II. ENVIRONMENTAL SETTING

DESCRIPTION OF THE STUDY AREA

The Memphis Landing is public property along the east side of the Wolf River Harbor in downtown Memphis (Figures 2 and 3). Before the formation of Mud Island at the turn of the twentieth century, the Landing was on the left descending bank of the Mississippi River approximately between River Miles 732.7 and 734.1.

Historically, the stone-paved surface associated with the great Memphis Landing began at Jefferson Avenue on the north and extended south beyond the south side of Beale Street. The stones extended from the water's edge on the west to Front Street on the east. Today, the area of stone pavement is much reduced. On the north, a large segment of the original Landing between Jefferson and Court avenues was covered with fill for Jefferson Davis Park. Construction of Riverside Drive in the 1930s destroyed or covered the eastern margin of the Landing. On the south end, where Riverside Drive is closest to the riverbank, a large segment of the stone paving is buried under talus slope and riprap at the northern end of Tom Lee Park.

For management purposes, the study area can be divided into two segments: 1) the visible, relatively intact stone pavement between Jefferson Davis Park on the north and the asphalt drive leading from the Beale Street access ramp on the south; and 2) the area south of the Beale Street access ramp disturbed by the proposed Tom Lee Monument relocation project.

The intact stone pavement north of the Beale Street ramp is the major focus of this cultural resource assessment and is shown in aerial view in Composite Map 1, Appendix 1. The area was surveyed by the City of Memphis for the study when the river level was relatively low and all of the stone pavement was exposed. The City's base map, with revisions, is presented as Figure 4. The survey established a baseline, marked in 100 foot intervals, beginning at the Beale Street ramp (point 0+00) and extending north to the base of the talus slope at Jefferson Davis Park (point 19+00). This segment of the Landing is approximately 1,900 feet long. The width of the Landing (measured from the base of the Riverside Drive embankment on the east to the western edge of the stone pavement) is quite variable. The pavement retains a maximum width of approximately 215 feet near the Landing's midsection (at the 10+00 line, just north of the intersection of Union Avenue and Riverside Drive). The pavement is narrower at the northern and southern ends, with minimum widths of approximately 120 feet at the 19+00 line (Court Street) and approximately 130 feet at the 4+00 line (Gayoso Street). Elevations at the surface of the stone pavement range from approximately 230 feet above mean sea level (AMSL) along the base of the Riverside Drive embankment (east end of the 10+00 line) to approximately 191 feet AMSL at the western edge of the intact pavement (west end of the 11+00 line). Overall, the northern end of the paved Landing is slightly higher than the south end, although the slope is consistent (Figure 5). During periods of rising high water, the river's edge reaches the eastern margin of the Landing at the southern end near the Beale Street ramp before covering the northern Court Street portion.

When the river stage is at 2 feet above the 0 water line (185.91 feet AMSL), as it was when aerial photographs were taken, the total area of the Landing north of the Beale Street ramp is approximately 379,000 square feet. Approximately 70,000 square feet of this total consists of silty river clay above the waterline but below the present edge of the cobbled surface. This area of river-deposited sediments presumably represents the area of the paved landing that has eroded away over the last 130 years. An estimated 813,442 cobbles cover the remaining 309,000 square feet.

Figure 2. Location of the Project Area.

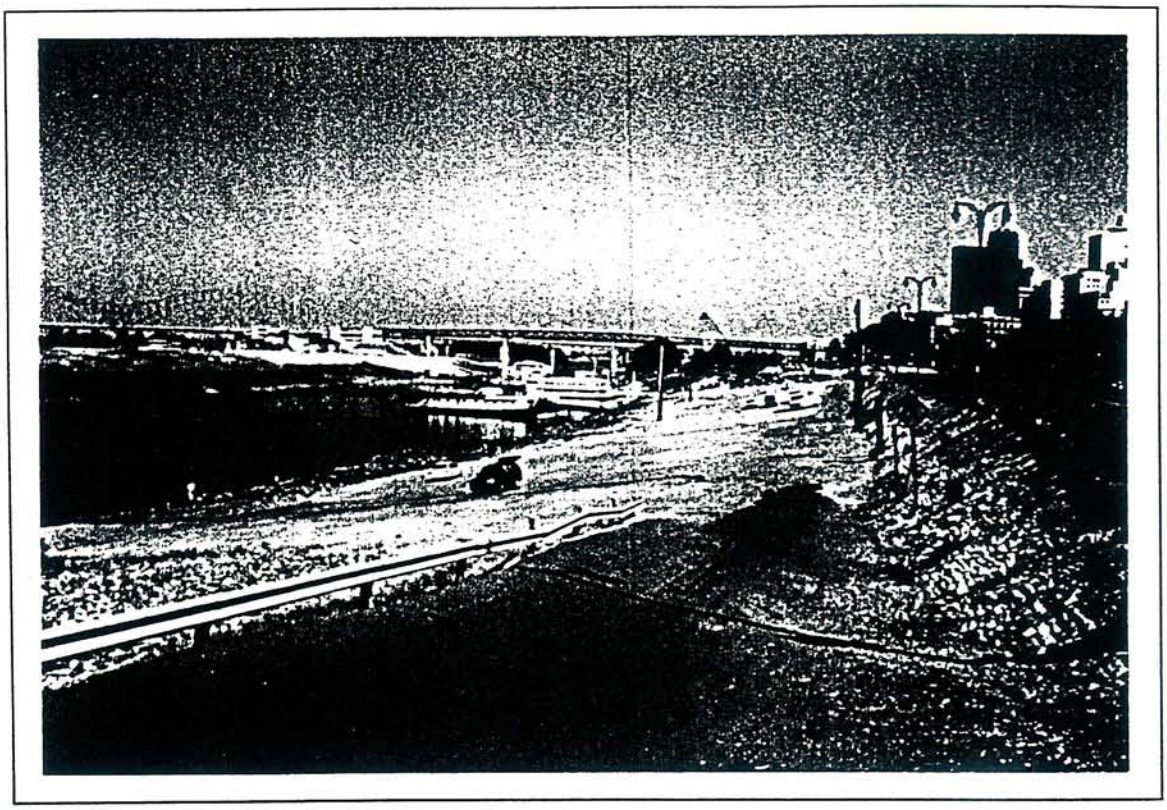
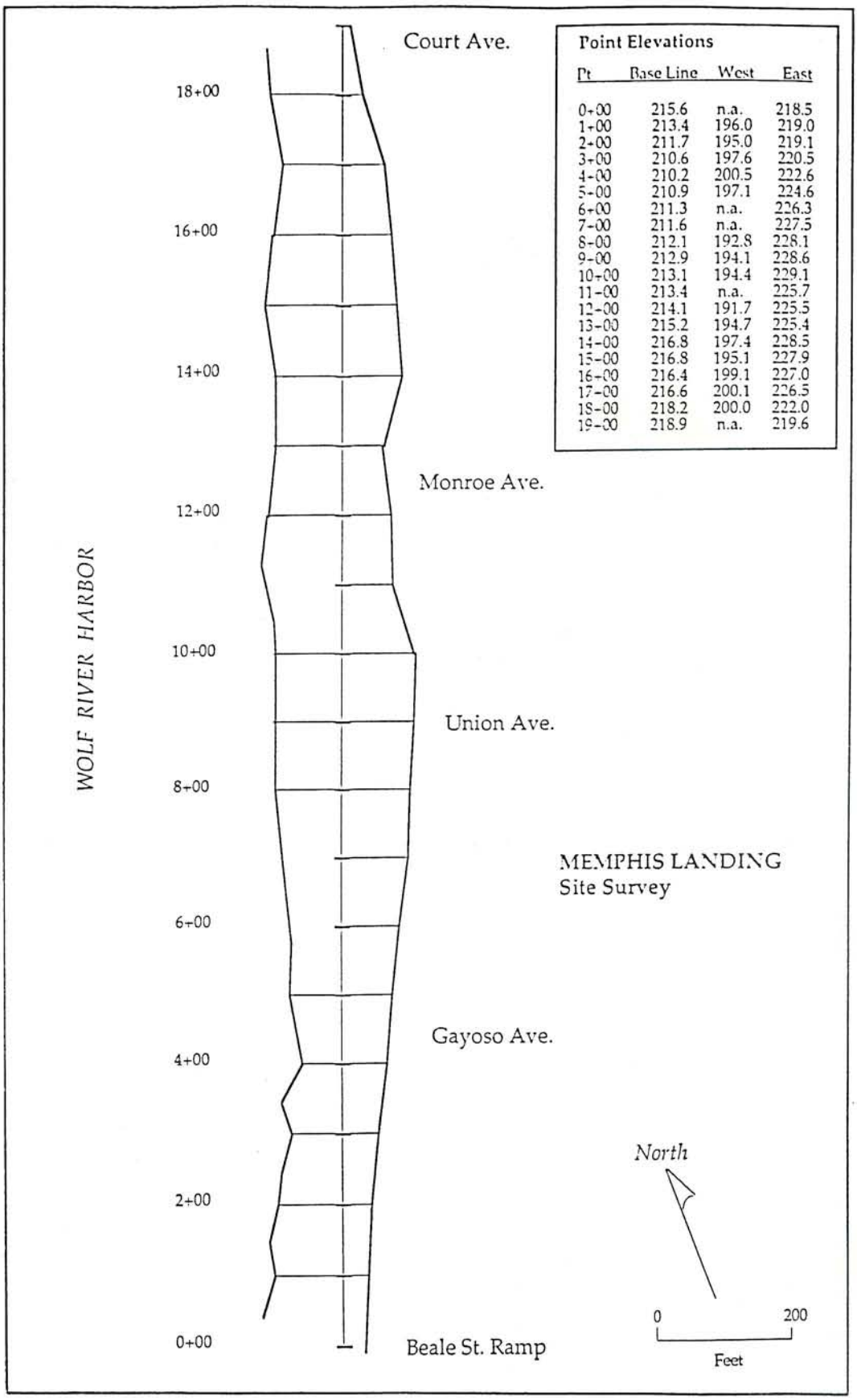


Figure 3. The Memphis Landing (View to the North from the Beale Street Ramp).



Point Elevations

Pt	Base Line	West	East
0+00	215.6	n.a.	218.5
1+00	213.4	196.0	219.0
2+00	211.7	195.0	219.1
3+00	210.6	197.6	220.5
4+00	210.2	200.5	222.6
5+00	210.9	197.1	224.6
6+00	211.3	n.a.	226.3
7+00	211.6	n.a.	227.5
8+00	212.1	192.8	228.1
9+00	212.9	194.1	228.6
10+00	213.1	194.4	229.1
11+00	213.4	n.a.	225.7
12+00	214.1	191.7	225.5
13+00	215.2	194.7	225.4
14+00	216.8	197.4	228.5
15+00	216.8	195.1	227.9
16+00	216.4	199.1	227.0
17+00	216.6	200.1	226.5
18+00	218.2	200.0	222.0
19+00	218.9	n.a.	219.6

Figure 4. City Survey of the Memphis Landing.

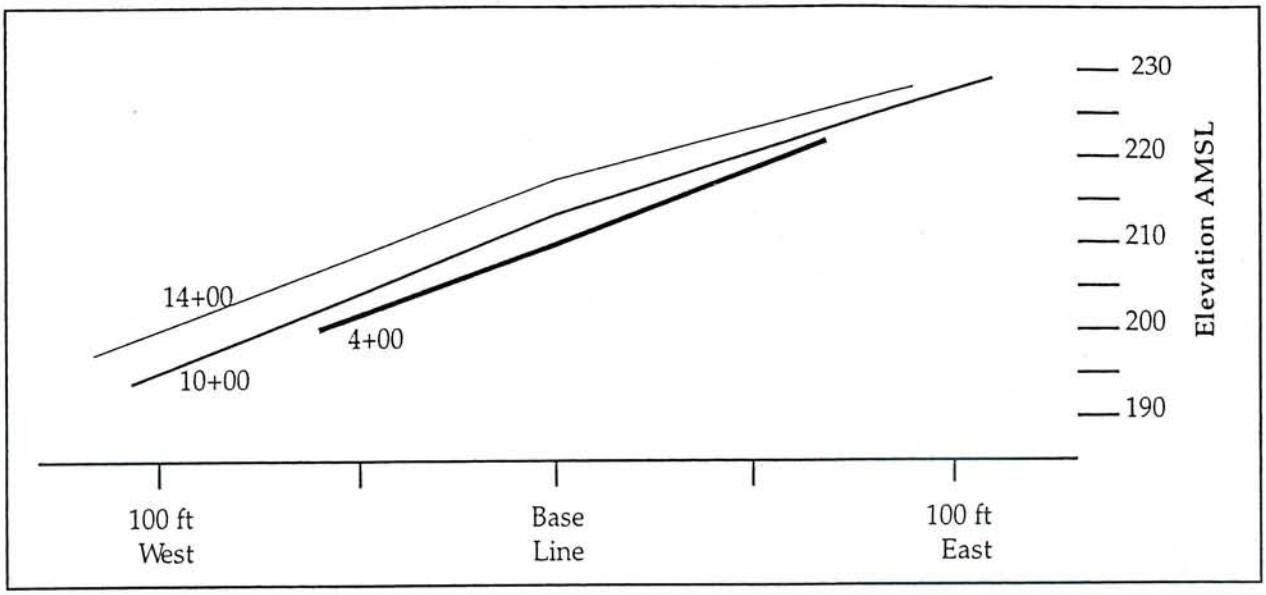


Figure 5. Comparison of Slope at Lines 14+00, 10+00, and 4+00.

At the time of this study, the site of the proposed Tom Lee Monument relocation project, located south of the Beale Street ramp, was covered with riprap and could not be examined in detail. However, this area was the subject of previous investigations by Weaver et al. (1994). Included here is an area of exposed stone paving, partially disturbed by construction, measuring approximately 170 feet north-south by 162 feet east-west (2,755 square feet). This area is bounded on the north by the asphalt road leading from the Beale Street ramp (the 0+00 line), on the east by the Riverside Drive embankment, on the west by the Wolf River Harbor, and on the south by a concrete culvert correlating with the centerline of Beale Street. South of the culvert, intact stone pavement is buried by layers of fill and riprap that line the western slope of Tom Lee Park. The paved surface extends at least 108 feet south of the concrete culvert at Beale Street and approximately 290 feet south of the 0+00 survey line at the Beale Street ramp.

HYDROLOGY

For most of its early history, the Memphis Landing fronted directly on the Mississippi River. Beginning about 1893, an outlying sandbar developed at the mouth of Wolf River. Formation of the sandbar increased as a result of the floods of 1912–1913, which changed the main channel of the Mississippi River from the Hopefield Chute, west of Island 40, to the existing channel east of Island 40. By the 1920s, the sandbar, now known as Mud Island, had extended so far south that Wolf River was trapped in a channel between the island and the bluff. In ca. 1935, Wolf River was diverted into the Loosahatchie Chute on the north side of Memphis, and the three-mile reach at the Wolf River's mouth became a slack-water harbor (Bragg 1977:77).

Records on water level fluctuations have been kept at Memphis since 1828, but detailed data from the Memphis gauge (at the foot of the Beale Street, River Mile 735.9) were not established until 1871 by the Mississippi River Commission. Before 1929, the zero mark on the Memphis gauge was determined to be 184.21 feet above Mean Gulf Level. Corrections were made in establishing the National Geodetic Vertical Datum of 1929 (NGVD); after this date, the zero mark on the Beale Street gauge was set at 183.91 feet NGVD (feet above mean sea level).

The Mississippi River at Memphis has a drainage area of approximately 928,700 square miles, It is approximately 2,800 feet wide from bank to bank at River Mile 735. The maximum recorded discharge at Memphis was 2,020,000 cubic feet per second (c.f.s.) during the flood of 1937. The lowest recorded discharge was 78,000 c.f.s. in 1936. The most current compiled data are from 1993, when the mean discharge equaled 816,000 c.f.s. (USCOE 1993).

The highest river stage at Memphis was recorded February 9, 1937, when the river reached 50.4 feet on the Beale Street gauge (234.31 feet NGVD). The lowest readings were on July 11 and 12, 1988, when the river fell to –10.0 feet (173.91 feet NGVD). This represents a fluctuation of 60.4 feet between the maximum and minimum recorded river levels. The expected 100-year flood mark at Memphis is 47.9 on the gauge (231.8 feet NGVD).

Preliminary figures from the Corps of Engineers have been compiled for monthly fluctuations at Memphis between 1945 and 1993 (Table 1; Figure 6). Mean fluctuations vary between an average maximum stage of 29.3 feet (213.2 feet NGVD) in April and a minimum average stage of 0.8 (184.71 feet NGVD) in October.

In 1993, a relatively wet year with flooding in the Missouri River basin, the highest stage was 33.26 feet on the gauge (217.17 feet NGVD), recorded on April 13; the lowest stage was 8.96 feet (192.87 NGVD), recorded on November 14 (a range of 24.3 feet). The yearly mean for 1993 was 22.47 feet (206.38 feet NGVD). Data on monthly fluctuations in 1993 are also shown in Table 1 and Figure 7 (USCOE 1993).

GEOLOGY, TOPOGRAPHY, AND SOILS

West Tennessee is in the Gulf Coastal Plain physiographic province, as defined by Fenneman (1938). It is situated in the northern part of the Mississippi Embayment syncline, a geological trough whose axis roughly parallels the Mississippi River. As one moves west from the Tennessee River toward the Mississippi River, progressively younger Cretaceous, Paleocene, Eocene, and Plio-Pleistocene surface strata are present. At the western boundary of the region, bottomlands in the Mississippi River floodplain are underlain by recent (Holocene) alluvium.

Between the Mississippi River floodplain and the West Tennessee Uplands is an area of gently rolling terrain called the West Tennessee Plain (Stearns 1975:4). Its topography is largely the result of sequential deposition and erosion of Pleistocene loess (eolian silts) formed at the close of the last (Wisconsinan) glaciation. The loess can be up to 80 feet thick along the Mississippi River but is increasingly thinner to the east, tapering away at about the location of Jackson, Tennessee. On the west, the West Tennessee Plain meets the Mississippi River floodplain and forms an escarpment known as the Loess Hills Bluffs. The Mississippi River abuts the escarpment at four locations between the mouth of the Ohio River and Vicksburg. The Memphis bluff, also known as the Fourth Chickasaw bluff, is the southernmost of the four locations. The Memphis bluff extends approximately 5.5 miles from about Auction Street on the north to Nonconnah Creek on the south. Elevations range from about 190 feet AMSL at the riverbank to about 280 feet AMSL between Front and Main streets.

After decades of urban development, exposures of the Memphis bluff have been modified and obscured by concrete, fill, and vegetation. Indeed, the soil survey for Shelby County classifies the project area as graded lands, silty material (Sease et al. 1989). However, correlation with other bluff exposures and with drilling logs presents a fairly good stratigraphic sequence of the bluffs. Figure 8 summarizes the late Quaternary eolian and fluvial units that comprise the Memphis bluff.

Table 1. Monthly Stages, Mississippi River at Memphis.

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1993												
Mean	23.45	15.96	25.94	31.81	26.66	17.66	25.35	28.10	19.48	18.33	16.61	20.27
Max.	26.9	24.1	30.5	33.3	31.5	20.3	29.9	30.9	24.6	26.4	27.4	25.5
Min.	19.1	11.4	19.4	29.4	17.0	15.0	18.1	20.9	17.6	12.1	9.0	10.0
1945–1993												
Mean	14.7	17.5	22.4	23.9	19.7	14.3	10.8	6.1	3.7	4.3	6.7	12.1
Max.	21.3	24.6	28.6	29.3	25.7	19.7	15.7	10.6	7.5	8.8	12.2	17.9
Min.	7.4	9.6	15.0	17.4	13.3	9.6	6.1	2.2	0.9	0.8	2.1	5.5

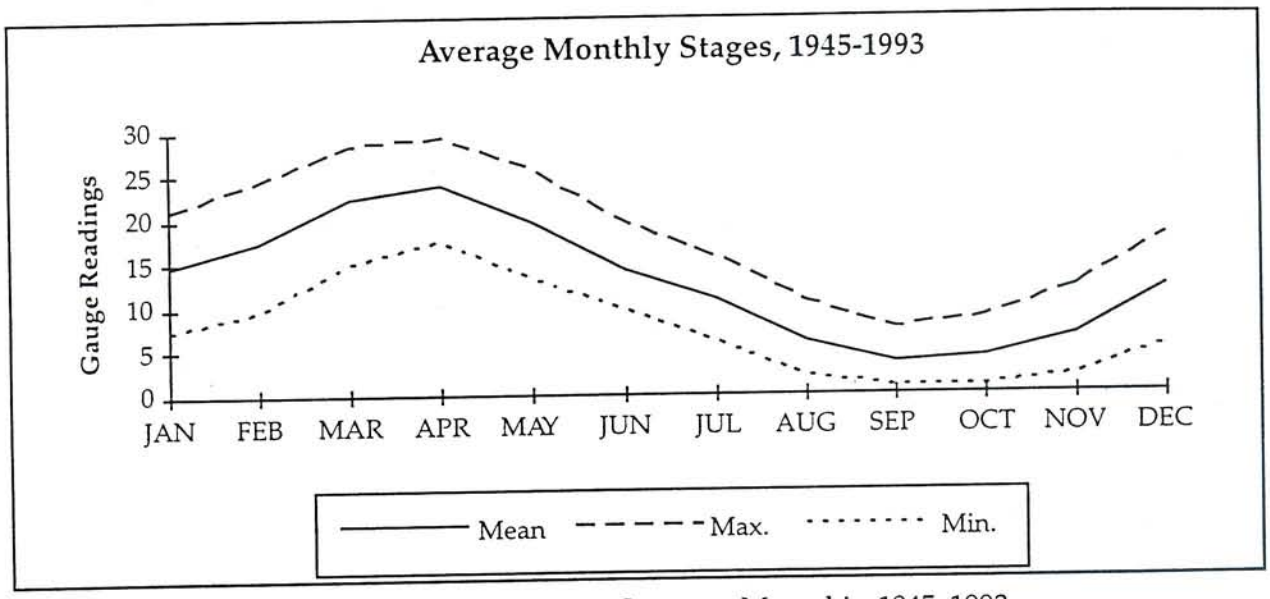


Figure 6. Average Monthly Mississippi River Stages at Memphis, 1945–1993.

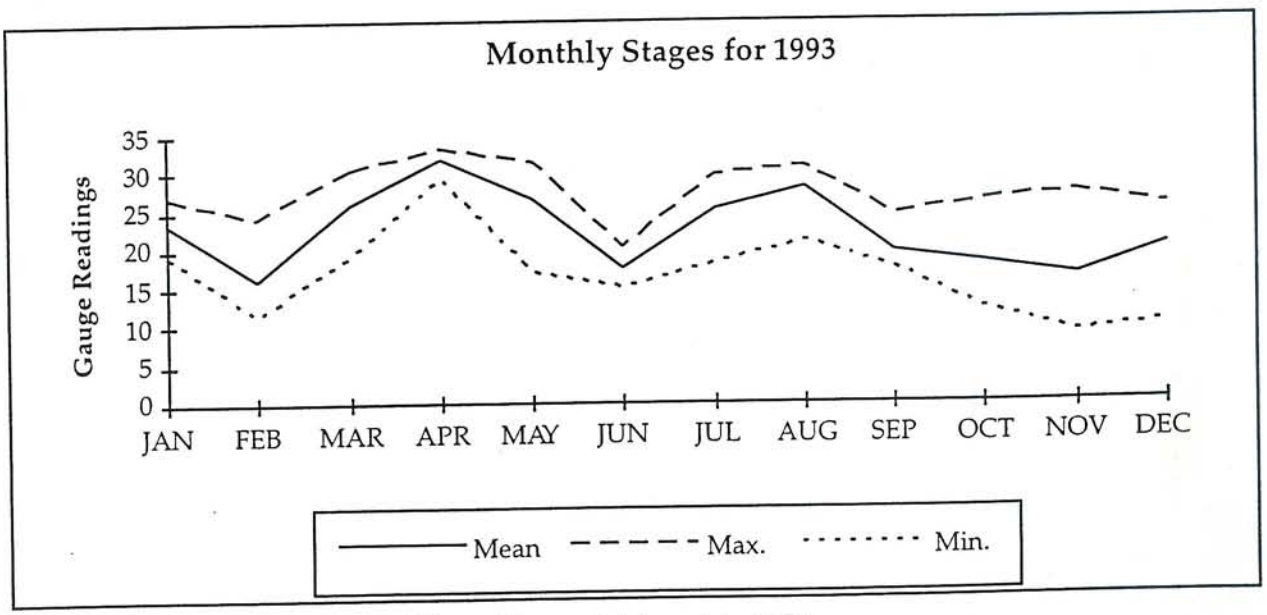


Figure 7. Monthly Mississippi River Stages at Memphis, 1993.

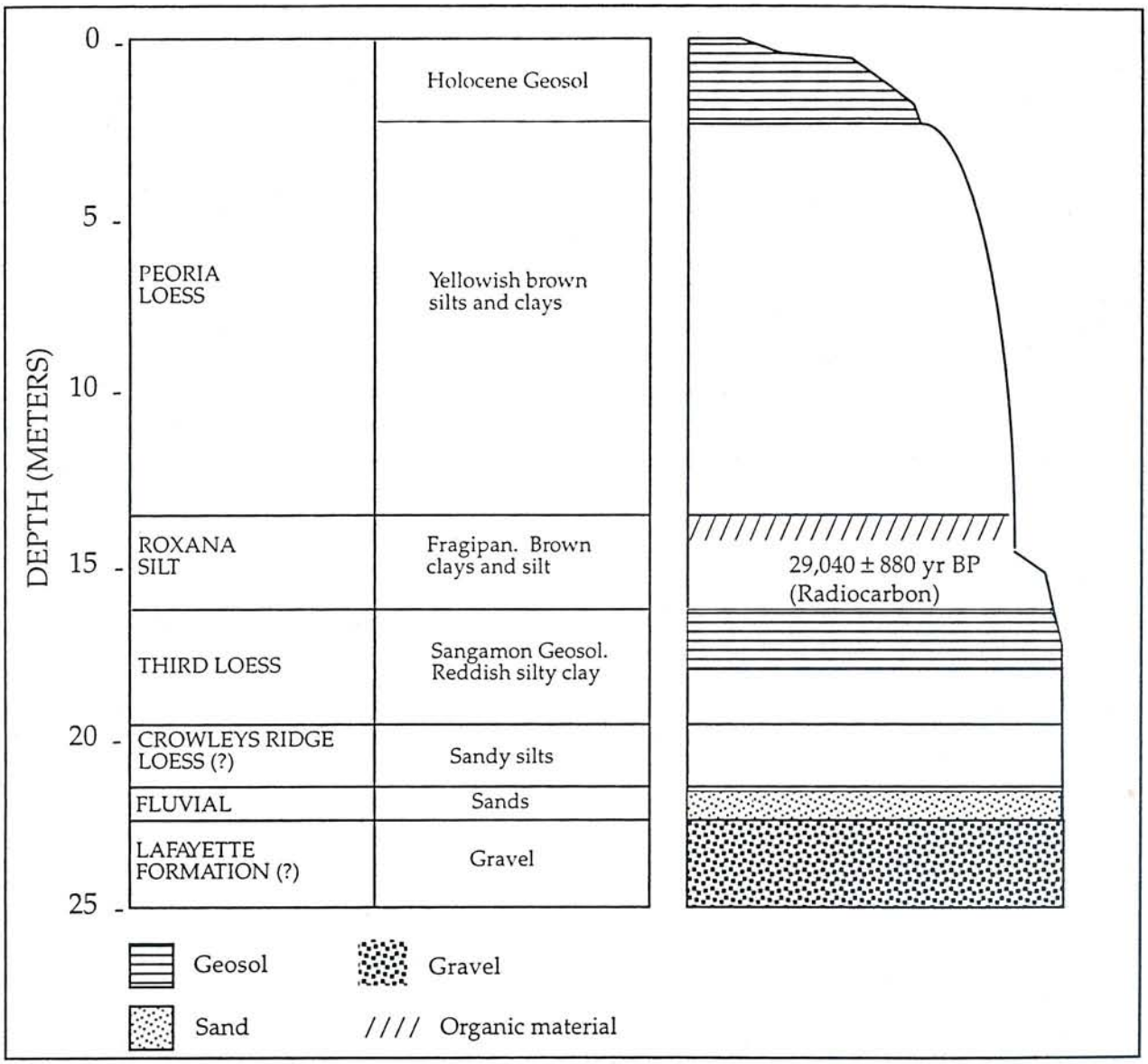


Figure 8. Late Quaternary Eolian and Fluvial Units Underlying Memphis (from Mirecki and Miller 1994:Figure 2).

Surface and near-surface geological units below the loess consist of relatively unconsolidated deposits of sand, silt, clay, chalk, gravel, and lignite belonging to the Upper Cretaceous Series of the Cretaceous System and to the Paleocene, Eocene, and Pliocene (?) Series of the Tertiary System. Paleozoic bedrock occurs at depths exceeding 3,000 feet (Parks and Lounsbury 1975:37). Table 2 summarizes the post-Paleozoic units.

CLIMATE

Shelby County, Tennessee, is characterized by mild winters and relatively hot summers, with an average annual temperature of 62°F (Sease et al. 1989:2–5). July is the warmest month, with an average of 82°F, and January is the coldest month, averaging 42°F. The average date of the last

Table 2. Post-Paleocene Geologic Units Underlying Memphis (from Parks and Lounsbury 1975:38).

System	*Series*	*Group*	*Stratigraphic Unit(feet)*	*Thickness*	*Lithology and Significance*
Quaternary	Holocene and Pleistocene		Alluvium	0–175	Sand, gravel, silt, and clay.
	Pleistocene		Loess	0–65	Silt, silty clay, and minor sand.
Quaternary and Tertiary (?)	Pleistocene and Pliocene		Fluvial deposits (Terrace deposits)	0–100	Sand and gravel; minorferruginous sandstone and (?)clay. Supplies water to many shallow domestic wells in suburban and county areas.
			Jackson Formation and upper part of Claiborne Group ("capping clay")	0–350	Clay, fine grained sand, and lignite. Supplies water to some shallow wells made in sands below the fluvial deposits, but generally considered to be of low permeability and to confine water in Memphis Sand.
		Claiborne	Memphis Sand ("500-foot sand")	600–880	Fine- to coarse-grained sand; subordinate lenses of clay and lignite. Very good aquifer from which most water for public and industrial supplies is obtained.
Tertiary	Eocene		Flour Island Formation	160–130	Clay, fine-grained sand, and lignite. Low permeability confines water in Memphis Sand and Fort Pillow Sand.
		Wilcox	Fort Pillow Sand	210–280	Fine- to medium-grained sand; subordinate lenses of clay and lignite. Once used as second principal aquifer for Memphis; now reserved for future use.
			Old Breastworks Formation	250	Clay, fine-grained sand, and lignite.

freezing temperature in the spring is March 20; November 12 is the average date for the first freezing temperature in the fall. The average growing season is 238 days. Rainfall is abundant, averaging 49.70 inches per year. January is the wettest month, with an average of 6.07 inches; October is the driest, with an average of 2.72 inches. Average annual snowfall is 3.90 inches.

FLORA AND FAUNA

A summary of paleobotanical studies in west Tennessee (Delcourt and Delcourt 1978:16–19; Delcourt et al. 1978, 1980) suggests that a mosaic of oak-pine forest and prairies dominated the region from approximately 26,000 to 20,000 B.C. Evidence of colder and wetter conditions from about 20,000 to 15,000 B.C. is indicated by the increase of spruce and northern pines. On Nonconnah Creek in south-central Shelby County, the remains of a mastodon were recovered in association with extensive botanical remains. This material dates to about 15,000 B.C. (Delcourt et al. 1980; Brister et al. 1981) and is further evidence of the climatic conditions of this period.

The loess hills east of the Mississippi River offered a less extreme environment that allowed mixed deciduous forests to persist in localized areas throughout the full glacial period. A major warming trend, starting about 15,000 B.C., was accompanied by a gradual replacement of conifers with an increasing number of deciduous species including oaks, ash, hickories, walnut, and birch. By about 3,000 B.C., modern climatic conditions had been established.

Current vegetation communities in Shelby County are included in the Mississippi Embayment section of the Western Mesophytic Forest region, as defined by Braun (1964:157–161). Like the Mississippian Plateau section to the east, a mosaic of prairie, oak-hickory forest, swamp forest, and mixed mesophytic communities is present.

The first inhabitants of what is now Shelby County encountered a wide variety of native plants and wildlife. Alluvial ridges and natural levees in the bottomlands of major drainages supported red and sweet gums, bottomland oaks, ash, honey locust, and hackberry. Low-lying areas and sloughs supported cypress, water oak, willow oak, tupelo gum, birch, cottonwood, sycamore, willow, shagbark and scalybark hickories, and other water-tolerant hardwoods. The loess-covered uplands and slopes were predominantly oak-hickory forests, with white oak, southern red oak, post oak, black oak, beech, upland hickories, sweet gum, yellow poplar, basswood, dogwood, redbud, and walnut. Cane could be gathered in the floodplains, and varieties of shrubs, vines, and herbaceous plants inhabited the uplands (Braun 1964; USDA 1964; Sease et al. 1989).

Native mammals included bison, deer, black bear, wolf, fox, bobcat, raccoon, opossum, beaver, and gray and fox squirrels. The area also supported diverse reptiles and amphibians. Turkey was an important food source for early inhabitants of the area, as were migratory and resident ducks and geese. Fish from the larger rivers and streams, oxbow lakes, and beaver ponds were also an important food source for prehistoric and historic occupants (USDA 1964, 1970).