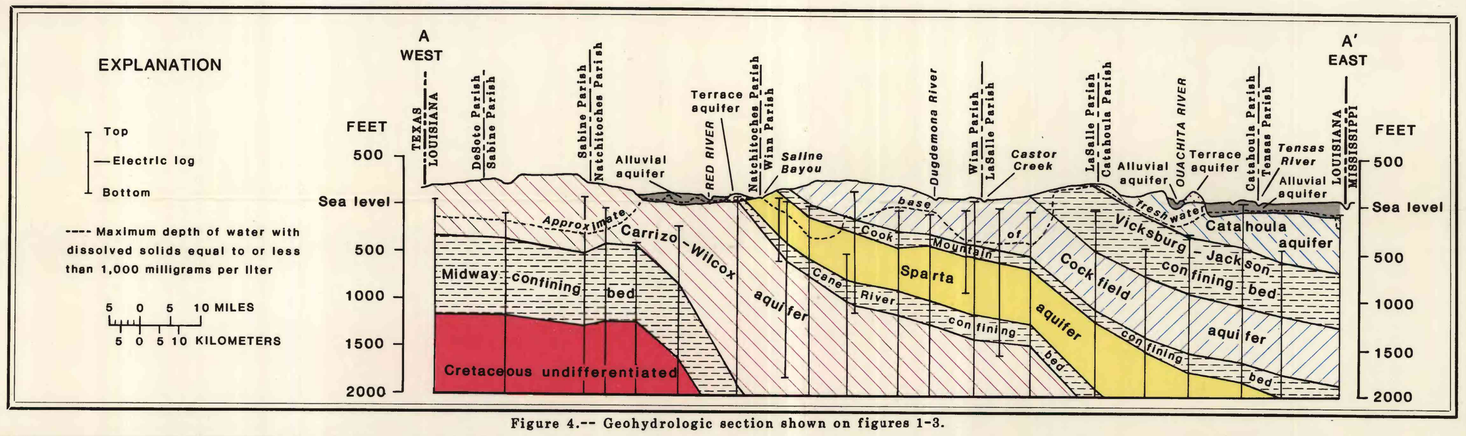

Figure 4.-- Geohydrologic section shown on figures 1-3.