Prepared in cooperation with the
LOUISIANA DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT
PUBLIC WORKS AND FLOOD CONTROL DIRECTORATE
WATER RESOURCES SECTION



## INTRODUCTION

The Mississippi River alluvial aquifer is the largest source of fresh ground water in northeastern Louisiana. The water is used primarily for agriculture, aquaculture, and public supply. In 1990, an average of 170 Mgal/d of water was withdrawn from the Mississippi River alluvial aquifer in 12 parishes in northeastern Louisiana; 95 percent of the withdrawn water was used for agriculture and aquaculture (Lovelace, 1991).

Additional knowledge about ground-water flow and the effects of withdrawals on the Mississippi River alluvial aquifer is needed for assessment of ground-water development potential and protection of the resource. To meet this need, the potentiometric surface of the aquifer and water-level changes in that surface are being monitored as part of the U.S. Geological Survey's cooperative program with the Louisiana Department of Transportation and Development.

This report presents maps that illustrate the potentiometric surface during September 1990 and water-level changes during 1974-90 for the Mississippi River alluvial aquifer. Hydrographs of water levels in selected wells completed in the aquifer also are presented. The water-level data are on file at the U.S. Geological Survey.

The potentiometric-surface map in this report can be used to determine the direction of ground-water flow, the hydraulic gradient, and the effects of withdrawals on ground water. An average rate of ground-water movement can be estimated from the hydraulic gradient when the hydraulic conductivity and porosity of the aquifer are known. Hydrographs are used to show water-level trends.

This map report is the sixth in a series of potentiometric surface and water-level change maps of the aquifers in Louisiana. Previous studies of northeastern Louisiana that describe the Mississippi River alluvial aquifer are included in the Selected References.

## HYDROGEOLOGY

The Mississippi River alluvial aquifer in northeastern Louisiana is comprised of fluvial sediments of Pleistocene age that overlie an irregularly eroded surface of Tertiary age. The aquifer is composed of coarse- to very coarse-grained sand and gravel at the base and grades upward to fine-grained sand. The aquifer ranges in thickness from 20 to 140 ft. The sediments increase in thickness to the east toward the Mississippi River and to the south. Silt and clay deposits of Pleistocene to Holocene age overlie the aquifer and range in thickness from 0 to 100 ft, but generally are less than 40 ft thick (Whitfield, 1975, p. 5). Alluvial deposits west of the Ouachita River in Ouachita Parish are referred to as the Ouachita River alluvial aquifer, but these deposits and the Mississippi River alluvial aquifer are hydraulically connected. In Morehouse Parish, terrace deposits of Pleistocene age also are hydraulically connected with the Mississippi River alluvial aquifer.

The Mississippi River alluvial aquifer is usually under artesian conditions; however, in areas where the overlying clay confining unit is thin, water-table conditions are present. Artesian conditions might change to water-table conditions if the water level in the aquifer is lowered below the base of the overlying confining unit by pumping or seasonal water-level declines (Whitfield, 1975, p. 5). Recharge enters the aquifer from downward seepage of surface runoff, upward movement of ground water from underlying aquifers, and discharge from streams during high stages (Whitfield, 1975).

Freshwater extends to the base of the aquifer in most of northeastern Louisiana; however, the water usually has to be treated for removal of hardness and iron before it is suitable for public supply. Chloride concentrations in water from the aquifer generally are less than 100 mg/L, but have been measured as high as 4,000 mg/L (Whitfield, 1975, p. 12). The areas in which the Mississippi River alluvial aquifer contains saltwater are shown in figures 1 and 2 (modified from Whitfield, 1975, fig. 2). In this report, saltwater is defined as water that contains chloride concentrations of 250 mg/L or greater. Concentrations greater than 250 mg/L exceed the secondary maximum contaminant level (SMCL)[1] for drinking water established by the U.S. Environmental Protection Agency (U.S. Environmental Protection Agency, 1977, 1992).

Yields of water from wells completed in the Mississippi River alluvial aquifer are dependent on location and construction. A properly constructed, large diameter well can yield as much as 7,000 gal/min; however, the average large capacity well yields less than 2,000 gal/min (Whitfield, 1975, p. 9).

## POTENTIOMETRIC SURFACE

The map of the potentiometric surface of the Mississippi River alluvial aquifer in September 1990 (fig. 1) was constructed using data from 76 wells screened in the Mississippi River alluvial aquifer, 4 wells screened in the Ouachita River alluvial aquifer, and 5 wells screened in terrace deposits (table 1). Altitude of water levels in the Mississippi River alluvial aquifer ranged from 20 ft above sea level in Catahoula Parish to greater than 90 ft above sea level in Morehouse Parish (fig. 1).

Ground water flows from an area of higher head to an area of lower head, with the direction of flow occurring perpendicular to the potentiometric contour lines. Ground-water flow within the Mississippi River alluvial aquifer generally is downvalley (fig. 1). Ground water also flows east toward the Mississippi River and west toward the Ouachita River. Smaller streams in the valley have a lesser effect on the local direction of flow. During dry periods, water from the aquifer discharges to the streams. During periods of high stream stages, the aquifer is recharged by water from the streams.

[1] Secondary Drinking-Water Regulations secondary maximum contaminant level (SMCL): Contaminants that affect the aesthetic quality of drinking water. At high concentrations or values, health implications as well as aesthetic degradation may also exist. SMCL's are not Federally enforceable, but are intended as guidelines for the states.


Index map

### CONVERSION FACTORS, VERTICAL DATUM, AND ABBREVIATED WATER-QUALITY UNIT

| Multiply | By | To obtain |
|---|---|---|
| foot (ft) | 0.3048 | meter |
| foot per year (ft/yr) | 0.3048 | meter per year |
| million gallons per day (Mgal/d) | 3,785 | cubic meter per day |
| gallons per minute (gal/min) | 0.06308 | liter per second |
| mile (mi) | 1.609 | kilometer (km) |

**Sea level:** In this report "sea level" refers to the National Geodetic Vertical Datum of 1929--a geodetic datum derived from a general adjustment of the first-order level nets of the United States and Canada, formerly called Sea Level Datum of 1929.

**Abbreviated water-quality unit:**
mg/L, milligrams per liter

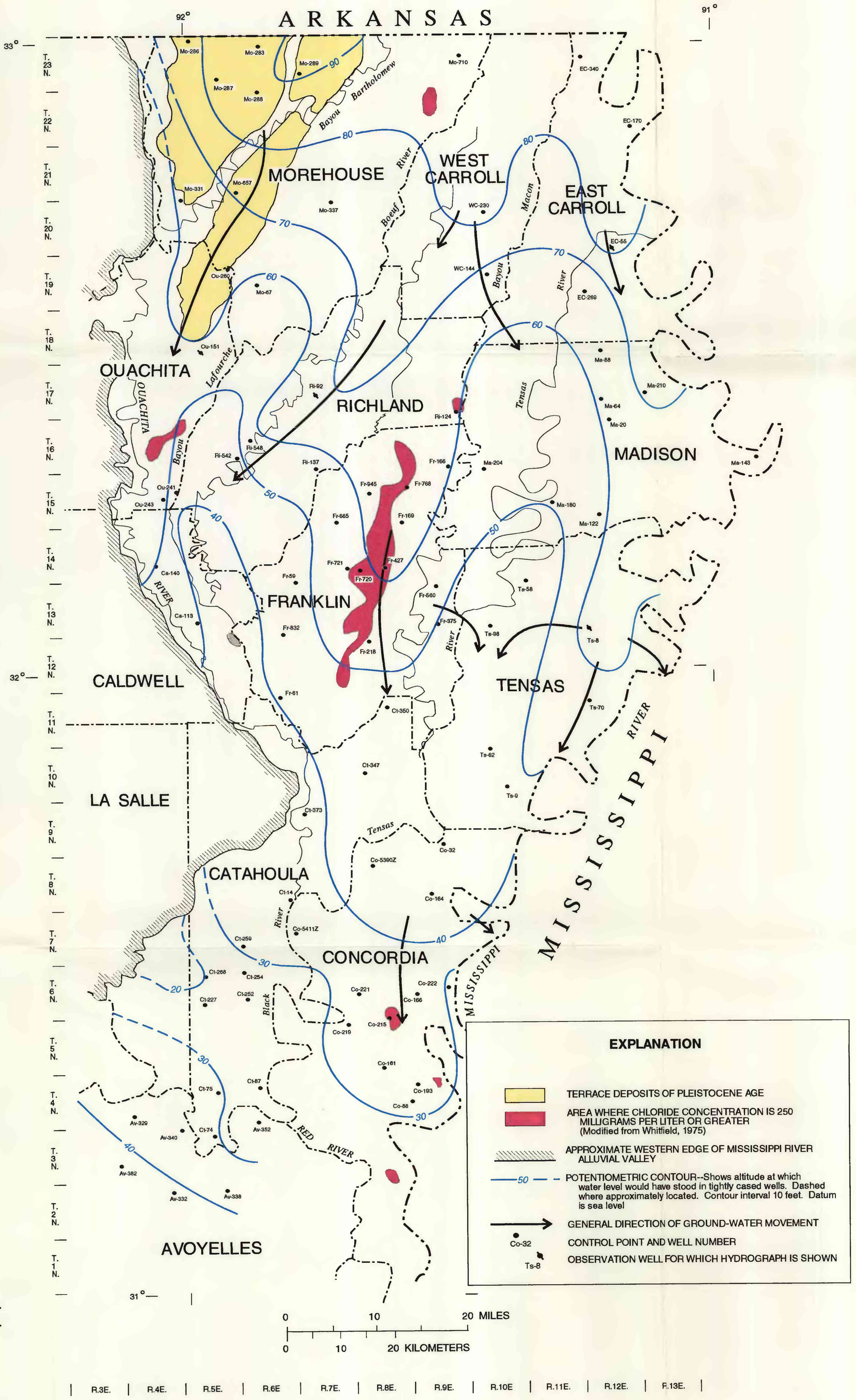


Figure 1. Potentiometric surface, September 1990, of the Mississippi River alluvial aquifer in northeastern Louisiana.

Table 1.--*Water-level data used to construct potentiometric-surface map of the Mississippi River alluvial aquifer in northeastern Louisiana, September 1990*

| Well number | Well depth (feet) | Water level (feet below land surface) | Water level (feet above sea level) | Date |
|---|---|---|---|---|
| **Avoyelles Parish** | | | | |
| Av-329 | 45 | 10.51 | 35.09 | 12 |
| Av-332 | 70 | 9.45 | 42.65 | 7 |
| Av-338 | 85 | 11.40 | 35.00 | 7 |
| Av-340 | 43 | 13.40 | 33.10 | 12 |
| Av-352 | 64 | 20.90 | 28.10 | 11 |
| Av-382 | 37 | 16.65 | 43.35 | 11 |
| **Caldwell Parish** | | | | |
| Ca-113 | 100 | 19.02 | 40.98 | 19 |
| Ca-140 | 60 | 15.28 | 49.72 | 19 |
| **Catahoula Parish** | | | | |
| Ct- 14 | 125 | 19.58 | 35.42 | 10 |
| Ct- 74 | 196 | 18.05 | 31.95 | 12 |
| Ct- 75 | 107 | 14.54 | 30.06 | 12 |
| Ct- 87 | 126 | 22.93 | 27.07 | 12 |
| Ct-227 | 100 | 11.86 | 28.14 | 12 |
| Ct-252 | 118 | 19.70 | 25.30 | 12 |
| Ct-254 | 140 | 17.21 | 27.79 | 12 |
| Ct-259 | 125 | 13.92 | 31.08 | 12 |
| Ct-268 | 130 | 21.05 | 19.95 | 12 |
| Ct-347 | 76 | 26.35 | 43.65 | 11 |
| Ct-350 | 111 | 28.83 | 47.17 | 11 |
| Ct-373 | 107 | 20.02 | 34.98 | 11 |
| **Concordia Parish** | | | | |
| Co- 32 | 136 | 16.82 | 43.18 | 11 |
| Co- 88 | 120 | 14.05 | 30.95 | 10 |
| Co-161 | 164 | 12.95 | 32.05 | 10 |
| Co-164 | 136 | 13.04 | 47.96 | 11 |
| Co-168 | 135 | 16.60 | 32.40 | 10 |
| Co-193 | 100 | 10.70 | 34.30 | 10 |
| Co-215 | 121 | 14.59 | 35.41 | 10 |
| Co-219 | 100 | 15.85 | 34.15 | 10 |
| Co-221 | 100 | 20.65 | 30.35 | 10 |
| Co-222 | 100 | 22.96 | 29.04 | 10 |
| Co-5390Z | 96 | 10.07 | 49.93 | 11 |
| Co-5411Z | 100 | 15.34 | 39.66 | 10 |
| **East Carroll Parish** | | | | |
| Ec- 55 | 114 | 14.44 | 82.56 | 11 |
| Ec-170 | 107 | 12.20 | 89.80 | 20 |
| Ec-269 | 121 | 26.50 | 60.50 | 20 |
| Ec-340 | 100 | 16.27 | 83.73 | 20 |
| **Franklin Parish** | | | | |
| Fr- 59 | 105 | 23.93 | 46.07 | 19 |
| Fr- 61 | 146 | 18.78 | 43.22 | 12 |
| Fr-166 | 90 | 21.90 | 65.10 | 19 |
| Fr-169 | 95 | 23.00 | 63.00 | 19 |
| Fr-218 | 110 | 22.47 | 54.53 | 11 |
| Fr-375 | 107 | 15.29 | 46.71 | 21 |
| Fr-427 | 100 | 18.32 | 61.68 | 25 |
| Fr-560 | 108 | 17.55 | 52.45 | 21 |
| Fr-665 | 60 | 18.97 | 55.03 | 20 |
| Fr-720 | 100 | 18.79 | 56.21 | 11 |
| Fr-721 | 77 | 11.35 | 53.65 | 11 |
| Fr-768 | 100 | 25.04 | 62.96 | 19 |
| Fr-832 | 95 | 21.70 | 44.30 | 19 |
| Fr-945 | 100 | 14.07 | 62.93 | 19 |
| **Madison Parish** | | | | |
| Ma- 20 | 130 | 16.03 | 58.97 | 13 |
| Ma- 64 | 117 | 13.39 | 66.61 | 20 |
| Ma- 88 | 115 | 14.46 | 67.54 | 20 |
| Ma-122 | 174 | 16.05 | 58.95 | 20 |
| Ma-143 | 148 | 24.48 | 63.52 | 14 |
| Ma-180 | 114 | 24.77 | 50.23 | 25 |
| Ma-204 | 95 | 12.72 | 58.28 | 25 |
| Ma-210 | 94 | 17.70 | 72.30 | 20 |
| **Morehouse Parish** | | | | |
| Mo- 67 | 81 | 13.81 | 59.69 | 10 |
| Mo-283[a] | 135 | 75.48 | 87.82 | 10 |
| Mo-286[a] | 67 | 24.69 | 75.61 | 21 |
| Mo-287[a] | 86 | 19.99 | 84.11 | 21 |
| Mo-288[a] | 158 | 57.32 | 88.38 | 21 |
| Mo-289[a] | 104 | 32.13 | 92.17 | 21 |
| Mo-331 | 41 | 16.74 | 60.36 | 11 |
| Mo-337 | 40 | 20.99 | 74.21 | 10 |
| Mo-657 | 97 | 56.10 | 70.50 | 11 |
| Mo-710 | 130 | 15.66 | 83.34 | 10 |
| **Ouachita Parish** | | | | |
| Ou-151[b] | 68 | 13.72 | 58.68 | 10 |
| Ou-241[b] | 70 | 21.24 | 40.26 | 10 |
| Ou-243[b] | 62 | 9.70 | 52.10 | 10 |
| Ou-260[b] | 52 | 12.32 | 66.28 | 13 |
| **Richland Parish** | | | | |
| Ri- 92 | 153 | 10.84 | 69.16 | 12 |
| Ri-124 | 84 | 32.49 | 62.51 | 11 |
| Ri-137 | 102 | 13.80 | 56.20 | 12 |
| Ri-542 | 99 | 21.63 | 48.37 | 12 |
| Ri-548 | 60 | 17.07 | 57.93 | 12 |
| **Tensas Parish** | | | | |
| Ts- 8 | 110 | 14.14 | 65.46 | 19 |
| Ts- 9 | 102 | 16.90 | 48.10 | 21 |
| Ts- 58 | 135 | 23.75 | 45.25 | 21 |
| Ts- 62 | 134 | 22.45 | 43.55 | 27 |
| Ts- 70 | 130 | 14.34 | 55.66 | 19 |
| Ts- 98 | 130 | 20.30 | 46.70 | 25 |
| **West Carroll Parish** | | | | |
| WC-144 | 92 | 30.02 | 68.98 | 11 |
| WC-230 | 87 | 30.33 | 84.67 | 11 |

[a] Wells screened in terrace deposits of Pleistocene age.
[b] Wells screened in the Ouachita River alluvial aquifer.

# LOUISIANA GROUND-WATER MAP NO. 6: POTENTIOMETRIC SURFACE, 1990, OF THE MISSISSIPPI RIVER ALLUVIAL AQUIFER IN NORTHEASTERN LOUISIANA

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1995

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