

Geomorphic Investigation of Montgomery Point, Arkansas

by Joseph B. Dunbar

Geotechnical Laboratory

U.S. Army Corps of Engineers
Waterways Experiment Station
3909 Halls Ferry Road
Vicksburg, MS 39180-6199

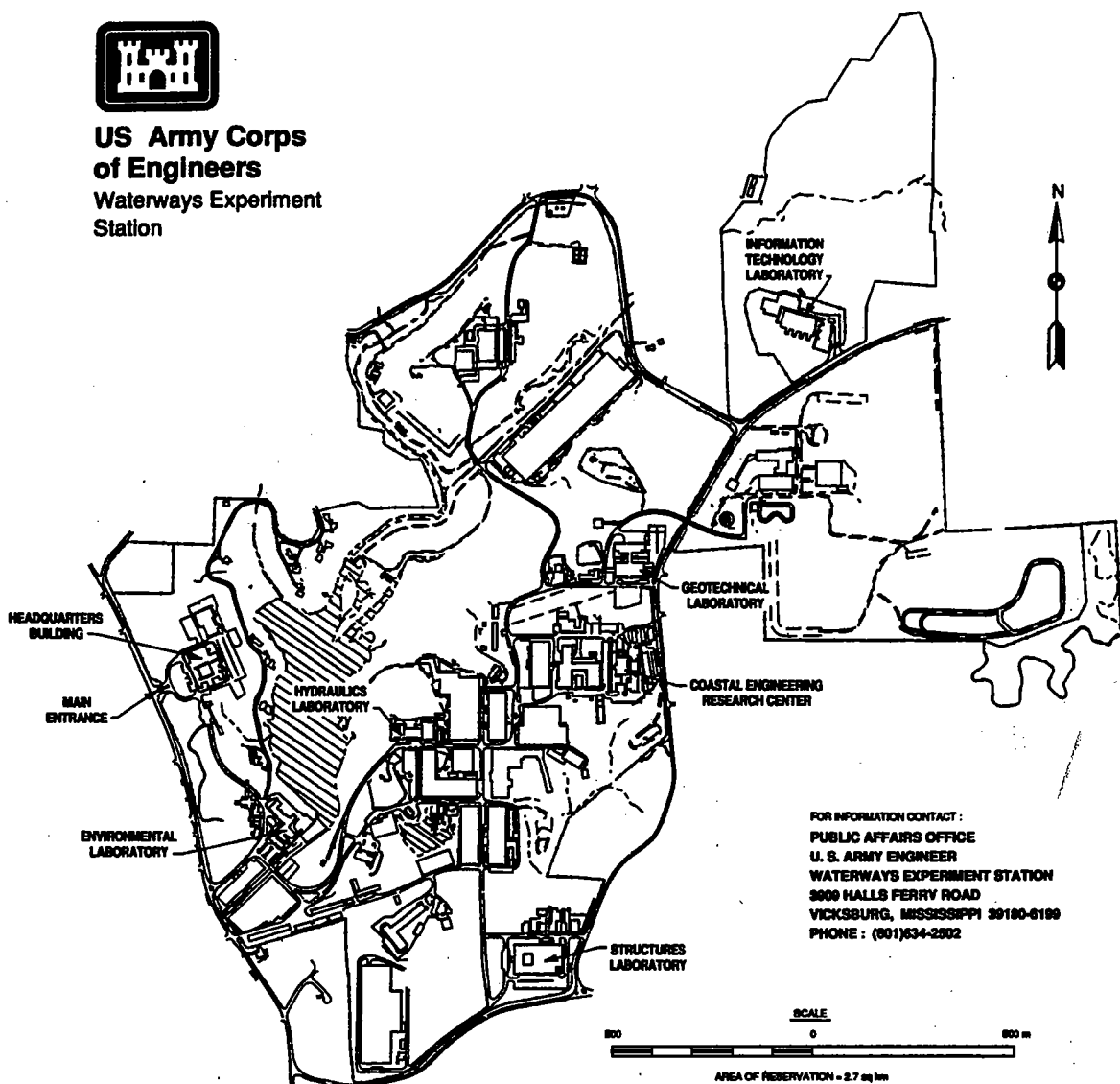
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PREFACE

The U.S. Army Engineer Waterways Experiment Station (WES) was authorized to conduct this investigation by the U.S. Army Engineer District, Little Rock (CESWL), on DA Form 2544, Order No. 89-153, "Geomorphic Investigation of the White River Entrance Channel," dated 13 July 1989.

Mr. Bob Dunn (CESWL-PL-A) was the Program Manager for this study. The following study or portions of this study will be included in a comprehensive report of the cultural resources of the Montgomery Point lock and dam site by Archeological Assessments Inc. (AAI), Nashville, Arkansas, for the CESWL.

The WES investigation was begun and the report prepared during the period 1 October 1989 to 17 November 1989. Mr. Joseph B. Dunbar, Geological Environments Analysis Section (GEAS), Engineering Geology Branch (EGB), Earthquake Engineering and Geosciences Division (EEGD), Geotechnical Laboratory (GL), performed the investigation and wrote the report. Field work in the Montgomery Point project area was conducted during the period 31 October 1989 to 3 November 1989 with personnel from AAI.

This investigation was performed under the direct supervision of Mr. Robert J. Larson, Chief, GEAS, and the general supervision of Dr. Lawson M. Smith, Chief, EGB, Dr. A. G. Franklin, Chief, EEGD, and Dr. William F. Marcuson III, Director, GL.

At the time of publication of this report, Dr. Robert W. Whalin was Director of WES. COL Bruce K. Howard, EN, was Commander.

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GEOMORPHIC INVESTIGATION OF MONTGOMERY POINT, ARKANSAS

PART I: INTRODUCTION

Background

1. Low water conditions at the mouth of the White River has caused navigation problems for barge traffic and has required the U.S. Army Engineer District, Little Rock (CESWL), to dredge the White River entrance channel to Lock and Dam 1 in order to keep a navigation channel open. The proposed construction of a lock and dam (i.e., Lock and Dam 0) at the mouth of the White River (river mile 0.55) will maintain a constant pool elevation during low water and eliminate major dredging activities which are necessary without the proposed structure. The proposed lock and dam will require barge traffic to lock through only during periods of low water. During periods of high water, river traffic will pass over collapsing gates on the dam. This study is part of a cultural resource investigation at the lock and dam site to evaluate the impacts of the proposed construction to cultural resources.

Purpose and Scope

2. The purpose of this investigation is to provide a geomorphic foundation for a cultural resource investigation of the proposed lock and dam site. Specific objectives of this investigation were as follows: identify and define the major geomorphic features and processes in the study area, reconstruct to the extent possible the geomorphic development of the study area, and determine the significance of the geomorphic features in terms of locating previously unknown archaeological sites and artifacts.

3. This investigation is a reconnaissance level study and involves the following tasks: data collection and literature review, interpretation of aerial photography and geomorphic mapping, a field reconnaissance of the study area, data analysis, and report preparation.

Study and Project Areas

4. The study area is located in southeast Arkansas at the mouth of the White River (see Figure 1). The study area consists of the northern half of the Big Island 15-minute (scale: 1:62,500) USGS topographic quadrangle. The

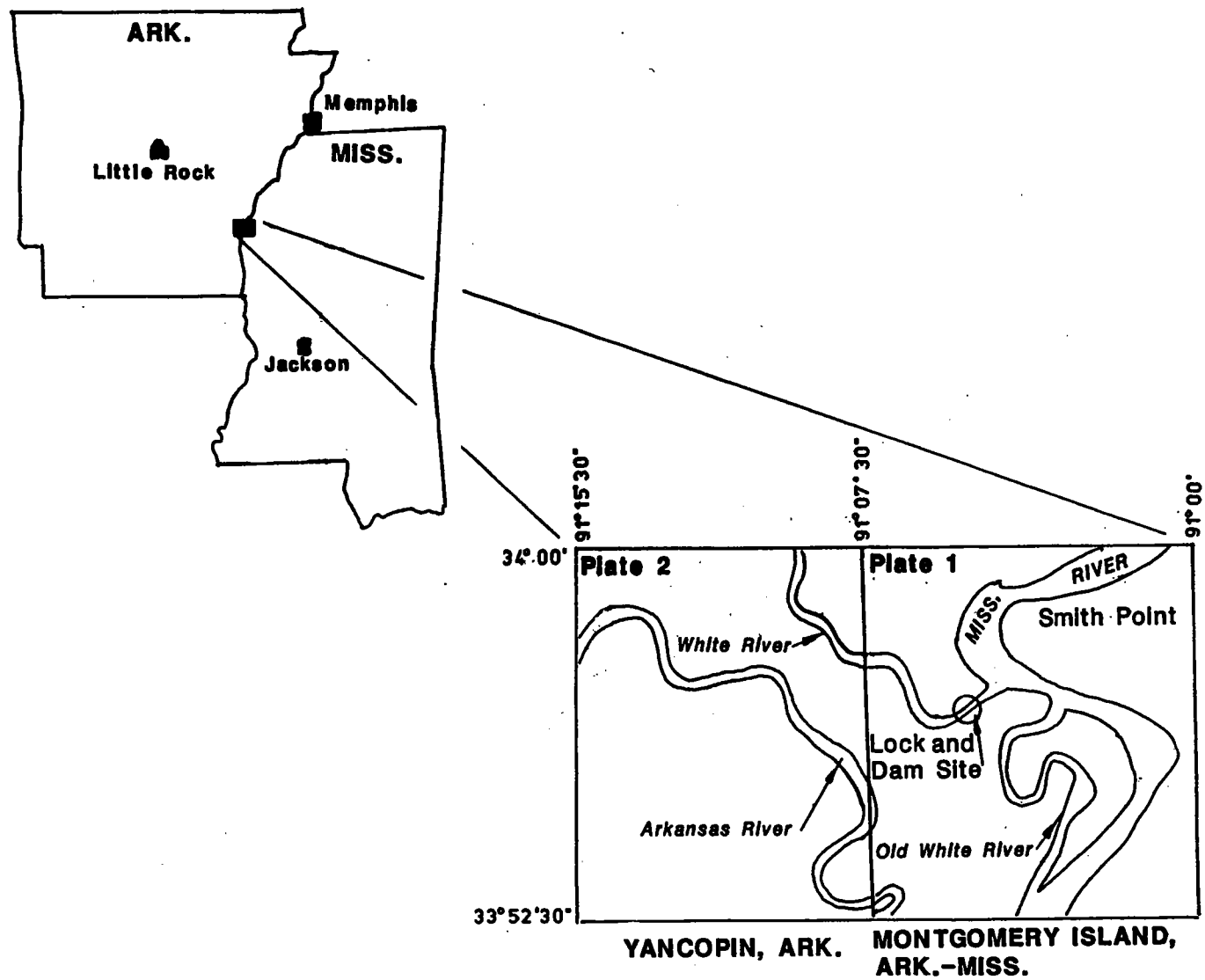


Figure 1. Location of study area and index to geomorphic maps

study area encompasses the Montgomery Island and Yancopin 7-1/2 minute (scale: 1:24,000) USGS topographic quadrangles. The proposed lock and dam site, the project area, is located approximately 1.0 km (1/2 mile) upstream from the mouth of the White River and encompasses the land area associated with the lock and dam and related structures. The White River intersects the Mississippi River at approximately river mile 599. The proposed lock and dam site is located in Desha County, Arkansas.

5. A major portion of the study area is contained within the levied flood plains of the Arkansas, Mississippi, and White Rivers. Consequently, there are no major towns located within the study area boundaries. The Arkansas and White Rivers are located within the boundaries of the Little Rock District. The Mississippi River is contained within the boundaries of the Vicksburg District.

PART II: GEOLOGY AND GEOMORPHOLOGY

Geologic Setting

6. The study area is located upon the flood plains of the Arkansas, Mississippi, and White Rivers. The study area is composed of the present courses of the Arkansas, Mississippi, and White Rivers, former courses and channels of these river systems, and the fluvial sediments deposited by these river systems as they have migrated across their respective flood plains. The migration of these different fluvial systems during the Holocene (10,000 years to present) has created a complex landscape which is marked by relict fluvial features and/or by abandoned flood plains or terraces.

7. A generalized geologic map of the central Mississippi River Valley is presented in Figure 2 and shows the major fluvial systems and courses within and adjacent to the study area (from Saucier, 1974). The study area is part of the most recent meander belt of the Arkansas, Mississippi, and White Rivers. Surrounding the study area are older meander belts and terraces. Older meander belts of the Arkansas and Mississippi Rivers are located upstream and downstream from the Montgomery Point study area.

8. Saucier (1974) estimates that the most recent meander belt of the Arkansas and White Rivers is less than about 2,500 years as shown by Figure 3. Throughout the early and middle Holocene, the mouth of the Arkansas and White Rivers has emptied into the Mississippi River upstream and downstream of its present position as determined by detailed engineering geologic mapping of the Lower Mississippi Valley (Saucier, 1967; Kolb and others, 1968; and Smith, 1979). Beginning in the latter part of the Holocene, the present meander belts of the Arkansas, White, and Mississippi Rivers migrated to their present location. Geomorphic mapping, historic bankline comparisons, and soils data evaluated during the course of this study indicates that the fluvial systems and sediments in the study area are fairly recent. It is estimated that most of the sediments forming the Montgomery Point study area are less than 1000 years old.

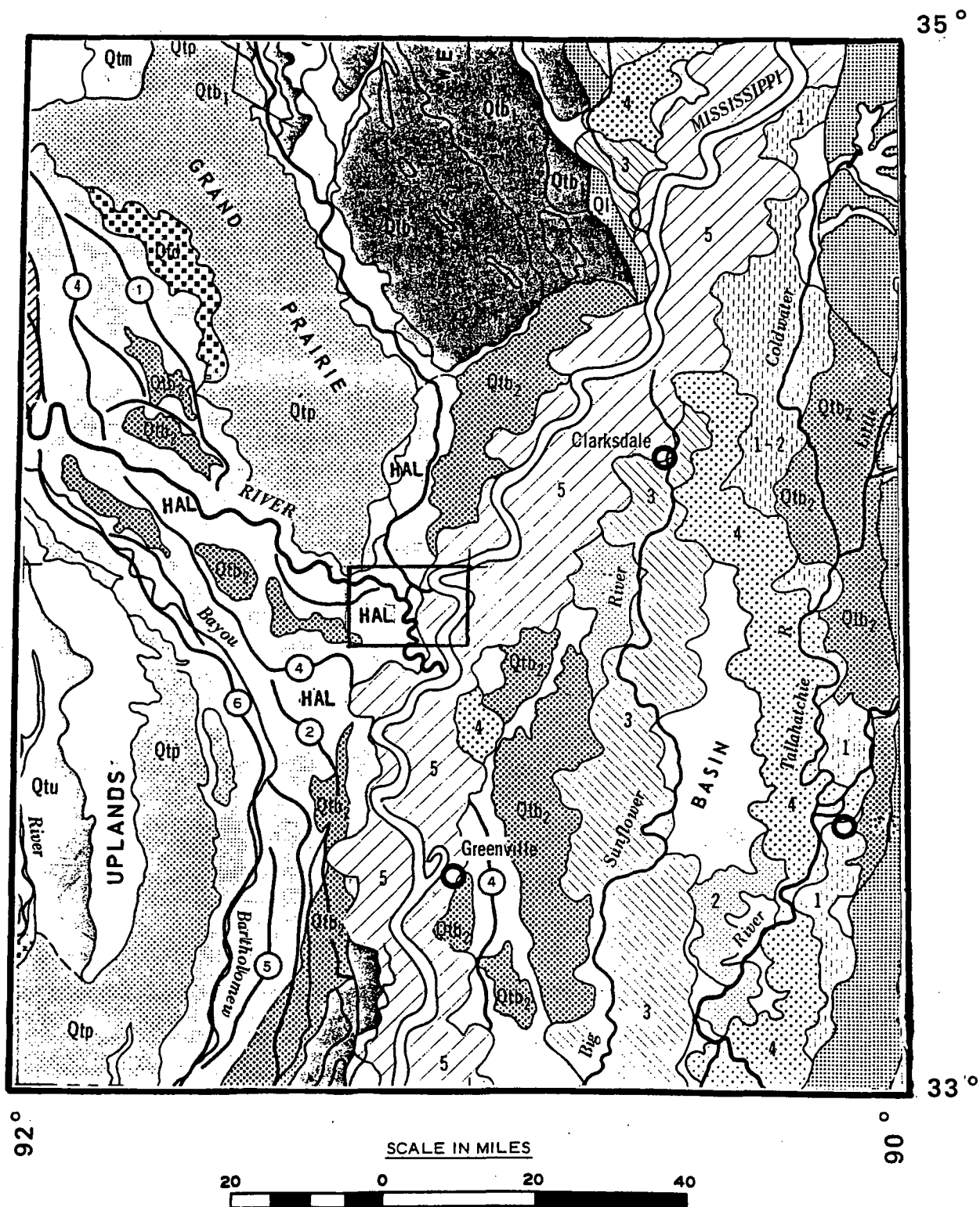


Figure 2a. Generalized geologic map of Southeastern Arkansas and Northwestern Mississippi (from Saucier, 1974). Study area is enclosed by the rectangle in the center part of the illustration. Legend to geologic map is presented in Figure 2b.

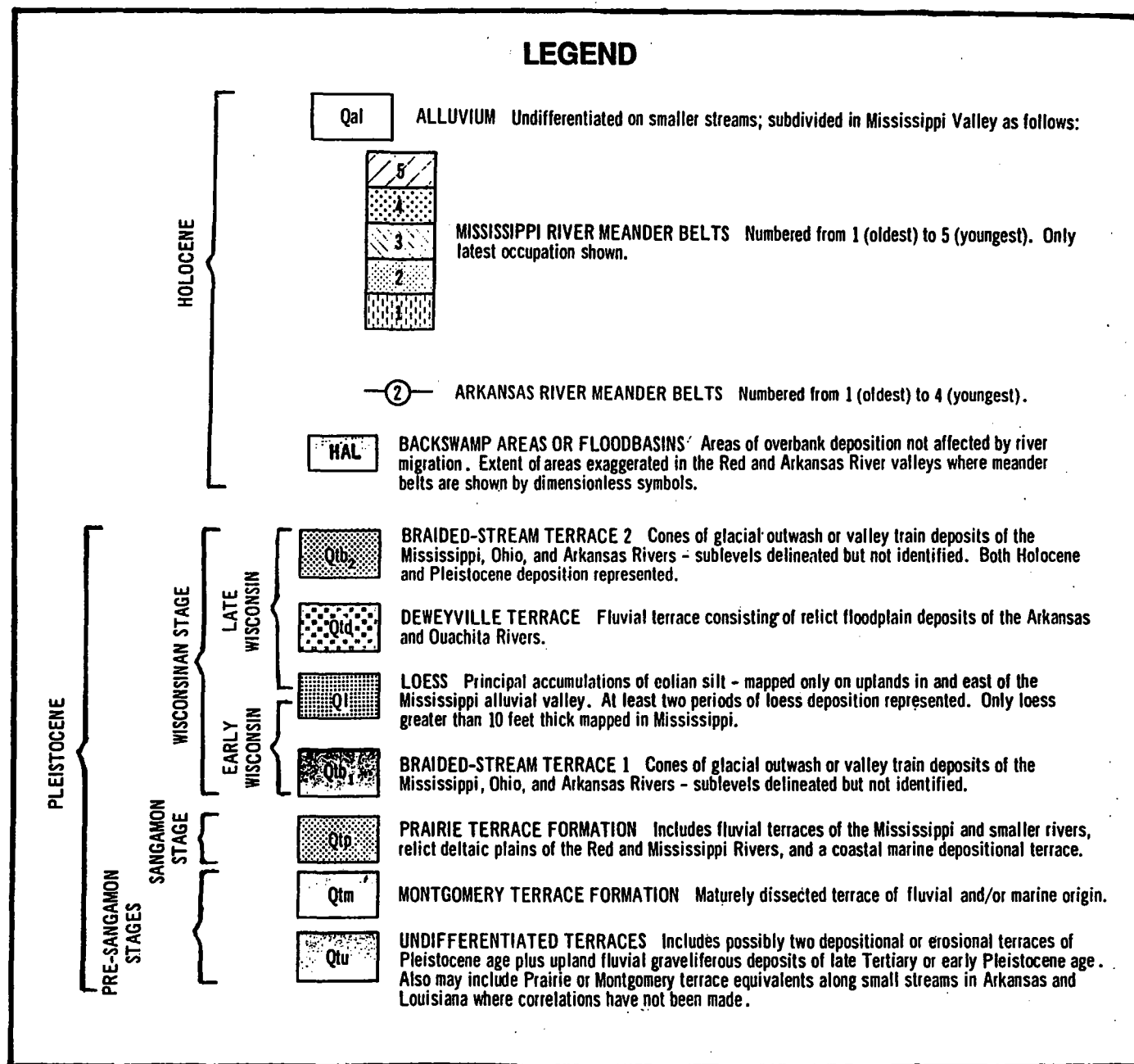


Figure 2b. Legend to geologic map in Figure 2a (from Saucier, 1974)

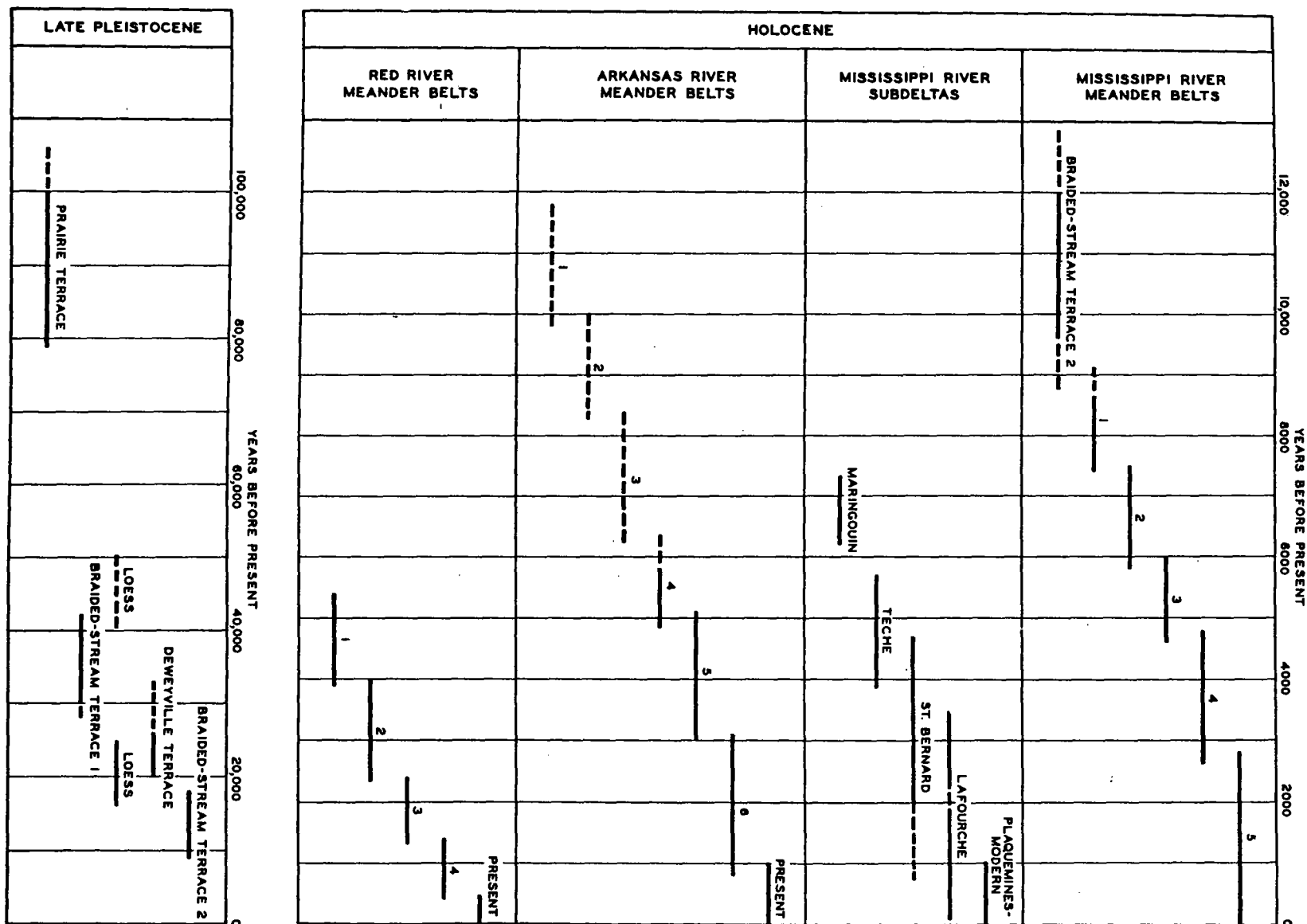


Figure 3. Chronology of Late Pleistocene and Holocene landforms and deposits
(from Saucier, 1974)

Geomorphic Mapping and Environments of Deposition

Geomorphic Mapping

9. The first objective of this study was to map the geomorphic features within the study and project areas. Mapping was done at a scale of 1:24,000 on USGS 7-1/2 minute topographic quadrangle maps. Delineation and definition of the geomorphic features was accomplished primarily by analysis of topographic data and aerial photography. The results of the geomorphic mapping are presented in Plates 1 and 2 (see Figure 1 for map index).

10. The geomorphic mapping was based upon and guided by previous WES studies (Smith and Breland, 1989; Saucier, 1967; Kolb and others, 1968; and Smith, 1979). These studies served as the foundation for the aerial photographic interpretation and provided detailed information about the subsurface geology. Several different coverages (1939, 1958, 1971, and 1988), and scales (1:24,000, 1:40,000, and 1:62,500) of black and white aerial photography were used to map the geomorphic features. Photographs used in mapping the geomorphic features in the Montgomery Point study area are maintained in the map files of the Engineering Geology Branch (GG-YG) at WES and are part of the photographic coverage of the Lower Mississippi Valley which was used in mapping the engineering geology (Saucier, 1967; Kolb and others, 1968; Smith and Saucier, 1971; and Smith, 1979) of the various drainage basin forming the Lower Mississippi Valley.

Environments of Deposition

11. Fluvial features identified on the geomorphic maps in Plates 1 and 2 were formed by the Arkansas, Mississippi, and White Rivers. An attempt was made to distinguish the fluvial system responsible for the mapped feature as shown by the legends on Plates 1 and 2. The fluvial system responsible is identified by a letter ("A" for Arkansas River, "M" for Mississippi River, and "W" for White River) preceding the landform symbol. In addition, historic (later than 1765) fluvial features and deposits are identified on the geomorphic maps by the letter "H" preceding the system and landform symbol. Mapping has identified 6 different environments of deposition in the study area. These environments are identified on the geomorphic maps by a landform symbol ("PB" for point bar, "CH" for abandoned channel, "CO" for abandoned course, "CC" for crevasse channel, "BS" for backswamp, "CB" for chutes and bars, "T" for terrace, and "TE" for eroded terrace). The different

geomorphic environments present in the study area are individually described in more detail below.

12. Point Bar and Chutes and Bars. Point bar deposits are by far the most widespread environment in the study area (see Figure 4 and Plates 1 and 2). Point bar deposits are formed as a river migrates across its floodplain. River channels migrate across their floodplain by eroding the outside or concave bank and depositing a sandbar on the inside or convex bank (see Figure 4). With time, the convex bar grows in size and the point bar is developed. Associated with the point bar are a series of arcuate ridges and swales. The ridges are formed by lateral channel movement and represent relic sandy lateral bars separated by low lying swales. The swales are locations where fine grained sediments accumulate.

13. Point bar deposits are easily recognized by distinguishing characteristics visible on aerial photography and topographic maps. The primary characteristic that distinguishes the point bar environment from others environments is the well developed ridge and swale topography as well as the numerous abandoned channels, most of which still receive stream flow during times of high water flow. Another diagnostic characteristic of the point bar environment is the well developed sandy point bars along the main channel. These sandy landforms are identified on the geomorphic maps as chutes and bars. The major characteristic that distinguish chutes and bars from point bar is the absence of a fine grained topstratum in the chutes and bars environment. The fine grained topstratum consists of sediment deposited by overbank deposition during high water flow periods. As the channel migrates away from the sandy bar and away from the high energy flow conditions that occur near the main channel, silts and clays are deposited upon the sandy bars forming topstratum deposits.

14. Point bar deposits are as thick as the total depth of the river that forms them. These deposits fine upward from the maximum size of the river's bedload (coarse sand and/or fine gravel) to fine grained soils (clay) at the surface. The basal or coarse grained portion of the point bar sequence, the substratum, is deposited by lateral accretion while the fine grained or upper portion of the point bar sequence, the topstratum, is deposited by overbank vertical accretion.

15. Point bar deposits are approximately 40 meters (130 ft) thick at the proposed lock and dam site as shown by the cross-section and borings in

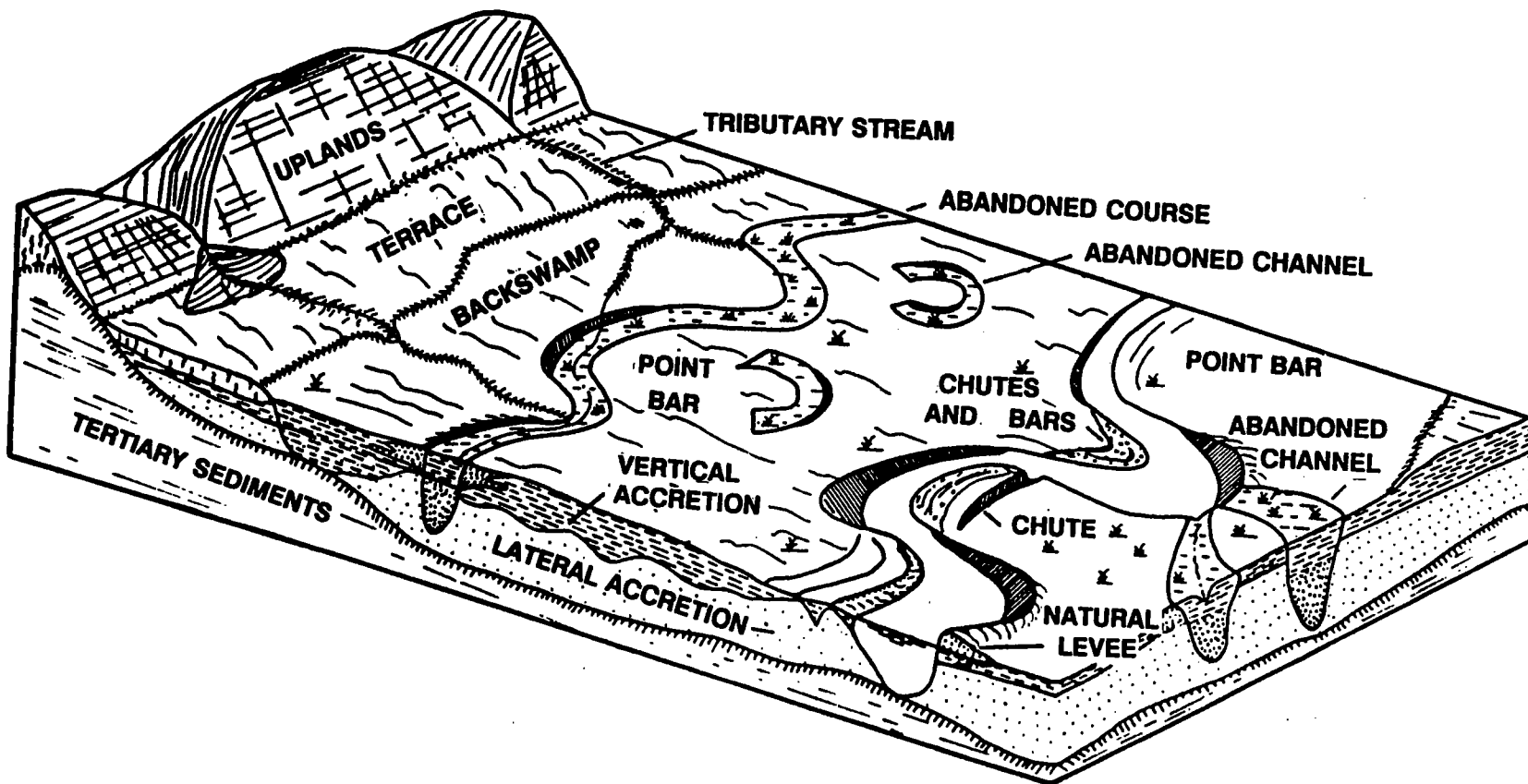


Figure 4. Generalized diagram of flood plain environments

Appendix A (from U.S. Army Corps of Engineers, 1989). Soil types as defined by the borings in Appendix A identify a typical point bar sequence as grading upward from sand and gravel at the base, to silty sand, silt, and clay near ground surface. These deposits are usually variable horizontally, especially where ridge and swale topography is well developed or relic chutes (high water channel across the point bar neck) are present.

16. Boring data in Appendix A shows that point bar deposits are separated into two distinct units based on soil types; a predominantly fine grained upper unit or point bar topstratum (silt and clay) deposited by vertical accretion, and a coarse grained lower unit or point bar substratum (silty sand and sand) deposited by lateral accretion. The thickness of the point bar topstratum at the proposed lock and dam site is variable, ranging from less than 10 meters (30 ft) to approximately 19 meters (60 ft). The substratum in comparison, is usually much thicker, generally greater than 15 meters (50 ft).

17. Abandoned channels are relic channel loops that are abandoned when the river cuts across its point bar (see Figure 4). The cutoff produces an oxbow lake. The process by which the river abandons the loop occurs either gradually over an extended period of time as a neck cutoff or during a single flood event as a chute cutoff. A chute is a high-water channel across the point bar neck.

18. Abandoned channels are abundant throughout the study area, especially on the flood plain of the Arkansas River. There are fewer abandoned channels on the Montgomery Island Quadrangle because the Mississippi River has rapidly migrated laterally through this area in historic times rather than abandoning channel segments and/or courses.

19. Filling of an abandoned channel in the study area is a rapid process (about 200 years or less) that is dominated initially by lateral accretion or infilling (coarse grained deposits) when the channel is still hydraulically connected to the main course. After the main channel has migrated away from the abandoned segment, vertical accretion dominates with the transport and deposition of fine grained sediment to the abandoned channel during times of high water flow.

20. Abandoned channels and courses have different physical properties. Abandoned channels fill primarily by overbank deposition and vertical accretion. In general, abandoned channels generally contain more finer

grained sediments than abandoned courses. Abandoned courses are usually filled by more coarse grained sediments.

21. Abandoned Course and Crevasse Channel. An abandoned course is a river channel that is abandoned in favor of a more hydraulically efficient course (see Figure 4). An abandoned course contains a minimum of two meander loops and forms when the river's flow path is diverted to a new position on the river's floodplain. This event usually is a gradual process and begins by a break or a "crevasse" in the river's natural levee during flood stage. The crevasse forms a temporary channel or a crevasse channel that may over time develop into a more permanent channel. Eventually, the new channel diverts the majority of flow and the old channel progressively fills. Final abandonment begins as coarse sediment fills the abandoned channel segment immediately down stream from the point of diversion. Complete filling of the abandoned course occurs by overbank deposition and may take approximately one thousand years to completely fill. Bank migration data evaluated for this study indicates that filling is a rapid process which may occur in less than 200 years. Abandoned courses in the study area are associated only with the Arkansas and White Rivers (see Plates 1 through 2).

22. Only three abandoned crevasse channels were identified on the geomorphic maps. One of these channels is located on the Montgomery Island quadrangle (Plate 1), a short distance upstream from the proposed lock and dam site, and is identified as Mayhorn Bayou on the topographic map. This crevasse channel is fairly recent and is an active feature during high water. The other two crevasse channels are inactive and are located on the Yancopin quadrangle. These two channels drain onto the backswamp deposits in the southwest corner of the study area, occurring as breaks in abandoned channels.

23. Abandoned courses in the study area are nearly all sediment filled; occurring as poorly drained swamps, as small underfit stream channels which eventually drain to the main channel, or as shallow lakes. Abandoned courses and abandoned crevasse channels are primarily sand filled, interbedded with clays and silts that grade into fine grained soils and organic sediments near the surface.

24. Backswamp. Backswamp deposits are vertical accretion deposits that receive sediment during times of high water flow, when the natural levees are crested and suspended sediment in the flood waters are deposited in areas well removed from the main channel (see Figure 4). Backswamp deposits are

confined to the southwest corner of the Yancopin quadrangle (Plate 2). Backswamp deposits are presently situated outside of the modern flood plain due to the construction of artificial levees.

25. The principal geomorphic processes associated with this environment are vertical accretion of new sediment from annual flooding (presently not possible with the construction of levees), pedogenesis (soil formation), and bioturbation. Bioturbation is the churning and stirring of the underlying sediment by vegetation and organisms (Bates and Jackson, 1980).

26. Smith (1979) indicates that backswamp deposits in the study area overlie Pleistocene outwash plain deposits (coarse grained sediments deposited by glacial melt water) at a shallow depth. The backswamp deposits in the southwestern part of the Yancopin quadrangle were formed by Arkansas and Mississippi River flood flow.

27. Natural Levee. Natural levee deposits were not mapped as a separate environment on the geomorphic maps because this environment is present throughout the study area to some extent and mapping this environment would confuse and detract from the topographic information on the base maps and identification of the underlying geomorphic features. Instead, natural levee was mapped in combination with other environments as indicated by the geomorphic maps. However, natural levee is described in this report as a separate environment because it is an important geomorphic process in the study area, especially as it affects cultural resources.

28. Recent natural levee deposits have covered the prehistoric landforms and may have covered archaeological artifacts that may have been present on these paleosurfaces. It is important to understand that the ground surface of prehistoric landforms are buried beneath recent sediments. The reasons for this new influx of sediment are due to constriction of the flood plain by the construction of artificial levees, shortening the course of the Mississippi River in the 1930's by cutting shorter channels across the necks of large meander loops, and major flood events such as the 1927 flood.

29. Natural levees are vertical accretion deposits formed when the river overtops its banks during flood stage and sediment suspended in the flood flow is deposited adjacent to the channel. The resulting landform is a low, wedge shaped ridge decreasing in thickness away from the main channel. Natural levee thickness is greatest at the river bank and decreases with distance from the river. Eventually, natural levee deposits merge with other

flood plain deposits, usually with older point bar or backswamp sediments.

30. Silt and sand are the predominant soil types in natural levee deposits. Natural levee deposits generally contain little organic sediments because of oxidation. Soils are typically brown to reddish brown. Small calcareous nodules are frequently associated with the more developed natural levee deposits, formed as a result of ground water percolating through the permeable levee soils. Natural levee soils are generally well drained and have low water contents.

31. The natural levee deposits at the proposed lock and dam area are considered to be quite recent. Geomorphic, pedogenic, and historic evidence indicates the natural levee sediments were generally deposited within the last 50 years. Consequently, Prehistoric landforms are buried beneath recent deposits. At the proposed lock and dam site, the natural levee sediments are approximately 1.5 m (5 ft) thick near the White River channel and generally are composed of fine grained loose sand and silt. At approximately 300 meters (1,000 ft) from the White River channel, the coarse grained natural levee sediments merge with the surrounding point bar sediments. Geomorphic evidence and boring data indicates that several different periods of active natural levee deposition have occurred within the study area as the various systems have migrated across their respective flood plains. Detailed boring logs and profile descriptions of natural levee sediments and the underlying point bar topstratum at the proposed lock and dam site are presented in Appendix A.

32. Terrace. A terrace is an abandoned flood plain that is elevated above the present river's flood plain (see Figure 4). A terrace consists of a relatively flat or gently inclined surface that is bounded on one edge by a steeper descending slope and on the other edge by a steeper ascending slope (Bates and Jackson, 1980). Terraces either border the modern flood plain or may be preserved as topographic islands or remnants within the modern flood plain.

33. A terrace is present in the northwest corner of the Yancopin quadrangle (Plate 2). Where the terrace has been eroded by surface run-off, it is noted on the Yancopin geomorphic map by the symbol "TE". The terrace mapped on the Yancopin quadrangle is a depositional terrace (i.e., composed of fluvial deposited sediments) formed by an ancestral Arkansas River. The mapped terrace is part of the Grand Prairie (see Figure 2) and is a Sangamon

(300,000 to 80,000 years before present) age landform. The Grand Prairie is a large scale physiographic feature in central Arkansas which is significantly higher than the surrounding topography.

34. The formation of a depositional terrace occurs as a river downcuts into its floodplain and creates a new flood plain at a lower elevation. The reasons for the stream downcutting into its flood plain may be the result of the natural geomorphic evolution of the stream system or it may be related to a change in climate, a change in base level, or a tectonic event (i.e., faulting or uplift).

Historic River Migration

35. Historic Mississippi River, Arkansas River, and White River banklines for various time intervals on the Montgomery Island (Plate 1) and Yancopin (Plate 2) quadrangles are presented in Figures 5 and 6, respectively. Selection of the different time intervals for the comparison was based on the availability of historic maps and charts of the area.

36. The following time intervals were mapped for Big Island: 1988 (Figure 5a; U.S. Army Corps of Engineers, 1988), 1977 (Figure 5b; U.S. Army Corps of Engineers, 1977), 1939 (Figure 5c; U.S. Army Corps of Engineers, 1939), 1904 (Figure 5d; U.S. Army Corps of Engineers, 1975), 1880-1881 (Figure 5e; Fisk, 1944: based on early maps in files of Mississippi River Commission), 1829-1830 (Figure 5f, U.S. Army Corps of Engineers, 1939), and 1765 (Figure 5g; Fisk, 1944). There are fewer time intervals available for the Yancopin quadrangle because of the greater distance from the Mississippi River which was the primary focus of interest. At Yancopin, time intervals were available for 1977 (Figure 6a; U.S. Army Corps of Engineers, 1977), 1939 (Figure 6b; U.S. Army Corps of Engineers, 1939), 1830-1840 (Figure 6c; U.S. Army Corps of Engineers, 1939), and partial Arkansas River for 1765 (Figure 6d; Fisk, 1944).

37. The results of the bankline migration mapping determined the limits of the historic point bar deposition identified on the geomorphic maps. Historic point bar deposition identified on the geomorphic maps signifies deposition that has occurred after 1765. All other landforms mapped were deposited or formed prior to 1765. It is noted again that prehistoric landforms have been receiving historic sediment as described in the preceding

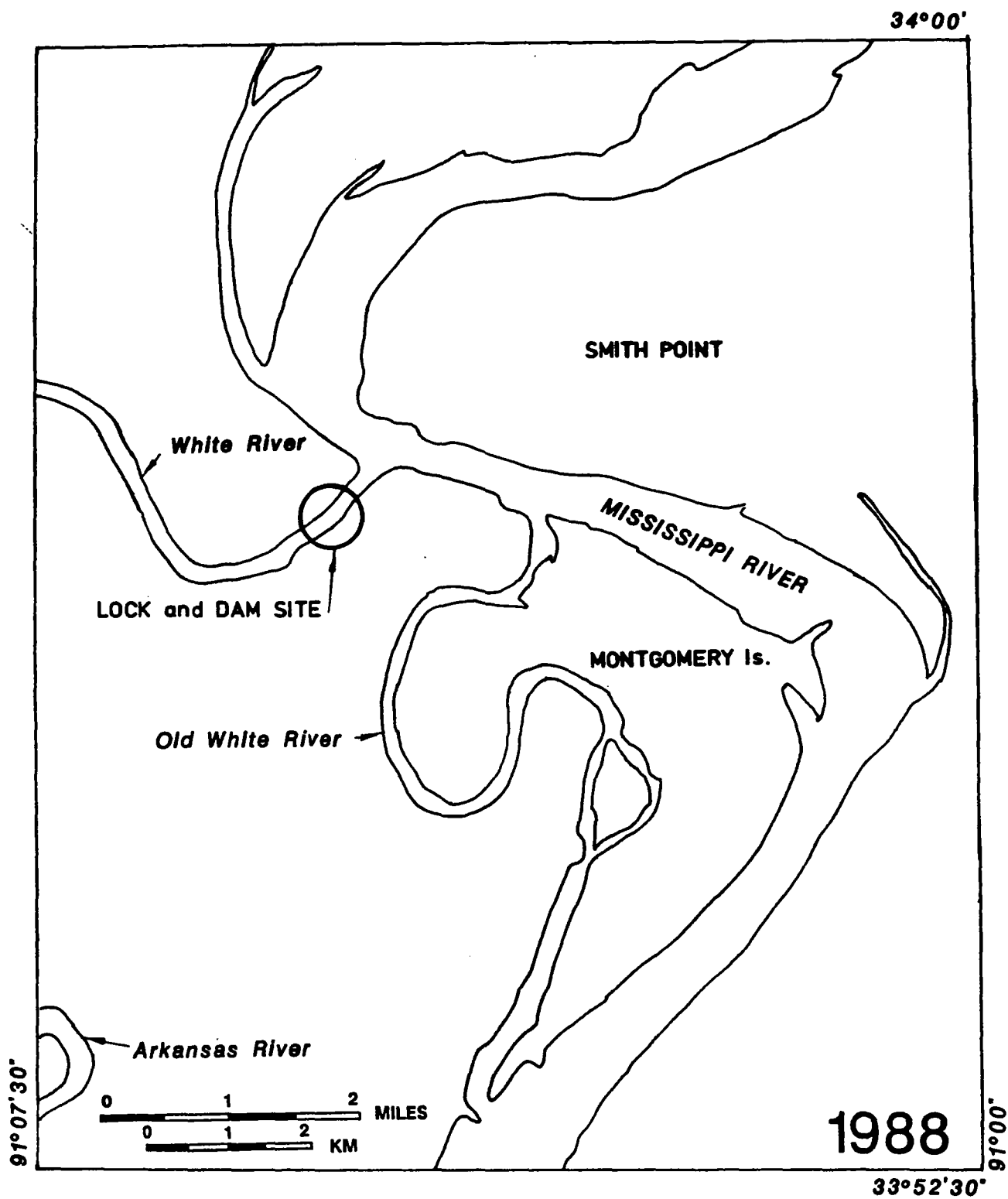


Figure 5a. Montgomery Island, river bankline in 1988 (U.S. Army Corps of Engineers, 1988)

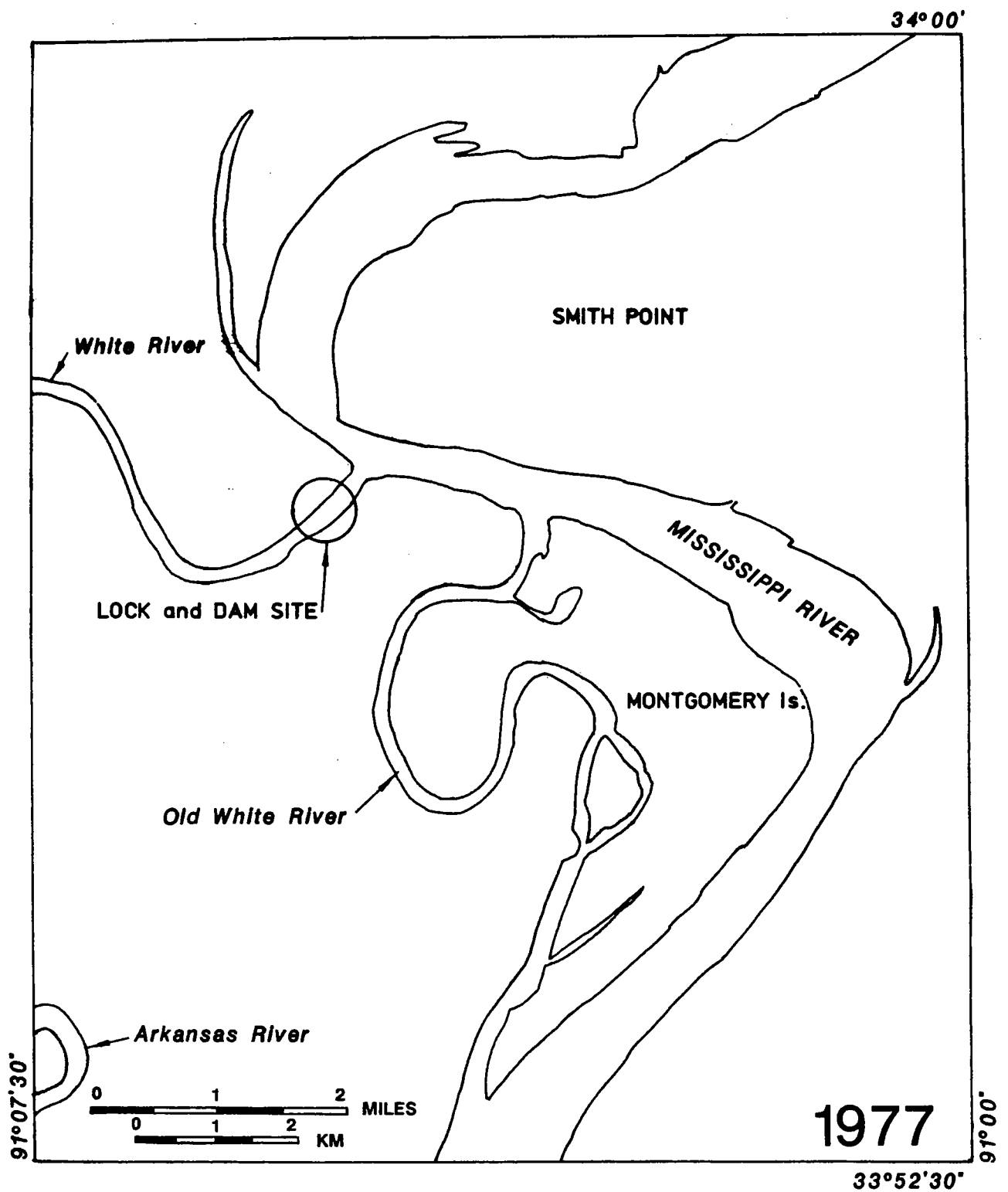


Figure 5b. Montgomery Island, river bankline in 1977 (U.S. Army Corps of Engineers, 1977)

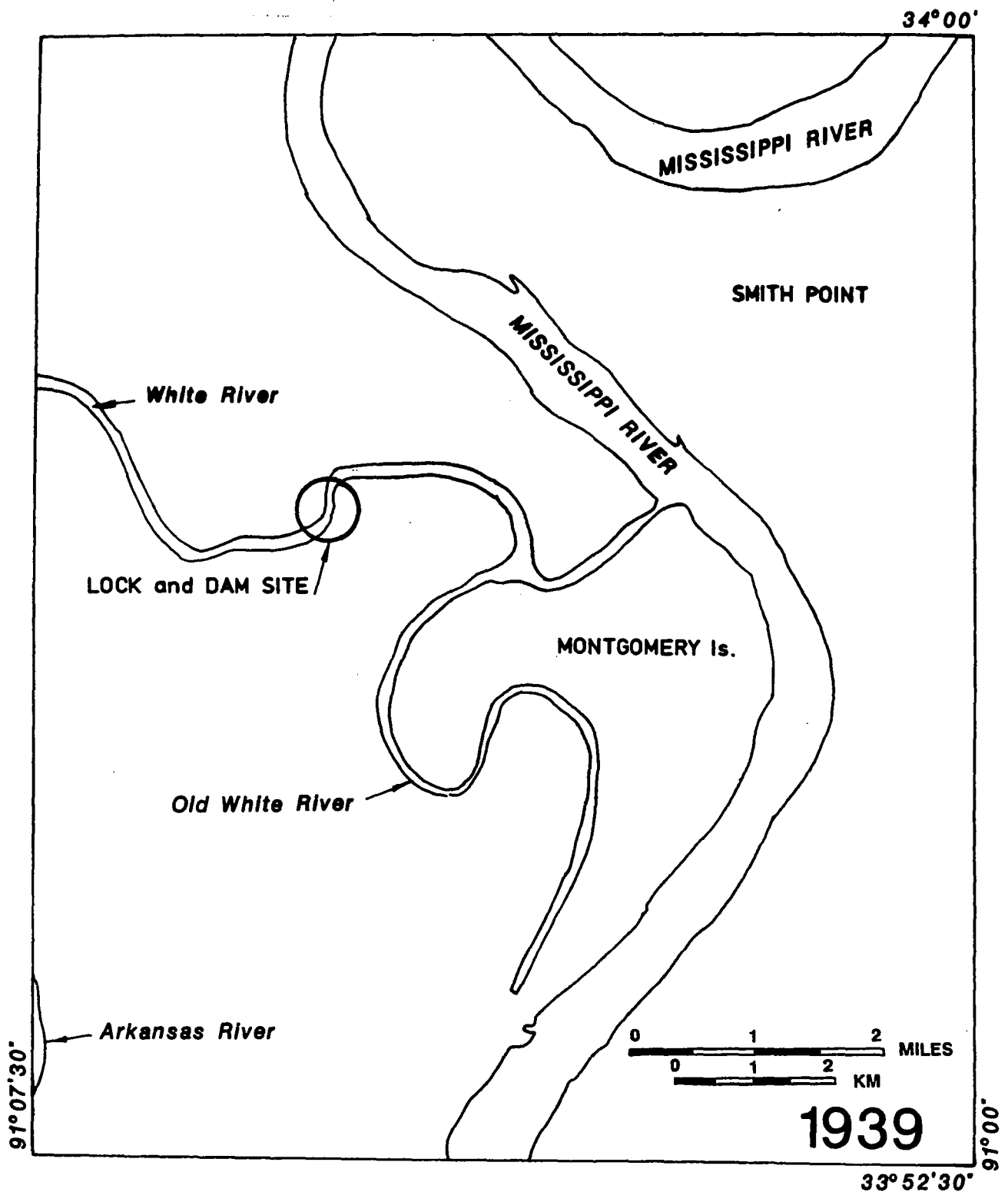


Figure 5c. Montgomery Island, river bankline in 1939 (U.S. Army Corps of Engineers, 1939)

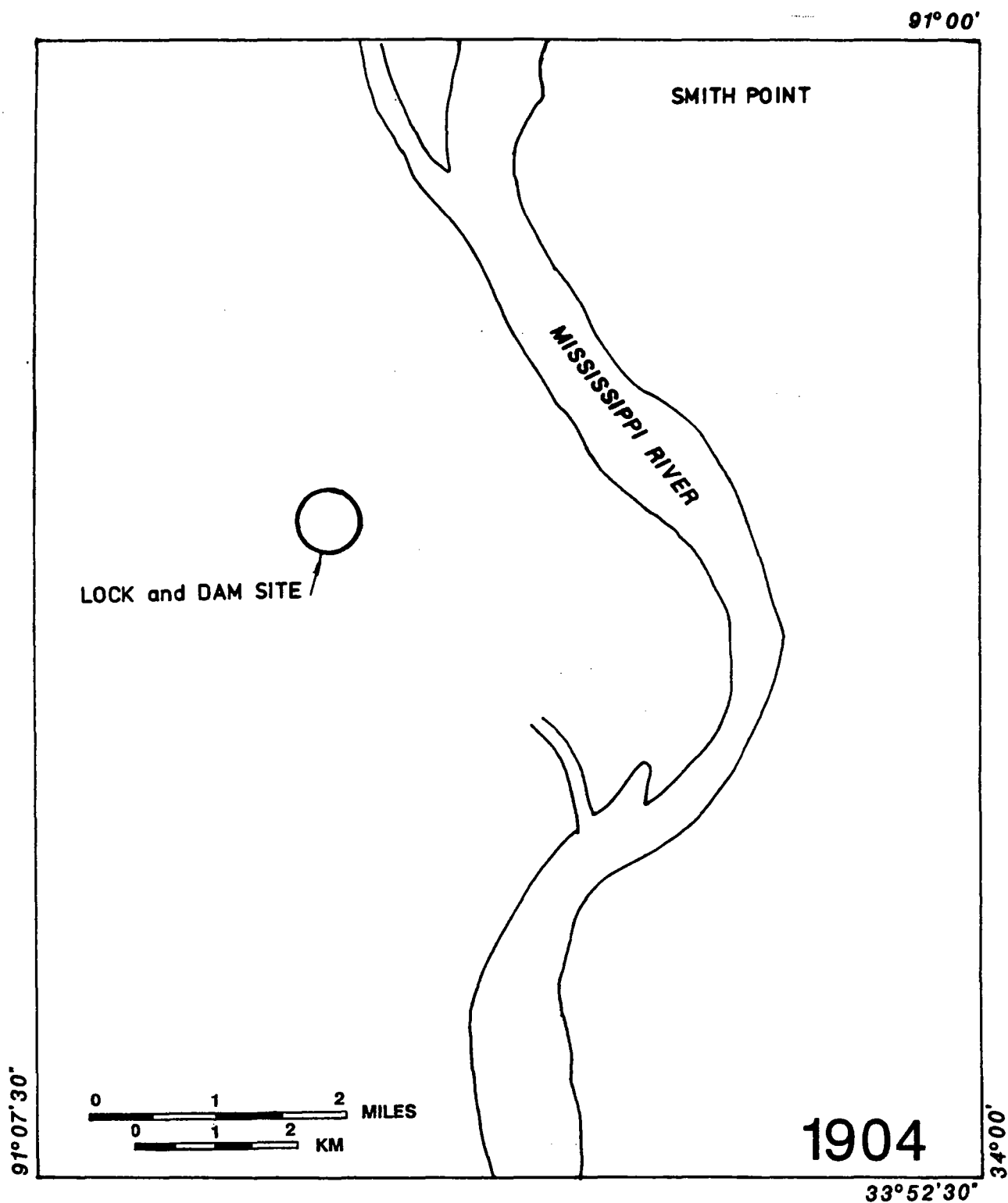


Figure 5d. Montgomery Island, river bankline in 1904 (U.S. Army Corps of Engineers, 1975)

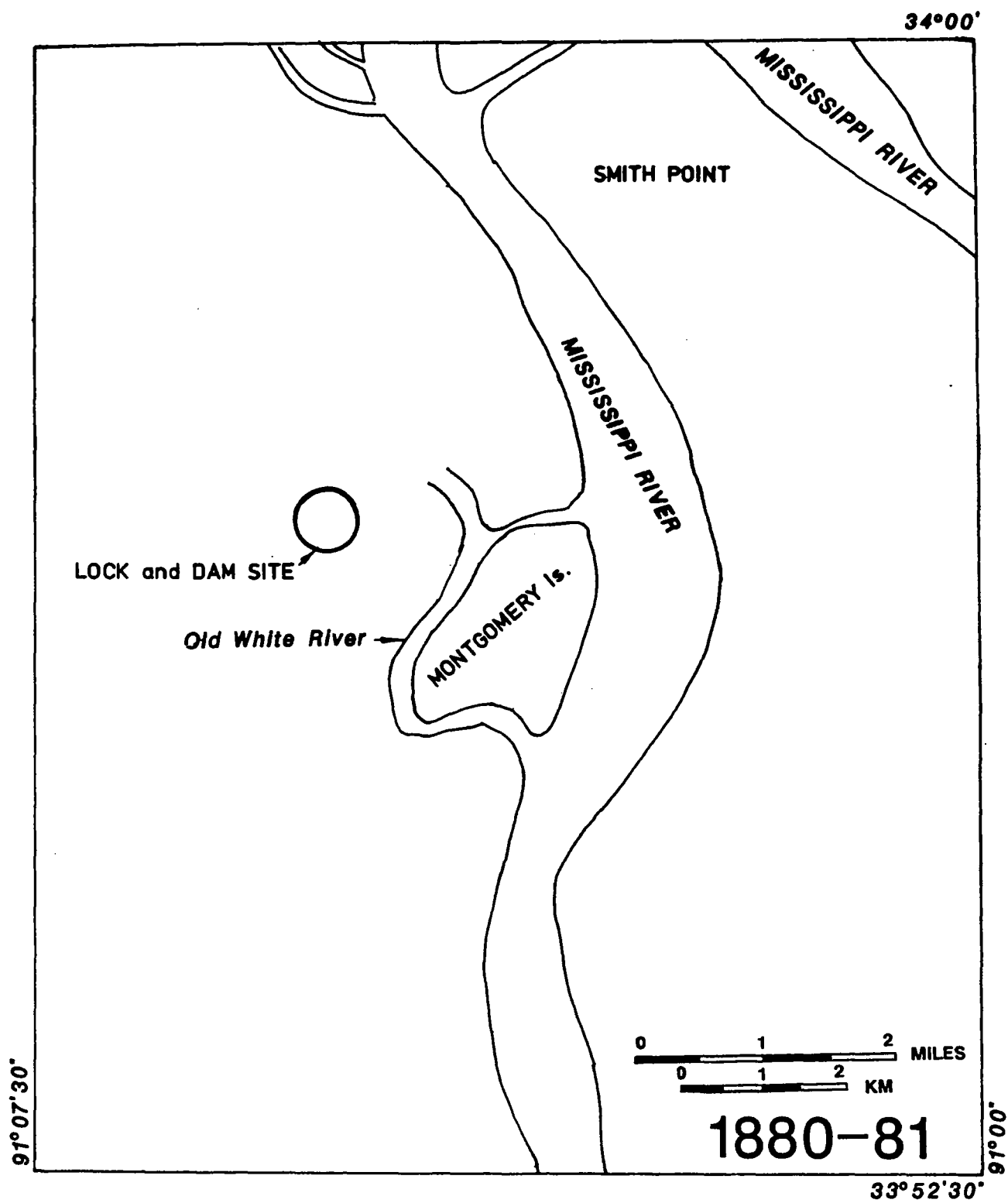


Figure 5e. Montgomery Island, river bankline in 1880-81 (Fisk, 1944)

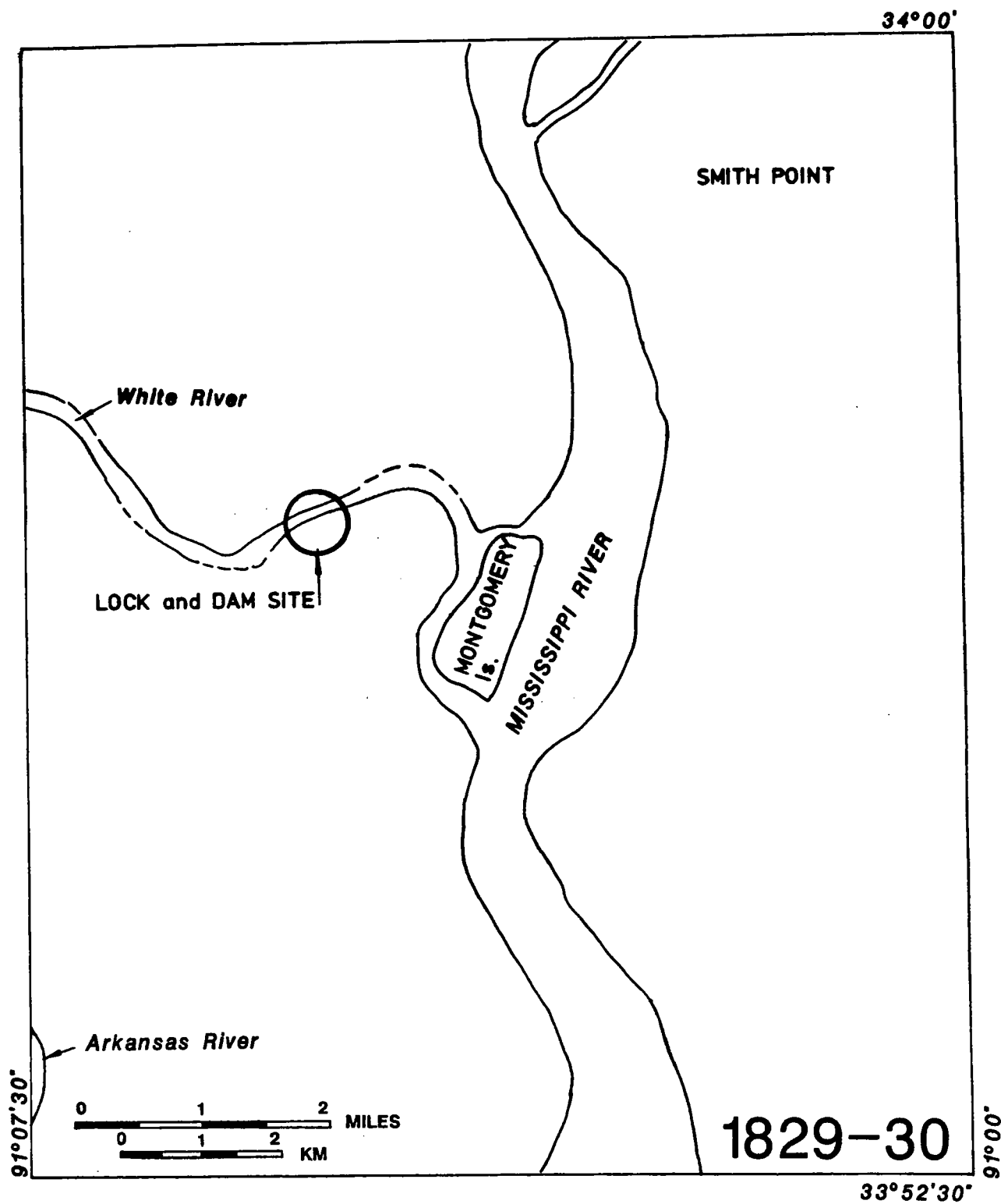


Figure 5f. Montgomery Island, river bankline in 1829-30 (U.S. Army Corps of Engineers, 1939)

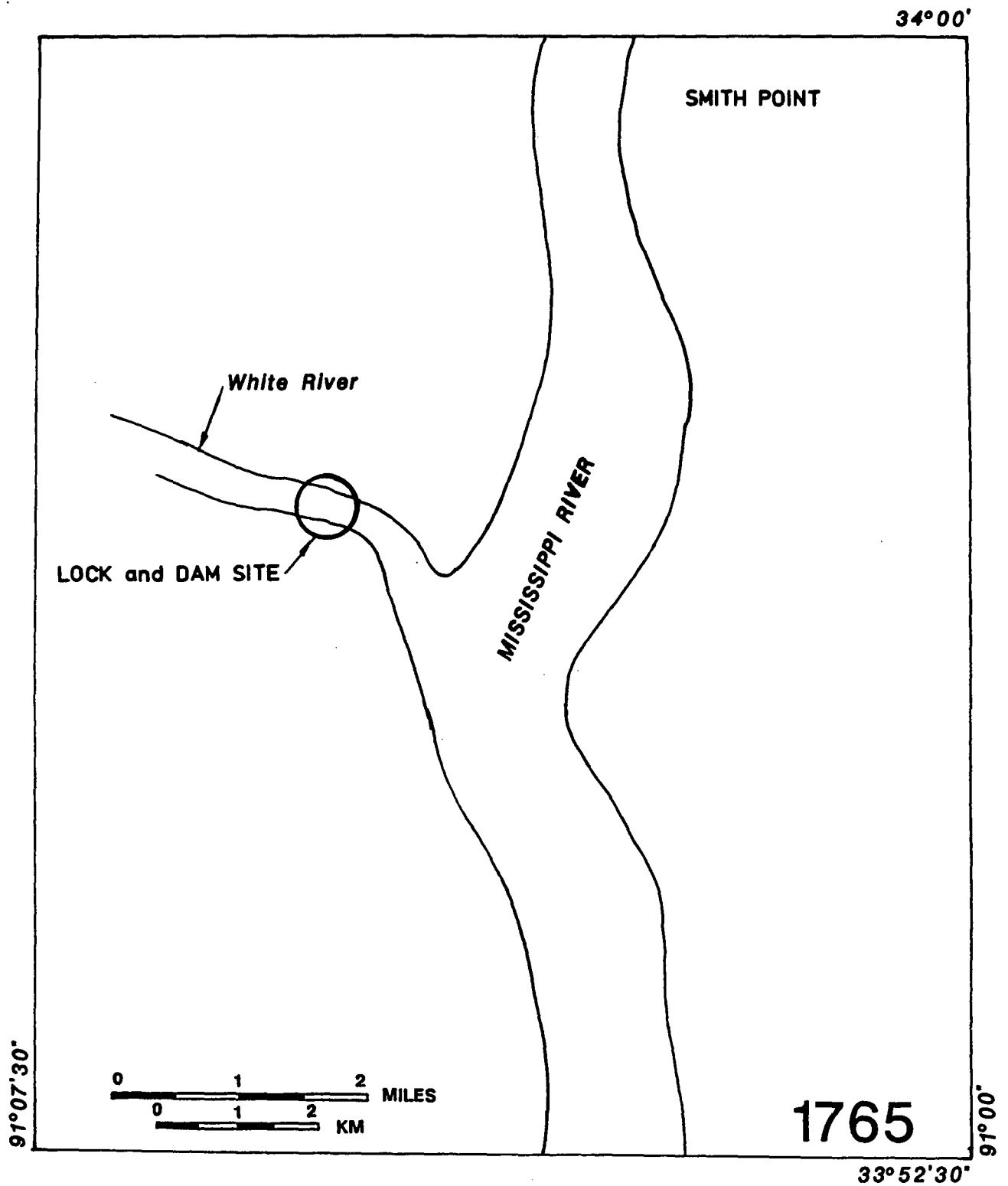


Figure 5g. Montgomery Island, river bankline in 1765 (Fisk, 1944)

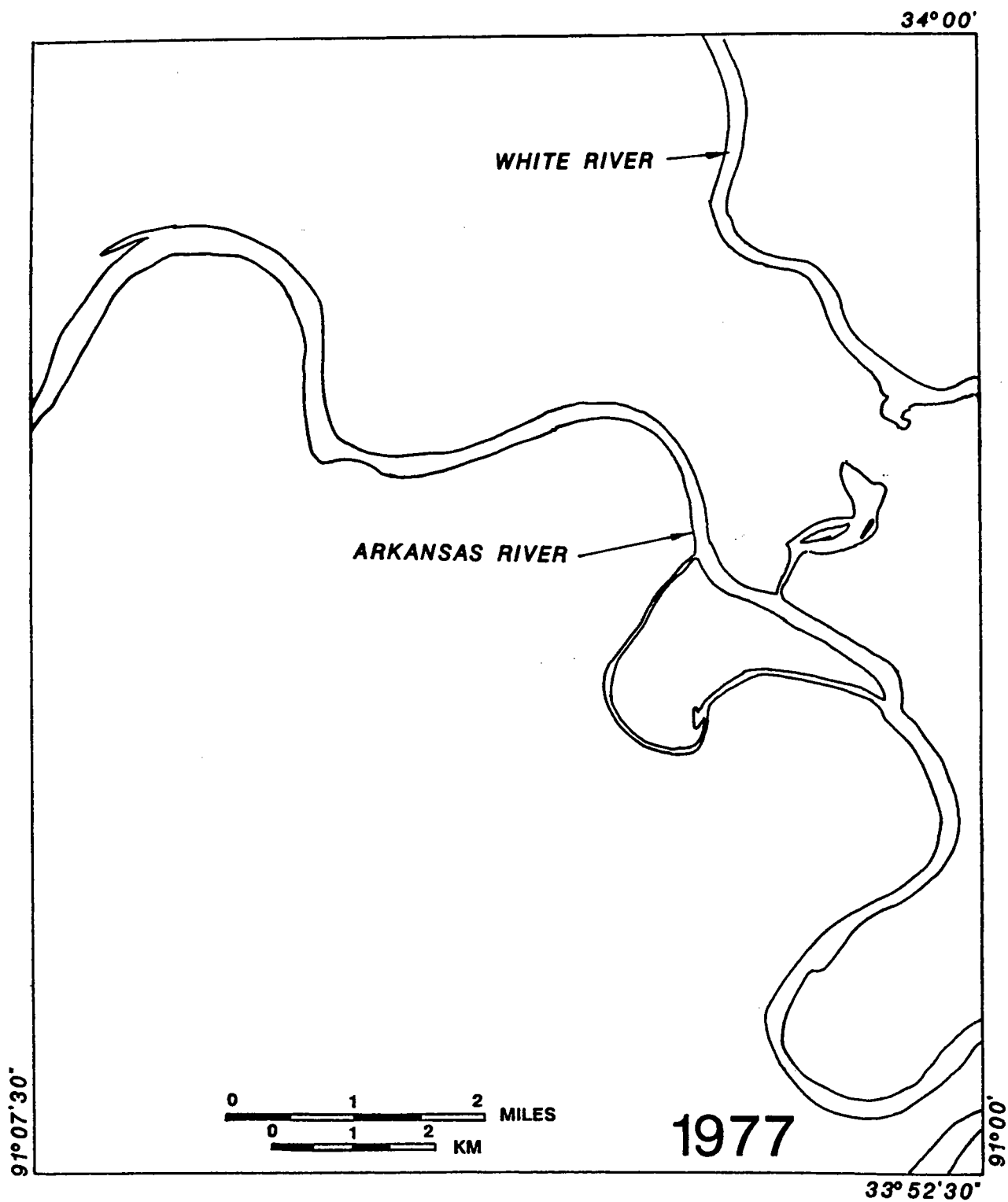


Figure 6a. Yancopin, river bankline in 1977 (U.S. Army Corps of Engineers, 1977)

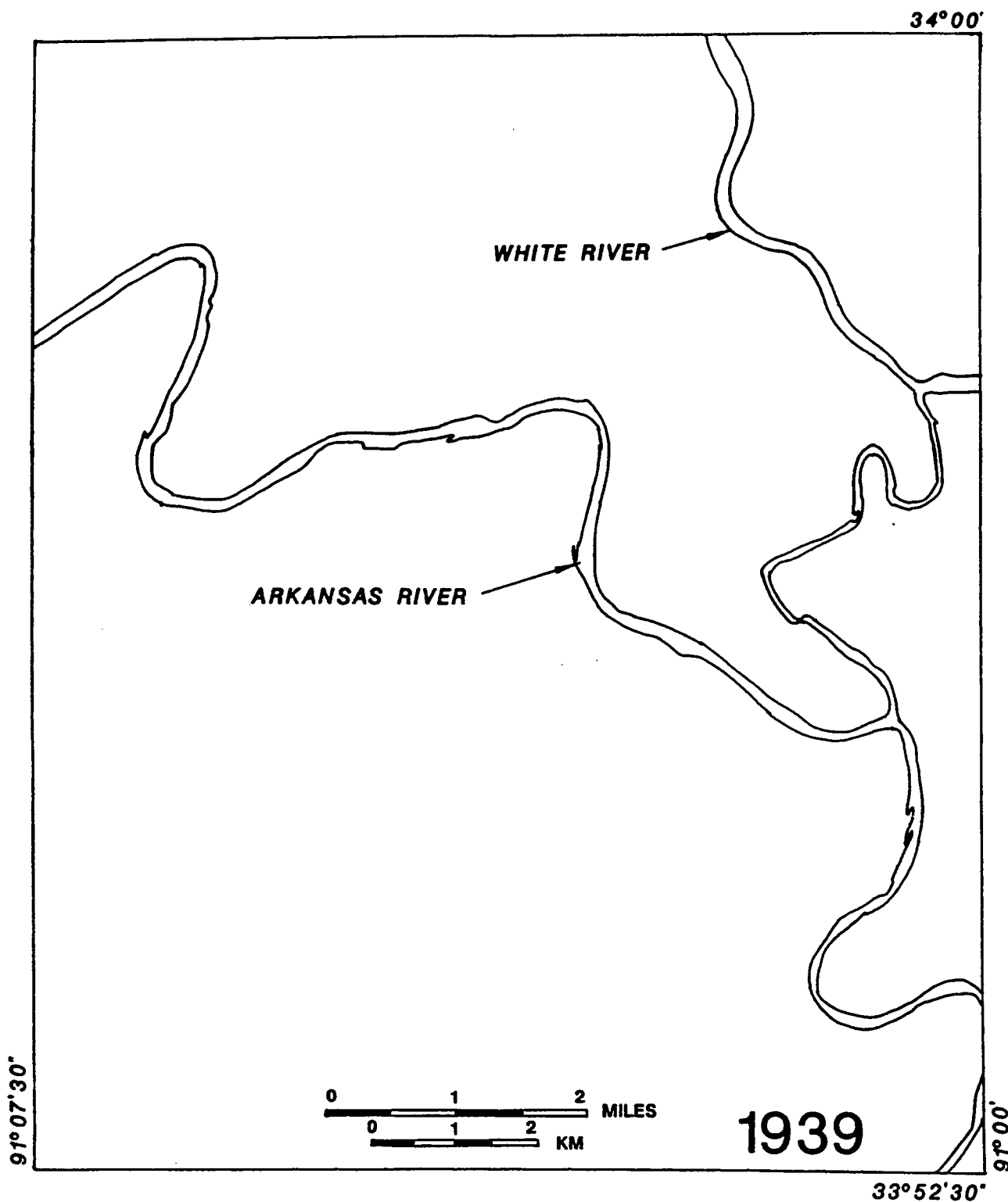


Figure 6b. Yancopin, river bankline in 1939 (U.S. Army Corps of Engineers, 1939)

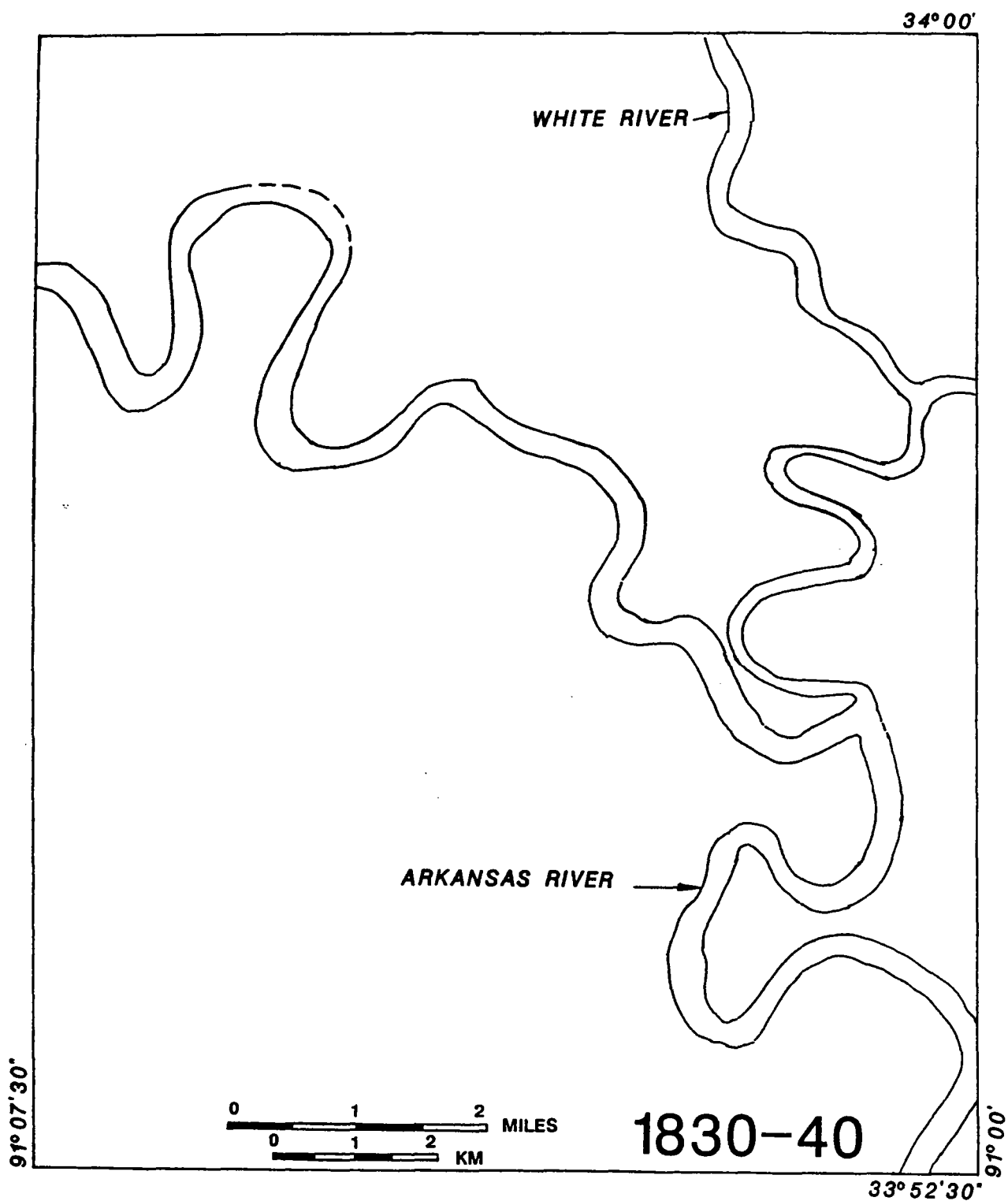


Figure 6c. Yancopin, river bankline in 1830-40 (U.S. Army Corps of Engineers, 1939)

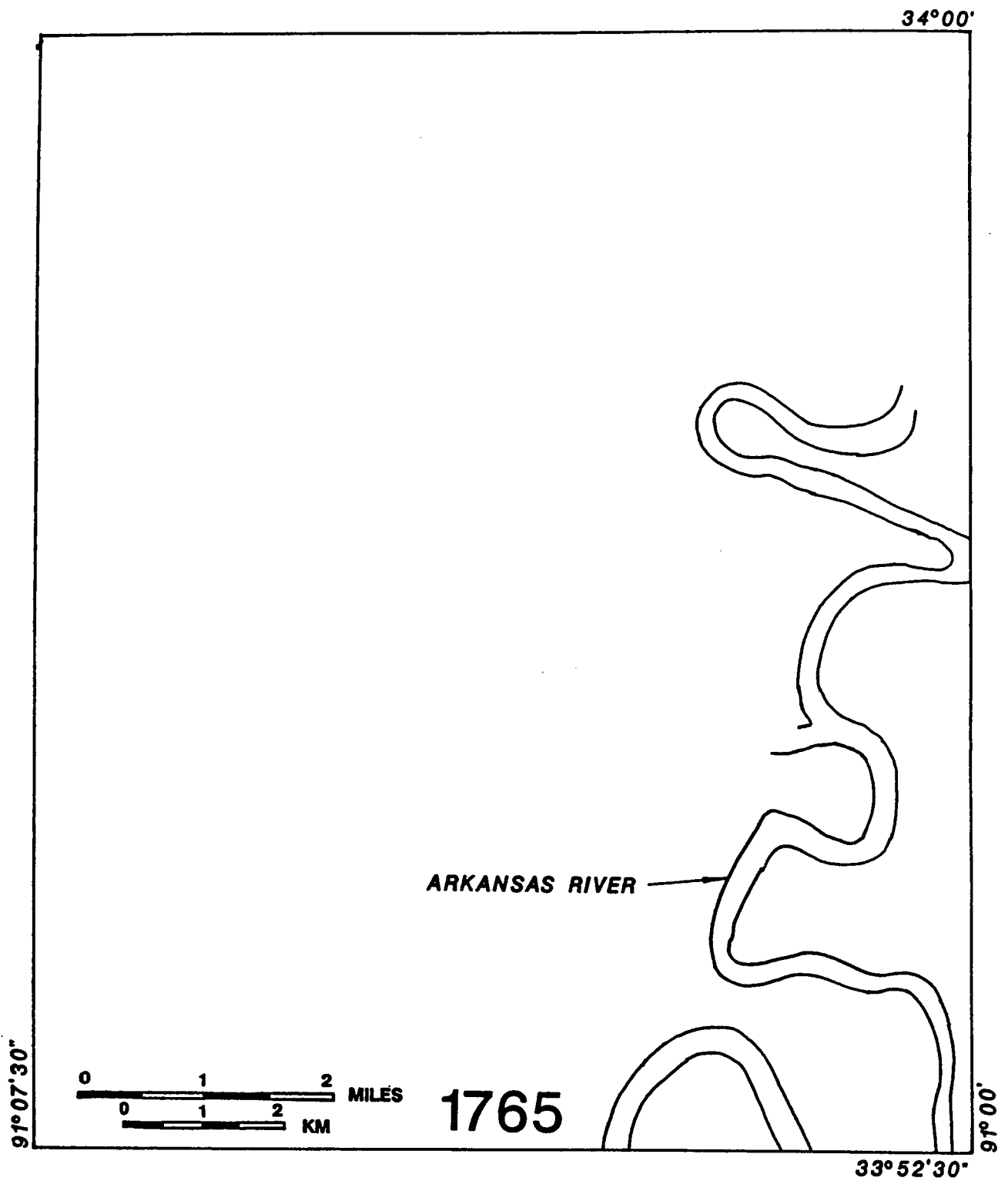


Figure 6d. Yancopin, river bankline in 1765 (Fisk, 1944)

section (see description of natural levee environment).

38. The magnitude of the bankline migration identified by the geomorphic mapping and the bankline comparison indicates a landscape that is relatively young in terms of Holocene time. The present flood plains of the Arkansas, Mississippi, and White Rivers in the study area are estimated to be less than 1,000 years old. This age estimate is comparable with estimates made by Saucier (1974) about the age of the youngest Arkansas and Mississippi River meander belts (see Figure 3). A more accurate age determination for the flood plains of the different fluvial systems in the study area is beyond the scope of this study. Detailed age determinations for the different flood plains and specific depositional environments will require further study and involve soil sampling of selected environments to obtain organic samples for radiometric dating.

Geomorphology of the Proposed Lock and Dam Site

39. Geomorphic mapping, bankline migration data, and soils information examined during this study indicates the proposed lock and dam site is located in an area which, for the most part, is composed of sediments that were deposited during the past 200 years. The north (left) bank of the site is composed entirely of historic point bar sediments. The south (right) bank of the proposed site is much older, cutting into prehistoric point bar sediments (i.e., present before 1765) which are covered with a thin (less than 1.5 meter, 5 ft) veneer of historic natural levee deposits. The overall age of the south bank of the proposed lock and dam site is estimated at less than 1,000 years old.

PART III: GEOMORPHIC SIGNIFICANCE TO CULTURAL RESOURCES

Introduction

40. The last objective of this study was to determine the archaeological significance of the geomorphic features. Major goals were to identify areas of high archaeological site potential according to a geomorphic context, provide guidance for locating sites that are of a specific age (and/or cultural component depending on availability of archaeological site data), and evaluate the significance of the geomorphic processes to determine their affects to sites that may be present.

Existing Archaeological Sites

41. The Arkansas Archeological Survey lists only one recorded site (3DE9) on the Montgomery Island quadrangle (Arkansas Archeological Survey, 1989; see Appendix B). Examination of the site report, see Appendix B, indicates the site report is a "second hand" account which was not examined in the field by the person making the report. Personnel from the Little Rock District attempted to locate this site and were unsuccessful (Riggs, 1988; see Appendix B). A second reconnaissance of the site was conducted by Archeological Assessments Inc. (AAI), Nashville, Arkansas, and WES. Examination of the study area by AAI and WES failed to locate this site. It is concluded that the site was destroyed by recent migration of the Mississippi River as determined from comparison of the site location identified on the site record (see Appendix B; site reported in 1967 and located on a sketch map accompanying the site report) and the 1988 river navigation maps of this area.

Prediction of Site Occurrence

Historic

42. Reference is made to Figures 5 and 6 and Plates 1 and 2 to correlate historic channel configurations with locations of important recorded historic events. AAI has compiled a list of historic events and settlements

that are possibly located within the study area boundaries. The list by AAI is contained in Appendix C. A bankline composite of the study area is presented in Figure 7 which shows the various historic channel configurations. Examination of Figure 7 indicates that historic remnants from the period of interest may be preserved in the present Arkansas River, Mississippi River, and White River flood plains. Careful and detailed field study is required to identify these remnants as they are buried by historic sedimentation and/or altered by later fluvial scouring.

Prehistoric

43. Prehistoric archaeological sites in the Lower Mississippi Valley are generally concentrated on high ground, near potential sources of food, fresh water, and usually close to river transportation. Archaeological sites generally correlate with specific landforms that reflect these characteristics. Consequently, sites tend to be concentrated upon natural levees of abandoned channels, abandoned courses, point bars associated with these geomorphic features, and terraces.

44. Geomorphic mapping identifies numerous prehistoric abandoned channels and courses within the Yancopin quadrangle. These abandoned prehistoric fluvial features have a high potential for hosting sites. In the Montgomery Island quadrangle, there are fewer abandoned channels and courses due to rapid lateral Mississippi River migration. A significant amount of migration has occurred in the Montgomery Point area during historic time. Because of the rapid migration, relict point bar banklines that reflect periods of short term stability are present and these features are identified on the Montgomery Island quadrangle. These relict banklines are considered high potential areas for archaeological sites.

Site Preservation and Buried Sites

45. An understanding of sedimentation rates in the study area is important in evaluating locations for buried sites and evaluating site decay. Knowledge about sedimentation rates is also important in understanding the stratigraphic and chronological significance of the archaeological record. Rapid sedimentation will promote the preservation and superposition of artifacts and features that result from serial occupation of sites as shown by Figure 8 (from Ferring, 1986). In contrast, slow sedimentation rates will

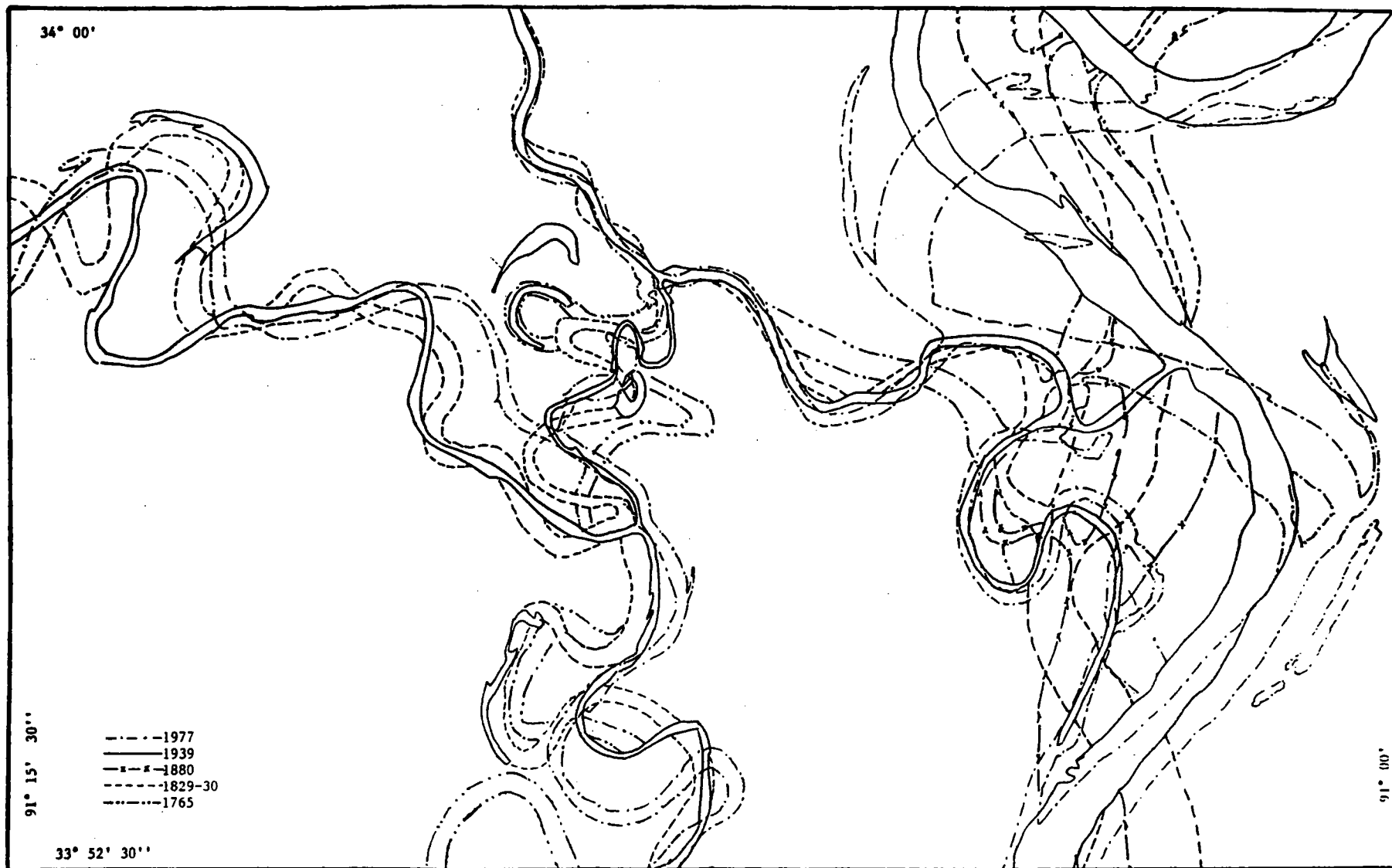


Figure 7. Composite of historic river banklines on the Montgomery Island and Yacopin quadrangles

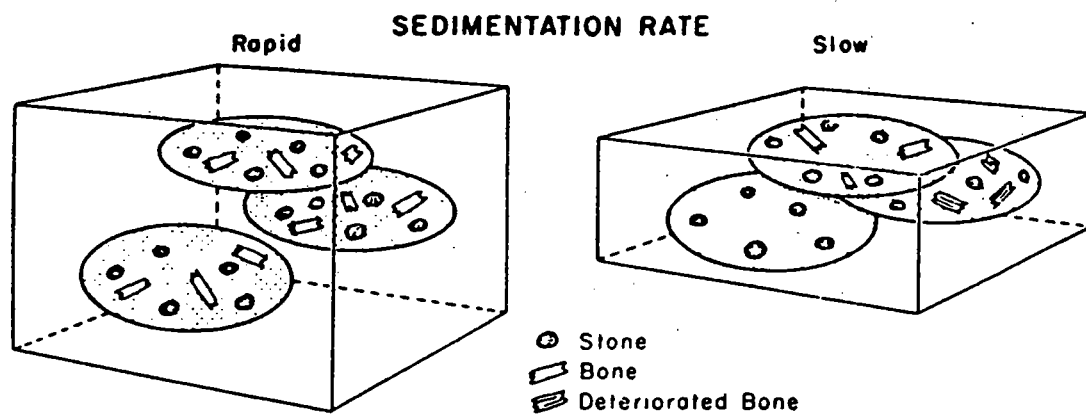


Figure 8. Sedimentation model contrasted between settings with rapid and slow sediment accumulation. Better superposition and artifact preservation occurs with rapid sedimentation as compared to slow sedimentation (from Ferring, 1986)

promote artifact decay and will result in the accumulation of archaeological debris as mixed assemblages. Therefore, it is important to understand, at least in general terms, the significance of sedimentation rates in the Montgomery Point area.

46. Sedimentation rates in the study area were interpreted from soil profiles, from boring data, geomorphic evidence, and bankline migration data. Boring data was used to identify soil types and pedogenic characteristics of the soil. Geomorphic and pedogenic evidence as shown by Figure 9 (from Ferring, 1986) provides information about sedimentary structure, soil profile development, bioturbation characteristics, and fossil conditions. This type of information is used to identify the types of geomorphic features present, interpret the age of the landform, and helps aid in reconstructing the sedimentation history.

47. Sedimentation rates are also important for estimating the impacts of chemical weathering to the archaeological record. Chemical weathering of archaeological sites in the Montgomery Point study area is site dependent and is based on a number of related variables (i.e., soil Ph, soil moisture, wet aerobic or anaerobic environments, types of microorganisms and macroorganisms present, sediment movement, and soil loading). The relationships between these variables are complex and may vary slightly and result in different decay properties for the different artifact types. A detailed discussion of chemical weathering properties related to each environment and the archaeological record is beyond the scope of this study. In general, chemical weathering promotes the decay of bone, shell, charcoal, and pottery. Stone artifacts are not affected. With increasing sedimentation and burial, artifact preservation is greatly enhanced as burial reduces the rate at which chemical and physical weathering occurs.

48. The most active sedimentation rates in the study area are associated with the point bar environment. Point bar deposits are dominated initially by lateral accretion and then by vertical accretion as the main channel migrates away from lateral accretion portion of the point bar landscape. In order for active point bar migration to occur, erosion must also take place on the opposing bank. Active and dynamic sedimentation rates occur during times of flood flow when channel migration and bank erosion are at a maximum. Bankline migration data shows that migration of the Mississippi River has been rapid throughout the study area during historic time.

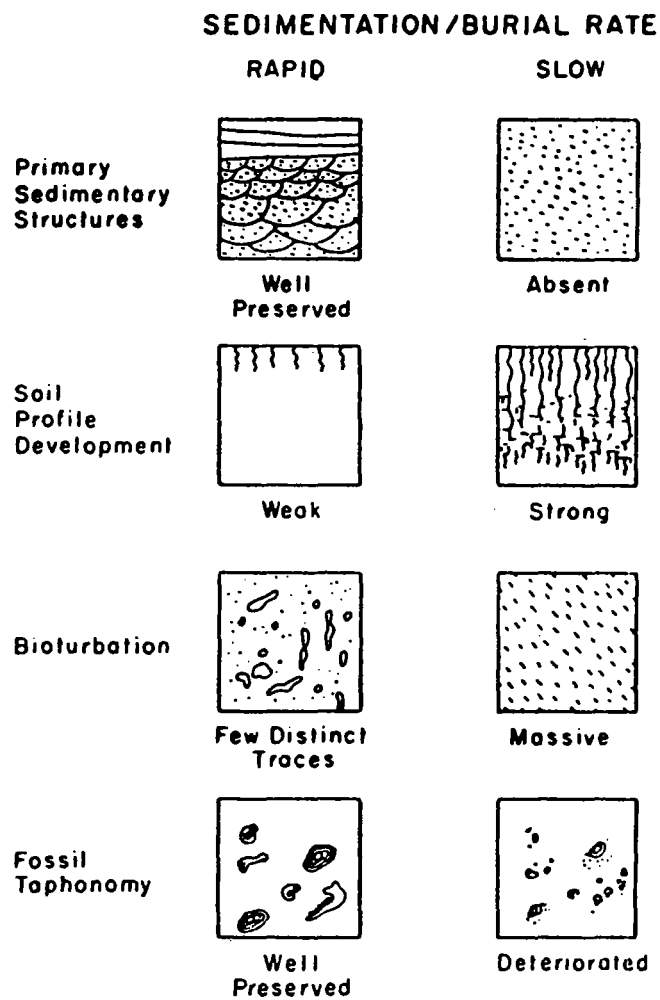


Figure 9. Geomorphic evidence for sedimentation rates (from Ferring, 1986)

Mississippi River migration has been rapid enough that a significant portion of the Montgomery Island quadrangle has been formed during the past 200 years (see Figures 5 and 6). Point bar processes are the most destructive to archaeological sites as channel migration and fluvial scouring can erode and destroy sites. However, the vertical accretion component of point bar deposits may host sites and preserve artifacts by burial. Burial may extend to a significant depth as the topstratum component of the point bar represents sediments deposited by overbank deposition.

49. Prehistoric landforms and sites are likely to be buried beneath historic (approximately last 50 years) natural levee sediments and/or buried within the vertical accretion component of the point bar sequence. Buried depths are site dependent and relate to distance from the active channel, age of the point bar deposit, and general position (i.e., ridge or swale).

Cultural Significance of the Proposed Lock and Dam Site

50. Geomorphic mapping, bankline migration data, and soils information examined during this study indicates the proposed lock and dam site, for the most part, is located in an area composed of sediments that were deposited during the past 200 years. The north (left) bank of the site is composed entirely of historic point bar sediments. The south (right) bank of the proposed site is much older, cutting into prehistoric point bar sediments (i.e., present before 1765) which are covered by a thin (less than 1.5 meter, 5 ft) veneer of historic natural levee deposits. Overall age of the south bank proposed lock and dam site is estimated to be less than 1,000 years old.

51. There are no known prehistoric archaeological sites located at ground surface at the proposed lock and dam site. The only recorded site on the Montgomery Island quadrangle, Site 3DE9, is believed to have been destroyed by recent Mississippi River channel migration as determined by comparing the sketch map accompanying the site report and the 1988 River Navigation maps.

52. In the project area, prehistoric archaeological sites or artifacts that may be present at the proposed lock and dam site will be buried beneath historic natural levee deposits on the south bank of the White River only. No prehistoric sites are judged to be present at the north bank of the White River at the lock and dam site as the point bar deposits at this location are

less than 200 years old.

53. Buried historic artifacts may be present within the point bar and natural levee sediments at the proposed lock and dam site, but there is no way to predict their presence from geomorphic evidence. A detailed review of the historic record (see Appendix D) by AAI indicates there are no historic ship wrecks or settlements at the proposed lock and dam site. Excavation of the lock and dam site during construction may reveal buried artifacts and/or contribute additional data to the historic record.

PART IV: CONCLUSIONS

54. The following conclusions are drawn from the work performed during this study:

- a. Geomorphic mapping of the Montgomery Island study area identified six primary depositional environments: point bar, abandoned channel, crevasse channel, abandoned course, backswamp, and terrace. These environments were further subdivided according to the fluvial system that formed them (i.e., Arkansas River, Mississippi River, and White River) and they were differentiated as to whether they formed during prehistoric (before 1765) or historic times.
- b. The vast majority of the sediments forming the study area as well as the proposed lock and dam site, the project area, are composed of point bar deposits.
- c. Geomorphic evidence, historic bankline migration data, and soils information indicate the Holocene sediments within the study area are generally less than 1,000 years old.
- d. The majority of sediments forming the proposed lock and dam site, the project area, are less than 200 years old. The north (left) bank is composed of historic point bar sediments. The south (right) bank is composed of prehistoric point bar sediments.
- e. Site 3DE9, the only recorded archaeological site on the Montgomery Island quadrangle (Plate 1), is believed to have been destroyed by recent Mississippi River channel migration.
- f. A thin (less than 1.5 meters, 5 ft) layer of natural levee sediments has been deposited within the proposed lock and dam site during the last 50 years. These sediments represent the effects of historic man made changes to the flood plains of the Arkansas, White, and Mississippi Rivers. These changes include flood plain constriction by construction of artificial levees, deforestation of the flood plain, shortening of the course of the Mississippi River by channelization and construction of cutoff channels, and effects of major floods such as the 1927 flood. Consequently, prehistoric archaeological sites that may have been located upon the prehistoric landscape surface will be buried by the recent influx of natural levee sediments.
- g. The construction of the proposed lock and dam at the mouth of the White River will have a minimal impact on the geomorphic processes presently operating. The primary impact will be a reduction of low water conditions and excess sedimentation at the mouth of the White River.

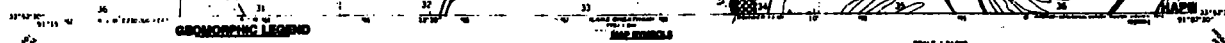
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 ZONE OF VERTICAL ACCRETION - SHALLOWS/SHOOF PIT
 INFINITE CONTACT
 FORMER BASELINE
 SPILL BANK

WCS CENTER AND BARS
WVS POINT BAR OVERLAIN BY NATURAL LEVEE
HVS HISTORIC POINT BAR OVERLAIN BY NATURAL LEVEE
BSH ABANDONED CHANNEL, OVERLAIN BY NATURAL LEVEE
HCH HISTORIC ABANDONED CHANNEL, OVERLAIN BY NATURAL LEVEE
WCC CREVASSE CHANNEL

WCS CHUTE AND BANK
WPS POINT BAR OVERLAIN BY NATURAL LEVEE
HWPS HISTORIC POINT BAR OVERLAIN BY NATURAL LEVEE
WCH ABANDONED CHANNEL, OVERLAIN BY NATURAL LEVEE
HWC HISTORIC ABANDONED CHANNEL, OVERLAIN BY NATURAL LEVEE
WCC CREVASSE CHANNEL

SCALE (2460)

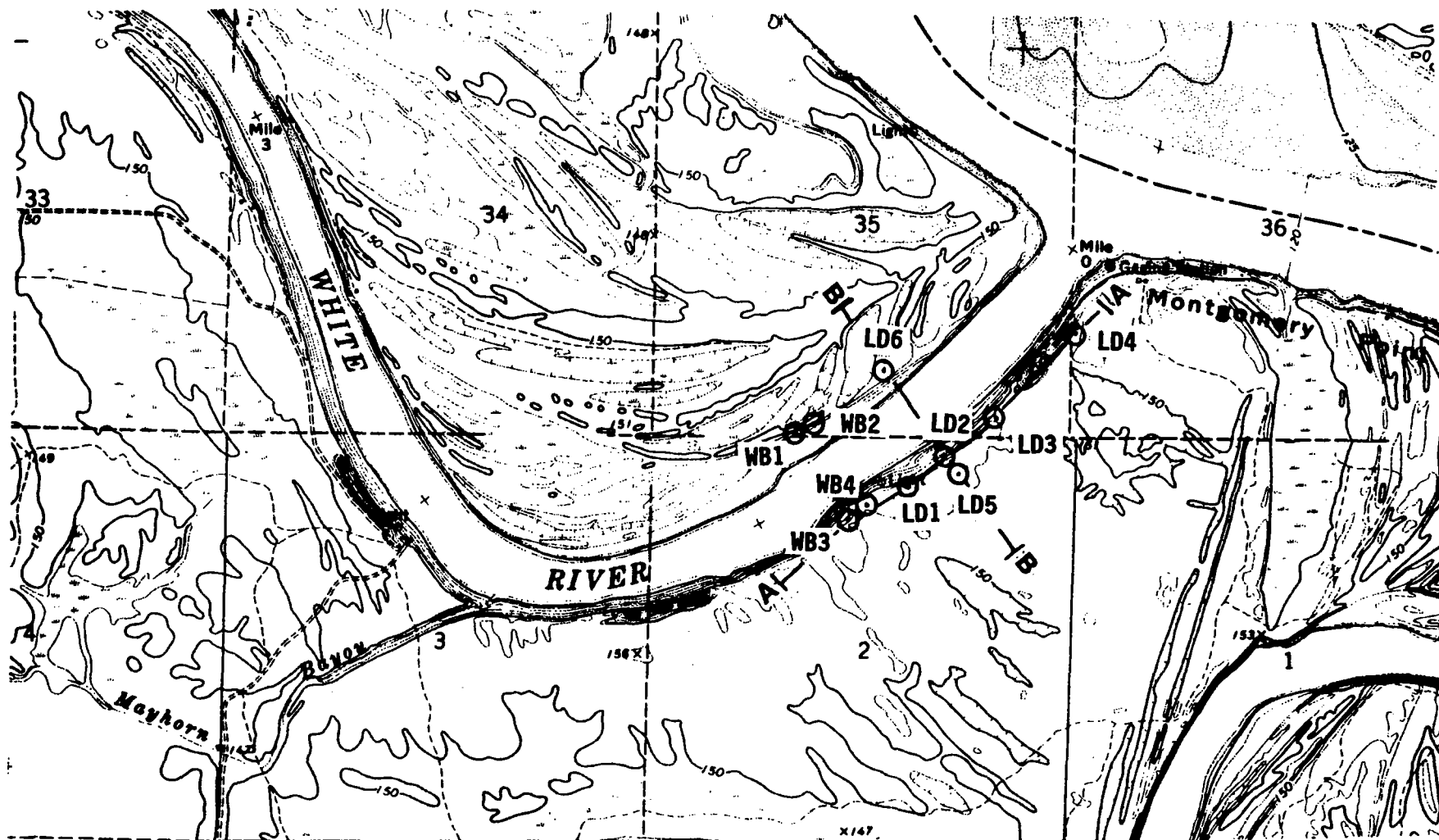
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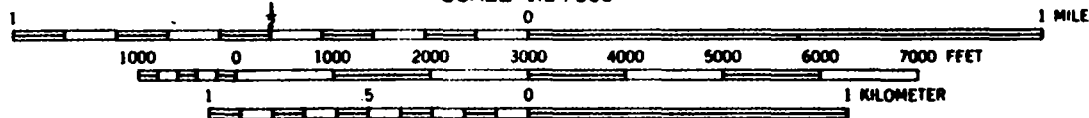
NATIONAL GEODESIC SURVEY, BUREAU OF LANDS

YANCOPIN, ARK.
Plate 2

APPENDIX A: BORING LOGS OF LOCK AND DAM SITE
(U.S. Army Corps of Engineers 1989)



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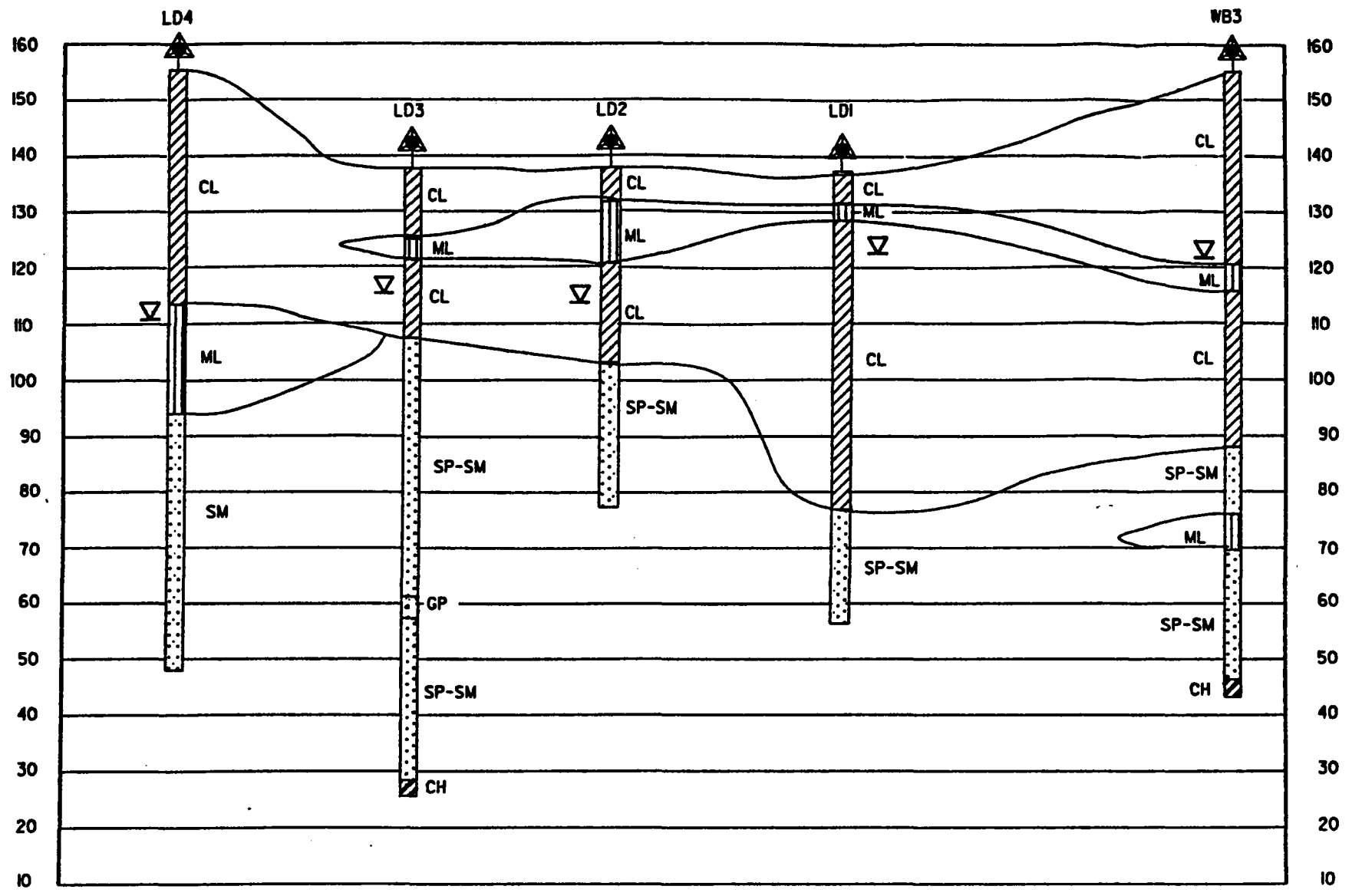


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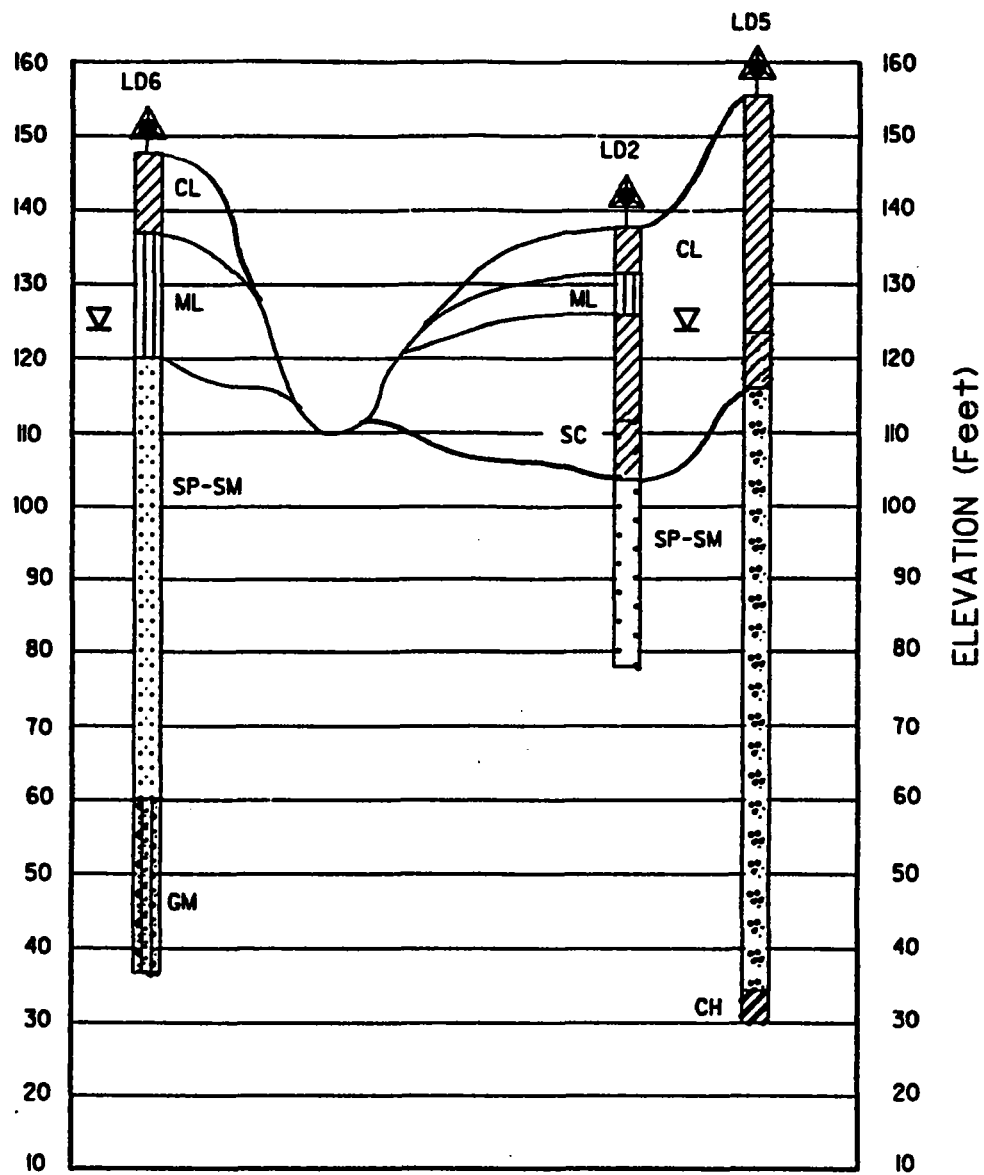
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ELEVATION (Feet)



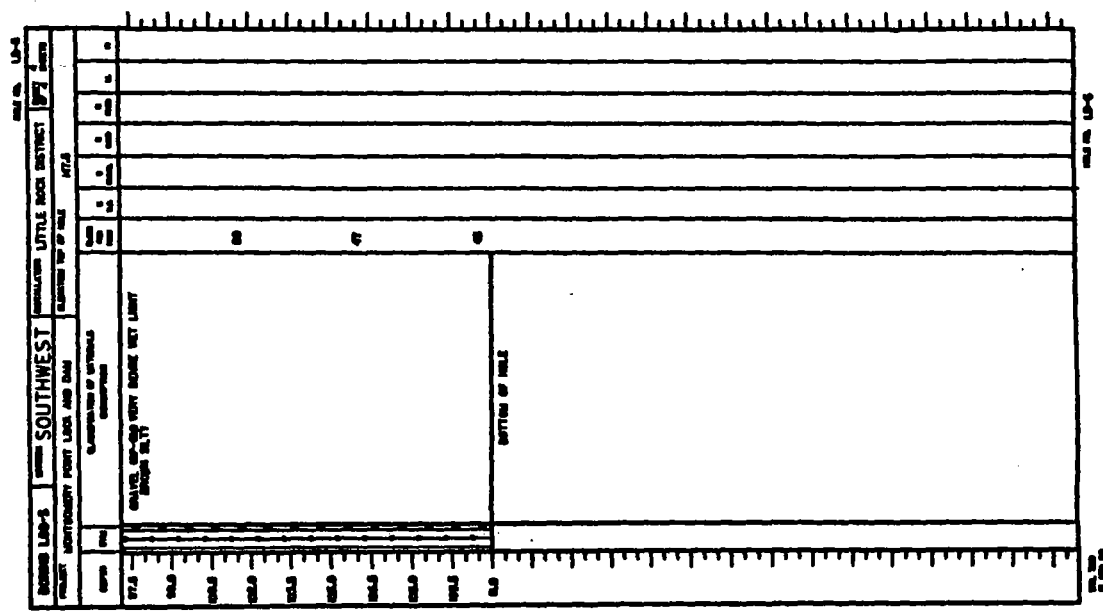
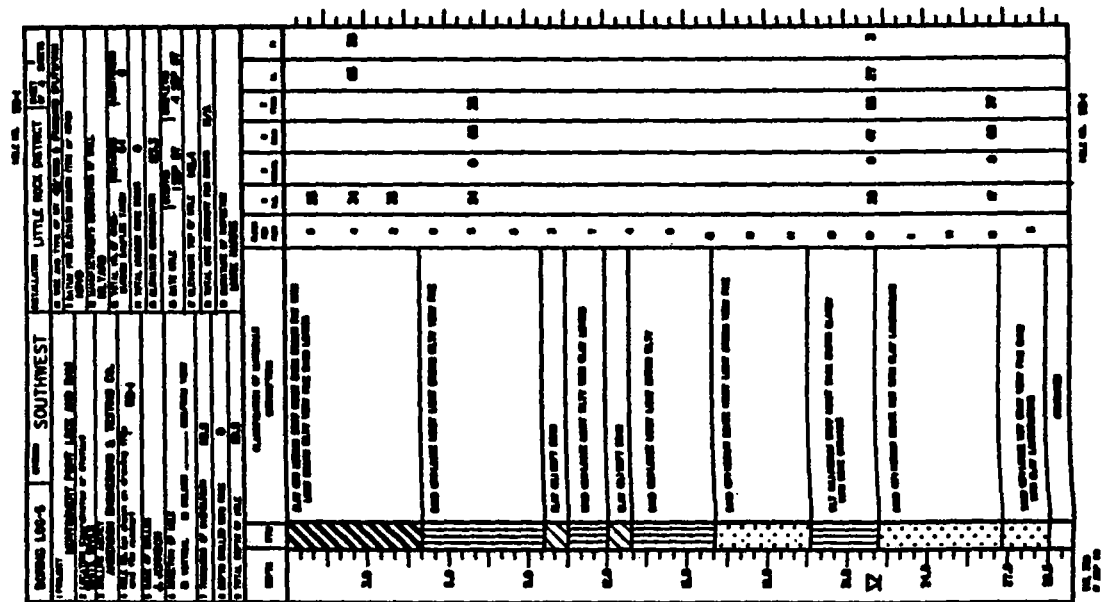
SECTION A-A



SOILS LEGEND

PT	PEAT AND OTHER HIGHLY ORGANIC SOILS
GW	WELL GRADED GRAVELS OR GRAVEL-SAND MIXTURES, LITTLE OR NO FINE
GP	POORLY GRADED GRAVELS OR GRAVEL-SAND MIXTURES, LITTLE OR NO FINE
GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
SW	WELL GRADED SANDS OR GRAVELLY SANDS, LITTLE OR NO FINE
SP	POORLY GRADED SANDS OR GRAVELLY SANDS, LITTLE OR NO FINE
SM	SILTY SANDS, SAND-SILT MIXTURES
SC	CLAYEY SANDS, SAND-CLAY MIXTURES
ML	ORGANIC SILTS AND VERY FINE SANDS, RICE FLOW, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
MH	ORGANIC SILTS, INCOHESIVE OR DISINTEGRABLE FINE SANDY OR SILTY SILTS, ELASTIC SILTS
CL	ORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, LUMPY CLAYS, SILTY CLAYS, LEAN CLAYS
CH	ORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
OL	ORGANIC SILTS AND ORGANIC SILT-CLAYS OF LOW PLASTICITY
OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
	NO RECORDING OR NO SAMPLE

[illegible][illegible]



APPENDIX B: DESCRIPTION OF SITE 3DE9

MEMORANDUM OF RECORD

4 AUG 88

SUBJECT: LOCATION ATTEMPT OF 3DE9 IN THE VICINITY OF LOCK AND DAM 0.

1. On 3 Aug 88, John Riggs of the Environmental Analysis Branch and Don Hubsch of the Norrell Office boated down the White River to the mouth of the White River at the Mississippi River in a search for archeological site 3DE9. The site was reported to the state by an amateur in 1967. The site has never been revisited but it was said to be undisturbed in 1967.

2. Currently the south bank of the Mississippi River is heavily riprapped with quarry run stone and woven concrete mattresses. This effectively obscures visibility because this covering extends onto the top bank. A few sections had, however, not stopped the erosion and some visibility of the upper three feet of profile were exposed. Intensive inspection of all of these revealed no cultural materials anywhere between the mouth of White River and where the old White River Cutoff leaves the current channel of the Mississippi about one mile below the mouth. The vegetation as well as the rip rap made visibility poor and a more thorough relook should be done later....January!

3. The southeast bank of White River in the vicinity of proposed Lock and Dam 0 was also noted to have the potential of having archeological sites. The bare cut bank extending well above the high water mark was inspected but no artifacts were found here either. If nothing was eroding out, it is doubtful that anything is there. Visibility was excellent.

John Riggs



ARKANSAS ARCHEOLOGICAL SURVEY

Director • Charles R. McGimsey III
State Archeologist • Hester A. Davis

Coordinating Office
P.O. Box 1249
Fayetteville, Arkansas 72702-1249
Phone: 501-575-3556

Bob Dunn
Corps of Engineers, Little Rock District
P.O. Box 867
Little Rock, Ar. 72203

Dear Bob:

Enclosed is a copy of the site form you requested for 3DE9. According to our records this is the only registered site on the Montgomery Island 7.5' quad. The location of this site as can be seen on the quad plot for this site form is on an area called Montgomery Point. We have no records with a site name for Montgomery Point Landing. Could this be the same site? If you have further information about this please let me know. Thank you.

Sincerely,

David Coble
Office of the Survey Registrar

Research Stations

University of Arkansas-Fayetteville
Arkansas Archeological Survey
Box 1249
Fayetteville, AR 72702-1249

University of Arkansas-Pine Bluff
Arkansas Archeological Survey
Box 136, UAPB
Pine Bluff, AR 71601

Arkansas State University
Arkansas Archeological Survey
Drawer 820, ASU
State University, AR 72467

University of Arkansas-Monticello
Arkansas Archeological Survey
Box 3087, UAM
Monticello, AR 71655

Henderson State University
Arkansas Archeological Survey
Box H-7857, HSU
Arkadelphia, AR 71823

Southern Arkansas University
Arkansas Archeological Survey
Box 1381, SAU
Magnolia, AR 71753

Arkansas Tech University
Arkansas Archeological Survey
Box 1356, Arkansas Tech
Russellville, AR 72801

Toltec Mounds State Park
Arkansas Archeological Survey
1 Toltec Mounds Road
Scott, AR 72142

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ARKANSAS ARCHEOLOGICAL SURVEY
SITE SURVEY FORM

State Survey No. 3 DE 9

Site Name _____ Reporter's Site No. _____

Other name(s) for site _____

NW 1/4 of the SW 1/4 of Sec. 36 Twpshp 24 N Range 1 W Co. Desha

Instructions for reaching site Boat, swim, or parachute drop. Site located
on north end of Big Island, no vehicle access except prohibition.

USGS Quad Big Island (15' quad)

Site description Site as yet unseen by this reporter, but apparently
quite prolific in pottery.

Present Condition Unknown, but according to Louis Rush site is
undisturbed.

Material collected by reporter large sample pottery (shards) given Survey
by Mr. Louis Rush.

Remarks and recommendations none possible, evaluation not possible until
site has been seen.

Reporter & address Mr. Louis Rush, Crockett's Bluff, Ark. (McClurken
Date 29 Sept. 1967

ADDITIONAL INFORMATION, IF KNOWN:

Owner of site and address Unknown

Tenant & address none

General cultural stage(s) Unknown

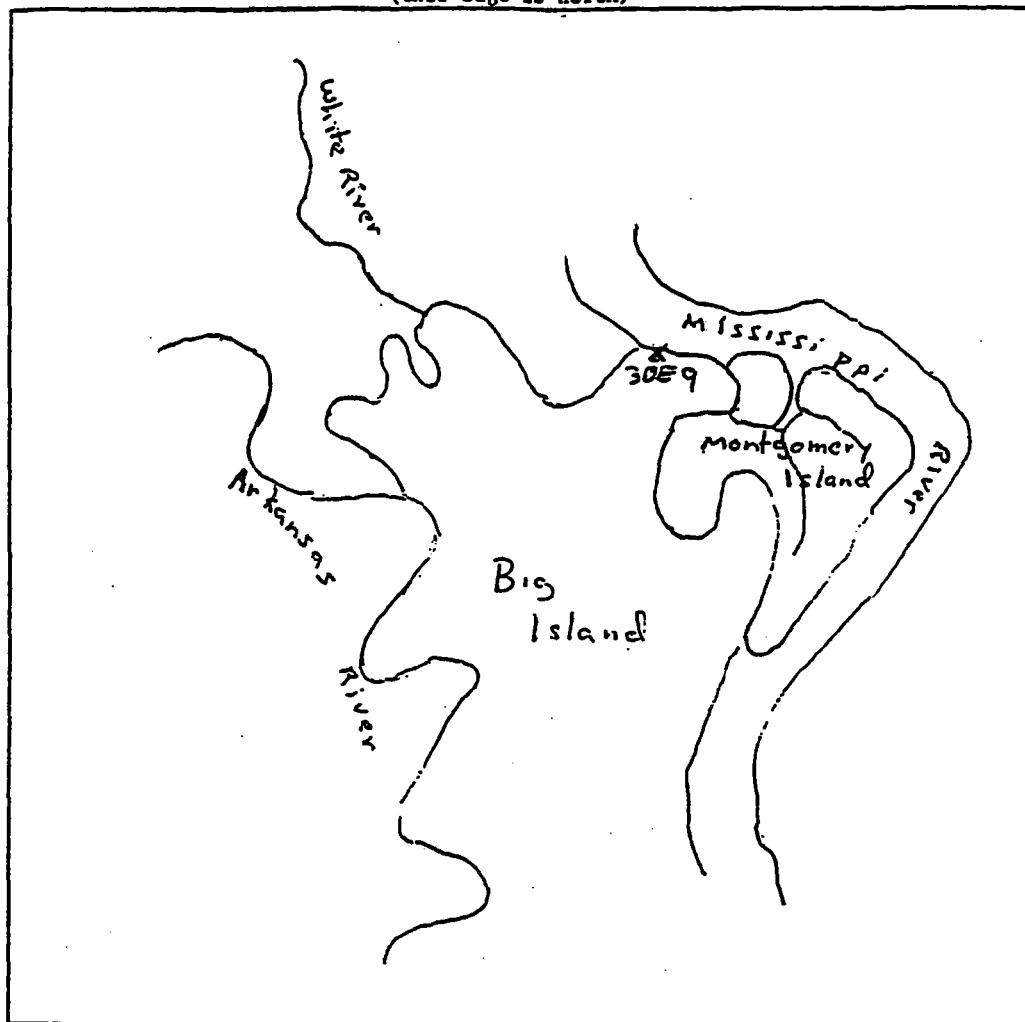
Nearby sources of stone _____

Excavations (when, by whom) None known

Previous collections (what, by whom) Pottery, Louis Rush, given to survey

Return to: Arkansas Archeological Survey, Coordinating Office
MAY 1968 UNIVERSITY OF ARKANSAS, Fayetteville, Arkansas 72701

SKETCH MAP OF SITE AREA
(this edge is north)



Approximate scale 1" = 2 mi. Photographs _____

(FOR OFFICE USE)

This copy for: Coordinating Office _____ Reg. Off. _____ Reg. Off. _____ Rptr. _____

Surface Collection

Accession Nos. 67-122

Excavation _____

Accession Nos. _____

Photograph _____

Negative Nos. _____

Supplementary _____

Data Sheet dates _____

Additional Documents in Site File _____

Publication or _____

Manuscript ref.: _____

**APPENDIX C: SUMMARY OF HISTORIC EVENTS IN THE
MONTGOMERY POINT STUDY AREA
(from Archeological Assessments Inc.)**

MONTGOMERY POINT HISTORIC SITES

- 1542 Every project area needs DeSoto. If the Menard site was Anilco, and there seems to be general agreement on that, then Guachoya, where DeSoto died was not too far away. Current thinking (Hudson) is that it was somewhere in Desha County. In any event DeSoto's army probably did camp or forage in or very near the project area.
- 1680s Discovering the location of the Quapaw villages of Tourima and Kappa (respectively at the mouth of the Arkansas and 8 to 11 leagues above the mouth of the Arkansas on the west bank of the Mississippi) is directly dependent on having geomorphological data on where the mouth of the Arkansas was at that date. See Philips, Ford, and Griffin for detailed discussion of this. Either of these villages might be within the project area.
- 1700 By this date Tourima and Kappa had moved, probably combined with Tonguinga at its location on the east bank of the Mississippi.
- 1740s Apparently nothing at the mouth of either the White or the Arkansas, as Vaudreuil received a number of complaints that having to go up to Arkansas to the Post delayed them, and did not offer them adequate protection.
- 1766- Many secondary sources report that Francois D'Armand opened a trading post at the mouth of the White on the location that was later owned by Robert Clary, then Patrick Cassidy, then John McLean. This is the place visited by Nuttall, Pope, and Cassandra Lockwood, and Featherstonhaugh. This was a major transshipment point for people and freight changing from large Mississippi River boats to smaller boats for the Arkansas and White Rivers. Now most likely in Mississippi.
- 1860s Troops camped at the mouth of the White while waiting for steamboats. Supplies were probably stored there as well.
- 1864 There was a freedman's camp of 95 workers, 65 infirm, and 43 children at the Mouth of White River. From the census taken that year it appears they were working for a commercial firm cutting and cording wood, presumably for steamboats. Since there was a road along the north bank of the river, that is probably where this camp (and the one for troops) was.

- 1882 The mouth of the White was still being used as a transshipment point. This probably continued into the early years of the twentieth century, perhaps as late as the 1920s, as long as steamboats were a major economic force on the Arkansas and White Rivers.
- 1927 Soil deposition and channel shifting by this and other great floods have probably effected the surfaces on which all of these sites rest.

The exact location and the extent of these facilities is still unknown. As the Mississippi River has shifted westward the warehouses, etc. would have moved with it. The Civil War era camps must have been fairly large and since they existed at the same time the description "at" the mouth of the White should not be taken too literally. Most of the lands at the present mouth of the White (sec. 34, 35, 36 T8S R1W and sec. 1, 2, 3 T9S R1W [north of the Arkansas]) were claimed as small parcels in the 1830s and 1840s so even if the project area does not include the transshipment facilities or camps, there is a strong possibility that it does include some early farmsteads.

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1971
25th
25th
1971

REPORT DOCUMENTATION PAGE			Form Approved OMB No. 0704-0188	
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4. TITLE AND SUBTITLE Geomorphic Investigation of Montgomery Point, Arkansas			5. FUNDING NUMBERS	
6. AUTHOR(S) Joseph B. Dunbar				
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) U.S. Army Engineer Waterways Experiment Station Geotechnical Laboratory 3909 Halls Ferry Road Vicksburg, MS 39180-6199			8. PERFORMING ORGANIZATION REPORT NUMBER Miscellaneous Paper GL-93-17	
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13. ABSTRACT (Maximum 200 words) This study provides a geomorphic foundation for a cultural resource investigation of the proposed rock and dam site. Specific objectives of this investigation are to identify and define the major geomorphic features and processes in the study area, reconstruct to the extent possible the geomorphic development of the area, and determine the significance of the geomorphic features in terms of locating previously unknown archaeological sites and artifacts.				
14. SUBJECT TERMS Archaeological sites Lock and dam Cultural resources White River Geomorphic maps			15. NUMBER OF PAGES 78	
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