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PHASE II AND PHASE III ARCHEOLOGICAL INVESTIGATIONS OF THE SHIPWRECK *KENTUCKY* (SITE 16BO358) AT EAGLE BEND, POOL 5, RED RIVER WATERWAY, BOSSIER PARISH, LOUISIANA

FINAL REPORT
APRIL 2004

PREPARED FOR:

U.S. ARMY CORPS OF ENGINEERS
VICKSBURG DISTRICT
2101 NORTH FRONTAGE ROAD
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Final Report

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EXECUTIVE SUMMARY

This report presents the results of Phase II and Phase III intensive archival and underwater archeological investigations of the shipwreck *Kentucky* (Site 16BO358) located at Eagle Bend, Pool 5, of the Red River Waterway, Bossier Parish, Louisiana. This work was conducted by R. Christopher Goodwin & Associates, Inc., on behalf of the U.S. Army Corps of Engineers (USACE), Vicksburg. The study was conducted as part of the USACE's Red River Waterway Project. A significant element in this program of navigational improvements to the Red River includes the construction of stone revetments along the banks of the river. In 1994, local informants reported to the Shreveport Area Office (SAO) of the USACE, Vicksburg District, seeing the "bow" of a "double-hulled" wooden shipwreck eroding from the west bank of the Red River at Bagley Island, at approximately River Mile 269.8. The site was visited by Vicksburg District Archeologist, Mr. Erwin Roemer, who determined that the wreck lay near the path of the planned Eagle Bend revetment.

Phase I investigations of the site were initiated in 1995 by Goodwin & Associates, Inc. for the Vicksburg District. The Phase I investigations indicated the apparent presence of the wooden hull of a large vessel; magnetometer survey suggested the presence of a large ferrous mass, such as an engine. The present study was undertaken as a continuation of the Phase I investigations.

A major objective of the Phase II archeological evaluation of the *Kentucky* was to determine the significance of the vessel, applying the National Register of Historic Places Criteria for Evaluation (36 CFR 60.4 [a-d]). Additional objectives were to determine the effects of the revetment project on the remains of the *Kentucky*; and to make management recommendations for preserving the integrity of the site. These objectives were addressed primarily through field investigation, which was guided by previous fieldwork and additional archival research. Background archival research consisted of a review of the history of the area, and included an examination of state archeological site files, previous reports, and pertinent primary and secondary sources. The results of these archival investigations were used to develop historical and technological contexts for *Kentucky*, and to produce a body of information on the history of the vessel.

Field investigations were undertaken to: 1) monitor coring of the site, undertaken by USACE personnel to assess subsurface conditions and distribution of wreckage; 2) further define and document the extent of wreckage that is exposed underwater; 3) determine the archeological integrity and research potential of the site; and 4) assess the potential effects that the USACE's Red River navigational enhancements will have on the wreck and to provide the Vicksburg District with management recommendations for the site.

The Phase II investigations indicated that the site was eligible for nomination to the National Register of Historic Places under Criteria A, C, and D (36 CFR 60.4 [a – d]. Under Criterion A, association with "events that have made a significant contribution to the broad patterns of history," the *Kentucky* qualifies for listing in the National Register through its association with the themes of Commerce and Military. Under Criterion C, a vessel possesses significance if it embodies "the distinctive characteristics of a type, period, or method of construction..." The *Kentucky* possesses significance under the themes of Architecture and Engineering. Under Criterion D, a vessel is significant if it is likely to yield information important to history.

Investigation of the *Kentucky* could potentially yield significant information not only on the construction and engineering of a mid-nineteenth century western river steamboat, but also on the ways in which such vessels were used, repaired, and modified. Of further significance is the anthropology of its passengers and crew. The *Kentucky* also possesses a high degree of integrity. Finally, Phase II investigations suggested that the shipwreck at Eagle Bend was likely to suffer both direct and indirect effects related to Corps of Engineers activities in Pool 5 aimed at achieving navigability of the Red River. Based on the results of the Phase II evaluations, the site was nominated to the National Register and plans were developed for mitigation and comprehensive data recovery on those portions of the site threatened by revetment construction.

The objectives and methodology for the Phase III investigations were based upon the results of the Phase II investigations. Having determined that the *Kentucky* was eligible for listing on the National Register for Historic Places under criteria A, C, and D, and that portions of the site would be adversely impacted by revetment construction, a data recovery plan was put in place. Objectives of the work were to collect additional archival information on the *Kentucky* and other vessels that could serve as comparisons, to fully record and document the threatened sections of the vessel, and to answer a series of research questions developed out of the Phase II study. This was to be accomplished by: 1) excavating the stern of the vessel; 2) recording the in situ remains as exposed by excavation; 3) dismantling exposed portions of the wreck and transferring them to land for more detailed recording; and 4) reburial of hull components in a stable natural environment. During the course of the fieldwork, the engineering for the revetment was changed, necessitating a change in field methods. The engineering changes, which moved the revetment out into the stream of the Red River, removed some of the adverse impacts anticipated from construction. The goal of the fieldwork therefore shifted to excavation of the stern of the vessel, complete *in situ* documentation of all exposed elements, and subsequent reburial of the hull in place. Additional objectives of the project after the completion of field work were preparation of a conservation needs assessment for objects recovered during excavation, conservation of these remains, and analysis of the materials and data collected during all phases of the work.

The Phase II and III investigations of 16BO358, the wreck of the steamboat *Kentucky*, were highly successful. Archival research revealed a remarkable amount of detail on the vessel's service history and the events that led to its destruction. Field investigations resulted in a highly detailed record of the stern of the vessel and show a variety of techniques that were used by nineteenth century boat builders to produce these remarkable shallow-water craft. The excavation and recording was completed in extremely limited visibility, with no loss of detail or precision.

The comprehensive recording of the vessel has permitted an assessment of the lines and structure of the vessel's aft end, and this may be combined with photographs and other accounts of similar vessels to project the *Kentucky*'s original appearance and configuration. Additional evidence has been preserved in place due to the Army Corps of Engineers' revisions to the revetment construction on this stretch of the Red River. The stern of the *Kentucky* has now been capped by a layer of sand and is protected from future erosion by the revetment and sheet piling left in place beneath it. The remarkable state of preservation encountered toward the bank line during the final stages of the Phase III suggests that the bulk of the *Kentucky* may lie in an excellent state of preservation beneath the bank of the Red River. These preserved elements of the vessel may include not only hull and superstructure, but propulsion and other machinery, furnishings from the vessel, and cargo and personal effects of the crew and passengers. Last but not least, it is likely that human remains still lie interred within the wreck of the *Kentucky*. The protection afforded the site through the revetment construction and the transfer of the site from the landowner to the government, ensures that this grave site and monument to American engineering will remain preserved for the future.

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CHAPTER I

INTRODUCTION

Project Location and Description

This report presents the results of Phase II and Phase III intensive archival and underwater archeological investigations of the shipwreck *Kentucky* (Site 16BO358) located at Eagle Bend, Pool 5, of the Red River Waterway, Bossier Parish, Louisiana (Figures 1 and 2). The field components of these investigations were performed between January and September 1995 and July – October 1997 by R. Christopher Goodwin & Associates, Inc., on behalf of the U.S. Army Corps of Engineers (USACE), Vicksburg District; archival research, analysis, and artifact conservation were carried out between the two field components and through August of 1999. The study was conducted as part of the USACE's Red River Waterway Project. A significant element in this program of navigational improvements to the Red River includes the construction of stone revetments along the banks of the river. In 1994, local informants reported to the Shreveport Area Office (SAO) of the USACE, Vicksburg District, seeing the "bow" of a "double-hulled" wooden shipwreck eroding from the west bank of the Red River at Bagley Island, at approximately River Mile 269.8. The site was visited by Vicksburg District Archeologist, Mr. Erwin Roemer, who determined that the wreck lay near the path of the planned Eagle Bend revetment.

Phase I archeological and archival investigations were initiated in January of 1995 by Goodwin & Associates, Inc. under Contract DACW38-91-D-0013, Delivery Order 11, Modification 02 with the Vicksburg District. A magnetometer survey produced a large, elongated anomaly in the northern corner of the project area, with an exceptionally large magnetic perturbation indicating the presence of a large ferrous mass, such as an engine (Irion 1995a). Hydraulic probing conducted in the area of the anomaly encountered the apparent wooden hull of a vessel ranging from 3.85 and 5.45 m (12.6 to 17.9 ft) below the ground surface. The wooden hull appeared to be sound and in an excellent state of preservation. Concurrent archival investigations identified the wreck at Eagle Bend as the side-wheel steamer *Kentucky*. The steamboat was built at Cincinnati, Ohio, in 1856, and subsequently lost in 1865, shortly after the end of the Civil War; the *Kentucky* was carrying an estimated 900 paroled Confederate soldiers when the vessel struck a snag.

This study was undertaken as a continuation of the Phase I investigations, pursuant to contract No. DACW38-91-D-0013, Delivery Orders 18 and 22 and Contract No. DACW38-96-D-0006, Delivery Order 1, and in compliance with Sections 106 and 110 of the National Historic Preservation Act (NHPA) of 1966, as amended, and the Abandoned Shipwreck Act of 1987 (Public Law 100-298). Investigations were conducted in accordance with the Scope-of-Work, with Federal guidelines established in 36 CFR Part 66, "Recovery of Scientific, Prehistoric, Historic, and Archeological Data: Methods, Standards and Reporting Requirements" (Federal Register Volume 42, No. 19, 1977), with the Secretary of Interior's *Standards and Guidelines for Archeology and Historic Preservation* (Federal Register Volume 48, No. 190, 1983), with 36 CFR

79 "Curation of Federally Owned and Administered Archeological Collections," and applicable portions of the Cultural Resources Code of Louisiana.

The project area was defined as a polygon measuring 51 m (167 ft) along the Red River waterfront and 102 m (335 ft) inland from the river bank; it extended 15.3 m into the river (Figure 3). The project area is bounded by the Red River on the northeast, a property line on the southeast, and an unnamed drainage flowing from an ox-bow lake located to the northwest and west. This drainage formed the main channel of the Red River until it was circumvented by Lattier's Cut-off in 1882. Over the course of the last 100 years, the main channel of the river has meandered further, and at the time of these investigations was eroding perpendicularly into its former bed. The wreckage of the *Kentucky*, which lies in the pre-1882 channel, was being exposed as the modern path of the river shifted south and westward. During these investigations, approximately 75 per cent of the *Kentucky* lay buried beneath the right descending bank of the river, while the remainder of the hull was partially exposed beneath the waters of the Red River. The projected centerline of the vessel ran roughly perpendicular to and across the centerline of the planned revetment. Subsequent to the onset of Phase III investigations, the engineering for the revetment was revised, and the entire vessel now is encapsulated in fill, with the revetment placed farther out into the river. Erosion of the hull remains therefore has ceased, and the site is protected from further erosional destruction by the revetment.

Research Design and Objectives

Phase II

A major objective of the Phase II archeological evaluation of the *Kentucky* was to determine the significance of the vessel, applying the National Register of Historic Places Criteria for evaluation (36 CFR 60,4 [a-d]). Additional objectives were to determine the effects of the revetment project on the remains of the *Kentucky*; and to make management recommendations for preserving the integrity of the site. These objectives were addressed primarily through field investigation, which was guided by previous fieldwork and additional archival research. Background archival research consisted of a review of the history of the area, and included an examination of state archeological site files, previous reports, and pertinent primary and secondary sources. The results of these archival investigations were used to develop historical and technological contexts for *Kentucky*, and to produce a body of information on the history of the vessel.

Field investigations were undertaken to: 1) monitor coring of the site, undertaken by USACE personnel to assess subsurface conditions and distribution of wreckage; 2) further define and document the extent of wreckage that is exposed underwater; 3) determine the archeological integrity and research potential of the site; and 4) assess the potential effects that the USACE's Red River navigational enhancements would have on the wreck and provide the Vicksburg District with management recommendations for the site.

Phase III

The objectives and methodology for the Phase III investigations were based upon the results of the Phase II investigations. Having determined that the *Kentucky* was eligible for listing in the National Register of Historic Places under criteria A, C, and D, and that portions of the site

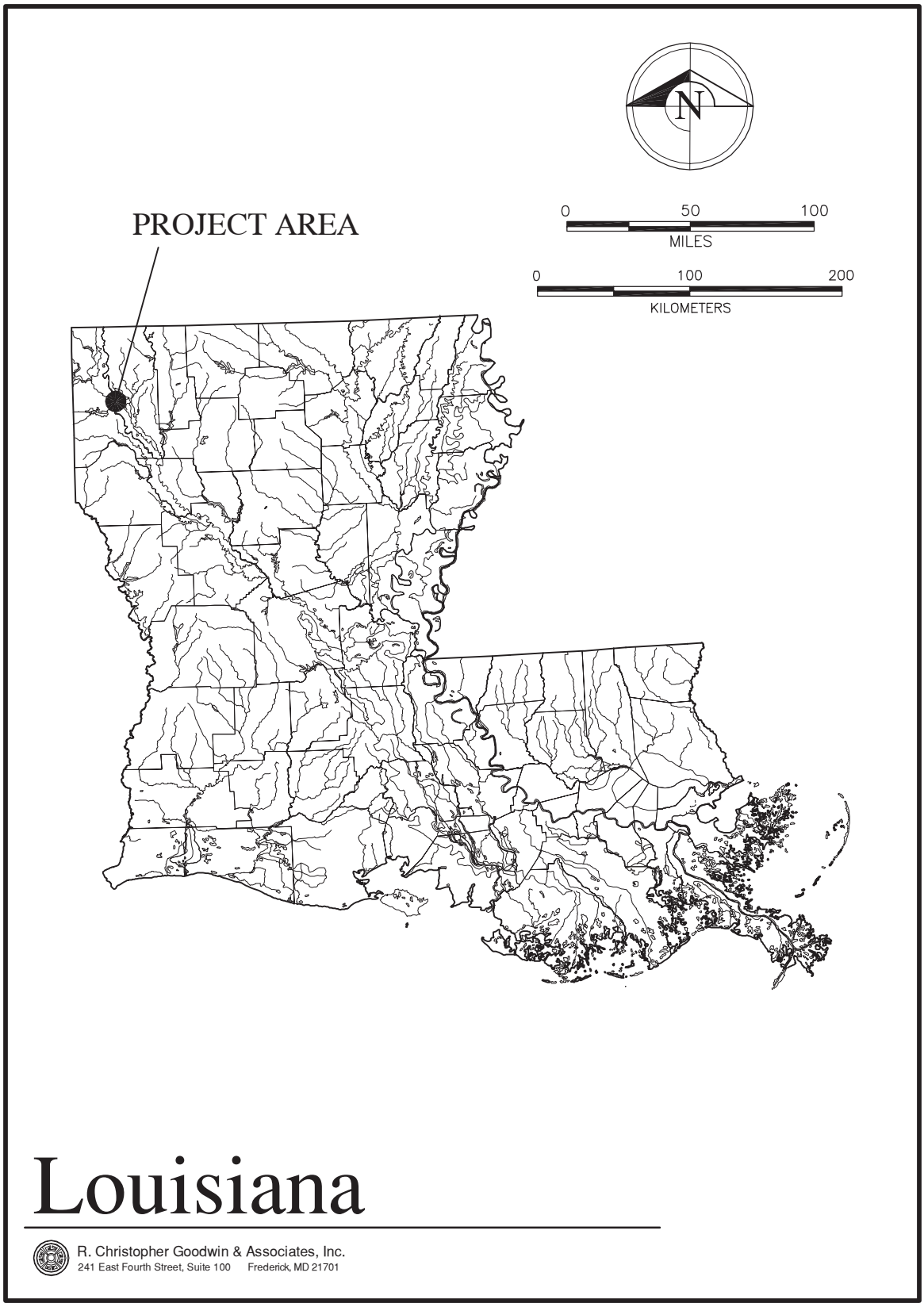


Figure 1 Map of Louisiana showing the general location of the project area

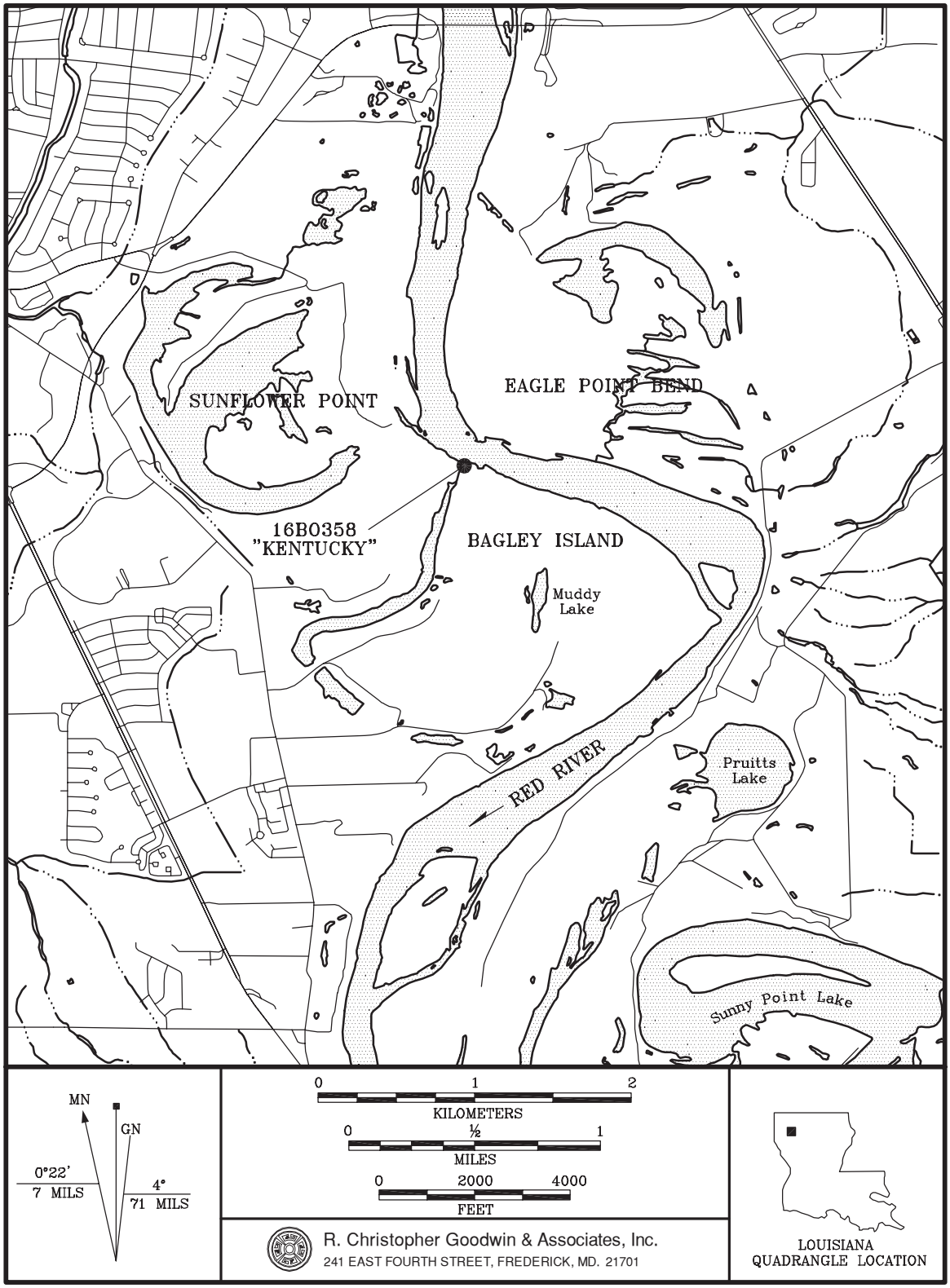


Figure 2 Excerpt from the 1980 USGS 7.5' Series Topographic Quadrangle, Shreveport East, Louisiana, depicting project area location

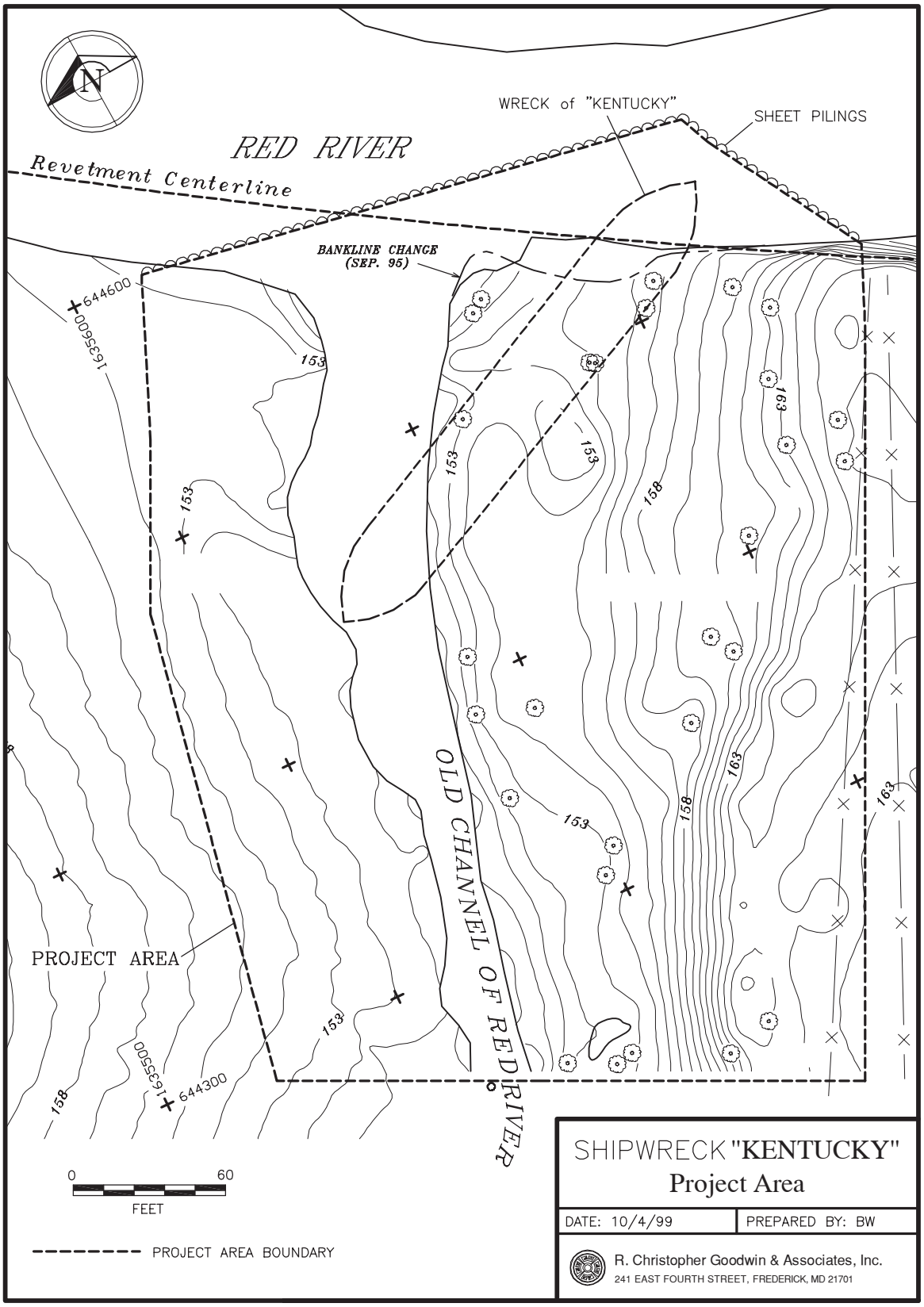


Figure 3 *Kentucky* shipwreck project area

would be impacted adversely by revetment construction, a data recovery plan was put in place. Objectives of the work were to collect additional archival information on the *Kentucky* and other vessels that could serve as comparisons, to fully record and document the threatened sections of the vessel, and to answer a series of research questions developed out of the Phase II study. This was to be accomplished by: 1) excavating the stern of the vessel; 2) recording the in situ remains as exposed by excavation; 3) dismantling exposed portions of the wreck and transferring them to land for more detailed recording; and 4) reburial of hull components in a stable natural environment. During the course of the fieldwork, the engineering for the revetment was changed, necessitating a change in field methods. The engineering changes, which moved the revetment out into the stream of the Red River, removed some of the adverse impacts anticipated from construction. The goal of the fieldwork therefore shifted to excavation of the stern of the vessel, complete in situ documentation of all exposed elements, and subsequent reburial of the hull in place. Additional objectives of the project after the completion of field work were preparation of a conservation needs assessment for objects recovered during excavation, conservation of these remains, and analysis of the materials and data collected during all phases of the work. The final disposition of the collections of artifacts from the *Kentucky* will be curated at the Louisiana State Museum in Baton Rouge through an agreement with the U.S. Army Corps Engineers Vicksburg District.

Organization of the Report

Chapters I-IV provide a variety of background information and context pertinent to 16BO358. Chapter I presents a general description of the project, its location, and its objectives. Chapter II reviews previous investigations in the project area and its vicinity; it also reviews the discovery of 16BO358 and Phase I investigations. The natural setting of the *Kentucky* site, in particular the geology and geomorphology of the region and site, is described in Chapter III. Chapter IV provides an historical context for the site. This includes a general overview of the area and a discussion of the role played by steamboats in the region. Chapter V presents the documentary evidence for the *Kentucky* and its loss. Chapter VI deals with the Phase II methods and results. Chapter VII presents the Phase III data recovery plan and field methods. The results of Phase III investigations are described in Chapter VIII. The design and morphology of the vessel are presented in Chapter IX. Chapters X and XI present a study of material culture recovered from the wreck, and a study of the faunal and botanical remains. Finally, Chapter XII summarizes the work, places it in a comparative perspective, and presents conclusions.

Appendix I contains a listing of primary source accounts relating to the *Kentucky* disaster; Appendix II is a land use history. The artifact inventory is contained in Appendix III; a faunal inventory is in Appendix IV. Appendix V describes the conservation needs assessment. Appendix VI is a State of Louisiana Site Record Form. A National Register Nomination form for *Kentucky* is included as Appendix VII. Appendix VIII includes resumes of key personnel.

CHAPTER II

PREVIOUS INVESTIGATIONS

Investigations in the General Project Vicinity

A number of previous archeological investigations have been conducted in the vicinity of the project area. Although they hold the potential for some comparable data, they include relatively little work dealing specifically with steam vessels. A brief review of this work is appropriate, however, as it helps to establish an archeological context for 16BO358. This review is taken from the most up to date review of the area, prepared by Goodwin & Associates in 1994 (Hinks et al. 1994:34-48).

During the mid-1970s, Gulf South Research Institute (1975) conducted investigations along the Red River from Daingerfield, Texas, downriver to the mouth of the Red River. Part of an environmental assessment associated with planned construction of the Red River Waterway project, the survey was conducted for the U.S. Army Corps of Engineers, New Orleans District, to provide preliminary cultural resources information prior to construction of the individual waterway segments. Subsequent surveys have been conducted for individual construction projects within the boundaries of the Red River Waterway.

The Gulf South Research Institute (1975) investigations combined magnetometer survey of the Red River with pedestrian survey of the adjacent areas. Archival and map research were undertaken to identify potential site locations and shipwrecks. Fieldwork was designed to relocate all previously recorded archeological sites, and to examine various high probability areas along and within the river. A total of 74 sites were examined in Louisiana and 38 sites were examined in Texas. No sites were identified in the vicinity of the *Kentucky*.

Saltus (1980) conducted a marine magnetometer survey of the Red River from near Simmesport to Shreveport, Louisiana. This marine survey was undertaken by Gulf South Research Institute for the U.S. Army Corps of Engineers, New Orleans District, to locate potential shipwrecks within the active channel of the Red River. Collected data were designed to supplement information collected previously (Gulf South Research Institute 1975). Saltus surveyed virtually the entire length of the active Red River channel, from the mouth of the Red River near Simmesport to near Shreveport. Archival research, coupled with an analysis of the magnetic data, resulted in identification of over 900 magnetic anomalies, including many possible "shipwreck" locations within the channel. In addition, earlier identified anomalies were verified; a number of these could be associated with modern refuse, cables and pipelines, or similar modern features (Saltus 1980). Identified anomalies were numbered by river mile, with multiple anomalies within a single river mile differentiated by letters and labeled from downriver to upriver. While the locations of the anomalies identified during survey are plotted on project maps, these maps are not available in the report. Although the report does not eliminate the need to conduct more detailed marine surveys along the Red River, it does provide a useful tool for assessing the potential for

cultural resources within the 1980 channel. During the survey, 31 anomalies were located near the Sunny Point Dikes and Revetment through Eagle Bend project items. While several of these anomalies had modern associations, no historic associations were noted (Saltus 1980).

In 1980, Rone Engineers, Inc., attempted to relocate and identify several of the magnetic anomalies found in earlier surveys of the Red River (Shiner and Wendorf 1982). Divers were unable to identify any clear remains that might have been from wrecked vessels. In 1980 and 1981, Coastal Environments, Inc., examined 17 proposed construction sites along the Red River, most of which were over old, silted channels of the Red River (Pearson et al. 1982). Magnetometer survey of these locales identified 98 anomalies, but none of those that were investigated bore evidence of shipwrecks. In a study limited to historical methods, archival research was utilized in an attempt to locate the remains of the *Mittie Stevens*, a steamboat lost in 1860 on Caddo Lake (Lang 1986).

In 1986, Coastal Environments, Inc. (Bryant et al. 1986) examined seven construction items along the Red River between Colfax and Cupples, Louisiana. Only two of these construction items were located near the current project area. The Cupples survey area was situated along the west bank of the Red River between the Sunny Point Dikes and Revetment project item and the Cecile Revetment project item. Survey within the Cupples area consisted of an intensive pedestrian survey augmented by judgmental shovel testing. Survey within the Colfax project item consisted solely of a marine magnetometer survey; no terrestrial survey was conducted in that area. Only one archeological site was identified within the two areas. Site 16CD202 was characterized as a late nineteenth to early twentieth century historic artifact scatter associated with a former tenement; the site was evaluated as not significant. No additional testing was recommended for these two project items.

A tributary of the Red River, Arkansas' Ouchita River, was surveyed by Coastal Environments, Inc., for steamboats (Pearson et al. 1987), and this was followed by testing of individual anomalies in a later project (Pearson and Saltus 1993). During the course of the latter investigation, the remains of the *Homer*, a mid-nineteenth century side-wheel steamer, were discovered. *Homer* operated on the Red and Ouchita Rivers and was scuttled at Camden, Arkansas, during the Civil War. Pearson and Saltus's investigation included partial excavation of the wreck.

R. Christopher Goodwin & Associates, Inc. (Goodwin et al. 1992) examined seven items along the Red River in Natchitoches and Grant parishes for the U.S. Army Corps of Engineers, Vicksburg District. One of these items, the Grappe Realignment and Barnhart Dikes project item, is relatively close to the current project area. Reconnaissance-level survey was conducted within all of the project items except for Barnhart Dikes. Only one of the Barnhart Dike tie-back areas was located on land; however, that one acre was tested and assessed for cultural resources. The remainder of the Barnhart Dikes project area was examined through riverine magnetometer survey. No riverine or terrestrial archeological resources were encountered during survey.

Coastal Environments, Inc. (1992) surveyed portions of the Lock and Dam No. 5 project area, which lies just downriver from the McDade Revetment area. This survey was conducted for the U.S. Army Corps of Engineers, Vicksburg District. Field investigations consisted of terrestrial survey of two access roads, remote sensing in a portion of Lake Ninock and across a large sand island in the Red River channel, and delineation of the apparent extent of the Mary Magdalene Cemetery. During survey, three archeological sites were identified. The Lake Ninock site (16BO241/16CD212) lies in Lake Ninock, a former channel of the Red River, on the Bossier/Caddo parish line. It consisted of a large magnetic anomaly, possibly the remains of the steamboat *Nat F. Dortch*, which sank at that approximate location in 1895. Some brick and other

historic debris were observed on the adjacent bankline, possibly materials salvaged from the wreck. The purported shipwreck is buried beneath an unknown amount of alluvium, and the planned construction activities would not impact this buried cultural resource. Coastal Environments, Inc. characterized the site as a potentially significant cultural resource and recommended avoidance of the site.

A long-term study of the Civil War ironclad *Eastport* was begun in 1992 by the Vicksburg District of the Corp of Engineers. The gunboat was scuttled below the town of Montgomery by the Union in 1864, during the Red river campaign. Historical research, reconstruction of past river channel locations, a magnetometer survey, and coring were utilized in preliminary studies (Birchett and Pearson 1995). The coring revealed wood and metal at great depths, suggesting the remains of two vessels had been located, the *Eastport*, and lying on top of it, the side-wheel steamboat *E. F. Dix*, which sank in 1865. Archeological testing was undertaken on the site in 1995 by Coastal Environments, Inc., revealing the remains of both vessels.

In 1996 and 1997, Panamerican Consultants conducted a remote sensing survey on the Red River between Shreveport and Lock and Dam 3 at Colfax, Louisiana (Tuttle 1997). Using a magnetometer, sidescan sonar, and fathometer, 118 miles of navigation channel were surveyed. The survey revealed 333 magnetic anomalies that were considered large enough to justify further investigation. The threshold for this evaluation drew on Pearson et al.'s (1991:70) consideration of anomaly significance, which suggested that "the amplitudes of magnetic anomalies associated with shipwrecks...range from moderate to high intensity (>50 gammas) when the sensor is at distances of 20 ft or so." The Panamerican survey, however, utilized a rather large transect interval of 100 ft (Tuttle 1997:44), suggesting that complete coverage of the survey area would have required either a smaller threshold for "significant " amplitudes, or a lane spacing that ensured a distance of no more than 20 ft between the sensor and any point in the survey area (a source mid-way between two transects 100 ft away from one another would be 50 ft away from the sensor, more than double the recommended distance for this threshold). Seventy-one anomalies could not be accounted for as modern or insignificant sources; thirty-one of these were surveyed with sidescan sonar, and three of these are thought to represent shipwrecks. The remainder was classified as potentially significant resources.

In addition to wrecked vessels, a number of terrestrial historic sites have been recorded near the project area. Most of these sites consist of late nineteenth and/or early twentieth century domestic sites that often contain surviving brick cisterns. One of these, 16NA288, includes a bluffland house that has been evaluated as a potentially significant cultural resource. Another such site, Caspiana Plantation (16CD77), consists of a vacant house and outbuildings, as well as the archeological deposits associated with the nineteenth century Caspiana Plantation; the site has been assessed as potentially significant. As discussed above, Site 16CD95 contains a scatter of redeposited early to mid-twentieth century artifacts; it was assessed as not significant. Beaver Ridge (16GR318) is an early historic artifact scatter, while Buck's Pen (16GR319) is a brick cistern with artifacts of unknown historic cultural affiliation; neither site has been evaluated.

Recent Investigations at Eagle Bend

In 1991 and 1992, R. Christopher Goodwin & Associates, Inc., conducted a survey of eight items in Pools 3 and 5 for the U.S. Army Corps of Engineers, Vicksburg District (Hinks et al. 1994). Seven of the project items were in Pool 5, namely the Eagle Bend Revetment, Curtis Revetment, Sunny Point Revetment and Dikes, Cecile Revetment, Elm Grove Revetment, Moss Revetment, and McDade Revetment. Pedestrian survey, systematic shovel testing, and limited

judgmental auger testing were used, along with a marine magnetometer survey. Two historic sites were identified within the project items. Both the Six Pecans site (16 CD 222) and the Bankline Scatter site (16 CD 224) contained twentieth century artifact scatters, possibly associated with former tenant houses. Neither was considered eligible for the National Register of Historic Places. The marine magnetometer survey yielded no significant anomalies within the proposed project areas, despite historical indications that two vessels were lost in the area (Gulf South Research Institute 1975). The first of these, the *Irene*, was lost to a snag on November 10, 1868, some 23 miles below Shreveport. Built in Louisville in 1864, the 330-ton stern-wheeler was 156 ft in length, had a beam of 31.8 ft, and a depth in hold of 4.7 feet. The second vessel was the *Kentucky*, built in Cincinnati in 1856 and lost in 1865 (Hinks et al. 1994:192). Due to the negative results of the magnetometer survey, several sites were examined which had been suggested as shipwrecks by local informants. One of these sites was located across the river from 16BO358, on Eagle Bend Point. A magnetometer survey over portions of a pasture revealed an anomaly consistent with buried wreckage, and it was posited that this might be the remains of *Kentucky*. A second site, located in an oxbow lake known as Lake Caspiana, also was investigated with a magnetometer. This revealed two anomalies consistent with shipwrecks. One was possibly the remains of a twentieth century cattle ferry, while the other seemed consistent with the location of *Irene*. All of these sites suggested by informants lay outside of the current river channel.

Discovery of 16BO358

During the summer of 1994, a local commercial fisherman on the Red River, Mr. Robert Dupont, observed what he described as the bow of a "double-hulled" wooden shipwreck eroding from the bank of the Red River at Bagley Island at approximately River Mile 269.8 (Figure 2). The "bow," which he described as having a pronounced flair, lay perpendicular to the present bank line. At the time of Mr. Dupont's observations, the pre-impoundment water level of the river was low, and approximately 9 m (30 ft) of the hull was exposed before it disappeared beneath the sharply vertical bank. He was able to collect a cast iron kettle and a shovel blade from the interior of the wreck. Dupont also noted transverse iron structural features that he described as having the appearance of turnbuckles.

Dupont later described his find to local artifact collector J. Frank McAneny, who visited the site with Dupont in September of 1994. By this time, the briefly exposed wreckage was again covered by a sand bar. Undeterred, Dupont and McAneny dug out a large iron, threaded turnbuckle with a rod attached by means of a loop formed in one end that may relate to the hogging chains of a nineteenth century steamboat (Figures 4 and 5). Mr. McAneny subsequently reported the find to the Shreveport Area Office of the U.S. Army Corps of Engineers, Vicksburg District, and archeological investigation of the site, designated 16BO358, began shortly thereafter.

Phase I Investigations

Phase I investigation of the site, undertaken by R. Christopher Goodwin & Associates, Inc., began in January of 1995. These investigations utilized a magnetometer to search for ferrous remains associated with the vessel, as well as hydraulic probing to determine the depth of the ship's structure (Irion 1995a). The following discussion of the investigation is taken from a management summary written by Dr. Jack Irion (1995a), who directed the work.

Prior to initiating survey, the project area was cleared of vegetation and an arbitrary grid bearing 25° east of true north was established with grid nodes at 3 m (9.8 ft) intervals. Total

Figure 4 Top: hogging chain under excavation; Bottom: hogging chain after excavation: Left to Right -–Robert Dupont, Frank McAneny

Figure 5 Hogging chain turnbuckle recovered from *Kentucky*, on display in the Louisiana State Exhibit Museum, Shreveport, Louisiana

magnetic field readings were collected at each grid node using a G-856 proton precession magnetometer and downloaded to a computer for post-processing. The collected field data were contoured using Golden Software's SURFER contouring package and analyzed for anomalous targets. The magnetic survey produced a large elongated anomaly in the northern corner of the project area (Figure 6). The anomaly produced a maximum perturbation of the ambient magnetic field of nearly 2,000 gammas, an exceptionally large magnetic disturbance indicating the presence of a large ferrous mass such as the engine of a vessel. The anomaly was detected over an area of roughly 660 m^2 (2,200 ft^2). The failure of two previous magnetic surveys conducted on the river adjacent to the site to locate an anomaly sufficiently large to be considered potentially significant (Hinks et al. 1993; Tuttle 1997) supports suggestions that more thought be given to both the spacing of survey transects and the threshold levels used to classify anomalies as potentially significant or insignificant (Murphy and Saltus 1990; Seidel, Robinson and Kane 1998).

The area of the magnetic anomaly subsequently was ground-truthed with a hydraulic probe to determine if hull structure existed beneath the river bank and, if so, the approximate depth of the covering sediments. The hydraulic probe consisted of a 3.1 cm (1 in) I.D. PVC-pipe measuring 5.75 m (18 ft 9 in) long, through which water was pumped. The probe was forced by hand through sediments until it encountered resistance from a solid object, in this case the wooden hull of a vessel. Eighteen test areas were investigated with the probe in the vicinity of the magnetic anomaly, ten of which encountered wooden structure at a depth of between 3.6 and 5.5 m (12 and 18 ft) below ground surface. The structure declined from its highest point near the present channel of the Red River on the downstream edge of the anomaly to a depth beyond the length of the probe as the anomaly trended to the southwest away from the present river. Its highest elevation coincides with a natural break in the topography that probably represents the pre-1882 river bank, whereas the deepest end terminates in what would have been the historic channel. A possible edge was established for the vessel on the downstream side of the anomaly, giving an apparent orientation for the long axis of the wreck of approximately 46° east of magnetic north. The opposite side of the wreck was too deeply buried to be struck by the probe except along the present river bank. The wooden hull appeared to be sound and in an excellent state of preservation.

Remote sensing data confirmed Mr. Robert Dupont's assertion that an intact wood-hulled shipwreck survived beneath the river bank at Eagle Bend. The strong magnetic fluctuations noted in the center of the wreckage were consistent with readings produced by the propulsion machinery of a nineteenth century steamboat and suggest that the wreck had not been salvaged of its engines and boilers. Dupont's observation that the vessel was "double-hulled" describes a ship constructed of external planking with internal frames overlain by ceiling planking. His further observation of iron "turnbuckles" athwartship and the recovery of one such piece suggest the presence of cross-chains, a well known, but little documented, feature of nineteenth century steamboats designed to prevent the hull from sagging.

Identification of the Vessel

A variety of clues suggested that the Eagle Bend shipwreck might be the *Kentucky*, a vessel that sank after striking a snag on June 9, 1865. The vessel carried 900 passengers at the time, mostly paroled Confederate soldiers and their families. In addition to the crew, the passengers, and their baggage, approximately 250 horses were on board. Contemporary accounts indicate that there was loss of life in this disaster. Many human remains, most of the horses, and almost all of the baggage never were recovered.

The position of the wreck relative to the pre-1882 channel indicates that the vessel must predate Lattier's Cut-off. Figure 7, an excerpt from a Red River survey conducted in 1891, clearly shows the old river course, the location of 16BO358 on the old channel, and Lattier's Cut-off to the southeast. A Red River shipwreck survivor provided another critical clue in an interview in 1940 that was recounted in an article in the July 10, 1974, Shreveport *Journal*. The survivor, Nannie Walton, recounted that William Crowder, a local planter, renamed his plantation in honor of the boat that sank just off his land, the side-wheel steamboat *Kentucky*. Significantly, Kentucky Plantation, which was bordered to the north by Eagle Bend Plantation, to the east by Old River (the pre-1882 channel of the Red River), and to the south by Bagley Plantation, is immediately adjacent to the shipwreck (Hinks et al. 1994:75). Finally, and most decisively, the wreck of the *Kentucky*, along with five other wrecks, was labeled on an 1872 map of the Red River by W.C. Melvin, an engineer engaged in levee improvements (Figure 8). Melvin's map was discovered after the completion of the 1992 survey of this area, and his placement of the *Kentucky* coincides perfectly with the location of the 16BO358 shipwreck.

The combination of evidence recorded by Irion indicated a high probability that the Eagle Bend wreck was a significant site, with substantial and intact remains. The Vicksburg District of the U.S. Army Corps of Engineers therefore determined that a Phase II evaluation of the site's significance was necessary. The Phase II evaluation required not only additional fieldwork, but a comprehensive examination of the site's natural and historical contexts.

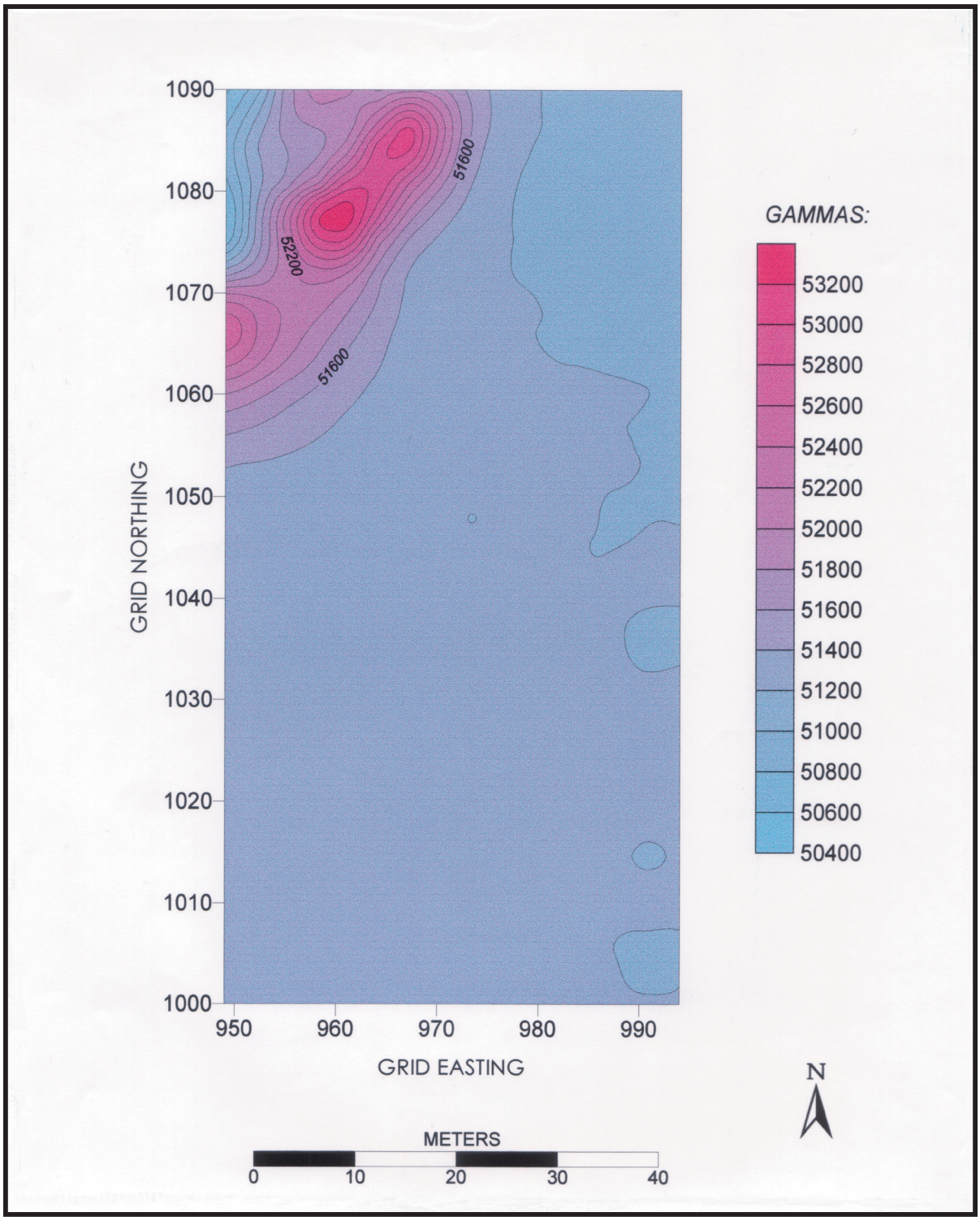


Figure 6 Magnetic contour map of the project area

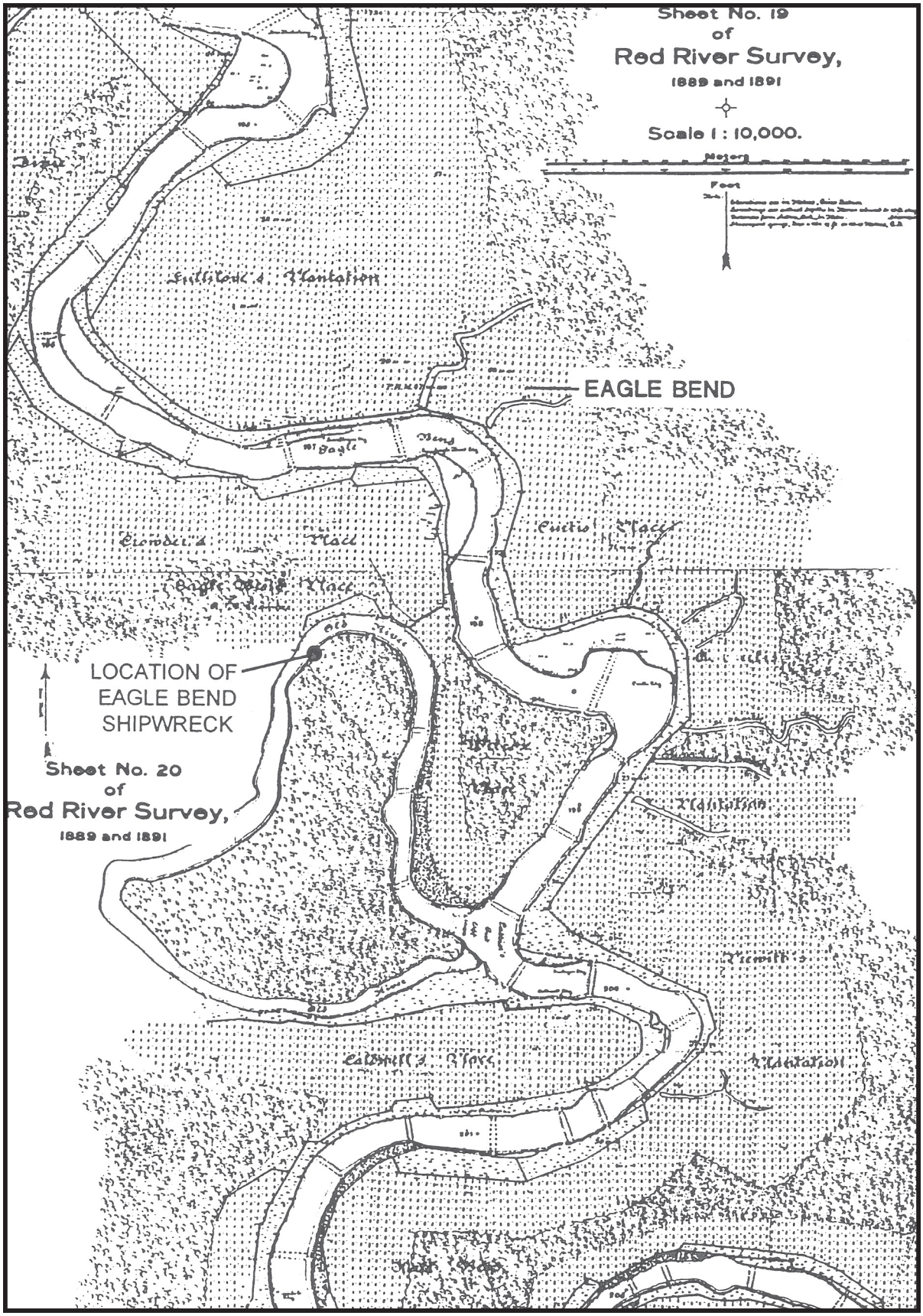


Figure 7 Excerpt from the Red River Survey, Sheets 19 and 20, depicting the project area in 1891

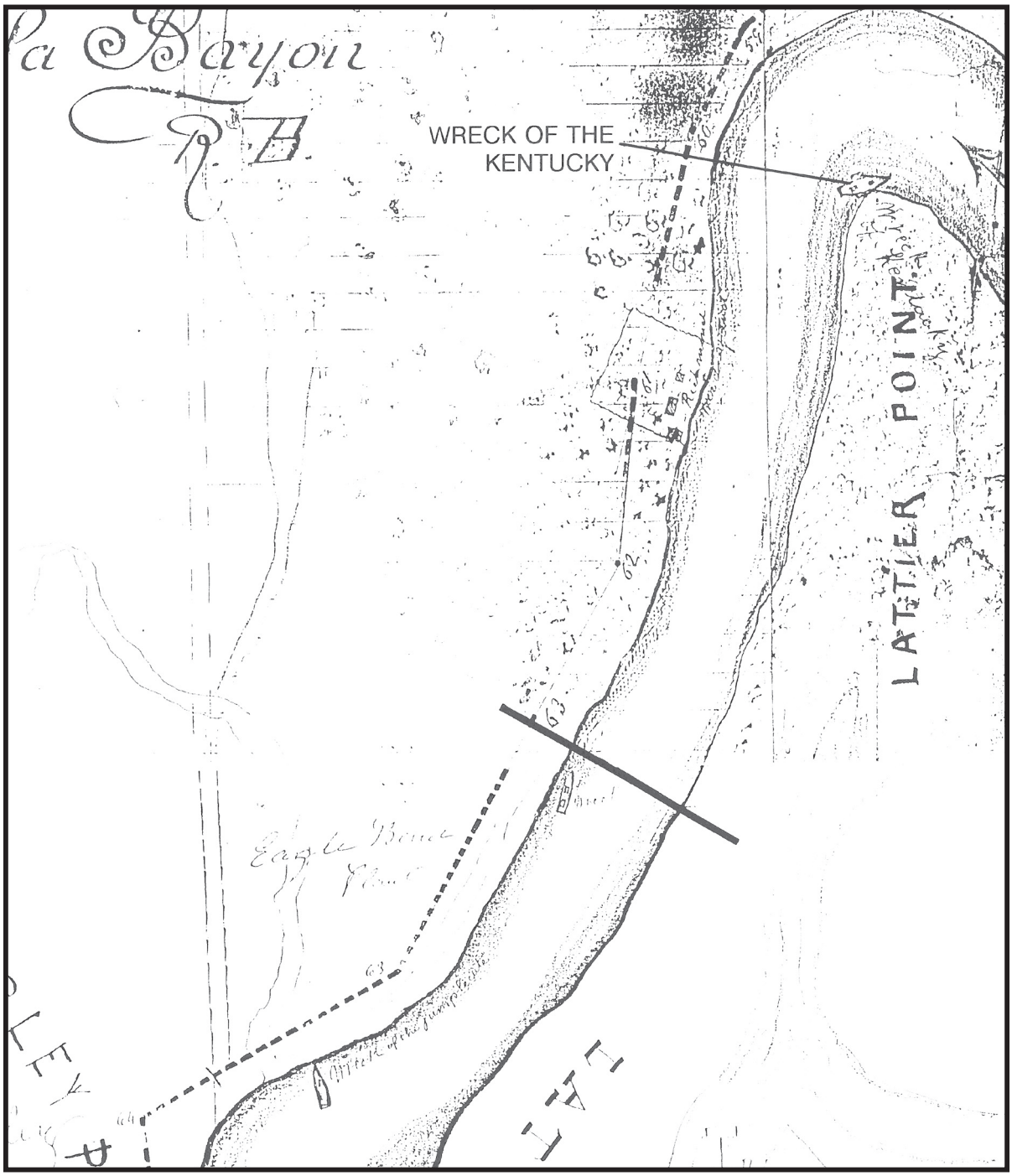


Figure 8 Excerpt from the 1872 Melvin Map, Red River from Shreveport, Louisiana to Pascagoula Bayou, Mississippi

CHAPTER III

NATURAL SETTING

Any understanding of navigation on the Red River, of shipwrecks, and of the post-depositional processes that affect wrecks, requires an understanding of the geology and geomorphology of rivers. Roger Saucier (1999b) was asked to prepare such a review for this investigation, the results of which follow and are combined with additional geomorphology studies prepared for the Phase II evaluation. The focus of the overview is on aspects of sedimentation related to the burial and preservation of the shipwreck and others in similar contexts. The overview initially focuses on the reach of the river from about the Arkansas-Louisiana state line south to about Alexandria, LA. Thereafter, attention is progressively restricted to a smaller area and eventually only to the shipwreck vicinity. Emphasis is on fluvial processes and sedimentary responses that have strongly influenced the regime of the river over the last several thousand years, but primarily during the historic period.

Methodology

Relying heavily on his knowledge of and experience with alluvial geomorphology and geoarcheology of the greater Lower Mississippi Valley area, Saucier conducted a literature review of the area. This included examination of large-scale geologic mapping, geologic reports, soil surveys, summaries of archeological surveys, historic accounts, special studies, and historical maps and surveys.

Special attention was devoted to identifying and reviewing literature items related to the Red River raft (the Great Raft), as this unusual phenomenon played an indirect but significant role in preservation (and discovery) of the shipwreck. Raft formation over a period of several centuries triggered a fluvial response that affected over 160 km (100 mi) of the Red River channel and floodplain, including the shipwreck location.

Historic maps were reviewed for evidence of changing channels and shifts relative to the site of the *Kentucky*. In addition, data from coring at the site was reviewed and interpreted. These data were used to establish a sequence for exposure, flooding, and silt deposition on the site in the years after the wreck.

This review aids in understanding the sequence of events and changes in environments that influenced the shipwreck over a 134-yr period. It also illustrates how dramatic geomorphic and landscape changes have characterized the entire valley area during historic times. These have been strongly deterministic in the preservation of shipwrecks and other historic resources, and in the ability of archeologists to discover and recover the resources.

Geographic and Regional Geologic Setting

The Red River extends for about 2,044 km (1,270 mi) between its headwaters in the plains of the Texas panhandle and northeastern New Mexico to where it becomes tributary to the Mississippi and Atchafalaya rivers in east-central Louisiana (Figure 9). Ranking tenth in volume of water carried by North American rivers, it flows eastward from the Texas panhandle to form the southern border of Oklahoma, dips into southwestern Arkansas and thence trends southeastward from northwestern Louisiana into central Louisiana. Suspension of large quantities of red sediment from ferruginous Pennsylvanian and Permian rocks in the western part of its drainage basin and iron-bearing minerals of the Tertiary period provide the river's name (Mathewson and Weirich 1990).

Downstream to eastern Oklahoma, the Red River flows in a braided regime with a sinuosity of less than 1.50. However, in southwestern Arkansas and in Louisiana, the river adopts a meandering regime with a sinuosity of greater than 1.50 and sometimes as high as 1.87 (Mathewson and Weirich 1990). In the latter area, the Red River alluvial valley ranges from 5 km (3 mi) to 30 km (18 mi) wide (Hunter et al. 1992). Portions of the valley are constricted by the resistant rock formations of the Sabine Uplift, the Nacogdoches Wold, and the Kisatchie Wold (Figure 10). The river valley is bounded by geologic formations of varying ages. North of Alexandria, in central Louisiana, the western valley wall is primarily Tertiary-aged, marine sedimentary rocks. South of Alexandria, portions of the western valley wall and most of the river's eastern boundary are uplands and terraces of Pleistocene, Red River, fluvial deposits. The southeastern boundary of the alluvial plain is formed by an abandoned Mississippi River meander belt. From the Arkansas-Louisiana state line south to Alexandria, alluvial deposits underlying the Red River floodplain are all of Tertiary age.

Big Cypress Bayou is a major western tributary to the Red River between the state line and Shreveport. However, between Shreveport and Alexandria, the drainage basin is highly asymmetrical, with the only major tributaries (Bodcau Bayou, Bayou Dorcheat, Black Lake Bayou, and Saline Bayou) entering from the east.

Upland terraces of Pleistocene age flank the major river valleys and occur along the boundary of the Tertiary rolling hills. The terraces identified along the Red River each are underlain by a sedimentary sequence that grades from gravels and coarse sands at the base, into silts and clays at the upper surface (Murray 1948). Fisk (1944) originally defined four terraces and designated them, from highest and oldest to lowest and youngest, the Williana, Bentley, Montgomery, and Prairie terraces. They were formed by cyclic changes of sea level during the Pleistocene period with deposition occurring primarily during interglacial stages and downcutting during glacial stages. It should be noted, however, that the Red River is the only major Mississippi River tributary that was not affected by runoff from either alpine or continental glaciers. There have been several investigations of the terrace sequence since the work of Fisk; Figure 11 presents the latest interpretation (Saucier and Snead 1989). This interpretation is almost exclusively derived from geologic mapping by Russ (1975) and Smith and Russ (1974), but with new correlations and terrace nomenclature.

From the standpoint of this report, the floodplain (alluvial valley) of the Red River and its underlying Holocene sedimentary sequence are the most important geological units. They are discussed in considerable detail later in this chapter.

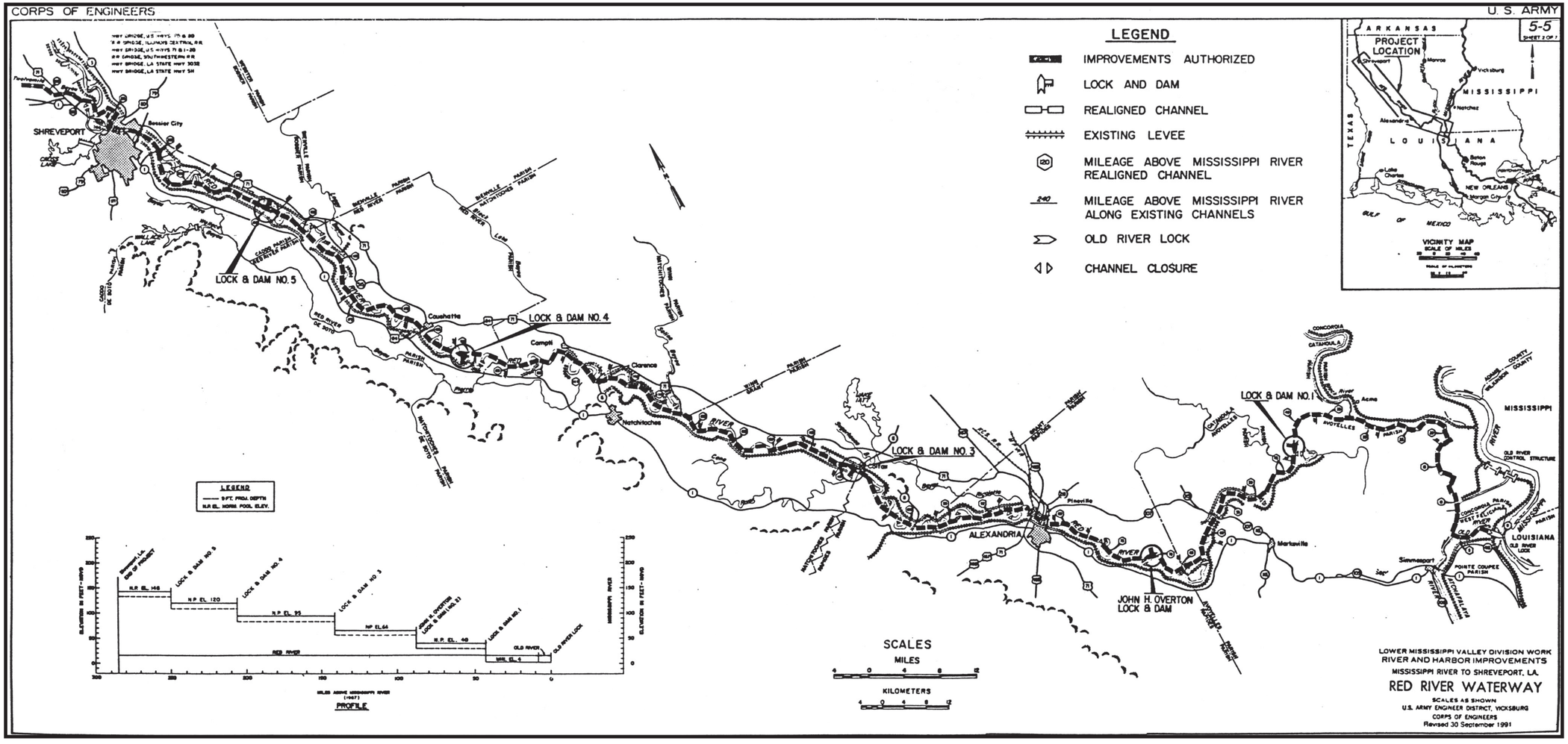


Figure 9 Major elements of the Red River Waterway project in northern and central Louisiana

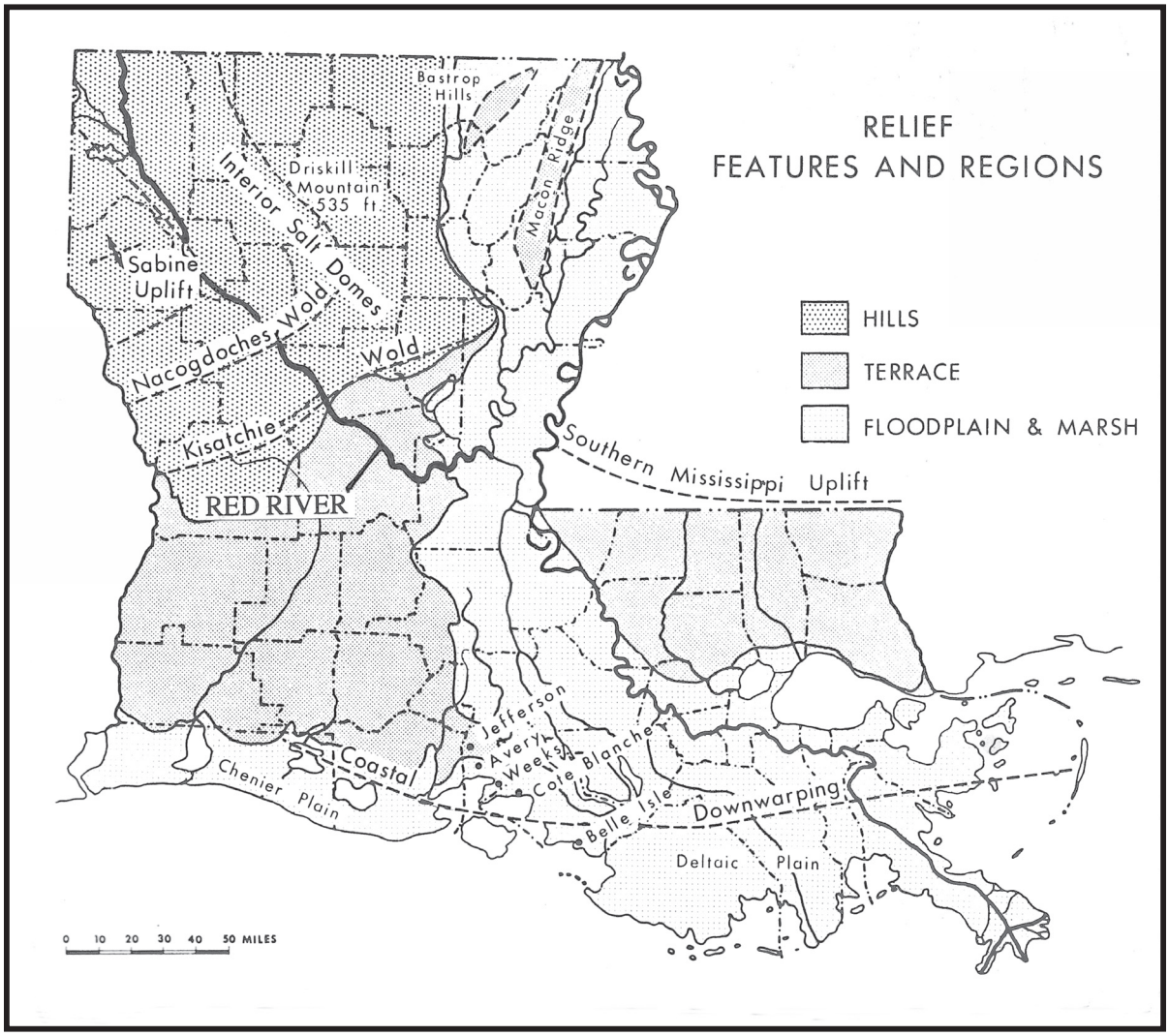


Figure 10 Major relief features and regions of Louisiana (From Kniffen and Hilliard 1988)

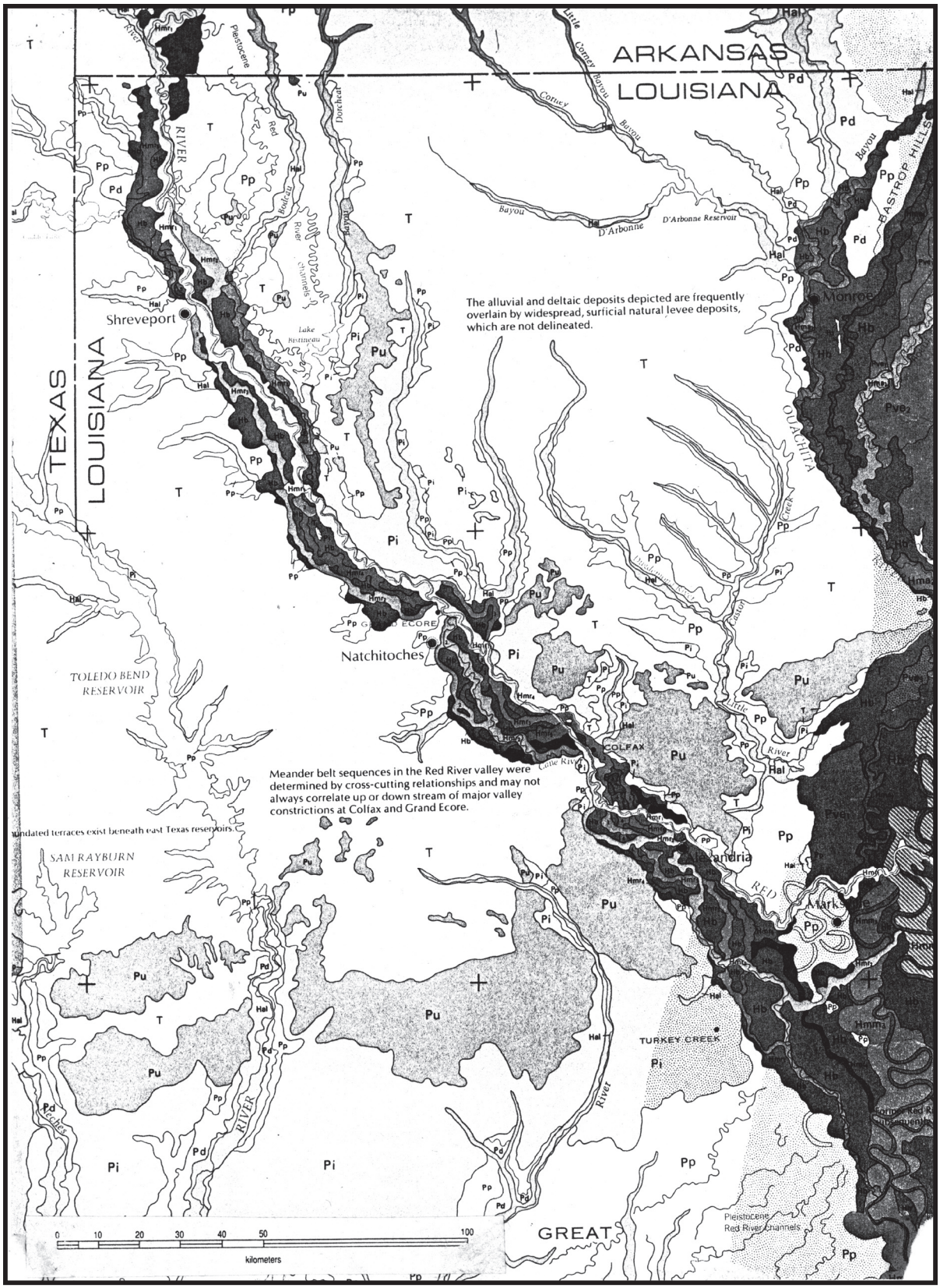


Figure 11 Quaternary geology of the Red River valley. Hal= Holocene alluvium; Hb=Holocene backswamp; Hmr1-5=Holocene meander belts 1 through 5; Pi=Pleistocene Intermediate complex; Pp=Pleistocene Prairie complex; Pu=Pleistocene Upland complex; T=Tertiary formations (From Saucier and Snead 1989)

Regional Geologic and Geomorphic Controls

In a study of a portion of the Red River valley between Shreveport and Alexandria, Smith (1982) identified four major extrinsic factors influencing the Quaternary geomorphology of the river valley; climatic variation, base level changes, geologic controls, and the Great Raft.

It is recognized widely that the cyclic waxing and waning of continental glaciations caused worldwide climatic oscillations, a principal result of which were major rises and falls in sea level. Following the lead of Fisk (1944), scientists have believed for years that sea level variations were the dominant factor in the periodic downcutting (entrenchment) and filling of the Quaternary valley of the Red River as well as those of other streams in the Coastal Plain. However, recently Saucier has postulated and presented evidence that significant valley downcutting and filling were caused by river regime changes due more to changes in river discharge and sediment loads than to sea level variations (Autin et al. 1991; Saucier 1994). This especially is true for the Red River north of Alexandria for reasons cited below. Irrespective of the reasons, the Red River valley has experienced vertical changes in floodplain level on the order of tens of meters in about the last 2.5 million years.

Direct evidence relating to Red River valley geomorphic changes due directly to climatically induced variations in discharge is scarce, but some does exist. North of Shreveport, scattered exposures of the Deweyville terrace complex (Smith and Russ 1974) substantiate the presence of intervals of significantly higher-than-present runoff with accompanying changes in meander geometry and sediment loads. These intervals have not been dated reliably, but definitely are older than the last glacial maximum at about 18,000 B.P. River responses to regional Holocene climatic variations such as the Hypsithermal Maximum about 5,000 to 8,000 years ago are possible but have not been documented (Saucier 1994).

Base level changes that affected the regime of the river are believed to have been caused by processes other than sea level variations and climatic change. At various times during the Holocene, the Red River south of Alexandria changed course, resulting in major shifts in where the river became tributary to the Mississippi River (Russ 1975). These avulsions caused differences in the length of the river and hence its gradient. Channel lengthening resulted in reduced gradients and floodplain aggradation. Channel shortening resulted in increased gradients and floodplain degradation. The most significant recent shortening occurred when the Red River diverted northeastward through the Moncla Gap south of Marksville, LA (course Hmr2, Figure 11). The date of this diversion is estimated variously at 600 years (Russ 1975) to 2,000 years (Pearson 1985). Because of the diversion, a knickpoint (point of abrupt change in gradient) migrated upstream, causing appreciable channel entrenchment. The effect of the knickpoint migration was blocked partially by a resistant ledge of Miocene siltstone (Fleming formation) at Alexandria, which controlled the slope of the river bed. Locally known as the Rapides, the rapids were removed by the U.S. Army Corps of Engineers in 1892 – 1893, permitting knickpoint migration and entrenchment to continue upstream (Hunter et al. 1992).

Geologic controls on the Red River apparently were significant during the Pleistocene period when regional uplift or warping contributed to the cyclical vertical separation of floodplains and hence the formation of terraces (Fisk 1939). However, structural movements (including faulting) have not been appreciable during the Holocene. Only in a passive sense has the regional geology been influential. The Red River has not been able to widen its Holocene valley to its characteristic 20 to 30 km (12 to 18 mi) width near Grand Ecore and Colfax, LA (Figure 11) where the valley is constrained by erosion-resistant Tertiary formations. As shown in Figure 11, the number of Red River meander belts has been reduced in these "gaps" because of valley width.

Without question, formation of the "Great Raft" on the Red River during and preceding the nineteenth century caused the most profound cultural as well as geomorphological changes of the last few millennia. Geomorphic changes of this type, mostly involving channel and floodplain aggradation and their side effects, were not unique in the valley, but truly were extraordinary in terms of rate and magnitude. The raft is discussed in considerable detail later in this chapter.

The Red River Alluvial Valley and Floodplain

The Red River floodplain can be described as a slightly undulating silty to sandy plain with sluggish streams and poor drainage. Local relief is on the order of 1.5 to 4.6 m (5 to 15 ft) while elevations decline from about 50.3 to 24.4 m (165 to 80 ft) between Shreveport and Alexandria. In a natural state, the floodplain was thickly vegetated with mixed, deciduous, bottomland hardwoods and alluvial backswamp hardwoods. Typical forest species included pecan (*Carya illinoensis*), sycamore (*Platanus occidentalis*), oak (*Quercus spp.*), cottonwood (*Populus deltoides*), and hackberry (*Celtis laevigata*) with willows (*Salix spp.*) and cypress (*Taxodium distichum*) along streams (Hunter et al. 1992).

Alluvial deposits underlying the floodplain have been investigated in considerable detail with the help of numerous borings (e.g. Kolb 1949; Schultz and Krinitzsky 1950; Smith and Russ 1974). In terms of gross lithology and mode of origin, the deposits can be differentiated into a relatively fine-grained topstratum and a coarse-grained substratum. The former can be differentiated further into inferred environments of deposition. In turn, the environments can be separated into those that occur in meander belts and those that occur in floodbasin (backswamp) areas. These sedimentary units are discussed below with the floodbasin environments being separated into those that have been characteristic of the entire Holocene versus those that are attributable just to the Great Raft.

Substratum Deposits

Consisting of fine- to coarse-grained sands with interbeds of gravel, substratum deposits are of Pleistocene age and were deposited by a Red River flowing in a braided regime. The deposits are massive and aerially persistent and fill a valley carved by the coalescing of scour pools and channels, which were caused by multiple cycles of erosion by streams flowing in both braided and meandering regimes.

Braided substratum deposits occur deeper than the scouring of the Red River in both its present and abandoned courses, which is about 15 to 18 m (50 to 60 ft) below ground surface. From those depths to the base of the entrenched valley is a distance of about 15.2 to 24.4 m (50 to 80 ft) south of Natchitoches, LA, and about 6.1 to 12.2 m (20 to 40 ft) between Natchitoches and the Arkansas-Louisiana state line. This is the zone of continuous substratum sands and gravels.

Topstratum Deposits

Nearly all of the deposits within the upper 18.3 m (60 ft) of the sedimentary sequence underlying the floodplain were laid down as overbank or lateral channel accretion deposits by a meandering Red River. More than half of them consist of clays and silts while the remainder are no coarser than fine to medium sands. The deposits are discussed below according to the

interpreted major environments of deposition. The first five are associated directly with meander belts while the sixth, the backswamp environment, occurs between meander belts.

Natural Levees. These are the most conspicuous topographic features of the floodplain, attaining heights of 1.5 to 4.6 m (5 to 15 ft) above adjacent low floodbasin areas. They occur as 1- to 2-km-wide (0.6 to 1.2 mi) low ridges that flank both sides of the present river channel, abandoned courses, and abandoned channels. The ridges are lenticular in cross section with the highest elevations immediately adjacent to the parent channels. They are the environment most associated with meander belts and the one of greatest cultural significance since they have provided competent soils and areas least likely to be flooded.

Natural levee deposits are laid down during times of overbank flooding. Sediment-laden water rapidly decreases in velocity as it flows away from the channel. Consequently, its sediment load is quickly depleted, dropping the coarsest particles out nearest the channel. Silts, fine sands, and clays occur nearest the channel and decrease in average grain size away from the channel. Because of good drainage, the deposits become well oxidized, are usually extensively reworked by organisms, and develop a firm to stiff consistency.

Natural levee ridges attain their greatest development on the outer (convex) sides of river bends (Figure 12). However, as they develop vertically and horizontally, they also are progressively truncated as the bends migrate into them, causing extensive bank caving. On the point bar (concave) sides of bends, natural levee growth is slower since the river channel, the source of the sediments, is moving away.

Crevasses. These are an important element in natural levee ridge development. Normally, flood waters in a stream channel overtop the levees and spread into adjacent floodbasin areas as sheetflow. However, occasionally the flow becomes concentrated at a particular location. When this occurs, a breach typically forms through the natural levee crest and mostly silts and sands are deposited just beyond the breach as a fan-shaped splay (Figures 12 and 13). The net result is a localized acceleration in the rate of natural levee buildup and buildout.

Most crevasses occur along the cutbank side of stream bends where most flood-flow energy is concentrated. Under unusually favorable conditions (e.g., an exceptionally high flood stage, rapid bank caving), a small splay channel may enlarge and develop rapidly into a distributary channel (Figures 12 and 13). Within a few decades, the distributary channel may extend for many kilometers into a floodbasin area, a natural levee ridge will develop, and occasionally even begins to meander and form cutoffs. In an extremely small number of cases, a distributary may enlarge to the point where it diverts sufficient flow (an avulsion) to become the main river channel and begin a new meander belt. This may have happened several times in the Holocene history of the Red River in the area under consideration.

Crevasse splays and distributaries became extremely important geomorphic elements of the valley during the duration of the Great Raft. They are discussed more fully later in this chapter.

Point Bars. The point bar environment results from the lateral migration of stream channel bends across a portion of a floodplain (Figure 13). It develops on the concave (inside) bank of stream meanders opposite from the cutbank, or eroding edge of the meander (Smith 1982). Formed through the welding of lateral sand bars onto an accreting bank, their resulting morphology is an arcuate washboard of alternating, parallel ridges and swales (sometimes called meander scroll topography). The silty and sandy ridges are the abandoned lateral bars. The swales are the low areas between the parallel ridges and usually fill with slackwater deposits of silts and clays. With

time, relief in most areas of point bar topography becomes subdued by the deposition of overbank sediments from nearby active stream channels and may eventually become completely obscured.

As a stream bend migrates laterally, preexisting deposits are scoured away and replaced with point bar deposits (Figure 12). The scouring extends to the maximum depths of the migrating channel, which, in the case of the Red River, is about 15 to 18 m (49 to 59 ft). Swales normally extend to a depth of about 6 to 9 m (20 to 30 ft), constituting a part of the fine-grained point bar topstratum. The remainder of the topstratum constitutes the upper 1.5 to 3.0 m (4.9 to 9.8 ft) of point bar ridges where the silts and sands contain appreciable amounts of clays, typically as thin lenses or layers representing separate flood cycles. Beneath the point bar topstratum, substratum sands extend downward and eventually merge with the braided (Pleistocene) substratum. A contact between the two units may or may not be distinguishable.

The present and abandoned meander belts of the Red River display a complex mosaic of intersecting and truncating point bar sequences due to the rapid migration of multiple river bends in different directions. These sequences reflect the tendency of bends not only to increase in amplitude, but also to have a net downstream movement, often intercepting and truncating point bar sequences from previous bends. Russ (1975) noted that, as an average, rates of bend migration (and thus also rates of cutbank recession) have been on the order of 1.2 to 2.4 m (3.9 to 7.9 ft) per year.

Abandoned Channels. These channels are segments of a meandering stream course (a single bend or several contiguous bends) which are isolated when the stream shortens its course. Neck cutoffs occur when stream flow during a flood diverts across a narrow neck separating two closely spaced bends (Figure 13). Abandoned channels formed in this way eventually are filled with a basal wedge of sand overlain by soft silts and clays.

Initial filling by sands occurs soon after cutoff as stream flow diminishes over a period of a few years. Filling occurs first as a sand wedge in the arms of the channel adjacent to the point of cutoff. The sand wedge rapidly thins away from the point of cutoff. At the surface and beyond the sand wedge, the abandoned channel typically is characterized by a slackwater body called an oxbow lake. With time, and as the active stream channel meanders away from the abandoned channel, the frequency of flooding diminishes. The oxbow lake slowly fills with a fining upward sequence of thinly interbedded clays, silts, and silty sands and diminishes in depth and areal extent. Eventually the lake disappears and the abandoned channel may be characterized only by a narrow tract of swamp with a small slough between the original banklines (as marked by the edges of natural levee ridges). As a final stage, the abandoned channel becomes completely filled (to the level of the adjacent natural levees), the wetland/aquatic environments disappear, and the whole area may become veneered with overbank sediments from subsequent river courses. A few centuries to a millennium or so may be involved in a typical abandoned channel life cycle.

Less arcuate crescentic channels (a segment of a bend) may be abandoned when the main stream channel cuts across a prominent swale or chute in a point bar sequence during a major flood. This type of cutoff is called a chute cutoff and is usually filled fairly rapidly (at most a few centuries) by mostly silts and sands. Typically a body of slackwater lasts only a few decades (or less) and late-stage filling by clays and silts is minimal. Since chute cutoffs occur on relatively young point bars where natural levees are immature, the abandoned channels tend to become less topographically distinct and far more obscure with time than those created by neck cutoffs.

Both neck and chute cutoffs are numerous in the present (modern) Red River meander belt, yet Russ (1975) observed that their frequency is surprisingly low in comparison to other

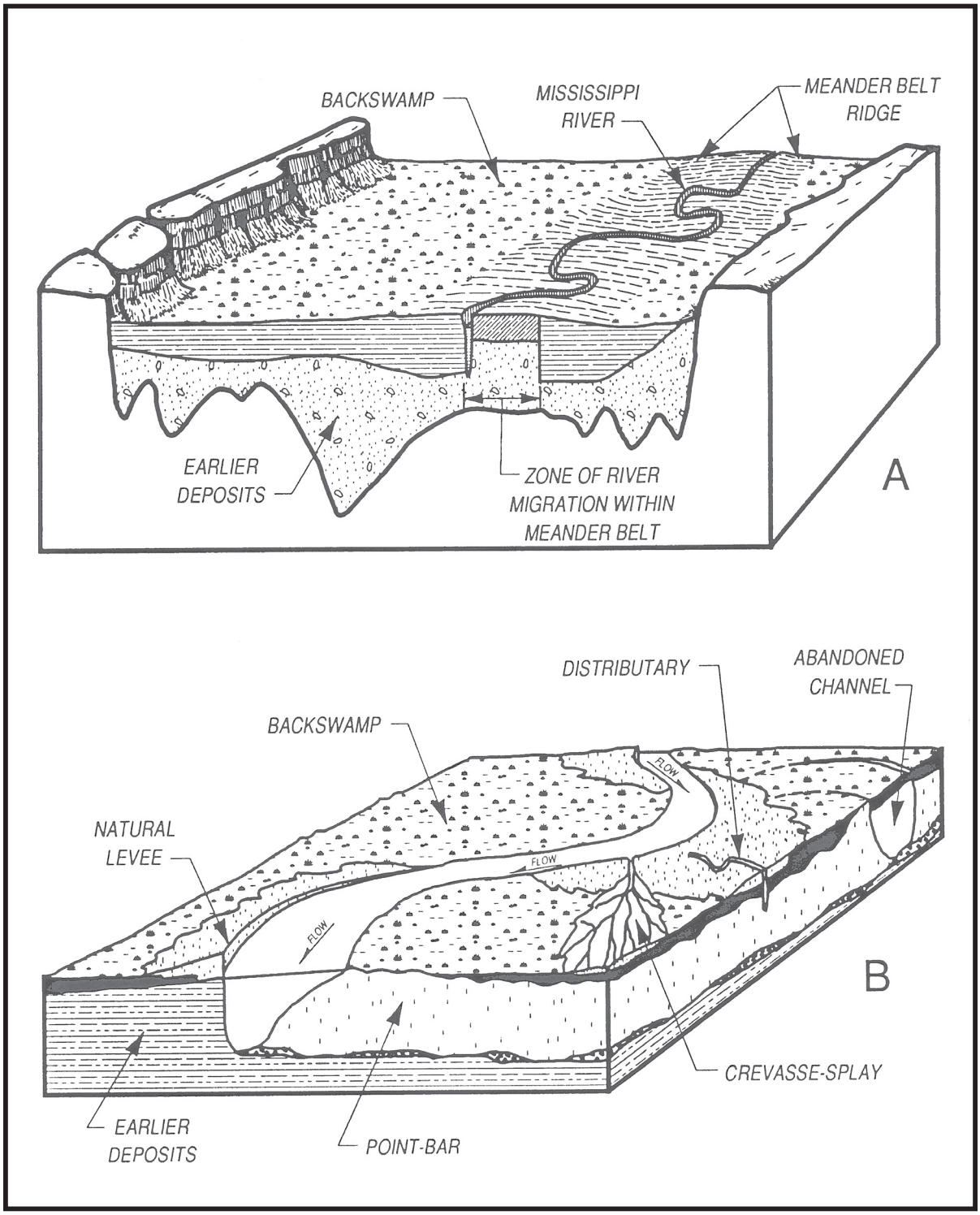


Figure 12 Principal depositional environments of a typical Holocene alluvial sequence of a major river valley (From Allen 1964)

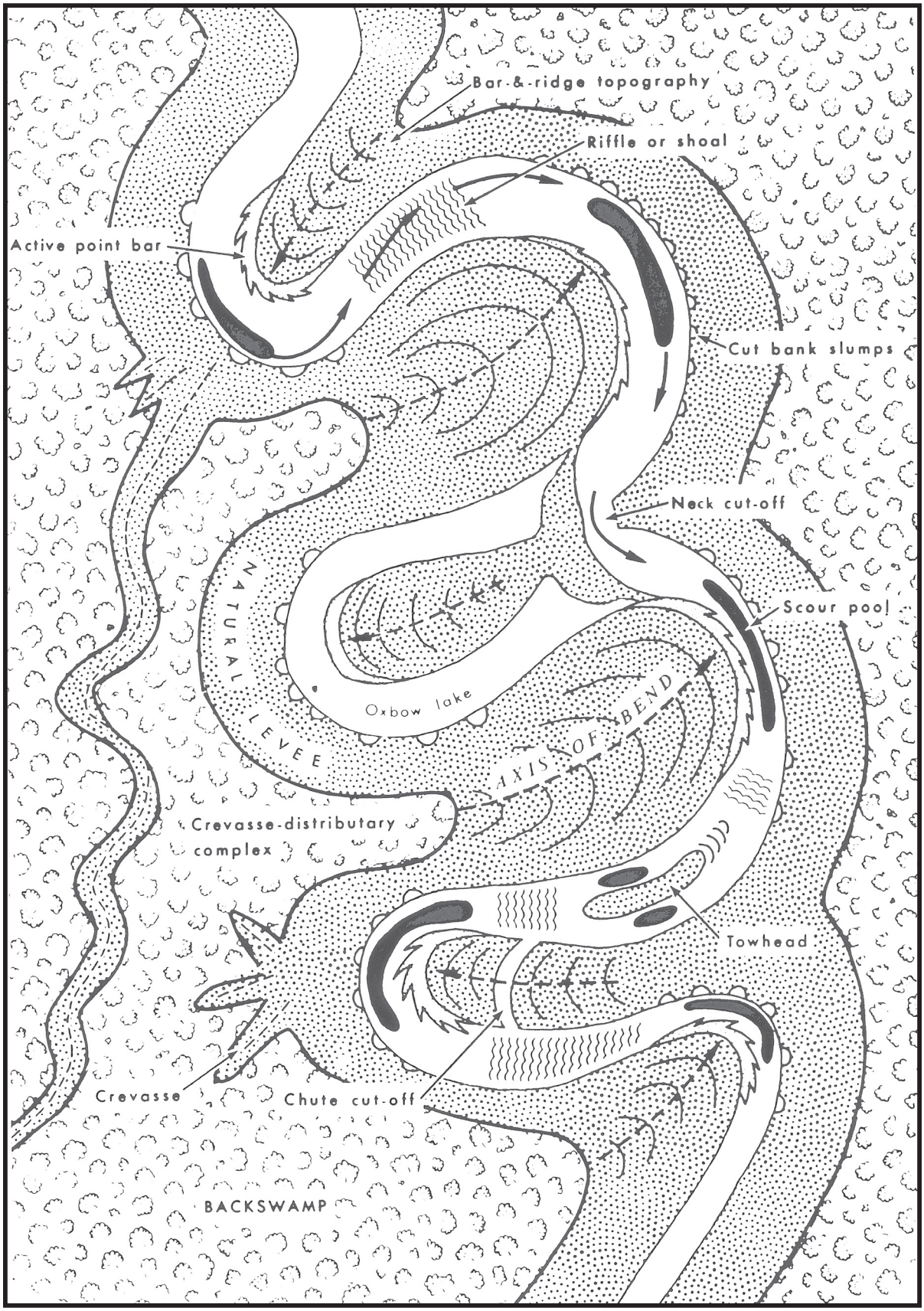


Figure 13 Primary and secondary depositional environments and related channel features of a typical meander belt (From Gagliano and van Beek 1970)

meandering river systems. He speculates this is due to the retarding effect on river meandering of backswamp deposits (discussed below) and the tendency of the river to abandoned whole channel segments rather than single bends. It also is definitely related to the regime of the river as affected by gradient.

Abandoned Courses. Abandoned courses are analogous to abandoned channels in terms of sedimentary characteristics and patterns and rates of filling; however, they include several to many separate bends and hence a stream segment measured in many tens of kilometers. Less than 20 abandoned courses have been identified in the Red River valley in Louisiana, each being centrally located within an abandoned meander belt segment (Figure 10).

Dating of the abandoned courses (and their associated meander belts) of the Red River has proven to be extraordinarily difficult (Saucier 1994) despite a multidisciplinary approach using geological, archeological, and other lines of evidence. Russ (1975) hypothesized that all courses and meander belts with surface expression are less than 7,000 years old while Saucier (1994), considering valley aggradation rates south of Alexandria, feels they may be no older than 5,000 to 6,000 years. Abandoned courses are not directly related to the geomorphology of the shipwreck *Kentucky*; however, their admittedly uncertain chronology implies that the present (modern) course and meander belt is quite young--perhaps no more than about 2,000 years in the shipwreck area. As a result of an archeological investigation in southwestern Arkansas, Pearson and Ducote (1980) estimated that about 50 per cent of the modern meander belt in that area is less than 400 years old.

Backswamp. Such areas occur between meander belts and between meander belts and the valley walls. They are low floodplain areas with low sedimentation rates wherein only the finest suspended-flow materials (dominantly clays and silts) fall out of suspension beyond the distal limits of natural levees. Backswamp areas are extremely flat, have poor drainage, and until the late historic period, were mostly heavily vegetated with swamp-forest species. These characteristics have contributed to the relatively soft, poorly oxidized, and organic-rich nature of the deposits.

Backswamp areas occupy approximately half of the area of the Holocene Red River floodplain between the Arkansas-Louisiana state line and Alexandria. In the subsurface, the deposits thin slightly in a downstream direction, averaging about 15.5 m (50.8 ft) north of Natchitoches and about 14.3 m (46.9 ft) south of that town (Smith and Russ 1974). These relatively thick sequences reflect the overbank sedimentation and slow floodplain aggradation that have occurred during most of the Holocene period.

In the subsurface, backswamp deposits occur immediately beyond the zones of point bar accretion in the present and abandoned Red River meander belts. Thus, it is typical for backswamp areas to be thinly veneered with natural levee deposits near the margins of meander belts. Natural levee deposits also may overlie backswamp deposits along distributaries.

As discussed later in this chapter, backswamp areas played an unusual major role in accommodating river discharge during the time of the Great Raft.

The Great Red River Raft

Formation and Characteristics

The bed load of the Red River consists of about 25 per cent silt and 75 per cent sand (Hunter et al. 1992). This promotes the rapid growth of point bars as described earlier. Point bar growth, in turn, deflects the threads of maximum current and deepest scour (the thalweg) against the cutbank side of bends. The suspended load of the river, although also quite silty, has sufficient clay to form bank deposits (mostly natural levees) that expand and shrink when moisture content changes (Hunter et al. 1992). This often results in dramatic and extensive bank failures, especially during falling river stages. Add to these factors the heavily vegetated nature of the banks (at least in prehistoric and early historic times), and conditions are ripe for the formation of log jams by drifting forest debris, especially in bends and opposite point bars where eddy currents tended to occur (U.S. Army Engineer District, Vicksburg n.d.). The relatively low gradient of the river plus the occurrence of occasional shoals combined to allow log jams to coalesce into a massive but not quite continuous raft--collectively called the Great Raft. No other river of North America showed so great a tendency to be choked with logs as did the Red River (Guardia 1933).

No one has been able to determine when the Great Raft first began forming, but the existence of a raft in the river supposedly is recounted in "early Indian legends" (Humphreys 1971). Veatch (1906) estimated that the raft had been present since the late 1400s, under the assumption that it started well south of Alexandria in Bayou Boeuf and moved upstream, causing the diversion of the river through Moncla Gap. It is certain, however, that the raft was observed by the French explorer Bienville in 1700 (Russ 1975). The raft first was described by Dunbar (1804) and thereafter by several writers in the early 19th century.

Based on historic accounts and numerous photographs (Humphreys 1971), it is apparent that the individual raft segments were tangled masses of cottonwood, ash, elm, cypress, and cedar with some oak and pine from the river bluffs. The woody debris was intertwined with vines, branches, and saplings, forming an impenetrable barrier to navigation (Figure 14). Since raft segments persisted for decades or more, considerable quantities of fine sediment became incorporated into the mass, willows sprouted, and some logs put down roots and anchored the raft to the river bottom (McCall 1988).

In 1820, the southern end of the raft was observed to be at Natchitoches (McCall 1988). Its length upstream from that point has been variously reported to have been 160 km (100 mi) by the U.S. Army Engineer District, Vicksburg (n.d.); 224 km (140 mi) by Russ (1975) and Guardia (1933); 256 km (160 mi) by Veatch (1906); and 320 km (200 mi) by McCall (1988). At that time, the northern end was in the vicinity of Shreveport, but later moved upstream to about 8 km (5 mi) south of the Arkansas-Louisiana state line.

In a sense, the raft was like a living, moving organism that slowly made its way upstream. The downstream end or foot of the raft was the relatively oldest part, and as the debris decayed, pieces would be lifted and dislodged and would float downstream (Guardia 1933). Concurrently, new materials would be added to the head of the raft. Occasionally about 8 km (5 mi) of new log jam could be added as a result of a single freshet (a sudden rise in stage caused by heavy upstream precipitation). Guardia (1933) estimated that the raft had a net upstream movement of about 1.3 km (0.8 mi) per year between 1820 and 1872 while others have estimated it at 1.6 km (1.0 mi) per year (U.S. Army Engineer District, Vicksburg, n.d.).

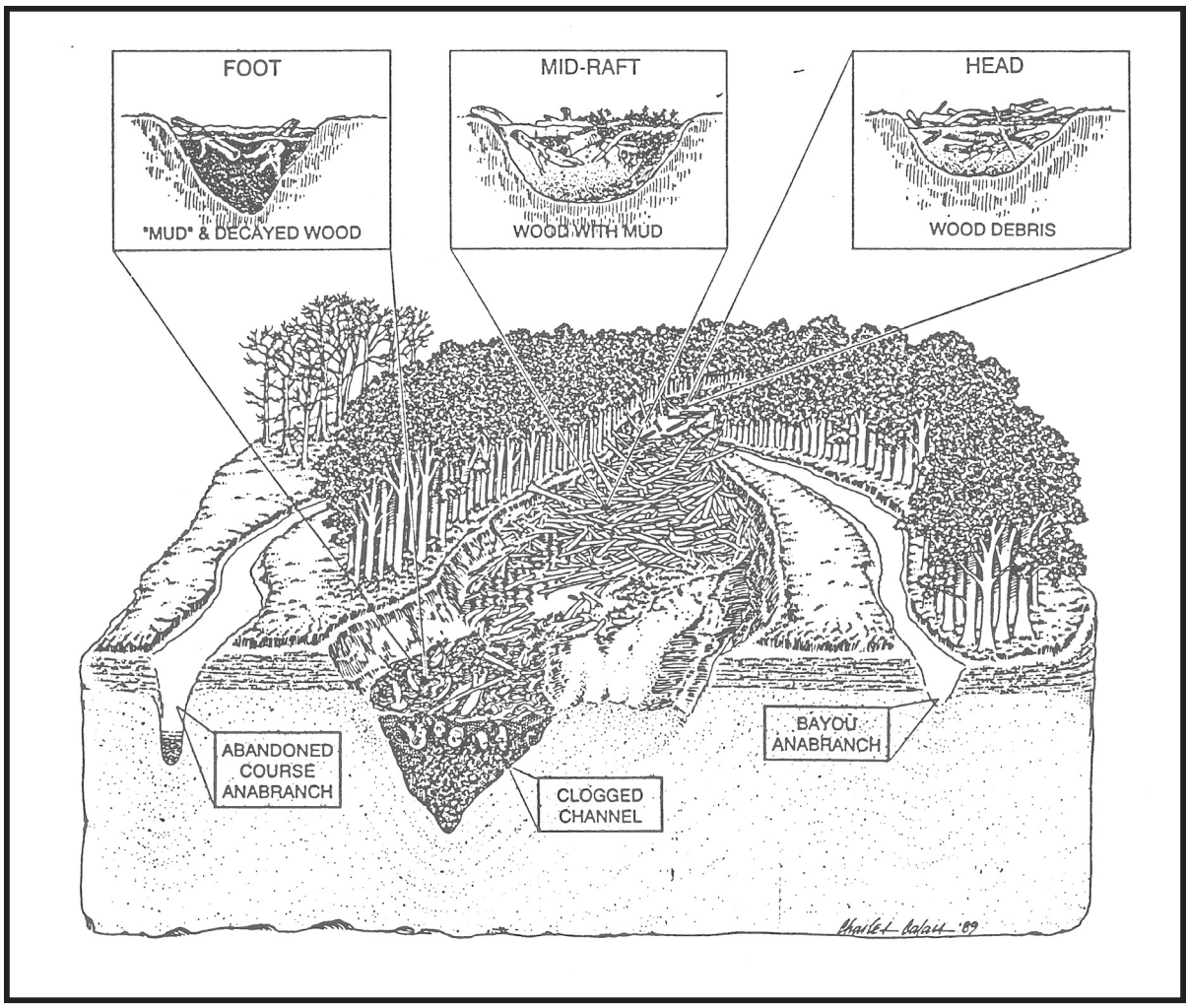


Figure 14 Artist conception of the Great Raft (From Albertson and Corcoran 1996)

As will be discussed later in the report, formation of the raft so blocked the flow in the river channel that numerous crevasses and distributaries occurred along its length. Above points of diversion of flow, the currents slowed, tending to form new raft segments or "fill in gaps."

Removal Efforts

The first attempt to remove the raft by mechanical means was initiated by Captain Henry M. Shreve in April 1833 with funds appropriated by Congress (Humphreys 1971). The channel was opened to steamboat traffic in March 1838, but the raft had reformed by July of the following year, again clogging the channel. During the next 30 years, steamboat navigation to the upper river had to follow alternate routes around the raft via narrow floodplain channels. From 1840 to 1872, ineffective periodic attempts were made to reopen parts of the main channel. Either parts of the raft were removed, or bypass channels and canals were cleared by Captain Thomas Williamson from 1841 to 1843, and by Colonel Charles A. Fuller in 1856. The Federal project was neglected almost completely during the Civil War and rapid re-formation of the raft occurred in immediate post-war years. Only a few feeble State efforts took place during this time. By 1872, the raft was 48 km (30 mi) long and located mainly in southwestern Arkansas, but the blockage-of-flow effect continued downstream and the channel was in a serious state of deterioration.

Finally, a successful attempt to remove the raft was accomplished in 1873 under the direction of Lieutenant E.A. Woodruff of the U.S. Army Corps of Engineers. He employed a specially outfitted, light draft steamboat together with crane boats, saw boats, and flatboats. After several months of sawing, blasting, pulling, and floating of logs and debris, the channel was opened to navigation and has remained so to date. After 1873, attention has focused on removing snags and falling timber from the river's banks (Humphreys 1971).

Geomorphic Effects

Existing channel. The Great Raft caused a variety of major geomorphic responses within time frames of years or decades rather than centuries or millennia. While quite varied in character, the responses all are related directly or indirectly to a fundamental effect--the main river channel in the raft area experienced significant aggradation and narrowing (Mathewson and Weirich 1990). The channel was so effectively blocked by the log jams that currents slowed dramatically, and suspended sediment loads were dropped in the channel and the bed load ceased moving downstream. Large deposits of silt and sand accumulated in the channel and along the banks as bars and ridges, some of which became vegetated with willow and hence stabilized (Humphreys 1971). In turn, rates of meandering accelerated, promoting cutoffs, and thereby reducing the stream gradient (Guardia 1933). A net effect, of course, was the appreciable raising of the water level (stage) for a flood of a given magnitude and hence an increase in flood frequency. Unable to be conveyed by the main channel, the discharge often spilled over the banks onto the floodplain with several major consequences.

Raft Lakes. Between the Arkansas-Louisiana state line and Alexandria, Red River tributaries discharge from the Tertiary uplands in rather broad valleys, enter the Red River valley, flow through backswamp areas (in a generally net downstream direction), and eventually enter the main channel. Under pre-raft conditions, runoff from heavy local precipitation sometimes was temporarily ponded in the uplands or backswamp areas when the Red River was in flood, but drained into the river during lower stages.

When the Red River channel was effectively blocked by the raft between at least 1700 and 1873, the aggradation of the bed and raising of water levels caused tributary drainage to be blocked even at lower river stages. The net result was the formation of large semi-permanent lakes in the downstream ends of tributary upland valleys and extending into backswamp areas. At their fullest extent, there were 17 named and 5 unnamed lakes in the valley as documented by Veatch (1906) and shown in Figure 15. The largest, Cross, Ferry, Poston, and Sodo Lakes, and Lake Bistineau, were located between Shreveport and the state line.

The raft lakes no doubt varied widely in stage on a seasonal basis, but stored huge volumes of tributary-stream runoff augmented by river overflow. Based on the elevations of shoreline features and the extent of timber killed by the flooding, the lakes sometimes had depths of 3.0 to 4.6 m (10 to 15 ft). After raft removal and lake drainage (by both natural and artificial means), it became apparent that considerable amounts of sediment had been deposited in the lakes, causing a significant amount of floodplain aggradation. Hence, the backswamp areas actually contain appreciable amounts of lacustrine sediments. In one of the few attempts to actually measure sediment thickness, Albertson and Dunbar (1993) made a boring in the former lake bed of Soda Lake [*sic*] and encountered 1.0 m (3.2 ft) of lacustrine sediments. This agrees with an estimate in a report to the Chief of Engineers of 0.9 to 1.2 m (3 to 4 ft) of sediment deposited by the Red River raft (U.S. Army Corps of Engineers 1873).

Distributary channels. In low floodplain (backswamp) areas where raft lakes did not form, flood overflow from the choked main channel created numerous raft distributary channels (Smith 1982). These channels departed from the main channel at points of crevassing and extended downstream, often for many kilometers, before eventually rejoining the main channel. The favored locations for distributary formation were just upstream from raft segments and in sharp bends. The new raft distributary channels sometimes simply enlarged existing backswamp drainage, but also sometimes occupied abandoned courses in older meander belts. It is estimated that the raft distributaries may have carried from 15 to 40 per cent of the total river discharge (Smith 1982).

Figure 16 shows a portion of the Red River valley south of Shreveport as it existed in 1841. Two large raft lakes, Lakes Wallace and Canisnia, are shown between the Red River meander belt and the western valley wall. Several interconnected and tortuous raft distributary channels are shown between the river and the eastern valley wall. While they appear small, some actually served as alternate navigation routes when the main river channel was blocked. Although the raft distributaries periodically shifted and some also became blocked by log jams, raft bypass navigation routes were reasonably effective and some persisted for several decades.

In addition to raft distributary channels, frequent overbank flow from the blocked main channel also caused overflow channels to form across the confining natural levee ridges. In essence, these were crevasse channels that have been described by Smith (1982) as being similar in function and origin to raft distributary channels. However, they were much smaller and more ephemeral, although they did serve to convey flood waters from the main channel into adjacent backswamp areas. Several overflow channels are shown in Figure 16 along the east bank of the river below Shreveport and opposite the location of the *Kentucky*.

Post-Raft Changes

Following the final removal of the Great Raft in 1873, several important geomorphic changes took place within a matter of years. Initially, full river flow was reestablished in the main channel and large volumes of sediment were scoured out and flushed downstream by the increased

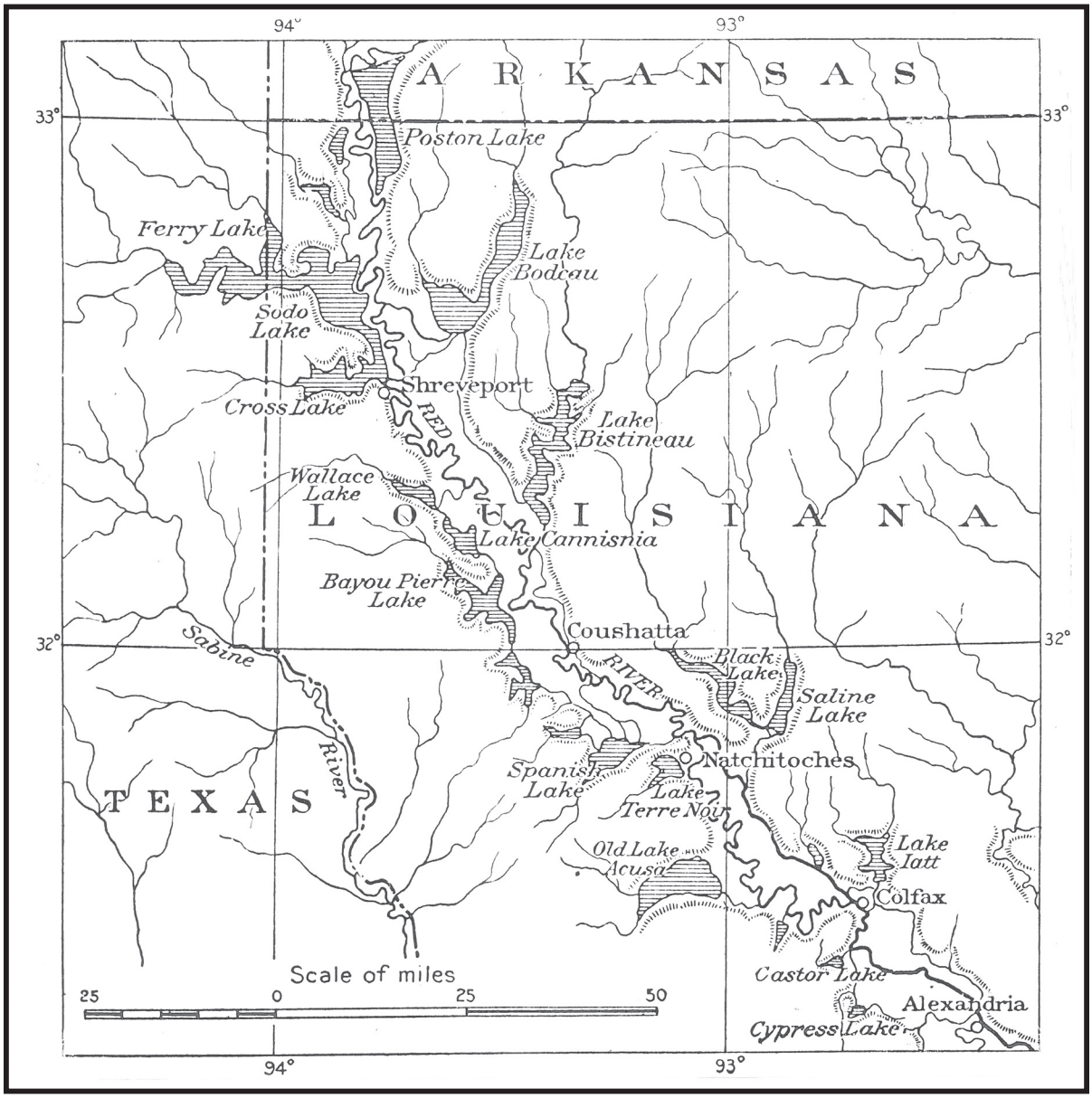


Figure 15 Raft lakes of the Red River valley in Louisiana at their fullest recorded development (From Veatch 1906)

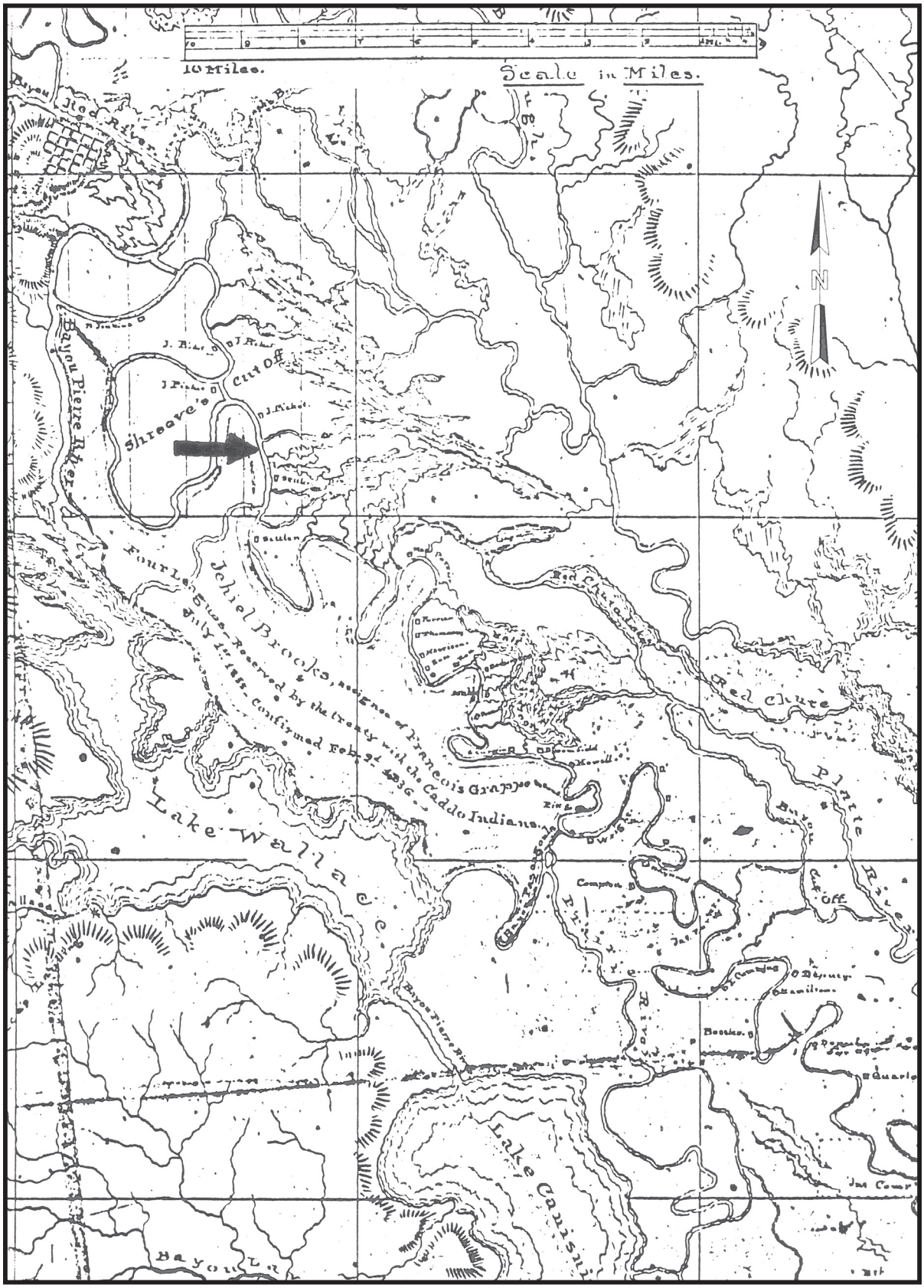


Figure 16 Excerpt from Baker's 1841 *Map of the Valley of Red River (From Miller et al. 1998)*. Approximate location of *Kentucky* shown by heavy arrow

water velocities. This caused the bed of the river to degrade and channel depths to increase, probably over a period of several decades. For example, between 1892 and 1988, the average channel depth has increased by 12.8 m (42.1 ft) at Alexandria, by 6.9 m (22.6 ft) at Grand Ecore, and by 2.9 m (9.5 ft) at Shreveport (Mathewson and Weirich 1990).

Since the river channel degraded and water levels dropped after raft removal, raft distributary channels were abandoned and became slackwater sloughs or shallow local drainage channels. Formerly blocked tributaries reverted to their original discharge function and raft lakes began to drain. The process involved the rapid deepening and widening of the downstream ends of tributaries, formation and upstream migration of knickpoints, eventual tapping of the lake waters, and reestablishment of the tributaries in their old stream channels. Veatch (1906) has demonstrated by surveys of different dates how several raft lakes, including Black Lake, Lake Bodcau, Poston Lake, and Sodo Lake, were completely drained by 1901-1902.

There can be no doubt that removal of the raft also has caused longer-term changes in the fluvial processes and regime of the Red River. The study by Mathewson and Weirich (1990) has documented how the sinuosity and gradient of the river have responded. Table 1 provides sinuosity values for three reaches of the river for the years 1892, 1938, and 1983. It is evident that the sinuosity has *decreased* above the raft and in the reach that was blocked by the raft. It has *increased* in the reach immediately downstream from the raft. The process of the river straightening its course above and in the area of the raft has resulted in an abnormally large number of cutoffs as compared with periods of comparable length during the Holocene.

Table 1. Sinuosity Values of the Red River Course in 1892, 1938, and 1983 (from Mathewson and Weirich 1990)

YEAR	REACH	SINUOSITY
1892	Fulton, AR to AR-LA border	2.2
1892	AR-LA border to Natchitoches, LA (reach blocked by raft)	1.87
1892	Natchitoches, LA to Alexandria, LA (reach immediately downstream from raft)	1.33
Scale = 1:200,000		
1938	Fulton, AR to AR-LA border	1.85
1938	AR-LA border to Natchitoches, LA (reach blocked by raft)	1.46
1938	Natchitoches, LA to Alexandria, LA (reach immediately downstream from raft)	1.5
Scale = 1:500,000		
1983	Fulton, AR to AR-LA border	1.78
1983	AR-LA border to Natchitoches, LA (reach blocked by raft)	1.42
1983	Natchitoches, LA to Alexandria, LA (reach immediately downstream from raft)	1.46
Scale = 1:250,000		

According to Abington (1971), removal of the Great Raft was only one of three factors that have contributed to a change in river sinuosity and gradient. He believed that removal of 7, 646 cu m (10,000 cu yds) of rock from the shoals at Alexandria in 1892 and 1893, plus diversion of the river through Moncla Gap, have allowed a knickpoint to migrate upstream through the raft area. From an analysis of extrapolated sinuosity values, he concluded that the Red River below Shreveport was shifting from a meandering to a braided regime. Certainly, this appears to be the case with the creation of several major artificial cutoffs since the early 1970s during construction of the Red River Waterway. No statistical analyses have been made, but it is apparent from maps that the width of the river channel has increased and the pattern and rates of lateral channel shifting and point bar formation have changed (Saucier 1999a).

Possible Prehistoric Rafts

If Veatch (1906) is correct in believing that the Great Raft began about A.D. 1400, by definition it extended back into prehistoric times. However, did it extend even farther back in time and/or were there rafts earlier than the Great Raft? There is no known *geological* evidence that suggests earlier rafts, but at best such evidence would be elusive and buried in the valley's sedimentary sequence because of the prevailing Holocene aggradation that has occurred. No attempts have been made to explicitly search for such evidence.

An interesting tentative hypothesis recently has been advanced largely on the basis of archeological evidence that the Great Raft may date back to about A.D. 1300 (Larry Banks, personal communication 1999). This idea is based on several disparate observations that have been linked together, including: a) a period of major aridity in the southwestern U.S. between about A.D. 1276 and 1300, during which time large amounts of standing timber on river banks may have died; b) a period of heavy precipitation following the drought that may have eroded banks and flushed the timber downstream; c) extrapolations from rates of upstream raft migration observed during the nineteenth century; and d) interpreted severe economic and cultural change (upheaval) in the Caddo Indian communities in the area. Each of these could suggest earlier raft formation, but no confirmation exists.

Considering the possibility of prehistoric raft formation in another way, virtually all of the major tributaries to the Red River valley between the Arkansas-Louisiana state line and Alexandria have very low gradients and wide and flat valleys for several tens of kilometers where they drain through flanking Tertiary uplands and Pleistocene terraces. Often broad swampy tracts are (or were) present in these areas. They generally are coincident with but also extend upstream from the maximum extent of the raft lakes. Smith (1982) called them remnant surfaces of large lakes and most are now the sites of reservoirs created by dams. Examples include Caddo Lake on Twelvemile Bayou, Clear Lake/Black Lake on Saline Bayou, Lake Bistineau on Loggy Bayou, and Wallace Lake on Cypress Bayou.

Throughout the Lower Mississippi Valley, there are several well-known cases where such swampy areas (and former lakes) occur in tributary valleys (Saucier 1994). Perhaps the most extensively studied is the former Lake Monroe in the Ouachita River in northeastern Louisiana and southern Arkansas (Saucier and Fleetwood 1970). It is apparent that lake and swampy-area formation, including the ones on the Red River, was strongly influenced by differential filling of the main valleys and the tributaries. As aggradation proceeded at a rapid rate, as it did during the Holocene in the Red River valley, tributaries were unable to fill their valleys at an equal rate, resulting in blockage of the mouths of the tributary valleys. This process has been recognized for many decades and was called "alluvial drowning" by Russell (1938).

Veatch (1906) was well aware of the former lakes, but concluded that the "alluvial drowning" theory was wrong with regard to the Red River. He stated emphatically that the features were due to the Great Raft and not natural sedimentation. More recent geologic mapping (Russ 1975; Smith and Russ 1974) and archeological evidence (Smith 1982) have not been able to establish definitive dates for the formation of the swampy areas and former lakes, but it is apparent that they date at least from the middle Holocene (about 5,000 years ago). This being the case, principles of alluvial morphology and valley stratigraphy strongly indicate that they must be due to "alluvial drowning" and not raft formation. Therefore, they cannot be viewed as raft lakes and do not stand as evidence of prehistoric rafts.

The *Kentucky* Shipwreck

Description and Location

At the end of the Civil War, the *Kentucky*, a 67.7-m (222-ft) sidewheel packet steamboat, was contracted by the U.S. Government to transport paroled Confederate soldiers from Shreveport to New Orleans (Simms and Albertson 1996). The *Kentucky* departed Shreveport the evening of June 9, 1865 with a passenger load of 900. It encountered a snag in the river and the ship began to leak. The captain eventually guided the ship toward shore but was unable to get close enough to put out the landing stage. A steamer, the *Col. Chapin*, was tied a few miles upstream and came to the aid of the *Kentucky*.

The U.S. Army Engineer District, Vicksburg, was contacted in the fall of 1994 by a local artifact collector who had heard reports from a local fisherman of timbers from a historic ship protruding from the west bank of the river during the summer of 1994. Some artifacts were recovered, but sand soon was redeposited over the wreckage.

In early 1995, the Corps District office enlisted personnel of the U.S. Army Engineer Waterways Experiment Station to conduct electromagnetic, ground penetrating radar, and magnetic surveys at the reported site to locate and define the depth and orientation of the shipwreck. The surveys, plus 21 borings, established the location and determined that the wreck was at a depth of 3.8 to 8.2 m (12.5 to 27.0 ft) with its long axis oriented in a generally northeast-southwest direction.

The surveyed area, established to be the shipwreck locale, is located along the right descending (west) bank of the Red River approximately at River Mile 221 (post-project mile) (Figures 1 and 2). This portion of the river channel is called Eagle Bend and the shipwreck is located on what is called Bagley Island. Specifically, it is located on what was formerly the left descending (east) bank of the river in 1865. Historic maps (U.S. Army Corps of Engineers 1886) indicate that the river bend that circumscribed what was to became Bagley Island was cutoff (presumably by artificial means) by Lattier's Cut-off 1882. The abandoned channel originally was designated Old River and this name probably persisted until the early 1900s.

Since the bank of Eagle Bend opposite the site is eroding, the U.S. Army Corps of Engineers has placed an artificial revetment in two phases--1992 and 1997. This has consisted of graded stone with upper bank paving.

Channel Changes

To understand the geomorphic context of the *Kentucky*, it first is necessary to consider a series of changes that have taken place since 1865 in the main channel of the Red River and in Old River. Figure 17 illustrates bankline positions of the features for seven dates as taken from historic surveys and aerial photos. Readers are cautioned that an inherent problem with using many such surveys is not knowing what datum or reference plane was used to show water levels in water bodies away from main river channels. It can be appreciated that even a meter or two of difference in elevation can greatly increase or decrease the apparent size of a water body such as Old River. Further, historic surveys provide very little or no information regarding seasonal changes in levels due to river-stage variations and local precipitation.

A few surveys of the area were conducted prior to the Civil War, such as shown in Figure 15; however, they are either too inaccurate and/or generalized or channel changes have been too great to allow them to be used in this consideration. Mostly, they cannot be used since they lack coordinate systems or other means of registration. During the Civil War itself, a small-scale, but moderately detailed and reasonably accurate survey was made by the Corps of Engineers in 1864 (Houston 1864) (Figure 18). This historic map contains township and range lines which allow recognition of the bend where the *Kentucky* sank a year later, but it is not sufficiently accurate to use in Figure 17.

The 1891 survey (Figure 17a) was made 26 years after the shipwreck and only nine years after Lattier's Cut-off which formed Old River. The approximate position of the shipwreck has been transferred from later surveys and is used as a point of reference. Note that in Figure 17, the location of the shipwreck in relation to the abandoned channel seems to "migrate" or wander by a few tens of meters. This is due to slight inaccuracies in the position and configuration of Old River in the various surveys.

It is definite, however, that the shipwreck occurred on a point bar in a transition zone (crossing) between a bend just to the north and a reach just to the south, and there was very little migration of the channel between 1865 and 1891. It is suggested by the size and configuration of Old River that, prior to cutoff, this Red River bend had "recovered" to pre-raft conditions following raft removal in 1873, i.e. the channel had been scoured and sand bars removed by flushing. Sounding in 1891 in the upper arm of Old River (Figure 19) show depths as great as 9.0 m (29.5 ft) beyond the sand wedge that already was forming at the point of cutoff. For comparison, the main river channel had an average thalweg (greatest water depth) of about 13.5 m (44.3 ft) and a maximum depth (in area of Figure 18) of about 21.7 m (71.2 ft). Note that the lower arm of Old River was already isolated from the river at the indicated stage.

Hydrographic conditions in the river at the shipwreck site in 1865 can only be surmised. That date was eight years prior to raft removal, but the foot of the raft was well upstream from the location. Water depths probably were not as deep as they were in 1891, but it is obvious that the channel was navigable. The greatest water depths (thalweg) were probably close to mid channel but shoaled significantly toward the point bar on the left descending bank.

The configuration of Old River was not updated for the 1908 survey (Figure 17b). However, the main Red River channel became much straighter and wider opposite the abandoned channel. No doubt some shoaling of the abandoned channel was taking place since its upper arm was still connected to the river at high stage. In terms of lithology, the channel filling probably was slightly finer-grained than the sand bedload of the river in the active river and in point bars.

Measurements made on the 1891 map suggest a mean Red River low water channel width of less than 200 m (656 ft) and that of Old River about 117 m (383 ft). In contrast, the 1908 mean channel width of the active river channel was about 250 m (820 ft).

By 1924 (Figure 17b), the overall position of the main Red River channel had changed little; however, it had migrated slightly westward, cutting into and truncating some of the upper and lower arms of the Old River abandoned channel. Once again, the survey of Old River had not been updated since 1891, but it can safely be assumed that the water body had become smaller and shallower and sand wedges had isolated the abandoned channel from the main channel at low water. It is postulated that this marked the beginning of channel filling that had an appreciable amount of clay and silt mixed with sand.

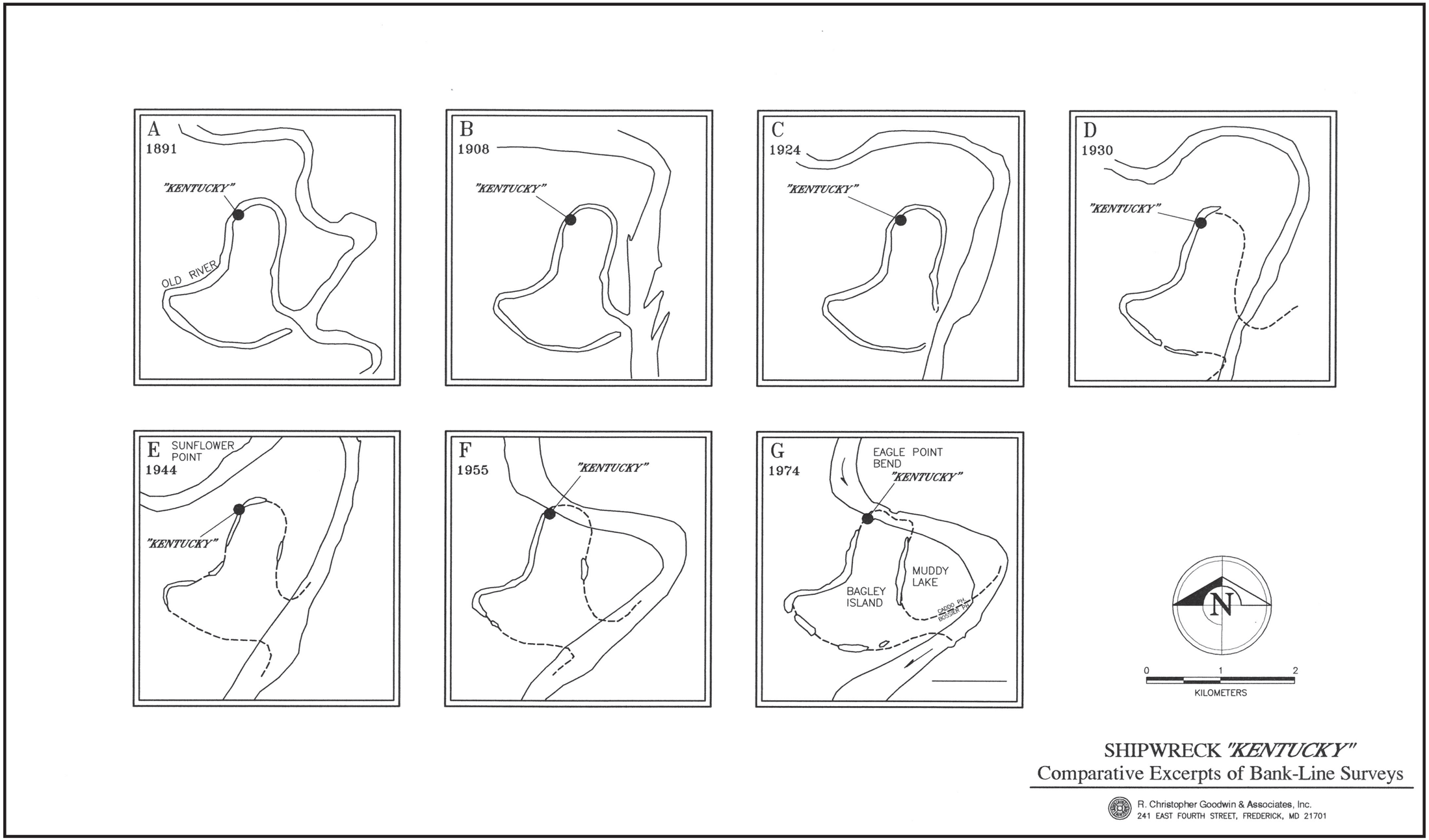


Figure 17 Comparative excerpts of bank-line surveys of the *Kentucky* vicinity (1891 survey from U.S. Army Corps of Engineers 1886; 1908 and 1924 surveys from U.S. Army Corps of Engineers 1887 and 1910; 1930 survey from U.S. Engineer Office 1930; 1944 survey from U.S. Geological Survey 1946; 1955 survey from U.S. Department of Agriculture 1955; and 1974 survey from U.S. Geological Survey 1980)

Figure 18 Excerpt from an 1864 map of the Red River (From Houston 1864). Location of *Kentucky* shown by heavy arrow

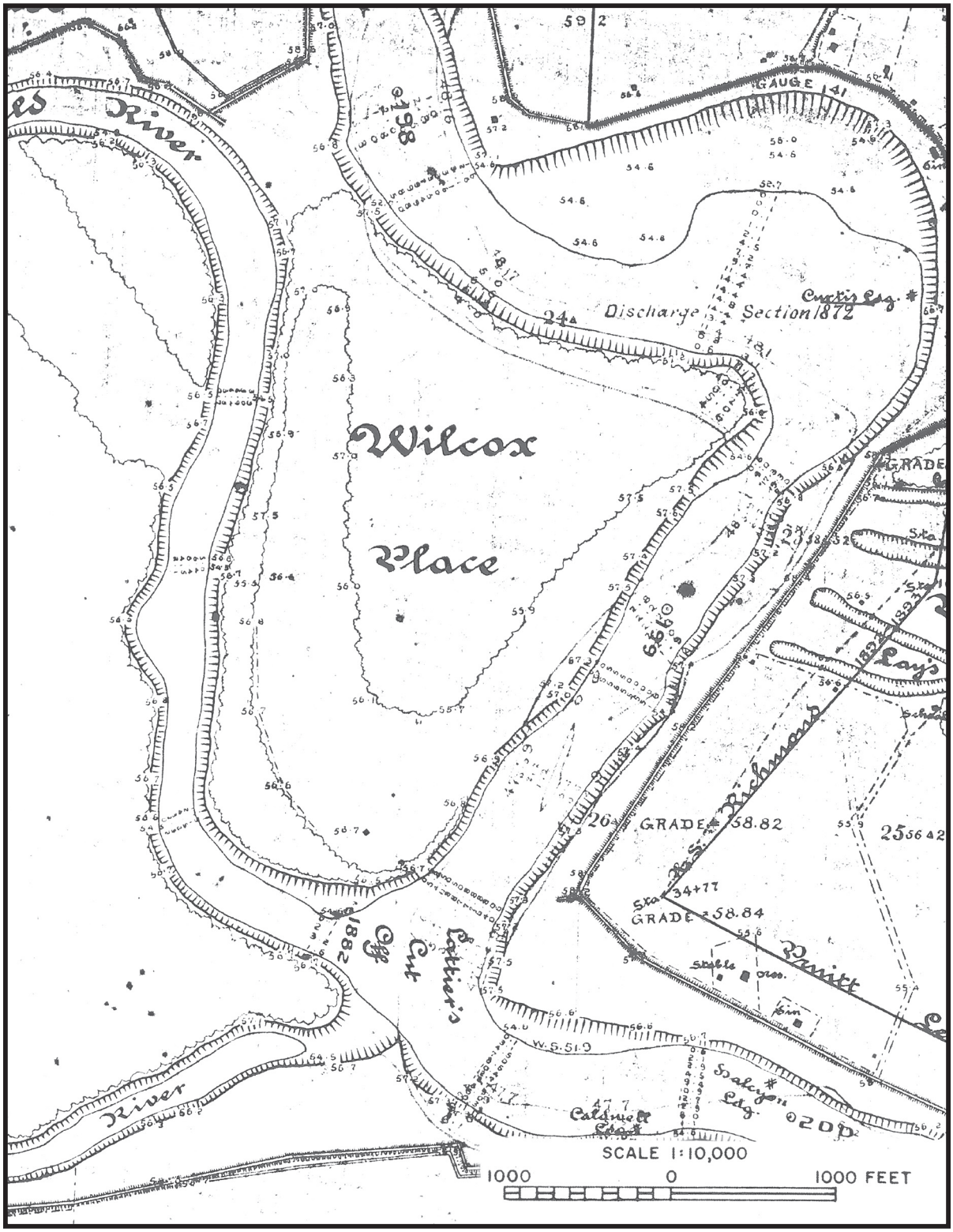


Figure 19 Portion of Red River channel and Old River in 1891 showing soundings in meters reduced to 10 ft (3.0 m) stage at Shreveport. Shreveport gauge zero = 161.27 ft (49.15 m), Cairo Datum (From U.S. Corps of Engineers 1886)

The progressive shrinking of Old River is verified by the 1930 survey (Figure 17d) which updated the mapping of both the abandoned channel and the main river channel. Extensive filling had converted much of the upper arm above the *Kentucky* site into a small ephemeral slough filled with swamp vegetation. Water depths at the shipwreck probably were not more than a few meters. Note that in this and subsequent surveys, the Caddo-Bossier Parish line is shown as reference. The line closely approximates the position of the river just prior to the 1891 survey.

By 1944 (Figure 17e), filling of the Old River abandoned channel was well advanced and the once continuous lake had become a series of shallow ponds, including one at the shipwreck site. The effectiveness of the filling suggests that little or no sediment was coming directly from the river via the remaining depressions in the upper and lower arms. Rather, most probably were derived from overbank flows from major floods that inundated much of the entire floodplain area. The nearest source of overbank flow was the river bend below Sunflower Point to the north of the site. This bend was migrating southward at a rapid rate directly toward the shipwreck site.

Sometime shortly after 1944 (at an unknown date), an artificial cutoff was made across Sunflower Point (Figure 17f). This cutoff initially brought the new river channel directly toward the upper arm of the abandoned channel and, within several years, it began cutting into and eroding away part of the upper arm. This probably began about 1950. By 1955, the river channel had advanced almost to the shipwreck site, but the rate of lateral migration appears to have begun slowing down. Note that the size of the shallow water bodies in the abandoned channel appears to have increased between 1944 and 1955. This is believed to be an artifact of the survey methods or artificial manipulation of water levels rather than any scouring or actual abandoned channel enlargement. Note also that for the first time, no open water existed at the shipwreck site. A wedge of sediment, probably analogous to natural levee deposits, was advancing into the upper arm of the abandoned channel ahead of the southward-migrating main river channel.

The survey of 1974 (Figure 17g), although now 25 yrs old, is the latest detailed survey available to the writer. At that time, the river channel had moved little from its 1955 position, but essentially was right at the shipwreck site. Figure 20 shows the course of the river from the 1891 Red River survey, overlaid on the 1980 channel. It is indeed fortunate that the rate of growth of Eagle Bend Point (and associated recession on the opposite bank) had slowed significantly. Otherwise, the shipwreck might have been completely destroyed by the 1980s. The noticeable increase in the extent of the water bodies in the abandoned channel in 1974, as compared with 1955, is due to a combination of excavation and embankment construction to manipulate water levels in the area by local interests.

Site Geomorphology

According to field notes of borings made at the shipwreck site in 1995 as part of the geophysical surveys (Simms and Albertson 1996), the shipwreck is buried by silt and silty sand and it rests on sand. The report on the site geology is ambiguous and does not mention the origin (depositional environment) of the deposits. By inference from earlier borings for the proposed revetment at the site, the authors suggested they are point bar topstratum and substratum deposits. This is most definitely not the case regarding the finer-grained materials. The silt and silty sand materials are interpreted herein as abandoned channel deposits while the sandy materials probably are channel to lower point bar deposits.

Figure 21 shows the interpreted position and orientation of the wreck in terms of the present surface topography and river channel location, with a superimposed interpretation of the

probable 1865 banklines. The latter takes into account the channel change scenario illustrated in Figure 21, the site topography, average channel widths, and an historic account that states that, after hitting a snag, the captain guided the vessel toward shore but was unable to get close enough to put out the landing stage (Irion 1995a).

This investigation suggests that the shipwreck remained mostly unburied and at least partially exposed on the river bottom until the early 1900s (but before 1924). Between 1865 and the early 1900s, it would have been subjected to subaqueous physical, chemical, and biological attack, but it probably was too far below the water surface to pose a navigation hazard. After the early 1900s, it was progressively covered with abandoned channel filling with the channel filled to its approximate present extent between 1944 and 1955. After about 1924, the wreck would have been relatively protected by the sediment cover and in a mostly but not entirely anaerobic environment. During times of seasonal dryness and low river stages, especially after about 1950, water tables may have dropped sufficiently to allow occasional oxidizing conditions. This would have been promoted by the proximity of the main river channel to the north and the sandy nature (high permeability) of the deposits. The possibility exists that occasional periods of lowered water tables occurred at earlier times, but cannot be estimated on the basis of geomorphic evidence.

Site Conditions During Archeological Investigations

Although erosion from river current slowed significantly for the period from 1955 to 1974, construction of a wing dyke upstream from the *Kentucky* site, on the opposite side of the river, appeared to have directed increased flow toward the site. This was compounded by a pronounced eddy effect produced by the existing portion of the Eagle Bend Revetment. This eddy was likely to further erode the bank and expose more of the shipwreck to the effects of erosion and deterioration. The effects of this erosion may be seen in Figure 3. The shoreline just north of the project area is shown as it was mapped in January of 1995. The edge of the bank in September of 1995 is shown by a dashed line (along points labeled "TB1-4").

The wing dyke can be seen in Figure 22, midway between the site and an upstream bridge. The extent of the bank cutting in the project area can be seen in Figure 23.

The riverine setting also was important in shaping the research design for this project. Conditions at the site imposed significant restrictions on the data collection methods that could be employed. The two most significant limitations are visibility and current. Visibility in this portion of the Red River is usually less than six inches (15.24 cm), making it difficult to see and record the wreck. It also is impossible to use photography and videography for recording underwater. Diver safety becomes an important concern in such circumstances, and current on the site presented an additional hazard. River velocities typically increase in mid-November to July, ranging from 8 ft (2.44 m) per second to as high as 11 ft (3.35 m) per second (Hill 1995). From November to mid-July, these velocities make unprotected diving on the site unacceptably hazardous. Current can not only sweep divers off the site, but debris such as trees moving downriver in the current threaten to pin divers against the wreckage. Trees and debris found on the site during the initial investigations presented an additional problem, as did a dense root mat around much of the wreckage. Together, these factors made it impossible to use many of the traditional recording techniques that are used to investigate underwater sites in clear, still water and that are analogs of the archeological methods practiced on land.

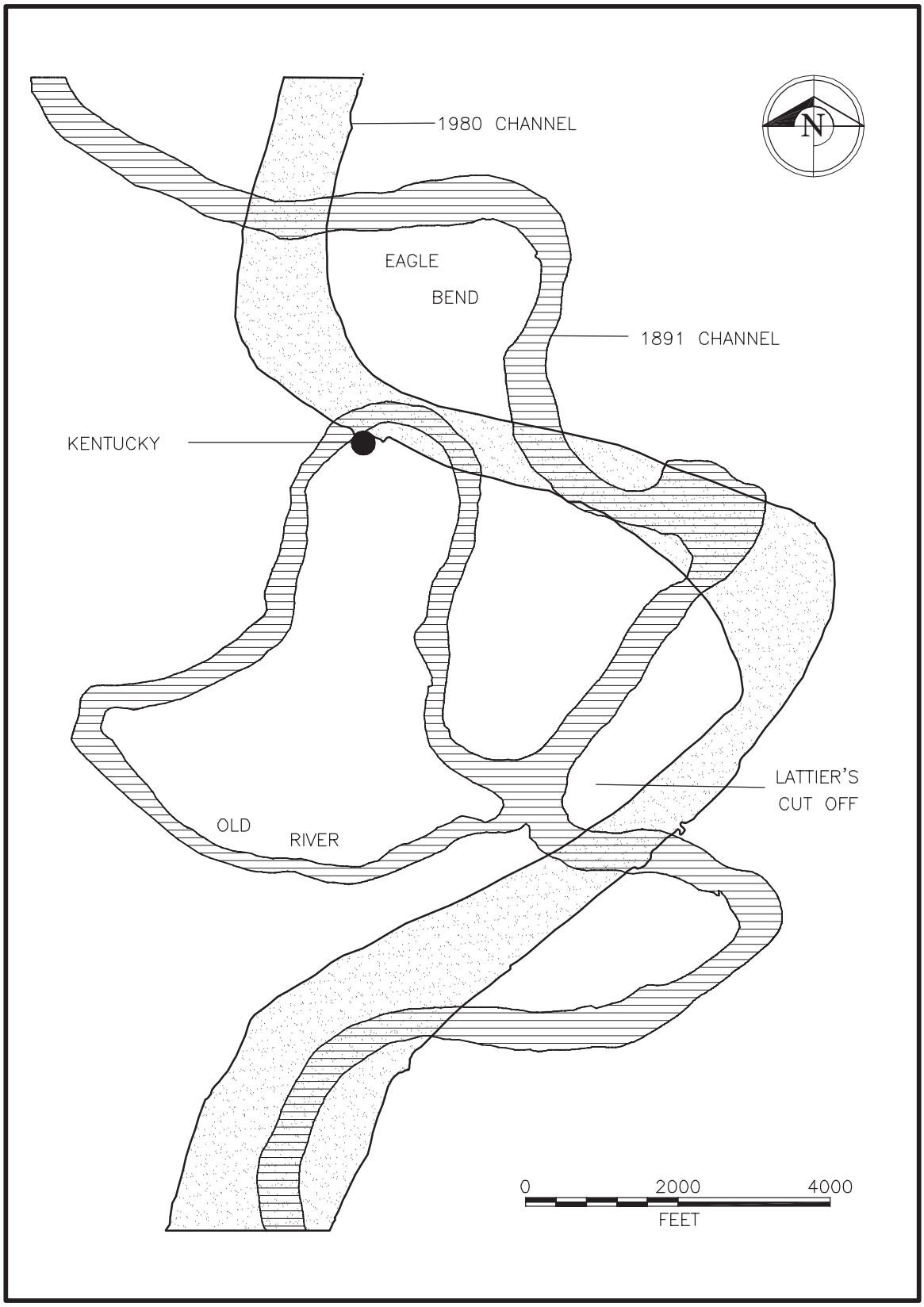


Figure 20 Course of the Red River from the 1891 Red River survey, overlaid on the 1980 channel (from the 1980 USGS 7.5 minute series topographic quadrangle, Shreveport East, Louisiana)

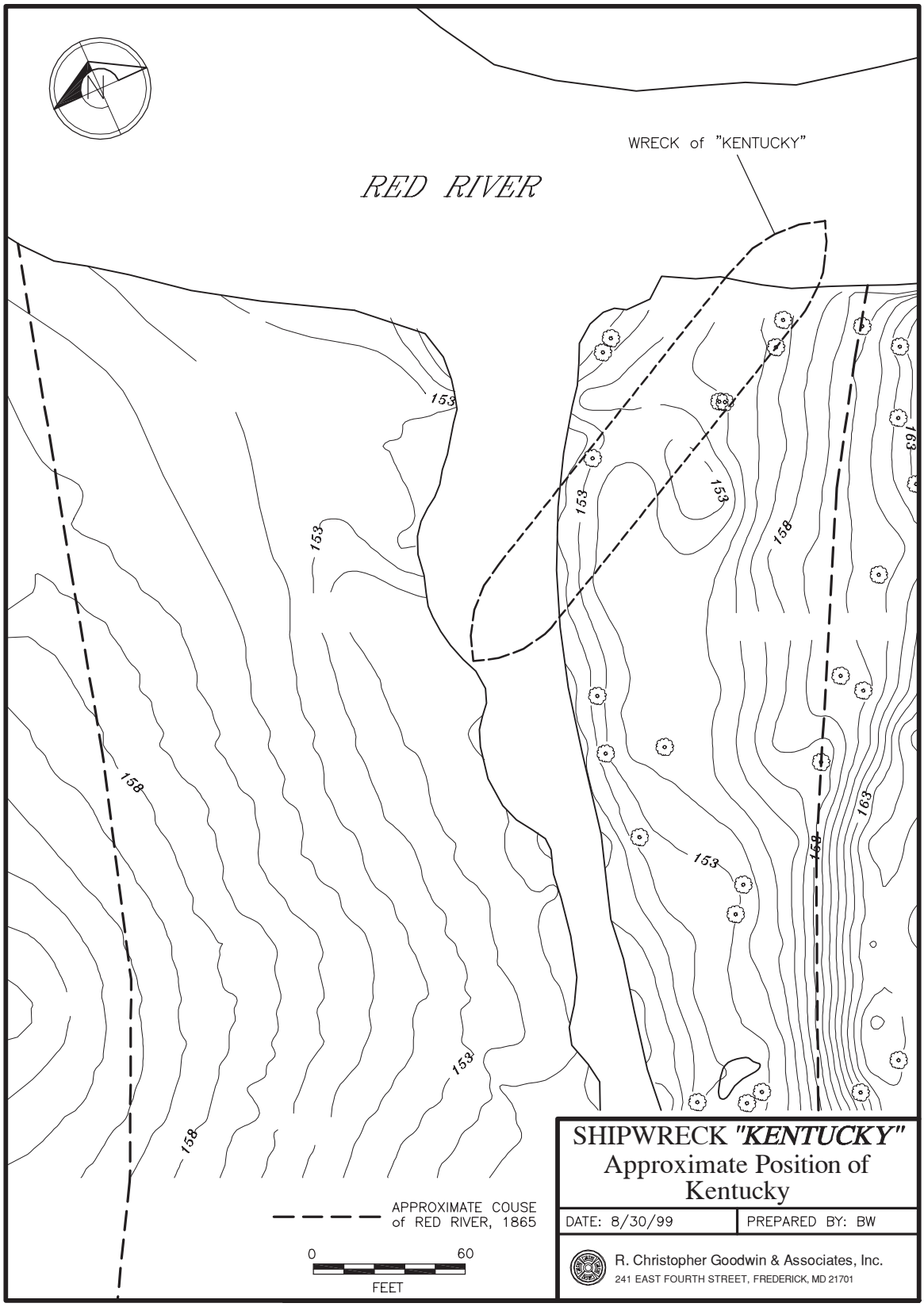


Figure 21 Topographic map of the *Kentucky* site showing the approximate position of the wreck as based on geophysical and geotechnical investigations from Simms and Albertson 1996. The heavy dashed lines show the interpreted river banklines as of 1865

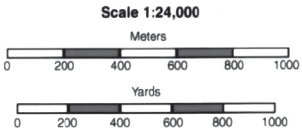


Figure 22 Spin-2 Satellite image of the project area (27 February 1998)

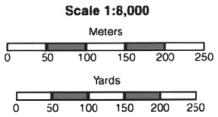


Figure 23 Spin-2 Satellite image showing close-up view of the project area (27 February 1998)

CHAPTER IV

HISTORICAL CONTEXT

Introduction

The potential importance of 16BO358 and its likely eligibility to the National Register of Historic Places prompted Phase II investigations of the vessel, designed to confirm the site's identity as the wreck of the *Kentucky*, to evaluate its preservation, and to formally assess its National Register significance. The Phase II investigation had two major components: archival research and field investigations.

Phase II study of the site ultimately determined that it was the wreck of the side-wheel steamboat *Kentucky*, and that the wreck was significant under National Register criteria. This assessment resulted in a Phase III data recovery that involved additional archival research. In order to make this report easier for other researchers to use, the methodologies and results of both the Phase II and the Phase III archival investigations have been combined and are reported in this and the subsequent chapter.

This chapter provides a general historical context for the site. After explaining the methodologies used in the archival research, it reviews the relevant Cultural Units and Themes established by *Louisiana's Comprehensive Archeological Plan* (Smith et al. 1983:127). The primary Cultural Units discussed here with relevance to 16BO358 are *Antebellum Louisiana 1803-1860* and *War and Aftermath 1860-1890*. The primary Themes are *Military History in Louisiana* and *The Steamboat Era*. This chapter's review of background contexts relevant to 16BO358 leads into a more detailed investigation of the *Kentucky* itself; that site-specific research is reviewed in the subsequent chapter, which examines the construction and service of the vessel, its role during the Civil War, the events leading to the sinking of the *Kentucky*, and a detailed examination of the disaster.

Methodology for Phase II and III Context and Archival Investigations

Background research on the history of the Bagley Island area utilized a variety of secondary sources, as well as primary sources such as maps. The development of steamboats was researched through a combination of secondary sources such as Hunter's (1993) classic study and recent overviews (Still, Watts, and Rodgers 1993), along with period studies of the vessels (Hall 1880; Russell 1861). Land title history was researched utilizing the conveyance and tax assessment records of Caddo and Bossier parishes and is provided in Appendix II.

The specialized nature of documents relating to historic vessels required a somewhat different approach to research on *Kentucky*'s history. Background research on the history of the vessel was conducted at both the Civil and Military Reference Branches of the National Archives in Washington, D.C., and at the Cartographic Reference Branch of the National Archives, College

Park, Maryland. Chain of title documentation for *Kentucky* from the period 1856-1860, when she served as a Mississippi River mail packet, was established from her enrolment papers, which were located in the Civil Reference Branch's Record Group 41, *Records of the Bureau of Marine Inspection and Navigation*. Documentation of *Kentucky*'s distinguished military service as a troop transport for both Confederate and Union forces, and her subsequent loss on the Red River were found in: the United States War Department's (1896) *The War of the Rebellion: A Compilation of the Official Records of the Union and Confederate Armies*; National Archive's Military Reference Branch's Record Group 45 *Naval Records Collection, Office of Naval Records and Library, Subject Files*; Record Group 92 *Office of the Quartermaster General, Water Transportation 1834-1900*; Record Group 94 *Records of Adjutant General's Office, Letters Received* (Main Series); Record Group 153 *Registers of the Records of the Proceedings of the U.S. Army General Courts Martial, 1809-1890*; and Record Group 393 *Records of the United States Army Continental Commands, 1821-1920, Endorsements Received and Special Orders and Letters Sent, Department of the Gulf and Louisiana, 1861-66*. Historic maps of the project area were located in National Archives' Cartographic Reference Branch's Record Group 77 and 77b, *Records of the Office of the Chief of Engineers (U.S. Army), Annual Reports and Map Files, Chiefs of Engineers*. These various sources provided a context for the site, helped with interpretation of its features, and allowed for an informed assessment of its significance.

The resources above were examined during the Phase II investigations of the *Kentucky*. Specific research initiatives for the Phase III investigation focused principally upon determining, to the extent possible, the answers to four basic questions: (1) What were the circumstances of the tragedy (i.e., exactly what happened); (2) Who and/or what formed the cargo of the steamboat on its last voyage?; (3) What was the nature of the loss, in terms of human life?; and, (4) Who should have been held responsible for the accident?

To answer these questions, researchers reviewed accounts contained in available surviving contemporary news journals from as far away as St. Louis, Missouri; in various files and indices of proceedings associated with the administration of the Federal Department of the Gulf that are held in the National Archives and Records Administration; and in other types of sources available at the U. S. Army Institute of Military History at Carlisle, Pennsylvania. Helpful corollary information also was supplied by independent researchers associated principally with the Sons of Confederate Veterans organization in Missouri; much of that material included data obtained from familial descendants of survivors and casualties of the disaster. Additional research also was conducted by Gary Joiner, Ph.D., at the University of Louisiana at Shreveport, who authored the section below on the Military History Theme.

Cultural Units & Themes

Louisiana's Comprehensive Archeological Plan (Smith et al. 1983:127) organizes the state's long history into cultural units, which may be used to examine a particular cultural phenomenon in time and space. It also provides a conceptual framework for highlighting cultural characteristics. Of the 14 cultural units defined for the state, two have particular relevance to site 16BO358, as they encompass the construction and use of *Kentucky*, as well as the demise of the vessel. These units are *Antebellum Louisiana 1803-1860* and *War and Aftermath 1860-1890*. The discussions below will focus upon these two units, with a major emphasis on the Red River during the Civil War, although a general overview of the historic period is provided.

Thematic discussions similarly will be geared towards the *Kentucky* and the Civil War period. In addition to the cultural units that are used to subdivide Louisiana's history and

prehistory, the state's archeological plan (Smith et al. 1983) delineates specific themes for each of Louisiana's six regional Management Units. These themes identify significant cultural topics or manifestations that are central to any examination of the state's past. The site lies within Management Unit I, and three of the archeological themes identified for the unit have special relevance (Smith et al. 1983:25): Theme 13 *Military History in Louisiana*; Theme 18 *The Steamboat Era*; and Theme 19 *Civil War Rivercraft*. Management Unit VI also encompasses the remains of *Kentucky*, covering as it does all water bottoms within the state of Louisiana or under its jurisdiction. Three of the six themes identified for this management unit are of significance for this investigation and include: Theme 1 *Submerged Archeological Sites*; Theme 4 *The Steamboat Era*; and Theme 5 *Civil War Rivercraft.* Therefore, the historical background which follows will provide an overview of the area's history with emphasis on the Civil War, a brief review of land tenure in the project area, and a thematic discussion of the evolution of steamboats such as *Kentucky* and the role they played in the development of the region.

Historical Overview of Project Area

Exploration & Colonization 1541-1803

The Red River provides a focal point for any discussion of the history of the area, just as it does for discussions of the natural setting. While the river provided an attractive locale for many prehistoric peoples, obstructions in the channel prevented its use for transportation throughout most of the early historic period. As early as 1700, explorers such as Sieur de Bienville found an extensive barrier of fallen trees, logs, and other debris that choked the river and prevented passage (Kniffen and Hilliard 1988:161; McLure and Howe 1937:9,18-21; Kelley 1994:32-33). As a result, Native Americans seem to have frequented the area less during this period, European travelers bypassed the project area, and settlement was stalled. Throughout the eighteenth century the logjam increased in size, eventually stretching for 257 km (160 miles) above Natchitoches, Louisiana.

Antebellum Period 1804-1859

"The Great Raft", as this logjam came to be called, prevented settlers of European descent from expanding into this section of the Red River until the 1830's. In the meantime, the United States acquired the region through the Louisiana Purchase of 1803. The importance of the Red River to the United States was enhanced by the potential passageway it offered to the contested boundary zone between the United States and Spanish holdings to the west. Partly as a result of this strategic significance, Henry Shreve was given the task of opening the Red River in 1832. With a specially designed snagboat named *Archimedes*, Shreve eventually cleared the river up to the present town of Shreveport. Shortly thereafter, in 1835, the federal government executed a treaty with the Caddo, who held title to the potential agricultural wealth of the river bottom (McLaurin 1985).

With the acquisition of land from the Caddo and the removal of the "Great Raft," settlement of the region began in earnest. Shreve Town, named after Henry Shreve, was established just above the project area in 1836. In 1837, the town's name was changed to Shreveport, and it was incorporated and designated the county seat of newly formed Caddo Parish in 1839. Around Shreveport and up and down the river, plantations were established, and cotton began its long reign over the economy of the area.

The river was crucial to cotton production for two reasons. First, the fertile, alluvial soils of the area supported high yields. On average, a bale of cotton could be produced for each acre of bottomlands, with some soils sustaining yields of two bales per acre. The second critical advantage afforded by the river was transportation; it provided the only efficient means of shipping the cotton to market. According to a survey of landmarks in present day Caddo and Bossier parishes (quoted in Griffin et al. 1999):

> The growth and prosperity of this area increased by the availability of river transportation. As the government lands were bought up by the settlers, they were developed into large cotton plantations. These plantations necessitated the building of warehouses, stores, cotton gins, and sawmills; and brought many steamboats up the river. Practically everything that came and went in the area was transported by the riverboats, including news.

With the opening of the river, Louisiana's legislature established Caddo Parish (on the right descending bank of the Red River) in 1838 and Bossier Parish (on the left descending bank) in 1843. Population growth, and the exploitation of cotton, was rapid. According to the 1840 census, Caddo Parish had a population of 5,282 (53 per cent of whom were slaves). By 1860, the population had reached 12,140 (60 per cent slaves). Bossier Parish's 1850 population totaled 6,962 (64 per cent slaves), and on the eve of the Civil War, in 1860, it had grown to 11,348 (70 per cent slaves) (Griffin et al. 1999).

Shreveport. Originally, the town of Shreveport was bordered on the east by the Red River, on the north by Cross Bayou, on the south by a shallow river overflow remnant called Silver Lake, and on the west by several parallel rows of ridges running in a north-south orientation. By the 1860s, Shreveport had begun to expand west into a low valley leading to the first of these parallel ridges. This low area, known as St. Paul's Bottoms, had been a swamp created by Cross Bayou. South of town and across Silver Lake was another plateau of high rolling hills that eventually turned into the flat fields that bordered the Wallace Bayou swamp.

Just below Shreveport, but still within its present corporate limits, were located the "head waters" of a major distributary stream, Bayou Pierre, that exited the Red River and roughly paralleled it until its water re-entered the river just above Grand Ecore. Like most of the other water bodies in the Red River valley, Bayou Pierre had been created by The Great Raft.

A man-made water channel that today is known as Tone's Bayou is located approximately 19 river miles south of the original site of Shreveport. This channel was created in 1851 by James Gilmer, a planter who was hostile toward the commercial development of Shreveport. In 1850, he brought several construction slaves called mechanics from another of his plantations to build a competing town that he proposed to call Red Bluff. The town never was built, but Gilmer did succeed in denying Shreveport some commercial traffic through construction of his alternate navigation channel (Mills 1978). Gilmer's 5,100 ft shunt between Red River and nearby Bayou Pierre followed the scar of an ancient crossover channel that had been blocked by Henry Miller Shreve in 1843 (Bridges 1989:33; see also Hardin 1935:780[map]). The difference in elevation from the east end to the west end was seven to eight feet, and the channel diverted 75 per cent of the flow from Red River (Shannon 1996:20). By the time of the Civil War, the waterway, which had assumed the name of a local resident, Antoine Pourier's Bayou or Tone's (a shortened form of Antoine's) Bayou, had become a great success.

In 1860, the State of Louisiana enacted legislation to remove the problem of Tone's Bayou by purchasing a riparian right-of-way at Scopini's Plantation (today known as Scopena) northeast

of the bayou and removing a long elliptical loop from the river (State of Louisiana 1860). The resulting work, begun in 1859, created Scopini Island, and the cutoff first was used in 1862 (Shannon 1996:25). The parallel streams, the man-made shunt, and the raft lakes provided opportunities for navigation that would both aid and impede Confederate efforts to defend the Red River Valley.

War & Aftermath 1860-1890

Shreveport During the Civil War. Since its establishment in the 1830s, the town of Shreveport had grown substantially to become the commercial nexus of the upper Red River. By 1860, its population had reached 2,190 (United States Census 1860), and the population of the surrounding parish numbered 12,140, including 4,733 whites, 69 free blacks, and 7,338 slaves (cited in Shannon 1996:25). However, by 1864, the population at Shreveport itself had swelled to more than 12,000, as refugees flooded in from South Louisiana, Arkansas, and Missouri (O'Pry 1928:167).

Shreveport and Caddo Parish also had developed into a very important commercial center, both as the primary transshipment complex for North Louisiana and East Texas cotton and as the end of the Texas Trail. Cattle were brought here for shipment down the river. In 1860, Caddo Parish ranked fourth in the State of Louisiana in the total number of business establishments and second overall in the annual value of products manufactured on a per-parish basis (Snyder 1972). A British officer, on his way to observe the operations of the Army of Northern Virginia, recorded in his diary that "Shreveport is a rather decent-looking place on the Red River" (Fremantle 1954:66).

As the Civil War progressed, Shreveport developed a thriving war-based industry (Joiner and James 1997: 27). With little or no help coming from east of the Mississippi River, the town was forced to become self-reliant. Fortunately, the surrounding region had enough natural resources and antebellum infrastructure to permit these developments. Shreveport itself was the location of at least one foundry, a powder house, an arsenal, two saw mills, and corn storage sheds, all of which were located along the south bank of the Red River or near Cross Bayou (Venable 1864:map). Outlying military installations, including several in East Texas, also were linked directly to the army command in Shreveport. Arsenals, foundries, a powder mill, and a magazine were created in Marshall, Texas, and a powder house and warehouses were located in Jefferson. Tyler housed a "laboratory for fabricating battery and small-arms ammunition," and ordnance works were found in Houston and San Antonio (United States War Department 1890-1901:XXII,2:1137-1139).

This regional industrial base, of course, supported the Confederate army in the region, but it also supported the naval construction and repair yard in Block 66 of the original plat of the town of Shreveport (Caddo Parish Conveyances N: 295). The Confederates built the ironclad *C.S.S. Missouri* here, using iron obtained by ripping up the rails from a segment of the antebellum Southern Pacific Railroad tracks which had been laid west of Shreveport (Lt. Jonathan Carter to the Directors of the Vicksburg, Shreveport and Texas Railroad, February 28, 1863; Jeter 1996). The *Missouri* would be the last Confederate ironclad to surrender in home waters (Still 1988:226). The man in charge of the *Missouri*'s construction, and who later served as her captain, was Lt. Jonathan Carter, C.S.N. (Jeter 1996:28). The high-speed ram *C.S.S. William S. Webb* also was repaired at this yard after her capture of the *U.S.S. Indianola* during the Vicksburg Campaign, and it was from this yard that the *Webb* would begin her famous dash down the Red and Mississippi rivers near the

end of the war. The yard also was the home of the tender *Mary T.*, which sometimes also was called the *J.A. Cotton* or the *Cotton II* (Joiner and James 1997: 27).

Recent investigations have revealed that the Shreveport yard also produced five submarines that were nearly identical to the *C.S.S. Hunley*. These vessels, designed and manufactured by the Singer Submarine Corporation, the firm that created the *Hunley*, were 40 feet long and 48 inches wide, with spar torpedo booms fore and aft. One of these vessels was dismantled and sent to Houston, Texas; the other four apparently never were salvaged and they remain in the silt of Cross Bayou or just off its mouth in the Red River (Ragan 1999:242-245).

Finally, Shreveport became the administrative hub of the Trans-Mississippi region. To be near the military command structure and the Confederate state government of Louisiana, the state government in exile from Missouri located first in Shreveport and then in Marshall, Texas, 40 mi west. The Confederate capital of Arkansas was located in Old Washington, Arkansas, 75 mi north. Shreveport was the only Confederate administrative center west of the Mississippi River that was worth striking; in fact, by late 1863, the Union High Command felt that there were only four targets of any consequence left in the entire Confederacy: Richmond, Atlanta, Mobile, and Shreveport (Johnson 1993:80).

At the outbreak of the Civil War, sentiment in Louisiana was overwhelmingly in favor of secession (Bridges 1989; Head 1989). Although both Caddo and Bossier parishes contributed significant numbers of troops for the Confederacy, the war did not take on a local aspect until New Orleans fell to Federal troops in April of 1862. Union control of New Orleans raised the specter of invasion up the Mississippi and its tributaries, including the Red River. The state capital therefore was moved from Baton Rouge to Opelousas in May 1862, followed by its removal to Shreveport in January 1863. In May of 1863, Shreveport also became home to the headquarters of the Trans-Mississippi Confederate Department (Winters 1963).

Despite heightened military activity, the project area never suffered actual invasion. A Federal force did make the attempt early in 1864, with the Red River Expedition, but it ground to a halt upon encountering shallow water at Loggy Bayou, just to the south. The river also had been blockaded by the Confederates with a sunken steamboat, and military reversals elsewhere in the region prevented the expedition from waiting for better river conditions (Winters 1963). Lee surrendered the Army of Northern Virginia on April 9, 1865. The Trans-Mississippi Department refused to surrender and moved to Houston; in June of 1865, Federal troops took possession of Shreveport.

The end of the war and the emancipation of slaves caused serious disruptions in the area. Labor obviously was unsettled, and the investment that many planters had made in bound labor disappeared overnight. Reconstruction was marked by violence due to these and other tensions. Blacks formed majorities in both Caddo and Bossier parishes, and this plurality increased in Caddo Parish after the war. Conflict was serious enough to require the intervention of Federal troops, and it continued until the restoration of native white home rule in 1877 (Head 1989:6-9).

Other dislocations were caused by changing transportation systems. Despite Shreveport's reliance upon water trade, the 1870's saw the emergence of railroads as a major factor in the region. The Texas and Pacific Line linked Shreveport with Dallas in 1873, and the Jefferson and Texarkana Railroad connected the city to St. Louis in 1874. A rail link to New Orleans came in 1881, with the extension of the Texas and Pacific to the Gulf. The railways made immediate and severe inroads on the trade of steamboats. River boats carried 193,00 bales of cotton to market in 1877-1878, just before the rail link to New Orleans was completed. In 1886-1887, only 55,128

bales were transported by water, while 322,538 were sent by rail (Griffin et al. 1999; Barker 1929:84). This shift spelled the end of active steamboat traffic on the Red River.

Industrialization & Modernization 1890-1940

Cotton production also had its problems after the Civil War. Although it remained the staple crop in the area, growers experienced cycles of profit and loss. In the first decade of the twentieth century, for example, the boll weevil severely ravaged crops and hurt planters. But the outbreak of war in Europe in 1914 reversed their decline in fortunes, increasing profits and demand. The subsequent depression, however, combined with foreign competition to once again create economic hardship. This decline lasted for more than a decade. The discovery of oil in East Texas and of gas in the Caddo-Bossier area (1930-1931), however, ameliorated some of the effects of the Great Depression. In addition, the grip that cotton held on the area slowly was broken, at least to the extent that other industries emerged. The proximity of hardwood forests, for example, and the accessibility of pine forests elsewhere in Louisiana and neighboring states via railroads, helped create an important manufacturing industry for wood products and furniture. Glass manufactories took advantage of industrial quality sands, and a variety of other industries emerged in the years surrounding the Second World War (Griffin et al. 1999).

Military History Theme - The Civil War

In March 1863, the Civil War west of the Mississippi was poised to enter a new phase. New Orleans had been occupied since 1862 and Union forces had been in central Arkansas since 1863. General Ulysses S. Grant still was conducting his unsuccessful "water experiments" as he tried to bypass Fortress Vicksburg. General William Tecumseh Sherman and his Corps, who were under Grant's command, occupied the Louisiana bank opposite and above Vicksburg, with their base of operations at the town of Milliken's Bend. Sherman's forces were the only Federal troops in northern Louisiana.

To counter this threat and defend the vital supply lines from Texas and Mexico, Jefferson Davis and his advisors decided that a new commander should be sent to the Department of the Trans-Mississippi. They appointed Edmund Kirby Smith, a native of Florida, to command this strategic Confederate territory west of the Mississippi River. Smith's troops consisted of men from Louisiana, Texas, Arkansas and Missouri; in just over two years, many of these Missourians would be on board the *Kentucky* as the vessel departed from Shreveport on her last voyage.

By 1864, the Confederacy was reeling from a series of setbacks. The high water mark of the rebellion had been reached in July of the previous year with the great twin defeats at Vicksburg and Gettysburg. With the fall of fortress Vicksburg and the smaller fortifications at Port Hudson, Louisiana, all Confederate forces west of the Mississippi River effectively were cut off from their comrades to the east. Union armies occupied strategic positions west of the great river.

In Louisiana, the Union Army's Department of the Gulf was headquartered in New Orleans, and its armies controlled Baton Rouge, all of the flat bayou country, and the prairies in southwest Louisiana. Because the Union also controlled northern and central Arkansas with forces headquartered in Little Rock, Missouri troops and their government in exile had been severed from any direct contact with home. Many Missouri families infiltrated Union lines or left the state by

trekking through the Indian Territory (Oklahoma) to come to an area that was perceived to be safe from invasion. That safe place was northwest Louisiana.

The Confederates controlled all of Texas (except some of the barrier islands), most of the Indian Territory in what is today the State of Oklahoma, southern Arkansas, and north and central Louisiana (Moore 1977:394). This area was officially termed the Department of the Trans-Mississippi, and the Department's headquarters were in Shreveport, Louisiana. Shreveport also served as the capital of Confederate Louisiana and as the nexus for the rudimentary military-industrial complex west of the Mississippi.

Fortifying the Red River

On March 7, 1863, Lieutenant General Edmund Kirby Smith arrived in Alexandria to assume formal command of the Trans-Mississippi Department (United States War Department 1890-1901 VXXII,2:781-2). This location, however, soon proved untenable when Union General Banks threatened Alexandria, and Kirby's headquarters was moved to Shreveport in May 1863. Shreveport was remote and would offer more time to prepare against a Union invasion from the south, although it would afford less response time in the event of a Union operation originating at Little Rock. The commander of the Western District of Louisiana, Major General Richard Taylor, had suggested Shreveport as a suitable base of operations from the beginning of his tenure in Louisiana, but General Smith had opposed such a move on the advice of his personal friend and staff surgeon, Dr. Sol Smith of Alexandria (Boggs 1913:57).

Among the members of Smith's staff was the recently-promoted Brigadier General William R. Boggs, who had been with Smith in Kentucky (Parks 1954:253). Boggs graduated fourth in the Class of 1853 from the United States Military Academy at West Point. Three of his classmates, John B. McPherson, Philip H. Sheridan, and John M. Schofield, served as Union generals and John Bell Hood became the highest-ranking Confederate general from the class.

One of Boggs' mentors was Dennis Hart Mahan, Professor of Military and Civil Engineering. All cadets who attended the Academy after 1833 and before the war studied under Mahan (Casdorph 1996:24). Thus, practically all Civil War engineering officers (typically the top ten percent of the graduating class) who graduated from West Point after 1835 had been inculcated with Mahan's ideas. His *Treatise on Field Fortification, Containing Instructions on the Methods of Laying Out, Constructing, Defending and Attacking Intrenchments, With the General Outlines Also of The Arrangement, the Attack and Defense of Permanent Fortifications,* first published in 1836 and used until well after the Civil War, became literally the bible of field fortifications. The similarities of field fortifications on battlefields of the Civil War testify to Mahan's pre-eminence in military engineering. The fortifications erected in Louisiana under Boggs' direction reflect Mahan's influence as well. Boggs, an engineering and ordnance officer, spent the war as a staff officer and never was given a field command.

In Louisiana, Boggs was appointed as General Kirby Smith's chief of staff (Boggs 1913:xiii, xix), and was given the task of creating a defense of the Red River Valley and its tributaries, especially the Ouachita and its lower portions known as the Black River. After an inspection trip to determine possible positions and methods of defense, he determined that several measures should be undertaken. Using the brief scare of a Union thrust up the Red and Ouachita rivers in the spring of 1863 as leverage, he began to formulate his ideas. To protect the Ouachita he built a fort at Trinity near Harrisonburg, which became known as Fort Beauregard. He also began entrenching and fortifying the high bluffs at the village of Grand Ecore, which served as the

port town of Natchitoches, four miles southwest (United States War Department 1890-1901 XXVI 2:322).

Fortifications on the lower Red River: Alexandria

After much discussion and bickering between Generals Smith and Taylor, Boggs selected a position near the town of Marksville in Avoyelles Parish for a lower Red River fortification. This was named Fort DeRussy for the engineer, Colonel L.G. DeRussy, who constructed it. The site, which was located on a hairpin turn in the river, could thwart gunboats if properly armed and staffed. Smith hoped that a suitable site also could be selected just below this location at or below the confluence of the Ouachita/Black with the Red (United States War Department 1890-1901 XXVI, 2:216-218). No suitable site was located for a large structure here, but Boggs did find sites for four small forward defensive positions close to the town of Simmesport, near the mouth of the Red River. These small defensive positions are known collectively as the Yellow Bayou forts. As early as April 22, 1863, Boggs reported to Taylor that Smith believed Fort DeRussy could not be defended against a combined Union Army and Navy expedition without an adequate troop garrison, and he was adamant that the fort not be abandoned unless absolutely necessary (United States War Department 1890-1901 XV: 1051).

For his part, Taylor wanted to build an obstruction near Fort DeRussy that would allow the giant log jam known as The Great Raft to re-form, because he believed that only a complete jamming of the river would stop the Union Navy. Smith, who was deeply jealous of Taylor, tried to discourage this project but left it up to Taylor to decide what to do (United States War Department 1890-1901 XV: 1051).

Taylor's *modus operandi* emphasized movement and maneuver. He disliked field fortifications and he believed that large scale river obstructions would protect his flanks from the Union Navy in the event of an incursion up the Red River. He disliked the idea of Fort DeRussy or any other device that could entrap his own men. The 1864 Red River campaign proved him correct. Later he would contemptuously call the fort "our Red River Gibraltar" (Taylor 1879:155).

On October 15, 1863, Boggs wrote to Taylor of his progress on the fortification plan and his concept of what Fort DeRussy should be (United States War Department 1890-1901 XXVI, 2:322):

Major-General TAYLOR:

GENERAL: Your letter concerning the works at Grand Ecore did not reach me until my return to this place. At Grand Ecore, I met Colonel [L. G.] DeRussy, and, at his suggestion, concluded to accompany him farther down the river. I think that the mouth of Black River is the most suitable position for the defense of Red River, and the work, although heavy, will require but a small garrison. I am aware that this work cannot be undertaken if the enemy move up from Berwick Bay. If the opportunity is favorable, I would suggest an inclosed [*sic*] work of a diamond shape (conforming to the locality), with four bastions; the parapet should be at least 40 feet thick and 12 feet high, with a wide, deep ditch all around. Four or five chains of railroad iron under the guns of the work would be of great advantage. I do not think that there is any other point on the river that can be so easily fortified after a foothold is made, that can be as easily defended, or offers so many advantages. There are many points on the river above suitable for strong defense, with a small force, against gunboats. The position at Plaisance has the advantage of covering Cane River.

Taylor's problems with conflicting orders, and with engineering officers whom he believed incompetent, strained his ability to communicate with Boggs and mid-level engineering officers. For example, on January 17, 1864, Captain D.F. Boyd, the engineer in charge at Fort DeRussy and a loyal ally of Taylor, reflected these divisions when he described progress in constructing the works (United States War Department 1890-1901 XXXIV, 2:892-3).

FORT DE RUSSY, *January* 17, 1864.
Major-General TAYLOR,
Commanding District of Louisiana:

GENERAL: Nothing of interest has transpired here since my last letter. The 9-inch and 32-pounder are both in position. The rain this evening prevented their being fired. The carriage of the 32-pounder is not good. It is the carriage of a 24-pounder, and is consequently a little too small; but it shall be made to answer our purpose. A lot of powder was sent here to-day per steamer *Beauregard*. The magazine will be fitted up to-morrow to receive it. I rode over the entire works here and at the raft on yesterday with General Walker. We also examined the ground at mouth of Bayou L'Eau-noir. He strongly condemned the works at the fort and cassettes as inadequate for the defense of the river. I suppose he will soon write you his opinion.

Major Douglas is offended because you have directed me to cover the bombproof within the fort with iron instead of earth, and says (to use his own language) "Unless my plans are carried out I shall not send more force to Fort De Russy, except by orders from Lieutenant-General Smith."

He says that the use of iron defeats his principal object in having it, viz., to defilade the north and east fronts. That has been done to some extent by raising the east and south fronts about 18 inches, and should be elevated as much more. Defilading the fort seems to be the major's only good reason for his earth covering. That point both Colonel De Russy and myself thought could be better attained than by the major's plan, which, on close scrutiny, was found to defilade the northeast fronts only in part, and in asking your permission to change it (because we feared we could not hear from Major Douglas in time) we really thought we were not only doing our duty to the service, but that our course would meet the approval of Major D. himself. In that I am mistaken, and but for your positive order to cover the bombproof with iron instead of earth, I would cheerfully carry out his plan.

I thought it my duty to call your attention to Major Douglas' disapproval of the change made in his plans, and especially to his refusal to send down the 200 Negroes as he promised in his letter of January 2, because that it is a matter of vital importance to the works, in which you are more deeply interested than any one else. It is very certain that without more hands the works here and at the raft cannot be carried on, and I am beginning to be strongly of the opinion that the raft, with more negroes and teams, &c., could be made a success, and, if successful, it would be worth all the forts and columbiads in the Trans-Mississippi Department.

The piling, though nearly complete, is much crippled by want of proper rope to run the machine, and is hobbling along painfully slow. We had cut yesterday 180 yards of rifle-pits immediately at the piling, and on the morrow General Walker will have rifle and, I believe, gun (cannon) pits dug at mouth of Bayou L'Eau-noir. The river was falling slightly up to this evening, but the few hours' rain will cause a little rise.

Respectfully submitted.

D. F. BOYD,
Captain and Chief Engineer

Douglas, the new chief engineer for the department after Boggs assumed the Chief-of-Staff duties, was clearly a Smith ally and openly displayed his disdain for Taylor. On the other hand, Boyd, a loyal Boggs follower and Taylor's engineer at the fort, knew he must work with his Department commander.

Taylor alerted Boggs of the difficulties and schisms that hampered the construction of the defenses (United States War Department 1890-1901 XXXIV, 2:890-892):
HEADQUARTERS DISTRICT OF WEST LOUISIANA,
Alexandria, January 19, 1864.

Brigadier-General BOGGS, Chief of Staff:

GENERAL: I beg leave to call the attention of the lieutenant-general commanding to the inclosed [*sic*] copy of a report just received from Captain Boyd, engineer in charge of works on lower Red River; also the report of General Walker, who was directed by me to give personal attention to these important works. Constant occupation here and an attack of illness have so far prevented me from visiting the work, which I intend doing to-day. In several former communications I have pointed out the difficulties resulting from a want of labor and tools. The economy of labor and time led me to approve the change in the manner of covering the casemate [at Fort DeRussy], which was earnestly desired by the engineers in charge. You will observe that in consequence of this change approved by me, the district commander, the 200 negroes *en route* are to be stopped. Utter confusion must necessarily follow this condition of affairs. When I applied for an engineer officer, I did not for a moment suppose that I surrendered my volition and all control of my district. I wished the benefit of the best engineering advice that could be obtained, reserving the right to make such modifications in proposed plans as might appear best for the service.

A statement of what has been done, or rather what has not been done, in the way of defensive works seems proper. When General Banks occupied Alexandria last spring, I caused some guns to be placed in position at Grand Ecore to prevent the ascent of the river to the enemy's gun-boats.

During the operations near Milliken's Bend and on the La Fourche, for the purpose of making diversion in favor of Vicksburg and Port Hudson, a company under Captain Hutton was left at Grand Ecore in charge of these guns. In the latter part of July, after my withdrawal from the La Fourche, I received a communication from the lieutenant-general commanding directing me to push on the works at Grand Ecore. As stated in reply, this was the first intimation I had received of works in progress at that point.

Taylor continued by describing the history of his attempts to fortify the lower reaches of the river. His frustration with superiors who overrode or negated his orders was palpable.

Thomas O. Selfridge, a Union ship captain, viewed Fort de Russy immediately after its capture, and noted in his memoirs that casemate batteries of that the fort had been strengthened with railroad iron (Selfridge 1987:362). Taylor indicated that the final armament of the fort consisted of eight heavy siege guns and two field pieces (Taylor 1879:155).

The piling that Boyd referred to in his report to Taylor was the obstruction that Taylor had hoped to build in the fall of 1863. By January 1864, work had progressed, but not at the hoped-for pace. Boyd and Douglas disagreed on the location of the barrier, and work was delayed until an agreement was reached (United States War Department 1890-1901 XXXIV, 1:892). Admiral

David Dixon Porter, Union naval commander of the Red River Campaign, wrote after the war that the obstruction was located eight or nine miles south of the fort near the "Bend of the Rappiones," in a hairpin turn of the river (Porter 1984:496). The obstructions apparently were very formidable. They were constructed of heavy wooden pilings fashioned from trees felled from around the site that were driven into the stream bed completely across the river (Joiner and Vetter 1994: 41). To these was added a second line, shorter in height, that was braced to the first line and strengthened with cross-banded ties. Attached to this structure was a raft of trees and timber that extended from the floor of the stream to the surface (Joiner and Vetter 1994: 41). In addition, the Confederates had cut down "a forest of trees" upstream and allowed them to pile up behind the structure. The Confederates also drove pilings into the riverbed downstream from this dam that extended for 200 yards at what appeared to be close but random intervals (Porter 1984:496).

The diary of a Shreveport man who worked on the barrier gives perhaps the only Confederate account of the structure. We learn from him that the location of the barrier was six river miles below the fort (Fullilove 1915:27, 29). Work on the barrier was feverish. Thomas Pope Fullilove wrote to his wife Elizabeth (Lizzie) on December 15, 1863: "There is getting to be too much confusion and hurry to do much here. I fear our object will not be accomplished and the scarcity of tools add confusion" (Fullilove 1915:26). He stated that the barrier was being erected in a straight section of the river, a position that allowed the current to hinder its construction (Fullilove 1915:28).

Three days later, Fullilove wrote that the water had been rising and the weather was bad. He had been detailed to work on the embankment connecting the fort to the river battery casemate (Fullilove 1915:27). In a letter dated January 31, 1864, he wrote (Fullilove 1915:29-30):

> The piling will be complete in about one week but the sinking timber, I think, never. Our raft is in part of the river nearly straight, the piling certainly cannot stand and we can never get logs enough in the river to block it up in high water. We haul a log way 175 ft. long and 15 ft. wide on our side and 75 ft. long on the other but the current carries them off so badly that it is doubtful in my mind whether they will meet. Every night we lose almost as much as we gain in the day at the ends and it is sinking down in the middle so that it is somewhat dangerous to work on it. A negro was drowned the day before yesterday at the piling about 50 ft. above our log way, the body could not be found, however no effort was made until today. We are hard run down I assure you. Yesterday we worked about half the day in the rain and ½ of the negroes are nearly naked and nearly all of them with shoes not fit to wear. Often the mud is so deep & so stiff that their shoes get pulled in pieces. A good many, some 25 or 30 are sick and coming in everyday, and mud and water every where it rains & only 110 hands at work. The piling is driven in at an angle of 45 across the 5 in a cluster 15 ft. apart in one row & a second row behind them ten ft. & single & cut off 3 ft. above the water & a plate pinned on the top, then the clusters are brought (rolled) [Fullilove's emphasis] together at the top 15 ft. higher than the plate & braces from the plate to the top of the clusters & cross pieces from plate on a level to the clusters. A great many of the pilings have come up without any cause. One whole cluster came up at one time after being fastened together. No floating has yet been put in but tomorrow a floating raft will be begun to lodge against the pilings made of logspinned together.

By February 10, the barrier had a gap of only 40 feet. He then felt that it would take another three weeks to finish the job (Fullilove 1915:31). To add to the confusion, Boyd was

kidnapped by Jayhawkers in early February and was not released until just after the Red River Campaign began (Fullilove 1915:30).

Boggs, whose primary mission, of course, was to protect Shreveport, focused on the defense of the Red River by scouting and preparing positions, delegating responsibilities as needed. Because there were no defensible positions between Fort DeRussy and north of Alexandria, no fortifications were prepared until late 1864 and early 1865, when two forts-- Randolph and Buhlow-- were constructed in the area (National Register nominations: Forts Randolph and Buhlow, on file at the Division of Archaeology, Department of Culture, Recreation, and Touris, Capitol Annex, Baton Rouge, Louisiana). Instead, Boggs gambled that Fort DeRussy and land reinforcements from General Taylor would be sufficient to protect the central Louisiana town.

Fortifying Grand Ecore

The first truly high ground one encounters coming up the river is the high bluffs at Grand Ecore, a village that served as the port for Natchitoches. Boggs was not the first military engineer to see the value of this site. The hill and bluff complex had been the site of a military camp and fortification during the Mexican War, when it served to protect the Red River from the Spanish in Texas and functioned as a marshaling point for the forces of General Zachary. A portion of the hill structure was used for Fort Solubrity during that war.

Judging from its intelligence reports, the Union army command certainly accorded Grand Ecore a healthy respect. Major D.C. Houston, aide-de-camp and chief engineer of the Department of the Gulf, described the upper Red River in a report to Major General Nathaniel P. Banks, commander of the Department of the Gulf and the general in charge of both the 1863 and 1864 invasions of the Red River. He astutely observed that "the Red River, [which] is very narrow and crooked and [which] has, in many places, high bluff banks where field artillery could be placed to enfilade the channel and have no fear of gun-boats. Such a point is Grand Ecore, where the bluff is 120 feet high. This point, I have been informed by spies, is fortified."(United States War Department 1890-1901 XXXIV, 2:126)

Boggs began to fortify the hills and bluffs with his usual vigor, an action Smith supported. However, Taylor, who did not like the idea of having his forces hemmed into the hill complex with no room to maneuver, wanted obstructions placed in the river channel as needed at the narrows near the bluffs and fortifications at an alternative location known as Plaisance. He complained to Smith and in September, 1863, Smith replied that Boggs was at Grand Ecore examining the progress of the entrenchments. He enclosed a copy of the orders to Major H.T. Douglas, now chief engineer of the Department, to cease any major expansion of the works. He also agreed to the fortification at Plaisance if it could be constructed with current work force (United States War Department 1890-1901 XXVI,2:256-257).

At this time, the Confederates already had placed heavy artillery at the bluffs. Smith suggested to Taylor that one of the two nine-inch guns could be left at Grand Ecore. On October 5, 1863, Smith had ordered Boggs to remove the two nine-inch guns, take them to Shreveport and cease any further works on the river below the bluffs (United States War Department 1890-1901 XXVI, 2:256-257). However, as late as January, 1864, Taylor sent a dispatch to Boggs complaining about some of the engineering officers, their abilities, and their willingness to carry out orders at both Grand Ecore and Fort DeRussy. Apparently, fortification work had continued against the orders of General Smith; Taylor blamed Major Douglas for the problems (United States War Department 1890-1901 XXVI, 2:88).

Fortifying Shreveport

North of Grand Ecore and extending upstream to the bluffs south of Shreveport, the Red River narrowed and the currents were swifter. Although the banks were elevated from the surrounding land at various points along this stretch, there was no place to create a commanding fortified position using elevation as the central feature. However, the great looping meanders, obscured parallel channels, distributaries, and ox-bow lakes along this stretch of the Red River valley would become the next segment in Boggs' master plan. James Gilmer's plan to starve Shreveport in 1851 now offered General Boggs the opportunity to lay an elegant trap. Boggs' plan for the river defenses of Shreveport was perhaps his most ingenious achievement.

To reconstruct General Boggs' defensive plan, sources other than the *Official Records of the Union and Confederate Armies in the War of the Rebellion* must be used. Historians estimate that perhaps 90 per cent of the dispatches, orders, and general correspondence from the Trans-Mississippi Department are missing and assume that they were lost, misplaced or destroyed when Shreveport was captured. Moreover, because the Union fleet and army units did not pass some of these structures until the surrender of Shreveport--indeed may never have passed them--there is no official Union correspondence that describes them.

To understand how Boggs' plan worked, one must remember what James Gilmer did. Bayou Pierre is an ancient raft channel of the Red River. It exits the river just below Coate's Bluff in what is today the City of Shreveport and roughly parallels the river, sometimes making great arcing meanders until it rejoins the river just north of Grand Ecore. Gilmer's shunt channel that created Tone's Bayou shunted most of the river's flow into Bayou Pierre, in much the same manner that Henry Miller Shreve created his islands in the Red River during the 1820s and 1830s. Gilmer let the force and direction of the Red River's current create the hydrodynamics for him. The Confederates observed that, when it was in operation, Tone's Bayou diverted almost all of the water into the bayou (United States War Department 1890-1901 XXVI, 2:322).

The compensatory cut-off that the State of Louisiana completed in 1862 did not accomplish its hoped-for objective. The problems that the Confederates experienced with this channel were apparent in a letter from the pilot of the gunboat *(J. A.) Cotton* as he described his trip up the narrows in May, 1863 (United States War Department 1890-1901 XXVI, 2:54-55):

> ALEXANDRIA, *LA.*,
>
> *June* 15, 1863.
>
> Maj. E. SURGET,
> *Assistant Adjutant-General:*
>
> SIR: Having learned that you have received both written and verbal reports in regard to the gunboat Cotton's trip from Grand Ecore to Shreveport, permit me to render you this my report:
>
> An order was unexpectedly received by me from Capt. H. Kelso, commanding gunboat fleet, "to take charge of the gunboat Cotton," and proceed with all dispatch to Shreveport, as soon as the ordnance stores should be placed on board. The third clause of the order reads thus: "The Grand Duke will render assistance to the Cotton whenever the latter may rejoin it."

On the morning of the 14th, having received all the ordnance stores on board, I left the landing at Grand Ecore for Shreveport, the Grand Duke following me, and did render me assistance as far up Red River as Loggy Bayou, where the river becomes very narrow. At a point above this, the Grand Duke left the Cotton, and proceeded on, leaving the steamboat T. S. Conley to assist me. With the assistance of the Conley, I reached the plantation of a Mr. Gatlin, some 83 miles from Shreveport. At this place I came very near sinking both boats, as the river was very narrow and the current very rapid. By great effort, with spring lines attached to the bank, the Conley would pull the Cotton away from the bank, and as soon as I could get steerage-way, the Conley could not get out of my way. After trying this repeatedly, at imminent risk, I shipped the ordnance stores by the Conley to Shreveport, together with the steam-pipe, as I was fully convinced that the Cotton could make no farther progress without having the use of her other wheel, or the assistance of a boat of sufficient power. Had the Grand Duke remained with the Cotton, I could have made the trip.

On Monday, the 18th of May, Mr. Boutte, engineer, went up with the steam-pipe, with an order to the quartermaster at Shreveport to have it repaired immediately. A letter from Mr. Boutte informed me the work could not be done right off. The steamer Texas came along, bound up. I got on board of her and went up. Lieut. Gen. E. Kirby Smith was on board, and I gave him the particulars. He issued an order to General Boggs to have the pipe repaired immediately. When I called on General Boggs, he referred me to the quartermaster, to whom I had sent the pipe at first. I informed him the steam-pipe had been in Shreveport for eight days, and the coppersmiths were employed on the new ram Missouri. He then gave me an order on the naval officer, the naval officer on the contractors, and the contractors on some one else, until finally the work was commenced the tenth day after it had left the Cotton.

During this time the river had fallen 3 feet, and, before I left Shreveport, I called on General Boggs to know what I should do in case I could not reach Shreveport. He told me to report immediately. The steam-pipe being fitted, I left Gatlin's plantation, and proceeded on the trip very well until I reached the "cut-off," or, as some term it, the "ditch" [Scopini's cut-off]. After a delay of thirty hours in endeavoring to get through, I repaired immediately in a skiff to Shreveport (31 miles), and reported to Brig. Gen. W. R. Boggs that I had removed all the loose bales of cotton to the bank, and I could not get the Cotton through the "ditch" without tearing both wheels out of her. He first advised me to communicate the facts to you, mentioning that the courier would leave at 4 p.m. It was then 12 m. But after a conference with General Smith, he ordered me to return to the boat and remain in charge until I was relieved.

The third day afterward he sent down Mr. Larmer, Sir. Alexander, and another party (whose name I am unacquainted with), who impressed some negroes, and the cotton in the bulk-heads was removed together with the heavy ordnance stores, &c., which lightened her up 12 inches forward and 13 inches aft. I then got up steam and started through. With the assistance of 16 negroes at the capstan, with a hawser to both banks, and 6 negroes at the fire-doors, I got through in four hours. The wheels of the boat walked over the bank nearly all the way through. Had I attempted this mode without lightening, *I would have lifted both wheels, shafts and all, out of her.*[italics in original] The persons sent down by General Boggs had

nothing whatever to say or do further than remove the cotton, ordnance stores, wood, &c. When steam was gotten up on the boat their orders terminated, and their reports to General Boggs have had a great tendency in inducing him to advise you, general, not to pay the crew of the gunboat Cotton their true, just, and equitable demands against the Government in full.

It is a crew that has seen service, part of whom have been in service since Captain [E. W.] Fuller first trod the roof of a gunboat. There is not a steamboatman on this river but what thinks I accomplished quite a feat in getting her through to Shreveport as well as I did. I will not go into minor details, but close this report, hoping you will throw the honor upon whom honor is due.

All of which is very respectfully submitted.

O. S. BURDETT,
Pilot, Commanding Gunboat Cotton

The Defenses at Tone's Bayou

In an April 22, 1863, dispatch to Boggs concerning Fort DeRussy, Taylor suggested placing an obstruction up river between Tone's Bayou and Coushatta Chute, at the junction of Bayou Coushatta and the Red River near the town of Coushatta (United States War Department 1890-1901 XXVI, 2:54-55). Smith endorsed this venture; however, he was concerned how an obstruction at "the Narrows" might affect his line of communications (United States War Department 1890-1901 XXVI, 2:54-55):

On the Upper Red River, in what is called the Narrows, between Tone's Bayou and Cushatta [Coushatta] Chute, the obstruction referred to by you is feasible. I inclose [sic] you a communication from Mr. Witter and other planters above this place. They present themselves as a committee, representing the planting interests above, and state that 1,000 hands could be obtained, under the superintendence [*sic*] of the planters themselves, for the purpose of carrying their proposition into effect. I discouraged their plan, whilst I stated I would forward it to you. The fall of the river, with the complete cessation of navigation, which must continue till the rise this winter, makes it a matter for consideration whether any steps should be taken for the obstruction of this portion of the river. To be prepared in advance for obstructions of the river above when necessity compels the abandonment below, I believe would be a wise forethought; further I am not prepared to recommend.

On October 8, 1863, Kirby Smith wrote to Taylor (United States War Department 1890-1901 XXVI, 2:54-55):

Major Douglas (of the Confederate Corps of Engineers) leaves in a day or two for the Lower Red River. He will examine and report upon the facilities and the best plan for obstructing the river above Natchitoches. He will advise and consult with you in Alexandria, having collected the necessary information on his trip down.

Boggs reported to Taylor that he did not believe that permanent obstructions in the Red River were a good idea. Moreover, he stated that:

> Lieutenant-General Smith has directed that the obstructions in the mouth of Tone's Bayou be removed, and steps be taken to stop the cut-off. This will take nearly all the water from Red River above Grand Ecore, and, owing to the scarcity of wagons, will make it difficult to supply your army from this region (United States War Department 1890-1901 XXVI, 2:323).

Captain (Dr.) Thomas P. Hotchkiss was ordered by the Confederate Secretary of War, almost certainly at the urging of Kirby Smith, to close the bayou (Shanon 1996:210). He did this by building a dam, which later bore his name, near the southernmost bend of Scopini Island on a spit of land between Scopini's cut-off and Tone's Bayou (Lavender 1906). The dam did not, as one might think, close Scopini's cut-off.

To guard this vital dam, Boggs constructed two fortifications, one on either end of and east of Scopini Island (Lavender 1906). The southern structure was a long artillery battery that overlooked the Hotchkiss dam and commanded a clear field of fire across open ground to the next downstream meander of the Red River. The battery was approximately 574 ft (175 m) long and shaped like a giant, elongated "E." Its northern anchor was a pond that may have been a borrow pit or a gun emplacement (Shannon 1996:53). A large infantry camp, Camp Morgan, was situated behind this emplacement to provide a garrison for the forts. The northern structure was a square star fortress with a causeway and apparently a water battery. It resembled Fort DeRussy in design, though perhaps not in scale (Heartsill 1992). This emplacement guarded Scopini's cut-off and was designed to provide enfilade fire for the southern battery.

The meanders of the river permitted either fortification to assist the other with covering fire. With Bayou Pierre on one side and the Red River on the other, a landing force encountering fire from either battery would have disembarked troops and headed overland. Due to the level of the ground and the cut-in bank nature of the old river surrounding Scopini Island, these troops would have faced not only an all but impenetrable river with a swift current, but also heavy artillery and infantry. The open field objective, the narrow marching front, and the almost non-existent flanking opportunities of the Tone's Bayou complex are reminiscent of the Rodriguez Canal, the fortification line for General Andrew Jackson at the Battle of New Orleans in the War of 1812. In the final analysis, had the Union army followed the Summer Road up the west bank of the Red River instead of invading inland, Taylor would have been able to marshal his forces behind this line, and call upon a portion of the artillery from the defenses in Shreveport as well as all of his own field artillery for support.

Although today there is no direct on-the-ground evidence, an additional obstruction must have been built at Scopini's cut off near the northern fortification to make this scenario work. This is a logical assumption since the dam would have had no impact on the river's flow if the Scopini cut off were functioning normally. The obstruction probably consisted of a raft-like dam. One source states that, when the blockage was blown, apparently on or soon after March 18, 1864, it drained the Red River "like pulling the plug out of a bathtub" (Cardin 1993:62). In the summer following the 1864 Red River Expedition, a Texas Cavalry mounted cavalry unit (the W.P. Lane Rangers) came to the site and crossed Bayou Pierre in short order, but it took them half a day to cross Tone's Bayou (Heartsill 1992:211). The river would not be returned to its main channel course until 1873 (Shannon 1996:210).

Boggs was not satisfied to permit the Tone's Bayou defensive system stand alone. His intent was to slow down the Union fleet first. He knew that if the river level dropped significantly, the Union navy could not bring its heavier draft ships up through the narrows, a view that proved correct, as demonstrated by the subsequent history of the 1864 campaign. Boggs therefore asked for, and received, permission to sink one of the Confederate defense fleet vessels below Tone's Bayou. The vessel was the *New Falls City*, which was anchored in or near the mouth of Coushatta Chute. *Way's Packet Directory* lists this vessel as an 880-ton side-wheel packet with a wooden hull, having a length of 301.3 feet and a beam of 39.7 feet with a draft of 7.6 feet (Way 1983:344). She may have been the largest vessel to navigate the Red River up until that time and certainly was one of the largest ever to do so. Boggs planned not only to sink her, but also to wedge her across the stream and thereby create a sand bar that would halt the Union warships until she could be removed. The orders for her placement were as follows (United States War Department 1890-1901 XXXIV, 2:1056-1057):

> HEADQUARTERS TRANS-MISSISSIPPI DEPARTMENT,
> *Shreveport, La., March* 18, 1864.
>
> Lieut. W. E. MARSHALL,
> *Engineer Troops:*
>
> The lieutenant-general commanding thinks it may be necessary to have the steamer New Falls City (now lying near Coushatta Chute) sunk in Red River just at the foot of Scopern's [*sic*: this should be *Scopini's*] Cut-off. He directs that you proceed without delay with the steamer Osceola to the point where the New Falls City is lying. You will put a crew on board and take her up to the cut-off, where you will hold her in readiness to be sunk on the approach of the enemy. Inclosed [*sic*] is an order for a crew from any negroes you may meet coming up the river. The chief engineer reports some sent up from Natchitoches. Should you, however, not meet them the inclosed [*sic*] order will enable you to impress them. An engineer and pilot will be furnished by the Osceola to bring the boat up. When it becomes necessary to sink her any assistance which you may require will be furnished by the officer in command of the steamer Missouri, which will be stationed near you. Should the enemy approach you will give the boats which may be below the cut-off time to pass before obstructing the channel. For details you must be governed by your judgment, though it will probably be well to fill the boat with earth, as rock cannot be had, so as to make her more stable. A detail may be sent down from this point to take out her machinery. Capt. James McCloskey, assistant quartermaster, now at Natchitoches, has been directed to notify you of the enemy's approach and when his last boat shall come up. You will do well to communicate with him as occasion may offer.
>
> Very respectfully, your obedient servant,
>
> E. CUNNINGHAM
> Lieutenant and Aide-de-Camp

Captain McCloskey's orders were as follows (United States War Department 1890-1901 XXXIV,2: 1057):

> Capt. JAMES McCLOSKEY,
> *A. Q. M., in Charge of River Transportation*
> *(Through Major-General Taylor):*
>
> CAPTAIN: Lieut. W. E. Marshall, engineer troops, has been sent to take the steam-boat New Falls City from near Coushatta Chute and, if necessary, sink her in Red River just at the foot of Scopern's Cut-off. He has been instructed to call upon you for such assistance as he may need in the execution of these orders, and the lieutenant-general commanding desires that you give him all the help you can. The channel will not be obstructed unless the enemy approaches, in which case he has been informed you would give him timely notice and also let him know when all the boats from below the cut-off had passed him. This information the commanding general directs that you give, with such other as may be of service, to Lieutenant Marshall.
>
> Very respectfully, your obedient servant,
>
> E. CUNNINGHAM,
> Lieutenant and aide-de-camp

Boggs also deployed a chain across the Red River at some point near his trap, possibly above the wreck of the New Falls City. The chain was forged at a plantation near Loggy Bayou on the Bossier Parish side of the river (Marston n.d.). A portion of the chain exists today and is located at the Mansfield State Commemorative Area Visitors' Center.

The greatest tribute to the effectiveness of these maneuvers is documented in a letter from Rear Admiral David Dixon Porter to Major General William T. Sherman (United States War Department 1890-1901 XXXIV,3:172):

> FLAG-SHIP CRICKET, *OFF ALEXANDRIA, LA.*,
> April 16, 1864.
>
> Maj. Gen. W. T. SHERMAN,
> *Comdg. Mil. Div. of the Miss., Nashville, Tenn.:*
>
> DEAR GENERAL: I wrote you a hurried note the other day by General Corse, and I imagine your disappointment at having your well-laid plans interfered with and having part of your command mixed up in an affair the management of which would be discreditable to a boy nine years of age. You need not blush, however, for anything that was done by your troops. You know I have always said that Providence was fighting this great battle its own way, and brings these reverses to teach us, a proud, stiff-necked, and unthankful people, how to be contented under a good Government, if peaceful times come again. I hope it will teach us not to place the destinies of a great nation in the hands of political generals or volunteer admirals.
>
> When I arrived at Springfield Landing I found a sight that made me laugh; it was the smartest thing I ever knew the rebels to do. They had gotten that huge steamer,

New Falls City, across Red River, 1 mile above Leggy [*sic*] Bayou, 15 feet of her on shore on each side, the boat broken down in the middle, and a sand-bar making below her. An invitation in large letters to attend a ball in Shreveport was kindly left stuck up by the rebels, which invitation we were never able to accept

DAVID D. PORTER,
Rear-Admiral

Porter, in fact, was not really sure of his position. In various communiqués, he stated that he was at Springfield Landing, at the Mouth of Loggy Bayou, and at the mouth of the Shreveport River, which does not exist. However, he definitely was not at Springfield Landing, which was some four miles west of the Red River. Because there are several mouths to Loggy Bayou, the admiral could have been as close as two miles south of Tone's Bayou, or as much as four to five miles below the bayou.

That the importance of Tone's Bayou was not lost on Boyd, Taylor's engineering officer, is evident from a heretofore unpublished letter that may be one of the most important documents to come from the Red River Campaign. Penned surreptitiously on the inside of a newspaper while Boyd was prisoner on board a Union prison boat, the note was smuggled out. The message subsequently was mishandled by a courier; lost until 1875, when it was copied and sent to Taylor from Boyd; incorrectly filed in the Brent Papers (an artillery officer who served under Taylor); and finally improperly microfilmed. The letter clearly describes what Boyd thought should be done to trap the Union fleet above Alexandria, and it presents a very accurate portrait of the Union forces feverishly regrouping at Grand Ecore after the battles at Mansfield and Pleasant Hill.

(Copy) [Boyd placed this at the top of the first page]
GRAND ECORE
April 14th, 1864

General Taylor,
Com. of Confederate Forces.

General:

Two iron-clad gunboats were lying at the mouth of Red river on 7th inst: The Essex at Fort DeRussey on 7th. The Benton at Alexandria on 8th; and on 12th a brigade of infantry, and one of cavalry, and four (4) light batteries at Alexandria (last is the statement of a private [Zauker ?], who left that place on 12th inst.

At Grand-Ecore four (4) heavy iron-clad Three (3) of Nine (9) guns, and One (1) monitor of Two (2) guns. [this was the *U.S.S. Osage*] Some Four (4) transports also.

Mostly the whole of Banks' Army is here (Grand-Ecore). A pontoon bridge spans the River; and a large forage train is encamped on East Bank, half (1/2) mile below the town; and evidently some cavalry and infantry are encamped on that side.

The enemy is said to be fortifying in rear of Grand-Ecore. They are foraging a great deal on East Bank. Some twenty (20) transports are above - between Grand-Ecore & Coushatta; and from the best information I can receive, they are protected by three (3) heavily plated gunboats, one (1) monitor and

another, a Ram, and six (6) Tin-Clads; and it is certain that a large body of infantry is aboard the transports - probably the whole of one (1) Division, belonging to 17th Army Corps, commanded by Kilby Smith. [He was correct]

The River is falling slowly - about four (4) inches last night (13th inst.). Scant six (6) feet of water is on the Falls. *Move heaven and earth to close up Scopini's Cut-Off!* [Boyd underlined this entire sentence and double underlined the last portion] A fall of two (2) feet more in the River would ruin the enemy. If the Fleet is lost, General banks considers himself ruined. He has been heard to say so. He is certainly much disturbed.

If Plaisance could be seized, and your 24 pounders and 30 pounder Parrot placed there, I think you wd [would] reap a rich harvest, th' your Battery was finally lost. Such a movement - if Plaisance were tenaciously held - would completely paralyze General Banks.

I have just now heard from a reliable source that there are but three (3) regiments & a squadron of Cavalry (Whites), and some negro troops (number not known) at Alexandria. To that number add about 500 Whites sent down on 13th. Three (3) boat loads, about 1500 men, came up from Alexandria on 12th.

I wd [would] have put-down this information neatly in a letter; but as the returning surgeon will be most likely required to carry out no letters but those examined & approved by the Federal authorities, I have thought it best to resort to this means [o-his mark] of communicating with you.

I hope you will give our enemies another good thrashing. They acknowledge themselves badly whipped.

We have now been on this Boat Ten (10) days, and many men are sick. I am well, and in good spirits, but bitterly regretting that my ignominious capture [x-his mark] has prevented my participating in your glorious victory.

Resp'y
D.F. Boyd

o - Penciled in the margin (inside) of N.Y. Herald
x - captured by Jayhawkers Feb'y 3rd, 1864.
- Federal Prison Boat - Polar Star.

D.F.B.

P.S. It is reported that a Brigade of Cavalry was sent up the East side of the River night before last (12th inst.); but that is by no means certain. The pontoon bridge is no doubt designed as a means of safety from attack on West Side of River, as a means of attacking Gen'l Liddell on East Side.

Later. [his note] The Fleet of transports has returned from above to Grand-Ecore. The impression is that Gen'l Banks is preparing to retreat.

The River is still falling, at the rate of six (6) inches in 24 hours. The Mississ'i River was falling on 9th inst.: at the rate of four inches per day, and all its northern tributaries are falling.

D.F. Boyd

Also written in the same letter is the following:

Sept. 2nd, 1875

This copy is respectfully forwarded to Gen'l R. Taylor. I have thought he might not have preserved a copy of it; and I believed he considered it a very important document.

Surgeon Eibbs 2nd La Cavalry, did not, as promised run deliver it in person, and as soon as possible, to Gen'l Taylor; but unfortunately gave it to some Courier, Surgeon Morrison[?] of Alexandria, has told me that he first discussed the communication while looking over the news-papers at Gen'l Taylor's Head-Quarters in Shreveport on the night of 19th April, the sixth day after Surgeon Eibbs brought out of Federal into Confederate hands. I was informed on my return from prison in Summer[?] 1864, that the communication was at-once copied [?] & sent [to] Gen'l E. Kirby Smith , who was then about one day's March against Steele in Arkansas.

D.F. Boyd (Brent n.d.)

If Boyd's letter had been delivered promptly to Richard Taylor, the Union fleet might have been captured or destroyed. In either case, the Union could not have enforced the blockade across the Mississippi River for at least several months. Also, an army in excess of 25,000 men would have been trapped at Grand Ecore with no ready means of escape, further demoralizing General Nathaniel P. Banks' command. The event also may have played a major role in the 1864 presidential campaign, by boosting the Democratic Party peace platform of General George McClellan--certainly not the effect for which Banks had hoped.

The Shreveport Defenses

General Boggs also was commanded to create a defensive complex to protect Shreveport directly. Union spies certainly were aware of these works as early as January, 1864 (United States War Department 1890-1901 XXXIV, 2:161-162):

OFFICE OF THE CHIEF ENGINEER, *DEPT. OF THE GULF,*
New Orleans, La., January 22, 1864.

Major-General BANKS,
Commanding Department of the Gulf:

GENERAL,: I have the honor to submit the following information concerning the routes from the Mississippi River to the interior of Texas: Suppose it is determined to concentrate the forces near Shreveport, preliminary to a movement into Texas.

> This point is the principal depot of the enemy west of the Mississippi. There are some machine-shops and dock-yards there and the place is fortified by a line of works with a radius of 2 or 3 miles. The position is a strong one, being on a bluff and commanding the eastern bank. The point suggests itself at once as a proper one for such a concentration
>
> D.C. HOUSTON,
> Major, A. D.C., and Chief Engineer, Dept. of the Gulf

The "works" referred to by Major Houston were indeed impressive, given the amount of time it took to construct them, the amount of labor available, and the fact that their designer also was at work on a variety of other major fortification projects points all along the Red River, some several hundred river miles away. Boggs had chosen the highest hills, ridges, and bluffs as anchor points for the defensive system (Venable 1864). Espousing the tenets he had learned from Dennis Hart Mahan, Boggs always selected positions that could be covered with adequate protective enfilading fire; the resulting works were designed to have the same effects as one of Vauban's star-fortresses built during the reign of Louis XIV.

The complex guarding Shreveport extended across the Red River to cover the eastern approaches in Bossier Parish. On the Caddo Parish side, the anchor forts were linked by defensive walls that resembled levees (Brock 1995). At the crests of hills, ridges, or bluffs that were too small for large fortifications, Boggs placed artillery batteries. Larger forts were combinations of construction types typical of Mahan's textbook, in that they made full use of the hill lines and interior routes of communication (Mahan 1863:Plate I; Brock 1995; Venable 1864; O'Pry 1928). Boggs did not build his line on the central plateau of the town itself. He extended his defenses to adjacent ridges.

There were three large anchor forts on the Caddo side and one on the Bossier side. The eastern anchor on the Caddo side was large fort on the first high ground north of Grand Ecore known as Coat's Bluff. This fortification was named Fort Turnbull, but the local name, attributed to General Prince John Magruder, was Fort Humbug, who called it a "humbug" due to its use of "Quaker guns" (tree trunks blackened to look like cannon). These false armaments were interspersed with genuine ordnance to give the impression of an impregnable position. In 1864, the river came up to the foot of the bluffs on which the fort was built. The large complex occupied several interior bluff lines. Several artillery batteries radiated from Fort Turnbull, including Battery Ewell, located to the north to provide cross-fire for a position across the river (Joiner 1997); Battery I, located due south of Fort Turnbull on the southern most rise of the bluff structure; Battery II, situated somewhat west and north of Battery I, on the west side of the bluff complex; Battery III, occupying an extension of the fort's bluff and positioned to cover the area to the defensive line or to the north to fire at targets in the river; and Battery IV, placed close to the Confederate hospital on high ground. These batteries most likely would have been under the direct control of Fort Turnbull. Battery V was located on a high hill behind the defensive line at a point from which its defenders could fire either south or east to cover targets in the river. Battery VI and two unnumbered batteries faced south, in a position where they could support the next anchor fort, Fort Jenkins.

Fort Jenkins was positioned outside the defensive ring atop the highest topographic elevation in Caddo Parish. From the fort, the line proceeded westward to Battery VII, located at the southwest corner of a ridge line that extended westward from the river at Coates Bluff. Between this bluff and the town of Shreveport lay Silver Lake, a shallow bog created by overflow

from the Red River. Only one road entered the town from the south and Fort Jenkins provided a frowning battlement to guard it. Fort Jenkins would have controlled these emplacements.

From Battery VII the defensive line extended northwest to connect to another ridge, this one aligned north-south. Behind this ridge lay the marsh and The Bottoms (Joiner 1997). Batteries VIII, IX, X, XI and XII all were located on this ridge. Behind and to the east of Battery XII, located on the extreme northern tip of the ridge, was a spectacular view of the town. North of Battery XII lay Cross Bayou; between Cross Bayou and the ridges lay a shallow marsh, an overflow remnant of the bayou, similar to, but smaller than Silver Lake.

On a parallel ridge west of the one just discussed, Boggs built Fort Albert Sydney Johnston. This long fort was designed to cover Cross Bayou to its north and to prevent any attempt to attack Shreveport from the west. Any assault from the west would have had to cross an opposing parallel ridge line and then descend into a densely wooded stream bottom before reaching the fort's ramparts atop a high ridge. Any attempt to ford Cross Bayou at this point would have been difficult at best, due to the stream's depth, the marsh, and the wide open ground to be traversed, all of which were well within range of intersecting fields of fire from the guns of Fort Albert Sydney Johnston and Battery XII.

To protect the Confederate capital from an assault from the east, Boggs designed a series of four fortifications, with a triangular star fort named in honor of Kirby Smith as an anchor. It was aligned to repel attacks from the east, north or southeast. South of the fort was a smaller square fort named Battery Ewell. Northwest of Fort Kirby Smith lay Battery Price, a large lunette that faced northeast. West-northwest of Battery Price lay another large lunette, Battery Walker, located on the river and facing north. The three northernmost Bossier side emplacements could provide enfilade fire for each other. The southern fort, Battery Ewell, was designed to protect Fort Kirby Smith, provide fire coverage against riverine targets, and offer enfilade fire for Fort Turnbull and its northern battery. The entire defensive ring was well laid out. The system radiated from the town of Shreveport like the rim of a wheel, extending from one to three miles in a broad arc. Inside this defensive line lay the center for the military industrial complex of the Trans-Mississippi West, the naval yard, a major infantry compound (named for General Boggs), and the Confederate government of Louisiana. Confederate forces in Shreveport or within the perimeter of the city's defenses could be shifted quickly to positions where they were needed most critically, even if such a maneuver involved crossing the river from the Shreveport/Caddo side to the Bossier side. To facilitate such movements, two pontoon bridges, one near the mouth of Cross Bayou and the other adjacent to Fort Turnbull and close to Battery Ewell, were constructed (Venable 1864).

The Red River Valley Campaigns: 1863 and 1864

Compared with other theatres of the Civil War, the Trans-Mississippi Department and the Union invasions of the Red River Valley in 1863 and 1864 have been under-studied, under-reported, and unanalyzed, due in large part to the personal animosities that surfaced between respective commanders on both sides and their cohorts and subordinates. On the Union side, no one wanted to take the blame for the failures of the Red River campaigns. For their part, the Southern leaders displayed such animosity after the campaign that Smith and Taylor actually tried to arrest each other. Boggs was forced out of his position as chief-of-staff by the Department Surgeon, Sol Smith, a close friend and confidant of Smith. As a result, when Boggs wrote his memoirs, he wrote in very general terms and provided few detailed descriptions of his actual engineering work.

Boggs offers the greatest potential for information to historians interested in studying the Trans-Mississippi Department, but very little of his work has survived; the *Official Records* provide some information that fills data gaps in his memoirs. In both sources, Boggs appears always as an educated West Pointer, a consummate engineer, and a loyal subordinate. Because he never held a field command and served most of his war time career far from the central theaters of action, he never was able to display his true abilities and he was subjected to inevitable scrutiny by others.

Surrender at Shreveport

Six weeks after Robert E. Lee surrendered the Army of Northern Virginia, Edmund Kirby Smith surrendered at Galveston, Texas, after having tried to regroup Confederate forces and carry on the fight from Mexico; Henry Watkins Allen, the Confederate governor of Louisiana, actually made it to Mexico and went into exile there (Winters 1963:426). Confederate units in North Louisiana and East Texas went into camp where they were and waited for Federal forces to come and parole them. Many soldiers simply left for their homes.

Shreveport was the scene of uncertainty and unrest as Confederate troops acted as police and provost guards. The largest Louisiana military unit present in the town was the 3rd Louisiana Infantry Regiment, but they were relieved of guard duty on May 18 (Bearss and Tunnard 1988:336). The largest out-of-state unit was, judging from the known casualties of the *Kentucky* disaster, Pindall's [Missouri] Battalion (Goodwin & Associates Inc. 1997). An unknown number of family members of the Missouri troops were with them at the end.

Even as Kirby Smith fled toward his ultimate capture in south Texas, his principal field commanders were meeting with the Union commander of the Department of the Gulf, General Edward R.S. Canby, to surrender the forces within the Confederate Trans-Mississippi Department. On May 26, Simon Buckner, Sterling Price, and Joseph Brent signed the Articles of Capitulation. The surrender document offered terms that were almost identical to those given to Robert E. Lee the previous month at Appomattox. Buckner returned to Shreveport and organized a force of 1,000 of his Missouri troops to restore order (Winters 1963:425-426).

Union forces also were dispatched to Shreveport and a 4,000 man contingent under the command of Major General Francis Herron entered the town on June 6, 1865 (Winters 1963:427). Federal officers and troops immediately began the transfer of authority. Their first duty was to find concentrations of Confederate units in their encampments and to issue paroles. A scene common throughout the South also was played out in Shreveport, Natchitoches, and Alexandria, as Union army officers collected the names of the Confederate soldiers and prepared parole papers for them. The parolee received a slip of paper signifying that he was no longer a belligerent to the government of the United States and that he would return to his home.

To reduce the opportunity for organized opposition groups to form, all former confederate soldiers were to return home. Units from states other than Louisiana and perhaps East Texas offered the greatest problem in this dispersal. The government of the United States assumed the responsibility of arranging transportation home to other states for many parolees. It was at this point that the steamboat *Kentucky* entered the scene. Steamboats were the primary means of moving people and goods throughout the region during the Civil War (and during much of the rest of the nineteenth century), taking advantage of a vast interior network of rivers and waterways that served as highways.

The Steamboat Era Theme

"The Steamboat Era," among all of the themes identified in the state archeological plan (Smith et al. 1983), stands out in terms of its relevance for 16B0358. The remains of any nineteenth century vessel have the potential to further our understanding of this theme. It therefore deserves special attention in any discussion of the historical context for 16BO358.

The Introduction of Steam to Navigation

The identity of the portion of the Red River around Shreveport is as much linked to steamboats as it is to cotton. It was river transportation that opened the region to development, and the advent of steam traffic made it possible for settlers and their descendants to move a bulky staple such as cotton to market. Steam vessels visited the lower reaches of the Red River early. Robert Fulton's *Clermont*, the first commercially successful steamboat on American waters, made its first run in 1807 on the Hudson River (Hunter 1993). Less than a decade later, in 1814, David French's *Enterprise* ran upstream against the Red River current to reach Alexandria (Coastal Environments 1992:33). In the following year, *Enterprise* successfully negotiated the rapids at Alexandria and made it up to Natchitoches. Other vessels quickly followed, such as the *Pike*, registered on the Red River in 1818 with a homeport at Alexandria, the *Newport*, converted to steam in 1818 and operated on the Red River until her loss in 1820, and the *Beaver*, which ran from New Orleans to Natchitoches after her launching in 1819 (Coastal Environments 1992:33-34).

These vessels were harbingers of an explosion in riverborne commerce that occurred in the west between the War of 1812 and the Civil War. Prior to this period, the Appalachian Mountains effectively had blocked the movement of agricultural products and finished goods between the western settlements and the east coast. Although crops and other materials theoretically could move down the interior rivers to New Orleans and thence through the Gulf of Mexico to the East Coast and Europe – with a corresponding reverse movement of goods into the interior – political realities made this exceedingly difficult prior to 1803. The sale of Louisiana to the United States in that year, however, removed this obstacle. The advent of steam navigation combined with the Louisiana Purchase to open up the Ohio/Mississippi river system and more firmly tie the west to larger commercial networks. In 1817, shortly after the debut of French's *Enterprise* on the Mississippi and Red rivers, 17 steamboats were plying the waters between New Orleans and the upper Ohio River. By 1820, the number had more than quadrupled to 69 vessels, and by 1855, 727 steamboats were moving people and goods on these rivers and their tributaries (Still, Watts, and Rodgers 1993:63).

The power plants behind most of these western vessels were high-pressure steam engines, and they were placed inside a hull and superstructure which was unique and distinctive. The evolution of these engines and vessel forms was the result of experimentation and adaptations in response to the potential of western rivers and the peculiar environmental constraints they placed upon navigation.

Early River Navigation

Prior to the development of steam as a propulsive power, movement up or down the rivers of North America was driven primarily by current, wind, or man-power. The capture of wind power by sails was ineffective on western rivers, due to their often powerful currents, the

narrowness of many channels, and the rarity of straight river reaches. As a result, early traffic on western rivers such as the Ohio and Mississippi drainages was propelled by the current or by people. The two most common forms of vernacular watercraft in this tradition were keelboats and flatboats, and elements of both would be used in the later development of western steamboats.

Keelboats. Keelboats were long, narrow vessels designed for use on shallow waters (Baldwin 1941: 44). Accounts of keelboats indicate that they were of a frame-based construction with a rockered keel and a cabin which spanned most of the boat. The strong four-inch square keels that gave them their name absorbed the blows of grounding in shallow waters (Allen 1990:66), and steering was accomplished with a long oar that pivoted on the top of the sternpost. Keelboats ranged in size from 40 to 80 feet long, with a breadth of seven to ten feet (Baldwin 1941: 45), and carried cargoes of between twenty and forty tons (Allen 1990:66).

Unlike flatboats, keelboats were used for upstream navigation as well as downstream. Given the widely varying conditions of the western rivers, several means were used to propel the craft against the river current. Most carried one or sometimes two sails, but favorable winds were intermittent at best. The workload fell squarely on the shoulders of the keelboat men. Depending on the conditions, keelboats were propelled by sail, poling, cordelling, or warping. Poling, the most common method of propulsion, was achieved by several men setting their poles against the river bottom and walking along cleated running boards toward the stern. The vessel was propelled one boat length each time a keelboat man walked from the bow to the stern. When the river was too deep to pole, a method called cordelling was used. This consisted of attaching a rope (the cordelle or hawser) several hundred or more feet long to the mast of the keelboat. A group of keelboat men would tow the vessel from the river bank or tow path (Baldwin 1941: 65; Allen 1990:70-71). This technique was limited to areas where the riverbanks were at least moderately hospitable to foot travel. The final method, warping, was used as a last resort. A group of keelboat men paddled or rowed a skiff upstream and attached the cordelle to a tree or snag. A capstan or windlass then was used to draw the keelboat upriver. A variant of this approach, used along wooded banks, was known as “bushwacking” and involved grabbing onto branches or bushes along the shore and using them to pull the boat upstream a little at a time (Allen 1990:71).

Although keelboats often are thought of as a primary means of river transport prior to the introduction of steamboats, the reality is that their slow and laborious upstream movement limited their utility. Upstream trade accounted for less than ten percent of the total commerce on the river after 1803, and little of that trade moved farther upstream than Natchez (Allen 1990:63). The bulk of the trade on western rivers moved via flatboats, and the trade persisted well into the century.

Flatboats. Flatboats were used solely for downstream transportation, having no means of moving against the current. Hastily constructed, they usually were dismantled and sold as timber when they reached their destination (Baldwin 1941: 49). Flatboats ranged in length from 20 to 100 feet, and had a beam of 12 to 20 feet (Baldwin 1941: 47); they averaged sixty feet in length and fifteen in width (Allen 1990:67). Contemporary depictions indicate they were bottom-based craft with a boxlike hull and sides that often extended about six feet above the water line. A roofed cabin often spanned a large portion of the vessel, and large oars were used for steering. Allen (1990:67-68) describes the construction of flatboats as follows:

> Professional boatbuilders appeared on the Upper Ohio as early as the 1750s and, by 1800, were working in boatbuilding centers such as Pittsburgh, Wheeling, Cincinnati, Louisville, and St. Louis. Although flatboats and keelboats became larger and more comfortable during the nineteenth century, the techniques for building them remained much the same. Keels and barges were always built by

> professional boatbuilders, but a flatboat could be assembled by any farmer or frontiersman who had some tools and a little help and advice. Flatboatman Miles Stacy of Marietta, Ohio, built all his own boats, felling and drafting "8,000 feet of lumber to build a boat 75 feet long." He framed the craft with "straight yellow poplar...gunnels," cross-ties, and "stringers," all hammered together with "some two thousand " wooden pins made of "seasoned white oak." Planks "were fastened to this framework and all the seams calked tight with oakum." The boat was built upside-down at the water's edge, and Stacy and his crew launched it and then piled rocks on one side until the weight tipped the boat rightside-up.

The flatboats and keelboats were invaluable to the settlement of the West. In the absence of any other more efficient means of transportation, they were essential in moving trade goods and people throughout the region. Their lack of effectiveness in upstream travel hampered their profitability, and eventually lead to their extinction. These craft, however, established a basic shipbuilding. The growth of this tradition, enhanced by the early arrival of professional boatbuilders along the rivers, laid a foundation that was borrowed heavily from in the construction of steamboats. The towns that were centers of keel and flatboat construction would also become centers for the construction of steamboats.

Eastern Steamboats. Once Fulton demonstrated that steam engines could be used to power watercraft, other builders began to use them in riverine and ocean-going vessels. Most of the steam-powered vessels that operated in the eastern United States during these early years utilized low-pressure, condensing engines. Typically, these low-pressure engines used a vertical cylinder and only a few pounds of steam pressure per square inch. The cylinders were double-acting, and steam was exhausted from the cylinder into a condenser, where a blast of cold water condensed the steam, reducing its volume and creating a partial vacuum. This vacuum was what primarily drove the piston, assisted by the pressure of steam. Low-pressure engines required cylinders with a large diameter to produce sufficient power to move a vessel at any speed or against a current. With vertically mounted engines, the piston moved up and down, and the movement was transferred to the paddle indirectly, via an overhead system such as a walking beam or half-beam. These beams required significant amounts of space, as well as heavy structural bracing (Hunter 1993:133-134).

The weight of such a large cylinder, combined with the weight of a condenser, the heavy structural framing for the engine, and the machinery for overhead power transmission, all placed specific demands on the hull of a steamboat and had consequences for its draft. Vessels which were heavily built could carry such a burden, and relatively deep water draft was not a drawback on rivers such as the Hudson (Hunter 1993; Still, Watts, and Rodgers 1993). Eastern steamboats therefore followed the traditional shipbuilding models designed for ocean-going vessels. These boats were solidly built, with heavy keels and framing.

This type of design was less successful on western rivers, which had shallow water for much of the year. In the 1880s, Hall (1880:174) summarized the conditions on the Ohio:

> The Ohio is subject to great fluctuations in the depth of water. In August and September the river is so low that sand-bars and ledges show up from the river bed with not more than 18 inches of water over them, and hundreds of steamboats have to be laid up at Pittsburgh and Cincinnati in consequence. Three times in the year the river rises, namely, in February, in May or June, and in November, the spring rise being the highest. At Cincinnati in 1832 the river rose 63 feet above the low water mark. Commercial activity is intimately connected with the periods of deep water.

Steamboat navigation was to varying degrees seasonal, with travel often commencing in September and ending in April (Walworth 1850:230). The fluctuations in depth on these rivers joined with numerous sand bars and shoals to place a premium on shallow draft. Although early vessels utilized on western rivers followed the eastern model, the success of steamboating would require modifications to that design. This was accomplished through changes in the engines and through architectural changes in the hull and superstructure.

Early Steam Engines on Western Rivers

The high-pressure engines that rapidly became the standard on western steamboats were significantly lighter than their low-pressure counterparts. Using pressures ranging from 40 to over 150 pounds per square inch, high-pressure engines dispensed with heavy condensers and utilized a smaller cylinder, with a shorter stroke. Steam pressure alone moved the piston, after which the steam was vented into the air. New water constantly was taken into the boilers in this engine design, and although they used more fuel as a result, they produced much greater power (Hunter 1993; Still, Watts, and Rodgers 1993). Oliver Evans usually is credited with developing the first high pressure engine in 1801 (Still, Watts, and Rodgers 1993) and most engines were built according to this plan, although a smaller number of vessels used the oscillating high-pressure engines built by Daniel French.

The rapid development of steam technology and the innovations adopted by early builders is traced most easily through a consideration of some of the engines developed for use in the west between 1811 and 1818.

New Orleans (1811). Steamboating in the West was initiated by Robert Fulton in 1811 when he built the *New Orleans*. Fulton chose Pittsburgh as the location to build his steamboat. The keel was laid along side Beelen's foundry on the banks of the Allegheny River. The infrastructure was present for the construction of a steamboat, but skilled labor, in the form of shipwrights and machinists, had to be brought in from New York City (Latrobe 1871:11-12). Even with the shipyard's proximity to a foundry, it was likely that some of the machinery was cast in New York (Morrison 1901:192). Very few specifics concerning the type of engine used on *New Orleans* have survived. The engine was of the low pressure variety with a 34 inch (0.86m) cylinder (Latrobe 1871:12).

Comet (1813). *Comet*, a diminutive sternwheeler of only 25 tons (23 metric tons) (Hall 1838:230), was the first western river steamboat to be propelled by a high pressure engine (Gould 1889:167). The vessel was built in Brownsville, Pennsylvania, with an engine based on a patent granted to Daniel French in 1809. This patent was for an oscillating steam engine for propelling boats (Hall 1837:230). *Comet's* engine apparently did not function well, because after less than a year of service the engine was removed and sold to a saw mill (Gould 1889:167).

Enterprise (1814). Daniel French's second steamboat ran more successfully than his first. The 45 ton *Enterprise* had a length of 80 ft (24.4m), a beam of 30 ft (9.1m) and a depth of hull of 12 ft (3.7 m). Following his patent, the engine was a 24 horsepower oscillating high pressure engine. Steam was raised in two cylindrical boilers 25 ft (7.62m) long, and 27 inches (.7m) in diameter, with at least one flue through each (Marestier 1824: 59). *Enterprise* had several successful voyages under Captain Henry Shreve, but was lost under the command of Captain D. Worley (Hall 1837: 231).

Vesuvius (1814). A detailed account of an early steamboat in the West comes from the journey of Edouard de Montulé onboard Robert Fulton's *Vesuvius*. *Vesuvius* was constructed in Pittsburgh 1814. She had a length of 160 ft (48.7m), a beam of 30 ft (8.5m), and a custom house measurement of 394 tons (358 metric tons)(Marestier 1824:9). Montulé's account of *Vesuvius* in 1816 or 1817 is the most thorough description yet discovered of an early steamboat used on the western rivers. He describes this sidewheeler as carrying one square sail in the bow and having an eighty foot long quarter deck (Montulé 1951:101). Although not explicitly stated, Montulé's description reveals that *Vesuvius* was propelled by a low pressure engine. His narrative of its working lacks many technical details, but it is enlightening.

> The water is contained in a large boiler, filled half full. A fire is built beneath, and the steam, seeking an outlet, rushes into a cast-iron pipe eight inches in diameter, which soon divides into two branches; one runs into the top of a big cylinder, three feet across and very strongly built, contains a piston which, continually bathed in oil, fits it exactly like that of a pump. This is made of iron and is very heavy. It is this piston which the steam must drive up and down and then put the wheels in motion. To this end, the cylinder is pierced by four holes, two at the top and two at the bottom, and diametrically opposed. Each of these has a valve. Let us suppose the piston to be at the bottom, and that it is set in motion. The steam forces its way through the first valve, and the instant this opens inwardly, one of those at the top opens also, but outwardly, in order to allow the air to escape. The steam entering through the lower valve, causes the piston to rise, and in so doing meets with no resistance. When it reaches the top, the valve which hitherto had remained closed, opens, and the other top valve closes. The steam enters, drives the piston from the top to the bottom, then the valve in this part opens, allowing the first steam to escape. Arrived at the bottom of the cylinder, it goes up again, and thus is in motion (Montulé 1951:102-103).

There is no mention of a condenser in Montulé's description, despite the fact that Fulton built all of his steamboats on the low pressure condensing engine plan pioneered by Bolton and Watt. Montulé goes on to speak of the dangerous pressure of steam in the boiler and a safety valve that carried a weight of 16 pounds (7.3kg) (Montulé 1951:104). This discrepancy may be explained by the tendency of early western river engineers to disconnect the condensers, and exhaust the steam directly into the air (Gould 1889:167). This adaptation represents a transitional step between the low pressure condensing engine and the high pressure engine.

Washington (1816). *Washington*, a 400 ton (364 metric tons) (Marestier 1824: 59) sternwheeler built by Henry Shreve in Brownsville, Pennsylvania, typically is viewed as the prototype of the later western river steamboats because of its engine type and layout. Much of the historic evidence is contradictory, but it can be said with certainty that *Washington* was the first steamboat to have a high pressure engine with a horizontal cylinder. This attribute, as well as the placement of the machinery on the main deck, was adopted on nearly all later western river steamboats. The engine had a 6 ft (1.83m) stroke and a cylinder with a diameter of 24 inches (.61m) (Morrison 1901:207). It had a powerful 100 horsepower engine that weighed only 9921 pounds (4500 kg) (Marestier 1824:59). The loss of *Washington* and seven of its passengers when one of its boilers burst was the first of many explosions on the western rivers that would stigmatize the high pressure engine.

Western Engineer (1818). The *Western Engineer* was built in Pittsburgh, Pennsylvania under the supervision of Major Stephen Long of the U.S. Topographical Engineers. The vessel was a sternwheeler with a length of 75 ft (22.9m) and a breadth of 13 ft (4.0m). *Western Engineer*

was designed for the exploration of the country on the Missouri River, and consequently the hull drew only 30 inches (0.76m) of water (Gould 1881:109). The high pressure engine of this steamboat had one improvement which was subsequently incorporated on all later western river steamboats. "By...use of the cut off cam...the steam is made to act with its full (or boiler) force through about five-eights of every stroke of the piston; and by its inherent or expansive force only, through the residue of the stroke, thus nearly doubling the efficiency of the steam power, in comparison with that previously employed in western river boats" (Walworth 1850:550). The vessel was powered by three cylindrical boilers, 15 ft (4.6m) long and 20 inches (.51m) in diameter. The boilers carried a working pressure of 96 pounds (43.6kg) per square inch (2.54cm), which on occasion was raised to 128 pounds (58.1kg) (Long 1831: 244).

Although a variety of innovations in engines can be seen in these early vessels, generally they lacked many of the structural features that typified the later western river steamboats. Instead, they more closely resembled ocean-going vessels, having deep drafts and heavily built hulls, as well as commonly carrying one or more sails, a bowsprit, and a figure head. Typically, the hull still contained the machinery and the passenger quarters (Hunter 1993: 65). The earliest western river shipwrights worked around the shallow draft problem by building smaller vessels that naturally drew less water (Hunter 1993: 72).

Evolution of Western River Steamboat Engines

The contest between the low and high pressure engine continued through most of the 1820s, but by the end of the decade the latter came to dominate. The rapid adoption of the high-pressure engine in western steamboats led to a somewhat standardized machinery layout as the century progressed, although there were no widely accepted specifications. The fireboxes used to heat the water were located in the front third of the vessel, along with the boilers. The boilers were long and cylindrical in shape, with their long axis oriented parallel to the long axis of the vessel. Beneath the boilers were drums to collect the sediment from the feed water, and they were connected by a steam drum overhead. Two tall smoke stacks were attached to the forward end of the boilers. The steam was sent to engines that originally were mounted vertically, but by the 1830s usually were mounted horizontally or slightly inclined (Still, Watts, and Rodgers 1993:64). With the introduction of a horizontal engine (Figure 24), energy could be transferred more directly by connecting the piston to the crank or wheel solely through a "pitman," or connecting rod (Hunter 1993:136). On western steamboats, the engines were "laid horizontally on the deck, one on either side of the boat, with pistons and long connecting-rods directly attached to the paddle-wheel shaft, and were worked with a pressure of from 50 to 150 pounds of steam, and with a long, slow, powerful stroke" (Hall 1880:175). Up to the 1850s, they generally turned paddle wheels mounted on the sides of the vessel, although stern mounted wheels became the rule on vessels constructed from the 1860s on (Still, Watts, and Rodgers 1993:67).

Some of the advantages of this new system are clear. High-pressure engines were significantly lighter in weight, they eliminated the need for heavy condensers, and when mounted horizontally they abolished the heavy beam system and attendant bracing (Hunter 1993:133-134). They also produced more power. Informed, contemporary observers had little doubt as to the advantages conferred by these new engines, as evidenced by the testimony of civil engineer Edwin F. Johnson in the Wheeling Bridge case:

> The conditions important to that navigation are lightness of draft of the boats, and a sufficient power in the engine to propel boats at the required speed. To this end it is essential that the engines with their appurtenances should have the least

> possible weight; this is attained by dispensing with the condensing apparatus and giving the cylindrical form to the boilers; so as to use, with greater safety, steam of a high pressure, in boilers of a small size and weight (Walworth 1850: 224).

Less obvious, but equally important, is the fact that such engines were cheaper to build, as well as simpler and more reliable. The engine used on the *Enterprise*, for example, is said to have used "but one-tenth the total parts and less than one-half the moving parts" found in low-pressure engines with beams (Hunter 1993:137). This meant less skill was required for manufacture and repairs were vastly simplified and cheaper, a matter of serious concern on western rivers where skilled mechanics might be few and far between.

The lack of generally accepted specifications for machinery design and layout, although it poses problems for historians, almost certainly encouraged experimentation and innovation by builders who had no set tradition to follow. The lack of standardization is shown by the general absence of plans or "blueprints" for construction and by the testimony of many builders themselves. Steamboat builder Reuben Miller's 1850 testimony on boiler construction in the Wheeling Bridge case reveals that there were no general rules for the construction of the furnace, the grate bars, the diameter of the flues, or the diameter and length of chimneys (Walworth 1850: 224). This lack of standards makes it important to summarize what is known about steamboat machinery in the mid-nineteenth century.

Boilers. Although technical literature regarding the design and development of the machinery of western river steamboats generally is scarce, high pressure boilers are one exception to the rule. The tendency of boilers to explode, often taking many lives, placed them under public scrutiny again and again during the nineteenth century. The horrific loss of life and the possible remedies to prevent boilers from exploding were investigated in numerous technical journals, and by the Congress of the United States. A clear understanding of the power plant of the western river steamboat can be drawn from this information.

The boilers for steamboats on the western rivers were long and cylindrical, and positioned horizontally on the main deck. They were constructed with little regard for efficiency, with the qualities of minimum weight, bulk, and cost, prevailing over all others (Hunter 1993: 153). They were revered by engineers on the western rivers for their ease of cleaning and repair, and reviled by many others for their tendency to explode (Figure 25).

Boilers, with only a few exceptions in the early years of steamboating, were constructed of iron (Littlefield 1831: 309). The boiler shell was assembled of rolled iron plates joined by iron rivets. Iron plates were fabricated by piling several slabs of iron on top of each other and passing them, at a high heat, between rollers (Locke 1838: 24). Boiler shells in the 1830s had thicknesses of one fifth to one sixth of an inch, but were increased to one quarter of an inch by 1850 (Walworth 1850: 453). The shell was sealed at each end by a boiler head. Cast iron heads were used through the 1830s because of the ease of their manufacture, but cast iron was subject to cracking through repeated heatings (Williams 1831: 289). In later years boiler heads were constructed of wrought iron (Hunter 1993: 155).

The number and dimension of boilers varied through time as steam engine builders experimented to find a design that combined minimum weight and cost with maximum strength and power. In the 1820s, two to three boilers with diameters of 18 inches (.46 m), and lengths of 18 ft (5.5 m) were sufficient for powering a steamboat, but this soon increased. In the mid-1830s, eight boilers with diameters of 3.5 ft (1.1 m) and lengths of 23 ft (7.0 m) were not uncommon (Water 1838: 321-324). The disadvantage of the extra weight in iron and water of so many boilers

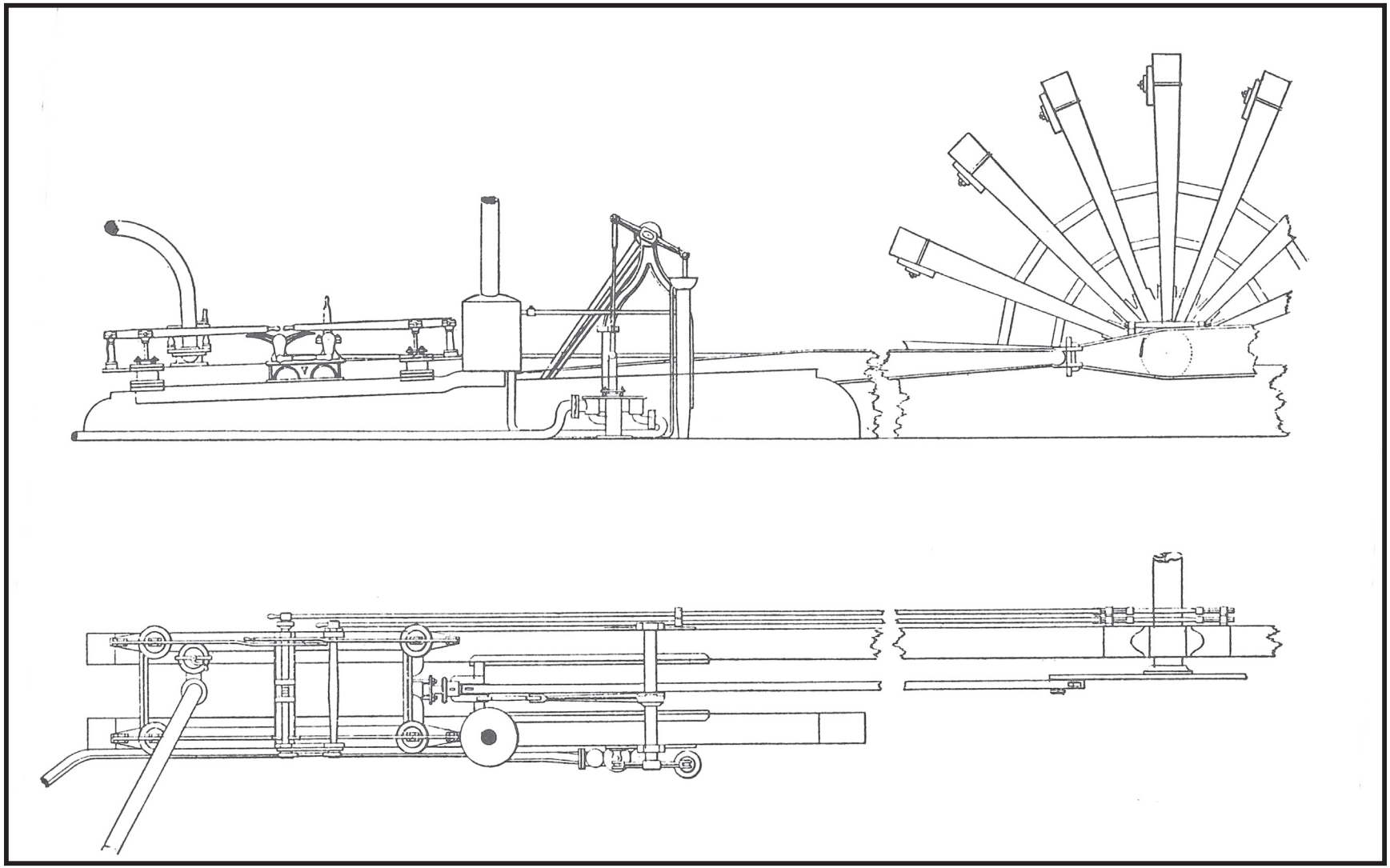


Figure 24 Early example (ca. 1837) of a high pressure, horizontal steam engine (from Hunter 1993)

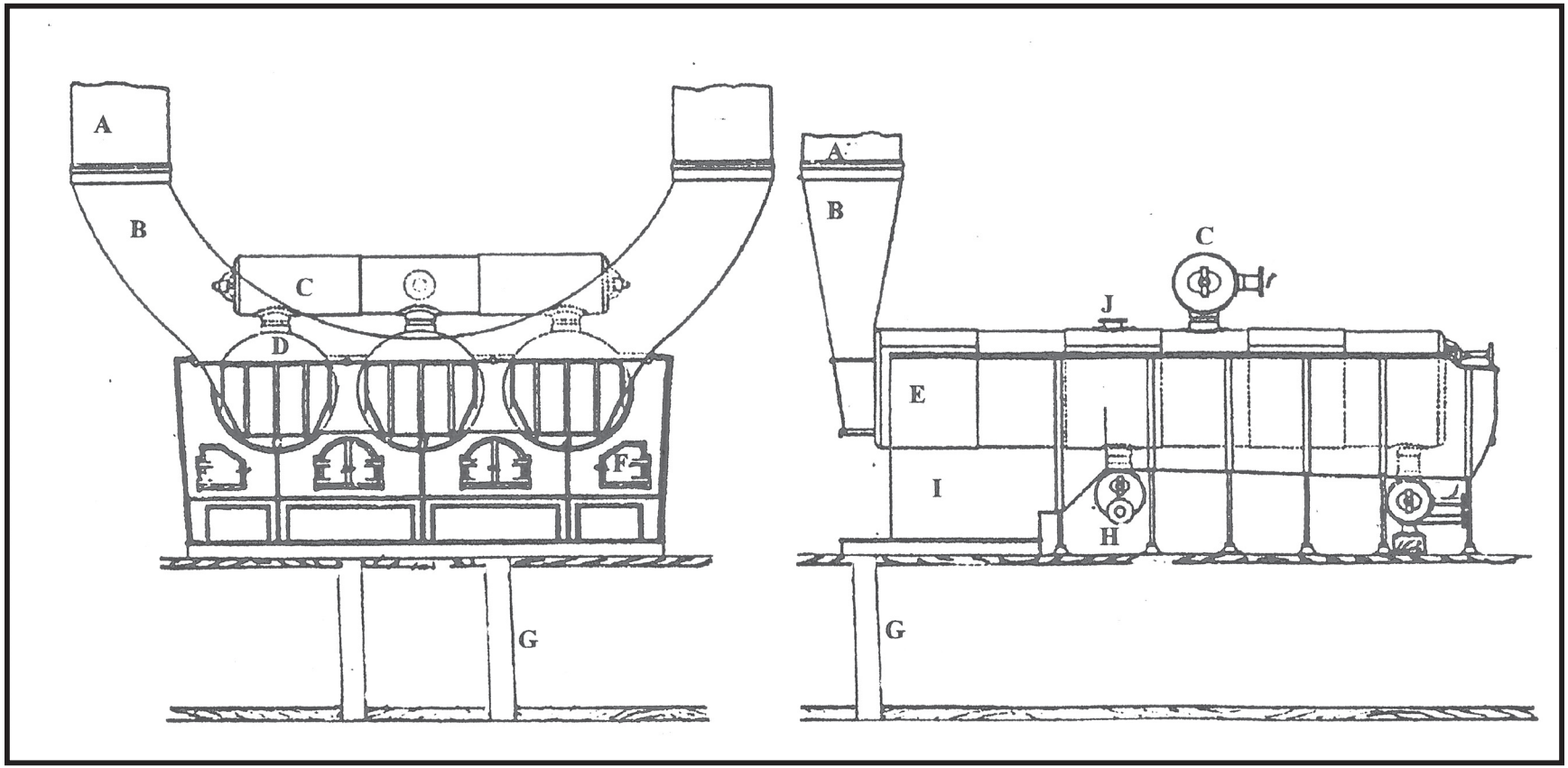


Figure 25 Typical boilers of a western river steamboat. A- Stack, B – Stack Breeching, C – Steam Drum, D – Boiler Head, E – Boiler, F – Furnace Door, G – Ash Well, H – Mud Drum, I – Furnace, and J- Safety Valve Nozzle. After Bates, *The Western Rivers Engineroom Cyclopoedium*

subsequently was realized, and in the following decade the trend was reversed. By 1850, four or five boilers were typical, with similar diameters, but an increase in length up to 28 (8.53 m) to 30 ft (9.14 m) (Walworth 1850: 635-639).

The fire was generated in the furnace at the forward end of the boilers. The position of the furnace, combined with the longitudinally oriented boilers, created a strong natural draft (Stevenson 1838: 152). Access to the furnace was through the furnace doors, located in between every boiler. The grate, upon which fuel was placed, averaged four ft (1.2 m) in depth (Walworth 1850: 635-639), and spanned the width of all of the boilers. Openings between each grate bar varied from five eights of an inch (1.6 cm) for coal to one inch (2.5 cm) for wood (Walworth 1850: 89).

Flues channeled hot gases from the furnace through the inside of the boiler, transferring heat from the furnace to the water and producing steam. In the years following 1860, the number of flues increased to up to six per boiler, but two was the standard between 1830 and 1860. Flues served to increase the efficiency of the boiler, but they introduced a weakness into the design. Flues ran through the center of the boiler, and thus, had the potential to be exposed if the water level in the boiler dropped too low. Without the relative cooling effect of the water, the flue would become red hot. Two unpleasant outcomes often resulted from this situation. The heat from the furnace caused the flues to become malleable and collapse, thus exploding the boiler; or the low water level was discovered and water added to remedy the deficiency. This second action would result in a dramatic increase in steam pressure from the instantaneous vaporization of the water when it hit the red hot flue. Sometimes the boilers would hold, and sometimes they would not.

Throughout the development of the western river steamboat, boilers were equipped with two basic safety devices designed to remedy this problem: the gauge cocks and a safety valve. Gauge cocks (Figure 26) were a series of three small valves located one above the other on the boiler head. They were positioned just below, equal to, and above the desired water level. The cocks were opened with a gauge stick (a broom handle): if water flowed when the highest gauge was opened, the water supply was cut off; if water flowed from the middle, but not the upper gauge, a normal supply of water was in the boiler; if only the lower gauge exhausted water, then more water was added. And if all of the gauge cocks were dry "there followed a guessing match as to just how far below the minimum the water really was, and what would be the result of throwing in a supply of cold water. The supply was always thrown in, and that quickly, as time counts in such cases" (Merrick 1909: 39).

The one or two safety valves (Figure 27) found on western steamboats were a subject of much controversy, as they tended only to create a false sense of security. In 1831, only half of the safety valves were more than one half the size of the throttle valve, and no more than one third of the steamboats were equipped with more than one (Benton 1831: 313-314). When enough steam built up in the boiler to open the safety valve, the width of the opening and the number of valves often were not large enough to expel a volume of steam sufficient to avoid an explosion. Safety valves were held down by a moveable weight, called the pea, on a lever known as the death hook (Bates 1996: 18). The death hook was so named because of the habit of the engineers to weight it down excessively to increase the pressure in the boiler. This practice was frowned upon, and various attempts were made to lock the safety valve away from the engineer, or to impose heavy fines for weighting it (Shield et al. 1844: 20).

The boilers of western river steamboats, although exempt from the corrosion problems inherent in using salt water, were subject to the drawbacks of using the silty water of the Mississippi Basin. Sediment and plant debris quickly accumulated in boilers and had to be

removed. The accumulation of sediment reduced the efficiency of the boilers and had the potential to form a crust on the boiler and flues, effectively sealing them off from contact with the water (Cist 1841: 69). Without contact with water, no heat was transferred from the flues. Aside from lowering the efficiency of the engine, the iron flues could become red hot and rupture. The unpleasant job of cleaning the boilers was conducted several times per journey, and normally by a cub-engineer. The experience of George Merrick as a cub-engineer accurately characterizes this task.

> Being a slim lad, one of my duties was to creep into the boilers through the manhole, which was just large enough to let me through; and with a hammer and a sharp-linked chain I must "scale" the boilers by pounding on the two large flues and the sides with the hammer, and sawing the chain around the flues until all the accumulated mud and sediment was loosened. Scaling boilers was what decided me not to persevere in the engineering line. To lie flat on one's stomach on the tip of a twelve-inch flue, studded with rivet heads, with a space of only fifteen inches above one's head, and in this position haul a chain back and forth without any leverage whatever, simply by the muscles of the arm, with the thermometer 90° in the shade, was a practice well calculated to disillusionize any one not wholly given over to mechanics (Merrick 1909: 37).

Cleaning the boilers was required less often after the advent of an iron cylinder located below and perpendicular to the boilers. Sediment accumulated in this mud drum and was blown off several times a day (Bates 1996: 10).

Steam pressure gauges, despite their apparent necessity, were not common on western river steamboats. Open tube mercury gauges had long been available for low pressure boilers, but the excessive height of the column of mercury required to measure the steam pressure in a high pressure boiler prevented their widespread use (Hunter 1993: 163). The invention of the Bourdon bent tube gauge in 1845 provided an adequate pressure gauge, but western river engineers were slow to adopt these. In 1852, Samuel Gilman noted that only a minority of the steamboats carried steam gauges, the actual working pressure being mere conjecture (Gilman 1852: 210).

Essential to the operation of the steam plant was a means of filling the boilers with water. This was accomplished with a feed water pump that took its motion from the engine. The feed pump worked well, as long as the engine was in motion. Often during stoppages the paddlewheels would be thrown out of gear so that the engines could continue to work (Stevenson 1838: 157). This was a wasteful and inconvenient technique, and frequently the dangerous practice of not adding water to the boilers during stops was adhered to. The feed water pump was largely replaced with the doctor, an independent donkey engine, by 1850 (Walworth 1850: 531). The name doctor was given to the device because of the claim that it cured all the evils of the western river steamboat by supplying a steady stream of water to the boilers (Rees 1907: 345). The doctor was also used to pump out the boat in case of an accident, and to supply the hose in case of a fire (Walworth 1850: 49).

Engines. The engine of a western river steamboat (Figure 28) was not an awe-inspiring sight; it had little if any bright work (Hodge 1840: 125) and generally lacked the refinement that was common in other types of steamboat engines. Despite its plain appearance, it was finely adapted to the function which it served. It was a light, powerful, inexpensive, and easily maintained machine. In 1860, Norman Russel, a British naval architect noted that in comparison to a comparable ordinary condensing engine, the engine of a western river steamboat was 60 per cent cheaper and 55 per cent lighter (Russell 1861: 123-124).

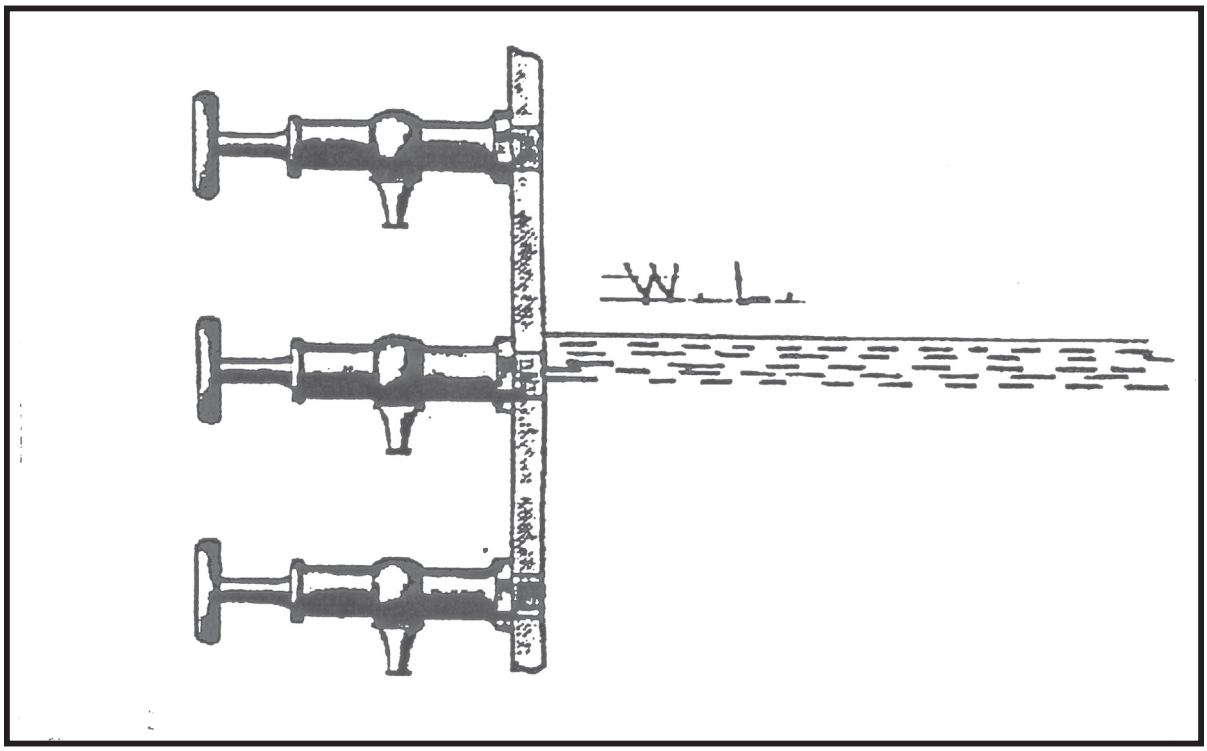


Figure 26 Profile of a boiler head sowing the gauge cocks. From Bates, *The Western Rivers Engineroom Cyclopoedium*

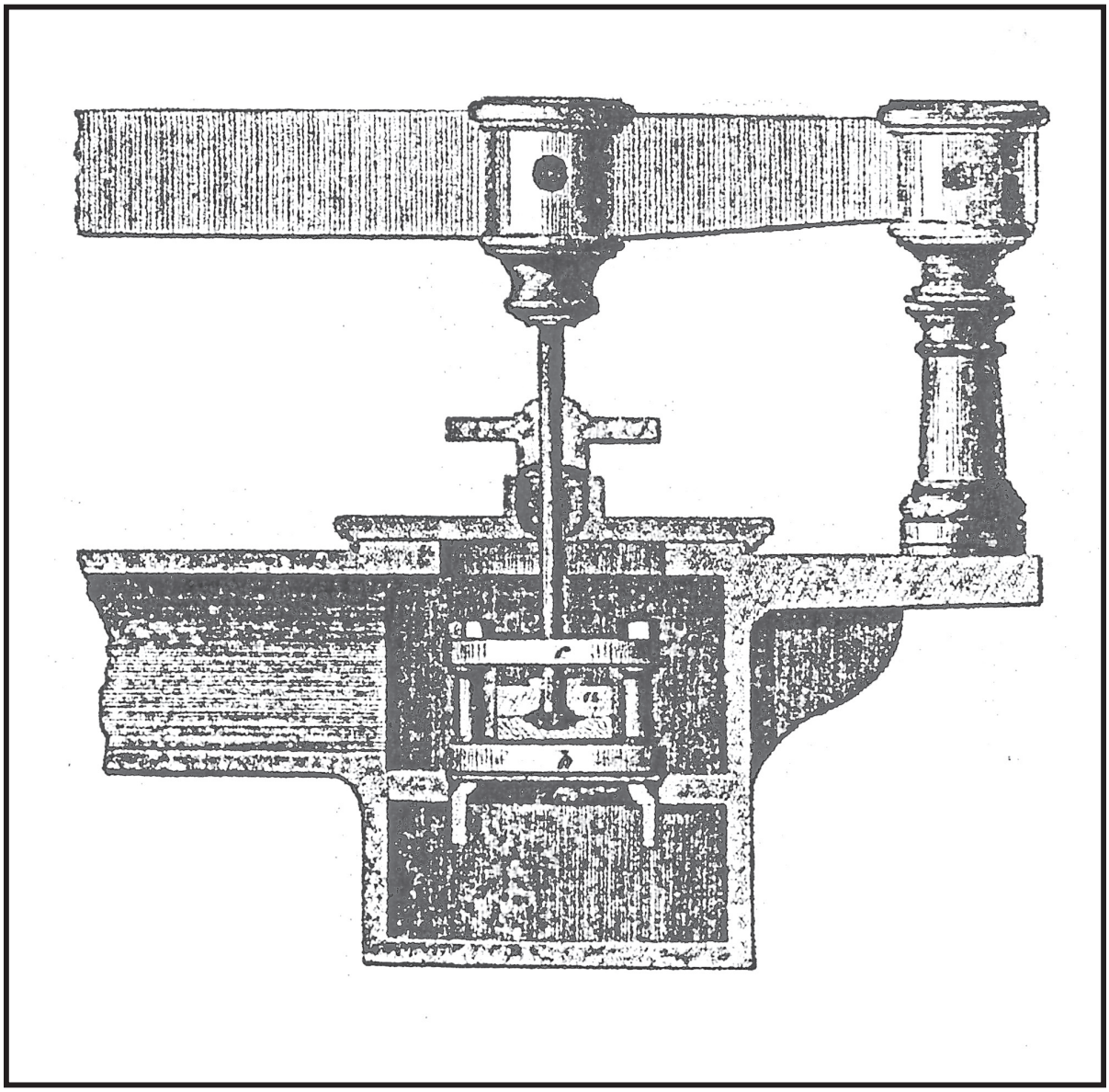


Figure 27 Cross section of a safety valve, from *Transactions of the Institution of Naval Architects*, London, 1861

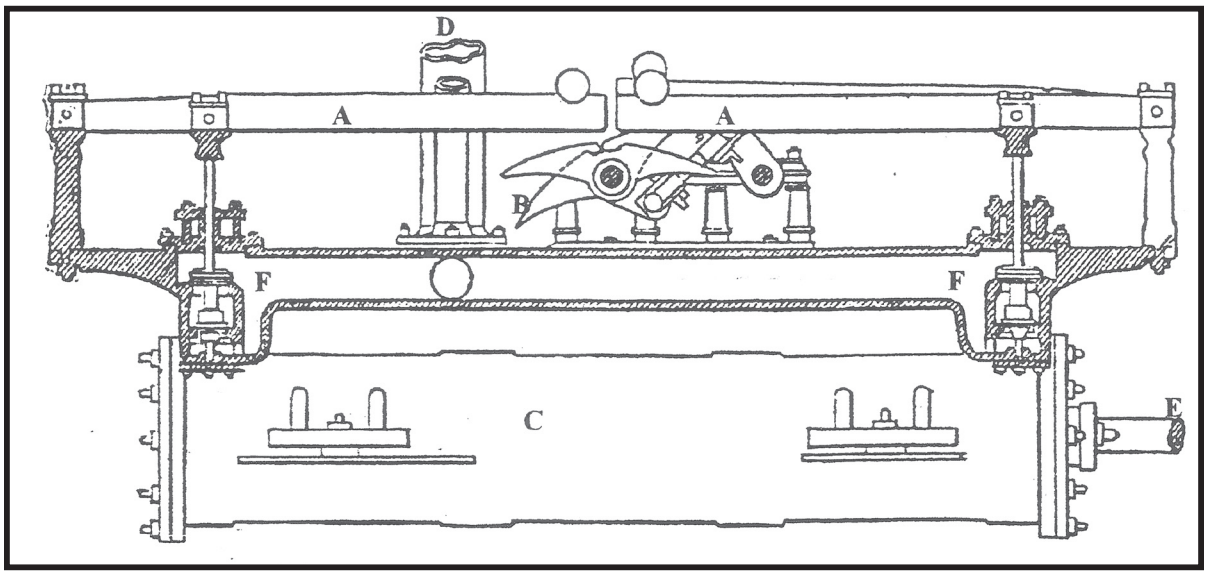


Figure 28 Cross sectional view of a steam cylinder equipped with the poppet valve system. A – Valve Levers, B – Wipers, C – Cylinder, D – Steam Pipe, E – Piston Rod, and F – Poppet Valves. After *Transactions of the Society of Naval Architects and Marine Engineers*, 1909

Early western river steamboats had one engine, but after 1840 many of the larger packets were equipped with two engines (Merrick 1852: 344). Two steam engines were more powerful than one, but the primary advantage was in the maneuverability provided by two engines. The ability to stop or back one paddle wheel while keeping the other going forward was essential in the navigation of narrow winding rivers. Steam pressure slowly was increased through the years, and by 1850 pressures of between 130 and 160 pounds per square inch were typical for packets on the Ohio River (Walworth 1850: 636-639).

The steam engine in the western river steamboat rested on a heavy timber frame. The base of the timber frame was mounted on the floors in the bottom of the hull (Ward 1909: 85). The timber frame continued for the length of the engine, and it angled upward and aft so that it also supported the paddlewheel shaft.

The heart of the steam engine was its cylinder. The cylinder was oriented just above horizontal, at an angle sufficient to intersect the center of the paddlewheel shaft. Cylinder size increased considerably in the early years of steamboating, with the average cylinder diameter of 20 inches (.51 m) in 1827 increasing to 28 inches (.71 m) by 1838 (Water 1838: 321-324). After 1840 cylinder diameters stabilized primarily due to the trend toward using two engines (Hunter 1993: 143).

Admission and exhaust of steam to and from the cylinder was effected in four valve chests and regulated by the poppet valve system (Figure 28). In this system the cylinder was cast with two nozzles at each end. Each nozzle was fitted with a valve chamber, with one chamber on each end for the admission of live steam and likewise for exhausting steam (Ward 1909:85). During each stroke of the piston, steam was admitted to one end of the cylinder, and simultaneously exhausted from the other. The steam being admitted was cut off at some point in the stroke and allowed to expand for the remainder of the stroke. This process then repeated itself at the opposite end of the cylinder (Bates 1996:39).

The timing of poppet valves was governed by two cams on the paddle wheel shaft. The cams, oblong discs mounted on the paddle wheel shaft, were enclosed in a cast iron frame or yoke. The yoke was attached to a long wrought iron bar called the rock shaft. The rock shaft was fitted with a double wiper, whose alternating motion lifted the levers and opened or closed the valves on the cylinder (Russell 1861:125). The amount of steam admitted into the cylinder could be controlled manually by inserting a two and one half inch (6.4 cm) square billet of wood, called the club, between the rocker arm and the lever which lifted the inlet valve. Inserting the club at the proper time would feed additional steam to the cylinder, thereby providing extra energy to the paddle wheel (Merrick 1909:41-42). When the paddle wheels rotated, the cam was turned, and that circular motion was imparted as an oscillating motion to the frame and rock shaft. The full stroke cam (Figure 29) opened the exhaust valves, while the half stroke cam let steam into the cylinder (Russell 1861: 125). The half stroke cam, also known as the cut off cam, was shaped so that the steam would be cut off at one half, five eighths, or three fourths of the stroke (Ward 1909: 85).

Upon completion of each stroke of the piston, steam was exhausted through a metal cylinder used for heating the water before it was fed to the boilers. The heated water was fed via the feed water pump or the doctor to the boilers. The steam was exhausted in one of two ways. Most commonly it was simply exhausted via a stack that passed through the upper works of the vessel, but in other instances it was vented into the paddle wheel housings to prevent the formation of ice on the paddle wheels (Tredgold 1851: 40-41).

Power Transmission. The reciprocating motion of the piston and piston rod was transferred to the paddle wheel shaft via a crosshead, a connecting rod and a crank. The crosshead was connected directly to the piston rod. The crosshead was fitted with a wrist pin which allowed the connecting rod to pivot on it (Bates 1996: 39). The connecting rod, known as the pitman on western river craft, was constructed of a wooden timber tapered at the ends with two iron straps bolted around the edges (Russell 1861: 124). The crank, which was attached to the after end of the pitman, was rotated by the pitman, and thus, turned the paddle wheel.

Even the early steamboats on western rivers had sophisticated power transmissions that allowed pilots to slip the wheel into "neutral," engage only one wheel at a time, or direct the wheels on either side of a side-wheeler in opposite directions, thus providing for greater maneuverability in tight areas. A good discussion of this system on early Red River vessels was given by Norman (1942:403-404):

> A heavy wooden flywheel was necessary for the smooth operation of this steam engine; it also enabled the engineer to prevent "stalling" his engine on "dead center" when it was necessary to reverse, or start, the engine. A brake was used to control the inertia of the flywheel. Each side paddle wheel had its own shaft (axle) which extended from the outer axle box of each paddle wheel to the longitudinal midline of the boat. The usual practice was to connect the "pitman" (connecting rod) directly to the inner end of the paddle wheel shaft through a "double crank" - this was called the "crank axle." The flywheel was also on this shaft, or axle. Sometimes another arrangement was used - the steam engine was a separate unit and its rotative motion was transmitted to a paddle wheel shaft through a belt. Irrespective of the mechanical arrangement, a clutch was interposed between the paddle wheel shafts, which enabled the engineer to disconnect one paddle wheel. There were two reasons for the clutch: first, in making landings or maneuvering around a sharp bend it was frequently necessary to stop one paddle wheel and reverse the other; second, the boiler feed pump which was called the "doctor" and supplied the boilers with water, water operated from the paddle wheel shaft, either through a cam or belt. Therefore, whenever there was a head of steam in the boilers it was necessary to keep the engine running to operate the "doctor." When at a landing it was more economical for the engine to turn one paddle wheel than to turn both paddle wheels.

The "doctor" also referred to an auxiliary engine, commonly fitted to vessels from about 1850 on, used to power pumps that supplied water for a variety of purposes, including the boilers and fire houses. They also were used to operate bilge pumps and to force air through the flues and chimneys in order to improve draft. After the Civil War, doctors also were used to turn capstans and hoists (Hunter 1993:162).

Structural Evolution of Western River Steamboats

Along with changes in engine design came shifts in the construction and design of the vessels themselves. During the initial phases of development, ship construction followed the traditions established for deeper water vessels. Heavy timbers or scantlings were used for strength, along with a double frame system. As long as these elements were thought to be necessary, one of the few ways to reduce draft through architecture was to flatten the vessel's bottom, so a longer and flatter hull gradually was adopted in an effort to more evenly distribute weight and decrease draft.

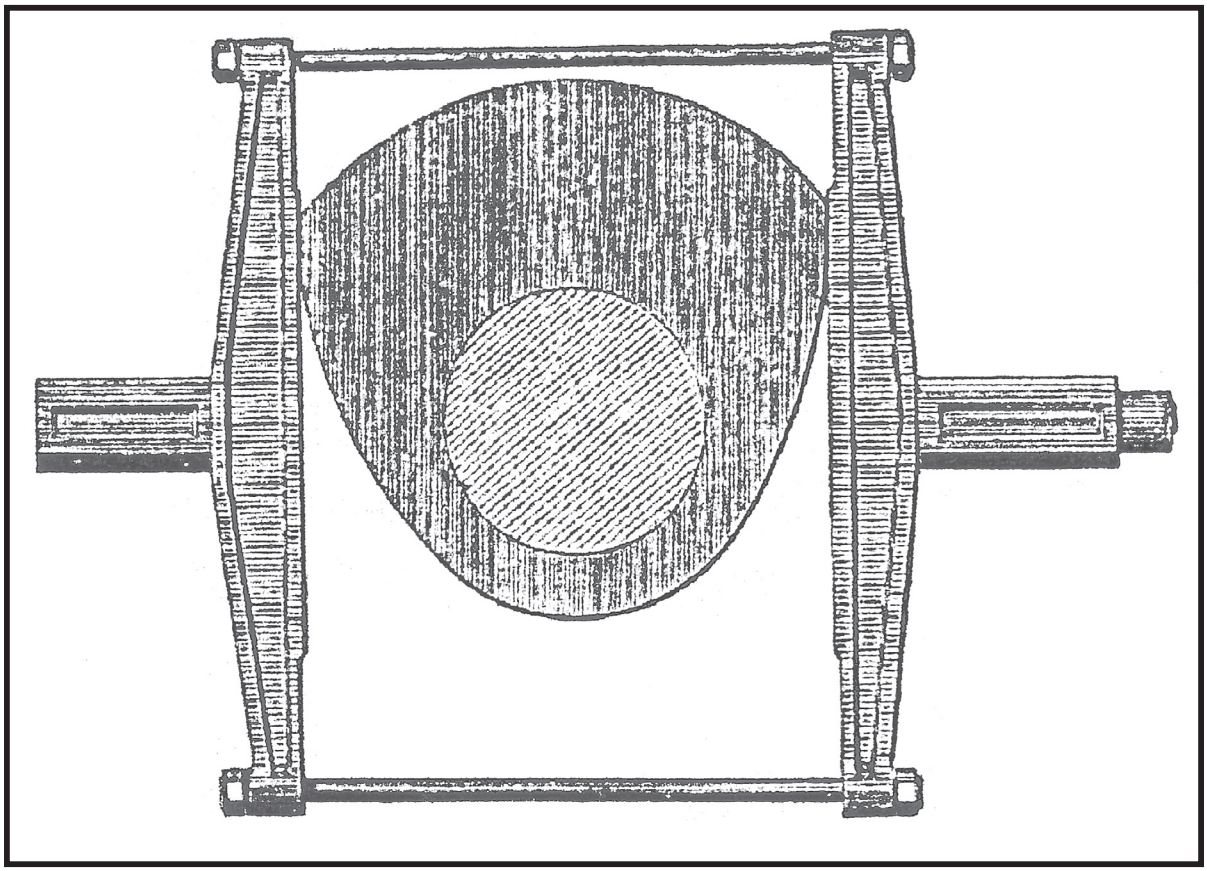


Figure 29 Profile of a full stroke cam and yoke. From *Transactions of the Institution of Naval Architects,* London, 1861

Gradually, it was realized that the heavy framing was unnecessary. From the 1840s on, it became common-place to build flat bottoms with single frames and lighter scantlings, all of which decreased weight and draft (Hall 1880:175).

Boat builders also found that changes could be made to the keel. In sailing vessels, a heavy keel provided structural strength and, because it projected below the bottom of the hull, prevented the vessel from slipping sideways as it was pushed by the wind (leeway). This was a liability in river boats powered by steam, as it provided resistance to sharp turning. By reducing or eliminating the keel, builders improved a boat's handling characteristics, while reducing the draft of some larger vessels by as much as twelve to fifteen inches. The structural duties of the keel were taken on by light keelsons, which were placed on the inside of the hull (Hunter 1993:78). White oak typically was used for planking, and planks usually were two inches thick. White oak also was used in framing for the hull, with timbers typically measuring three by six inches or four by five inches. Pine, cedar, and poplar, all lighter woods, were used for the decking and superstructure (Hunter 1993:80-82).

Other changes were made to increase buoyancy and speed (Hunter 1993:76-77). A hull similar to that of a flatboat, with a flat bottom, straight sides and square ends, has the greatest buoyancy and can therefore carry more weight in shallower water. This became the standard hull form for western steamboats. These essentially rectangular hulls also were lengthened substantially, as this was thought to increase both speed and maneuverability (Russell 1861:109; Hunter 1993:85-89). Sharp bows cut through the water and reduced the turbulence in the water reaching the paddlewheel; sterns of sidewheel vessels were fine, sometimes with a hollow. The sheer was reduced to one to two feet at the ends, with most of the length of the vessel being flat. These refinements were summarized by Pittsburgh steamboat builder Burton Hazen in his 1850 testimony in the Wheeling Bridge case:

> We consider we have made considerable improvement in the model of the hulls of steamboats since 1830, in the form of the bottom of the vessel, making it flatter, fore and aft, than formerly, by which we get a lighter draft of water. Our models are somewhat sharper than they were, at the bow; by which we have increased the speed, and they are sharper at the water line. There is generally an increase of the length of floor; for the purpose of lightening the water draft. The size of the boats has been increased. We build them likewise of much lighter timber; which increases the lightness of the draft (Walworth 1850: 426).

With a flatter hull and lighter draft, space in the hold was decreased, and the engines and boilers were moved up to the main deck. The main deck was widened considerably, partly to add room in compensation for lost hold space. This was accomplished by extending the deck beyond the hull line. These extensions of the main deck were known as guards, and on side-wheelers they extended to the outer limit of the wheels and gave them added structural support. In another attempt to add cargo and passenger space, more levels of light decking were added to the superstructure. By the 1830s, three decks were commonplace on western steamboats, and a fourth became common before mid-century (Still, Watts, and Rodgers 1993:65). In this type of deck arrangement, the main deck, just above the water line, was the widest (Figures 30 and 31). Above it was the boiler deck, which generally was narrower than the main deck and housed passenger cabins. Even narrower were the hurricane and texas decks, which sat above the boiler deck. At the top of the superstructure was the much smaller pilot house (Hunter 1993:91).

Efforts to decrease draft were highly successful. The draft of vessels operating around New York, Philadelphia, and Baltimore ranged from four and a half to seven feet (six was

common), with a depth of hold from seven to nine feet (Hall 1880:147). By 1860 on the western rivers, according to Still, Watts, and Rodgers (1993:65):

> the average smaller steamboat of 100-125 tons was 132 ft in length, 24 ft in beam. Its average draught had decreased from 6.3 ft to 3.7 ft. By that date many of the boats on the Mississippi/Ohio system were more than 200 ft long, 35 ft in beam, but still drawing less than 7 ft.

There were, of course, trade-offs in this kind of design. The decreased depth of hold was only one such trade-off. Another was a reduction in the sturdiness of hulls. This was recognized by a number of contemporary observers, including Henry Shreve, who had pioneered the use of light hulls (Hunter 1993:80). Perhaps one of the greatest difficulties presented by the new design was "to hold up the sterns, bows, bilges, and guards, as well as to give proper support to the hull when it feels the weight of the boilers" (Hall 1880:192). In pursuit of lessened draft, the heavy keel typical of ocean-going vessels had been abandoned, the size of scantlings was reduced, and an increasing length-to-beam ratio was seen. As a result, there was far less rigidity in the framing, and longer and narrower hulls had a tendency to hog, or droop at the ends. In addition, boilers and engines pushed down more heavily on some parts of the hull than others, despite the best efforts to evenly distribute the weight.

To minimize distortion from these forces, iron rods called “chains” were fastened to hull timbers at the bow and stern and then run above the deck over a series of braces and struts. Two turn buckles, one forward and one aft, could be tightened or loosened as required to achieve the appropriate amount of tension. Hunter (1993:96) suggests that such chains came into use between 1835 and 1841, based on an analysis of the length to depth ratios of hulls. In addition to these "hog chains," "cross chains" were used to support the outer extremities of the guards, which had a tendency to droop towards the water. "Knuckle chains" were used to support the sharp bilges, which accepted a great deal of downward force from the superstructure (Bates 1968:28). The one-inch to two and a half-inch wrought iron rods typically used in these chains provided enormous strength, relative to their weight (Hall 1880:179, 192). Through a careful arrangement of chains and struts, the chains effectively lifted the drooping portions of the hull, while the struts (under the downward pressure exerted by the chains which passed over them) pressed down on parts of the hull which tended to lift (Russell 1861:112-113).

Longitudinal distortion of the hull also was minimized through the use of several structures in the hold of the vessel. Numerous relatively small bilge stringers were widely utilized on western river steamboats. Although individually these timbers would have little stiffening effect, as a whole they would aid in the prevention of hogging. Bulkheads of various types also could be used to add stability, as revealed through archeological research and from contemporary technical literature. An example of a solid fore and aft bulkhead was noted on *Bertrand* (1864) (Petsche 1974), while diagonal trussing was utilized on other vessels. An English naval engineer visiting the United States in 1860 noted the use of a series of wooden arches mounted on top of the keelson (Russell 1861: 121). Finally, the keelson was an important structural member for the prevention of hogging. The keelson generally was the largest structural member, and often was strengthened by the use of sister keelsons.

Centers for Steamboat Construction

As a result of the changes and innovations in both machinery and vessel structure, western steamboats became exceedingly well adapted to the exigencies of river travel in the

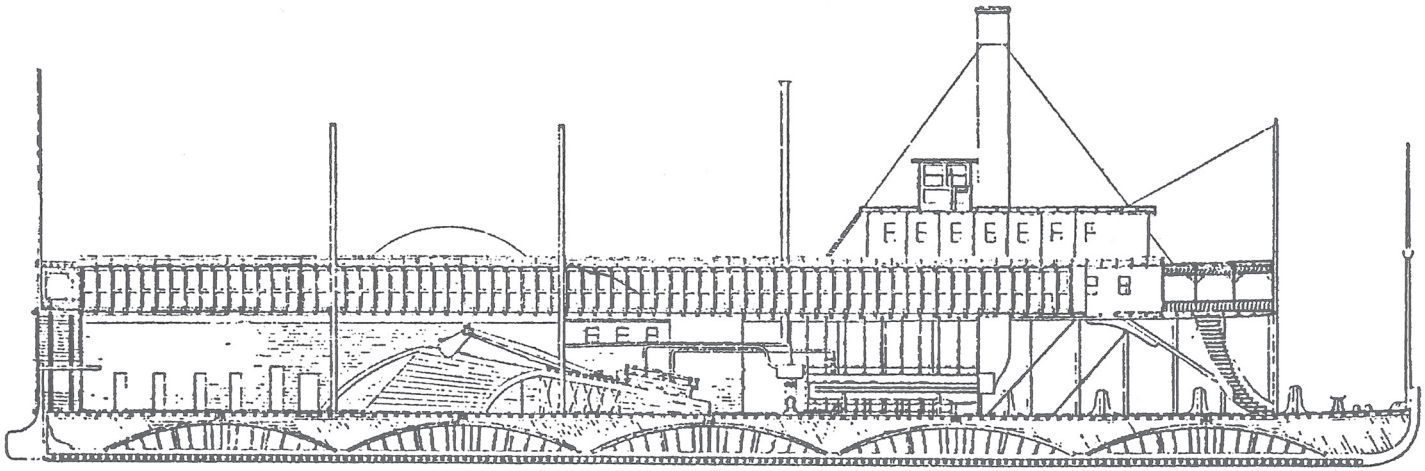


Figure 30 Longitudinal section of a typical western river steamboat of the 1850s (Transactions of the London Institute of Naval Architects, London, 1861; from Hunter 1993)

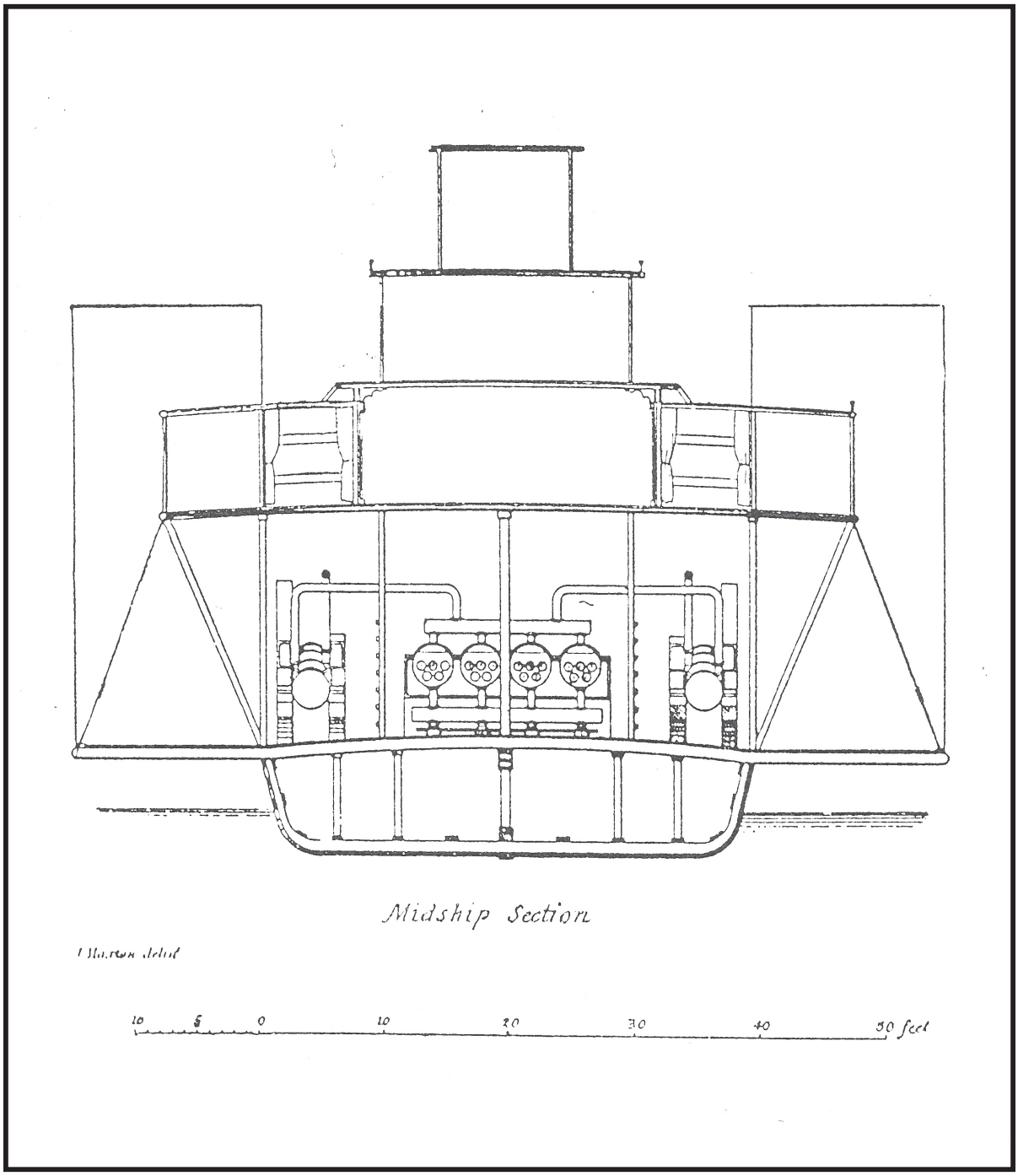


Figure 31 Midships section of a Western Steamboat, from *Transactions of the Institution of Naval Architects,* London, 1861

Ohio/Mississippi drainage. They reached into virtually every corner of the region and played a crucial role in its settlement and in everyday life. More of the steamboats that operated in the western rivers were built in the upper Ohio Valley than anywhere else; over seventy-five percent were built between Pittsburgh, Pennsylvania, and Louisville, Kentucky (Hunter 1993:105). Pittsburgh was the most important center for construction, accounting for almost one third of the vessels which operated in the west; Cincinnati and Louisville ranked second and third in volume (Hunter 1993:105-106). Yards scattered along the Ohio and the Monongahela Rivers accounted for much of the additional tonnage constructed from 1820 to 1880. The only important center outside of the Ohio Valley was St. Louis, which became the fourth largest source after the 1840s (Hunter 1993:107).

Steamboats on the Red River

On many western streams, such as the Mississippi, Missouri, Arkansas and Red Rivers, early steam navigation was carried out for military purposes, transporting troops and supplies (Hunter 1993:51). On the *Enterprise*'s first journey on the Red River in 1815, for example, a company of troops under the command of Captain Shreve was carried to Alexandria (Hunter 1993:51). Commercial traffic usually was quick to follow these military forays. Despite the early appearance of steam vessels on the Red River, however, a variety of obstructions hampered movement on the river. At Alexandria, a shoal called the "Falls" or "Rapids" made it possible to move up river only during periods of relatively high water. It seems that smaller vessels frequently were used above Alexandria, while larger vessels operated in the lower segments of the river. During periods of low water, materials would be off-loaded at the "Falls" and transferred from a vessel on one side of the obstacle to a vessel on the other. In this fashion, the shoal could be circumvented and transportation was provided to the upper river through most of the year. Two other physical obstacles to navigation were the bar at the confluence of the Red and the Mississippi and that enormous complex of tree trunks and debris known as the Great Raft.

The Great Raft remained an obstruction to navigation above Natchitoches until the 1830s. Log jams in the eastern channel of the river above Alexandria could be avoided by taking other channels to Natchitoches. Stretches above Natchitoches also could be reached by circuitous routes through back bayous and lakes, but this was a long and expensive detour. The *Enterprise* once again was the first vessel to run this upper portion of the river, towing keel boats around the obstructions to supply Fort Towson on the upper reaches of the river (Hunter 1993:52). But above Natchitoches, the obstructions simply were too extensive to permit regular navigation by steamboats. Henry Shreve began clearing this stretch in 1833, but it was years before clearing reached the site which would become Shreveport (Coastal Environments, Inc. 1992).

Prior to clearing the Great Raft, Natchitoches was the usual limit of steam traffic. By 1822, at least five vessels provided regular service between Natchitoches and New Orleans. Typical of these early vessels was the *Arkansaw*. This side-wheeler probably had one engine, and was small: 51 tons, 95 ft 10 in long, 14 ft 6 in wide, and 3 ft 10 in deep (Coastal Environments, Inc. 1992:34). *Arkansaw* had but one deck, with a hurricane house, no masts, and a square stern. Most of the early Red River steamers seem to have been in the 90 to 135 ft range, with displacements of between 80 and 190 tons (Coastal Environments, Inc. 1992:35).

Steamboats on the Red River in ensuing years mirrored the changes seen on vessels throughout the rest of the western river systems, with the addition of double engines and increased length and capacity. In the 1830s, the clearing of the rafts opened up the river to settlement above Natchitoches. This coincided with the development of the steam-powered cotton gin, and cotton

cultivation took over the valley. As the number of plantations increased, so did the number of vessels serving them. In the ten to fifteen years preceding the Civil War, over 100 steamboats worked the river, exporting over 280,000 bales of cotton (Coastal Environments, Inc. 1992).

The Union closure of the Mississippi in 1862 already has been noted, along with the abortive Red River campaign of 1864. During these campaigns, a large number of civilian vessels were commandeered by both sides for use as transports. Some steamboats were converted to "tinclad" gunboats, through the fitting of one-half to three-quarters inch thick iron plate around the main deck (Hunt 1987:223). Other riverine vessels were captured and destroyed, and commercial traffic in the area almost came to a halt.

The war was hard on steam vessels, and a significant percentage of the tonnage had to be replaced by the end of the war (Hall 1880). This was quickly effected, however, as commerce resumed on the southern rivers, which included the Red. They continued to provide the major avenue in and out of the region until their use was eclipsed by the railroads.

Causes of Vessel Loss

The life span of most vessels on western rivers was short, perhaps four to five years on average, for boats built prior to the Civil War (Still, Watts, and Rodgers 1993:66). Collision with obstructions was the most common accident on the river. Boiler explosions were the second leading cause of vessel losses on the western rivers, followed by fire and, in a distant fourth place, collisions with other vessels.

Collisions. Collisions between vessels were relatively infrequent on western rivers, accounting for only four percent or so of the total losses (Hunter 1993). This is surprising, given the large amount of traffic on rivers and the narrow channels in which pilots often navigated. Rivermen developed their own rules of the road, however, with whistles, light signals, and other rules that gradually were incorporated into laws.

Fires. Fires were more common than collisions as a cause of vessel loss, accounting for between 16 and 17 per cent of the recorded losses (Hunter 1993). When one considers the construction and operation of these boats, however, the wonder is that more were not consumed in flame. Wood superstructures of steamboats were constructed out of light and highly flammable woods such as pine, often painted with flammable paints. Lights in and on the vessel used oil and kerosene for fuel. Cargoes often included flammable goods, and wood fuel for the boat itself was stacked on the deck. While the boilers and engines were in operation, sparks and cinders flew from the smoke stacks, and passengers and crew provided another potential source of ignition with pipes and cigars. Once such as vessel caught fire, there often was little hope of putting it out. If there was a flammable or explosive cargo on board, the results could be disastrous. In 1833, a cargo of gunpowder blew up in the *Lioness* just below Colfax on the Red River. A large portion of the vessel's superstructure simply disintegrated, while the hull sank within minutes. Fourteen lives were lost in the incident, including that of a U.S. senator, and the event was an important catalyst to the passage of a strong law regulating Louisiana's steamboat commerce.

Boiler Explosions. The most spectacular of the accidents were undoubtedly boiler explosions, and these most commonly occurred in full view of spectators, as boats pulled away from landings. If the feed pumps did not operate while the vessel was stopped at the landing, pressure built up in the system, and when the vessel got underway and the feed pumps resumed operation, the abrupt flood of cold water into a hot boiler might have disastrous results. In the first thirty years

that steamboats ran on western rivers there were 185 recorded boiler explosions, and public pressure resulted in legislation to regulate steam machinery. Louisiana passed its first law aimed at steamboats in 1826, followed by the 1834 law, which required periodic inspections of boats and their machinery, including hydrostatic testing of boilers at three month intervals. A federal law followed in 1838, although it was weakened substantially by the absence of any requirement for hydrostatic testing of boilers. Despite efforts to improve the safety of travel on western rivers, fatalities were inevitable. Between 1807 and 1853, more than 7,000 lives were lost in steamboat collisions, sinkings, fires, and boiler explosions (Brown 1989).

Obstructions and Snags. The greatest threat to the longevity of vessels, if not to their passengers, came from obstructions in the river. More than half of the 985 losses on the Ohio/Mississippi River system between 1811 and 1851 were due to encounters with obstructions (Hunter 1993:272). Sand bars were one type of obstruction. Sand bars formed, disappeared, and re-formed, so pilots had to be alert, but such a grounding seldom caused serious damage by itself. The great danger was that a vessel could be caught by the current and swung around. If it swung broadside to the current and listed, water could pour over the low sides and the vessel would go under. Rocks and the hulls of sunken vessels provided another set of obstacles, but the worst were snags, submerged or partially submerged trees. These trees dropped into the river as the bank eroded, and gradually lost both their limbs and buoyancy as they floated downstream. One end would eventually come to rest in or on the river bottom, while the remainder inclined upward, threatening to impale any unwary boat moving its way. Although snags accounted for more than half the accidents, they caused far fewer fatalities than other mishaps. In discussing accidents which occurred between 1830 and 1840, Hunter (1993:273) notes:

> only in three instances did a snagging lead to a loss of life and the total fatalities amounted to but sixteen. Often the snag did not penetrate the hull, but instead struck the wide guards or paddle wheel, doing much damage and even crippling the machinery but, unless some members of the crew or passengers were in its path, resulting in neither loss of life nor injuries. The destruction of which an inert stick of timber planted in the river bottom was capable seems remarkable unless one remembers that many snags were massive tree trunks, fifty to seventy-five feet in length and weighing many tons.

Snags also seem to have been the single most prevalent risk to vessels working the Red River. An 1895 report listed 197 steamboat wrecks in the river, of which 86 (43.6 per cent) were the result of snags (Chief of Engineers 1895:1576). Although not often fatal to passengers and crew, snags did account for an abnormally high loss in vessels and cargo. In 1876 it was reported that steamboats were ten times more likely to be damaged on the Red River than on the Mississippi or Ohio, and few insurance underwriters would even insure vessels operating on the Red (Board of State Engineers 1876).

Influence of Geomorphology on Shipwreck Occurrence. It is estimated that more than 100 historic shipwrecks occurred in the Red River channel between the Arkansas-Louisiana state line and Alexandria. Coastal Environments, Inc. (1997) identified 69 wrecks that occurred just in Red River Pools 3 and 4 between the late 1820s and the late 1890s. From a variety of evidence, it does not appear that there is a clear relationship between the locations and/or timing of the shipwrecks and the geomorphology of the Red River, especially as related to the Great Raft.

Shipwrecks in Pools 3 and 4 roughly doubled each decade after the 1820s, reached a peak (21 shipwrecks) in the 1860s, and declined sharply thereafter. Most of the steamboat traffic took place when the river was not effectively blocked by log jams or below jams, in areas that had been

cleared. The frequency of shipwreck occurrence seems more likely to be a function of the amount of boat traffic, as dictated by growing population along the river, the popularity of steamboat commerce, and economic trends.

A review of the locations of the shipwrecks plotted in relation to probable channel positions does, however, reveal that a high percentage occurred in river bends (although it must be recognized that, because of the high channel sinuosities, reaches were rare). Running aground, which presumably would be more likely in the bends of a river, rarely seems to have been a cause of vessel loss. Other causes of wrecks, such as boiler explosions, fire, and collisions that could have happened anywhere, although collisions might be somewhat more likely at bends due to the restricted room for maneuver. It seems likely that encounters with snags, the most frequent cause of vessel loss, also would be more likely in bends, due to both restricted maneuverability and the potential diversion of the pilot's attention. The high concentration of known wrecks around the severe river curves from Eagle Bend down past the later Lattier's Cut-off emphasizes this pattern. Whatever the cause of an accident, captains tried to beach the ships on a point bar or close to a bank if they were able to maneuver.

The rapid rate of natural channel meandering in the Red River, as well as the effects of artificial cutoffs, have probably meant that a significant percentage of known shipwrecks have been destroyed by later channel changes rather than being buried. However, revetments and other artificial channel stabilization measures of the last several decades probably have reversed the trend. It is hypothesized that channel aggradation and raised water levels that accompanied the Great Raft may have promoted the preservation of wrecks that occurred during the first several decades of the steamboat era. On the other hand, channel scouring and degradation and enhanced meandering that followed raft removal may have had the reverse effect.

Despite the general outline of the development, use, and loss of western steamboats given above, there is much that is unknown about these remarkable American engineering innovations. The paucity of detailed descriptions of vessel and machinery construction, the rarity of construction plans, and the general absence of shipbuilder's models, have left us to speculate on precisely how early builders achieved what they did. The archeological investigation of lost vessels therefore offers the best chance of understanding these boats that opened up the American West to settlement and development.

CHAPTER V

DOCUMENTARY EVIDENCE FOR THE *KENTUCKY* AND ITS LOSS

The Disaster

At 6:30 pm on the evening of June 9, 1865, the steamboat *Kentucky* reportedly left Shreveport bound for New Orleans with 900 passengers, baggage, and provisions. For the most part, the passengers were paroled Confederate soldiers, weary veterans of the Missouri and other regiments that had defended Shreveport (*New Orleans Times*, June 15, 1865). Among the passengers were Captain Anthony Walton of Glasgow, Missouri, his wife, Mary Winn Walton, and their six children, ranging in age from four-month old Nannie to 18-year old Clemmie (*Shreveport Journal*, July 10, 1974:D1). Mary and the children were crowded into the "Ladies' Cabin" on the aft portion of the boiler deck with the families of some of the other soldiers. The forward part of the main deck was packed with 250 horses that the parolees had been allowed to keep after the surrender.

Some two hours into her voyage, the boat struck a snag, one of the partially submerged logs that made the Red River notorious. The vessel ran for about four miles after she began to leak, and by the time the captain finally turned for shore, the *Kentucky* had settled so much that he could not get near enough to the bank to put out his landing stage. A stern line was run to shore, but it snapped immediately. A survivor of the wreck reported the horrifying events of the next few moments:

> As the boat careened a great rush took place to the hurricane deck. Many passengers were in their berths, and were saved almost wholly destitute of clothing. A large number were caught between decks and drowned. The ladies generally succeeded in gaining the hurricane deck and were all saved. Some children were lost (*New Orleans Times* June 15, 1865).

The boat sank instantly, the water washing over the hurricane deck forward while the stern remained above water. As the boat heeled over, pandemonium broke out in the over-crowded decks below as passengers rushed for the hurricane deck. Adding to the confusion, the texas caught fire as coal oil lamps spilled their contents on the beds. Fortunately, the fire was extinguished quickly. A large number of passengers were trapped in the forward cabin and drowned; estimates of losses ran as high as 200. The women on board, who occupied the ladies' cabin aft, survived but several children were lost (*The New Orleans Times*, June 15, 1865). The loss of life was unusually heavy for a snagging accident.

Word of the disaster quickly spread to another steamer, the *Col. Chapin*, which had tied up for the night some 5 to 7 miles upstream. Captain Stephen J. Webber, Assistant Quartermaster and "Captain Commanding Transport," was aboard the *Col. Chapin* when the news was received. He immediately ordered steam to be raised and set out to render assistance to the survivors. The vessel

arrived on the site at about 11:30 pm and found some 400 to 500 people crowded onto the elevated after portion of the stricken *Kentucky*. Webber succeeded in getting two lines from the shipwreck to shore and began ferrying the survivors ashore in two small boats. Eighteen-year old Clemmie Walton, with her infant sister Nannie's gown clutched between her teeth, had been pulled to safety on the shore. Mrs. Walton and three other children were rescued from the wreck by the *Col. Chapin*'s boats. Her husband and son were among the missing (*Shreveport Journal* July 10, 1974:D1).

Reports of the missing and dead ranged from 20 to over 200. The official military report listed between 50 and 75 drowned (National Archives, Military Reference Branch [NAMRB] 1865). Bodies of the men trapped between the decks were pulled from the wreck for days after the sinking, while Mrs. Walton and her surviving children sat on a trunk nearby. Her husband and son were never found and she and her five children eventually made their way to Missouri (*Shreveport Journal* July 10, 1974:D1).

Captain Webber was furious with the officers of the *Kentucky*, charging that their reckless decision to run the boat at night brought about a needless disaster. He later wrote to *The New Orleans Times* (June 16, 1865) that: "If I had the power, I would hang the captain and pilots to the first tree that I could find." A subsequent investigation by Major General Francis J. Herron, commander of the Northern Division of Louisiana, found the officers innocent of any wrong doing, but resulted in an order prohibiting transports on the Red River running at night (*The New Orleans Times* June 19, 1865).

In the midst of the confusion and social upheaval that resulted from the end of the Civil War, the wreck of the *Kentucky* quickly passed from memory. No organized attempt to salvage the vessel appears to have ever been mounted although the hull continued to be visible in Old River at low water as late as 1947 (Shreveport *Journal* July 10, 1974:D1).

What kind of vessel was the *Kentucky*? Where was the boat built, and what kind of shape was it in when it sank? What were the events that led to the loss of the vessel, and how many lives actually were lost in the disaster? Phase II and III archival research has provided answers to many of these questions, while others still are clouded in uncertainty.

History of the *Kentucky*

Tracking the history of individual steamboats often is difficult, as few documents relating to their construction and subsequent service generally survive. Because of *Kentucky*'s role during the Civil War and subsequent suits for compensation of the owners, the vessel has left a documentary trail which is unusual.

Early Years

The *Kentucky* was constructed as a side-wheel steamboat in Cincinnati, Ohio, in 1856 and first was enrolled there on July 28 of that year (National Archives, Civil Reference Branch 1856: Enrollment #59). The vessel was recorded officially as having a length of 222 ft, a beam of 32 ft and a depth of 5 ft 6 in with a capacity of 375 tons. It was described as having a "transom stern with tuck, no gallery," and a plain head. Four boilers were mounted on the main deck of *Kentucky*, and they fed two high pressure steam engines, each having a cylinder 56 cm (22 in) in diameter

with a 2.13 m (7 ft) stroke (Way 1983: 269). The *Kentucky* must have looked quite similar to the *Itasca*, a vessel of very similar dimensions (230 length) built only a year after *Kentucky* in Cincinnati (Figure 32).

Kentucky was built as a large, elegant packet for use on the Ohio and Mississippi Rivers and was similar in layout to hundreds of other steamboats that worked on those waters. The main deck, where the boilers and engines were mounted, was fitted with guards that extended the deck out from the hull to protect the paddle wheels. The main deck served as the principal cargo deck. Above the main deck was the boiler deck, where the passenger accommodations were located. A long, narrow cabin was located centrally, with staterooms opening onto it from the sides. The *Kentucky* had 52 staterooms furnished with bedding; her cabin boasted carpets, chairs, a sofa, tables and tableware (National Archives, Military Reference Group 1874b: Deposition of James Keniston). The sexes typically were segregated aboard packet boats, with the gentlemen's salon located forward and the ladies' aft (Hunter 1993:393). Above the boiler deck was the hurricane deck and the crew quarters, and officers were quartered in the texas on the next level. The pilothouse was atop the texas, aft of the chimneys.

The new vessel's first owners were the Cincinnati, Maysville, and Portsmouth U.S. Mail Line Co; B. Kepner was her first master (National Archives, Civil Reference Branch 1856: Enrollment No. 59). A U.S. mail line service implied regularly scheduled and punctual trips with penalties for non-performance (Hunter 1993:336). In 1858, ownership of the vessel was transferred to the Cincinnati and Louisville U.S. Mail Line Co., the oldest and best known of the western steamboat lines (National Archives, Civil Reference Branch [NACRB] 1858: Enrollment #142). During the following year, the *Kentucky's* home port was transferred from Cincinnati to Louisville, Kentucky (NACRB 1859: Enrollment #162). The vessel was sold in 1860 to I. M. Gosler of the Memphis and New Orleans Steam Packet Co. and was re-enrolled on April 10 at the Port of Memphis with James Lee as her Master (NACRB 1860: Enrollment # 8). Three months later the vessel was enrolled yet again, this time by the Memphis & New Orleans Steam Packet Co. under the names of J.J. Rawlings, J.M. Gregory and William Wray, Trustees (NACRB 1860: Enrollment No. 19). The Memphis & New Orleans Line ran in conjunction with the Memphis and Charleston Railroad for several seasons preceding the Civil War (Hunter 1993:631). The company, however, lost money and the boats were sold, with substantial losses to the stockholders. Six months later, in October, the vessel was enrolled under the ownership of J.C. McManus and T.A. Kendig, although James Lee continued as her captain (NACRB 1860: Enrollment # 40).

Civil War Years

The *Kentucky* was in her home port of Memphis at the outbreak of the Civil War. Shortly thereafter, the vessel was purchased by Preston Lodwick. Lodwick started in the steamboat business in 1837, as a young man of 24. When war broke out, he was the owner of a side-wheeler called the *Prince of Wales*, which ran from Cairo, Illinois, to New Orleans. Around the end of April or first of May, 1861, Lodwick took on freight at New Orleans for Louisville, intending to slip past the Confederate authorities and head north. Instead, he was detained by the Rebels at Memphis and forced to unload and head back to New Orleans. He sold the one-year-old *Prince of Wales* in New Orleans at a loss of $12,000. With tensions increasing, Lodwick was desperate to return north and seized the opportunity to purchase the *Kentucky*, which, at that time, was engaged in running to Columbus, Kentucky, above Memphis. Thinking the new boat would allow him to slide past the authorities at Memphis, Lodwick headed north, although he could only get "rebel pilots." Lodwick had miscalculated the vigilance of the Confederates at Memphis who, once again, turned him back. Finally abandoning the boat just above Island No. 10, Lodwick escaped on foot

back to Illinois (National Archives, Military Reference Branch [NAMRB] 1874b: Deposition of Preston Lodwick). Confederate authorities ordered the boat to be burned, but the chief engineer, James Keniston, assumed the duties of captain and ran it "under duress" as directed by the Confederates.

Keniston continued to operate the vessel as a Confederate transport until June, 1862. Little is known of the operation of the *Kentucky* while she remained in Confederate hands. Keniston later professed his allegiance to the Union and claimed he acted under duress. He even swore that at one point he almost succeeded in getting the boat into Union hands on the White River, but the Confederate authorities changed his course to Little Rock (NAMRB 1874b: Deposition of James Keniston). Ironically, the captain of the *Kentucky* was cited in November 1861 by the Confederate army for exhibiting "fearlessness and energy deserving the highest praise" under fire for ten days and nights spent ferrying Major General Leonidas Polk's troops between Columbus, Kentucky, and Belmont, Mississippi (United States Navy Department 1963:541). The timely arrival of reinforcements allowed the Confederates to surround Union forces under Ulysses Grant, prompting him to remark that "we had cut our way in and could cut our way out just as well" (McPherson 1988:396). The *Kentucky* again dodged shells to bring reinforcements to Brigadier General J. P. McCown as he sought to hold Island No. 10 in March, 1862 (United States Navy Department 1963:541).

Lodwick heard nothing more of his boat until June, 1862, when Memphis fell to Federal forces. He then proceeded to Memphis to claim his vessel, but found on arrival that the *Kentucky* had been taken as a prize of war and was being used by the Unites States Army as an express mail boat, carrying freight, passengers, and produce from Memphis to Cairo, Illinois. The *Kentucky* had been captured by the Western Gunboat Flotilla, which was then part of the army but commanded by naval officers (the Fleet was transferred to the Navy Department on July 16, 1862). Between June 6, 1862, and February 4, 1863, the *Kentucky* served first the army, then the navy. Lodwick sought the return of his boat from Federal authorities and it eventually was restored to him by the U.S. Marshal on February 5, 1863 (NAMRB 1875), "in very bad condition" (NAMRB 1874a). Years after the war, Preston Lodwick and his brother Kimby filed a claim for charter fees of $200.00 a day for the 242 days that the *Kentucky* was in government service. After being bounced back and forth between the War Department and the Navy Department, the Lodwicks' claim was eventually denied on the basis of an Act of Congress dated February 21, 1867, which "prohibited the settlement of any claim for the appropriation of personal property where such claim originated during the war in a State declared in insurrection" (NAMRB 1876).

Six months after the *Kentucky* was restored to Preston Lodwick, his brother Kimby and B. H. Campbell chartered the vessel to the U.S. Quartermaster Corps for $60.00 per day (NAMRB 1863). By 1864, the *Kentucky* was operating in the Red River and lower Mississippi River. The New Orleans *Daily Picayune* of May 5, 1864, noted her arrival with Captain Lodwick and 366 bales of cotton consigned to the U.S.Q.M. (*Daily Picayune* 1864). When the war drew to a close in this region, the *Kentucky* was still in service to the U.S. Quartermaster and soon would appear at Shreveport, tasked with transporting paroled Confederate soldiers out of Louisiana (United States War Department 1896, I, 48:582). The situation in Louisiana at this time, particularly around the Shreveport area, was confused and chaotic.

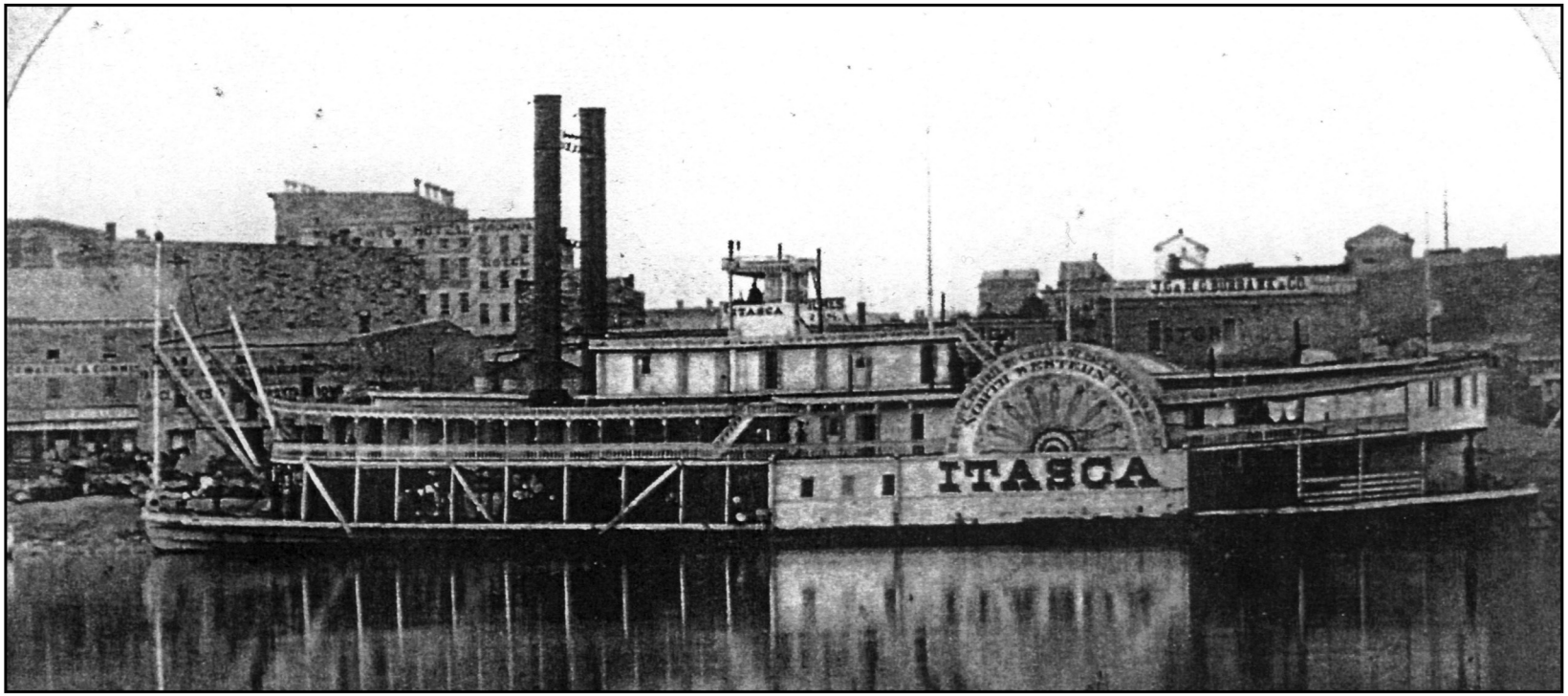


Figure 32 Steamboat *Itasca*, built in Cincinnati in 1857 and photographed ca. 1862

Events Leading to the *Kentucky's* Appearance on the Red River

Overview

As noted in a previous section of this report, the Trans-Mississippi Department of the Confederate States of America, which encompassed the project area, was removed from contention as a major theatre of war as a result of the gradual conquest of the Mississippi River by the Union. The Mississippi River campaign culminated with the surrender of Vicksburg to the Union in July, 1863. However, the capture and occupation of New Orleans by Union forces under General Benjamin ("Beast") Butler, and the subsequent Union occupation of the state capital, Baton Rouge, only 75 miles upriver, had seriously impaired Confederate military strategy and logistics fully one year prior to the surrender of Vicksburg. Although units commanded by Confederate General Richard Taylor kept Butler's command reasonably well contained in the immediate New Orleans area and within the Mississippi River Valley, a Confederate initiative under the leadership of General John C. Breckenridge was unable to dislodge Federal forces from Baton Rouge (Hansen 1971:47; Winters 1963:123). The Union seizure of Baton Rouge forced Louisiana's Confederate government to flee to a location removed from threat of immediate Union interference, and in May of 1862, the town of Opelousas, some fifty miles further west, was designated as the interim seat of government. However, Butler's more energetic, (albeit inexperienced) successor, Union General Nathaniel Banks, soon launched a series of military campaigns against the Confederate armies of the Trans-Mississippi Department; these forays forced Taylor to retreat and much of Southern Louisiana gradually fell under Union control (Winters 1963:*passim*; Hansen 1971:47). In response to increasing Union control within the region, the Louisiana government moved to Shreveport in January of 1863; three months later, the city also was designated as the headquarters of the Trans-Mississippi Department, now under the command of General Kirby Smith, an 1845 West Point graduate (O'Pry 1928:166; Hansen 1971:47; Seidel et al. 1995:15).

Events in Shreveport

During the sixteen months and seven days that it served as the center of the state government and military headquarters, the town of Shreveport changed tremendously. Its population swelled from an estimated pre-war level of 4,000 inhabitants to a mini-city of perhaps 12,000 permanent and temporary residents. The population was swelled by refugees from military campaigns in the lower parishes, an influx of state government officials, and, of course, various military units (O'Pry 1928:167). The extensive system of defensive earthworks, gun batteries, and forts, described earlier, gradually was extended around the perimeter of the town (O'Pry 1928:167-168). The presence of a major resident Confederate military command forced the city and its environs to develop its manufacturing capacity. The CSA Clothing Bureau established shoe and hat factories, and the Ordnance Bureau set up foundries, laboratories, and shops (Winters 1963:321). Particular emphasis was placed on the production of weapons, ammunition, and explosives at the arsenal on the Logan Plantation and at the T. W. Jones Foundry (O'Pry 1928:169). As a shipping center, Shreveport gained in importance throughout the war. In 1863, T. H. Thurman recalled that "sixty-one steamboats plied between New Orleans and St. Louis to Shreveport. In 1865 there were... more than 250" (quoted in O'Pry 1928:89). Throughout the war, volunteer military units organized in the upper Red River region utilized Shreveport as a "jumping off point" for transportation to their ultimate military destinations.

O'Pry (1928:171) commented on the frenzied atmosphere that overtook the formerly sleepy northwest Louisiana town:

> "One unacquainted with Shreveport at this period as the great central point, the nucleus of all military operations, could scarcely imagine the activity which prevailed there; the influx and egress of all grades of military officials; the arrival and departure of trains and steamers, shipment and receipt of stores, etc…"

Disintegration

Banks's Federal forces stepped up the pressure on Confederate strongholds in northern and western Louisiana by launching his Red River campaign. The ultimate objective of this foray was to take Shreveport and gain control of both Western Louisiana and the Red River. The river, in turn, would facilitate access into Texas, the Indian Territory, and other population and supply centers in the interior of the Trans-Mississippi Department. The Federal assault proceeded in two main columns: a force of 19 gunboats and transports under Admiral David Porter proceeded up the Red River, while a second force ascended the Bayou Teche. However, the two-pronged thrust eventually stalled at Mansfield, just south of Shreveport, where Kirby Smith's Confederates successfully halted the Union advance, and forced Banks' forces to retreat to Alexandria (O'Pry 1928:168; Hansen 1971:48; Kerby 1972:325). By July 1864, most effective Union military strength within the lower Trans-Mississippi Department had been nullified (Hansen 1971:48), although Federal forces remained active in Arkansas and Missouri and Union control of lower Louisiana had to be contained (Kerby 1972:332-333).

On both the home front and within Confederate military ranks, the combined effects of Federal control of the Mississippi River, the Union blockade, and the devastation resulting from the Red River campaign created severe shortages of both war materiel and civilian consumer goods. Throughout the Trans-Mississippi Department, the ration situation worsened, and supplies of food and clothing were inadequate. Winters (1963:386) attested to the severe inflationary pressures on retail prices in Shreveport during the latter half of 1864:

> "Living costs… continued to rise. By early August, a pound of butter cost $5, eggs $5 a dozen, beans $2.50 a quart, melons $5 apiece, and a single apple sold for 50 cents. Room and board at the hotel cost $20 a day. Even the one-way fare on the makeshift stage from Shreveport to Alexandria had risen to $240.

Meanwhile, the Confederate military situation east of the Mississippi was deteriorating rapidly. Needing reinforcements for his eastern military departments and presumably viewing the military situation in the west as stable, Jefferson Davis ordered Kirby Smith to send several units of his command to reinforce armies east of the Mississippi. At the time, Kirby Smith's entire command consisted of only an estimated 30,000 troops, which were scattered throughout Missouri, Arkansas, Louisiana, and Texas (Kerby 1972:325). Smith argued that his own troop strength was insufficient; moreover, when news of the threatened redeployment spread through the Confederate units west of the Mississippi, morale fell and desertions began to increase. Pointing out the logistical difficulties involved in attempting to transfer large numbers of troops across a major river controlled by the enemy, Kirby Smith managed to procrastinate long enough that Davis finally countermanded the order (Kerby 1972:325-331).

Instead, Kirby Smith subsequently planned what was to be the final strategy and deployment for the forces of the Trans-Mississippi Department. To the south, he assigned Major's Texas Brigade, Liddell's Louisiana Horse, and the Texas volunteers of Bagby's New Mexico Brigade to guard lower Louisiana. To the north, General Sterling ("Old Pap") Price initiated a

protracted raid into Missouri where large numbers of disaffected Southern sympathizers reportedly were simply waiting to rise up and throw off the shackles of "Yankee" domination (Kerby 1972:331-333; Sallee 1991:*passim*). Price's Army, which originally had been organized in 1862, was composed primarily of Missouri and Arkansas volunteer units that had seen earlier extensive action during the Tennessee River and Vicksburg campaigns of 1862-1863 (Ruyle n.d. *passim*).

By November of 1864, Price was in full retreat, having "sustained heavy losses of veteran troops" -- those who survived the largely ineffective Missouri raid were "ill, exhausted… and not in fit condition to fight any body of men." Retreating through Kansas and the Oklahoma Indian Territory, some of Price's units were furloughed and presumably disbanded, while others, including Clark's and Shelby's Brigades, escaped into Texas (Sallee 1991:61). The remainder apparently returned to Shreveport, where the remains of Price's Escort, including Pindell's Sharpshooters, ultimately comprised a substantial proportion of the passengers who boarded *Kentucky* for its ill-fated last voyage (Sifakis 1995:125; Bartells 1991:*passim*; Arkansas *State Gazette* 1865; Shreveport *South-Western* 1865).

Surrender

By March, 1865, the Confederacy could muster barely 36,000 men under arms within the entire Trans-Mississippi Department (Trudeau 1994:335). As morale declined, some units of the command disbanded unilaterally, troops deserted, and both civilians and troops ransacked government supply depots (Hall n.d.: 133; Winters 1963:415). For example, the rank and file of the 28th Louisiana Infantry, which was stationed near Mansfield, "perceived they could not further serve the cause, and were anxious to return to their families and homes." General Order #13, issued at Mansfield, noted that "the major portion of the command [had] deserted camp and gone to their homes," and that "all the government animals and most of the wagons [had] been carried away" (Hall n.d.:133-135). In an effort to counteract the steady stream of bad news from the East, discourage desertions, and maintain troop morale, the citizens of Shreveport treated units stationed in the area to frequent fetes, and the troops in turn frequently paraded in grand reviews (Bearss and Tunnard 1988).

In late April, when news of Lee's surrender at Appomattox reached the Trans-Mississippi Department, the demoralization and loss of discipline within the rank and file intensified (Kerby 1972:418-425). Reports of drunkenness and rowdyism increased, and looting by troops and civilians alike reached epidemic proportions (Trudeau 1994:338; White 1988:40-44). In Shreveport, O'Pry (1928:171) noted that "Confederate officers disappeared very suddenly; the stars and bars very mysteriously departed, but citizens in fine apparel became quite numerous." Tunnard (Bearss and Tunnard 1988) stated that "[I]t became dangerous for even General Smith or any staff officers to be caught in the streets at night," and regular patrols were established around the city (Winters 1963:419). In a final futile effort to maintain resistance, a Red River steamboat was hurriedly converted into a blockade runner called the *Webb*, and was sent downstream towards the Gulf of Mexico; however, her captain was forced to surrender and scuttle the vessel in the Mississippi approximately 25 mi below New Orleans (Winters 1963:419).

The confused situation that prevailed in the Trans-Mississippi Department did not improve as General Kirby Smith agonized over whether or not to continue active resistance. Personally, Smith wanted to continue to put up a show of force, and his decision to move his command headquarters to Houston was motivated by the desire to preserve the Department's military and administrative structure. However, as the general departed from Shreveport, several units from Arkansas and Missouri reportedly refused to follow him, and soldiers in the camps around

Shreveport "began to desert by the hundreds" and "pillage the Confederate depots and quartermaster warehouses" (Winters 1963:422-425). While Smith was en route to Houston, his unit commanders in Arkansas, Texas, and Louisiana also began to demobilize unilaterally.

Kirby Smith was "mortified, powerless, and humiliated" by the disarray that surrounded him. In his farewell address to his troops, he remarked bitterly that "I am left a Commander without an army--a General without troops. You have made yr. choice. It was unwise and unpatriotic. But it is final. I pray you may not live to regret it" (quoted in Kerby 1972:426). To the Union commander at Shreveport, he wrote "The department is now open to occupation by your government. The citizen and soldier alike, weary of war, are ready to accept the authority and yield obedience to the laws of the United States" (quoted in White 1988:45).

However, General Edward Canby, in command of the Union's Department of the Gulf, would accept only a united surrender. Smith's subordinate field commanders met with Canby in New Orleans on May 25 to negotiate terms. The next day, having negotiated terms similar to those offered at Appomattox, Confederate Generals Simon Buckner, Sterling Price, and Joseph L. Brent signed the articles of capitulation, subject to Smith's approval (O'Pry 1928:173; Winters 1963:425; Kerby 1972:425; Trudeau 1994:338). On June 6, 1865, a 4,000-man Federal force under Major General Francis J. Herron occupied Shreveport (Winters 1963:427).

By the first week in June, discipline among many Confederate units in and around the city had been disintegrating for nearly a month. Individuals and groups assigned to these units had unilaterally departed, probably in a fashion similar to the Third Louisiana Infantry:

> The morning of the l9th [of May] found the majority of the regiment gone, or preparing to leave… On the 20th, the men were all furloughed by the Confederate authorities, or, more properly speaking, formally discharged from the Confederate army. Numbers left, declaring they would take neighter [sic] furlough, discharge nor parole. Many went down the river in pontoons. The officers staid [sic] with the men until the finale (Bearss and Tunnard 1866:337).

After signing the surrender, Buckner subsequently returned to Shreveport where he reorganized a unit of one thousand hand-picked Missouri troops, whom he led through Texas and into Mexico (Winters 1963:426).

It is against this backdrop of confusion that the *Kentucky* arrived in Shreveport and subsequently was lost. Union authorities were in a hurry to parole and repatriate Confederate soldiers, thereby reducing the chance of organized groups forming in opposition to their occupation. The parole process was swiftly implemented and transportation was arranged for parolees from other states. The *Kentucky* was one of several vessels brought in by the U.S. Quartermaster to move the paroled soldiers. The process was unlikely to have been smooth, as the parolees were not all in discrete, organized units (Tables 2 and 3). Contributing further to the chaos and transportation difficulties was the presence of many camp-followers and soldiers' families. The haste with which paroles were taken, the splintered nature of various Confederate units, and the overall confusion that prevailed goes far to explain the apparent discrepancies in the story of exactly what happened, who was to blame, and most importantly, who was lost, when the steamboat *Kentucky* went down in the Red River on the night of June 9, 1865.

Table 2. Partial List of Confederate Units Surrendered at Shreveport, Louisiana: May 26, 1865

MISSOURI

Regular Units and Components

- First Cavalry (Elliott's Battalion)
- First Artillery/Battery
  - -Roberts' Artillery Battery
- Second Infantry (Burbridge's)
- Second Artillery (formerly "Clark's Missouri State Guard")
  - -Collins' Missouri Battery
- Second Cavalry
  - -Price's Bodyguard Company; aka Price's Escort Company I)
- Third Infantry
- Third Field Artillery Brigade
  - -LeSeuer's Brigade
- Fourth Cavalry (Burbidge's)
- Fourth Engineers (formerly First Engineers Battlion)
- Fifth Cavalry (Shelby's)
  - -Gordon's Cavalry
  - -Marmaduke's Escort (Co. D)
- Seventh Infantry (Caldwell's)
  - -Jackman's (formerly, 16th Infantry)
- Eighth Infantry (Mitchell's; Burns')
- Eighth Cavalry (Jeffers')
- Eighth Battery
- Ninth Infantry (Clark's)
  - -Buster's Infantry
  - **-Pindall's Sharpshooters (9th Btn)**
  - -Clarkson's Missouri Cavalry (merged)
- Tenth Infantry (Steen's/Pickett's/Moore's Regiment)
- Tenth Cavalry
  - -Missouri 7th Cavalry Regiment
  - -Lawther's Cavalry
- Eleventh Infantry (Burns' Infantry)
- Eleventh Cavalry
  - -Hooper's Cavalry
  - -Thompson's Cavalry
- Twelfth Cavalry
  - -Shanks' (Jackson County) Cavalry
- Thirteenth Infantry (Benjamin Rives' Regiment)
- Fourteenth Cavalry (Woods')
- Sixteenth Infantry (Jackman's; combined with Seventh)
- Sixteenth Cavalry (Jackman's, Nichols')

Independent/Unidentified Units

- Searcy's Sharpshooters (Searcy's Cavalry Regiment)
- Slayback's Cavalry (disbanded 1864?)
- Williams' Cavalry (disbanded 1865?)
- 1st Northeast Volunteers (Porter's Cavalry; disbanded 1862?)
- Perkins' Battery/Infantry

TEXAS

Regular Units

- First Cavalry (Buchel's)
- Third Cavalry/Battery (Ross')

•Fourth
•Fifth
•Tenth
•Seventeenth (Walker's Division)
•Eighteenth
•Nineteenth
•Twenty-third
•Twenty-eighth (Walker's Texas Division)
•Twenty-ninth
•Thirty-fourth Cavalry (Terrel's; Wells')

Unidentified Units
•Saufley's Texas Cavalry Battalion

LOUISIANA

Regular Units
•Second Infantry
•Third Infantry
•Sixth Infantry
•Twenty-fourth Infantry (Consolidated Crescent Infantry; Beard's)
•Twenty-sixth Infantry
•Twenty-eighth Infantry (Grey's Old Regiment)

Independent/Unidentified Units
•Carter's Scouts (Wheeler's Mounted Scouts)
•Maddox's (17th Infantry Regiment; First Louisiana Brigade?)
•Ranson's Brigade (Ransom Guards, Louisiana Militia?)
•Stewart's Infantry (Stewart's Legion, Louisiana Volunteers?)

ARKANSAS

Regular Units
•First Cavalry Regiment (Monroe's; Crawford's?)
•Second Infantry
•Third
•Twenty-Second Infantry (McRae's)
•Thirty-second Infantry
•Thirty-fourth Infantry
•Thirty-eighth Infantry Regiment (Shaver's; aka the Bloody Seventh)

Independent Units
•Boon's Arkansas
•Dobbins' (1st Arkansas Cavalry Reg't [disbanded /reassigned])

COMBINED UNITS

•Confederate First Trans-Mississippi Cavalry Battlion (First Arkansas and First Louisiana)

UNIDENTIFIED UNITS

•Burnett's (Barnett's?) Sharpshooters
•Bryan's Battery
•Buster's Battery
•Chambers' Battery
•Coffer's (?)
•Flippen's (?)
•Green's (?)
•Hoops' (Hawps') (?)
•Pindley's Battery

Table 3. List of Arkansas Troops paroled at Shreveport, June, 1865 (After Allen 1988)

Charles W. Allen
W. C. Ashley
R. A. Bandy
R. S. Bandy
John Black
James Brandon
William Brannon
J. H. Brown
B. F. Brumley
J. F. Carter
D. C. Cashon
John Casper
William Chestnut
William Cozort
Andrew Dailey
A. J. Davidson
J. M. Deaton
Ozias Denton
Thomas C. Dickson
G. W. Dildy
Dishman
S. H. Doane
S. R. Erwin
T. C. Erwin
Robert C. Evans
William Faulkenbery
B. P. Ferrill
J. T. Fife
William Fisher
G. W. Franks
J. G. Garner
Elias Gibson
Matthew Gleghorn
Allen Goings
C. E. Goodwin
Allen Gossett
J. S. Graves
Hordan Haddock
H. Haggard
A. S. Hansborough
J. W. Heard
G. W. Hensley
S. T. Hensley
William Herndon
J. M. Higginbottom
Asa Hill
J. R. Hill
J. C. Hill
J. L. Hillis
B. Halley
J. F. Huckabee
B. W. Hudson
Josh Hudson
J. F. Huffstader
B. W. Ivie
Alex Jackson
William Jackson
James Justus
Walter Kees
Dan Kelner
W. T. Kirkpatrick
W. G. Leverton
W. F. Lively
J. B Low
Wiley Matthews
D. McBride
A. J. McCarrol
D. F. McCord
John McGehehey
James McCloud
Joseph/John McCloud
A. T. McMillion
G. R. Minich
John Moore
Isaac Morgan
W. J. Mayers
James Neely
Isaac Norman
--- Overstreet
--- Owens
Thomas Peoples
James Perin
J. Petts
Tom Predmore
J. H. A. Puckett
Henry Richie
R. H. Riddle
Jesse Riggs
George Rogers
William Rogers
Jacob Sammons
Samuel Sandifer
P. M. Shannon
J. P. Smith
P. T. Smith
W. D. Smith
M. L. Standfield
W. H. Thompson
Liles Tiner
Anderson Vance
Anderson Ward
Joseph Ward
H. G. Watson
J. L. Watson
J. W. Wier
Washington Wells
William Wells
James Wiles
James Williams
John Williams
T. W. Williams
David Wirt
W. F. Wood
William Wright

The *Kentucky*'s Last Voyage

All primary sources consulted generally agreed upon the date, time, and approximate location of the *Kentucky's* demise. The steamboat left the Shreveport wharves about 6:30 PM on June 9, 1865, and sank at about 9:00 P.M., approximately two and one-half hours after leaving Shreveport (Shreveport *South-Western*, 6/14/65; New Orleans *Times*, 6/14/65). The sun set on June 9, 1865 at Shreveport at 8:27 P.M., and by 9:00 P.M. the sky was in deep twilight but not total darkness. The first stars were visible by 8:50 P.M. There was no moon; a thin crescent moon would rise at 4:03 A.M. on the morning of July 10, 1865 (Sunset, twilight and moonrise calculation performed on Starry Night DeLuxe software, Sienna Software). The location of the wreck was placed at between twelve (New Orleans *Times* 6/14/65) and sixteen (Shreveport *South-Western* 6/14/65) miles downriver from Shreveport.

Passengers and Cargo

Kentucky was "perfectly jammed" (Shreveport *Southwestern* 6/14/1865) when it slid away from the wharves in Shreveport that evening. The main cargo was human. The list of passengers included between 700 (*Missouri Republican* 6/24/1865) and 1,200 (*New Orleans Times* 6/14/1865) paroled Confederate soldiers who had been assigned to various units of the defunct Trans-Mississippi Department, and who had been paroled at Shreveport. Although they represented a number of surrendered units of Kirby Smith's command, including several Louisiana and Arkansas units, the majority later were identified as belonging either to Pindall's Sharpshooters, a unit of the Missouri Infantry, to "Price's Escort" (*Missouri Republican* 6/21, 6/24/1865), or to the Third Louisiana Cavalry (Baton Rouge *Weekly Gazette and Comet* 6/27/1865). "Pindall's Sharpshooters" was the informal name for the 9th Missouri Sharpshooter Battalion, who took their name from their commander, Major Lebbeus A. Pindall. The diary of James T. Wallace of Company D notes that his unit "turned over our arms, munitions, etc on 7th of June," after which they were "furnished transportation on old steamer...'Kentucky'" (Thompson, personal communication 1999). No Federal troops were included in any passenger lists. Many of the parolees were "lying about the boat" and/or sleeping on the floor of the forward cabin when the accident occurred (Missouri *Republican* 6/21/1865).

The *Kentucky's* passenger manifest also included about "thirty citizens, mostly women and children" and "one hundred Negroes" (Missouri *Republican* 6/24/1865). The women and children would have been traveling in the vessel's regular passenger cabins, but the Negroes reportedly had been "accommodated" in the open on one of the decks (*Arkansas State Gazette* 6/23/1865), almost certainly the main deck. In addition to its passengers and crew, *Kentucky* also was laden with a mixed cargo that included approximately 260 horses belonging to some of the troops, and an unspecified amount of personal baggage. Horses and larger elements of the cargo also would have been carried on the main deck.

Why and How the Vessel Sank

Reports that the *Kentucky* was "perfectly jammed" (Shreveport *Southwestern* 6/14/1865) implied that overloading was a contributing cause to the sinking and subsequent loss of life. When *Kentucky*'s load is compared with the recorded capacities of similar vessels, the conclusion seems to be that the vessel was not over-loaded. The slightly smaller *N.W. Thomas* (Figure 33), a 190 ft side-wheel steamboat built in Cincinnati in 1853, was expected to carry 1,000 troops, 100 horses,

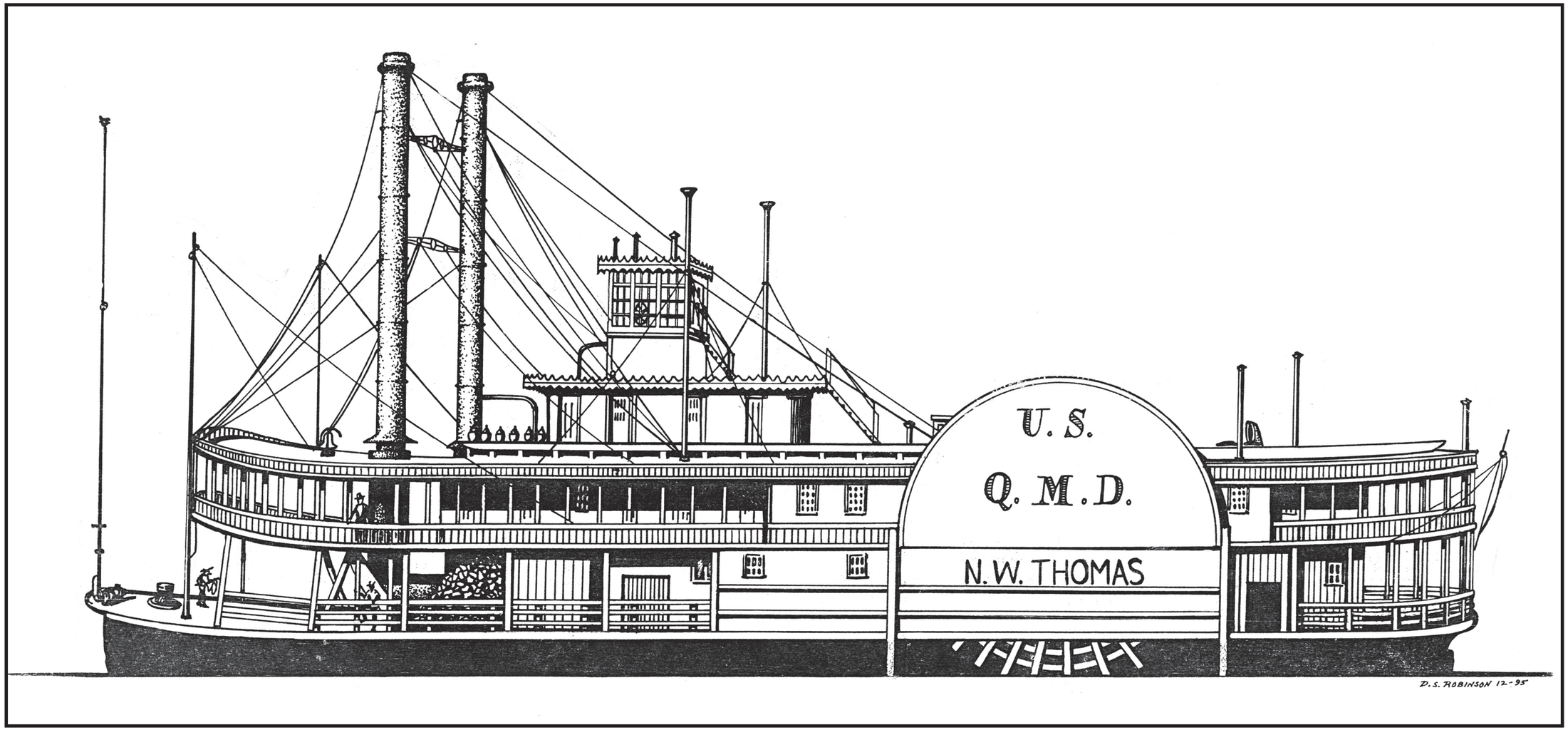


Figure 33 *N. W. Thomas*, built in Cincinnati, Ohio, 1853. Length on deck of 190 ft, breadth to outside of guards of 49 ft; capacity: 1,000 troops, 100 horses and 500 tons of freight. After a drawing by an unknown artist, color print in New Orleans District, U.S. Army Corps of Engineers (from Collections of the National Archives and the Records Service, General Services Administration)

and 500 tons of freight (caption on a drawing from the Collections of the National Archives and the Records Service, General Services Administration - copy at the New Orleans District, U.S. Army Corps of Engineers). *Kentucky* reportedly carried approximately the same number of people as the rated capacity of *N.W. Thomas*, and substantially more horses.

Could the increased number of horses, combined with personal baggage and other cargo, have severely overload the vessel? Arriving at an estimate of the total load imposed by the passengers and horses is, of course difficult, but such speculation is necessary to gain some insight into the issues of whether or not the *Kentucky* was overloaded. To pursue this argument, the following conservative statistical averages were adopted: (1) an average weight of 150 pounds for each of no fewer than 950 repatriated, probably thin and undernourished, Confederate soldiers; (2) an average weight of 100 pounds for each of the reported thirty civilian passengers, including men, women and children; (3) an average weight of 1,250 pounds for each horse (American Horse Association, personal communication 1997); and (4) an average weight for each of the 100 Negroes (again a mix of men, women and children) of 100 pounds. The nature and amount of the passengers' personal effects, or the amount of additional cargo, such as cotton or fodder, could not be ascertained from the available sources.

Using the weights hypothesized above, and assuming an average of 950 soldiers, the total load represented by the human and animal cargo was 240.25 T (480,500 lbs). Utilizing the maximum reported count for the number of repatriated soldiers (1,200) adjusts the total load upward to 259 T (518,000 pounds).

The hypothetical scenario presented suggests that the *Kentucky*, at least in terms of its realistic capacity, probably was not overloaded; the vessel should have been able to accommodate substantially more passengers and cargo than were reported on board. In fact, Gibson and Gibson (1995:589) maintain that vessel capacity routinely was considered when assigning troops to vessels, although bribery may have resulted in an excessive load and played a large role in precipitating another major disaster, the wreck of the steamboat *Sultana*.

Although the Arkansas *State Gazette* (June 23, 1865) implied that the *Kentucky* may have been "in a sinking condition" before leaving Shreveport and the vessel was undeniably old, most sources tended to agree that the steamboat struck some sort of obstacle--either a snag or tow-head (*New Orleans Times* 6/14-15/1865), or the riverbank itself (Alexandria *Democrat* 6/14/1865; *Missouri Republican* 6/21/1865)--perhaps twelve miles below Shreveport. *Kentucky's* encounter with this obstacle apparently ruptured the vessel's hull, and she began to take on water. An article in the *Shreveport Journal* for July 10, 1974, described how the survivors of the disaster, returning to Shreveport in 1940, 75 years after the wreck, mentioned that the vessel hit a snag; this same article also recounted the rumor that Federal troops “had something to do with the sinking of the boat” (*Shreveport Journal*, 7/10/1974).

Initially, the incident apparently passed with little concern on the part of the captain, and the vessel continued its journey; the *Missouri Republican* (6/21/1865) observed that "nothing serious was apprehended of it (i.e., striking the bank) [until] about 9 1-2 o'clock P.M., [when] it was discovered that the boat had two and a half feet of water in her hold." The *New Orleans Times* (6/15/1865) reported that "it was fully one-half an hour after the snag was struck before the steamer went down," and that "She ran about four miles after commencing to leak…"

At this point, *Kentucky*'s captain and crew apparently took a variety of precautionary measures. All sources agree that the crew's attempts to maneuver the vessel towards the shore, secure her to the bank with lines, and put out the landing stages, were futile. The inability of the

captain and crew to accomplish these tasks was attributed to a variety of factors, chief of which were the strength of the river's current, which caused the vessel to swing around uncontrollably (*Missouri Republican* 6/21/1865), and/or the amount of water already in the vessel's hold that seriously impaired her maneuverability (*New Orleans Times* 6/15/1865). One survivor of the wreck later noted that he thought that the captain also had ordered the pumps to be started in a belated effort to empty the water in the hold (*Missouri Republican* 6/24/1865).

Most newspaper accounts concur that the vessel then careened; that is, that it tilted severely, slanting the decks at such an angle that on-deck passengers and cargo slid or were thrown into the river. The *New Orleans Times* (6/15/1865) related that "The boat then careened and sunk instantly, the water washing over the hurricane deck forward. The stern remained above water." The *Missouri Republican* (6/21/1865) recounted a slightly different version:

> "The boat careened over on its side, slowly at first, and then suddenly the bow went down, and only about twenty feet of the ladies' cabin remained out of water, -- this too standing at such an inclination, so nearly perpendicular, that it was with great difficulty any one could climb out… the texas and hurricane deck forward remained out of water… "

According to one of the survivors, "she careened to the starboard side, shipped water on the seine (?) guard and went down immediately. The boat settled to the hurricane reef… " (*Missouri Republican* 6/24/1865). At least three accounts inferred or stated directly that the boat broke in two (*New Orleans Times* [6/15/1865]; *Missouri Republican* [6/21/1865]; *Arkansas State Gazette* [6/23/1865]); two (*New Orleans Times* 6/15/1865); *Missouri Republican* 6/24/1865) mentioned specifically that the texas caught fire, but noted that the blaze was extinguished quickly. One of the crew began ringing the *Kentucky's* bell and another vessel, the *Col. Chapin* came from about a mile upstream to the aid of the passengers.

Casualties

As the vessel careened, broke apart, and sank, pandemonium erupted, as many passengers were washed off the decks during the initial moments of the incident (*Missouri Republican*, 6/24/1865). Those who could do so subsequently rushed for the hurricane deck; these survived, but many who were caught between decks drowned (*New Orleans Times* 6/14/1865). A New Orleans *Picayune* story quoted in the June 21 *Missouri Republican* noted that "the soldiers had been permitted to remain asleep" during the initial moments of the incident, and thus "nearly all of them were carried under with the boat." The same article went on to describe the "confusion and terror" that reigned as those passengers who "were outside or could easily extricate themselves, rose to the surface and swam out," while "some clambered up the sides and floor of the boat and thus escaped." Some passengers were able to swim to the safety of the river shore (*New Orleans Times* 6/14/1865), including two or three of the "Negroes," but most of these reportedly were washed overboard within the first few seconds (*Missouri Republican* 6/22/1865). The *Kentucky's* crew survived, but all except three of the horses perished.

Passengers who managed to remain afloat in the river's strong current were picked up by another transport, the steamboat *Chapin*, which had hove to about one mile upstream and responded to the incessant ringing of the *Kentucky*'s bell. The captain and crew of the *Chapin* are credited with saving between "four hundred and five hundred souls," including nearly all of the women and children passengers (*New Orleans Times* 6/16/1865).

Preliminary estimates of casualties ranged between fifty and two hundred persons; however, because contemporary news journals often quoted somewhat dated dispatches from other papers, the two hundred figure continued to dominate later accounts of the *Kentucky* incident, thereby adding to the confusion in trying to determine exactly how many were lost. In fact, a single news item in the June 22 issue of the *Missouri Republican* cited conflicting figures; in that eyewitness account, a survivor contended:

> that the loss of life occasioned by the sinking of the Kentucky, below Shreveport, is greatly exaggerated. I am satisfied that **not more than 15 or 20 white persons, and about 50 negroes, mostly women and children,** were drowned, instead of 200, as has been stated. About that number of the latter were on board, and, being on deck, were submerged immediately with the sinking of the boat. **About fifty white persons are known to have drowned and about the same number of negroes.** [Emphasis added].

After recording in his journal that the vessel sank and then settled on its side, James Wallace, a member of Pindall's Sharpshooters, noted that "...3 from our company perished, Joseph Wilson, Washington Burkhart and John Bumps" (Thompson, personal communication 1999). The fact that he listed only three lost members from Pindall's, one of the most numerous units on board, is significant.

Four months after the disaster, in his final report to Quartermaster General of the U. S. Army, the Union's Chief of Rail and River Transportation, Lewis B. Parsons, maintained that the exact number of casualties remained unknown even then, but he believed that it did "not [to] exceed thirty lives" (*United States War Department 1890 - 1901*, Ser. I, Vol. LII, Part I, 1865:706). This figure corresponds reasonably well to the twenty-eight names on the independent list of casualties derived from the various sources reviewed for this report (Table 4). Given the historic and geographic context of incident, the names and numbers of the vessel's African American casualties probably never will be known.

According to people who lived on an adjacent plantation, a cemetery was established adjacent to the wreck site to bury the dead that could be retrieved (*Shreveport Journal* 7/10/1974), but this cemetery was washed away in a large flood in 1908.

Responsibility

In a tragedy such as this, a search for who was to blame inevitably ensues. Maj. Gen. Herron convened a court of inquiry in Shreveport to ascertain the facts of the case; at the conclusion of the inquiry, the officers of the *Kentucky* were absolved of any responsibility for the incident. Both the *New Orleans Times* (6/19/1865) and the Arkansas *State Gazette* (6/27/1865) carried the official verdict: "The investigation touching the loss of the U. S. transport *Kentucky*, resulted in a finding favorable to the officers who were in charge of her at the time. It was held by the commission that the occurrence was entirely accidental."

At least two survivors of the wreck took pains to recount the perhaps ineffectual, but nonetheless extensive, evasive actions taken by the captain and his crew. Their accounts mentioned efforts to make the vessel fast when its crew finally noticed that she was taking on water (*New Orleans Times* 6/15/1865; Shreveport *Southwestern* 6/14/1865; *Missouri Republican* 6/21/1865; 6/24/1865). One of these survivors also mentioned that the Captain checked on the

Table 4. Known Casualties from the Kentucky Disaster

Casualty	Unit (if known)	Information Source
John Douer (J. W Dover?)	Pindall's Battalion, Co . A	*South-western (6/14/1865);* *Journal* (7/10/1974); *Mo. Republican* (6/24/1865)
Daniel Fagatey / Fagally (?)	"	"
R. Kincannon		"
Joseph Wilson		Thompson, Joe 1999 *Mo. Republican* (6/24/1865)
John Burns	Pindall's Sharpshooters, Co. D	"
W. Burkheart /Birkhardt	"	Thompson, Joe 1999"
W. Baker	"	*South-western (6/14/1865);* *Journal* (7/10/1974)
Jacob Clayton	"	*South-western (6/14/1865);* *Journal* (7/10/1974); *Mo. Republican* (6/24/1865)
William Burton (Barton?)	Pindall's Sharpshooters, Co. F	"
Benjamin F. Honchens	"	"
Benjamin Cooper	Pindall's Sharpshooters, Co F	"
R. J. Cason		"
Fries (?) Cason		*Journal* (7/10/1974)
J. R. Enlow		*South-western (6/14/1865);* *Journal* (7/10/1974); *Mo. Republican* (6/24/1865)
R. Thomas		*Journal* (7/10/1974)
Brantley Hines		*Journal* (7/10/1974); *Mo. Republican* (6/24/1865)
R. C. Robertson (Robinson?)		"
(Capt.) Anthony Walton	Stone's Regiment; (Price's Army)	*Journal* (7/10/1974)
--. McCulough		"
H. Russell		"
James E. Dry	Pindall's Sharpshooters, Co F	*Journal* (7/10/1974)
Col. Bush	3rd Louisiana Cavalry	*New Orleans Times* (6/16/1865)
James P. Walton		"
John O. Giallard		Shreveport *Journal* (7/10/1974)
M. Ancions	18th Louisiana, Co. F	"
Rufus King	Unidentified/Civilian (?)	*Missouri Republican* (6/22/1865)
____ Gregory	"	"
James M. Thomas	"	*Missouri Republican* (6/24/1865)
A. H. Watson John Bumps	"	" Thompson, Joe, 1999

water level in the hold, ordered the pumps to be worked, and awakened the passengers (*Missouri Republican* 6/24/1865).

However, the majority of public opinion expressed in the press coverage of the incident refused to exonerate the Federal authorities responsible for transportation operations. The Arkansas *State Gazette* (6/23/1865), for example, literally accused the authorities at Shreveport of forcing the *Kentucky*'s captain to undertake the voyage against his better judgment.

However, most coverage faulted the captain of the vessel for running at night along an extremely hazardous stretch of the river; for not having reacted when the vessel first hit or snagged; for failing to give warning to those on board; and/or for not taking effective action once the accident occurred. For example, the *New Orleans Times* (6/15/1865) editorialized that "The loss of life might have been prevented had the effort been made to effect a landing at an earlier moment." The *Missouri Republican* (6/21/1865) went further:

> … if notice of the dangerous condition of the boat had been given to the sleepers, or, better still, there had been such watchfulness and good conduct as not to have waited until the hull was full of water before trying to land, the lives of two hundred victims of this piece of criminal indifference and carelessness would have been saved.

Perhaps most damning were the remarks made by the captain of the *Chapin* in an open letter published in several journals:

> … in the opinion of all high minded and honorable men, as well as some who were on board with these officers of the boat, and also in my opinion too, the disaster could have been avoided, and [that] it only resulted from inattention and ignorance, as an investigation of the same will prove. During the rescue of the people on board, and while running my small boat in person, I made use of the following language: `If I had the power, I would hang the captain and pilots to the first tree that I could find,' an assertion that I am prepared to maintain (*New Orleans Times* 6/16/1865).

Archeological Issues

While it has provided answers for some questions, the preceding documentary exposition of the wreck of the *Kentucky* leaves numerous others unresolved, and in fact raises more. These issues may be susceptible to further archeological and archival research

While the documentation clearly suggests that the number of casualties was far less than the 900 claimed by some researchers (e.g., Joiner 1997), the list of dead amassed through examination of contemporary newspaper accounts and through inquiries into genealogical sources (Table 4) may be far from complete. The most recent scholar to tackle the vastly more well-documented *Sultana* disaster (Salecker 1996) indicated that it took fifteen years to complete the project, and that he still was unsure that he had accounted for everyone (Salecker 1996:219). Clearly, continuing archival research into other newspapers, unit histories, genealogies, official records, and personal reminiscences could extend the list of the dead. In particular, information should be sought on the identities of the 100 African-Americans who, until the present research, had been overlooked completely.

A related issue revolves around the question of whether the wreck of the *Kentucky* constitutes a "tomb," as some have contended. One newspaper account speaks of the fact that passengers caught between decks were trapped and drowned (*New Orleans Times* 6/14/1865). However, other survivors' accounts cited in the Shreveport *Journal* (Watkins 1974:D-1) suggest that major efforts were exerted to remove and inter the casualties of the wreck, several of whom were buried on nearby plantations. The bodies of others, including Captain Anthony Walton and his son, apparently were carried down the river and never recovered. Only careful archeological excavation can resolve the issue of whether any human remains still are entombed within the wreck of the *Kentucky*.

Questions remain about exactly how the wreck occurred, and the extent to which the vessel's crew was able to take appropriate actions to prevent or mitigate the tragedy. For example, how serious was the damage to *Kentucky*'s hull as a result of her striking the snag or bank as she proceeded down the Red River? Were the pumps in operation when the vessel went down? Can the position of the rudder and steering mechanism shed some light on whether *Kentucky*'s captain and crew could control the vessel? Did the vessel "break in two," as some newspaper accounts suggested?

Finally, the nature of the non-human/animal cargo carried aboard the boat never has been ascertained. What personal effects were carried by the civilian passengers? How did these differ from the items carried by the repatriated troops? Can the African-American presence be documented through artifact analysis? What other types of items comprised part of the vessel's cargo?

CHAPTER VI

PHASE II FIELD METHODS & RESULTS

Given the potential importance of 16BO358, the possible impacts to the site from erosion and construction became a serious concern, and an assessment of its eligibility to the National Register of Historic Places was required. This prompted the Phase II investigations of the vessel, and a work plan was developed to provide information that was critical for assessing the remains and developing a management plan. Upon completion of the Phase II investigations, significance of the site was established. Various options for mitigation then were assessed, and a work plan was developed for Phase III data recovery in consultation with the Vicksburg District of the U.S. Army Corps of Engineers. This chapter describes the field methods used to establish the identity of the shipwreck and to assess its significance.

Phase II Field Investigations

The research design for the Phase II field investigation of the *Kentucky* called for two stages of field work. The first phase was to place cores across the site, so that boundaries could be established. The cores were also designed to assess the depth and preservation of the subterranean segments of the vessel. The second stage of the investigation was for divers on SCUBA to explore the submerged portions of the wreck.

Coring Survey

Between March 13 and March 17, 1995, staff from R. Christopher Goodwin & Associates, Inc. monitored coring activities conducted by staff from USACE, Vicksburg. Twenty-one core-tests were excavated at the site; the location of these cores are depicted on Figure 34, and grid locations are detailed in Table 5. The grid originally established on the site in January of 1995 was utilized for this coring survey, and all locations were therefore recorded with metric measurements. Core drilling was performed by the geotechnical staff of the Vicksburg District, U.S. Army Corps of Engineers (Figure 35). The objectives of the drilling operation were to determine, if possible, the structure and orientation of the wreck and to see if large elements (such as the engine) or smaller artifacts were present. Samples of wood recovered from the wreck were to be collected and analyzed if hull structure was encountered.

A "Memorandum for the Record," prepared by Mr. Kenneth Jones of the Vicksburg District, U.S. Army Corps of Engineers, described the methods used for coring (Jones 1995):

Table 5. Core Holes and Grid Locations

CORE #	GRID REFERENCE	CORE #	GRID REFERENCE
Core #1	N1090 E957.5	Core #12	6.25m from N1090 E949 6.15m from N1090 E955
Core #2	N1084 E957	Core #13	6.60m from N1090 E949 4.90m from N1090 E955
Core #3	8.50m from N1081 E961 11.75m from N1063 E961 5.05m from N1072 E961	Core #14	2.85m from N1090 E958 2.20m from N1090 E961
Core #4	7.10m from N1072 E961 5.20m from N1063 E961	Core #15	3.80m from N1090 E961 9.40m from N1081 E961
Core #5	4.90m from N1063 E961 4.25m from N1072 E961	Core #16	N1090 E967.40
Core #6	N1066 E963	Core #17	N1090 E969.30
Core #7	7.50m from N1072 E961 11.55m from N1063 E961	Core #18	5.75m from N1090 E958 8.55m from N1090 E952
Core #8	8.15m from N1072 E961 9.15m from N1063 E961	Core #19	8.30m from N1090 E964 8.90m from N1090 E955
Core #9	9.20m from N1072 E961 7.65m from N1063 E961	Core #20	10.00m from N1090 E964 10.80m from N1090 E958
Core #10	10.30m from N1072 E961 7.50m from N1063 E961	Core #21	11.25m from N1090 E964 12.50m from N1090 E958
Core #11	1.95m from N1063 E947 11.90m from N1063 E961		

Several methods of sampling were employed and each met with varying degrees of success. The initial two holes were advanced by jetting an open drilling string into the sandy soil creating a 4 to 6 inch hole. Water for the jetting operation was pumped directly from the Red River using a gasoline powered portable pump. The open pipe was advanced until an obstruction was encountered and a sample was recovered using the drive tube and down hole hammer. Typically the top deck of the boat was encountered at a depth of 15 to 20 feet and the "hull" at a depth of 25 to 30 feet. Samples of oak planking ranged from 1 to 6 inches. This technique didn't afford the desired control and subsequent jetted holes were advanced using the rig's pump. Other drilling and sampling included conventional rotary drilling with mud using a shelby tube and/or a core barrel. The shelby tube was not robust enough to "push" samples of the oak planking and was abandoned. The core barrel proved unworkable because of bearing problems. A standard 2.5 inch tube with a downhole hammer proved unworkable because the sampler tended to "bounce" on the oak planking.

The technique that eventually proved most successful involved jetting a hole with clear water until an obstruction was encountered. Water was pumped from the mud box which was kept full by the portable pump. Return water was allowed to drain into the river. When an obstruction was encountered bentonite was added to the mud box water until its return was noted at the top of the hole. This was done to increase the unit weight of the fluid and keep the hole opened. A 2.5 inch drive tube was attached to the bottom of the drill string and a sample was pushed using the hydraulic rams. Jetting or sampling continued through the entire target interval. On occasion it proved advantageous to rotate the sampler while advancing it. This action seemed to cut the oak planking. This technique

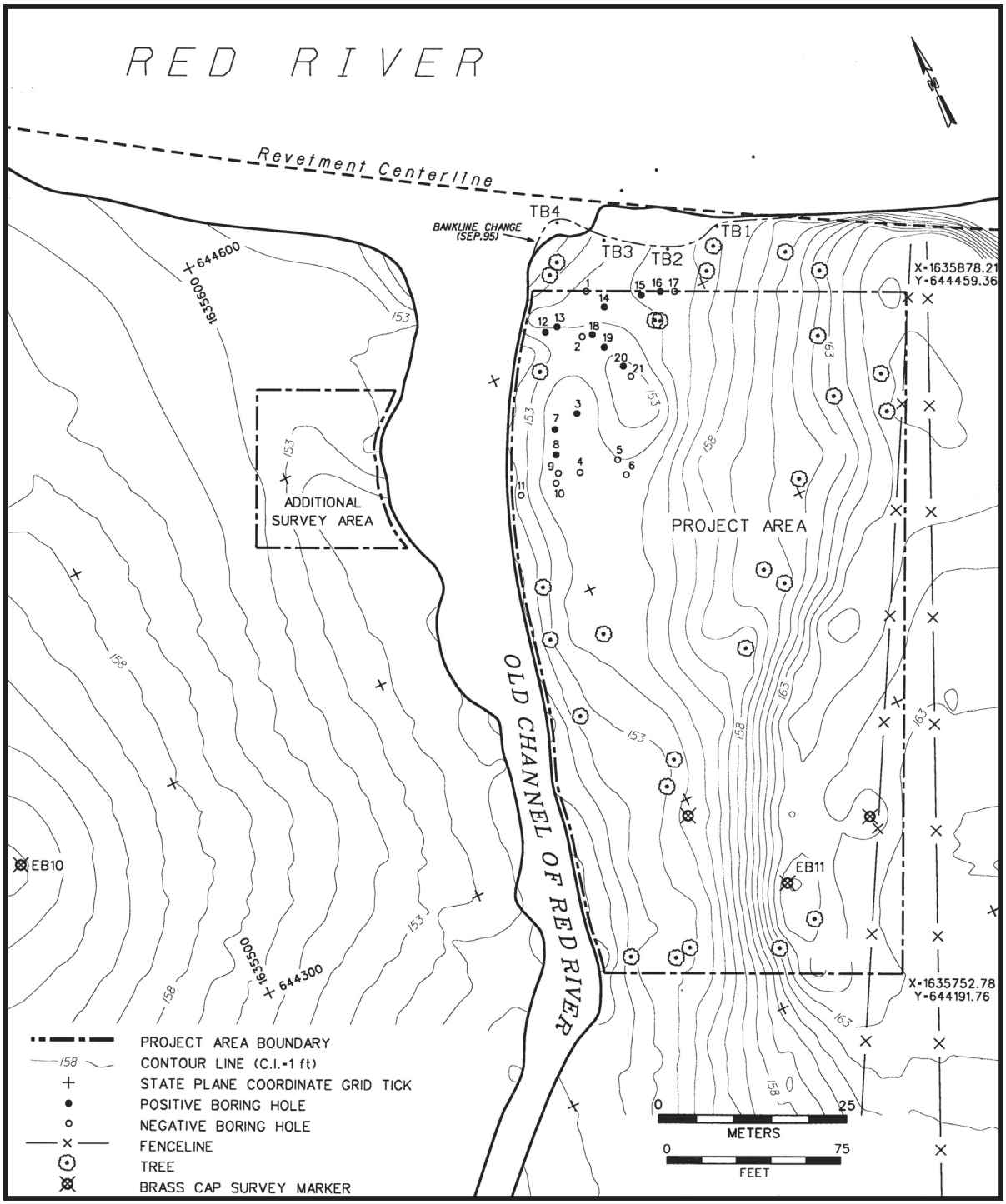


Figure 34 Locations of core sampling

Figure 35 Coring rig in operation at 16BO358

allowed the boring party to advance 6 to 8 holes per day. Twenty-one exploratory holes were bored and a piezometer was installed in hole #3 (Jones 1995).

Laboratory Analysis

Wood Species Identification. Wood samples retrieved from core holes 12, 15, and 18 were sent to Dr. Terrance E. Conners of the Forest Products Laboratory at Mississippi State University for analysis and species identification. Portions of wood were excised from each sample and examined with a hand lens as part of the initial evaluation. Two of the three samples could not be adequately evaluated with the hand lens due to their deteriorated state, so all were sectioned, examined microscopically, and identified using the microscopic feature keys found in standard texts on wood technology. Multiple sections of three mutually orthogonal views of each portion were obtained (cross-section, radial section and tangential section) to confirm the presence or absence of the requisite features.

Underwater Survey

The objectives of this aspect of the study were: 1) to locate, delimit, and accurately map the exposed portions of *Kentucky*'s wreckage; 2) to recover archeological evidence of the vessel's function, age, construction, integrity, and research potential; and 3) to obtain additional evidence further substantiating the wreck's identification as *Kentucky*.

Initial Location of Exposed Wreckage by Divers. Exposed portions of *Kentucky*'s hull were located underwater using systematic underwater surveying techniques that employed a recording fathometer and SCUBA divers. Prior to commencing diving operations, an informal bathymetric survey was conducted using a recording fathometer to determine river bed topography, and to detect the presence of exposed wreckage. Following the completion of the bathymetric survey, diving operations commenced from the west bank, at the approximate centerline of the vessel as indicated by the coring and magnetometer surveys. A central datum, consisting of a simple device for determining azimuth, was established near the water's edge at this point, and its position was recorded relative to two nearby USGS benchmarks and several other previously mapped landmarks. The azimuth device consisted of a 4 ft x 3/4 in (1.2 m x 2 cm) copper pipe, over which was passed a circular, plastic compass card and an attached compass. The compass is used to align the compass card with magnetic north, after which the compass card is fixed in place. A line or tape measure then can be extended from the center of the card into the water. When the far end of the tape is placed over a feature or target, the device provides an effective and reliable means of determining bearing and distance to the target (Robinson 1995).

Dive team personnel, consisting of a single tethered SCUBA diver, a tender/safety diver, radio operator, and research vessel operator, conducted the surveys. Divers were equipped with a full-face breathing-mask and wireless two-way voice communications. The ability to maintain continuous communications between the diver and topside personnel via the diver's mask-integrated wireless communication system greatly enhanced diver safety and the underwater data collection process. The tender/safety diver monitored the diving operations from the azimuth device on shore and tended the diver's tether line. The radio operator monitored diver-surface communications on board the research vessel and recorded the diver's observations. The vessel operator navigated to and from the project area and provided general assistance with all topside survey tasks.

At the start of each initial survey dive, the azimuth device was calibrated to magnetic north, after which the diver secured a tether to a brass clip and ring to the device and entered the water. Once submerged, the tethered diver moved along the river bank to a pre-determined distance from the datum, and then moved into the channel, surveying an arc of approximately 180° across the face of the river bank to the opposite side of the datum. After completing the 180° sweep, the diver's tether was extended or retracted 10 ft (3 m), and another sweep was made. This process was repeated at 10 ft (3 m) increments to delimit all of the exposed areas of *Kentucky*'s hull. In addition to recording starting and ending azimuths (compass bearings) of each sweep, surface personnel also recorded in detail the diver's observations on bottom topography, and the location, size, and orientation of exposed hull structures. The position of exposed hull features located during the survey were recorded by azimuth and distance, and then marked with reference buoys to indicate their position on the water's surface. Relatively precise positioning data for these features were obtained by U.S. Army Corps of Engineers surveyors, who used Electronic Distance Metering (EDM) equipment to survey the locations of the buoys and position of the present bank-line.

Documentation and Excavation of Exposed Wreckage. Once *Kentucky*'s exposed wreckage was located and mapped, a detailed examination and limited excavation of portions of the hull were undertaken to document the vessel's function, age, construction, archeological integrity, research potential, and to obtain evidence that might further substantiate the wreck's identification as *Kentucky*. During this phase of the field investigations, diving operations were staged from the research vessel, and were conducted un-tethered, solo, and in buddy pairs. Overall dimensions, scantlings, and construction details of the exposed hull were recorded by divers on underwater slates, or relayed verbally to topside personnel, who entered it into the project's master notebook. Limited excavation was undertaken at the stern, both inside and outside the hull, using a hand-held venturi dredge, to reveal the extent of its preservation below the mud and to recover any potentially diagnostic artifacts (i.e. uniform buttons, coins, etc.). To ensure against the loss of artifacts during excavation, sediments removed from these areas were filtered through a 3/16 in nylon mesh bag secured over the end of the dredge's exhaust hose.

Field Results

Coring Survey

Core Samples. The locations of individual core samples are shown on Figure 34, with the grid coordinates for each hole noted on Table 5. Just under half of the core holes yielded no evidence of the shipwreck. Core holes which yielded no cultural remains or other evidence of the shipwreck were cores 1, 2, 4, 5, 6, 9, 10, 11, 17, and 21. Core holes which encountered wood or metal are depicted on Figure 34 along with negative test cores. Positive core results are summarized in Table 6.

Table 6. Core Results

CORE #	RESULTS
3	Small pieces of wood were encountered at 3.96-4.57 m (13-15 ft); wood and a metal spike were retrieved from between 5.49-6.40 m (18-21 ft).
7	Pieces of wood were found at 5.79-6.10 m (19-20 ft) in a fine to medium grained gray sand; a 11.4 cm (4.5 in) plug of wood was retrieved at 8.84-9.14 m (29-30 ft); and wood was encountered between clay and sand at 9.14- 9.45 m (30-31 ft).
8	Six in of wood were encountered at 8.53-9.14 m (28-30 ft), with a layer of gray sand and shell beneath the wood.
12	Wood was retrieved from between 6.71-7.32 m (22-24 ft). *[Wood species: white pine.]*
13	Thin pieces of metal were encountered at 4.88-5.49 m (16-18 ft) in gray sand; some small fragments of metal were also encountered at 6.10-6.71 m (20-22 ft), but could have fallen from the initial contact zone at 4.88 m (16 ft).
14	A 4-6 in plug of wood was encountered, along with a square nail, at 5.18-5.79 m (17-19 ft); a 5 cm (2 in) plug of wood was recovered in gray sand at 7.01-7.92 (23-26 ft).
15	Two plugs of wood 7.6-10.2 cm (3-4 in) thick were recovered in a fine gray sand at 6.10-6.71 m (20-22 ft). *[Wood species: White oak]*
16	Wood was retrieved from a depth of 4.88 m (16 ft), along with an impenetrable metal mass.
18	Wood and fine, gray sand were encountered at 5.49-6.10 m (18-20 ft); at 6.71-7.01 m (22-23 ft), a 12.7-15.2 cm (5-6 in) plug of wood was recovered, along with a 35.6-40.6 cm (14-16 in) piece that appeared to be vertically oriented; at 7.01-7.62 m (23-25 ft) a 10 cm (4 in) wood plug was brought up from a context of fine, gray sand. *[Wood species: poplar.]*
19	A 5.1-6.3 cm (2-2 1/2 in) wood plug was recovered at 14.88-5.49 m (6-18 ft); a 15.2-20.3 cm (6-8 in) thick sample of wood was recovered from between 6.40-7.01 m (21-23 ft), and this sample had an iron spike through the center of the sample; at 7.01-7.62 m (23-25 ft), a 20 cm (8 in) thick wood sample was retrieved.
20	A 3.8 cm (1.5 in) plug of wood was recovered from a depth of 5.49 m (18 ft).

Wood Species Identification. Wood samples retrieved from core holes 12, 15, and 18 were sent to Dr. Terrance E. Conners of the Forest Products Laboratory at Mississippi State University for analysis and species identification. A wood sample from Core 12, recovered from approximately 17.5 ft (5.3 m) below surface, was identified as Eastern White Pine (*Pinus strobus*). Eastern White Pine has a range extending no farther south than Tennessee, South Carolina, and the extreme northeastern corner of Georgia (Conners 1995). The species distribution strongly suggests that this wood was brought to the site through human agency. White pine typically was used in steamboat construction where great strength was not required, and in an effort to reduce hull weight (Hunter 1993:81). Resinous pine wood also was considered by some to be the "best of all steamboat fuels" (Hunter 1993:265).

Core 15 contained White Oak (*Quercus alba*) recovered from a depth of 20 ft (6.1 m) below surface. Although members of the white oak group cannot be differentiated on the basis of anatomical features, various types of white oak were widely used in shipbuilding during the mid nineteenth century, particularly for framework and planking (Hunter 1993:81). Core 18 yielded a wood sample identified as yellow, or tulip, poplar (*Liriodendron tulipifera*). According to Conners, yellow poplar was usually used for millwork or lightweight furniture, as opposed to structural members. Hunter (1993:81) notes that in steamboat construction, poplar frequently was used in the same way as white pine or cedar, outside of the frame and hull planking in an attempt to lessen weight. The upper works of steam vessels, in particular, were eventually made almost solely of white pine or poplar, which also kept construction costs down (Hunter 1993:82).

Discussion. Eleven of the cores yielded positive evidence of the presence of the shipwreck, and careful analysis reveals some patterns which may be indicative of the vessel's orientation. The distribution of positive and negative core holes makes it clear that the long axis of the *Kentucky* runs roughly southwest to northeast. Negative core tests to the south and east help to define a discrete limit to the vessel in that area. There also are suggestions that the vessel is pitched slightly along this long axis. The deepest contact with the vessel came from cores at the extreme southwestern end of the distribution. Cores 7 and 8 encountered wood at depths of 31 and 30 ft (9.45 and 9.14 m), respectively (see Figure 34 and Table 7). This contrasts with cores 14 and 15 at the other end of the wreck, which encountered nothing beyond 26 and 22 ft (7.92 and 6.71 m), respectively (the northeastern-most core, core 16, encountered an impenetrable iron mass at a depth of 16 ft (4.88 m). The vessel may therefore have come to rest at an angle, with its northeastern end somewhat higher; alternatively, the hull may have broke in two at some point or was warped by the pressures of sediment. Cores across the width of the hull also yielded some interesting patterns. Cores 12 and 13 were located along the northern side of the vessel. Unlike other positive cores just to the south, wood was only encountered at one location within Core 12. This was a sample of white pine retrieved from between 22 – 24 ft (6.71 - 7.32 m) deep. Core 13 yielded nothing but some thin metal fragments. Both the pattern and the wood type suggest that Core 12 encountered the guard along the side of the steamboat. Guards were an extension of the main deck beyond the hull line of the vessel. They originally were developed to protect the paddle wheels along the side of the vessel, but the main deck planking could be extended out to the edge of the guard, significantly increasing deck space for cargo, fuel and the movement of passengers (Hunter 1993:91-93). Wide guards were characteristic of western steamboats, and the "extreme over-all width commonly exceeded the width of the hull by 50 to 75 per cent" (Hunter 1993:93). Guards were relatively light in weight and construction, as can be seen in Figure 33, with deck planking using lighter woods such as white pine. Coring at the edge of the vessel might therefore be expected to yield results similar to those encountered in Core 12. A similar pattern can be seen on the other side of the wreck. Core 20 is on the southern edge of the boring pattern, and it encountered a thin level of wood at a depth similar to that at which Core 12 encountered the possible guard.

In contrast to a core that was placed through a guard, a core through the central portion of a steamboat should encounter wood at several levels. At a minimum, it might be expected to hit the main deck and then, at a lower level, encounter the hull. Cores 7, 14, 18, and 19 were all placed in what is presumed to be the central line of the hull, and all encountered wood at two or more discrete depths. Core 18, in particular, may have encountered more complex structural elements, as it hit wood between 18 and 20 ft (5.49 and 6.10 m), and then hit a 5 – 6 in (12.7-15.2 cm) piece of timber at 22 – 23 ft (6.71 - 7.01 m). This 5 – 6 in (12.7 - 15.2 cm) timber appeared to run horizontally, but was associated with a second piece of wood some 14 – 16 in (35.6-40.6 cm) long that was oriented vertically. Finally, a 4 in (10 cm) plug of wood was brought up from between 23 – 25 (7.01 - 7.62) in depth. Significantly, it was the uppermost sample of wood that was identified as poplar. This is consistent with usage in the upper works of such a vessel, and it appears likely that this core first encountered the ship's superstructure, then penetrated the main decking and structural supports, and then hit the hull. A similar pattern may be seen in Core 19, in which three levels of wood were encountered, ranging from 16 ft (4.89 m) at the upper level to a depth of 25 ft (7.62 m) at the bottom.

Table 7. Matrix of Core Obstructions and Depths

Depth (feet)	Core 3	Core 7	Core 8	Core 12	Core 13	Core 14	Core 15	Core 16	Core 18	Core 19	Core 20
12 ft											
13	W										
14	W										
15	W										
16					m			W		W	
17					m	W		m		W	
18	W				m	W			W	W	W
19	W	W				W			W		
20	W	W			m?				W		
21	W				m?					W	
22				W	m?		W		W	W	
23				W		W	W		W	W	
24				W		W	W		W	W	
25						W			W	W	
26						W					
27											
28			W								
29		W	W								
30		W	W								
31											

W = wood m = metal

While the analysis outlined above suggests some specific conclusions as to the precise position and orientation of the wreck, caution should be exercised in using these results. While the negative cores to the south provide a clear boundary for structure in that vicinity, it is important to recognize that this is not so to the north. Further coring was prohibited in that area by the relic channel of the Red River, and it may be that remains extend farther into that area than demonstrated in this survey. It is possible, for example, to envision a sequence of events in which the *Kentucky* not only pitched fore and aft when it came to rest, with the stern higher than the bow, but also heeled over to one side or the other. Given the relatively flimsy construction of the upper works of most steamboats, the upper decks would likely have collapsed toward the lower side of the ship. This could result in a distribution of wood remains which is much wider than the original maximum breadth of the vessel. For this reason it was hoped that an investigation by divers of submerged portions of the hull would clarify the situation.

Underwater Survey

High water levels and velocities in the Red River made it impossible to pursue underwater investigations of the *Kentucky* until September of 1995. Lower velocities then made it possible for Goodwin & Associates, Inc., to conduct detailed underwater investigations at the wreck site. Despite the site's challenging environmental conditions, the systematic underwater survey methodology resulted in the successful location of all exposed sections of *Kentucky*'s stern, as well as portions of the starboard guard and main deck.

Fathometer Survey. Fathometer transects are depicted on Figure 36, along with the areas covered by divers on survey sweeps across the bottom. Fathometer data showed an abrupt drop in water depth, from 3 ft to 10 ft (1.0 m 3.0 m), approximately 10 – 25 ft (3 - 7.62 m) away from the river's west bank, where divers subsequently discovered a remnant bank-line that forms a submerged terrace composed of sediments and dense root mat (Figure 37). At the base of the root mat terrace, 10 ft (3 m) below the water's surface, the silty clay river bed slopes gradually downward an additional 10 – 20 ft (3-6.1 m) out into the river before becoming a nearly vertical wall that extends to the bottom of the river's deep channel. It is on this gradually sloping, muddy river bed, 10.4 – 13.2 ft (3.17 - 4.02 m) below the surface, that a portion of *Kentucky*'s starboard guard, main deck, and stern protrude from the root mat wall and are exposed above the mud. Some elements of the wreckage could be detected by the fathometer during this survey, but the image was confused by numerous trees that had fallen into the water from the eroding west bank or had been carried downstream by the river and lodged against the hull. Despite the ambiguous fathometer imagery, this survey provided the team with a better understanding of bottom conditions, obstructions, and water depths.

Diver Investigations. The sweeps conducted by divers on SCUBA can be seen on Figure 36. These arcs or sweeps were used to locate and map vessel structure amid the tangle of roots and trees underwater. Remains were found in three concentrations, each of which was marked by a buoy. On Figures 36 and 38, these buoys are shown as solid dots labeled "A," "B," and "C." Buoy "A" marked the end of the vessel, and detailed investigation made it clear that this is the stern of the *Kentucky* (Figure 39). Buoys "B" and "C" marked sections of the vessel's starboard guard, resting between and under several trees, along with a stanchion.

Kentucky's exposed stern section extends approximately 10 ft (3.0 m) out into the river from the dense root mat terrace and rests on a roughly even keel (Figures 39 and 40). The keel lies buried beneath approximately 3 ft (1.0 m) of mud. Divers gained access to the keel by excavating a

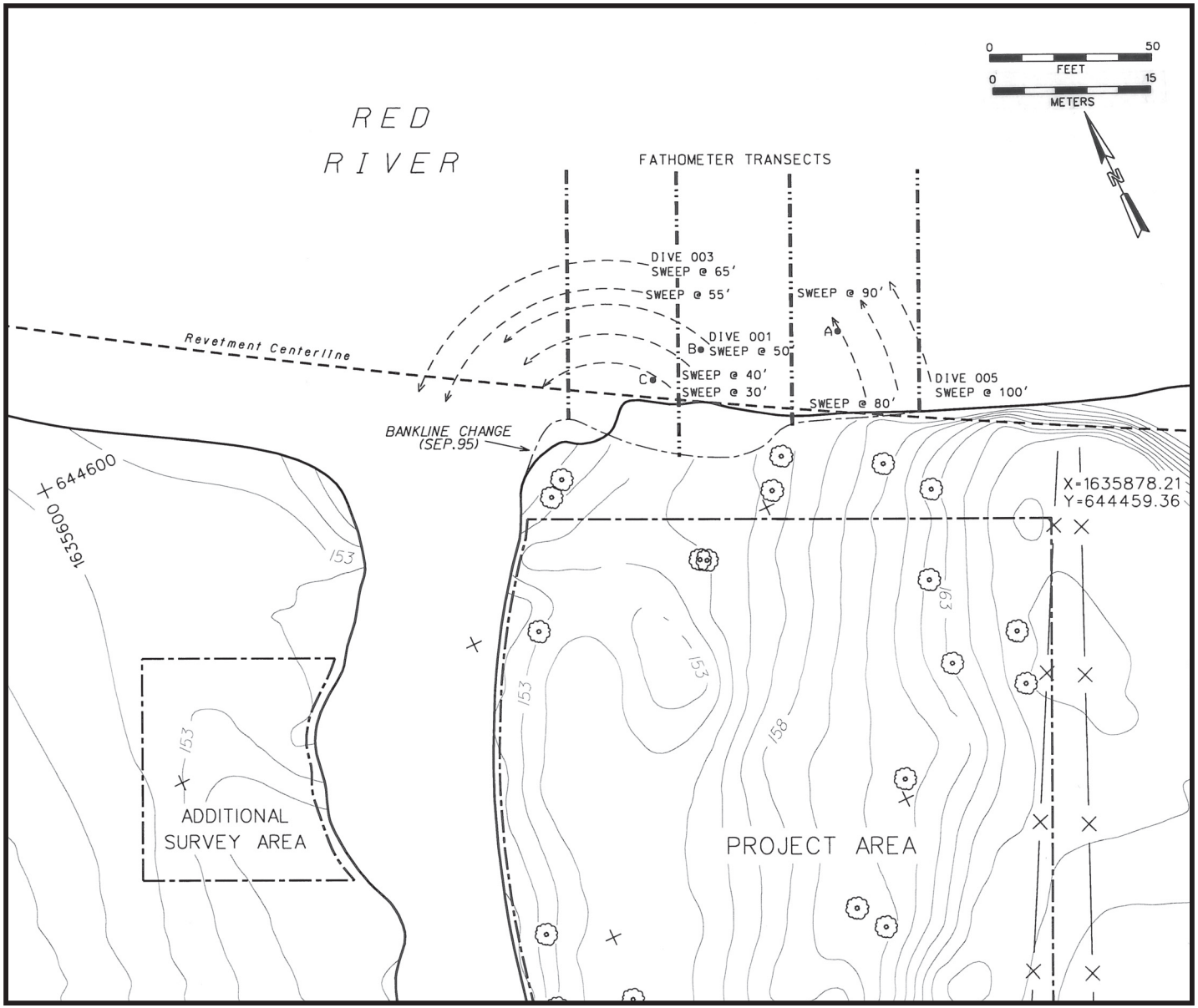


Figure 36 Site plan indicating areas surveyed underwater

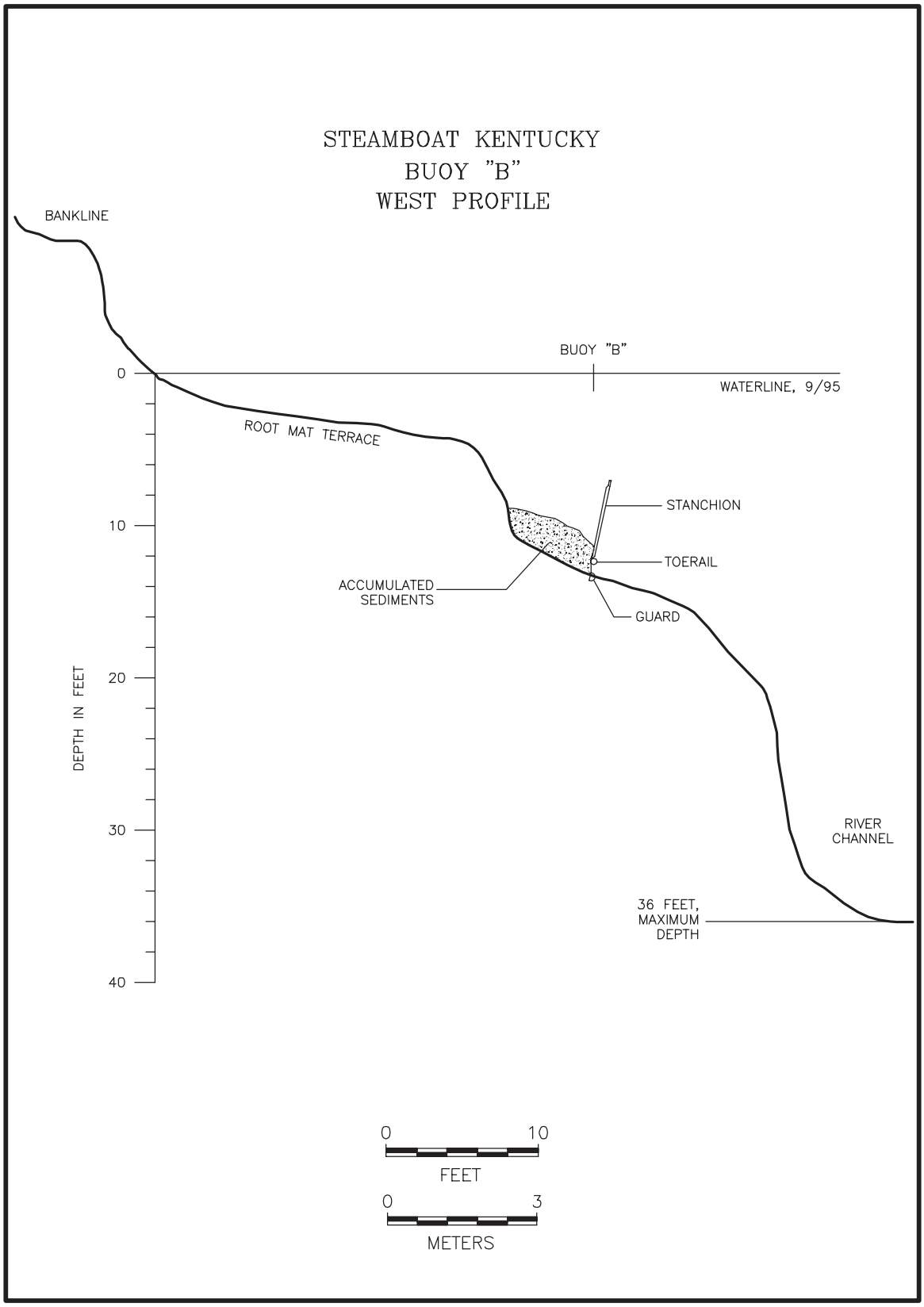


Figure 37 Profile of the river bottom and bank in the vicinity of *Kentucky*

Figure 38 Reference buoys marking exposed wreck structures; U.S. Army Corps of Engineers Surveyors mapping buoy locations

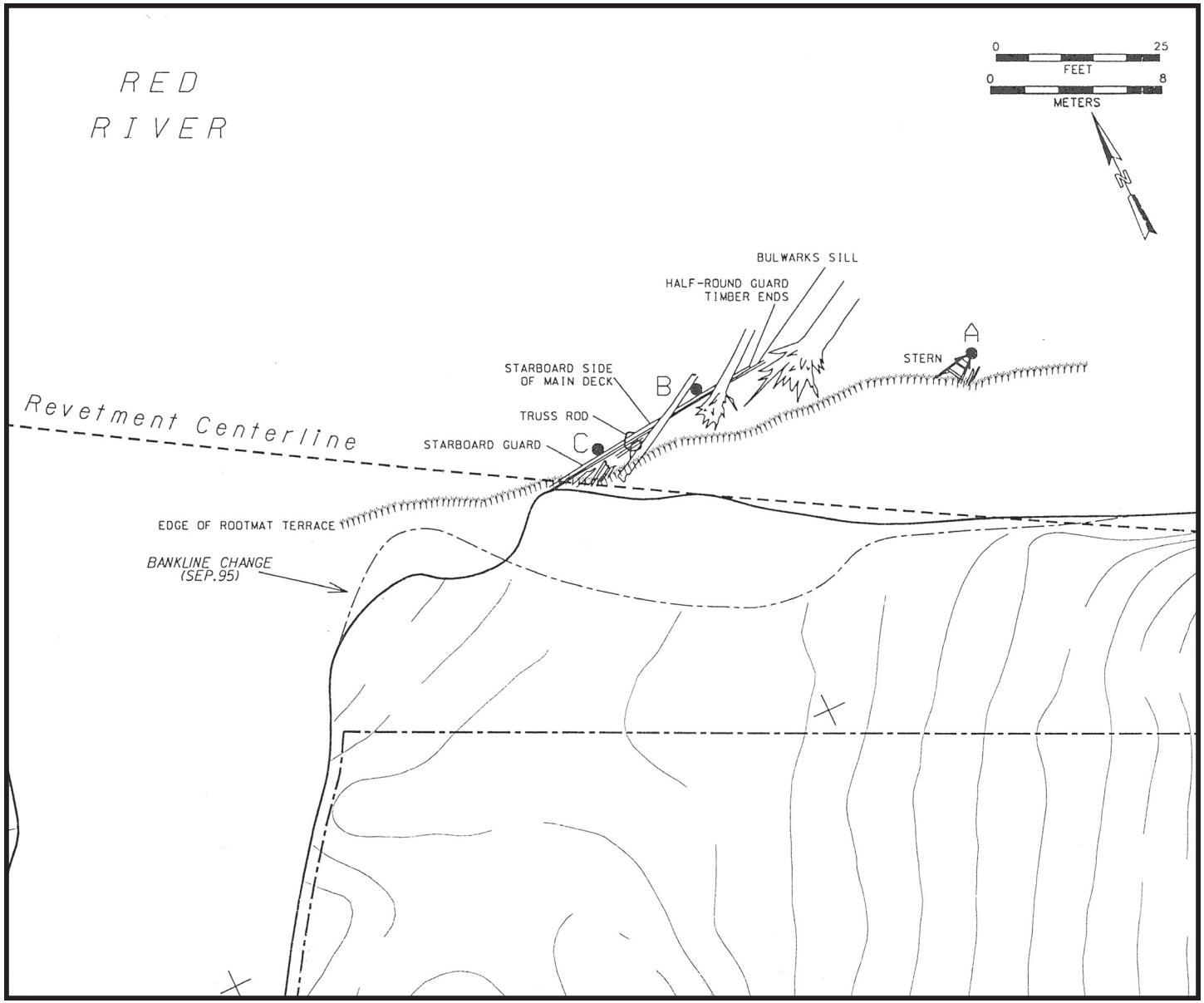


Figure 39 Site plan showing various structural elements of the wreck

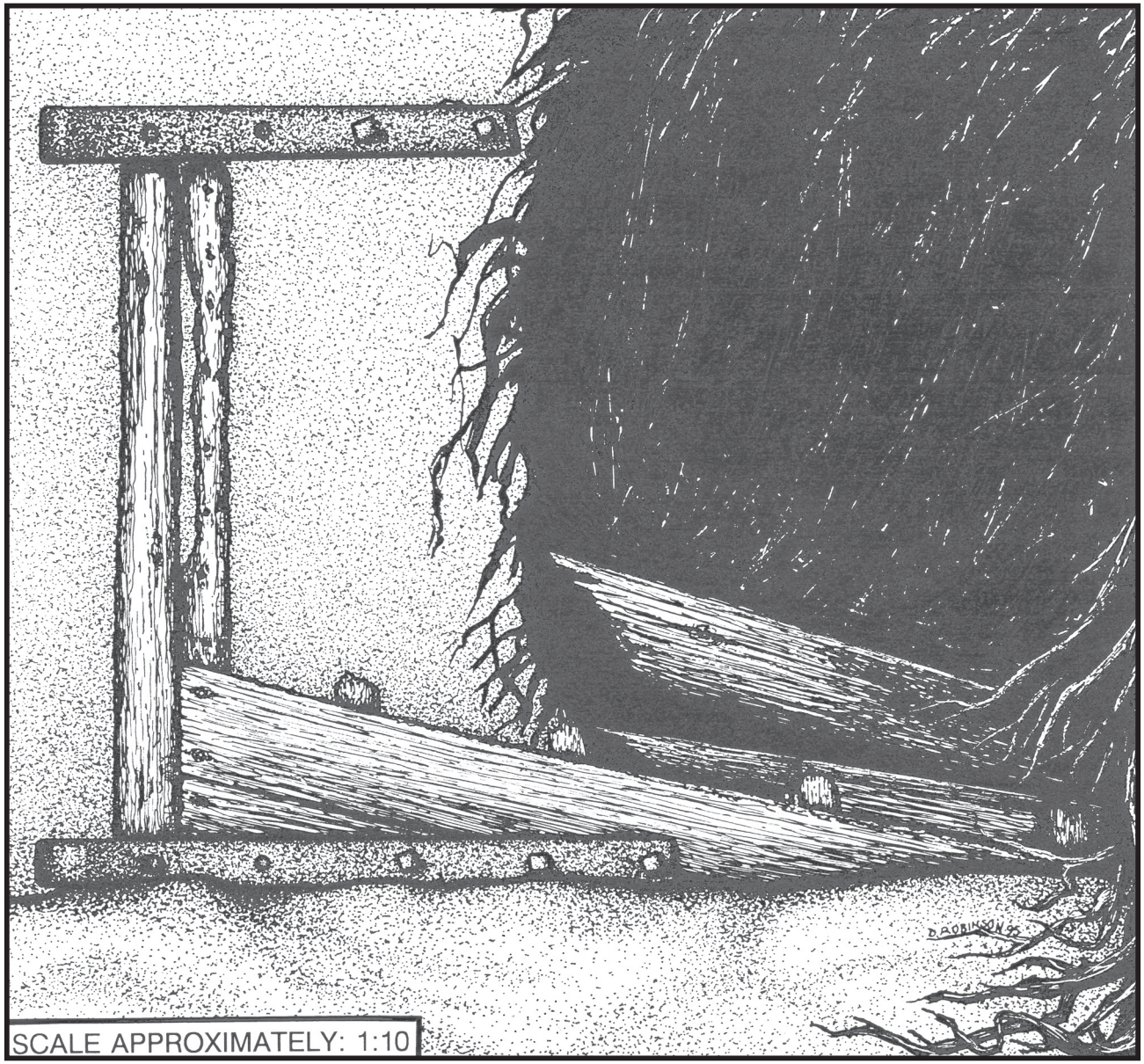


Figure 40 Elevations of the stern's starboard side

small diameter hole along the port side of the hull, immediately forward of the sternpost, where the keel's molded dimension measured approximately 4 in to the rabbet. Although badly deteriorated above the level of the mud, *Kentucky*'s sternpost remained upright and in its original position. It was preserved over a measured length of approximately 8 ft (2.44 m). When discovered, two, large, iron gudgeons remained attached to the sternpost, near its head and heel. These are visible on Figure 40, bracketing the vertical stern post at either end. However, Goodwin & Associates, Inc.'s divers removed the uppermost gudgeon, because it was barely held in place by a single fastener and presented a potential hazard to divers. This gudgeon is also visible in the plan view, Figure 41. After its removal, the heavy (75-100 lb) gudgeon was brought to the surface for documentation. It then was redeposited inside the hull, immediately forward of the stern post. Careful examination of the gudgeon provided a wealth of detailed information that would have been impossible or impractical to record underwater. The impressions of a vertical seam and wood grain in the corrosion product that had accreted to the gudgeon's inner surface revealed that the sternpost was fashioned from two timbers, which together measured 9 in (23 cm) sided and 9 in (23 cm) molded at the head. The gudgeon was fastened to the sternpost by a single, iron through-pin, 1 in (2.5 cm) in diameter, which was pounded into a pre-drilled hole from the port side of the hull, as indicated by its peened head. Further examination of the gudgeon's fasteners and their corrosion products revealed that each of the gudgeon's 1 in (2.4 cm) thick x 3 in (7.6 cm) wide x 2 ft 6 in (76 cm) straps had been secured to 3 in (7.6 cm) thick hull strakes (possibly a wale or the sheer strake) with a single iron dump bolt and two square-headed through bolts that passed through both the thick hull strake and a 1.5 in (3.8 cm) thick ceiling strake. A thin fragment of iron strapping was used beneath the nut on the inboard end of one of the through-bolts to prevent the nut from pulling into the wood while being tightened. Interestingly, none of the fasteners were secured to framing. The wider angle by the upper gudgeon, compared to the narrowly angled hull planking lower down on the sternpost, reflects a flair to the hull (discussed below).

The broken heads of four sets of square, half frames protrude above the mud inside of the hull. The frames' average dimensions measured 6 in (15.2 cm) molded x 3 in (7.6 cm) sided, and had an average spacing of 13 in (33 cm) on center. Transverse bulkheads, constructed from vertically oriented, 7/8 in (2.2 cm) thick tongue-and-groove planking, appeared to be secured to the after faces of the third and fourth frames, forward of the stern post. Frame three also marked the after terminus of the main deck. A curious feature of the 3 in (7.6 cm) thick decking was several 1 in (2.5 cm) deep recessed areas in its upper surface. Outside the hull, four strakes of 1.5 in (3.8 cm) thick by 7 in (17.8 cm) wide hull planking were preserved in place on the starboard side. Two additional strakes were preserved on the port side, but were sprung from the rabbet and broken at their ends.

Approximately 40 ft (12.2 m) of the outboard edge of what was probably the *Kentucky*'s starboard guard extended out of the submerged root mat terrace and was exposed above the sediments before the after end of the guard dipped back down below the mud to where it was inaccessible (see site plan, Figure 39). Large trees resting against the wreckage concealed much of the guard, although it was accessible for documentation in several areas. The guard itself consisted of 7 in (17.8 cm) diameter half-round log, topped by a 3.5 x 4 in (8.9 x 2 cm) longitudinal timber (Figure 42). Two wooden stanchions, measuring 4 x 5 in (10.2 x 12.7 cm), and spaced apart 8 ft 2 in (25.4 cm) on center, were loosely secured in dados cut into the longitudinal timber's inboard face. The location of the forward-most of the two stanchions corresponds with buoy "B" on the site plan (Figure 39). This buoy "B" stanchion measured 4 ft 10 in (1.47 m) in height, from its base to where it ended in a break; the second stanchion also was broken off at its upper end. At a point close to where the guard disappeared beneath the root mat terrace (buoy "C"), approximately 15 ft (4.57 m) forward of the buoy "B" stanchion, a broken segment of 1.5 in (3.8 cm) diameter iron rod (probably part of a hogging, cross, or knuckle chain), and badly damaged horizontal planking (which may be a

bulwark) and decking was exposed. The condition and orientation of the chain and the hull timbers suggested that hull might be broken and twisted at this point.

Discussion. Underwater investigations also confirmed coring data results, which indicated that *Kentucky*'s hull was preserved, at a minimum, to the level of her main deck. Scantlings and frame spacing recorded underwater approximate those of the few other archeologically documented, large, mid-nineteenth river steamers, such as the *Bertrand* (Petsche 1974:75-122). The relatively obtuse angle formed by the uppermost gudgeon, as compared to the narrow breadth of the hull at top of uppermost intact planking strake, suggests a pronounced flair in the hull immediately forward of the stern post, which is indicative of the short run that is typical for a flat bottomed, shallow-drafted vessel. The overall height of the sternpost and the projected original hull depth also approximate *Kentucky*'s 6 ft registered depth-of-hold, and indicates a date of construction post-dating 1830 (Petsche 1974:101). An additional piece of evidence that the wreck is that of a large, mid-nineteenth century river steamer was recovered from the wreck by Messrs. Robert Dupont and J. Frank McAneny, when it was exposed during a period of low water on the River several years ago. The item consists of an iron hogging chain segment and an attached turnbuckle. An identical turnbuckle was recovered from the wreck of the U.S.S. *Cairo*, and is on display at the *Cairo* museum in Vicksburg, Mississippi.

The orientation of the vessel, with its stern in the channel, is the reverse of that believed to be true prior to this investigation. Because of the likelihood that some of the starboard elements mapped underwater, such as the guard, have sprung loose from the hull and are displaced, it is difficult to project a precise alignment for the wreck. Figure 43 shows the congruence between the magnetometer data and the coring results, however, and these help to refine the alignment. The most likely position of the vessel, based on the mapping of submerged structure, positive cores, magnetometry, and historic measurements of *Kentucky*, is shown in Figure 44.

Using this alignment and known measurements of *Kentucky*, it is possible to say something about where other portions of the vessel lie. General practice in the design of such vessels (*cf.* Hunter 1993; Petsche 1974; Still, Watts, and Rodgers 1993) seems to have placed the paddle wheel at approximately one third of the total vessel length from the stern. Boilers, on the other hand, were placed about one third of this length from the bow. The ship's engine and drive train would have been placed between these two points, at amidships. This kind of placement would place the paddle wheel and shaft quite close to the current river bank, perhaps beneath the dense root mat encountered by divers during this investigation. The engine and drive machinery would have been a bit farther inland; they are the most likely source for the magnetic anomalies encountered during Phase I survey. The boilers must lie close to the bank of the old river channel, at the west edge of the project area.

The results from both the coring operation and diver investigation indicate an excellent level of preservation in the site. Wood is preserved in the water and beneath the alluvium on land. In addition to hull structure, less sturdy elements of the vessel are preserved, such as guards and stanchions. Despite the high level of preservation, however, the exposed portions of the wreck are threatened by river action, and this impact is likely to expand.

Identification as the *Kentucky*

A variety of clues support the identification of 16BO358 as the *Kentucky*. The first of these is the dating of the vessel. Without extensive artifact recovery, there are no objects which can

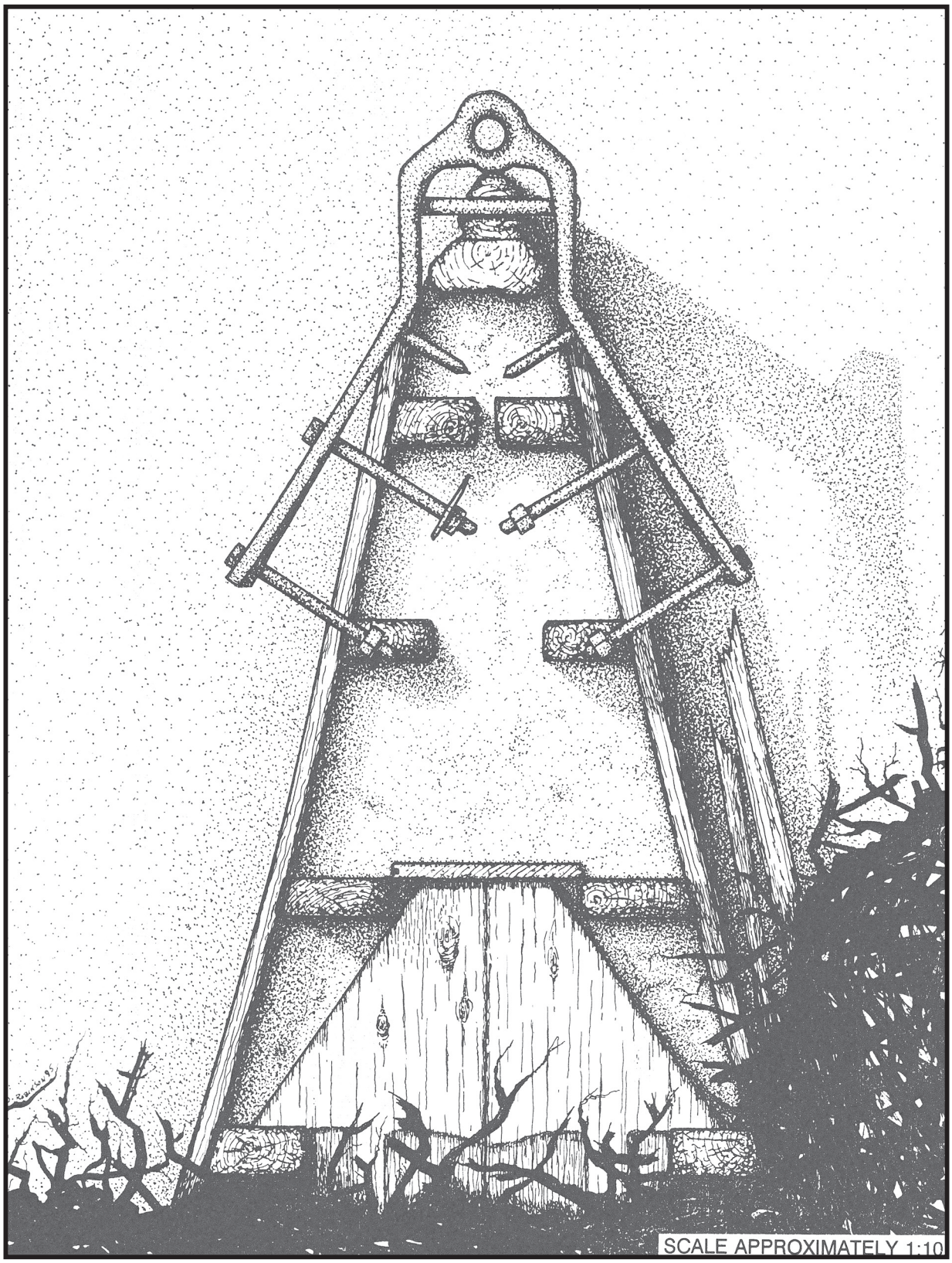


Figure 41 Plan view of the stern

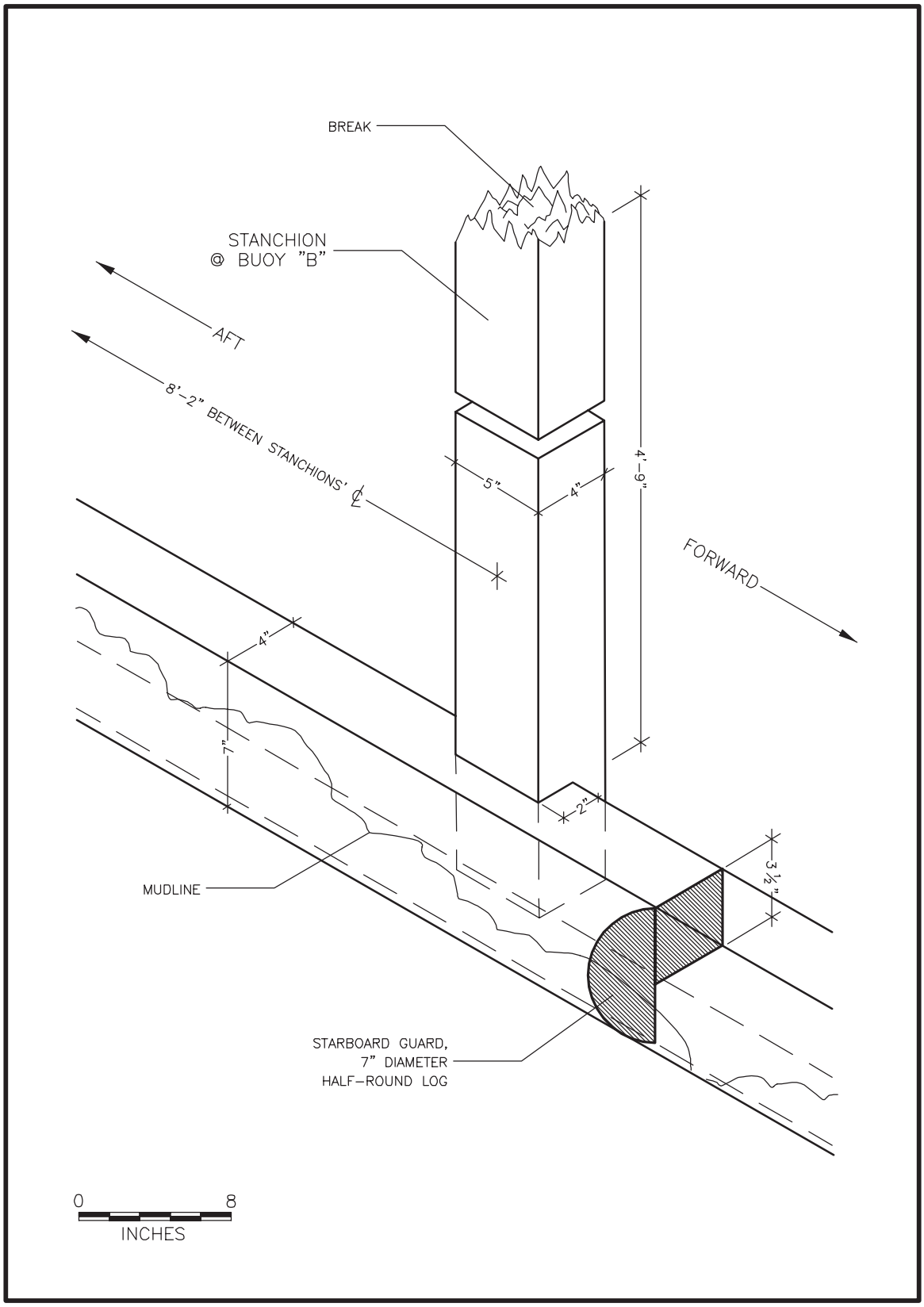


Figure 42 Isometric detail of buoy "B" stanchion and starboard guard

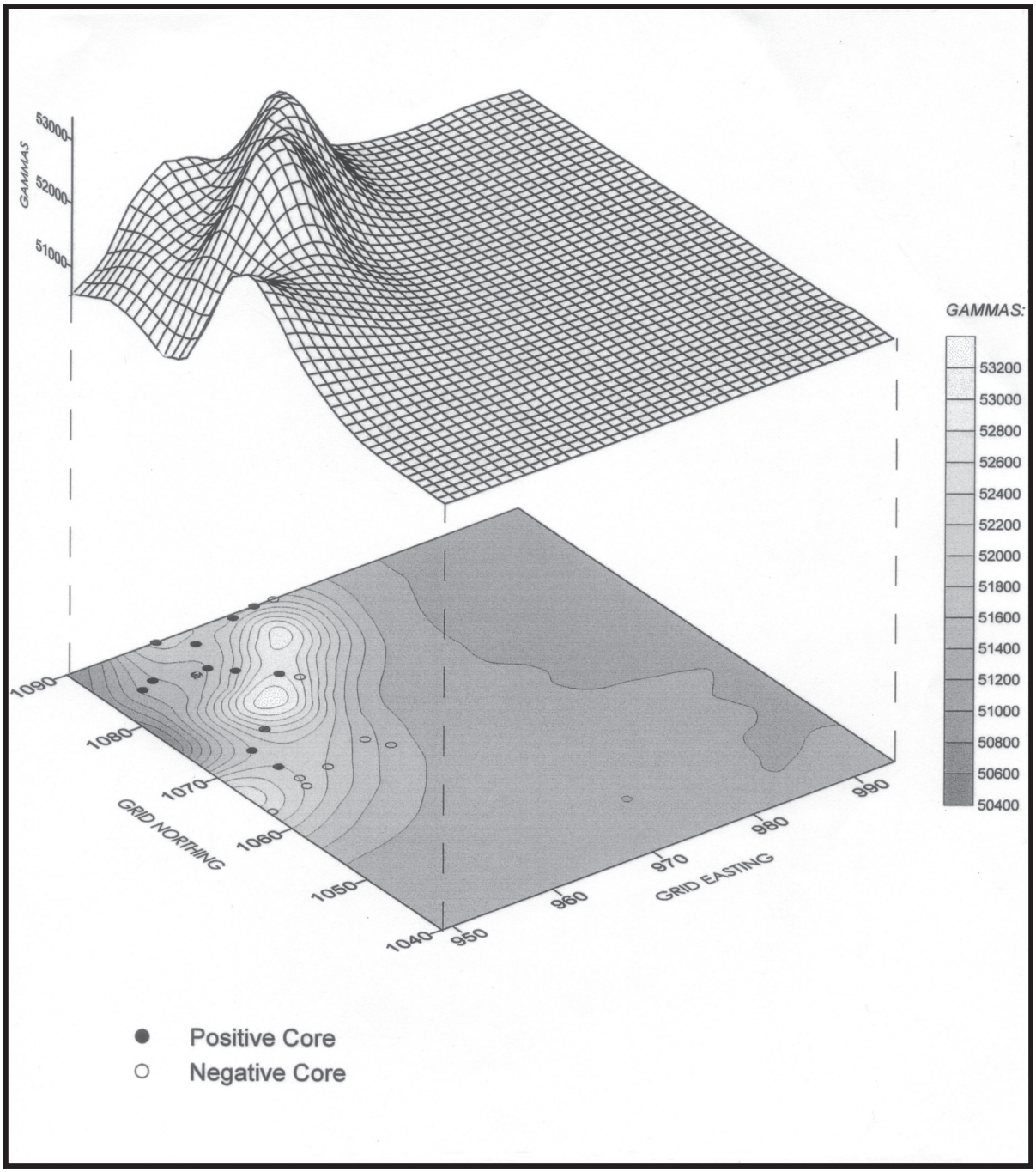


Figure 43 Coring and magnetometer results

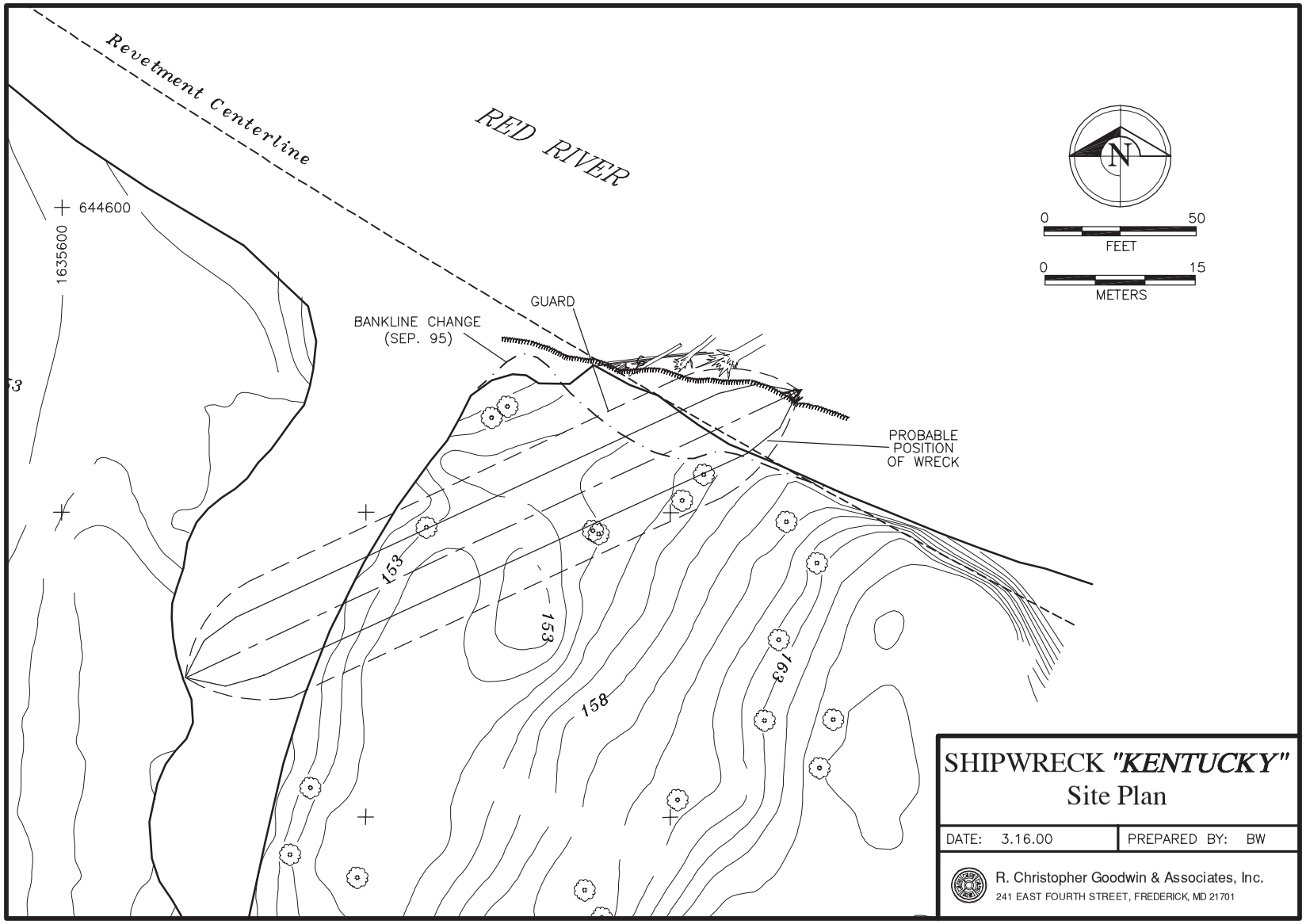


Figure 44 Site plan with the projected alignment of the ship

provide *termini post* or *ante quem* for the site, but elements of the wreck itself help to place it within chronological brackets. For a *terminus ante quem*, the vessel must certainly have been lost prior to the isolation of this channel by Lattier's Cut-off in 1882. Furthermore, Melvin's 1872 map shows a wreck in this spot (Figure 8). Even if he had the identification of the ship wrong, it must have been there in 1872. For a *terminus post quem*, the vessel seems most likely to have been constructed in 1848 or later, as the first documented use of hogging chains is in that year (Hunter 1993:99). This is supported by the use of light framing and a flat bottom, both of which became prevalent in the 1840s. The demise of the 16BO358 wreck must have been subsequent to that date, placing its loss within the 24 year period between 1848 and 1872. The morphology of the stern indicates that this vessel was a side-wheeler, rather than a stern-wheeler. This makes it much more likely that the ship was constructed in the first, or early, half of that 24 year period, as stern-wheel construction began to prevail in the 1860s (Still, Watts, and Rodgers 1993:67). Based on this evidence, the ship at Eagle Bend was probably built between 1848 and the 1860s and was lost some time before 1872. *Kentucky* was built in 1856 and lost in 1865.

In addition to the dating, which is consistent with the construction and loss of the *Kentucky*, the pitch and length of the vessel at 16BO358 are appropriate. The *Kentucky* went down bow first, with the stern up and the bow in the deeper channel. This mirrors the attitude of 16BO358. A measurement from the stern of the vessel southwest to the farthest positive core hole yields a distance of just over 150 ft (45 m). Magnetic data, however, indicate that the vessel extended somewhat farther southwest, into the relic channel (Irion 1995a). This indicates a length of 200 ft (61 m) or more, which approaches the documented 222 ft (67.67 m) length of *Kentucky*. A vessel of this size would have a relatively large displacement. *Kentucky* had a displacement of 375 tons, which was large for the Red River, and would therefore have been one of the larger vessels ever lost on the Red River. Using the list of steamboats in Norman's (1942) study of the Red River, Coastal Environments (1992:37) concluded that even the larger commercial vessels on the Red in the 1850s and 1860s "seldom exceeded 300 tons", although some of the largest did reach between 400 and 800 tons in the fifties (Hunter 1993:52). The lengths of three other vessels lost on the same stretch of river during the period offer an instructive comparison. The *Irene*, lost in 1868, was enrolled at 155.9 ft in length*; Elnora*, also lost in 1868, was 152 ft long; and the *Richmond*, lost in 1869, was 142.5 ft in length. Coring results were also consistent with *Kentucky*'s documented beam of 9.75 m (32 ft), with guards which extended to either side of the hull. The overall height of the sternpost and the projected original hull depth of 16BO358 also approximate *Kentucky*'s 6 ft (1.83 m) registered depth-of-hold (5.51 ft [1.68 m]).

Finally, there are two documentary indications that 16BO358 is the *Kentucky*. The first of these is circumstantial; the wreck lies adjacent to Crowder's "Kentucky Plantation," which was named for the wreck (Shreveport *Journal*, July 10, 1974). The second is far less tentative, in that Melvin's 1872 map of the Red River clearly shows a wreck at precisely the location of 16BO358 and labels it "Wreck of Kentucky" (Melvin 1872). All of the elements discussed above support this identification.

National Register Potential

Relevance to Regional Themes

Both archival research and field observations identify the remains at 16BO358 as those of the steamship *Kentucky*. The historical background of the vessel and its archeological potential demonstrate that *Kentucky* has relevance for several themes associated with Management Units I and VI of *Louisiana's Comprehensive Archaeological Plan* (Smith et al. 1983). Within Management

Unit I, covering the northwest portion of Louisiana, 16BO358 contributes directly to our understanding of three of twenty-three identified themes: Theme 13 - Military History in Louisiana; Theme 18 - The Steamboat Era; and, Theme 19 - Civil War Rivercraft. The latter two themes recur in Management Unit VI (water bottoms in Louisiana), as Themes 4 (The Steamboat Era) and 5 (Civil War Rivercraft).

As a representative of the Steamboat Era, *Kentucky* has few parallels. Built at the height of steamboat construction in the United States, this side-wheel steamboat is typical of an enormous number which were built on the upper Ohio and proliferated through the west. Despite the historical significance of these vessels in opening the interior of the continent, we know little about the specifics of design and construction. As noted by Hunter (1993:88) in his seminal study of western steamboats:

> Paucity of information makes it impossible to say much about the finer points of steamboat design...The use of scale drawings and models appears to have been an exceptional practice until quite late in the period; few of either have survived. Our knowledge is confined to the briefest allusions to this subject in contemporary descriptions, chiefly newspaper accounts.

Since steamboat builders never kept plans of their vessels, they may only be known from the archeological record. Few have been archeologically examined. The steamboats *Columbus*, investigated by Goodwin & Associates (Irion and Beard 1995), and *Indiana*, examined by the Smithsonian Institution (Robinson 1992; Johnston and Robinson 1993) provide some comparable data, but they are earlier and different types of vessels, designed for the Chesapeake Bay and the Great Lakes, respectively. By contrast, the steamboat *Bertrand* was a western-style vessel, but of a different type: the stern-wheel, single deck, mountain boat (Petsche 1974). As noted by *Louisiana's Comprehensive Archaeological Plan* (Smith et al. 1983:258, 268), vessels such as *Kentucky* are now as rare as they once were common.

Kentucky played a pivotal role in several Civil War engagements, making it significant for the Military History Theme of Management Unit I and for the Civil War Rivercraft theme of both Units I and VI. As a troop transport, it functioned as a class of vessel seldom studied. The only other troop transport that has been archeologically investigated is the *Maple Leaf* (Cantelas 1993), a Federal vessel sunk in northern Florida's St. John River in 1864. What makes *Kentucky* so unique, however, is not just her function as a military transport, but the fact that she carried Confederate prisoners of war. There has been little study of military imprisonment and the material status of captives. This is especially true of the late and immediate post-war periods. Camp followers such as the families accompanying these southern parolees are equally enigmatic in the historical and archeological records. Louisiana's Comprehensive State Plan (Smith 1983:268, 270, 272) recognizes these sites as rare within the state. They are also rare throughout the rest of the nation.

Integrity

Phase I archeological survey suggested that much of the vessel might remain intact, and this was borne out by the Phase II investigations described here. Divers located and recorded elements of an intact sternpost, hull planking and frames, decking, stanchions, guards, and chains. These structural elements retained integrity sufficient to allow for accurate recording and reconstruction of ship architecture. All indications at this stage were that preservation was equally good for portions of the wreck lying beneath the bank. Coring demonstrated that several levels of

wood structure existed, and a magnetometer survey indicated that elements of the propulsion system might lie beneath the sediment. The anomalies recorded were large enough to suggest that the boilers and other elements of the ship's machinery were never salvaged.

National Register Eligibility

Taken as a whole, Phase I and II archeological and archival research indicated that the site is eligible for nomination to the National Register of Historic Places under Criteria A, C, and D (36 CFR 60.4, Delgado 1985). Under Criterion A, association with "events that have made a significant contribution to the broad patterns of history," the *Kentucky* qualifies for listing in the National Register through its association with the themes of Commerce and Military. Prior to the Civil War, the *Kentucky* served the lower Mississippi River Valley as a passenger steamer; it was one of the large, elegant side-wheelers that helped to define the antebellum South. The steamboat era on the Mississippi was a brief, but important, period of American history that was pivotal to the expansion of the West and to the development of the cotton monoculture that dominated southern life. During the Civil War, the *Kentucky* served both the Confederate States and the United States as a troop transport ship. During its Confederate career, the vessel was credited with turning the tide of the Battle of Belmont, Missouri, to the Confederate side by delivering reinforcements through enemy fire to General Leonidas Polk, whose troops succeeded in surrounding the Union forces across the river at Columbus, Kentucky. A Union defeat was only diverted by the coolheadedness of their commander, Ulysses S. Grant, who remarked "we had cut our way in and could cut our way out just as well" (McPherson 1988:396).

Under Criterion C, a vessel possesses significance if it embodies "the distinctive characteristics of a type, period, or method of construction..." The *Kentucky* possesses significance under the themes of Architecture and Engineering. The vessel is a good representative of an antebellum side-wheel steamboat, a type significant in American history. The 1850s, the period from which the vessel's construction dates, represents the apogee of steamboat design and evolution; yet it is a period that is poorly understood in terms of hull construction or engineering design. The *Kentucky* affords a unique opportunity to document the intact hull of just such a vessel.

Under Criterion D, a vessel is significant if it is likely to yield information important to history. Investigation of the *Kentucky* could potentially yield significant information not only on the construction and engineering of a mid-nineteenth century steamboat, but also on the ways in which such vessels were used, repaired, and modified. Of further significance is the anthropology of its passengers and crew. All of the baggage of some 900 passengers went down with the ship and may remain trapped within its hold. Of particular interest would be the personal effects of the paroled Confederate prisoners on board. Research issues could be developed examining what equipment the defeated Confederate soldier was allowed to retain, and how their kit differed from their Northern counterparts. In addition, the personal effects of the crew and officers, along with the furniture and hardware of the vessel, are likely to be represented on the site. Given the demonstrated preservation of wood throughout the site, it is likely that a wide variety of materials are well-preserved, including organic remains.

Recommendations from the Phase II Evaluation

Phase II investigations suggested that the shipwreck at Eagle Bend was likely to suffer both direct and indirect effects related to Corps of Engineers activities in Pool 5 aimed at achieving navigability of the Red River. Chief among these impacts is the pronounced eddy effect produced by the Eagle Bend Revetment in the channel adjacent to the shipwreck. The bank receded by 15 ft (4.6 m) during the course of the archeological investigation, over a period of less than one year. This exposed intact hull and decking of the vessel to scouring action and impact damage from partially submerged trees and debris. During SCUBA dives made on the site in September of 1995, divers observed exposed objects, including organic remains such as seeds and bone, which might be lost to current. This eddy was likely to further erode the bank and expose more of the shipwreck to the effects of erosion and deterioration. This process was expected to accelerate during the winter, when river velocities increase. This would endanger the hull structure itself. Secondarily, barge traffic in the Red River was likely to result in bank erosion due to wake action. This effect was particularly pronounced in the vicinity of the shipwreck where the propeller wash from tugs heading upstream through Eagle Bend was observed to fall directly on the shipwreck site. Exposure of the shipwreck to river currents would result in further deterioration of the hull and a scattering of any artifacts contained within it.

A further impact could be expected from planned revetment construction along this portion of the Red River. The centerline of the proposed revetment is shown in the various site plans (Figures 32, 35, and 40). Any cutting of the river bank in the immediate vicinity of the wreck would damage the vessel's structure and compromise its integrity.

As a result of these various concerns, as well as the vessel’s significance under National Register criteria, a work plan for Phase III data recovery was formulated.

CHAPTER VII

PHASE III DATA RECOVERY PLAN & FIELD METHODS

Although avoidance generally is the preferred approach to mitigation of a resource as important as the *Kentucky*, this did not appear to be possible. Revetment construction already had taken place upstream from the site, and various wing dykes already were in position along this stretch of the river. An examination of the engineering plans by USACE Vicksburg District staff indicated that moving the revetment sufficiently far into the channel to avoid the site would be extremely difficult, if not impossible, from an engineering standpoint, and that it also would result in an unsafe navigation channel.

With avoidance being infeasible, a data recovery plan was prepared by R. Christopher Goodwin & Associates, Inc. for the *Kentucky*. This plan was changed in important ways at least twice; first due to changed physical and environmental conditions on the site, and, second, due to revised assessments of engineering possibilities. The Phase III work began, however, based on certain assumptions and with a clear data recovery plan in place. This initial plan will be outlined first, after which changes to the plan are discussed.

All elements of the Data Recovery Plan developed for Phase III investigations of the *Kentucky* were consistent with the *Secretary of the Interior's Standards and Guidelines for Archeological Documentation*, 48 CFR 44734-37, and with principles established in the Advisory Council on Historic Preservation's regulations, "Protection of Historic Properties" [36 CFR Part 800]. The plan also was designed for consistency with the standards of the Department of Interior, issued pursuant to the Archeological and Historic Preservation Act of 1974 (P.L. 93-291), and embodied in 36 CFR Part 66.2. All work at the site was overseen by a qualified nautical archeologist, and all field personnel diving on the wreck held valid diving certificates from a recognized diving instruction association, had passed a diving physical within the past year, and otherwise met all of the requirements for scientific diving required by Goodwin & Associates, Inc. and the Academy of Underwater Sciences. Diving operations were overseen by a certified dive master and a safety officer at all times.

Initial Data Recovery Plan

Research Questions

The Phase III archeological investigations required a comprehensive data recovery plan designed to address specific research questions relating to the vessel and its occupants. There generally are three main aspects of a ship involved in its normal activities. These are:

1. The ship as a machine designed for harnessing a source of power in order to serve as a means of transport.

2. The ship as an element in an economic system.

3. The ship as a closed community, with its own hierarchy, customs, and conventions.

These aspects are important elements of research in this Data Recovery Plan, but the *Kentucky's* unique character poses some additional research questions.

1. How was the vessel constructed? Is there any evidence of structural changes during its lifetime?

2. How does hull construction compare to other river steamers? How does this vessel figure in the history of American steam navigation?

3. What can be learned of shipboard life on the vessel? What were conditions of life for the steamboat's crew and for its passengers?

4. Aside from passengers and their personal effects, what cargo did the vessel carry? What can be learned of the range of goods carried by the vessel and the economic system it served?

5. What were the material circumstances for the paroled Confederate soldiers on board? What equipment were they allowed to retain in captivity and how did their kit differ from that of their Northern counterparts?

This was not intended as an exhaustive list of research questions, but it provided an indication of the directions in which the investigations might go. It was anticipated that additional questions would develop as the field work and archival research progressed.

Definition of Data Needs

In order to address the topics outlined above, the following data was required:

* Accurate orientation of the vessel and dimensions and lines of exposed and excavated portions of the wreck.

* Detailed drawings of selected architectural features.

* Details on the construction of the vessel.

* Collection and analysis of diagnostic artifacts that might aid in the interpretation of the vessel's function and the material circumstances of its crew and passengers.

* Compilation of as complete a history as possible for the vessel, including its construction, significant alterations or repairs, and career.

Description of Planned Methods

The planned Phase III investigations were broken into tasks consisting of: 1) archival investigations for comparable vessels; 2) initial mapping; 3) excavation & recording of the hull; 4) dismantling of selected hull elements and their removal to dry land; 5) detailed recording of dismantled hull elements on land; 6) reburial of dismantled hull elements and associated artifacts; 7) conservation of a representative sample of artifacts; 8) analysis and draft report preparation; and 9) final report preparation. The methodology and results of Phase III archival investigations have been related in a previous chapter of this report. Detailed objectives were laid out for each of the other tasks.

Task 2: Initial Mapping. Estimates of the ship's precise location and orientation after the Phase II study was completed were based on field observations of exposed underwater sections of the hull (the stern, located in the river channel); on terrestrial magnetometry, which indicated the presence of large ferrous masses under the bank; and on coring, which encountered buried remains of deck and hull planking in various locations. Projections of the vessel's orientation based on magnetometry and coring did not align precisely with orientations based upon the underwater sections of the vessel. This may stem from a variety of factors, but initial mapping for the Phase III data recovery first would attempt to provide a more precise alignment, either through additional coring and terrestrial magnetometry in the old river channel and on the opposite bank of the old channel, or through additional work on the exposed portions of the hull. This information would be useful in planning for the excavation and recording of the exposed remains.

Task 3: Excavation & Recording Underwater. A dredge was to be used to excavate sediments from around and within the hull up to the current shoreline. A submerged terrace composed of sediment and dense root mat was revealed during the Phase II work, extending out approximately fifteen feet from the water's edge. This terrace and root mat then gave way and the bank dropped sharply, exposing the upper portion the vessel's hull. Excavations were designed to extend up to this terrace or root mat. Some of the roots would be cut away in exposing the hull, but most were to be left in place as a trap for sediment and as a cushion for later revetment construction. Excavations would at a minimum expose the bottom of the hull and one side of the ship up to the vessel's centerline. For the purposes of hull reconstruction, it was assumed that the other side of the vessel was a mirror image of the exposed portion. As sediments were excavated from around and within the hull, artifacts were to be recovered and their location and context recorded, and dredged sediments were to be screened for this purpose. All artifacts were to be assigned inventory numbers and labeled in the field with waterproof tags which would be retained until the artifacts were stabilized for curation.

Once the requisite sections of the wreck were exposed through excavation, selected elements would be disassembled and brought to the surface for more detailed recording. It was hoped that this would substantially reduce recording time and improve the accuracy and detail of the final record. Before disassembly could take place, any in situ recording required for HABS/HAER quality records would be completed. In addition, pieces for removal would be selected by the field team, their precise locations recorded, and each piece numbered on the site plan.

Task 4: Dismantling of Selected Hull Elements. Hull elements selected for removal and detailed recording were to be pieces with detail difficult to record underwater or elements critical to understanding the construction and life of the vessel. Once these pieces were selected and their positions recorded, they were to be taken apart and carefully moved to the surface. Where

possible, pieces were to be taken apart along existing seams, joints, or scarfs. Where this was not possible, and at the edges of excavation, pieces would be cut away from the wreck.

Task 5: Recording of Dismantled Sections. After being brought to the surface, dismantled sections of the vessel were to be kept wet. A team of recorders, including an architectural/naval historian experienced in HABS/HAER recording, would draw each piece to scale, recording diagnostic details and marks, along with the shape and outline of each piece. These elements also would be recorded via photography and videotape.

While the wreck structure was being documented, artifacts were to be examined and catalogued by a second team. In addition to recording basic information such as artifact type and function, a representative sample was to be selected for retention and conservation. Selection was to be based on two primary criteria: first, a representative sample of the total assemblage was to be retained; second, samples of materials which are diagnostic or which may answer specific research questions would be retained. These might, for example, aid in interpretation of ship-board life, they might be elements of the kit of paroled soldiers or personal effects of families or crew, or they might include elements of the vessel's hardware. These materials were to be selected in consultation with the USACE Contracting Officer's Representative (COR) and the State Historic Preservation Office (SHPO), and would be limited to those materials for which sufficient conservation funds were available. Wood samples would be retained to allow species identification of materials used in construction of the vessel.

Task 6: Reburial of Structural Elements and Artifacts. Upon completion of detailed recording of retrieved hull sections, the initial recovery plan called for these pieces to be carefully buried close to the site. Reburial beneath the water table, preferably in clay soils, would prevent or impede future deterioration of the remains. A large pit was to be excavated and pumps used to reduce the water level. Structural pieces would then be carefully placed in the pit, with their positions recorded on a map, should recovery be necessary at some time in the future. In addition, any artifacts that were not retained were to be treated in this fashion and accompanied by the waterproof tags used for inventory control. Care was to be taken that materials were not damaged during reburial and that they were entombed in an anaerobic environment.

Reburial of structural elements of the wreck and of artifacts was recognized as opening up a variety of potential problems, but was planned as the way to conserve materials within the budgetary constraints placed on the project. Placement of silts or sediments over reburied materials, for example, may induce changes in the electro-chemical equilibrium of the site. These changes are complex and difficult to predict, but potentially can be harmful. Any changes to the geomorphology may disturb this equilibrium, thereby increasing the degradation rates of all the materials present at the site (i.e. changes in pH can have a serious impact upon cellulose, inducing swelling and distortion of wood (Milne 1995) and enzymatic attack (Singley 1988); pH changes and increases in oxygen and hydrogen sulfide caused by soil disturbance also affect corrosion of metals). Fluid mechanics and soil resistivities of sediments are additional factors which should be considered. It was therefore recognized that establishing baseline data from sediments for monitoring purposes would be necessary, and at least three water sampling tubes were planned at different positions and elevations within the reburial pit. These would provide water samples for future testing and permit monitoring of conditions in the reburial pit, ensuring that biological activity was minimized and preservation maximized.

Sheet Piling Installation

As a precursor to Phase III work, sheet piling was installed around the outside (river side) of the wreckage by USACE. The purpose of the sheet piling was both to protect the site from the effects of current and impacts from submerged objects such as trees and to protect archeological divers from those forces during the investigations. The sheet piling was installed in January and February of 1996, as shown on Figure 3. The top of the sheet piling extended approximately four to five feet above the water level at normal stages. At roughly the midpoint of the down-river segment of piling, the top edge of the piling was placed two feet below normal water levels, so that water could move freely between the interior and exterior and to allow runoff to drain from the old stream channel to the south.

Changes in the Data Recovery Plan

Environmental Changes on the Site 1995 - 1997

Although it was anticipated that Phase III work would begin in the spring following the 1996 installation of sheet piling, budgetary issues delayed the beginning of field work for more than a year, until July of 1997. During that time, the river bank above the *Kentucky* continued to collapse and recede. On a visit to the site in early December 1995, it was observed that the bank had receded by another one foot from its position at the end of Phase II field work two months earlier, in September. Although the installation of the sheet piling slowed the rate of collapse during periods of normal or low water, the river continued to work on the bank during periods of high water, when river levels sometimes covered the top of the sheet piling, completely submerging it. The extent of this impact became evident on a field inspection of the site preparatory to beginning the data recovery operation. This visit, during the last week of June 1997, revealed that the bank had collapsed severely in the preceding year, in some places by an estimated ten to twenty feet inland or more. Sediment from this collapse, combined with silts carried in by the river at flood stage, had completely filled in the area inside the sheet piling (Figure 45). This sediment was above water and dry at the time of the field visit, with the exception of a small stream carved through the sediment and draining from the old stream channel to the south. The entire wreckage therefore was encapsulated in sediments reaching fifteen to twenty feet in depth; the river bank, while still steep, had shifted to the south a considerable distance.

Revised Dredging Plan

This covering of the wreckage by flood silts necessitated a substantial change in the initial excavation strategy. Before any work could begin on site, the wreckage that had been exposed to divers several years before would have to be exposed through sediment removal. Excavation by hand would have been unrealistic and unnecessary. The high water table precluded excavation of the sediments over the wreck with a backhoe, however, and after consultation with USACE Vicksburg archeologist Erwin Roemer, a plan for extensive dredging of the new sediments was designed. In this approach, a crane-mounted, ten-inch suction dredge would be used to remove the bulk of the sediment overlying the wreckage. The heavy dredging would be stopped at a foot or so above the wreckage of the *Kentucky*, and the remainder of the sediment would be removed by archeologists using a hand-dredge. Due to the way in which the river bank had eroded, it was hoped that the heavy dredging might also induce additional slumping from the vertical river bank, resulting in a more gradual slope from ground level down to the water. This was desired because

of the danger that a vertical bank would pose to archeological divers; dredging close to the bank might dislodge sections of the bank, with the collapse falling upon divers. Because of this potential danger, it was determined that if the bank was still steep upon completion of the heavy dredging operation, a trackhoe and bulldozer might be used to carefully grade the bank to the shallow slope necessary for safe diving and data recovery.

Revised Data Recovery Plan

In all other respects it was anticipated that work would adhere to the original data recovery plan, but events changed this plan two additional times during the course of the field work. A minor change was made upon completion of the heavy dredging at the site. As discussed in Chapter VIII below, the initial dives made on the site after the dredging was completed revealed that the extensive slumping of the river bank induced by both natural flooding and the dredging had exposed more of the wreck than was visible during 1995. The orientation of the vessel was clear, and there was little point in pursuing the additional mapping outlined as Task 2 in the data recovery plan. With the concurrence of the USACE, it was decided that the time would be better spent in recording the additional structure now visible on the bottom.

The second change to the data recovery plan was a major shift that came approximately midway through the field effort. On August 28, 1997 USACE engineers with the Red River navigation project visited the site to examine field conditions and discuss the extent to which the vessel should be dismantled and removed for recording prior to burial, per the data recovery plan. A much larger segment of the vessel had been exposed and recorded than was anticipated in the original recovery plan, and this was likely to pose some problems in the dismantling and recording phase of the operation. Fortunately, conversations with USACE engineering staff since the fieldwork had begun suggested that it might now be possible to preserve a substantial portion of exposed wreckage by capping it with a thick layer of dredged sand prior to construction of the revetment. This now was a viable option primarily because excavations had revealed that the interior of the vessel was filled with dense sand deposits. The earlier concern with capping the wreck beneath the revetment had been that the existence of any voids in the structure would collapse under the increased weight of revetment stone, resulting in substantial destruction of the resource. In this new scenario, such collapse was not an issue and the critical area for dismantling was now the wreckage outside (on the river side) of the toe of the revetment; it might be possible to preserve and bury the remainder. The August 28 field visit was intended to examine field conditions and maps of the wreckage thus far exposed to determine what course of action might preserve the greatest amount of wreckage in situ.

After a careful examination of the site and the exposed wreckage, the engineers determined that the latest construction plans actually placed the toe of the revetment, where the heaviest load of stone was to be placed, along the line of the sheet piling, not on the wreck itself as believed earlier. They felt that it could actually be moved even farther into the channel without creating navigation or construction problems. This raised the possibility that the sheet piling could be left in place, after which sand could be pumped over the wreckage, followed by a two foot layer of stone forming the bank of the revetment. From a geotechnical standpoint, sand was preferable as a fill material or capping the wreck, as the silt sediments of the existing bank would tend to both compress and flow out from under the stone. Under existing permits it would be possible for a USACE dredge to pump sand from the channel of the Red River over the wreck, capping it in a relatively short time after all archeological investigations were complete.

Figure 45 Sediment inside sheet piling, June 1997. Top photo looking downstream; bottom photo looking upstream

As a result of this visit and extensive conversations with USACE archeologists and representative of the State Historic Preservation Office, an alternative plan was adopted which called for continued recording of exposed wreckage, removal of some small, manageable and robust segments of the vessel for conservation and study on land, followed by reburial of the remaining wreckage in situ under a cap of sand. Once the sand cap was in place, revetment construction would proceed. The sheet piling would be left in place as an additional level of protection for the site. This alternative strategy offered several distinct advantages:

- the wood structure of the vessel, which was not as robust as originally hoped, would not be subjected to the risk of destruction through dismantling;
- the remains would be left in their original environment, rather than in a reburial pit;
- preservation in place, which generally is the preferred option for cultural resources, would be achieved; and
- abandonment of the time-consuming dismantling effort would free substantial additional time for adequate recording of the larger than anticipated exposure of the vessel.

Although there was some residual concern over the possible distortion of the in situ remains from the weight of the revetment, it was felt that the weight would be minimized by moving the bulk of the stone (found in the revetment toe) away from the wreck, and that any resulting distortion would be mitigated by the recording efforts already underway.

Dive Operations

Environmental Conditions

Environmental conditions were the single most important factor in determining the diving and recording methods used on the *Kentucky*. The aptly named Red River has a high suspended sediment load that reduces underwater visibility to a maximum of six inches near the surface. After storms and when the water had been disturbed through dredging or other activities, visibility decreased. The suspended particles resulted in a rapid loss of light at even shallow depths, with a further drop in visibility. Dive lights were only marginally useful at depth, as much of the light was reflected back by the suspended particles.

Although visibility was poor, other water conditions generally were favorable. The sheet piling eliminated current, and water temperatures ranged from 88 to 95 degrees Fahrenheit, making it possible to achieve long bottom times without significant concern over exposure to cold.

Animal life in the vicinity of the project area was a concern throughout the field work. Poisonous snakes are common in northwest Louisiana, and cotton-mouth water moccasins frequently were encountered on the road into the site. Several non-venomous water snakes were seen inside the sheet-piling at various times during the data recovery effort. Alligators were another potential hazard. Several alligators were reported upriver in the vicinity of Shreveport during the fieldwork, and alligators were heard in the swampy woods adjacent to the site. The tracks of immature alligators were observed near the site, but none were encountered during the

diving operations. Other animals of potential concern, although not observed during the project, were snapping turtles.

Diving Techniques

The archeological diving techniques adopted for data recovery on the *Kentucky* were designed to ensure diver safety, achieve efficiency and accuracy in recording, and to cope with the environmental conditions prevalent on the site. Diving was conducted using a surface supplied air (SSA) system, with EXO-26 full face masks and 30 cu ft bailout bottles. The use of SSA offered several advantages over SCUBA. The use of full face masks and umbilical hoses allowed divers to obtain air from 300 cu ft tanks on the dive platform, freeing them from both the burden and the limited air supply of a 80 cu ft SCUBA tank. In addition, the use of umbilicals ensured that divers were in constant contact with the surface; a member of the crew was on duty as a tender for every submerged diver and could maintain contact by feel through the umbilical and retrieve the diver via the umbilical if necessary. Safety was enhanced by hard-wired communications between the divers' EXO-26 masks and the surface, allowing constant communication as well as dictation of observations and measurements by divers to the surface. The communication system allowed diver-to-diver communication as well as diver-to-surface communication. The EXO-26 masks provided more protection for the diver's face, while the 30 cu ft bailout bottle allowed the diver to switch to a self-contained air system should the supply from the surface somehow be disrupted. In the event of such an emergency, the umbilical could be disconnected by the diver, allowing an unencumbered ascent.

A 12 by 25 ft barge was placed inside the sheet piling enclosure on the downstream side for use as a dive platform during the Phase III effort at 16BO358. Indoor-outdoor carpet was installed on the dive barge to improve traction, and a canopy was mounted to protect personnel and equipment from the sun. Equipment on the barge included two 300 cu ft compressed air tanks (refilled each day by a local company), the communications console, a table for recording and drawing, several chairs, a cellular phone, and the SSA manifold and hoses. After being fully inspected, divers climbed approximately fifteen ft down an aluminum ladder from the barge to the river bottom. Once on the bottom, they were directed to the wreckage by surface personnel. Surface crew consisted at all times of a tender for each diver, a fully-suited rescue diver on stand-by, and a communications person. Additional staff were employed at various times in recording data as it was transmitted from the bottom, screening effluent as it was dredged, or other tasks.

In addition to the stand-by diver, emergency provisions included oxygen and first aid kits on the dive platform and emergency training for all personnel. All staff were familiar with a predetermined emergency response plan, which included contact with emergency medical support via cell-phone. First response to emergencies was coordinated with Shreveport's Willis-Knighton Hospital and its hyperbaric unit. The proximity of the project area to Shreveport meant that Willis-Knighton's Life Air Rescue could have a helicopter on site five minutes after initial contact. Life Air Rescue conducted a trial run, ensuring a smoothly operating plan and training of the archeological staff on all procedures. In the event that air rescue was unavailable or grounded due to weather, a backup plan called for dispatch of an ambulance by ground. Because the road into the project area was primarily dirt and difficult to traverse in wet weather, dive operations were suspended during inclement weather.

Archeological Excavation & Recording

Excavation and Provenience

Once probing and inspection by divers indicated that the remaining bottom sediments were close to the wreckage (approximately one to three ft), excavation was completed with a smaller hand dredge. This water induction (venturi) dredge was used a 2 in Keene high-pressure pump powered by an 8 horse-power Honda GX 240 two-stroke gas engine. Sediments were fanned into the mouth of the intake hose by divers, and effluent was pumped to the surface, where it was screened through one-quarter inch mesh. A small, floating platform was constructed with two removable screens so that divers could shift proveniences quickly, without being delayed by a screening operation that lagged behind; as the diver moved to a new provenience, the dredge outlet simply was moved to a new screen.

All artifacts retrieved from the screen or from the bottom were placed in plastic bags filled with water. Each artifact was labeled with provenience information, denoting the precise location on the wreck where it was recovered. As discussed more fully in Chapter VIII below, provenience was provided in several ways, depending upon which portion of the wreck was being excavated. On the main deck, archeologists excavated 3 by 3 ft units. Each unit was recorded separately and artifacts were bagged by unit. In the hull, however, square units were not efficient. Instead, the space between hull frames became excavation units, further subdivided into port and starboard units by using the keelson as the dividing line. Sediments within the hull were divided into two or more levels, with materials recorded and bagged separately from each of these levels.

Measurement and Documentation

The primary tools used to document the *Kentucky*'s hull and to control excavation locations were 100 ft tape measures and metal yard sticks and rulers. Archeological documentation in zero visibility required the use of simple tools and techniques that could be utilized almost without vision, but that would accurately map a complex structure. The minimal visibility rendered all attempts to draw or write underwater futile, so every measurement taken on the wreck had to be relayed verbally by a diver to a recorder on the surface. Control points had to be established around the wreck to provide a framework for recording and to allow archeologists to move around the wreck by feel. At the same time, these control points had to be designed in such a fashion that they would not impede "blind" divers trailing umbilical hoses behind them.

The first element of this framework was a series of datums in the form of eye bolts that were mounted on the wreckage. An initial point was placed in the sternpost, and all excavation and mapping began at this initial datum point and gradually moved forward. As the work progressed, additional datum points were established along the vessel's centerline, first along the keelson and then along the main deck. These provided a straight baseline that ran along the center of the vessel. Additional eye bolts were mounted at other points to either side of the vessel's centerline. These were measured relative to one another and to the center baseline through trilateration. Tape measures could be stretched between any two or more of these bolts for use as independent baselines off which measurements could be made. As an additional control over mapping, datum points also were established above water. Eight eye bolts were fixed in the sheet piling, along the starboard side of the wreckage, and another eight points were established via metal stakes driven into the river bank, along the port side of the vessel. The position of each of these points was recorded with an electronic transit relative to a site datum, which was in turn mapped relative to a

series of control points set by USACE surveyors for the revetment construction project. Distances from these "dry" datum points along the bank and sheet piling were measured to each of the eye bolt datum points established below water on the wreck. Although the distances measured in this fashion sloped down from above water to the wreckage, computer software known as "WEB" was used to correct for the inaccuracies introduced by slope-taping. Designed by Nick Rule for work on the well-known excavation of the *Mary Rose* in Great Britain, WEB allowed an independent test of the accuracy of points measured in zero visibility on the river bottom.

The precise fixing of datum points on the bottom allowed points on the wreckage to be accurately recorded via trilateration, in which measurements are taken from two or more datums out to a point being recorded. In practice, the zero end of a tape measure was affixed to a datum point. The tape then was stretched by a diver to the point to be recorded; the diver ensured that the tape was straight and tight, with no bends or curves. The diver then marked with a finger the point on the tape at which it intersected the point to be mapped. With the aid of a very strong light mounted on the diver's head, it usually was possible to read the measurement, provided that the tape and finger were then held an inch or so from the mask. This measurement then was relayed to the surface, and the distance was transferred to the site plan by a draftsman via a beam compass. A second measurement, taken in the same fashion, also was transferred to the site plan and the position of the object was thereby fixed through trilateration.

The primary difficulty with trilateration in zero visibility is the difficulty in ensuring that measuring tapes are straight. It is difficult for a diver with a tape to swim straight from a datum point to a mapping point that he cannot see, and it thus becomes difficult to stretch the tape in a straight line and avoid having it bend around obtruding structures. As a result, recording on the *Kentucky* relied heavily on simpler measuring techniques such as the use of fixed linear components of the vessel as baselines. For example, the dimensions and spacing of deck planks could be measured by using various straight lines incorporated in the vessel by its builders. Deck planks running fore-and-aft were nailed to deck beams that ran at a right angle to the boat's centerline. In zero visibility, a diver could start at the centerline and move athwartship at a right angle to the centerline simply by following the line of fasteners that were nailed through the deck planks and into the deck beam. To obtain measurements on the planks, a tape was fastened at the centerline and run down the line of fasteners. The diver then reported a measurement for the point at which each plank intersected the tape; this allowed a draftsman on the surface to draw in each plank with the appropriate width, using the measurements reported to the surface by divers. This process was repeated at each deck beam, allowing the draftsman to build up a composite picture of the deck. The outer edges of the deck also could be recorded in this fashion, providing an outline for the vessel. WEB was used to periodically check the accuracy of points recorded in this fashion. In a similar fashion, the keelson was used as a baseline for measuring the room and space of frames.

The documentation of a particular timber or feature normally was directed from the surface, with the diver acting as a tool used by the archeologists above to verbally relay descriptions and measurements. Divers took measurements by stretching a tape across an object, marking the ends of the object on the tape with their fingers, and then holding the tape close enough to the face mask that the measurement could be read and relayed to the surface. Immediately following each dive, divers sketched what they had felt and reviewed and amended the drawings and records made by surface personnel.

The measurement of the curvature of hull timbers is essential for an accurate reconstruction of the vessel, but it poses different set of problems. An essential tool for this aspect of recording was a digital goniometer. This relatively simple tool consists of an electronic level sealed inside a

one foot long clear, waterproof plastic housing. Manipulation of the instrument is achieved through two through-case switches. A series of measurements recording the angle of the timber at one foot intervals along its length permits the curvature to be reconstructed on the drafting table. The goniometer was used for recording the curvature of hull frames, the angles of cross-bracing used along the vessel's centerline, and the angle of hogging chains.

Planes of Recording

The recording or mapping of relatively intact vessels underwater differs in a rarely discussed but fundamental way from the mapping done on terrestrial sites. All mapping techniques on land rely for their accuracy upon the use of level tapes and instruments. A house that is excavated, for example, originally was laid out by its builders using level measuring tapes and with relatively level floors and vertical walls. If the archeologist's measurements are made along a similarly level plane, then a planimetric map of the house can be constructed that is accurate in two dimensions and reflects the original structure. Ships and boats may be designed on paper using similar planimetric techniques to describe or illustrate the deck plan, and they may be built in the stocks in a similar fashion. When they wreck, however, they rarely come to rest on the bottom at a perfectly horizontal angle. Instead, they are canted or sloped both fore-and-aft and from side-to-side. An archeologist charged with recording the wreck therefore has a decision to make before recording begins. The use of traditional mapping techniques would result in a site plan that is accurate in two dimensional space and provides an accurate view of the ship as seen from above. It would not, however, result in an accurate view of the deck as it was built and used. Because the deck is canted over at an angle, a measurement of the beam of the vessel taken from such a map would yield a much narrower measurement than the real beam of the vessel, and fore-and-aft measurements similarly would be distorted. Recovery of an accurate deck plan of the vessel therefore requires the archeologist to adjust the mapping techniques. In practice, what is needed are two plans, one showing the vessel as seen from above (i.e., a traditional site plan) and another that records the vessel as seen at a 90° angle from the plane of the deck (i.e., a "deck plan"). In terms of understanding the vessel and its construction and use, it is the deck plan that is of greatest use. For understanding the position of the wreckage relative to other features and for avoidance during a construction project, it is the site plan that is most useful.

Recording of vessel features on the *Kentucky* was done primarily with a view to producing a deck plan. Thus when measuring tapes drawn from the vessel's centerline to the periphery are referred to as "level," this mean that they are roughly parallel to the plane of the deck. In a similar fashion, a "vertical line" from the keelson to the main deck is a line that runs at a 90° angle to the plane of the deck. Plans constructed in this fashion provide the greatest utility for vessel reconstruction and interpretation.

A second plan of the *Kentucky* was prepared for use as a site plan. This plan recorded the site and its components as seen from above. Rather than going through the time-consuming exercise of mapping all of the vessel details twice, once from above for a site plan, and once from a different angle for a deck plan, all details were recorded using the deck plan view. Datum points and the outline of the vessel then were recorded a second time using normal planimetric techniques. Details were then added to the planimetric view through the use of AutoCAD. This was accomplished by separately digitizing both the conventional site plan and the deck plan in AutoCAD, with common datum points and the vessel outline in each. The deck plan drawing then was brought into the planimetric site plan as an overlay, and AutoCAD's three-dimensional rotation functions were used to "tilt" the deck plan until it aligned with the outline of the vessel on

the site plan and all control points matched. With this accomplished, an accurate site plan with all of the requisite detail was completed.

CHAPTER VIII

RESULTS OF PHASE III DATA RECOVERY EFFORTS

Introduction

This chapter summarizes the results of the Phase III data recovery efforts. It provides a general overview of the progress of the field investigation and of the results of that work. Greater detail on specific aspects of the work and analyses carried out subsequent to the fieldwork are related in ensuing chapters; these include details on vessel construction and morphology (Chapter IX), artifact analysis (Chapter X), and analysis of floral and faunal remains (Chapter XII). The discussions in this chapter follow the unfolding of field work in chronological order and discuss features, artifacts, and ecofacts only in general terms.

Initial Dredging on the Site

Initial dredging operations on 16BO358 commenced on July 18, 1997, with the arrival of the USACE *Key Woods*, a 65 ft tugboat captained by Lynn Lejune. *Key Woods* brought with it a 140 ft barge supporting a 50 ton crane and ten-inch suction dredge for use in removing the overburden of silt that had built up on the site during the previous year. The dredge barge was positioned just outside of the sheet piling enclosure, on the downstream side. Under the direction of archeologists, a grab bucket was used to dig an initial hole in the sediments a safe distance away from the wreckage recorded in 1995. Once this initial hole was opened, it quickly filled with water and the dredge was placed in it. The dredge head, using water jets to dislodge sediments, was capable of moving up to sixty cubic yards of sediment per hour via suction. Dredging continued with some interruptions due to weather and crew scheduling changes from July 18 through July 24, during which time the bulk of the sediment was removed from within the sheet piling enclosure. Substantial amounts of the river bank slumped into the water during this process, and these sediments also were removed with the dredge. Despite the slumping, the river bank was still relatively steep and posed a hazard to divers, so a trackhoe and bulldozer were used to carefully remove additional sediment on the bank and create a shallow slope down to the water.

No remains of the vessel were encountered or disturbed during any of these operations. Control over the sediment pumping was maintained through continuous monitoring by an archeologist, and the depth of the sediment remaining over the wreck was constantly monitored by probing. Once the crane-mounted dredge drew near to the level of the wreckage (within four to five feet), as indicated by probing, the pace of dredging was slowed and effluent was screened through quarter-inch mesh. No artifacts or other cultural debris were encountered. The grading operations on land also were under the constant supervision of an archeologist. Using diving inspections and

the 1995 coring data, the grading of the bank was terminated substantially above the level at which vessel remains were expected.

Heavy dredging using the crane mounted equipment was suspended on July 25, 1997 when it was determined that the sediments were within two or three feet of the wreckage and that comprehensive diving inspections were required. A series of inspection dives were then made to determine specific locations that required additional sediment removal. Once this was completed, archeological divers used a hand dredge to clean up the area around the sternpost, preparatory to beginning controlled excavation of the vessel structure. In general, it was possible to discern the difference between loose, recently deposited sediments and the more compact, undisturbed deposits that lay just above and within the vessel. These undisturbed deposits were not removed during the initial dredging process, but were instead left for controlled excavation. During the cleaning of the site the upper gudgeon that was recorded and redeposited on the bottom in 1995 was recovered, along with a mast or spar hoop.

Archeological Excavation

Excavation & Provenience Designations

Controlled excavations began at the sternpost using the hand-operated water induction (venturi) dredge. Sediments were fanned into the mouth of the intake hose by divers, and effluent was pumped to the surface, where it was screened through one-quarter inch mesh. As excavation proceeded, individual sets of frames were exposed and numbered, beginning with the designation of “F1" for the stern-most set of frames, immediately adjacent to and abutting the sternpost (Figure 46). Each successive set of frames was similarly numbered, resulting in the designations “F2,” “F3,” “F4,” and so on toward the bow of the vessel. Within the hull, the frames themselves were used as controls for the excavation, with the sediments between each successive set of frames excavated separately. The first provenience unit of the 1997 excavations, designated Field Specimen (FS) 4, covered the area between the sternpost and frame F2 (Field Specimens 1 and 2 were used during the 1995 Phase I-II investigations; FS 3 designated materials collected during the USACE dredging operation, all of which were natural objects rather than artifacts). The next provenience unit excavated in 1997, FS 5, lay between frames F2 and F3. Between frames F3 and F4 the hull became wide enough that it was useful to distinguish between the materials excavated on either side of the vessel’s centerline. First the area to the port of the centerline was removed between each subsequent set of frames, and then the material to the starboard of the centerline was excavated, with each excavated area given its own FS number. As excavation moved forward, it was found that a difference could be distinguished between the texture and feel of the silt in the upper layer and the more compact, sediment at the bottom of the hull. In these instances the upper material was designated Level 1, while the lower stratum was designated Level 2; each of these levels also was given a distinct FS number. Although there may have been additional stratigraphic differences within these deposits, the lack of visibility made it impossible to reliably and consistently make such distinctions.

A plan view of excavated features overlaid with provenience information is included as Figure 47. An inventory of materials recovered from each FS unit are included as Appendix III and faunal remains are inventoried in Appendix IV.

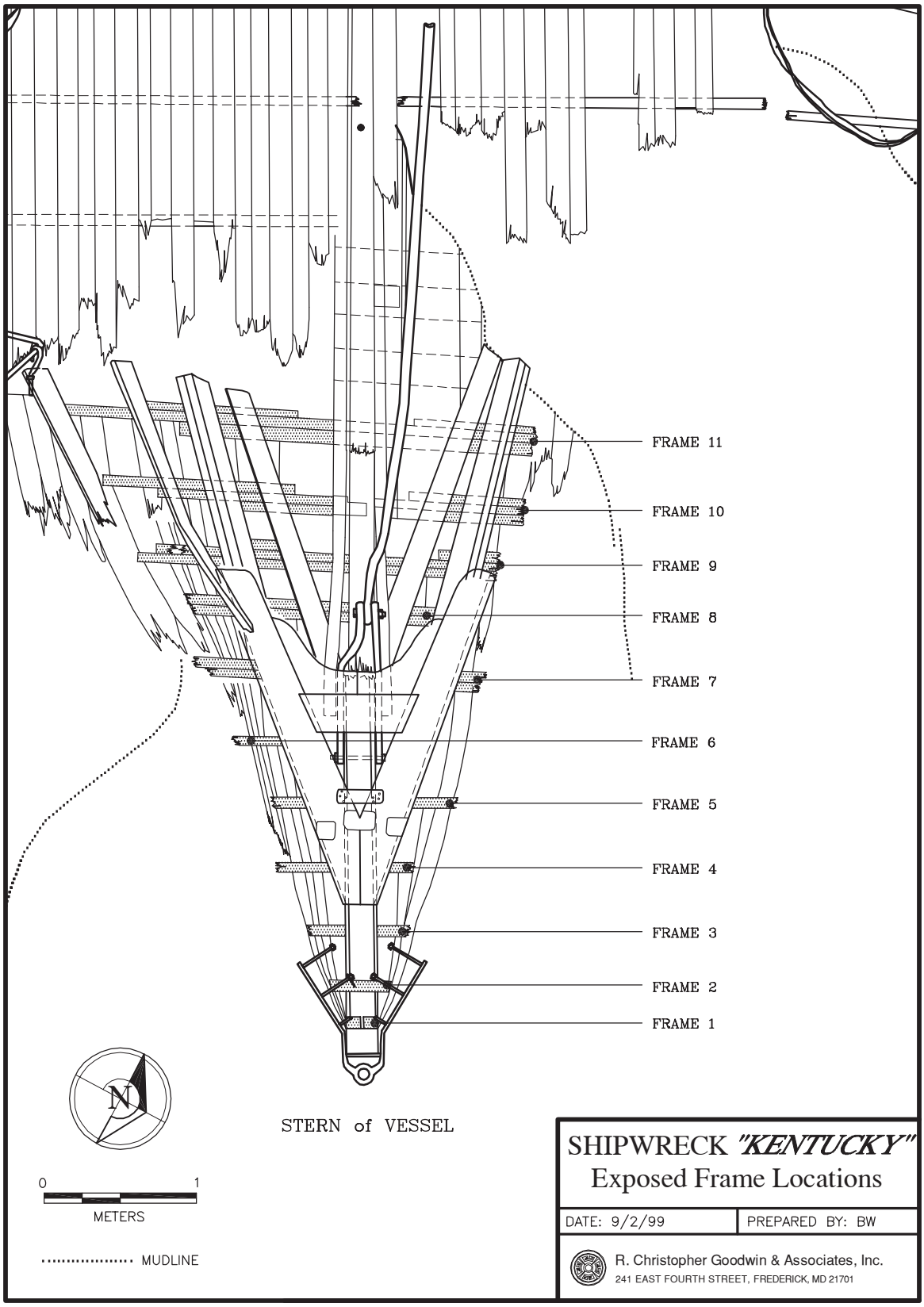
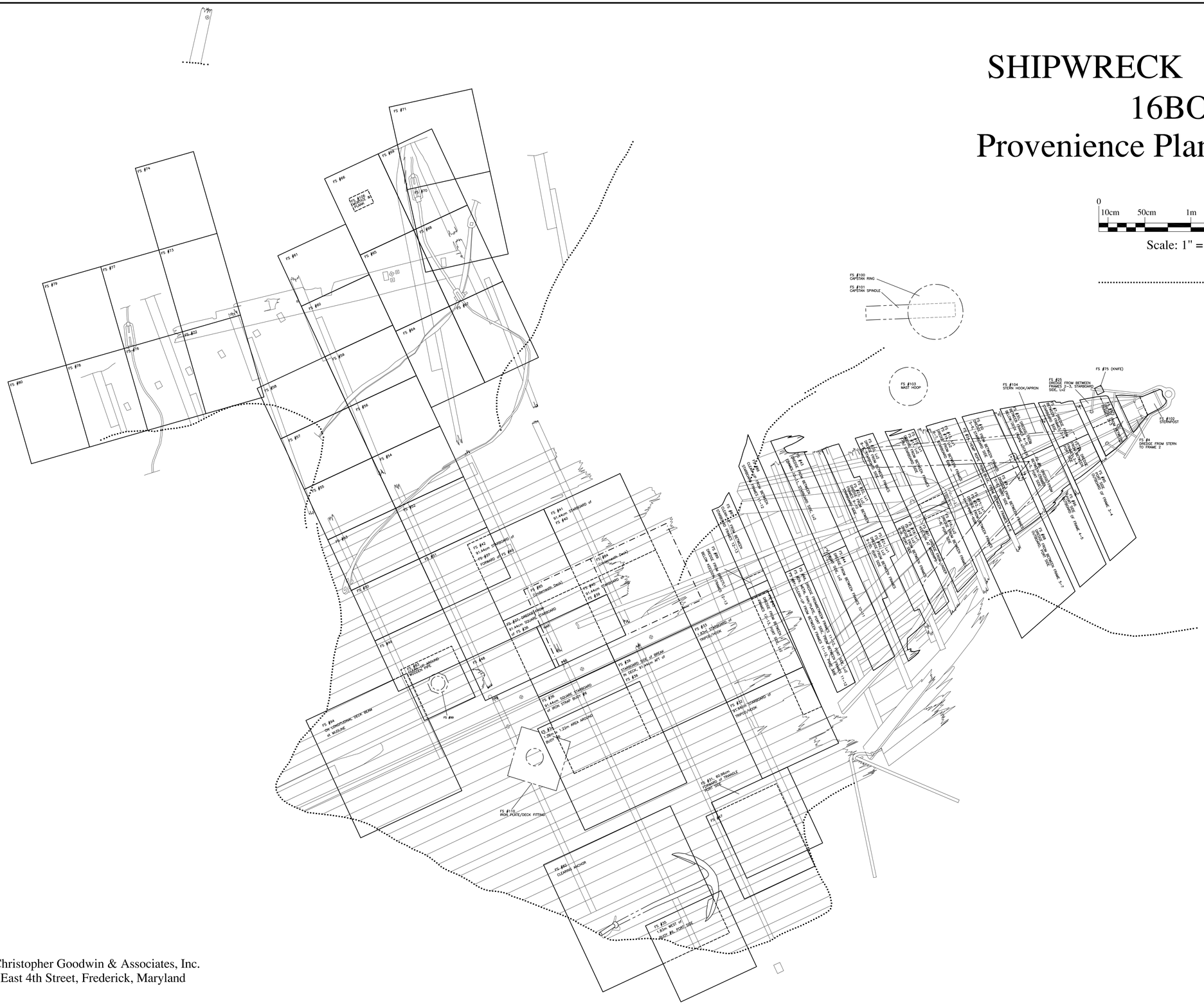


Figure 46 Stern of vessel with frames numbered

SHIPWRECK *"KENTUCKY"*
16BO358
Provenience Plan View Overlay



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Excavations in the Hull

Excavations within the hull of the *Kentucky* began at the sternpost and were completed up to the thirteenth frame forward. From the sternpost to the thirteenth frame it was possible to excavate deposits across the entire width of the hull. Elements of the vessels structure uncovered during this phase of excavation are depicted in the partial plan, Figure 46 (in the following discussions, the reader may find it helpful to also refer to the inked drawing of the deck plan, Figure 48, on which structural features are labeled). From this point forward, however, excavation was hampered and eventually terminated due to the continual slumping of sediments into the hull from outside and because the presence of the main deck overhead would have compromised the safety of divers. Only a small portion of the deposits inside the hull therefore were excavated forward of the thirteenth frame.

Sternpost to Frame 3. Excavation in this area was, from a logistical standpoint, the easiest, as the dive platform and screening raft were close to the sternpost. The primary concern was preventing contact between the dredge hoses and the sternpost and hull planking, which was accomplished with floats and careful planning. Removal of the thick, gooey, silty-clay between the first few frames proceeded quickly. The space between the sternpost and frame F2 held a relatively small volume of sediment, as did the area between frames F2 and F3. Although the sternpost was preserved to a height of just over 5.5 ft (1.68 m), the first frames had deteriorated to a much lower point on the hull. Excavation revealed intact hull planking to either side, with three strakes on the starboard side and four on the port, as well as the top of a keelson measuring six in across (sided). Although it was not initially apparent, the keelson sat on top of deadwood over the keel. The frames angled up sharply from the deadwood, with better preservation to port, where the hull on the river bank side was less exposed and better shielded from the effects of current. This enhanced preservation proved to be the rule along the entire port side of the vessel as excavation progressed. This stern-most area was designated FS 4. Although no artifacts were recovered from the area, a femur and second phalanx from a domestic pig (*Sus scrofa*) were found.

Recovered from within the area between the sternpost and frame F3 (FS 5) were turtle bones (species unidentified; one was retained and is discussed in Chapter XI) that must have been deposited subsequent to the wrecking event, an iron washer (1.8 in diameter, with a 0.55 in) opening) and two fragments of machine cut finishing nails. The initial excavation between frames F2-F3 on the starboard side failed to completely remove all sediments, particularly at the bottom of the bilge between the deadwood and the hull planking. Subsequent dredging to clean this area resulted in the recovery of an annular pearlware cup base, 3 wrought iron spikes with 0.5 in shanks (lengths of 6 in, 4.5 in, and a 2 in fragment), a cut nail, and 10 cut nail fragments (2 finish and 8 common), 2 window glass sherds, a porcelain or milk glass clothing button, and coal fragments (FS 25). This deposit also contained turtle bone (species unidentified), part of a rat humerus (*Rattus sp.*), and a horse acetabulum.

Frames 3-7. Excavations between frames F3-F7 revealed more complex structure, including a stern hook, a stirrup assembly for the *Kentucky*'s hog chain, and sister keelsons. With the wider space between frames F3 and F4, the port and starboard side sediments were separated for provenience control during excavation. The port half of this area (FS 6) included a decoratively carved wood "dutchman," perhaps once part of a rail finial on the vessel's superstructure, a 5 in long iron spike, and 3 fragments of machine cut nails. To starboard (FS 7), turtle bone was recovered (alligator snapping turtle, *Macrolemys temmickii*), along with a spike and a basal sherd of brown salt-glaze stoneware.

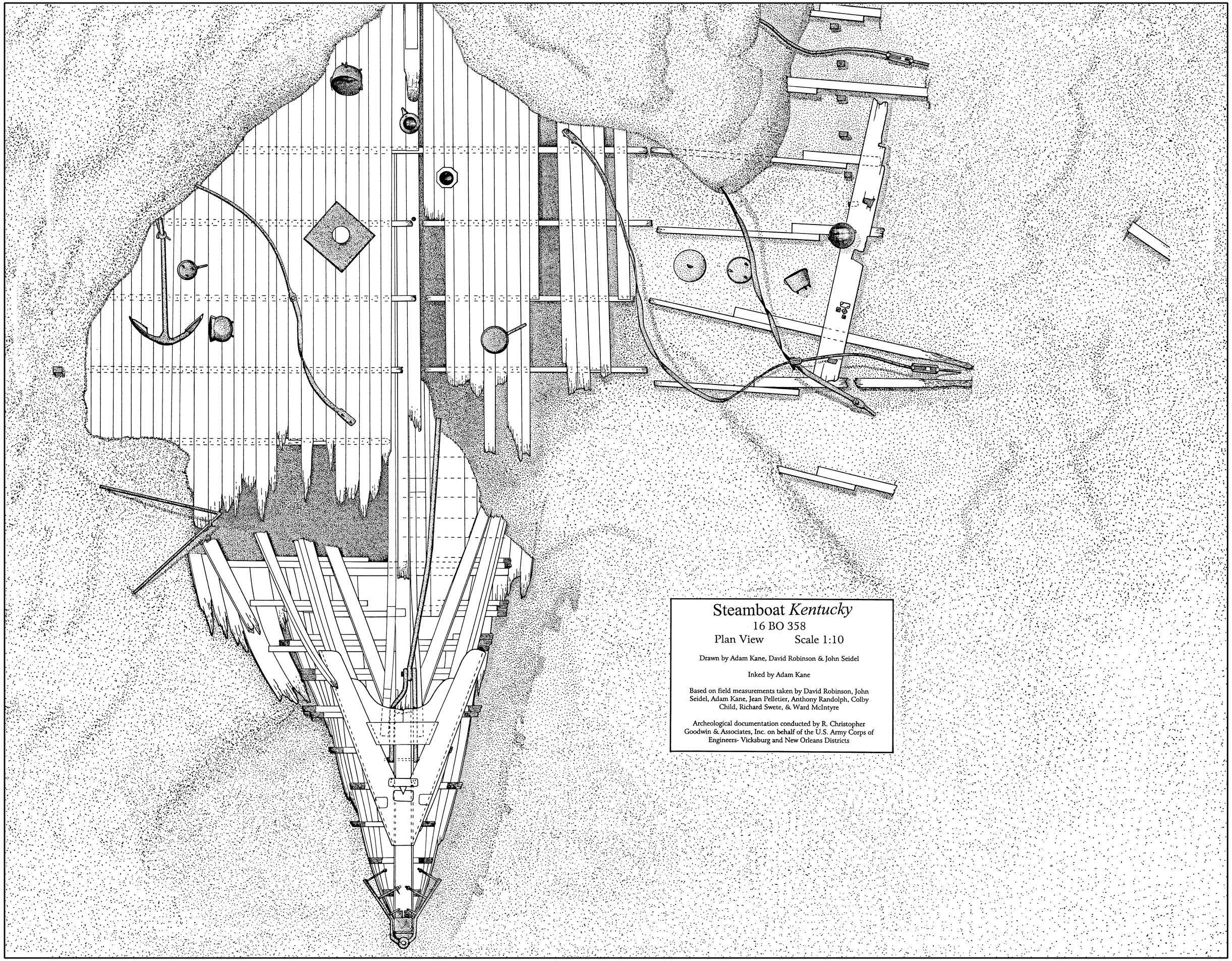
Excavations here revealed hull planking again, as well as the keelson, deadwood, and somewhat longer lengths of frames. Within the bilge and halfway between frames F3 and F4, the tapered ends of another wood component were revealed wedged in between the frames. This was the stern hook, fitted tightly against the frames approximately 9 in above the top of the keelson. As described in the next chapter, the stern hook was a composite wood piece in the shape of an "A", with its legs stretching forward to frame F9. The legs of the "A" were joined near the apex by a small piece of wood nailed across their top face, and by a much more substantial cross-piece and knees farther forward. Excavations followed the stern-hook forward between frames F4 and F5, first uncovering fragments of rope or hawser lying on the stern-hook, and then longer, intact lengths of hawser that emerged from beneath the stern hook. More hawser was recovered from below the stern hook, suggesting that the space beneath the stern hook between frames F4 and F6 had served as a rope locker. The sediment excavated to port between frames F4-F5 (FS 8) included hawser fragments, various cut nails, coal fragments, a portion of deck planking, and two small, sawn wood blocks. This deposit also included bones from domestic pig (*Sus scrofa*) and cow (*Bos taurus*). No artifacts were recovered to starboard. At the very bottom of the bilge between frames F4-F5, in what was termed the rope locker (FS 30), a fragment of window glass was recovered, along with 2 portions of iron spikes and a plethora of bone. The bone was subsequently identified as belonging primarily to turtles and rats. Soft shell turtles (*Apalone sp.*) accounted for 22 bones or bone fragments, while common snapping turtles (*Chelydra serpentina*) accounted for another 16 bones. These almost certainly came from animals inhabiting or frequenting the hull after the wrecking event. The remaining 4 bones from Old World rats (*Rattus sp.*), on the other hand, may represent occupants of the vessel during its service prior to the wreck.

Beneath the hawser recovered between frames F5 and F6 lay the keelson and deadwood, but excavation also revealed a large iron assembly attached to the deadwood. This was a shackle or stirrup that served as the main attachment point in the stern for the vessel's hog chain. Excavations between frames F6-F9 demonstrated that the stirrup extended forward at an upward angle of approximately 35°, emerging between the forward ends of the stern hook's arms where it was shackled to the hog chain itself.

Between frames F6-F7, sediments were deep enough that they could profitably be separated into two levels. At the bottom of the bilge, in Level 2, the ends of sister keelsons were located. These were splayed out, separated from the keelson by at least 3 in at their aft ends, a peculiarity that is discussed in the next chapter. Additional construction details, not immediately evident during excavation, were recognized during the subsequent recording effort and also are addressed in the following chapter.

In addition to lengths of hawser recovered from on top of and beneath the stern hook, cut iron spikes and nails were retrieved, along with coal, miscellaneous pieces of wood, and a very large quantity of turtle bone and shell fragments (common snapping turtle and alligator snapping turtle; see Appendix IV), not all of which were retained. These were recovered from all levels. In the port side of the bilge, between frames F5-F6 (FS 9), a piece of undecorated whiteware was found, along with a brass tack (2.5 in long), 11 cut nails or nail fragments, and many pieces of turtle bone; to starboard (FS 10), a peach pit and pumpkin seed were recovered, as well as a wood wedge, a wood dowel fragment, a sherd of pane glass, a sherd of undecorated porcelain, 2 spikes, and 7 cut nails and nail fragments.

From the port side Level 1 between frames F6-F7 (FS 11), more turtle bone (common snapping turtle) was recovered in large quantities, along with fragments of horse hoof. Additional segments of hawser also were recovered. Similar materials were encountered beneath this deposit in Level 2 (FS 12), including domestic pig (*Sus scrofa*). To starboard, the Level 1 (FS 13)


Steamboat *Kentucky*
16 BO 358
Plan View Scale 1:10
Drawn by Adam Kane, David Robinson & John Seidel
Inked by Adam Kane
Based on field measurements taken by David Robinson, John Seidel, Adam Kane, Jean Pelletier, Anthony Randolph, Colby Child, Richard Swete, & Ward McIntyre
Archeological documentation conducted by R. Christopher Goodwin & Associates, Inc. on behalf of the U.S. Army Corps of Engineers- Vicksburg and New Orleans Districts

assemblage consisted entirely of turtle bone (common snapping turtle) and small fragments of deteriorating hawser; these materials were augmented in Level 2 (FS 14) by rat bones, iron spike fragments, and a corroded 3 in long iron fastener.

Frames 7-11. Beginning at frame F7, the frames became more complex, formed of futtocks and floor timbers rather than the simple half-frames found aft. Partially as a result of this more robust construction, substantially greater lengths of the port framing were preserved from frame F7 forward, as were unsupported sections of sharp hull planking above the tops of the extant frame sections. These fragile strakes became a concern during dredging operations, partially because of the hazard they posed to divers, but also because of their vulnerability to damage from dredge hoses. With the dredge pump stationed on the river bank to port of the wreck, constant attention to hose placement was required to avoid damage to the strakes. Contact with hull structure was minimized through suspension of the hoses above the structure with floats, careful monitoring, and frequent readjustment of the hoses.

With the better preservation of structure to port, the sedimentary deposits were deeper. The upper level (Level 1) on the port side between frames F7-F8 apparently consisted primarily of recent slump and contained no artifacts. A similar situation was encountered in the first level on the starboard side. The materials recovered from the second level on port side (FS 16) were comprised solely of faunal remains (horse and soft shell turtle), while the starboard level 2 (FS 17) held several cut nail fragments, and a 2 x 2 in fragment of tar paper. The tar paper almost certainly was used on deck, and the tar was mixed with sand to provide improved traction on a wet deck. Removal of these deposits revealed the forward continuation of the hog chain stirrup, keelson, and sister keelson. In addition, several more structural features were found attached to the hull frames. These elements were fayed into the keelson and spread out as they moved forward to follow the curve of the hull; they are more fully described in Chapter IX. Mortises were cut into the top face of the keelson and port sister keelson mid-way between frames F7-F8 and where they intersected frame F10. The specific function of these mortises, intended to seat vertical structural elements (supports for the longitudinal deck beam and cross-bracing), likewise is discussed in the next chapter. Directly above frame F7, just forward of the stirrup's attachment point to the deadwood, the keelson and keel were broken. The keel and keelson ran along a roughly horizontal plane from this fracture point back to the sternpost, while forward of the break the entire wreck pitched down toward the bow.

The first excavation level on the port side between frames F8-F9 (FS 18) yielded only a single fragment of a 2.25 in (5.75 cm) diameter iron fastener, while the level beneath it (FS 19) contained several iron nail fragments, bone from common snapping turtle, and a small 0.25 inch in diameter button made of porcelain or milk glass. The upper level to starboard was devoid of artifacts, while Level 2 (FS 20) on the starboard side included large numbers of rat bones (11), a cut nail and 2 fragments, a sherd of window glass, and a single sherd of Canton porcelain (flatware, dating 1800-1830). Structural elements uncovered in this area, as well as forward between frames F9-F10 were essentially continuations of features revealed farther aft. Materials recovered from the levels between frames F9-F10 (FS 21-23, FS 62) likewise were similar to those previously discussed. The only materials deserving particular mention are two fragments of tongue and groove wood planking recovered from FS 23 (Level 2, starboard side); other artifacts included the usual cut nail and spike fragments, turtle bones, some window glass (1 sherd in FS 21), and a bone (cleitherum) from a freshwater catfish (FS 22).

The practice of excavating in two levels was continued between frames F10-F11, with the port side Level 2 (FS 44) yielding rat bones (10) and fragments of iron. It also yielded a relatively recent .22 cal. bullet, indicating either that some of these hull deposits are recent in origin or that

there has been a certain amount of movement of materials within the layers. Alternatively, and most likely, it is possible that the hull was used as a target during a recent period of low water, and that the bullet is simply an isolated intrusive find. The starboard side Level 2 (FS 43) produced more of the ubiquitous turtle bones (softshell) and iron fastener fragments.

Beginning at frame F10, two new structural features were revealed on the starboard side. Butted up against the sister keelson at frame F11and running parallel to it was a 9.5 in (24.1 cm) moulded by 4 in (10.3 cm) sided timber that extended forward beyond the limits of excavation. The aft upper end of this timber (a footling, discussed more fully in Chapter IX) was rounded, and the piece sat directly on the frames. Abutting the footling to starboard was the first documented piece of ceiling plank. Tapered at the aft end to fit in the narrow space between the footling and a curving longitudinal feature (futtock head strake, described in the next chapter), the 1 in (2.5 cm) thick plank reached a maximum width of 12 in (30.5 cm) just forward of frame F11.

As noted previously, greater sections of the port side hull were preserved beginning at frame F7. The upper sections of the hull in this area exhibited a pronounced outboard flare that extended above the preserved segments of intact framing in some areas. Sediments on this hull planking threatened to slump into the hull, and these were removed in a separate dredging operation, with materials recovered from it designated as FS 26. FS 26 included another example of tongue and groove plank, five sherds of window glass, six 5.0 in (12.7 cm) long iron spikes, two spikes measuring 4.75 in (12 cm) long, and fragments of three more spikes.

Frames 11-13. Beginning at frame F11, the overburden in *Kentucky*'s hull was substantially deeper than that encountered previously. Excavation was time-consuming, made difficult in part by the continued slumping of materials from farther forward and to port (the river bank side of the wreck). In addition, as excavators probed farther forward into the murk beyond frame F11, it became apparent that significant portions of the main deck were intact above the level of excavation. Continued movement forward eventually put divers into an enclosed, overhead environment, with consequent safety hazards and difficulties in safely running dredge hoses. As a result, excavation along the port side of the vessel from frame F11 forward was not successful in removing all of the sediments down to the bottom of the bilge. Despite continued attempts, slump and sediment infiltration from above and from the bank were impossible to overcome. Efforts to expose the bottom of the hold were more successful to starboard, although they had to be curtailed just forward of frame F13 due to overhead obstructions from the main deck.

The Level 1 deposits throughout the area between frames F10-F13 were sterile. On the starboard side between frames F11-F12, Level 2 (FS 86) held a single cut nail measuring 4 in (10.2 cm) long, two additional nail fragments, unidentifiable iron pieces, and 32 rat bones. The port side Level 1 yielded 9 pieces of 1/16 in (0.18 cm) iron sheeting that were recovered prior to excavation (FS 29). Level 2 (FS 46) between port frames F11-F12 held only a cut nail. During later clean-up excavations in this area to remove sediment prior to recording, a single chain link was found, along with a spike and an iron concretion (FS 81).

With the exception of one sherd of pane glass, artifacts recovered from Level 2 to the port side between frames F12-F13 (FS 45) all were iron: a 10.5 in (26.6 cm) long spike, a 2.5 in (6.3 cm) long cut nail, seven cut nail fragments, and miscellaneous unidentifiable iron. The starboard Level 2 between frames F12-F13 (FS 87) held five nail fragments, a single sherd of green bottle glass, and a small piece of loose wood. A separate provenience (FS 89) was established for material excavated from directly against the starboard side of the keelson at the bottom of the bilge; five shaped wood plugs were retrieved from this area.

Although excavations on the port side between frames F11-F13 failed to uncover the bottom of the vessel, to starboard excavators exposed more of the footling and ceiling plank. The footling had a mortise let into it over frame F13. In addition, a complex vertical structural feature was encountered running forward along the boat's centerline at frame F12. This feature was comprised of vertical studs and diagonal cross-braces. Portions of this longitudinal bracing may be seen in Figure 49 (elevation). These timbers were set into mortises cut into the keelson and starboard sister keelson, and they extended from the bottom of the hold up to a longitudinal capping timber that supported the main deck beams, running outboard at a right angle to the vessel's centerline. Paralleling this cap and "bulkhead" to the port was a larger longitudinal beam that similarly supported the main deck and was itself supported by a series of vertical stanchions let into the keelson and port sister keelson. These features are more fully discussed and their functions assessed in Chapter IX.

Sediments Forward of Frame 13 & Implications for Site Disposition. Forward of frame F13 it was apparent that the hold was solidly filled with fine and compact sediments that extended from the bottom of the hull up to the main deck on the port side. On the starboard side, sediments did not completely fill the hold for another 11 ft (3 m) or so, after which this area also was solidly filled with sediments. This was an important discovery, with implications for the future disposition of the site. Prior to this it was thought possible that voids or air pockets might exist inside the hull structure. It was feared that the additional weight from revetment stone might cause the collapse of main deck structure into these voids, with serious negative impacts upon the vessel. The density of the sediments filling the hold forward of frame F13 allayed these fears and made possible the revised strategy of leaving the wreck *in situ* and capping it with sand prior to revetment construction, as outlined previously in Chapter VII. Extensive excavation within these solidified deposits not only would be exceptionally difficult, but would remove an important element that worked toward stabilizing the remains. It therefore was decided that excavation within the hold would terminate here, with the exception of three units placed to sample the interior deposits on the more accessible starboard side of the hull. The three units each measured 3 ft (0.91 m) fore-and-aft by 5 ft (1.52 m) side-to-side, and the port side of each unit was placed along the vessel's centerline. It was hoped that these excavations might encounter deposits that had less potential for having been disturbed, given their location beneath more intact portions of the main deck. In addition, they would make it possible to view a better preserved segment of the longitudinal cross-bracing that formed such an important structural component of *Kentucky*.

Excavation in the Hold Forward of Frame F13. The first excavation unit forward of Frame F13 on the starboard side encountered fairly compact sediments. It was difficult to discern any stratigraphic changes within the unit due to compaction, so all materials collected were placed within one provenience, FS 84. Nine wrought iron spikes were recovered, along with one four inch cut nail (possibly burned) and a cut nail fragment. Also recovered were two iron bridle rings (2.25 in dia). It seems unlikely that leather harness and tack for the horses being transported on *Kentucky* would have been stored in the wet hold of the vessel, so it appears likely that these originated on the main deck. A single horse rib confirmed this interpretation. The only artifact excavated from the next unit forward, FS 85, also was a piece of horse tack. This was a well-preserved copper alloy buckle, probably from a bridle. FS 85 also contained a large number of soft shell turtle bones (31). In the forward-most of these three excavation units (FS 93) a wood drawer pull was retrieved, along with coal slag (3 pieces), wood fragments, unidentified iron or steel fragments that may have been straps, a cut nail, and a nail fragment. A mandible fragment from a horse also was found in FS 93. Softshell turtle remains were found in all three proveniences (16 in FS 84, 31 from FS 85, and 8 from FS 93). In all three of these units it was virtually impossible to reach the bottom of the bilge and to expose frames or ceiling planking because of continued slumping of sediments. Because of this slumping and the appearance of items that probably originated on the main deck,

excavation was stopped before the bottom of these deposits was reached. A substantial section of the longitudinal cross-bracing was exposed for complete recording and drawing, however, including most of the base of the feature.

Excavations on the Main Deck

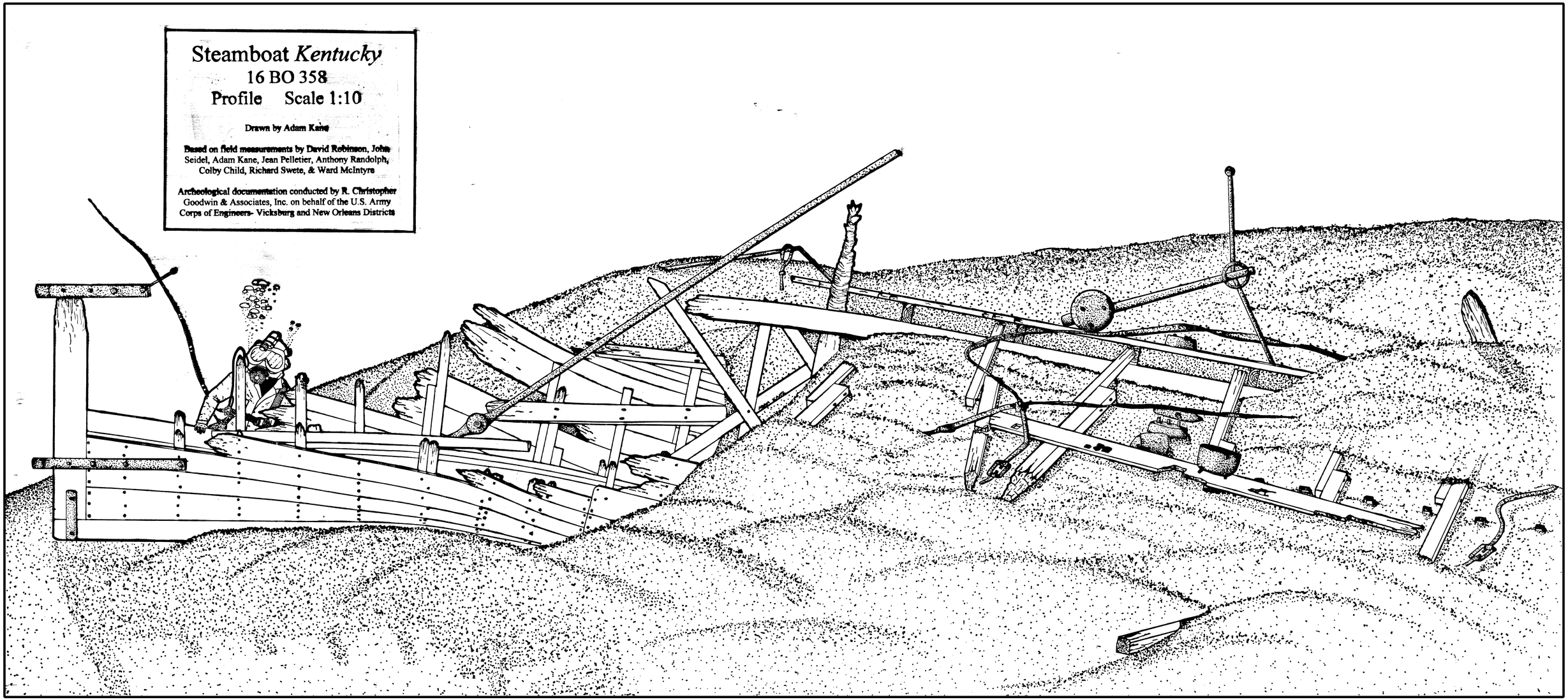
The discovery of intact segments of the main deck made this area the next logical target for excavation (Figures 50 and 48). Excavators faced a number of challenges during this operation. The primary difficulty involved the lack of visibility and the general absence of obvious and easily definable structural features on the main deck. Excavations within the hold utilized structural features such as frames and the keelson to clearly define and delineate the boundaries between excavation units and proveniences. The deck area, however, was largely devoid of such obvious features, with one section of deck looking and feeling much like any other segment.

As a first step in providing guides to excavators, a tape measure was stretched from the sternpost forward down the centerline of the vessel. Attached to an eye-bolt fixed high up on the sternpost, the tape measure was run at roughly the same elevation above the keelson as the main deck (see Chapter VII for an overview of recording techniques). Deck planking had for some reason pulled away from the deck beams along the centerline, revealing the top of the longitudinal beam that supported deck beams. The exposure of this longitudinal beam made it easy to follow the vessel's centerline along the main deck, which would have been difficult had it been covered with deck planking. Three markers or datum points, consisting of lag bolts topped by eyes, were set into this longitudinal beam at intervals along *Kentucky*'s centerline. Their distances from the sternpost were recorded, and they provided a baseline from which the main deck excavation and recording could be conducted. The location of excavation units and features on the main deck were recorded relative to this baseline, strung along the vessel's centerline, with checks on accuracy provided via WEB (see Chapter VII for a discussion of WEB).

Once excavations began, it was found that some features on the deck could be used to provide additional orientation to divers. The deck planking, for example, ran fore-and-aft and was nailed into deck beams that ran perpendicularly, at a right angle, to the longitudinal beam and centerline. A diver moving away from the centerline of the vessel could ensure that he was moving at a right angle simply by feeling for and following the line of nail heads that went through the deck planks and into the deck beams. Once the perpendicular orientation of the deck beams was verified through trilateration conducted off the baseline and by WEB, this became an important method by which divers maneuvered around the deck and kept track of their locations.

Despite these aids to navigation, the utter lack of visibility made occasional confusion unavoidable. The effects of such confusion were minimized through a constant process of double-checking measurements, by the use of trilateration to verify measurements recorded as offsets from the baseline, and with careful record-keeping. Although confusion on several occasions resulted in slightly overlapping excavations, the mistakes were caught and rectified on the site plan with no adverse impact upon recording or later analysis.

The order in which excavations are discussed below does not precisely mirror the order in which excavations were carried out, but instead follows an orderly progression across the deck. This should make it easier to follow the results than if the discussion followed the fits and starts of the actual excavation process. Sediments lying on top of the main deck were not exceptionally deep, and in no instance during these excavations could any stratigraphic distinctions be discerned. Consequently only one FS number was assigned to each discrete area of excavation. Although


Steamboat *Kentucky*
16 BO 358
Profile Scale 1:10
Drawn by Adam Kane
Based on field measurements by David Robinson, John Seidel, Adam Kane, Jean Pelletier, Anthony Randolph, Colby Child, Richard Swete, & Ward McIntyre
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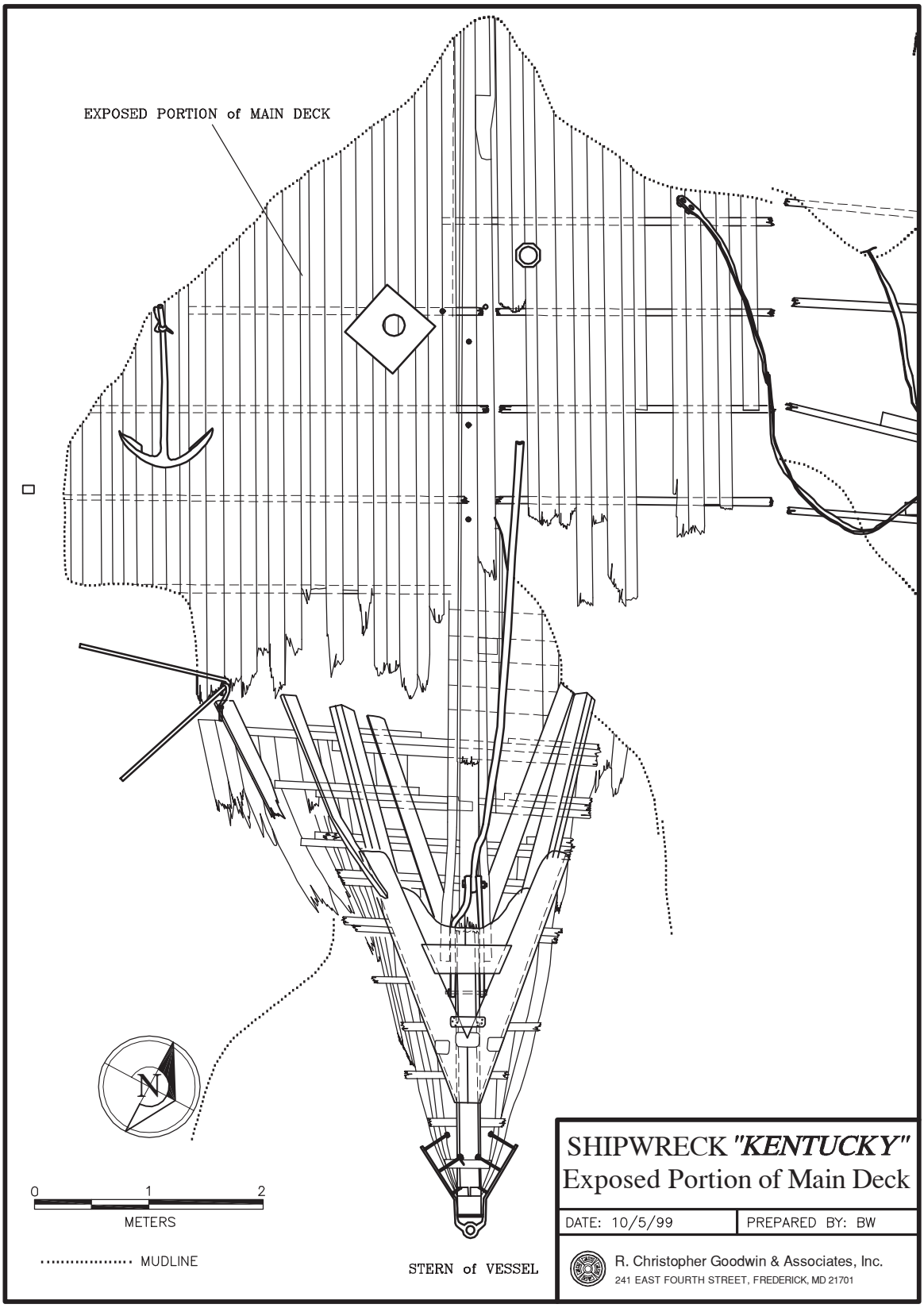


Figure 50 Stern of vessel and exposed portions of main deck

excavation units were numbered separately, the text below will avoid the confusion of multiple numbers by referring to each excavation unit by its associated FS number rather than by the excavation unit number and FS number. This will make it easier for the reader to make reference to the artifact inventory, which is keyed to the FS numbers. The reader may also find it useful to refer to Figure 47, which depicts FS areas on the deck plan.

Port & Starboard Sides of the Main Deck. The initial phase of excavation resulted in the placement of several test excavations on the port side of the deck. FS 31 was placed on the main deck to the port, at the edge of the mud slope that ran up onto the adjacent river bank. This 3 ft (0.914 m) square unit probed the mud bank and revealed additional deck planking, five spikes, and a sherd of window pane glass. Later during the project, excavators returned to this portion of the deck to record deck planking and cleared sediments from the area once again. This material was designated FS 47, and it contained a horse astragalus and no artifacts. A third unit, FS 35 (also 3 ft [0.914 m] square), was located somewhat forward of FS 31 and to port. It was not excavated to the level of the deck, as sediment continually slumped into the unit from the bank. Later excavations, discussed below, more successfully cleaned this area with interesting results (FS 82). The only materials recovered during the excavation of FS 35 included a single sherd of pane glass, 7 horse bones, and 4 unidentified mammal bones.

Upon completion of these initial test units, a series of four units was placed on the deck nearer the center line of the vessel. The first two units, located side-by-side at the broken aft edge of the deck, each measured 3 ft (0.914 m) square. FS 33 was located directly to port of the longitudinal beam and vessel centerline, while FS 32 adjoined it to port; additional materials were collected from the FS 32 area in an example of the initial confusion due to limited visibility; this material was recorded as FS 27. A porcelain or milk glass button was retrieved from FS 33, along with a bone awl and a phalanx and metapodial from a horse. FS 32/27 yielded only 4 spikes, a spike fragment, 4 cut nails, and an unidentifiable piece of iron or steel. The deck planks and fastening exposed in this excavation are more fully described in the following chapter, but the planks were butt-jointed and nailed into the underlying deck beams.

Excavations continued forward with the dredging of two more 3 ft (0.914 m) squares, FS 39 and FS 36. FS 39 was located directly forward of FS 33, along the port side of the longitudinal beam, while FS 36 continued forward in line with FS 33 and FS 39. While no artifacts were recovered from FS 39, FS 36 contained a variety of materials. These included unidentifiable iron fragments (8), 3 fragments of a tin cup, and one sherd of window glass. More interesting were the recovery of two percussion caps and a brass Confederate infantry button, the first clearly military items encountered. Also recovered was the handle to an iron kettle. These artifacts are more fully described in a following chapter (Chapter X), as are faunal remains which included 42 cranial fragments, a maxilla, and 2 other horse bones (Chapter XI).

Once a strip of 9 ft (3 m) in length had been cleared along the port side of the vessel's centerline, excavation moved to the starboard side. The decking on the starboard side was broken off farther forward, so the first excavation was located directly starboard of FS 39. This unit, designated FS 40, was excavated immediately to port of FS 36 and measured 3 ft (0.914 m) square. FS 40 included two window pane fragments, three possible nail fragments, two horse molars, rat bone, and unidentifiable bones. FS 37, situated just forward of FS 40, included a blue glass pharmaceutical bottle, a horse mandible (including the left and right halves) and another 147 horse bones, including cranial fragments, teeth, and a rib.

Directly to starboard of FS 40 and FS 37, respectively, were two identically-sized units, FS 41 and FS 42. FS 41 was devoid of artifacts and faunal material, however FS42 contained a spike

and a cast iron frying pan that was the first of a series of kitchen cookware that would be recovered from the main deck.

Slightly overlapping FS 37, and forward of it, a narrow area was cleared of sediment later in the excavation and labeled FS 48. This cleaning of the fragmentary deck planks and the longitudinal beam in this vicinity yielded only a single glass button.

Explorations by divers indicated that forward of these units there were substantial and intact deck remains that stretched for some distance to starboard (Figures 48 and 51). These remains appeared to include portions of outriggers that would have supported the guards. The next step in excavation therefore was to move slightly forward of the completed excavations and begin excavation of a long corridor to starboard. For control purposes, these excavation units encompassed a slightly smaller area. Although the fore-and-aft dimension was retained at 3 ft (0.914 m), mirroring and taking advantage of the interval between deck beams, the side-to-side dimension was reduced to 2 ft (0.6 m).

The first unit in this starboard corridor was FS 49. The port side of the unit lay slightly starboard of the vessel's centerline, as seen in Figure 47, and the unit was placed just forward of FS 37 and FS 42. FS 49 excavations uncovered the main deck in this area and revealed larger quantities of nails than previously seen in such a confined area. Nine fragments of cut nails were recovered, along 13 with additional iron objects that defied identification, a probable bale seal, 4 horse teeth, and 6 other horse bones. Immediately starboard of FS 49, FS 50 continued the exposure of the deck and yielded another horse tooth and additional nail fragments. Nails and unidentifiable iron conglomerates were common in the ensuing excavations, and in the following text they will not be discussed further; they are itemized in the artifact inventory, Appendix III. FS 51 continued excavations immediately aft of FS 50, exposing a horse tooth and 19 fragments of horse cranium. Some of the unidentifiable iron objects (9) recovered from this portion of the deck probably were iron straps.

FS 52 and FS 53 were located adjacent to and starboard if FS 51 and FS 50, respectively. FS 52 revealed more probable strap fragments and 7 horse cranial fragments, while FS 53 included the ubiquitous metal, as well as 4 sherds of window glass. A flattened wrought iron strap also cut diagonally across FS 53, and this was part of guard chain that extended to starboard for some distance, as depicted on the deck plans.

FS 54 and FS55 were located starboard of FS 52 and FS 53. As the dredge was moved to starboard in these units, it became apparent the that deck beams in this area were broken and that the deck planking had been removed either by deterioration, current, or some other mechanism. As a result, excavation penetrated only a small distance into the sediment that filled the hull; it did, however, uncover the deck beams so that they could be recorded. No faunal remains were recovered in these two units, which yielded only the usual nail and iron fragments, along with one sherd of window glass in FS 54. Starboard of the break in the deck beams, these structural elements angled downward. At some point in the past, it appears that sediments supporting the guard and the outer extremity of the hull to starboard were washed away. Deprived of adequate support, the structure to starboard shifted downward, resulting in the fracture of the deck beams. It is likely that the frames and hull structure beneath this area are similarly broken.

Starboard of FS 54 and FS 55, respectively, were FS 56 and FS 57. In FS 56, a bone button was excavated, as well as a cast iron lid for a kettle or dutch oven. More guard chain was uncovered in FS 57. This guard chain also was encountered in FS 59, which was located starboard of FS 56. The dredging in FS 59 also resulted in the discovery of a kettle, the mate of the lid found

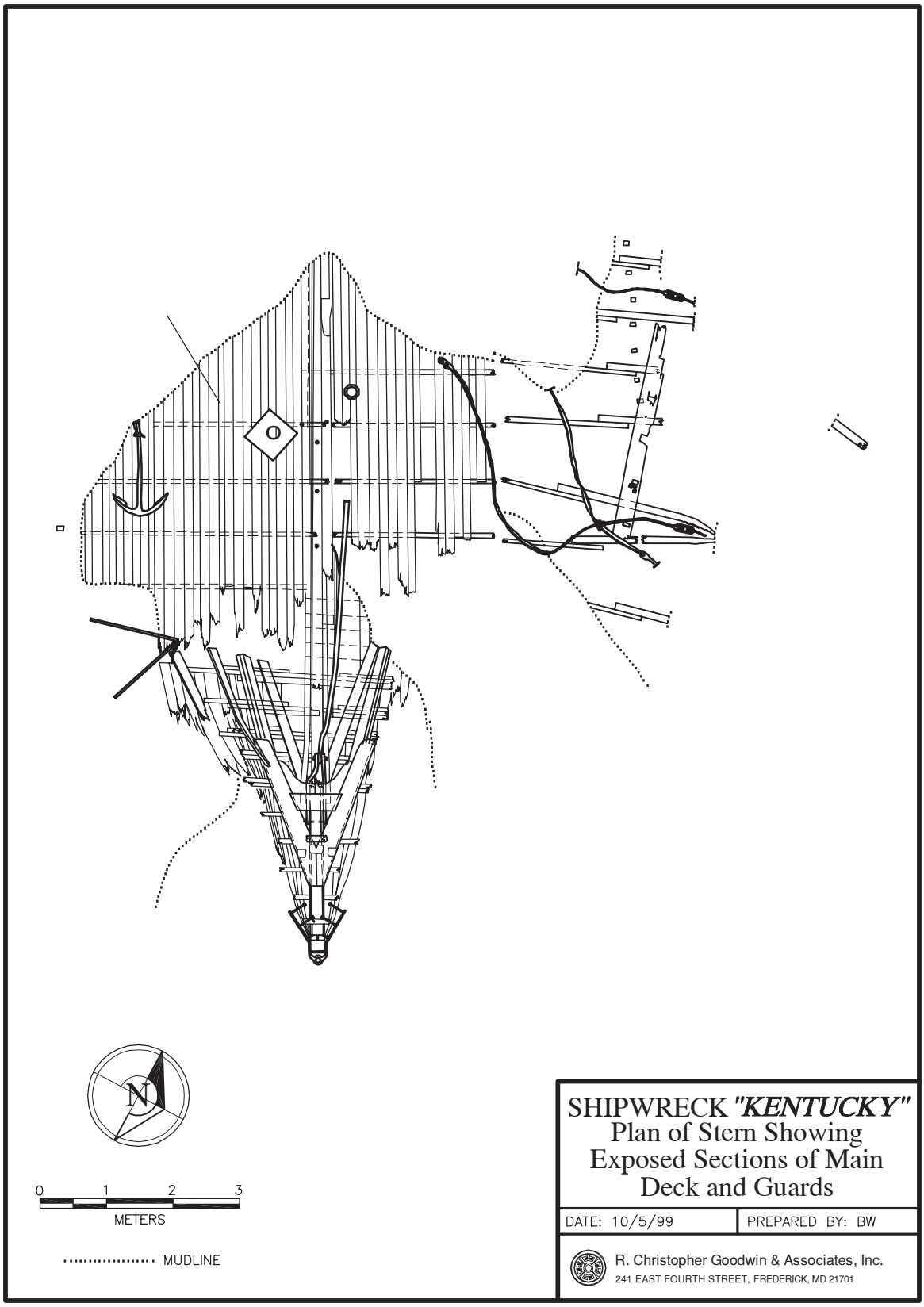


Figure 51 Stern, exposed sections of main deck, and guards

to port, and a mandible from an opossum (*Didelphis virgina*). FS 58, located forward of FS 59, held only the usual iron fragments and nails. The kettle and lid found in FS 55 and FS 57 were recorded in situ prior to their removal and drawn on the site plan with careful attention to orientation and other details. This procedure also was followed for additional cookware that came to light as the project continued.

Two final units were excavated in this corridor. Immediately to starboard of FS 59, FS 60 was excavated, with FS 61 located to starboard of FS 60. In FS 60, the deck beam terminated. Another beam, the inboard end of an outrigger, was sistered to the forward face of the deck beam and fastened with three large nails driven through both beams from the forward face and clenched on the other side. The outrigger continued to starboard in FS 61. FS 60 and FS 61 also uncovered an 11.25 in (28.5 cm) wide structural timber that appeared to run roughly fore-and-aft. This piece, cut by several mortises 2 in (5.0 cm) (fore-and-aft) by 4.15 in (10.75 cm) let into it, was presumed to be a waterway and would have marked the starboard limit of the *Kentucky*'s hull in this area. Beneath the probable waterway on the outboard side were three planks, each measuring 4 in (10.15 cm) thick, that were bolted together to form a face of 12 in (30.4 cm); the width, or moulded dimension, of these timbers could not be determined. Artifacts retrieved from the dredging of FS 60 included iron fastener fragments, 30 kettle fragments, and an iron cauldron. Another cast iron kettle was recovered in FS 61, lying on top of the waterway and outrigger. Samples of tarred felt, used to cover the upper surfaces of the deck, also were collected in FS 61. After the complete excavation of this block of units, the dredge was used to clean up accumulated sediments so that the underlying expanse of deck could be recorded. During this clean-up across FS 53-61, a single cut nail and 2 unidentifiable pieces of metal were recovered (FS 63).

The discovery of both outriggers and a possible waterway prompted additional excavations in this vicinity. The presumed waterway clearly ran aft, as did both sections of the guard chain encountered earlier, so the initial focus was to expand excavations aft along the edge of the hull. A block of six units was laid out so that they would straddle the waterway, hopefully uncovering features on either side. These six units also measured 2 ft (0.6 m) by 3 ft (0.914 m), but the short dimension ran fore-and-aft in these units Figure 47.

FS 64 abutted the after edges of both FS 56 and FS 59, and excavation revealed another sistered joint between a deck beam and outrigger. No artifacts were encountered. FS 67 was placed immediately aft of FS 64, revealing yet another deck beam-outrigger joint. Samples of tongue-and-grooved deck planking were retrieved from this unit. Each unit had a different section of guard chain running through it.

Moving to starboard, FS 65 and FS 68 adjoined FS 64 and FS 67, respectively. Excavation of both units exposed more of the presumed waterway, with two additional mortises let into the timber at a spacing of 2.5 ft (73.66 cm). In FS 65, a cluster of three square nuts were concreted to the waterway immediately aft of a mortise. The function of these nuts is unknown, but it is almost certain that they fell onto this timber and that corrosion locked them in place; they were not set into the waterway, nor were they attached to bolts coming up through the waterway. The nuts later were collected and designated FS 106. Two lengths of guard chain ran through FS 68, and the outrigger in this unit was broken just outboard of the waterway. From this break, it ran downward into the mud at an angle of approximately 45°. The after end of the waterway was broken where it crossed the outrigger in FS 68. Although no artifacts were recovered from FS 68, FS 65 produced one piece of white ironstone and the usual iron fragments. Four sections of guard chain were removed from this unit and retained as samples.

Outboard of FS 65 and FS 68, respectively, were FS 66 and FS 69. In the sediments of FS 66, a briar wood pipe bowl was recovered, along with a piece of leather that resembled part of a wallet or kit. Segments of barbed wire were encountered in FS 69 (much barbed wire, similarly dated to the post-1870 period, was encountered around the wreck during the 1995 investigation).

Two additional units were excavated slightly aft of and over-lapping this six-unit block to determine whether additional sections of the waterway could be found aft of the broken end recorded in FS 68. FS 70 was a 3 ft (0.914 m) square unit placed just inboard of the projected line of the waterway, while FS 71 adjoined it outboard of the waterway. Tongue-and-groove deck planking samples were recovered from FS 70, along with samples of deck tar and an iron nut. No artifacts were recovered from FS 71. These two units failed to uncover any evidence of the waterway, and excavations in this area were terminated.

The next goal of excavations on the starboard side of the main deck was to trace the presumed waterway forward. A particular objective was to seek evidence of any hull remains or framing that might be associated with this structural feature; if its identification as a waterway was correct, it would have been seated on top of the hull's top timbers. No evidence of these framing elements had been discovered in the previously described excavations. These new excavations were comprised of 8 excavation units, each measuring 2 ft (0.6 m) from side-to-side (athwartship) by 3 ft (0.914 m) fore-and-aft Figure 47.

Four of these units were excavated on top of and inboard of the waterway. The first of these (farthest aft), FS 72, uncovered more of the waterway and another sistered deck beam and outrigger combination. More significantly, the upper end of a top timber was exposed and recorded. Although somewhat degraded, the timber's dimensions were compatible with those of the mortises recorded along the waterway, roughly 2 in (5 cm) sided by 4.25 in (10.75 cm) moulded. A clasp knife with a copper band and bone handle was recovered from this unit, as well a probable wire bail (handle) from a kettle. Deck tar and nail fragments also were found. Immediately forward of this unit, FS 76 also was located just inboard of the waterway; excavation here revealed another deck beam and outrigger, as well as the top of another frame. A guard chain also ran through this unit, but no artifacts were recovered. Continuing along the same line forward, FS 78 revealed another frame top, deck beam, and outrigger. The only artifacts from this area were a carbonized cut nail and unidentifiable metal fragments. Forward of this unit, FS 80 revealed no structural features and the only item recovered was a fragment of a wood dowel.

With the completion of FS 80, excavators faced a 4.5 ft (1.4 m) high wall of sediment that precluded any further excavation forward. Instead, excavations moved outboard. FS 73 was located adjoining FS 72 on the outboard side of the waterway. This excavation revealed the other half of the waterway, but no other structural elements or artifacts. FS 77 was excavated immediately forward of FS 73 (outboard of FS 76), disclosing a continuation of the outrigger encountered in FS 76, as well as the guard chain. The chain included a turnbuckle used to adjust the tension in the chain. No artifacts were found. FS 79, forward of FS 77, revealed no structural evidence and contained only two artifacts, a wood sample and a knife handle (composite of wood, iron, and cuprous metal).

The last excavation unit dredged in this block was located outboard of FS 73. This unit, FS 74 encountered nothing but sediment. Dredging was continued forward of this unit for a distance of 4 ft (1.2 m), but as no structural remains or artifacts were encountered, no FS numbers were assigned to this area. Although reconnaissance by divers farther to port revealed at least one more portion of an outrigger, as depicted on the deck plans, remains in this area appeared too fragmentary to warrant the amount of time necessary for systematic excavation. It is highly

unlikely that much remains of the guard in these areas closest to the stern, as it experienced the brunt of the impact from the river's current in recent years.

Clean-up Excavations on the Main Deck. The excavations described above resulted in a sufficient cross-sectional exposure of the main deck for recording purposes. Given the revised strategy for burying the wreckage in situ, this meant that the primary goal of excavation had been attained. In several areas on the main deck, however, divers had encountered features of sufficient interest to warrant additional exposure and cleaning for recording purposes. The edge of an oddly shaped wood feature, for example, was noticed protruding from the port side of the FS 49 excavation. A small area 2 ft (0.61 m) square (FS 83) was excavated around this feature, during which 4 nail fragments were recovered along with unidentifiable metal. This excavation revealed an octagonally-shaped bilge pump assembly, the top of which was recorded in situ. Just forward of the bilge pump, emerging from the mud line, divers also observed a timber that seemed to extend upward from beneath the main deck, rising at an angle toward the stern of the boat. This was cleared for recording through the excavation of a 4 ft (1.22 m) square into the mud bank. This clearing operation, designated FS 94, permitted recording of the timber, which was a hogging-chain brace. Set at an angle of approximately 58° from the plane of the keel, the visible portions of the timber (somewhat degraded) measured approximately 7.25 in (18.5 cm) moulded and 6 in (15.25 cm) sided. The brace served as a support for the boat's main hogging-chain and transferred some of the stresses from the lifted stern of the vessel down onto a more buoyant portion of the hull, as discussed in Chapters IV and IX. On the deck near the hogging-chain brace, also in FS 94, lay yet another cast iron kettle and a tea kettle (as well as 2 cut nails).

Partially overlapping the previously excavated FS 36 and FS 39, a much larger unit, designated FS 34, was excavated. Measuring 4 ft (1.22 m) square, this area revealed additional decking and artifacts that included 2 percussion caps, a wood button, a glass button, a clenched wrought nail, a spike, 2 cut nail fragments, and a horse bone (pisiform). Extending partially into the unit was a piece of flat plate or sheet iron that was later retrieved as FS 110, probably a fitting from a stove. In an extremely advanced stage of degradation, this piece did not survive, but it was completely recorded and drawn before being removed. Prior to removal of FS 110, the dredge was used to clean up sediments lying over its forward side and corner. Designated FS 97, the effluent from this operation included a bone button and a pipe bowl made of ball clay.

On the port side of the deck, a large area was cleared up against the mud bank and designated FS 82. This area measured 5 ft (1.52 m) square, and excavation here uncovered an iron-stocked stream anchor lying where it had originally been stowed on the deck. Next to the anchor was a pin and ring. This probably was a through-deck fitting, the ring providing a tie-down point for the anchor. In addition to the anchor, which is more fully described in the following chapter, a larger assemblage of artifacts was recovered than usual. This included large amounts of window glass (63 sherds), 3 fragments of glass from a lamp, 2 sherds of clear bottle glass, a sherd of dark green bottle glass, 5 cut nail fragments, 6 fragments of tar paper, a glass clothing button, a brass U.S. Army button, a cast iron skillet or spider, a cast iron kettle, and part of a curry comb for a horse. Eight horse bones also were recovered here, primarily from the hoof, as well as a small piece of worked bone.

Other areas of minor clean-up included the dredging of a small area on the stern portion of the main deck, in the area previously excavated as FS 32. Artifacts recovered during this cleaning were labeled as FS 90 and included a single sherd of window glass and 4 small iron concretions that were unidentifiable. The previously excavated FS 41 was cleaned in a similar fashion, with artifacts designated as FS 107. Recovered objects included 6 spikes, 16 nails of various types, and 11 nail fragments. All of these materials in FS 90 and FS 107 may be interpreted as coming from a

secondary context, as they were deposited in this area after the completion of initial excavations earlier in the project.

Similar clean-up was done beneath the main deck prior to the recording of deck angles with a goniometer, in the area of FS 85 and FS 93. Material recovered in this operation, designated FS 108, had slumped in from the hold deposits farther forward and possibly from the main deck. This material, obviously located in a secondary context, included 2 sherds of window glass, and iron nut measuring 2.25 in (5.7 cm) square by 1 in (2.5 cm) thick, 9 nails of various sizes, nail fragments, coal, and wood.

Beneath the keelson, between frames F7 and F8, a sample of bulkhead planking (FS 91) was found and retained during a cleaning excavation prior to recording. A final area from which artifacts were retrieved during cleaning lay just inboard of the sternpost. FS 109 contained 2 small sherds of amethyst colored bottle glass and various wood fragments.

Excavation Outside the Hull. Although most excavation on the *Kentucky* took place in the hold or on the main deck, some excavation was undertaken in other areas for specific purposes. Most of these excavations involved the removal of sediment along the mud bank to prevent slumping into work areas. The bulk of this dredging produced no artifacts. An exception occurred during removal of sediments on the port side of the stern that constantly threatened to fill in previously excavated areas in the hold. Between Frames F3 and F4, an area extending from the hull approximately 2.8 ft (85 cm) outboard (to the port side) was excavated until the top of the sediment was below the level of preserved hull planking, thus preventing slumping into the interior of the hold. Designated FS 95, this excavation revealed the last cast iron kettle found in 1997. Excavation was continued along the port side between frames F5 and F7; designated FS 98, it contained a rodent-gnawed hyoid bone from a horse, along with a spike, 8 cut nails, 6 nail fragments, wood fragments, and charcoal.

Removal of Selected Structural Elements and Hardware

In some areas, selected structural features and large pieces of the *Kentucky*'s hardware or equipment were removed for more detailed recording and conservation on land. The first element to removed was the stern hook assembly, designated FS 104. Removal of this piece was essential, in that it revealed additional structural details of the hull that were hidden beneath it. In addition, it will provide a tangible element of the wreck for use in later public displays. The stern hook was removed in one piece and brought to the surface using lift bags. It was then maneuvered to the river bank and carefully slid onto a plywood sheet. The entire assembly was stored in an aqueous solution and later packaged for transport to the laboratory.

Another structural portion of the *Kentucky* that was removed for additional recording and later display was the bilge pump. The round shaft of the pump was inserted through a hole in the main deck, its bottom resting in a sediment-filled portion of the bilge. It was easily removed with the aid of a lift bag, brought to the surface, and stored for transport to the lab and conservation. The pump was designated FS 99 and is described more fully in subsequent chapters.

Near the bilge pump on the port side of the main deck lay the stream anchor. As noted previously, the anchor apparently was attached to an iron ring affixed to the deck. Once excavation of this area was completed and the anchor's position was recorded, it was raised using lift bags and brought to the surface for retention and conservation. This lifting operation was the most difficult

of the project because of the great weight of the anchor, but it was achieved without damage to the object or the surrounding vessel structure.

Several pieces of deck equipment or other structural pieces located outside the hull also were removed. The first of these was the upper gudgeon, which had been brought to the surface during the 1995 investigation, recorded, and then replaced on the bottom next to the sternpost (outside the hull). This was retrieved and labeled FS 102. While freeing the gudgeon with the dredge, effluent was screened as a precaution, and an interesting assortment of arms-related artifacts were discovered. These included 9 cast balls of approximately .32 caliber (5/16 of an in), 2 slightly smaller shot (.32 cal.) 46 percussion caps and another 31fragments of caps, and a leather pouch fragment, possibly part of a cap pouch. These materials are more fully discussed in Chapter X. Just forward of the sternpost, on the starboard side, another isolated find was made, FS 75, a small bone knife handle.

Farther forward outside the starboard side of the hull an iron mast or yard hoop was located and retrieved as FS 103. Associated with this object were 7 spikes and 8 cut nails, all recovered from dredge effluent while the hoop was being freed from the sediment. These materials were retrieved from a circular area some 3 ft (91.5 cm) in diameter, located only 20 in (51 cm) away from the hull. Even farther to starboard, approximately 3.28 (1 m) away from frame F6, portions of a capstan were found. These included the capstan rim (FS 100) and capstan spindle (FS 101). Both items were removed for retention and conservation.

Site Stabilization

Excavation and recording of the *Kentucky* was completed on September 25, 1997, and artifacts, samples, and field records were packed for transport to R. Christopher Goodwin's Frederick, Maryland, office. The bulk of the field crew departed the site at the end of September, but a supervisory archeologist was left on site to monitor backfilling at 16BO358. Backfilling was accomplished by USACE personnel in early October, using clean sand dredged from the channel of the Red River outside of the sheet piling enclosure. Exceptional care was taken to avoid stress on the exposed hull remains and to avoid disturbance, particularly during the initial stages of backfilling.

Backfilling was completed up to the top of the sheet piling, above the water level, without any noticeable disturbance to the *Kentucky*'s remains. Dredged material also was deposited on land, along the bank that sloped down toward the site, serving as a buffer against impact during the later installation of the revetment planned for this area. Revetment construction was completed some months later according to the revised construction plans, preserving the remains of the *Kentucky* beneath a stable cap of dredged sand and rock.

CHAPTER IX

THE CONSTRUCTION OF THE *KENTUCKY* BASED ON THE FIELD INVESTIGATIONS OF 1995 AND 1997

Introduction

The dearth of information available on the finer points of antebellum steamboat design relating to the form, lines, and construction of the hull, especially at the bow and stern, appears to be a consequence of the common practice of the day among shipbuilders to work without any plans or drawings (Hunter 1993:88; Robinson 1999:6-10). According to western steamboat historian Louis C. Hunter, this situation has been exacerbated by the fact that, "unlike the sailing and steam marine, western steamboats gave rise to almost no technical literature," and, "left behind no collections of hull models, very few prints, and even fewer scale drawings, while their structural evolution was virtually completed when the photographic record began" (Hunter 1993:66). Current knowledge of hull design has been confined to the passing observations that appeared in contemporary newspapers, and the very basic information noted in vessel enrollments. However, the incompleteness of the historic record highlights the comparative wealth of information that is available through the archeological study of *Kentucky*'s remains. It is the unique research potential of *Kentucky*'s wreck site that makes its discovery so significant. Consequently, one of the principal research objectives of the archeological field work conducted at the wreck site of *Kentucky* was to record in as much detail as possible the previously undocumented design and construction of a middle nineteenth century Mississippi River sidewheel steamboat. In this chapter, the materials, dimensions, and assembly of *Kentucky's* excavated hull remains, as they were recorded under water during the 1995 and 1997 archeological field investigations, are presented. Because the parameters of the 1997 Phase III Mitigation Plan for the *Kentucky* site restricted excavation of the hull to an area encompassing approximately 30 ft (9.14 m) of *Kentucky*'s stern, most of the steamer's hull (located forward of this point) was not excavated or accessible for documentation, and, therefore, is not described below.

During the course of the archeological research conducted at the *Kentucky* site, thousands of measurements were taken underwater in near zero visibility conditions, and dozens of field drawings of hull elements and artifacts were produced. Additionally, numerous wood samples were collected to determine the species of the timbers that were used in *Kentucky*'s construction. Although the extremely poor underwater visibility at the wreck site precluded underwater photography, several select elements of *Kentucky*'s hull that were recovered for documentation were photographed at the surface. All of these data served as the bases for the site plan, reconstructed lines, and construction plans that appear in Figures 48, 49, 52, 53, 54, and 55 that are referenced throughout this chapter. The descriptions of individual hull components that follow are presented in approximately the same sequence as they were assembled during *Kentucky*'s original

construction. *Kentucky*'s hull contained many elements that were unique to western steamboat construction. However, without a complete contemporary lexicon of western steamboat hull construction terminology, some of *Kentucky*'s timbers were difficult to identify by name. Therefore, it was necessary to derive some terms for *Kentucky*'s hull members from modern sources, such as Hunter (1993), Bates (1968), and Petsche (1974). Although every effort has been made to the present this information to the reader in as clear and concise a manner as possible, because of the complexity of many of the structures and the technical nature of these descriptions, the reader is encouraged to refer frequently to the above-referenced illustrations and plans. For convenience, a separate plan is provided on which the major structural components are labeled (Figure 52).

Species Analyses and Identification of Wood Specimens Recovered from *Kentucky*'s Hull

A total of 69 wood specimens were recovered from *Kentucky* during the 1997 field investigations. Analyses of these specimens revealed that *Kentucky*'s hull was constructed primarily of wood comprising the white oak (*Leucobalanus*) group. Exceptions were samples removed from the decking, a bilge-pump tube, the aftermost hog-chain brace, and a ceiling plank, all of which were fabricated from wood of the yellow or hard pine group (*Pinus spp*.). Additional hull members constructed of wood types other than oak included a second hog-chain brace that was fashioned from maple (*Acer spp*.) and a hull plug that was carved from spruce (*Picea spp*.). White oak was the premier wood selected by nineteenth century American shipbuilders, principally because of its superior durability, strength, resistance to rot, and versatility. Because of its growth pattern, every structural member (i.e., keel, frames, beams, planking, knees, etc.) of a ship could be manufactured from white oak. Perhaps even more importantly, its widespread availability throughout the eastern United States, including northern Ohio and other states bordering the Mississippi River, made it an economical choice for *Kentucky*'s builders in Cincinnati, Ohio. Ranking second only to white oak in its use as a shipbuilding wood was yellow pine. A common species in the southeastern United States, yellow pine was highly valued for its straight and inconspicuous grain, durability, hardness, and superior resistance to rot. Yellow pine was the wood-of-choice in shipbuilding for creating planking, knees, beams, and some of the larger hull components. Unlike white oak, however, yellow pine rarely was used to fabricate keels, stems, or sternposts (Crothers 1997:25). Hard maple is a dense, strong wood that is shaped easily with tools. Abundant from the Atlantic coast to the Mississippi River and from the Ohio River north to the Great Lakes, its use in shipbuilding was generally limited to heavier structural members, such as the keel. Spruce was not used in shipbuilding as a rule. Thus, its presence in *Kentucky*'s hull indicates that the plug may have been used to make an emergency repair. Complete results from the analyses of the wood samples recovered from *Kentucky* are presented in Chapter XI of this report.

Fasteners

Documented fastenings employed in the joinery of *Kentucky*'s hull components consisted of iron nails, spikes, and bolts. The dimensions of these different fasteners and their relationship to individual hull components were recorded to the greatest extent possible, but poor underwater visibility on the wreck site and project time constraints prevented a more detailed in situ examination of *Kentucky*'s hull fastenings. Fortunately, several different sizes and types of hull fasteners that were found inside the hull attached to loose timbers were recovered during

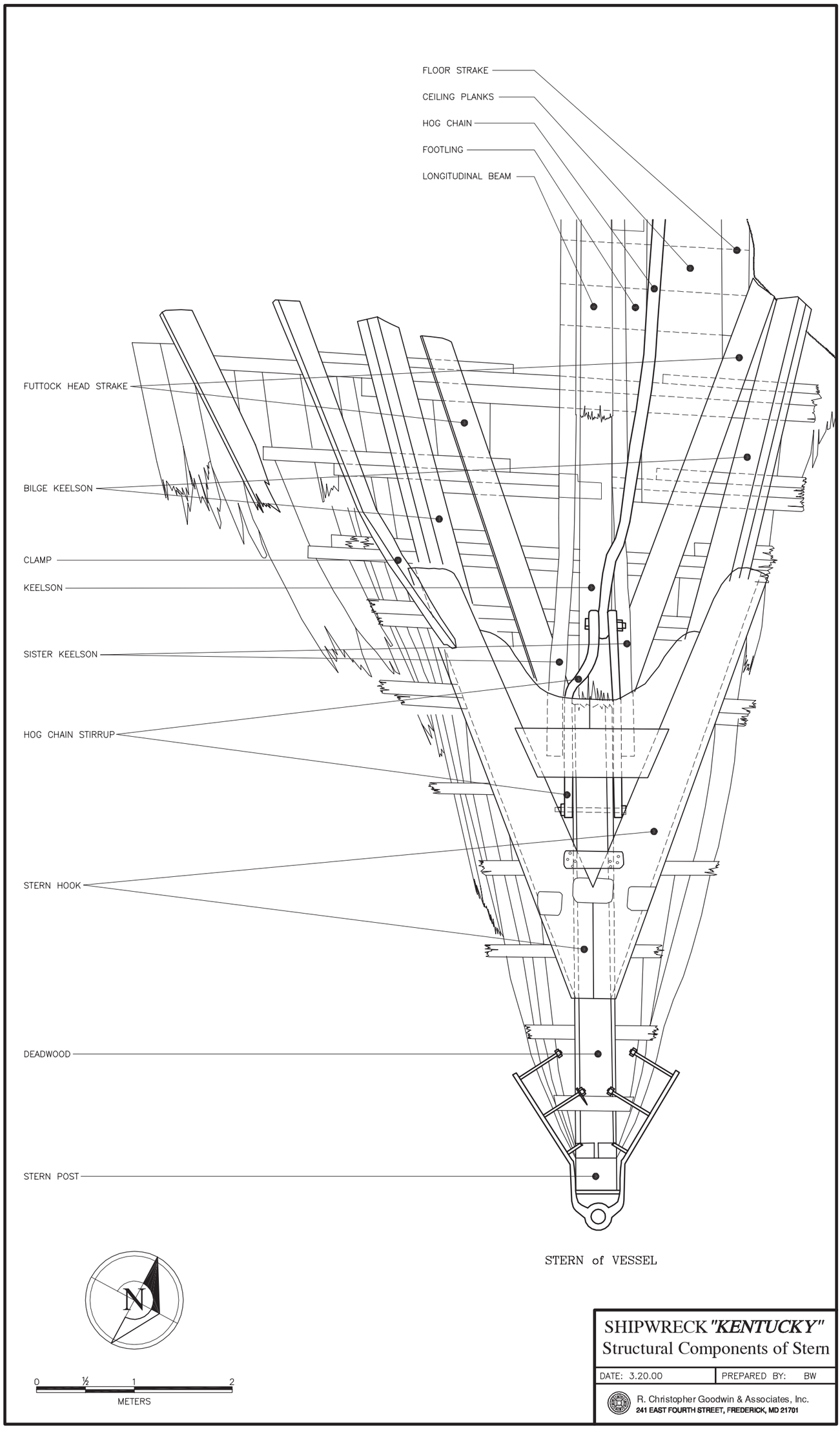


Figure 52 Plan showing structural components referred to in the text

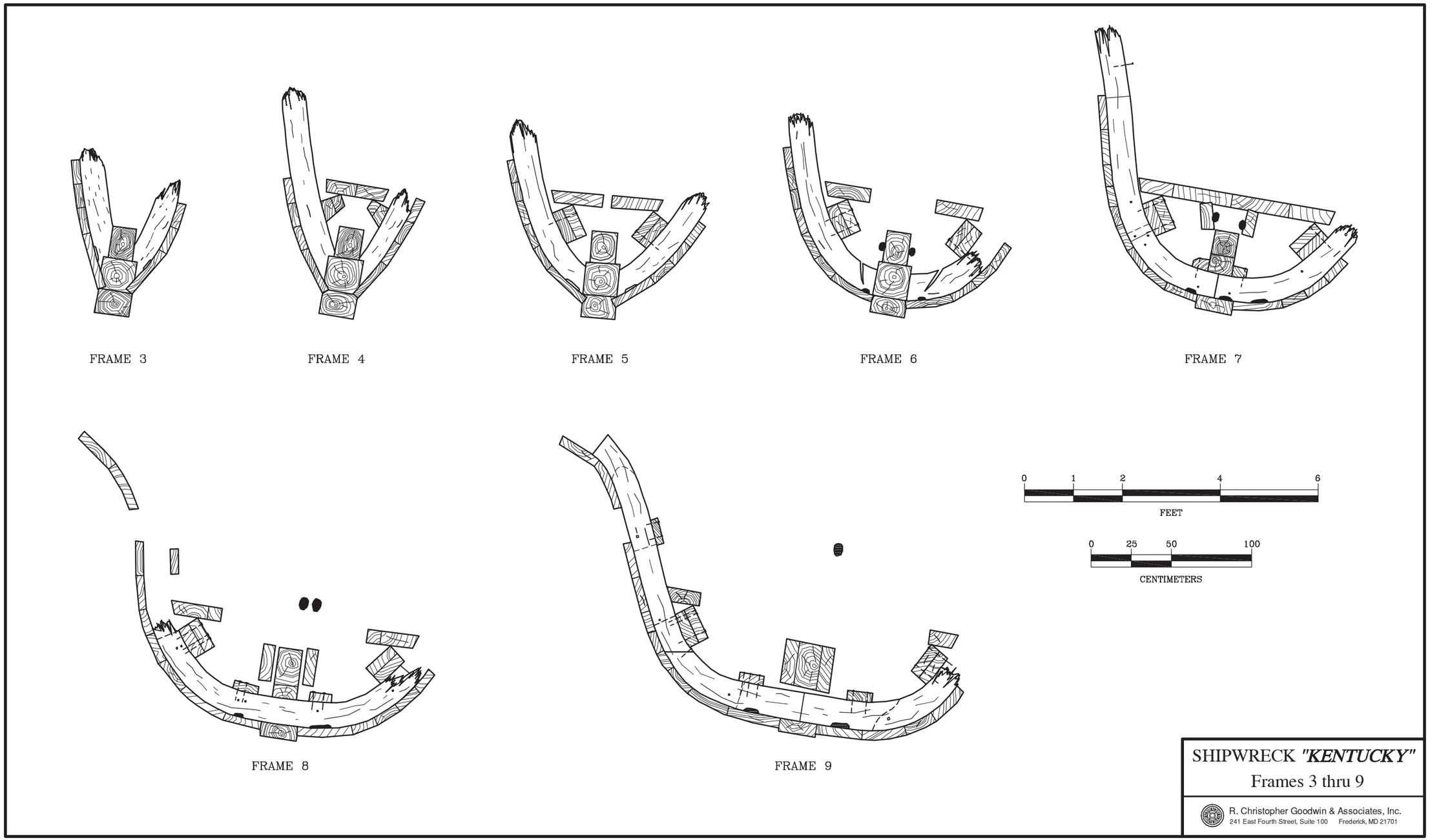


Figure 53 Cross-sectional views of *Kentucky's* hull at frames 3 – 9 (See Figure 46 for location of individual frames)

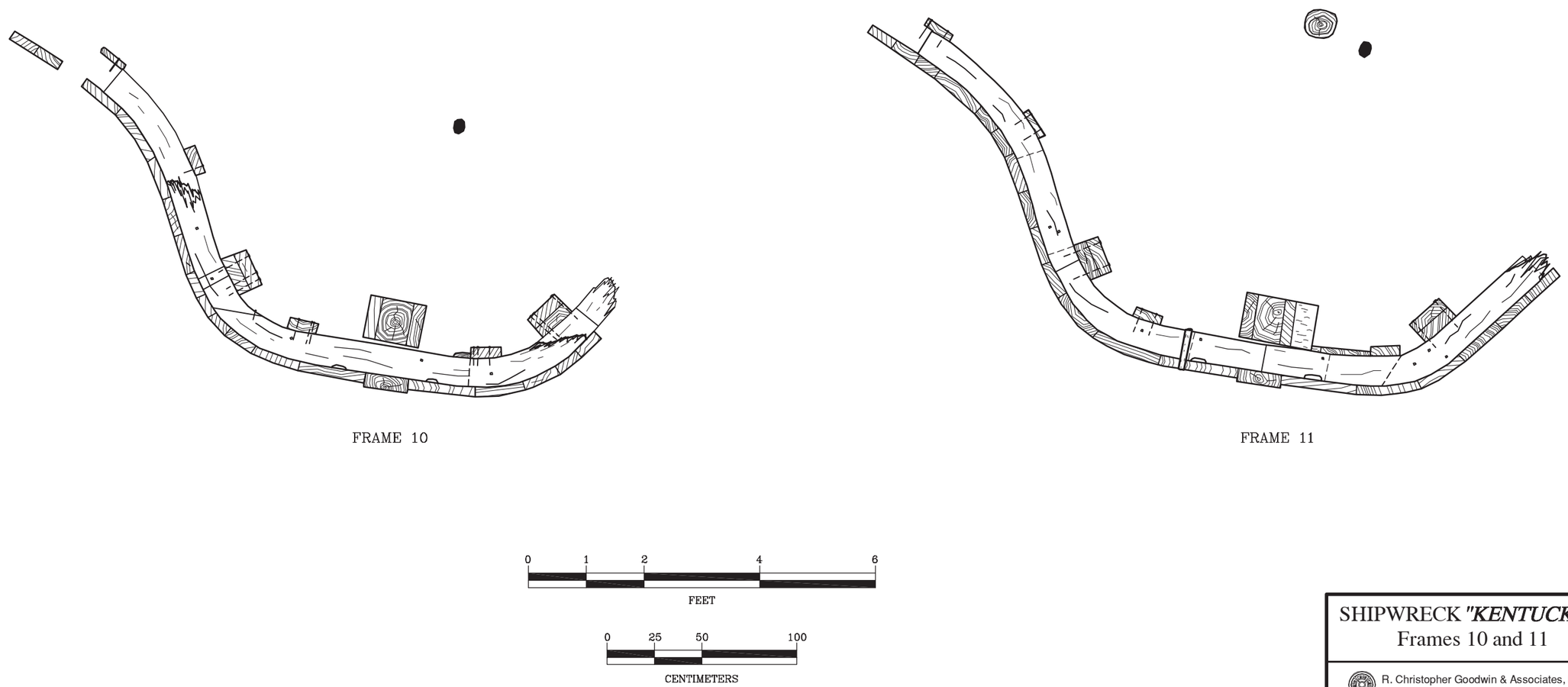


Figure 54 Cross-sectional views of *Kentucky's* hull at frames 10 and 11 (See Figure 46 for location of individual frames)

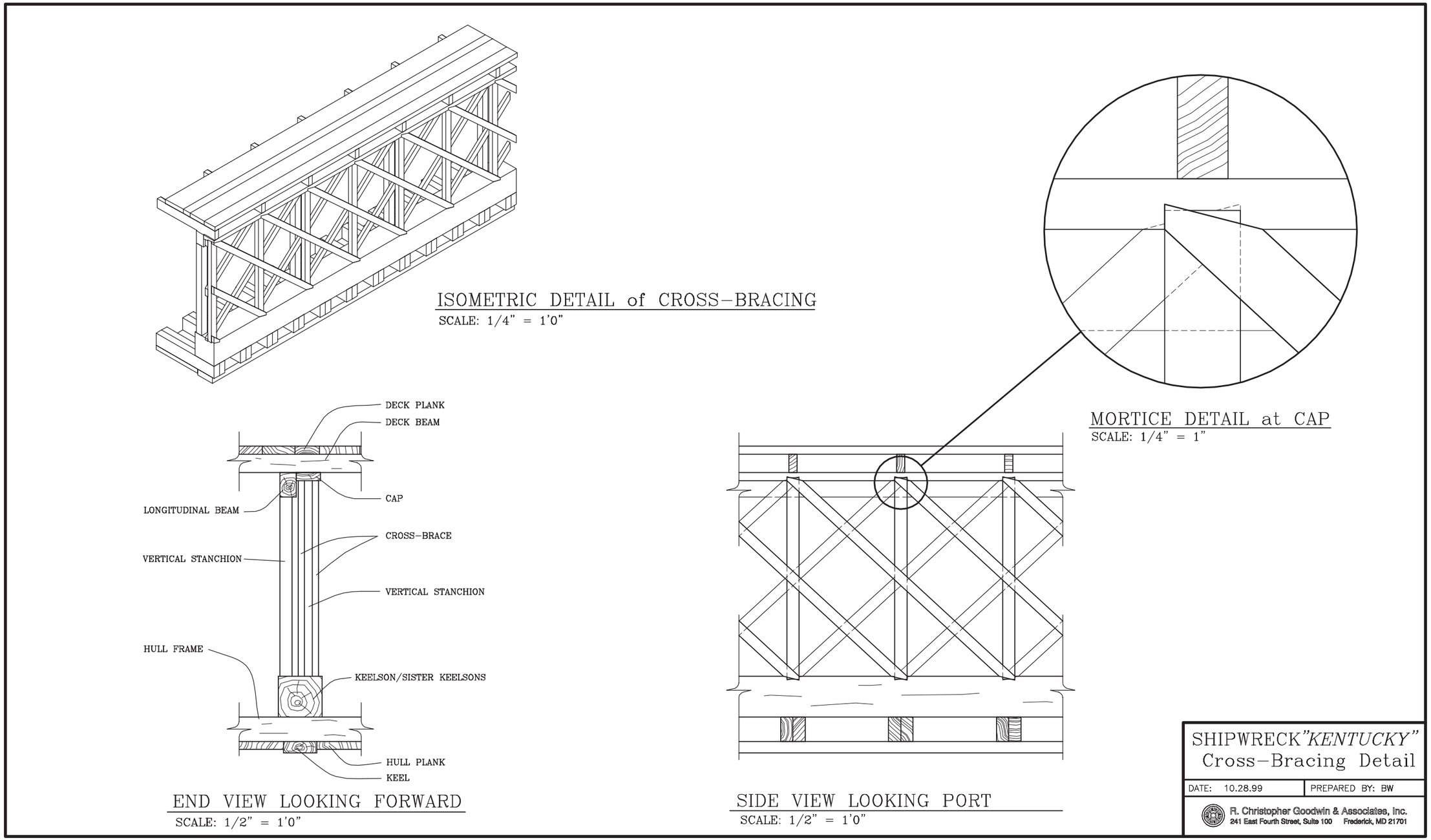


Figure 55 Details of longitudinal cross bracing

excavation for careful study and documentation. From this examination, it was revealed that trim, interior bulkheads, partitions, and other lightly-constructed joinery elements comprising *Kentucky*'s upper works were fastened with 2 – 4 (5.08 - 10.16 cm) long x 1/8 in (0.317 cm) square-shanked cut nails. Hull planking was secured to frames with iron spikes measuring 5.5 in (14.0 cm) in length and ¼ in (0.63 cm) square in section. Larger timbers that formed the underlying framework of *Kentucky*'s hull were spiked and bolted together. Bolts that were documented measured from 10.5 in – 13.5 in (26.7 - 34.3 cm) long and 3/8 – ½ in (.95 – 1.27 cm) in section, and were fitted with 1.5 in (3.8 cm) diameter clinch rings to distribute the compressive loading under their peened heads. Detailed descriptive information pertaining to individual examples of *Kentucky*'s fasteners are included in the Artifact Inventory presented in Appendix III and in Chapter X of this report.

The Keel

The backbone of *Kentucky*'s hull design comprised three structural elements: keel, stem, and sternpost. These elements were the first of *Kentucky*'s hull components to be assembled on the stocks and they defined the vessel's overall length between perpendiculars. The dimensions and forms of these members were determined by economic concerns, the specific construction requirements of the vessel, the prevailing environmental conditions in the vessel's planned area of operation, availability of materials, and the builder's working knowledge of shipbuilding theory and techniques.

Kentucky's upright orientation on the river bed and minimal deadrise, as well as the immovable hull timbers, debris, and loose sand in and around the hull made it difficult to gain access to the keel and record details of its shape, construction, and dimensions. However, measurements were obtained in nine different locations where it was possible to excavate and expose the keel (i.e., at frames F7, F8, F9, F10, and F11 inside the hull, directly below the sternpost, and at frames F3, F5, and F7 on the hull's exterior). These measurements indicated that the keel had a maximum horizontal width, or sided dimension, of 9 in (22.86 cm) and tapered in its vertical height, or moulded dimension, from a maximum of 6 in (15.24 cm) at the sternpost to 3 in (7.62 cm) at frame F7. On the outside of the hull, *Kentucky*'s keel extended just 1 in (2.54 cm) below the bottom of the hull planking.

The relatively diminutive moulded height of *Kentucky*'s keel was characteristic of boats operating on the shoal waters of the western rivers and it differed greatly in size and function from the much deeper and more robust keels of oceanic sailing vessels and the earliest western river steamboats. In contrast, the keels of ocean-going vessels, which sometimes projected as much as 2 ft (0.61 m) below the hull, provided the hull with increased longitudinal stiffness and countered its "rolling" (i.e., the side-to-side rocking motion of a ship) and "leeway" (i.e., the lateral slippage of the hull across the water resulting from cross-winds). A deep keel of this type would have been ill-suited for the vessels that operated on the shallow, relatively protected waters of the western rivers. In fact, the increased lateral resistance resulting from a deep keel would have greatly impeded a western river steamboat's maneuverability by reducing its capability to slide sideways and turn rapidly, thus, making it difficult or impossible to successfully navigate the tortuous twists and turns that characterized most western rivers. Although *Kentucky*'s keel served as the vessel's backbone in theory, the lightness of its dimensions prevented it from contributing very much girder strength to the hull. Consequently, additional support structures (i.e., the keelson assembly, floor strakes, bilge keelsons, futtock head strakes, multiple clamp timbers, longitudinal cross-bracing within the hull, and fore-and-aft hogging chains) were all employed in *Kentucky*'s hull to provide it with the requisite amount of longitudinal stiffness.

The Sternpost

Attached to the upper surface of the after end of *Kentucky*'s keel was the sternpost. The sternpost consisted of a single, vertically-oriented timber and several related pieces of iron hardware. While the sternpost's lower half was found to be in excellent condition, its upper half was deteriorated and exhibited signs of erosion and repeated exposure to air. Despite this damage, *Kentucky*'s sternpost was preserved over most of its estimated full original length, and measured 5 ft (1.52 m) long with a maximum sided dimension of 9 in (22.86 cm) and a maximum moulded dimension of 7.5 in (19.1 cm). Upright and securely fastened in its original position to the top of the keel, the sternpost was held in place with a single bolt and two iron "fishplates." The single bolt that connected the keel and sternpost was driven up through the bottom of the keel and into the base of the sternpost. This rather weak connection was reinforced by two, ½ in (1.27 cm) thick x 3 in (7.62 cm) wide x 15.5 in (39.4 cm) long iron "fishplates" that spanned the joint between the keel and the sternpost on either side of the hull. The fishplates were held in place with two iron through-bolts. In addition to the fishplates, other hardware found on the sternpost consisted of two iron hinge-like components, or gudgeons, that were attached to the after face of the sternpost, 14 in (35.36 cm) and 5 ft (1.52 m) above its base. Each of the gudgeons was secured to the hull with seven fasteners. These fasteners included a single bolt that passed through the sternpost, a pair of spikes fastened into F1 (i.e., the first frame forward of the sternpost), and two pairs of threaded bolts that were secured through frames F2 and F3 (i.e., the second and third frames forward of the sternpost). These two gudgeons served as the support points for *Kentucky*'s rudder. Iron pintles fastened onto the rudder's forward edge would have fitted into and pivoted within the sockets formed by the gudgeons to create the hinged connection between the hull and rudder. The upper gudgeon was removed from its original point of attachment at the top of the sternpost during the Phase II field investigations to prevent it from being dislodged accidentally and falling onto and injuring a project diver. The same gudgeon was later recovered from the wreck during the Phase III field work for documentation, conservation, and curation (see Appendix III).

The Framing

While *Kentucky*'s keel, stem, and sternpost formed the backbone of its hull and defined the length and form of its ends, the breadth and cross-sectional shape of the hull was determined by *Kentucky*'s ribs or frames. In the normal sequence of a ship's construction, the framing of a vessel followed the erection of the stem and sternpost onto the keel. Typically, three types of frames were employed in wooden ship construction: square frames, half frames, and cant frames. Square frames were those that crossed the keel and completely spanned the breadth of the hull as a complete unit forward and aft of the midships frame. Frames of this type were referred to as "square," because they were set transversely across the hull at a 90 degree angle, or perpendicular, to the keel. Unlike ribs, which are fabricated from just a single piece of wood and are typical of smaller-sized boats, the square frames of larger vessels, such as *Kentucky*, are composed of separate pieces of timber fastened together in order to have the grain of the wood run along the length of the piece in question as the direction of the frame changes from horizontal to vertical (Crothers 1997:144). The individual timbers that comprise each frame are termed floors, futtocks, top timbers, and rail stanchions. Floors are the pieces of framing timbers that span the keel. Futtocks are the timbers that get attached to the floor timbers and extend up the sides of the hull to the level of the main deck or planksheer. In cases where more than one futtock is needed, the futtocks closest to the keel are termed the "first" futtocks, the next are the "second" futtocks, and so on up the sides of the hull. The uppermost futtocks that terminate at the level of the main deck are the top timbers. The futtock timbers that extend above the deck are the rail stanchions. At the

forward and after ends of a ship's hull, where it begins to narrow, the angles of the floors become increasingly steep as they rise from a horizontal attitude. Eventually, the forms of the timbers needed for the floors become too acute to be readily available and "deadwood" timbers (i.e., horizontal, longitudinal members that usually have the same sided dimension as the keel and are stacked on top of it) are used to fill the narrow space directly above the keel. The addition of these deadwood timbers effectively separates the hull into two distinct halves, port and starboard. In such cases, square frames are abandoned for half frames.

Half frames are square frames that have been divided into two identical, although opposite, halves that were fastened onto either side of the deadwood. These half frames, which were oriented square to the keel, continue as far forward and aft as possible in the hull up to the regions around the stem and sternpost. At these points, the angle of the half frames' bevel becomes impracticably acute for securely fastening planking to them, and cant frames are introduced and used instead. Cant frames are essentially half frames that are set at varying angles to the keel rather than being set square to it. Because of their angle, they provide a larger, more secure fastening surface for the adjacent planking. Sound fastening of the planking was particularly important at the bow and stern where it usually had to be steam-bent and forced into place and had a natural tendency to spring away from the hull.

During the 1997 Phase III field investigations, a total of 21 frames (e.g., 15 square frames and 6 pairs of half frames) were examined. For recording purposes, each of the frames were numbered sequentially, beginning with the first frame (F1) forward of the sternpost. Generally speaking, framing on *Kentucky*'s port side was found to be better preserved than the corresponding framing on the starboard side. In fact, *Kentucky*'s overall preservation seemed to improve as one moved further forward in the hull. Consequently, the forwardmost of the excavated port frames, although broken at a point about half way up the side of the hull, were among the best preserved and were otherwise intact up to the level of the main deck. Most of the starboard framing, by comparison, was in far worse condition, and frames extended only slightly above the turn-of-the-bilge. This pattern of preservation is hardly surprising given the long-term exposure of *Kentucky*'s stern and, in particular, the starboard side of the hull, to the debris-laden, swift-flowing currents of the Red River.

Nine of the 21 frames identified during the course of the 1997 field investigations (i.e., frames F3-F11) were documented in detail and are illustrated in Figures 53 and 54, which depict cross-sectional views of the hull at each of these nine frames. Unfortunately, continuous slumping of the fine sediments in and around *Kentucky*'s wreckage prevented similarly detailed documentation of frames F12 to F15. Deep sediments and intact decking that covered the majority of the eight additional frames that were found further forward in the hull (i.e., frame F16 on the port side and frames F20 to F26 on the starboard side) prevented the recording of all but the sided and molded dimensions and spacing of these frames' top timbers.

The dimensions, construction, and spacing of *Kentucky*'s frames provide primary evidence of the mid-nineteenth century trend to build western river steamers with lighter and fewer timbers than their predecessors of the 1820s to 1840s. Influenced by traditions of eastern steamboat construction, the early steamers of the western rivers were built along essentially seagoing lines and were strongly framed and planked to withstand the forces of wind and waves. As noted above in the discussion of *Kentucky*'s keel, storms and waves played very minor roles in the navigation of the western rivers. Although western river pilots certainly faced many other hazards (i.e., swift currents, numerous natural obstructions, an absence of conventional wharves, etc.), the shallowness of the rivers was the single greatest factor that affected western steamboat design, operation, and construction. Reducing the size and number of a vessel's framing timbers was one of the easiest

methods of adapting the eastern steamboat design to shallow-river navigation. In addition to the obvious economic incentives (i.e., lower construction costs and greater cargo capacity), lighter methods of hull construction also were encouraged by the adoption of effective measures of snag removal and the regular maintenance of the rivers that commenced during the 1820s and 1830s. By 1840, a significant shift was underway in the manner western steamboats were framed, from the traditional method of "double frames" and heavy scantling found on the earlier boats to "...a system of building with single frames and light scantling, which greatly reduced the weight of their vessels and made them marvels of naval construction" (Hall 1880:175). During the 1840s and 1850s, increasing numbers of large steamboats of substantial tonnage were being built with framing timbers that measured 3 – 4 in (7.62 - 10.16 cm) sided and 5 – 6 in (12.7 - 15.24 cm) moulded (Hunter 1993:81). Apparently, *Kentucky*'s builder was aware of this trend towards lighter framing, because *Kentucky*'s individual framing timbers measured just 2 – 2.5 in (5.08 - 6.4 cm) sided and 5 – 6.5 in (12.7 - 16.5 cm) moulded and were spaced apart 1.5 ft (o.46 m) on center. The lightness of *Kentucky*'s framing becomes more apparent when compared to the framing of the 350-ton, 146 ft (44.5 m) long Great Lakes propeller-driven steamboat *Indiana*, built in 1848 at Vermilion, Ohio. *Indiana* was double-framed in the traditional manner to create frames that measured 10 in (25.4 cm) sided and 9 in (22.86 cm) moulded (over the keel), which like *Kentucky*'s were also spaced on 1.5 ft (0.46 m) centers (Robinson 1999). The dimensions of circa 1850s clipper ships frames, which averaged 1 ft (30.48 cm) sided and 1.5 ft (0.46 m) moulded, further illustrates the exceptional lightness of *Kentucky*'s framing relative to the overall size of its hull (Crothers 1997).

Frames F1 to F6 were half frames whose heels were secured in notches cut into the sides of the deadwood timber fastened to the top of the keel at *Kentucky*'s stern. Frames F1 and F2 were degraded to such a great extent that they consisted of little more than wood fragments. Fortunately, fasteners and compression ghosts from these frames that were preserved in the adjacent hull planking provided some evidence for these frames' existence, and their orientation and extent. Both halves of frames F1 to F6 consisted of single timbers that originally extended from the deadwood to the sheer. Small, 1 in (2.54 cm) tall x 3 in (7.62 cm) wide, rectangular notches or limber holes were cut into the bottom of frames F3, F5, and F6 to allow bilge water to flow between the frames to a point in the hull where it could be pumped out. While frames F1 and F2 appeared to have been essentially square in section, the frames forward of F2 took on a distinctive shape that was carried forward through the remainder of the excavated portion of the hull, in which the moulded dimension of the framing timbers consistently measured almost three times larger than its sided dimension. By drastically reducing the sided dimension of the framing timbers while maintaining a relatively large moulded dimension, *Kentucky*'s builder was able to drastically reduce the weight of the frames without sacrificing their strength.

Frames F7 and F8 each were composed of two sets of futtocks and single floor timbers that were fastened together. The preserved portion of frame F7 was composed of five different timbers, consisting of a floor, two first futtocks that were butt-joined over the keel, and two second futtocks. In contrast, the remains of frame F8, one of the worst preserved frames, were unique in that they consisted of two floors. This unusual configuration of double floors may have been a result of a replacement or repair to frame F8. Limber holes of the same dimensions as those in frames F3, F5, and F6 were present on both frames F7 and F8, although frame F7 was unique for having a third limber hole located in the center of the frame's floor timber.

Frames F9 through F15 were composed of three staggered layers of framing timbers that created a laminate-construction frame that was two timbers wide at the keel and three timbers across at the heel of the second futtock. The maximum sided dimension of the combined framing timbers ranged from 7 ¼ - 8.5 in (18.42 to 21.6 cm). Frame F9 was composed of six individual timbers: one floor, two first futtocks butt-joined over the keel, and three second futtocks. Frame

F10 consisted of one floor, two first futtocks butt-joined over the keel, and two second futtocks. Frame F11, the forwardmost frame that was recorded in detail, was composed of one floor, two first futtocks butt-joined over the keel, four second futtocks, and one third futtock. Spacing of frames F9 through F15 varied from 11 in (27.94 cm) to 1 ft 5 ½ in (44.5 cm) on center. Fasteners used to join the futtocks and floor timbers were hammered into the frames from their forward and after sides. As with most of the after frames, limber holes also were present on frames F9 to F11, and can be assumed to have been present on the remainder of *Kentucky*'s undocumented frames.

Although only the first eleven frames could be fully uncovered and documented, project underwater archeologists excavating along the perimeter of the hull on *Kentucky*'s main deck were able to locate the heads of eight additional frames. Seven of these frame heads were recorded on the hull's starboard side, and one frame head was documented on the port side. The frame head on the port side appeared to correspond with frame F16, while the frame heads on the starboard side appeared to correspond with frames F20 through F26. These frame heads were positioned a considerable distance from the longitudinal centerline of *Kentucky*'s hull: frame F16 was located 12 ft 5 in (3.78 m) to port of the centerline, and frames F20 through F26 measured from 15 ft 5 in (4.7 m) to 16 ft 3 in (4.95 m) to starboard of the centerline. Based on *Kentucky*'s registered beam of 32 ft (9.75 m), the locations of these frame heads relative to the hull's center provided evidence for reconstructing the shape of the after third of the hull and indicated that the hull expanded to its full breadth at a point approximately 30 ft (9.14 m) forward of the sternpost.

The Keelson Assembly

Once *Kentucky*'s stem, sternpost, and frames had been set into place on the keel, an additional heavy longitudinal line of timbers that extended from the stem to the sternpost, termed the keelson, was installed across the tops of the floors directly over and parallel to the keel. Once in place, staggered holes corresponding to the locations of frames, inset 2 in (5.08 cm) from the keelson's outboard edges, were drilled down through the keelson, floor, and keel. Long iron through bolts, measuring 0.5 in (1.27 cm) square in section, were then inserted into each hole, driven into place, and clinched flush on both ends. With fastenings installed through the keelson, floors, and the keel, the foundation of *Kentucky*'s hull was as sound as materials and craftsmanship could make it. Because of the minimal moulded height of the keel, *Kentucky*'s 6 in (15.24 cm) sided x 7 – 8.5 in (17.78 cm to 21.6 cm) moulded keelson and its related timbers acted as one of the principal longitudinal support structures in the steamer's hull.

Stern Deadwood

For reasons described above, a single, 7 ft 6 in (2.29 m) long deadwood timber, sided 8.5 in (21.6 cm) and moulded 8 in (20.32 cm), was secured to the top of the keel in the narrow extreme after portion of *Kentucky*'s hull between the sternpost and a point 13 in (33.02 cm) forward of the front of frame F6. The port and starboard sides of the deadwood were notched to receive the inboard ends of half frames F1 through F6. In addition to filling the interior of the hull's after end, the deadwood was an integral component of *Kentucky*'s hogging truss system and served as the after anchor point for its central longitudinal hogging chain. Between frame F7 and F8 the keelson tapered down on its moulded dimension to 6 in (15.24 cm), forming a square in cross-section, and this shape was continued back to the sternpost.

Filler Piece Under Keelson

The moulded dimension of the deadwood at its forward end measured 3 in (7.62 cm) taller than the top of the floor at frame F7, so the bottom of the keelson was several inches higher than the top of the frame, leaving a gap between the keelson and frame. This gap between the two members was compensated for by the addition of a notched, plank-like, 3in (7.62 cm) thick, 6 in (15.24 cm) wide, line of timbers that was laid flat along the centerline of the hull between the floors and the keelson. To help lock the floors into place in their positions on the keel, a series of 1 in (2.54 cm) deep recesses corresponding with the locations of the frames that were cut across the underside of these filler pieces before the keelson was lowered into place on top of them and fastened.

Sister Keelsons

Kentucky's keelson was strengthened by the placement of two, plank-like lines of timbers laid edgewise along both sides of the keelson beginning just aft of frame F7. These narrow "sister keelsons" were sided 2.5 in (6.35 cm) on the starboard side and 3 ¼ in (8.26 cm) on the port side, and moulded from 3.5 in (8.9 cm) at their after ends to their full moulded height of 9 in (22.86 cm) between frames F7 and F8. This tapering of the sister keelsons' after ends was necessary to allow them to match the taper of the keelson aft of frame F8 and to allow them to fit beneath the hogging chain's large attachment stirrup. In the frame F7 section shown in Figure 53, the sister keelsons are shown with their top sides up against the bottom of the stern hook. This is higher than their original position and resulted from the post-depositional breakage of the keel and keelson at frame F7. The stern dropped when this break occurred (presumably with the parting of the hogging chain), while the sister keelsons remained in their original position. This may also account for the peculiar outward splay of the sister keelsons from frame F9 to their aft ends.

Footlings

In addition to its principal function of increasing *Kentucky*'s longitudinal stability, the keelson assembly created a strong, wide, flat foundation for stanchions, masts, hog-chain braces or Sampson posts, and other vertical support members positioned along the centerline of the hull. In cases where such vertical timbers had to bear an extremely heavy burden (i.e., a mast or Sampson post), or it was necessary to offset the position of the vertical member to one side of the hull's longitudinal centerline, the width or sided dimension of the keelson assembly was expanded by the addition of a short timber, or footling, that was placed alongside the keelson. In the excavated portion of *Kentucky*'s hull, a single footling was uncovered and documented. Attached to the starboard side of the keelson assembly, between the after face of frame F11, and the forward face of frame F15, the footling measured 4 in (10.16 cm) sided and 9.5 in (24.1 cm) moulded. The upper corners of the forward and after ends of the footling were rounded. A large square mortise, positioned directly above frame F13, was cut into the footling and the adjacent keelson assembly to accept the heel of a vertical bracing timber.

The Floor Strakes, Futtock Head Strakes, Bilge Keelsons, and the Clamps

While the keelson assembly acted as the principal longitudinal strength member inside *Kentucky*'s hull, a significant amount of additional longitudinal stiffness was also imparted to the

hull by the use of several lines of longitudinal timbers set on the inside surface of the frames. From the hull's centerline to a point just below the planksheer, the lines of timbers preserved in *Kentucky*'s hull included floor strakes, futtock head strakes, bilge keelsons, and two clamps. The number of these lines of timbers almost certainly would have increased further forward in the hull as it reached its maximum breadth. Installation of these longitudinal strength timbers followed the assembly and fastening of the keelson.

Floor Strake

Located the closest to and parallel with the keelson, just 27 in (68.58 cm) to starboard of the hull's centerline, the floor strake was essentially a 2 x 6 in (5.08 x 15.24 cm) planking strake that was fastened onto the tops of the floors and extended forward from frame F12 into the unexcavated portion of *Kentucky*'s hull. The outboard after end of the floor strake was tapered to fit against the convergent inboard edge of the starboard futtock head strake. Although recorded only on the starboard side of the hull, this floor strake probably would have had a companion on the unexcavated port side of the hull as well.

Futtock Head Strakes

Outboard of the floor strake, and with similar dimensions (2 x 6 in [5.08 x 15.24 cm]) was a second line of timbers. The futtock head strake was recorded on the port and starboard sides of the hull. Unlike the floor strake, however, the converging lines of timbers comprising the port and starboard floor strakes followed the curve of the hull as it narrowed towards the stern and were fayed into the outboard faces of the sister keelsons between frames F7 and F8.

Bilge Keelsons

At the turn-of-the-bilge, outboard of the futtock head strakes, project archeologists located and recorded two-tier bilge keelsons on the port and starboard sides of *Kentucky*'s hull. Slightly larger than the other longitudinal strengthening members, the plank-like timbers comprising the bilge keelsons measured 2.5 in (6.4 cm) thick, and 8 in (20.32 cm) wide, the combination of which gave the bilge keelson a sided dimension of 5 in (12.7 cm). Like the futtock head strakes, the bilge keelsons followed the shape of the hull and converged at their after ends as the stern narrowed. The after ends of the bilge keelsons tapered aft of frame F5 and were fayed to the outboard sides of the deadwood between half frames F3 and F4, providing a shelf upon which rested a stern hook.

The Stern Hook

Kentucky's stern hook, located between frames F3 and F9, performed the vital function of securely binding the sides of the vessel together (Crothers 1997:248). Composed of multiple timbers rather than just a single naturally-formed or grown knee, *Kentucky*'s “made” stern hook consisted of 6 individual pieces: two arms, two knees, one filler piece, and a small brace. The two 7 ft 7 in (2.31 m) long timbers that formed the legs or arms of the "A"-shaped hook measured 3 in (7.62 cm) thick and 8 – 12 in (20.32 - 30.48 cm) wide. The outboard edges of the arms were beveled to fit securely against the top of the bilge keelson and the inboard faces of the outward sloping frames to which they were toe-nailed from above. Three ¾ in (1.9 cm) deep mortises were

visible in the upper surfaces of the arms' where they converged at their after ends. The central mortise, 8 – 5 in (20.32 - 12.7 cm), is straddled by two mortises, which each measured 4 ¾ in (12.07 cm) square. The purpose of the mortises is unclear, but the two mortises on the sides may have been for the heels of short deck stanchions. The central mortice may have seated a stanchion to support a longitudinal deck beam that is described below. The gap between the arms was spanned by two grown knees, a trapezoid-shaped filler piece, and a small brace. Each of these timbers helped reinforce the joint between the hook's arms and the sides of the hull and prevented them from pulling apart.

The small brace near the apex of the hook was simply tacked onto the upper surface of the arms with two nails on each side, while the larger filler piece was let into the arms and toe-nailed into position with four spikes. The knees were spiked to both the cross piece and the arms. The arms themselves were joined by through-bolts fastened with nuts and washers.

The Clamps

As noted above, preservation of the port side of *Kentucky's* hull was significantly greater than that of the starboard side. Consequently, two clamps, 2 in (5.08 cm) thick and 6 in (15.24 cm) wide, were preserved above the two-tier bilge keelson on the port side of the hull. The after end of the lower of the two clamps was broken off just aft of frame F8. The upper clamp's after end also ended in a break just aft of frame F10. Both clamps followed the curvature of the hull.

Planking

Exterior hull planking is the planking attached to the outside of the hull between the keel and the main deck level or planksheer. Planking is arranged in rows or strakes that are composed of multiple planks butt-joined or scarfed together and nailed to the outside surfaces of the framing. Nomenclature of individual planking strakes was distinctive, and, progressing upward from the keel, usually consisted of the garboard, diminishing strakes, bottom or common planking, wales, and the waist. The obvious function of this planking was to provide a watertight envelope around *Kentucky*'s hull.

Kentucky's documented planking had a uniform thickness of 2 in (5.08 cm) and ranged in width from 4 in (10.16 cm) to 16 in (40.6 cm). Although some distinction between *Kentucky*'s planking strakes was apparent, they did not conform exactly to the pattern outlined above. At frame F5, the 9/5 in (24.1 cm) garboard was nearly twice as wide as the three adjacent strakes of bottom planking, all of which measured approximately 6 in (15.24 cm). At *Kentucky*'s abrupt turn-of-bilge, the widths of the two bilge strakes covering this area of the hull narrowed to 4 ¼ in – 4 ½ in (10.8 cm - 11.4 cm) to accommodate the curve. Above the bilges, the width of the next planking strake expanded dramatically to 9 in (22.86 cm). The next strake above it was the last to be preserved at frame F5 and it measured 6 in (15.24 cm) wide. Although additional planking strakes were preserved on the port side further forward in the hull, no evidence of the sheer plank was found. Individual planks comprising each strake were fastened to the frames with two iron spikes per frame, except where four spikes were used at the butt-joints. Although no samples of oakum caulking were recovered from the seams between the planking strakes, an unidentified tar paying was present within the seams, which indicated that they probably had been caulked in the usual manner.

The Longitudinal Cross-Bracing

Following the installation of the keelson assembly and longitudinal strength timbers in *Kentucky*'s hull, a latticed longitudinal bulkhead-like structure that extended from the top of the keelson to the underside of the deckbeams was fabricated and placed into the steamer's hull. Consisting of stanchions, wooden cross-bracing, vertical iron tie-rods, and a longitudinal cap, the structure mimicked the latticed diagonal iron bracing that was at that time being installed into some of the world's largest wooden oceanic vessels to combat the inevitable tendency for the ends of the hull to droop, in a condition known as "hogging." *Kentucky's* latticed bulkhead ran fore-and-aft along the starboard side of the centerline of the vessel. Unlike some contemporary western river steamboats, *Kentucky's* bulkhead was not of a solid construction, but instead was composed of crossed timbers and vertical stanchions that together formed a series of "X's" along the length of the hull (Figure 55). Although only the aftermost portion of the bulkhead was accessible for documentation, it is assumed that the bulkhead assembly extended forward for most of *Kentucky*'s full length. Surviving braces did not extend farther aft than frame F11, and the absence of mortises set into the starboard keelson and keelson aft of this point suggests the bulkhead originally terminated at frame F11. Had it continued aft, it would have eventually collided with a central hog chain (described below).

Each "set" of cross-bracing was composed of three timbers, one vertical timber, and two cross pieces, each measuring 2 x 3 7/8 in (5.08 x 9.8 cm). The vertical timbers in each set were spaced apart 31 in (78.74 cm) on center and were positioned at the middle of each cross-brace set. A single iron spike nailed through the center of the "X" secured the three timbers together. The ends of the cross-bracing timbers were set and toenailed into shallow mortises cut into the top of the keelson assembly and the longitudinal cap strake. The cap strake, a 2 in (5.08 cm) thick x 5.5 in (14.0 cm) piece of wood, was positioned between the heads of the cross-bracing timbers and the underside of the transverse deck beams. The entire assembly was anchored to the hull by 1 in (2.54 cm) diameter iron tie-rods that extended from the top of the cap strake down into the keelson, and perhaps even through the keel. A single example of these tie-rods was recorded near the forward limits of the excavation area. This ingenious system of cross-bracing worked to significantly stiffen the hull.

The Main Deck

Longitudinal Deck Beam

Also important in providing stiffening was a longitudinal beam that ran fore and aft parallel to the cross-bracing and complemented it. The longitudinal deck beam was sided 4.5 in (11.4 cm) and moulded 6 in (15.24 cm). Running down the centerline of *Kentucky*'s hull, it supported the transverse deck beams at their centers. The longitudinal deck beam itself was supported from below by a series of centerline stanchions, 4 in (10.16 cm) square in section, that were set along the top of *Kentucky's* keelson at a regular interval of 5 ft 3 in (1.6 m). As with the cross-bracing timbers in the longitudinal bulkhead, the ends of each stanchion were seated in shallow mortises cut into the top of the keelson assembly and into the underside of the longitudinal deck beam and then were toenailed into place. These main deck centerline stanchions were installed adjacent to and on the port side of every other vertical member of the cross-bracing sets.

The longitudinal beam extended aft to a point above frame F11, at which point it was broken. A mortise cut into the top of the port sister keelson and the port side of the keelson at

frame F10 must have seated a vertical stanchion, as did a similar mortise let into the keelson and port sister keelson between frames F7 and F8. These mortises indicate that the longitudinal beam extended at least this far aft; it is likely that it ran from here back to and joined the sternpost, supported midway by a stanchion set into a mortise in the stern hook.

The overwhelming absence of such a member in the construction of other types of watercraft makes this hull component unusual; however, these structures may have been commonplace on western river steamboats, because of the extreme breadth of these steamers' main decks and length of their hulls relative to those of other vessel types. In addition to the support that the longitudinal deck beam provided to the transverse deck beams, it also would have contributed a great deal of longitudinal strength to *Kentucky*'s hull, especially when paired with the cross-bracing that ran alongside it.

Deck Framing

Despite the fact that *Kentucky* had four different decks, only a portion of the lowermost or main deck was preserved in the area of the hull that was excavated. After installation of the longitudinal cross-bracing and deck beam inside the hull, framing for *Kentucky*'s main deck would have been laid out and fastened into place. Elements of *Kentucky*'s deck framing that were exposed and recorded consisted of the partially preserved remains of seven transverse deck beams, their attached outriggers, and a 40 ft (12.19 m) long section of the starboard guard wale. No evidence of hanging knees, lodging knees, carlings, companionways, or cargo hatchways were present.

Oriented perpendicular to the longitudinal deck beam, the transverse deck beams held the sides of the hull together and supported the main deck. The transverse deck beams had sided and moulded dimensions of 2 – 2.5 in (5.08 - 6.35 cm) and 6 in (15.24 cm), respectively, and were spaced at a regular interval of 2 ft 6 in (76.72 cm) on center. The entire length of each deck beam's upper surface was chased down its middle with a .5 in (1.27 cm) wide x .5 in (1.27 cm) deep groove for salt. The introduction of salt to the upper surface of the deck beams helped preserve the wood from rot caused by the frequent condensation of moisture on the underside of the main deck due to the great variations in temperature on the decking's upper surface (Crothers 1997:229).

Although the recorded beam of the vessel was 32 ft, this referred to the width of the actual hull at its widest point; the main deck of most steamers actually extended well beyond the edge of the hull. In order to span the exceptionally large breadth of *Kentucky*'s deck, which at its widest point probably had extended nearly 70 ft (21.34 m), additional deck beam timbers called outriggers were lap-joined to the forward faces of the deck beams at their ends to extend their length. The outriggers' sided measurement ranged from 3 – 5 in (7.62 - 12.7 cm) and their moulded dimension was 6 in (15.24 cm). Remains of outriggers were found on the starboard side of all seven of the recorded transverse deck beams. The extension of the deck they supported was known as the guard.

During the Phase II field investigations conducted in 1995, a 40 ft (12.19 m) long section of what appeared to be the outboard edge of the starboard guard was recorded. This structure, referred to as a guard wale, consisted of a 7 in (17.78 cm) diameter half-round log and a 3.5 in (8.9 cm) sided x 4 in (10.16 cm) moulded longitudinal timber that was attached to the flat inboard surface of the half-round log. Remnants of two wooden stanchions, or stationaries, measuring 4 x 5 in (0.16 x 12.7 cm) in section, and spaced apart 8 ft 2 in (2.49 m) on center, were loosely secured in notches cut into the longitudinal timber's inboard face. Unfortunately, no evidence of this

interesting feature was discovered during the 1997 fieldwork, it likely having been swept away by the Red River between the two phases of field work.

Decking

Kentucky's decking served two rather obvious purposes. First, the deck provided a planked surface upon which people could walk. Second, the deck was made tight to form the topside portion of the waterproof envelope that was *Kentucky*'s hull. A total of 44 planking strakes of *Kentucky*'s main deck were exposed and documented during the Phase III fieldwork. The planking strakes were laid parallel to the centerline of the hull and individual planks comprising the strakes were butt-joined together. The butt- joints were shifted in a random pattern, although they were always placed over the transverse deck beams and separated by at least one strake. Deck planks were fastened to the deck beams with two nails per beam, except at the joints where four nails per beam were used. The thickness of the decking measured 1 – 1 3/8 in (2.54 cm - 3.49 cm), with the latter measurement probably closer to its original thickness. Decking widths ranged from 3.5 – 6.5 in (8.9 - 16.5 cm). A single exception to these decking dimensions were those of the starboard waterway, the outermost decking strake that connected the deck with the outside of the hull, which measured 1 ¾ in (4.45 cm) thick and 13 in (33.02 cm) wide. This detached section of waterway was perforated with five mortises spaced apart at a regular interval of 2 ft, 5 in (73.66 cm) on center. These mortises marked the former locations of the frame's top timbers, which served as the vertical supports for the main deck's bulwark. Several fragments of the decking that were recovered for documentation revealed that the upper surface of the decking had been tarred, covered with a felt-like fabric, tarred a second time, and then dusted with a coarse sand.

The Upper Works

Although three-fourths to four-fifths of *Kentucky*'s original structure was located above the main deck, with the boiler, hurricane, and texas decks and their cabins rising upwards of 40 ft (12.19 m) above it, remarkably little evidence of the steamer's upper works was present in the areas investigated during the Phase II and Phase III archeological fieldwork. Although this fact may seem surprising initially, it has been observed by several historians and nautical archeologists that elements of upper deck structures rarely are found on wrecks and frequently when steamboats have sunk in deeper waters the cabins have usually broken loose from the hull and floated off. This absence has been attributed to the comparatively lighter construction of the upper deck structures, which made them more buoyant, and also made them more easily demolished during or soon after the wrecking event (Hunter 1993:437; Lenihan 1987:229; Robinson 1999:111, 124).

The small amount of material evidence comprising the documented remains of *Kentucky*'s upper works consisted of the stationaries (described above), sherds of clear plate glass from deck cabin windows, a small chunk of gilded plaster, the fragmentary remains of tongue-and-groove sheathing from the main deck bulwark and bulkheading, and elements of *Kentucky*'s hog-chain and cross-chains. A total of 91 sherds of 1/16 in (.158 cm) thick window glass was recovered during the Phase III excavation of Kentucky's hull. This glass would have come from the numerous windows located in the upper works at the stern that were shattered during and after the sinking event. The small chunk of plaster with gold leaf visible on its surface was discovered in the lowest part of the hull next to the keelson. The plaster probably originated from the decorative treatment of the ceiling in *Kentucky*'s saloon, which commonly were covered with elaborate gilded ornamentation. The 32 samples of tongue-and-groove sheathing that were recovered measured 5/8

in (1.58 cm) thick x 3.5 in (8.9 cm) wide. Such sheathing is likely to have been fastened to the outside of the bulwarks and upper works bulkheading.

The Hog Chain

The problem of hull flexion (i.e., the drooping of a vessel's ends or the sagging in the middle of the hull) had long been a central problem in wooden shipbuilding, but its solution was particularly difficult in western river steamboats such as *Kentucky*, with their exaggerated length-to-breadth and length-to-depth ratios. The problem was exacerbated by the concentrated weight of *Kentucky*'s two engines, four boilers, and paddlewheels positioned near amidships, all of which placed additional strains on the vessel's timbers and greatly decreased the hull's structural integrity and longitudinal stability. Given these facts, as well as the extreme depth limitations of the western rivers, which demanded the shallowest draft possible, extraordinary means were necessary to strengthen the hulls of western river steamers measuring in excess of 150 ft (45.72 m) in length. In addition to the ingenious timber structures that were employed in *Kentucky*'s hull to combat excessive flexion (i.e., the keelson assembly, the bilge keelsons, the longitudinal deck beam, and the longitudinal bulkhead described above), shipwrights of the middle nineteenth century turned to hogging-truss technology as another means of increasing the longitudinal strength and rigidity of their steamers.

Although usually associated with western river steamboats, composite wood and iron hogging trusses originated on Hudson River steamers during the late 1820s. The first documented use of a hogging truss on steamboat was on the 1827 Hudson River steamer *North America* built by Robert L. Stevens. By the late 1830s combinations of angular-frame and bow-shaped hogging trusses were appearing on the steamers of Lake Champlain. It was not until a decade later that hull-stiffening trusses started to be employed on the steamboats of the western rivers. However, unlike the more heavily-constructed composite wood frame and iron stay hogging trusses found in steamboats of the eastern seaboard, builders of western steamers used a much simpler and lighter system of "hog chains" to provide longitudinal strength to their vessels while avoiding the added weight and bulk of the framed trusses. The first documented use of this particular type of truss system was on the Pittsburgh-Cincinnati packet steamer *Brilliant* (361 tons) built in 1848, just eight years before *Kentucky* (Hunter 1993:99). The system consisted of a rod that was connected end-to-end by turnbuckles and carried over a series of struts or braces with their ends secured to hull timbers at the bow and stern. In addition to the hog chains, western steamers of the period also employed "cross chains" that ran athwartships and passed over vertical masts or "Sampson posts" raised from the main deck above the planksheer or from the keelson. Unlike the more visually prominent framed trusses, this combined system of hog chains and cross chains was less obtrusive and extended into, but not usually above a vessel's superstructure.

Although the system of chains and braces was effective, it also had its drawbacks. It required frequent adjustment and interfered with the physical arrangement of the boat, "...with the handling of freight, and...with the convenience of passengers" (Hunter 1993:99). It also was not a complete panacea for all of the weaknesses in such radical hull structures. Furthermore, the Sampson posts that were employed in the early versions of the cross-chain systems quickly went out of use, all but disappearing by the end of the 1850s, because of an inherent flaw in their design: the concentrated load on a single vertical timber tended to punch holes in the bottom of the boats in which they were installed.

Kentucky's archeological remains revealed that the vessel was fitted with a fore-and-aft hog-chain and cross-chains. Given *Kentucky*'s documented hull length of 222 ft (67.67 m) and its

exaggerated length-to-breadth and length-to-depth ratios of 6.9:1 and 40.4:1, respectively (as compared to those of contemporary sailing vessels [4:1 and 10:1, respectively]), it is not at all surprising that this type of stiffening device was employed in the steamer's hull (Hunter 1993:87, 95). The after end of *Kentucky*'s hog-chain assembly, exposed during the 1997 Phase III data recovery project, consisted of a 2 in (5.08 cm) diameter wrought-iron rod, broken 12 ft, 3 in (3.73 m) from its after end, that was attached to two, 3.5 ft (1.1 m) long wrought-iron straps that formed a stirrup that straddled and anchored the hog chain into the stern deadwood. Although the chain was bent, it ran forward at an upward angle of between 35 and 40^0 from the plane of the keel.

Cross-chains also were recorded on *Kentucky*'s hull and were much lighter than the hog-chain. No complete example was discovered in the excavated portion of the steamer, but the fragmentary evidence that was available was sufficient to reconstruct their general configuration. An iron, inverted "V"-shaped length of chain with a section of straight chain that was hooked through the apex of the V was discovered on the port side of the vessel between frames F11 and F12, mounted through the main deck near the outboard edge of the guard. A short segment of chain consisting of an iron rod terminating in a hook eye was hooked onto the “V” at its apex. While no other portion of the cross-chain was located on the port side, three cross chain components were discovered on the outboard edge of the hull's starboard side. These cross-chain components included a section of straight chain, a turnbuckle, and a length of chain ending in a strap.

By combining the information from both sides of the vessel, the design of *Kentucky*'s stern cross chain can be extrapolated. The cross-chain appears to have been mounted into the deck using the inverted “V”-shaped chain. This two-point chain anchoring system distributed the tension exerted by the chain over a greater area, thereby lessening the likelihood that the chain would be pulled out of the hull. The cross-chain was connected to the “V” shaped chain with a hook. This hook-ended segment of chain was attached to another segment of chain with a turnbuckle that allowed the chain's tension to be adjusted. These round cross-sectioned portions of the chain were shackled at their inboard end to flat, wrought iron straps; one of these is visible to starboard in Figure 48, passing over the waterway. The inboard end of the flat chain segment terminated in a spatulate section with rivets or bolts that may have attached it to either another segment of chain or to the top of the Sampson post.

In addition to the iron chain assemblies that were discovered in *Kentucky*'s hull, two braces were also identified and recorded. One of these timbers appears to have supported the hog-chain, while the other may have been a Sampson post or mast intended for supporting the cross-chain in the stern. The hog-chain brace, which measured 7 in (17.78 cm) square, was located 30.5 ft (9.3 m) forward of the after edge of the sternpost. The brace extended from the bottom of the hull at a 58-degree angle toward the stern. Project archeologists were not able to excavate the portion of *Kentucky*'s hull where the base of the brace was located to determine how the brace was mounted to the bottom of the hull. However, it can be inferred that the timber probably was set into a shallow mortise in the keelson assembly and a footling. The partial preservation of the upper end of the brace, which extended just 3 ft, 1 in (93.98 cm) above the level of the main deck, also made it impossible to determine the method by which the brace was attached to the hog-chain.

What appears to be a Sampson post, used to support a cross-chain in the stern, was set in a mortise in the keelson assembly and a footling at frame F13. The 6 in (15.24 cm) square Sampson post extended vertically through the main deck to a point where it intersected a cross chain. Unfortunately, preservation of the timber above the main deck was also poor, thus, it is unclear how the cross-chain had been attached to the post. This post is roughly opposite the “V”-shaped cross chain anchor noted earlier, and may have supported its chain.

The vital role the hog-chain and cross-chains played in stabilizing and stiffening *Kentucky*'s hull is illustrated by the visible damage to several of the vessel's principal longitudinal timbers that resulted from the loss of these important support systems. The keel and keelson of *Kentucky* are broken 7 ft, 7 in (2.31 m) forward of the sternpost. This damage apparently occurred after the hog-chain parted, which allowed the after end of the vessel to sag and break.

Deck Equipment

Five separate elements of *Kentucky*'s deck equipment were located and recovered from the wreck site during archeological investigations. These elements included a wooden bilge pump tube, two iron capstan parts, an iron-stocked stream anchor, a length of hawser, and an iron piece of hardware from an after cargo boom.

Bilge Pump

One of the last pieces of equipment to be operated on board *Kentucky* just prior to its loss probably was the bilge pump(s). A single wooden bilge pump tube was discovered just to the port side of the hull's centerline. The tube, which extended from the bottom of the hull's interior to and through the main deck, was recovered for documentation and conservation during the Phase III data recovery project. The tube consists of a hollowed-out, tapered, round timber with an internal foot-valve and a perforated tinned-steel collar at is lower end. The upper end of the tube that passed through the deck has been dubbed to give it an octagonal shape in section (see Figure 47). The tube was shaped in this manner to lock it into place and prevent it from spinning. The tube measured 11 in (27.94 cm) in diameter x 6 ft, 8 in (2.03 m) in length (Figures 56 to 59).

Capstan Parts

An iron capstan pawl-rim (Figure 60) and spindle (Figure 61) were located in and recovered from the sediments adjacent to *Kentucky*'s starboard aft quarter during the 1997 Phase III archeological fieldwork. A capstan is a vertically-oriented winch. This manually operated capstan had been originally mounted on the main deck at the stern, where it had used for hauling in anchor, mooring, and cargo boom lines. The capstan's pawl rim measured 2 ft 4 in (68.58 cm) in diameter and was 5.5 in (14.0 cm) tall. The spindle had a maximum diameter of 1 ft, 3.5 in (39.4 cm) (measured at a flange) and a height of 4 ft, 5 in (1.35 m).

Anchor

A single, removable iron-stocked, stream anchor was discovered on and recovered from the port aft quarter of *Kentucky*'s main deck (Figure 47 and 62). The anchor has a total length of 4 ft, 7 in (1.4 m), measured from the ring to the crown. The diameter of the octagonal shank measured 1 ¼ in (3.18 cm) in diameter. The anchor arms' breadth measured 2 ft, 9 ½ in (85.1 cm) across from bill to bill. Additional anchors would have been stowed on *Kentucky*'s bow.

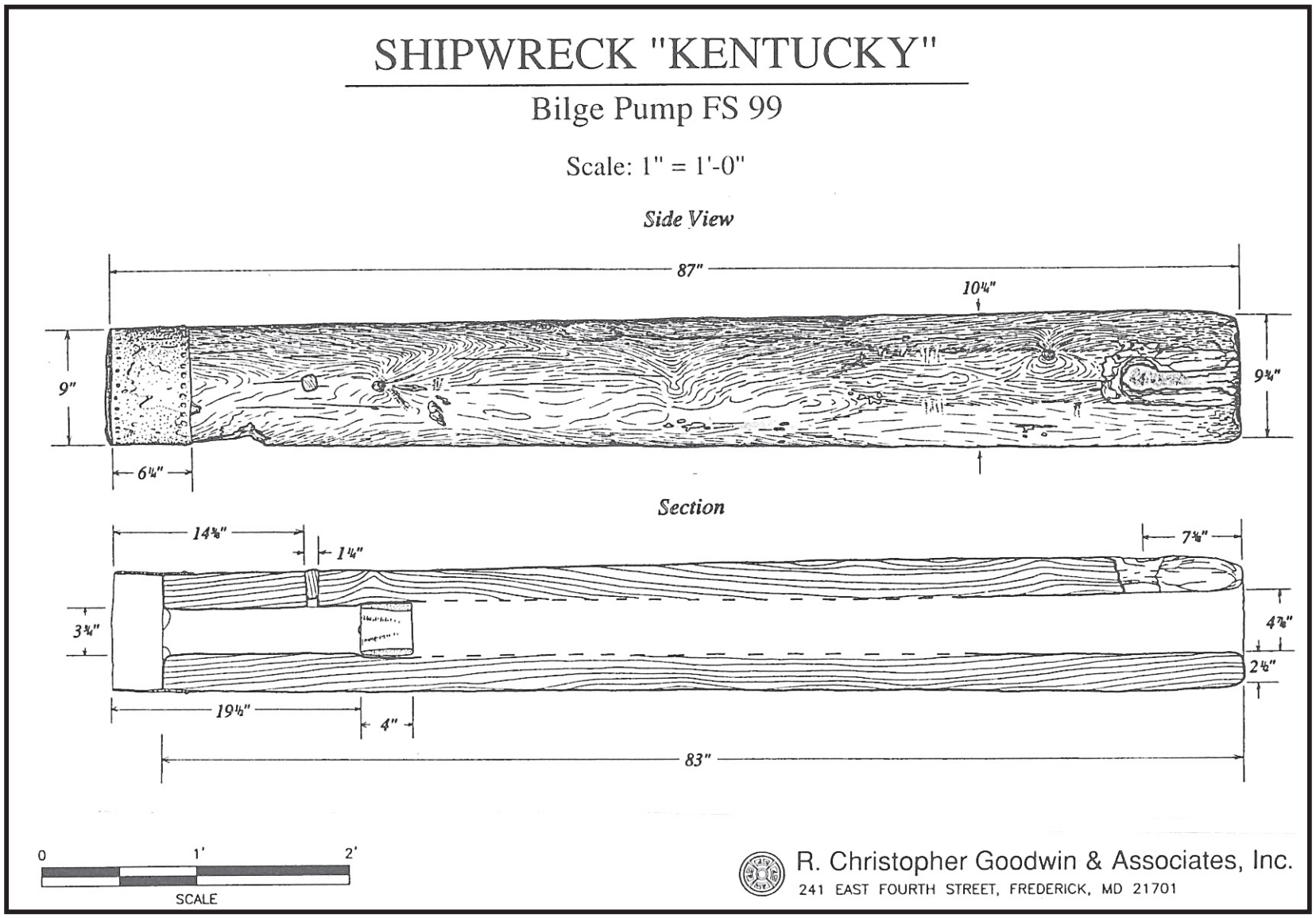


Figure 56 Bilge Pump (FS 99), entire pump

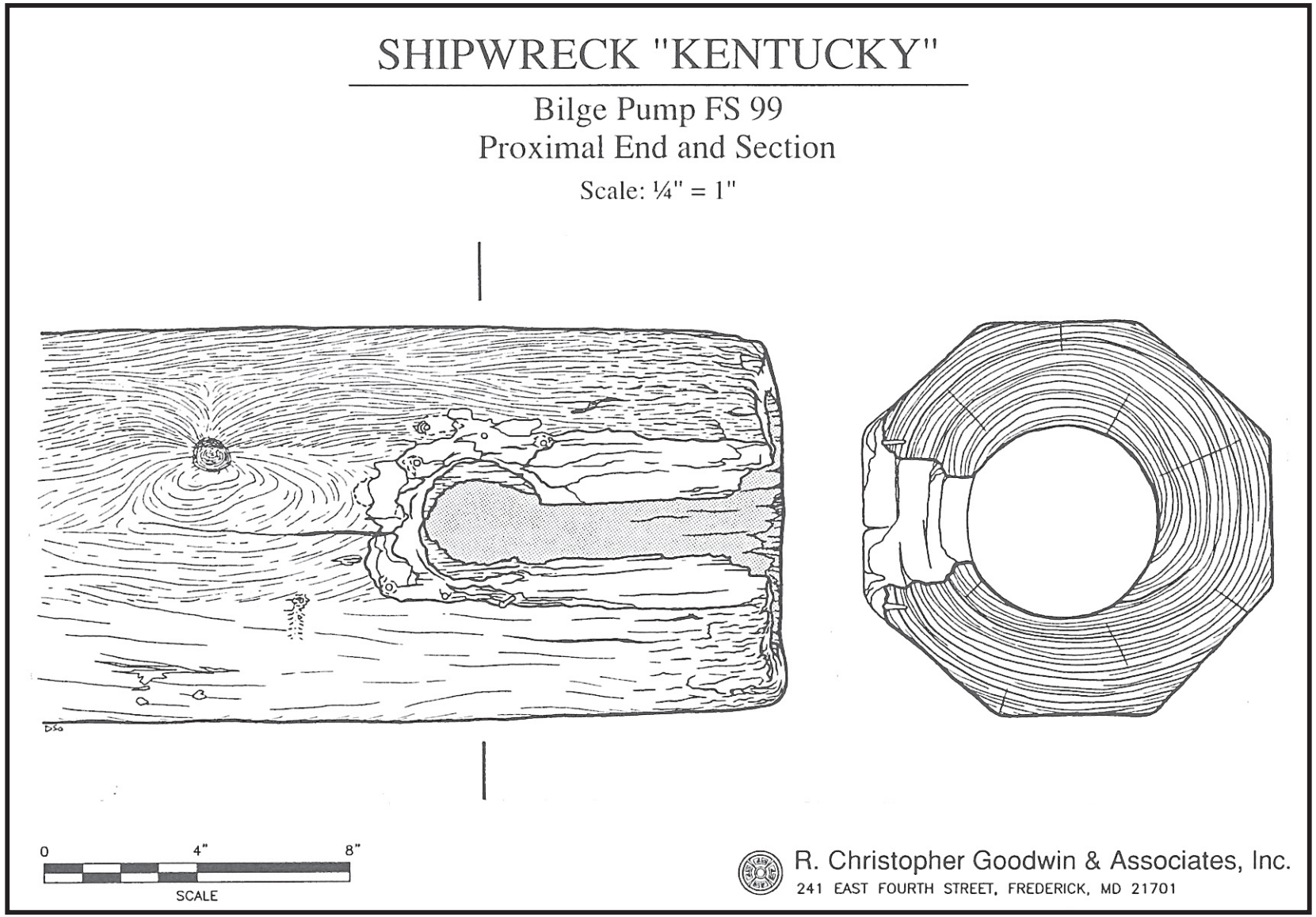


Figure 57 Bilge Pump (FS 99), proximal end and section

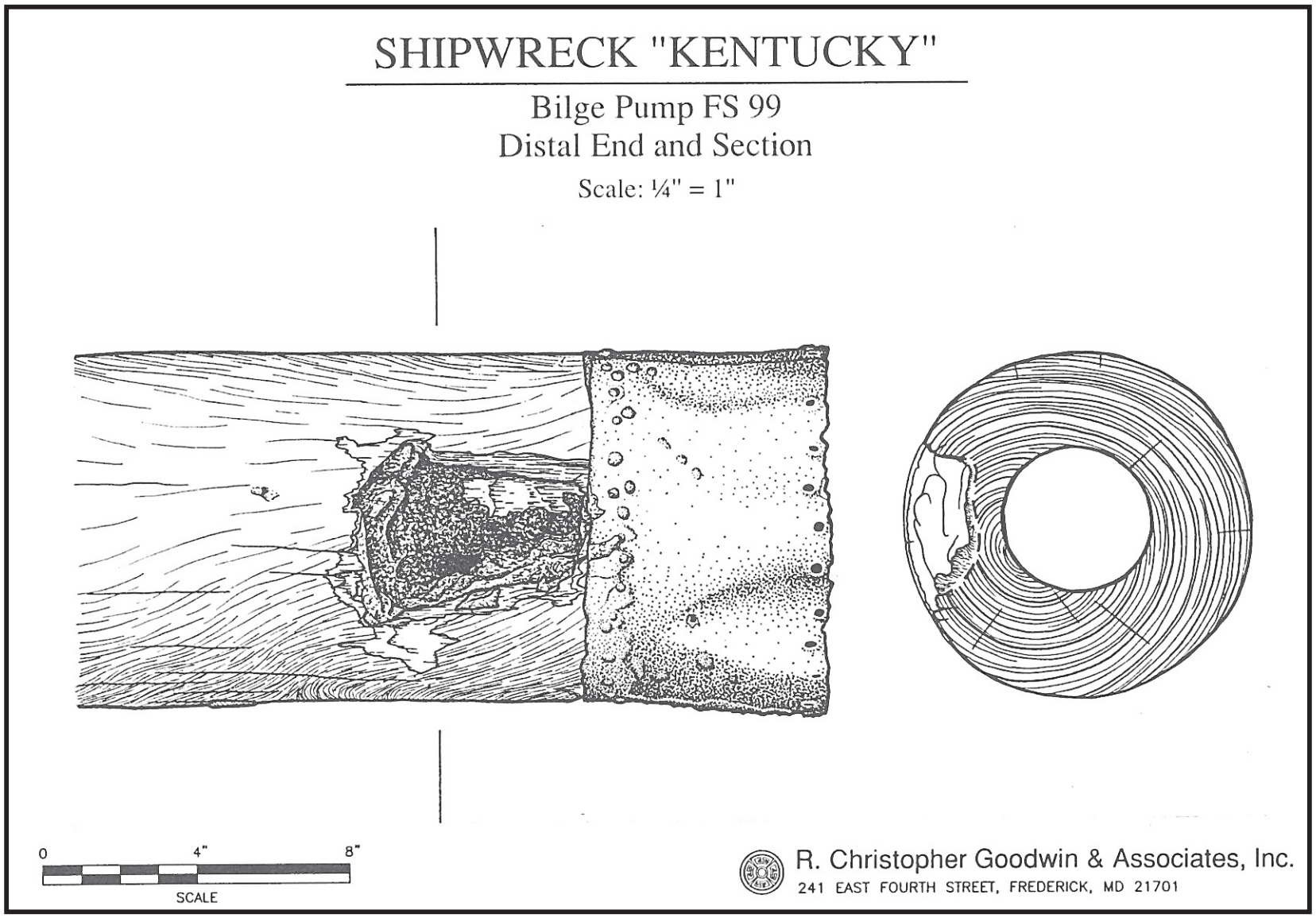


Figure 58 Bilge Pump (FS 99), distal end and section

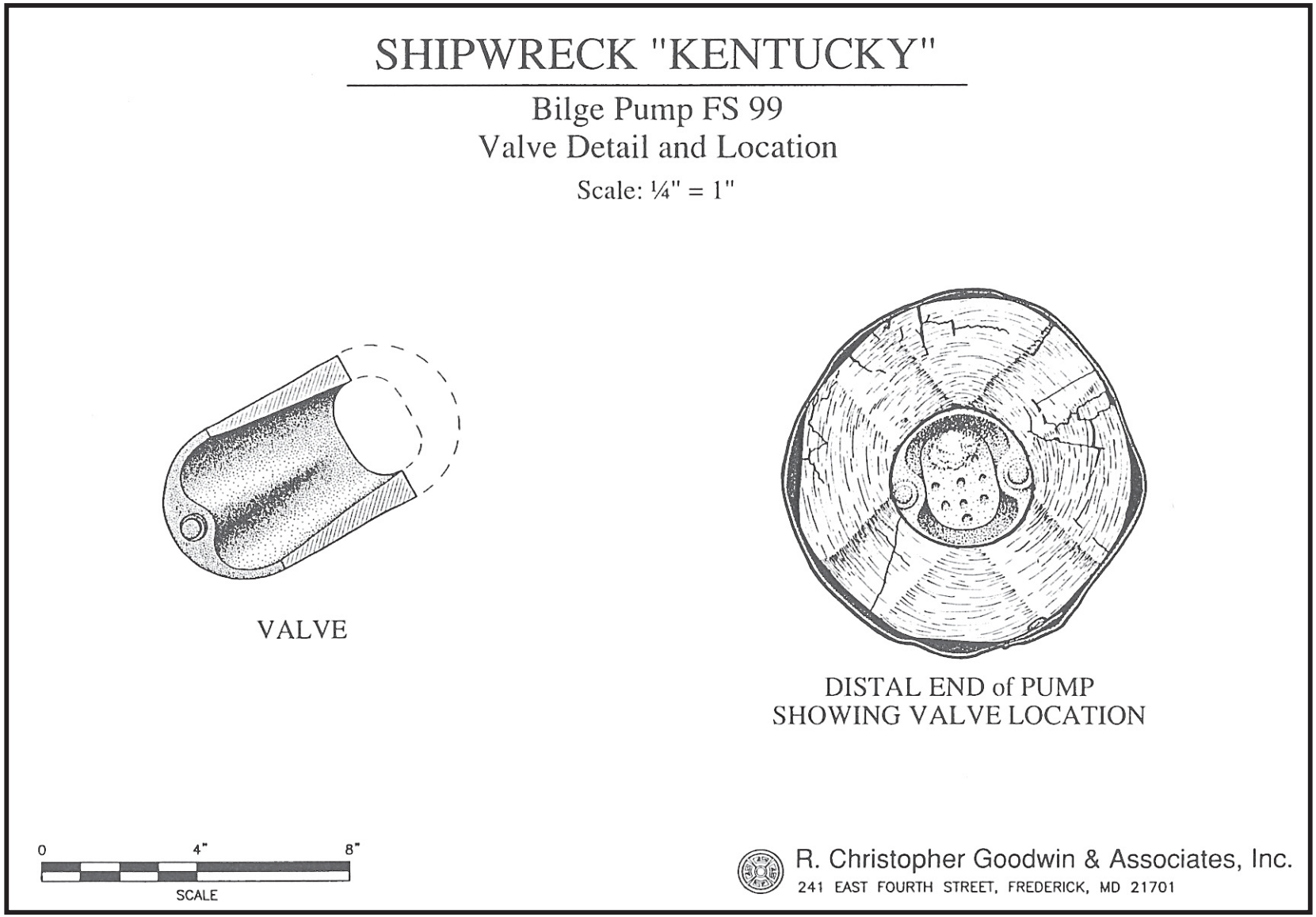


Figure 59 Bilge Pump (FS 99), valve detail and plan view of distal end of pump showing location of valve

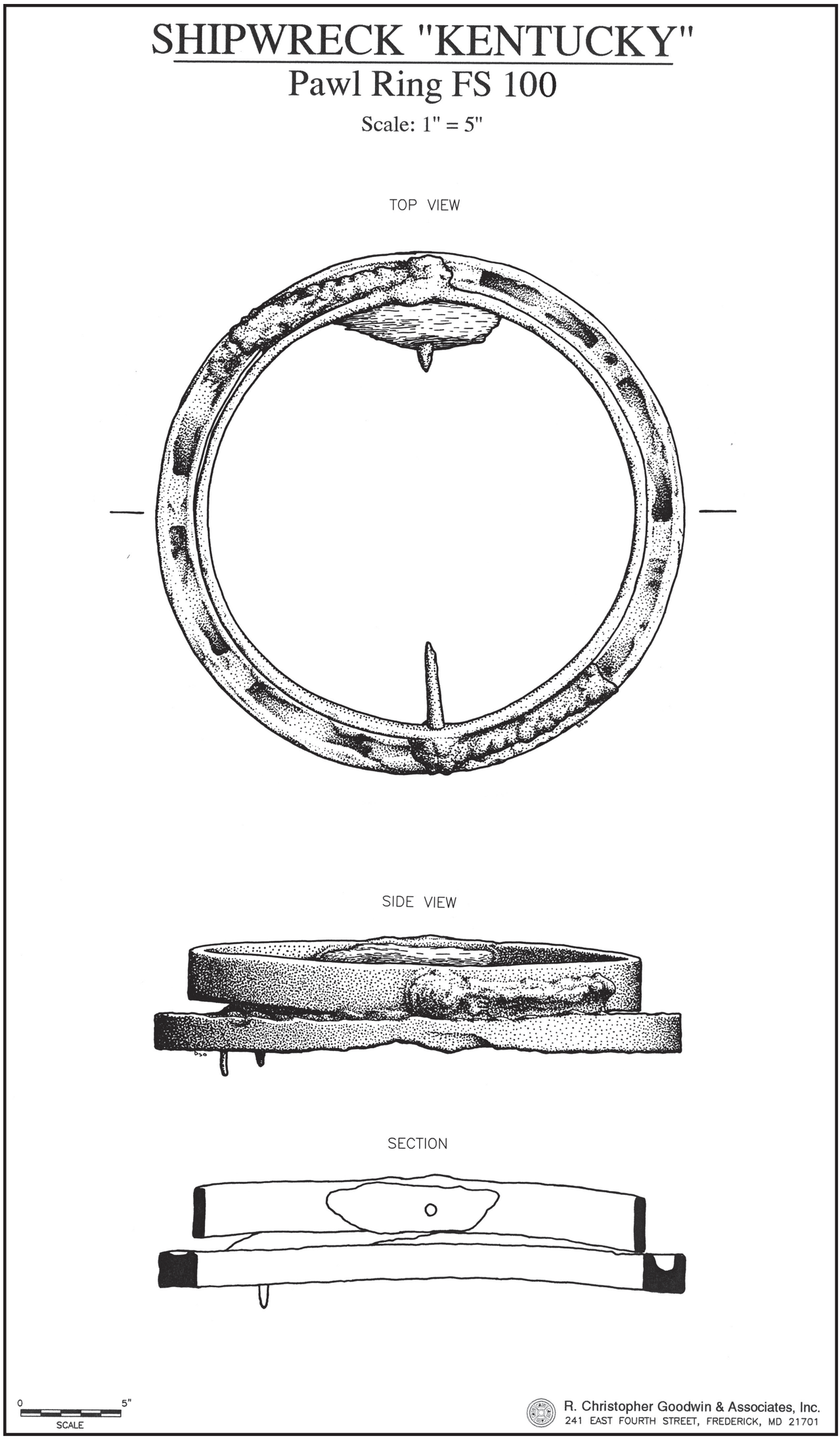


Figure 60 Drawing of capstan pawl ring (FS 100)

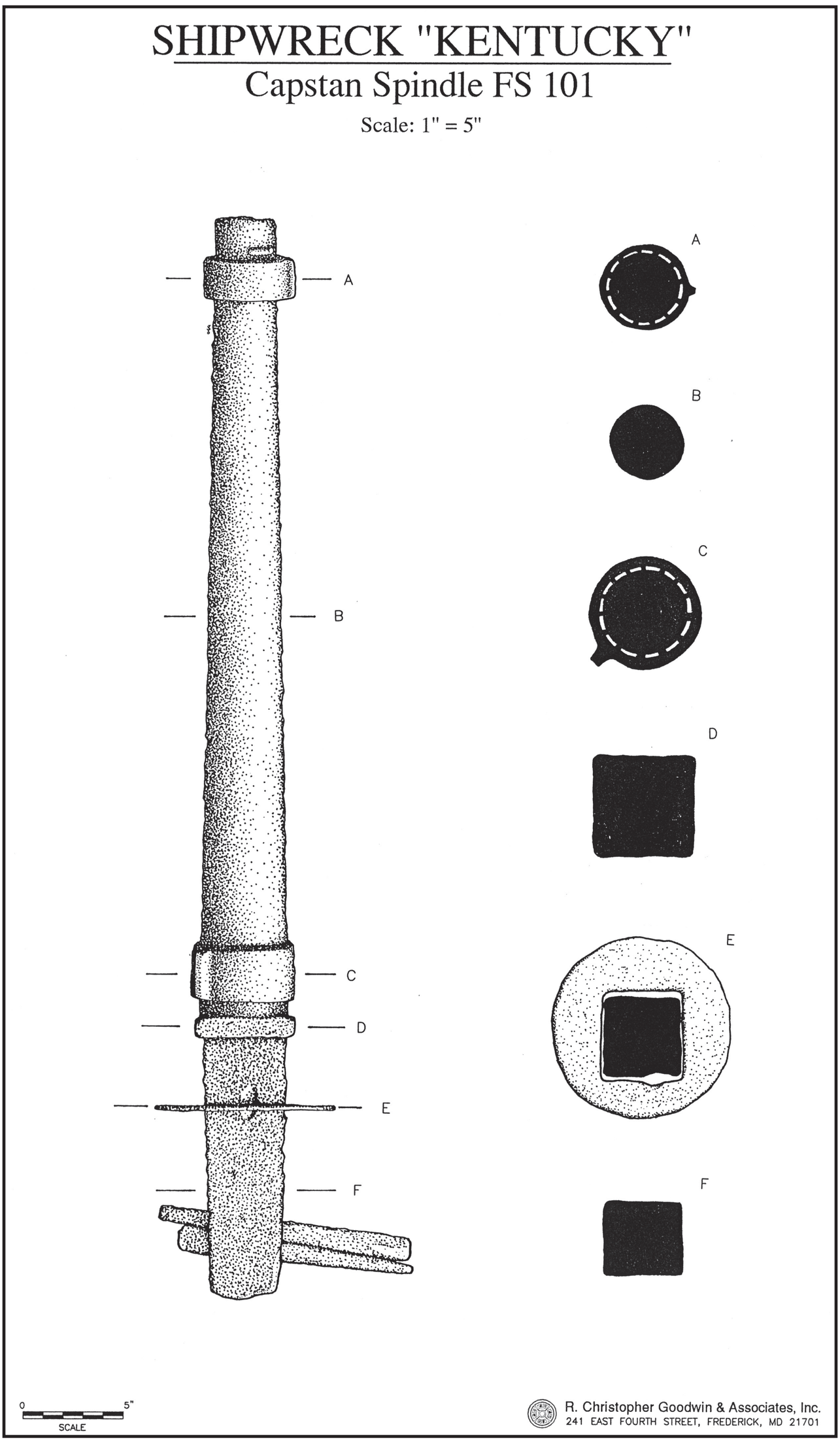


Figure 61 Drawing of capstan spindle (FS 101)

Figure 62 Photograph of conserved anchor

Hawser

Although not technically deck equipment *per se*, a single length of hawser was discovered during excavation of the aftermost portion of the hull, coiled up and lying between half frames F5 and F6. The 5.08 cm (2 in) diameter plain-laid rope actually appeared to have been found in its original position as stowed. It is interesting to speculate whether this stern line was one of the lines that was used in the failed attempt to keep *Kentucky*'s stern along the river bank on the night the steamer sank.

Cargo Boom Hoop

An iron hoop was recorded on and removed from *Kentucky*'s after deck. The hoop consists of a ½ in (1.27 cm) thick x 3.5 in (8.9 cm) wide x 1 ft, 3.5 in (39.4 cm) diameter iron band that has been formed into an open ring with an adjustable screw-clamp mechanism for tightening the hoop around the end of a wooden cargo boom. This boom was located in *Kentucky*'s stern and was used for shifting cargo to and from the after deck.

CHAPTER X

ARTIFACT ASSEMBLAGE

Introduction

Excavation of the *Kentucky* resulted in recovery of 1684 items, including: 917 artifacts, 626 faunal elements, 69 wood samples, 23 seeds and nutshells, and 49 clam and snail shells that likely are naturally-occurring ecofacts. Analysis of the faunal and botanical materials is presented in Chapter XI. This chapter presents the methods and results of analysis of the non-faunal/botanical materials. Measurements and descriptions of artifacts were prepared by various laboratory staff and summarized for this chapter by Anthony Randolph. The materials then were reviewed by senior project staff and Dr. Lawrence E. Babits of the Maritime Studies Program at East Carolina University. Dr. Babits spent several days in Goodwin & Associates, Inc.'s laboratory facility examining the collection and supporting documentation and prepared a report that has been incorporated into this chapter.

Methods

Upon excavation, each artifact was assigned a field specimen (FS) number. The artifact immediately was placed in an appropriate aqueous holding solution in the field and was packed appropriately for transport to Goodwin & Associates, Inc.'s Frederick, Maryland laboratory. During the inventory process, each group of artifacts from a unique provenience were catalogued; all FS numbers were logged and recorded on tags that were affixed to each item. Artifacts then were placed in polyethylene bags or packed in acid-free containers in appropriate aqueous holding solutions to await treatment. The conservation needs of the collection were assessed based on each item's historical significance and the immediacy of its treatment needs. Items selected for conservation and the conservation measures are described in Appendix V. Conservation is ongoing.

All artifacts were identified and classified by material type, distinguishing attributes, and functional category. The coded catalog system incorporated artifact attribute data, artifact counts, comments, and dates, date ranges, or mean dates chronological information; the data base allowed manipulation of all or part of the artifact data sets. The hierarchically arranged artifact classification system included four levels of classification: the category; the functional group, based on Stanley South's (1977) functional classifications; the artifact type, which grouped materials by diagnostic attributes; and, the sub-type. For ceramics, types and sub-types were identified following classification systems developed by Miller (1980, 1991), Noel Hume (1969, 1973, 1976), Worthy (1982), and others. Dating of glass artifacts was predicated on the identification of the manufacturing techniques used to produce the vessel, after models established in Jones and Sullivan (1985).

Assigning artifacts to a functional group is the basic step most often used in the analysis of cultural material from historic sites. Functional classification is based on the use to which the original object was put. A series of functional groups developed by Stanley South (1977) covers most materials from historic sites. These groups consist of activities, arms, architecture, clothing, furniture, kitchen, miscellaneous, personal, and transportation. This grouping can be modified as necessary to accommodate a greater range of materials, and allows for interpretation of the type, age, and function of a site through analysis of the relative quantities of materials from various functional groups. For the purposes of this analysis, a Nautical Group also was included to account for artifacts whose function was ship related.

Each functional category is broken down further for more detailed analysis, generally by ware type. For example, kitchen materials are broken down into glass, ceramic, bone, and metal. This classification system is a basic tool to which other analytical techniques, such as dating, manufacture, changes in occupation or function of a site or locus, or analysis of faunal or botanical materials, can be applied.

Comparative Materials

Civil War material culture is very well documented for the eastern theater, especially for Virginia, Maryland and Pennsylvania (Crouch 1978; Thomas 1997; Todd 1974). The southeastern coastal theater is not as well known but studies are emerging (Babits 1989, 1995; Babits et al. 1987; Legg and Smith 1989; South 1974). Published Army of Tennessee material is available from Tennessee and North Georgia (Braley 1987; McBride 1994; Smith 1994; Wood and Wood 1990). West of the Mississippi River, material culture studies relating to the Civil War are not as well known because few sites have been archeologically excavated and very few relic hunting results have been published. The little information available is not detailed but does present a general overview suggesting a lack of uniformity (Lees 1994). Consequently, many interpretations made here are based on eastern materials.

Neither of the two military units most clearly associated with the sinking of the *Kentucky*, Pindall's Battalion (or Pindall's Sharpshooters), a Missouri unit, and the 3rd Louisiana Cavalry of these units appear in the written record with distinctive clothing or equipment (Todd 1983:855, 974).

The ex-Confederates were not prisoners. The little documentary evidence that exists suggests that their units were disbanded, the men mustered out, and that they then gave their parole to Federal authorities before embarking on the *Kentucky*. The paroled Confederates would not have had any military weapons and accouterments, but they may have carried some military items such as canteens, haversacks, and knapsacks. These items would not likely survive because of differential preservation and because they were light enough to be carried away by the river's current if they were not saved. Some *Kentucky* artifacts, such as the pocketknife and pipes, often were carried in haversacks (Hinman 1895:51-53; McCarthy 1961:296; Billings 1980:276).

Four vessels contemporary with the *Kentucky* were preserved quickly after sinking and have been excavated. The Bertrand was a sternwheel mountain packet intended for use on the Upper Missouri River. The Bertrand was launched in 1864 and sank in 1865. Excavation occurred during 1968-1969. The vessel's structural material has been published (Petsche 1974) and provides good comparative material despite it being a sternwheeler. The Arabia sank in 1856 and construction details have not yet been published. The Maple Leaf has been subjected to considerable analysis but is not well known (Cantelas 1993; 1995; Holland et al 1993). These three

vessels provide the majority of the comparative material for this report. The fourth vessel, the U.S.S. Cairo, was partially documented despite being badly damaged during recovery and subsequent storage (Bearss 1980). As a purpose-built Civil War river ironclad, it is not expected to provide much information on the structural and material culture of non-military riverboats, even if they were carrying soldiers.

The following description and discussion of the artifact assemblage is organized by functional group (Table 8).

Table 8. Functional Groups

Sum of Count		
Group	**Class**	**Total**
Activities	Glass	3
	Metal	10
	Synthetic	8
Activities Total		21
Architecture	Biological	3
	Glass	91
	Metal	318
	Synthetic	14
Architecture Total		426
Arms	Metal	93
Arms Total		93
Clothing	Biological	5
	Ceramic	3
	Glass	3
	Metal	2
Clothing Total		13
Furniture	Biological	1
	Metal	1
Furniture Total		2
Kitchen	Biological	51
	Ceramic	9
	Glass	6
	Metal	48
Kitchen Total		114
Miscellaneous	Biological	14
	Metal	141
	Stone	34
	Synthetic	1
Miscellaneous Total		190
Nautical	Biological	88
	Metal	10
Nautical Total		98
Personal	Biological	2
	Ceramic	1
	Glass	1
	Metal	1
Personal Total		5
Transportation	Metal	4
Transportation Total		4
Grand Total		966

Activities Group

The Activities Group consisted of 21 artifacts (Table 9).

Lamp Fragments

Glass artifacts in the activities group consisted of three lamp glass fragments (FS 82). These likely were associated with liquid fuel, vertical wick lamps. The lamp glass provides evidence for the type of lighting devices used in Western style steamboats during the Civil War period. These fragments represent pieces of the lamp glass globe that shields the burner and wick assembly of the lamp. Lamps of this type were reported to have broken shortly after *Kentucky* went down, starting a fire in the vessel's upper works.

Metal Hardware

Metal artifacts in the Activities Group included eight miscellaneous hardware items, one iron ring and pin, and one lead disk (FS 49). The miscellaneous metal artifacts were: three barbed wire fragments that post-date the wreck (FS 69), two chain link fragments (FS 57, FS 81), two iron nuts (FS 70, FS 108), and an iron washer (FS 5). The lead disk (FS 49) probably is a baling seal. This item is irregular in outline and has an apparent hole through the middle that seems to have an iron concretion in it. The letters "DE" are on one side of the hole. If the concretion in the hole is iron, then it is likely wire and, if so, this lead disk is probably a seal.

Table 9. Activities Group

Sum of Count				Group
Class	**Type**	**Subtype**	**FS Number**	**Activities**
Glass	Miscellaneous	Lamp Glass	82	3
		Lamp Glass Total		3
	Miscellaneous Total			3
Glass Total				3
Metal	Miscellaneous Hardware	Barbed Wire	69	3
		Barbed Wire Total		3
		Chain	57	1
			81	1
		Chain Total		2
		Nut	70	1
			108	1
		Nut Total		2
		Washer	5	1
		Washer Total		1
	Miscellaneous Hardware Total			8
	Tool	Unidentified	82	1
		Unidentified Total		1
	Tool Total			1
	(blank)	lead disk	49	1
		lead disk Total		1
	(blank) Total			1
Metal Total				10
Synthetic	Miscellaneous	Rope	11	5
			14	3
		Rope Total		8
	Miscellaneous Total			8
Synthetic Total				8
Grand Total				21

The iron ring and pin (FS 82) were concreted together. The ring measured 2.5 inches in diameter with approximately a .25 inch wire width. The pin, the proximal end of which terminates in a .5 inch diameter eye, is approximately 3 inches long with a shank width of .25 inches. These component parts were fused together with a mass of corrosion product that clearly exhibited wood grain pseudomorphs along the shaft of the pin, where it had extended through the deck planks. The location of the pin and ring next to the anchor on the main deck suggests that it was used as a tie-down point for use in securing the anchor. Although placed in the Activities Group during initial analysis, it may be better categorized as part of the Nautical Group.

Hawser

Eight fragments of plain-laid hemp rope (FS 11, 14) were included in the Activities Group, although they might have been placed in the Nautical Group with equal justification. The best preserved piece of line (FS 11) was originally approximately two inches in diameter and had a 6.5 inch circumference. It was hawser-laid with three strands composed of seven yarns (Smythe 1996:579-80). Hawser, which is defined as rope with a circumference of 5.0 inches or greater, typically was used as an anchor or throw line (Kemp 1988).

Architecture Group

The Architecture Group consisted of 426 artifacts (Table 10). Three pieces of cut lumber (FS 10) comprised the biological class of the Architecture Group. These may have been used as shims, as evidenced by the compression ghosts that scar these artifacts.

Window Glass

Glass was represented in the Architecture Group by 91 window glass fragments (FS 10, 20, 21, 25, 26, 27, 30, 31, 35, 36, 40, 45, 53, 54, 82, 90, 108). The window glass measures approximately 1/6 inch thick and is representative of the typical sheet glass common during the mid-nineteenth century. Windows using this type of glass were located on the boiler, hurricane, and texas decks of the *Kentucky*, and perhaps sparingly on the main deck. The *Kentucky*'s architectural glass was not decorated by painting or etching. The lack of decorated window glass may reflect a less ornate vessel than other steamboats, some of which had elaborately treated window glass in the cabins and salon (Hunter 1949:395-97). As an example, the Maple Leaf had etched and painted architectural glass (Cantelas 1995:153-156). Since approximately 20 per cent of the recovered Maple Leaf glass was decorated (Cantelas 1995:152), if the *Kentucky* had decorated window glass, some examples should have survived. On the other hand, all of the pane glass recovered from *Kentucky* was retrieved in the proximity of the hull and main deck, and it may have originated on the lower decks of the vessel. It thus may reflect the use of less ornate materials on the main and boiler decks, but not necessarily a lack of detail in the primary passenger areas.

Fasteners

Metal artifacts in the Architecture Group include 77 spikes and spike fragments, 238 nails and nail fragments, and three miscellaneous construction hardware items. The three miscellaneous construction hardware items were iron nuts from FS 106.

In general, the complete spikes recovered from the *Kentucky* possessed large, circular heads with a straight shank and were hand-wrought (Table 11). Variations within this sub-type were manifested in shank length and width. Slender spikes, with average shank dimensions of 5.5 x 0.25 inches, probably were used to join single structural elements such as futtocks and deck beams. Larger spikes, with shank dimensions as large as 13 x ½ inches, likely were used to secure multiple structural elements such as the gudgeon, stern hook and stern post attachment and the keelson, futtock, and keel union.

Table 10. Architecture Group

Sum of Count				Group
Class	**Type**	**Subtype**	**FS Number**	**Architecture**
Biological	Architectural Element	Lumber (cut)	10	3
		Lumber (cut) Total		3
	Architectural Element Total			3
Biological Total				3
Glass	Architectural Element	Window Glass	10	1
			20	1
			21	1
			25	2
			26	5
			27	3
			30	1
			31	1
			35	1
			36	1
			40	2
			45	1
			53	4
			54	1
			82	63
			90	1
			108	2
		Window Glass Total		91
	Architectural Element Total			91
Glass Total				91
Construction Hardware		Other	106	3
		Other Total		3
		Spike	6	1
			7	1
			10	2
			14	9
			17	1
			22	2
			23	6
			25	3
			26	11
			27	4
			30	2
			31	5

			32	1
			34	1
			42	1
			44	1
			45	1
			53	1
			81	1
			84	9
			98	1
			103	7
			107	6
		Spike Total		77
	Construction Hardware Total			80
	Machine Cut Nail	> 4"	23	1
			86	1
			103	8
		> 4" Total		10
		2-4"	9	1
			23	1
		2-4" Total		2
		Fragment	6	3
			9	7
			23	4
			86	2
		Fragment Total		16
	Machine Cut Nail Total			28
	Machine Cut Nail, Common	< 2"	107	2
		< 2" Total		2
		> 4"	32	1
			46	1
			84	1
			107	9
			108	6
		> 4" Total		18
		2-4"	20	1
			25	1
			43	2
			45	1
			93	1
			94	2

			98	8
			107	5
			108	3
		2-4" Total		24
		Fragment	8	14
			17	3
			18	1
			19	3
			20	2
			21	5
			22	1
			25	8
			27	3
			34	2
			43	6
			44	1
			45	7
			49	9
			50	3
			51	4
			52	4
			53	8
			55	3
			58	1
			60	7
			62	1
			63	1
			72	4
			78	1
			82	5
			83	4
			84	1
			87	5
			88	2
			93	1
			98	6
			107	11
			108	7
		Fragment Total		144
	Machine Cut Nail, Common Total			188
	Machine Cut Nail, Finish	< 2"	5	1

		< 2" Total		1
		2-4"	9	1
			10	3
		2-4" Total		4
		Fragment	5	1
			9	1
			10	5
			20	1
			23	2
			25	2
		Fragment Total		12
	Machine Cut Nail, Finish Total			17
	Unidentified	Cut/Wrought Nail	9	1
			34	1
		Cut/Wrought Nail Total		2
		Nail	43	3
		Nail Total		3
	Unidentified Total			5
Metal Total				318
Synthetic	Miscellaneous	Roofing Shingle, Tar Paper	62	1
			70	2
			72	4
			82	6
		Roofing Shingle, Tar Paper Total		13
		Tar Paper	17	1
		Tar Paper Total		1
	Miscellaneous Total			14
Synthetic Total				14
Grand Total				426

Table 11. Summary of Complete Spikes

FS#	Type	Subtype	Count	Comments
7	Construction Hardware	Spike	1	4.25"x0.25"
10	Construction Hardware	Spike	1	complete
10	Construction Hardware	Spike	1	3" fragment
17	Construction Hardware	Spike	1	4.25" long w/0.5" wide shank
22	Construction Hardware	Spike	2	1" x 2.5" frag. & 1" x 1.5" frag., both are 0.5" square shanked deck spikes
23	Construction Hardware	Spike	2	
23	Construction Hardware	Spike	4	all 0.5" square shanked spike
25	Construction Hardware	Spike	1	6" long shank is 0.5" wide & square
25	Construction Hardware	Spike	1	4.5" long shank is 0.5" wide & square
26	Construction Hardware	Spike	2	4.5" long shank is 0.25" square
26	Construction Hardware	Spike	6	5" long shank is 0.25" square
27	Construction Hardware	Spike	2	0.25" square shanked, 4.5" long, spikes are carbonized
27	Construction Hardware	Spike	2	5.5" long shank is 0.5" square
30	Construction Hardware	Spike	1	5" frag. of 0.5" square shanked spike
30	Construction Hardware	Spike	1	0.5" square shanked, 5" long spike
31	Construction Hardware	Spike	2	2" x 4.5" long, 0.5" square shanked deck spikes, 1 w/wood attachment
42	Construction Hardware	Spike	1	siding spike, 8"x0.5" shank
44	Construction Hardware	Spike	1	10"x5/8" shank
45	Construction Hardware	Spike	1	10"x5/8" shank
53	Construction Hardware	Spike	1	6" long w/0.5" shank, bent at 90 degree angle, with "ghost" indicating that half of nail was exposed
81	Construction Hardware	Spike	1	0.25" wide shank, poss. hull spike, small
84	Construction Hardware	Spike	9	deck/hull spike frags., iron, 0.25" shank
98	Construction Hardware	Spike	1	8"x0.5" shank
103	Construction Hardware	Spike	7	Deck spikes, all spikes 13"x0.5"
107	Construction Hardware	Spike	6	headless machine cut spike, iron

The 57 complete nails recovered from the *Kentucky* are typical of the machine-cut nails of the mid- to late nineteenth century (Table 12). Given the relatively standard nail form, functional differentiation within this sub-assemblage was ascertained only through measuring shank length. The shank length subdivisions include: (3) machine cut nails with a shank less than 2 inches; (30) machine cut nails with a 2-4 inch shank; and (24) machine cut nails with shanks measuring 4 inches or greater.

Nails with a shank length of less than 2 inches were used to fasten trim, wall sheathing, and other decorative wooden elements to the main structural framework of the vessel. These types of nails would have been used most often in the ship's interior cabins and staterooms. Nails with shank lengths of between 2 and 4 inches were used to fasten deck planking to deck beams. Nails with shank lengths greater than 4 inches were used to secure deck planking to the frames (generally using 5 ½ inch long nails) and to pin structural elements together.

Table 12. Summary of Complete Nails

FS#	Type	Subtype	Count	Comments
5	Machine Cut Nail, Finish	< 2"	1	1/8" wide shank
9	Machine Cut Nail	2-4"	1	head missing or headless
9	Machine Cut Nail, Finish	2-4"	1	1/4" wide shank
10	Machine Cut Nail, Finish	2-4"	3	complete w/ 1/8" wide shank
20	Machine Cut Nail, Common	2-4"	1	complete
23	Machine Cut Nail	> 4"	1	complete
23	Machine Cut Nail	2-4"	1	complete
25	Machine Cut Nail, Common	2-4"	1	complete
32	Machine Cut Nail, Common	> 4"	1	5.5" long x 0.25" wide square shank, severe ferric concretions
43	Machine Cut Nail, Common	2-4"	1	headless brad w/1/8" x 1/8" shank
43	Machine Cut Nail, Common	2-4"	1	
45	Machine Cut Nail, Common	2-4"	1	
46	Machine Cut Nail, Common	> 4"	1	deck plank fastener, iron
84	Machine Cut Nail, Common	> 4"	1	well preserved example, poss. carbonized (burned)
86	Machine Cut Nail	> 4"	1	poss. carbonized, condition is good
93	Machine Cut Nail, Common	2-4"	1	1/4" wide shank
94	Machine Cut Nail, Common	2-4"	2	deck plank nails, 1/8" shank dimension
98	Machine Cut Nail, Common	2-4"	8	0.24" shank, some well preserved, others badly concreted
103	Machine Cut Nail	> 4"	4	4.25"x0.25"
107	Machine Cut Nail, Common	< 2"	2	1/8" shank, iron
107	Machine Cut Nail, Common	> 4"	9	0.25" shank, iron
107	Machine Cut Nail, Common	2-4"	5	1/8" shank, iron
108	Machine Cut Nail, Common	> 4"	2	0.25" shank
108	Machine Cut Nail, Common	> 4"	4	0.25" shank, iron
108	Machine Cut Nail, Common	2-4"	1	0.25" shank, iron
108	Machine Cut Nail, Common	2-4"	2	1/8" shank, iron

Deck and Roof Tarring

Also included in the Architecture Group were 14 pieces from FS 17, 62, FS 70, FS 72, and FS 82, that initially were classified as “roofing shingle/tar paper.” Some of this material was tar paper, while other fragments were simply tar; both were used as a sealant. Tar was paid into the seams to make them watertight. The roof of the vessel usually was covered with tar paper to shed water. Often, the roofing was composed of sand or sawdust to make the paper more resistant to wear (Bates 1968:59) and to improve traction on a wet deck. Tar paper from the *Kentucky* is approximately 1/8th inch thick and appears to have sand mixed in the tar.

Arms Group

The Arms Group consisted of 93 artifacts (Table 13). This group included 11 fragments of lead shot (FS 102), a .22 caliber bullet (FS 44), and 81 whole and fragmentary percussion caps (FS 34, 36, and 102).

Table 13. Arms Group

Sum of Count				Group
Class	**Type**	**Subtype**	**FS Number**	**Arms**
Metal	Projectile Part	Centerfire Cartridge .22	44	1
		Centerfire Cartridge .22 Total		1
		Lead Shot	102	11
		Lead Shot Total		11
		Percussion Cap	34	2
			36	2
			102	77
		Percussion Cap Total		81
	Projectile Part Total			93
Metal Total				93
Grand Total				93

Shot

Among the 11 lead shot recovered, a group of nine cast lead shot with variable diameters approximating 5/16 inch with sprues cut off were found in a single cluster (FS 102). Several had an air hole suggesting the lead was very hot when poured into what was probably a gang mold. These shot may have been a single paper wrapped shotgun cartridge. However, it is also possible that it was a buckshot load (Figure 63) for a smoothbore, .69 caliber musket, although twelve and fifteen .31 caliber shot were more commonly used (Thomas 1997:104; Dean S. Thomas, personal communication, 14 August 1999). Given the irregular shape and size and the wide casting seams, it is possible these were cast in a stone mold or, if done in a metal mold, it was very worn.

A fired .22 caliber lead bullet (FS 44) found in the bilge may be intrusive. This size bullet is not typical of those utilized in the Civil War era. This bullet is not likely to have washed in because of its small size and relatively heavy weight. Since the vessel has been exposed on occasion, it is possible that this bullet represents a post-1900, target shooting or hunting episode where the bullet was fired, probably from a rifle at the *Kentucky*'s stern area after the aft decking was lost.

Percussion Caps

Many percussion caps for muskets or rifled muskets were recovered. There are at least two types of musket percussion caps in the collection (Figure 64). One type has four flanges, the other six. Making a distinction between these variant percussion caps is probably not relevant in terms of the original users but they are different. The most common type is the four-flange style (Lord 1982:190). Very little research on percussion caps has been published to date. It is possible that the six flanged caps are European or from a locally produced source (Dean S. Thomas, personal communication 14 August 1999).

FS 102 is especially interesting because at least 24 percussion caps were found together with a badly corroded piece of leather. The leather, despite efforts to stabilize it, did not survive but descriptions of it by the excavators mention that it was paper thin and very brittle. It is likely

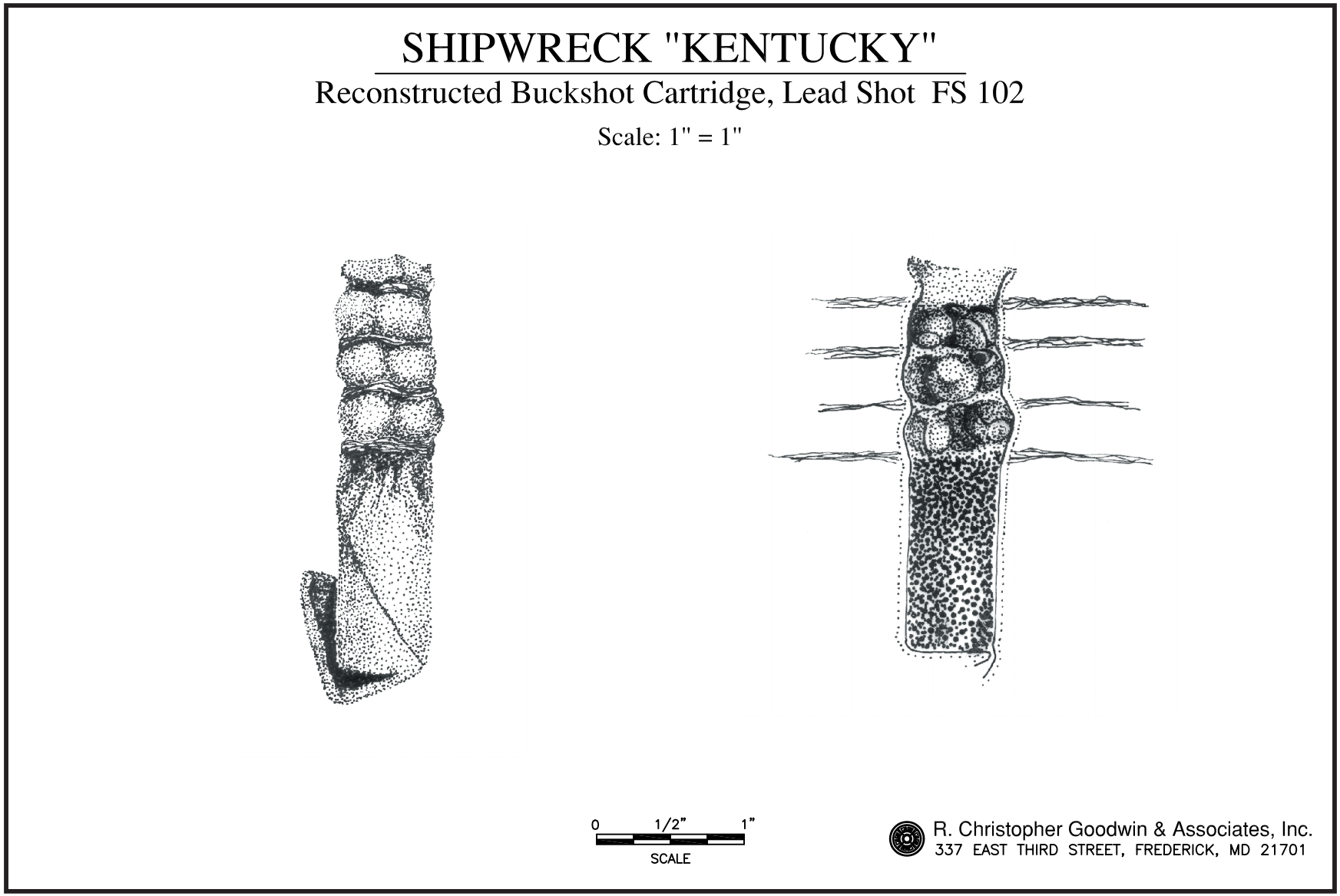


Figure 63 Drawing of reconstructed buckshot cartridge (lead shot balls recovered from FS 102)

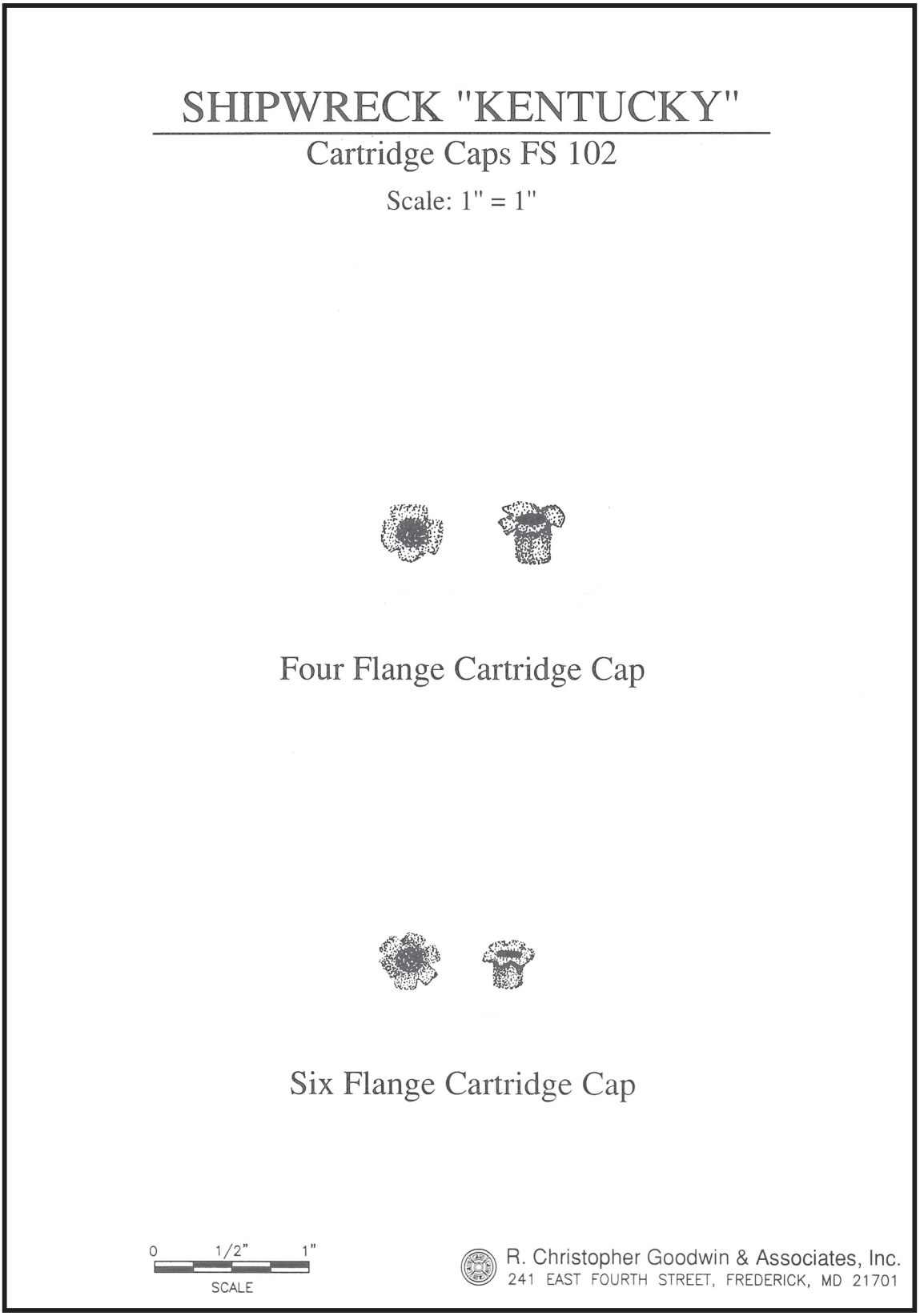


Figure 64 Drawing of percussion caps (FS 102). Top: four flange; Bottom: six flange

this clustering of caps represented the contents of a single cap pouch filled with caps from two different sources.

Clothing Group

Thirteen artifacts comprised the Clothing Group (Table 14). This group is composed of eleven buttons and two fragments of the possible cap pouch, discussed above, which did not survive despite efforts at stabilization.

Table 14. Clothing Group

Sum of Count				**Group**	
Class	**Type**	**Subtype**	**FS Number**	**Clothing**	**Grand Total**
Biological	Bone/Leather Clothing	Bone Button	56	1	1
			97	1	1
		Bone Button Total		2	2
		Other	102	2	2
		Other Total		2	2
	Bone/Leather Clothing Total			4	4
	Wood Clothing	Wooden Button	34	1	1
		Wooden Button Total		1	1
	Wood Clothing Total			1	1
Biological Total				5	5
Ceramic	Ceramic Clothing	Porcelain Button	19	1	1
			25	1	1
			33	1	1
		Porcelain Button Total		3	3
	Ceramic Clothing Total			3	3
Ceramic Total				3	3
Glass	Glass Clothing	Button	34	1	1
			48	1	1
			82	1	1
		Button Total		3	3
	Glass Clothing Total			3	3
Glass Total				3	3
Metal	Metal Clothing	Brass Button	36	1	1
			82	1	1
		Brass Button Total		2	2
	Metal Clothing Total			2	2
Metal Total				2	2
Grand Total				13	13

Buttons

Of the eleven buttons recovered, two were military and the others were civilian. The two military buttons were made of yellow metal, a copper alloy. Both buttons are missing their backs, a crucial element for identifying the manufacturer.

Military Buttons. FS 36, a Confederate Infantry button, had a block, or Roman "I" on its face (Figure 65). The "I" is plain rather than lined. Examples of this type were made in England by Charles Rowley (Albert 1976:374-6; McGuinn and Bazelon 1992:84). While it most closely resembles Albert #181, a Richmond, Virginia, type, it is more likely that it was produced in the west, possible in New Orleans or Baton Rouge. Many local variants exist and it is much more likely that this specimen with its high copper content is a local product. The dimensions of the front shell are .85 inches in diameter and .15 inches in width. The back piece is badly deteriorated but is also constructed of cuprous alloy. The cuprous alloy eye shank was soldered to the back piece using a tin/lead compound.

The other yellow metal button (FS 82) was a Union infantry button with a diameter of 0.6 inches (Figure 65). The smaller of two generalized sizes, it was used on kepis, coat and jacket cuffs and vests (Albert 1976:39). Similar buttons are routinely found in both Union and Confederate campsites (Crouch 1978:100,120,140; Legg and Smith 1989:100,108; McBride 1994:146-47; Smith 1994:70).

Non-Military Buttons. Two bone buttons were recovered. FS 97 is a recessed, four hole variety (Figure 65). It is very large for a button (2.25 inches diameter and 1/16 inch thick), suggesting use on a civilian overcoat. FS 56 is a recessed four hole, 0.7 inch diameter button. This button may have had gold leaf on it as there was a fragment of gold leaf in the recessed area around the holes. This size button was used in a variety of places including shirt, vest and trouser fly.

Six milk glass/porcelain buttons were recovered. FS 25, 33, 34, 48 and 82 are four hole, .4 inch diameter buttons (Figure 66). This type button was commonly used on shirts and underwear (Legg and Smith 1989:105-106). FS19 is a larger porcelain/milk glass button .6 inch in diameter that may have been used on a shirt or as a fly button.

The wood button recovered from FS 34 was fashioned from a wooden disc measuring approximately ½ inch in diameter and approximately 1/6 inch thick (Figure 65). As with the porcelain/milk glass buttons, this wooden example has four holes in its recessed centers. Some remnants of possible gold leaf or paint remain on the button's surface.

No shell buttons nor any tinned and iron buttons (Legg and Smith 1989:106; Lewis 1972:68) were found. Their absence is somewhat surprising since they were very common on both civilian and military clothing. Used as suspender, fly and underwear fasteners, they were susceptible to loss because of rough use. Their absence from the *Kentucky* collection may be due to differential preservation, in that they were small and thin and likely quickly rusted away. Generally speaking, the difference between suspender/fly buttons and others is that they have a bulge on the reverse to create space between the garment's fabric and the button's reverse surface. The gap facilitates movement of the button when fastened. The post-Civil War, U.S. Army Quartermaster documents detailing buttons suggest that the suspender buttons were 27 lignes diameter while the fly buttons were 22 lignes (Greene 1986:94-95). The smaller size is about one half inch, the larger is about 0.6 inch.

Figure 65 Photograph of selected buttons. Top Row, Left to Right: FS34 – wooden button; FS 97 – bone button; FS 56 - bone button. Bottom Row, Left to Right: FS 36 – Confederate Infantry button; FS 82 – Union Infantry button

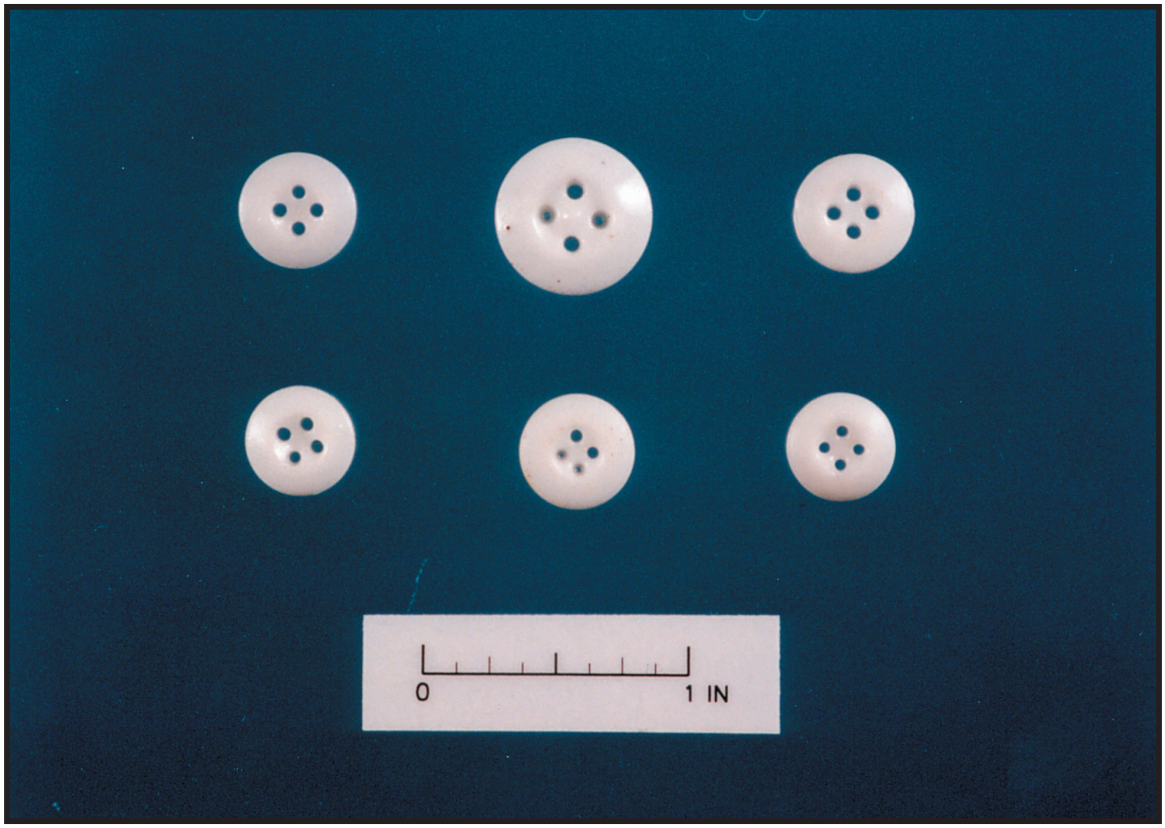


Figure 66 Photograph of milk glass/porcelain buttons (FS 19, 25, 33, 34, 48, and 82)

Furniture Group

Two artifacts were included in the Furniture Group (Table 15). An irregularly shaped piece of wood (Figure 67) with two very small holes may be a drawer pull for a desk or a cabin bureau (FS 93). This was 1.5 inches long, 0.4 inch high and 0.6 inch wide. What probably is the under side was beveled at both ends to provide a concavity for gripping. The fastener hole shapes and small diameter indicates they probably were finishing nails or brads. The other item in the Furniture Group was a single brass furniture tack (FS 9) measuring 2.5 inches in length.

Table 15. Furniture Group

Sum of Count				**Group**
Class	**Type**	**Subtype**	**FS Number**	**Furniture**
Biological	Drawer Pull	Other	93	1
		Other Total		1
	Drawer Pull Total			1
Biological Total				1
Metal	Miscellaneous Hardware	Brass Tack	9	1
		Brass Tack Total		1
	Miscellaneous Hardware Total			1
Metal Total				1
Grand Total				2

Kitchen Group

The Kitchen Group contained 114 items (Table 16). Items in the Kitchen Group were classified as biological, ceramic, glass, and metal. Biological materials in the Kitchen Group included 44 clam shells and 5 snail shells. The clam shells and snail shells likely represent naturally occurring organisms rather than cultural artifacts.

Knives

Also included in this group were a bone knife handle (FS 75) and a wooden knife handle (FS 79). The bone-handled table knife (FS 75) was found in the stern bilge. This knife is more typical of those used in a home setting than in the field. The blade probably was about one inch high and one eighth inch thick. Similar knives were found on the Maple Leaf (Cantelas 1993:67) and on either the C.S.S. *Florida* or the U.S.S. *Cumberland* (Robinson 1996:77). This style also has been found in eastern army camps (Crouch 1978:64) and on blockade runners (Bright 1977:140). FS 75 contained copper alloy and ferrous alloy components; it included the complete handle, which was formed from two bone coverings that "sandwich" the ferrous alloy knife tang. Three cuprous alloy rivets, spaced roughly equidistant along the length of the handle, secured the two bone coverings to the tang. The handle measures approximately 3.25 inches long and is approximately 0.75 x 0.3 inches thick. Approximately 1.5 inches of the severely corroded ferrous alloy blade remains. The wooden knife handle fragment (FS 79) consisted of a severely decayed wooden handle measuring 3.25 inches long and approximately 0.75 x 0.75 inches thick. The artifact was manufactured by pinning two worked hardwood slats to either side of a ferrous alloy tang. Two ferrous alloy pins, spaced roughly equidistant along the length of the handle, attached these wooden sidepieces to the iron shaft. The majority of the wooden coverings have deteriorated,

Table 16. Kitchen Group

5				Group
Class	**Type**	**Subtype**	**FS Number**	**Kitchen**
Biological	Kitchen Use	Bone Handle	75	1
		Bone Handle Total		1
		Wood Handle	79	1
		Wood Handle Total		1
	Kitchen Use Total			2
	Shell	Clam	60	33
			62	11
		Clam Total		44
		Unidentifiable	62	5
		Unidentifiable Total		5
	Shell Total			49
Biological Total				51
Ceramic	Domestic Brown Stoneware	Brown Salt-Glaze, Undecorated	7	1
		Brown Salt-Glaze, Undecorated Total		1
	Domestic Brown Stoneware Total			1
	Early Porcelain Type	Canton	20	1
		Canton Total		1
	Early Porcelain Type Total			1
	Ironstone	White Undecorated	65	1
		White Undecorated Total		1
	Ironstone Total			1
	Later Porcelain Type	Undecorated Porcelain, Hard	10	1
		Undecorated Porcelain, Hard Total		1
	Later Porcelain Type Total			1
	Pearlware	Annular	25	1
		Annular Total		1
	Pearlware Total			1
	Whiteware	Undecorated	7	1
			9	3
		Undecorated Total		4
	Whiteware Total			4
Ceramic Total				9
Glass	Unidentified Bottle Glass	Amethyst	109	2
		Amethyst Total		2
		Clear	82	2
		Clear Total		2
		Dark Green	82	1
		Dark Green Total		1
		Green	87	1
		Green Total		1
	Unidentified Bottle Glass Total			6
Glass Total				6
Metal	Kitchen Pot	Coffee/Tea Pot	94	2
		Coffee/Tea Pot Total		2
		Cup	36	3
		Cup Total		3
		Kettle	36	1
			56	1
			60	31
			61	1
			82	1
			94	1
			95	1
		Kettle Total		37
		Skillet	42	1
			82	1
		Skillet Total		2
		Dutch Oven	59	1
		Dutch Oven Total		1
	Kitchen Pot Total			45
	Kitchen Utensil	Unidentified Handle	72	3
		Unidentified Handle Total		3
	Kitchen Utensil Total			3
Metal Total				48
Grand Total				114

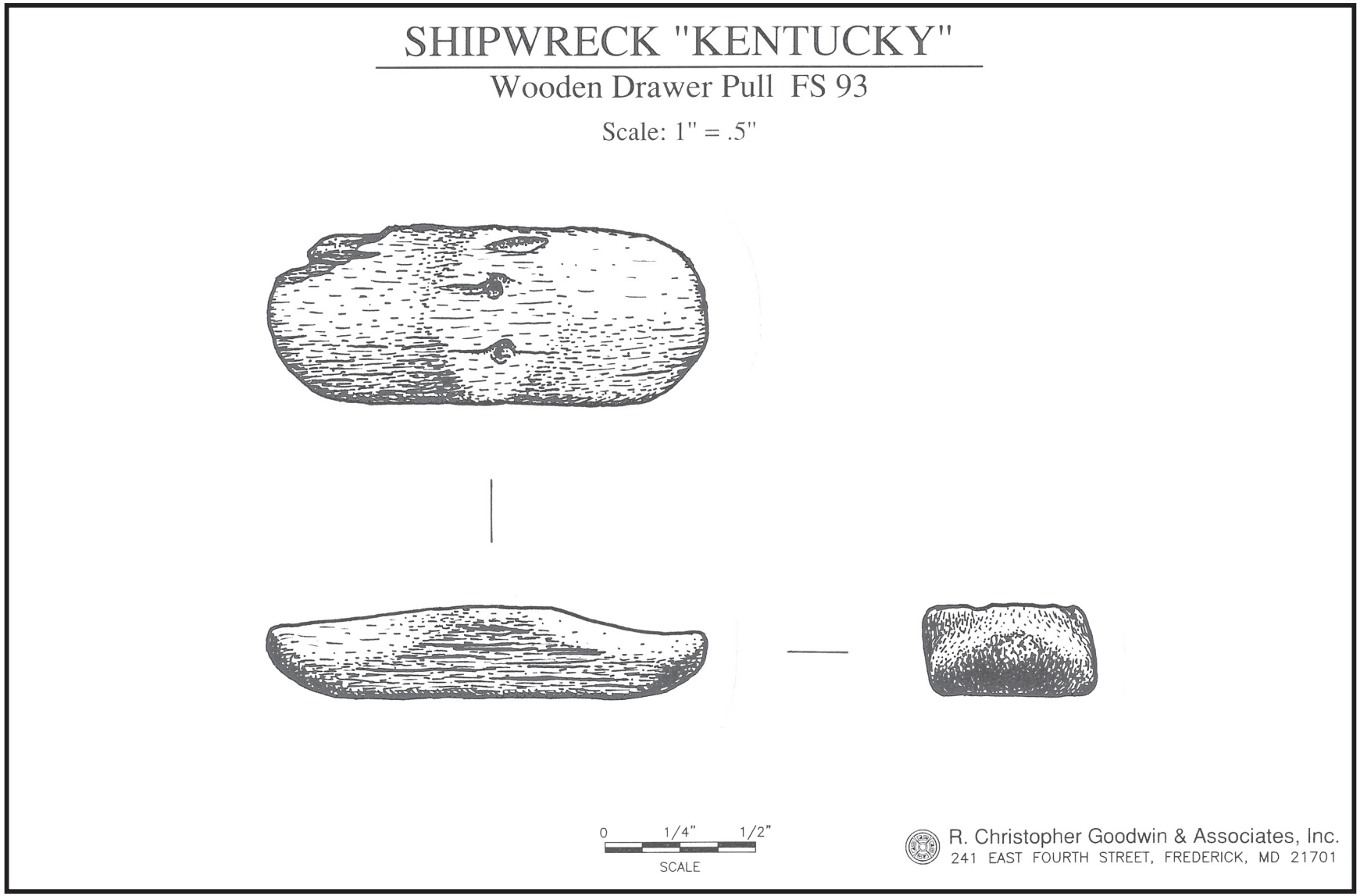


Figure 67 Drawing of wooden drawer pull (FS 93)

leaving the ferrous alloy pins protruding from the tang and preventing any definitive identification of wood type.

Ceramics

Ceramics in the Kitchen Group included nine sherds. These included one domestic brown salt-glazed stoneware base fragment (FS 7 [1750-1900]); one Canton style porcelain sherd (FS 20 [1800-1830]); one sherd of white undecorated ironstone (FS 65 [1850-present]); one sherd of undecorated hard porcelain (FS 10); four undecorated whiteware sherds (FS 7 and FS 9 [1820-present]); and one sherd of annular pearlware (FS 25 [generally dated 1790-1820]; Figure 68). The annular bowl fragment (FS 25), at first glance, seems to be somewhat early for this site. However, unlike the earlier pearlware vessels with blue pooling made with a soft paste, this particular example was fired at a much higher temperature producing a denser body. The classic blue pooling on the bottom, suggestive of late eighteenth and early nineteenth century pearlwares, is misleading. Harder bodied "pearlwares" were made in the mid-1840s and early 1850s and this fragment might represent a family's table setting. Just as recent research demonstrates an earlier inception for the use of pearlware than commonly accepted (Seidel 1990), FS 25 indicates a later usage than often is recognized, and variations within the ware are important to recognize. Although the ceramic assemblage is too small to provide much information, some general observations are possible. The sub-assemblage suggests that storage containers (FS7), flatware (FS 20, 65, and 9), and holloware (FS 7 - whiteware, FS 10, and FS 25) were present. The ceramic types and forms generally are typical of wares available and commonly used during the Civil War period.

Bottle Glass

Six bottle glass fragments were classified in the Kitchen Group. These included two sherds of amethyst glass (FS 109), two clear glass sherds (FS 82), one dark green glass sherd (FS 82), and one green glass sherd (FS 87).

Tin Can or Cup Fragments

Three tin fragments with a slight curve were recovered from FS 36. These fragments represent the remains of one or more standard mid-nineteenth century tin cups or a tinned food can. Cup and cans were interchangeable and served a variety of uses (Billings 1980:129; McCarthy 1961:297).

Cooking Ware

One striking pattern to the artifacts recovered from *Kentucky* is an unusual amount of cooking ware from the limited expanse of the deck. Five complete cast iron cooking pots (FS 60, 61, 82, 94, and 95), 30 cast iron cooking pot fragments (FS 60), a kettle handle fragment (FS 36), two "spider" type frying pans/skillets (FS 42 and 82), a cast iron dutch oven (FS 59), a largely complete tea kettle with handle (FS 94), three tin cup fragments (FS 36), a complete cooking pot lid (FS 56), and three fragments of a possible wire cauldron handle (FS72) were included in this class. At the rims, the pot diameters were 10.5, 11.5 (2), 12 and 13 inches. A photograph of a pot similar to those found on the *Kentucky* is shown in Davis (1982:III:196).

Five complete pots or cauldrons of various shapes, sizes, and styles were recovered. All were designed to be either hung over or placed on a cooking fire, as cast feet and handle lugs are present on all examples. No maker's marks, regimental symbols, or serial numbers were identified on these artifacts. Iron cookware would have been used to prepare a variety of foodstuffs including soups, stews, and boiled meats.

The vessel recovered from FS 60 measures approximately 10.5 inches in diameter at the rim. The body of the pot, excluding the legs, measures approximately 7 inches in height and 9.5 inches in diameter at the center of the body. It has three 1.25 inch cast legs at the base of the pot spaced roughly equidistant from one another in a triangular pattern. Two cast handle lugs are located on either side of the rim; these measure approximately 2.5 inches in height and extend 1 inch from the body of the vessel. The sides of the vessel are roughly cylindrical and taper gently towards the slightly convex base.

The vessel recovered from FS 61 measures approximately 11.5 inches in diameter at the rim and is approximately 7.5 inches in height with an average body thickness of 0.5 inches (Figure 69). This pot has three 0.75 inch long legs cast to the base of the form. These are spaced in a roughly equidistant triangular pattern. Two cast handle lugs are present, one on either side of the rim; both measure approximately 2.5 inches in height and extend approximately 1 inch from the body of the pot at the rim. The roughly cylindrical vessel curves sharply at the slightly convex base.

The cooking pot from FS 82 measures approximately 11.5 inches in diameter at the rim and is approximately 9.5 inches in height and 0.5 inches thick. This pot has three 1.0 inch legs cast at the base, again spaced roughly equidistant from one another in a triangular pattern. Two 1.5 inch high "D" type cast handle lugs are present, located on either side of the vessel approximately 1.5 inch below its flared rim. The loop handle was present and can be seen in the pre-conservation photograph; this handle did not survive conservation efforts. The body of this pot is bulbous; it expands outward from the rim and then tapers gradually toward the rounded base.

The vessel from FS 94 measures 12 inches at the rim and 10 inches in height. The body of the pot is 0.5 inches thick. It has 1.25 inch cast legs at the base of the vessel spaced in a triangular pattern. Two handle lugs are present, one on either side of the cauldron rim. The lugs measure approximately 2.5 inches in height and extend 1 inch from the body of the vessel. The vessel is roughly cylindrical and tapers gently towards the slightly convex base.

The pot from FS 95 measures approximately 13 inches in diameter and is 8.5 inches tall excluding the legs. It has three 2.0 inch legs arranged in a triangular pattern at the base of the pot. Two "D" type cast handle lugs are present on either side of the rim; a short fragmentary section of the loop handle is attached.

The 30 cast iron cooking pot fragments from FS 60 can be reconstructed to form a pot that measures approximately 11 inches in height; the body is .25 inches thick. This vessel has three 1 inch cast legs at the base of the pot. The walls are roughly cylindrical until they curve sharply at the convex base. No handle lugs were present.

Two cast iron "spider" type frying pans/skillets were recovered (FS 42 and 82; Figure 70). These frying pans are heavier than those used by individual soldiers and probably represent a company mess item. Cast iron has a reputation for heating food slowly and evenly, thus making these frying pans a perfect choice for preparing a variety of foods, including cornbread as shown in

Figure 68 Photograph of annular pearlware vessel fragment (FS 25)

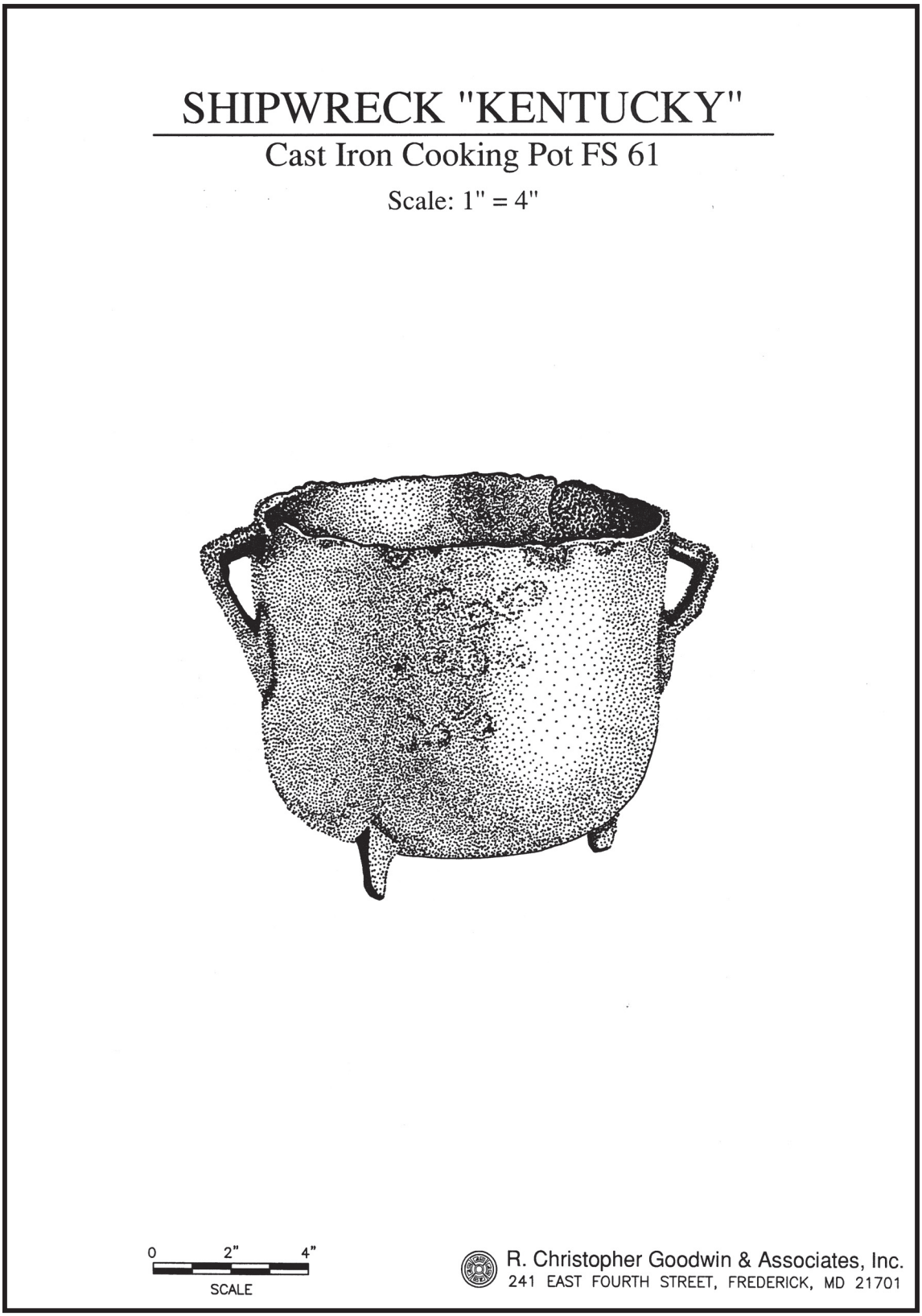


Figure 69 Drawing of cast iron cooking pot (FS 61)

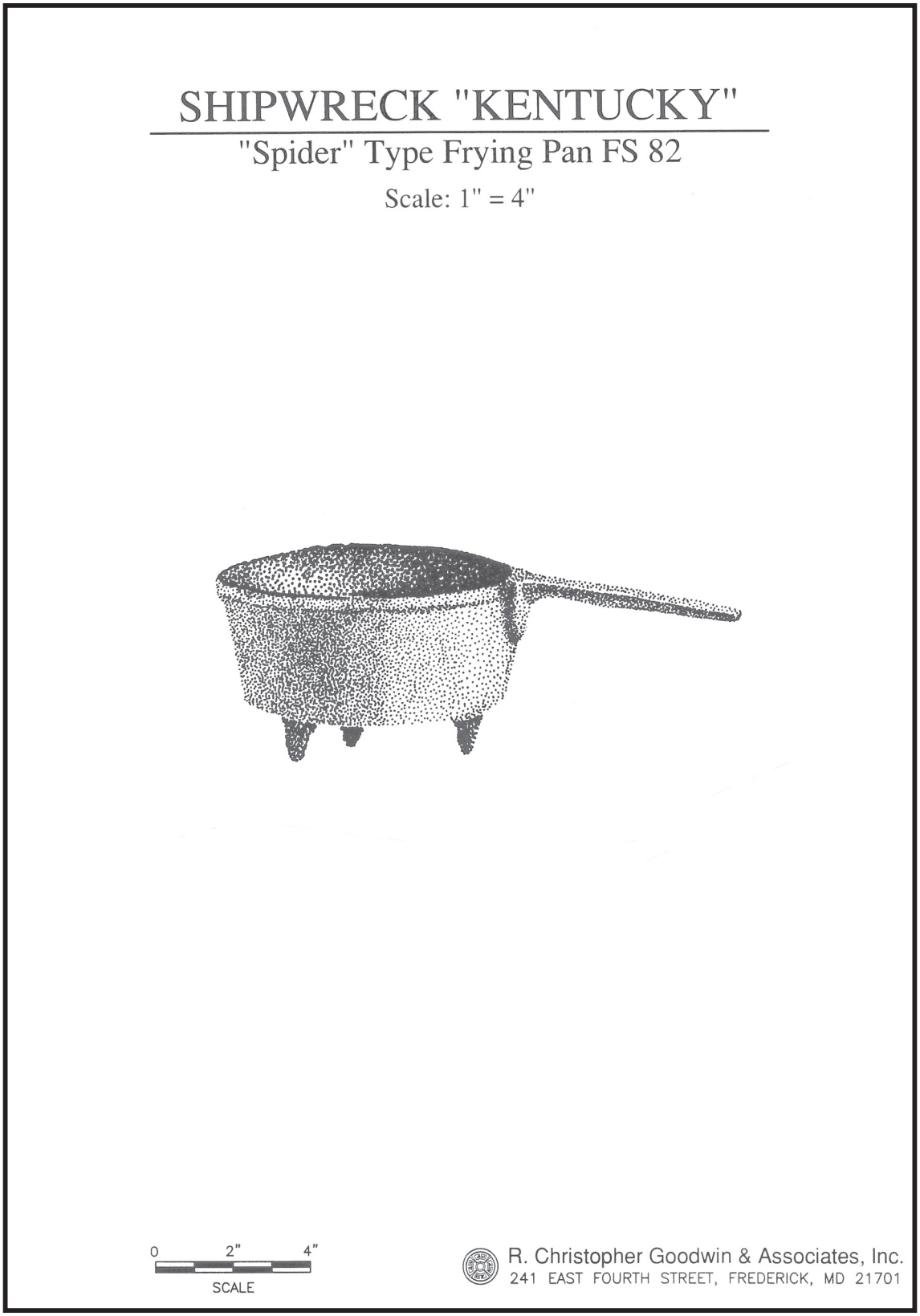


Figure 70 Drawing of "spider" type frying pan (FS 82)

a picture of a Texas soldier holding a frying pan similar to FS82 (Davis 1982:III:189). A description of a mess cook and his skillet or dutch oven can be found in McCarthy (1961:316-17).

The spider recovered from FS 42 measures approximately 11.5 inches in diameter at the rim, 5.25 inches in height, and 0.70 inches thick. This vessel has three 2 inch long legs cast on the base of the skillet. These are spaced in a triangular pattern. A thin, elongated cast handle measures approximately 9.75 inches in length and is approximately 2.5 inches in width where the handle meets the skillet body. The handle tapers gradually to 1 inch at the distal end. The sides of this skillet slope inward slightly to meet a squared, flat base.

The frying pan from FS 82 (Figure 70) is smaller than the other two examples; it measures approximately 8/5 inches in diameter at the rim, 4.5 inches in height, and 0.75 inches in thickness. Three legs are cast on the base; these are approximately 1.5 inches long and are spaced in a triangular pattern, with one leg located at the edge of the base to offset the weight of the handle. A thin, elongated cast handle measures approximately 5 inches long. The handle is 1.5 inches wide at the skillet body and tapers gradually to 1 inch at the distal end. The side of the skillet taper to a squared, flat base.

The dutch oven from FS 59 (Figure 71) measures approximately 11/75 inches in diameter at the rim, is approximately 5.25 inches in height, and 0.70 inches thick. The vessel has three 2 inch legs cast as part of the skillet. These are spaced in a triangular pattern roughly equidistant from one another. The sides of this vessel taper to a square, flat base.

The tea kettle from FS 94 measures approximately 9 inches in diameter at its center. The vessel is 6.0 inches in height and the body is approximately 0.5 inches thick. This kettle appears to have been cast in one piece; it has a spheriodal body that tapers gradually towards a 5.5 inch opening at its top. The short spout measures 3.5 inches wide at the body and tapers to 0.5 inches at the distal end. The spout extends 3.0 inches from the body at diagonally upward angle. Two remnant elements of a broken handle attachment are visible on the top of the kettle. The heavily encrusted tea kettle held approximately one gallon and is quite massive for a its type at a time when sheet metal was more commonly used.

The cauldron lid from FS 56 measures approximately 13.75 inches in diameter and is approximately 0.35 inches thick. A half-round handle that was cast with the lid is located roughly in the center of the form; the handle is approximately 2.5 inches long and rises 1.5 inches above the top of the cover. The lid is slightly convex with squared edges. The dimensions of this lid indicate that there were even larger cooking vessels aboard the boat than those recovered.

Cooking Hardware

A piece of ¼ inch thick sheet iron, 24 inches square, also was found on the deck near the cooking pots. This sheet metal was corroded and no riveting was noted. The 8 inch circular hole centrally located in the sheet did not exhibit any fastening evidence. Given its presence amid a scatter of cooking pots and frying pans, it is possible that this is the top of a field expedient stove. There were several varieties of sheet metal stove in use during the war (Davis 1982:II:104,209; Lord 1982:263-65). Two oval stoves were recovered from the Maple Leaf (Cantelas 1995; Holland, et al 1993). If this sheet iron were a stove, then it was likely a field expedient type built on the deck. If this interpretation is correct, then the firebox was probably a sand box with brick sides and the sheet iron was simply laid across the side.

Given the large number of cooking utensils in this relatively constricted area, it is possible that the aft area on the *Kentucky*'s boiler deck was set aside for cooking. Certainly, the large size and heavyweight of the pots is suggestive of group cooking arrangements (McCarthy 1961:298).

Miscellaneous Group

The Miscellaneous Group contained 190 items (Table 17). These included four felt samples recovered from FS 61, which likely were used as chinking between deck planks. Other biological material in this group included 5 carbonized wood fragments from FS 22, two worked bone fragments probably used as awls or punches (FS 33, 82), two charcoal fragments (FS 107), and two pieces of unmodified wood (FS 30). The Miscellaneous Group also included 141 metal objects most of which were too deteriorated or fragmentary for positive identification. Thirty-four coal or coal slag fragments were recovered from various proveniences. Finally, one unidentified rubber fragment was classified in this group.

Table 17. Miscellaneous Group

Sum of Count				**Group**
Class	**Type**	**Subtype**	**FS Number**	**Miscellaneous**
Biological	Miscellaneous	Fabric	61	4
		Fabric Total		4
		Other	22	5
		Other Total		5
		Worked Bone	33	1
			82	1
		Worked Bone Total		2
	Miscellaneous Total			11
	Wood	Charcoal	107	2
		Charcoal Total		2
		Unmodified Wood	30	1
		Unmodified Wood Total		1
	Wood Total			3
Biological Total				14
Metal	Unidentified Object	Iron/Steel	8	1
			19	1
			22	1
			29	9
			32	1
			36	8
			40	3
			45	2
			49	13
			50	2
			51	9
			52	7
			53	10
			54	5
			55	9
			56	6
			58	1
			59	1
			63	2
			65	10
			66	10
			69	3
			78	2
			81	1
			82	3

			83	4
			86	4
			90	4
			93	4
			108	1
		Iron/Steel Total		137
		Sheet Metal	57	4
		Sheet Metal Total		4
	Unidentified Object Total			141
Metal Total				141
Stone	Miscellaneous Stone	Coal	8	5
			20	3
			25	5
			108	15
		Coal Total		28
		Coal Slag	6	1
			25	2
			93	3
		Coal Slag Total		6
	Miscellaneous Stone Total			34
Stone Total				34
Synthetic	Unidentified Object	Unidentified Rubber Material	8	1
		Unidentified Rubber Material Total		1
	Unidentified Object Total			1
Synthetic Total				1
Grand Total				190

Personal Group

Five items were classified in the Personal Group (Table 18). These included a leather object (FS 66), two pipe fragments (FS 66 and 97), a pharmaceutical bottle (FS 37), and a pocket knife (FS 72).

Table 18. Personal Group

Sum of Count				**Group**
Class	**Type**	**Subtype**	**FS Number**	**Personal**
Biological	Miscellaneous	Leather	66	1
		Leather Total		1
	Miscellaneous Total			1
	Tobacco Pipe	Other	66	1
		Other Total		1
	Tobacco Pipe Total			1
Biological Total				2
Ceramic	Tobacco Pipe	Ball Clay Bowl, Molded	97	1
		Ball Clay Bowl, Molded Total		1
	Tobacco Pipe Total			1
Ceramic Total				1
Glass	Blown in Mold	Blue	37	1
		Blue Total		1
	Blown in Mold Total			1
Glass Total				1
Metal	Personal Use	Pocket Knife	72	1
		Pocket Knife Total		1
	Personal Use Total			1
Metal Total				1
Grand Total				5

Leather Sewing Kit

A 6.5 x 8.0 inch piece of leather was recovered from FS 66 (Figure 72). The leather has two short lines of stitching (9 stitches to the inch) on one end. One line is approximately 1.5 inches long and half an inch from the long side of the piece; the other line is approximately 1.5 inches long and 3/8 inch from the opposite long end. The two rows of stitching are parallel, but they do not overlap making their use questionable. A 3.5 inch cut was made about ¾ inch from one short end. No stitching is associated with this cut. The cut may have served to clasp the opposite edge if the piece were folded together. It is possible that this piece of leather represents the outer portions of a sewing kit, or housewife. The stitching could have secured pieces of cloth to hold pins or needles.

Tobacco Pipes

Two pipes were recovered. One is a composite, metal banded briar pipe (FS 66; Figure 73). It is missing the stem, which may have been a reed. Variants of the briar were found on the Maple Leaf and a Confederate example without metallic banding is illustrated by Donald (1975:205). The other *Kentucky* pipe is an elongated ball clay pipe (FS 97), similar to aboriginal clay forms dating to the 16th and 17th century. Pipes with identical forms are depicted in the 1875 edition of WM Demuth & Co. pipe importers catalogue. Pipes were very common during the war and many varieties exist (Crouch 1978:170; Holland et al 1993:116; McCarthy 1961:316).

Medicine Vial

An intact medicine vial (FS 37) is an aqua colored, octagonal little bottle with a flared (flanged) lip (Figure 74). It is 0.9 inch across the base, with a slightly flaring shoulder and stands 2.1 inches tall. It is a mold blown bottle; the body has ten rectangular panels. The base exhibits a glass-tipped pontil scar. The rim is of an everted type characteristic of pharmaceutical bottles of the period. Little bottles of this type were used to hold a variety of materials other than medicines, including toilet water. No precise comparative examples were found in the sources consulted (Herskovitz 1978; Jones and Sullivan et al 1989; Switzer 1974).

Pen Knife

The final item in the Personal Group is a small, curved pen knife (FS72; Figure 75) with copper bolsters on each end resembles a "congress pen" style shown in Peterson (1958:138). Two parallel blades were so corroded as to be unrecognizable, but they seem to have been attached at the same end. The dimensions of the handle are ½ x 3 ¼ inches. This knife was likely carried in a pocket or haversack. Similar knives have been recovered from campsites (Crouch 1978:120; Legg and Smith 1989:112). A great many jack knives were recovered from the blockade runner Modern Greece (Bright 1977:123-27), but these imported, single bolster knives are heavier than the *Kentucky* example.

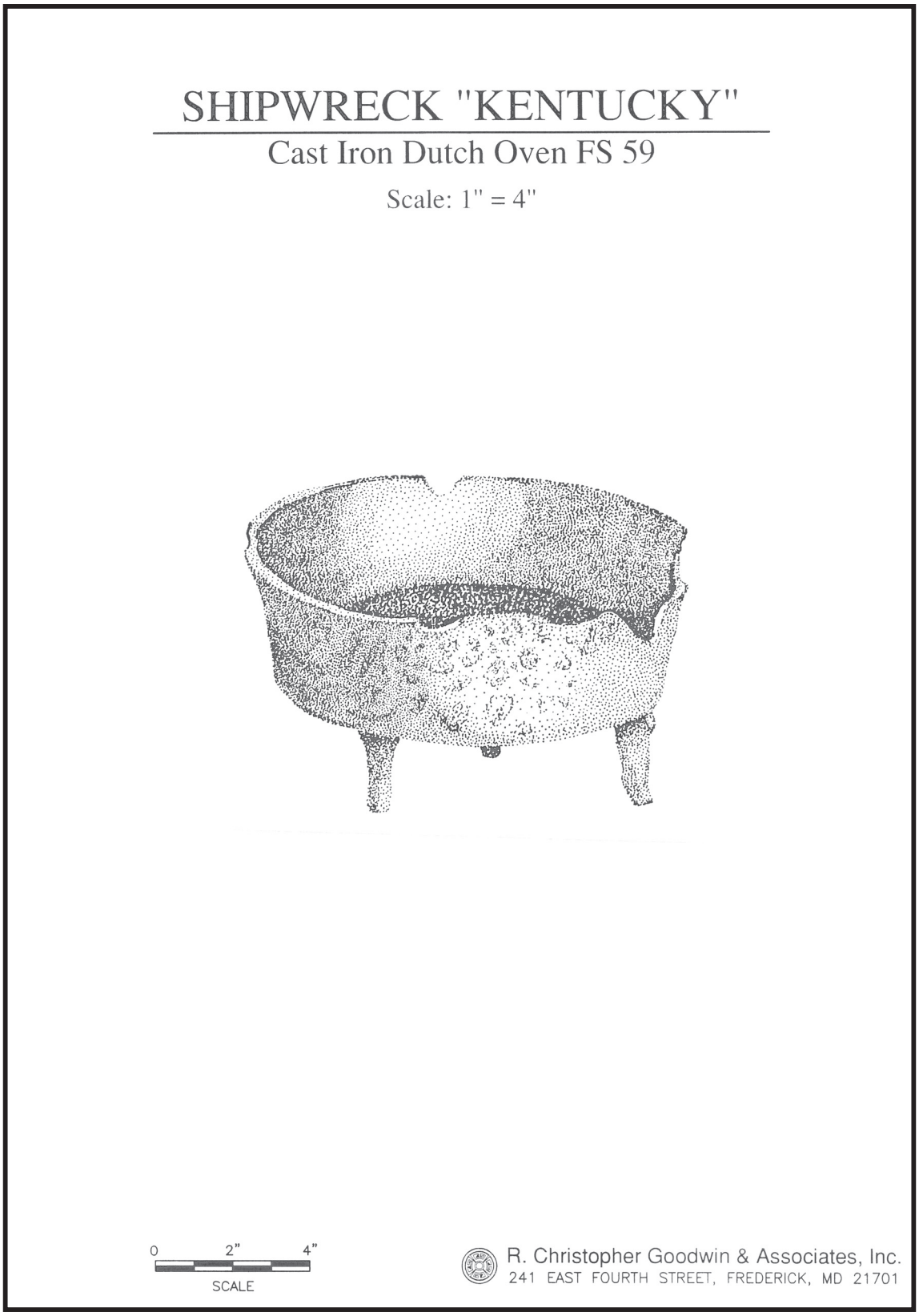


Figure 71 Drawing of cast iron dutch oven (FS 59)

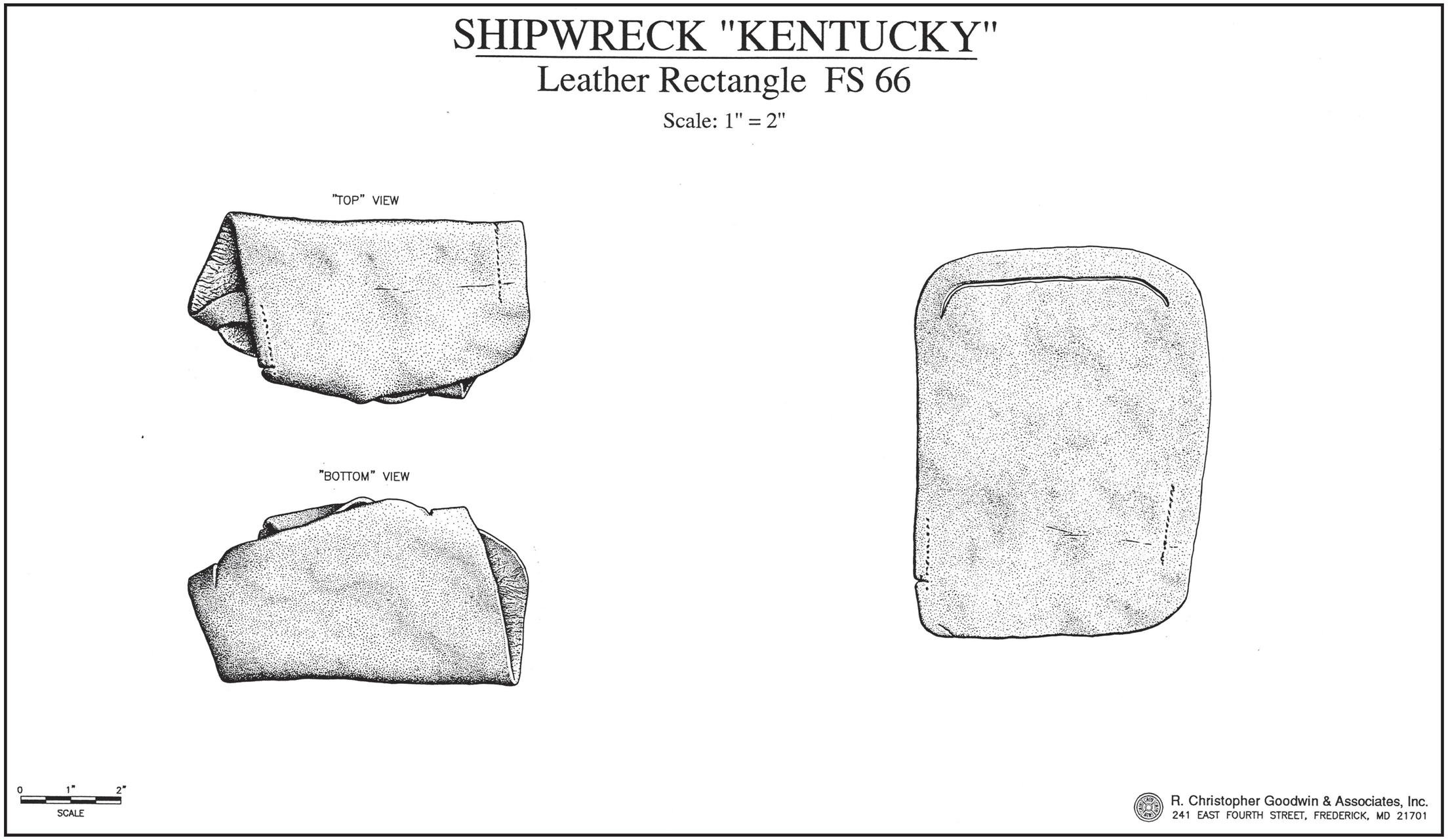


Figure 72 Drawing of leather rectangle with cut and two lines of stitching (FS 66)

Figure 73 Photograph of briarwood pipe bowl with copper alloy collar and decorative silver foot (FS 66)

Figure 74 Photograph of mold blown glass pharmaceutical bottle (FS 37)

Figure 75 Photograph of conserved clasp knife (FS 72)

Transportation Group

Four items were included in the Transportation Group; all of these related to horse care and equestrian transportation (Table 19).

Table 19. Transportation Group

Sum of Count				Group
Class	**Type**	**Subtype**	**FS Number**	**Transportation**
Metal	Stable Item	Harness/Saddle Part	85	1
		Harness/Saddle Part Total		1
		Miscellaneous Horse Care Item	82	1
			84	2
		Miscellaneous Horse Care Item Total		3
	Stable Item Total			4
Metal Total				4
Grand Total				4

Harness Buckle

A copper alloy buckle with offset tang bar (FS 85) probably was part of a harness. The rectangular frame is 1 15/16 x 1 5/8 inches, and the strap was probably one inch wide. No comparable examples of this buckle are shown in saddle-related works suggesting it was from wagon-related harness (Steffen 1973). A copper alloy buckle from a saddle or harness was recovered from FS 85; this has a cast, semi-rectangular buckle frame with a copper alloy tang.

Curry Comb

A curry comb fragment (FS 82) was recovered; it consisted of approximately 70 per cent of the flat base plate section of the comb and ten per cent of the handle terminus. Curry combs would have been used to groom the horses transported on the *Kentucky*. Two wrought iron bridle rings FS 84) measuring approximately 2.25 inches in diameter also were recovered. These rings are similar to those used to join the cheek-piece and rein of most late nineteenth century bridles.

Nautical Group

The Nautical Group consisted of 98 items (Table 20). Metal items in this group included an anchor (FS 82), two capstan parts (FS 100 and 101), a gudgeon (FS 102), 4 hogging chain pieces (FS 65), and a cargo boom hoop (FS 103).

Stream Anchor

The anchor is a cast iron stream anchor with a removable iron stock (FS 82), as discussed in the previous chapter (Figure 62). This anchor was recovered with the ring, cotter pin, and stock

Table 20. Nautical Group

Sum of Count				Group
Class	**Type**	**Subtype**	**FS Number**	**Nautical**
Biological	Accessories	Dowel	10	1
			80	1
		Dowel Total		2
	Accessories Total			2
	Miscellaneous Structural Part	Apron/Hook	104	1
		Apron/Hook Total		1
		Bilge Pump	99	1
		Bilge Pump Total		1
		Deck-Part	6	1
			8	3
			23	2
			26	1
			34	1
			54	2
			55	3
			56	1
			57	1
			58	2
			59	2
			60	6
			62	1
			65	1
			66	2
			67	7
			70	3
			72	1
			79	1
			87	1
			89	5
			91	1
			93	11
			107	12
			108	1
			109	10
		Deck-Part Total		82
		Frame	6	1
			21	1
		Frame Total		2
	Miscellaneous Structural Part Total			86
Biological Total				88
Metal	Accessories	Anchor	82	1
		Anchor Total		1
		Capstan-Part	100	1
			101	1
		Capstan-Part Total		2
	Accessories Total			3
	Miscellaneous Structural Part	Deck Fitting	110	1
		Deck Fitting Total		1
		Hogging Chain	65	4
		Hogging Chain Total		4
		Mast Hoop	103	1
		Mast Hoop Total		1
		Gudgeon	102	1
		Gudgeon Total		1
	Miscellaneous Structural Part Total			7
Metal Total				10
Grand Total				98

intact. The dimensions of the anchor are 55 inches from ring to crown and 33 ½ inches from bill to bill. The stock is 1 ¼ inch in diameter and octagonal in cross-section. Additional anchors would have been stowed on *Kentucky*'s bow.

Capstan

The capstan was present in two pieces; the spindle (FS 101) and the, now detached, pawl ring and pawl rim (FS 100). A capstan is a vertical winch that is used for pulling in lines and heavy weights, particularly for weighing anchor and raising cargo booms. The dimensions of the pawl-ring (Figure 60) are 28 inches in diameter by 5.5 inches in height. The two pawls on opposite sides of the ring are fastened to the ring by fasteners that went through the ring and were anchored four inches deep in capstan barrel. The pawls were bent so as to follow the curve of the pawl ring and were one inch square and nine inches long.. The pawl ring was anchored to the deck beneath the capstan by four half inch square iron fasteners equally spaced around the ring. A series of 14 epressions (“scores”) cast into the ring provided points to catch the pawls so as to keep the capstan from turning.

The iron capstan spindle (FS 101; Figure 61), which would have been aligned vertically inside of the pawl-rim, is an elongated, single-toothed gear that functioned as a spool when the hawser was being drawn. In order to reduce slippage, the spindle was aligned vertically with wooded whelps that provided a gripping surface for the cable during retrieval. The iron capstan spindle is 52 inches in length and tapers from a four inch square base to a round cross section three and a half inches in diameter just below the upper collar. Two shims (keys) locked the square base into the spindle socket in the deck and kept it from moving. A nine inch diameter, 0.25 inch thick "washer" spread the barrel’s weight around the insertion point in the deck. The weight of the spindle was spread onto the washer by a one inch thick expansion of the squared spindle fourteen inches above the lower end. The "washer" was mounted on the spindle through a square hole in the washer showing that it was not intended to rotate. Given the position of this fairly heavy piece of equipment, it is likely that the capstan was on the fantail and that, as the stern decking outboard of the hull was washed away, the capstan simply moved down below its approximate location when in use.

Gudgeons

The upper gudgeon (FS 102) consists of a large yoke-shaped, cast iron staple that contains a pintle hole at the crest of the form. The diverging arms of the gudgeon were bolted to the sternpost and nailed to frames as discussed in the previous chapter.

Cross-Chains

The four cross-chain fragments from FS 65 are composed of 1.5 inch in diameter wrought iron bars that are punctated by iron turnbuckles and two eyebolt attachments. Hogging and cross-chain assemblies were fastened to major structural members of the vessel at stern and bow and port and starboard, and then were suspended over the boat on a series of masts that extended from the keelsons. Several chains were used together to form a network support that was needed to counteract the effects of hogging fore-and-aft, and sagging of the guards outboard, from side-to-side. The tension of the chain could be altered by tightening and loosening the turnbuckles, thus

allowing the crew to vary support based on load and water conditions. The length of the fragments recovered ranged from 13 to 118 inches.

Cargo Boom Hoop

The cargo boom hoop recovered from the *Kentucky* (FS 103) consists of a flat wrought iron band that has been hammered into an open ring shape. The ring could be tightened by means of an adjustable screw clamp located at either end of the open hoop and was fitted around the center of the cargo boom, which was used to raise and lower cargo from the deck.

Wood Artifacts or Vessel Parts

Wooden items in the Nautical Group included a stern hook (FS 104), a bilge pump (FS 99), two dowels (FS 10 and 80), five carved pine plugs (FS89), a faceted wooden dutchman (FS 6), a deck beam (FS 21), 32 examples of tongue and groove sheathing (Table 21), and 45 additional deck-part fragments.

The stern hook (FS 104), discussed in depth in the previous chapter, is a wooden, V-shaped brace that served to bind the sides of the vessel together at the stern.

The suction-style bilge pump (FS 99), also discussed in the previous chapter consists of a bored hardwood tube that contains a foot valve in the center, the ghosts of hand pump attachments at its faceted proximal end, and a 6 inch wide perforated tinned steel collar at its distal end. The upper end was set into an octagonal fitting on the main deck, while the collared portion was able to be lowered into a recessed section of the bilge known as the bilge well. A double valve and brake assembly, which was not recovered, then would be used to draw wastewater and seepage out of the bilge. The dimensions of the bilge tube are 11 inches in diameter by 80 inches long.

The two wooden dowel fragments recovered from FS 10 and FS 80 were used to fill gaps that formed when wood knots fell from the deck or hull planking. The five carved pine plug fragments recovered from FS 89 were used to fill chink gaps in the hull; pine was preferred for this task since it swells when wet, thus forming a tight seal below the waterline.

A faceted wooden dutchman (FS 6) represented the single decorative element recovered. This item likely was used as a cap or finial on one of the numerous railings that lined the decks of the *Kentucky*. The dutchman measures 2.0 x 0.375 inches.

A deck beam fragment with two cut nails embedded in it was recovered from FS 21. The fragment was 7.25 inches long; and measured 1.5 x 2 inches in size.

Thirty-two examples of tongue and groove sheathing were recovered (Table 21). Tongue and groove sheathing was used to create an overlapping wall or floor surface that would retain heat and impede the flow of water. It commonly was used to sheath the walls of interior cabins and staterooms. All of these planks had a one/quarter inch deep by one quarter inch wide tongue and groove. Planks can be divided into three general categories on the basis of their thickness. The thickest planks were 7/8 to 1 inch thick. They included a variety of widths at 6, 4 and 3 inches. The middle group was ½ to 5/8 inch thick with widths of 4 and 6 inches. The smaller planking was

Table 21. Nautical Architecture Group - Tongue and Groove Members

FS #	Type	Subtype	Count	Comments
23	Miscellaneous Structural Part	Deck-Part	2	3/4" tongue and groove sheeting
26	Miscellaneous Structural Part	Deck-Part	1	9" long sample of tongue & groove railing
34	Miscellaneous Structural Part	Deck-Part	1	7/8" tongue and groove sheeting
54	Miscellaneous Structural Part	Deck-Part	2	1/2" tongue & groove sheeting
55	Miscellaneous Structural Part	Deck-Part	3	3.5" tongue & groove bulkhead planking samples
56	Miscellaneous Structural Part	Deck-Part	1	6/10" tongue & groove sheeting
57	Miscellaneous Structural Part	Deck-Part	1	6/10" tongue & groove sheeting
58	Miscellaneous Structural Part	Deck-Part	2	6/10" tongue & groove sheeting
59	Miscellaneous Structural Part	Deck-Part	1	6/10" tongue & groove sheeting
60	Miscellaneous Structural Part	Deck-Part	5	6/10" tongue & groove sheeting
67	Miscellaneous Structural Part	Deck-Part	7	tongue & groove, very worn, 0.5" thick
70	Miscellaneous Structural Part	Deck-Part	3	6/10" tongue & groove sheeting
72	Miscellaneous Structural Part	Deck-Part	1	1/2" tounge & groove sheeting
91	Miscellaneous Structural Part	Deck-Part	1	bulkhead plank
109	Miscellaneous Structural Part	Deck-Part	1	7/8" tongue and groove sheeting

¼ to 3/8 inch thick. The variable thickness suggests different uses on board the *Kentucky*. Typically, planks were vertical when used as cabin siding (Bates 1968:53). The 5/16 inch is probably paneling. The thickest size (7/8 to 1 inch) may have been for exterior cabin walls. The middle, or circa half inch thickness, may have been used for interior cabin/stateroom walls or for the main/boiler deck, where planking was usually about 5/8 inch thick (Bates 1968:49). While most tongue and groove planking probably was used in the superstructure, tongue and groove planking was utilized for light decking that could be removed (Babits, et al 1998:10). On the *Maple Leaf*, 7/8 inch tongue and groove planking was used as decking in the aft cargo hold (Cantelas 1995:123). Thinner tongue and groove planking was utilized vertically for a bulkhead in the *Maple Leaf's* cargo hold.

Summary

Although the artifact assemblage from *Kentucky* is not exceptionally large, it covers a wide spectrum of materials, ranging from hardware, furniture, and equipment that is vessel-related to personal objects, company-issued equipment, and military materials. In addition to providing evocative illustrations of life on board *Kentucky*, these materials provide information on the construction and repair of the vessel, elements of the boat's cargo, and a range of personal objects.

The confinement of excavation to the stern of the *Kentucky* has resulted in a limited ability to discern patterns within the assemblage. It seems clear that toward the stern of the vessel, the main deck was used for a variety of purposes. Horses were confined to this area, and heavy equipment, exemplified by the cooking pots, was stowed on this portion of the main deck. Materials excavated from the main deck are most likely to have been in use during the vessel's last voyage. The scatter of materials such as cookware across the deck almost certainly reflects some displacement from its original position, probably during the wreck event. Some of the materials found in the hold and outside the hull probably originated on the main deck or higher on the vessel's superstructure and were deposited in lower levels during the process of the boat's break-up and deterioration. The capstan is a good example of this, probably having fallen almost vertically from its original position on the main deck. It seems likely that many of the objects recovered from the upper stratum of the hold (generally Level 1) also fall into this category. Materials lower down in the bilge deposits (Level 2) are more likely to reflect earlier accumulations of material during the working life of *Kentucky*, as evidenced by the presence of watermelon seeds and peach pits which were not in season when the *Kentucky* sank.

The stern of the vessel, particularly the higher portions of the wreckage, clearly seem to have suffered the greatest amount of deterioration. This degradation is due to exposure to river currents, impact from floating debris, and a cyclical process of saturation followed by drying. Preservation improved markedly toward the bank-line and the front of the vessel. The breadth of materials recovered from the shattered stern, and their often remarkable preservation, suggests a very high probability for much greater preservation on the less disturbed portions of the wreck that were left untouched in this project, as evidenced by the presence of watermelon seeds and peach pits which were not in season when the *Kentucky* sank. This offers enormous promise for any future investigation of the *Kentucky*.

CHAPTER XI

FAUNAL AND BOTANICAL REMAINS

Faunal Remains

Introduction

Archeologists sometimes are faced with the problem of determining which faunal remains recovered from a site are or are not the result of human behavior. Archeological sites generally reflect an accumulation of material over extended periods of time with either continual or intermittent human occupation influencing faunal assemblages in a direct or indirect manner. Archeological faunal assemblages may be the result of food procurement, butchery, food preparation, refuse disposal, skin or hide procurement, ritual, or burial, to name a few. These assemblages generally reflect cultural adaptations of the people that create them, though many animals enter the archeological record through avenues not directly associated with human behavior. Some sites, such as rock shelter or cave sites, may accumulate bone assemblages from both predator activity and episodic human occupation (Keck and Reitz 1996). Often these taxa are termed “non-cultural” or “natural” bone to distinguish them from the “cultural” bone deposited through human purposiveness (Thomas 1971). Other non-cultural bone may accumulate from owl pellets, fluvial deposits, and predator denning or rodent burrowing activities.

The presence of small animals in the archeological record, particularly mice, rats, snakes, frogs, toads, or lizards, often is explained away as a part of the general ecology of any site or household. Modern cultural biases preclude the thought that small animals such as rats were consumed. The remains of burrowing animals are assumed to be intrusive, particularly at seasonally-occupied sites with periodic abandonment. The presence of small rodents or other small animals is considered common in sedentary sites as well. Residential households provide a context where the relationship between humans, pets, and assorted vermin is symbiotic and often unobtrusive, hence the category, "commensal," or literally "eating at the same table." Other commensal taxa include work or draft animals such as horses and oxen. Nevertheless, these taxa could provide opportunistic food sources (Neusius 1996; Stahl 1982; Szuter 1994).

Distinguishing such taxa as cultural or non-cultural, commensal or non-commensal, does not always reflect those animals that were used for food. Several studies have attempted to differentiate between cultural and noncultural bone, commensal versus non-commensal taxa, and/or food versus non-food taxa (Keck and Reitz 1996; Hirschfield 1968; Neusius 1996; Reitz and Keck 1998; Reitz 1994; Stahl 1982; Szuter 1994). Well-quantified studies from several sites in 16th century Spanish Florida show that commensal taxa account for five percent of the faunal assemblages. It is entirely possible however that the Spanish in the New World consumed

commensal taxa; there is documentation, for example, that some complained of famine and forced consumption of vermin (Reitz and Scarry 1985; Reitz 1994).

Studies of archeological assemblages that attempt to determine commensal versus non-commensal taxa, food versus non-food remains, or natural versus cultural bone always must consider the ecological context of the site. The type of death the animal experienced and subsequent dissociation of body parts are as important in taphonomic studies as post mortem processes of weathering, transport, burial, fossilization, or selective preservation (Butzer 1982).

Many taphonomy studies focus on describing the assemblage and comparing it to other assemblages to discuss conformity or divergence (Gifford 1981). Taphonomic analyses in archeology may provide further empirical data on the spatial, temporal, ecological, and cultural factors influencing site assemblage formation (Butzer 1982; Gifford 1981; Reitz 1994; Thomas 1971). However, the use of analogic reasoning and uniformitarian assumptions requires caution, stringent methodology, and a careful consideration of the archeological context (Butzer 1982; Gifford 1981). While there is no generally accepted body of procedures, nor a representative body of data for taphonomy, certain procedures may be adhered to in a taphonomic study of archeological materials to distinguish commensal from non-commensal taxa, or to determine whether such taxa were utilized for food (Butzer 1982).

Gifford (1981) suggests a two step approach to taphonomic studies. First, the analyst must consider the events that produced the assemblage within an ecological and geological context. Second, the analyst must use modern studies of site formation as analogous to the archeological assemblage. For example, many ethnoarcheological studies attempt to demonstrate post depositional bone assemblage processes (Kent 1981). From these two steps the assemblage may be predicted based on the action of specified processes. Once the predictive model is established, the archeological assemblage can be tested.

Early taphonomic studies focused on the issues of early hominid behavior in the Old World and ignored the "cultural filter" (Reed 1963). Early hominids are considered on the same level as any predator or scavenger choosing its food supply based on ecologically relevant laws of energy efficiency. Geomorphic processes, like ecological processes, also tend to sort carcasses according to size and transport energy (Butzer 1982). The effects of gravity and flowing water on the transport of animal carcasses vary according to the size, shape, density, and strength of elements as well as the degree of dissociation between articulations (Hanson 1980; Voorhies 1969).

Whether ecological (including human ecological processes) or geological, carcasses break down in predictable sequences, with the least tightly articulated joints dissociating first and the most tightly last (Hill 1979a, 1979b). Due to the strength of some articulations, certain body segments containing sets of bones are highly likely to be transported as a unit. Kill sites are characterized by a high rate of bone articulation, axial bones common, low species diversity, limited dispersal, and a low incidence of fragmentation. Habitation or terminal processing sites conversely are characterized by a high rate of bone disarticulation, dispersal, and fragmentation, as well as a high degree of species diversity. Appendicular bones are common (Butzer 1982; Perkins and Daly 1968).

One geologic process affecting bone assemblage is water transport. Voorhies' (1969) study of water transport of sheep and coyote bones shows that skeletal elements tend to move in predictable "transport groups" depending on size and velocity of the flow of water. Low-velocity current tends to transport ribs, vertebrae, scapulae, phalanges, and ulnae; medium-velocity current tends to transport femurs, tibiae, humerei, radeii, metapodiae, pelves, scapulae, phalanges, and

ulnae; high-velocity current tends to transport crania and mandibles. Voorhies' (1969) experiments did not account for degree of body segment dissociation, though Behrensmeyer (1975) found similar results using fossilized bones.

A detailed analysis of element distribution is useful in discerning patterns of animal use. Skeletal remains of animals with a high degree of economic importance are likely to be distributed in a variety of contexts associated with many uses. Butchery methods, meat cut preferences, redistribution, or basic energy cost relationships are a few issues that may be addressed from a detailed analysis of element distribution. For example, large animals such as deer are often killed at a distance from the area of human habitation. To reduce the energy cost of transporting the entire carcass back to the home site, hunters often dress the animal at the kill site, leaving behind the less desirable or heavier portions of the carcass (Perkins and Daly 1968). Kill sites, or butchery sites often are characterized by an overrepresentation of cranial and foot elements whereas habitation sites show an overrepresentation of fore- and hindquarter elements. In addition, an examination of element distribution is used to distinguish commensal from food taxa. A high degree of skeletal completeness may indicate the animal is intrusive such as occurs when an animal dies in its burrow. Skeletal incompleteness results when an animal is disarticulated for food preparation, consumption, and disposal.

The goal of this study is to determine those animals utilized for food from those that were non-food on board the C.S.S. *Kentucky*. It is known that horses or mules, utilized as transportation or draft animals during the war, were on the ship when it wrecked. It is entirely plausible however that such animals may have been utilized as an opportunistic food source when one occasionally died from natural causes or was put down due to fractures suffered in mishaps such as might occur on a ship. Secondly, it also is possible that the abundant aquatic resources such as fish and turtle available from the Red River may have supplemented or perhaps dominated the diet. Finally, it may be possible to gain some insight into the cuts of meat or types of meals prepared and served during the Civil War on board the *Kentucky*.

Although man-made, the wreck of the C.S.S. *Kentucky* could act as a natural trap. Natural traps may be defined as deep, steep-sided pit features that remain uncovered while slowly filling with debris (Reitz 1994). Natural traps may indeed be "natural" as in the case of caves formed from cooling lava (White et al 1984) or they may merely "act" as natural traps as in the case of abandoned wells left uncovered (Reitz 1994). Several studies of natural traps indicate that certain animals are attracted to these features then become entrapped (Armitage and West 1985; Gibbons and Semlitsch 1981; Hirschfield 1968; Hudson and Solf 1959). Small vertebrates such as insectivores, mice, rats, frogs, and toads are initially attracted to natural traps that are surrounded by some type of vegetation. Natural predators of these animals likewise are attracted to the traps. These studies show that most animals caught in the traps are juvenile or sub-adult individuals indicating that a lack of experience or wariness contributed to their demise. In some instances carnivorous predators became entrapped after following prey into small cave openings (White et al 1984).

For purposes of this study the following criteria will be used to distinguish those taxa representing food from those which were commensal, or non-food. First, a high degree of skeletal completeness would indicate the carcass was intact when it was deposited at the site. Second, evidence of butchery, disarticulation, cooking, consumption, or differential disposal would indicate the carcass was utilized for food. Third, the presence of intact or relatively intact "diagnostic zones" of body segments would indicate skeletal completeness of articulated elements. This would characterize the skeletons of Equids that were trapped in the wreckage of the *Kentucky*. As taphonomic studies have shown, large carcasses dissociate in predictable patterns over time,

particularly with the aid of flowing water. Relatively intact diagnostic zones of body segments would indicate the carcass was not disarticulated at the joint as is often done in butchering an animal for food.

Materials and Methods

Vertebrate remains from the C.S.S. *Kentucky* were examined using standard zooarcheological methods (Grayson 1973, 1979; Wing and Brown 1979). In house identifications were made using the comparative reference skeletal collections of Goodwin & Associates, Inc. located in the New Orleans Laboratory. Guidelines and manuals used to aid identification procedures included Olsen (1968) and Sisson and Grossman (1938), but these were not used in lieu of reference skeletons. Some identifications were made at the Zooarchaeology Laboratory, Louisiana State University, Baton Rouge, Louisiana. Because it is difficult to distinguish horses from mules at an osteological level, all elements identified as either horse or mule were placed in the category Equidae, or horse family.

A number of primary data classes were recorded for purposes of analysis (Wing and Brown 1979). Specimens were identified in terms of elements represented, the portion recovered, symmetry, and degree of fusion. The Number of Identified Specimens (NISP) was determined. Where specimens cross-mended, these counted as single specimens. Modifications were noted in general terms such as burned, cut, or rodent gnawed. All specimens were weighed to provide additional information about the relative abundance of taxa identified. The Minimum Number of Individuals (MNI) was estimated based on paired elements and age.

While MNI is a standard zooarcheological quantification method, the measure has several well-known biases. MNI emphasizes small species over larger ones. For example, a collection with twenty squirrels and one deer shows a greater use of squirrels. This is misleading because the one deer provides more meat and is therefore of more economic importance than twenty squirrels. In addition, some elements are more readily identifiable than others. The taxa represented by these elements may be over-represented. Conversely, some taxa represented by large numbers of specimens may present few paired elements and hence be underrepresented. Gars and turtles are good examples of this bias, in which perhaps over one thousand scales or carapace fragments are counted as representative of a single gar or turtle respectively. Further, a basic consideration with respect to MNI is the assumption that the entire individual animal was utilized at the site. From ethnographic evidence it is known that this is not always true (Perkins and Daly 1968). This is particularly the case for larger individuals and animals used for special purposes. In these cases, it often is necessary to examine the element distribution patterns evident in the collection (Thomas 1971).

The measure, MNI, is also subject to bias introduced by the way samples are aggregated during analysis. The aggregation of separate samples into one analytical whole (Grayson 1973, 1979, 1981) allows for a conservative estimate of MNI, while the "maximum distinction" method applied when analysis isolates discrete sample units, such as test units, levels, or features, results in a much larger MNI. In estimating MNI for the *Kentucky* assemblage, all faunal materials recovered from the shipwreck were examined as a single analytical unit.

The mammalian and turtle elements identified from the *Kentucky* are summarized into categories by body segments. The Head category includes only skull fragments, including teeth. The atlas and axis, and other vertebrae and ribs are placed in the Vertebra/Rib category. Forequarter includes the scapula, humerus, radius, and ulna. The Hindquarter category includes the innominate,

sacrum, femur, patella, and tibia. Finally, metapodiae, podiae, phalanges, and sesamoids are assigned to the Foot category. In the case of turtles, carapace and plastron elements that were identifiable to specific elements (i.e. nuchal, pygal, neural, pleural, hyoplastron, hypoplastron, epiplastron, etc.) were placed in the carapace/plastron category. During analysis, carapace/plastron specimens too fragmented to determine specific skeletal location were not used for estimates of MNI or element distribution though they were included in NISP counts.

Modifications can indicate butchering methods as well as site formation processes. Modifications are classified as burned, cut, clean cut, and rodent-gnawed. Burned specimens may result from exposure to fire when a cut of meat is roasted. Burns also may occur if specimens are burned intentionally or unintentionally after discard. Cuts are small incisions across the surface of specimens. These marks are probably made by knives as meat was removed before or after the meat was cooked. Cuts also may be left on bone if attempts are made to disarticulate a carcass at joints. Clean cut refers to bone that exhibits straight cuts as might be expected from sawing or hacking. It often is difficult to determine if a straight cut was the result of a saw or a cleaver. The presence of parallel striations on the outer layer of compact bone indicates that the bone was sawed, presumably before cooking. Gnawing by carnivores and rodents indicate that specimens were not buried immediately after disposal. Carnivores would include such animals as dogs and raccoons. Rodents would include such animals as mice, rats, and squirrels.

Specimen count (NISP), MNI, and other derived measures are subject to several common biases including preservation and recovery technique which affect sample size (Grayson 1979, 1981; Payne 1972). In general, samples of at least 200 individuals or 1,400 specimens are needed for reliable interpretations (Wing and Brown 1979). Smaller samples frequently generate a short species list with undue emphasis on one species in relation to others, whereas once the sample size reaches a representative population, additional data does not alter the relative abundance ratios among taxa. A further consideration, briefly outlined above, is the identifiability of certain species. Elements of some animals, for example the carapace and plastron fragments of turtles, are readily identifiable. In these cases the NISP may be high but the MNI may be very low. It is important, therefore, to examine relative abundance ratios derived from specimen counts (NISP) and MNI estimates with caution.

Results

Faunal remains from the C.S.S. *Kentucky* provided a small but well preserved assemblage. The archeological specimens were in excellent condition, often intact, facilitating accurate identification. A total of 626 vertebrate specimens weighing 5572.49 g was analyzed for this study (Table 22). The majority was nearly equally divided between turtle (NISP = 261) and horse (NISP = 272) specimens. All but five of the turtle specimens and eight of the mammalian specimens were identifiable to species.

A total of 16 individuals were identified from three classes. A single catfish (Ictaluridae) represented the class, Osteichthyes. Reptiles included five turtles consisting of one snapping turtle (*Chelydra serpentina*), one alligator snapping turtle (*Macrolemys temminickii*), one cooter turtle (*Psuedemys* sp.), and two softshell (*Apalone* sp.) turtles. The mammalian class provided the majority of individuals in this assemblage. Four Old World Rats (*Rattus* sp.) accounted for a quarter of the MNI. There were at least three individual Equids identified. Other mammals identified in the assemblage included one opossum (*Didelphis virginiana*) and one domestic pig (*Sus scrofa*). One domestic cow (*Bos taurus*) was cautiously identified from a single specimen that

Table 22. Vertebrate Fauna Recovered from the C.S.S. Kentucky

Scientific/Common Name	NISP#	NISP%	MNI#	MNI%	Wt./g	Wt-%
Ictaluridae/Freshwater catfish family	2	0.32%	1	6.25%	0.6	0.01%
Unidentified Turtle	5	0.80%			4.02	0.07%
Chelydridae/Snapping turtle family	7	1.12%			14.8	0.26%
*Chelydra serpentina/*Common snapping turtle	135	21.60%	1	6.25%	407.75	7.32%
*Macroclemys temminckii/*Alligator snapping turtle	14	2.24%	1	6.25%	61.00	1.09%
Pseudemys sp./Cooter	2	0.32%	1	6.25%	23.69	0.43%
Apalone sp./Softshell turtle	98	15.68%	2	12.50%	465.9	8.36%
Unidentified Mammal	8	1.28%			33.36	0.60%
*Didelphis virginiana/*Opossum	2	0.32%	1	6.25%	4.76	0.09%
Rattus *sp./Old World rat*	68	10.88%	4	25.00%	14.39	0.26%
Equuidae/Horse family	272	43.52%	3	18.75%	4451.13	79.88%
*Sus scrofa/*Domestic pig	6	0.96%	1	6.25%	59.75	1.07%
Cf.*Bos taurus/*Domestic cow	1	0.16%	1	6.25%	30.2	0.54%
Unidentified vertebrate	5	0.80%			1.14	0.02%
Total	**625**	**100.00%**	**16**	**100.00%**	**5572.49**	**100.00%**

compared favorably (cf.) with the illium of the skeleton used for reference. This specimen was sawed on both ends at an oblique angle.

In terms of weight, the assemblage was dominated by Equid specimens accounting for over 79 per cent of the total bone weight. Snapping turtle and softshell turtle accounted for nine and eight per cent of the total bone weight respectively. Rats, though representing a quarter of the individuals identified in this collection, accounted for less than three tenths of the total weight.

Many specimens were discolored, though none exhibited burns or charring. The cow specimen was sawed as mentioned previously. This specimen also exhibited cut marks as a knife would make. Rodent gnawing accounted for the majority of modified bone and was observed on mammalian elements only (Table 23). Five of the six identified pig specimens exhibited rodent gnawing as well as the single cow specimen. One Equid metatarsal (FS 82) exhibited rust stains from adherence to an iron pot. This specimen was complete and did not exhibit any modifications associated with food preparation, consumption, or disposal.

Table 23. Modifications observed on faunal remains recovered from the C.S.S. *Kentucky*

Taxon	Burned	Cut	Clean Cut/Sawed	Rodent Gnawed
Ictaluridae/Freshwater catfish family	0	0	0	0
Unidentified Turtle	0	0	0	0
Chelydridae/Snapping turtle family	0	0	0	0
*Chelydra serpentina/*Common snapping turtle	0	0	0	0
*Macrolemys temminickii/*Alligator snapping turtle	0	0	0	0
*Pseudemys sp./*Cooter	0	0	0	0
*Apalone sp./*Softshell turtle	0	0	0	0
Unidentified Mammal	0	0	0	1
*Didelphis virginiana/*Opossum	0	0	0	0
*Rattus sp./*Old World rat	0	0	0	1
Equuidae/Horse family	0	0	0	2
*Sus scrofa/*Domestic pig	0	0	0	5
Cf.*Bos taurus/*Domestic cow	0	1	1	1
Unidentified vertebrate	0	0	0	1
Total	**0**	**1**	**1**	**11**

Element distribution analysis of mammalian specimens shows cranial fragments were recovered most frequently among rats and horses (Table 24). Many loose teeth and tooth fragments contributed to the high frequency of Equid cranial fragments. In addition to cranial fragments Equid foot elements were relatively well represented in this assemblage. Rat elements show a high degree of skeletal completeness with all categories but the foot represented. Lack of foot elements is likely due to recovery bias. Often nearly complete rat skeletons were recovered within a single Field Specimen sample (see FS 20 and 86 in Appendix III). Equid crania (FS 36, 37, 49, 50, 51) and podiae diagnostic zones (FS 33 and 82) often were recovered relatively intact. Two opossum elements were identified from mandibles. Pig element distribution shows all but the head category represented. The single cow specimen represents the hindquarter.

Table 24. Distribution of mammalian elements recovered from the C.S.S. Kentucky

Taxon	**Head**	**Vertebrae/ Ribs**	**Forequarter**	**Hindquarter**	**Foot**
*Didelphis virginiana/*Opossum	2	0	0	0	0
*Rattus sp./*Old World rat	25	14	9	20	0
Equidae/Horse family	236	2	0	1	33
*Sus scrofa/*Domestic pig	0	1	1	2	2
*Bos taurus/*Domestic cow	0	0	0	1	0
Total	**263**	**17**	**10**	**24**	**35**

Observations on degree of epiphyseal fusion indicate that all Equid specimens were from adult animals. Pig elements often were too fragmented or eroded to observe degree of fusion, however, if size may be used to indicate maturity it appears the pig remains were from adult animals as well.

Element distribution of turtle specimens shows a high degree of skeletal completeness (Table 25). Often skeletal completeness was observed within a single Field Specimen number (see Appendix A). For example, FS 85 contained a nearly complete softshell turtle carapace and plastron while FS 84 contained a complete softshell turtle cranium as well as a number of appendicular skeletal elements. One common snapping turtle exhibited a high degree of skeletal completeness in FS 3, 11, 12, and 13.

Table 25. Distribution of turtle elements recovered from the C.S.S. Kentucky

Taxon	**Head**	**Vertebrae/ Ribs**	**Appendicular Skeleton**	**Carapace/ Plastron**
Chelydridae/Snapping turtle family				7
*helydra serpentina/*Common snapping turtle	29	7	13	86
*Macrolemys temminickii/*Alligator snapping turtle	0	2	1	11
*Pseudemys sp./*Cooter turtle	1	0	0	1
*Apalone sp./*Softshell turtle	5	14	13	66
Total	35	23	27	171

Discussion

There are several attributes of the faunal assemblage from the *Kentucky* that make it a noteworthy study. Shipwreck sites offer a discreet assemblage that assumes a rare uniformitarianism rather than an accumulation of data over extended periods of time. Although the sample size is small, excellent preservation facilitated identification. Over 97 per cent of the specimens were identified below the level of class. Horses, turtles, and rats dominate the assemblage; they do not appear to have been utilized at any point for food. In addition, modifications and element frequencies are present in relatively sufficient quantity to infer some taphonomic processes.

Although the hull of the ship could have prevented carcasses from being transported, the presence of a quantity of Equid cranial elements indicates that the velocity of flowing water at this submerged site was not high. A relatively large number of Equid foot elements indicates that the water was likewise not medium velocity. Lack of Equid vertebrae, ribs, scapulae, and other light elements may indicate a low velocity water transport of these elements. It is, however, highly probable that the shipwreck acted as a natural trap allowing for an accumulation of animals that perished during the accident and entrapped scavengers seeking food afterwards.

It is evident that episodic low water levels exposed the shipwreck for periods of time. Remains of the entrapped animals were exposed long enough for rodents such as mice, woodrats, muskrats, or squirrels to gnaw on the osseous remains. Because rodents prefer bone that is weathered and free from fat, sinew, or other soft tissue (Gifford 1981) it may be inferred that these episodes of exposure occurred some time after the flesh had been removed from bone. It is important to note that faunal remains from pig and cow exhibited rodent gnawing as well as the Equids known to have perished in the shipwreck. Assuming that soft tissue of the pig and cow elements was removed some time before that of the other mammals, it may be inferred that rodent gnawing of the pig and cow remains occurred while refuse accumulated on the ship before it wrecked. Another possibility is that the sedimentation process after the shipwreck proceeded at a slow enough rate to allow the other mammalian elements to decay to the point where the bone was exposed to the same degree as the bone from the ship's refuse. It could not be determined if the pig bones were the remains from meals already consumed on board or if they represent cuts of meat that were cured and in storage for future consumption. However, the cow specimen exhibited knife cut marks and represents the refuse from a meal consumed. A lack of rodent gnawing on the turtle remains could indicate these specimens were deposited after episodic exposure of the mammalian remains.

Due to element distribution analyses it is evident that horses, turtles, and rats represent non-food taxa. Nearly complete skeletons of turtles and rats were recovered from the site as well as nearly complete Equid crania and foot segments. None of the Equid or turtle remains exhibited any modifications indicating butchery or consumption. The high rate of skeletal completeness shows the carcasses were not disarticulated and redistributed as would occur for purposes of food preparation or consumption.

There is some evidence of the foodways from the faunal collection. The cow, pig, and opossum specimen element distributions indicate these animals were utilized for food. The element identified as domestic cow represents the area of the hindquarter referred to as the sirloin (Stewart-Abernathy and Ruff 1989). The thickness of the bone indicates a steak approximately three quarter inches thick. Fresh meat would have to have been consumed quickly upon acquiring it and would most likely be consumed by those of higher social status or rank due to its relative expense.

Pork is known for its excellent preservation qualities. Smoked or brine cured pork has been a common component of the American diet, being used particularly to characterize the South (Hilliard 1972; Reitz 1995; Stewart-Abernathy and Ruff 1989). The cuts of meat represented in this assemblage indicate nearly all portions of the pig carcass were utilized, a practice not uncommon in the nineteenth century. The ulna represents that area of the pig carcass referred to as the foreshank. The femur shaft represents the round. The tibia is part of the hindshank. The metapodial and second phalanx are foot bones. All but the round are considered cheaper cuts of meat (Stewart-Abernathy and Ruff 1989). Smoked shanks, ham hocks, and foot bones could be used to season soups and add some degree of animal protein to inexpensive dishes. A smoked round would have provided more meat and may have been consumed by those of higher social status or rank.

Opossum meat generally is stewed until the meat falls off the bone. The presence of opossum mandibles in the assemblage indicates the animal may have been skinned, gutted, and the head removed and discarded before cooking. Although opossum and cow are nearly equally represented in the assemblage with similar NISP and MNI, the small sample size precludes any definitive interpretation of these remains. Short species lists tend to over-represent rare taxa and in this case either the cow or the opossum or both could represent food sources that were rarely, occasionally, or often consumed.

Analysis of Marine Timbers and Food Remains

Introduction

During underwater excavation of the *Kentucky*, wood samples were collected from well-preserved portions of structural and ornamental timbers, and the remains of seeds and nuts were recovered from loose sediments that had collected at the base of the ship. All specimens were packed as found in vinyl bags, and stored in alcohol (as a preservative) pending analysis.

Analysis of wood remains from the *Kentucky* was conducted to establish the types of woods used in the construction and repair of the vessel, and to document differences between and preferences for certain construction materials. Analysis of persistent foodstuffs from the ship aids in better understanding the kinds of foods consumed on the ship, their geographic origin, and relative value to the diet of the ship's crew.

Assessment of non-carbonized, waterlogged vegetative remains from submerged portions of the *Kentucky* also provides a baseline for assessing the extent, condition, and potential value of persistent organic remains at the site.

Methods

A total of 69 wood specimens was analyzed. Each specimen was examined under low magnification (10X) and its general condition was assessed and noted. Storage of the *Kentucky* samples in alcohol had the effect of hardening minute wood fibers (Williams 1975), making minute features readily apparent. Identification of wood fibers based on micro-structure relies upon obtaining a clear traverse section of wood fibers. A good result was achieved by cutting across the grain by hand with a sharp scalpel. Each specimen then was examined under 10X-30X magnification and key anatomical features were noted. The structure of the *Kentucky* specimens

was compared with appropriate keys (Constantine 1987; Edlin 1969; Panshin and deZeeuw 1980; Dimbleby 1978) and checked against wood specimens from a comparative reference collection germane to the forest cover of central Ohio (where the vessel was built), and to the central and lower Mississippi river valley (where the *Kentucky* operated and was maintained). Wood identifications were made to the genus level when possible, and to the species level only when the assignment could be made with absolute certainty.

Seed and nut remains analyzed included 23 specimens classified as fruit pits (seeds) and nutshells from 12 separate proveniences within the hull of the *Kentucky*. Analysis included an external examination of each specimen under low magnification (10X-30X). Identification of specimens was made with the assistance of appropriate keys (Schopmeyer 1974; Martin and Barkley 1961), and by comparison with specimens from a comprehensive reference collection. As was the case with the wood analysis above, seed and nut identifications were made to the genus level when possible, and to the species level *only* when the assignment could be made with absolute certainty.

Results of Analysis

Wood Remains. Classification of waterlogged wood often is hampered by the deterioration of diagnostic features due to post-depositional processes (Pearsall 1989). Cell walls can disintegrate due to repeated freezing and thawing, and decay caused by anaerobic bacteria and fungi often obliterate key morphological characteristics (Dimbleby 1978).

Examination of wood fibers from the *Kentucky* revealed that some destruction of minute features had taken place that complicated species identification, but that generally the wood fibers recovered from the ship were in good condition, with most aspects of diagnostic structure intact. Ninety-nine percent of the analyzed wood specimens were minimally identifiable to the genus level.

The wood assemblage analyzed from the *Kentucky* revealed an overwhelming predominance of white oak species *(Quercus spp. LEUCOBALANUS group)* in ship construction. White oak accounted for 78 per cent of the analyzed wood specimens. Other wood taxa identified included unidentifiable oak species *(Quercus spp.)* (6 per cent), pine of the yellow or hard pine group *(Pinus spp.)* (6 per cent), maple *(Acer sp.)* (1 per cent), and spruce *(Picea spp.)* (1 per cent). A single wood specimen was inconclusively identified as oak *(Quercus spp.)*. Table 26 presents the provenience information and species identification for each wood specimen analyzed.

Seed and Nut Remains. Analysis of the seed and nut remains recovered from the *Kentucky* represent an interesting array of wild and exotic plant food resources. A total of 23 specimens from 12 distinct proveniences were examined, identification of 96 per cent of these specimens was possible - a single specimen was so deteriorated that no taxonomic classification was possible. Seed remains totaled 16 specimens including 8 peach pits *(Prunus persica)*, 4 persimmon *(Diospyros virginiana)* seeds, 1 almond pit (nut) *(Prunus amygdalus)*, and 3 common cocklebur seeds *(Xanthium pennsylvanicum)*. Nutshell remains totaled 5 specimens including 1 chestnut shell fragment *(Castanea sativa)*, 1 black walnut shell fragment *(Juglans nigra)*, 1 filbert shell fragment *(Corylus avellana)*, 1 thick-walled hickory nutshell *(Carya spp.)*, 1 pecan nutshell fragment *(Carya*

Table 26. Species Identification of Wood Fibers Recovered from Kentucky (Site 16BO358)

WS #	Provenience	Taxon	Comments
1	Sternpost	*Quercus spp. (LEUCOBALANUS)*	white oak group
2	Keelson	*Quercus spp. (LEUCOBALANUS)*	white oak group
3	Deadwood	*Quercus spp. (LEUCOBALANUS)*	white oak group
4	Port F2	*Quercus spp. (LEUCOBALANUS)*	white oak group
5	Plank above port F3	*Quercus spp. (LEUCOBALANUS)*	white oak group
6	Port F4	*Quercus spp. (LEUCOBALANUS)*	white oak group
7	Port F7	*Quercus spp. (LEUCOBALANUS)*	white oak group
8	Port F6	*Quercus spp. (LEUCOBALANUS)*	white oak group
9	Port F7 forward futtock	possible *Quercus spp.*	oak
10	Port Frame 7 aft futtock	*Quercus spp.*	unspecified oak
11	Port frame 8 forward futtock	*Quercus spp. (LEUCOBALANUS)*	white oak group
12	Port frame 8 aft futtock	*Quercus spp. (LEUCOBALANUS)*	white oak group
13	Port frame 9 forward futtock	*Quercus spp.*	unspecified oak
14	F9 aft futtock	*Quercus spp.*	unspecified oak
15	Port F10 forward futtock	*Quercus spp. (LEUCOBALANUS)*	white oak group
16	Port F10 middle futtock	*Quercus spp. (LEUCOBALANUS)*	white oak group
17	Port F10 aft futtock	*Quercus spp. (LEUCOBALANUS)*	white oak group
18	Port F11 forward futtock	*Quercus spp. (LEUCOBALANUS)*	white oak group
19	Port F11 middle futtock	*Quercus spp. (LEUCOBALANUS)*	white oak group
20	Port F11 aft futtock	*Quercus spp. (LEUCOBALANUS)*	white oak group
21	sister keelson port side	*Quercus spp. (LEUCOBALANUS)*	white oak group
22	lower port clamp	*Quercus spp. (LEUCOBALANUS)*	white oak group
23	middle port clamp	*Quercus spp. (LEUCOBALANUS)*	white oak group
24	upper port clamp	*Quercus spp. (LEUCOBALANUS)*	white oak group
25	sample long beam	*Quercus spp. (LEUCOBALANUS)*	white oak group
26	deck beam sample	*Quercus spp. (LEUCOBALANUS)*	white oak group
27	STBD F2	*Quercus spp. (LEUCOBALANUS)*	white oak group
28	STBD F3	*Quercus spp. (LEUCOBALANUS)*	white oak group
29	STBD F4	*Quercus spp. (LEUCOBALANUS)*	white oak group
30	STBD F5	*Quercus spp. (LEUCOBALANUS)*	white oak group
31	STBD F6	*Quercus spp. (LEUCOBALANUS)*	white oak group
32	STBD F7 forward futtock	*Quercus spp. (LEUCOBALANUS)*	white oak group
33	STBD F7 aft futtock	*Quercus spp. (LEUCOBALANUS)*	white oak group
34	STBD F8 forward futtock	*Quercus spp. (LEUCOBALANUS)*	white oak group
35	STBD F8 aft futtock	*Quercus spp. (LEUCOBALANUS)*	white oak group
36	STBD F9 forward futtock	*Quercus spp. (LEUCOBALANUS)*	white oak group
37	STBD F9 middle futtock	*Quercus spp. (LEUCOBALANUS)*	white oak group
38	STBD F9 aft futtock	*Quercus spp. (LEUCOBALANUS)*	white oak group
39	STBD F10 forward futtock	*Quercus spp. (LEUCOBALANUS)*	white oak group
40	STBD F10 middle futtock	*Quercus spp. (LEUCOBALANUS)*	white oak group
41	STBD F10 aft futtock	*Quercus spp. (LEUCOBALANUS)*	white oak group
42	STBD F11 forward futtock	*Quercus spp. (LEUCOBALANUS)*	white oak group
43	STBD F11 middle futtock	*Quercus spp. (LEUCOBALANUS)*	white oak group
44	STBD F11 aft futtock	*Quercus spp. (LEUCOBALANUS)*	white oak group
45	plug sample	*Picea spp.*	Spruce
46	Port F9 middle futtock	*Quercus spp.*	unspecified oak
47	footling AKA “wards treasure chest”	*Quercus spp. (LEUCOBALANUS)*	white oak group
48	lg hogging brace forward	*Acer spp.*	maple
49	ceiling plank	*Pinus spp.*	pine
50	STBD mortise plank	*Quercus spp. (LEUCOBALANUS)*	white oak group
51	aft most oct. Rigger	*Quercus spp. (LEUCOBALANUS)*	white oak group
52	outrigger 2	*Quercus spp. (LEUCOBALANUS)*	white oak group
53	outrigger with eyebolt ‘I’	*Quercus spp. (LEUCOBALANUS)*	white oak group
54	keel	*Quercus spp. (LEUCOBALANUS)*	white oak group

WS #	Provenience	Taxon	Comments
55	Plank under keelson	*Quercus spp. (LEUCOBALANUS)*	white oak group
56	stanchion under long 'D' beam at eyebolt 'D'	*Quercus spp. (LEUCOBALANUS)*	white oak group
57	SDP 8	*Pinus spp.*	southern/hard/ yellow pine group
57	STBD sister keelson	*Quercus spp. (LEUCOBALANUS)*	white oak group
58	lap strake	*Quercus spp.*	Unspecified oak
59	bilge pump	*Pinus spp.*	southern/hard/ yellow pine group
60	stern hook pont knee	*Quercus spp. (LEUCOBALANUS)*	white oak group
61	Misc deck plank sample	*Pinus spp.*	southern/hard/ yellow pine group
62	stern hook STBD knee	*Quercus spp.*	Unspecified oak
63	deck planking	*Pinus spp.*	Tar surface adhering
na	center arm brace	*Quercus spp. (LEUCOBALANUS)*	white oak group
na	aft hog chain brace	*Pinus spp.*	southern/hard/ yellow pine group
na	frame ?5 ports - illegible	*Quercus spp. (LEUCOBALANUS)*	white oak group
na	port arm brace	*Quercus spp. (LEUCOBALANUS)*	white oak group
na	STBD arm brace	*Quercus spp. (LEUCOBALANUS)*	white oak group

illinoensis) and 1 Brazil nut *(Bertholletia excelsa)*. Provenience, specimen count, and species identification information are presented in Table 27.

Description of Recovered Taxa

Quercus sp. [LEUCOBALANUS] [wood] (white oak group). Wood fragments belonging to the white oak groups dominated the analyzed assemblage from *Kentucky*. Although segregation of the particular species of white oak is not possible based on minute anatomy (Panshin and deZeeuw 1980:586-587), the two major groups of the genus *Quercus* (the red oak group and the white oak group) can be distinguished. The white oak group *(LEUCOBALANUS)* contains such species as white oak (*Quercus alba*), bur oak (*Quercus macrocarpa*), post oak (*Quercus stellata*), swamp white oak *(Quercus bicolor)*, Durand oak *(Quercus durandii)*, chestnut oak *(Quercus prinus)* and overcup oak (*Quercus lyrata*). The presence of these oak species within this archeobotanical assemblage is consistent with the regional forest cover of the regions where the *Kentucky* was built and operated: Swamp white oak *(Quercus bicolor)* and bur oak (*Quercus macrocarpa*) are native to south western Ohio where the *Kentucky* was built, but not to the lower Mississippi where the ship operated in later years. Durand oak *(Quercus durandii)* and overcup oak (*Quercus lyrata*) are indigenous to Louisiana where the *Kentucky* may have received repairs, but not to Ohio where the ship originally was constructed. The geographic range of the other white oak species mentioned above extends across all regions occupied by the *Kentucky* (Eyre 1980; Little 1980).

Lumber of white oak species historically has been used for applications requiring hardness, resiliency, and natural durability. The species exhibit positive qualities for ship and boat building (Panshin and deZeeuw 1980:568-572). White oak *(Quercus alba)* is the most important lumber tree of the white oak group and one of the best oaks with high-grade, all-purpose timber (USDA 1971:797).

Table 27. Seed and Nut Remains Recovered from Kentucky (Site 16BO358)

FS#	Provenience	Taxon	Count	Description
4	Dredge	Prunus persica	1	peach pit - half (50%)
8	Dredge, port, frame 04-05	Prunus persica	2	peach pit - halves (50%)
		Prunus amygdalus	1	almond pit - (40%)
		Castanea sativa	1	chestnut shell fragment - (50%)
10	Dredge, starboard, frame 05-06	Prunus persica	1	peach pit - entire (100%)
26	Dredge from above guard, port	Carya spp.	1	thick-walled hickory - (50%)
33	6ft. Starboard of hook/tripod	Corylus avellana	1	filbert - half (50%)
56	Starboard,. Unit 10	Diospyros virginiana	1	persimmon - entire (100%)
57	Starboard, Unit 11	Diospyros virginiana	1	persimmon - entire (100%)
69	Starboard, Unit 21	Diospyros virginiana	1	persimmon - entire (100%)
76	Starboard, Unit 27	Diospyros virginiana	1	persimmon - entire (100%)
96	Port, frame 05	Prunus persica	1	peach pit - 90%
		Xanthium pennsylvanicum	3	common cocklebur (100%)
		unidentifiable	1	
107	Stern Dredge on Deck	Prunus persica	2	entire - (100%)
		Carya illinoensis	1	pecan fragment - (30%)
108	Stern Dredge Under Deck	Juglans nigra	1	black walnut - (55%)
		Prunus persica	1	peach pit - entire (100%)
		Bertholletia excelsa	1	Brazil nut - (70%)

Live oak *(Quercus virginiana)* has the strongest connection with ship building of any of our native oak species. Ships 'knees' were cut from the extremely strong wood where the large roots join the trunk. The *USS Constitution* (aka "Old Ironsides") was made principally from live oak grown in Georgia (Constantine 1987:256).

Pinus spp. [wood] (yellow, hard or southern pine group). Pine *(Pinus spp.)* timber classified as yellow or hard pine was identified from the *Kentucky*. This group of pine species cannot be separated to the species level on the basis of minute wood structure (Panshin and deZeeuw 1980:444-447). Various species of the yellow/hard pine group occupy a broad range of environmental zones from New Jersey south to the Mississippi River Delta. Members of the yellow/hard pine group include the following species: longleaf pine (*P. palustris*), shortleaf pine (*P. echinata*), loblolly pine (*P. taeda*), pitch pine (*P. rigida*), and pond pine (*P. serotina*). Yellow/hard pine species native to southwestern Ohio where the *Kentucky* was constructed include pitch pine (*P. rigida*) and shortleaf pine (*P. echinata*). Pine species of this group indigenous to the lower Mississippi River Valley where the *Kentucky* operated include longleaf pine (*P. palustris*), shortleaf pine (*P. echinata*) and loblolly pine (*P. taeda*). Contemporary lumber trade classifies yellow/hard pines according to structural density, with longleaf and slash pines frequently exhibiting multiple late-wood bands measuring up to 0.2 inches in diameter against 0.1 inches or less for other southern pines (Kukachka 1960:43:887-896). Such classification does not translate well to pine specimens recovered from submerged archeological contexts, because considerable shrinkage and other quantitative modification to the wood structure over time is common.

Yellow or hard pines have been of great economic importance throughout the southern and eastern United States for centuries. Due to its strength, stiffness, and hardness, timber from this group of pines has been highly suited for structural timbers in bridges and trestles, for building construction, and in ship and boat building. These woods also are favored for agricultural implements, railroad-car construction, tanks and silos, destructive distillation, railroad ties, slack cooperage, and pulpwood (Panshin and deZeeuw 1980:444-447). *Pinus palustris*, or longleaf yellow pine was the preferred pine for naval construction (Little 1980:291). *Pinus palustris* also is one of the best producers of the resin from which naval stores (such as turpentine) are derived. According to Grimm (1957:45), choice stands *of P. palustris* from the southern colonies were appropriated during the reign of King George I for the exclusive use of the Royal Navy. Shortleaf pine *(Pinus echinata)* was one of the most prized woods for ship building, and was used for the masts in all naval vessels belonging to the United States and Great Britain. In the early eighteenth century, Great Britain claimed that all shortleaf pine growing in the North American colonies belonged to the British Crown for the masts of the Royal Navy (Constantine 1987:278).

Picea spp.[wood] (spruce). The woods of the white *(Picea glauca)*, black *(Picea mariana)*, red *(Picea rubens)*, and Engelmann *(Picea engelmannii)* spruces cannot be separated with certainty based on minute anatomy. These northern species are not native to the *Kentucky* project areas. Spruce species are useful for pulpwood, cooperage, boxes and crates, railroad car construction and ties, boat building, and paddles and oars (Panshin and deZeeuw 1980:457-459).

Acer spp.[wood] (maple). Maple species (Acer spp.) include approximately 13 native trees in North America. Maples have a tremendous north-south range throughout the United States, and a variety of species are native to the Mississippi Valley. These include boxelder *(Acer negundo)*, black maple *(Acer nigrum)* (upper Mississippi Valley), red maple *(Acer rubrum)*, silver maple *(Acer saccharinum)*, and sugar maple *(Acer saccharum)*, (upper Mississippi Valley). Throughout the range of the species, maple timber had historic application in the manufacturing of flooring, furniture, boxes, crates, wall paneling, and food containers (Panshin and deZeeuw 1980:607).

Prunus persica [pit] (peach). Peaches are native to the Orient (Sturtevant 1972:462) and are thought to have been introduced to England about the middle of the sixteenth century, probably from France (McIntosh 1855:485). The earliest mention of peaches in North America is a record of peach seeds ordered by the Massachusetts Bay Colony in New England in 1629 (U.S. Patent Office Report 1853:284). Throughout the seventeenth century, peaches spread rapidly in America, being planted by the pit on farms throughout the colonies. By the 1850s, peaches were a very common fruit, both eaten fresh or preserved by canning or drying.

Prunus amygdalus [pit] (almond). The almond is native to North Africa and the Orient, and has been cultivated for ages. Closely related to the peach *(P. persica)*, the almond 'nut' is actually the pit of a thick, dry, wooly-skinned fruit. The almond was introduced to England before 1548, and from there to North America (where certain varieties are deemed hardy as far north as New York) in the seventeenth century (Sturtevant 1972:456).

Carya sp. [nutshell] (hickory -thick walled). The true hickories *(Carya sp.)* include a variety of native species including bitternut *(Carya cordiformis)*, pignut hickory *(Carya glabra)*, shellbark hickory *(Carya laciniosa)*, shagbark hickory *(Carya ovata)*, and mockernut hickory *(Carya tomentosa).* These species occupy a variety of ecological zones, and produce a heavy nut crop which ripens during September and October (Munson 1986). *Carya* species constitute a dominant tree type in the southern forest region (Eyre 1980).

Carya illinoensis (sweet pecan). Sweet pecan is a large wild and planted tree with a broad, rounded crown and familiar pecan nuts. Pecan is one of the most valuable cultivated plants native to North America. The nuts are sweet and tasty, and the wood is used for furniture, flooring, and veneer. The tree was specific to the Mississippi River Valley prior to widespread cultivation (Little 1980:348).

Castanea sativa [nut] (chestnut). Originally from the temperate zones of Europe and Asia minor, the fruits of this chestnut produce three nuts inside each husk. Chestnuts contains more starch and less oil than other nuts. They are eaten whole, boiled, steamed or roasted, or ground into flour to make bread.

Diospyros virginiana [seed] (persimmon). This tree is native to moist alluvial soils within the Mississippi River drainage system. The date-like fruit of the persimmon was a dietary staple of historic Native American populations, and continued to be eaten throughout historic times (Little 1980:635-636). The fruits were eaten fresh during the months of October and November when they ripen, and were dried and stored for later use (Smith 1986:152). The persimmon was called the Indian plum by Hariot (1588), Smith (1986), de Laet (1633).

> "They are of several Sizes, between the Bigness of a Damasine and a Burgamot Pear. The Taste of them is so very rough, it is not to be endured, till they are full ripe, and then they are a pleasant Fruit. Of these some Veruosi make an agreeable kind of Beer; to which Purpose they dry them in Cakes, and ley them up for Use. These, like most other Fruits there, grow as thick upon the Trees, as Ropes of Onion; the Branches very often break down by the might Weight of the Fruit" (Beverly 1705:130).

Bertholletia excelsa [nut] (Brazil nut). Native to Brazil, this majestic tree bears large, oily, triangular *"nuts of commerce everywhere used as a food"* (Sturtevant 1972:89). The tree first was described in 1808 (Humbolt 1850:179).

Xanthium pennsylvanicum [seed] (common cocklebur). Common cocklebur is an annual herb native to the Mississippi Valley, Eurasia and Central America. It bears hard, woody burs which are oval to oblong, light brown and about 1-2 cm long. The burs are glabrous or nearly glabrous, with numerous crowded prickles 3-6 mm in length. These prickles are hooked at their terminus, glandular-pubescent and sometimes sparsely spiny near the base. Burs develop from late August through October. The plant is common to cultivated fields, abandoned land, poor pastures, roadsides, bottomlands and waste places (USDA 1971:444).

Summary

The recovery of lumber remains from the *Kentucky* are consistent with documented construction techniques for nineteenth century marine architecture (Grimm 1957). In the eighteenth and nineteenth centuries, resinous pine timber was preferred for marine construction based on its ability to resist rot and for its proven durability in submerged environments. Even after the wide-spread use of chemical preservative treatments to marine timber, southern pine species remained the wood of choice (Stefferud 1949:733). The recovery of pine timbers from this middle nineteenth century vessel may reflect the intentional selection of prime coniferous taxa best suited for shipbuilding. The *Pinus spp*. timber identified from the *Kentucky* may reveal the utilization of locally available pine resources or the importation of prime pine lumber for marine

architecture. White oak species appear to comprise the bulk of the construction materials used in the *Kentucky*. Historically, white oak timber (especially *Quercus alba*) was widely used for shipbuilding (Grimm 1957:200). White oak species were popular for steamboat construction during the mid nineteenth century for ship framing and decking (Hunter 1993:81). Unfortunately, the source of lumber and the preference for construction and repair materials applied to the *Kentucky* cannot be more clearly established based on these wood data alone.

The seed and nut remains identified from the *Kentucky* offer an interesting mix of locally available foods (i.e. peaches and pecans) and exotic, imported items (i.e. Brazil nut). Additionally, the seed and nut assemblage documents the use of wild plant food resources in combination with cultivated crops (filberts and black walnuts). Unfortunately, no clear patterns of seed and nut distribution throughout the ship are evident which might indicate the differential consumption of plant foods by socio-economic groups on the ship.

CHAPTER XII

SUMMARY AND CONCLUSIONS

Background to the Project

The U.S. Army Corps of Engineers is carrying out a program aimed at improving the navigability of the Red River. A significant element in this program is the construction of wing dykes and stone revetments along the banks of the river. In 1994, local informants reported to the Shreveport Area Office of the USACE, Vicksburg District, seeing the "bow" of a "double-hulled" wooden shipwreck eroding from the west bank of the Red River at Bagley Island, at approximately River Mile 269.8 within a planned revetment construction area. This wreck tentatively was identified as the *Kentucky* and further evaluation was required to determine the site's significance relative to National Register of Historic Places Criteria (36 CFR 60.4 [a-d]). After a determination was made that the site was significant, a data recovery effort was required to mitigate the impacts of the construction work on the site. Both the Phase II and Phase III work was carried out by R. Christopher Goodwin & Associates, Inc., on behalf of the Vicksburg District of the U.S. Army Corps of Engineers.

Phase II Evaluations

Initial field investigations, including an intensive magnetometer survey, revealed the remains of a substantial wooden steam boat. Magnetic data suggested that significant portions of the propulsion machinery were intact, never having been salvaged. Synthesis of archival data and field observations left little doubt that 16BO358 is the remains of the steamboat *Kentucky*, which sank after striking a snag on June 9, 1865. The vessel carried 900 passengers at the time, mostly paroled Confederate soldiers and their families. An unknown number of African-Americans, probably between 50 and 100, took passage on the main deck. In addition to the crew, the passengers, and their baggage, approximately 250 horses were on board. Contemporary accounts consulted during the Phase II evaluation indicated that there was significant loss of life in this disaster. Many human remains, most of the horses, and almost all of the baggage never were recovered from the wreck.

Initial archival research revealed that *Kentucky* was a side-wheel steamboat built in Cincinnati, Ohio, in 1856. The vessel was officially recorded as having a length of 222 ft, a beam of 32 ft, and a depth of 5 ft 6 in, with a capacity of 375 tons. The 1850's, when the vessel was constructed, represents the apogee of steamboat design and evolution, yet it is a period that is poorly understood in terms of hull construction or engineering design. Plans seldom were kept of such vessels by their builders, and archeological remains provide almost the sole record of the period. Prior to the Civil War, *Kentucky* served the lower Mississippi River Valley as one of the large, elegant side-wheelers which helped define the antebellum South. During the Civil War, the vessel served both the Confederate States and the United States as a troop transport ship. It served with distinction in several engagements, and while in Confederate service was credited with

turning the tide of the Battle of Belmont, Missouri, by delivering reinforcements through enemy fire to General Leonidas Polk.

The Phase II investigations involved the monitoring of coring operations and diver investigation of the submerged portions of the wreck. Coring over the terrestrial component of the site revealed that the wood and metal structure of the ship is covered with more than 16 ft of alluvium. The cores penetrated several levels of wood, suggestive of decking and hull planking. A fathometer survey and sweeps by divers on SCUBA then were used to find the portions of the vessel that extended into the river. Divers located and mapped the aft end of the boat, including the stern post, gudgeons, and hull planking. The line of wreckage was followed forward, revealing portions of the boat's guards (which extended the main deck well beyond the hull line and protected the side-mounted paddle wheels) and stanchions (which supported upper decks). Remarkably, this precise mapping and detailed recording was accomplished in adverse conditions which included numerous snags, trees, barbed wire, and exposed root mass around the wreckage, along with zero visibility.

National Register Significance

The Phase II work revealed that 16BO358 contains vessel remains that are very well preserved. Organic remains, including hull and decking, are intact, and much of the vessel does not appear to have suffered from salvage attempts or other disruptive forces. The site possesses a high degree of integrity. The wreck of the *Kentucky* appears eligible for nomination to the National Register of Historic Places under Criteria A, C, and D (36 CFR 60.4).

Criterion A The *Kentucky* is associated with "events that have made a significant contribution to the broad patterns of history," specifically under the themes of Commerce and Military, i.e., the Civil War.

Criterion C The *Kentucky* is significant under the Architecture and Engineering themes, embodying the "distinctive characteristics of a type, period, or method of construction." The vessel is a good representative of a side-wheel steamboat from the 1850s, the apogee of steamboat design and evolution. It is, however, a period for which hull construction and engineering design are poorly understood; archeological remains such as this constitute the primary evidence.

Criterion D The site holds the potential to yield information which is important to history. This includes construction and engineering information, as well as information on the passengers and crew. The baggage of over 900 passengers, including paroled Confederate prisoners and their families, was never recovered. It went to the bottom accompanied by the personal effects of the crew and the ship's furniture.

Based on the results of the Phase II evaluations, the site was nominated to the National Register and plans were developed for mitigation and comprehensive data recovery on those portions of the site threatened by revetment construction.

Data Recovery Plans

In general terms, the data recovery plan developed for the Phase III efforts on *Kentucky* called for staged investigations. Additional background research was to be carried out on the geomorphology of the region, on the progress of the Civil War and *Kentucky*'s role in the conflict, and on the vessel and the wrecking event itself. On the site, the first stage of the field effort called for placement by the USACE of a sheet piling enclosure around the site, both to protect it from the effects of current and to protect archeological divers during the field investigation. The data recovery effort was predicated on an inability to change the course or design of the planned revetment, which would cross the vessel and destroy a significant portion of the stern. The phased field work included more detailed mapping of the exposed wreckage; excavation and recording of the underwater segments of the wreck threatened by construction; dismantling and recovery of selected hull components, followed by their reburial near the site; and retrieval of artifacts and other materials from the wreck, with the retention of a representative sample and reburial of the remainder. The field portion of the investigation was to be followed by conservation of materials and preparation of a report on the entire project.

Subsequent events required several changes in the work plans for 16BO358. Sheet piling was installed around the wreckage in early 1996, but budgetary issues delayed the beginning of fieldwork until July of 1997. During the interim, the 20 ft deep water within the sheet piling enclosure was displaced by a deep deposit of silt carried in during floods and eroded from the adjacent river bank. This silt completely covered the remains that were exposed and recorded in 1995. A new work plan was required for the removal of this overburden with a large barge-mounted hydraulic dredge. The work plan was changed yet again when, during the field effort, consultations with project engineers resulted in a new engineering plan that allowed construction of the revetment in such a way that the wreckage could be avoided. This eliminated the need for large-scale dismantling and reburial of the vessel's stern and allowed wide archeological exposure of the stern, detailed recording, and preservation of the remains in place.

The results of all components of the Phase III efforts were highly successful and they are briefly summarized below.

Summary of Geomorphology

The geomorphology of the area has had a powerful effect on the region's history and on the preservation and discovery of archeological sites such as 16BO358. Between the Arkansas-Louisiana state line and Alexandria, the Red River is a meandering stream of low gradient and moderate sinuosity that flows in an alluvial valley constrained by Tertiary formations and Pleistocene terrace complexes. This western Mississippi River tributary carries a heavy load of silt and sand that promotes bank caving and point bar formation. The material deposited in the river by bank caving includes not only sediment, but trees that formed snags and rafts that are serious threats to navigation. The river valley has experienced cyclical degradation and aggradation during glacial cycles, but it has been an aggrading system during the Holocene. The river regime is sensitive to base level changes and has changed significantly even during historic times due to channel shortening and lengthening caused by course changes.

Quaternary deposits underlying the Red River floodplain include a thick substratum of sands and gravels and a relatively thinner topstratum composed of fine sands, silts, and clays. All topstratum deposits can be classified according to environment of deposition. Those of meander

belt ridges include natural levee, crevasse, point bar, abandoned channel, and abandoned course, and the active and abandoned ridges are separated by broad areas of backswamp.

In the more recent geological history of the region, the Great Red River Raft was a powerful and perhaps unique geomorphic agent that caused very rapid channel and floodplain aggradation. The raft was a tangled mass of logs, branches, vines, and saplings and incorporated sediment which, in 1820, extended discontinuously for more than 160 km (100 mi) along the river between Natchitoches and Shreveport. It grew upstream by the addition of new debris at its head and decay of older debris at its foot. First observed in 1700 A.D., the raft may date back to the 1400s and even to 1300 A.D. Several efforts were made to clear the river channel after 1833, but these met with limited success until the U.S. Corps of Engineers finally removed it in 1873 by a concerted effort of sawing, blasting, pulling, and floating.

Perhaps the most visible effect of the raft was the creation of 23 raft lakes in the lower ends of valley tributaries and low backswamp areas adjacent to the active meander belt. The lakes attained depths of 3.0 to 4.6 m (10 to 15 ft) and, before the raft was removed, accumulated sediment to an average depth of 0.9 to 1.2 m (3 to 4 ft). Less visible effects were the creation of numerous crevasses above blocked channel segments and long raft distributary channels that formed to provide bypass routes for floodwaters through backswamp areas. All of these features had important impacts upon navigation and trade in the region.

Within several decades of raft removal, the river channel rapidly scoured, raft lakes drained, and raft distributary channels were abandoned. Over a longer time frame, the channel gradient has steepened and, especially because of navigation improvements, has been shifting from meandering toward a braided regime.

The steamboat *Kentucky* hit a snag and sank on a lower Red River point bar in 1865 just south of Shreveport while enroute to New Orleans. Eagle Bend, where the wreck occurred, was artificially cutoff from the river in 1882. The sunken vessel was probably covered with abandoned channel filling in a progressively narrowing and shallowing oxbow lake by about 1924. Seven historic maps allowed a reconstruction of main river channel changes in the area between 1889 and 1974. The river channel north of the site gradually cut farther south, eventually exhuming a part of the wreck in 1994 and exposing it to discovery.

Historical Summary

The *Kentucky* is important both because of its role in the Civil War and because it stands as an example of a uniquely American type of vessel that played a fundamental role in opening up the west to settlement and trade. Despite a long interest on the part of historians in the role of steamboats on western rivers, there is much that is unknown about these remarkable American engineering innovations. The paucity of detailed descriptions of vessel and machinery construction, the rarity of construction plans, and the general absence of shipbuilder's models, have left us to speculate on precisely how early builders constructed these vessels and how their design evolved over time. The history both of the region and of the development of western steamboats presented in Chapter IV clearly outlines the significance of these steamboats, and places the *Kentucky* in its larger historical context.

The Phase II and III archival research, on the other hand, clearly revealed the details of *Kentucky*'s life and death. After starting service in 1856 as one of the swifter and larger than

average packets operating on Ohio and lower Mississippi, the vessel must have been nearing the end of its expected life span by the time the Civil War began. The life span of western river steamboats averaged four to five years (Hunter 1993:64; Still, Watts, and Rodgers 1993:66), and in 1860 the average age of 88 vessels inspected in Pittsburgh was only 2.23 years (Hunter 1993:101). Despite the boat's age, five years old at the outbreak of the war and nine years old when it sank, it provided active service to both sides during the war and figured prominently in several actions on the region's rivers. A post-war dispute between *Kentucky*'s owner and the U.S. government left a remarkable record of that service.

The last voyage of *Kentucky* was documented primarily in newspaper accounts of the disaster. Coming as it did at the end of the war, it is not surprising that accounts of the wrecking were incomplete, contradictory, and often laden with political bias. All reports seem to agree on the basic facts. The *Kentucky* was loaded with approximately 900 to 1,000 souls, including the crew, Confederate parolees from the Army of the Trans-Mississippi, their families, an unknown number of African-Americans, their baggage, and 250 horses. The vessel departed Shreveport on June 9, 1865, headed for New Orleans, and for unknown reasons her master ran down a twisting and difficult stretch of the river at night, after other vessels engaged in similar duty had tied up along the bank. The boat took on water after hitting a snag, and belated attempts to reach the shore and put out landing stages were unsuccessful. Most accounts agree that the bow went under rapidly, that the confusion onboard was exacerbated by a fire that broke out on the upper decks, and that the greatest number of casualties came from the lower decks. Another vessel came to *Kentucky*'s aid and saved a large number of passengers, especially women and children who congregated on the stern's upper decks.

Other aspects of the event are less clear. Initial accounts reported a very heavy loss of life, but the reported death toll diminished with time. After reporting as many as 200 drowned on June 23, for example, the Arkansas *State Gazette* reported several days later, on June 28, that an eyewitness reported that the claims of loss of life on the Kentucky were exaggerated: "not more than 15 or 20 white persons and about 50 Negroes (mostly women and children) were lost. The Negroes were on deck and were immediately submerged." This account, and the final report of the Army's investigation of the incident, correlate well with analyses carried out for this project, in which a total of 28 names were identified as fatalities. The names of the approximately 50 African-Americans who perished on board were not recorded and probably never will be known.

Some contemporary accounts also charged that *Kentucky* had been overloaded with passengers and cargo, contributing to the unsafe operation of the vessel. Analyses of the vessel's capacity and cargo on the last voyage suggest that *Kentucky* was not overloaded.

Although newspaper accounts refer to efforts to recover bodies during the week after the disaster, they are silent on the issue of salvage. It would seem surprising if the boat was not the subject of salvage operations, but none are recorded. Indeed, the magnetometry survey carried out in 1995 indicates that much of the vessel's machinery must still lie beneath the bank. It is possible that the boilers were left in place and the engines were salvaged, but the depth of the wreckage and the presence of so many dead may have inhibited salvage attempts. It must be assumed, however, that portions of the upper works that were accessible above water were cleared of valuables after the wreck.

Summary of the Excavation & Recording

The Phase III excavations at 16BO358 commenced on July 18, 1997, and excavation and recording of the *Kentucky* was completed on September 25, 1997. Removal of overburden with a large, barge-mounted dredge was successfully achieved with no damage to the site or loss of archeological materials. Excavations within the hull and on the main deck of *Kentucky* then were carried out using a hand-held dredge. The interior of the hull was fully exposed for a distance of approximately 15 ft forward of the sternpost, while another 10 ft length was exposed along the starboard side. Portions of the main deck were encountered beginning at about 15 ft forward of the sternpost, and these were cleared by excavation for a distance of approximately 35 ft from the sternpost along the vessel's centerline. Sections of the main deck and guards were excavated for a distance of 12 ft to port of the centerline and 20 ft to starboard.

Structural elements of the vessel, such as the frames and keelson, were used as markers for control and provenience of excavations within the hull. This proved an efficient and effective approach, and screening of all effluent prevented the loss of artifacts and ecofacts. It was more difficult to control excavations on the main deck, due to the absence of clear architectural landmarks and low visibility. Although some excavation units were found to overlap one another during this process, such incidents were rare. The redundancy and cross-checks built into the recording system allowed such errors to be caught and provenience was firmly established for all remains. The precision and efficiency of the excavations were greatly improved through the use of surface supplied air and two-way communications between the divers and the surface.

As excavation proceeded up the wreckage, a team followed to record structural details and a comprehensive plan of the wreckage was compiled. The communications system also was indispensable during this recording effort, as the exceptionally low visibility precluded any written recording by divers on the bottom. All measurements were relayed to the surface, where logs were kept of measurements and a detailed site plan was prepared as the data came in. It proved possible to prepare highly detailed deck and site plans in this fashion, and accuracy was continually checked through redundant measurements and the complementary use of different measuring systems such as trilateration and the computer-based WEB. WEB also provided three-dimensional data, and profiles and elevations of the wreckage were produced using this technique and vertical measurements from the surface of the water down to the wreck. The curvature of frames and other vessel components was successfully recorded using a goniometer. Removal of some components of the hull, such as the stern hook and bilge pump, allowed archeologists access to otherwise invisible portions of the hull. These dismantled portions of the wreck were raised and recorded on land and will provide visual reminders of the *Kentucky* after their conservation and installation in the USACE's planned visitor center for the Red River navigation project.

Vessel Architecture

The recording of *Kentucky*'s stern, combined with contemporary records and comparisons with other vessels of the period, has resulted in a better understanding of how western side-wheel steamboats were constructed. The 1850-1870 era was one of dramatic change for the western river packet boats (Hunter 1993:61-120). A combination of shallow draft and light construction was necessary to work on rivers subjected to severe depth fluctuations (Petsche 1974:101-105). As more experience was gained, newer vessels incorporated changes to improve capacity, speed, and survivability on the river. Many changes were not documented at the time and are very poorly understood today. The Kentucky was built and operated during this time of rapid changes, so any

specific structural details are important for understanding how later vessels evolved. *Kentucky* had a long service life compared to most vessels working on western rivers, a longevity that is all the more impressive when her rough war-time service is considered. The techniques used by her builders, as well as any repairs or changes made during her life-time, must surely have been effective ones. The vessel therefore provides an archeological model for successful construction technology.

Based on contemporary documents, when *Kentucky* was constructed in 1856 the vessel had a capacity of 375 tons, a 222 ft length, 32 ft beam, and depth of hold of 5.5 ft. These measurements can be used to derive various useful ratios for expressing the boat's relative length to depth and length to breadth, important structural considerations. *Kentucky* had a length to depth ratio of 40.4:1 (222 ft length/5.5 depth of hold), a relatively large ratio. Hunter (1993:96, Table 8) gives average length to depth ratios for boats of several sizes through time and provides a means of comparison. He reports a mean ratio of 29.9:1 for vessels of 300-350 tons in 1851; vessels of 400-500 tons at that time had a mean ratio of 37.9:1. In 1860, mean ratios for those same classes were 31.7:1 and 36.0:1, respectively. This suggests that the *Kentucky* was quite long relative to its depth. *Kentucky*'s length to breadth ratio was 6.9:1 (222/32). In 1851, the mean length-to-breadth ratio for steamboats 300-350 tons was 6.3:1; 400-500 ton vessels averaged 7.9:1 (Hunter 1993:86, Table 7). By 1860 these ratios were 5.6:1 and 6.1:1, respectively. In addition to the boat's longer length (relative to depth), then, the *Kentucky* also was relatively wide for her length. In both of these measures, *Kentucky* was at the extreme end of the ratios.

Building such a long, shallow vessel provides some distinct challenges for the boat-builder, as discussed in Chapter IV. These challenges include achieving a very shallow draft on a hull surmounted with a large superstructure, while preventing hogging and other distortions of the shallow and long hull. A vessel toward the extreme end of the range must provide even greater challenges, yet the *Kentucky* was a highly durable vessel. A variety of evidence was recovered during this investigation that illustrates the ways in which her builders solved these structural problems.

Part of the solution began with the choice of the woods used in construction. A strong frame and hull was essential, and the primary wood used in these areas was white oak (*Quercus spp. Leucobalanus* group). In the deck planking and certain other areas (hog chain brace, ceiling plank, and bilge pump tube), yellow or hard pine (*Pinus spp.*) was utilized. Another hog chain brace was constructed of maple (*Acer spp.)*. These woods contrast markedly with some of the wood samples retrieved at higher elevations via coring during the Phase II investigation, such as poplar (*Liriodendron tulipifera*) and white pine (*Pinus strobas*). Although strength and durability could not be sacrificed in the hull and framing, it was essential to reduce weight in the upper works, and this was accomplished in part by using lighter woods.

The sternpost and keel of the *Kentucky*, along with the inaccessible stem, formed the central components of the hull's frame. The keel had a relatively small moulded height, ensuring a shallower draft for the vessel and adding to its maneuverability. The relatively light vertical sternpost was fastened to the keel with a single through-bolt and fishplates on either side of the assembly. Twenty-one frames were uncovered during the excavations, and these illustrate yet another way in which the *Kentucky*'s builders lightened the vessel while retaining structural integrity. Rather than using closely spaced double frames in the traditional way, single frames were used, placed a greater distance apart from one another. In addition, the frames were considerably lighter than those used in ocean-going or traditional craft. The framing timbers on *Kentucky* averaged between 3 to 4 in sided and 5 to 6 in moulded. This ensured that the widest part

of the timber was opposed to the primary stresses to which it would be subjected, but that it's size was diminished where such strength was less important (i.e., the sided dimension).

This solution is analogous to a similar trend seen during the nineteenth century in house framing, where substantial framing timbers that were square in cross-section were abandoned for lighter and cheaper lumber, culminating in the 2 by 4 in and 2 by 6 in timbers commonplace today. This new balloon framing made use of light studs running from sill to plate, stiffened by exterior sheathing, and fastened with cheap, readily available nails (Upton 1981:88). As in house-wrighting, this shift in construction methods for boats both stream-lined the labor process and demystified the building process, moving it out of "the realm of craft to that of industry" (Upton 1981:92). For the builders of steamboats on western rivers, this technique also had the distinct advantages of lightening the vessel and decreasing draft, as well as making it possible to construct vessels in a much shorter period of time, thereby reducing their cost. It may well be that the use of balloon framing in houses, thought to have originated in the Midwest during the 1830s, owes much to the innovation of boatbuilders.

The *Kentucky* demonstrates the durable structure that could be achieved using light framing joined with nails and stiffened by sheathing. On the exterior, the hull was sheathed with 2 in thick hull planking of varying widths, from 4 in to 16 in. As with traditional vessels, however, the changing angles of frames in the stern meant that this area needed additional strength, and this was achieved through a traditional method, using a sternhook.

Although the lighter frames of the *Kentucky* clearly were adequate to their task, the shallow keel was not sufficient to stiffen the vessel on its own. A variety of methods were used to provide additional stiffening and longitudinal strength; some techniques were traditional, while some were less so. The keelson and stern deadwood were familiar means of strengthening the vessel's backbone, and they were assisted by the installation of two sister keelsons that paralleled the keelson. Added longitudinal stiffness then was provided by series of additional structural elements, including floor strakes, futtock head strakes, bilge keelsons, and two clamps. The floor strake seen on the starboard side was a 2 by 6 in plank that paralleled the keelson. Outboard of the floor strakes, futtock head strakes were installed. Even farther outboard, the builders installed a composite bilge keelson that ran along the inside of the hull at the turn of the bilge. Although the turn of the bilge on the *Kentucky* was not nearly as angular and abrupt as in the *Bertrand*, it was more severe than those found on more traditional hull forms and required the additional strengthening provided by the bilge keelson. The use of a composite piece, formed of two 2-1/2 by 8 in planks, imparted a greater strength to this area; it also was cheaper and easier to form a composite piece than to produce a single piece of wood measuring 5 by 8 in. Additional stiffening was provided farther up the curve of the hull by clamps. The stern section of the hull uncovered during this project almost certainly was relatively narrow compared to the full beam of the boat amidships, and these longitudinal stiffeners likely would have been joined by additional members farther forward as the hull widened.

These various structural elements provided some of the necessary stiffness required in a long hull, but they were not by themselves sufficient to resist hogging or other powerful distorting forces that worked on the vessel. Additional strength was imparted to the structure along its long axis by the installation of a series of cross-braces placed vertically between the keelson and the center beam for the main deck. Formed in much the same fashion as bracing for wood bridges and other engineering innovations of the nineteenth century, these diagonally and vertically oriented timbers imparted tremendous longitudinal strength to the hull. They also helped support the weight of the main deck and, farther forward, the additional weight of boilers and fireboxes. Although it is hard to trace the influence that this kind of innovation had on other industries, it seems likely that

these construction techniques did spread and that there was cross-fertilization between various industries. The Philadelphia engineer Oliver Evans, for example, who is credited with designing the first high pressure steam engine in 1801 and was heavily involved in its application to river boats (Hunter 1993:123-125; Still, Watts, and Rodgers 1993), also was involved in the construction a bridge across the Schuylkill River in 1813. This massive bridge, designed by Lewis Wernag and called the "Colossus" of Philadelphia, was the longest single arch wooden bridge of its time at 340 ft, and it employed cross-bracing that was quite similar to that used on the *Kentucky* (Nelson 1981:164-173, Figure 2). The techniques moved into other areas as well. By the mid-1850s, for example, railroad travel was expanding and changing significantly, and longer, more commodious rail cars were needed. Rail car builders already had adopted a much lighter balloon-like frame stiffened by thin sheathing to save weight, but any significant lengthening of the cars required a way to introduce longitudinal stiffness without substantially increasing the size of sills. This is a design problem that is quite similar to that already encountered by boat builders. The solution was achieved in the 1850s by the introduction of the side truss panel, a system of vertical and diagonal braces much like the cross braces found on *Kentucky*. On railway cars these were placed along the side of the car below the windows, and they permitted a 50 per cent lengthening of the cars without greatly increasing their weight (White 1981:205-206).

The cross-bracing on *Kentucky* was complemented by a hog chain that stretched along the centerline of the boat. Securely anchored in the dead wood of the stern, the 2 in diameter wrought iron chain ran up over a series of braces placed along the keelson and footling. Although inaccessible to archeologists, the other end of the chain must have been anchored at the bow of the vessel. The chain served to lift the narrowest and least buoyant portions of the hull, the bow and the stern, while transferring downward pressure through the braces to the more buoyant central sections of the hull.

Running alongside the top of the longitudinal cross-braces was a deck beam that ran down the centerline of the boat and supported the transverse support beams of the main deck. This is a feature that is not paralleled in other forms of maritime construction, and it probably was made necessary by the vessel's exaggerated length and breadth at the main deck. Placed at right angles to this longitudinal beam, the transverse beams of the main deck measured 2 to 2-1/2 in (sided) by 6 in (moulded). As with the frames, they were cut down in size where strength was not needed (the sided dimension), but given adequate depth (along the moulded dimension) to support the main deck without bowing under its weight. They both supported the deck planking and held the sides of the hull together. An important element in preserving these beams from the decay induced by condensation on the underside of the deck was a groove chased into their upper surfaces for salt. One to 1-3/8 in thick pine decking was placed over these beams parallel to the vessel's centerline and butt-jointed fore and aft. The deck was tarred, covered with a material resembling felt, tarred again, and then covered with sand.

Kentucky's beam was recorded as 32 ft, but like other western steamboats, guards extended the main deck well beyond the edge of the hull to provide an expanse of deck that likely approached 70 ft. The main transverse deck beams terminated at the outer edge of the hull, but the deck's guards were extended outward and supported by outriggers that were lap-joined to the forward faces of the transverse beams. Over the junction of each set of beams and outriggers, along the top of the hull, ran a waterway, a 1-3/4 in thick by 13 in wide board. Mortises were let into the waterway for the hull's top timbers, which supported the main deck's bulwark. No decking remained intact on the guards. As the guards were in effect cantilevered over the water as they extended out from the hull, their weight would have placed an enormous strain on the joint between deck beams and outriggers were it not for yet another system of chains. Attached to the guards toward their outboard ends, cross-chains ran up over the deck, passing over sampson posts

set in the center of the hull before ending at the guards on the opposite side of the boat. Each end of a cross chain had a two point attachment to the guard; this "V" shaped attachment spread the strain, while a turn-buckle was used to adjust the tension on the chain. Portions of at least two such cross-chains were recorded on the exposed portions of *Kentucky*, but their original spacing could not be determined.

The combination of structural features employed on *Kentucky* allowed for a light-weight, shallow draft hull that resisted hogging and distortion, yet was flexible enough to withstand the rigors of western rivers, a remarkable accomplishment. Relatively little evidence of *Kentucky*'s upper structure was recovered. This material was confined primarily to window glass, tongue and groove sheathing, and a fragment of plaster with gold leaf.

Artifact Summary

The artifact assemblage from *Kentucky* covers a wide spectrum of materials, ranging from hardware, furniture, and equipment that is vessel-related to personal objects, company-issued equipment, and military materials. In addition to providing evocative illustrations of life on board *Kentucky*, these materials provide information on the construction and repair of the vessel, elements of the boat's cargo, and a range of personal objects. The most striking aspects of the assemblage are the large number of cast iron cooking vessels, the recovered deck and vessel equipment (anchor, capstan, and bilge pump), the small but varied mixture of personal items and a few clearly military objects, and the large number of bones both from horses and from post-wrecking denizens of the structure. The presence of a large number of valuable objects on the main deck, such as the cookware, is an indication that salvage efforts on the vessel may have been minimal.

The confinement of excavation to the stern of the *Kentucky* limited attempts to discern patterns within the assemblage. Nevertheless, it is clear that the stern portion of the vessel's main deck was used for a variety of purposes. Heavy equipment, such as the cooking pots, was stowed in this area, and it appears that horses were transported there as well. Materials excavated from the main deck are most likely to have been in use during the vessel's last voyage, albeit with some displacement from their original position. Some of the materials found in the hold and outside the hull probably originated on the main deck or higher on the vessel's superstructure and were deposited in lower levels during the process of the boat's break-up and deterioration. The capstan is a good example of this, probably having fallen almost vertically from its original position on the main deck. It seems likely that many of the objects recovered from the upper stratum of the hold also fall into this category (horse tack found in the hold was unlikely to have been stored in such a wet environment originally), while materials found lower down in the bilge deposits are more likely to reflect earlier accumulations of material during the working life of *Kentucky*.

Site Formation Processes

The attitude of the wreckage, the distribution of large and small remains, and the geomorphology study make it possible to reconstruct the processes whereby the vessel broke apart and the site was formed. Recording of the pitch of the *Kentucky*'s stern, as well as evidence from the terrestrial coring, support eyewitness reports that the boat went down bow first. The vessel also heeled over to starboard. Although the stern superstructure was out of the water immediately after the wrecking, it is not clear whether the stern's main deck was underwater at that time. Until

Lattier's Cut-off formed several decades later, the stern and port side of the wreckage would have been subjected to the greatest effects of the current. As the stern angled out from the bank and upstream, it is likely that sediments were trapped rather quickly on the upstream (port) side and that part of the structure silted in. This contributed to the better preservation on that side of the site. It is unlikely that much of the superstructure survived for any length of time after the wreck. Given the light construction of the upper works and the strong current of the river, some segments may simply have lifted off the hull and floated away, while others would have been buffeted by the current, as well as trees and other solid objects carried by the stream.

The stern of the vessel, particularly the higher portions of the wreckage and the starboard side, clearly seem to have suffered the greatest amount of deterioration. This degradation is due to exposure to river currents, impact from floating debris, and a cyclical process of saturation followed by drying. Portions of the wreckage must have been accessible for some time after the wreck, given the copious quantities of turtle remains recovered during excavation. This supports geomorphological analysis indicating that the vessel lay at least partially unburied on the river bottom until the early 1900s.

As wooden structural elements weakened through exposure to water and current, and as sediments forced themselves on the wreck, the starboard guard weakened to the point that it collapsed downward. This resulted in the fractured deck beams that are visible on the site plans. The hull frames probably fractured, as well. This downward movement and the break in the deck beams no doubt loosened or started the deck planking and, once loose, it was stripped away from the guards. The main transverse deck beams also fractured at the longitudinal beam, resulting in a flattening of the entire wreckage to starboard. This process may have been exacerbated by sediments washing out from under the starboard guard. At some point, it also appears that sediment washed out from beneath the stern and the hog chain parted. As a result, the stern of the boat dropped down, fracturing the keel and keelson. Much of this breakage may have occurred during the first twenty years after the wreck.

As the main deck at the stern of the boat deteriorated and broke apart, objects dropped to the bottom of the hold or outside the structure. The capstan is a good example of this, apparently having dropped straight down from its position on the fantail. The upper stratum excavated within the hold contained much of this type of displaced material, including horse bone, bridle pieces, and tack. The lower levels contained materials that are more likely in a primary context, including rat bones that point to an often overlooked portion of the boat's company. Some of the displaced material probably was shifted relatively recently, with the modern exposure of the wreckage. The recovery of a cast iron pot outside the port edge of the hull provides an obvious example. Its displacement up the incline of the deck suggests movement by the current, which only in recent times has been directed toward the stern and port sides of the vessel; in the nineteenth century, the current ran in the opposite direction. Although much of the starboard side of *Kentucky* may have suffered degradation over the last 135 years, preservation clearly improves toward the bow. It seems likely that more of the vessel is intact beneath the river bank, possibly including some elements of the superstructure.

Conclusions

By any objective measure, the Phase II and III investigations of 16BO358, the wreck of the steamboat *Kentucky*, were highly successful. Archival research revealed a remarkable amount of detail on the vessel's service history and the events that led to its destruction. Field investigations

resulted in a highly detailed record of the stern of the vessel and show a variety of techniques that were used by nineteenth century boat builders to produce these remarkable shallow-water craft. The excavation and recording was completed in extremely limited visibility, with no loss of detail or precision.

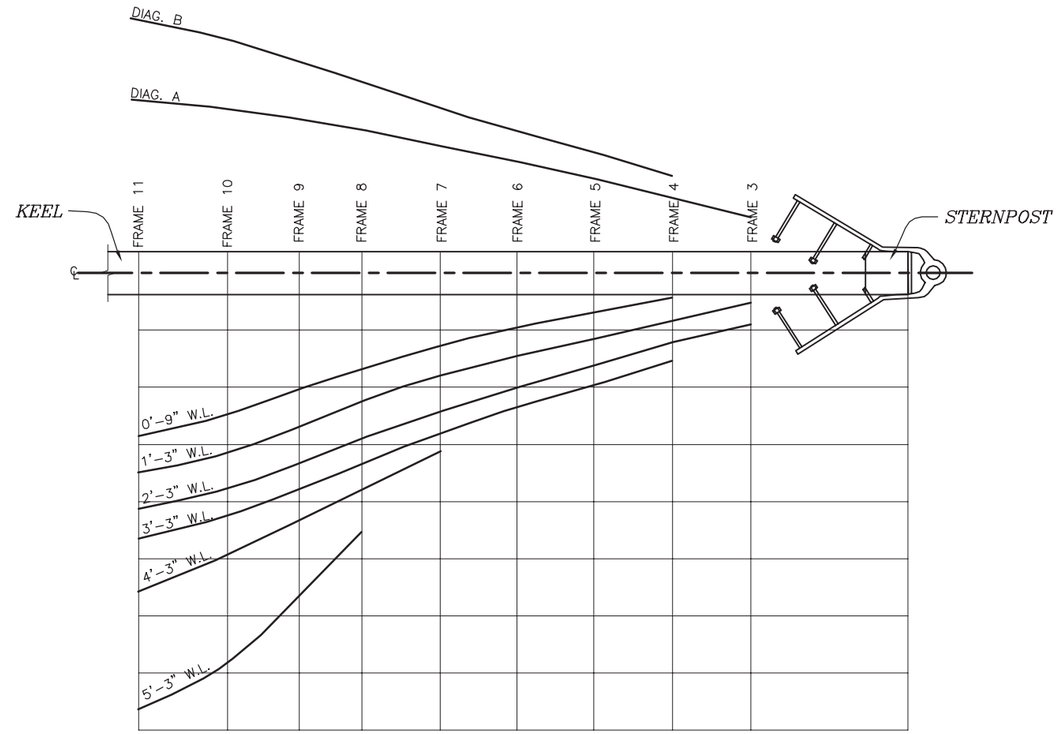
The comprehensive recording of the vessel has permitted an assessment of the lines and structure of the vessel's aft end (Figure 76), and this may be combined with photographs and other accounts of similar vessels to project the *Kentucky*'s original appearance and configuration. Although conjectural above the main deck and forward of the excavated parts of the boat, the reconstructions shown as Figures 77 and 78 probably reflect something quite similar to the vessel's appearance before it sank.

Although these reconstructions are conjectural, additional evidence has been preserved in place due to the Army Corps of Engineers' revisions to the revetment construction on this stretch of the Red River. The stern of the *Kentucky* has now been capped by a layer of sand and is protected from future erosion by the revetment and sheet piling left in place beneath it. The remarkable state of preservation encountered toward the bank line during the final stages of the Phase III suggests that the bulk of the *Kentucky* may lie in an excellent state of preservation beneath the bank of the Red River. These preserved elements of the vessel may include not only hull and superstructure, but propulsion and other machinery, furnishings from the vessel, and cargo and personal effects of the crew and passengers. Last but not least, it is likely that human remains still lie interred within the wreck of the *Kentucky*. The protection afforded the site through the revetment construction and the transfer of the site from the landowner to the government, ensures that this grave site and monument to American engineering will remain preserved for the future.

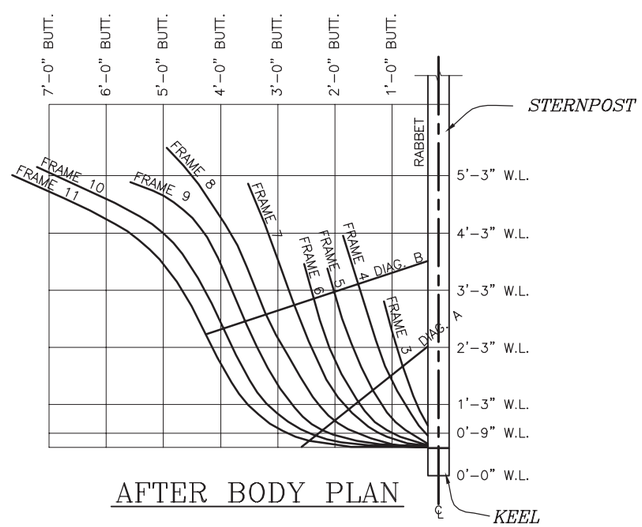
TABLE of OFFSETS

All dimensions below are given in feet, inches, and quarters of an inch.

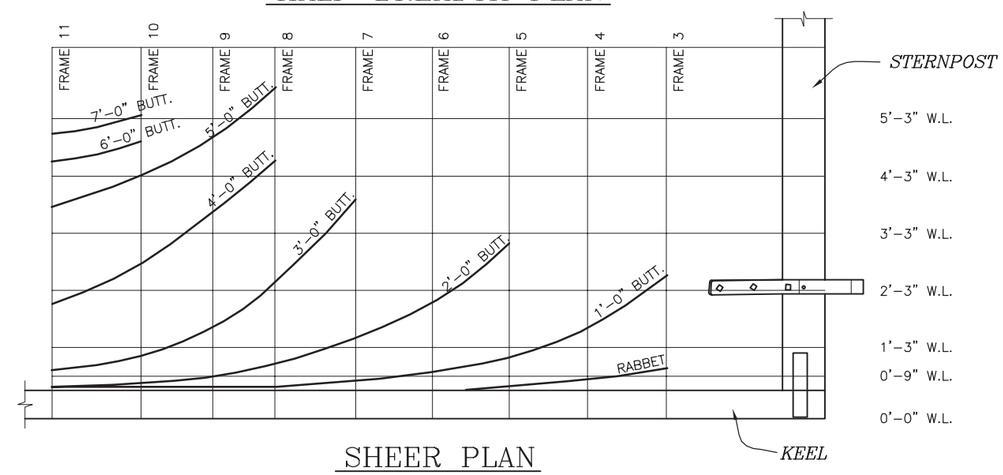
		STATIONS								
		FRAME 3	FRAME 4	FRAME 5	FRAME 6	FRAME 7	FRAME 8	FRAME 9	FRAME 10	FRAME 11
HEIGHTS ABOVE BASE	7'–0" BUTTOCK								4–9–3	4–5–3
	6'–0" BUTTOCK								4–4–0	4–0–0
	5'–0" BUTTOCK						5–3–2	4–5–0	3–9–0	3–2–2
	4'–0" BUTTOCK						4–0–0	3–1–0	2–2–2	1–6–0
	3'–0" BUTTOCK					3–3–3	1–10–3	1–1–1	0–7–1	0–4–0
	2'–0" BUTTOCK			2–7–0	1–6–1	0–11–0	0–5–2	0–3–0	0–1–2	0–0–3
	1'–0" BUTTOCK	2–0–1	1–1–0	0–5–3	0–3–3	0–1–3	0–0–2	0–0–2	0–0–2	0–0–0
	RABBET	0–4–2	0–2–1	0–0–3	0–0–0	0–0–0	0–0–0	0–0–0	0–0–0	0–0–0
HALF–BREADTHS	0'–9" W.L.						4–7–3	5–9–2	6–11–1	3–9–1
	1'–3" W.L.					3–2–3	3–10–3	4–5–1	5–0–3	5–8–2
	2'–3" W.L.		1–5–1	2–1–1	2–6–0	2–11–1	3–5–2	3–10–3	4–4–1	4–9–1
	3'–3" W.L.	1–0–1	1–4–1	1–9–1	2–1–3	2–6–3	3–0–1	3–5–2	3–10–3	4–2–3
	4'–3" W.L.	0–7–3	0–11–2	1–3–2	1–7–1	1–11–2	2–4–3	2–9–3	3–3–1	3–7–1
	5'–3" W.L.		0–6–2	0–9–3	1–1–0	1–4–3	1–10–0	2–2–1	2–7–3	2–11–3
DIAGONALS	A	0–11–1	1–3–3	1–7–3	1–11–1	2–2–1	2–5–3	2–8–1	2–10–1	2–11–3
	B		1–9–1	2–0–3	2–5–1	2–10–2	3–4–0	3–8–2	4–4–1	4–9–3



HALF–BREADTH PLAN



AFTER BODY PLAN



SHEER PLAN

SHIPWRECK *"KENTUCKY"*

Sheer Plan

DATE: 10.22.99 | PREPARED BY: BW

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Figure 76 Sheer plan, after body plan, and half-breath plan of *Kentucky*

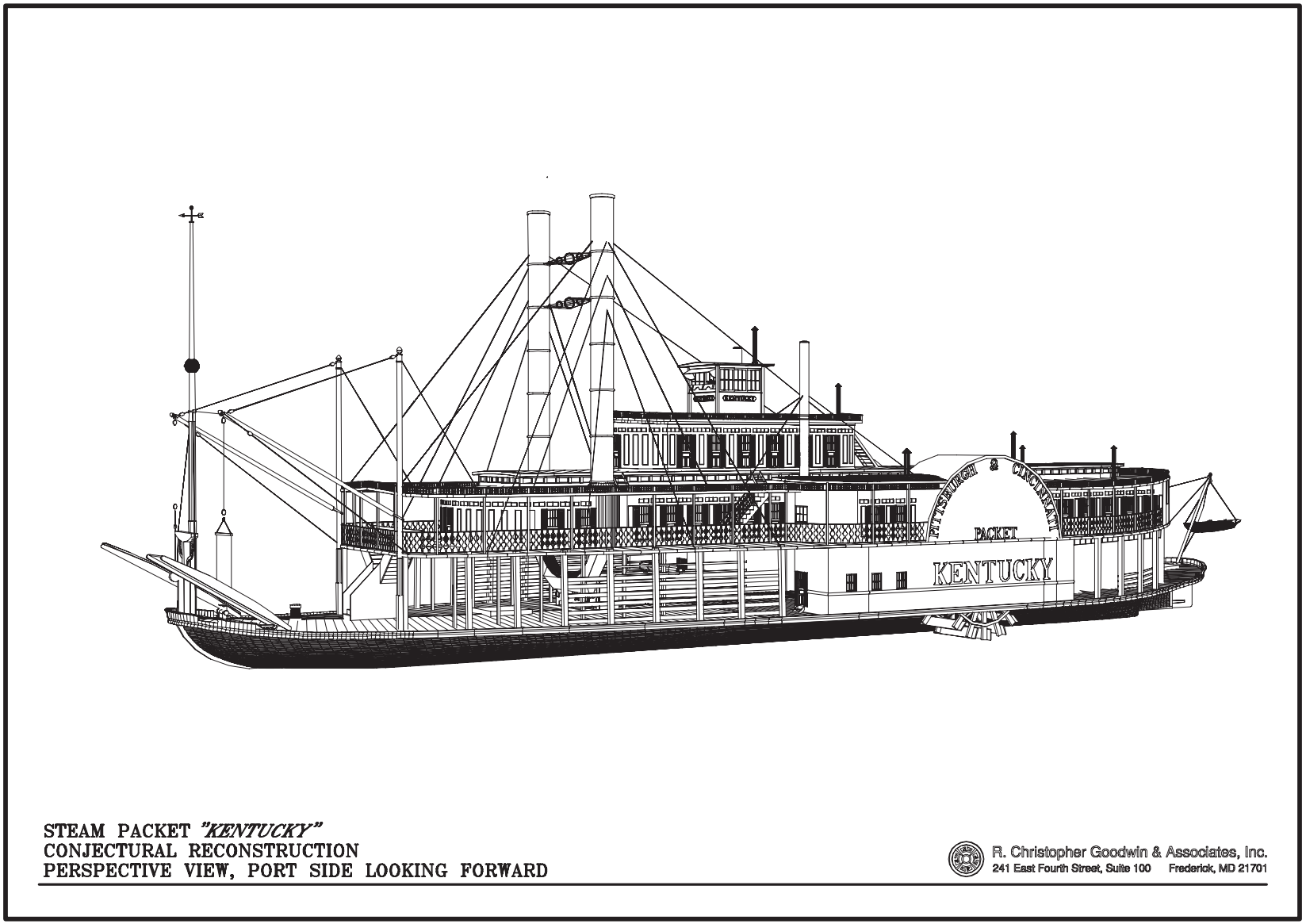
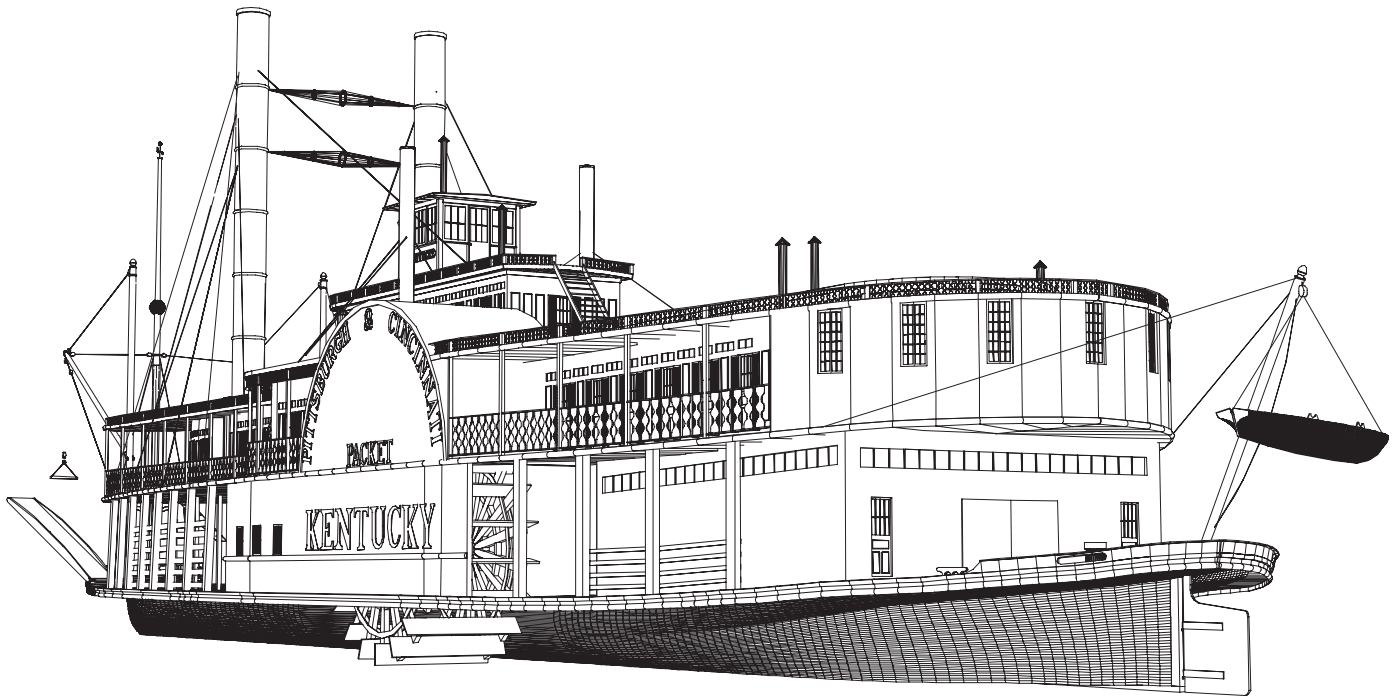


Figure 77 Conjectural reconstruction of *Kentucky*, perspective view, port side looking aft



STEAM PACKET *"KENTUCKY"*
CONJECTURAL RECONSTRUCTION
PERSPECTIVE VIEW, PORT SIDE LOOKING FORWARD

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Figure 78 Conjectural reconstruction of *Kentucky*, perspective view, port side looking forward

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At Goodwin & Associates, Inc., Dr. R. Christopher Goodwin acted as Co-Principal Investigator and provided oversight to all aspects of the work. Dr. John L. Seidel acted as Co-Principal Investigator and project manager for the *Kentucky* investigations and directed field operations. David S. Robinson directed diving operations, the vessel reconstruction, and served as Dive Safety Officer for the Phase II and Phase III investigations, with assistance from Adam Kane during the Phase II work. The field crew for the Phase II research included John L. Seidel, David S. Robinson, Science Kilner, and Dick Swete. The Phase III field crew included John L. Seidel, David Robinson, Colby Child, Adam Kane, Jean B. Pelletier, Anthony Randolph, Dick Swete, and Ward McIntyre. Support from Goodwin & Associates' New Orleans office was provided by Randy Primm and William Athens.

A large number of people contributed to the production of this report. John L. Seidel was the primary report author. David S. Robinson, formerly of Goodwin & Associates and now Director of Conservation and Nautical Archeologist at the Lake Champlain Maritime Museum, wrote the chapter on the construction of the *Kentucky*. Adam Kane researched and wrote portions of the chapter on the history of the western steamboat; he also prepared vessel lines and inked the plan and elevation of the wreck. Martha Williams conducted archival research and wrote a portion of the history. Anthony G. Randolph, Jr. performed the initial artifact analysis and wrote a portion of the artifact analysis chapter, and Charlene Keck analyzed and reported on the faunal collection. Andrew Madsen supervised laboratory processing and undertook artifact conservation. April L. Fehr compiled and edited the report. Graphics were prepared by Barry Warthen. Cyd Goodwin and David Olney completed the artifact drawings. The report was produced by Stacy Beitz.

Other scholars contributing to the project included: Dr. Roger Thomas Saucier, who prepared the report sections dealing with geomorphology; Gary D. Joiner, CEO of Precision Cartographics, who contributed the chapter on Civil War history; Dr. Lawrence E. Babits, Associate Professor of Historical Archeology and Maritime History at East Carolina University, who examined the artifact collection and contributed to the analysis; and Justine W. McKnight, who analyzed and reported on the botanical collection.

APPENDIX I

PRIMARY SOURCE ACCOUNTS RELATING TO THE *KENTUCKY* DISASTER

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PRIMARY SOURCE ACCOUNTS RELATING TO THE *KENTUCKY* DISASTER

A. Final Report of Brig. Gen. Lewis B. Parsons (U.S.A.), Chief of Rail and River Transportation, to Bvt. Maj. Gen. Montgomery C. Meigs, Quartermaster-General, U.S.A. October 15, 1865.

Third. The sinking of the steamer *Kentucky*, on the Red River, in the month of June last, was attended with the loss of a number of paroled rebel soldiers, the exact number of which is not yet known, though believed not to exceed thirty lives. I would respectfully submit whether the adoption of a general rule in the case of such accidents that an immediate and strict examination by court martial or military commission should be had, would not tend to produce a greater degree of caution on the part of officers having boats under their control, and be more satisfactory to the public, by fixing blame upon the parties responsible, or, if resulting from causes beyond the control of human agencies, by relieving the officers and department from responsibility.

B. Arkansas *State Gazette*, Little Rock, AK.

June 23, 1865: On Friday, June 9, the steamer Kentucky with 1000 of Parsons' command on board broke in two fifteen miles below Shreveport and sunk. Two hundred persons were drowned, including Judge R. T. Robinson of Saline County, Missouri, and a number of ladies. General Price's escort was aboard. The military authorities compelled the boat to push out when the Captain protested and informed them that she was then in a sinking condition. They are deserving of the severest punishment. The Captain, when he found the boat was actually going to pieces, tried to land, but she was totally unmanageable. Major Roberts, son of Judge Roberts, was among the saved.

June 27, 1865 (Summary): Investigation of the Kentucky incident resulted in a finding favorable to the officers in charge at the time. (The incident was) ruled accidental, but (Maj. Gen.) Herron ordered further investigations. The officers involved were released.

June 28, 1865: An eyewitness reported that the reports of loss of life on the Kentucky were exaggerated. **"Not more than 15 or 20 white persons and about 50 Negroes (mostly women and children) were lost. The Negroes were on deck and were immediately submerged."**

C. *The South-Western*, Shreveport, Louisiana. June 14, 1865.

We learn from passengers, who were on the ill-fated Kentucky, at the time of the catastrophe, that she left this port last Thursday evening perfectly jammed with passengers inside and out, most of them paroled Confederates--the larger portion being Missourians. When about sixteen miles below the city, she was found to be in a sinking condition and several ineffectual attempts were made by her officers to land her before they succeeded. The scene is here represented to have beggared description as she sunk beneath the water, carrying down with her at least one hundred souls. The heaviest loss occurred among those on the forecastle, composed of Missourians. The after part of the ladies cabin being still partly out of the water, it is supposed but few if any of the ladies and children of which there were a large number on board, were lost. Most of the cabin passengers lost all their baggage. It is difficult to arrive at the precise number of lives lost as there are as many relators as estimates, varying from fifty to two hundred. Accounts of the origins of the disaster are conflicting, and as the case will undergo legal investigation, we refrain from censuring any one.

D. *The New Orleans Times*, New Orleans, Louisiana.

June 14, 1865. The U. S. transport Kentucky left Shreveport on the 9th with twelve hundred troops. Within twelve miles of Shreveport, she struck a snag and sank in three minutes. The loss of life was over two hundred, mostly paroled prisoners from the different regiments of Louisiana and Arkansas.
I will send you full particulars by first boat today. [Also copied in New Orleans *Bee* for June 14, 1865].

June 15, 1865. The U. S. transport *Kentucky*, with about 900 passengers, (principally paroled prisoners and families, returning to their homes,) left Shreveport for New Orleans on Friday, June 9th, at 6½ o'clock P.M. About 9 o'clock the same night, it was discovered that the boat was making water rapidly, and before the boat was landed and the stages out she sunk in about 20 feet of water, the timbers breaking and crashing.

The loss of life must have been terrible, she being so crowded and sinking inside of three minutes. It is supposed that some 200 perished. She had about 250 horses on board--all lost, except three. The passengers lost everything.

The U. S. steamer *Col. Chapin* came to the rescue and rendered valuable aid in rescuing hundreds who still clung to the wreck.

Mr. A. H. Isaacson who, with his family, very narrowly escaped destruction; Sam. McMontgomery and family are known to be saved, and have returned to Shreveport.

The friends of the above will be glad to learn that none of the intimate friends of either were among the missing. Should anything of interest be received by the next boat, I will dispatch it to you at once.

Further Particulars

We are indebted to a gentleman just arrived from Shreveport, and who was a passenger on the ill-fated transport *Kentucky* at the time of the recent terrible catastrophe, for some additional items of interest concerning that affair.

We are informed that it was fully one-half an hour after the snag was struck before the steamer went down. She ran about four miles after commending to leak, passing some three miles beyond the *Chapin*, which was tied up for the night, before the final disaster occurred. The *Chapin* started for her as soon as possible, and rendered a great deal of timely assistance in rescuing and saving the unfortunate passengers, struggling in the current, which was very strong, and clinging to those portions of the wreck remaining above water. It was thought by many among the passengers and by those on board the *Chapin* that the great loss of life might have been prevented had the effort been made to effect a landing at an earlier moment.

The Captain finding that the water was gaining very rapidly on the steamer, made for the shore at last, but found that she had settled too much to enable him to get near enough to the bank to put out the stage. A stern line was got to the shore, but it snapped immediately. The boat then careened and sunk instantly, the water washing over the hurricane deck forward. The stern remained above water.

As the boat careened a great rush took place to the hurricane deck. Many of the passengers were in their berths and were saved almost wholly destitute of clothing. A large number were caught between decks and drowned. The ladies generally succeeded in gaining the hurricane deck, and were, says our informant, all saved. Some children were lost. Some of the passengers gained the nearest bank, and others reached the opposite side in safety.

To render the disaster more appalling the texas took fire after the steamer had careened. It was supposed that the coal oil lamps were upset by the shock, and that their inflammable contents were spilled

upon the beds. This fire was fortunately quickly extinguished, otherwise a very large number would have been added to the mournful list of the lost.

The paroled prisoners were principally members of Missouri regiments. There were some Arkansas soldiers on board, and a small number of Louisianans. There were no Federal soldiers among the number.

The officers of the *Kentucky* were, it is believed, all saved. [Portions excerpted in New Orleans *Bee* for June 15, 1865)

June 16, 1865. The following letters, which we are kindly permitted to use, will explain themselves:

Steamer *Colonel Chapin*
25 Miles below Shreveport, June 10, 1865

To Capt. F. W. Perkins, A.Q.M. of transportation:

Captain--I left Shreveport in obedience to orders from Major General Herron, thirty minutes past seven o'clock, June 9th. Finding it impracticable to travel after night, I landed the boat. The steamer *Kentucky* left previous to me about one hour. I presumed that all the boats would lay up together for the night. On proceeding down the river, I found the *Kentucky* against the bank, turning the point and of course thought she was landing for the night. I therefore proceeded a short distance from her and laid the boat up. After being there a short time the Kentucky passed under a head of steam, at the rate of fifteen miles an hour, (to the best of my judgment) and had passed us somewhere between five and seven miles when she sunk. I had the fire banked with the intention of remaining until daylight. After remaining about one and a half hours I was notified from the shore that the *Kentucky* had sunk, and that the assistance of the boat was required to prevent further loss of life (a great many having already been drowned) and destruction of property. I immediately raised steam and got under way, arriving at the wreck about half-past eleven P.M. I found everything in confusion, and endeavored with all available means on board to secure men and women. I immediately lowered the boat and went in person to the boat; found no boats yet at work. I at once stretched a trail line to the shore, to run boats by, the current being too strong to use sweeps or oars. My first mate directly afterward stretched another from the starboard after cabin guard, when we set two boats to work, having procured one from the neighboring plantations. We eventually got everyone off who wished to come, some remaining on board--for what purpose I know not. The whole affair is very disastrous, involving a great loss of life, and in the opinion of all high minded and honorable men, as well as some who were on board with these offices of the boat, and also in my opinion too, the disaster could have been avoided, and that it only resulted from inattention and ignorance, as an investigation of the same will prove. During the rescue of the people on board, and while running my small boat in person, I made use of the following language: "If I had the power, I would hang the captain and pilots to the first tree that I could find," an assertion that I am prepared to maintain.

Having ascertained indirectly that the officers of this boat intend reporting me for the use of the above language is the cause of my making this statement, as I know that they are wholly incompetent to command or have charge of anything regarding transportation, where human life is concerned.

Stephen J. Webber
Captain Commanding Transport

CARD FROM PASSENGERS ON BOARD THE *KENTUCKY*

Baton Rouge, June 14th, 1865

The undersigned passengers on board the ill-fated U. S. steamer *Kentucky* feel it incumbent on them to notice through your columns the noble acts of the officers of the U. S. Steamer *Colonel Chapin*, who came to the wreck and assisted in rescuing some four hundred to five hundred souls, and administered many acts of kindness to the survivors, especially to the women and children, many of whom lost their all. We shall every bear in kind remembrance Capt. S. J. Webber, clerk F. Bruce, Capt. Wm. T. Goodwin, U.S.A., and the first

mate, F. Kierman and William Roberts, second engineer, for their indefatigable endeavors in saving life and property.

A. H. Isaacson and family,
John G. Ong and family,
Wm. B. Jones, Captain Engineer Corps
Jas. S. Cartright, Lieutenant Artillery
Alcide Bossier
Ursin Rodrigue
Van DeMoss
F. Hagan
D. G. Wilson
J. C. D. Blackburn
L. M. Spencer
C. A. Fischer
Lewis D. Cook
H. L. Turner

The following are reported lost by the sinking of the *Kentucky*: Col. Bush, 3rd La. Cavalry, and Mr. James P. Walton.

June 19, 1865. The investigation touching the loss of the U. S. transport *Kentucky*, resulted in a finding favorable to the officers who were in charge of her at the time. It was held by the commission that the occurrence was entirely accidental. but, though the officers have been released from arrest, a further investigation has been ordered by Major Gen. Herron; an order has also been issued prohibiting transports on Red River running in night time.

E. *Weekly Gazette and Comet*, Baton Rouge.

June 17, 1865. **The Disaster on the Red River.**--*Further particulars of the loss of the Transport Kentucky.*--The U. S. transport Kentucky, with about 900 passengers (principally paroled prisoners and families, returning to their homes), left Shreveport for New Orleans on Friday, June 9th, at 6½ o'clock P.M. About 9 o'clock the same night it was discovered that the boat was making water rapidly, and before the boat was landed and the stages out she sunk in about 20 feet of water, the timbers breaking and crashing.

The loss of life must have been terrible, she being so crowded and sinking inside of three minutes. It is supposed that some 200 perished. She had about 260 horses on board--all lost, except three. The passengers lost everything.

The U. S. steamer Col Chapin came to the rescue, and tendered valuable aid in rescuing hundreds who still clung to the wreck.

Mr. A. B. Isaacson, who, with his family, very narrowly escaped destruction; Sam. McMontgomery and family are known to be saved and have returned to Shreveport.

The paroled prisoners were principally members of Missouri regiments. There were some Arkansas soldiers on board and a small number of Louisianians. There were no Federal soldiers among the number.

The officers of the Kentucky, were, it is believed, all saved. --*New Orleans Times, 14th inst.*

F. *Louisiana Democrat*, Alexandria, Louisiana.

June 14, 1865. We learn that the steamer Kentucky, while on her trip down from Shreveport, with a load of public stores, etc., and a large crowd of passengers and paroled prisoners, on last Friday night fifteen miles below Shreveport struck the bank, and sank immediately in twenty feet of water. Over one hundred and fifty persons are said to have been drowned. The boat is a total loss.

G. *The Missouri Republican*, St. Louis, MO.

June 21, 1865. On Friday, the 9th, the Kentucky, with 1,000 of Parson's command on board, broke in two 15 miles below Shreveport and sank. Two hundred persons were drowned, including Judge R. T. Robertson of

Saline County, Missouri, and a number of ladies. Gen. Price's escort was on board. The military authorities who compelled the boat to push out, when the Captain protested and informed them she was in a sinking condition, are deserving of the severest punishment. The Captain, when he found the boat going to pieces, tried to land, but she was totally unmanageable. Maj. Robertson, son of Judge Robertson, was saved.

The New Orleans *Picayune* gives the following particulars: "Col Bush of the 3rd Louisiana Cavalry, son of Dr. Concannon, and James O. Walton were lost on the Kentucky. The craft had shortly after leaving Shreveport, been run into the river bank, with quite a jar, but nothing serious was apprehended of it, and all retired to sleep. There were about 800 passengers on board, chiefly Confederate soldiers from Missouri, and these were lying about the best, and in the forward cabin, sound asleep, when, about 9 1-2 o'clock P.M., it was discovered that the boat had two and a half feet of water in her hold. No alarm was given at first, and an attempt was made to run her ashore, but, as the boat proved unmanageable, this failed. A stern line was then got out and fastened to the shore, but not in time to do any good, for the boat swung out into the river, where the current was strong and the water deep, and her bow was carried under. The boat careened over on its side, slowly at first, and then suddenly the bow went down, and only about twenty feet of the ladies' cabin remained out of water,--this too standing at such an inclination, so nearly perpendicular, that it was with great difficulty any one could climb out. It is likely the boat broke in the middle, as the texas and hurricane deck forward remained out of water, as well as the bell, which was kept ringing until the vessel sunk, until the steamer Chapin came to their assistance. For some reason yet to be explained, the soldiers were permitted to remain asleep in fanciful security, while the boat had thus filled with water and was sinking, and thus nearly all of them were carried under with the boat. Some who were outside, or, could easily extricate themselves, rose to the surface and swam out. Some clambered up the sides and floor of the boat, and thus escaped; but about two hundred of them were undoubtedly lost. Such was the confusion and terror, occurring as this did in the night, and while the men were asleep, when they emerged from their dreams they thought of nothing but self-preservation. Among the few who exerted themselves to save the ladies our informant names Maj. Buckner, Maj. Wardell, and Captain Montgomery, of the Confederate army, and Mr. A. H. Isaacson. There were others whose names escaped his memory. He himself succeeded in rescuing a little daughter of Mr. Hissoson who had already fallen down in the water. He clambered up with her with great difficulty, until she could be put into a life boat and taken ashore. The current was exceedingly swift and the boats were almost unmanageable, otherwise more might have been saved. As it was 400 persons were taken off, including all the ladies and children, as far as known, and their luggage. The Champion, which had come down owing to the incessant ringing of the bell, rendered the greatest assistance, in rescuing those who clung to the wreck, and her officers merit the gratitude of all who are in any degree interested in the survivors. The Chapin took on board the ladies and children, and many other passengers, all of whom were wet and weary, made them comfortable, and gave aid to all, so far as lay in their power. We are informed all the officers and crew of the Kentucky were saved, and, if notice of the dangerous condition of the boat had been given to the sleepers, or, better still, there had been such watchfulness and good conduct as not to have waited until the hull was full of water before trying to land, the lives of two hundred victims of this piece of criminal indifference and carelessness would have been saved."

June 22, 1865.

Sinking of the Kentucky

A gentleman now in this city states that the loss of life occasioned by the sinking of the Kentucky, below Shreveport, is greatly exaggerated. He was himself on board the boat at the time of the disaster, and is satisfied not more than 15 or 20 or three of the negroes escaped by clinging to planks, or other floating materials, and reached shore in safety.

Of the persons drowned, he remembered only the names of RUFUS KING of St. Charles county, Mo., and ----- GREGORY of Callaway.

(Note: this issue also reprinted the letters from the Captain of the Col. Chapin and the passengers of the Kentucky that originally appeared in the New Orleans *Times*.)

June 24, 1865.

Sinking of the "Kentucky"

The U. S. transport, "Kentucky," left Shreveport, at half past ? P.M., with about seven hundred paroled prisoners belonging to the following commands, viz: Pindall's Sharpshooters, Missouri infantry, two hundred and ninety men; Price's escort, five; and detachments from various commands of Missouri and Louisiana. In addition to these were on board some thirty citizens, mostly women and children, and one hundred negroes. At about half past 3 o'clock, she struck a tow head about twelve miles below Shreveport; about 9 o'clock she struck heavily against the bank on the larboard side. Shortly after the boat careened from side to side, which aroused my suspicions of danger. From five to ten minutes after she struck the bank, I heard the Captain of the boat giving orders to go into the hold and see how much water was there. I was at this time on the boiler deck. Seeing considerable confusion among officers and crew of the boat, and hearing the Captain giving orders to get out a stern line, and then head and spring lines, I went down on the lower deck and assisted in getting out head and spring lines, which were made fast to the shore. After being made fast, she careened to the starboard side, shipped water on the seine (?) guard and went down immediately.

After swimming ashore I noticed the boat had settled to the hurricane reef, and that the texas was on fire, which was quickly extinguished by Col. Pindall and Serg't Noland, of his battalion. From the time the Captain gave orders to get out the lines, he also ordered the pumps to be worked, which I believe was attempted. The engines were at work when she went down, for what purpose I cannot say. From the time she struck the bank until she went down did not exceed twenty-five minutes. During this time the men and passengers were all waked up and told to remain quiet, but held themselves ready for any emergency. When the boat careened many were washed off and it was from among these that the greater number was drowned.

The U. S. transport Col. Chapin arrived about one hour after the boat had settled, and rendered great assistance, taking the passengers and baggage ashore. The ladies were placed on board the Chapin and made comparatively comfortable, but, as she was already crowded with paroled prisoners, it was impossible to do any thing for the men, although a great many got ashore with nothing but a shirt, and suffered considerably with cold during the night.

As far as I can learn the casualties are about as follows: About fifty white persons are known to have drowned and about the same number of negroes. The following is a list of the names of those lost, so far as heard:

John Dover Cole county, Missouri; Daniel Fagally, Marion county; Robt. Kincannon, Saline county; Washington Burkhart, Knox county; John Burns, Audrain county; Joseph L. Wilson, Monroe county; J. T. Clayton, Ralls county; R. J. Cason, Howard county; Wm Barton, Howard county; Benjamin Houchins, Monroe county; Benj. Cooper, Howard county; James H. Enlow, Johnson county; James M. Thomas, Boone county; Brantley Hines, Henry county; Judge R. C. Robinson, Saline county, and A. H. Watson, Howard county.

By a passenger, on steamboat Kentucky

APPENDIX II

LAND TITLE HISTORY

APPENDIX II

LAND TITLE HISTORY

The history of land titles in the immediate project area reflects the prevalence of cotton as a staple throughout much of the region's history. Large plantations were the most efficient and profitable means of exploiting the crop, and extensive holdings characterized the immediate project area into the twentieth century. Land titles were researched for an earlier project carried out by Goodwin & Associates (Hinks *et al.* 1994: 67-139), utilizing the conveyance and tax assessment records of Caddo and Bossier parishes. The boundary line between Caddo Parish and Bossier Parish always has been indefinite. The eastern Caddo line was established along the Red River in 1838, the parish having been carved out of Natchitoches Parish. Bossier Parish was formed in 1843 out of Claiborne Parish. The western boundary of Bossier Parish was set along the Red River, bordering Caddo Parish; however, the river's course shifted during the five years between formation of the two parishes, resulting in property overlapping both parishes, or property becoming "no-man's land" -- land claimed by neither parish. According to both English common law and the Louisiana civil code, property boundary lines must shift with river movement, causing a net gain or loss of land as the river course changes. Because the Caddo/Bossier Parish boundary line question never has been resolved, property owners along the Red River have been assessed according to the changing river meander. Some properties have been assessed in both parishes, some have switched parishes as the river course has changed, while others have not been assessed at all (Hinks *et al.* 1994:67).

Site 16BO358 is located at the northern tip of Bagley's Island, known earlier as Lattier's Island, which originally lay in Bossier Parish. The early history of this tract is covered by Hinks *et al.* (1994). Large tracts in this area were claimed by Francois Lattier and were confirmed to him in 1840 (Hinks *et al.* 1994:79). Various transactions carried out in the 1840's conveyed much of this land to Michel Lattier, who by 1849 owned all of the land which makes up Lattier's, or Bagley, Island.

Michel Lattier was a Louisiana native who, in 1860, owned 420 acres of improved land and 2,176 unimproved acres, with an aggregate value of $9,332.00 (Menn 1964, in Hinks *et al.* 1994:79). Whether these acreages represent one plantation or comprise all of Lattier's holdings in the parish is unknown, but they were worked by about 54 slaves and produced 3,000 bushels of Indian corn, 383 bales of ginned cotton, 10 bushels of Irish potatoes, and 500 bushels of sweet potatoes (Menn 1964:155-156, in Hinks *et al.* 1994:79-80).

In 1843, Capt. T. B. Linnard proposed a cutoff of the Red River at "Latche's land" to "accelerate the current, and diminish the discharge through the bayous immediately above on the left bank -- 300 yards" (Linnard 1843). This cut was to be made at a narrow neck of the Red River and can be seen on the 1891 survey (Figures 4 and 5), where the river bypasses the old channel. "Latche" appears to be a misspelling of Lattier. Michel Lattier definitely held title to the island in 1843, and at some time before his death in the 1860s, he built his home near the proposed cut-off. Lattier's Cut-off, however, was not put through until 1882.

In 1862, Lattier's daughters, Julia Caldwell and Aimée Stacey, inherited their father's property. Julia received the southeast 1/4 of the northwest 1/4 of Section 35, where Michel Lattier's personal residence was situated. Aimée was willed the remainder of Lattier's Island, which she held until January 2, 1884, when she transferred title to Julia and her husband, John Caldwell (Bossier Parish Clerk of Court: Probate No. 574; Hinks *et al.* 1994).

The *Red River Survey* suggests no agricultural use of Lattier's Island during the period between 1889 - 1891. Lattier's Cut-off, created in 1882, was located immediately east of the area where Lattier's house had been located. It is conceivable that the creation of the cutoff required destruction of the family home, which in turn may have caused abandonment of the island during the late nineteenth century (Hinks *et al.* 1994).

Lattier's Island was conveyed with a much larger tract, the Bagley Plantation, to Perry Hutchinson on March 24, 1893. It remained a part of that larger tract until 1917, after which the various Bagley and Lattier properties were subdivided and sold to a number of landholders. Current assessments

in Lattier's Island are as follows: upper Section 26 (Eagle Bend Revetment project item) and most of the northwest 1/4 of Section 35 (Sunny Point Dikes) to Malcolm D. Dutton and Mrs. Elsie Lloyd Allison, and north-central Section 35 (Sunny Point Dikes) to the Barton Land Company. The lower edge of Lattier's Island in Section 35 is now a part of Sandy-Bend Acres Subdivision in Caddo Parish (Hinks *et al.* 1994). Malcolm Dutton is the current owner of the parcel containing 16BO358.

APPENDIX III

ARTIFACT INVENTORY

Artifact Inventory

4/20/2004

Category	Group	Class	Type	Sub-Type	Count	Weight (g)	Comments
KENTUCKY III 16BO358							
FS 83							**CLEAN-UP AROUND WOODEN PIPE**
HISTORICS	Architecture	Metal	Machine Cut Nail, Common	Fragment		4	1815-1890
	Miscellaneous	Metal	Unidentified Object	Iron/Steel		4	poss. iron vessel frags. w/wood "ghosts" on ventral side of concretion
					Total Count= 8		**Total Weight=**
FS 110							**IRON PLATE/DECK FITTING**
HISTORICS	Nautical	Metal	Miscellaneous Structural Part	Deck Fitting		1	iron deck fitting, not retained
					Total Count= 1		**Total Weight=**
FS 95		**SIDE PORT**	**FRAME 03**				**OUTBOARD OF FRAME 3**
HISTORICS	Kitchen	Metal	Kitchen Pot	Kettle		1	cauldron; conserved
					Total Count= 1		**Total Weight=**
FS 96		**SIDE PORT**	**FRAME 05**				**OUTBOARD OF FRAME 3; NO ARTIFACTS RECOVERED**
HISTORICS	Kitchen	Biological	Kitchen Use	Nut/Seed/Pit		1	unid. type
	Kitchen	Biological	Kitchen Use	Nut/Seed/Pit		1	poss. peach pit
	Kitchen	Biological	Kitchen Use	Nut/Seed/Pit		3	unid. plant remains

KENTUCKY III 16BO358

Category	Group	Class	Type	Sub-Type	Count	Weight (g)	Comments
					Total Count= 5		Total Weight=
FS 81		**SIDE PORT**	**FRAME 11-12**				**CLEAN-UP**
HISTORICS	Activities	Metal	Miscellaneous Hardware	Chain	1		chain link, 0.25" in diameter, 40% complete
	Architecture	Metal	Construction Hardware	Spike	1		0.25" wide shank, poss. hull spike, small
	Miscellaneous	Metal	Unidentified Object	Iron/Steel	1		unid. iron concretion
					Total Count= 3		Total Weight=
FS 86		**SIDE STARBOARD**	**FRAME 11-12**				**CLEAN-UP**
HISTORICS	Architecture	Metal	Machine Cut Nail	> 4"	1		poss. carbonized, condition is good; conserved, 1815-1890
	Architecture	Metal	Machine Cut Nail	Fragment	2		iron nail frags., 1815-1890
	Miscellaneous	Metal	Unidentified Object	Iron/Steel	4		unid. iron concretions
	Undetermined Functional Group	Biological	Unrelated	Bone	25		small mammal, see lab notes
					Total Count= 32		Total Weight=
FS 87		**SIDE STARBOARD**	**FRAME 12-13**				**CLEAN-UP**
HISTORICS	Architecture	Metal	Machine Cut Nail, Common	Fragment	5		nail frags., 1815-1890
	Kitchen	Glass	Unidentified Bottle Glass	Green	1		
	Nautical	Biological	Miscellaneous Structural Part	Deck-Part	1		unid. wood frag., no visible "ghosts"

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Category	Group	Class	Type	Sub-Type	Count	Weight (g)	Comments
					Total Count= 7	Total Weight=	
FS 94			**SIDE STARBOARD SIDE ON LONGITUDINAL DECK BEAM AT MUD LINE**				
HISTORICS	Architecture	Metal	Machine Cut Nail, Common	2-4"		2	deck plank nails, 1/8" shank dimension, 1815-1890
	Kitchen	Metal	Kitchen Pot	Coffee/Tea Pot		2	tea kettle w/handle; conserved
	Kitchen	Metal	Kitchen Pot	Kettle		1	cauldron; conserved
					Total Count= 5	Total Weight=	
FS 48			**SIDE STARBOARD**	**UNIT 01**			
HISTORICS	Clothing	Glass	Glass Clothing	Button		1	see lab notes
	Undetermined Functional Group	Biological	Unrelated	Bone		1	large mammal, see lab notes
					Total Count= 2	Total Weight=	
FS 47			**SIDE PORT**	**UNIT 03**			
HISTORICS	Undetermined Functional Group	Biological	Unrelated	Bone		1	large mammal, see lab notes
					Total Count= 1	Total Weight=	
FS 49			**SIDE STARBOARD**	**UNIT 03**			
HISTORICS	Architecture	Metal	Machine Cut Nail, Common	Fragment		11	fragments of miscellaneous length & shank width, iron, 1815-1890

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Category	Group	Class	Type	Sub-Type	Count	Weight (g)	Comments
HISTORICS	Clothing	Metal	Metal Clothing	White Metal Button	1		
	Miscellaneous	Metal	Unidentified Object	Iron/Steel	20		see lab notes
	Undetermined Functional Group	Biological	Unrelated	Bone	1		large mammal, complete long bone
	Undetermined Functional Group	Biological	Unrelated	Bone	6		large mammal, bone frags., see lab notes
	Undetermined Functional Group	Biological	Unrelated	Tooth	5		see lab notes
					Total Count= 44		Total Weight=

FS 50 **SIDE STARBOARD** **UNIT 04**

HISTORICS	Architecture	Metal	Machine Cut Nail, Common	Fragment	3		unid. nail fragments w/wood/iron concretions, 1815-1890
	Miscellaneous	Metal	Unidentified Object	Iron/Steel	2		unid. iron concretions
	Undetermined Functional Group	Biological	Unrelated	Bone	1		large mammal, unid. bone frag.
	Undetermined Functional Group	Biological	Unrelated	Tooth	1		see lab notes
					Total Count= 7		Total Weight=

FS 51 **SIDE STARBOARD** **UNIT 05**

HISTORICS	Architecture	Metal	Machine Cut Nail, Common	Fragment	4		assorted nail frags., 1815-1890
	Miscellaneous	Metal	Unidentified Object	Iron/Steel	9		poss. iron strap frags. used for wrapping crates
	Undetermined Functional Group	Biological	Unrelated	Bone	14		large mammal, see lab notes
	Undetermined Functional Group	Biological	Unrelated	Tooth	1		see lab notes

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Category	Group	Class	Type	Sub-Type	Count	Weight (g)	Comments
					Total Count= 28		Total Weight=
FS 52		**SIDE STARBOARD**		**UNIT 06**			
HISTORICS	Architecture	Metal	Machine Cut Nail, Common	Fragment	4		assorted nail frags., 1815-1890
	Miscellaneous	Metal	Unidentified Object	Iron/Steel	7		poss. iron strap frags., badly corroded
	Undetermined Functional Group	Biological	Unrelated	Bone	8		large mammal, fragments
					Total Count= 19		Total Weight=
FS 53		**SIDE STARBOARD**		**UNIT 07**			
HISTORICS	Architecture	Glass	Architectural Element	Window Glass	4		
	Architecture	Metal	Construction Hardware	Spike	1		6" long w/0.5" shank, bent at 90 degree angle, with "ghost" indicating that half of nail was exposed
	Architecture	Metal	Machine Cut Nail, Common	Fragment	8		assorted nail frags., 1815-1890
	Miscellaneous	Metal	Unidentified Object	Iron/Steel	10		unid. iron concretions
	Undetermined Functional Group	Biological	Unrelated	Bone	1		unid. mammal, misc. bone frag.
					Total Count= 24		Total Weight=
FS 54		**SIDE STARBOARD**		**UNIT 08**			
HISTORICS	Architecture	Glass	Architectural Element	Window Glass	1		
	Miscellaneous	Metal	Unidentified Object	Iron/Steel	5		unid. iron concretions
	Nautical	Biological	Miscellaneous Structural Part	Deck-Part	2		tongue & groove, see lab notes

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Category	Group	Class	Type	Sub-Type	Count	Weight (g)	Comments
					Total Count= 8	Total Weight=	
FS 55		**SIDE STARBOARD**		**UNIT 09**			
HISTORICS	Architecture	Metal	Machine Cut Nail, Common	Fragment	3		1815-1890
	Miscellaneous	Metal	Unidentified Object	Iron/Steel	9		poss. iron strap frags.
	Nautical	Biological	Miscellaneous Structural Part	Deck-Part	3		tongue & groove bulkhead planking samples
					Total Count= 15	Total Weight=	
FS 56		**SIDE STARBOARD**		**UNIT 10**			
HISTORICS	Clothing	Biological	Bone/Leather Clothing	Bone Button	1		one part; 4 hole button with recessed central section; conserved
	Kitchen	Biological	Kitchen Use	Nut/Seed/Pit	1		poss. watermelon seed
	Kitchen	Biological	Shell	Turtle Shell	2		unid. species
	Kitchen	Metal	Kitchen Pot	Kettle	1		complete cauldron lid; conserved
	Nautical	Biological	Miscellaneous Structural Part	Deck-Part	1		see lab notes for plank FS #91
					Total Count= 6	Total Weight=	
FS 57		**SIDE STARBOARD**		**UNIT 11**			
HISTORICS	Activities	Metal	Miscellaneous Hardware	Chain	1		portion of broken chain link (60% complete), 0.25" diameter aste link, fair condition
	Kitchen	Biological	Kitchen Use	Nut/Seed/Pit	1		poss. watermelon seed
	Miscellaneous	Metal	Unidentified Object	Sheet Metal	4		iron
					Total Count= 6	Total Weight=	

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Category	Group	Class	Type	Sub-Type	Count	Weight (g)	Comments
FS 58		**SIDE STARBOARD**		**UNIT 12**			
HISTORICS	Architecture	Metal	Machine Cut Nail, Common	Fragment	4		badly concreted, 1815-1890
	Miscellaneous	Metal	Unidentified Object	Iron/Steel	1		oblong concretion, should be explored w/electrolysis
	Nautical	Biological	Miscellaneous Structural Part	Deck-Part	2		see lab notes for FS#57, example 1
					Total Count= 7	**Total Weight=**	
FS 59		**SIDE STARBOARD**		**UNIT 13**			
HISTORICS	Kitchen	Metal	Kitchen Pot	Other Serving/Cooking	1		dutch oven; conserved
	Miscellaneous	Metal	Unidentified Object	Iron/Steel	1		unid. fastener frag.
	Nautical	Biological	Miscellaneous Structural Part	Deck-Part	1		see lab notes for FS#57 tongue & groove sample
	Nautical	Biological	Miscellaneous Structural Part	Deck-Part	1		unid. wood frag.
	Undetermined Functional Group	Biological	Unrelated	Bone	2		small mammal/rodent, mandible
					Total Count= 6	**Total Weight=**	
FS 60		**SIDE STARBOARD**		**UNIT 14**			
HISTORICS	Architecture	Metal	Machine Cut Nail, Common	Fragment	7		assorted fastener frags., 1815-1890
	Kitchen	Biological	Shell	Clam	33		unid. freshwater clam/bivalve
	Kitchen	Metal	Kitchen Pot	Kettle	30		cauldron/kettle frags.
	Nautical	Biological	Miscellaneous Structural Part	Deck-Part	5		see lab notes for FS#57 tongue & groove sample

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Category	Group	Class	Type	Sub-Type	Count	Weight (g)	Comments
HISTORICS	Nautical	Biological	Miscellaneous Structural Part	Deck-Part	1		badly damaged wood frag., 0.25" thick
					Total Count= 76		Total Weight=
FS 61		**SIDE STARBOARD**		**UNIT 15**			
HISTORICS	Kitchen	Metal	Kitchen Pot	Kettle	1		iron cauldron; conserved
	Miscellaneous	Biological	Miscellaneous	Fabric	4		felt samples used for chinking between deck planks
					Total Count= 5		Total Weight=
FS 65		**SIDE STARBOARD**		**UNIT 17**			
HISTORICS	Kitchen	Ceramic	Ironstone	White Undecorated	1		flatware, 1850-PRESENT
	Miscellaneous	Metal	Unidentified Object	Iron/Steel	1		badly concreted iron object, should be explored by electrolysis
	Miscellaneous	Metal	Unidentified Object	Iron/Steel	9		badly concreted iron frags.
	Nautical	Biological	Miscellaneous Structural Part	Deck-Part	1		badly worn, cross section would deceive, 0.5" thick
	Nautical	Metal	Miscellaneous Structural Part	Hogging Chain	3		Three lengths of hogging chains; cut to four pieces for conservation
	Nautical	Metal	Miscellaneous Structural Part	Hogging Chain	4		8" frag. w/nuts at either end;
					Total Count= 19		Total Weight=
FS 66		**SIDE STARBOARD**		**UNIT 18**			
HISTORICS	Miscellaneous	Metal	Unidentified Object	Iron/Steel	10		poss. iron sheeting frags.
	Nautical	Biological	Miscellaneous Structural Part	Deck-Part	2		badly worn, cross section would deceive, 5/16" thick

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Category	Group	Class	Type	Sub-Type	Count	Weight (g)	Comments
HISTORICS	Personal	Biological	Grooming	Other	1		briar wood pipe bowl w/copper collar & brass foot; conserved
	Personal	Biological	Personal Item	Leather Wallet	1		poss. sewing kit/housewife; conserved
					Total Count= 14		Total Weight=
FS 67			**SIDE STARBOARD**	**UNIT 19**			
HISTORICS	Nautical	Biological	Miscellaneous Structural Part	Deck-Part	7		tongue & groove, very worn, 0.5" thick, see lab notes for FS#57
					Total Count= 7		Total Weight=
FS 69			**SIDE STARBOARD**	**UNIT 21**			
HISTORICS	Activities	Metal	Miscellaneous Hardware	Barbed Wire	3		POST 1870
	Kitchen	Biological	Kitchen Use	Nut/Seed/Pit	1		poss. watermelon seed
	Miscellaneous	Metal	Unidentified Object	Iron/Steel	3		poss. iron pipe frags.
					Total Count= 7		Total Weight=
FS 70			**SIDE STARBOARD**	**UNIT 22**			
HISTORICS	Activities	Metal	Miscellaneous Hardware	Nut	1		2.25" x 2.25", 1" thick, iron
	Architecture	Synthetic	Miscellaneous	Roofing Shingle, Tar Paper	2		deck tar, not tar paper
	Nautical	Biological	Miscellaneous Structural Part	Deck-Part	3		see lab notes for tongue & groove sheeting for FS#57
					Total Count= 6		Total Weight=
FS 72			**SIDE STARBOARD**	**UNIT 24**			
HISTORICS	Architecture	Synthetic	Miscellaneous	Roofing Shingle, Tar Paper	2		

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Category	Group	Class	Type	Sub-Type	Count	Weight (g)	Comments
HISTORICS	Architecture	Synthetic	Miscellaneous	Roofing Shingle, Tar Paper	2		tar mixed w/sand, not tar paper
	Kitchen	Metal	Kitchen Utensil	Unidentified Handle	3		poss. wire cauldron handle; conserved
	Nautical	Biological	Miscellaneous Structural Part	Deck-Part	1		see lab notes
	Personal	Metal	Personal Use	Pocket Knife	1		clasp knife w/copper bands and bone slats; conserved
	Undetermined Functional Group	Biological	Unrelated	Bone	1		unid. small mammal/amphibian
					Total Count= 10		**Total Weight=**
FS 76		**SIDE STARBOARD**		**UNIT 27**			
HISTORICS	Kitchen	Biological	Kitchen Use	Nut/Seed/Pit	1		poss. watermelon seed
					Total Count= 1		**Total Weight=**
FS 78		**SIDE STARBOARD**		**UNIT 29**			
HISTORICS	Architecture	Metal	Machine Cut Nail, Common	Fragment	1		carbonized, 1815-1890
	Miscellaneous	Metal	Unidentified Object	Iron/Steel	2		unid. iron concretions, poss. iron strap frags.
					Total Count= 3		**Total Weight=**
FS 79		**SIDE STARBOARD**		**UNIT 30**			
HISTORICS	Kitchen	Biological	Kitchen Use	Wood Handle	1		knife handle w/copper alloy and iron components; conserved
	Nautical	Biological	Miscellaneous Structural Part	Deck-Part	1		unid. wood frag.
					Total Count= 2		**Total Weight=**

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Category	Group	Class	Type	Sub-Type	Count	Weight (g)	Comments
FS 80		**SIDE STARBOARD**		**UNIT 31**			
HISTORICS	Kitchen	Biological	Kitchen Use	Nut/Seed/Pit	1		poss. watermelon seed
	Nautical	Biological	Accessories	Dowel	1		dowel fragment, see lab notes
				Total Count= 2		**Total Weight=**	
FS 84		**SIDE STARBOARD**		**UNIT 32**			
HISTORICS	Architecture	Metal	Construction Hardware	Spike	9		deck/hull spike frags., wrought iron, 0.25" shank
	Architecture	Metal	Machine Cut Nail, Common	> 4"	1		well preserved example, poss. carbonized (burned); conserved, 1815-1890
	Architecture	Metal	Machine Cut Nail, Common	Fragment	1		1/8" shank, 1815-1890
	Kitchen	Biological	Shell	Turtle Shell	5		species unid.
	Transportation	Metal	Stable Item	Miscellaneous Horse Care Item	2		two 2.25" diameter iron bridle rings (0.25" wrought ring diam.)
	Undetermined Functional Group	Biological	Unrelated	Bone	2		large mammal, see lab notes
	Undetermined Functional Group	Biological	Unrelated	Bone	7		amphibian, see lab notes
	Undetermined Functional Group	Biological	Unrelated	Fish Scale/Bone	1		poss. fish vertebrae
				Total Count= 28		**Total Weight=**	
FS 90		**SIDE STARBOARD**		**UNIT 32**			**CLEAN-UP**
HISTORICS	Architecture	Glass	Architectural Element	Window Glass	1		
	Miscellaneous	Metal	Unidentified Object	Iron/Steel	4		poss. iron strap frag.

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Category	Group	Class	Type	Sub-Type	Count	Weight (g)	Comments
					Total Count= 5	Total Weight=	
FS 85		**SIDE STARBOARD**		**UNIT 33**			
HISTORICS	Kitchen	Biological	Shell	Turtle Shell	12		
	Transportation	Metal	Stable Item	Harness/Saddle Part	1		copper alloy buckle, in excellent condition; conserved
	Undetermined Functional Group	Biological	Unrelated	Bone	13		amphibian, see lab notes
					Total Count= 26	Total Weight=	
FS 88		**SIDE STARBOARD**		**UNIT 33**			**CLEAN-UP**
HISTORICS	Architecture	Metal	Machine Cut Nail, Common	Fragment	2		iron nail frag., 1815-1890
	Undetermined Functional Group	Biological	Unrelated	Bone	1		large mammal, unid. bone frag.
					Total Count= 3	Total Weight=	
FS 93		**SIDE STARBOARD**		**UNIT 34**			
HISTORICS	Activities	Biological	Household Item	Other	1		drawer pull, see lab notes
	Architecture	Metal	Machine Cut Nail, Common	2-4"	3		0.25" shank (width0; conserved, 1815-1890
	Architecture	Metal	Machine Cut Nail, Common	Fragment	1		1815-1890
	Kitchen	Biological	Kitchen Use	Nut/Seed/Pit	1		unid. type
	Miscellaneous	Metal	Unidentified Object	Iron/Steel	4		poss. iron strap frags.
	Miscellaneous	Stone	Miscellaneous Stone	Coal Slag	3		
	Nautical	Biological	Miscellaneous Structural Part	Deck-Part	11		unid. wood frags.

Category	Group	Class	Type	Sub-Type	Count	Weight (g)	Comments
KENTUCKY III 16BO358							
HISTORICS	Undetermined Functional Group	Biological	Unrelated	Bone	9		large mammal, unid. bone frags.
					Total Count= 33		**Total Weight=**
FS 63		**SIDE STARBOARD**		**UNIT 7-15**			**CLEAN-UP**
HISTORICS	Architecture	Metal	Machine Cut Nail, Common	Fragment	1		1815-1890
	Miscellaneous	Metal	Unidentified Object	Iron/Steel	2		poss. iron sheet frags.
					Total Count= 3		**Total Weight=**
FS 75	**AREA 14 FT. FORWARD OF STERN HOOK, 11.5 FT. STARBOARD**						
HISTORICS	Kitchen	Biological	Kitchen Use	Bone Handle	1		knife handle; conserved
					Total Count= 1		**Total Weight=**
FS 31	**AREA 2 FT. FORWARD OF TRIANGLE**	**SIDE PORT**					**3 FT. SQUARE**
HISTORICS	Architecture	Glass	Architectural Element	Window Glass	1		
	Architecture	Metal	Construction Hardware	Spike	2		2" x 4.5" long, 0.5" square shanked deck spikes, 1 w/wood attachment
	Architecture	Metal	Construction Hardware	Spike	3		3.25" frags. of deck spikes, 0.5" square shank in cross-section
					Total Count= 6		**Total Weight=**

Category	Group	Class	Type	Sub-Type	Count	Weight (g)	Comments
KENTUCKY III 16BO358							
FS 36	**AREA 3 FT. SQUARE STARBOARD OF IRON STRAP, BOUY #6**	**SIDE MIDSHIPS**					
HISTORICS	Architecture	Glass	Architectural Element	Window Glass	1		
	Clothing	Metal	Metal Clothing	Brass Button	1		Civil War Confederate "Roman I" Infantry (1861-1865), style associated with E. M. Lewis and Co., Richmond, VA, 21.5 mm diameter, 2-piece; conserved
	Kitchen	Metal	Kitchen Pot	Cup	3		tin cup frags.
	Miscellaneous	Metal	Unidentified Object	Iron/Steel	8		poss. iron stamp frags
	Miscellaneous	Metal	Unidentified Object	Unidentified Metal	4		probably associated with .69 or .58 caliber rifles, .51 mm diameter; percussion cap
	Undetermined Functional Group	Biological	Unrelated	Bone	50		large mammal, see lab notes
	Undetermined Functional Group	Biological	Unrelated	Tooth	6		large mammal, see lab notes
				Total Count= 73		**Total Weight=**	
FS 42	**AREA 3 FT. STARBOARD OF FS#37, FORWARD OF FS#40**						
HISTORICS	Architecture	Metal	Construction Hardware	Spike	2		siding spike, see lab notes
				Total Count= 2		**Total Weight=**	

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Category	Group	Class	Type	Sub-Type	Count	Weight (g)	Comments
FS 40	**AREA 3 FT. STARBOARD OF FS#39**						
HISTORICS	Architecture	Glass	Architectural Element	Window Glass	2		
	Kitchen	Metal	Kitchen Pot	Skillet	1		spider/frying pan
	Miscellaneous	Metal	Unidentified Object	Iron/Steel	3		poss. nail frags.
	Undetermined Functional Group	Biological	Unrelated	Bone	3		large mammal, see lab notes
	Undetermined Functional Group	Biological	Unrelated	Tooth	2		large mammal, see lab notes
				Total Count= 11		**Total Weight=**	
FS 32	**AREA 3 FT. STARBOARD OF TRIPOD/HOOK**	**SIDE STARBOARD**					**3 FT. SQUARE**
HISTORICS	Architecture	Metal	Construction Hardware	Spike	1		1" x 3" frag., 0.5" wide square shank
	Architecture	Metal	Machine Cut Nail, Common	> 4"	1		5.5" long x 0.25" wide square shank, severe ferric concretions, 1815-1890
	Miscellaneous	Metal	Unidentified Object	Iron/Steel	1		function unknown
				Total Count= 3		**Total Weight=**	
FS 34	**AREA 4 X 4 FT. AREA AROUND BOUY #6**						
HISTORICS	Architecture	Metal	Construction Hardware	Spike	1		square machine cut, head encrusted with wood, tip missing

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Category	Group	Class	Type	Sub-Type	Count	Weight (g)	Comments
HISTORICS	Architecture	Metal	Unidentified	Cut/Wrought Nail	1		clinched tip
	Clothing	Biological	Wood Clothing	Wooden Button	1		see lab notes; conserved
	Clothing	Glass	Glass Clothing	Button	1		Four-holed, inset face, 1.15 mm diameter
	Miscellaneous	Metal	Unidentified Object	Unidentified Metal	2		lead shot probably associated with .69 or .58 caliber rifles
	Miscellaneous	Metal	Unidentified Object	Unidentified Metal	11		fragments; percussion cap
	Nautical	Biological	Miscellaneous Structural Part	Deck-Part	1		see lab notes
	Undetermined Functional Group	Biological	Unrelated	Bone	1		large mammal
					Total Count= 19		**Total Weight=**
FS 33	**AREA 6 FT. STARBOARD OF HOOK/TRIPOD**	**SIDE STARBOARD**					**3 FT. SQUARE**
HISTORICS	Kitchen	Biological	Kitchen Use	Nut/Seed/Pit	1		poss. pecan frag.
	Miscellaneous	Biological	Miscellaneous	Worked Bone	1		bone awl fashioned from longbone, species unid.
	Undetermined Functional Group	Biological	Unrelated	Bone	1		large mammal
					Total Count= 3		**Total Weight=**
FS 35	**AREA 6 FT. WEST OF BOUY #6**	**SIDE PORT**					
HISTORICS	Architecture	Glass	Architectural Element	Window Glass	1		
	Undetermined Functional Group	Biological	Unrelated	Bone	5		unid. species
					Total Count= 6		**Total Weight=**

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Category	Group	Class	Type	Sub-Type	Count	Weight (g)	Comments
FS 3	**AREA ACOE DREDGE**						**GENERAL COLLECTION**
HISTORICS	Undetermined Functional Group	Biological	Unrelated	Bone	5		medium amphibian
	Undetermined Functional Group	Biological	Unrelated	Bone	1		small mammal, mandible
					Total Count= 6		**Total Weight=**
FS 99	**AREA BILGE PUMP**						
HISTORICS	Nautical	Biological	Miscellaneous Structural Part	Bilge Pump	1		
					Total Count= 1		**Total Weight=**
FS 100	**AREA CAPSTAN RIM**						
HISTORICS	Nautical	Metal	Accessories	Capstan-Part	1		capstan rim
					Total Count= 1		**Total Weight=**
FS 101	**AREA CAPSTAN SPINDLE**						
HISTORICS	Nautical	Metal	Accessories	Capstan-Part	1		capstan spindle
					Total Count= 1		**Total Weight=**
FS 82	**AREA CLEARING ANCHOR**						
HISTORICS	Activities	Metal	Tool	Unidentified	1		iron ring & pin (concreted together), pin driven into bulkhead, used to hobble horse/livestock; conserved

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Category	Group	Class	Type	Sub-Type	Count	Weight (g)	Comments
HISTORICS	Architecture	Glass	Architectural Element	Window Glass	65		
	Architecture	Metal	Machine Cut Nail, Common	Fragment	5		1815-1890
	Architecture	Synthetic	Miscellaneous	Roofing Shingle, Tar Paper	6		conserved
	Clothing	Glass	Glass Clothing	Button	1		same as button documented for FS#48
	Clothing	Metal	Metal Clothing	Brass Button	1		U.S. Army enlistedman's/officer's infantry cuff sized, (1851-1865+) eagle motif with Roman "I" on breast, 2-piece stamped brass, backpiece missing; conserved
	Kitchen	Glass	Unidentified Bottle Glass	Clear	2		
	Kitchen	Glass	Unidentified Bottle Glass	Dark Green	1		
	Kitchen	Metal	Kitchen Pot	Kettle	1		iron cauldron; conserved
	Kitchen	Metal	Kitchen Pot	Skillet	1		small spider/frying pan; conserved
	Miscellaneous	Biological	Miscellaneous	Worked Bone	1		medium mammal, small long bone worked to point, could be used as punch/awl
	Miscellaneous	Metal	Unidentified Object	Iron/Steel	2		poss. can frags.
	Miscellaneous	Metal	Unidentified Object	Iron/Steel	1		unid. iron concretion
	Nautical	Metal	Accessories	Anchor	1		anchor; L.C.M.M conservation
	Transportation	Metal	Stable Item	Miscellaneous Horse Care Item	1		iron curry comb frag., base plate (70%) and handle terminal (10%)
	Undetermined Functional Group	Biological	Unrelated	Bone	7		large mammal, see lab notes
					Total Count= 97		**Total Weight=**

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Category	Group	Class	Type	Sub-Type	Count	Weight (g)	Comments
FS 97	**AREA CORNER #1**						
HISTORICS	Clothing	Biological	Bone/Leather Clothing	Bone Button	1		see lab notes
	Personal	Ceramic	Tobacco Pipe	Ball Clay Bowl, Molded	1		4/64 bone diam., pipe designed to mimmic Native American pipes of 15th century
				Total Count= 2		**Total Weight=**	
FS 4	**AREA DREDGE**			**LEVEL 2**			
HISTORICS	Kitchen	Biological	Kitchen Use	Nut/Seed/Pit	1		peach pit, 50% complete
	Undetermined Functional Group	Biological	Unrelated	Bone	2		small mammal
				Total Count= 3		**Total Weight=**	
FS 5	**AREA DREDGE**		**FRAME 02-03**	**LEVEL 1 & 2**			
HISTORICS	Activities	Metal	Miscellaneous Hardware	Washer	1		1.8" in diameter, 0.2" thick, center hole= .55" in diameter
	Architecture	Metal	Machine Cut Nail, Finish	< 2"	1		1815-1890
	Architecture	Metal	Machine Cut Nail, Finish	Fragment	1		1815-1890
	Kitchen	Biological	Food Related	Bone	1		large mammal
				Total Count= 4		**Total Weight=**	
FS 104	**AREA DREDGE**		**FRAME 03-08**				
HISTORICS	Nautical	Biological	Miscellaneous Structural Part	Apron/Hook	1		stern hook/apron
				Total Count= 1		**Total Weight=**	

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Category	Group	Class	Type	Sub-Type	Count	Weight (g)	Comments
FS 6	**AREA DREDGE**	**SIDE PORT**	**FRAME 03-04**	**LEVEL 1 & 2**			
HISTORICS	Architecture	Metal	Construction Hardware	Spike	1		frag., badly corroded
	Architecture	Metal	Machine Cut Nail	Fragment	3		1815-1890
	Miscellaneous	Stone	Miscellaneous Stone	Coal Slag	1		
	Nautical	Biological	Miscellaneous Structural Part	Deck-Part	2		faceted wooden Dutchman used to decorate top of wooden rail/post; conserved
	Nautical	Biological	Miscellaneous Structural Part	Frame	1		unid. frame fragment
				Total Count= 8		**Total Weight=**	
FS 8	**AREA DREDGE**	**SIDE PORT**	**FRAME 04-05**				
HISTORICS	Architecture	Metal	Machine Cut Nail, Common	Fragment	14		1815-1890
	Kitchen	Biological	Food Related	Cut/Butchered Bone	1		large mammal, sawed bone
	Kitchen	Biological	Kitchen Use	Nut/Seed/Pit	1		poss. pecan fragment
	Kitchen	Biological	Kitchen Use	Nut/Seed/Pit	1		poss. chesnut fragment
	Kitchen	Biological	Kitchen Use	Nut/Seed/Pit	2		poss. peach pit, there are 2 halves, poss. broken
	Miscellaneous	Metal	Unidentified Object	Iron/Steel	1		poss. strap fragment
	Miscellaneous	Stone	Miscellaneous Stone	Coal	5		sample for determining source
	Miscellaneous	Synthetic	Unidentified Object	Unidentified Rubber Material	1		poss. rubber strap frag.
	Nautical	Biological	Miscellaneous Structural Part	Deck-Part	1		poss. deck plank frag. w/two 2.5" cut nails insitu
	Nautical	Biological	Miscellaneous Structural Part	Deck-Part	2		sawn wooden blocks, see lab notes

Category	Group	Class	Type	Sub-Type	Count	Weight (g)	Comments
KENTUCKY III 16BO358							
HISTORICS	Undetermined Functional Group	Biological	Unrelated	Bone	2		unid. amphibian
	Undetermined Functional Group	Biological	Unrelated	Bone	2		medium mammal, fractured & gnawed by rodent
					Total Count= 33		**Total Weight=**
FS 9	**AREA DREDGE**	**SIDE PORT**	**FRAME 05-06**				
HISTORICS	Architecture	Metal	Machine Cut Nail, Finish	2-4"	1		complete, 1815-1890
	Architecture	Metal	Machine Cut Nail, Finish	Fragment	1		1815-1890
	Architecture	Metal	Machine Cut Nail	2-4"	1		head missing or headless, 1815-1890
	Architecture	Metal	Machine Cut Nail	Fragment	7		1815-1890
	Architecture	Metal	Unidentified	Cut/Wrought Nail	1		
	Furniture	Metal	Miscellaneous Hardware	Brass Tack	1		2.5" in length
	Kitchen	Ceramic	Whiteware	Undecorated	3		flatware, 1820-PRESENT
	Undetermined Functional Group	Biological	Unrelated	Bone	8		medium amphibian
					Total Count= 23		**Total Weight=**
FS 98	**AREA DREDGE**	**SIDE PORT**	**FRAME 05-07**				**OUTSIDE HULL**
HISTORICS	Architecture	Metal	Construction Hardware	Spike	1		see lab notes for FS#42 spike
	Architecture	Metal	Machine Cut Nail, Common	2-4"	8		0.24" shank, some well preserved, others badly concreted, see lab notes for FS #7, 1815-1890

KENTUCKY III 16BO358

Category	Group	Class	Type	Sub-Type	Count	Weight (g)	Comments
HISTORICS	Architecture	Metal	Machine Cut Nail, Common	Fragment	6		assorted nail frags., 1815-1890
	Undetermined Functional Group	Biological	Unrelated	Bone	1		large mammal, unid. species
					Total Count= 16		**Total Weight=**
FS 11	**AREA DREDGE**	**SIDE PORT**	**FRAME 06-07**	**LEVEL 1**			
HISTORICS	Activities	Synthetic	Miscellaneous	Rope	5		Hemp rope strands of various length; sample conserved
	Kitchen	Biological	Shell	Turtle Shell	1		large amphibian, see lab notes
	Undetermined Functional Group	Biological	Unrelated	Bone	65		large amphibian, see lab notes
					Total Count= 71		**Total Weight=**
FS 12	**AREA DREDGE**	**SIDE PORT**	**FRAME 06-07**	**LEVEL 2**			
HISTORICS	Undetermined Functional Group	Biological	Unrelated	Bone	1		medium mammal, gnawed by rodent at ends
	Undetermined Functional Group	Biological	Unrelated	Bone	6		large amphibian
					Total Count= 7		**Total Weight=**
FS 16	**AREA DREDGE**	**SIDE PORT**	**FRAME 07-08**	**LEVEL 2**			
HISTORICS	Undetermined Functional Group	Biological	Unrelated	Bone	5		medium amphibian
					Total Count= 5		**Total Weight=**

KENTUCKY III 16BO358

Category	Group	Class	Type	Sub-Type	Count	Weight (g)	Comments
FS 18	**AREA DREDGE**	**SIDE PORT**	**FRAME 08-09**	**LEVEL 1**			
HISTORICS	Architecture	Metal	Machine Cut Nail, Common	Fragment	1		no head, 1815-1890
				Total Count= 1		**Total Weight=**	
FS 19	**AREA DREDGE**	**SIDE PORT**	**FRAME 08-09**	**LEVEL 2**			
HISTORICS	Architecture	Metal	Machine Cut Nail, Common	Fragment	3		1815-1890
	Clothing	Ceramic	Ceramic Clothing	Porcelain Button	1		poss. milk glass
	Miscellaneous	Metal	Unidentified Object	Iron/Steel	1		function unid., concretion, iron
	Mortuary	Biological	Human Remains	Tooth	1		
	Undetermined Functional Group	Biological	Unrelated	Bone	4		small amphibian
				Total Count= 10		**Total Weight=**	
FS 21	**AREA DREDGE**	**SIDE PORT**	**FRAME 09-10**	**LEVEL 1**			
HISTORICS	Architecture	Glass	Architectural Element	Window Glass	1		
	Architecture	Metal	Machine Cut Nail, Common	Fragment	5		1815-1890
	Nautical	Biological	Miscellaneous Structural Part	Frame	1		frame/deck beam frag. w/2 cut nails imbedded in matrix, see lab notes
	Undetermined Functional Group	Biological	Unrelated	Bone	1		large amphibian
				Total Count= 8		**Total Weight=**	

KENTUCKY III 16BO358

Category	Group	Class	Type	Sub-Type	Count	Weight (g)	Comments
FS 62	**AREA DREDGE**		**SIDE PORT**	**FRAME 09-10**	**LEVEL 2**		
HISTORICS	Architecture	Synthetic	Miscellaneous	Roofing Shingle, Tar Paper	1		deck tar (not tar paper), infused w/sand to provide traction on deck
	Kitchen	Biological	Shell	Clam	11		small (2-4cm width) freshwater clams/bivalves
	Kitchen	Biological	Shell	Unidentifiable	5		small freshwater univalves (snails)
	Nautical	Biological	Miscellaneous Structural Part	Deck-Part	1		minute wood frag.
	Undetermined Functional Group	Biological	Unrelated	Bone	1		large amphibian, see lab notes
					Total Count= 19		**Total Weight=**
FS 44	**AREA DREDGE**		**SIDE PORT**	**FRAME 10-11**	**LEVEL 2**		
HISTORICS	Architecture	Metal	Construction Hardware	Spike	1		see lab notes
	Architecture	Metal	Machine Cut Nail, Common	Fragment	1		1815-1890
					Total Count= 2		**Total Weight=**
FS 46	**AREA DREDGE**		**SIDE PORT**	**FRAME 11-12**	**LEVEL 2**		
HISTORICS	Architecture	Metal	Machine Cut Nail, Common	> 4"	1		deck plank fastener, iron, 1815-1890
					Total Count= 1		**Total Weight=**
FS 45	**AREA DREDGE**		**SIDE PORT**	**FRAME 12-13**	**LEVEL 2**		
HISTORICS	Architecture	Glass	Architectural Element	Window Glass	1		

KENTUCKY III 16BO358

Category	Group	Class	Type	Sub-Type	Count	Weight (g)	Comments
HISTORICS	Architecture	Metal	Construction Hardware	Spike	1		see lab notes; conserved
	Architecture	Metal	Machine Cut Nail, Common	2-4"	1		1815-1890
	Architecture	Metal	Machine Cut Nail, Common	Fragment	7		1815-1890
	Kitchen	Biological	Shell	Turtle Shell	1		
	Miscellaneous	Metal	Unidentified Object	Iron/Steel	2		
					Total Count= 13		Total Weight=

FS 25 AREA DREDGE SIDE STARBOARD FRAME 02-03 LEVEL 2

HISTORICS	Architecture	Glass	Architectural Element	Window Glass	2		thin & solarized
	Architecture	Metal	Construction Hardware	Spike	1		6" long shank is 0.5" wide & square
	Architecture	Metal	Construction Hardware	Spike	1		2" fragment
	Architecture	Metal	Construction Hardware	Spike	1		4.5" long shank is 0.5" wide & square
	Architecture	Metal	Machine Cut Nail, Common	2-4"	1		complete, 1815-1890
	Architecture	Metal	Machine Cut Nail, Common	Fragment	8		all are 0.25" square shanked cut nail fragments, 1815-1890
	Architecture	Metal	Machine Cut Nail, Finish	Fragment	2		1815-1890
	Clothing	Ceramic	Ceramic Clothing	Porcelain Button	1		poss. milk glass, 3/8" diameter w/4 holes
	Kitchen	Ceramic	Pearlware	Annular	1		hollowware, fragment, poss. teacup, 1790-1820
	Miscellaneous	Stone	Miscellaneous Stone	Coal	5		sample
	Miscellaneous	Stone	Miscellaneous Stone	Coal Slag	2		

Category	Group	Class	Type	Sub-Type	Count	Weight (g)	Comments
KENTUCKY III 16BO358							
HISTORICS	Undetermined Functional Group	Biological	Unrelated	Bone	3		medium/small amphibian
					Total Count= 28		**Total Weight=**
FS 7	**AREA DREDGE**	**SIDE STARBOARD**	**FRAME 03-04**	**LEVEL 2**			
HISTORICS	Architecture	Metal	Construction Hardware	Spike	1		see lab notes
	Kitchen	Ceramic	Domestic Brown Stoneware	Brown Salt-Glaze, Undecorated	1		hollowware, base frag., 1750-1900
	Kitchen	Ceramic	Whiteware	Undecorated	1		hollowware, 1820-PRESENT
	Undetermined Functional Group	Biological	Unrelated	Bone	12		medium amphibian, see lab notes
					Total Count= 15		**Total Weight=**
FS 10	**AREA DREDGE**	**SIDE STARBOARD**	**FRAME 05-06**				
HISTORICS	Architecture	Biological	Architectural Element	Lumber (cut)	3		poss. cut wedge
	Architecture	Glass	Architectural Element	Window Glass	1		
	Architecture	Metal	Construction Hardware	Spike	1		3" fragment
	Architecture	Metal	Construction Hardware	Spike	1		complete
	Architecture	Metal	Machine Cut Nail, Finish	2-4"	3		complete, 1815-1890
	Architecture	Metal	Machine Cut Nail, Finish	Fragment	4		1815-1890
	Architecture	Metal	Machine Cut Nail, Finish	Fragment	1		1815-1890
	Kitchen	Biological	Kitchen Use	Nut/Seed/Pit	1		poss. peach pit
	Kitchen	Ceramic	Later Porcelain Type	Undecorated Porcelain, Hard	1		hollowware

KENTUCKY III 16BO358

Category	Group	Class	Type	Sub-Type	Count	Weight (g)	Comments
HISTORICS	Nautical	Biological	Accessories	Dowel	1		cut/beveled dowel fragment; conserved
	Undetermined Functional Group	Biological	Unrelated	Bone	1		small frag.
	Undetermined Functional Group	Biological	Unrelated	Bone	1		large mammal, poss. rib frag.
	Undetermined Functional Group	Biological	Unrelated	Bone	10		medium amphibian
					Total Count= 29	**Total Weight=**	

FS 13 AREA DREDGE SIDE STARBOARD FRAME 06-07 LEVEL 1

HISTORICS	Kitchen	Biological	Shell	Turtle Shell	5		
	Undetermined Functional Group	Biological	Unrelated	Unidentified Bone	16		see lab notes
					Total Count= 21	**Total Weight=**	

FS 14 AREA DREDGE SIDE STARBOARD FRAME 06-07 LEVEL 2

HISTORICS	Activities	Synthetic	Miscellaneous	Rope	3		3 hemp rope fragments
	Architecture	Metal	Construction Hardware	Spike	1		3" frag. of headless spike with 1/4" shank
					Total Count= 4	**Total Weight=**	

FS 17 AREA DREDGE SIDE STARBOARD FRAME 07-08 LEVEL 2

HISTORICS	Architecture	Metal	Construction Hardware	Spike	1		4.25" long w/0.5" wide shank
	Architecture	Metal	Machine Cut Nail, Common	Fragment	3		1815-1890

KENTUCKY III 16BO358

Category	Group	Class	Type	Sub-Type	Count	Weight (g)	Comments
HISTORICS	Architecture	Synthetic	Miscellaneous	Roofing Shingle, Tar Paper	1		2" x 2" frag. of deck tar paper, sand added for better traction on wet decks
	Kitchen	Biological	Shell	Turtle Shell	1		
	Undetermined Functional Group	Biological	Unrelated	Bone	1		amphibian, see lab notes
					Total Count= 7	**Total Weight=**	

FS 20 AREA DREDGE SIDE STARBOARD FRAME 08-09 LEVEL 2

Category	Group	Class	Type	Sub-Type	Count	Weight (g)	Comments
HISTORICS	Architecture	Glass	Architectural Element	Window Glass	1		
	Architecture	Metal	Machine Cut Nail, Common	2-4"	1		complete, 1815-1890
	Architecture	Metal	Machine Cut Nail, Common	Fragment	2		1815-1890
	Architecture	Metal	Machine Cut Nail, Finish	Fragment	1		1815-1890
	Kitchen	Biological	Kitchen Use	Nut/Seed/Pit	2		unid.
	Kitchen	Ceramic	Early Porcelain Type	Canton	1		flatware, 1800-1830
	Miscellaneous	Stone	Miscellaneous Stone	Coal	3		sample
	Undetermined Functional Group	Biological	Unrelated	Bone	11		very small mammal
					Total Count= 22	**Total Weight=**	

FS 22 AREA DREDGE SIDE STARBOARD FRAME 09-10 LEVEL 1

Category	Group	Class	Type	Sub-Type	Count	Weight (g)	Comments
HISTORICS	Architecture	Metal	Construction Hardware	Spike	2		1" x 2.5" frag. & 1" x 1.5" frag., both are 0.5" square shanked deck spikes
	Architecture	Metal	Machine Cut Nail, Common	Fragment	1		1815-1890

KENTUCKY III 16BO358

Category	Group	Class	Type	Sub-Type	Count	Weight (g)	Comments
HISTORICS	Miscellaneous	Biological	Miscellaneous	Other	5		frags. of carbonized wood
	Miscellaneous	Metal	Unidentified Object	Iron/Steel	1		concretion
	Undetermined Functional Group	Biological	Unrelated	Bone	1		small amphibian
					Total Count= 10		**Total Weight=**

FS 23 AREA DREDGE SIDE STARBOARD FRAME 09-10 LEVEL 2

HISTORICS	Architecture	Metal	Construction Hardware	Spike	2		
	Architecture	Metal	Construction Hardware	Spike	4		all 0.5" square shanked spike
	Architecture	Metal	Machine Cut Nail, Finish	Fragment	2		1815-1890
	Architecture	Metal	Machine Cut Nail	> 4"	1		complete, 1815-1890
	Architecture	Metal	Machine Cut Nail	2-4"	1		complete, 1815-1890
	Architecture	Metal	Machine Cut Nail	Fragment	4		1815-1890
	Kitchen	Biological	Shell	Turtle Shell	12		large mammal
	Nautical	Biological	Miscellaneous Structural Part	Deck-Part	2		see lab notes
	Undetermined Functional Group	Biological	Unrelated	Bone	3		large amphibian
					Total Count= 31		**Total Weight=**

FS 43 AREA DREDGE SIDE STARBOARD FRAME 10-11 LEVEL 2

HISTORICS	Architecture	Metal	Machine Cut Nail, Common	2-4"	1		1815-1890
	Architecture	Metal	Machine Cut Nail, Common	2-4"	1		headless brad w/1/8" x 1/8" shank, 1815-1890
	Architecture	Metal	Machine Cut Nail, Common	Fragment	6		1815-1890

Category	Group	Class	Type	Sub-Type	Count	Weight (g)	Comments
KENTUCKY III 16BO358							
HISTORICS	Architecture	Metal	Unidentified	Nail	3		
	Kitchen	Biological	Shell	Turtle Shell	3		
					Total Count= 14	**Total Weight=**	
FS 91	**AREA DREDGE FROM UNDER KEELSON AT MIDSHIPS**		**FRAME 07-08**				
HISTORICS	Nautical	Biological	Miscellaneous Structural Part	Deck-Part	1		bulkhead plank, see lab notes
					Total Count= 1	**Total Weight=**	
FS 109	**AREA DREDGE FILL INBOARD OF STERNPOST**						
HISTORICS	Kitchen	Glass	Unidentified Bottle Glass	Amethyst	2		
	Nautical	Biological	Miscellaneous Structural Part	Deck-Part	1		see lab notes
	Nautical	Biological	Miscellaneous Structural Part	Deck-Part	9		misc. wood frags.
					Total Count= 12	**Total Weight=**	
FS 26	**AREA DREDGE FROM ABOVE GUARD**		**SIDE PORT**				**CLEANING MUD?**
HISTORICS	Architecture	Glass	Architectural Element	Window Glass	5		
	Architecture	Metal	Construction Hardware	Spike	3		1" x 3.5" frag., 2" x 2" frag.
	Architecture	Metal	Construction Hardware	Spike	6		5" long shank is 0.25" square
	Architecture	Metal	Construction Hardware	Spike	2		4.5" long shank is 0.25" square
	Kitchen	Biological	Kitchen Use	Nut/Seed/Pit	1		70% complete, poss. beech nut

KENTUCKY III 16BO358

Category	Group	Class	Type	Sub-Type	Count	Weight (g)	Comments
HISTORICS	Nautical	Biological	Miscellaneous Structural Part	Deck-Part	1		9" long sample of tongue & groove railing
				Total Count= 18		Total Weight=	
FS 89	**AREA DREDGE FROM DIRECTLY BELOW KEELSON**		**FRAME 12-13**				
HISTORICS	Nautical	Biological	Miscellaneous Structural Part	Deck-Part	5		wooden spike/plug frags., can be mended to form 2 spikes/plugs, wood type unid.
				Total Count= 5		Total Weight=	
FS 27	**AREA DREDGE FROM MAIN DECK**	**SIDE PORT, AFT END**					
HISTORICS	Architecture	Glass	Architectural Element	Window Glass	3		
	Architecture	Metal	Construction Hardware	Spike	2		5.5" long shank is 0.5" square
	Architecture	Metal	Construction Hardware	Spike	2		0.25" square shanked, 4.5" long, nails are carbonized
	Architecture	Metal	Machine Cut Nail, Common	Fragment	3		1815-1890
				Total Count= 10		Total Weight=	
FS 37	**AREA DREDGE-3 FT. SQUARE STARBOARD OF FS#36**	**SIDE STARBOARD**					
HISTORICS	Kitchen	Glass	Mouth-Blown in Mold	Blue	1		pharmaceutical bottle w/flared rim; conserved
	Kitchen	Metal	Kitchen Pot	Kettle	1		kettle handle, badly corroded; conserved

Category	Group	Class	Type	Sub-Type	Count	Weight (g)	Comments
KENTUCKY III 16BO358							
HISTORICS	Undetermined Functional Group	Biological	Unrelated	Bone	91		large mammal, see lab notes
	Undetermined Functional Group	Biological	Unrelated	Tooth	29		large mammal, see lab notes
					Total Count= 122		**Total Weight=**
FS 30	**AREA DREDGE-BELOW DECK**		**FRAME 04-05**		**LEVEL 2**		**IN ROPE LOCKER**
HISTORICS	Architecture	Glass	Architectural Element	Window Glass	1		
	Architecture	Metal	Construction Hardware	Spike	1		5" frag. of 0.5" square shanked spike
	Architecture	Metal	Construction Hardware	Spike	1		0.5" square shanked, 5" long spike
	Kitchen	Biological	Shell	Turtle Shell	17		large amphibian
	Miscellaneous	Biological	Wood	Unmodified Wood	1		carbonized wood
	Undetermined Functional Group	Biological	Unrelated	Bone	2		large mammal
	Undetermined Functional Group	Biological	Unrelated	Bone	3		small mammal, poss. rodent skull & mandible
	Undetermined Functional Group	Biological	Unrelated	Bone	23		large amphibian
					Total Count= 49		**Total Weight=**
FS 29	**AREA METAL PAN/PLATE**	**SIDE PORT**	**FRAME 11-12**				
HISTORICS	Miscellaneous	Metal	Unidentified Object	Iron/Steel	9		1/16" thick iron sheeting
					Total Count= 9		**Total Weight=**

KENTUCKY III 16BO358

Category	Group	Class	Type	Sub-Type	Count	Weight (g)	Comments
FS 106	**AREA MORTICED PLANKS**						
HISTORICS	Architecture	Metal	Construction Hardware	Other		2	2.25" square, 1" thick
	Architecture	Metal	Construction Hardware	Other		1	1.75" square, 1" thick
					Total Count= 3		**Total Weight=**
FS 107	**AREA STERN DREDGE ON DECK**						
HISTORICS	Architecture	Metal	Construction Hardware	Spike		6	headless machine cut spike, iron
	Architecture	Metal	Machine Cut Nail, Common	< 2"		2	1/8" shank, iron, 1815-1890
	Architecture	Metal	Machine Cut Nail, Common	> 4"		9	0.25" shank, iron, 1815-1890
	Architecture	Metal	Machine Cut Nail, Common	2-4"		5	1/8" shank, iron, 1815-1890
	Architecture	Metal	Machine Cut Nail, Common	Fragment		11	iron, 1815-1890
	Kitchen	Biological	Kitchen Use	Nut/Seed/Pit		2	poss. peach pits
	Miscellaneous	Biological	Wood	Charcoal		2	
	Nautical	Biological	Miscellaneous Structural Part	Deck-Part		9	misc. wood frags.
	Nautical	Biological	Miscellaneous Structural Part	Deck-Part		3	3" wide, 1" thick, no finished ends, poss. deck plank
	Undetermined Functional Group	Biological	Unrelated	Bone		26	large mammal, species unid.
					Total Count= 75		**Total Weight=**

KENTUCKY III 16BO358

FS 108 **AREA STERN DREDGE UNDER DECK**

Category	Group	Class	Type	Sub-Type	Count	Weight (g)	Comments
HISTORICS	Activities	Metal	Miscellaneous Hardware	Nut	1		2.25" x 2.25", 1" thick
	Architecture	Glass	Architectural Element	Window Glass	2		
	Architecture	Metal	Machine Cut Nail, Common	> 4"	2		0.25" shank, 1815-1890
	Architecture	Metal	Machine Cut Nail, Common	> 4"	4		0.25" shank, iron, 1815-1890
	Architecture	Metal	Machine Cut Nail, Common	2-4"	2		1/8" shank, iron, 1815-1890
	Architecture	Metal	Machine Cut Nail, Common	2-4"	1		0.25" shank, iron, 1815-1890
	Architecture	Metal	Machine Cut Nail, Common	Fragment	6		iron, 1815-1890
	Architecture	Metal	Machine Cut Nail, Common	Fragment	1		1815-1890
	Kitchen	Biological	Kitchen Use	Nut/Seed/Pit	1		poss. peach pit, complete
	Kitchen	Biological	Kitchen Use	Nut/Seed/Pit	1		poss. walnut, complete
	Kitchen	Biological	Kitchen Use	Nut/Seed/Pit	1		poss. brazil nut, complete
	Kitchen	Biological	Kitchen Use	Nut/Seed/Pit	1		poss. peach pit
	Miscellaneous	Metal	Unidentified Object	Iron/Steel	1		iron concretion
	Miscellaneous	Stone	Miscellaneous Stone	Coal	15		
	Nautical	Biological	Miscellaneous Structural Part	Deck-Part	1		badly deteriorated wood frag. w/nail hole
	Undetermined Functional Group	Biological	Unrelated	Bone	2		small mammal, unid. species
	Undetermined Functional Group	Biological	Unrelated	Bone	16		species unid.
					Total Count= 58		**Total Weight=**

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Category	Group	Class	Type	Sub-Type	Count	Weight (g)	Comments
FS 102	**AREA STERN POST**						
HISTORICS	Clothing	Biological	Bone/Leather Clothing	Other	2		military percussion cap pouch
	Miscellaneous	Metal	Unidentified Object	Unidentified Metal	36		percussion cap; prob. associated with .69 or .58 caliber rifles/muskets
	Miscellaneous	Metal	Unidentified Object	Unidentified Metal	9		semi-round, nose-cast, 32 cal. round for cap and ball type pisotl/revolver, .33 cm diameter
	Miscellaneous	Metal	Unidentified Object	Unidentified Metal	2		percussion cap; .32 caliber for pistol/revolver
	Miscellaneous	Metal	Unidentified Object	Unidentified Metal	31		13.33 grams of percussion cap fragments
	Miscellaneous	Metal	Unidentified Object	Unidentified Metal	10		mostly complete examples; percussion cap
	Nautical	Metal	Miscellaneous Structural Part	Gludgeon	1		upper gudgeon
				Total Count= 91		**Total Weight=**	
FS 103	**AREA UNKNOWN**						
HISTORICS	Architecture	Metal	Construction Hardware	Spike	7		Deck spikes, see lab notes for F.S. #42, all spikes 13in.
	Architecture	Metal	Machine Cut Nail	> 4"	8		see lab notes for F.S.#7, 1815-1890
	Nautical	Metal	Miscellaneous Structural Part	Mast Hoop	1		mast hoop
				Total Count= 16		**Total Weight=**	

APPENDIX IV

INVENTORY OF FAUNAL REMAINS

APPENDIX IV
Inventory of Faunal Remains

FS	Class	Family	*Genus*	*Species*	Common Name	CT	WT	Element	Side	Additional Description
3	Mammalia				UID Mammal	1	2.07	Misc. cranial fragment	0	
3	Mammalia	Didelphidae	*Didelphis*	*virginina*	Opossum	1	2.76	Mandible	R	Includes dentition; no modification
3	Reptilia	Chelydridae	*Macrolemys*	*temminckii*	Alligator snapping turtle	1	10.1	Neural	0	
3	Reptilia	Chelydridae			Snapping turtle family	2	4.4	Pleural	0	
3	Reptilia	Testudinidata			UID Turtle	1	0.4	Humerus	R	Too fragmented to identify
4	Mammalia	Tayassuidae	*Sus*	*scrofa*	Domestic pig	1	24.48	Femur	R	Fusion indeterminate but appears to be adult
4	Mammalia	Tayassuidae	*Sus*	*scrofa*	Domestic pig	1	4.35	Second phalanx	0	Proximally and distally fused; rodent gnawed
5	Reptilia	Testudinidata			UID Turtle	1	1.2	C/P fragment	0	
7	Mammalia	Equidae			Horse family	7	0.9	Laminae of hoof wall	0	
7	Reptilia	Chelydridae	*Macrolemys*	*temminckii*	Alligator snapping turtle	2	23.3	Pleural	0	
7	Reptilia	Chelydridae	*Macrolemys*	*temminckii*	Alligator snapping turtle	6	10.9	C/P fragment		cf.
7	Reptilia	Chelydridae	*Macrolemys*	*temminckii*	Alligator snapping turtle	2	0.6	Misc. Vertebra	0	cf.
7	Reptilia	Chelydridae	*Macrolemys*	*temminckii*	Alligator snapping turtle	1	0.5	Pubis	0	cf.
8	Mammalia	Tayassuidae	*Sus*	*scrofa*	Domestic pig	1	1.03	Rib	0	Rodent gnawed
8	Mammalia	Tayassuidae	*Sus*	*scrofa*	Domestic pig	1	22.05	Ulna	R	Rodent gnawed; fusion indeterminate, but appears to be adult
8	Mammalia	Bovidae	*Bos*	*taurus*	Cow	1	30.2	Illium	L	Clean cut; knife cut marks, and rodent gnawed; bone 3/4" thick
8	Mammalia	Tayassuidae	*Sus*	*scrofa*	Domestic pig	1	2.55	Tibia	L	Rodent gnawed; fusion indeterminate
9	Reptilia	Chelydridae	*Macrolemys*	*temminckii*	Alligator snapping turtle	2	15.6	Pleural	0	
9	Reptilia	Chelydridae			Snapping turtle family	5	10.4	C/P fragment	0	
10	Reptilia	Chelydridae	*Chelydra*	*serpentina*	Common snapping turtle	12	24.79	C/P fragment	0	
10	Reptilia	Chelydridae	*Chelydra*	*serpentina*	Common snapping turtle	3	34.62	Peripheral	0	
10	Reptilia	Chelydridae	*Chelydra*	*serpentina*	Common snapping turtle	1	12.05	Humerus	R	
10	Mammalia				UID Mammal	1	23.62	Rib	0	Rodent gnawed; cut mark appears modern
11	Reptilia	Chelydridae	*Chelydra*	*serpentina*	Common snapping turtle	30	19.93	C/P fragment	0	Misc. C/P fragments, cranial fragments, and minute fragments
11	Reptilia	Chelydridae	*Chelydra*	*serpentina*	Common snapping turtle	20	35.67	Misc. cranial fragment	0	
11	Reptilia	Chelydridae	*Chelydra*	*serpentina*	Common snapping turtle	1	8.03	Scapula	R	Four fragments from same element
11	Reptilia	Chelydridae	*Chelydra*	*serpentina*	Common snapping turtle	1	9.45	Dentary	R	
11	Reptilia	Chelydridae	*Chelydra*	*serpentina*	Common snapping turtle	1	9.12	Dentary	L	
11	Reptilia	Chelydridae	*Chelydra*	*serpentina*	Common snapping turtle	1	1.23	Basioccipital	0	
11	Reptilia	Chelydridae	*Chelydra*	*serpentina*	Common snapping turtle	2	3.42	Misc. Vertebra	0	
11	Reptilia	Chelydridae	*Chelydra*	*serpentina*	Common snapping turtle	1	1.3	Squamosal	L	
11	Reptilia	Chelydridae	*Chelydra*	*serpentina*	Common snapping turtle	1	7.83	Quadrate	R	
11	Reptilia	Chelydridae	*Chelydra*	*serpentina*	Common snapping turtle	1	6.29	Misc. cranial fragment	R	Parietal?
11	Reptilia	Chelydridae	*Chelydra*	*serpentina*	Common snapping turtle	4	37.49	Peripheral	0	
11	Mammalia	Equidae			Horse family	9	3.13	Laminae of hoof wall	0	
11	Reptilia	Chelydridae	*Chelydra*	*serpentina*	Common snapping turtle	1	2.5	Frontal	L	
12	Reptilia	Chelydridae	*Chelydra*	*serpentina*	Common snapping turtle	10	1.73	C/P fragment		
12	Reptilia	Chelydridae	*Chelydra*	*serpentina*	Common snapping turtle	1	9.57	Coracoid	I	
12	Reptilia	Chelydridae	*Chelydra*	*serpentina*	Common snapping turtle	1	1.29	Misc. Vertebra	0	
12	Reptilia	Chelydridae	*Chelydra*	*serpentina*	Common snapping turtle	1	12.87	Scapula	L	
12	Mammalia	Tayassuidae	*Sus*	*scrofa*	Domestic pig	1	5.29	Metapodial	0	Rodent gnawed; fusion indeterminate

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13	Reptilia	Chelydridae	*Chelydra*	*serpentina*	Common snapping turtle	10	6.43	C/P fragment	0	
13	Reptilia	Chelydridae	*Chelydra*	*serpentina*	Common snapping turtle	5	21.76	C/P fragment	0	
13	Reptilia	Chelydridae	*Chelydra*	*serpentina*	Common snapping turtle	2	13.22	Neural	0	
13	Reptilia	Chelydridae	*Chelydra*	*serpentina*	Common snapping turtle	1	0.35	Metapodial	0	
13	Reptilia	Chelydridae	*Chelydra*	*serpentina*	Common snapping turtle	1	0.76	Frontal	0	
13	Reptilia	Chelydridae	*Chelydra*	*serpentina*	Common snapping turtle	1	4.61	Maxilla	0	
13	Reptilia	Emydidae	*Pseudemys*	*sp.*	Cooters	1	5.8	Dentary	0	
14	Mammalia	Muridae	*Rattus*	*sp.*	Old World Rats	1	0.47	Femur	L	Proximally and distally unfused
14	Mammalia	Muridae	*Rattus*	*sp.*	Old World Rats	1	0.08	Incisor	0	
14	Mammalia	Muridae	*Rattus*	*sp.*	Old World Rats	1	0.23	Misc. cranial fragment	R	Parietal
14	Mammalia	Muridae	*Rattus*	*sp.*	Old World Rats	1	0.48	Innominate	R	
14	Mammalia	Muridae	*Rattus*	*sp.*	Old World Rats	1	0.43	Innominate	L	
14	Mammalia	Muridae	*Rattus*	*sp.*	Old World Rats	1	0.1	Zygomatic	L	
14	Mammalia	Muridae	*Rattus*	*sp.*	Old World Rats	3	0.12	Misc. cranial fragment	0	
16	Mammalia	Equidae			Horse family	2	0.46	Laminae of hoof wall	0	
16	Reptilia	Chelydridae	*Chelydra*	*serpentina*	Common snapping turtle	1	0.17	Misc. cranial fragment	0	
16	Reptilia	Chelydridae	*Chelydra*	*serpentina*	Common snapping turtle	1	15.85	Scapula	0	Two fragments mend
16	Reptilia	Chelydridae	*Chelydra*	*serpentina*	Common snapping turtle	1	0.7	Carpal/Tarsal	0	
17	Reptilia	Testudinidata			UID Turtle	1	1.55	Misc. cranial fragment	0	
17	Reptilia	Trionychidae	*Apalone*	*sp.*	Softshell turtle	1	0.71	C/P fragment	0	
19	Reptilia	Chelydridae	*Chelydra*	*serpentina*	Common snapping turtle	1	1.42	Misc. Vertebra	0	
19	Reptilia	Chelydridae	*Chelydra*	*serpentina*	Common snapping turtle	1	3.76	Tibia	0	
20	Mammalia	Muridae	*Rattus*	*sp.*	Old World Rats	1	0.08	Illium	L	
20	Mammalia	Muridae	*Rattus*	*sp.*	Old World Rats	1	0.18	Femur	L	Proximally and distally unfused
20	Mammalia	Muridae	*Rattus*	*sp.*	Old World Rats	1	0.19	Mandible	L	Includes incisor, CT 1
20	Mammalia	Muridae	*Rattus*	*sp.*	Old World Rats	1	0.22	Mandible	R	Includes CT 1, CT 2
20	Mammalia	Muridae	*Rattus*	*sp.*	Old World Rats	1	0.01	Misc. cranial fragment	0	Parietal
20	Mammalia	Muridae	*Rattus*	*sp.*	Old World Rats	1	0.01	Frontal	L	
20	Mammalia	Muridae	*Rattus*	*sp.*	Old World Rats	1	0.09	Humerus	L	Proximally unfused; distally fused
20	Mammalia	Muridae	*Rattus*	*sp.*	Old World Rats	1	0.02	Frontal	R	
20	Mammalia	Muridae	*Rattus*	*sp.*	Old World Rats	1	0.13	Tibia	L	Proximally and distally unfused
20	Mammalia	Muridae	*Rattus*	*sp.*	Old World Rats	1	0.18	Femur	R	Proximally and distally unfused
20	Mammalia	Muridae	*Rattus*	*sp.*	Old World Rats	1	0.08	Illium	R	
21	Reptilia	Trionychidae	*Apalone*	*sp.*	Softshell turtle	1	9.53	Pleural	0	
22	Osteichthyes	Ictaluridae			Freshwater catfishes	1	0.31	Cleithrum	R	
23	Reptilia	Trionychidae	*Apalone*	*sp.*	Softshell turtle	1	4.1	Scapula	R	
23	Reptilia	Trionychidae	*Apalone*	*sp.*	Softshell turtle	2	5.65	Neural	0	
23	Reptilia	Trionychidae	*Apalone*	*sp.*	Softshell turtle	1	2.69	Coracoid	R	
23	Reptilia	Trionychidae	*Apalone*	*sp.*	Softshell turtle	1	20.19	Plastron	0	
23	Reptilia	Trionychidae	*Apalone*	*sp.*	Softshell turtle	3	6.29	C/P fragment	0	
23	Reptilia	Trionychidae	*Apalone*	*sp.*	Softshell turtle	5	53.66	Pleural	0	
23	Reptilia	Chelydridae	*Chelydra*	*serpentina*	Common snapping turtle	1	3.14	Neural		Two fragments mend

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25	Mammalia	Muridae	*Rattus*	*sp.*	Old World Rats	1	0.27	Humerus	R	Rodent gnawed; proximally fused; distally fused
25	Mammalia	Equidae			Horse family	1	9.7	Acetabulum	0	Rodent gnawed
25	Reptilia	Testudinidata			UID Turtle	1	0.27	Pleural	0	
30	Reptilia	Trionychidae	*Apalone*	*sp.*	Softshell turtle	1	1.71	Maxilla	R	
30	Reptilia	Trionychidae	*Apalone*	*sp.*	Softshell turtle	1	1.14	Fibula	R	
30	Reptilia	Trionychidae	*Apalone*	*sp.*	Softshell turtle	2	0.91	Metapodial	0	
30	Reptilia	Trionychidae	*Apalone*	*sp.*	Softshell turtle	4	37.08	Pleural	0	
30	Reptilia	Trionychidae	*Apalone*	*sp.*	Softshell turtle	1	1.42	Maxilla	L	
30	Reptilia	Testudinidata			UID Turtle	1	0.6	C/P fragment	0	
30	Reptilia	Trionychidae	*Apalone*	*sp.*	Softshell turtle	1	7.84	Scapula	L	
30	Reptilia	Chelydridae	*Chelydra*	*serpentina*	Common snapping turtle	1	10.9	Innominate	0	Five fragments
30	Reptilia	Trionychidae	*Apalone*	*sp.*	Softshell turtle	1	1.92	Dentary	R	
30	Reptilia	Chelydridae	*Chelydra*	*serpentina*	Common snapping turtle	2	45.1	Peripheral	0	
30	Reptilia	Chelydridae	*Chelydra*	*serpentina*	Common snapping turtle	3	0.8	Misc. Vertebra	0	
30	Reptilia	Chelydridae	*Chelydra*	*serpentina*	Common snapping turtle	7	17.2	C/P fragment	0	
30	Mammalia	Muridae	*Rattus*	*sp.*	Old World Rats	1	0.46	Mandible	R	No dentition
30	Reptilia	Chelydridae	*Chelydra*	*serpentina*	Common snapping turtle	1	9.7	Femur	R	
30	Reptilia	Chelydridae	*Chelydra*	*serpentina*	Common snapping turtle	1	3.3	Tibia		
30	Reptilia	Trionychidae	*Apalone*	*sp.*	Softshell turtle	2	31.14	Plastron	0	Check FS 23 for MNI
30	Reptilia	Chelydridae	*Chelydra*	*serpentina*	Common snapping turtle	1	9.4	Femur	L	
30	Mammalia	Muridae	*Rattus*	*sp.*	Old World Rats	1	0.24	Scapula	R	
30	Mammalia	Muridae	*Rattus*	*sp.*	Old World Rats	1	1.49	Misc. cranial fragment	0	
30	Reptilia	Trionychidae	*Apalone*	*sp.*	Softshell turtle	9	30.32	C/P fragment	0	
30	Mammalia	Muridae	*Rattus*	*sp.*	Old World Rats	1	0.21	Mandible	L	No dentition
33	Mammalia	Equidae			Horse family	1	2.97	First phalanx	0	Proximally and distally fused
33	Mammalia	Equidae			Horse family	1	0.76	Metapodial	0	Proximally fused
34	Mammalia	Equidae			Horse family	1	0.37	Pisiform	0	Proximally and distally fused
35	Mammalia	Equidae			Horse family	1	114.1	Occipital	0	
35	Mammalia	Equidae			Horse family	4	223.4	Molar	0	All uppers
35	Mammalia	Equidae			Horse family	1	56.9	Upper M3	R	
35	Mammalia	Equidae			Horse family	1	100.1	First phalanx		Proximally and distally fused.
35	Mammalia				Unidentified mammal	4	0.81	Misc. fragment		
36	Mammalia	Equidae			Horse family	1	25.3	Petrous		
36	Mammalia	Equidae			Horse family	1	43.7	Upper PM2	R	
36	Mammalia	Equidae			Horse family	41	186.5	Misc. cranial fragment		
36	Mammalia	Equidae			Horse family	1	2	Misc. cranial fragment		
36	Mammalia	Equidae			Horse family	1	71.1	Maxilla	L	Includes C, I 2, I 3
37	Mammalia	Equidae			Horse family	1	297.4	Mandible	R	Includes p 2, p 3, p 4
37	Mammalia	Equidae			Horse family	18	121.82	Misc. cranial fragment	0	
37	Mammalia	Equidae			Horse family	1	46.9	Lower PM3	L	
37	Mammalia	Equidae			Horse family	3	31.5	Incisor	0	
37	Mammalia	Equidae			Horse family	1	4.9	Palatine	0	

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37	Mammalia	Equidae			Horse family	86	178.5	Misc. cranial fragment	0	
37	Mammalia	Equidae			Horse family	1	9.5	Rib	0	
37	Mammalia	Equidae			Horse family	4	16.2	Canine tooth		Two upper; two lower
37	Mammalia	Equidae			Horse family	9	82.2	Incisor	0	Includes two upper I 3
37	Mammalia	Equidae			Horse family	1	50.2	Upper PM1	L	
37	Mammalia	Equidae			Horse family	1	50.2	Upper PM1	R	
37	Mammalia	Equidae			Horse family	1	26.5	Petrous	0	
37	Mammalia	Equidae			Horse family	1	39.4	Lower PM2	R	
37	Mammalia	Equidae			Horse family	1	43.8	Mandible	L	
37	Mammalia	Equidae			Horse family	1	52.6	Lower M1	L	
37	Mammalia	Equidae			Horse family	6	270.6	Molar	0	All uppers
37	Mammalia	Equidae			Horse family	1	60.9	Upper M3	R	
37	Mammalia	Equidae			Horse family	1	36.6	Lower PM4	L	
37	Mammalia	Equidae			Horse family	1	37.3	Lower PM4	R	
37	Mammalia	Equidae			Horse family	1	37.4	Molar		Lower
37	Mammalia	Equidae			Horse family	2	19.6	Misc. cranial fragment	0	
37	Mammalia	Equidae			Horse family	1	17.8	Carpal/Tarsal	0	
37	Mammalia	Equidae			Horse family	1	31.2	Lower PM2	L	
37	Mammalia	Equidae			Horse family	1	39.4	Lower PM2	L	
40	Mammalia	Equidae			Horse family	1	38.6	Lower M1	L	
40	Vertebrata				UID Vertebrate	4	0.4	Misc.fragment	1	
40	Mammalia	Muridae	*Rattus*	*sp.*	Old World Rats	1	0.4	Basioccipital	0	
40	Mammalia	Equidae			Horse family	1	62.5	Molar	0	
43	Reptilia	Trionychidae	*Apalone*	*sp.*	Softshell turtle	1	12.03	Pleural	0	
43	Reptilia	Trionychidae	*Apalone*	*sp.*	Softshell turtle	3	9.61	C/P fragment	0	
44	Mammalia	Muridae	*Rattus*	*sp.*	Old World Rats	1	0.71	Femur	R	Proximally and distally fused.
44	Mammalia	Muridae	*Rattus*	*sp.*	Old World Rats	1	0.72	Femur	L	Proximally and distally fused.
44	Mammalia	Muridae	*Rattus*	*sp.*	Old World Rats	1	0.5	Tibia	R	Proximally unfused; distally fused.
44	Mammalia	Muridae	*Rattus*	*sp.*	Old World Rats	1	0.49	Tibia	L	Proximally unfused; distally fused.
44	Mammalia	Muridae	*Rattus*	*sp.*	Old World Rats	1	0.64	Sacrum		
44	Mammalia	Muridae	*Rattus*	*sp.*	Old World Rats	1	0.64	Pelvis	R	
44	Mammalia	Muridae	*Rattus*	*sp.*	Old World Rats	1	0.05	Rib		
44	Mammalia	Muridae	*Rattus*	*sp.*	Old World Rats	2	0.43	Misc. vertebrae		
44	Mammalia	Muridae	*Rattus*	*sp.*	Old World Rats	1	0.24	Scapula	L	
45	Reptilia	Trionychidae	*Apalone*	*sp.*	Softshell turtle	1	7.19	Epiplastron	R	
47	Mammalia	Equidae			Horse family	1	2.91	Astragalus	L	Proximally and distally fused
49	Mammalia	Equidae			Horse family	1	249.1	Metacarpal	L	Third metacarpal; proximally and distally fused
49	Mammalia	Equidae			Horse family	3	16.9	Misc. cranial fragment	0	
49	Mammalia	Equidae			Horse family	1	17.4	Maxilla	0	
49	Mammalia	Equidae			Horse family	1	24.4	Premaxilla	R	
49	Mammalia	Equidae			Horse family	1	45.5	Upper PM2	R	
49	Mammalia	Equidae			Horse family	2	20	Incisor	R	I 3, I 2

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49	Mammalia	Equidae			Horse family	1	56	Molar	0	Upper
49	Mammalia	Equidae			Horse family	1	4.4	Canine tooth	0	
50	Mammalia	Equidae			Horse family	1	54.5	Molar	0	Upper
51	Mammalia	Equidae			Horse family	19	67.8	Misc. cranial fragment	0	
51	Mammalia	Equidae			Horse family	1	62.8	Upper M3	R	
52	Mammalia	Equidae			Horse family	7	11.94	Misc. cranial fragment	0	
53	Vertebrata				UID Vertebrate	1	0.74	Misc.fragment	0	
56	Reptilia	Emydidae	*Pseudemys*	*sp.*	Cooters	1	17.89	Hyoplastron	R	
59	Mammalia	Didelphidae	*Didelphis*	*virginina*	Opossum	1	2	Mandible	L	Includes M 3
62	Reptilia	Trionychidae	*Apalone*	*sp.*	Softshell turtle	1	8.41	Entoplastron	0	
82	Mammalia	Equidae			Horse family	1	86.6	First phalanx	0	Proximally and distally fused
82	Mammalia	Equidae			Horse family	1	111.2	Astragalus	L	Proximally and distally fused
82	Mammalia	Equidae			Horse family	1	429	Metatarsal	R	Third metatarsal; proximally and distally fused
82	Mammalia	Equidae			Horse family	1	450	Metatarsal	L	Third metatarsal; proximally and distally fused; rust stains from adherence to iron pot
82	Mammalia	Equidae			Horse family	1	40.1	Third phalanx		Proximally and distally fused
82	Mammalia	Equidae			Horse family	1	8.3	Sesamoid	0	
82	Mammalia	Equidae			Horse family	1	93.3	Calcaneus	R	Proximally fused
82	Mammalia	Equidae			Horse family	1	9.4	Metapodial	0	Proximally fused
84	Reptilia	Trionychidae	*Apalone*	*sp.*	Softshell turtle	1	1.68	Coracoid	L	
84	Reptilia	Trionychidae	*Apalone*	*sp.*	Softshell turtle	1	3.59	Scapula	L	
84	Reptilia	Trionychidae	*Apalone*	*sp.*	Softshell turtle	1	8.31	Misc. cranial fragment	0	Complete skull
84	Reptilia	Trionychidae	*Apalone*	*sp.*	Softshell turtle	1	2.21	Entoplastron	0	
84	Osteichthyes	Ictaluridae			Freshwater catfishes	1	0.29	Weberian apparatus	0	
84	Reptilia	Trionychidae	*Apalone*	*sp.*	Softshell turtle	1	12.23	Hyoplastron	R	
84	Reptilia	Trionychidae	*Apalone*	*sp.*	Softshell turtle	1	12.01	Hyoplastron	L	
84	Reptilia	Trionychidae	*Apalone*	*sp.*	Softshell turtle	1	1.93	Dentary	0	Left and right dentary fused at symphysis
84	Reptilia	Trionychidae	*Apalone*	*sp.*	Softshell turtle	1	7.37	Epiplastron	R	
84	Reptilia	Trionychidae	*Apalone*	*sp.*	Softshell turtle	2	2.1	Cervical Vertebra	0	
84	Reptilia	Trionychidae	*Apalone*	*sp.*	Softshell turtle	1	0.47	Ulna	R	
84	Reptilia	Trionychidae	*Apalone*	*sp.*	Softshell turtle	3	0.17	C/P fragment	0	
84	Mammalia	Equidae			Horse family	1	24.62	Rib	0	Two pieces mend
84	Reptilia	Trionychidae	*Apalone*	*sp.*	Softshell turtle	1	17.55	Hypoplastron	L	
84	Reptilia	Trionychidae	*Apalone*	*sp.*	Softshell turtle	1	17.27	Hypoplastron	R	
85	Reptilia	Trionychidae	*Apalone*	*sp.*	Softshell turtle	1	0.17	Metapodial	0	
85	Reptilia	Trionychidae	*Apalone*	*sp.*	Softshell turtle	1	0.2	C/P fragment	0	
85	Reptilia	Trionychidae	*Apalone*	*sp.*	Softshell turtle	5	2.47	Misc. Vertebra	0	
85	Reptilia	Trionychidae	*Apalone*	*sp.*	Softshell turtle	1	0.3	Misc. phalanx	0	
85	Reptilia	Trionychidae	*Apalone*	*sp.*	Softshell turtle	1	0.75	Atlas	0	
85	Reptilia	Trionychidae	*Apalone*	*sp.*	Softshell turtle	1	8.12	Nuchal	0	
85	Reptilia	Trionychidae	*Apalone*	*sp.*	Softshell turtle	13	100.62	Pleural	0	One missing costal recovered in FS 21
85	Reptilia	Trionychidae	*Apalone*	*sp.*	Softshell turtle	7	9.78	Neural	0	All neurals from one specimen present

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85	Reptilia	Trionychidae	*Apalone*	*sp.*	Softshell turtle	1	0.84	Hypoplastron	L	
86	Mammalia	Muridae	*Rattus*	*sp.*	Old World Rats	1	0.24	Innominate	L	
86	Mammalia	Muridae	*Rattus*	*sp.*	Old World Rats	1	0.29	Femur	R	Proximally and distally unfused
86	Mammalia	Muridae	*Rattus*	*sp.*	Old World Rats	1	0.29	Femur	L	Proximally and distally unfused
86	Mammalia	Muridae	*Rattus*	*sp.*	Old World Rats	1	0.09	Radius	R	
86	Mammalia	Muridae	*Rattus*	*sp.*	Old World Rats	1	0.11	Humerus	R	
86	Mammalia	Muridae	*Rattus*	*sp.*	Old World Rats	1	0.08	Scapula	R	
86	Mammalia	Muridae	*Rattus*	*sp.*	Old World Rats	1	0.07	Scapula	L	
86	Mammalia	Muridae	*Rattus*	*sp.*	Old World Rats	10	0.59	Misc. Vertebra	0	
86	Mammalia	Muridae	*Rattus*	*sp.*	Old World Rats	1	0.09	Sternum	0	
86	Mammalia	Muridae	*Rattus*	*sp.*	Old World Rats	1	0.04	Petrous	0	
86	Mammalia	Muridae	*Rattus*	*sp.*	Old World Rats	1	0.28	Tibia	R	Proximally unfused; distally fused
86	Mammalia	Muridae	*Rattus*	*sp.*	Old World Rats	1	0.09	Occipital	0	
86	Mammalia	Muridae	*Rattus*	*sp.*	Old World Rats	1	0.28	Tibia	L	Proximally unfused; distally fused
86	Mammalia	Muridae	*Rattus*	*sp.*	Old World Rats	1	0.06	Frontal	R	
86	Mammalia	Muridae	*Rattus*	*sp.*	Old World Rats	1	0.23	Innominate	R	
86	Mammalia	Muridae	*Rattus*	*sp.*	Old World Rats	1	0.04	Atlas	0	
86	Mammalia	Muridae	*Rattus*	*sp.*	Old World Rats	1	0.04	Misc. cranial fragment	0	Parietal
86	Mammalia	Muridae	*Rattus*	*sp.*	Old World Rats	1	0.03	Zygomatic	L	
86	Mammalia	Muridae	*Rattus*	*sp.*	Old World Rats	1	0.16	Maxilla	L	Includes incisor
86	Mammalia	Muridae	*Rattus*	*sp.*	Old World Rats	1	0.16	Mandible	L	Includes incisor, CT 1, CT 2
86	Mammalia	Muridae	*Rattus*	*sp.*	Old World Rats	1	0.24	Mandible	L	Includes incisor, CT 1, CT 2
86	Mammalia	Muridae	*Rattus*	*sp.*	Old World Rats	1	0.23	Maxilla	R	Includes incisor
86	Mammalia	Muridae	*Rattus*	*sp.*	Old World Rats	1	0.07	Frontal	L	
88	Mammalia				UID Mammal	1	3.8	Misc. cranial fragment	0	
93	Reptilia	Trionychidae	*Apalone*	*sp.*	Softshell turtle	6	1.62	Misc. Vertebra	0	
93	Reptilia	Trionychidae	*Apalone*	*sp.*	Softshell turtle	1	0.42	Fibula	L	
93	Reptilia	Trionychidae	*Apalone*	*sp.*	Softshell turtle	1	0.18	Misc. phalanx	0	
93	Mammalia	Equidae			Horse family	1	10.55	Misc. cranial fragment		Mandible fragment
96	Mammalia				Unidentified mammal	2	3.06	Misc. cranial fragment		No diagnostic features makes further identification infeasible
98	Mammalia	Equidae			Horse family	1	9.5	Hyoid	0	Rodent gnawed

APPENDIX V

CONSERVATION NEEDS ASSESSMENT

APPENDIX V

CONSERVATION NEEDS ASSESSMENT - PROCEDURES

Introduction

Conservation procedures were developed for artifacts from the *Kentucky* project based on procedures recommended by the Virginia Department of Historic Resources, Richmond, Virginia; the Archaeological Conservation Center at the College of William and Mary, Williamsburg, Virginia; the Colonial Williamsburg Foundation, Williamsburg, Virginia; and the Texas A&M University Nautical Archaeology Program Conservation facilities. Additional guidance was obtained from Cronyn (1990), Pearson (1987), and Plenderleith (1988). The treatment procedures prescribed for this collection additionally were developed in compliance with guidelines established by the International Institute for Conservation (IIC) for all conservators (International Institute for Conservation 1975 [a-h]).

Each material type in the collection is discussed below, including a brief description of the conservation problem; recommendations for pre-treatment storage; conservation treatment undertaken; and post-treatment storage procedures. The treatments described were designed specifically for the conservation problems presented by this collection; they may not be suitable for other collections.

Seventy-nine objects from the *Kentucky* were chosen for conservation. Those objects came from the following field samples (Appendix III – Artifact Inventory): FS 85, copper alloy buckle, FS 102 copper alloy percussion caps, FS 102 lead alloy shot, FS 36 copper alloy Confederate button, FS 36 ferrous alloy kettle/cooking pot handle, FS 37 ferrous alloy cooking pot, FS 40 ferrous alloy skillet, FS 56 ferrous alloy cooking pot lid, FS 59 ferrous alloy skillet, FS 61 ferrous alloy cooking pot, FS 82 copper alloy Federal infantry button, FS 82 ferrous alloy cooking pot, FS 82 ferrous alloy skillet, FS 94 ferrous alloy tea kettle with handle, FS 94 ferrous alloy cooking pot, FS 95 ferrous alloy cooking pot, FS 98 ferrous alloy spikes, FS 98 ferrous alloy machine cut nails, FS 108 machine cut nails, FS 37 mold blown

glass phial, FS 33 possible bone awl, FS 56 bone one part four hole button, FS 75 bone knife handle, FS 82 bone possible awl/punch, FS 97 bone button, FS 6 wood decorative Dutchman, FS 10 wood dowel, FS 34 wood button, FS 67 wood tongue and groove deck part, FS 72 wood deck part, FS 80 wood dowel fragment, FS 11 hemp rope fragments, FS66 leather pouch fragments, FS 66 composite briarwood/copper alloy/silver pipe bowl, FS 72 composite wood/copper alloy clasp knife, FS 79 composite wood/copper alloy/iron knife handle, FS 19, 25, 33, 48, 82 porcelain button, FS 10 late porcelain hollowware, FS 97 ball clay pipe, FS 7 whiteware hollowware, FS 9 whiteware hollowware, FS 65 ironstone, and FS 25 pearlware.

Conservation Protocol (All Artifacts)

A daily documentation "treatment record" form was completed that recorded all treatment actions performed; metal desalinization and electrolytic reduction forms were completed on an as needed basis. Once in treatment the, the objects were handled with gloves at all times.

Pretreatment Documentation/Recordation

As part of the conservation process, every artifact must be documented thoroughly before, during, and after conservation. Documentation is one of the most important steps in the artifact conservation process, as it provides permanent written and visual records of the artifact through all stages of its treatment. Completion of this step also ensures that at least some data is preserved, in the unlikely event that the object is destroyed during the course of treatment.

Pre-treatment documentation included pre- and post- conservation photographs, scale 1:1 drawings of selected artifacts, and x-radiography for selected artifacts. Materials identification also was part of each artifact's preliminary documentation. The sequence of pre-treatment artifact documentation followed standard procedures, including:

- A conservation lab "condition report" was completely filled out.

- A request for photography form was completed, requesting obverse and reverse photos of the object (color slide and b/w print), information on roll and exposure numbers was recorded on the "condition report".
- Selected objects were drawn to scale.
- A tag, or acid/solvent proof tape strip with the conservation lab number was made and kept with the object during the duration of the treatment.

Pre-treatment Storage

All metal objects were stored submerged in a corrosion inhibitive alkaline solution, consisting of a 5 per cent solution of sodium carbonate in fresh water. To retard further corrosion of the core metal, adhering corrosion layers were left intact until the initiation of treatment procedures.

Organic artifacts recovered from the aqueous environment surrounding the *Kentucky* were stored in a de-ionized solution containing a biocide, or sufficient quantity of isopropyl alcohol to retard bacterial growth. The containers periodically were agitated, and exposed to a light source to further retard the development of microbial growth.

Inorganic non-metallic artifacts such as ceramic, glass, and stone also were stored in fresh water, using the same pre-treatment storage procedures described for organic artifacts. Storage of these materials with corroded metal artifacts was avoided, as some glass and stone artifacts can be affected adversely by acids that are produced during the corrosion process.

Bone Artifacts: FS 33 possible bone awl, FS 56 bone one part four hole button, FS 75 bone knife handle, FS 82 bone possible awl/punch, FS 97 bone button.

Identification of the Conservation Problem

The physical composition of bone consists of the main inorganic components of calcium phosphate associated with carbonate and fluoride, and ossein, which comprises the organic tissue and

accounts for about 30 per cent of a bone's total weight. In bone deposited on underwater sites, the organic ossein is broken down by hydrolysis, while the inorganic compounds are disintegrated by acids. The soluble chlorides that are absorbed into the bone from the marine environment are hygroscopic; that is, they readily take up and retain water. Fluctuations in relative humidity will cause these soluble chlorides to crystallize and dissolve repeatedly. Eventually these salts migrate to the surface of the bone, where their extensive crystallization causes surface flaking, which can lead to the bone artifact's destruction. Conservation treatment of bone concentrates on removing the majority of absorbed soluble chlorides.

Treatment Procedures

Desalinization. Bone was placed in a stainless steel container filled with fresh de-ionized water. All bone to be conserved went through a 15-minute rinse in running de-ionized water. Bone with no calcium, insoluble salt deposits, or staining went through sequential de-ionized water baths to remove any soluble salts. The bone then was placed in a stainless steel pan filled with fresh de-ionized water to a level 2 cm above the surface of the object. After 24 hours, the de-ionized water was tested with a hand held TDS (total dissolved solids) meter; passive soaks in fresh de-ionized water continued until 2 sequential readings of <10 ppm TDS was achieved.

Dehydration. Bone then was placed in a stainless steel container filled with a 50% ETOH/50% de-ionized water mixture. A second dehydration soak in a mixture of 90% ETOH and 10% de-ionized water followed. Finally, a third bath of 100% ETOH was given. Sequential dehydration baths in ETOH is recommended so that the bone does not dry too quickly and exfoliate, crack, or delaminate.

Mechanical cleaning. Bone then was placed in a stainless steel container filled with fresh ETOH, and was mechanically cleaned with soft sable brushes while in the ETOH bath. After mechanical cleaning the bone was left to soak in the ETOH for 1 hr.

Surface barrier. The bone then was placed in a solution of 10% w/v B-72/acetone in the vacuum chamber set at a pressure of 22 lbs. until all bubbling had stopped.

Air dry. The bone then was removed from the vacuum chamber and left to air-dry on an elevated wire mesh screen for a minimum of 24 hours

Post-treatment documentation/storage

The bone object then was placed into a breathable, acid-free bag labeled with the relevant provenience information. The conservator completed a photo request form, requesting both color slide and b/w prints to document the post-conservation condition of the object. The relevant roll and exposure numbers of the photos were written on the "condition report" form. As objects were removed from conservation and turned over to the lab, a transmittal memorandum including instructions for care/storage and handling of the objects was turned over to the lab director.

Storage/Handling/Curation Recommendations

Conserved bone should be stored in a temperature and humidity controlled, monitored environment free of airborne pollutants, gases, insects, etc., at a stable relative humidity between 40-65%, and a stable temperature of between 15-20 degrees C (Pearson 1987:269). The object should only come in contact with acid-free packaging and storage materials, and should be stored in archival boxes and breathable acid-free bags within metal cabinets without caustic paints. Care should be taken not to store bone in wood cabinets, especially those constructed of plywood. Rubber examination gloves should be worn when handling conserved bone. Attention should be paid to any potentially structurally weak elements of the object. The object should be physically supported to minimize physical strain during handling.

Ceramic Artifacts: FS 19, 25, 33, 48, 82 porcelain button, FS 10 late porcelain hollowware, FS 97 ball clay pipe, FS 7 whiteware hollowware, FS 9 whiteware hollowware, FS 65 ironstone, and FS 25 pearlware.

Identification of the Conservation Problem

Ceramic artifacts exposed to marine environments can become saturated with soluble chlorides, phosphates, and nitrates, and/or their surfaces can become covered with insoluble salts such as calcium carbonate and calcium sulfate. The soluble salts contained within untreated ceramic objects are hygroscopic; that is, they take up and retain moisture readily. Fluctuations in relative humidity cause the soluble salts to dissolve and crystallize repeatedly. As a result, these salts eventually migrate to the surface of the ceramic object where extensive crystallization takes place; this causes surface exfoliation and the eventual destruction of the ceramic artifact through internal stresses. To stabilize the ceramic materials, the soluble salts must be removed.

Treatment Procedures

Initial Assessment. Appropriate conservation regimens for archeological ceramics are varied and dependent upon the type of ceramic ware to be conserved, the type of glaze used, and the presence/absence of overglaze enameled decoration. Ceramic wares vary considerably in physical characteristics and these factors must be considered prior to the initiation of treatment. The ceramic vessel or sherd to be conserved first is evaluated to determine waretype, method of construction, glaze type, and presence/absence of overglaze decoration.

Earthenwares (pearlware, whiteware, ironstone, ball clay) and Porcelain (late porcelain clothing buttons).

Desalinization. Earthenwares are porous and are apt to absorb salts. The salts may get into the fabric of the ceramic object, causing spalling of the exterior surface and/or of the glaze. All ceramic fragments to be conserved must go through a 15-minute rinse in running de-ionized water. Ceramic fragments with no calcium or insoluble salt deposits were subjected to sequential de-ionized water baths to remove any soluble salts. The sherd then was placed in a stainless steel pan filled with fresh de-ionized water to a level 2 cm above the surface of the artifact. The de-ionized water was tested with the hand held

TDS (total dissolved solids) meter following a 24-hour soak. Passive soaks in fresh de-ionized water were continued until 2 sequential readings of <10 ppm TDS was achieved.

Dehydration. The sherd then is placed in a fresh bath of acetone and left to dehydrate overnight. The specific gravity then is measured and recorded. Repeated acetone baths are necessary until the specific gravity is <.810, at which point the object is dehydrated. If any residual sodium hexametaphosphate is observed on the sherds they are be rinsed again in de-ionized water and then acetone dehydrated.

Consolidation. If glaze spalling is noticed the sherd is vacuum impregnated in a dilute solution of B-72 in acetone under 22 lbs. pressure until bubbling stops. The B-72 impregnation consolidates the object and aids in the prevention of further spalling of the glaze. After vacuum impregnation the sherds are left to air dry on an elevated wire mesh screen.

Stonewares. Stoneware is largely impervious to water and is not as likely to absorb salts from the archeological environment. However, the treatment regimen for conserving stoneware ceramics is the same as that outlined above.

Porcelain. Like stoneware, porcelain is largely impervious to water and is less likely to have absorbed salts from the archeological environment. Some porcelain, particularly Chinese export has residual elements of overglaze enameled decoration. Such decoration can be fugitive and very difficult to recognize; it sometimes is observable only as a "ghosting" when held obliquely under a light source. If such overglaze decoration is present, care is taken not to brush the surface of the object. In these cases, sequential de-ionized water baths followed by vacuum impregnation consolidation with dilute B-72 will aid in holding the overglaze enamel to the body. Treatment regimens for specific porcelain objects were assigned after the particular condition of the object was evaluated. Overglaze porcelains with insoluble salt concretions may be treated by making a sodium hexametaphosphate poultice, or slurry with cabosil. The poultice or slurry is applied only to the specific areas with the insoluble salts. After poultice treatment, the object is rinsed in a 1 hour running de-ionized water rinse, followed by the sequential de-ionized water baths and testing with the handheld TDS meter.

Mending/reconstruction of ceramic vessels

When necessary, the mending of ceramic vessels or vessel portions was accomplished as follows. A thick, viscous solution of B-72/Acetone was mixed to be used as the adhesive. "Dry fitting" of all ceramic mends was attempted to ensure a clean tight fit. Any residual concretions, deposits or other materials affecting the fit were evaluated These were either removed mechanically, or they were removed with sodium hexametaphosphate or EDTA-tetra sodium followed by a thorough rinse in running de-ionized water.

A small bead of the B-72/acetone was placed in the area to be mended and the sherds were fit together. A suitable tape was stretched across and perpendicular to the mend to act as a clamp while the mend dried. Any of the B-72/acetone material that oozed from the mend was picked off with tweezers.

Post-treatment documentation/storage

The ceramic object was placed into an acid-free, breathable bag, and the bag was labeled with the relevant provenience information. The conservator completed a photo request form, requesting both color slide and b/w prints to document the post-conservation condition of the object. The relevant roll and exposure numbers of the photos was written on the "condition report" form. The objects, accompanied by a transmittal memorandum containing instructions for care/storage and handling of the objects, were turned over to the lab director by the conservator.

Storage/Handling/Curation Recommendations.

Conserved ceramic objects should be stored in a temperature and humidity controlled, monitored environment free of airborne pollutants, gases, insects, etc., at a stable relative humidity of between 40 - 70%, and within a stable temperature range between 4 - 30 degrees C (Conservation Guidelines No.3, U.K. Institute for Conservation). The objects should only come in contact with acid-free packaging and storage materials, and should be stored in archival boxes, and breathable acid-free bags within metal

cabinets without caustic paints. Care should be taken not to store ceramic objects in wood cabinets, especially those constructed of plywood. Rubber examination gloves should be worn when handling conserved ceramic objects. Attention should be paid to any potentially structurally weak elements of the object. The object should be physically supported to minimize physical strain during handling.

Cuprous Alloy Artifacts: FS 85, copper alloy buckle, FS 102 copper alloy percussion caps. FS 36 copper alloy Confederate Civil War button, FS 82 copper alloy Federal Civil War infantry button

Identification of the Conservation Problem

The non-specific term "cuprous alloy" refers to copper and its alloys, such as brass and bronze, where copper is the predominant material. Cuprous metals exposed to the marine environment corrode to form cuprous chloride and cuprous sulfide. In the presence of water and oxygen, cuprous clorides hydrolyze to form hydrochloric acid and basic cupric chloride. The hydrochloric acid attacks the uncorroded metal, and produces more cuprous chlorides, completing a corrosion cycle that continues until the parent metal is gone. Conservation treatment of chloride contaminated cuprous metal objects requires the removal of cuprous chlorides, their conversion to harmless cuprous oxide, and an interruption of the corrosion cycle.

Treatment Procedures

The treatment regimen of the copper alloy objects differed with the stability of the object.

Even green malachite patina objects (solid or thin core, and thin core cuprous alloys). *Chemical treatment to remove insoluble salts (deposits of calcium and magnesium salts).* The object was immersed in an aqueous solution of 5% w/v sodium hexametaphosphate in de-ionized water. The object was brushed with a soft sable brush while in the solution to help loosen the insoluble salts. If this treatment was not effective, the concentration of the solution was increased to 10% and then to 15% when

necessary. The object was removed regularly, rinsed, assessed, and reimmersed in the solution as necessary.

Rinsing. The object was placed in a container with a running de-ionized water rinse for 1 hour to remove residual traces of the sodium hexametaphosphate solution.

De-ionized water immersion baths to remove soluble chlorides. After completion of the chemical cleaning and rinsing portion of the treatment, the object was subjected to a series of "hot wash" baths and testing of the de-ionized water for total dissolved soils in ppm with a hand held total dissolved solids meter. Repeated "hot wash" baths were necessary to drop the measurable total dissolved solids reading to a level <10 ppm for two sequential baths. The sequence of the bath actions was as follows.

The object was rinsed in running de-ionized water for a few minutes. The object then was placed in a clean stainless steel pan not appreciably larger than the size of the object. The pan was filled to approximately 2cm above the highest point of the object with de-ionized water. The object was left for a period of 24 to 48 hours, after which point the total dissolved solids (TDS) of the water were measured with the handheld TDS meter. This first extended soak and TDS reading served as the "baseline reading".

The container then was placed on the hot plate until the water reached the boiling point. Then the container was removed from the hot plate and left to cool to <100 degrees F; at this point, the total dissolved solids were tested with the handheld TDS meter. This sequence was repeated and the TDS reading in ppm was recorded on the "metals desalinization" form until two sequential readings < 10ppm was reached.

Dehydration: The de-ionized water from the stainless steel container was replaced with Acetone. The object then was immersed in a "wet" acetone bath. After 24 hours, the specific gravity of the acetone was measured with a hygrometer and graduated cylinder and recorded. The object then was immersed in a second bath of acetone called the "dry" bath. After a 24 hour immersion, the specific gravity was again measured and recorded. If necessary, additional acetone baths were completed until the specific gravity reached <.810.

Vacuum Benzotriazole impregnation. The object was placed in a 3% v/v Benzotriazole/ETOH solution and then vacuum impregnated at a pressure of 22lbs. The pressure was held at 22 " for 1-24 hours After removal from the vacuum chamber, the object quickly was wiped with a clean cloth to remove the excess Benzotriazole solution.

Air Dry. The object was left to "cure" overnight. The object was inspected the following day and, when necessary, it was brushed with a glass bristle brush to remove any residual Benzotriazole solution.

Surface barrier. The object was coated with two coats of a surface barrier consisting of a dilute solution of B-72 in acetone with a 1% v/v concentration of Benzotriazole added as an inhibitive supplement.

Air Dry. The object was left to air dry on an elevated steel wire mesh screen for a minimum of 24 hours prior to bagging.

Heavily encrusted cuprous alloys with active "bronze disease", (cuprous chloride, or cupric chloride): (2 possible treatments, electrolysis, or acid treatments).

Electrochemical removal of active "bronze disease" products. The object was immersed in an aqueous solution of 5% w/v sodium carbonate in de-ionized water, in a Nalgene, non-metallic tank. Metal clips were attached to the object and the clips were connected to copper wire wound around the copper cathode bar; the object is thus the negative electrode (cathode). Expanded steel mesh screen was cut to fit the sides of the tank; the screen was placed in the tank and the sheets connected with clips. The screen served as the positive electrode (anode). The cathode was connected to the negative side of the power supply; the anode was connected to the positive side of the power supply. Current density was adjusted to between 1 - 4 amps depending upon the point at which the evolution of hydrogen gas is apparent and upon the amount of solid core metal remaining. Daily monitoring of the effect of the electrolysis upon the object was necessary to observe the effectiveness and action of the process. When necessary, (approximately once a week) the electrolyte solution was renewed. The object remained in electrolysis until all of the oxide layers were removed.

Mechanical cleaning of oxide layers. When the electrolyte solution was renewed, each object was subjected to mechanical cleaning with x-acto blades, dental picks, wooden picks, etc., to remove loosened, corrosion products to the interface with the solid cuprous core.

Acid treatment for cuprous alloys. As an alternative to electrolysis, some objects were more suited for an acid treatment. The object was immersed in a 10% v/v solution of Citric acid, or 15% v/v solution of Formic acid in de-ionized water. While immersed, the object was brushed with soft sable brushed, wooden picks, etc to facilitate the removal of the corrosion products. As necessary, the object was removed, rinsed in de-ionized water, assessed, and placed back into the acid solution as necessary. This process continued for both varieties of acid treatments until satisfactory removal of the active cuprous corrosion products was accomplished.

For both electrolytic reduction and acid treatment of cuprous alloys, the rinsing, desalinization, air dehydration, vacuum impregnation, air drying, surface barrier, and final air drying was the same as for the treatment of cuprous alloys with a malachite patina as above.

Post-treatment documentation/storage

The object was placed into an acid-free, breathable bag, and the bag was labeled with the relevant provenience information. The conservator completed a photo request form, requesting both color slide and b/w prints to document the post-conservation condition of the object. The relevant roll and exposure numbers of the photos was written on the "condition report" form. The objects, with an accompanying transmittal memorandum including instructions for care/storage and handling of the objects, were turned over to the lab director by the conservator.

Storage/Handling/Curation Recommendations

Conserved cuprous alloy objects should be stored in a temperature and humidity controlled, monitored environment free of airborne pollutants, gases, insects, etc., at a stable relative humidity

between 45 - 60%, and within a stable temperature range between 10 - 25 degrees C (Conservation Guidelines No.3, U.K. Institute for Conservation). Ideal conditions for the storage of cuprous alloys is a relative humidity of 10%. The object should be curated, and only come in contact with acid-free packaging and storage materials, and should be stored in archival boxes and breathable acid-free bags within metal cabinets without caustic paints. Care should be taken not to store ferrous alloys in wood cabinets, especially those constructed of plywood. Rubber examination gloves should be worn when handling cuprous alloys. Attention should be paid to any potentially structurally weak elements of the object. The object should be physically supported to minimize physical strain during handling.

Glass Artifacts: FS 37 mold blown glass phial

Identification of the Conservation Problem

Glass is formed primarily from Silica (SiO2). The deterioration of glass in an aqueous environment is influenced by the combination of the chemical composition of the glass, the burial environment, and the period of time the glass has been subjected to the burial environment. Glass not containing a specific amount of silica can become unstable in the presence of moisture; glass absent the optimum 10 per cent lime (RO) will also have an accelerated deterioration (Cronyn 1990:130). Flaws and/or scratches in the glass can accelerate the deterioration of the glass. The key factor influencing the deterioration of glass is the amount of moisture to which the glass is exposed. Archeologically recovered glass can have the appearance of iridescence, dulling, a laminating opaque surface, and in extreme situations, a chemical breakdown of the glass into blocky square fragments, a process known as divitrification. Encrustations of insoluble salts can deposit on the surface of the glass, appearing as a whitish deposit.

Treatment Procedures

Mechanical cleaning. Glass objects were placed in a stainless steel container filled with de-ionized water to 2 cm above the level of the object. Mechanical cleaning with soft sable brushes and wooden picks followed, as necessary. After mechanical cleaning was completed, the glass was rinsed for 15 minutes in running de-ionized water.

Desalinization. Glass is very porous and is apt to absorb salts. The salts may get into the structure of the glass, causing exfoliation and cracking of the exterior surface. All glass conserved was subjected to a 15 minute rinse in running de-ionized water. Glass with no calcium, insoluble salt deposits, or staining went through sequential de-ionized water baths to remove any soluble salts. Treatment regimens for glass with calcium deposits or other glass corrosion deposits were decided on an individual basis. The glass object then was placed in a stainless steel pan filled with fresh de-ionized water to a level 2 cm above the surface of the object. A 24 hour soak was followed by testing the de-ionized water with the hand held TDS (total dissolved solids) meter. Passive soaks in fresh de-ionized water were continued until 2 sequential readings of <10 ppm TDS were achieved.

Dehydration. The glass object then was placed in a fresh acetone bath and was left to dehydrate overnight. Then, the specific gravity was measured and recorded. Repeated acetone baths were given until a specific gravity of was <.810 was attained Glass with iron oxide staining or other associated condition was evaluated individually and a specific treatment regimen were devised.

Consolidation. The glass object was vacuum impregnated in a dilute solution of B-72 in acetone under 22 lbs. pressure until bubbling stopped. The B-72 impregnation served to consolidate the object and aid in the prevention of further devitrification of the glass. It also and filled in the irregularities of the glass surface, making the glass appear more transparent and mitigating the appearance of the devitrification. After vacuum impregnation, the glass objects were left to air dry on an elevated wire mesh screen.

Post-treatment documentation/storage:

The object was placed into an acid-free, breathable bag labeled with the relevant provenience information. The conservator completed a photo request form, requesting both color slide and b/w prints to document the post-conservation condition of the object. The relevant roll and exposure numbers of the photos were written on the "condition report" form. The objects, with the accompanying transmittal memorandum including instructions for care/storage and handling of the objects, were turned over to the lab director by the conservator.

Storage/Handling/Curation Recommendations.

Conserved glass should be stored in a temperature and humidity controlled, monitored environment free of airborne pollutants, gases, insects, etc., at a stable relative humidity between 45 - 60%, and within a stable temperature range between 10 - 25 degrees C (Conservation Guidelines No.3, U.K. Institute for Conservation). The object should only come in contact with acid-free packaging and storage materials, and should be stored in archival boxes and breathable acid-free bags within metal cabinets without caustic paints. Care should be taken not to store glass objects in wood cabinets, especially those constructed of plywood. Rubber examination gloves should be worn when handling glass objects. Attention should be paid to any potentially structurally weak elements of the object. The object should be physically supported to minimize physical strain during handling.

Ferrous Alloy Artifacts: FS 36 ferrous alloy kettle/cooking pot handle, FS 37 ferrous alloy cooking pot, FS 40 ferrous alloy skillet, FS 56 ferrous alloy cooking pot lid, FS 59 ferrous alloy skillet, FS 61 ferrous alloy cooking pot, FS 82 copper alloy Federal infantry button, FS 82 ferrous alloy cooking pot, FS 82 ferrous alloy skillet, FS 94 ferrous alloy tea kettle with handle, FS 94 ferrous alloy cooking pot, FS 95 ferrous alloy cooking pot, FS 98 ferrous alloy spikes, FS 98 ferrous alloy machine cut nails, FS 108 machine cut nails

Identification of the Conservation Problem

Ferrous alloys (cast iron, wrought iron, and steel) recovered from the marine environment are the most difficult metals for the conservator to treat. Once a ferrous alloy artifact has been removed from underwater, the corrosion process accelerates unless the artifact is stored in a corrosion inhibitive solution. Ferrous compounds exposed to atmospheric moisture and oxygen oxidize to a ferric state, commonly known as rust. Because ferric oxide occupies a greater volume, the object's surface scales off, disfiguring and ultimately destroying the artifact. The oxidation process is fueled by various ferrous chlorides that were absorbed while the artifact was submerged in the marine environment. When exposed to atmospheric moisture and oxygen, hydrated ferrous chlorides hydrolyze to form ferric oxide (or ferric hydroxide) and hydrochloric acid. The hydrochloric acid then oxidizes the uncorroded metal, forming additional ferrous chloride, hydrogen, or ferric chloride and water. The corrosion cycle continues until all of the metal has been oxidized.

Prior to treating a ferrous alloy artifact, the object should be examined carefully and its condition should be evaluated to determine the most appropriate conservation procedure. Based on these evaluations, ferrous metal artifacts generally were placed in one of three categories:

1. Objects with substantial metal core;
2. Badly corroded specimens that have little metal core, but still retain their original shape
3. Artifacts that are so badly corroded and fragile that they cannon be treated without disintegrating.

Treatment Procedures

Category 1 Artifacts: Solid, substantial metal core, expanded corrosion layer objects. *Electrochemical removal of active corrosion products.* The object was immersed in an aqueous solution of 5% w/v sodium carbonate in de-ionized water in a Nalgene, non-metallic tank. Metal clips were attached to the object. The clips were connected to copper wire wound around the copper cathode bar. The object is thus the negative electrode (cathode). Expanded steel mesh screen was cut to fit the sides of

the tank; the screen was placed in the tank and the sheets were connected with clips. The screen was the positive electrode (anode). The cathode was connected to the negative side of the power supply; the anode was connected to the positive side of the power supply. Current density was adjusted between 1 - 4 amps depending upon the point at which the evolution of hydrogen gas was observed, and depending upon the amount of solid core metal remaining. Daily monitoring of the effect of the electrolysis upon the object was necessary to monitor the effectiveness and action of the process. When necessary, (approximately once a week) the electrolyte solution was renewed. The object remained in electrolysis until all of the oxide layers had been removed.

Mechanical cleaning of oxide layers. When the electrolyte solution was renewed, each object was subjected to mechanical cleaning with x-acto blades, dental picks, wooden picks, etc., to remove loosened, expanded oxide layers to the interface with the black, magnetite layer.

De-ionized water immersion baths to remove soluble chlorides. After completion of the electrolysis portion of the treatment, the object was subjected to a series of "hot wash" baths and testing of the de-ionized water for total dissolved soils in ppm with a hand held total dissolved solids meter. Repeated "hot wash" baths were necessary to drop the measurable total dissolved solids reading to a level <10 ppm for two sequential baths. The sequence of the bath actions as follows:

The object was rinsed in running de-ionized water for a few minutes. The object then was placed in a clean stainless steel pan not appreciably larger than the size of the object; the pan was filled to approximately 2cm above the highest point of the object with de-ionized water. The object was left for a period of 24 to 48 hours, after which point the total dissolved solids (TDS) in the water were measured with the handheld TDS meter. This first extended soak and TDS reading served as the "baseline reading". The object in the container then was placed on the hot plate until it reached the boiling point. The container was removed from the hot plate and left to cool to <100 degrees F and the total dissolved solids were tested with the handheld TDS meter. This sequence was repeated and the TDS reading in ppm was recorded on the "metals desalinization" form until two sequential readings < 10ppm were reached.

Dehydration. The de-ionized water from the stainless steel container was replaced with acetone. The object was then immersed in a "wet" acetone bath. After 24 hours, the specific gravity of the acetone was measured with a hygrometer and graduated cylinder and recorded. The object then was immersed in a second bath of acetone called the "dry" bath. After a 24 hour immersion, the specific gravity was again measured and recorded. Additional acetone baths were given until the specific gravity of the "dry" bath was <.810.

Mechanical cleaning. Any residual "flash rusting" of the object was removed with a fiberglass bristle brush. The glass bristle brush aided in evening the appearance of the black, or grayish black magnetite layer, and acted as a means of final mechanical cleaning of the object.

Inhibiting. A 20 tannin solution of 200g tannin, 1 liter of de-ionized water, and 150 ml of ethanol was made. The object was either painted with a series of thin coats of the tannin solution, or immersed in the tannin solution. If the object is brushed with the tannin solution, sufficient time was allowed between coats to allow for an air drying of the object,; this created a protective oxidation inhibitive barrier. The object then was allowed to air dry for 1 to 2 days prior to the application of the surface barrier.

Surface barrier. A vat of Whitco 180M microcrystalline wax was heated to 325 degrees and the object was immersed in the wax. Any residual moisture within the object, and any moisture absorbed by the object was volatilized. After 30 minutes at 325 degrees, the temperature of the wax was lowered to 250 degrees and held until the bubbling stopped. After the bubbling had stopped, the temperature of the wax was lowered to 200 degrees, at which point the object was removed, wiped off as necessary, and allowed to air dry on an elevated wire mesh screen. The object was left to air dry, and the wax to harden and cure for a period of 24 to 48 hours

Category 2, 3 Artifacts: Ferrous alloys without a strong solid core.

Inspection. Thin ferrous alloys, or ferrous alloys that did not retain a high percentage of solid core metal, were not treated with electrolysis. The action of the electrolysis is dependent upon a solid core of metal to serve as the negative electrode (cathode) in the process. Ferrous alloy objects which have

little core metal and are mainly held together with ferrous corrosion products will be damaged in electrolysis. In extreme cases, a ferrous alloy object will be entirely mineralized, leaving no solid core metal.

Mechanical cleaning. The least invasive and potentially damaging, but effective mechanical cleaning method was employed to remove some, but not all, of the ferrous corrosion products. The ferrous corrosion products can act as a structural stabilizer of the object, so care must be taken not to remove all of the corrosion products and weaken the object. Dental picks, x-acto blades, wooden picks, abrasive grinding stones, and/or glass bristle brushes were employed to remove the ferrous corrosion products.

The remaining treatment actions of desalinization baths, dehydration, inhibiting, and the application of a surface barrier as outlined above, were followed for the non-electrolytic removal of the ferrous alloy corrosion products.

Treatment of Structural Cracks

Pre-treatment x-radiography and treatment actions revealed significant structural cracks in the bodies of some of the cast ferrous alloy cooking pots. This likely was the result of the objects being covered in a tough, inflexible, silty, ferruginous accreted corrosion layer while the cast iron pot continued to expand, causing the severe cracks to the structure of the cooking pots. In order to compensate for the structural weakness in the cast iron cooking pots, a reinforcing fill mixture of thick B-72/acetone with pigments added was placed in areas of structural weakness to strengthen the structure of the cooking vessels. Additional materials, including thin acid free crepeline (a synthetic, none reactive woven sheet), were used to further strengthen and reinforce the structure of the vessels. The vessels with the most significant structural weakness that required the B-72/acetone and crepeline reinforcing, received a surface barrier of a dilute B-72/acetone rather than the Whitco 180 microcrystalline wax.

Post-treatment documentation/storage

The object was placed into an acid-free, breathable bag labeled with the relevant provenience information. The conservator completed a photo request form, requesting both color slide and b/w prints to document the post-conservation condition of the object. The relevant roll and exposure numbers of the photos were written on the "condition report" form. The objects, with the accompanying transmittal memorandum including instructions for care/storage and handling of the objects, were turned over to the lab director by the conservator.

Storage/Handling/Curation Recommendations

Conserved ferrous alloy objects should be stored in a temperature and humidity controlled, monitored environment free of airborne pollutants, gases, insects, etc., at a stable low relative humidity lower than 55%, and within a stable temperature range between 10 - 25 degrees C (Conservation Guidelines No.3, U.K. Institute for Conservation). Ideal conditions for the storage of ferrous alloys is a relative humidity of 10%. Object should only come in contact with acid-free packaging and storage materials, and should be stored in archival boxes and breathable acid-free bags within metal cabinets without caustic paints. Care should be taken not to store ferrous alloys in wood cabinets, especially those constructed of plywood. Rubber examination gloves should be worn when handling ferrous alloys. Attention should be paid to any potentially structurally weak elements of the object; the object should be physically supported to minimize physical strain during handling.

Lead Alloy (White Metal) Artifacts: FS 102 lead alloy shot

Identification of the Conservation Problem

The term lead alloy refers to metal that contains lead alloyed with tin and silver, where lead is the predominant material. Commonly referred to as "pewter" or "white metal," lead alloys can, when exposed to an aqueous or anaerobic environment, appear a black or dull gold color due to blackening with

lead sulfide/galena (PbS)(Cronyn 1990:204). This lead sulfide layer can act as a protective barrier, or in extreme cases can just be a sludge with no remaining solid lead core metal. White discolored layers of cerussite, lead carbonate (PbCO3), and hydrocerussite (basic lead carbonate (2PbCO3.Pb(OH)2) formed on lead alloys exposed to both oxygen and water), can have protective properties(Cronyn 1990:204). Occasionally, lead alloys recovered from an aqueous environment can appear a dull gold color; this results from copper and iron sulfides. Concretions of calcium carbonate (calcite and aragonite) and/or barnacles also can be found on lead alloys recovered from marine/aqueous environments. Lead corrodes quickly in the presence of organic acids, air, and water. Accelerated corrosion takes place in soft water environments with high acidity in the absence of the formation of protective corrosion layers. Lead alloy corrosion can extend deep into the lead alloy object, weakening the object even when the exterior of the object appears sound.

Treatment Procedures

Chemical removal of active Pb alloy corrosion deposits (lead carbonate). The object was immersed in an aqueous solution of 10% v/v disodium (di-Na) EDTA in de-ionized water. While immersed, the object was brushed with soft sable brushes, wooden picks, etc., to facilitate the removal of the lead carbonate corrosion products. As necessary, the object was removed, rinsed in de-ionized water, assessed, and placed back into the acid solution, as necessary. This process was continued for both varieties of EDTA treatments until satisfactory removal of the active lead carbonate corrosion products was accomplished.

Rinsing. The object was placed in a container with a running warm de-ionized water rinse for 1 hour to remove residual traces of the disodium EDTA solution.

De-ionized water immersion baths to remove soluble chlorides. After completion of the chemical cleaning and rinsing portion of the treatment, the object was subjected to a series of passive baths and testing of the de-ionized water for total dissolved soils in ppm with a hand held total dissolved solids

meter. Repeated passive baths were necessary to drop the measurable total dissolved solids reading to a level <10 ppm for two sequential baths. The sequence of the bath actions was as follows:

The object was rinsed in running de-ionized water for a few minutes. The object then was placed in a clean stainless steel pan not appreciably larger than the size of the object; the pan was filled to approximately 2cm above the highest point of the object with de-ionized water. The object was left in the rinse for a period of 24 - 48 hours, after which point the total dissolved solids (TDS) of the water was measured with the handheld TDS meter. This first extended soak and TDS reading served as the "baseline reading". This sequence was be repeated and the TDS reading in ppm was recorded on the "metals desalinization" form until two sequential readings of < 10ppm was reached.

Dehydration. The de-ionized water from the stainless steel container was replaced with Acetone. The object then was immersed in a "wet" acetone bath. After 24 hours, the specific gravity of the acetone was measured with a hygrometer and graduated cylinder and was recorded. The object then was immersed in a second bath of acetone called the "dry" bath. After a 24 hour immersion the specific gravity was again measured and recorded. If necessary, additional acetone baths were completed until the specific gravity was <.810.

Mechanical cleaning. The surface of the object was brushed with a glass bristle brush as needed to remove any remaining fine corrosion products and give the object an even surface.

Dehydration rinse. The object was rinsed after mechanical cleaning in clean ETOH.

Surface barrier. The object was coated with two coats of a surface barrier consisting of a dilute solution of B-72/acetone.

Air Dry. The object was left to air dry on an elevated steel wire mesh screen for a minimum of 24 hours prior to bagging.

Post-treatment documentation/storage

The object was placed into an acid-free, breathable bag labeled with the relevant provenience information. The conservator completed a photo request form, requesting both color slide and b/w prints

to document the post-conservation condition of the object. The relevant roll and exposure numbers of the photos were written on the "condition report" form. The objects, with the accompanying transmittal memorandum including instructions for care/storage and handling of the objects, were turned over to the lab director by the conservator.

Storage/Handling/Curation Recommendations

Conserved Pb alloy objects should be stored in a temperature and humidity controlled, monitored environment free of airborne pollutants, gases, insects, etc., at a stable relative humidity between 45 - 60%, and within a stable temperature range between 10 - 25 degrees C (Conservation Guidelines No.3, U.K. Institute for Conservation). The object should only come in contact with acid-free packaging and storage materials, and should be stored in archival boxes and breathable acid-free bags within metal cabinets without caustic paints. Care should be taken not to store Pb alloys in wood cabinets, especially those constructed of plywood. Rubber examination gloves should be worn when handling Pb alloys. Attention should be paid to any potentially structurally weak elements of the object; the object should physically supported to minimizing physical strain during handling.

Composite Material Artifacts: FS 66 composite briarwood/copper alloy/silver pipe bowl, FS 72 composite wood/copper alloy clasp knife, FS 79 composite wood/copper alloy/iron knife handle

Identification of Conservation Problem

By their very nature, composite artifacts present the conservator with a more complex set of conservation problems than do objects comprised of a single material. Whenever possible, the different materials of the composite artifact are treated separately. However, in many instances this is not possible and items must be treated as one piece. Treating artifacts as a single piece is complicated by the fact that some treatment procedures for one material are detrimental to other materials. Therefore, it is up to the

conservator to determine which alternative treatment procedures are compatible with all of the component materials in a given artifact.

Composite wood/metal objects usually are the most plentiful and most difficult composite artifacts to treat. As metal corrosion products leach out of the metal and stain and mineralize the cellular structure of the adjacent wood, it becomes difficult to remove the corroded metal from the wood without destroying the object. Additionally, the expanding ferrous corrosion products can cause the wood elements to crack and split. Although both materials are relatively simple to treat individually, most of the commonly used treatment procedures for the wood can be detrimental to the ferrous alloy.

Gilded objects, and items composed of two or more dissimilar metals with differing reduction and corrosion potentials, form galvanic couples when immersed in salt water. The base metal becomes an anode; it is corroded preferentially as it loses electrons, and it forms positive ions that go into solution, while the more precious metal is given cathodic protection. This corrosion process accelerates when objects such as these are removed from a marine environment. In these cases, the treatment should focus on the anodic base metal. A wooden pipe bowl with cuprous alloy and silver fittings, wooden objects with attached metal fasteners and cuprous alloy components, and a pocket knife with iron and cuprous alloy fittings and a wood/bone handle are some examples of the composite artifacts found in this collection. The majority of the composite objects within the collection recovered from the *Kentucky* include composite wood and metal (ferrous and/or cuprous alloy) artifacts. The conservation treatment procedures outlined below are designed for these types of composite artifacts. Specific treatment procedures for composite artifacts were adjusted on an individual, as needed basis, depending upon the specific condition and needs of the object.

Treatment Procedures

De-ionized water immersion baths to remove soluble chlorides. The object was subjected to a series of passive de-ionized water baths and testing of the de-ionized water for total dissolved soils in ppm with a hand held total dissolved solids meter. Repeated passive baths were undertaken as necessary,

to drop the measurable total dissolved solids reading to a level <10 ppm for two sequential baths. The sequence of the bath actions was as follows:

The object was rinsed in running de-ionized water for a few minutes. The object was then placed in a clean stainless steel pan not appreciably larger than the size of the object; the pan was filled to approximately 2cm above the highest point of the object with de-ionized water. The object was left for a period of 24 - 48 hours; then the total dissolved solids (TDS) of the water were measured with the handheld TDS meter. This first extended soak and TDS reading served as the "baseline reading". This sequence was repeated and the TDS reading in ppm was recorded on the "metals desalinization" form until two sequential readings < 10ppm was reached.

Acetone/Rosin consolidation. The object was dehydrated in a series of successive acetone baths until a specific gravity of <.810 was reached. Water is incompatible with the rosin so care was taken to ensure complete dehydration of the object.

The object was placed in a sealed container in a saturated solution of rosin in acetone and heated to approximately 52 degrees C. Lump technical grade rosin was used. The object remained suspended in the rosin treatment at a maintained temperature of 52 degrees C for a period of approximately 2 - 4 weeks depending upon the size and thickness of the object. The object was removed from the acetone/rosin solution and wiped off with acetone-wetted rags.

Cuprous alloy, (Lead Alloy), ferrous alloy fitting treatment. Rosin on the metal aspects of the composite artifact was removed very carefully using small amounts of an acetone moistened blotter. The exposed metal fittings then were polished with a fiberglass bristle brush to remove any fine corrosion products and give the object an even surface.

Surface barrier. The object was coated with two coats of a surface barrier consisting of a dilute solution of B-72/acetone.

Post-treatment documentation/storage

The object was placed in an acid-free, breathable bag; the bag was labeled with the relevant provenience information. The conservator completed a photo request form, requesting both color slide and b/w prints to document the post-conservation condition of the object. The relevant roll and exposure numbers of the photos were written on the "condition report" form. The objects, with the accompanying transmittal memorandum including instructions for care/storage and handling of the objects, were turned over to the lab director by the conservator.

Storage/Handling/Curation Recommendations

Conserved composite objects should be stored in a temperature and humidity controlled, monitored environment free of airborne pollutants, gases, insects, etc., at a stable relative humidity between 45 - 60%, and within a stable temperature range between 10 - 25 degrees C (Conservation Guidelines No.3, U.K. Institute for Conservation). The object should only come in contact with acid-free packaging and storage materials, and should be stored in archival boxes and breathable acid-free bags within metal cabinets without caustic paints. Care should be taken not to store composite artifacts in wood cabinets, especially those constructed of plywood. Rubber examination gloves should be worn when handling composite material artifacts. Attention should be paid to any potentially structurally weak elements of the object, which should be physically supported to minimize physical strain during handling.

Leather Artifacts: FS66 leather pouch fragments

Identification of the Conservation Problem

Animal skin is a proteinaceous material composed of collagen and keratin arranged in a random fiber network. Manufacturers of leather goods used tannins, dyes, and oil-based dressings to stabilize the bonds of this fiber network, and to transform the animal skin into leather. During the eighteenth and nineteenth centuries, most American tanneries used vegetable extracts from sources such as hemlock and oak for this purpose. In leather items that have been subjected to immersion in an aqueous environments

for an extended period of time, these additives gradually leach out and are replaced by water, iron chlorides, and bacteria. Physically, the leather swells as this process of hydrolysis occurs. The removal of water from within the leather's fiber network will cause it to collapse, permanently altering its physical structure. When preserving waterlogged leather, it is advisable to choose the course of action that will affect the leather least.

Treatment Procedures

De-ionized water immersion baths to remove soluble chlorides. The object was subjected to a series of passive de-ionized water baths, and testing of the de-ionized water for total dissolved soils in ppm with a hand held total dissolved solids meter. Repeated passive baths were necessary to drop the measurable total dissolved solids reading to a level <10 ppm for two sequential baths. The sequence of the bath actions was as follows:

The object was rinsed in running de-ionized water for a few minutes. The object then was placed in a clean stainless steel pan not appreciably larger than the size of the object; the pan was filled with de-ionized water to approximately 2cm above the highest point of the object. The object was left for a period of 24 - 48 hours, after which the total dissolved solids (TDS) of the water was measured with the handheld TDS meter. The first extended soak and TDS reading served as the "baseline reading". The total dissolved solids were tested with the handheld TDS meter. This sequence was be repeated and the TDS reading in ppm was recorded on the "metals desalinization" form until two sequential readings < 10ppm had been reached.

A solution of 30% v/v glycerol in ETOH was made, and the waterlogged leather object immersed in a suitable container containing the solution. The waterlogged leather was left immersed in the glycerol for a period of at least two months to ensure absorption of the glycerol into the cells of the leather. Periodically, the leather pouch fragment (FS 66) was opened slightly in an attempt to fold flat this leather fragment.

After the glycerol/ETOH immersion was complete, the object was removed and inspected for pliability; the excess glycerol solution was wiped off with de-ionized water. The leather then was air dried on a wire mesh screen in an humidity controlled container.

The leather was left to air dry slowly under controlled conditions.

Post-treatment documentation/storage

The object was placed into an acid-free, breathable bag labeled with the relevant provenience information. The conservator completed a photo request form, requesting both color slide and b/w prints to document the post-conservation condition of the object. The relevant roll and exposure numbers of the photos were written on the "condition report" form. The objects, with the accompanying transmittal memorandum including instructions for care/storage and handling of the objects, were turned over to the lab director by the conservator.

Storage/Handling/Curation Recommendations

Conserved leather objects should be stored in a temperature and humidity controlled, monitored environment free of airborne pollutants, gases, insects, etc., at a stable relative humidity to remain between 40 - 65%, with a stable temperature range between 15 - 20 degrees C (Pearson 1987:269). The object should only come in contact with acid-free packaging and storage materials, and should be stored in archival boxes and breathable acid-free bags within metal cabinets without caustic paints. Care should be taken not to store conserved leather in wood cabinets, especially those constructed of plywood. Rubber examination gloves should be worn when handling conserved leather. Attention should be paid to any potentially structurally weak elements of the object; the object should be physically supported to minimize physical strain during handling.

Rope: FS 11 hemp rope fragments

Identification of the Conservation Problem

Rope is another form of textile that was removed from the *Kentucky* shipwreck site. The same combination of organic, physical, and chemical factors that attack other textiles found underwater also are responsible for affecting rope adversely. Comprised almost exclusively of vegetable fiber, rope found on shipwrecks is particularly susceptible to attack by sulfate-reducing bacteria and acid hydrolysis that is caused by iron chlorides leaching out of the ship's iron fasteners and structural members.

Treatment Procedures

The object was immersed in an aqueous solution of 5% v/v disodium EDTA in de-ionized water. While immersed, the object was brushed with soft sable brushed to facilitate the removal of remaining iron stains and other accreted deposits. As necessary, the object was removed and rinsed in de-ionized water, assessed, and placed back into the acid solution as necessary. This process was continued until satisfactory removal of the iron staining was accomplished.

Rinse. The object was placed in a stainless steel container and rinsed for 1.5 hours in a running de-ionized water rinse. The object then was placed in de-ionized water immersion baths to remove soluble chlorides.

De-ionized water immersion baths. After completion of the rinsing portion of the treatment, the object was subjected to a series of passive de-ionized water baths, and testing of the de-ionized water for total dissolved soils in ppm with a hand held total dissolved solids meter. Repeated passive baths were necessary to drop the measurable total dissolved solids reading to a level <10 ppm for two sequential baths. The sequence of the bath actions as follows:

The object was rinsed in running de-ionized water for a few minutes. The object then was placed in a clean stainless steel pan not appreciably larger than the size of the object and the pan was filled with de-ionized water to approximately 2cm above the highest point of the object. The object was left for a

period of 24 - 48 hours; then total dissolved solids (TDS) of the water were measured with the handheld TDS meter. This first extended soak and TDS reading served as the "baseline reading". This sequence was repeated and the TDS reading in ppm recorded on the "metals desalinization" form until two sequential readings < 10ppm was reached.

Dehydration. The de-ionized water from the stainless steel container was replaced with Acetone. The object then was immersed in a "wet" acetone bath. After 24 hours, the specific gravity of the acetone was measured with a hygrometer and graduated cylinder and recorded. The object then was immersed in a second bath of acetone called the "dry" bath. After a 24 hour immersion the specific gravity was again measured and recorded. Additional acetone baths were completed as necessary until the specific gravity was <.810.

Air Dry. Once solvent dehydration was complete, the object was removed from the acetone bath and place on a suitable support to air dry under a fume hood.

Surface barrier/consolidation. The object was immersed in a container of dilute B-72/acetone and placed into the vacuum chamber. The vacuum within the chamber was held at 22 lbs. until bubbling stopped. The rope then was removed from the vacuum chamber and air-dried.

Air Dry. The object was left to air dry on an elevated steel wire mesh screen, or other suitable support for a minimum of 24 hour prior to bagging.

Post-treatment documentation/storage

The object was placed into an acid-free, breathable bag, labeled with the relevant provenience information. The conservator completed a photo request form, requesting both color slide and b/w prints to document the post-conservation condition of the object. The relevant roll and exposure numbers of the photos were written on the "condition report" form. The objects, along with the accompanying transmittal memorandum including instructions for care/storage and handling, of the objects were turned over to the lab director by the conservator.

Storage/Handling/Curation Recommendations

Conserved rope objects should be stored in a temperature and humidity controlled, monitored environment free of airborne pollutants, gases, insects, etc., at a stable relative humidity to remain between 40 - 65%, within a stable temperature range between 15 - 20 degrees C (Pearson 1987:269). The object should only come in contact with acid-free packaging and storage materials, and should be stored in archival boxes and breathable acid-free bags within metal cabinets without caustic paints. Care should be taken not to store conserved rope in wood cabinets, especially those constructed of plywood. Rubber examination gloves should be worn when handling conserved rope. Attention should be paid to any potentially structurally weak elements of the object; the object should be physically supported to minimize physical strain during handling.

Wood Artifacts: FS 6 wood decorative Dutchman, FS 10 wood dowel, FS 34 wood button, FS 67 wood tongue and groove deck part, FS 72 wood deck part, FS 80 wood dowel fragment

Identification of the Conservation Problem

The successful conservation of wood recovered from an underwater archeological site usually involves: (1) the removal of excess water from the object through a method that will prevent shrinkage and distortion; and (2) impregnation of the wood's internal structure with a material that will both consolidate and accord mechanical strength to the wood.

Treatment Procedures

Mechanical cleaning. The object was placed in a suitable container of de-ionized water and brushed with soft sable brushes to remove surface silt deposits. The object was rinsed in running de-ionized water.

De-ionized water immersion baths to remove soluble chlorides. After completion of the mechanical cleaning portion of the treatment, the object was subjected to a series of passive de-ionized water baths, and testing of the de-ionized water for total dissolved soils in ppm with a hand held total dissolved solids meter. Repeated passive baths were necessary to drop the measurable total dissolved solids reading to a level <10 ppm for two sequential baths. The sequence of the bath actions as follows:

The object was rinsed in running de-ionized water for a few minutes. The object then was placed in a clean stainless steel pan not appreciably larger than the size of the object the pan was filled to approximately 2cm above the highest point of the object with de-ionized water. The object was left for a period of 24 - 48 hour, after which point the total dissolved solids (TDS) of the water was measured with the handheld TDS meter. This first extended soak and TDS reading served as the "baseline reading". This sequence was repeated and the TDS reading in ppm was recorded on the "metals desalinization" form until two sequential readings < 10ppm were recorded.

Acetone/Rosin consolidation. The object was dehydrated in a series of successive acetone baths until a specific gravity of <.810 was reached. Water is incompatible with the rosin so care was taken to ensure complete dehydration of the object. The object was placed in a sealed container in a saturated solution of rosin in acetone and heated to approximately 52 degrees C. Lump technical grade rosin was used. The object remained suspended in the rosin treatment at a maintained temperature of 52 degrees C for a period of approximately 2 - 4 weeks depending upon the size and thickness of the object. The object was removed from the acetone/rosin solution and wiped off with acetone-wetted rags.

Post-treatment documentation/storage

The object was placed into an acid-free, breathable bag labeled with the relevant provenience information. The conservator completed a photo request form, requesting both color slide and b/w prints to document the post-conservation condition of the object. The relevant roll and exposure numbers of the photos were written on the "condition report" form. The objects, with the accompanying transmittal

memorandum including instructions for care/storage and handling of the objects, were turned over to the lab director by the conservator.

Storage/Handling/Curation Recommendations

Conserved wood objects should be stored in a temperature and humidity controlled, monitored environment free of airborne pollutants, gases, insects, etc., at a stable relative humidity to remain between 40-65%, within a stable temperature range between 15-20 degrees C (Pearson 1987:269). The object should only come in contact with acid-free packaging and storage materials, and should be stored in archival boxes and breathable acid-free bags within metal cabinets without caustic paints. Care should be taken not to store conserved wood in wood cabinets, especially those constructed of plywood. Rubber examination gloves should be worn when handling conserved wood. Attention should be paid to any potentially structurally weak elements of the object; the object should be physically supported to minimize physical strain during handling.

APPENDIX VI

STATE OF LOUISIANA SITE RECORD FORM

STATE OF LOUISIANA
SITE RECORD FORM

LOCATIONAL DATA

SITE NAME: Steamship *Kentucky* **STATE SURVEY NO.:** 16BO358

OTHER SITE DESIGNATIONS: Eagle Bend Shipwreck

SITE LOCATION AND APPROACH: Located on the Red River south of Shreveport at RM 269.8 (1967 mileage).

PARISH: Bossier

NW/C **of the** SW FRAC. PRTN. **of Section** 26 **Township** 17N **Range** 13W

USGS QUADRANGLE: Shreveport East, LA

UTM COORDINATES: 3,588,460N / 436,002E
NAD 1927, Clark 1866 ellipsoid, Zone 15N

GEOGRAPHICAL COORDINATES: 32°25'59.2"N/93°40'50.6"W (NAD27)

PHYSICAL SETTING

LANDFORM: Relic channel of the Red River

GEOMORPHIC PROCESSES: Alluviation

ELEVATION AND RELIEF: +97' MSL

NEAREST WATER: Red River

POSITION WITH RESPECT TO TERRAIN: The wreck is buried between 4 and 6 m deep and lies perpendicular to present course of the Red River within a relic (pre-1882) channel around Bagley Island. The present river channel is now cutting perpendicularly into its former bed, exposing the wreck. Approximately 20% of the wreck lies in the river; the other 80% is buried in the filled relic channel that now forms part of the bank line. A remnant of the relic channel survives as a minor drainage of an ox-bow lake.

SOIL CHARACTERISTICS: Alluvium, silty sand. Soil Series Number 12.

FLORAL COMMUNITIES:

FAUNAL COMMUNITIES:

NEAREST KNOWN SITE: 16 CD 95

SITE DESCRIPTION

SITE DESCRIPTION: The *Kentucky* was constructed as a sidewheel steamboat in Cincinnati, Ohio, in 1856 and was first enrolled there on July 28 of that year (National Archives, RG41, Cincinnati, OH, Enrollment #59). The vessel was recorded officially as having a length of 222 ft, a beam of 32 ft and a depth of 5 ft 6 in with a capacity of 375 tons. It was described as having a "transom stern with tuck, no gallery," and a plain head. She was described by her captain as having a full cabin and texas, and 52 state rooms (National Archives, Military Reference Branch [NAMRB] 1874 a&b).

The new vessel's first owners were the Cincinnati, Maysville, and Portsmouth U.S. Mail Line Co; B. Kepner was her first master. In 1858, ownership of the vessel was transferred to the Cincinnati and Louisville U.S. Mail Line Co. (National Archives, Civil Reference Branch [NACRB], RG41, Cincinnati, OH, Enrollment #142). During the following year, the *Kentucky's* home port was transferred from Cincinnati to Louisville, Kentucky (NACRB, RG41, Cincinnati, OH, Enrollment #162). The vessel was sold in 1860 to the Memphis and New Orleans Steam Packet Co. and was re-enrolled on April 10 at the Port of Memphis with James Lee as her Master (NACRB, RG41, Memphis, TN, Enrollment # 8). Six months later in October, the vessel was enrolled under the ownership of J.C. McManus and T.A. Kendig, although James Lee continued as her captain (NACRB, RG41, Memphis, TN, Enrollment # 40).
The *Kentucky* was in her home port of Memphis at the outbreak of the Civil War. She rendered distinguished service to the Confederacy as a troop transport in November, 1861, and March, 1862 (Navy Department 1963:541). The *Kentucky's* captain, Preston Lodwick, was credited by the Confederates as having "exhibited fearlessness and energy deserving the highest praise" for ferrying Major General Leonidas Polk's troops and some Union prisoners between Columbus, Kentucky, and Belmont, Missouri, while frequently under fire. At Madrid Bend in March, 1862, again dodged shells to get the battalions through to Brigadier General J. P. McCown, who fought desperately to hold on to Island No. 10.

Ironically, Captain Lodwick, who is cited in Confederate records for conspicuous bravery, later swore that he was a loyal citizen of Ohio and that "he was not at any time in the interest of (either in feeling or action) the so-called Confederate States or in any way by his own will engaged with the rebels in said rebellion" (NAMRB 1874a). According to Lodwick, when war broke out he was three quarters owner of a large sidewheeler called the *Prince of Wales*, running in the trade between New Orleans and Cairo, Illinois. As soon as he ascertained that war was about to commence he took freight at New Orleans for Louisville intending to head north. Around May 1, his boat was seized at Memphis and he was compelled to return to New Orleans, where he sold the vessel. Using the proceeds from the sale of the *Prince of Wales*, Lodwick purchased one half of the *Kentucky* with a mortgage on the other half, which was preparing to run to Columbus, Kentucky. Thinking he could escape with the vessel, he departed New Orleans but found it to be impossible to get north with the boat. According to Lodwick's sworn testimony, he jumped ship just above Island No. 10 and made his escape on foot to Illinois (NAMRB 1874b). Confederate authorities ordered the boat to be burned, but the chief engineer, James Keniston, assumed the duties of captain and ran it "under duress" as directed by the Confederates.

Lodwick heard nothing more of his boat until June, 1862, when Memphis fell to Federal forces. He then proceeded to Memphis to claim his vessel but found on arrival that the *Kentucky* had been taken as a prize of war and was being used by the Unites States Army as an express mail boat, carrying freight, passengers, and produce from Memphis to Cairo, Illinois. The *Kentucky* had been captured by the Western Gunboat Flotilla, which was then part of the army but commanded by naval officers (the Fleet was transferred to the Navy Department on July 16, 1862). Between June 6, 1862, and February 4, 1863, the *Kentucky* served first the army; then, the navy. Lodwick sought the return of his boat from Federal authorities and it eventually was restored to him by the U.S. Marshal on February 5, 1863 (NAMRB 1875) "in very bad condition" (NAMRB 1874a). Years after the war, Preston Lodwick and his brother Kimby filed a claim for charter fees of $200.00 a day for the 242 days that the *Kentucky* was in government service. After being bounced back and forth between the War Department and the Navy Department, the Lodwicks' claim was eventually denied on the basis of an Act of Congress dated February 21, 1867, which "prohibited the settlement of any claim for the appropriation of personal property where such claim originated during the war in a State declared in

insurrection" (NAMRB 1876).

Six months after the *Kentucky* was restored to Preston Lodwick, his brother Kimby and B. H. Campbell chartered the vessel to the U.S. Quartermaster Corps for $60.00 per day (NAMRB 1863). By 1864, the *Kentucky* was operating in the Red River and lower Mississippi. The New Orleans *Daily Picayune* of May 5, 1864, noted her arrival with Captain Lodwick and 366 bales of cotton consigned to the U.S.Q.M. (Dewey A. Somdal Collection, 022, Box 14, Folder 547, Noel Memorial Library, Louisiana State University, Shreveport, Louisiana). The *Kentucky* was still in service to the U.S.Q.M after the end of the war in 1865, transporting paroled Confederate prisoners out of Louisiana (United States War Department 1896, I, 48:582).

At 6:30 pm on the evening of June 9, 1865, the *Kentucky* left Shreveport bound for New Orleans with 900 passengers and 250 horses on board, mostly paroled Confederate prisoners from Missouri, with a few from Arkansas and Louisiana. Some two hours into her voyage, the boat struck a snag, one of the partially submerged logs that made the Red notorious. The vessel ran for about four miles after she began to leak and by the time the captain finally turned for shore, the *Kentucky* had settled so much that he could not get near enough to the bank to put out his landing stage. A stern line was got to shore, but it snapped immediately. The boat then careened and sunk instantly, the water washing over the hurricane deck forward while the stern remained above water. As the boat heeled over, pandemonium broke out in the over-crowded decks below as passengers rushed for the hurricane deck. Adding to the confusion, the texas caught fire as coal oil lamps spilled their contents on the beds. Fortunately, the fire was extinguished quickly. A large number of passengers were trapped in the forward cabin and drowned; estimates of losses ran as high as 200. The women on board, who occupied the ladies' cabin aft, survived but several children were lost (*The New Orleans Times*, June 15, 1865, throughout).

Word of the disaster quickly spread to another steamer, the *Col. Chapin*, which had tied up for the night some 5 to 7 miles upstream. The captain of the *Col. Chapin*, Stephen J. Webber, immediately ordered steam to be raised and set out render assistance to the survivors. The vessel arrived on site about 11:30 pm to find some 400 to 500 people crowded onto the elevated after portion of the stricken *Kentucky*. Webber succeeded in getting two lines from the shipwreck to shore and began ferrying the survivors ashore in two small boats. Webber was furious with the officers of the *Kentucky*, charging that their reckless decision to run the boat a night brought about a needless disaster. He later wrote to *The New Orleans Times* (June 16, 1865) that: "If I had the power, I would hang the captain and pilots to the first tree that I could find." A subsequent investigation by Major General Francis J. Herron, commander of the Northern Division of Louisiana, found the officers innocent of any wrong doing, but resulted in an order prohibiting transports on the Red River running in night time (*The New Orleans Times* June 19, 1865).

In the midst of the confusion and social upheaval that resulted from the end of the Civil War, the wreck of the *Kentucky* quickly passed from memory. No organized attempt to salvage her appears to have ever been mounted although her hull continued to be visible in Old River at low water as late as 1947 (Shreveport *Journal* July 10, 1974:D1). Presumably, her machinery, lower hull, and the baggage of her 900 passengers survives intact beneath the silt and sand bank at Eagle Bend.

SITE SIZE: 250 ft by 50 ft (76.2 by 15.2 m)

CONFIGURATION: Vessel hull and debris field

DENSITY OF CULTURAL MATERIALS: Unknown at presence

DEPTH OF DEPOSIT/STRATIGRAPHY: Beneath the levee, the wreck lies at a depth of 4 to 5 m beneath the alluvium overburden. In the river, upper portions of the sternpost are exposed, along with hull planking, bulkheads and some of the main deck. Another 1.25 to 2.0 m of the hull is buried in the mud bottom. Sections of the starboard guard and stanchions are exposed and in good condition.

FEATURES: Side-wheel Steamboat

DATING/CULTURAL AFFILIATION: Built 1856, sank 1865. Vessel leased to U.S. Quartermaster Corps at time of loss.

PRESENT CONDITION/PRESERVATION: Informant accounts describe good preservation of lower hull. Beneath the levee, probing and coring encountered a solid wood surface in sound condition. Coring suggests several levels of wood structure. Preservation of the lower hull is expected to be excellent. In the water, preservation of wood hull and decking is excellent beneath the mud.

PRESENT USE: None

PRESENT AND FUTURE IMPACTS: Erosion of bank from eddy created by Eagle Bend Revetment and elevation of water level to make Red River navigable will expose wreck to deterioration. Future barge traffic in river will adversely effect portions of the wreck in the present river channel. Proposed construction of revetment will have an adverse impact upon exposed and buried portions of the hull.

COLLECTIONS

SURVEY/EXCAVATION METHOD: Remote Sensing (magnetometer, ground penetrating radar, soil conductivity, hydraulic probing) during Phase I investigations. Phase II investigations utilized coring on land. Divers on SCUBA mapped exposed portions of the hull (stern) in the river and utilized a dredge for limited clearing of interior down to keel.

DESCRIPTION OF MATERIAL: Wooden hull of a sidewheel steamboat. Magnetic survey indicates likely presence of steam machinery.

SITE EVALUATION

RESEARCH POTENTIAL: Excellent

STATE OR NATIONAL REGISTER ELIGIBILITY: Potentially eligible under Criteria A, C, and D.

RECOMMENDATIONS: Avoidance recommended if possible. Otherwise, data recovery strongly recommended.

RECORDS

OWNER/TENANT AND ADDRESS: Malcolm D. Dutton
3936 Gilbert St.
Shreveport, LA 71106
(318)861-6245

INFORMANTS: Robert Dupont (318)221-3588
Frank MacInney (318) 424-0058

PREVIOUS INVESTIGATIONS: None

COLLECTIONS AND AVAILABILITY: Cast iron kettle, iron shovel blade, and hogging chain turnbuckle in possession of F. MacInney of Shreveport. Turnbuckle on display in Louisiana State Exhibit Museum, Shreveport.

PHOTOGRAPHS AND MAPS: 1872 map of Red River drawn by W.C. Melvin labels "Wreck of the

Kentucky." Map in possession of F. MacInney.

REFERENCES:

Hall, Henry
1880 Report on the Ship-building Industry of the United States. *United States Tenth Census,* VIII.

Hinks, Stephen; Susan Barrett Smith; Paul V. Heinrich; Allen Saltus, Jr.; and William P. Athens
1994 *Survey and Testing of Eight Items on the Red River in Pools 3 and 5, Red River Waterway, Louisiana.* Submitted to U.S. Army Corps of Engineers, Vicksburg District, by R. Christopher Goodwin & Associates, Inc., New Orleans.

Hunter, Louis C.
1993 *Steamboats on Western Rivers.* Dover Publications, New York. (originally published 1949 by Harvard University Press).

McPherson, James M.
1988 *The Battle Cry of Freedom.* Ballantine Books, New York.

National Archives, Military Reference Branch
1863 Charter between K. Lodwick and B. H. Campbell and the United States for hire of the steamer *Kentucky,* dated August 4, 1863. MS on file, Record Group 92, Office of the Quartermaster General, Water Transportation 1834-1900, Box No. 50, steamer *Kentucky* vessel papers.

1874a Exhibit "A," Preston Lodwick, Claims for use of S.B. *Kentucky*, January 6, 1874. MS on file, Record Group 92, Office of the Quartermaster General, Water Transportation 1834-1900, Box No. 50, steamer *Kentucky* vessel papers.

1874b Exhibit "B," United States vs Steamer *Kentucky*, January 22, 1874. MS on file, Record Group 92, Office of the Quartermaster General, Water Transportation 1834-1900, Box No. 50, steamer *Kentucky* vessel papers.

1875 Letter dated September 23, 1875, from Bvt. Major General Ingalls, Acting Quartermaster General to the Honorable Secretary of War. MS on file, Record Group 92, Office of the Quartermaster General, Water Transportation 1834-1900, Box No. 50, steamer *Kentucky* vessel papers.

1876 Letter dated January 19, 1876 from Henry Goodfellow, Judge Advocate, to M. W. Belknap, Secretary of War. MS on file, Record Group 92, Office of the Quartermaster General, Water Transportation 1834-1900, Box No. 50, steamer *Kentucky* vessel papers.

Seidel, John L., and David S. Robinson
1995 *Phase II Archeological Investigations of Shipwreck "Kentucky" (Site 16BO358) at Eagle Bend, Pool 5, Red River Waterway, Bossier Parish, Louisiana.* Submitted to U.S. Army Corps of Engineers, Vicksburg District, by R. Christopher Goodwin & Associates, Inc., New Orleans.

United States Navy Department
1963 *Dictionary of American Naval Fighting Ships, Vol. II.* Naval History Division, Washington, D.C.

United States War Department
1896 *The War of the Rebellion: A Compilation of the Official Records of the Union and Confederate Armies [ORA].* Government Printing Office, Washington.

RECORDED BY: Dr. John L. Seidel & Dr. Jack B. Irion
R. Christopher Goodwin & Associates, Inc.

5824 Plauche Street
New Orleans, Louisiana 70123
(504)736-9323

DATE: December 5, 1995

APPENDIX VII

NATIONAL REGISTER NOMINATION FORM

NPS Form 10-900
(Rev. 10-90)

OMB No. 10024-0018

United States Department of the Interior
National Park Service

NATIONAL REGISTER OF HISTORIC PLACES
REGISTRATION FORM

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1. Name of Property

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Historic name: *Shipwreck Kentucky*
other names/site number: *Eagle Bend Shipwreck Site No. 16BO358*

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2. Location

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street & number: *1.9 mi. w. of jct. SR 526 & SR 1, on r. descending bank of Red River, at RM 269.8 (1967 mileage)*
city or town: *Shreveport* vicinity: *X*
state: *Louisiana* code: *LA* county: *Bossier Parish* code: *015*
not for publication: *X*
zip code: *71133*

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3. State/Federal Agency Certification

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As the designated authority under the National Historic Preservation Act of 1986, as amended, I hereby certify that this ____ nomination ____ request for determination of eligibility meets the documentation standards for registering properties in the National Register of Historic Places and meets the procedural and professional requirements set forth in 36 CFR Part 60. In my opinion, the property ____ meets ____ does not meet the National Register Criteria. I recommend that this property be considered significant ___ nationally ___ statewide ___ locally. (___ See continuation sheet for additional comments.)

_____ _____
Signature of certifying official Date

_____
State or Federal agency and bureau

In my opinion, the property ____ meets ____ does not meet the National Register criteria. (___ See continuation sheet for additional comments.)

_____ _____
Signature of commenting or other official Date

_____
State or Federal agency and bureau

4. National Park Service Certification

I, hereby certify that this property is:

_____ entered in the National Register _____
_____ See continuation sheet.
_____ determined eligible for the National Register
_____ See continuation sheet.
_____ determined not eligible for the National Register
_____ removed from the National Register _____
_____ other (explain): _____

_____ _____
Signature of Keeper Date of Action

5. Classification

Ownership of Property (Check as many boxes as apply)

_X_ private
___ public-local
___ public-State
_X_ public-Federal

Category of Property (Check only one box)

___ building(s)
___ district
_X_ site
___ structure
___ object

Number of Resources within District:

Contributing	Noncontributing	
0	0	buildings
1	0	sites
0	0	structures
0	0	objects
1	0	Total

Number of contributing resources previously listed in the National Register: *N/A*

Name of related multiple property listing (Enter "N/A" if property is not part of a multiple property listing.): *N/A*

6. Function or Use

Historic Functions (Enter Categories from instructions)

Cat:	Sub:
Commerce	*trade*
Defense	*naval facility*
Transportation	*water-related*

Current Functions:

Cat:	Sub:
Not in use	

7. Description

Architectural Classification (Enter categories from instructions)

Other: *Side-wheel steamboat*

Materials (Enter categories from instructions)

foundation:
roof:
walls:
other: *wood hull and structure; metal hogging chains, engine and boilers*

Narrative Description (Describe the historic and current condition of the property on one or more continuation sheets.)

See continuation sheet.

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8. Statement of Significance

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Applicable National Register Criteria (Mark 'x" in one or more boxes for the criteria qualifying the property for National Register listing)

__X__ A Property is associated with events that have made a significant contribution to the broad patterns of our history.

_____ B Property is associated with the lives of persons significant in our past.

__X__ C Property embodies the distinctive characteristics of a type, period, or method of construction or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components lack individual distinction.

__X__ D Property has yielded, or is likely to yield information important in prehistory or history.

Criteria Considerations (Mark "X" in all the boxes that apply.)

_____ A owned by a religious institution or used for religious purposes.

_____ B removed from its original position.

_____ C a birthplace or a grave.

_____ D a cemetery.

_____ E a reconstructed building, object, or structure.

_____ F a commemorative property.

_____ G less than 50 years of age or achieved significance within the past 50 years.

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8. Statement of Significance (cont'd)

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Areas of Significance (Enter categories from instructions)

Cat:	Sub:
Archeology	*Historic-Non-aboriginal*
Architecture	
Commerce	
Maritime history	
Transportation	
Engineering	
Military	

Period of Significance: *1856-1865*

Significant Dates: *1856*
November 1861
March 1862
June 9, 1865

Significant Person (Complete if Criterion B is Marked above): *N/A*

Cultural Affiliation: *N/A*

Architect/Builder: *Unknown*

Narrative Statement of Significance (Explain the significance of the property on one or more continuation sheets.)

See continuation sheet.

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9. Major Bibliographic References

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(Cite books, articles, and other sources used in preparing this form on one or more continuation sheets.)

See continuation sheet.

Previous documentation on file (NPS)

____ preliminary determination of individual listing (36CFR67) has been requested.
____ previously listed in the National Register
____ previously determined eligible by the National Register
____ designated a National Historic Landmark
____ recorded by Historic American Buildings Survey # _____
____ recorded by Historic American Engineering Record # _____

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9. Major Bibliographic References (cont'd)

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Primary Location of Additional Data
____ State Historic Preservation Office
____ Other State Agency
_X__ Federal Agency
____ Local government
____ University
____ Other

Name of repository: *National Archives*

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10. Geographical Data

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Acreage of Property:
UTM References: (Place additional UTM references on a continuation sheet)

Zone: 15N *Easting: 436,002* *Northing: 3,588,460*

NAD 1927, Clark 1866 ellipsoid

Verbal Boundary Description (Describe the boundaries of the property on a continuation sheet.)
Boundary Justification (Explain why the boundaries were selected on a continuation sheet.)

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11. Form Prepared By

==========

Name/title: *Dr. John L. Seidel/Asst. Vice President, Nautical Archeology*

Organization: *R. Christopher Goodwin & Associates, Inc.*

Date: *November 30, 1995*

Street & Number: *337 East Third Street*

Telephone: *(301) 694-0428*

City or Town: *Frederick* State: *Maryland* Zip code: *21701*

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Additional Documentation

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Maps: USGS quadrangle (7.5 minute series)

Other maps

Photographs: see the Continuation Sheet labeled: Photographs, pp. 1.

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Property Owner

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(Complete this item at the request of the SHPO or FPO.):

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Description

Summary

The wreck of the *Kentucky* lies on the right descending bank of the Red River on Bagley Island, at approximately River Mile 269.8 (1967 mileage) in Bossier Parish, Louisiana. Approximately 60 ft of the vessel's stern is exposed under water in the current river channel. The remainder of the ship, another 160 ft in length, extends back under the river bank and is buried beneath 16 ft of alluvial soils which form a natural levee, and under a small drainage which was once the main channel of the river. The *Kentucky* was a side-wheel steamboat constructed in 1856 and was typical of those plying the western rivers in the mid-19th century. Two-hundred-twenty-two ft in length, the *Kentucky* sank in 1865, with over 900 paroled Confederate prisoners-of-war and their families aboard. Its hull up to the main deck is now preserved in the water and underground, along with guards, stanchions, and parts of the propulsion system. Elements of the superstructure, above the main deck, also may be preserved underground. The exposed stern is surrounded by submerged trees and other debris carried downstream by the river's swift current (from 1-2 ft per second (fps) in summer to highs over 11 fps in winter). The

height of the river bank above the stern varies with the river level, but averages 8-10 ft. This levee is lightly wooded, and the soil is a fine sandy loam.

Historical Description

The *Kentucky* was a wooden-hulled side wheel steamboat constructed in Cincinnati, Ohio, in 1856. Its registered dimensions were 222 ft long by 32 ft wide with a depth of hull of 5.5 ft and a capacity of 375 tons. The hull had a plain head and a transom stern "with tuck" and no gallery (National Archives, civilian Reference Branch 1856-1860:Cincinnati Enrollments No. 59, July 28, 1856). The vessel was powered by two high pressure steam engines which were 22 in in diameter with a 7 ft stroke. Four boilers were mounted on the main deck (Way 1983: 269). Built as a large, elegant packet for use on the Ohio and Mississippi, the vessel possessed a main deck where the boilers and engines were mounted, with guards extending out from the hull to protect the paddle wheels. The main deck also served as the principal cargo deck. Above the main deck was the boiler deck, where the passenger accommodations were located. A long, narrow cabin was centrally located, with staterooms opening onto it from the sides. The *Kentucky* had 52 staterooms furnished with bedding; the cabin

boasted carpets, chairs, a sofa, tables and tableware (National Archives, Military Reference Branch 1874a: Deposition of James Keniston). Social areas were typically segregated by sex aboard packet boats, with the gentlemen's salon located forward and the ladies' aft (Hunter 1993:393). Above the boiler deck was the hurricane deck and the crew quarters. Officers were quartered in the texas on the next level, and a pilothouse sat atop the texas, aft of the chimneys.

The *Kentucky* served the upper Ohio and Mississippi as a mail packet and passenger carrier to 1861, although its homeport shifted between Cincinnati, Louisville, and Memphis. During the Civil War, the vessel was taken for use as a Confederate troop and supply transport, serving in several important engagements. In 1862, the *Kentucky* was appropriated by the Union army and served as a military transport until 1863. It is unknown what modifications, if any, were made to the vessel during these periods of service. Returned to its civilian owner in 1863, the *Kentucky* was chartered to the U.S. government as a troop transport, and at the end of the war was engaged to transport paroled Confederate veterans on their return home (National Archives, Military Reference Branch 1863).

Wrecking

On June 9, 1865, the *Kentucky* left Shreveport for New Orleans, carrying 900 paroled Confederate prisoners and their families and baggage, along with 250 horses. Several hours after departure, the vessel hit a submerged log, or snag. Although taking on water, the *Kentucky* ran downstream for another four hours before the captain headed for shore. By this time, the vessel had settled so much in the water that the captain could not maneuver close enough to the bank to put out the landing stage. A stern line was carried to shore, but it quickly snapped. The boat then careened and sank instantly, the water washing over the hurricane deck forward while the stern remained above water. As the boat heeled over, pandemonium broke out in the over-crowded decks below as passengers rushed for the hurricane deck. Adding to the confusion, the texas caught fire, although the fire was extinguished quickly. A large number of passengers were trapped in the forward cabin and drowned; estimates of losses ran as high as 200. The women on board, who occupied the ladies' cabin aft, survived, but several children were lost (*The New Orleans Times*, June 15, 1865). The loss of life was unusually heavy for a snagging accident.

Post-Depositional Impacts

In the midst of the confusion and social upheaval that resulted from the end of the Civil War, the wreck of the *Kentucky* quickly passed from memory. Given the average life span of four to five years for western steamboats (Hunter 1993:64), the vessel was old when lost. No organized attempt at salvage appears to have been mounted, although part of the hull was visible in Old River at low water as late as 1947 (Shreveport *Journal* July 10, 1974:D1).

The *Kentucky* still lay at the river's edge in 1872, when a local engineer depicted the vessel on a map of levees along the river (Melvin 1872). In 1882, this channel of the Red River was circumvented by "Lattier's Cut-off" and gradually silted in. Geomorphology indicates that this process actually began in the 1860's (Seidel and Robinson 1995), and silt effectively capped the remains. Due to the silt cap and the high water table, anaerobic conditions prevail, and natural disturbance of the site was minimal until the last decade. During this period, the channel of the Red River has moved south and west; it is now cutting into the site and exposing the wreckage. The sternpost of the vessel, with intact gudgeons, is the most exposed portion of the wreck, but has not yet suffered serious

degradation (Seidel and Robinson 1995).

Archeological Investigations

Archeological investigation of the site was first undertaken in January of 1995, when a magnetometer survey of the terrestrial component was completed for the Vicksburg District , U.S. Army Corps of Engineers (USACE), by R. Christopher Goodwin & Associates, Inc. Dr. Jack Irion directed the survey. The magnetic survey revealed a large elongated anomaly in the northern corner of the project area. The anomaly produced a maximum perturbation of the ambient magnetic field of nearly 2,000 gammas, an exceptionally large magnetic disturbance indicating the presence of a large ferrous mass such as the engine of a vessel. The anomaly was detected over an area of roughly 660 m^2 (2,200 ft^2); this evidence supports the notion that major salvage efforts never took place (Seidel and Robinson 1995).

In February, 1995, USACE staff placed 22 cores across the site under the supervision of Dr. Jack Irion of Goodwin & Associates, Inc. Some core holes encountered wood at several levels and were indicative of structural levels such as decking and hull planking. The samples suggested a good level of preservation. Negative cores helped define

the edges of the vessel and the site's boundary (Seidel & Robinson 1995).

In September of 1995, additional recording was undertaken by Goodwin & Associates, Inc., under the supervision of Mr. David Robinson and Dr. John Seidel. Divers on SCUBA surveyed underwater for remains of the vessel. They located and mapped the stern of the vessel, including the sternpost and gudgeons, hull planking, and the main deck. Through careful and limited use of a venturi dredge, enough silt was removed to expose interior elements of the stern, including several frames, a bulkhead, and the keel of the vessel. Additional mapping located sections of the ship's starboard guard and stanchions. Submerged trees, branches and debris complicated survey, and zero visibility, due to suspended silts, precluded photographic recording. Elements of the wreck may be seen on the attached site plan and on detailed drawings (Figures 2-4).

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Statement of Significance

Summary

The *Kentucky* is associated with "events that have made a significant contribution to the broad patterns of history," and therefore possesses the qualities of national significance defined in Criteria A . The *Kentucky* is also significant under Criterion C, embodying as it does the "distinctive characteristics of a type, period, or method of construction." The vessel is a good representative of a sidewheel steamboat from the 1850s, the apogee of steamboat design and evolution. The site also holds the potential to yield information which is important to history. This includes construction and engineering information, as well as information on the passengers and crew. The site therefore possesses the quality of significance under Criterion D. The cultural and archeological contexts for the *Kentucky* are described below, followed by a discussion of the specific attributes of the site and its qualities of significance.

Cultural Context

The mid-west and western United States were in large part opened up to settlement by changes in river transportation in the early 19th

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century. The introduction of steam power made it possible to move up and down the great rivers of the region, utilizing them as highways, first for the movement first of troops, and then of settlers. The advent of steam power resulted in an explosion in riverborne commerce in the west between the War of 1812 and the Civil War. In 1817, shortly after the first appearance of a steamboat on the Mississippi and Red Rivers, seventeen steamboats were plying the waters between New Orleans and the upper Ohio River. By 1820, the number more than quadrupled to sixty-nine vessels, and by 1855, 727 steamboats were moving people and goods on these rivers and their tributaries (Still, Watts, and Rogers 1993:63).

Most of the steam-powered vessels that operated in the East during this early period utilized low-pressure, condensing engines. These craft carried heavy engines and their design was based on traditional deep water craft. This type of design was unsuccessful on western rivers, which were shallow for much of the year. To be used successfully in the west, steam vessels had to be changed in ways which made shallow water navigation possible. Lighter weight, high-pressure steam engines were adopted, and they were placed inside a hull and superstructure with a unique and distinctive design. In

pursuit of lessened draft, the heavy keel typical of ocean-going vessels was abandoned, the size of scantlings was reduced, and an increasing length-to-beam ratio was used. As a result, there was far less rigidity in the framing, and innovative systems of trusses or supporting chains were developed to redistribute the weight of engines and boilers and to mediate the other forces on the structure.

As a result of these innovations, western steamboats became exceedingly well adapted to the exigencies of river travel in the Ohio/Mississippi drainage. They reached into virtually every corner of the region and played a crucial role in its settlement and in everyday life. As the land was turned to agriculture, crops such as cotton were moved to market by steamboat, and finished goods moved inland. The steamboat was the essential transportation link prior to the development of railroads.

The ability of western steamboats such as the *Kentucky* to range widely carrying very large loads, made them critical assets to commanders during the Civil War. Like railroads, they were used to carry troops and supplies throughout the Mississippi and Ohio drainage. Many civilian vessels were commandeered, purchased, or chartered for use as troop transports. Others were made into fighting

vessels through the addition of cotton bales for protection, or via heavier oak bulwarks or iron plate. Steam vessels were especially important to both armies in the west because of a Union strategy of invasion via the Mississippi. Farragut's capture of New Orleans in April of 1862 opened up the river and made it possible to combine operations with land forces throughout the Mississippi basin(Still 1992:61-65).

Archeological Context

Despite the crucial role played by steamboats in commerce, warfare and everyday life, and despite the highly successful architectural and engineering innovations made in steamboat production, relatively little is known about the details of construction (Hunter 1993:88). The use of scale drawings and models was rare, making archeological examples one of the best sources of information. None of the side-wheel, high-pressure steamboats like the *Kentucky*, which were so important in the 1840's through 1860's, have survived, and few have been examined archeologically. The steamboats *Phoenix* (Simmons 1988:191-192), *Columbus* (Irion and Beard 1995), and *Indiana* (Robinson 1992; Johnston and Robinson 1993) provide some comparable data, but these examples are much earlier and are

different types of vessels designed for the Chesapeake Bay and the Great Lakes. By contrast, the steamboat *Bertrand* was a western-style vessel, but of a different type: the stern-wheel, single deck, mountain boat (Petsche 1974). Another stern-wheeler, the *Cremona* (built in 1852), was found in Mobile Bay, where archeologists documented some elements of the hull (Simmons 1988:199). The *Black Cloud* is one of the few side-wheelers of the period to have been archeologically investigated. Built in Texas in 1864, the wreck was crossed by a gas pipeline in 1965 and the remains were later mapped by students from Texas A&M University; no large scale excavations took place (Simmons 1988:199).

Role of the Kentucky

Within these cultural and archeological contexts, the *Kentucky* fills a significant niche. Side-wheelers with high pressure engines predominated on western rivers into the 1860's, after which they were replaced by vessels driven with paddle wheels on the stern (Still, Watts, and Rogers 1993:67). Cincinnati, birth place of the *Kentucky*, was the second leading construction center for western steamboats, behind Pittsburgh (Hunter 1993:105-106). Like the bulk of these

vessels, the *Kentucky* was built as a packet boat to carry passengers and cargo. A review of the vessel's service history helps place it squarely in context.

The *Kentucky* first served on the upper Mississippi in the Cincinnati, Maysville, and Portsmouth U.S. Mail Line Company (National Archives, Civilian Reference Branch 1856-1860: Cincinnati Enrollments No. 59, July 28, 1856). A U.S. mail line service implied regularly scheduled and punctual trips, with penalties for non-performance (Hunter 1993:336). Two years later, the vessel was sold to Z. M. Sherley and the Cincinnati & Louisville U.S. Mail Line Company (National Archives, Civilian Reference Branch 1856-1860: Cincinnati Enrollments No. 143, April 30, 1858), the oldest and most famous line on the western rivers. The steamer was sold in 1860 to I.M. Gosler of the Memphis & New Orleans Steam Packet Company (National Archives, Civilian Reference Branch 1856-1860: Memphis Enrollments No. 8, April 10, 1860). Three months later the vessel was re-enrolled by the Memphis & New Orleans Steam Packet Co. under the names of J.J. Rawlings, J.M. Gregory and William Wray T(rustees?) (National Archives, Civilian Reference Branch 1856-1860: Memphis Enrollments No. 19, June 19, 1860). The Memphis & New Orleans Line ran in conjunction

with the Memphis and Charleston Railroad for several seasons preceding the Civil War (Hunter 1993:631). The company, however, lost money and the boats were sold, with substantial losses to the stockholders. The *Kentucky* was sold to J.C. McManus and T.A. Kendig of Memphis in October of 1861 (National Archives, Civilian Reference Branch 1856-1860: Memphis Enrollments No. 40, October 27, 1860).

Shortly after the start of the Civil War the *Kentucky* was purchased by Preston Lodwick. Lodwick was desperate to return north and seized the opportunity to purchase the *Kentucky*, which, at that time, was engaged in running to Columbus, Kentucky, above Memphis. Thinking the new boat would allow him to slide past the authorities at Memphis, Lodwick headed north, but Confederates at Memphis turned him back. Finally abandoning the boat just above Island No. 10, Lodwick escaped on foot back to Illinois (National Archives, Military Reference Branch 1874a: Deposition of Preston Lodwick).

A friend of Preston Lodwick, James Keniston, went aboard the abandoned *Kentucky* as the captain, thus saving the boat from being burned. Keniston continued to operate the vessel as a Confederate transport until June, 1862. The captain of the *Kentucky* was cited in November 1861 by the Confederate army for exhibiting under fire

"fearlessness and energy deserving the highest praise" for ten days and nights spent ferrying Major General Leonidas Polk's troops between Columbus, Kentucky, and Belmont, Mississippi (United States Navy Dept. 1963:541). The timely arrival of reinforcements allowed the Confederates to surround Union forces under Ulysses Grant (McPherson 1988:396). The *Kentucky* again dodged shells to bring reinforcements to Brigadier General J. P. McCown as he sought to hold Island No. 10 in March, 1862 (United States Navy Dept. 1963:541).

When Memphis was retaken by Union forces on June 6, 1862, the *Kentucky* was appropriated by the Western Gunboat Flotilla. From June 6 to about August 6, 1862, the *Kentucky* served as a military transport between Memphis and Cairo. The vessel was then taken to St. Louis where it remained until February, 1863. During this period, Preston Lodwick continually sought the return of his steamboat. It was finally surrendered to him by the U.S. Marshall "in a very bad condition" on February 4 (National Archives, Military Reference Branch 1874a: Deposition of Kimby Lodwick). After the war, Lodwick submitted a claim for the services of the *Kentucky* for the 242 days it was in military service between June 6, 1862, and February 4, 1863. Although he was never compensated, his claim presents a rare record

of his boat's activities during the Civil War that is preserved in the National Archives Military Reference Branch (National Archives, Military, Reference Branch 1863, 1874a, 1874b, 1875, 1876).

Six months after Preston Lodwick secured the return of the *Kentucky* from the military, his brother Kimby and B.H. Campbell chartered the vessel to the government as "a transport for troops and stores" (National Archives, Military Reference Branch 1863). The *Kentucky* remained in the service of the U.S. Quartermaster for the remainder of the war. In the months following the surrender of the Confederate armies, the vessel was engaged in transporting paroled Confederate veterans to points of embarkation from which they made their way back home.

The *Kentucky* was on just such a voyage when it struck a snag and sank on June 9, 1865. "Snaggings" were the most common disaster on the rivers, but seldom resulted in loss of life (Hunter 1993:273). This was not true in the case of the *Kentucky*. In addition to 250 horses, the vessel carried 900 passengers, mostly paroled Confederate prisoners-of-war and their families. Estimates of the lives lost ran as high as 200 (The *New Orlean Times*, June 15,1865). All but two of the horses disappeared, and all of the baggage of the passengers went

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down with the vessel.

Significance

The historical associations, distinctive characteristics, and research potential of the *Kentucky* indicate that the site possesses the qualities of national significance defined in Criteria A, C, and D of the National Register of Historic Places. Under Criterion A, the *Kentucky* is associated with the themes of Commerce, Maritime History, Transportation, and the Military. Prior to the Civil War, the *Kentucky* served the lower Mississippi River Valley as a passenger and packet steamer; it was one of the large, elegant side-wheelers that helped to define the antebellum South. The steamboat era on the Mississippi was a period of American history that was pivotal to the expansion of the West and to the development of the cotton monoculture that dominated southern life. During the Civil War, the *Kentucky* served both the Confederate States and the United States as a troop transport ship. During its Confederate career, the vessel was credited with turning the tide of the Battle of Belmont, Missouri, to the Confederate side by delivering reinforcements through enemy fire to General Leonidas Polk, whose troops succeeded in surrounding the Union forces across the river at Columbus, Kentucky. A Union defeat

was only diverted by the coolheadedness of their commander, Ulysses S. Grant, who remarked "we had cut our way in and could cut our way out just as well" (McPherson 1988:396).

Under Criterion C, a vessel possesses significance if it embodies "the distinctive characteristics of a type, period, or method of construction..." The *Kentucky* possesses significance under the themes of Architecture and Engineering. The *Kentucky* was designed and built as a distinctive class of vessel; it is an excellent representative of an antebellum side-wheel steamboat, a type significant in American history. The 1850's, the period when this vessel was built, represents the apogee of steamboat design and evolution; yet it is a period that is poorly understood in terms of hull construction or engineering design. The intact hull of the *Kentucky* provides a unique record of how such vessels were engineered and constructed.

Under Criterion D, a vessel is significant if it is likely to yield information important to history. The intact hull allows for the reconstruction of the ship's lines and an understanding of construction methods. The hogging chains observed on the wreck could reveal the way in which these systems were applied. It is likely that significant portions of the engine and propulsion system also are

present. Investigation of the *Kentucky* potentially could yield significant information not only on the construction and engineering of a mid-nineteenth century steamboat, but also on the ways in which such vessels were used, repaired, and modified. Of further significance is the anthropology of its passengers and crew. All of the baggage of some 900 passengers went down with the ship and may remain trapped within its hold. Of particular interest would be the personal effects of the paroled Confederate prisoners on board. Research issues could be developed examining what equipment defeated Confederate soldiers were allowed to retain, and how their kit differed from their Northern counterparts. In addition, the personal effects of the crew and officers, along with the furniture and hardware of the vessel, are likely to be present on the site. Finally, it is likely that human remains are associated with the wreck. Documentary evidence clearly indicates that there was significant loss of life, and that many remains went unrecovered.

Integrity

Phase I and II archeological surveys demonstrate that much of the vessel is intact. Post-depositional disturbance is minimal, as is disturbance from archeological investigation and excavation. Elements

of an intact sternpost, hull planking and frames, decking, stanchions, guards, and chains have been identified. These structural elements have integrity sufficient to allow for accurate recording and reconstruction of ship architecture. Indications are that preservation is equally good for portions of the wreck which lie beneath the bank. Coring demonstrated that several levels of wood structure exist, and a magnetometer survey indicated that elements of the propulsion system might lie beneath the sediment. The anomalies were large enough to suggest that the boilers and other elements of the ship's machinery were never salvaged. Given the demonstrated preservation of wood throughout the site, it is likely that a wide variety of materials are well-preserved, including organic remains.

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Maps

Melvin, W.C
1872 *Red River from Shreveport to Pascagoula Bayou.* MS map courtesy Frank MacInney, Shreveport, Louisiana.

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Boundary Description

This site is located on the Red River at River Mile 269.8 in Bossier County, Louisiana. The boundary line for 16BO358 takes the form of a long hexagon placed twenty feet away from the ends and sides of the ship. Corners of the site boundary are shown on Figure 5 and have been referenced with state plane coordinates (1927 NAD) and by bearing and distance from a brass-capped survey monument, Bench Mark EB11, maintained by the U.S. Army Corps of Engineers adjacent to the site:

Corner	State Plane Coord.	Bearing, Dist from EB11	
Corner 1	1635792.58 E / 644561.27 N	N12°E	321 ft
Corner 2	1635860.40 E / 644546.81 N	N24°E	328 ft
Corner 3	1635827.25 E / 644487.54 N	N23°E	261 ft
Corner 4	1635679.40 E / 644419.57 N	N14°W	177 ft
Corner 5	1635624.80 E / 644437.46 N	N28°W	214 ft
Corner 6	1635652.54 E / 644494.98 N	N16°W	257 ft

Boundary Justification

The boundary includes the exposed and submerged segments of the wreck, as well as the projected remainder of the vessel, based on positive core samples, magnetometry survey, and the historically recorded dimensions of the vessel; a twenty foot buffer has been added along the sides of the vessel for the inclusion of artifact scatters and structural debris.

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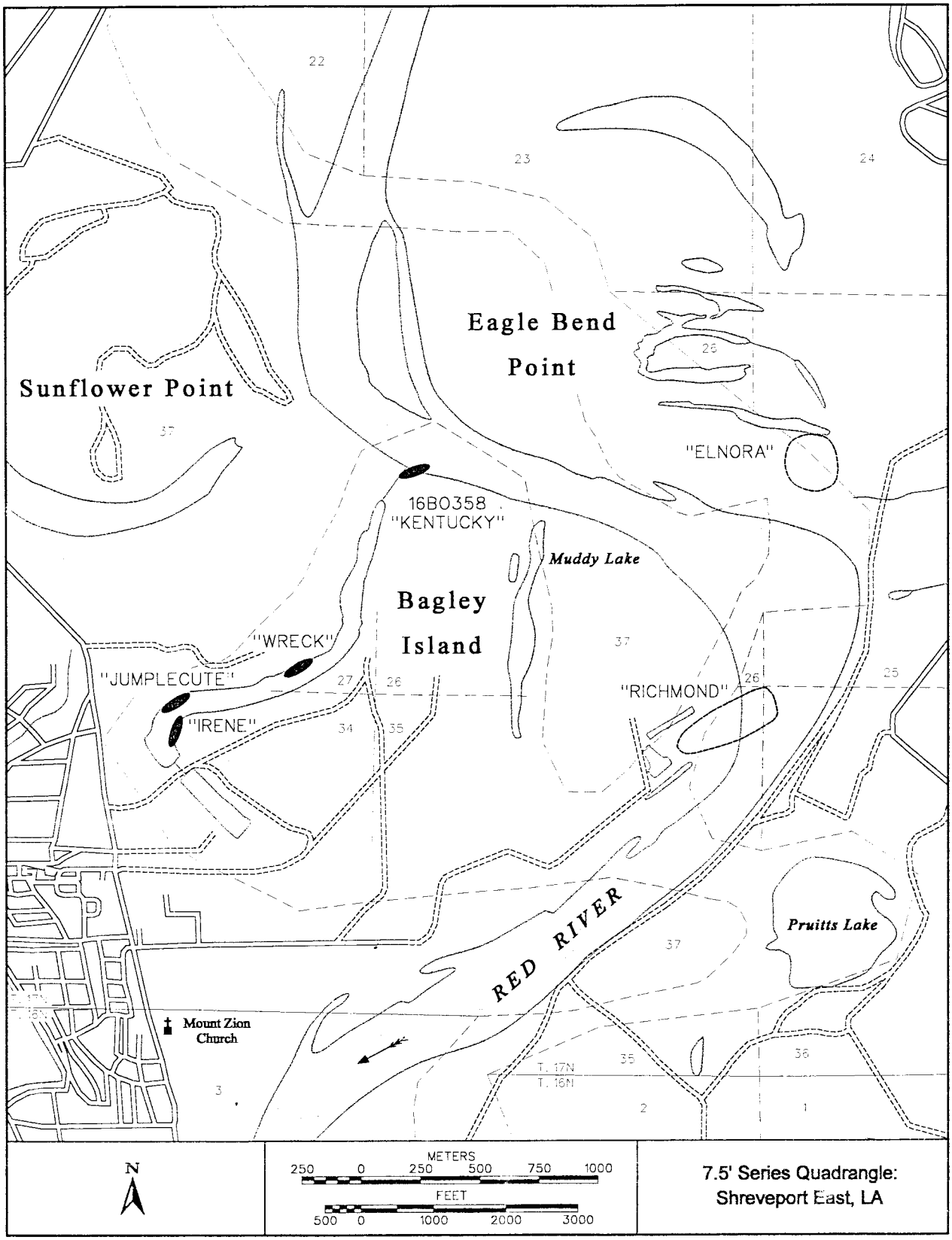
Photo #1

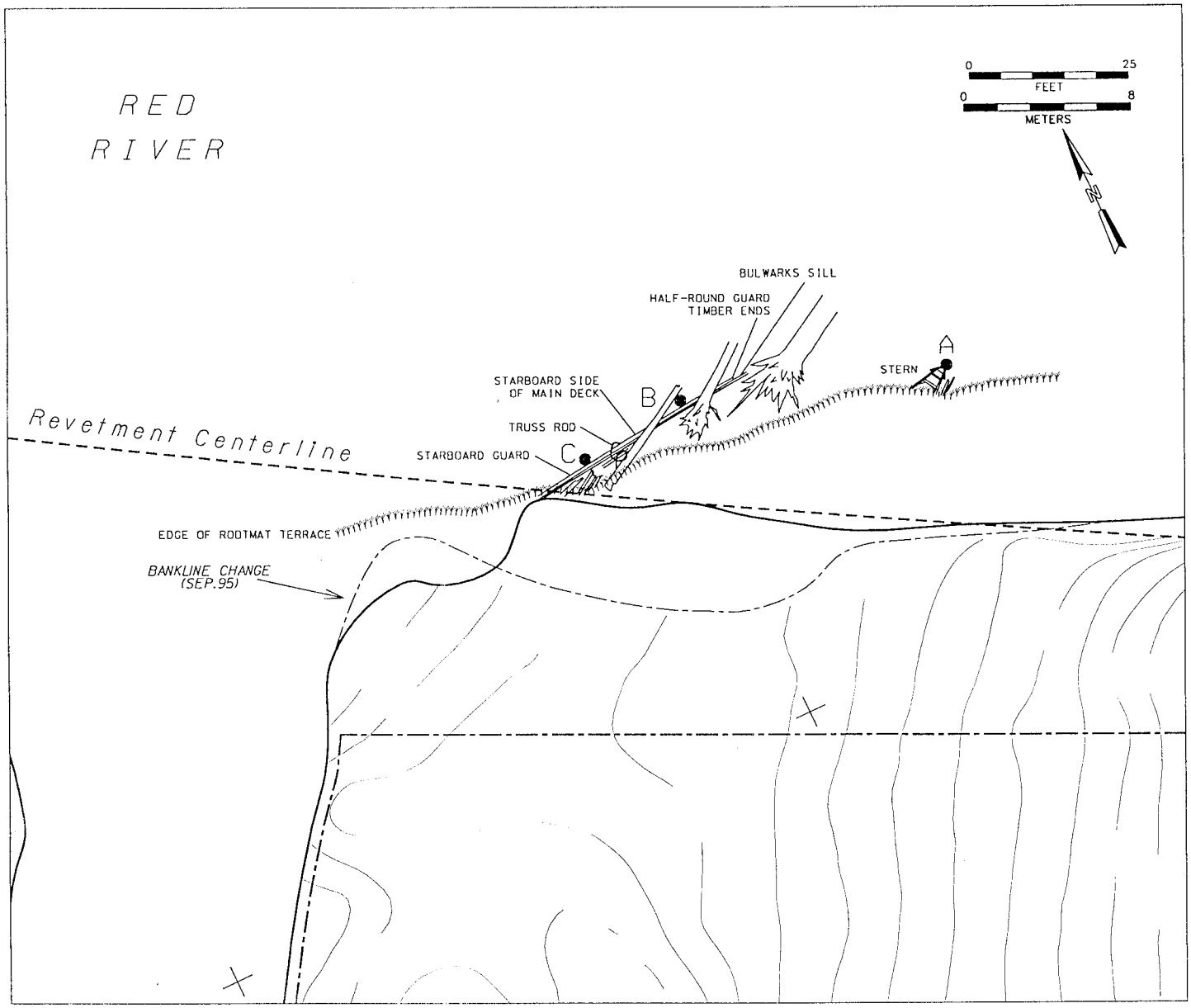
1. 16BO358 - Shipwreck *Kentucky*
2. Bossier Parish, Louisiana
3. David Robinson
4. 09/1995
5. R. Christopher Goodwin & Assoc., Inc.
   337 E. Third Street, Frederick, Maryland 21701
6. View of the site from the east, with the levee and bank to the left; the buoy in the lower right marks the vessel's stern; the two buoys to the left mark the ship's guards and stanchions.

Photo# 2

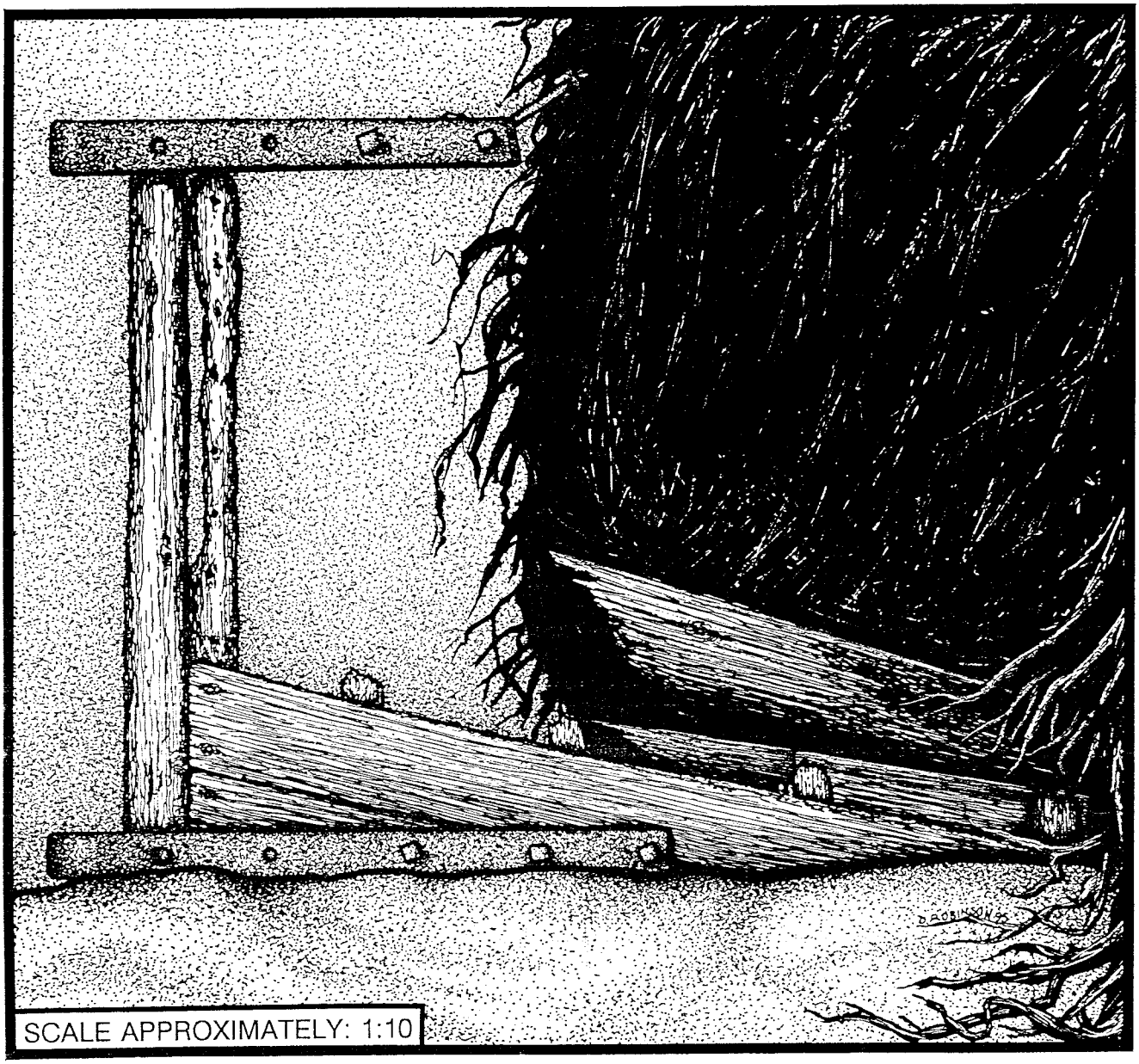
1. 16BO358 - Shipwreck *Kentucky*
2. Bossier Parish, Louisiana
3. David Robinson
4. 09/1995
5. R. Christopher Goodwin & Assoc., Inc.
   337 E. Third Street, Frederick, Maryland 21701
6. View of the site from the west, with the levee to right and the submerged stern of the vessel, marked by buoys, underwater to the left.



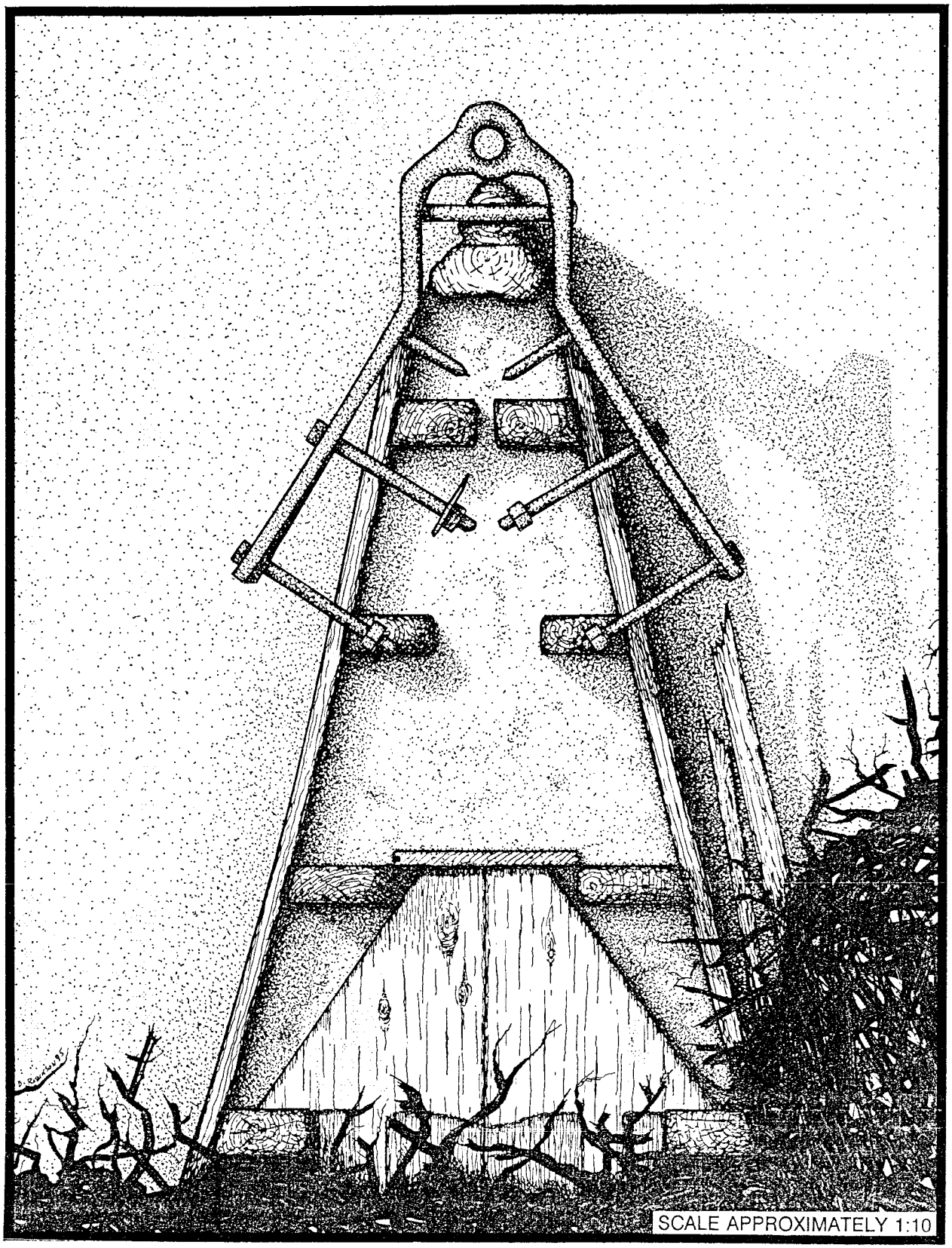
Excerpt from the 1980 USGS 7.5' Series Topographic Quadrangle, Shreveport East, Louisiana, Depicting Project Area Location



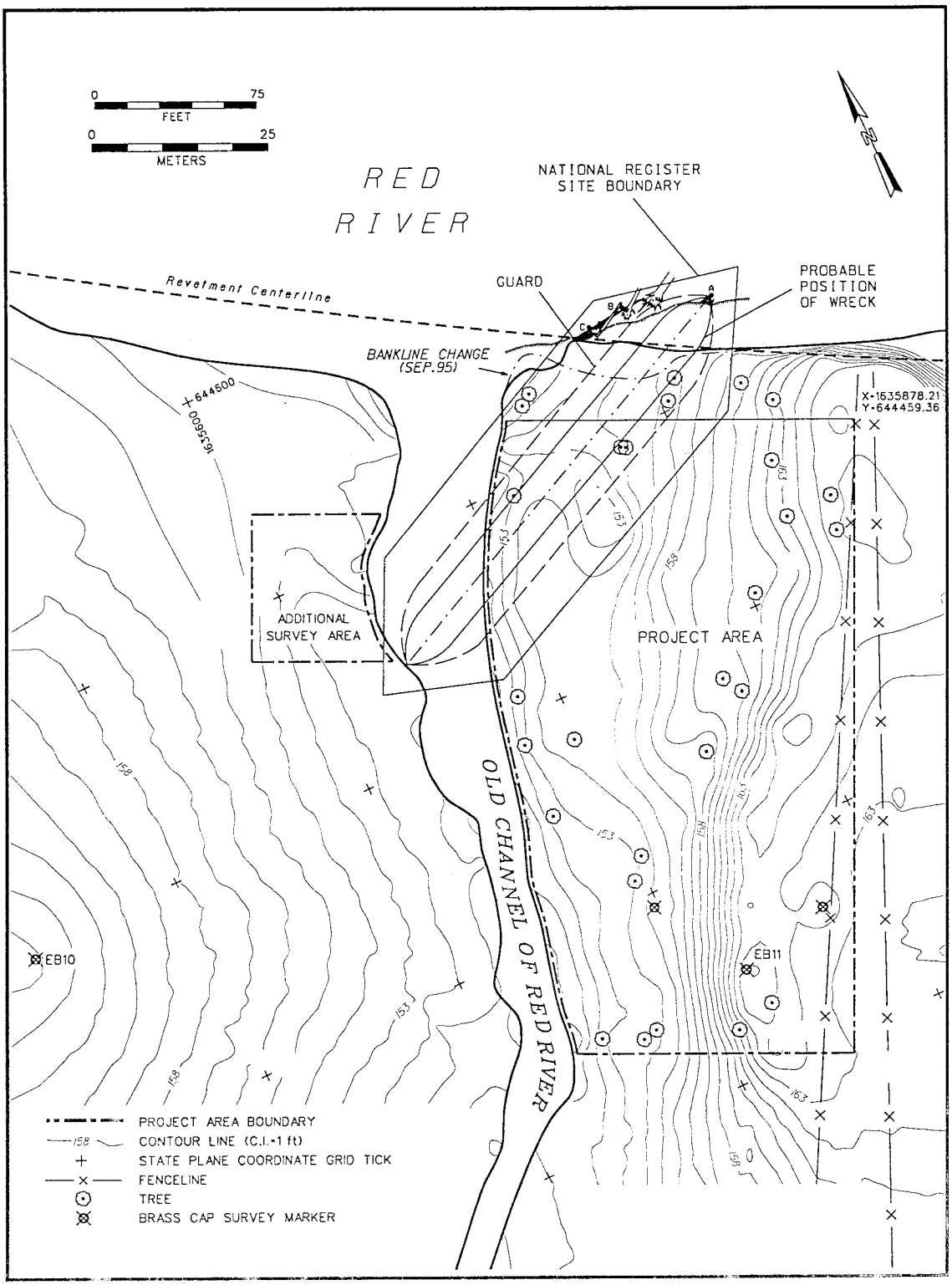
Site Plan showing Various Structural Elements of the Wreck



Elevation of the Stern



Plan of the Stern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APPENDIX VIII

RESUMES OF KEY PERSONNEL

R. CHRISTOPHER GOODWIN, Ph.D.

PRESIDENT
DIRECTOR OF RESEARCH

Education

Bachelor of Arts with Honors in Political Science, Tulane University, 1971.

Master of Science in Anthropology, Florida State University, Tallahassee, Florida, 1974.

Doctor of Philosophy (Ph.D.) in Anthropology, Arizona State University, Tempe, Arizona, 1979.

Postdoctoral Fellow - Scholar in Residence, Smithsonian Institution, Washington, D.C., 1979-1980.

Workshop "Property Transfer Site Assessment Research Methods," Illinois State Museum, Springfield, Illinois, 1992.

Workshop "National Environmental Policy Act", University of Southern Maine, Summer Session Program, 1999.

Workshop "Environmental Inspection and Construction Compliance," Southern Gas Association, Houston, Texas, February 7-9, 2000.

Honors

Phi Eta Sigma Honor Society (1967); Alpha Epsilon Delta Honor Fraternity (1968); Pi Sigma Alpha Honor Society (1969); Sigma Xi Scientific Research Society (1977); University Fellow, Arizona State University (1978-1979); Elected Fellow, Virgin Islands Archeological Society (1978); Postdoctoral Fellow, Smithsonian Institution (1979-1980); Certificate of Merit, Universidad Central de Venezuela (1981); Certificate of Appreciation, International Wedgwood Society (1984); Friend of the Chitimacha Indians (1985); Certificate of Appreciation, Universidad del Norte, Barranquilla, Colombia (1985); Achievement in Archeology Award, Anne Arundel County Trust for Historic Preservation, Inc. (1991); Achievement in Archeology Award, Anne Arundel County Trust for Historic Preservation, Inc. (1992); National Preservation Honor Award, National Trust for Historic Preservation (1992); *Who's Who in Leading American Executives (1992)*; *Who's Who Among Outstanding Americans* (1995-96); Small Business Administration's Administrator's Award of Excellence (1996-7).

Professional Experience

Director of Research, R. Christopher Goodwin & Associates, Inc., Frederick, Maryland, 1981 to present.

Visiting Professor, Department of Anthropology, Universidad del Norte, Barranquilla, Colombia, 1985. Course taught: Archeological Method and Theory.

Visiting Professor, Department of Anthropology, Universidad Central de Venezuela, Caracas, Venezuela, 1982. Course taught: Archeological Ceramics.

Elected to Board of Directors, Museo Regional Altos de Chavon, Dominican Republic, 1981.

Visiting Professor, Nicholls State University, Thibodaux, Louisiana, Summer 1981. Course taught: Field Methods in Archeology.

Scholar-In-Residence, United States National Museum, Smithsonian Institution, National Museum of Natural History, 1979-1980.

Assistant Professor, Arizona State University, Summer 1979 (Archeological Field School). Courses taught: Archeological Field Techniques, Archeological Sampling, Graduate Research.

Chairman, Eighth International Congress for the Study of Pre-Columbian Cultures of the Lesser Antilles, St. Kitts, West Indies, Summer 1979.
Graduate Associate, Department of Anthropology, Arizona State University, 1979.
Elected to Board of Directors, International Association for Caribbean Archeology, July, 1977 - July, 1979.

Research Associate, Yale Peabody Museum, New Haven, CT, 1975-6.

Research Associate, Climatic Impact Assessment Program, Department of Economics, Florida State University, 1974.

Staff Archeologist, Intercontinental Investments, Boqueron, Puerto Rico, 1973. Prehistoric and historic sites archeology, cultural resources management.

Visiting Professor of Anthropology, InterAmerican University, San German, Puerto Rico, Summer 1972.
Special Assistant to the President, the Puerto Rico International Undersea Laboratory (PRINUL), Cabo Rojo, Puerto Rico, 1971 - 1972.

Civic and Community Activities

Washington Program Chairman, National Exploration Awards, Boy Scouts of America, 1976 - 1977.

Member, Education and Youth Activities, The Explorers Club, 1976 - 1977.

National Chairman, National Exploration Awards, Boy Scouts of America, 1978. NEA is Scouting's highest honor in recognition of scientific achievement and potential.

Member, National Events Committee, Boy Scouts of America, 1978.

Proposal Reviewer, Committee on Research and Exploration, National Geographic Society, Washington, D.C., 1979 -present.

Proposal Reviewer, National Endowment for the Humanities, 1979 - 1983.

Special Skills

Court-qualified Expert in Archeology and Cultural Resources Management. Forensic skeletal analysis; Spanish and French archival research, spoken Spanish.

Manuscripts, Publications, and Papers Presented

1971 *United States Seabed Resource Policy.* Honors Thesis, Department of Political Science, Tulane University, New Orleans, Louisiana.

1973 Saving an Early Taino Site in Southwest Puerto Rico. *Revista Interamericana* 3(2):127-134. San Juan.

1974a Dental Morphology and Pathology of the Sowell Mound Population, Bay County, Florida. *American Journal of Physical Anthropology* 41(3):482. Philadelphia.

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1979c *The Prehistoric Cultural Ecology of St. Kitts, West Indies: A Case Study in Island Archeology.* Unpublished Ph.D. dissertation, Department of Anthropology, Arizona State University, Tempe.

1980a The Preservation and Study of Prehistoric Coral and Coral Artifacts (with A.E. Dittert, Jr., E.S. Sipe, and J.P. Collins). *Anthropological Research Papers No. 22,* pp. 246-253. Tempe, Arizona.

1980b Demographic Change and the Crab-Shell Dichotomy. *Proceedings of the Eighth International Congress for the Study of Pre-Columbian Cultures of the Lesser Antilles,* pp. 45-68. Tempe, Arizona.

1980c The Conservation of Shell and Shell Artifacts from Archeological Contexts (with A.E. Dittert, Jr. and E.S. Sipe). *Anthropological Research Papers No. 22,* pp. 218-236. Tempe, Arizona.

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1981a Cultural Resources Survey of the Peabody Coal Terminal, St. Rose Plantation, St. James Parish, Louisiana (with Laura A. Landry). Research report on file, New Orleans District, U.S. Army Corps of Engineers, 69 pp.

1981b Cultural Resource Survey of the Maynard Oil Company Well Site and Access Road, Iberville Parish, Louisiana (with Laura A. Landry and Cyd Heymann). Research report on file, Division of Archeology, Department of Culture, Recreation, and Tourism, Baton Rouge, Louisiana, 37 pp.

1981c Report on Human Skeletal Remains from Ruth Canal, St. Martin Parish, Louisiana. Research report submitted to Sheriff Charles A. Fusilier, The Courthouse, St. Martinville, Louisiana, 35 pp.

1981d Cultural Resources Survey of the Proposed Sewerage System Development Project, East Bank of St. Charles Parish, Louisiana. Research report on file, Division of Archeology, Department of Culture, Recreation, and Tourism, Baton Rouge, Louisiana, 45 pp.

1981e Production Step Measures and Prehistoric Caribbean Ceramics: An Exploratory Study (with Peter F. Thall). *Proceedings of the Ninth International Congress for the Study of Pre-Columbian Cultures of the Lesser Antilles.*

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1982b *Report on the Level II Archeological Survey of Magnolia Plantation, Plaquemines Parish, Louisiana* (with Jill-Karen Yakubik). Submitted to the Division of Archeology, Department of Culture, Recreation, and Tourism, State of Louisiana, Baton Rouge, 118 pp.

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1989ba *Phase I Archeological Survey of the Planned Royersford Main Post Office, Montgomery County, Pennsylvania* (with Thomas W. Neumann and Michelle Moran). Submitted to the United States Postal Service, Facilities Service Center.

1989bb *Architectural Survey of the Planned Royersford Main Post Office, Montgomery County, Pennsylvania* (with Kathryn M. Kuranda and Michelle T. Moran). Submitted to the United States Postal Service, Facilities Service Center.

1989bc *Phase I Archeological Investigation of the Pettebone Farms 88-186 Subdivision, Anne Arundel County, Maryland* (with April M. Fehr, Paul Patterson, Janet Shoemaker, and E. Jeanne Harris). Submitted to Mr. Dennis Hudak, Patten Corporation.

1990a *Phase I Archeological Testing at the New Castle Disposal Site, Lawrence County, Pennsylvania* (with Christopher R. Polglase and Michelle T. Moran). Submitted to Blazosky Associates, Inc.

1990b *A Phase I Archeological Investigation of the Windermere Estates Section 2 Project Area, Anne Arundel County, Maryland* (with Thomas W. Neumann and Martha Williams). Submitted to the Belle Grove Corporation.

1990c *A Phase I Intensive Archeological Investigation of the Proposed Brock Bridge Estates Project Area, Anne Arundel County, Maryland* (with Thomas W. Neumann and Michelle T. Moran). Submitted to Development Facilitators, Inc.

1990d *Detailed Archeological and Architectural Investigations of the Tabard Village Project Area, Cedar Grove Complex (AA-881), and Archeological Site 18AN594, Anne Arundel County, Maryland* (with Thomas W. Neumann, Kathryn M. Kuranda, and Michelle T. Moran). Submitted to Classic Community Corporation.

1990e *A Phase I Intensive Archeological Investigation of the Proposed Waste Water Discharge Pipeline Corridor, C & O Canal National Historic Park, Washington County, Maryland* (with Thomas W. Neumann and Michelle T. Moran). Submitted to W.D. Byron & Sons, Inc./Garden State Tanning, Inc.

1990f *Phase II Archeological Testing of Sites 18CH334, 18CH335, and 18CH336, Charles County Landfill No. 2, Waldorf, Maryland* (with Thomas W. Neumann, Christopher R. Polglase, Martha Williams, and Michelle T. Moran). Submitted to the Interstate General Company, LP.

1990g *A Phase I Intensive Archeological Investigation of the Proposed Ridge Commons Project Area, Anne Arundel County, Maryland* (with Thomas W. Neumann and Michelle T. Moran). Anarex, Inc.

1990h *A Phase I and Phase II Intensive Archeological Investigation of the Proposed Monocacy River Interceptor Sewer Line Corridor, Frederick County, Maryland* (with Thomas W. Neumann and Michelle T. Moran). Submitted to Frederick County, Department of Engineering.

1990i *Phase III Archeological Data Recovery from Sites 18AN685 and 18AN687, Anne Arundel County, Maryland* (with Thomas W. Neumann and Christopher R. Polglase). Submitted to the Russett Center Limited Partnership.

1990j *Phase I and II Archeological Investigations of Bachelor's Hope Farm, St. Mary's County, Maryland* (with Martha Williams, Kathryn M. Kuranda, and Suzanne Sanders). Submitted to Archetype.

1990k *A Phase I Archeological Survey of the Shipley's Choice Area K Commercial Complex Subdivision, Anne Arundel County, Maryland* (with Martha R. Williams and Michelle T. Moran). Submitted to Greenebaum & Rose Associates, Inc.

1990l *Phase I Archeological Survey of the Proposed Water Line for Resource Recovery Facility Dickerson, Maryland* (with Martha R. Williams and Michelle T. Moran). Submitted to ENSR Consulting and Engineering.

1990m *Phase II Archeological Testing of Sites 44FX923 and 44FX924, Fairfax County, Virginia* (with Martha R. Williams and Suzanne Sanders). Submitted to Copper Land Company.

1990n *A Phase I Intensive Archeological Investigation of the Novak Property, Anne Arundel County, Maryland* (with Thomas W. Neumann and Martha R. Williams). Submitted to Brown & Brown Builders, Ltd.

1990o *Archeological and Architectural Reconnaissance of the Suitland Federal Center, Prince Georges County, Maryland* (with Christopher R. Polglase, April Fehr, Michelle Theresa Moran, Janet S. Shoemaker, and Kathryn M. Kuranda). Submitted to Ward/Hall Associates, Inc.

1990p *A Phase I Archeological Investigation of the Chisolm's Choice Subdivision, Glen Burnie, Anne Arundel County, Maryland* (with Martha R. Williams and Michelle T. Moran). Submitted to Development Facilitators, Inc.

1990q *Island Carib Origins: Evidence and Non-Evidence* (with Dave D. Davis). American Antiquity 55:37-48.

1990r *Phase I Archeological Survey of the Proposed Land Proffer from Gettysburg National Military Park to Gettysburg College, Gettysburg, Pennsylvania* (with Christopher R. Polglase, Peter H. Morrison, Michelle T. Moran, and Martha R. Williams). Submitted to Gettysburg College.

1990s *Phase I & II Archeological Investigations in the Shaw and Fourteenth Street Urban Renewal Areas, Washington, D.C.* (with Suzanne L. Sanders and Michelle T. Moran). Submitted to the Government of the District of Columbia.

1990t *Phase I Archeological Investigations of Billingsley Road, U.S. Route 301 to the Charles County Sanitary Landfill No. 2, Waldorf, Maryland*, (with Kathryn M. Kuranda and Michelle T. Moran). Submitted to Whitman, Requardt and Associates.

1990u *Phase I Intensive Archeological Investigations of the Mountain View Subdivision, Anne Arundel County, Maryland* (with Christopher R. Polglase, Martha R. Williams, Peter H. Morrison, and Michelle T. Moran). Submitted to Development Facilitators, Inc.

1990v *Phase III Archeological Data Recovery at Russett Site 8 (18AN666), Anne Arundel County, Maryland* (with Christopher R. Polglase and Thomas W. Neumann). Submitted to Russett Center Limited Partnership.

1990w *Phase II Investigations at the Water Intake Pumphouse Site, Brunswick, Maryland* (with Martha R. Williams and Michelle T. Moran). Submitted to the Town of Brunswick.

1990x *Architectural Survey of the Planned Oakmont Green Development, Carroll County, Maryland* (with Kathryn M. Kuranda, Michelle T. Moran, and Mary Kendall Shipe). Submitted to Oakmont Green Limited Partnership.

1990y *Phase I Archeological Survey and Architectural Investigation of the Proposed 24-Mile BG&E Pipeline, Harford County, Maryland* (with Kathryn M. Kuranda, Martha R. Williams, Mary K. Shipe, and Peter Morrison). Submitted to Biohabitats.

1990z *A Cultural Resource Survey Upper Yazoo Project, Item 3A-2, Mississippi* (with William P. Athens, William A. Morgan, James M. Wojtala, Ralph Draughon, Jr., Susan Barrett Smith, and Jennifer A. Cohen). Submitted to the U.S. Army Corps of Engineers, Vicksburg District.

1990aa *Cultural Resources Investigations of the Citrus Lands Area, New Orleans to Venice Project, Plaquemines Parish, Louisiana* (with William P. Athens, James M. Wojtala, Susan Barrett Smith, Ralph Draughon, Jr., Julie H. McClay, Jennifer A. Cohen, and William A. Morgan). Submitted to the U.S. Army Corps of Engineers, New Orleans District.

1990ab *Cultural Resource Investigations, Jackson Metropolitan Area, Mississippi* (with William P. Athens, Stephen Hinks, Julie McClay, and William A. Morgan). Submitted to the U.S. Army Corps of Engineers, Vicksburg District.

1990ac *Gas System of Cartersville 12-Inch O.D. Diameter Pipeline in Bartow and Floyd Counties, Georgia* (with William P. Athens, James M. Wojtala, Robert J. Hard, William A. Morgan, Julie H. McClay, and Jennifer A. Cohen). Submitted to Southern Natural Gas Company.

1990ad *A Cultural Resources Survey of the Proposed Bayou Sale Loop 20-Inch O.D. Pipeline Project* (with William P. Athens, James M. Wojtala, William A. Morgan, Stephen Hinks, Julie H. McClay, Jennifer A. Cohen, and Robert J. Hard). Submitted to Trunkline Gas Company.

1990ae *Level II Cultural Resources Survey of the 20-Inch O.D. Erath - South Section 28 Pipeline Near Erath, Louisiana* (with William P. Athens, James M. Wojtala, William A. Morgan, Julie H. McClay, and Jennifer A. Cohen). Submitted to Southern Natural Gas Company.

1990af *Literature Search and Research Design, Amite River and Tributaries Project* (with William P. Athens, Stephen Hinks, Lawrence L. Hewitt, and William A. Morgan). Submitted to the U.S. Army Corps of Engineers, New Orleans District.

1990ag *Historical and Archeological Investigations of Fort Bisland and Lower Bayou Teche, St. Mary Parish, Louisiana* (with William P. Athens, Stephen Hinks, Ralph Draughon, Jr., Jennifer A. Cohen, William A. Morgan, Allen R. Saltus, Jr., and Paul V. Heinrich). Submitted to the U.S. Army Corps of Engineers, New Orleans District.

1990ah *Phase I/Phase II Archeological Investigations in Mississippi* (with William P. Athens, James M. Wojtala, April Miller Fehr, Ralph Draughon, Jr., Julie H. McClay, Jennifer A. Cohen, Paul V. Heinrich, and William A. Morgan). Submitted to Texas Eastern Gas Pipeline Company, Houston, Texas.

1990ai *A Cultural Resource Survey of Portions of the Slidell Levee Protection Project, St. Tammany Parish, Louisiana* (with William P. Athens, Stephen Hinks, William A. Morgan, Susan Barrett Smith, Ralph Draughon, Jr., and Jennifer Cohen). Submitted to the U.S. Army Corps of Engineers, Vicksburg District.

1990aj *Level II Cultural Resources Survey of an Approximately 15 Acre Borrow Area Located at 16140 Chef Menteur Highway, New Orleans, Louisiana* (with William P. Athens, Stephen Hinks, and Susan Barrett Smith). Submitted to River Road Construction, Inc., Mandeville, Louisiana.

1990ak *Evaluation of Magnetic Anomalies Located in Lower Bayou Teche, St. Mary Parish, Louisiana* (with William P. Athens and Allen R. Saltus, Jr.). Submitted to the U.S. Army Corps of Engineers, New Orleans District.

1990al *A Phase I Archeological Investigation of the Chisolm Choice Subdivision, Glen Burnie, Anne Arundel County, Maryland* (Principal Investigator; Martha R. Williams and Michelle T. Moran. Prepared for Development Facilitators, Inc.

1990am *Phase I Intensive Archeological Survey of the Runway 15L and Runway 33R Improvement Areas, Baltimore/Washington International Airport, Anne Arundel County, Maryland* (with Thomas W. Neumann). Submitted to Kibler Construction.

1990an *Phase II Intensive Survey of Historic and Prehistoric Archeological Components at the Packer Site (36CN7A), Clinton County, Pennsylvania* (with Jennifer A. Cohen, Thomas W. Neumann, and Stephen Hinks). Draft report. Submitted to Baltimore District, U.S. Army Corps of Engineers.

1991a *Preliminary Archeological Reconnaissance of the Folly Branch SWM Facility, Prince Georges County, Maryland* (with Martha R. Williams, Michelle T. Moran, and Christopher R. Polglase). Submitted to Engineering Technologies Associates, Inc.

1991b *Archeological Survey and Architectural Investigation of the Proposed 7-Mile BG&E Dublin Extension Pipeline, Harford County, Maryland* (with Kathryn M. Kuranda, Michelle Moran, Mary K. Shipe, and Martha R. Williams). Submitted to Biohabitats.

1991c *Phase I Archeological Survey and Architectural Investigation of the Proposed 24-Mile BG&E Pipeline, Harford County, Maryland* (with Kathryn M. Kuranda, Martha R. Williams, Mary K. Shipe, and Peter Morrison). Submitted to Biohabitats.

1991d *Phase I Intensive Archeological Investigations of the Proposed Cattail Creek Country Club, Oakland, Howard County, Maryland* (with Suzanne L. Sanders and Michelle T. Moran). Submitted to Cattail Creek Country Club.

1991e *Historical and Archeological Investigations of the Planned Washington National Airport Surveillance Radar Facility Site, Washington, D.C.* (with Christopher R. Polglase and Martha R. Williams, with contributions by Lawrence Hewitt). Submitted to City of Manassas Park.

1991f *Phase II and IIIA Archeological Investigations of the Signal Hill and Bobby Tracts, Prince William County, Virginia; Volume 1: The Non-Military Sites* (with Suzanne L. Sanders and Martha Williams, with contributions by Lawrence Hewitt). Submitted to City of Manassas Park.

1991g *Phase II and IIIA Archeological Investigations of the Signal Hill and Bobby Tracts, Prince William County, Virginia; Volume II: The Military Sites* (with Suzanne L. Sanders and Martha Williams, with contributions by Lawrence Hewitt). Submitted to City of Manassas Park.

1991h *Overview, Inventory, and Assessment of Cultural Resources in the Louisiana Coastal Zone* (with William P. Athens, Paul Heinrich, and Stephen Hinks). Submitted to Coastal Management Division, Department of Natural Resources.

1991i *A Cultural Resource Survey Upper Yazoo Project, Item 3A-2, Leflore and Holmes Counties, Mississippi* (with William P. Athens, Stephen Hinks, William A. Morgan, April M. Fehr, Ralph Draughon, Jr., Julie H. McClay, Susan Barrett Smith, Jennifer A. Cohen, and Robert Hard). Submitted to the U.S. Army Corps of Engineers, Vicksburg District.

1991j *Survey and Testing of Three Items on the Red River in Pools 4 and 5 Red River Waterway, Louisiana* (with William P. Athens, Paul Henrich, James M. Wojtala, Ralph Draughon, Jr., Susan Barrett Smith, Allen R. Saltus, Jr., and William Morgan). Submitted to the U.S. Army Corps of Engineers, Vicksburg District.

1991k *Cultural Resources Investigations of Larose to Golden Meadow Hurricane Protection Project Levee Section D, Lafourche Parish, Louisiana* (with William P. Athens, Stephen Hinks, Ralph Draughon, Jr., Paul V. Heinrich, Susan Barrett Smith, and Jennifer A. Cohen). Submitted to the U.S. Army Corps of Engineers, New Orleans District.

1991l *A Cultural Resource Survey Brown Bend Realignment and Slay Bend Revetment, Red River Waterway, Arkansas* (with William P. Athens, James M. Wojtala, Julie H. McClay, Teresa L. Paglione, William A. Morgan, Jennifer A. Cohen, and James Allen Green, Jr.). Submitted to the U.S. Army Corps of Engineers, Vicksburg District.

1991m *A Cultural Resource Survey Howard Realignment and Williams Downstream Revetment, Red River Waterway, Louisiana* (with William P. Athens, James M. Wojtala, Julie H. McClay, William A. Morgan, and Jennifer A. Cohen). Submitted to the U.S. Army Corps of Engineers, Vicksburg District.

1991n *A Cultural Resource Survey of the Proposed ConAgra Broiler Company Facility, Union Parish, Louisiana* (with William P. Athens, Stephen Hinks, Susan Barrett Smith, Paul Heinrich, and Jennifer A. Cohen). Submitted to The Honorable Mayor J. Carlton White.

1991o *Phase I Archeological Survey of the Riddle Tract, Anne Arundel County, Maryland* (with Peter H. Morrison, Michelle T. Moran, and Christopher R. Polglase). Submitted to Reds Dove, Inc.

1991p *Phase I Archeological Investigations of the Traville Development Corporation (CENAB-OP-RS, 90-00132-5), Willows of Potomac Shady Grove Road Club (CENAB-OP-RX, 91-0048-9), and Traville Partnership (CENAB-OP-RP, 91-00713-5) Properties, Montgomery County, Maryland* (with Suzanne L. Sanders and Michelle T. Moran). Submitted to Traville Development Corporation, Shady Grove Road Club, and Traville Partnership.

1991q *Phase I Archeological Survey of the AES/Warrior Run Cogeneration Facility, Allegany County, Maryland* (with Thomas W. Neumann, and Martha R. Williams, with contributions by Christopher R. Polglase). Submitted to AES/Warrior Run Inc.

1991r *Phase IB Archeological Investigations of a Proposed 230-kV Transmission Line and Construction Access Road, Clover Power Generation Plant, Halifax County, Virginia* (with Thomas W. Neumann and Martha R. Williams). Submitted to Old Dominion Electric Cooperative.

1991s La edad ceramista en las Antillas Menores, in Marcio Veloz M., Ed. *Panorama Historico del Caribe Precolombino*, Banco Central de la Republica Dominicana

1991t *Archeological Inventory and Testing of the Monocacy - Mount Airy 230 kV Transmission Line, the 230 kV Eaglehead Loop, and the Eaglehead 230 kV Substation, Frederick County, Maryland* (Principal Investigator; Suzanne L. Sanders, Michelle T. Moran, Thomas W. Neumann, and Christopher R. Polglase). Prepared for Allegheny Power System.

1991u *Phase I and II Intensive Archeological Investigations of the James Drane House, Accident, Garrett County, Maryland* (Principal Investigator; Suzanne L. Sanders, April L. Fehr, and Michelle T. Moran). Prepared for the Town of Accident.

1991v *Phase IA Historical Background Study and Phase IB Archeological Investigations of the Maryland Library for the Blind and Physically Handicapped, Baltimore, Maryland* (Principal Investigator; Martha R. Williams). Prepared for Ayers Saint Gross.

1991w *Phase I Archeological Investigation of the Carr's Grant Subdivision, Anne Arundel County, Maryland* (Principal Investigator; Christopher R. Polglase, Michelle T. Moran, and Martha R. Williams). Submitted to Anchor Capital Group, Inc.

1991x *Historical and Architectural Investigations of the Humphrey Wolfe Farm, Howard County, Maryland* (Principal Investigator; Kathryn M. Kuranda and Michelle T. Moran). Prepared for Cattail Creek Country Club.

1991y *Combined Phase I and Phase II Archeological Investigations of Centre 9500, Howard County, Maryland* (Principal Investigator; Suzanne L. Sanders and Michelle T. Moran). Prepared for Land Design Engineering, Inc.

1991z *A Phase I Intensive Archeological Investigation of the Degrange Project Area, Anne Arundel County, Maryland* (Principal Investigator; Martha R. Williams). Prepared for Brenton & Associates, Inc.

1991aa *Cultural Resources Management Plan and Maintenance, Rehabilitation, and Repair Guidelines for Fort Detrick, Maryland* (Principal Investigator; Deborah K. Cannan, Christopher R. Polglase, John Mintz, William Henry, and Estella K. Bryans-Munson). Prepared for the U.S. Army Corps of Engineers, Baltimore District.

1991ab *A Study of Secondary Impacts to Historic Resources Resulting from Construction of the Proposed Montgomery County Resource Recovery Facility, Dickerson, Maryland* (with Kathryn M. Kuranda and Michelle T. Moran). Submitted to ENSR Consulting and Engineering.

1991ac *Phases I and II Archeological Investigations of the Frederick Municipal Golf Course, Frederick County, Maryland* (with Thomas W. Neumann and Michelle T. Moran, with contributions by Kathryn M. Kuranda). Submitted to City of Frederick, Maryland.

1991ad *Phase I Archeological Investigations of the Percon Property - Waverly Development, Howard County, Maryland* (with Thomas W. Neumann, Michelle T. Moran, and Christopher R. Poglase). Submitted to GTW Joint Venture.

1991ae *Phase I and II Archeological Investigations of Sites 18AN779 and 18AN780, Heather Heights Subdivision, Anne Arundel County, Maryland* (with Thomas W. Neumann, Martha R. Williams, and Michelle T. Moran). Submitted to Maryland Community Developers.

1991af *Phase I Intensive Archeological Investigations of the Ice House Square, Gettysburg, Adams County, Pennsylvania* (with Suzanne L. Sanders, Ralph Draughon, Jr., and Michelle T. Moran). Prepared for Historic Properties of Gettysburg, Inc.

1991ag *Architectural History Investigations of the Washington National Airport Surveillance Radar Facility, Washington, D.C.* (with Kathryn M. Kuranda and Michelle T. Moran). Submitted to Information Systems and Network Corporation.

1991ah *Phase II Archeological Investigations of 18PR377, Barnes Farm, Prince Georges County, Maryland* (with Suzanne L. Sanders, Ralph Draughon, Michelle T. Moran, Christopher R. Polglase, and Cynthia A. Whitley). Prepared for U.S. Army Corps of Engineers, Baltimore District).

1991ai *Phase II Archeological Investigations of Sites 18CR18 and 18CR196, London Square Business Park, Carroll County, Maryland* (Principal Investigator; Christopher R. Polglase). Prepared for London Square Partnership.

1991aj *Phase I Archeological Survey of the Proposed Corbalis Water Treatment Plant to Loudoun County Line 36" Water Main Alignment, Fairfax County, Virginia* (Principal Investigator; Martha R. Williams). Submitted to Loudoun County Sanitation Authority.

1991ak *Phase I Archeological Investigations of Oakmont Green, Carroll County, Maryland* (with Suzanne L. Sanders and Mary Shipe). Prepared for Oakmont Green Limited Partnership.

1991al *Phase I Archeological Investigations and Architectural Reconnaissance Survey of the BG&E Utility Corridor from Herald Harbor Road to Maryland Route 3, Anne Arundel County, Maryland* (with Christopher R. Polglase, William R. Henry, Kathryn M. Kuranda, and Michelle T. Moran). Prepared for Baltimore Gas & Electric Company.

1991am *Suitland Federal Center Historic Preservation Compliance Sectino 110 and 106 Compliance, Prince George's County, Maryland* (with Kathryn M. Kuranda, Michelle T. Moran, and Deborah Cannan). Submitted to Ward/Hall Associates, AIA.

1991an *Archeological Investigations at the Third Haven Meeting House (18TA241), Talbot County, Maryland* (with Thomas W. Neumann and Martha R. Williams). Prepared for Third Haven Friends Meeting.

1991ao *Phase I Archeological Survey of the Proposed Expanion, Wildewood Planned Unit Development, St. Mary's County, Maryland* (Principal Investigator; Pamela Crane and Martha Williams). Prepared for Paragon Builders, Inc.

1991ap *Phase II Archeological Investigations within the Wyoming Valley Local Flood Protection Study Area, Susquehanna River Valley, Luzerne County, Pennsylvania* (with Gary D. Shaffer, April M. Fehr, and Michelle Moran). Submitted to Baltimore District, U.S. Army Corps of Engineers.

1991aq *Phase I Archeological Investigation at the Meadows, Baltimore County, Maryland*, (with Kathryn M. Kuranda and Suzanne L. Sanders). Submitted to The Macks Group.

1992a *Phase I and Phase II Archeological and Architectural Investigations for the Proposed Site of the William H. Natcher Building, National Institutes of Health, Bethesda, Maryland* (with Kathryn M. Kuranda and Suzanne L. Sanders). Prepared for AEPA Architects Engineers.

1992b *Phase II Archeological Evaluation of Site 46RD142, Randolph County, West Virginia* (with Thomas W. Davis and Thomas W. Neumann). Submitted to the U.S. Army Corps of Engineers, Baltimore District).

1992c *Supplemental Archeological Investigations of Lower Bayou Teche, St. Mary Parish, Louisiana* (with William P. Athens, Stephen Hinks, Ralph Draughon, Susan Barrett Smith, Jennifer A. Cohen, and Paul Heinrich). Submitted to the U.S. Army Corps of Engineers, New Orleans District.

1992d *Cultural Resources Investigations for the Westbank Hurricane Protection Project, Plaquemines and Jefferson Parishes, Louisiana* (with William P. Athens, Stephen Hinks, Ralph Draughon, Susan Barrett Smith, Jennifer A. Cohen, and Paul Heinrich). Submitted to the U.S. Army Corps of Engineers, New Orleans District.

1992e *Cultural Resource Survey and Testing of Eight Items on the Red River in Pool 5, Red River Waterway, Louisiana* (Stephen Hinks, Ralph Draughon, Susan Barrett Smith, Jennifer A. Cohen, and Paul Heinrich). Draft in progress by R. Christopher Goodwin & Associates, Inc. to be submitted to the U.S. Army Corps of Engineers, Vicksburg District.

1992f *Historical and Archeological Investigations of Fort Bisland and Lower Bayou Teche, St. Mary Parish, Louisiana* (with William P. Athens, Stephen Hinks, Ralph Draughon, Jennifer A. Cohen, William A. Morgan, Allen R. Saltus, Jr., and Paul V. Heinrich). Submitted to the U.S. Army Corps of Engineers, New Orleans District.

1992g *Southern Natural Gas 1992 Pipeline Replacement Program 14" O.D. Logansport Line - Logansport District, DeSoto Parish, Louisiana* (with William P. Athens, David Courington, Paul V. Heinrich, and Julie McClay). Submitted to Southern Natural Gas, Birmingham, Alabama.

1992h *Southern Natural Gas 1992 Pipeline Replacement Program 14" O.D. Logansport Line - Logansport District, Shelby County, Texas* (with William P. Athens, David Courington, Paul V. Heinrich, and Julie McClay). Submitted to Southern Natural Gas, Birmingham, Alabama.

1992i *Archeological Testing of Site 16EBR80, East Baton Rouge Parish, Louisiana* (with William P. Athens, Stephen Hinks, Susan Barrett Smith, and Jennifer A. Cohen). Submitted to the United States Postal Service, Memphis, Tennessee.

1992j *Archeological Survey of a Planned Postal Facility Parcel, Mandeville, St. Tammany Parish, Louisiana* (with William P. Athens, Stephen Hinks, Susan Barrett Smith, and Jennifer A. Cohen). Submitted to the U.S. Postal Service, Memphis, Tennessee.

1992k *Archeological Survey of Gillis W. Long Hansen's Disease Center, Iberville Parish, Louisiana* (with William P. Athens, Stephen Hinks, Ralph Draughon, Jr., and Jennifer A. Cohen). Submitted to the Department of Health and Human Services, Gillis W. Long Hansen's Disease Center, Carville, Louisiana.

1992l *Cultural Resource Survey and Testing of the East Jefferson Parish Levee Gap Closure, Jefferson Parish, Louisiana* (with William P. Athens, Stephen Hinks, Susan Barrett Smith, and Jennifer Cohen). Submitted to the U.S. Army Corps of Engineers, New Orleans District.

1992m *Cultural Resources Investigations of Larose to Golden Meadow Hurricane Protection Project Levee Section D, Lafourche Parish, Louisiana* (with William P. Athens, Stephen Hinks, Paul V. Heinrich, and Susan Barrett Smith). Submitted to the U.S. Army Corps of Engineers, New Orleans District.

1992n *Phase I/Level II Cultural Resource Survey of an Approximately 22.2 Acre Borrow Area Located South of Chef Menteur Highway, Orleans Parish, Louisiana* (with William P. Athens, Stephen Hinks, and Susan Barrett Smith). Submitted to Logistics Services International, Metairie, Louisiana.

1992o *Battery No. 3 and Parapet Excavations, the Chalmette Unit, Jean Lafitte National Historical Park, St. Bernard Parish, Louisiana* (with William P. Athens, Stephen Hinks, Ralph Draughon, Jr., and Jennifer A. Cohen). Submitted to the National Park Service, Santa Fe, New Mexico.

1992p *Phase I Cultural Resources Investigation of the Florida Gas Transmission Company Proposed Phase III Expansion West Leg Mainline Extension Natural Gas Pipeline Corridor* (with William P. Athens, Paul V. Heinrich, and Julie McClay). Submitted to Enron Gas Pipeline Operating Company.

1992q *Phase I Cultural Resources Investigation of the Florida Portion of the Florida Gas Transmission Company Proposed Phase III Expansion Natural Gas Pipeline Corridor* (with William P. Athens, Paul V. Heinrich, and Julie McClay). Submitted to Enron Gas Pipeline Operating Company.

1992r *Phase I Cultural Resources Investigation of the Florida Gas Transmission Company Proposed Phase III Expansion, Orlando Loop Natural Gas Pipeline Corridor* (with William P. Athens, Paul V. Heinrich, and Julie McClay). Submitted to Enron Gas Pipeline Operating Company.

1992s *Phase I Cultural Resources Investigation of the Florida Gas Transmission Company Proposed Phase III Expansion, Sarasota Loop Natural Gas Pipeline Corridor* (with William P. Athens, Paul V. Heinrich, and Ralph Draughon, Jr.). Submitted to Enron Gas Pipeline Operating Company.

1992t *Phase I Cultural Resources Investigation of the Florida Gas Transmission Company Proposed Phase III Expansion, St. Petersburg Loop Natural Gas Pipeline Corridor* (with William P. Athens, Paul V. Heinrich, and Ralph Draughon, Jr.). Submitted to Enron Gas Pipeline Operating Company.

1992u *Phase I Cultural Resources Investigation of the Mississippi Portion of the Florida Gas Transmission Company Proposed Phase III Expansion Natural Gas Pipeline Corridor* (with William P. Athens, Paul V. Heinrich, and Julie McClay). Submitted to Enron Gas Pipeline Operating Company.

1992v *Phase I Cultural Resources Investigation of the Alabama Portion of the Florida Gas Transmission Company Proposed Phase III Expansion Natural Gas Pipeline Corridor* (with William P. Athens, Paul V. Heinrich, and Julie McClay). Submitted to Enron Gas Pipeline Operating Company.

1992w *Phase I Cultural Resources Investigation of the Louisiana Portion of the Florida Gas Transmission Company Proposed Phase III Expansion Natural Gas Pipeline Corridor* (with William P. Athens, Paul V. Heinrich, and Susan Barrett Smith). Submitted to Enron Gas Pipeline Operating Company.

1992x *A Cultural Resource Survey, Preliminary Areas, Lake George Mitigation, Yazoo Basin, Yazoo County, Mississippi* (with William P. Athens, Jennifer Cohen, Paul V. Heinrich, Susan Barrett Smith, Steve Hinks, and James Wojtala). Submitted to the U.S. Army Corps of Engineers, Vicksburg District.

1992y *Architectural and Archeological Investigations in and adjacent to the Bywater Historic District, New Orleans, Louisiana* (with William P. Athens, Stephen Hinks, Jack B. Irion, Kathryn M. Kuranda, Ralph Draughon, Jr., and Paul V. Heinrich). Submitted to the U.S. Army Corps of Engineers, New Orleans District.

1992z *Cultural Resource Investigations Upper Yazoo Project, Greenwood to Darling, Mississippi* (with William P. Athens and Stephen Hinks). Submitted to the U.S. Army Corps of Engineers, Vicksburg District.

1992aa *Cultural Resources Investigations of Larose to Golden Meadow Hurricane Protection Project Levee Section D-North (Compromise Alignment), Lafourche Parish, Louisiana* (with William P. Athens, Stephen Hinks, Susan Barrett Smith, and Paul V. Heinrich). Submitted to the U.S. Army Corps of Engineers, New Orleans District.

1992ab *Supplemental Archeological Investigations at the Gillis W. Long Hansen's Disease Center, Iberville Parish, Louisiana* (with William P. Athens, Stephen Hinks, and Jennifer A. Cohen). Submitted to Department of Health and Human Services, Gillis W. Long Hansen's Disease Center, Carville, Louisiana.

1992ac *Phase I Cultural Resources Investigation of Various Items along the St. Petersburg - Sarasota Connector Lateral and Phase II Testing and Evaluation of the Big Cowhuna Site (8HI4039), Hillsborough County, Florida* (with William P. Athens, Bradley M. Mueller, Floyd B. Largent, Jennifer Cohen, Paul Heinrich, Thomas Neumann, and Susan Barrett Smith). Submitted to Enron Gas Operating Company, Houston, Texas.

1992ad *Phase I Cultural Resources Investigation of the Florida Gas Transmission Company Proposed Phase III Expansion, Customer Facilities Natural Gas Pipeline Corridor* (with William P. Athens, Bradley Mueller, and Floyd B. Largent, Jr.). Submitted to Enron Gas Pipeline Operating Company.

1992ae *Phase I Cultural Resources Investigation of the Florida Gas Transmission Company Proposed Phase III Expansion, West Leg Extension Natural Gas Pipeline Corridor* (with William P. Athens, Bradley Mueller, and Floyd B. Largent, Jr.). Submitted to Enron Gas Pipeline Operating Company.

1992af *Phase I Cultural Resources Investigation of the Florida Gas Transmission Company Proposed Phase III Expansion, Mainline Loop South Natural Gas Pipeline Corridor* (with William P. Athens, Bradley Mueller, and Floyd B. Largent, Jr.). Submitted to Enron Gas Pipeline Operating Company.

1992ag *Phase IB Terrestrial and Underwater Archeological Investigations of the Proposed Cogentrix Coal-Fired Power Plant, Mayaguez, Puerto Rico* (with Suzanne L. Sanders, Jack B. Irion, and Martha R. Williams). Submitted to ENSR Consulting and Engineering.

1992ah *Phase I Cultural Resource Investigations of the Lake Shore Athletic Complex, Anne Arundel County, Maryland* (with Christopher R. Polglase, Pamela Crane, and Hugh McAloon). Submitted to Anne Arundel County, Maryland.

1992ai *Cultural Resource Reconnaissance and Sensitivity Study for the C & D Canal Feasibility Study, Chesapeake Bay and Delaware River* (with Christopher R. Polglase, Kathryn M. Kuranda, Michelle T. Moran, Peter H. Morrison, Katherine E. Grandine, and Thomas W. Neumann). Submitted to the Maryland Port Administration.

1992aj *Phase I Archeological Investigations of Parcel 4 of the Sandy Hill Creative Disposal Project Expansion, Prince George's County, Maryland* (with Suzanne L. Sanders, Pamela Crane, Estella Bryans-Munson, and Cynthia Whitley). Submitted to Loiderman Associates, Inc.

1992ak *Phase II Archeological Investigations of Three Shipwreck Sites in the Baltimore Harbor and Channels Federal Navigation 50 ft. Project, Chesapeake Bay, Maryland and Virginia* (Principal Investigator; Peter H. Morrison, Stephen R. James, and Michael Pohoski). Prepared for the U.S. Army Corps of Engineers, Baltimore District.

1992al *Phase I Archival and Archeological Investigations of the Proposed Courts of Belle Pointe Subdivision, Anne Arundel County, Maryland* (Principal Investigator; John J. Mintz, Katherine Grandine, and Justine Woodard). Submitted to New England Developers, Inc.

1992am *Phase I Archeological Investigation of the Proposed Alternate 4 ("East") Gunston Road Extension, Fort Belvoir, Fairfax County, Virginia* (Principal Investigator; Martha R. Williams).

1992an *Phase I Archeological Survey of the Colonial Beach Wastewater Treatment Facility, Westmoreland County, Virginia* (Principal Investigator; Thomas W. Neumann, Martha R. Williams, Justine Woodard, and Colby Child). Prepared for U.S. Environmental Protection Agency and Virginia State Water Control Board. Submitted to Patton Harris, Rust & Associates.

1992ao *Phase IA Investigations of the Proposed Dalecarlia to Chain Bridge Water Supply Main Project, Washington, D.C., and Montgomery County, Maryland* (Principal Investigator; Martha R. Williams and Suzanne L. Sanders). Prepared for Gannett Fleming, Inc.

1992ap *Phase I Archeological Investigations of the Proposed Gallatin Woods Subdivision, Anne Arundel County, Maryland* (with Thomas W. Neumann and Michelle T. Moran). Submitted to Adventures in Home Building, LTD, c/o Anarex, Inc.

1992aq *Phase IA Reconnaissance of the Proposed Harwood's Mill Raw Water Pipeline in James City County, York County and the City of Newport News, Virginia* (Principal Investigator; Suzanne L. Sanders and Michelle T. Moran). Prepared for Gannett Fleming, Inc.

1992ar *Phase II Archeological Evaluation of Site 44YO163, Newport News City Park, Virginia* (Principal Investigator; Thomas W. Davis, Leo Hirrel, and Christopher R. Polglase). Prepared for the U.S. Army Corps of Engineers, Norfolk District, submitted to Gannett Fleming, Inc.

1992as *Phase III Archeological Data Recovery of Site 18FR55, Frederick County, Maryland* (Principal Investigation; Thomas W. Neumann). Submitted to Frederick County Division of Public Works.

1992at *Phase I Archival and Archeological Investigations of the Proposed New Market 230 kV Loop Transmission Line and the New Market Substation and Access Road, Frederick County, Maryland* (with John J. Mintz, Pamela Crane, and Hugh B. McAloon). Prepared for Allegheny Power System.

1992au *Phase I Archeological Investigations of Portions of the Proposed Nicholson's Manor Subdivision, Baltimore County, Maryland* (Principal Investigator; Suzanne L. Sanders, Michael A. Simons, and Katherine E. Grandine). Prepared for McKee and Associates, Inc.

1992av *Phase I Architectural and Archeological Investigations of the Original and Realigned BG&E Perryman to Sharon Gate and James Run Pipeline Corridors, Harford County, Maryland* (with Kathryn N. Kuranda, Michelle T. Moran, Mary K. Shipe, and Martha R. Williams). Prepared for Biohabitats.

1992aw *Archeological and Architectural Survey of the Potomac Palisades, Arlington County, Virginia* (Principal Investigator; Martha R. Williams, Deborah K. Cannan, Christopher R. Polglase, Pamela Crane, and Thomas W. Neumann). Prepared for Arlington County Department of Community Planning, Housing and Development.

1992ax *Phase IA Reconnaissance and Historical Background Study of the Proposed Prince William County Service Authority Western Zone Water Transmission Line* (Principal Investigator; Thomas W. Davis and Martha R. Williams). Prepared for Gannett Fleming, Inc.

1992ay *Architectural Investigations of a Portion of Camp Shelby, Mississipppi* (Principal Investigator; Kathryn M. Kuranda and Leo P. Hirrel).

1992az *Historical and Architectural Investigations of the Shipley House, Howard County, Maryland* (Principal Investigator; Deborah Cannan, Tom Dod, and Hugh McAloon). Prepared for J. Christopher Batten, Inc.

1992ba *Phase I Archeological Survey of the Texaco Well Test Site, Charles County, Maryland* (Principal Investigator; John Mintz and Hugh McAloon). Prepared for Texaco USA.

1992bb *Archeological and Historical Investigations of the South Road Area, Sully Historic Site, Fairfax County, Virginia* (with Suzanne L. Sanders, Cynthia A. Whitley, Martha R. Williams, and with contributions by Pamela Crane). Submitted to the Fairfax County Park Authority.

1992bc *Archeological and Architectural Investigations at Camden Yards, Baltimore, Maryland* (with Kathryn M. Kuranda, Elizabeth Pena, Martha R. Williams, Suzanne M. Sanders, and with a contribution by David B. Landon). Submitted to the Maryland Stadium Authority.

1993a *Phase II/III Archeological Investigations at the Garman Site (18AN486), Woodside Ridge Subdivision, Anne Arundel County, Maryland* (Christopher R. Polglase, Thomas W. Neumann, and Peter Morrison).

1993b *Archival and Architectural Investigations of the Mississippi Basin Model, Clinton, Mississippi* (Principal Investigator; Kathryn M. Kuranda, Martha Williams, and Bethany Usher). Prepared for the U.S. Army Corps of Engineers, Vicksburg District.

1993c *Conditions Analyses and Preservation Treatment Recommendations for Historic Brick Buildings at Aberdeen Proving Ground* (Principal Investigator; Brooke V. Best and Kathryn M. Kuranda). Prepared for the U.S. Army Corps of Engineers, Baltimore District.

1993d *Historical and Archeological Investigations for the Proposed U.S. Army Materiel Command Army Research Laboratory, Aberdeen Proving Ground, Maryland* (Principal Investigator; John J. Mintz, Michelle T. Moran, Alice Crampton, and Thomas W. Davis). Prepared for the U.S. Army Corps of Engineers, Baltimore District.

1993e *Phase I and II Archeological Investigations at Benjamin Banneker Historical Park, Baltimore County, Maryland* (Principal Investigator; Suzanne L. Sanders, Michelle T. Moran, Martha R. Williams, Michael A. Simons, and Justine Woodard). Prepared for Baltimore County, Office of Central Services.

1993f *Phase I Archeological Survey of the Beards Creek Estates Subdivision, Anne Arundel County, Maryland* (Principal Investigator; John J. Mintz, Michelle T. Moran, Colby A. Child, Thomas W. Davis, and Christopher R. Polglase). Prepared for Mandrin Construction Company, Inc.

1993g *Cultural Resource Investigation Brown's Battery Breaking Site Berks County, Pennsylvania* (Principal Investigator; Thomas W. Davis, John J. Mintz, Leo Hirrel, Hugh B. McAloon, Christopher R. Polglase, and Kathryn M. Kuranda). Prepared under Contract to U.S. Army Corps of Engineers, Baltimore District.

1993h *Phase II Archeological Evaluations of Sites 18CV61 and 18CV62, Calvert County, Maryland* (Principal Investigator; Thomas W. Davis, Leo Hirrell, Thomas W. Neumann, Timothy Silva, Kathleen Federline, Justine Woodard, and Christopher R. Polglase). Prepared for Baltimore Gas & Electric Co.

1993i *Phase IB Archeological Investigations of the Proposed Dalecarlia Reservoir to Chain Bridge Water Supply Main, Washington, D.C., and Montgomery County, Maryland* (Principal Investigator; John J. Mintz, Justine Woodard, Martha Williams, and Suzanne L. Sanders). Submitted to Gannett Fleming, Inc.

1993j *Phase II/III Archeological Investigations of the Gott's Court Parking Facility, Annapolis, Maryland* (with Suzanne L. C. Sanders, Michelle T. Moran, and David Landon). Submitted to the City of Annapolis.

1993k *Phase I Investigations of Segment "O" of the Harwood's Mill Raw Water Pipeline, York County, Virginia* (Principal Investigator; Colby A. Child, Thomas W. Davis, and Suzanne L. Sanders). Prepared for the U.S. Army Corps of Engineers, Norfolk District, submitted to Gannett Fleming, Inc.

1993l *Phase I and Phase II Archeological Investigations for the Villages of Lyonsfield Run, Baltimore County, Maryland* (Principal Investigator; Jeffrey H. Maymon, Michael A. Simons, Christopher R. Polglase, and Hugh B. McAloon). Prepared for Westinghouse Credit Corporation.

1993m *Cultural Resource Management Plan for Morgantown Energy Technology Center* (Principal Investigation; Christopher R. Polglase, Michelle T. Moran, Thomas W. Davis, Hugh McAloon, and Timothy Silva). Submitted to Department of Energy, Morgantown, West Virginia.

1993n *Phase I Archeological Investigations for Proposed Vegetation Maintenance/Management Areas and a Proposed Wetlands Restoration Project, Naval Air Station Oceana, Virginia Beach, Virginia* (Principal Investigator; Thomas W. Davis, William T. Dod, and John J. Mintz). Submitted to Atlantic Division, Naval Facilities Engineering Command.

1993o *Phase I Archeological Investigations of Portions of Pemberton Historical Park Wicomico County, Maryland* (Principal Investigator; Suzanne L. Sanders and Michelle T. Moran). Submitted to Wicomico County, Department of Recreation and Parks.

1993p *Phase I Archeological Survey of the Parker's Creek Road Materials Storage Yard for the Proposed Baltimore Gas & Electric Company Calvert Cliffs Nuclear Power Station to Chalk Point Power Station 500 kV Transmission Line Corridor, Calvert County and Prince George's County, Maryland* (Principal Investigator; Thomas W. Davis and Michael Simons). Submitted to Black & Veatch.

1993q *Phase I Investigations of the Russett Board of Education Property, Anne Arundel County, Maryland* (Principal Investigator; Thomas W. Davis, Michelle T. Moran, and Colby A. Child). Prepared for Curtis F. Peterson, Inc.

1993r *Phase III Archeological Data Recovery at Russett Site 5 (18AN665), Anne Arundel County, Maryland* (Principal Investigator; Christopher R. Polglase, Jeffrey H. Maymon, Kathleen Child, and S. Justine Woodard). Prepared for Russett Center Limited Partnership.

1994a *Phase I Archeological Survey of the Proposed AES/Warrior Run Power Line Right-of-Way to the Town of Ridgeley, Mineral County, West Virginia* (Principal Investigator; Michael B. Hornum, W. Patrick Giglio, and Henry W. Measells, IV). Submitted to AES/Warrior Run, Inc.

1994b *Phase IA Archeological Investigations at Poplar Island, Talbot County, Maryland* (Principal Investigator; John J. Mintz, Martha R. Williams, Patrick R. Jennings, and S. Justine Woodard).

1994c *Phase I Archeological Survey for the Proposed Sagamore Run Subdivision, Anne Arundel County, Maryland* (Principal Investigator; Lance K. Trask, W. Patrick Giglio, and Michael B. Hornum). Prepared for G. W. Koch & Associates, Inc.

1994d *Archeological Resources Overview, Norfolk Naval Shipyard, Portsmouth, Virginia* (Principal Investigator; Martha R. Williams). Prepared for the Atlantic Division, Naval Facilities Engineering Command.

1994e *Phase I/II Archeological Investigations for the Proposed Baltimore Convention Center Expansion, Baltimore, Maryland* (Principal Investigator; Suzanne L. Sanders and Martha R. Williams). Prepared for the Maryland Stadium Authority.

1994f *Phase I Archeological Survey and Architectural Investigations of the Proposed Delmarva Power & Light Company Easton-Steele 138 kV Transmission Line, Maryland* (Principal Investigator; Michael A. Simons, Geoffrey E. Melhuish, W. Thomas Dod, Kathryn M. Kuranda, and Christopher R. Polglase). Prepared for Delmarva Power & Light Company.

1994g *Phase II Archeological Investigations of the Proposed ASR-9 Radar Facility, Anacostia, Washington, D.C., S.E.* (Principal Investigator; Suzanne L. Sanders, Martha R. Williams, Donald J. Maher, and Michael A. Simons). Prepared for Information Systems & Networks Corporation.

1994h *Historic American Buildings Survey: 120 East South Street (Garage) and 122 East South Street (House)* Principal Investigator; W. Patrick Giglio and Deborah K. Cannan). Submitted to Way Station, Inc.

1994i *Cultural Resources Investigations at the Defense Information School (DINFOS) (Formerly Defense Media School), Fort George G. Meade, Anne Arundel County, Maryland* (Principal Investigator; Martha R. Williams and Hugh B. McAloon). Prepared for the U.S. Army Corps of Engineers, Baltimore District.

1994j *Fort George G. Meade, Cultural Resource Management Plan* (Principal Investigator; Hugh B. McAloon, John J. Mintz, Martha R. Williams, William T. Dod, Kathleen F. Child, Leo P. Hirrel, and Kathryn M. Kuranda). Prepared for the U.S. Army Corps of Engineers, Baltimore District.

1994k *Phase I and Phase II Archival, Architectural, and Archeological Investigations for the Local Flood Control Project, Moorefield, Hardy County, West Virginia* (Principal Investigator; John J. Mintz, Thomas W. Davis, Thomas W. Neumann, Christopher R. Polglase, Deborah K. Cannan, Michelle T. Moran, Ralph Draughon, and Kathryn J. Saul). Prepared for the U.S. Army Corps of Engineers, Baltimore District.

1994l *Archeological Investigations at Sites 310N533, 310N534, and 310N536 Camp Lejeune, Onslow County, North Carolina* (Principal Investigator; Christopher R. Polglase, John J. Mintz, Martha R. Williams, April M. Fehr, S. Justine Woodard, and Kathleen Child). Submitted to Atlantic Division, Naval Facilities Engineering Command.

1994m *Phase II Archeological Investigations of Portions of the Sanders/Rawls Section of the "Coston Family Cemetery," Onslow County, North Carolina* (Principal Investigator; Suzanne L. Sanders, John J. Mintz, Martha Williams, Kathleen F. Child, and S. Jusine Woodard). Submitted to Atlantic Division, Naval Facilities Engineering Command.

1994n *Phase I Archeological Survey of Approximately 300 Acres at the New Kent Leased Property, Fleet Surveillance Support Command, New Kent County, Virginia* (Principal Investigator; Michael B. Hornum and Martha R. Williams). Submitted to Atlantic Division, Naval Facilities Engineering Command.

1994o *Phase I Archeological Survey of 860 Acres at Naval Station Rooseelt Roads, Ceiba, Puerto Rico* (Principal Investigator; Suzanne L. Sanders, Jose R. Oliver, Eliza Edwards, John A. Calabrese, and Donald J. Maher). Submitted to Atlantic Division, Naval Facilities Engineering Command.

1994p *Phase I Archeological Survey of Approximately 2,000 Acres at Naval Air Station Oceana, Virginia Beach, Virginia, and Naval Auxiliary Landing Field Fentress, Chesapeake City, Virginia* (Principal Investigator; Michael B. Hornum, W. Patrick Giglio, and William T. Dod). Submitted to Atlantic Division, Naval Facilities Engineering Command.

1994q *Phase I Underwater Archeological Investigations, Borrow Area 9, Atlantic Coast Project, Ocean City, Maryland* (Principal Investigator; Jack B. Irion, Patrick Jennings, and Michael Pohuski). Submitted to U.S. Army Corps of Engineers, Baltimore District.

1995a *Documentation of Several Historic Vernacular Watercraft on Bayou DuLarge, Terrebonne Parish, Louisiana* (Principal Investigator; David S. Robinson and John L. Seidel). Submitted to New Orleans District, U.S. Army Corps of Engineers.

1995b *Phase II Archeological Investigations of Shipwreck* Kentucky *(Site 16BO358) at Eagle Bend, Pool 5, Red River Waterway, Bossier Parish, Louisiana* (Principal Investigator; John L. Seidel and David S. Robinson). Submitted to the U.S. Army Corps of Engineers, Vicksburg District.

1995c *Stage IA Cultural Resources Reconnaissance in Support of a Shallow Draft Navigation Reconnaissance Study of Reynolds Channel and New York State Boat Channel, Nassau and Suffolk Counties, New York* (Principal Investigator; April L. Fehr, Martha R. Williams, and David S. Robinson). Prepared for the U.S. Army Corps of Engineers, New York District.

1995d *Archeological Investigations of the Proposed C&D Canal, Maryland and Delaware* (Principal Investigator; Jack B. Irion, Geoffrey Melhuish, Antonio Segovia, and David V. Beard). Prepared for the Maryland Port Administration.

1995e *Phase I Archeological Investigations for the Proposed Denitration/Acid Mix Facility Indian Head Division, Naval Surface Warfare Center, Maryland* (Principal Investigator; Thomas W. Davis and Eliza H. Edwards). Submitted to ECG, Inc.

1995f *National Historic Context for Department of Defense Installations, 1790 - 1940* (Principal Investigator; Deborah K. Cannan, Leo Hirrel, Katherine E. Grandine, Kathryn M. Kuranda, Bethany M. Usher, Hugh B. McAloon, and Martha R. Williams). Prepared for the U.S. Army Corps of Engineers, Baltimore District.

1995g *Archeological Investigations at the Maggie L. Walker National Historic Site, Richmond, Virginia* (Principal Investigator; Suzanne L. Sanders and Martha R. Williams). Prepared for the National Park Service, Mid-Atlantic Region.

1996a *Phase I Terrestrial and Marine Archeological Surveys for the Poplar Island Reclamation Project and Phase II Investigations of Site 18T237 and Six Marine Anomalies, Talbot County, Maryland* (Principal Investigator; April Fehr, David S. Robinson, Martha Williams, John L. Seidel, Jack Irion, and Donald Maher). Prepared for GBA-M&N, A Joint Venture.

1996b *Phase I Archeological Investigations of the Maryland-National Capital Park and Planning Commission Recreation Complex Site, Prince George's County, Maryland* (Principal Investigator; Martha R. Williams). Prepared for Redskins Stadium, Inc.

1996c *U.S. Army Consultation Guidelines for Army and Native American, Native Alaskan, and Native Hawaiian Consultation* (Principal Investigator; Donald G. Jones and Ellen Saint Onge). Prepared for the Department of the Army, St. Louis District, Corps of Engineers.

1996d *Historic and Archeological Resources Protection Plan for NAVSTA Roosevelt Roads, Cieba, Puerto Rico* (Principal Investigator; Suzanne L. Sanders, Martha R. Williams, and Julian Granberry). Prepared for the Atlantic Division, Naval Facilities Engineering Command.

1996e *Archeological and Architectural Survey of NSGA Sabana Seca, Sabana Seca, Puerto Rico* (Principal Investigator; Suzanne L. Sanders, Brooke V. Best, Ellen Saint Onge, and Michael A. Simons). Prepared for the Atlantic Division, Naval Facilities Engineering Command.

1996f *Phase I Archeological Investigations and Architectural Evaluations for the Proposed Redskins Stadium, Landover, Maryland* (Principal Investigator; Kathryn J. Saul, Martha R. Williams, and Eliza E. Burden). Prepred for Redskins Stadium, Inc.

1996g *Cultural Resources Program Guidebook Northern Border Project Docket No. CP95-194-001* Prepared for Northern Border Pipeline Company.

1996h *Phase I Archeological and Architectural Survey for the Village of Piscataway Development* (Principal Investigator; Thomas W. Davis, Deborah C. Whelan, Katherine E. Grandine, and Connie A. Capozzola). Prepared for Cascades Associates LP.

1996i *Supplemental Phase I Archeological Investigation for the Villages at Piscataway, Prince George's County, Maryland* (Principal Investigator; Thomas W. Davis, Nora B. Sheehan, and Steven A. Mallory). Prepared for Greenvest, L.C.

1996j *Phase III Data Recovery at Site 8LI76 for the Proposed Florida Gas Transmission Phase III Expansion Project, Liberty County, Florida* (Principal Investigator with William P. Athens; Jeffrey H. Maymon, Thomas F. Majarov, Frank Vento, Michelle Williams, Arleen Fradkin, Clifford T. Brown, Kathleen Child, and John C. Clarke). Prepared for Florida Gas Transmission Company.

1996k *Phase II Archeological Evaluation of Sites 8LF007, 8SU291, and 8SU104 for the Proposed Florida Gas Transmission Phase III Expansion Project, Lafayette and Suwanne Counties, Florida* (Principal Investigator; Thomas W. Davis, Jeffrey H. Maymon, Lance B. Trask, Donald J. Maher, J. Hampton Tucker, Amy K. Fanz, and John G. Clarke). Prepared for Florida Gas Transmission Company.

1996l *Phase II Archeological Evaluation of Thirteen Sites for the Proposed Florida Gas Transmission Phase III Expansion Project, Jefferson and Madison Counties, Florida* (Principal Investigator; Thomas W. Davis, Jeffrey H. Maymon, Michael P. Hornum, Lance B. Trask, John Calabrese, Thomas F. Majarov, Timothy A. Silva, Amy K. Fanz, Connie Capozzola, John G. Clarke, Clifford A. Brown, Donald J. Maher, Meril Dunn, Ellen Saint Onge, J. Hampton Tucker, and S. Justine Woodard). Prepared for Florida Gas Transmission Company.

1996m *Phase II Archeological Evaluation of Sites 8LE2095 and 8LE2105 for the Proposed Florida Gas Transmission Phase III Expansion Project, Leon County, Florida* (Principal Investigator; Jeffrey H. Maymon, Thomas W. Davis, Michael B. Hornum, and Donald J. Maher). Prepared for Florida Gas Transmission Company.

1996n *Phase I Archeological Investigations at the Proposed Vanderback Subdivision, Adams County, Pennsylvania* (Principal Investigator; Suzanne L. Sanders and Leo Hirrel). Prepared for Group Insurance Services.

1996o *Phase I Remote Sensing Marine Archeological Survey of the Proposed Dredge Site at Sandbridge Shoal, Virginia Beach, Virginia* (Prinicpal Investigator; David S. Robinson and Martha R. Williams). Prepared for the Atlantic Division, Naval Facilities Engineering Command.

1997a *Archeological Resources Overview, Norfolk Naval Shipyard, Portsmouth, Virginia* (Principal Investigator; Martha R. Williams). Prepared for the Atlantic Division, Naval Facilities Engineering Command.

1997b *Archeological Survey of Portions of NAVSTA Roosevelt Roads, Puerto Rico (Year 2)* (Principal Investigator; Suzanne L. Sanders, Antonio Curet, John Clark, and Donald Maher). Prepared for the Atlantic Division, Naval Facilities Engineering Command.

1997c *Phase I Remote Sensing Marine Archeological Survey of the Proposed Dredge Site at Naval Amphibious Base Little Creek, Virginia Beach, Virginia* (Principal Investigator; David S. Robinson, Martha R. Williams, and Adam I. Kane). Prepared for Atlantic Division, Naval Facilities Engineering Command.

1997d *Cultural Resources Stabilization Study of Site 12VPR2-66, and Field Verification of Survey Results for 200 Acres on Vieques Island, NAVSTA Roosevelt Roads, Vieques, Puerto Rico* (Principal Investigator; Suzanne L. Sanders, Mike A. Simons, and Connie A. Capozzola). Prepared for the Atlantic Division, Naval Facilities Engineering Command.

1997e *Intensive Archeological Resource Surveys of Portions of NRTF Isabela, NRTF Aguada, and NRRF Salinas, Puerto Rico* (Principal Investigator; Suzanne L. Sanders, Michael A. Simons, and Connie A. Capozzola). Prepared for the Atlantic Division, Naval Facilities Engineering Command.

1997f *Intensive Archeological and Architectural Investigations of Portions of Ice House Square, Gettysburg, Adams County, Pennsylvania* (Principal Investigator; Suzanne L. Sanders, Michelle T. Moran, Hugh B. McAloon, and Deborah Cannan). Submitted to Gettysburg College.

1997g *Further Real Estate Acquisitions in the Atchafalaya Basin: Land use Studies in St. Martin, St. Mary, Iberia, and Iberville Parishes, Louisiana* (Principal Investigator; Ralph Draughon, Jr., Susan Barrett Smith, Jeremy Horowitz, Michael Godzinski, Denise Matherne, and Christopher Matthews). Submitted to U.S. Army Corps of Engineers, New Orleans District.

1997h *Archeological and Architectural Investigations at NAVSTA Roosevelt Roads (Year 3), Ceiba, Puerto Rico* (Principal Investigator; Suzanne Sanders, Geoffrey Melhuish, W. Patrick Giglio, and Ellen Saint Onge). Prepared for Atlantic Division, Naval Facilities Engineering Command.

1997i *Archival/Cultural Resource Assessment Survey and Testing at J. Percy Priest Lake, Rutherford County, Tennessee* (Principal Investigator; Scott E. Simmons, Ralph B. Draughon, Jr., Jeremy P. Pincoske, Thomas R. Fenn, James Allen Green, and David D. Davis). Prepared for U.S. Army Corps of Engineers, Nashville District.

1997j *Phase III Data Recovery Excavations at Grand Bayou Reservoir, Sites 16RR64 and 16RR292, Red River Parish, Louisiana* (Principal Investigator; Christopher Davies, Clifford Brown, Thomas Fenn, Michele Williams, James Allen Green, Jr., and David D. Davis). Prepared for Louisiana Department of Transportation Development.

1997k *Cultural Resources Survey of Bayou Dularge Disposal Areas, Terrebonne Parish, Louisiana* (Principal Investigator; Glenn Walter, Cinder Miller, Jeremy Pincoske, Roger Saucier, Susan Barrett Smith, and David D. Davis). Prepared for U.S. Army Corps of Engineers, New Orleans District.

1997l *Archeological Survey of Approximately 125 Acres within the Vieques Naval Reservation, Vieques Island, Puerto Rico; and 18 Acres at Fort Allen, Juana Diaz, Puerto Rico* (Principal Investigator; Michael A. Simons and Ellen St. Onge). Prepared for the Atlantic Division, Naval Facilities Engineering Command.

1997m *Phase I Archeological and Phase II Architectural Investigations for the Villages at Piscataway, Prince George's County, Maryland* (Principal Investigator; Thomas W. Davis, Deborah C. Whelan, Katherine E. Grandine, Connie A. Capozzola, Nora B. Sheehan, and Steven A. Mallory). Prepared for Greenvest, L.C.

1997n *Cultural Resources Overview of the Proposed North Atlantic Pipeline Project, Gulf of Maine to Rockingham Co., New Hampshire*. (Principal Investigator:Dave D. Davis, Nathan Hamilton, John Seidel and Martha R. Williams). Prepared for North Atlantic Pipeline Partners, L.P.

1997o *Phase I Cultural Resource Survey of Agricultural Lease Areas in the Vicinity of Vieques Airport, Vieques Naval Reservation Naval Station Roosevelt Roads, Vieques, Puerto Rico* (Principal Investigator: Michael A. Simons). Prepared for Atlantic Division, Naval Facilities Engineering Command.

1997p *Archeological Survey and Evaluation of Various Sites, NSGA Sabana Seca, Puerto Rico - Volume I* (Principal Investigator: Suzanne Sanders, Michael A. Simons, and John Clarke). Prepared for Atlantic Division, Naval Facilities Engineering Command.

1998a *Archeological Survey and Evaluation of Sites at NSGA Sabana Seca, Sabana Seca, Puerto Rico (Volume 3).* (Co-Principal Investigator with Suzanne Sanders; Ellen Saint Onge, R. Christopher Goodwin). Prepared for Atlantic Division, Naval Facilities Engineering Command.

1998b *Ethnohistoric and Ethnographic Information Related to the Fort Carson Military Reservation and Pinon Canyon Maneuver Site in Colorado* (Principal Investigator: Donald G. Jones, Martha Williams, Kathy Stemmler, Michael McGrath, and Elizabeth Winstead). Prepared for Department of the Army Corps of Engineers, St. Louis District.

1998c *Archeological Mitigation of the J.S. Berry Brick Mill (18BC88) and Pawley Stoneware Kiln (18BC89), Baltimore, Maryland* (Principal Investigator; Suzanne L. Sanders and Martha R. Williams). Prepared for the Maryland Stadium Authority.

1998d *Marine Remote Sensing Survey of the Atchafalaya Dredged Material Disposal Site, Louisiana* (Principal Investigator; John L. Seidel, David S. Robinson, and Adam Kane). Submitted to U.S. Army Corps of Engineers, New Orleans District.

1998e *Archeological Investigations at NAVSTA Roosevelt Roads (Year 3), Ceiba, Puerto Rico* (Principal Investigator; Suzanne Sanders, Ellen Saint Onge). Submitted to Atlantic Division, Naval Facilities Engineering Command.

1999a *Phase I Marine Archeological Remote Sensing Survey of the Calcasieu River Saltwater Barrier Repair Project* (Principal Investigator; Jean B. Pelletier, David Trubey, William Barr, Susan Barrett Smith, Jeremy Pincoske, and Patrick Robblee). Submitted to U.S. Army Corps of Engineers, New Orleans District.

1999b *Phase I Remote Sensing Archeological Survey for the Medora Crossing Soft Dike Construction Project, Mississippi River, Louisiana* (Principal Investigator; Jean B. Pelletier, David Trubey, William Barr, Ralph Draughon, Charlene Keck, William Hayden, Roger Saucier, and Martha Williams). Submitted to U.S. Army Corps of Engineers, New Orleans District.

1999c *ANR Pipeline Company Cultural Resources Survey and Inventory Results Proposed 36-Inh Gas Pipeline, Mobile Bay to Florida Three League Line* (Principal Investigator; with Jean B. Pelletier, David Trubey, John Czarasty, and Richard Vidutis). Submitted to ENSR.

1999d *Phase I Marine Archeological Remote Sensing Survey of Segments Along the Southwest Pass of the Mississippi River, Plaquemines Parish, Louisiana* (Principal Investigator; with Jean Pelletier, David Trubey, Roger Saucier, Ralph Draughon, and Martha Williams). Submitted to New Orleans District, U.S. Army Corps of Engineers.

2000a *Phase I Underwater Cultural Resource Remote Sensing Survey, Hathaway Bridge Replacement Project. SR30 (US 98) FPN4062141-31-01, Bay County, Florida* (Principal Investigator; with Jean B. Pelletier, M.A., Larkin A. Post, B.A., Sarah A. Milstead, B.A., and Richard Vidutis, Ph.D.). Submitted to Florida Department of Transportation.

2000b *Analysis of Regulations for Compliance with Section 106 of the National Historic Preservation Act of 1966, As Amended.* Prepared for The INGAA Foundation, Inc.

2000c *Underwater Cultural Resources Investigations for Red River Waterway, Mississippi to Shreveport, Poisson and Cognac Additional Control Structures, Natchitoches and Grant Parishes, Louisiana* (Principal Investigator, with Jean B. Pellitier, M.A., David W. Trubey, B.A., Larkin A. Post, B.A., Sarah A. Milstead, B.A., Richard Vidutis, Ph.D., and Roger Saucier, Ph.D.). Submitted to U.S. Corps of Engineers, Vicksburg District.

2000d *Phase I Marine Archeological Remote Sensing Survey of Barataria Pass, Ocean Dredge Material Disposal Site, Louisiana* (Principal Investigator, with Jean B. Pelletier, M.A., Sarah Milstead, B.A., Larkin A. Post, B.A., Carrie Sowden, B.A., Richard Vidutis, Ph.D., and Douglas Jones, B.A.). Submitted to U.S. Corps of Engineers, New Orleans District.

2000c *Phase I Cultural Resources Survey for P.R. 208 Aguas Buenas Bypass from P.R. 156 to P.R. 173-South of Town, Aguas Buenas* (Principal Investigator, with Michael A. Simons, M.A., W. Patrick Giglio, M.F.A.). Submitted to GF Caribe Engineers, P.S.C.

JOHN L. SEIDEL, PH.D. RESEARCH ASSOCIATE

Education

Bachelor of Arts, Drew University, Madison, New Jersey, 1976.

Master of Arts, Department of Anthropology, University of Pennsylvania, 1980.

Master of Arts, Department of American Civilization, University of Pennsylvania, 1981.

Doctor of Philosophy, Historical Archaeology, Department of American Civilization, University of Pennsylvania, 1987.

Research Interests

Maritime & Historical Archaeology
Remote Sensing & Geophysical Testing in Archaeology
Environmental Archaeology and Human Ecology
Site Taphonomy & Environment

Professional Experience

1998 - present	*Assistant Professor*, Anthropology & Environmental Studies, Washington College, Chestertown, Maryland.
	Research Associate, R. Christopher Goodwin & Associates, Inc.
1995 - 1998	*Assistant Vice-President*, Nautical Archeological Services, R. Christopher Goodwin & Associates, Inc.
1989 - 1995	*Assistant Professor*, Department of Anthropology, University of Maryland, College Park.
1994 - 1995	*Associate Director*, Field School in Public Archaeology, Archaeology in Annapolis, University of Maryland College Park.
1987-1989	*Assistant Professor*, Department of Anthropology, Rutgers University, New Brunswick, New Jersey.
1985-1987	*Instructor*, Department of Classics & Archaeology, Douglass College, Rutgers University.
1985 Spring	***Lecturer*, Department of Anthropology, Drew University.**
1984-1985	***Lecturer*, Department of Classics & Archaeology, Douglass College, Rutgers University.**
1984-1989	***Director*, Field School in Archaeology, The Summer Session, Rutgers University.**

Courses Taught

Washington College

Introduction to Archaeology
Doing Archaeology (Method & Theory)
Culture & Environment in the Chesapeake Region
Reconstructing Past Environments
Archaeology & Historic Preservation
Field School in Archaeology
Summer Field Study in Bermuda

University of Maryland **** denotes course offered for graduate credit***

Introduction to Archaeology
Introduction to Physical Anthropology & Archaeology
Method & Theory in Archaeology
Chesapeake: An Archaeology of Maryland
* **Historical Archaeology**
* **Analytical & Interpretive Methods in Historical Archaeology**
* **Historical Archaeology of Anonymous Peoples**
* **AutoCAD for Anthropologists**
* **Saving Maryland's Past: Archaeology & Historic Preservation**
* **Field School in Urban Archaeology**
* **Independent Study and Field School in Underwater Archaeology**
* **Graduate Internship Preparation**
* **Graduate Internship**
* **Graduate Internship Analysis**

Rutgers University **** denotes course offered for graduate credit***

Introduction to Archaeology
Laboratory in Archaeology
Historical Archaeology
Archaeology of Colonial North America
* **Science & Archaeology**
* **Quantification of Archaeological Data**
Vernacular Architecture of Colonial North America
Special Topics: Military Sites Archaeology

College Service

Departmental:

Advisor to Anthropology Majors with an archaeology focus
Assisted in preparation of proposal for a major in Anthropology, Spring 1999

Departmental: (cont'd)

Four course proposals for Anthropology, Spring 1999
Faculty Advisor, Anthropology Club (with Jeanette Sherbondy)

CNW, Freshman Advising:

Freshman Orientation 1998 and 1999
Freshmen Advisor - 17 freshmen 1998-99
CNW courses - Fall 1998, Spring 1999

Committee Work:
Chesapeake Regional Studies Committee 1998-1999
Environmental Studies Committee 1998-1999
Steering Committee and Search Committee, Center for Environment & Society

College Representative to External Groups:
Heritage Areas Planning Team, Upper Eastern Shore Heritage Area 1998-1999
Steering Committee, Institute for Museum, Preservation, and Archaeology Research & Training 1999

Membership & Service in Societies

Council for Maryland Archaeology
Council for Northeast Historical Archaeology
Executive Vice Chair, 1992 to 1994
Executive Board, 1988 to 1994
Chair, Membership Committee, 1992 to 1994
Conference Chair & Organizer, 1989 Annual Meeting, Morristown, New Jersey
Institute of Nautical Archaeology
Maritime Archaeological & Historical Society
Board of Directors, 1992-1994.
President, 1991.
Vice-President, 1990.
Chair, Education Committee, 1992 to present.
Society for Historical Archaeology
Government Affairs Committee, 1990 to 1994
Chair, Military Sites Roundtable, 1990.
Archaeology Society of Maryland
Finance Committee, 1993 to 1998.
Field Session Committee, 1993.
Co-Director, 1993 Field Session.

Boards & Directorships

Maryland Historical Trust (Maryland Department of Housing & Community Development)
Board of Trustees, 1998 to present.
Advisory Committee on Maryland Archaeology, 1991 to 1995.
Dive Safety Board, 1992 to present.
Chair, Maritime Archaeology Subcommittee, Advisory Committee on Archaeology, 1992 to 1995.
Search Committee for State Underwater Archaeologist, 1993-1994.
Governor's Task Force on the Preservation & Enhancement of Maryland's Heritage Resources, 2000
Maryland Heritage Alliance
Board of Directors, 2000.
Chestertown Historic District Commission, City of Chestertown, Kent County, Maryland.
Commissioner, 2000.
Institute for Museum, Preservation, and Archaeological Research and Training (IMPART)
Planning Committee, 1999 to 2000.
The National Aquarium in Baltimore
Advisory Board, 1991 to 1995.
Carroll Park Restoration Foundation, Inc. (Baltimore)
Board of Directors, 1990 to 1995.
The Pluckemin Archaeological Project, Inc. (Bedminster, New Jersey)
Board of Directors, 1980 to present.

Awards

Award of Recognition, 1984. New Jersey Historical Commission, for research with the Pluckemin Archaeological Project.

Heritage Award, 1984. Raritan Valley Sons of the American Revolution. For accomplishments with the Pluckemin Archaeological Project.

Service Award, 1985. New Jersey Society of the Sons of the American Revolution. For research on the American Revolution.

Achievement Award for Contributions to the History of the American Revolution, 1988. Morgan's Rifle Company and Lamb's Artillery.

Lilly Teaching Fellow, 1990-1991. University of Maryland, College Park.

Award of Recognition, 1991. Morristown National Historical Park, National Park Service.

Achievement Award, 1992. Archaeological Society of New Jersey.

Nominated for *Outstanding Teacher of the Year,* College Park Association of Parents, University of Maryland, College Park, 1992.

Teaching Excellence Award, 1994. College of Behavioral & Social Sciences, University of Maryland College Park.

Outstanding Citizenship Award, 1994. For distinguished achievement in both citizenship and scholarship. The National Society of the Sons of the American Revolution, John Paul Jones Chapter, Annapolis.

Award for Outstanding Service to Returning Students, 1995. University Counseling Center, University of Maryland, College Park.

Phi Kappa Phi Distinguished Faculty Mentor Award, 1995. Phi Kappa Phi Honor Society, University of Maryland System.

Service Award, 1998. Maritime Archaeological & Historical Society.

Research & Field Positions

1999

Co-Principal Investigator

* African American History & Archaeology Project. Washington College and the Maryland Historical Trust. Co-Principal Investigator, Richard Hughes, Chief, Office of Archaeology, Maryland Historical Trust. *Search for Frederick Douglass birthplace site and other African American sites.*
* Environmental Analysis & Stabilization Effort, HMS *Fowey*, Biscayne national Park, Florida. Co-Principal Investigator, Larry Murphy, Submerged Cultural Resource Unit, National Park Service.

Principal Investigator

* Archaeological Investigations of the Hermitage Slave Quarters, Queen Anne's County, Maryland.
* Experimental Magnetometry Project, Washington College. *Comparative testing of proton and cesium magnetometers and cesium gradiometer.*

* Assessment of Cultural Resources in Upper Eastern Shore Transportation Corridors, Kent & Queen Anne's Counties, Maryland. Transportation Enhancement Program, Maryland State Highway Administration.

Research Associate (R. Christopher Goodwin & Associates)

* Analysis and Vessel Reconstruction, Civil War Steamboat *Kentucky*. Vicksburg District, U.S. Army Corps of Engineers.
* ANR Gulfstream Pipeline Project, Tampa Bay, Florida, to Mobile, Alabama.
* Predictive Model for Submerged Cultural Resources, Vieques Island, Puerto Rico. U. S. Navy, LANTDIV

1998 *Principal Investigator*

* Public Archaeology at the Cray House, Stevensville, Queen Anne's County, Maryland. Washington College, Kent Island Heritage Society, and the Historic Sites Consortium of Queen Anne's County.
* Archaeological Overview & Management Plan for Kent County, Maryland. Washington College and the Maryland Historical Trust.

Research Associate (R. Christopher Goodwin & Associates)

* Phase III Recovery of the Civil War Steamboat *Kentucky*, Red River Waterway, Bossier Parish, Louisiana. US Army Corps of Engineers, Vicksburg District.
* Phase I Archaeological Study of the Northern Border Crossing of the Illinois & Michigan Canal, Will County, Illinois. Northern Border Pipeline Company.
* Phase I Archaeological Survey for the Medora Crossing Soft Dike Construction Project. New Orleans District, U.S. Army Corps of Engineers.
* Phase I Archaeological Investigations for the Marsh Island Hydrologic Restoration Project. New Orleans District, U.S. Army Corps of Engineers.
* Phase I Remote Sensing Marine Archaeological Project for the Coan River Navigation Improvement Project. Baltimore District, U.S. Army Corps of Engineers.
* Investigation of Civil War Steamboats and Cultural Resources Survey of Items 3B-2 and 4 of the Upper Yazoo River Projects, Leflore County, Mississippi. US Army Corps of Engineers, New Orleans District.

Principal Investigator:

* Cultural Resource Management Plan for Mount Independence State Historic Site, Orwell, Vermont. Vermont Division for Historic Preservation and the Fort Ticonderoga Association.
* Phase I Marine Remote Sensing Survey, Kedges Strait Oyster Bed restoration Project. Baltimore District, U.S. Army Corps of Engineers.

1997 *Co-Principal Investigator:*

* Urban Archeological Investigations, Phase I-III: Stribling & Tecumseh Tunnels, United States Naval Academy, Annapolis Maryland. US Naval Academy.

Project Manager, Marine Archeologist

* Phase III Data Recovery of the Civil War Steamboat *Kentucky*, Red River Waterway, Bossier Parish, Louisiana. US Army Corps of Engineers, Vicksburg District.
* Phase I Submerged Cultural resources Survey of the St. Georges Island Bridge Crossing, Apalachicola Bay, Franklin County, Florida. Florida Department of Transportation.

* Submerged Cultural Resources Survey, Texaco Pipeline Lake Salvador Crossing, St. Charles and Jefferson Parishes, Louisiana. Texaco Oil Company.

Marine Archeologist:
* Submerged Cultural Resource Assessment, Patterson Looping Project, ANR Pipeline Company, Patterson. Louisiana to Block 63, Gulf of Mexico.
* Research Document, Context Preparation & Research Design, North Atlantic Pipeline, New Hampshire.

1996 *Project Manager, Marine Archeologist:*
* Phase I Remote Sensing Survey of NAB Little Creek Navigation Channel, Norfolk, Virginia. LANTOPS, NAVFACENGCOM, U.S. Navy.
* Phase I Remote Sensing Survey, Discovery Pipeline Project, Lafourche Parish, Louisiana. Bridgeline Gas Distribution LLC.
* Phase I Remote Sensing Survey of the Atchafalaya River Ocean Dredged Material Disposal Site, Louisiana. U. S. Army Corps of Engineers, New Orleans District.
* Remote Sensing Survey of the Sandbridge Shoal Area, FCTLANT Dam Neck, Virginia Beach, Virginia. LANTOPS, NAVFACENGCOM, U.S. Navy.
* Investigation of Discovery, Pipeline Crossing of the Flint River, Georgia. SONAT Georgia Settlement Facilities Phase II Expansion. Southern Natural Gas Company.

Marine Archeologist:
* Research Document, Context Preparation & Research Design, Patterson Looping Project, ANR Pipeline Company, Patterson. Louisiana to Block 63, Gulf of Mexico.
* Research Document, Context Preparation & Research Design, Destin Pipeline, Georgia and Alabama.

Project Manager, Historical Archeologist:
* Phase I & II Archeological Investigations of the Proposed Parole Plaza Shopping Center Redevelopment, Annapolis, Maryland. Landvisions, Inc.

Historical Archeologist:
* Cultural Resource Management Plan, U.S. Naval Academy, Anne Arundel County and Annapolis, Maryland. U.S. Naval Academy Department of Public Works and Engineering Field Activity Chesapeake, U.S. Navy.

1995 *Marine Archeologist:*
* Documentation of Historical Vernacular Watercraft, Bayou DuLarge, Terrebonne Parish, Louisiana. U.S. Army Corps of Engineers New Orleans District.
* Phase I & II Investigations, Poplar Island Reclamation Project, Talbot County, Maryland. GBA-M&N A Joint Venture.

Project Manager and Marine Archeologist:
* Phase II Investigation of the Civil War steamboat *Kentucky*, Red River, Bossier Parish, Louisiana. U.S. Army Corps of Engineers Vicksburg District.

1994 - 1995 *Associate Director*, Archaeology in Annapolis. Joint project in urban archaeology between Historic Annapolis Foundation and the University of Maryland.
* Slayton House, Ridout Row, Annapolis.
* Bordeley-Randall House Excavations, Annapolis.
* Anne Arundel County Courthouse Project, Annapolis.

1994 - 1995 *Principal Investigator*, Reconnaissance for Underwater Resources, United States Naval Academy, Annapolis Maryland (Archaeology in Annapolis). Department of Defense Legacy project for identification of submerged cultural resources and CAD cartographic analysis of shorelines. Remote sensing survey of surrounding waters.

1995 *Co-Principal Investigator*, HMS *Fowey* Stabilization Project, Biscayne National Park, Florida. Interdisciplinary project to develop and test longterm stabilization of submerged cultural resources. Remote sensing and site documentation. [Co-Principal Investigator Larry Murphy, Submerged Cultural Resource Unit, National Park Service, Santa Fe.]

1980 - 1995 *Director*, Pluckemin Archaeological Project, Inc., Pluckemin, New Jersey. A not-for-profit, interdisciplinary research group investigating the 1778-1779 Cantonment of Continental Artillery, Military Stores Department.

1992 - 1995 *Principal Investigator*, Carroll Park Archaeology Program, Baltimore. Carroll Park Restoration Foundation, Inc.

1994 *Principal Investigator*, Annapolis Court House Project. Archaeology in Annapolis. Phase III investigation of a city block containing complex 17th-20th century remains, including a 17th century forge and earthfast dwelling, an 18th century mansion, and rowhouses, apartments, and tenements from the 19th through early 20th centuries.

1994 *Co-Principal Investigator*, Archaeological Investigations at the United States Naval Academy. Archaeology in Annapolis. Department of Defense Legacy grant for cultural resource database management. [Co-Principal Investigator Dr. Mark Leone.]

1993 *Primary Consultant*, AutoCAD & Field Survey, Archaeological Investigations at the United States Naval Academy. Archaeology in Annapolis. Department of Defense Legacy grant for Phase I cultural resource survey and database design.

1993 *Co-Principal Investigator*, HMS Fowey Documentation Project, Biscayne National Park. National Park Service. Documentation, mapping and stabilization of the wreck of HMS Fowey (1748), exposed by Hurricane Andrew. Remote sensing of surrounding area and other portions of Biscayne National Park. [Co-Principal Investigator Larry Murphy, Submerged Cultural Resource Unit, National Park Service.]

1993 *Co-Principal Investigator*, Steward Shipyard Site, Anne Arundel County, Maryland. Joint terrestrial and underwater investigation by the Archaeological Society of Maryland, the Maryland Historical Trust, and the University of Maryland. Remote sensing on land and in river. [Co-PI: Bruce Thompson, Maryland Historical Trust.]

1992 - 1993 *Principal Investigator*, Computer Aided Mapping Project, West & Rhode Rivers, Anne Arundel County, Maryland. Maritime Archaeological & Historical Society.

1990 *Co-Director*, Dry Tortugas Underwater Archaeological Survey, Fort Jefferson National Monument, Florida. (Survey of Ft. Jefferson National Monument by the Maritime Archaeological and Historical Society and the National Park Service.)

1990 *Director*, Maritime Archaeological & Historical Society Field School in Underwater Archaeology.

1989 - 1990 *Principal Investigator*, Computer Aided Mapping & Photographic Analysis, Fort Nonsense, Morristown National Historical Park, New Jersey.

1989 *Principal Investigator*, Cultural Resource Review of Shoreline Stabilization Project, Beverly City, Burlington County, New Jersey. Soil Conservation Service, U.S. Department of Agriculture. (Underwater & terrestrial remains.)

1989 *Director*, Fort Nonsense Archaeological Survey, Morristown National Historical Park, Morristown, New Jersey. National Park Service, U.S. Department of Interior.

1989 *Principal Investigator*, Archaeological and Architectural Investigation of the Pettit House Site, Brick Township, Monmouth County, New Jersey. Grubb & Associates, Cranbury, NJ.

1987 *Principal Investigator*, Archaeological Assessment of the Grand Parade, Jockey Hollow Section, Morristown National Historical Park, Morristown, New Jersey. National Park Service, U.S. Department of Interior.

1987 *Principal Investigator*, Geophysical Survey of the New Jersey Brigade Encampment, Jockey Hollow Section, Morristown National Historical Park, Morristown, New Jersey. National Park Service, U.S. Department of Interior.

1987 *Principal Investigator*, Archaeological Survey of Section 2, Block 2, Lot 9, Town of New Windsor, Orange County, New York. Hunter Research, Trenton, NJ. Survey of portion of New Windsor Cantonment, 1782-1783.

1987 *Principal Investigator*, Eoff Homestead Project, Bedminster Township, Somerset County, New Jersey. Sammis Corporation.

1985 *Director*, Buccleuch Mansion Excavations, New Brunswick, New Jersey. Rutgers University. Anthony White House, constructed 1739.

1985 *Director*, Wallace House Excavations, Wallace House, Somerville, New Jersey. Washington's Headquarters, winter of 1778-1779.

1981-1982 *Research Assistant*, American Historical Archaeology Section, University Museum, University of Pennsylvania. Research and collections management: material from Utah, Pennsylvania, New Jersey, and Massachusetts.

1979 *Archaeologist*, Drew Institute for Archaeological Research, Drew University, Madison, New Jersey. Institute projects in New Jersey, Jordan, and Israel.

1978-1979 *Supervisory Archaeologist*, Rutgers Archaeological Survey Office, Department of Human Ecology, Rutgers University, New Brunswick, New Jersey. Cultural resource management throughout New Jersey.

1978 *Supervisor*, Acropolis Excavation Program, Quirigua Project, Guatemala. Field Director: Robert J. Sharer, University Museum, University of Pennsylvania.

1976 *Team Member,* Preliminary Underwater Harbor Survey, Caesarea Maritima, the Joint Expedition to Caesarea Maritima.

1976 *Area Supervisor*, field instructor, Field School, the Joint Expedition to Caesarea Maritima, Israel. Director: Robert J. Bull

Monographs

1979 "Historical Archaeology", in *Cultural Resource Survey & Potential National Register Resources within the Impact Area of Route I-95 sections 6C, 7A and 7E, Howell Township, Monmouth County.* Joel Grossman, Principal Investigator.

1980 *The 1778-1779 Continental Artillery Winter Cantonment, Pluckemin, New Jersey.* Drew University Institute for Archaeological Research, Madison, New Jersey.

1981-1989 Yearly preliminary reports on archaeological field work, Pluckemin Archaeological Project. Copies on file with the Pluckemin Archaeological Project, Inc., Pluckemin, New Jersey.

1983 "The Quirigua Project: the 1978 Season", with Robert J. Sharer et. al.. Paper No. 7 in *Quirigua Reports Volume II*, Papers 6-13, by Edward M. Schortman & Patricia A. Urban (eds.): pp. 39-54. The University Museum of the University of Pennsylvania, Philadelphia.

1989 *Architectural Study of the Spann & Von Culin House/Strupp House, Block & Lot 58/9,10.* Pluckemin Archaeological Project, Inc. & Township of Bedminster, Bedminster, New Jersey.

1989 *Cultural Resource Review: Shoreline Stabilization Project, Beverly City, Burlington County, New Jersey.* Report to Soil Conservation Service, U.S. Dept. of Agriculture.

1989 *Interim Report on Archaeological Investigations of the Fort Nonsense Area, Morristown National Historical Park, Morristown, New Jersey.* National Park Service, U. S. Department of the Interior.

1990 *Archaeological Survey of the Grand Parade Area, Morristown National Historical Park, Morristown, New Jersey.* Morristown National Historical Park, Morristown, NJ, and North Atlantic Regional Office, National Park Service, U.S. Dept. of Interior, Boston.

1990 *Fort Nonsense: 1989 Archaeological Investigations.* Morristown National Historical Park, Morristown, NJ, and North Atlantic Regional Office, National Park Service, U.S. Dept. of Interior, Boston.

1993 *Steward's Shipyard - Preliminary Report on 1993 Archaeological Society of Maryland Field Session at Steward's Shipyard (18AN817): The Terrestrial Investigations.* Maryland Historical Trust & the Archaeological Society of Maryland, Crownsville, Maryland.

1994 *Historic Maps of the West & Rhode Rivers - A Review & Computer-based Analysis.* 2 Volumes. Maritime Archaeological & Historical Society, Washington, DC.

1996 *Guide for Cultural Resource Management, United States Naval Academy, Legacy Resource Management Program Archaeological Reconnaissance Survey.* Archaeology in Annapolis, University of Maryland College Park. U.S. Naval Academy, Annapolis.

1996 *Discovery on the Flint River (Jonesboro, Georgia) at SONAT Georgia Settlement Facilities Phase II Expansion.* Report prepared by R. Christopher Goodwin & Associates, Inc. for Southern Natural Gas Company.

1997 *Phase I Remote Sensing Survey for Submerged Cultural resources within the SR 300 Project Area at Apalachicola Bay, Franklin County, Florida.* Report prepared by R. Christopher Goodwin & Associates, Inc., for the Florida Department of Transportation.

1999 *Preliminary Report on 1998 Archaeological Investigations at the Cray House (18QU962), Stevensville, Queen Anne's County Maryland.* Preliminary report submitted to the Kent Island Heritage Society and the Maryland Historical Trust.

Co-authored Monographs

1983 "The Quirigua Project: the 1978 Season," with Robert J. Sharer et al. Paper No. 7 in *Quirigua Reports Volume II,* Papers 6-13, edited by Edward M. Schortman and Patricia A. Urban:39-54. The University Museum of the University of Pennsylvania. Philadelphia.

1989 *Archaeological & Architectural Investigation of the Pettit House Site, Brick Township, Monmouth County, New Jersey.* With Richard Grubb. Office of New Jersey Heritage, Department of Environmental Protection. *[Named as best CRM report of 1989 by the Office of New Jersey Heritage.]*

1991 *Computer Mapping at Fort Nonsense: Archaeological Analysis & Interpretation.* With Carol Theobald. Morristown National Historical Park, Morristown, NJ, and North Atlantic Regional Office, National Park Service, U.S. Dept. of Interior, Boston.

1992-1994 *Review & Assessment of Archaeology at Carroll Park*, Volumes I-IV. With George Logan. Carroll Park Foundation, Baltimore, Maryland.

1994 *Map Analysis, Oral Histories and Tract Histories, Legacy Resource Management Program Archaeological Reconnaissance Survey.* With C. Jane Cox, Jean Russo, Hannah Jopling, Lynn Jones, Carey O'Reilly. Archaeology in Annapolis, University of Maryland College Park. U.S. Naval Academy, Annapolis.

1994 *The 1984 Shovel Test Survey of Mount Clare, Carroll Park.* With George C. Logan. Carroll Park Foundation, Baltimore.

1995 *Mount Clare's Kitchen: 1986 Archaeological Research at Carroll Park.* With George C. Logan. Carroll Park Foundation, Baltimore.

1995 *Three Centuries in Annapolis: Archaeological Excavations at the Court House Block, Annapolis, Maryland.* With Elizabeth Aiello. Archaeology in Annapolis, University of Maryland College Park.

1995 *Phase II Archeological Investigations of Shipwreck Kentucky (Site 16BO358) at Eagle Bend, Pool 5, Red River Waterway, Bossier Parish, Louisiana.* With David S. Robinson, contributions by Jack B. Irion and Ralph Draughon. Draft report prepared by R. Christopher Goodwin & Associates, Inc. for the U. S. Army Corps of Engineers Vicksburg District.

1996 *Development of a Geographic Information System for the Historic District of Annapolis, Maryland.* With E.A. Aiello and C.J. Cox. Report prepared by the University of Maryland College Park for the Maryland Historical Trust, Crownsville, Maryland.

1996 *Archaeological Survey of the United States Naval Academy Waters and Shoreline, Annapolis, Maryland.* With Elizabeth Aiello. Report prepared by Archaeology in Annapolis, University of Maryland College Park, for the United States Naval Academy, Annapolis, Maryland.

1996 *Catalog of Historic Maps for Cultural Resource Management, United States Naval Academy, Legacy Resource Management Program Archaeological Reconnaissance Survey*. With C. Jane Cox, Carey O'Reilly, Gilda Anroman. Archaeology in Annapolis, Report prepared by the University of Maryland College Park for the United States Naval Academy, Annapolis, Maryland.

1996 *Phase I Terrestrial and Marine Archeological Surveys for the Poplar Island Reclamation Project and Phase II Investigations of Site 18TA237 and Six Marine Anomalies, Talbot County, Maryland.* With A. Fehr, D.S. Robinson, M. Williams, J. Irion, and D. Maher. Report prepared by R. Christopher Goodwin & Associates, Inc. for GBA-M&N A Joint Venture, Baltimore, Maryland.

1996 *Intensive Level Reconnaissance at the United States Naval Academy: The Main Campus, NSWC Annapolis Housing, USNA North Severn, and the Naval Academy Dairy Farm, Annapolis and Anne Arundel County, Maryland.* With Martha S. Williams and Elizabeth Rupp. Draft Report prepared by R. Christopher Goodwin & Associates for Engineering Field Activity - Chesapeake, U. S. Navy.

1996 *Phase I Cultural Resources Survey and Inventory of the Proposed Discovery Gas Transmission LLC Pipeline Project, Gulf of Mexico to Lafourche Parish, Louisiana.* With C.G. Miller, D.S. Robinson, R. Saucier, S.B. Smith, G. Walter, C.T. Brown, and M. Williams, W.P. Athens. Report prepared by R. Christopher Goodwin & Associates, Inc. for Discovery Gas Transmission Line LLC, New Orleans, Louisiana.

1997 *Phase I Archeological and Archival Investigations of the Proposed Parole Plaza Redevelopment, and Phase II Archeological and Archival Investigations of Site 18AN1026, Parole, Anne Arundel County, Maryland.* With Nora Sheehan. Report prepared by R. Christopher Goodwin & Associates for Parole Plaza Limited Partnership, Mt. Laurel, NJ.

1997 *Archeological , Engineering, and Hazard Study, Proposed 30-Inch Gas Pipeline Route from "A" Structure Block 63, Eugene Island Area to Shore, East Bay, Louisiana.* With W. Kerry Behrens and Michael R. Samson. Report prepared by John E. Chance & Associates, Inc., for ANR Pipeline Company, Detroit, Michigan.

1997 *Documentation of Several Historic Vernacular Watercraft on Bayou DuLarge, Terrebonne Parish, Louisiana.* With David S. Robinson, contributions by Richard K. Anderson. Report prepared by R. Christopher Goodwin & Associates, Inc. for the U. S. Army Corps of Engineers New Orleans District.

1997 *Historic Preservation Plan: United States Naval Academy, Annapolis, Maryland.* With Lex Campbell and Martha Williams. Report prepared by R. Christopher Goodwin & Associates, Inc., for Engineering Field Activity - Chesapeake, U. S. Navy, Washington, D.C.

1997 *Mount Independence State Historic Site Cultural Resource Management Plan.* With David S. Robinson and Martha Williams. Draft report prepared by R. Christopher Goodwin & Associates, Inc. for the Vermont Division for Historic Preservation, Montpelier, Vermont.

1998 Cultural Resources Survey of Items 3B-2 and 4 of the Upper Yazoo River Projects, Leflore County, Mississippi. US Army Corps of Engineers, New Orleans District. With Adam Kane, J. B. Pelletier, and Martha Williams. Report prepared by R. Christopher Goodwin & Associates, Inc. for the U. S. Army Corps of Engineers New Orleans District.

1998 *Marine Remote Sensing Survey for Submerged Cultural Resources at the Atchafalaya River Ocean Dredged Material Disposal Site, Gulf of Mexico and St. Mary's Parish, Louisiana.* With D.S. Robinson and A. Kane. Report prepared by R. Christopher Goodwin & Associates, Inc. for the U.S. Army Corps of Engineers, New Orleans District.

1998 *Phase I Remote Sensing Marine Archeological Survey, Little Creek to Thimble Shoal Channel, Naval Amphibious Base Little Creek, Virginia Beach, Virginia.* With D.S. Robinson, M. Williams, and A. Kane. Report prepared by R. Christopher Goodwin & Associates, Inc. for Atlantic Division, Naval Facilities Engineering Command, Norfolk, Virginia.

2000 *The Civil War Steamboat Kentucky: Phase II and III Archaeological Investigations at Site 16BO358, Eagle Bend, pool 5, Red River Waterway, Bossier Parish, Louisiana.* With David S. Robinson, Martha Williams, and Adam Kane. R. Christopher Goodwin & Associates, Inc. for the U.S. Army Corps of Engineers, Vicksburg District.

Monographs in Preparation

ND *The HMS Fowey: Investigating the Wreck of a 1748 British War Ship*. With Larry Murphy. Southwest Cultural Resources Center Professional Papers, National Park Service, Santa Fe, New Mexico.

Journal Articles & Book Chapters

1983 "Archaeological Research at the 1778-1779 Winter Cantonment of the Continental Artillery, Pluckemin, New Jersey", *Northeast Historical Archaeology*, Vol. 12: 7-14.

1990 "'China Glaze' Wares on Sites from the American Revolution: Pearlware Before Wedgwood?", in *Historical Archaeology* Vol. 24, No. 1:82-95.

1992 "Fort Nonsense: Fact or Fiction?", in *Proceedings* of the Washington Association of New Jersey: pp. 22-47. Morristown, New Jersey.

1993 "The Winter of 1778-1779 at Pluckemin", in *Flintlock and Powderhorn*, Vol. 11, No. 1:4-11.

1995 "Military Industry in the New Nation", in *Invisible America*, ed. by Mark Leone & Neil Silberman. Henry Holt & Company, New York.

1995 "'Class Warfare': The American Militia System", in *Invisible America*, ed. by Mark Leone & Neil Silberman. Henry Holt & Company, New York.

Newsletter Articles, Book Reviews & Other Publications

1990 "Research at the Fort Jefferson National Monument", in *MAHSNEWS: Newsletter of the Society for Maritime Archaeological & Historical Society*, Vol. 2, No. 6.

1990 "Public Television and the Treasure Hunter", in *MAHSNEWS: Newsletter of the Maritime Archaeological & Historical Society*, Vol. 2, No. 6.

1990 "Francis Drake's Cannons?", in *MAHSNEWS: Newsletter of the Maritime Archaeological & Historical Society,* Vol. 2, No. 7.

1990 "The *Gallega*: Searching for Columbus' Caravel," in *MAHSNEWS: Newsletter of the Maritime Archaeological & Historical Society*, Vol. 2, No. 7.

1990 "Survey of the Chesapeake Bay's Deep Trough," in *MAHSNEWS: Newsletter of the Maritime Archaeological & Historical Society*, Vol. 2, No. 8.

1991 "The Debate Over Maryland's Regulations for Submerged Cultural Resources", in *MAHSNews: Newsletter of the Maritime Archaeological & Historical Society*, Vol. 3, No. 1.

1991 "The Maritime Archaeological & Historical Society: Support for Maritime Research & Preservation", in *ASM Ink: Newsletter of the Archaeological Society of Maryland*, Vol. XVII, No. 4.

1991 "Enforcement of Maritime Cultural Resource Protection Laws," in *MAHSNews: Newsletter of the Maritime Archaeological & Historical Society*, Vol. 3, Number 1.

1991 "Revisions to Maryland's Proposed Regulations for Submerged Sites," in *MAHSNews: Newsletter of the Maritime Archaeological & Historical Society*, Vol. 3, Number 2.

1993 "Report of the Underwater Archaeology Subcommittee", in *Annual Report of the Advisory Committee on Maryland Archaeology*, Maryland Historical Trust, Department of Housing & Community Development. Crownsville, Maryland.

1999 "Conserving Our Buried Treasures," in *Chester River Currents*, Volume 9. Journal of the Chester River Association, Chestertown, Maryland.

1999 "Maritime Archaeology Comes of Age in Maryland," in *Shipmates*, Newsletter of the Schooner Sultana Project, Volume 1, Issue 4.

Presented Papers

1983 "1981-1982 Archaeological Research at Knox's Artillery Park, Pluckemin, New Jersey." Society for Historical Archaeology, Denver. January.

1983 "Current Research at the 1778-1779 Winter Cantonment of the Continental Artillery, Pluckemin, New Jersey." Council of Northeast Historical Archaeology, New Windsor, NY.

1985 "New Approaches to Overhead Site Photography." Society for Historical Archaeology, Boston. January.

1988 "China-Glaze Wares on Historic Sites from the American Revolution: Pearlware Before Wedgwood?" Society for Historical Archaeology, Reno, Nevada. January.

1989 "Making the Most of Development: Working with Developers at Artillery Park, Pluckemin, New Jersey." Society for Historical Archaeology & Joint Archaeological Congress, Baltimore. January.

1990 "Revisiting the Revolution: A View from Northern New Jersey." Society for Historical Archaeology, Tucson. January.

1990 "Site Survey & Underwater Mapping in Underwater Archaeology." Maritime Archaeological & Historical Society, Arlington. March.

1992 "New Jersey's Revolutionary War Sites: Retrospect & Prospect." Symposium on *New Jersey: The Invisible Middle Colony.* Society for Historical Archaeology, Kingston, Jamaica.

1992 "Casting a Wider Net: Regional Perspectives on Revolutionary War Archaeology." Symposium on *Regional Comparative Perspectives in the Military Archaeology of Eastern North America*. Society for Historical Archaeology, Kingston Jamaica.

1992 "A Photographic and Computer-Aided Assessment of an Obliterated Revolutionary War Earthwork." Council for Northeast Historical Archaeology, Glenn Falls, New York. October.

1993 "The Steward Shipyard Site." With Bruce Thompson. Workshop in Archaeology, sponsored by the Archaeological Society of Maryland and the Maryland Historical Trust. February.

1993 "The 1993 Field Session of the Archaeological Society of Maryland". Archaeological Society of Maryland Spring Symposium. March.

1993 "Mapping the *HMS Fowey*: Underwater Archaeology at Biscayne National Park, Florida." Maritime Archaeological & Historical Society. October.

1994 "Understanding Military Community by Ethnographic Analogy." Society for Historical Archaeology, Vancouver, British Columbia. January.

1994 "*HMS Fowey* (1748): Survey & Documentation at Biscayne National Park, Florida." First Annual Underwater Archaeology Conference, University of Maryland College Park. April.

1996 "Documentation and Site Stabilization of BISC-020: Lessons in Site Formation Processes and Preservation." With Larry E. Murphy. Conference on Underwater Archaeology and Society for Historical Archaeology, Cincinnati, Ohio. January.

1997 "Excavation, Recording, and Recovery of the Steamboat *Columbus* (18ST625), Chesapeake Bay, Maryland." With David S. Robinson. Annual conference of the Society for Industrial Archeology, Houghton, Michigan. May.

1997 "Archaeological Data Recovery on the *Kentucky*: Investigating the Wreck of a Civil War Steamboat." Southeastern Archaeological Conference, Baton Rouge, Louisiana. November.

1998 " Archaeology on the Upper Eastern Shore: A Regional Effort to Discover the Past." Joseph H. McLain Program in Environmental Studies, Washington College. April.

1998 "History Underfoot: Archaeology of the United States Naval Academy." Chesapeake Bay Maritime Museum Fall Lecture Series. October.

1998 "Washington College & Archaeology on the Upper Eastern Shore." September.

Invited Papers & Addresses

1987 "Unearthing the Revolution: An Archaeological Perspective on the War." Archaeology Colloquium, Montclair State College, New Jersey. Fall.

1990 "Knox's Artillery Cantonment: A Case Study in Preservation Needs." Symposium on Wooded Archaeological Site Preservation, National Park Service, Department of Interior, Morristown, New Jersey. September.

1992 "Fort Nonsense: Fact or Fiction?" Address to the Annual Meeting of the Washington Association of New Jersey. February.

1992 "Methodological Approaches to Revolutionary War Archaeology: A Case Study from New Jersey". Invited lecture, Historic Sites Commission of Vermont, Mount Independence State Historic Site.

1992 "Archaeological Perspectives on the American Revolution." Invited lecture at the Fraunces Tavern Museum, New York. October.

1992 "An Archaeological Consortium from the University Perspective." Maryland Annual Preservation Conference and Commercial Revitalization Training Program (Maryland Historical Trust and Community Assistance Administration). November.

1992 The Frederick M. Stiner Memorial Lecture: "Archaeology of a Revolutionary War Artillery Camp in New Jersey." 29th Annual Meeting of the Archaeological Society of Maryland.

1992 "Capturing the Past: the Archaeological Search for Earlier Peoples." Invited lecture at the Arthur M. Sackler Gallery, Smithsonian Institution, Washington, D.C.

1993 "Digital Mapping & AutoCAD: A Tool for Research and Resource Management." Maryland Annual Preservation Conference and Commercial Revitalization Training Program (Maryland Historical Trust and Community Assistance Administration). November.

1997 "Underwater Archaeological Investigations of the Civil War Steamboat *Kentucky*." Northern Louisiana Civil War Roundtable, Centenary College, Shreveport, Louisiana. September.

1997 "The Archaeology of the American Revolution." Yorktown Victory Center, Yorktown, Virginia. October.

1997 "Archaeological Investigations at the United States Naval Academy." 34th Annual Meeting of the Archaeological Society of Maryland, Annapolis. October.

1997 "Managing Mount Independence's Cultural Resources." Annual Meeting of the Archaeological Society of Vermont, Burlington. October.

1999 "An Archaeological Perspective on the American Revolution." Annual Meeting of the Queen Anne's County Historical Society. Centreville, Maryland. January.

1999 "Nineteenth Century Ceramics & Social History." With Elizabeth Seidel. Lecture and workshop, Furnacetown Historic Site, Snow Hill, Maryland. April 24.

1999 "Searching for Freedom: the Archaeological search for the Birthplaces of Harriet Tubman and Frederick Douglass." With Richard Hughes. Maryland Preservation Conference, Easton, Maryland. May 1.

1999 "Archaeological Recovery of the Wreck of the Civil War Steamboat *Kentucky*." Archaeological Society of Maryland, Easton, Maryland. May 28.

1999 "An Environmental Perspective on the Archaeology of Maryland." Maryland State Forestry Board, Annual Banquet Meeting, Chestertown, Maryland. September 23

Chaired Meetings, Sessions

Conference Chair & Organizer, Council for Northeast Historical Archaeology, 1989 Annual Meeting, Morristown, New Jersey.

Co-Chair, Symposium on "Regional Comparative Perspectives in the Military Archaeology of Eastern North America." Society for Historical Archaeology, Kingston, Jamaica. January, 1992.

Chair, Symposium on "Historical Archaeology on Military Sites." Society for Historical Archaeology, Washington, DC., 1995.

Editorial Work

* *Editorial Advisory Committee*, Northeast Historical Archaeology, 1990 to present
* *Editorial Advisor*, MAHSNews, Newsletter of the Maritime Archaeological & Historical Society, 1990 to present.

Review of Articles

* Historical Archaeology, Society for Historical Archaeology
* Northeast Historical Archaeology, Council for Northeast Historical Archaeology

Media Productions

1998 *Diving Into History: An Introductory Course in Underwater Archaeology.* Ten part video series produced by the Maritime Archaeological & Historical Society. *Consultant* for the series

Speaker for five of the ten segments:

* Introduction (Part I): Maritime Archaeology
* Introduction (Part 2): A Case Study - HMS *Fowey*
* Position Fixing & Search Methods
* Surveying, Mapping, and Recording
* Project Planning & Reports

Research Grants

1999 $ 39,140 Principal Investigator, Non-Capital Grant (FY00) for Maryland Historical Trust to Washington College for a Regional Archaeology Program for the Upper Eastern Shore.

1998	$ 35,000	Principal Investigator, Non-Capital Grant (FY99) for Maryland Historical Trust to Washington College for a Regional Archaeology Program for the Upper Eastern Shore.
	$ 48,387	Principal Investigator, Assessment of Archaeological resources in Upper Eastern Shore transportation Corridors, Kent & Queen Anne's Counties, Maryland. Transportation Enhancement Program, Maryland State Highways Administration.
	$ 26,000	Principal Investigator, Research in African American History and Archaeology. Preservation Fund from River House, administered by the Maryland Historical Trust.
	$ 5,643	Principal Investigator, Public Archaeology at the Cray House, Stevensville, Maryland. Maryland Humanities Council and the National Endowment for the Humanities.
	$ 300	Cash match to the above project from the Kent Island Heritage Society.
1995	$ 35,000	Principal Investigator, Non-Capital Grant for Maryland Historical Trust to the University of Maryland College Park for development of a Geographic Information System for the Historic District of Annapolis, Maryland.
1994	$ 35,000	Principal Investigator of Legacy Grant, Department of Defense, for Underwater Survey of the United States Naval Academy.
	$111,874	Principal Investigator, Anne Arundel County Court House Archaeological Investigation from Anne Arundel County.
	$ 35,000	Principal Investigator, Non-Capital Grant from the Maryland Historical Trust to Carroll Park Restoration Foundation, Inc.
	$ 5,540	Principal Investigator, grant from City of Baltimore for archaeological survey at Carroll Park.
	$ 2,500	Principal Investigator, Non-Capital Grant from the Maryland Historical Trust - Analysis of Materials from the Steward Shipyard.
1993	$ 5,000	Co-Principal Investigator, *HMS Fowey* Documentation Project, National Park Service.
	$ 5,000	Principal Investigator, Non-Capital Grant from the Maryland Historical Trust - Analysis of Materials from the Steward Shipyard.
1992	$ 35,000	Principal Investigator, Non-Capital Grant from the Maryland Historical Trust to Carroll Park Restoration Foundation, Inc.: $ 17,500. Additional $17,500 match raised from other sources.
	$ 5,000	Principal Investigator, Survey & Planning Grant from Maryland Historical Trust to the Maritime Archaeological & Historical Society.
	$ 5,000	Principal Investigator, Research Grant from Maritime Archaeological & Historical Society.
1990	$ 5,000	General Research Board Grant, University of Maryland.
	$ 11,000	Computer Enhancement Grant, College of Behavioral & Social Sciences, University of Maryland.
	$ 5,485	Washington Association of New Jersey, research grant.
1989	$ 35,000	Hills development Company, grant to the Pluckemin Archaeological Project.
	$ 500	Society of Colonial Wars, research grant, PAP.
	$ 6,681	Washington Association of New Jersey, research grant.
1988	$ 7,428	US Department of Interior, National Park Service.

	$105,000	Hills Development Co., research grant, PAP.
	$ 1,000	Johnson & Johnson Companies, research grant, PAP.
	$ 18,800	Environmental Disposal Corp., research grant, PAP.
	$ 600	Society of Colonial Wars, research grant, PAP.
1987	$ 7,500	Brady Foundation, research grant.
	$ 44,500	Hills Development Co., research grant.
	$ 14,500	Sammis Corporation, research grant.
	$ 600	Society of Colonial Wars, research grant.

1980-1986 Research grants totaling $ 185,650 from:

Alan Deane Corporation	Hills Development Co.
Beneficial Corp.	Kirby Foundation
Brady Foundation	Leland Schubert Foundation
Geraldine R. Dodge Foundation	Lindberg Foundation
Ethicon, Inc.	

SCUBA Certifications

Divemaster, Professional Association of Diving Instructors (PADI)
Rescue Diver, PADI, NAUI (National Association of Underwater Instructors)
SLAM (Scuba Lifesaving & Accident Management), YMCA
DAN Oxygen Provider Certification
American Academy of Underwater Sciences certification:
SCUBA and surface supplied air systems
Open water, ocean, riverine, and low visibility diving

Member: American Academy of Underwater Sciences
Professional Association of Diving Instructors
Diver's Alert Network (DAN)

DAVID STEWART ROBINSON

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e-mail: daverob@sover.net

EDUCATION:

Master of Arts, Anthropology (GPA 3.83/4.0), Graduate Program in Nautical Archaeology, Dept. of Anthropology, Institute of Nautical Archaeology (INA), Texas A&M University, College Station, TX. May 1999.

Imagenex Digital Side Scan Sonar Training, R. Christopher Goodwin & Associates, Inc., New Orleans, LA. June 26-27, 1996.

***Hypack* Hydrographic Survey Software (version 6.4) Training**, R. Christopher Goodwin & Associates, Inc., Frederick,
MD. June 19, 1996.

Introduction to Federal Projects and Historic Preservation Law, The Advisory Council On Historic Preservation, and The GSA Interagency Training Center, Washington, DC. Jan. 11-13, 1994.

Bachelor of Arts (with honors), Anthropology and Art Studio (double major), University of Rhode Island, Kingston, RI. Aug. 1990.

Open Water SCUBA Instructor, Professional Association of Diving Instructors, Chelmsford, MA. Aug. 1986.
*(*see also: Diving Related Education/Certifications)*

EMPLOYMENT:

Director of Conservation, Nautical Archaeologist, Educator, and Staff Team Leader, Lake Champlain Maritime Museum, Basin Harbor, VT. June, 1999 - present.

Nautical Archaeologist and Conservator, Lake Champlain Maritime Museum, Basin Harbor, VT. Sept. 1998 - June 1999.

Director of Nautical Archaeological Services Division, Director of Archaeological Conservation, and Diving Safety Officer, R. Christopher Goodwin & Associates, Inc., Frederick, MD. Jan. - July, 1998.

Assistant Project Manager, Nautical Archaeologist, Remote Sensing Specialist, Archaeological Conservator, and Diving Safety Officer, R. Christopher Goodwin & Associates, Inc., Frederick, MD. Nov. 1995 - present.

Archaeological Illustrator, R. Christopher Goodwin & Associates, Inc., Frederick, MD. Nov. 1993 - present.

Conservation Lab Manager, Chief Conservator, Underwater Archaeologist, Divemaster, Exhibit Coordinator, and Museum Interpreter, Lake Champlain Maritime Museum, Basin Harbor, VT. May 10 - Nov. 12, 1993.

Graduate Research Assistant, Institute of Nautical Archaeology (INA), Graduate Program in Nautical Archaeology, Texas A&M University, College Station, TX. January 1991-May 1992.

Archaeological Illustrator, Consulting Archaeology Laboratory, Department of Anthropology, Texas A&M

University, College Station, TX. September 1990-December 1990.

Graphic Designer, Nyman Manufacturing, East Providence, RI. May 1988 - Aug. 1990.
Manager and Teaching Assistant, photography and film-making studios, Department of Fine Arts, University of Rhode Island, Kingston, RI. Sept. 1989 - Aug. 1990.

Assistant Manager, Open Water Scuba Instructor, and Scuba Equipment Repair Specialist, Ocean State Scuba, Jamestown, RI. Feb. 1985 - March 1988.

PROFESSIONAL EXPERIENCE:

Invited Speaker, "Conserving the War of 1812 Anchor from Plattsburgh Bay: A Community Project," a presentation given to the Plattsburgh Rotary Club, Plattsburgh, NY. October 16, 1999.

Guest Speaker, "Conservation and Historical Research on the War of 1812 Anchor from Plattsburgh Bay: A Progress Report," presented to residents of Clinton County, New York, during Clinton County Weekend at the Lake Champlain Maritime Museum. September 18-19, 1999.

Consultant, University of Maine History Department. Provided technical support during cannon conservation project conducted by marine archaeologist Dr. Warren Reiss at the University of Maine's Darling Marine Science Center. July-August, 1999.

Consultant, Hartgen Archaeological Associates, Inc. Provided technical guidance concerning the interim conservation needs of a large, complex, archaeological site and its collection of artifacts dating from the seventeenth to the nineteenth centuries. Project is being conducted by Hartgen Archaeological Associates, Inc., on behalf of SUNY-Albany, Albany, NY. July, 1999-present.

Principal Investigator, *Kentucky* Shipwreck Artifact Conservation Project, Lake Champlain Maritime Museum, Basin Harbor, VT. Responsible for supervising and directing the conservation of a collection of large, composite artifacts recovered during the Phase III archaeological excavation of the Civil War-era shipwreck *Kentucky*. Project being conducted for R. Christopher Goodwin & Associates, Inc., on behalf of the U.S. Army Corps of Engineers, Vicksburg District, Vicksburg, MS. August, 1999 - present.

Director of Conservation, Nautical Archaeologist, Educator, and Staff Team Leader, Lake Champlain Maritime Museum, Basin Harbor, VT. Responsible for developing LCMM's conservation laboratory and staff into a nationally-recognized leader in archaeological conservation research and education. June, 1999 - present.

Invited Speaker, "The War of 1812 Anchor from Plattsburgh Bay," a public presentation given as part of the Lake Champlain Maritime Museum's 1999 Summer Lecture Series, sponsored by the Vermont Council on the Humanities, Basin Harbor, VT. August 12, 1999.

Supervisor, LCMM Summer Conservation Lab Graduate Student Internship Program. Responsible for training and supervising graduate student interns from Texas A&M University's Program in Nautical Archaeology during their summer employment in LCMM's Conservation Laboratory. May - August 1999.

Invited Speaker, presented "The Tale of Three Gunboats," and discussed management options for the newly-discovered Revolutionary War gunboat, lost in Lake Champlain during the 1776 Battle of Valcour Island, with the Vergennes Lion's Club during their final Spring-season meeting, Vergennes, VT. May 19, 1999.

Invited Speaker, presented paper entitled, "Preserving Lake Champlain's Maritime Legacy: Conservation at the Lake Champlain Maritime Museum," during the Spring meeting of the Vermont Archaeological Society, Middlebury College, Middlebury, VT. April 17, 1999.

Instructor and Undergraduate Student Internship Supervisor, formulated and taught intensive college-level

course in archaeological conservation techniques to a SUNY-Albany undergraduate student, Ferrisburgh, VT. Jan. - March, 1999.

Supervisor, LCMM Conservation Lab High School Student Internship Program. Responsible for training and mentoring middle school and high school students from work-study, alternative education, and community service programs offered by local school systems. Provided instruction in conservation, archaeological illustration, and photography, Ferrisburgh, VT. December 1998 - present.

Project Manager and Conservator, *Confiance* Anchor Conservation Project. Responsible for supervising the recovery, conservation, and display of a 3,000-pound anchor, shot off of the bow of the British flagship *Confiance* during the War of 1812 Battle of Plattsburgh Bay. The project is being conducted by the Lake Champlain Maritime Museum, on behalf of the State of New York, and the Clinton County Historical Association, Plattsburgh, NY. Sept., 1998 - present.

Project Manager, Revolutionary War Gunboat Management Study. Responsible for preparing a cultural resources management plan for the submerged remains of a wooden gunboat lost in 1776 on Lake Champlain during the Revolutionary War Battle of Valcour Island. The project is being conducted by the Lake Champlain Maritime Museum, on behalf of the United States Navy, Washington, D.C. Sept., 1998 - present.

Conservator, Mirror Lake Civil War Ordnance Conservation Project. Responsible for completing the conservation treatment of 62 pieces of Civil War-era spherical case shot equipped with Bormann timed fuses, and for coordinating the national distribution of these artifacts to museums and Civil War interpretive centers. Project being conducted by the Lake Champlain Maritime Museum, on behalf of the Vermont Division for Historic Preservation, Montpelier, VT, and the National Park Service, Dept. of the Interior, Washington, D.C. Sept., 1998 - present.

Nautical Archaeologist and Conservator, Lake Champlain Maritime Museum, Basin Harbor, VT. Sept., 1998 - June 1999.

Invited Speaker, presented "The Steamboat *Columbus*: Archaeological Recovery of an Early Crosshead Steam Engine," during the annual meeting of the Friends of the Jefferson-Patterson Park and Museum, held at the Maryland Historical Trust's Archaeological Conservation Laboratory, St. Leonard, MD. June 11, 1998.

Invited Speaker, presented discussion on underwater archaeology and scientific diving to elementary school students at the Deer Crossing Elementary School, New Market, MD. June 9, 1998.

Project Manager, Vermilion River Submerged Cultural Resources Investigation. A Phase I marine remote sensing survey of approximately 3 linear miles of riverbed within the Vermilion River, Lafayette Parish, LA. The project was conducted by R. Christopher Goodwin & Associates, Inc., on behalf of the U.S. Army Corps of Engineers, New Orleans District, in support of planned improvements to the river channel. April - July, 1998.

Project Manager, Field Director, and Project Diving Supervisor, U.S. Naval Academy Submerged Cultural Resources Investigation. A Phase I underwater archaeological survey of a proposed boat mooring field, located in the Severn River, adjacent to the U.S. Naval Academy, Annapolis, Maryland. Project entailed systematic, controlled underwater excavation of dredge-test units in zero-visibility conditions, utilizing a venturi dredge, surface-supplied air, and hard-wired surface-to-diver communications, and a differential global positioning system to record precisely the positions of the dredge test units. The project was conducted by R. Christopher Goodwin & Associates, Inc., on behalf of the U.S. Naval Acadamy, Annapolis, Maryland. March - July, 1998.

Project Manager, Coan River Submerged Cultural Resources Investigation. A Phase I marine remote sensing of approximately 2 miles of riverbed within the navigation channel located at the confluence of the Coan and Potomac Rivers, Northumberland County, VA. The project was conducted by R. Christopher Goodwin & Associates, Inc., on behalf of the U.S. Army Corps of Engineers, Baltimore District, in support of their plan to dredge the current channel at the mouth of the Coan River, Northumberland County, Virginia. February - July, 1998.

Logistical Coordinator, Steamboat *Columbus* Propulsion Machinery Conservation Project. Coordinated transfer of 32,000 pounds of components from the earliest extant commercial marine steam engine and paddle wheel shaft, recovered in 1992 at the wreck site of the Chesapeake Bay steamboat *Columbus* (1828), from the International Artifact Conservation and Research Lab, Inc. in Belle Chasse, LA to the Maryland Historical Trust's Archaeological Conservation Lab in St. Leonard, MD. January 27, 1998.

Project Manager, Marsh Island Marine Archeological Remote Sensing Survey. A Phase I submerged cultural resources survey of approximately 129 linear miles of seabed within two 5,000 x 5,000 ft square proposed dredged materials borrow sites located in East Cote and West Cote Bays, Marsh Island, Iberia Parish, Louisiana. The project was conducted by R. Christopher Goodwin & Associates, Inc., on behalf of the U.S. Army Corps of Engineers - New Orleans District, New Orleans, LA. January - July, 1998.

Project Manager and Field Director, Upper Yazoo River Marine Archeological Remote Sensing Survey. A Phase I submerged cultural resources survey of approximately 14 mi (84 linear miles) of the Yazoo River, Mississippi and Leflore Counties, Mississippi. The project was conducted by R. Christopher Goodwin & Associates, Inc., on behalf of the U.S. Army Corps of Engineers - Vicksburg and New Orleans Districts, Vicksburg, MS and New Orleans, LA. January - July, 1998.

Director of Underwater Archaeological Services Division, Director of Conservation, and Diving Safety Officer, R. Christopher Goodwin & Associates, Inc., Frederick, MD. January - July, 1998.

Conservator, Brown's Tavern Archaeological Project. Responsible for designing a technical proposal and completing the documentation and stabilization of the last extant (sandstone) milepost, installed in 1813, on Route 1 in Maryland. The milepost conservation is part of a Phase II archaeological excavation of the lands surrounding Brown's Tavern, an historic tavern dating to the late eighteenth century. The project was conducted by R. Christopher Goodwin & Associates, Inc., on behalf of Federal Reality Investment Trust, Beltsville, MD. December, 1997 - July, 1998.

Director of Conservation, Annapolis Gateway Phase III Archaeological Project. Responsible for designing a technical proposal and directing the documentation and stabilization of a collection of leather and ferrous metal artifacts dating from the late nineteenth and early twentieth centuries. The project was conducted by R. Christopher Goodwin & Associates, Inc., on behalf of the City of Annapolis, MD. December, 1997 - July, 1998.

Director of Conservation, Old Baltimore Phase II Archaeological Project. Responsible for designing a technical cost proposal and directing the documentation and stabilization of a collection of iron, pewter, and copper artifacts dating from the first half of the seventeenth century recovered during archaeological excavations conducted at the U.S. Army's Weapons Proving Ground, Aberdeen, Maryland. The project was conducted by R. Christopher Goodwin & Associates, Inc., on behalf of the Dynamac Corporation and the Directorate of Safety, Health, and the Environment, Aberdeen Proving Ground, U.S. Army, Aberdeen, MD. November, 1997 - July, 1998.

Invited Speaker, Maritime Archaeological Historical Society (MAHS). Presented filmed discussion on creating computerized video-mosaics of underwater sites for production of the Underwater Photography segment of a video course on Basic Underwater Archaeology to be aired on Maryland Public Television and made available to the sport diving public. Frederick, MD. November 14, 1997.

Director of Conservation, *Kentucky* Phase III Archaeological Project. Responsible for designing a technical cost proposal and directing the documentation and stabilization of more than 1,000 artifacts, including large iron and composite wood and iron ship components, and bone, glass, iron, lead, silver, copper, wood, and leather artifacts dating from the middle nineteenth century, recovered during underwater archaeological excavations the submerged remains of the 1856 Mississippi River sidewheel steamboat, *Kentucky*, commandeered by Confederate and Union forces during the Civil War and lost in 1865 on the Red River, south of Shreveport, LA, as a Union troop-transport carrying 750 paroled Confederate prisoners of war and their families, with 250 horses. Project was conducted by R.

Christopher Goodwin & Associates, Inc. on behalf of the U.S. Army Corps of Engineers, Vicksburg District, Vicksburg, MS. October 1997 - July 1998.

Assistant Project Manager, Co-Field Director, Supervisor of Diving Operations, and Nautical Archaeologist, *Kentucky* Shipwreck Underwater Excavation. A Phase III underwater archaeological excavation and documentation of the submerged remains of a 1856 Mississippi River sidewheel steamboat, commandeered by Confederate and Union forces during the Civil War and lost in 1865 on the Red River, south of Shreveport, LA, as a Union troop-transport carrying 750 paroled Confederate prisoners of war and their families, with 250 horses. All diving was carried out in black water, using a surface-supplied air and hard-wire communications diving mode. Project was conducted by R. Christopher Goodwin & Associates, Inc. on behalf of the U.S. Army Corps of Engineers, Vicksburg District, Vicksburg, MS, July - October, 1997.

Invited Speaker, presented discussion on underwater archaeology and scientific diving to elementary school students at the Banner School, Frederick, MD. June 1997.

Assistant Project Manager, Co-Field Director, Nautical Archaeologist, and Remote Sensing Specialist, Kedges Straits Marine Archaeological Remote Sensing Survey. A Phase I submerged cultural resources survey of approximately 11 linear miles of seabed along a proposed oyster shell dredge site area located at Kedges Straits, Somerset County, Maryland. The project was conducted by R. Christopher Goodwin & Associates, Inc., on behalf of the U.S. Army Corps of Engineers - Baltimore District, Baltimore, MD. June - December 1997.

Invited Speaker, presented professional paper ("The Steamboat *Columbus*: Archaeological Recovery of an Early Crosshead Steam Engine") during a U.S. Army Corps of Engineers-sponsored symposium entitled, "Industrial Archaeology in the U.S. Army Corps of Engineers," held at the 1997 Society for Industrial Archaeology's Annual National Conference, Michigan Technological University, Houghton, MI. May 31, 1997.

Chief Archaeological Conservator, Sebana Seca, Puerto Rico Phase II Archeological Project. Responsible for the documentation and stabilization of a collection of copper coins dating from the middle sixteenth century to the early twentieth century. The coins were recovered during archaeological excavations conducted at the U.S. Naval Security Activity Sebana Seca, Puerto Rico. The project is being conducted by R. Christopher Goodwin & Associates, Inc., on behalf of the U.S. Navy, Atlantic Division Naval Facilities Engineering Command, Norfolk, VA. May 1997.

Guest Lecturer, Maritime Archaeological Historical Society (MAHS). Presented lecture on archaeological conservation during MAHS' annual Basic Underwater Archaeology Course. Lecture was videotaped for production of a video version of the course that will be aired on Maryland Public Television and will be made available to the sport diving public. Cabin John, MD. March 25, 1997.

Invited Speaker, presented paper ("Sinking Islands, Burning Boats, and Stolen Artifacts: Meeting the Challenges of Preserving the Chesapeake Bay's Submerged Cultural Resources") during a State of Maryland-sponsored session entitled,"A Decade of Underwater Archaeology in Maryland," at the 1997 Middle Atlantic Archaeological Conference, Ocean City, Maryland. March 8, 1997.

Maritime Archaeological Consultant, FUGRO/John E. Chance & Associates, Inc. Analyzed magnetometer, side scan sonar, subbottom profiler, and bathymetric data and prepared archaeological assessment report for inclusion in a technical report (ANR Pipeline Company Archaeological, Engineering, and Hazard Study: Proposed 30-inch Gas Pipeline Route Block 63, Eugene Island Area to East Bay, Louisiana.) prepared by FUGRO/Chance, in cooperation with R. Christopher Goodwin & Associates, Inc., for the ANR Gas Corporation, Detroit, MI. Lafayette, LA. March 3-4, 1997.

Assistant Project Manager, Submerged Cultural Resources Management Planner, Mount Independence, Vermont Revolutionary War State Historic Site Cultural Resources Management Plan Project. The purpose of this project is to provide the State of Vermont with an effective long-range management plan for documenting, protecting and interpreting the site's nationally significant terrestrial and underwater

archaeological resources. Interpretative data management tools such as a Geographic Information System (GIS) computer database, and CD ROM "homepage-style" interactive computer software for use on the Internet will be developed as part of the plan. The project is being conducted by R. Christopher Goodwin & Associates, Inc., on behalf of the Vermont Division for Historic Preservation, Montpelier, VT. December 1996-present.

Archaeological Conservator, Sebana Seca, Puerto Rico Phase II Archaeological Project. Responsible for designing a technical proposal and implementing the documentation and stabilization of a 600-800 year old intact human skeleton recovered during archaeological excavations conducted at the U.S. Naval Security Activity Sebana Seca, Puerto Rico. The project is being conducted by R. Christopher Goodwin & Associates, Inc., on behalf of the U.S. Navy, Atlantic Division Naval Facilities Engineering Command, Norfolk, VA. December 1996-present.

Archaeological Conservator, Southern Natural (SONAT) Gas Company Flint River Discovery Archeological Investigation. Responsible for designing a technical cost proposal and implementing the documentation and conservation of a Civil War-vintage 1862 Spencer repeating rifle recovered from the Flint River, Jonesboro, Georgia, during pipeline construction. The project is being conducted by R. Christopher Goodwin & Associates, Inc., on behalf of the Southern Natural Gas Company, Atlanta, GA. December 1996-present.

Assistant Project Manager, Co-Field Director, Nautical Archaeologist, and Remote Sensing Specialist, Little Creek Naval Amphibious Base Marine Archaeological Remote Sensing Survey. A Phase I submerged cultural resources survey of approximately 60 linear miles of seabed along a proposed dredge site area located between Little Creek inlet and the Thimble Shoal Channel, Norfolk, Virginia. The project was conducted by R. Christopher Goodwin & Associates, Inc., on behalf of the U.S. Navy, Atlantic Division Naval Facilities Engineering Command, Norfolk, VA. December 6-10, 1996.

Assistant Project Manager, Co-Field Director, Nautical Archaeologist, and Remote Sensing Specialist, Texaco Discovery Gas Transmission Pipeline Corridor Marine Archaeological Remote Sensing Survey. A Phase I submerged cultural resources impact study of approximately 60 linear miles of seabed at proposed pipeline corridor located in Timbalier Bay, Louisiana and extending 3 miles offshore into the Gulf of Mexico. The project was conducted by R. Christopher Goodwin & Associates, Inc., on behalf of the Texaco Oil Company, Fourchon, LA. October 8 - 14, 1996.

Archaeological Reconstruction Specialist, Maryland Stadium Authority Archeological Project. Created a photomosaic, and both two- and three-dimensional reconstructions of a mid-nineteenth century horse-powered pug mill utilizing 3-D Modeler computer graphics software, 35mm photography, and traditional illustration techniques. Project conducted as part of Phase III archaeological investigations undertaken by R. Christopher Goodwin & Associates, Inc., on behalf of the Maryland Stadium Authority, Baltimore, MD. October 6-7, 1996.

Archaeological Conservator, Moorefield Archaeological Study. Responsible for the stabilization of copper alloy, wooden, bone, and iron artifacts and human skeletal remains recovered during Phase III archaeological excavations of 17 early seventeenth century Native American burial sites. Project Conducted on behalf of the U.S. Army Corps of Engineers, Baltimore District, MD. September, 1996.

Field Archaeologist and Historian, Native American Rock Art Survey. Combined archival site file research and archaeological field surveys documenting prehistoric rock art within the boundaries of U.S. Naval Security Activities at Winter Harbor and Machias, Maine. The Project was conducted by R. Christopher Goodwin & Associates, Inc., on behalf of the U.S. Navy, Atlantic Division Naval Facilities Engineering Command, Norfolk, VA. August 12 - 16, 1996.

Assistant Project Manager, Co-Field Director, Nautical Archaeologist, and Remote Sensing Specialist and Remote Sensing System Designer, Atchafalaya Ocean Dredged Material Disposal Site Remote Sensing Marine

Archaeological Survey. A Phase I submerged cultural resources impact study of approximately 320 liner miles of seabed at a proposed dredge material disposal site located in the Gulf of Mexico along the southern Louisiana shoreline at the mouth of the Atchafalaya River. The survey was conducted utilized state-of-the-art surveying instruments, including a Northstar 941XD Differential Global Positioning System, Imagenex 858 Color Imaging Side Scan Sonar, an EG&G 866 Recording Marine Proton Precession Magnetometer, and a Cetrek 930-370 C-net Recording Depth Sounder. This custom-designed suite of instruments was interfaced with an IBM Thinkpad 486 laptop computer using Version 6.4 of Coastal Oceanographics' *Hypack for Windows* hydrographic surveying software to collect and store survey data digitally and in real time. Project was conducted by R. Christopher Goodwin & Associates, Inc., on behalf of the U.S. Army Corps of Engineers, New Orleans District, LA. June 24, 1996-present.

Archaeologist, Fischer Property Archaeological Survey. A Phase Ia archaeological reconnaissance survey of a 1,280 acre property located in Charles County, MD. Project conducted on behalf of the Driggs Corporation by R. Christopher Goodwin & Associates, Inc., Frederick, MD. June 10, 1996.

Field Crew Chief, Archaeologist, Historic Built-Structure Recordation Specialist, Project Photographer, Maryland Stadium Authority Archaeological Project. Directed the Phase III data recovery and documentation of an antebellum horse-powered "pug mill" used for mixing clay at an historic brick-making factory in Baltimore, MD. Pug mill documentation was accomplished using a self-designed and fabricated azimuthal device, and through photography, to create a photomosaic of the entire pug mill feature. Project conducted on behalf of the Maryland Stadium Authority by R. Christopher Goodwin & Associates, Inc., Frederick, MD. May 20-24, 1996.

Remote Sensing Specialist, Underwater Archaeologist, Southern Natural (SONAT) Gas Discovery on the Flint River, Jonesboro, Georgia - Remote Sensing and Underwater Reconnaissance Survey. Terrestrial and underwater metal detector and visual reconnaissance surveys were conducted along SONAT's proposed pipeline corridor across the Flint River, at Jonesboro, Georgia, to determine the presence of additional artifacts or features, following the discovery of a Civil War vintage firearm during construction activities. Project was conducted by R. Christopher Goodwin & Associates, Inc., on behalf of the Southern Natural (SONAT) Gas Company, Birmingham, AL. May 18, 1996.

Archaeological Conservator, Northwest Phase II and III Archaeological Studies. Conserved a collection of iron and bone domestic and agriculturally related artifacts recovered from the site of a late eighteenth century plantation. located in Chesapeake City, VA, on the U.S. Naval Security Group Activity Northwest. Project conducted by R. Christopher Goodwin & Associates, Inc., Frederick, MD, on behalf of the U.S. Navy, Atlantic Division Naval Facilities Engineering Command, Norfolk, VA. April-May, 1996.

Invited Guest Lecturer, Anne Arundel Community College. Presented lecture on recording shipwrecks in low visibility water during public course in Basic Underwater Archaeology offered jointly by the Maryland Historic Trust, Anne Arundel Community College, and the Maritime Archaeological Historical Society (MAHS). Anne Arundel Community College, Arnold, Maryland. March 2, 1996.

Assistant Project Manager, Co-Field Director, Nautical Archaeologist, and Remote Sensing Specialist, Sandbridge Shoal Remote Sensing Marine Archaeological Survey. A Phase I submerged cultural resources impact study of approximately 75 linear miles of seabed at a proposed dredge site located at Sandbridge Shoal, Virginia Beach, VA, utilizing remote sensing techniques (proton precession magnetometer, side-scan sonar, and fathometer integrated with Hypack hydrographic survey computer software and a differential global positioning satellite (DGPS) locational system). Project conducted by R. Christopher Goodwin & Associates, Inc., on behalf of the U.S. Navy's Atlantic Division Naval Facilities Engineering Command, Norfolk, VA. February 9-14, 1996.

Project Manager, Field Director, Ship Recordation Specialist, and Oral Historian, Bayou DuLarge Vernacular Watercraft Documentation Project. Documentation of six wooden vernacular watercraft and oral historical research on Bayou DuLarge, Terrebonne Parish, LA. Project conducted by R. Christopher Goodwin & Associates, Inc., with the assistance of Richard K. Anderson, Jr., on behalf of the U.S. Army Corps of Engineers, New Orleans District,

New Orleans, LA, October 1995.

Assistant Project Manager, Field Director, Supervisor of Diving Operations, Historian, and Nautical Archaeologist, *Kentucky* Shipwreck Underwater Survey. A Phase IB investigation and delimitation of the submerged remains of a 1856 Mississippi River sidewheel steamboat, commandeered by Confederate and Union forces during the Civil War and lost in 1865 on the Red River, south of Shreveport, LA, as a Union troop-transport carrying 750 paroled Confederate prisoners of war and their families, with 250 horses. Project conducted by R. Christopher Goodwin & Associates, Inc. on behalf of the U.S. Army Corps of Engineers, Vicksburg District, Vicksburg, MS, January-September 1995.

Nautical Archaeologist, Reynolds Channel and New York Boat Channel Cultural Resources Reconnaissance Study. A Phase IA cultural resources reconnaissance investigation performed in support of a Shallow Draft Navigation Reconnaissance Study of Reynolds Channel and the New York State Boat Channel, Long Island, NY. Project conducted by R. Christopher Goodwin & Associates, Inc. for Andrews, Miller, and Associates, Inc. on behalf of the U.S. Army Corps of Engineers, New York District, December 1994.

Invited Guest Speaker, National Maritime Center. Presented paper ("Collections Management of Looted Artifacts from the Civil War Wrecks *C.S.S Florida* and *U.S.S. Cumberland*") during public program recognizing significant events in preservation of the United States' maritime heritage. Sponsored by the Departments of Justice, Interior, and Navy, the program featured a series papers followed by the presentation of the first statutory reward under the Archaeological Resources Protection Act (ARPA), made to the Confederate Naval Historical Society for their assistance in the successful prosecution of the looting, and illegal commercial trafficking of *C.S.S. Florida* and *U.S.S. Cumberland* artifacts. National Maritime Center, Norfolk, VA, November 28,1994.

Nautical Archaeologist, Remote Sensing Specialist, Field Crew Chief, Poplar Island Phase IB Survey. A submerged cultural resources impact study of an inundated Chesapeake Bay island, utilizing remote sensing (CHIRPS sub-bottom profiling sonar, side-scan sonar, and electro-magnetic remote-sensing equipment integrated with Hypack hydrographic survey computer software and a differential global positioning satellite navigational system), terrestrial shovel testing, and underwater induction dredging. Project conducted by R. Christopher Goodwin & Associates, Inc., on behalf of the U.S. Army Corps of Engineers, Baltimore District, Baltimore, MD. November 7, 1994 - present.

Nautical Archaeologist and Assistant Project Manager, Washington Naval Historical Center. Responsible for managing sub-contracted materials conservator Curtiss Peterson in his assessment of the conservation needs of 361 items in the Washington Naval Historical Center's collection. A Department of Defense's Legacy Resource Management Program Project, conducted by R. Christopher Goodwin & Associates, Inc., on behalf of the Department of Defense's Atlantic Division Naval Facilities Engineering Command, Norfolk, VA. Dec. 6, 1993 - present.

Invited Guest Speaker, Hampton Roads Naval Museum. Presented a series of talks regarding the Legacy Demonstration Project *Inventory and Conservation Needs Assessment of Artifacts from the Civil War Wrecks* C.S.S. Florida *and* U.S.S. Cumberland, as part of the Department of Defense Legacy Resource Management Program's East Coast Regional Workshop, National Maritime Center, Norfolk, VA. September 13, 1994.

Nautical Archaeologist and Chief Archaeological Conservator-in-Residence, Hampton Roads Naval Museum. Responsible for cataloging and assessing the conservation needs of 535 confiscated underwater artifacts illegally removed from the Civil War wrecks *C.S.S. Florida* and *U.S.S. Cumberland*, as part of a Department of Defense Legacy Resource Management Program Project conducted by R. Christopher Goodwin & Associates, Inc., on behalf of the Department of Defense's Atlantic Division Naval Facilities Engineering Command, National Maritime Center, Norfolk, VA. Dec. 16, 1993 - Sept. 15, 1994.

Nautical Archaeologist, Remote Sensing Specialist, and Field Crew Chief, Baltimore Harbor Remote-Sensing Survey. A submerged cultural resources impact study of portions of Baltimore's outer harbor, utilizing side-scan

sonar and electro-magnetic remote-sensing equipment in combination with Hypack hydrographic survey computer software and a differential global positioning satellite navigational system. Project conducted by R. Christopher Goodwin & Associates, Inc., on behalf of the U.S. Army Corps of Engineers, Baltimore District, Baltimore, MD. June 6-9, 1994.

Nautical Archaeologist and Remote Sensing Specialist, Chesapeake & Delaware Canal Remote-Sensing Survey. A submerged cultural resources impact study of approximately 300 linear miles of seabed, located adjacent to shipping lanes and within anchorages, north and south of the Canal. A sub-bottom profiler, side-scan sonar, fathometer, and magnetometer were used during the survey in conjunction with Hypack hydrographic survey computer software and a differential global positioning satellite navigational system. Project conducted by R. Christopher Goodwin & Associates, Inc., on behalf of the Maryland Port Administration, Baltimore, MD. March 14 - April 4, 1994.

Conservation Laboratory Manager and Chief Archaeological Conservator, Mount Independence Artifact Recovery Program. A State of Vermont funded program to recover, conserve and interpret a collection of Revolutionary War underwater artifacts, Lake Champlain Maritime Museum. Responsibilities included management of the laboratory and staff, conducting educational tours of the facility, and the documentation and conservation of more than 900 iron, copper alloy, wooden, glass, ceramic, stone, bone, vegetable fiber and leather artifacts recovered from the submerged late 18th century site in Lake Champlain, Basin Harbor, VT. July 2, 1993 - Nov. 12, 1993.

Underwater Archaeologist and Project Photographer, *Water Witch* Project. Archaeological documentation of an early 19th century Lake Champlain steamboat; later converted into a schooner. Project conducted jointly by the Institute of Nautical Archaeology the Lake Champlain Maritime Museum and the Vermont Division for Historic Preservation, Basin Harbor, VT. July 6-9, 1993.

Staff Underwater Archaeologist and Divemaster, Mount Independence Project. Archaeological survey, documentation and recovery of Revolutionary War (1777) artifacts from submerged site of a floating bridge that once connected Mt. Independence, VT to Fort Ticonderoga, NY. Project part of a field school in Nautical Archaeology conducted jointly by the Institute of Nautical Archaeology, Texas A&M University, University of Vermont and the Lake Champlain Maritime Museum, Basin Harbor, VT. June 14 - July 2, 1993.

Staff Underwater Archaeologist and Divemaster, *Champlain II* Project. Archaeological documentation of a mid-19th century Lake Champlain steamboat that ran aground and sank in 1875 at Westport, NY. Project part of a field school in Nautical Archaeology conducted jointly by the Institute of Nautical Archaeology, Texas A&M University, the University of Vermont and the Lake Champlain Maritime Museum, Basin Harbor, VT. June 14 - July 2, 1993.

Project Manager, Field Director, and Principal Ship Reconstructor, *Indiana* Project. Archaeological documentation of an early Great Lakes screw-propelled steamboat, *Indiana* (1848), lost in Lake Superior off of Crisp Pt., MI in 1858. Project conducted by The National Museum of American History, Smithsonian Institution, Washington, D.C. June 4-9, 1993.

Underwater Archaeologist and Project Photographer, *General Butler* Project. Phase I of an ongoing submerged cultural resource impact study of the late 19th century sailing canal boat *General Butler*. Project conducted for the city of Burlington by the Lake Champlain Maritime Museum and the Vermont Division for Historic Preservation, Burlington, VT. May 10-24, 1993.

Underwater Archaeologist and Supervisor of Diving Operations, Breton Island Project. A submerged cultural resources impact study at the mouth of the Mississippi River, utilizing both electro-magnetic remote-sensing equipment and divers to inspect potentially significant archaeological sites submerged beneath the waters around Breton Island, LA. Project conducted by R. Christopher Goodwin & Associates, Inc., on behalf of the U.S. Army Corps of Engineers, New Orleans District, New Orleans, LA. March 22 - April 2, 1993.

Ship Recordation Specialist (volunteer), Mystic Seaport Museum. Assisted in the documentation of the"Verity skiff," Mystic, CT. Oct. 1992.

Senior Underwater Archaeologist and Project Illustrator, *Columbus* Project. Phase III archaeological excavation, documentation and recovery of artifacts from the submerged wreck site of an early Chesapeake Bay steamboat, *Columbus* (1829), lost off of Pt. Lookout, MD in 1850. Project conducted by R. Christopher Goodwin & Associates, Inc., on behalf of the U.S. Army Corps of Engineers, Baltimore District, Baltimore, MD. Aug 23 - Oct. 2, 1993.

Project Manager, Field Director, and Principal Ship Reconstructor, *Indiana* Project. Archaeological documentation of an early Great Lakes screw-propelled steamboat, *Indiana* (1848), lost in Lake Superior off of Crisp Pt., MI in 1858. Project conducted by The National Museum of American History, Smithsonian Institution, Washington, DC. Aug. 1-15, 1992.

Underwater Archaeologist, Mount Independence - Fort Ticonderoga Great Bridge Archaeological Survey. Location and documentation of submerged Revolutionary War-era bridge remnants and their associated artifacts in Lake Champlain. Project conducted jointly by the Institute of Nautical Archaeology and the Lake Champlain Maritime Museum as part of a federally funded study for the Lake Champlain Basin Program, Basin Harbor, VT. July 15-16, 1992.

Underwater Archaeologist, Ship Recordation Specialist, and Divemaster (volunteer), Burlington Bay Horse Ferry Project. Archaeological excavation and documentation of a horse-powered ferry operated on Lake Champlain during the first half of the 19th century. Project part of a field school conducted jointly by the Institute of Nautical Archaeology, Texas A&M University, University of Vermont and the Lake Champlain Maritime Museum, Burlington, VT. June 14-17, 1992.

Participant, in the documentation of historic small craft on display at the Galveston Maritime Museum. Project conducted as part of an Advanced Ship Reconstruction course offered at Texas A&M University, College Station, TX. Feb. 1992.

Project Co-Director, and Ship Recordation Specialist, documentation of an unidentified Confederate-built submersible on display at the Louisiana State Museum, New Orleans, LA. Feb. 6-9, 1992.

Guest Lecturer, in Dr. Kevin J. Crisman's undergraduate *History of American Seafaring* course. Texas A&M University, College Station, TX. Fall 1991.

Underwater Archaeologist, and Ship Recordation Specialist (volunteer), North Beach Wreck Archaeological Project. Archaeological excavation and documentation of an unidentified, mid-19th century sailing canal boat. Project conducted jointly by the Lake Champlain Maritime Museum and the Vermont Division for Historic Preservation, Burlington, VT. Aug. 17-22, 1991.

Project Manager, Field Director, and Principal Ship Reconstructor, *Indiana* Project. Archaeological documentation of an early Great Lakes screw-propelled steamboat, *Indiana* (1848), lost in Lake Superior off of Crisp Pt., MI in 1858. Project conducted by the National Museum of American History, Smithsonian Institution, Washington, DC. Aug. 3-17, 1991.

Underwater Archaeologist and Graduate Research Assistant, Burlington Bay Horse Ferry Project. Archaeological excavation of a horse-powered ferry operated on Lake Champlain during the first half of the 19th century. Project part of a field school conducted jointly by the Institute of Nautical Archaeology, Texas A&M University, University of Vermont and the Lake Champlain Maritime Museum, Burlington, VT. June 3 - July 16, 1991.

Archaeological Illustrator, Archaeological Research Laboratory, Dept. of Anthropology, Texas A&M University, College Station, TX. Sept. 1990 - Jan. 1991.

PUBLICATIONS/PRESENTATIONS:

1991 "The Wreck of the *Indiana* and the Development of the Propeller-driven Steamboat," a lecture presented in Dr. Kevin J. Crisman's undergraduate course *History of American Seafaring*, Texas A&M University, College Station, TX.

1992a "The *Indiana*: Pioneer Steamboat of the Great Lakes," *Institute of Nautical Archaeology Quarterly* (Summer 1992) 2, Institute of Nautical Archaeology, College Station, TX.

1992b "Research Opportunities for Nautical Archaeologists Interested in Working in the Great Lakes," a presentation given to *The Mist in the Sea Society*, College Station, TX.

1993a "The Wreck of the Steamboat *Indiana*: Interim Report (with Paul F. Johnston)," *The International Journal of Nautical Archaeology and Underwater Exploration* (1993) **22**.3: 219-235, Nautical Archaeological Society, Academic Press, London.

1993b "The Design and Construction of the *Indiana*: An Early Great Lakes Screw-propeller," a professional paper presented at the Society for Historical Archaeology's Annual Conference on Underwater Archaeology, Kansas City, MO.

1994a *Inventory and Conservation Needs Assessment for Artifacts from Civil War Wrecks* C.S.S. Florida *an* U.S.S. Cumberland. Draft Report prepared for the U.S. Navy's Naval Facilities Engineering Command, Atlantic Division, Norfolk, VA.

1994b "Cataloging and Assessing the Conservation Needs of 535 Artifacts from the Civil War Wrecks *C.S.S. Florida* and *U.S.S. Cumberland*," a presentation given during the U.S. Department of Defense's 1994 East Coast Regional Legacy Conference, Hampton Roads Naval Museum, Norfolk, VA.

1994c "Collections Management of Looted Artifacts from Civil War Wrecks *C.S.S. Florida* and *U.S.S. Cumberland*," a professional paper presented at the National Maritime Center during public program recognizing significant events in preservation of nation's maritime heritage. Sponsored by the Departments of Justice, Interior, and Navy, the program also featured a presentation of the first statutory reward under the Archaeological Resources Protection Act (ARPA), made to the Confederate Naval Historical Society for their assistance in the successful prosecution of the looting, and illegal commercial trafficking of *C.S.S. Florida* and *U.S.S. Cumberland* artifacts. Norfolk, VA.

1994d *Cultural Resources Reconnaissance Study for Reynolds Channel and New York Boat Channel* (with April Fehr and Martha R. Williams). Draft Report. Prepared for the U.S. Army Corps of Engineers, New York District on behalf of Andrews, Miller, and Associates, Inc., Baltimore, MD.

1995a *Phase II Evaluation of Six Marine Anomalies for the Poplar Island Reclamation Project, Talbot County, MD. Addendum to Phase I Terrestrial and Marine Archaeological Surveys for the Poplar Island Reclamation Project and Phase II Investigations of Site 18TA237, Talbot County Maryland.* Prepared for GBA - M&N A Joint Venture, Baltimore, MD.

1995b *Phase II Archaeological Investigations of the Shipwreck* Kentucky *(Site 16BO358) at Eagle Bend, Pool 5, Red River Waterway, Bossier Parish, Louisiana* (with John L. Seidel, Jack B. Irion, and Ralph Draughon). Draft Report. Prepared for the U.S. Army Corps of Engineers, Vicksburg District, Vicksburg, MS.

1995c *Documentation of Several Historic Boats Abandoned on Bayou DuLarge, Terrebonne Parish, Louisiana* (with John L. Seidel and Richard K. Anderson). Draft Report. Prepared for the U.S. Army Corps of Engineers, New Orleans District, New Orleans, LA.

1995d *Lake Champlain Maritime Museum Conservation Manual* (with Elizabeth R. Baldwin). Lake Champlain Maritime Museum, Basin Harbor, VT.

1995e *R. Christopher Goodwin & Associates, Inc. Scientific Diving Program Diving Safety Manual.* R. Christopher Goodwin & Associates, Inc., Frederick, MD.

1996a "Documenting Shipwrecks in Low Visibility Water," a presentation given during a public course in Basic Underwater Archaeology offered jointly by the Maryland Historic Trust, Anne Arundel Community College, and the Maritime Archaeological Historical Society (MAHS). Anne Arundel Community College, Arnold, MD.

1996b *Phase I Terrestrial and Marine Archaeological Surveys for the Poplar Island Reclamation Project and Phase II Investigations of Site 18TA237 and Six Marine Anomalies, Talbot County Maryland* (with April Fehr, Martha R. Williams, John L. Seidel, Jack B. Irion, Donald Maher, Peter H. Morrison, and S. Justine Woodard). Final Report. Prepared for GBA-M&N A Joint Venture, Baltimore, MD.

1996c *Phase I Remote Sensing Marine Archaeological Survey of the Proposed Dredge Site at Sandbridge Shoal, Virginia Beach, Virginia* (with Martha R. Williams). Final Report. Prepared for the U.S. Navy's Naval Facilities Engineering Command, Atlantic Division, Norfolk, VA.

1996d *Results of Phase III Archaeological Field Investigations of a ca. 1845 Horse-powered Pug Mill, Baltimore MD.* Unpublished manuscript prepared on behalf of the Maryland Stadium Authority. On file, R. Christopher Goodwin & Associates, Frederick, MD.

1996e *Phase III Archaeological Data Recovery at Sites 44CS187 and 44CS188, Naval Securities Group Activity Northwest, Chesapeake City, Virginia* (2 vols.) (with Michael B. Hornum, Katherine Grandine, Nora Sheehan, Andrew Madsen, Michelle Williams, and Meril Dunn). Draft Report prepared on behalf of the U.S. Navy's Atlantic Division Naval Facilities Engineering Command, Norfolk, VA.

1996f *Phase I Cultural Resources Survey and Inventory of the Proposed Gas Transmission LLC Pipeline Project, Gulf of Mexico to Lafourche Parish, Louisiana* (with Cinder Griffin Miller, Roger Saucier, Susan Barrett Smith, John L. Seidel, Glenn Walter, Clifford T. Brown, Michele Williams, and William P. Athens). Draft Report prepared for the Discovery Gas Transmission LCC, New Orleans, LA.

1997a *Phase I Remote Sensing Marine Archaeological Survey of the Proposed Atchafalaya Ocean Dredged Materials Disposal Area, Terrebonne and St. Mary's Parishes, Louisiana* (with John L. Seidel and Adam I. Kane). Draft Report prepared for the U.S. Army Corps of Engineers, New Orleans District. New Orleans, LA.

1997b *Phase I Remote Sensing Marine Archaeological Survey of the Proposed Dredge Site at Naval Amphibious Base Little Creek, Virginia Beach, Virginia* (with Martha R. Williams, Adam I. Kane, and John L. Seidel). Draft Report prepared for the U.S. Navy's Atlantic Division Naval Facilities Engineering Command, Norfolk, VA.

1997c *The Mount Independence State Historic Site Cultural Resource Management Plan* (with John L. Seidel and Martha R. Williams). Prepared for the State of Vermont, Division for Historic

Preservation, Montpelier, VT.

1997d "Sinking Islands, Burning Boats, and Stolen Artifacts: Meeting the Challenges of Preserving the Chesapeake Bay's Submerged Cultural Resources," professional paper presented at the 1997 Middle Atlantic Archaeological Conference symposium, "A Decade of Underwater Archaeological Research on the Chesapeake: 1987-1997," Ocean City, MD.

1997e *Archaeological Assessment of the Proposed ANR Patterson Loop - Offshore Gas Transmission Line* (with John L. Seidel, Adam I. Kane, Michael Samson, and W. Kerry Behrens). Draft Report prepared on behalf of John E. Chance & Associates, Inc., and FUGRO, Inc., for the ANR Gas Corporation, Detroit, MI.

1997f "Archaeological Conservation for the Avocational Underwater Archaeologist: An Overview of Procedures and Protocol." A lecture presented during the Maritime Archaeological Historical Society's (MAHS) annual Basic Underwater Archaeology Course. Cabin John, MD.

1997g "The Steamboat *Columbus*: Archaeological Recovery of an Early Crosshead Steam Engine," a professional paper presented at the 1997 Society for Industrial Archaeology's Annual National Conference symposium, "Industrial Archaeology in the U.S. Army Corps of Engineers," Michigan Technological University, Houghton, MI.

1997h *Gateway Park Development, Prince George's County, Maryland: Phase I Archaeology; Milestone Conservation, and; Architectural Analysis* (with W. Patrick Giglio and Nora B. Sheehan). An Executive Summary Report submitted to Federal Reality Trust, Rockville, MD.

1998a "Archaeological Conservation for the Avocational Underwater Archaeologist: An Overview of Procedures and Protocol." A lecture presented during the Maritime Archaeological Historical Society's (MAHS) annual Basic Underwater Archaeology Course. Cabin John, MD.

1998b *Conservation of an 1862 Spencer Carbine Recovered from the Flint River, Jonesboro, Georgia.* A technical report documenting the methods and materials used in the stabilization of an 1862 Spencer Carbine recovered during gas pipeline excavation activities on the Flint River, adjacent to an historic Civil War battlefield site, Jonesboro, GA. Project was conducted in conjunction with the Federal Energy Regulatory Commission, the State of Georgia, E.O.D. staff of the U.S. Naval Weapons Station, Yorktown, VA, and the E.O.D. staff of the U.S. Marine Corps, Camp LeJeune, NC. Conservation and report completed by R. Christopher Goodwin & Associates, Inc. on behalf of SONAT, Inc., Jackson, MS.

1998c *Phase I Remote Sensing Marine Archaeological Survey for Submerged Cultural Resources Within the SR 300 (Bryant Patton) Project Area at Apalachicola Bay, between Eastpoint and St. George Island, Franklin County, Florida* (editor). Draft Report prepared by R. Christopher Goodwin & Associates, Inc., on behalf of the Florida Department of Transportation, Chipley, FL.

1998d *Phase I Submerged Cultural Resources Survey for the Proposed Installation of 40 Helical Moorings at the Naval Weapons Station Marina, U.S. Naval Acadamy, Annapolis, Maryland* (with April Fehr, Adam I. Kane, and Jean B. Pelletier). Draft Report prepared by R. Christopher Goodwin & Associates, Inc., on behalf of the U.S. Naval Acadamy, Annapolis, MD.

1998e *Phase I Remote Sensing Marine Archeological Survey for the Proposed Improvements to the Coan River Navigation Channel, Northumberland County, Virginia* (with Martha R. Williams, Brian Cleven, and Adam I. Kane). Draft Report prepared by R. Christopher Goodwin & Associates, Inc., on behalf of the U.S. Army Corps of Engineers, Baltimore District, Baltimore, MD.

1998f *Submerged Cultural Resources Survey of Items 3B-2 and 4 of the Upper Yazoo River, Leflore County, Mississippi* (with Adam I. Kane, Jean B. Pelletier, Martha R Williams, Ralph Draughon, and Roger Saucier). Draft Report prepared by R. Christopher Goodwin & Associates, Inc., on behalf of the U.S. Army Corps of Engineers - Vicksburg and New Orleans Districts, Vicksburg, MS and New Orleans, LA.

1999a Indiana: *The History and Archaeology of an Early Great Lakes Propeller*. Unpublished master's thesis 342 pp). Nautical Archaeology Program, Department of Anthropology, Texas A&M University, College Station, TX.

1999b "Preserving Lake Champlain's Maritime Legacy: Conservation at the Lake Champlain Maritime Museum." A paper presented during the Spring meeting of the Vermont Archaeological Society, Middlebury College, Middlebury, VT.

1999c "The Tale of Three Gunboats, and Lake Champlain Maritime Museum's Management Options for the Newly-Discovered Revolutionary War Gunboat." A lecture presented to the Vergennes Lion's Club during their final Spring-season meeting, Vergennes, VT.

1999d "Benedict Arnold's Last Gunboat: Management Plan Progresses." *LCMMnews* (Spring & Summer 1999) 4-5.

1999e "*War of 1812* Confiance *Anchor: Conservation is Well Underway*." *LCMMnews* (Spring & Summer 1999) 6.

1999f "LCMM Conservation Lab Offers Winter Internships." *LCMMnews* (Spring & Summer 1999) 7.

1999g "Conservation Collaboration: LCMM and Texas A&M University Conservators Team Up to Complete Mirror Lake Spherical Case Shot Conservation." *LCMMnews* (Spring & Summer 1999) 8.

1999h "The War of 1812 Anchor from Plattsburgh Bay." A public presentation given as part of the Lake Champlain Maritime Museum's 1999 Summer Lecture Series, sponsored by the Vermont Council on the Humanities, Basin Harbor, VT. August 12, 1999.

1999i *Revolutionary War Gunboat Shipwreck Management Study*. A cultural resources management plan for the submerged remains of a wooden gunboat lost in 1776 on Lake Champlain during the Revolutionary War Battle of Valcour Island. Draft report prepared by the Lake Champlain Maritime Museum on behalf of the United States Navy, Washington, D.C. (In preparation).

1999j "Conservation and Historical Research on the War of 1812 Anchor from Plattsburgh Bay: A Progress Report," presented to residents of Clinton County, New York, during Clinton County Weekend at the Lake Champlain Maritime Museum, Ferrisburgh, VT. September 18-19, 1999.

1999k "Conserving the War of 1812 Anchor from Plattsburgh Bay: A Community Project," a presentation given to the Plattsburgh Rotary Club, Plattsburgh, NY. October 16, 1999.

1999l *Phase II and Phase III Archaeological Investigations of Shipwreck* Kentucky *(Site 16BO358) at Eagle Bend, Pool 5, Red River Waterway, Bossier Parish, Louisiana* (with John Seidel, April Fehr, Adam Kane, Martha Williams, Ralph Draughon, Roger Saucier, Andrew Madsen, Anthony Randolph, Gary Joiner, Lawrence Babbit, and Jack Irion). Draft Report prepared by R.

Christopher Goodwin & Associates, Inc., on behalf of the U.S. Army Corps of Engineers - Vicksburg District, Vicksburg, MS.

1999m "War of 1812 ***Confiance*** Anchor Conservation Project Continues." *LCMMnews* (Fall & Winter 1999).

1999n "What Happened to the British Flagship *Confiance* After the Battle of Plattsburgh Bay?"*LCMMnews* (Fall & Winter 1999).

1999o "Texas A&M University Provides LCMM with First-Rate Graduate Student Interns"*LCMMnews* (Fall & Winter 1999).

1999p "LCMM Gains Three New Volunteers in the Conservation Lab" *LCMMnews* (Fall & Winter 1999).

1999q "Kids Dig New LCMM Summer Program in Archaeology and Conservation" *LCMMnews* (Fall & Winter 1999).

1999r "LCMM Conservation Lab Expands Facilities, Staff, and Services" *LCMMnews* (Fall & Winter 1999).

HONORS AND AWARDS:

Certificate of Appreciation, in recognition of "Service Above Self." Presented by the President of the Plattsburgh Rotary Club, Plattsburgh, New York. October 6, 1999.

Certificate of Appreciation, in recognition of ten years of dedicated effort and continuous support as a member of the Professional Association of Diving Instructors. Presented by Ralph Erickson, President and CEO, and Drew Richardson, Vice President of Training, Education, and Memberships, PADI International, Santa Ana, CA. December 31, 1996.

Certificate of Appreciation, for Supporting Shipwreck Archaeology, Shipwreck Preservation, and Shipwreck Preserves. Presented by the New York Sea Grant and Bateaux Below, Inc., Wilton, NY. 1995.

Certificate of Appreciation, in recognition of valuable services performed as a Behind-the-Scenes Volunteer. Presented by the Regents and the Secretary of the Smithsonian Institution, Washington, DC. December 1993.

Institute of Nautical Archaeology's Competitive Academic Scholarship, Texas A&M University, College Station, TX. Sept. 1992.

Texas A&M University Academic Excellence Award/Mary Johnston Competitive Scholarship, Texas A&M University, College Station, TX. April 1992.

Competitive Graduate Research Assistantship, Uluburun Project. Old World Projects Laboratory, Nautical Archaeology Program, Texas A&M University, College Station, TX. Jan. 1992.

Competitive Graduate Research Assistantship, Serçe Limani Project. Old World Projects Laboratory, Nautical Archaeology Program, College Station, TX. Sept. 1991.

Competitive Graduate Research Assistantship, Horse Ferry Project Field School. Nautical Archaeology Program, Texas A&M University, College Station, TX. April 1991.

Competitive Graduate Research Assistantship, Serçe Limani Project. Old World Projects Laboratory, Nautical Archaeology Program, Texas A&M University, College Station, TX. Jan. 1991.

Elected Member, Phi Kappa Phi National Honor Society, University of Rhode Island, Kingston, RI. April 1990.

Member, Golden Key National Honor Society, University of Rhode Island, Kingston, RI. March 1990.

Dean's List, University of Rhode Island, Kingston, RI. Spring 1989, Fall 1988, Spring 1987, and Fall 1986.

Invited Member, "Who's Who in American Colleges and Universities," 1990. University of Rhode Island, Kingston, RI. Fall 1990.

DIVING & SAFETY-RELATED EDUCATION/CERTIFICATIONS:

Completed, Vermont State Firefighting Essentials Training Course, Middlebury, VT. May 8, 1999.

Completed, Standard First Aid Course, Walkersville, MD. January 1998.

Completed, Adult CPR Course, Frederick, MD. January 1998.

Completed, Divers Alert Network's (DAN) Oxygen Provider course, Frederick, MD. March 21, 1997.

Completed, Adult CPR Course, Frederick, MD. March 1997.

Participant, Professional Association of Diving Instructors' (PADI) Update '96, Baltimore, MD. March 1996.

Accredited, Scientific Diving Safety Officer of an Organizational Member (R. Christopher Goodwin & Associates, Inc.) of the American Academy of Underwater Sciences (AAUS). January 1996 - present.

Completed, Adult CPR Course, Frederick, MD. November 1995.

Appointed, Diving Safety Officer, R. Christopher Goodwin & Associates, Inc., Frederick, MD. March 1995.

Completed, Standard First Aid Course, Frederick, MD. Dec. 1994.

Completed, Adult CPR Course, Frederick, MD. Dec. 1994.

Participant, Professional Association of Diving Instructors' (PADI) Update '93, Boston, MA. March 1993.

Certified, Scientific Diver (130 ft. depth authorized), Texas A&M University, College Station, TX. July 1992.

Completed, Divers Alert Network's (DAN) Oxygen Provider course, College Station, TX. April 1992.

Completed, Basic First Aid course, College Station, TX. April 1992.

Completed, Basic CPR course, College Station, TX. April 1992.

Certified, Scientific Diver (100 ft. depth authorized), Texas A&M University, College Station, TX. May 1991.

Participant, Professional Association of Diving Instructors' (PADI) Update '90, Boston, MA. March 1990.

Completed, PSI SCUBA-cylinder Inspection Course, Boston, MA. Feb. 1988.

Completed, U.S. Divers Aqua-lung Technical School, Boston, MA. May, 1987.

Completed, Dacor Diving Equipment Service Clinic, Lynn, MA. March, 1987.

Certified, URI Staff Assistant SCUBA Instructor, University of Rhode Island's Graduate School of Oceanography's Scientific Diving Program, Narragansett, RI. Spring Semester 1987.

Certified, Master SCUBA Diver, the National Association of Underwater Instructors (NAUI #MD328), University of Rhode Island's Graduate School of Oceanography's Scientific Diving Program, Narragansett, RI. Jan. 1987.

Certified, Diving Rescue Techniques, the National Association of Underwater Instructors (NAUI), University of Rhode Island's Graduate School of Oceanography's Scientific Diving Program, Narragansett, RI. Jan. 1987.

Participant, Professional Association of Diving Instructors' (PADI) Divemaster Seminar '86, Chelmsford, MA. Nov. 1986.

Certified, Open Water SCUBA Instructor (PADI #27007-OWSI) after successfully completing the Professional Association of Diving Instructors' (PADI) Instructor Training Course (ITC) and passing the Instructor Evaluation Course (IEC), Chelmsford, MA. Aug. 1986.

Certified, Divemaster (PADI #D-27007), the Professional Association of Diving Instructors (PADI), Jamestown, RI. Aug. 1986.

Certified, Rescue Diver (PADI #86177812), the Professional Association of Diving Instructors (PADI), Jamestown, RI. May 1986.

Completed, Advanced Lifesaving course, Peacedale, RI. May 1986.

Completed, Tekna SCUBA Regulator Repair Clinic, Orlando, FL. Jan. 1986.

Completed, Sherwood SCUBA Repair Clinic, Lee, MA. Oct. 1985.

Certified, Research Diver, the National Association of Underwater Instructors (NAUI), University of Rhode Island's Graduate School of Oceanography's Scientific Diving Program, Narragansett, RI. May 1984.

Certified, Advanced Diver, the National Association of Underwater Instructors (NAUI), University of Rhode Island's Graduate School of Oceanography's Scientific Diving Program, Narragansett, RI. May 1984.

Certified, Basic SCUBA Diver by the Young Men's Christian Association (YMCA), Newport, RI. November 1980.

PROFESSIONAL AFFILIATIONS:

American Academy of Underwater Sciences
American Institute of Conservation
Institute of Nautical Archaeology
Historical Diving Society
Professional Association of Diving Instructors
Society for Industrial Archaeology
Vermont Archaeological Society

ADAM ISAAC KANE, B.A.

NAUTICAL ARCHEOLOGIST II\
SCIENTIFIC DIVER
REMOTE SENSING SPECIALIST

Education

Millersville University of Pennsylvania. Bachelor of Arts in Anthropology and Environmental Geography. May 1995.

University of Humberside, Hull, England. Study Abroad Program, 1993 -1994.

Honors and Awards

Anthropology Student of the Year. Millersville University of Pennsylvania, 1995.

Graduated *cum laude* with Departmental Honors in Anthropology. Millersville University of Pennsylvania, 1995.

Diving Related Education/Certifications

American Red Cross CPR. Frederick, MD. March 1998.

Assistant Diving Safety Officer. R. Christopher Goodwin & Associates, Inc. Frederick, MD. August 1997-present.

Divemaster (DM-157213). Professional Association of Diving Instructors (PADI). July 1997.

Surface Supplied Air Diving Techniques. R. Christopher Goodwin & Associates, Inc., Frederick, MD. June 1997.

Scientific Diver. R. Christopher Goodwin and Associates, Inc. (in accordance with the American Academy of Underwater Sciences [AAUS] standards). Frederick, MD. June 1997.

American Red Cross Preventing Disease Transmission. Frederick, MD. April 1997.

Divers Alert Network□s (DAN) Emergency Oxygen Provider Course. Frederick, MD. March 1997.

Rescue Diver (PADI #9607213142). Professional Association of Diving Instructors (PADI). July 1997.

Advanced Diver. Professional Association of Diving Instructors (PADI). June 1997.

American Red Cross Standard First Aid. Frederick, MD. May 1996.

Open Water Diver. YMCA, Millersville University, Millersville, PA. December 1994.

Work Related Training

OSHA Confined Spaces/Trench Safety Training. Hazmat T.I.S.I., Columbia, MD. February 1997.

Global Positioning Systems (GPS) Training. Allegheny Community College, Pittsburgh, PA. August 1996.

Imagenex Digital Color-Imaging Side Scan Sonar Training. R. Christopher Goodwin & Associates, Inc., Frederick, MD. July 1996.

Hypack Hydrographic Survey Software (version 6.4) Training. R. Christopher Goodwin & Associates, Inc., Frederick, MD. June 1996.

Employment

Currently a graduate student at Texas A&M University.

Nautical Archeologist, Assistant Diving Safety Officer, Remote Sensing Specialist and Crew Chief. R. Christopher Goodwin & Associates, Inc., Frederick, MD. October 1995-1999.

Field Archeologist. Cultural Heritage Research Services, Inc., North Wales, PA. May 1995 -October 1995.

Archeological Crew Chief. Millersville University, Archaeological Field School. June - July 1994.

Lab Technician. Millersville University, Archeology Laboratory. February 1992 - May 1995.

Field Archeologist. Delaware Department of Natural Resources and Environmental Control. June - August 1991 -1993.

Professional Experience

Crew Chief and Remote Sensing Specialist. Vermilion River Marine Remote Sensing Survey. A Phase I marine remote sensing survey of approximately one mile of the Vermilion River near Lafayette, LA. The survey utilized a proton precession magnetometer, side-scan sonar, and fathometer integrated with *Hypack* hydrographic survey computer software and differential global positioning systems (DGPS). Conducted by R. Christopher Goodwin & Associates, Inc. for the USACE-NO. April 1998.

Crew Chief and Remote Sensing Specialist. Coan River Marine Remote Sensing Survey. A Phase I marine remote sensing survey at the mouth of the Coan River, VA. The survey utilized a proton precession magnetometer, and side-scan sonar integrated with *Hypack* hydrographic survey computer software and differential global positioning systems (DGPS). Conducted by R. Christopher Goodwin & Associates, Inc. for the USACE-BD. March 1998.

Assistant Diving Safety Officer. U.S. Naval Academy Mooring Survey, Annapolis, MD. A diving survey of a mooring field in the mouth of Carr Creek at the USNA Marina. Responsible for the supervision and coordination of all aspects of surface-supplied air diving logistics. Conducted by R. Christopher Goodwin & Associates, Inc., Frederick MD. March 1998.

Draftsman. Documentation of Several Historic Vernacular Watercraft on Bayou Dularge, Terrebonne Parish, LA. Responsible for the inking of the plan, profile, and cross section views of four vernacular watercraft in accordance with HABS\HAER standards. Conducted by R. Christopher Goodwin & Associates, Inc. for the USACE-NO. January - February 1998.

Crew Chief and Remote Sensing Specialist. Yazoo River Marine Remote Sensing Survey of Items 3B and 4, Greenwood, MS. A Phase I remote sensing survey of the Yazoo River, between river miles 148.48 and 162.8, utilizing a proton precession magnetometer, side-scan sonar, and fathometer integrated with *Hypack* hydrographic survey computer software and differential global positioning systems (DGPS). A terrestrial

survey of marine magnetic anomalies located near the river bank was conducted using a land magnetometer and a hydroprobe. The survey located the remains of at least five nineteenth century steamboats. Conducted by R. Christopher Goodwin & Associates, Inc. for the USACE-VD and NO. February 1998.

Remote Sensing Specialist. SR 300 Project Corridor, Apalachicola Bay, Franklin County, Florida. Responsible for the analysis and interpretation of magnetic and side scan sonar data. Conducted by R. Christopher Goodwin & Associates, Inc., Frederick, MD for the Florida Department of Transportation. October 1997.

Nautical Archeologist and Assistant Project Diving Safety Officer. *Kentucky* Shipwreck Project, Shreveport, LA. A Phase III submerged cultural resources data recovery at the site of a 1856 Mississippi River sidewheel steamboat. Responsible for assisting with the supervision and coordination of all aspects of surface-supplied air diving logistics, for underwater mapping, documentation, and recovery of the *Kentucky*'s remains in zero visibility water, and for drafting the plan view of the wreck, inboard and outboard hull profiles, cross-sectional views of frames, and the ship's lines. Conducted by R. Christopher Goodwin & Associates, Inc. for the USACE-VD. March 1997 - present.

Remote Sensing Specialist. Lake Salvador, LA Remote Sensing Marine Archeological Survey. Responsible for the analysis and interpretation of magnetic and side scan sonar data. Conducted by R. Christopher Goodwin & Associates, Inc., Frederick, MD. July 1997.

Remote Sensing Specialist. Kedges Strait Remote Sensing Marine Archeological Survey. Responsible for the analysis and interpretation of magnetic and side scan sonar data. Conducted by R. Christopher Goodwin & Associates, Inc. for the USACE-BD. July 1997.

Remote Sensing Specialist. FUGRO/John E. Chance & Associates, Inc. Analyzed magnetometer, side scan sonar, and bathymetric data and prepared an archeological assessment report for inclusion in a technical report (*ANR Pipeline Company Archeological, Engineering, and Hazard Study: Proposed 30-inch Gas Pipeline Route Block 63, Eugene Island Area to East Bay, Louisiana.*) prepared by FUGRO/Chance, in cooperation with R. Christopher Goodwin & Associates Inc., for the ANR Gas Corporation, Detroit, MI. Lafayette, LA. March 1997.

Field Archeologist. Chapman□s Landing Mitigation, Charles County MD. Phase III Survey of a stratified prehistoric site. Conducted by R. Christopher Goodwin & Associates, Inc., Frederick, MD. February 1997.

Crew Chief. Indian Head 1776 Phase I Survey. A cultural resources impact survey on the Indian Head Naval Ordinance Disposal Facility, Indian Head, MD. Project conducted by R. Christopher Goodwin & Associates, Inc., Frederick, MD. February 1997.

Remote Sensing Specialist, and Archival Researcher. Little Creek Naval Amphibious Base Remote Sensing Marine Archeological Survey. A Phase I submerged cultural resources impact study at a proposed dredge site located at Little Creek, VA, utilizing remote sensing techniques (proton precession magnetometer, side-scan sonar, and fathometer integrated with *Hypack* hydrographic survey computer software and differential global positioning systems (DGPS). Responsible for assisting with field survey, conducting historical background research at the Library of Congress, Washington, DC, and the National Archives II, College Park, MD, post-processing, inventorying, and interpreting digitally-recorded magnetic, acoustic, and bathymetric data, and report preparation. Conducted by R. Christopher Goodwin & Associates, Inc., Frederick, MD. December 1996 - January 1997.

Field Archeologist. Northwest Phase II Archaeological Survey. A Phase II cultural resources evaluation of archeological sites located on the Naval Security Group Activity Northwest, Chesapeake, VA. Conducted by R. Christopher Goodwin & Associates, Inc., Frederick, MD. September 1997.

Remote Sensing Specialist. Atchafalaya Ocean Dredged Material Disposal Site Remote Sensing Marine Archaeological Survey. A Phase I submerged cultural resources impact study of approximately 320 linear miles of seabed in the Gulf of Mexico. Responsible for post-processing, inventorying, and interpreting digitally-recorded magnetic, acoustic, and bathymetric data. Conducted by R. Christopher Goodwin & Associates, Inc., Frederick, MD. August - December 1996.

Field Archeologist. Destin Pipeline. A Phase I cultural resources impact study of a pipeline corridor in central Mississippi. Conducted by R. Christopher Goodwin & Associates, Inc., Frederick, MD. November 1996.

Remote Sensing Specialist. Texaco Discovery Gas Transmission Pipeline Corridor Marine Archeological Remote Sensing Survey. A Phase I submerged cultural resources impact study of approximately 60 linear miles of seabed in Timbalier Bay, Louisiana and the Gulf of Mexico. Responsible for post-processing, inventorying, and interpreting digitally-recorded magnetic, acoustic, and bathymetric data. Conducted by R. Christopher Goodwin & Associates, Inc., Frederick, MD. October - November 1996.

Field Archeologist. Driver Phase II. A Phase II cultural resources study on the Driver Naval Antenna Range, Driver, VA. Conducted by R. Christopher Goodwin & Associates, Inc., Frederick, MD. Frederick, MD. May - October 1996.

Field Archeologist. Piscataway Phase I. A Phase I cultural resources impact study in Piscataway, MD. Conducted by R. Christopher Goodwin & Associates, Inc., Frederick, MD. September 1996.

Field Archeologist. Moorefield Phase III. A cultural resources mitigation, including the excavation and reburial of Native American human remains, undertaken for the Army Corps of Engineers in Moorefield, WV. Conducted by R. Christopher Goodwin & Associates, Inc., Frederick, MD. August 1996.

Field Archeologist. Naval Academy. A Phase I cultural resources study on the Naval Academy, Annapolis, MD. Conducted by R. Christopher Goodwin & Associates, Inc., Frederick, MD. June 1996

Field Archeologist. Virginia Natural Gas. A Phase I cultural resources impact study of a natural gas pipeline corridor in West Point, VA. Conducted by R. Christopher Goodwin & Associates, Inc., Frederick, MD. June 1996.

Field Archeologist. Maryland Stadium Authority. A Phase III study of an eighteenth century stoneware kiln and a nineteenth century pug mill in Baltimore, MD. Conducted by R. Christopher Goodwin & Associates, Inc., Frederick, MD. May 1996.

Field Archeologist. Cherry Point. A Phase I survey of portions of Bogue, Oak Grove, and Cherry Point Marine Bases. Conducted by R. Christopher Goodwin & Associates, Inc., Frederick, MD. March - April 1996.

Field Archeologist. Wilson Farm. A Phase I survey in Landover, MD on the tract of land upon which the new Washington Redskins Stadium is to be built. Conducted by R. Christopher Goodwin & Associates, Inc., Frederick, MD. March 1996.

Field Archeologist. Oceana. A Phase I survey of the Oceana Naval Air Station in Virginia Beach, VA. Conducted by R. Christopher Goodwin & Associates, Inc., Frederick, MD. February, 1996.

Field Archeologist. Northwest III. A Phase III survey of a late eighteenth century farm site on the Naval Security Group Activity Northwest, Chesapeake, VA. Conducted by R. Christopher Goodwin & Associates, Inc., Frederick, MD. December 1995 - February 1996.

Field Archeologist. Driver I. A Phase I survey of the Driver Naval Antenna Range in Driver, VA. Conducted by R. Christopher Goodwin & Associates, Inc., Frederick, MD. December 1995.

Field Archeologist. Yorktown I. A Phase I cultural resources survey of the Yorktown Naval Weapons Station, Yorktown, VA. Conducted by R. Christopher Goodwin & Associates, Inc., Frederick, MD. October - November 1995.

Field Archeologist. Destec. A Phase III survey of an early nineteenth century farm site in Quakertown, PA. Conducted by Cultural Heritage Research Services, Inc. October 1995.

Field Archeologist. Towanda II. A Phase II survey of a stratified prehistoric site along the banks of the Susquehanna River in Towanda, PA. Conducted by Cultural Heritage Research Services, Inc. September 1995.

Field Archeologist. Marshal□s Creek II. A Phase II survey of numerous historic and prehistoric sites to be impacted by the expansion of Route 209 in Delaware Water Gap, PA. Conducted by Cultural Heritage Research Services, Inc. September 1995.

Field Archeologist. Destec II. A Phase II survey of an early nineteenth century farm site and a multi-component prehistoric site. Conducted by Cultural Heritage Research Services, Inc. August 1995.

Laboratory Assistant. Henry Clay Iron Furnace Site. Analysis and cataloging of artifacts recovered from a nineteenth century industrial site. Conducted by Millersville University Department of Anthropology. February 1992 - May 1995.

Crew Chief. Henry Clay Iron Furnace Field School. Responsible for supervising students during the excavation of a nineteenth century industrial site. Conducted by Millersville University Department of Anthropology. June-July 1994.

Field Archeologist. Assawoman Wildlife Preserve Archeological Survey. A Phase I and II survey of the Assawoman Wildlife Preserve in Bethany Beach, DE. Conducted by the Delaware Department of Natural Resources and Environmental Control. June-August 1993.

Field Archeologist. Killen□s Pond State Park Archeological Survey. A Phase I and II survey of Killen□s Pond State Park in Fredricka, DE. Conducted by the Delaware Department of Natural Resources and Environmental Control. June-August 1992.

Field Archeologist. Thompson□s Island Archeological Survey. A Phase I and II survey of Thompson□s Island in Dewey Beach, DE. Conducted by the Delaware Department of Natural Resources and Environmental Control. June-August 1991.

Professional Affiliations

American Academy of Underwater Sciences in association with R. Christopher Goodwin & Assoc. Inc.
Divers Alert Network
Professional Association of Diving Instructors

Publications

1998a *Phase III Archeological Mitigation of the Civil War Era Steamboat* Kentucky. (with David Robinson, John Seidel and Anthony Randolph). Draft report prepared for the U.S. Army Corps of Engineers, Vicksburg District, Vicksburg, LA. In preparation.

1998b *A Cultural Resources Survey of Items 3B and 4 of the Upper Yazoo River Projects, LaFlore County Mississippi.* (with Jean Pelletier, David Robinson, Martha Williams, and Roger Saucier). Draft report prepared for the U.S. Army Corps of Engineers, Vicksburg District, Vicksburg, LA. July 1998.

1998c *Phase I Archeological Survey for the Vermilion River Maintenance Dredging Project.* (with David Robinson and Patrick Roble). Draft report prepared for the U.S. Army Corps of Engineers, New Orleans District, New Orleans, LA. June 1998.

1998d *Phase I Remote Marine Archeological Survey for the Coan River Navigation Improvement Project, Coan River, Northumberland County, Virginia.* (with David Robinson and Martha Williams). Draft report prepared for the U.S. Army Corps of Engineers, Baltimore District, Baltimore, MD. June 1998.

1997a *The Archeological Excavation of the Civil War Era Steamboat* Kentucky. A presentation given to the Millersville University Archeology Society. November 1997.

1997b *Phase I Submerged Cultural Resource Survey, Kedges Strait Oyster Recovery Project, Chesapeake Bay, Maryland* (with David Robinson and John Seidel) Draft report prepared for the Baltimore District U.S. Army Corps of Engineers. July 1997.

1997c *Phase I Archeological Survey of the Proposed Storage Shed Location P-1 Addendum to: Phase I Archeological Investigations for the Proposed Fresh and River Water Lines to Building 1776, Indian Head Division, Naval Surface Warfare Center, Maryland.* (with Thomas W. Davis) Report prepared for the Department of Public Works, Indian Head Division, Indian Head, MD. June 1997.

1997d *Phase I Remote Sensing Marine Archeological Survey of the Proposed Dredge Site at Naval Amphibious Base Little Creek, Virginia Beach, Virginia* (with David S. Robinson, Martha R. Williams, and John L. Seidel). Report prepared for the U.S. Navy Atlantic Division Naval Facilities Engineering Command, Norfolk, VA. July 1997.

1997e *Phase I Archeological Investigations for the Proposed Fresh and River Water Lines to Building 1776 Indian Head Division, Naval Surface Warfare Center, Maryland* (with Thomas W. Davis and Patrick Giglio). Report prepared for the Department of Public Works Indian Head Division, Indian Head, MD. March 1997.

1997f *Archeological Assessment of the Proposed ANR Patterson Loop - Offshore Gas Transmission Line* (with David S. Robinson, John L. Seidel, Michael Samson, and W. Kerry Behrens). Draft report prepared on behalf of John E. Chance & Associates, Inc., and FUGRO, Inc., for the ANR Gas Corporation, Detroit, MI. March 1997.

1996 *Phase I Remote Sensing Marine Archeological Survey of the Proposed Atchafalaya Ocean Dredged Materials Disposal Area, Terrebonne and St. Mary□s Parishes, Louisiana* (with David S. Robinson and John L. Seidel). Draft report prepared for the U.S. Army Corps of Engineers, New Orleans District. New Orleans, LA. November 1996.

MARTHA R. WILLIAMS, M.A., M.Ed.

PROJECT MANAGER
HISTORIAN
ARCHEOLOGIST

Education

B.A., French, Lebanon Valley College, 1960.

M.Ed., University of Pennsylvania, 1965.

M.A., Applied History, George Mason University, 1987.

Workshop "National Environmental Policy Act", University of Southern Maine, Summer Session Program, 1999.

Professional Experience

Project Manager/Archeologist, R. Christopher Goodwin & Associates, Inc., Frederick, Maryland, 1989-present.

Historic Sites Specialist, R. Christopher Goodwin & Associates, Inc., Frederick, Maryland, 1989-1996.

Museum Technician, National Capital Region, National Park Service, 1988-1989.

Teacher, Social Studies, Fairfax County (VA) Public Schools, 1962-1988.

Paid Intern, Cultural Resources Planning Project, Heritage Resources Branch/Fairfax County History Commission, 1984.

Educational Consultant, Curriculum Kit, National Committee for the Bicentennial of the Treaty of Paris, 1984.

Grant Review Panelist, Youth Projects, National Endowment for the Humanities, 1980, 1982.

Grant Review Panelist, Elementary and Secondary Education Grants, National Endowment for the Humanities, 1981.

Archeological Consultant, Sully Museum Development Project, Fairfax County Park Authority, 1979.

Archeological Consultant, Ellanor C. Lawrence Park Environmental Assessment, EcolSciences, Inc., 1977.

Director, Sully Plantation Laboratory Project, Sully Foundation, Inc., 1976.

Instructor, Seminar in Archeology, Fairfax County Public Schools, 1973-75, 1978-1980, 1985-1987.

Field School, Colonial Williamsburg, 1972

Teacher, French, Upper Darby (PA) Schools, 1960-1961.

Professional Affiliations

Society for Historic Archeology: Chair, Education Committee, 1990-1992; 1994-present
National Trust for Historic Preservation

Archeological Society for Virginia: Board of Directors, 1984-1990, 1993 - present; Vice-President, 1990-1992
Council for Maryland Archeology

Manuscripts and Publications

1974a "Belvoir Manor: Summer Seminar in Historical Archeology," Fairfax County Public Schools.

1974b "Retrieval of an environment that disappeared nearly 200 years ago," *Fairfax Schools Bulletin* (Vol 10, No. 5).

1977c "Teacher's Column: Archeology Curriculum," *Roundtable Reports,* Museum Education Roundtable.

1977d *Route 50/I-495 Area Study,* Office of Comprehensive Planning, Fairfax, Virginia (Contributor).

1977e *Environmental Assessment of Conceptual Master Plan of Ellanor C. Lawrence Park,* Vienna, Virginia, EcolSciences, Inc. (Contributor).

1978 "History in Ruins--the Dulin Site," *Fairfax Chronicles* (Vol. 2, No. 1).

1979 *The Dulin Site: Excavation Report 1* (with Jack L. Hiller), Northern Virginia Chapter, Archeological Society of Virginia, Occasional Paper 80-1.

1981 "Volunteers: A Vital Component in Fairfax Archeology." *Fairfax Chronicles* (Vol. 5, No. 2).

1982 "Artifacts and Status: Correlated to What Degree?" *Quarterly Bulletin of the Archeological Society of Virginia* (Vol. 37, No. 4).

1983 *The Dulin Site: Excavation Report II,* Northern Virginia Chapter, Archeological Society of Virginia, Occasional Paper 83-1 (with Jack L. Hiller).

1984 *Fairfax County Heritage Resource Management Plan,* Fairfax, Virginia, Heritage Resources Branch, Office of Comprehensive Planning (with Betsy Chittenden, Elizabeth David, Susan L. Henry, and Michael Johnson).

1985 "Preserving the Future of our Past." *Fairfax Chronicles* (Vol. IX, No. 4).

1986a *The Oakley Site: 44FX734* (with Malcolm Richardson and John Imlay). Northern Virginia Chapter, Archeological Society of Virginia, Occasional Paper 86-2.

1986b "Farmington: A Partnership in Preservation." *Fairfax Chronicles* (Vol. XI, No. 1).

1988 "The Scotts of Farmington: A Site Interpretation." *Yearbook of the Historical Society of Fairfax County, Virginia,* Vol. 21.

1989 *A Phase I Archeological Investigation of the Hallameyer Property, Anne Arundel County, Maryland* (with R. Christopher Goodwin, and Thomas W. Neumann). Submitted to Trotter Kent, Inc.

1990a *Architectural Recordation of the Frederick High School (Elm Street School), Frederick, Maryland* (with Kathryn Kuranda). Submitted to Frederick Memorial Hospital, Frederick, Md.

1990b *Press Packet: Archeology and History at Camden Yards: The George Herman Ruth Saloon Site.* Submitted to Maryland Stadium Authority.

1990c *A Phase I Intensive Archeological Investigation of the Novak Property, Anne Arundel County, Maryland* (with Thomas W. Neumann). Submitted to Brown and Brown Builders, Ltd.

1990d *A Phase I Intensive Archeological Investigation of the Windermere Estates, Section 2, Project Area, Anne Arundel County, Maryland* (with Thomas W. Neumann). Submitted to Belle Grove Corp. Millersville, MD.

1990e *Phase II Archeological Testing of Sites 44FX923 and 44FX924, Fairfax County, Virginia* (with Suzanne Sanders). Submitted to Copper Land Company.

1990f *A Phase I Archeological Investigation of the Chisolm's Choice Subdivision, Glen Burnie, Anne Arundel County, Maryland* (with Michelle T. Moran). Submitted for Development Facilitators, Inc.

1990g *Phase I Archeological Survey of the Proposed Water Line for a Resource Recovery Facility, Dickerson, Maryland* (with Michelle T. Moran). Submitted to ENSR Consulting and Engineering.

1990h *Phase I and II Archeological Investigations of Bachelor's Hope Farm, St. Mary's County, Maryland* (with Kathryn M. Kuranda, and Suzanne Sanders). Submitted to Archetype.

1990i *Phase II Archeological Testing of Sites 18CH334, 18CH335, and 18CH336, Charles County Landfill No. 2, Waldorf, Maryland* (with Christopher Polglase, Thomas W. Neumann, and Michelle Moran). Submitted to Interstate General Company, LP.

1990j *A Phase I Archeological Survey of the Shipley's Choice Area K Commercial Complex Subdivision, Anne Arundel County, Maryland* (with Michelle T. Moran). Submitted to Greenebaum & Rose Associates, Inc.

1990k *Phase I Archeological Survey of the Proposed Land Proffer from Gettysburg National Military Park to Gettysburg College, Gettysburg, Pennsylvania* (with R. Christopher Goodwin, Christopher R. Polglase, Peter H. Morrison, and Michelle T. Moran). Submitted to Gettysburg College, Gettysburg, Pennsylvania.

1990l *Phase I Intensive Archeological Investigation of the Mountain View Subdivision, Anne Arundel County, Maryland* (with R. Christopher Goodwin, and Michelle T. Moran). Submitted to Development Facilitators, Inc., Severna Park, Maryland.

1990m *Phase I and II Archeological Investigations of Sites 18AN779 and 18AN780, Heather Heights Subdivision, Anne Arundel County, Maryland* (with R. Christopher Goodwin, Thomas W. Neumann, and Michelle T. Moran). Submitted to Maryland Community Developers.

1990n *Phase II Investigations at the Water Intake Pumphouse Site, Brunswick, Maryland* (with R. Christopher Goodwin). Submitted to the Town of Brunswick.

1991a *Preliminary Archeological Reconnaissance of the Folly Branch SWM Facility, Prince George's County, Maryland* (with R. Christopher Goodwin, Michelle T. Moran, and Christopher R. Polglase). Submitted to Engineering Technologies Associates, Inc.

1991b *Archeological Survey and Architectural Investigation of the Proposed 7-Mile BG&E Dublin Extension Pipeline, Harford County, Maryland* (with R. Christopher Goodwin, Kathryn M. Kuranda, Michelle Moran, and Mary K. Shipe). Submitted to Biohabitats.

1991c *Phase I Archeological Survey and Architectural Investigation of the Proposed 24-Mile BG&E Pipeline, Harford County, Maryland* (with R. Christopher Goodwin, Kathryn M. Kuranda, Mary K. Shipe, and Peter Morrison). Submitted to Biohabitats.

1991d *Phase II and IIIA Archeological Investigations of the Signal Hill and Bobby Tracts, Prince William County, Virginia; Volume I: The Non-Military Sites* (with R. Christopher Goodwin, and Suzanne L. Sanders, with contributions by Lawrence Hewitt). Submitted to City of Manassas Park.

1991e *Phase II and IIIA Archeological Investigations of the Signal Hill and Bobby Tracts, Prince William County, Virginia; Volume I: The Military Sites* (with R. Christopher Goodwin, and Suzanne L. Sanders, with contributions by Lawrence Hewitt). Submitted to City of Manassas Park.

1991f *Phase I Archeological Survey of the Proposed Corbalis Water Treatment Plant to Loudoun County Line 36" Water Main Alignment, Fairfax County, Virginia.* Submitted to the Loudoun County Sanitation Authority.

1991g *Phase I Intensive Archeological Investigation of the DeGrange Project Area, Anne Arundel County, Maryland.* Submitted to Brenton & Associates, Inc.

1991h *Phase I Archeological Survey of the AES/Warrior Run Cogeneration Facility, Allegany County, Maryland* (with R. Christopher Goodwin, and Thomas W. Neumann, with contributions by Christopher R. Polglase). Submitted to AES/Warrior Run Inc.

1991i *Phase IB Archeological Investigations of a Proposed 230-kV Transmission Line and Construction Access Road, Clover Power Generation Plant, Halifax County, Virginia* (with R. Christopher Goodwin, and Thomas W. Neumann). Submitted to Old Dominion Electric Cooperative.

1991j *Archeological and Architectural Investigations at Camden Yards, Baltimore, Maryland* (with R. Christopher Goodwin, Kathryn M. Kuranda, Elizabeth Pena, Suzanne M. Sanders, and with a contribution by David B. Landon). Submitted to the Maryland Stadium Authority.

1991k *Archeological and Historical Investigations of the South Road Area, Sully Historic Site, Fairfax County, Virginia* (with R. Christopher Goodwin, Suzanne L. Sanders, Cynthia A. Whitley, and with contributions by Pamela Crane). Submitted to the Fairfax County Park Authority.

1991l *Phase I Archeological Survey of the Proposed Expansion, Wildewood Planned Unit Development, St. Mary's County, Maryland* (with R. Christopher Goodwin, and Pamela Crane). Submitted to Paragon Builders, Inc.

1992a *Phase I Archeological Investigation of the Proposed Alternate 4 ("East") Gunston Road Extension, Fort Belvoir, Fairfax County, Virginia.* Submitted to STV/LYON GROUP.

1992b *Phase IA Reconnaissance and Historical Background Study of the Proposed Prince William County Service Authority Western Zone Water Transmission Line* (with Thomas W. Davis). Prepared for Gannett Fleming, Inc.

1992c *Phase I and II Archeological Investigations at Benjamin Banneker Historical Park, Baltimore County, Maryland* (with Suzanne L. Sanders, Michelle T. Moran, Michael A. Simons, and Justine Woodard). Submitted to Baltimore County, Maryland.

1992d *Phase IB Terrestrial and Underwater Archeological Investigations of the Proposed Cogentrix Coal-Fired Power Plant, Mayaguez, Puerto Rico* (with R. Christopher Goodwin, Jack B. Irion, and Suzanne L. Sanders). Submitted to ENSR Consulting and Engineering.

1992e *Phase IA Investigations of the Proposed Dalecarlia to Chain Bridge Water Supply Main Project, Washington, D.C., and Montgomery County, Maryland* (with Suzanne L. Sanders). Submitted to Gannett Fleming, Inc.

1992f *Phase I Archeological Survey of the Colonial Beach Wastewater Treatment Facility, Westmoreland County, Virginia* (with Thomas W. Neumann, Justine Woodard, and Colby Child). Submitted to Patton Harris, Rust & Associates, prepared for U.S. Environmental Protection Agency (EPA) and Virginia State Water Control Board.

1992g *Phase II Archival and Archeological Investigations at the Wallace's Mill Site (18AN432), Anne Arundel County, Maryland* (with John J. Mintz, Alice Crampton, Christopher R. Polglase, Justine Woodard, and Kathy Federline). Submitted to Whitman, Requardt and Associates.

1993a *Archival and Architectural Investigations of the Mississippi Basin Model, Clinton, Mississippi* (with Kathryn M. Kuranda and Bethany M. Usher). Submitted to the U.S. Army Corps of Engineers, Vicksburg District.

1993b *Archeological Investigations for the Fiber-Optic Line Project, Carlisle Barracks, Cumberland County, Pennsylvania* (with John J. Mintz, S. Justine Woodard, William T. Dod, Donald J. Maher, and Suzanne L. Sanders). Submitted to the U.S. Army Communications Electronic Command.

1993c *Cultural Resource Investigations, Defense Media School, Fort George G. Meade, Anne Arundel County* (with Hugh B. McAloon and with contributions by Donald Maher). Submitted to the U.S. Army Corps of Engineers, Baltimore District.

1993d *Phase II Archeological Investigations of the Proposed ASR-9 Radar Facility, Anacostia, Washington, D.C., S.E.* (with Suzanne L. Sanders, Donald J. Maher, and Michael A. Simons). Submitted to Information Systems & Networks Corporation.

1993e *Phase II Archeological Investigations of Portions of the Sanders/Rawls Section of the "Coston Family Cemetery," Onslow County, North Carolina* (with Suzanne L. Sanders, John J. Mintz, Kathleen F. Child, and S. Justine Woodard). Submitted to the Atlantic Division, Naval Facilities Engineering Command.

1993f *Fort George G. Meade, Cultural Resource Management Plan* (with John J. Mintz, Hugh B. McAloon, Kathleen F. Child, Leo P. Hirrel, and Kathryn M. Kuranda). Submitted to the U.S. Army Corps of Engineers, Baltimore District.

1993g *Phase IA Archeological Investigations at Poplar Island, Talbot County, Maryland* (with John J. Mintz, Patrick R. Jennings, and S. Justine Woodard). Submitted to Maryland Environmental Service.

1993h *Archeological Investigations at Sites 31ON533, 31ON534, 31ON535, and 31ON536 Camp Lejeune, Onslow County, North Carolina* (with Christopher R. Polglase, John J. Mintz, S. Justine Woodard, and Kathleen Child). Prepared for the Atlantic Division, Naval Facilities Engineering Command.

1993i *Cultural Resources in the Department of the Defense* (with Deborah K. Cannan). Submitted to the U.S. Army Corps of Engineers, Baltimore District, on behalf of DoD Legacy Resource Management Program.

1994a *Phase I/II Archeological Investigations for the Proposed Baltimore Convention Center Expansion Baltimore, Maryland* (with Suzanne L. Sanders). Submitted to the Maryland Stadium Authority.

1994b *Phase I Archeological Investigations of the Daley/Webb/Shotwell Property, Fairfax County, Virginia* (with Christopher R. Polglase). Submitted to Toll Brothers of Potomac, Inc.

1994c *Phase I Archeological Survey of Approximately 300 Acres at the New Kent Leased Property, Fleet Surveillance Support Command New Kent County, Virginia* (with Michael B. Hornum). Prepared for Atlantic Division, Naval Facilities Engineering Command (LANTDIV).

1994d *Phase Ii Investigations of Sites 44FX619 and 44FX1942, Cheney School Outgrant Project, U.S. Army Garrison Fort Belvoir, Fairfax County, Virginia* (with Ellen C. Saint Onge). Submitted to Paciulli, Simmons & Associates, Ltd.

1994e *Phase I Archival and Archeological Investigations of the Proposed Linganore Creek Wastewater Interceptor, Frederick County, Maryland.* Submitted to the Bureau of Water and Sewer, Frederick County Department of Public Works.

1994f *Cultural Resources Investigations at the Defense Information School (DINFOS) (Formerly Defense Media School), Fort George G. Meade, Anne Arundel County, MD* (with Hugh McAloon). Submitted to the U.S. Army Corps of Engineers, Baltimore District.

1994g *National Historic Context for Department of Defense Installations 1790 - 1940* (with Leo Hirrel, Katherine Grandine, Kathryn Kuranda, Bethany Usher and Hugh McAloon). Submitted to U.S. Army Corps of Engineers, Baltimore District on behalf of DoD Legacy Resource Management Program.

1994h *Department of Defense's Archeological Resources.* A training video produced for Bregman and Associates for the Department of the Navy. (Draft)

1994i *Stage IA Cultural Resources Reconnaissance in Support of a Shallow Draft Navigation Reconnaissance Study of Reynolds Channel and New York State Boat Channel, Nassau and Suffolk Counties, New York* (with April L. Fehr and David Robinson). Submitted to Andrews, Miller, & Associates, Inc.

1995a *Phase I Archeological Investigations of the Proposed Jason's Landing Development, Anne Arundel County, Maryland.* Prepared for RE Properties.

1995b *Archeological Investigations at the Maggie L. Walker National Historic Site, Richmond, Virginia* (with Suzanne L. Sanders). Submitted to the National Park Service, Mid-Atlantic Region.

1995c *Phase I Archival and Archeological Investigations of a Portion of Oak Marr Park, Fairfax County, Virginia* (with Michael A. Simons). Prepared for and with funding by Fairfax County Park Authority.

1995d *Archeological Mitigation for the Natural Gas Line, Carlisle Barracks, Carlisle, Pennsylvania* (with Suzanne L. Sanders and Andrew D. Madsen). Prepared for the U.S. Army Corps of Engineers, Baltimore District.

1995e *Phase I Archeological Investigations of Portions of the Dudrow Industrial Park, Frederick County, Maryland* (with Steve A. Mallory). Prepared for ToysRUs and Dudrow Industrial, LLC.

1995f Review: Public Archeology in Annapolis: A Critical Approach to History in Maryland's Ancient City (Parker B. Potter, Jr.), *Journal of Middle Atlantic Archaeology* 11:177-179.

1995g *Phase I Terrestrial and Marine Archeological Surveys for the Poplar Island Reclamation Project and Phase II Investigations of Site 18TA237, Talbot County, Maryland* (with April Fehr, Jack Irion, and Donald Maher). Prepared for GBA-M&N, a Joint Venture.

1995h *Phase IB Archeological Investigations of the Proposed Health Sciences Library, University of Maryland at Baltimore, Baltimore, Maryland.* Prepared for Kann and Associates, Inc.

1995i *Washington Aqueduct Cultural Resource Management Plan* (with Eliza E. Burden). Prepared for the U.S. Army Corps of Engineers, Baltimore District.

1996a *Phase II Investigations of Sites 44FX1340, 44FX1344, 44FX1672, 44FX167, and 44FX1926, U.S. Army Garrison Fort Belvoir, Fairfax County, Virginia* (with Michael A. Simons). Prepared for Pacuilli, Simmons & Associates, Ltd.

1996b *Historic and Archeological Resources Protection Plan for NAVSTA Roosevelt Roads, Cieba, Puerto Rico* (with Suzanne L. Sanders and Julian Granberry). Prepared for the Atlantic Division, Naval Facilities Engineering Command.

1996c *Phase I Architectural and Archeological Survey at Cheatham Annex, York County, Virginia* (with Kathryn J. Saul, Katherine Grandine, Thomas W. Davis, Andrew Madsen, Steven A. Mallory, Michael H. McGrath, Hugh B. McAloon, and David S. Olney). Prepared for the Atlantic Division, Naval Facilities Engineering Command.

1996d Guest Editorial and Bibliography. *Archeology and Public Education*, 5 (1) Society for American Archaeology.

1996e *Phase IB Archeological Investigations of the Proposed 653 West Pratt Street Facility, Baltimore, Maryland.* Submitted to the University of Maryland Medical System, Baltimore, Maryland.

1996f *Phase IB Archeological Investigations of the Proposed Health Sciences Library, University of Maryland at Baltimore, Baltimore, Maryland.* Submitted to Kann and Associates, Inc., Baltimore, Maryland.

1996g *Langley Air Force Base (AFB) Cultural Resource Management Plan* (with Brooke V. Best and Lex Campbell). Draft Report. Prepared for the U.S. Army Corps of Engineers, Baltimore District, and Langley AFB.

1996h *Cultural Resources Management Investigations for the Main Street Reconstruction Project, Annapolis, Anne Arundel County, Maryland* (with April L. Fehr, Suzanne Sanders, David Landon, Andrew D. Madsen, Kathleen Child, and Michele Williams). Prepared for City of Annapolis.

1996i *Intensive Level Reconnaissance at the United States Naval Academy: The Main Campus, NSWC Annapolis Housing, USNA North Severn, and the Naval Academy Dairy Farm, Annapolis and Anne Arundel County, Maryland* (with John L. Seidel and Elizabeth Rupp). Draft. Prepared for Engineering Field Activity - Chesapeake.

1996j *Phase II Archeological Evaluation of Site 44HT46 at NASA Langley Research Center, Hampton, Virginia* (with Ann B. Markell and Kathleen Child). Draft. Prepared for National Aeronautics and Space Administration.

1996k *Rock Art Study on DOD Property Located in LANTOPS, EFA Chesapeake, and NORTHDIV Areas of Responsibility* (with Clement W. Meighan). Final. Prepared for Atlantic Division, Naval Facilities Engineering Command.

1997a *Historic Preservation Plan: United States Naval Academy, Annapolis, Maryland* (with Lex Campbell and John L. Seidel). Draft. Prepared for Engineering Field Activity - Chesapeake.

1997b *Cultural Resources Investigations for Alignment and Environmental Studies, Halfway Boulevard Extended and Newgate Boulevard (PUR-577), Washington County, Maryland* (with April L. Fehr, Kathryn M. Kuranda, W. Patrick Giglio, and Ellen Saint Onge). Draft. Prepared for KCI Technologies.

1997c *Archeological Resources Overview, Norfolk Naval Shipyard, Portsmouth, Virginia.* Final. Prepared for Atlantic Division, Naval Facilities Engineering Command.

1997d *Phase I Archeological Survey of a Proposed Microwave Antenna Site, Roanoke Island, Dare County, North Carolina* (with Kathleen M. Child). Draft. Prepared for Atlantic Division, Naval Facilities Engineering Command.

1997e *National Register Evaluation of the Triplett Family Cemetery (44FX739), Lacey's Hill Cemetery (44FX1208), and Woodlawn United Methodist Cemetery (44FX1210), Fort Belvoir, Fairfax County, Virginia* (with Geoffrey E. Melhuish). Submitted to Paciulli, Simmons & Associates, Ltd.

1997f *Architectural Investigations of St. Juliens Creek Annex* (with Hugh B. McAloon, Geoffrey E. Melhuish, and William T. Dod). Submitted to Atlantic Division, Naval Facilities Engineering Command.

1997g *Phase I Remote Sensing Marine Archeological Survey of the Proposed Dredge Site at Naval Amphibious Base Little Creek, Virginia Beach, Virginia* (with David S. Robinson and Adam I. Kane). Prepared for Atlantic Division, Naval Facilities Engineering Command.

1997h *The Mount Independence State Historic Site Cultural Resource Management Plan.* With John Seidel and David S. Robinson. Report prepared by R. Christopher Goodwin & Associates, Inc. for State of Vermont, Division for Historic Preservation.

1997i *Archeological Overview and Architectural Reconnaissance of the Proposed Coldspring Lane Light Rail Station Parking Facility, Baltimore, Maryland* (with Katherine E. Grandine). Prepared for Whitman, Requardt and Associates.

1997j *Phase I Archeological Survey at Naval Security Group Activity Northwest, Chesapeake City, Virginia, and Currituck County, North Carolina* (with Michael B. Hornum, Nora Sheehan, Sonja Ingram, and Geoffrey Melhuish). Prepared for the Atlantic Division, Naval Facilities Engineering Command.

1997k *Cultural Resources Overview of the Proposed North Atlantic Pipeline Project, Gulf of Maine to Rockingham County, New Hampshire* (with Dave D. Davis, Nathan Hamilton and John L. Seidel). Prepared for North Atlantic Pipeline Partners, L.P.

1997l *Phase I Archeological Investigations at Marine Corps Air Station Cherry Point, North Carolina* (with Thomas W. Davis, Kathleen M. Child, and W. Patrick Giglio). Submitted to Atlantic Division, Naval Facilities Engineering Command.

1998a *Phase I Survey for Submerged Cultural Resources, Chesapeake Bay Oyster Recovery Project, Chesapeake Bay, Somerset County, Maryland* (with John L. Seidel). Prepared for Baltimore District, U.S. Army Corps of Engineers.

1998b *Ethnohistoric and Ethnographic Information Related to the Fort Carson Military Reservation and Pinon Canyon Maneuver Site in Colorado* (with Donald G. Jones, Kathy Stemmler, Michael McGrath, and Elizabeth Winstead). Prepared for Department of the Army Corps of Engineers, St. Louis District.

1998c *Phase IB Study of a Portion of the MD 28 Project Area and Phase II Evaluation of the Hunting Hill Store and Post Office Site (18MO468), Montgomery County, Maryland* (with Andrew D. Madsen and Jane Armstrong). Prepared for Maryland Department of Transportation, State Highway Administration.

1998d *Phase I Archeological Investigation and Architectural Evaluation of the Cold Spring Lane Light Rail Parking Facility, Baltimore, Maryland* (with Elaine Kiernan, Katherine Grandine, and John Clarke). Prepared for Maryland Mass Transmit Administration and Whitman Requardt and Associates.

1998e *Archeological Mitigation of the J.S. Berry Brick Mill (18BC89) and Pawley Stoneware Kiln (18BC88), at the Proposed Ravens' Stadium, Baltimore, Maryland* (with Suzanne Sanders). Prepared for Maryland Stadium Authority.

1998f *Phase I Archeological Survey and Phase II Evaluation of the Brown's Tavern (Site 18PR552), Within the Proposed Gateway Park Development, Prince George's County, Maryland* (with Martha Williams, Jane Armstrong, and April Fehr). Prepared for Federal Realty Investment Trust.

1998g *Phase I Submerged Cultural Resources Survey of SR300 Proposed Bridge Corridor Across Apalachicola Bay, Between Eastpoint and St. George Island, Franklin County, Florida* (with John Seidel). Submitted to Florida Department of Transportation.

1998h *Phase I Archeological Investigations, Phase II Evaluation, and Phase III Mitigation Studies Related to the Replacement of the HTW Piping, United States Naval Academy, Annapolis, Maryland* (with Nora Sheehan). Prepared for RMF Engineering, Inc.

1998i *Interim Report on Archeological Survey of the Proposed Independence Pipeline Corridor through Lawrence, Butler, Armstrong, Clarion, Jefferson, Clearfield, Elk, Forest, McKean, Cameron, Potter, and Clinton Counties, Pennsylvania* (with Michael B. Hornum, Thomas W. Davis, William Lowthert, John Zielinski, Kathleen Child, Dan Grose, Greg Katz, Andrew Madsen, and Kathryn McGrath). Prepared for ANR Pipeline Company.

1998j *Phase I Remote Sensing Marine Archeological Survey for the Coan River Navigation Improvement Project, Coan River, Northumberland County, Virginia* (with David Robinson, Adam Kane, Jean Pelletier, and Brian Cleven). Prepared for the Baltimore District, U.S. Army Corps of Engineers.

1998k *Architectural Inventory of Norfolk Naval Shipyard and Satellite Activities, Norfolk, Virginia* (with Hugh B. McAloon, William T. Dod, and Geoffrey E. Melhuish). Submitted to the Naval Facilities Engineering Command, Atlantic Division.

1998l *Phase I Remote Sensing Marine Archeological Survey for the Washington Sailing Marina* (with Jean B. Pelletier, David Trubey, and Adam I. Kane). Submitted to U.S. Army Corps of Engineers, Baltimore District.

1998m *Inventory and Conservation Needs Assessment for Artifacts from the Civil War Shipwreck Kentucky* (with Andrew Madsen and Anthony Randolph). Submitted to U.S. Army Corps of Engineers, Vicksburg District.

1998n *Integrated Cultural Resources Management Plan, US Army Garrison, Fort Belvoir, Virginia* (with Brooke Best and W. Patrick Giglio). Submitted to Dewberry & Davis on behalf of the Environmental & Natural Resources Division, Fort Belvoir, Virginia.

1999a *Phase I Remote Sensing Archeological Survey for the Medora Crossing Soft Dike Construction Project, Mississippi River, Louisiana* (with Jean B. Pelletier, David Trubey, William Barr, Ralph Draughon, Charlene Keck, William Hayden, and Roger Saucier). Submitted to U.S. Army Corps of Engineers, New Orleans District.

1999b *Archeological Investigations Related to the Loudoun County Courthouse Expansion, Including Site 44LD567, Leesburg, Virginia* (with Nora Sheehan and Martha Williams). Prepared for Department of Historic Resources, Petersburg, Virginia.

1999c *Phase I Archeological and Architectural Survey at Naval Weapons Station Yorktown, York County, James City County, and the City of Newport News, Virginia* (with Nora B. Sheehan, Michael B. Hornum, Katherine Grandine, Brian A. Stone, Steven A. Mallory, Liza Rupp, and Anthony Randolph). Prepared for Atlantic Division, Naval Facilities Engineering Command.

1999d *Archival Overview, Disturbance Assessment, and Archeological Investigations of the Proposed Maryland Museum of African American History and Culture Property, Baltimore County, Maryland.* (with April Fehr and Kathleen Child). Submitted to Maryland Department of Housing and Community Development.

1999e *Phase I/II Archeological Investigations for the Proposed Officer's Club Parking Lot Expansion and Golf Field House Modifications, Naval Air Station, Patuxent River, St. Mary's County, Maryland* (with Kathleen Child and Michael Hornum). Submitted to TAMS Consultants, Inc.

1999f *Phase I-III Archeological Investigations for the Chilled Water Line Upgrade (P-165), Including site 18AP83, U.S. Naval Academy, Annapolis, Maryland* (Nora Sheehan and Eleanor Breen). Submitted to Michael Baker, Jr., Inc.

1999g *Phase I Remote Sensing Marine Archeological Survey for the DNR Shellfish Dredging Project, Upper Chesapeake Bay, Maryland* (with Jean B. Pelletier and David Trubey). Submitted to Maryland Department of Natural Services.

1999h *Archival Investigations and Disturbance Assessment for the Proposed Addition to the James Senate Office Building, Annapolis, Maryland* (with Nora Sheehan). Submitted to Maryland Department of General Services.

1999i *Phase IB Cultural Resources Identification of Portions of the Proposed Prince William County Service Authority Western Zone Water Transmission Line, Prince William County, Virginia.* Submitted to Gannett Fleming, Inc.

1999j *Interim Report on Architectural Reconnaissance Survey of the Proposed Independence Pipeline Corridor through Lawrence, Butler, Armstrong, Clarion, Jefferson, Forest, and Elk Counties, Pennsylvania* (with Patrick Giglio, Elaine Kiernan, and Brooke Best). Submitted to ANR

1999k *Cultural Resources Management Investigations for the Site of the Proposed James Senate Office Building Addition, Annapolis, Maryland* (with Nora Sheehan and April Fehr). Submitted to Maryland Department of General Services.

1999l *Assessment of Archeological Resources in the City of Falls Church, Virginia* (Co-Principal Investigator with Christopher R. Polglase, M.A., ABD). Submitted to Virginia Department of Historic Resources.

2000a *Archeological Investigations at the Juvenile Justice Center, Baltimore, Maryland* (with Nora Sheehan, M.A., and Suzanne Sanders, M.A). Submitted to Maryland Department of General Services.

2000b *Phase I Archeological Inventory Survey of Harvey Point Defense Testing Activity, Perquimans County, North Carolina* (with William H. Lowthert, IV, M.A., Peter Godwin, B.A., Jennifer Tobey, M.A., W. Patrick Giglio, M.F.A., Meril Dunn, B.A., Matthew Gill, B.A., Jesse Kulp, B.A., and Joshua Weller, B.A.). Submitted to TAMS Consultants, Inc.

RÉSUMÉ

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Current Position(s): Consultant

Education: Louisiana State University, PhD (Geography), 1968
Univ. California, Los Angeles, 1958-59
Louisiana State University, MA (Geography), 1958
Louisiana State University, BA (Geography), 1957

Professional Experience:

Physical Scientist, Environmental Laboratory, US Army Engineer Waterways Experiment Station (USAEWES), 1981-1994
Special Assistant, Environmental Laboratory, USAEWES, 1974-1981
Research Geographer, Soils Division, USAEWES, 1961-1974
Field Geologist, American Museum of Natural History, 1961
Contract Fellow, Coastal Studies Institute, Louisiana State University, 1959-1961

Major Areas of Research:

Alluvial and deltaic geomorphology
Fluvial and coastal processes
Landscape evolution and paleoenvironmental reconstruction
Lower Mississippi Valley Quaternary chronology and stratigraphy
Archeological geology
Engineering geology of alluvial deposits

Affiliations:

Association of Engineering Geologists (Member)
American Quaternary Association (Charter Member)
Geological Society of America (Fellow)
Society for American Archaeology (Member)
The Coastal Society (Charter Member)
Society of Professional Archeologists (Member)
Arkansas Archaeological Society (Member)
Louisiana Archaeological Society (Life Member)
Mississippi Archaeological Assoc. (Life Member)
Phi Kappa Phi (Member)

Society of the Sigma Xi
Vicksburg-Warren Co. Chamber of Commerce
Port City Kiwanis Club
Vicksburg Chapter, American Red Cross

Offices Held:

Secretary, Lower Mississippi Valley Section, Association of Engineering Geologists, 1985-1986
Vice-Chairman, Lower Mississippi Valley Section, Assoc. of Engineering Geologists, 1987-1988
Certified Professional Archeologist, 1981-present
Affiliate Member, Graduate Faculty, Louisiana State University, 1987-1994
Registered Professional Geologist (Arkansas), 1988-present
President, WES Chapter, Vicksburg-Warren Co. Chamber of Commerce, 1992-1993
President, Port City Kiwanis Club, 1996-97
Board of Directors, Vicksburg Chapter, American Red Cross, 1995-1997
Vice-President, Louisiana Archaeological Society, 1996-1997
Lt. Governor, Kiwanis Division 15, 1997-1998
President, Louisiana Archaeological Society, 1998-

Technical Committee/Society Activities:

Environmental Protection Agency/Corps of Engineers Technical Committee on Criteria Development, 1976

Session Chairman/Organizer, American Society of Civil Engineers Specialty Conference, Mobile, AL, January 26-28, 1976

Vice Chairman, Technical Paper Committee, VII World Dredging Conference, an Francisco, CA, July 9-13, 1976

Program Committee and Session Chairman, 2nd Annual Meeting, The Coastal Society, New Orleans, LA, November 17-20, 1976

Program Subcommittee, 1977 Offshore Technology Conference, Houston, TX

Review Panel, Louisiana State University Sea Grant Program, Baton Rouge, LA, 1979

Panel Moderator, Conference on Coastal Erosion and Wetlands Modification in Louisiana, Baton Rouge, LA, September 1981

Abstract Reviewer, Geological Society of America Annual Meeting, Orlando, FL, 1985

Banquet Presentation, Mississippi Archaeological Association Annual Meeting, Jackson, MS, October 1986

Technical Advisory Committee, Symposium on Global Climate Change, University of Oklahoma Science and Public Policy Program, Norman, OK, March 1986

Panel Moderator, Association of Engineering Geologists, Lower Mississippi Valley Seminar, Vicksburg, MS, May 1987

Luncheon Presentation, Baton Rouge Geological Society Meeting, Baton Rouge, LA, 1987

Session Chairman (Geomorphology), 1988 Annual Meeting, Geological Society of America, Denver, CO, November 3, 1988

Luncheon Presentation, Baton Rouge Geological Society Meeting, Baton Rouge, LA, 1993

Luncheon Presentation, Louisiana Water Well Association Meeting, Baton Rouge, LA, 1993

Guest Lecturer, Geosciences Dept., Northeast Louisiana University, Monroe, LA, 1994

Banquet Speaker, Missouri Archaeological Society Meeting, Columbia, MO, 1993

Guest Lecturer, Humanities Series, Phillips Co. Community College, Helena, AR, 1994

Guest Lecturer, Poverty Point Workshop on Pedogenesis, Poverty Point, LA, 1995

Luncheon Presentation, Baton Rouge Geological Society, Baton Rouge, LA, 1995

Field Trip Leader, Engineering Geology of New Orleans; Water, Water, Everywhere. Geological Society of America Annual Conference, New Orleans, LA, 1995

Guest Lecturer, Tulane Univ. Environmental Faculty Seminar, New Orleans, LA, 1997

Guest Lecturer, Mississippi Gem and Mineral Society, Jackson, MS, 1998

Presentation on "Archaeological Significance of River Channel Changes" for Archaeology Week, Ferriday, LA, 1998

Administrative Activities

US Army Engineer Waterways Experiment Station
- Member of Futures Committee
- Member of Professionalism Committee
- Chairman, Historical Committee
- Member, Graduate Institute Advisory Board

Awards, Lectureships, or Prizes

Lewis Gottlieb Fellowship, Louisiana State University, 1957

Department of the Army, Decoration for Meritorious Civilian Service, 1973

US Army Engineer Waterways Experiment Station, Director's Research and Development Achievement Award, 1979

Society for American Archeology, Roald Fryxell Award for Interdisciplinary Research, 1985

Geological Society of America, Kirk Bryan Award, 1996

Geological Society of America, E.B. Burwell, Jr., Award, 1998

American Men and Women of Science

Who's Who in the South and Southeast

Who's Who in Technology Today

Publications (Book chapters, journal articles, refereed bulletins)

and Gagliano, S.M., 1963, Poverty Point sites in southeastern Louisiana: American Antiquity, v. 28, p. 320-327.

1966, Soil survey reports and archaeological investigations: American Antiquity, v. 31, p. 419-422.

1968, A new chronology for braided stream surface formation in the lower Mississippi Valley: Southeastern Geology, v. 9, p. 65-76.

and Fleetwood, A.R., 1970, Origin and chronologic significance of late Quaternary terraces, Ouachita River, Arkansas and Louisiana: Geological Society of America Bulletin, v. 81, p. 869-890.

1970, Origin of the St. Francis Sunk Lands, Arkansas and Missouri: Geological Society of America Bulletin, v. 81, p. 2847-2854.

and Fleetwood, A.R., 1970, Origin and chronologic significance of late Quaternary terraces, Ouachita River, Arkansas and Louisiana: Empirical equation correction: Geological Society of America Bulletin, v. 81, p. 3155-3156.

1978, Sand dunes and related eolian features of the lower Mississippi River alluvial valley, *in* Man and environment in the lower Mississippi Valley: Geoscience and Man, v. 19, p. 23-40.

1981, Current thinking on riverine processes and geologic history as related to human settlement in the southeast, *in* Traces of prehistory, papers in honor of William G. Haag: Geoscience and Man, v. 22, p. 7-18.

and Kolb, C.R., 1982, Engineering geology of New Orleans, *in* Legget, R., ed., Geology under cities: Geological Society of America Case Histories in Engineering Geology, no. 5, p. 75-93.

1983, Historic changes in Current River meander regime: Proceedings, American Society of Civil Engineers Specialty Conference, Rivers '83, New Orleans, LA, p. 180-190.

1986, Holocene fluvial landforms and depositional environments of the lower Mississippi Valley, *in* Neathery, T.L., ed., Centennial field guide, Volume 6, Southeastern section of the Geological Society of America: Geological Society of America, p. 409-412.

1987, Geomorphological interpretation of late Quaternary terraces in western Tennessee and their regional tectonic implications: US Geological Survey Professional Paper 1336-A, 19 p.

1987, The physical setting of the Ouachita, Saline, and Little Missouri Rivers, southern Arkansas: The Arkansas Archaeologist, v. 25-26, p. 63-74.

1989, Evidence for episodic sand-blow activity during the 1811-1812 New Madrid (Missouri) earthquake series: Geology, v. 17, p. 103-106.

1991, Comment on "Formation of Mima mounds: a seismic hypothesis": Geology, v. 19, p. 284-285.

1991, Geoarchaeological evidence of strong prehistoric earthquakes in the New Madrid (Missouri) seismic zone: Geology, v. 19, p. 296-298.

1991, Have you seen any good Archaic earthquake cracks lately? *in* McNutt, C.H., *ed.*, The Archaic period in the Mid-South; Proceedings of the 1989 Mid-South Archaeological Conference, Memphis, TN - July 15, 1989: Mississippi Department of Archives and History, Archaeological Report No. 24, p. 6-14.

and Kidder, T.R., 1991, Archaeological and geological evidence for protohistoric water management in northeast Louisiana: Geoarchaeology, v. 6, p. 307-335.

and Autin, W.J., Burns, S.F., Miller, B.J., and Snead, J.I., 1991, Quaternary geology of the Lower Mississippi Valley, *in* Morrison, R.B., ed., Quaternary nonglacial geology; Conterminous U.S.: Boulder, Colorado, Geological Society of America, The Geology of North America, v. K-2, p. 547-582.

1991, A postulated "lost" river system in southeastern Arkansas and northeastern Louisiana--is there archeological evidence? Louisiana Archaeology, v. 18, pp. 131-142.

1993, Towosahgy State Historic Site and its physical environment: The Missouri Archaeologist, v. 51, pp. 72-91.

1994, The paleoenvironmental setting of northeast Louisiana during the Paleo-Indian period: Louisiana Archaeology, No. 16, pp. 129-146.

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1994, Evidence of late glacial runoff in the Lower Mississippi Valley: Quaternary Science Reviews, v. 13, pp. 973-981.

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1996, A Contemporary Appraisal of Some Key Fiskian Concepts with Emphasis on Holocene Meander Belt Formation and Morphology. Engineering Geology, v. 45, pp. 67-86.

and Smith, L.M. and Autin, W.J. (editors), 1996, Conference Proceedings, Geology in the Lower Mississippi Valley: Implications For Engineering, The Half Century Since Fisk, 1944, Vicksburg, Mississippi, December 5-8, 1994: Engineering Geology, v. 45, 479 p.

1997, Late Quaternary Geologic History of the Western Lowlands, *in* Sloan, A Paleoindian Dalton Cemetery in Arkansas, by D.F. Morse. Smithsonian Institution Press, pp. 96-102.

and J.W. Saunders, R.D. Mandel, E.T. Allen, C.T. Hallmark, J.K. Johnson, E.H. Jackson, C.M. Allen, G.L. Stringer, D.S. Frink, J.K. Feathers, S. Williams, K.J. Gremillion, M.F. Vidrine, R. Jones, 1997, A Mound Complex in Louisiana at 5400-5000 Years Before the Present, Science, Vol. 277, No. 5333, pp. 1796-1799. (19 Sept. issue)

Publications (Reports, Papers, and others)

1959, The meaning of middens: The Times-Picayune DIXIE Roto Magazine, p. 5-9.

1962, Ouachita River, general geology: US Army Engineer Waterways Experiment Station Miscellaneous Paper 3-507, 3 p.

1962, Geologic aspects of site selection, Columbia Lock and Dam, Ouachita River, Louisiana: US Army Engineer Waterways Experiment Station Miscellaneous Paper 3-518, 6 p.

and Broughton, J.D., 1962, A technique for mapping terrain microgeometry: US Army Engineer Waterways Experiment Station Technical Report 3-612, 25 p.

1962, Lower Ouachita and Black Rivers, Arkansas and Louisiana, general geology: US Army Engineer Waterways Experiment Station Miscellaneous Paper 3-546, 16 p.

1963, General geology, lower St. Francis River, Arkansas: US Army Engineer Waterways Experiment Station Miscellaneous Paper 3-555, 3 p.

and Smith, D.D., 1963, Organization and Presentation of Environmental Data for Office of Civil Defense Use, A Feasibility Study: US Army Engineer Waterways Experiment Station Technical Report 5-622, 29 p.

and Steinriede, W.B., Jr., and Stanley, D.L., 1963, Geologic aspects of site selection, Jonesville Lock and Dam, Black River, Louisiana: US Army Engineer Waterways Experiment Station Miscellaneous Paper 3-571, 7 p.

1963, Columbia Lock and Dam, Ouachita River, Louisiana: US Army Engineer Waterways Experiment Station Miscellaneous Paper 3-569, 11 p.

1963, Geologic aspects of site selection, Haleside Pumping Station, Lower St. Francis River, Arkansas: US Army Engineer Waterways Experiment Station Miscellaneous Paper 3-595, 11 p.

1963, Recent geomorphic history of the Pontchartrain Basin, Louisiana: Louisiana State University Studies, Coastal Studies Series No. 9, 114 p.

and Wire, J.C., 1964, Project PRE-SCHOONER, geological investigations for test site selection, Gold Meadows area, Nevada Test Site: US Army Engineer Waterways Experiment Station Miscellaneous Paper 3-618, 11 p.

and Mathews, A.L., and Hunt, R.W., 1964, Additional site exploration, vacuum solar telescope site, Sacramento Peak, New Mexico: US Army Engineer Waterways Experiment Station Miscellaneous Paper 3-639, 11 p.

and Banks, D.C., 1964, Engineering geology of Buckboard Mesa, Nevada Test Site: US Army Engineer Waterways Experiment Station Preliminary Report PNE- 5001, 147 p.

1964, Organization and presentation of environmental data for Office of Civil Defense use, a feasibility study, App. F: Engineering-geologic map folio cost analysis; and App. G: Environmental data source directory investigations: US Army Engineer Waterways Experiment Station Technical Report 5-622, 33 p.

1964, Geological investigation of the St. Francis Basin: US Army Engineer Waterways Experiment Station Technical Report 3-659, 5 p.

1964, Site geology, Jonesville Lock and Dam, Black River, Louisiana: US Army Engineer Waterways Experiment Station Miscellaneous Paper 3-684, 12 p.

1965, Geologic aspects of site selection, Felsenthal Lock and Dam, Ouachita River, Arkansas: US Army Engineer Waterways Experiment Station Miscellaneous Paper 3-696, 7 p.

1965, New Orleans-it's geologic setting: Geotimes, v. 9, pp. 9-10.

1965, Geologic investigation of the St. Francis Basin (Supplement 1): US Army Engineer Waterways Experiment Station Technical Report 3-659, 6 p.

and Banks, D.C., 1965, Engineering properties of nuclear craters, Report 1, Site selection investigations, wet medium cratering experiments: US Army Engineer Waterways Experiment Station Technical Report 3-699, 85 p.

1965, Geologic aspects of site selection, Calion Lock and Dam, Ouachita River, Arkansas: US Army Engineer Waterways Experiment Station Miscellaneous Paper 3-775, 9 p.

and Mathews, A.L., and Ballard, R.F., Jr., 1965, Properties of foundation materials, vacuum solar telescope site, Sacramento Peak, New Mexico: US Army Engineer Waterways Experiment Station Miscellaneous Paper 3-763, 25 p.

1966, Selected geologic literature, lower Mississippi Valley Division area, index and annotated bibliography: US Army Engineer Waterways Experiment Station Technical Report 3-712, 65 p.

1966, Geologic investigation of the Yazoo Basin (Supplement 3): US Army Engineer Waterways Experiment Station Technical Report 3-480, 12 p.

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1967, Geological investigation of the Boeuf-Tensas Basin: US Army Engineer Waterways Experiment Station Technical Report 3-757, 4 p.

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and Kolb, C.R., 1967, Alluvial geology of the Yazoo Basin, lower Mississippi Valley (Scale 1:250,000): US Army Engineer Waterways Experiment Station, 3 sheets.

1967, Guidebook, aerial tour, Mississippi River deltaic plain: Geological Society of America 1967 Annual Meeting, New Orleans, La., 18 p.

1967, Geological reconnaissance of the Sulphur River and Cypress Creek Basins, Texas: US Army Engineer Waterways Experiment Station Technical Report 3-798, 54 p.

1968, Geological investigation of the Boeuf-Tensas Basin (Supplement 1): US Army Engineer Waterways Experiment Station Technical Report 3-757, 6 p.

1968, Selected geologic literature, Lower Mississippi Valley Division area, index and annotated bibliography (Supplement 2): US Army Engineer Waterways Experiment Station Technical Report 3-712, 19 p.

1969, Geological investigation of the Boeuf-Tensas Basin (Supplement 2): US Army Engineer Waterways Experiment Station Technical Report 3-757, 12 p.

1969, Geological investigation of the Mississippi River area, Artonish to Donaldsonville, Louisiana: US Army Engineer Waterways Experiment Station Technical Report S-69-4, 25 p.

and Fleetwood, A.R., 1969, Geological investigation of the St. Francis Basin (Supplement 3): US Army Engineer Waterways Experiment Station Technical Report 3-659, 30 p.

1969, Acoustic subbottom profiling survey, Walter F. George Reservoir, Alabama-Georgia: US Army Engineer Waterways Experiment Station Miscellaneous Paper S-69-32, 17 p.

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1970, Acoustic subbottom profiling systems, a state-of-the-art survey: US Army Engineer Waterways Experiment Station Miscellaneous Paper S-70-17, 15 p.

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Louisiana Tech University, Ruston, Louisiana – B.A. degree, double majors History and Geography, 1973

Louisiana Tech University, Ruston, Louisiana – M.A. degree, History, emphasis in Military History, 1975

Post-graduate studies: Louisiana Tech University, Ruston, archaeology
Louisiana State University in Shreveport, historic preservation

ACADEMIC AND PROFESSIONAL ORGANIZATIONS

Phi Alpha Theta, National History Fraternity, member & advisor of LSU in Shreveport Chapter

U.S. Civil War Center, LSU in Baton Rouge, member, board of directors

International Lincoln Association, member, board of directors

North Louisiana Civil War Round Table, member, past president, past coordinator of Eddie Vetter Memorial symposium

Young-Sanders Center for the Study of the War Between the States in Louisiana, board of directors

American Cartographic Association, member

Louisiana Historical Association, member

North Louisiana Historical Association, board of directors, treasurer

American Congress on Surveying and Mapping, member

ACADEMIC EMPLOYMENT

Department of History and Social Sciences, Louisiana State University in Shreveport

Full-time Instructor 1997 – present
Teaching courses in Civil War, Louisiana history, Middle Eastern history, and western civilization.

Assistant Director, Red River Regional Studies Center, an arm of the university dedicated to research projects focusing on history and geography and offering opportunities for students to gain practical skills in these fields.

Geographic Information Systems Coordinator, Red River Regional Studies Center, advising and supervising both undergraduate and graduate students in research projects combining GIS and cultural or historical issues.

Adjunct Instructor 1995 - 1997
Teaching courses in western civilization and Louisiana history.

Bossier Parish Community College

Adjunct Instructor of History 1991 – 1995
Teaching courses in western civilization and Louisiana history.

ACADEMIC RESEARCH PROJECTS/CURRENT

Mapping of Vicksburg National Military Park, National Park Service

Project conducted through Red River Regional Studies Center. Utilizes graduate and upper level undergraduate students to create a database of all monuments, markers, tablets, plaques, artillery pieces, earthworks, road and land forms within the park. Building all pertinent data through use of global positioning system receivers and ArcView software. Conducting all fieldwork and all mapping of all pertinent features. This is the first project of its kind conducted for the National Park Service.

Civil War Soldiers Database, A project of the U.S. Civil War Center in Baton Rouge, Louisiana, and Tyler Moore Center for the Study of the Civil War at Shepherdstown College, Shepherdstown, West Virginia

Supervising the Louisiana portion of the database which will ultimately be a master database of all Louisiana soldiers who fought in the War Between the States. Project involves transcribing all data collected by the National Archives for each soldier and entering documents into a standardized database. Ten students are working on this project with a completion goal of 2011, the sesquicentennial of the War.

History of the Prostitution District in Shreveport, Louisiana, 1897-1917

Mapping and recording the history of a district which has been designated as a historic preservation district by the State of Louisiana. Project will record existing building extant during this period. The goal is to determine whether the district retains enough building to remain a designated historic district.

CORPORATE EMPLOYMENT

Petroleum Graphics and its subsidiary, Precision Cartographics 1981 – present

Owner and chief operating office of the only full-time professional cartography firm in the State of Louisiana. Firm specializes in creating geographic information systems, detailed demographic analysis, reapportionment projects, historical and cultural analysis, and the creation of 911 addressing system maps and databases.

In this capacity recognized as an expert in cartographic and geographic issues, working with governmental clients and organizations as well as select corporate and nonprofit clients. Among its services are reapportionment, assessment mapping, E-911 implementation, special research projects, as well as consultation to the legal profession in matters related to mapping and history. Recognized as an expert witness in the U.S. District Court for the Middle District of Louisiana, U.S. District Court for the Western District of Louisiana (Lake Charles), U.S. District Court for the District of Columbia (Washington, D.C.) and the 1st, 2nd, and 3rd Judicial Districts in Louisiana. In addition, preparation of exhibits and analysis presented to the U.S. Supreme Court (Bossier Parish School Board vs. United States).

Clients of Petroleum Graphics have included more than 95 organizations, including parish/county assessors' offices, school boards, police juries, communications districts, school boards, and municipalities, national military parks, corporations, as well as various social services organizations, law firms, and historic organizations.

Morrison & Associations 1995 – present

Affiliated with a strategic planning firm in Shreveport. Provide demographic projections and analysis for governmental or industrial/commercial clients.

Petroleum Land Management 1975 – 1984

Title curation for various oil and gas companies specializing in curing land ownership problems for drill site and adjacent drilling units.

HISTORICAL CONSULTANCY

Consultant, State of Louisiana Department of Recreation and Tourism 1996-1997
Selected to examine all viable Civil War sites in the Red River Valley in Louisiana for nomination potential as National Historic Landmark status.

Historic Remediation Harrah's Casino 1997-1999

Hotel site historic, archaeological and environmental analysis to determine impact on sites of historic importance.

View-shed study to determine impact of hotel high-rise on adjacent historic district

Phase I Historical Study City of Shreveport 1998

Review of proposed festival site for historical importance.

Phase I Historical Study City of Shreveport 1997

Review of Union Pacific Railroad property to determine historical importance.

Phase I Historical Impact Statement/Study City of Shreveport 1999

Study for construction of proposed Shreveport Convention Center.

Phase I Historical Impact Study City of Shreveport 1999

Red River riverscape project to determine historical importance along Cross Bayou-Downtown Shreveport-Red River riverfront.

PUBLICATIONS

Co-author Article	"The Union Naval Expedition on the Red River Campaign" *Civil War Regiments*, Vol. IV, No. 2, 1994.
Co-author Chapter	"Photographs and Drawings" *The American Civil War: A Handbook of Literature and Research*, Steven E. Woodworth, ed., 1996.
Co-author/Lead Book	*Red River Steamboats* Arcadia Publishing, 1999.

In Progress

Author Book	Working Title: *One Damn Blunder from Beginning to End* A history of the Red River Campaign in 1864.
Co-Editor Book	Working Title: *Memories of Camp Life in the Civil War: The Diary of William Henry King* Editing and annotating a diary of Louisiana Confederate soldier from Bossier Parish
Author	"Confederate Defenses on the Red River" Submitted for publication in *Columbiad,* A Journal of the Civil War.

CURRICULUM VITA

NAME Lawrence E. Babits

PERMANENT ADDRESS 313 Crestline Blvd, Greenville, NC 27834

MARTIAL STATUS Married, one child

DATE OF BIRTH 22 June 1943 - Blytheville, Arkansas

SOCIAL SECURITY # 217-42-1872

EDUCATION

1981 Ph.D., Brown University, Providence, RI, 1981 - Anthropology with a concentration in Historic Sites Archaeology. Dissertation Title: *Military Documents and Archaeological Sites: Methodological Contributions to Historical Archaeology*.

1974 M.A., University of Maryland, College Park - Anthropology with Ethnohistorical Concentration. Thesis Title: *The Evolution and Adoption of Firearm Ignition Systems in Eastern North America: An Ethnohistorical Approach*.

1969 B.A., University of Maryland, College Park - Anthropology with History Minor

1961 Surrattsville High School, Clinton, MD

EMPLOYMENT

1992- Program in Maritime History and Nautical Archaeology, East Carolina University, Greenville, NC, Associate Professor of Historical Archaeology and Maritime History Courses Taught: Early American History, Civilization I, Maritime Material Culture, History and Theory of Nautical Archaeology, "Seamester" Above Water Nautical Archaeology
1996 Granted Tenure
1999 - Promoted to Full Professor

1981-1992 Department of History, Armstrong State College, Savannah, GA. Assistant Professor of History and Archaeology
Courses Taught: Early American Civilization, Archaeological Analysis, American Material Culture, Military History, Historical Archaeology, Archaeological Field Methods, European Civilization I, Human Evolution, Introductory Anthropology, American Indians, Primitive Religion
1986 Promoted to Associate Professor
1987 Granted Tenure

1980-1981 Department of Sociology and Anthropology, Washington and Lee University, Lexington, VA.
Courses Taught: Survey Archaeology, Physical Anthropology, Anthropological Theory, Introductory Anthropology, North American Prehistory, Archaeological Field Methods.

1978-1979 Department of Anthropology, Brown University, Providence, RI, Teaching Assistant
1979-1980 Teaching Fellow: Archaeological Field Methods

1973-1976 Archaeology Section, North Carolina Department of Cultural Resources, Raleigh. Archaeologist.
1969-1973 Department of Anthropology, University of Maryland, College Park, Teaching Assistant.
1963-1966 U.S. Army - Honorable Discharge, Sergeant E-5

FORUMS/WORKSHOPS

1987-1991 Elderhostel Archaeological Project, Skidaway Marine Resources Institute, Savannah, GA
1989 IBM-Sloan Workshop on Quantitative Exercises and Computer-Assisted Instruction for Social Science Courses - by Savannah State College at Armstrong State College, Savannah
1988 125th Anniversary of the Gettysburg Address, Gettysburg, PA, sponsored by National Park Service
1986 A History of Low Country Forts - Center for Low Country Studies, Savannah, GA
1985 Shell-Faculty Forum, Houston, TX
1983 Military History Workshop, ROTC-TRADOC US Military Academy, West Point, NY

BOOKS

1998 *Maritime Archaeology - A Guide to Theoretical and Substantive Contributions*. Plenum Press, New York (co-edited w/Hans Van Tilburg)
A Devil of a Whipping - The Battle of Cowpens. University of North Carolina Press, Chapel Hill
1993 *Cowpens Battlefield - A Walking Guide*. Overmountain Press, Johnson City, TN.

EDITED PROCEEDINGS

1988 *Underwater Archaeology 1998*, Society for Historical Archaeology, Tucson, Arizona (with Catherine Fach and Ryan Harris)

BOOK CHAPTERS

1988 Military Records and Historical Archaeology (Chapter 10) *Documentary Archaeology in the New World*, edited by Mary Beaudry, Cambridge University Press, New York.
1988 Anthropological Title Searches in Rockbridge County, Virginia (Chapter 12-with Henry Langhorne) *Documentary Archaeology in the New World*, edited by Mary Beaudry, Cambridge University Press, New York.
1986 Greene's Strategy in the Southern Campaign. *Adapting to Conditions: War and Society in the Eighteenth Century*. Edited by Maarten Ultee, pp. 135-149. University of Alabama Press, University, AL.

JOURNAL ARTICLES

1999 1785 Common Sailors' Clothing and a Ship's Camboose from the *General Carleton of Whitby* in *Underwater Archeology 1998*, pp. 61-66, Society for Historical Archaeology, Tucson, Arizona.

1998 Rapport de Fouilles Relatif aux Vestiges Francais de la Guerre de l'Independence Americaine Trouves a Savannah, Georgie, Aux Etats-Unis. *Carnet de la Sabretache* 135:15-16,29-30. (co-authored with Thomas Babits).

1997 Reconstructing the 1740 Scoutboat SAVANNAH. Museum Small Craft Association *Transactions* 3:14-22 (with Deirdre O'Regan).

Locating the Small Boat in the Archaeological Record: A Model From the North Carolina Sounds. Museum Small Craft Association *Transactions* 3:34-45 (with Annalies C. Kjorness).

1996 A Working Definition of "Periauger." *Proceedings of the 29th Annual Conference on Historical and Underwater Archaeology*. Society for Historical Archaeology, Tucson. pp. 22-28.

1995 Rubber Poncho and Blankets from the Union Transport *Maple Leaf*. *Military Collector and Historian* XLVII (2):60-68. Bullets from the *Maple Leaf*. *Military Collector and Historian* XLVII (3):119-126.

Supplying the Southern Army, March 1780-September 1781. *Military Collector and Historian* XLVII (4): 163-171.

1994 Exploring a Civil War Sidewheeler. *Archaeology* 47(5):48-50. Table of Organization: The American Main Line at Cowpens, 17 January 1781. *Military Collector and Historian* 46 (4) 158-162.

1993 Balloon. *Encyclopedia of the Confederacy* I:125, Simon and Schuster, New York.

Archaeology. *Encyclopedia of the Confederacy* I:48-50, Simon and Schuster, New York.

An Early Falcon and its Shot. *Military Collector and Historian* XLV(1):38-39 (with Brad Rodgers)

Two Cannon from the CSS Georgia. *Military Collector and Historian* XLV(1):30-32.

1992 Additional Artillery Equipment from Causton's Bluff, Savannah, GA. *Military Collector and Historian* XLIV (1):35-36.

The Floyd Drum: A Revolutionary War Drum from Virginia. *Military Collector and Historian* XLIV (3):150-152.

The 19th Foot at Monck's Corner, SC. *Military Collector and Historian* XLIV:175.

1990 A Confederate Bombproof Interior *Military Collector and Historian* XLII(4):135-137

1989 Confederate Earthworks Internal Structure. *Military Collector and Historian* XLI(4):194-198.

A Civil War Corps Badge from Savannah. *Military Collector and Historian* XLI(1):42

1988 Confederate Two Tiered Grapeshot from Savannah, Georgia. *Military Collector and Historian* XL(1):32-33.

USN Marked Ship's Nails - War of 1812 Construction? *Military Collector and Historian* XL(2):90.

A Confederate Columbiad Gunsight from Chatham County, GA, *Military Collector and Historian* XL (4):182-84.

The "Fifth" Maryland Regiment at Guilford Courthouse. *Maryland Historical Magazine* 84:370-378

1983 Greene's Strategy in the Southern Campaign, 1780-1781. *Air Force Journal of Logistics* VIII(1):10-13.

1983 Historical Archaeology and the Analysis of a Region. Historical Archaeology West of the Blue Ridge, edited by John McDaniel and Kurt C. Russ, *James G. Leyburn Papers in Anthropology* 1:78-90.

1983 "Log cabins" and Other Structures in the Lower Shenandoah Valley. Historical Archaeology West of the Blue Ridge, edited by John McDaniel and Kurt C. Russ, *James G. Leyburn Papers in Anthropology* 1:67-77 (w/William Cole).

The Berth 52 Vessel. *Historical Archaeology* Special Publication 4:8-9.

1982 A Note on the Roster of the South Carolina Continental Corps of Artillery. *South Carolina Magazine of Ancestral Research* X (1):3-5.

French and Indian War Button Backmarks: A Clue to Movements after June 1758. *Military Collector and Historian* XXXIV(1):35-6.

Shoe life in the 71st Regiment of Foot. *Military Collector and Historian* XXXIV:84-86.

A Reevaluation of Revolutionary War "MB" Buttons. *Military Collector and Historian* XXXIV:81-84.

Georgia's Coastal Forts, A Guide and Brochure, (Georgia Semiquincentenary Grant #84).

1981 The Chicod Creek Wreck, Pitt County, North Carolina. Underwater Archaeology: The Challenge before Us., *Proceedings of the 12th Annual Conference on Underwater Archaeology*. pp 3-9, Fathom Eight, San Marino, CA.

1978 Some Ideas on Early Firearms. *Artifacts* VII(3):(3-4).

1975 The Continental Soldier. *Tarheel Jr. Historian* Fall 1975:6-10.

A Napoleon Breech Face Fable of Fire. *Military Collector and Historian* XXVII(3):126-127.

Dating a Confederate Frock Coat. *Military Collector and Historian* XXVII(4):160-162.

1975 The Evolution and Adoption of Firearm Ignition Systems in Eastern North America: An Ethnohistorical Approach. *The Chesopeian* 14 (3,4):(40-82).

1974 A North Carolina Revolutionary War Button. *Military Collector and Historian* XXVI:52.

Excavation of Halifax Town Lot 52. *Tarheel Jr. Historian* Fall 1974:4-5.

1974 The Guns of Fort Branch. *Military Collector and Historian* XXVI(2):115.

REPORTS

1998 Preliminary Report on Phase II Testing - Grover's Creek Cove Site. Report submitted to the Maryland State Archaeologist, Crownsville, MD (with Catharine Fach and Ryan Harris)

1998 Preliminary Report on the Flotilla Project. Report Submitted to Donald Shomette and the Maryland State Archaeologist, Crownsville, MD. (with Catharine Fach and Ryan Harris)

1995 A Survey of the Pungo River, Wade's Point to Woodstock Point, Beaufort County, North Carolina. Report on File, Office of State Archaeologist, Raleigh, North Carolina (with Annalies C. Kjorness).

A Survey of the North Shore Pamlico River: Bath Creek to Wade's Point. Report on File, Office of State Archaeologist, Raleigh, North Carolina (with Jeff Morris and Annalies C. Kjorness).

1992 Battery Wimberly A Preliminary Topographical and Documentary Survey, Wormsloe State Historic Site, Savannah, GA.

1991 Preliminary Cultural Resources Survey of the Proposed Stone Revetment, Savannah Plant, Kemira, Inc. Report on File, Archaeology Laboratory, Armstrong State College, Savannah

1990 Clearing the Levi Sheftall Cemetery, Savannah, Georgia (w/ Rick Leech). Archaeology Laboratory, Armstrong State College, Savannah, GA.

Report on Archaeological Investigation Conducted for the Bloomingdale Police Department (BPD 89-03-0029). Report on File, Archaeological Laboratory, Armstrong State College, Savannah, GA.

1989 A Preliminary Survey of Watercraft and Vessel Remains in Chatham County, Georgia. (w/ Judy Wood, Rick Leech and Rusty Fleetwood), State Historic Preservation Office, Department of Natural Resources, Atlanta, GA.

Report on Exploratory Excavations, Jekyll Island Club Hotel Annex 89. (w/ Rick Leech). Archaeology Laboratory, Armstrong State College, Savannah, GA.

1988 Preliminary Report on Human Remains from the Red Bird Creek Site, Bryan County, GA. (w/ Rick Leech).

The Savannah River Obstructions - A Preliminary Report. Archaeology Laboratory, Armstrong State College, Savannah.

Notes on the Exploration of the Old Ebenezer Burial Area. Archaeology Laboratory, Armstrong State College, Savannah.

1987 Archaeological Investigations at Caustons Bluff, Chatham County, Georgia. Archaeology Laboratory, Armstrong State College, Savannah, GA (w/ J. Barnes, T. Foard R. Leech, S. Simmons, A. S. Walsh).

The Cannon Vessel, Archaeology Laboratory, Armstrong State College, Savannah, GA (w/ Rick Leech).

1987 Bull River Plantation Marina Survey, Archaeology Laboratory, Armstrong State College, Savannah, GA.

Phase I Archaeological Survey of the Galbreath Hammocks, Bryan County, GA (w/ Rick Leech).

1986 Phase I Archaeological Survey of the Bull River Site, Chatham County, GA. Archaeology Laboratory, Armstrong State College, Savannah (W/ Susan Simmons).

Phase I Archaeological Survey, Rincon 201 Facility Plant, Rincon, Effingham County, GA. Archaeology Laboratory, Armstrong State College, Savannah (w/ Julie A, Barnes, Gina M. Cupstid).

Archaeological Survey of the Hampton River Club. Butler's Point, Saint Simons Island, GA. Archaeology Laboratory, Armstrong State College, Savannah (with Timothy Foard).

1985 Archaeological Investigation of the Marine Railway Site, Hutchinson's Island, Savannah, GA. Savannah District, US Army Corps of Engineers, Savannah (with Julie A. Barnes).

Report of Test Excavations at Battlefield Park. Archaeology Laboratory, Armstrong State College, Savannah, GA.

1984 Cultural Resources survey of Causton's Bluff, Chatham County, GA. Savannah District, US Army Corps of Engineers, Savannah, GA.

Archaeological Survey and Testing at Hunter Army Airfield, Savannah, GA. Archaeological Services Branch, National Park Service, Atlanta, GA (w/ Robin L. Smith, R. Bruce Council and Nicholas Honerkamp).

Archaeological Investigation of the Central of Georgia Train Shed, Savannah, GA. Georgia Historical Society, Savannah (w/ Julie A. Barnes).

1983 Archaeological Survey of the Savannah River (Ranges 75+500 to 77+500). Savannah District, US Army Corps of Engineers, Savannah, GA.

Archaeological Survey of the Savannah River (Ranges 81+500 to 83+500). Savannah District, US Army Corps of Engineers, Savannah, GA.

Preliminary Archaeological Investigation Long Point, Whitemarsh Island, Chatham County, GA. Archaeology Laboratory, Armstrong State College, Savannah, GA.

Phase II Archaeological Investigation - Long Point, Whitemarsh Island, Savannah, GA. Archaeology Laboratory, Armstrong State College, Savannah, GA.

1982 Report of an Initial Archaeological Reconnaissance, Temple Boat Landing, Camden County, GA. USDA Soil Conservation Service, Athens, GA.

Report of an Initial Archaeological Reconnaissance, Rincon, GA 201 Facility Planning Area. Archaeological Laboratory, Armstrong State College, Savannah, GA.

Preliminary Investigation, Richmond Hill Plantation, Power Plant Chimney. WAPORA, Inc., Norcross, GA.

1982 Phase I Test Excavations, Mortar Battery, Fort McAllister, Richmond Hill, GA. Fort McAllister State Historic Site, Richmond Hill, GA.

Preliminary Archaeological Survey of the Highway 17 Farm Tract, Richmond Hill, GA. Archaeological Laboratory, Armstrong State College, Savannah, GA.

The Berth 52 vessel (09CH691): Interim report. Georgia Historical Society, Savannah, GA.

1981 Archaeological Investigations, Fort McHenry National Monument and Historic Shrine, Baltimore, MD. Denver Service Center, National Park Service (w/ Patricia Rubertone and William Stokinger).

1980 Phase I Archaeological Testing at Fort Barton, Tiverton, RI. RI Historical Preservation Commission, Providence, RI.

1979 Report on Preliminary Archaeological Investigation: Fort Butts 1777-1781. RI Historical Preservation Commission, Providence, RI.

1978 Chapter 6 - Foncin Parade Components IN A Final Report of Archaeological Investigations at Fort Independence: 1976-1977. Edited by William Stokinger and Geoff Moran. Public Archaeology Lab, Brown University, Providence (w/Myron Stachiw and Stephen Mrzowski).

1976 Archaeology at Town Lot 52, Halifax, NC. Archaeology Section, NC Department of Cultural Resources, Raleigh.

Archaeology at Fort Dobbs State Historic Site, Iredell County, NC, NC Department of Cultural Resources, Raleigh.

Exploratory Archaeology at Bentonville Battleground State Historic Site. NC Department of Cultural Resources, Raleigh.

Archaeology at the Reed Gold Mine, Engine Mill House, Cabarrus County, NC. Archaeology Section, NC Department of Cultural Resources, Raleigh.

1974 A Preliminary Investigation of 31PT1, Pitt County, NC, Archaeology Section, NC Department of Cultural Resources, Raleigh.

BOOK REVIEWS

1999 *The Voyage of the Frolic: New England Merchants and the Opium Trade*. Thomas N. Layton. *Historical Archaeology* 33 (2):152-153.

Whom We Would Never More See: History and Archaeology Recover the Lives and Deaths of African American Civil War Soldiers on Folly Island, South Carolina. Stephen D. Smith. *Historical Archaeology* 33 (2):155.

Winfield Scott: The quest for Military Glory. Timothy D. Johnson. *Choice* March.

Academy on the James: The Confederate Naval School. R. Thomas Campbell. *Choice* June

For Honor, Glory, and Union: the Mexican and Civil War Letters of Brigadier General William H. Lytle. edited by Ruth C. Carter. *Choice*

1998 *The Rise of the National Guard: The evolution of the American Militia, 1865-1920*. Jerry Cooper. *Choice* April

Artefacts from Wrecks: Dated Assemblages from the late Middle Ages to the Industrial Revolution. Mark Redknap. *Choice* June

1998 *Encyclopedia of Underwater and Maritime Archaeology*. James P. Delgado. *Choice* June

1997 *Beating plowshares in swords: the political economy of American warfare*. Paul A. C. Koistinen. *Choice* April.

Fatal glory: Narciso Lopez and the first clandestine U.S. war against Cuba. Tom Chaffin. *Choice* April

Ghost fleet: the sunken ships of Bikini Atoll. James P. Delgado. *Choice*.

1996 *A Sea of Words - A Lexicon and Companion for Patrick O'Brian's Seafaring Tales*. by Dean King, with John B. Hattendorf and J. Worth Estes. *Military Collector and Historian* XLVIII (3): 144

Fighting for Liberty and Virtue: Political and Cultural Wars in eighteenth-century America. Marvin Olasky. *Choice* January.

A Succession of Honorable Victories. Richard A. Sauers. *Choice* September.

Historical Archaeology of the Chesapeake Paul A. Shackel and Barbara J. Little, eds. *Historical Archaeology* 30(3):90-92.

The U. S. Army in the West, 1870-1880: Uniforms, Weapons, and Equipment. Douglas C. McChristian. *Historical Archaeology* 30(3):98-99.

Hollandia Compendium: A Contribution to the history, archaeology, classification and lexicography of a 150 ft. Dutch East Indianman, (1740-1750). Jerzy Gawronski, Bas Kist and Odilia Stokvis-Van Boetzelaer. *Military Collector and Historian* XLVII (1):48.

"Our Duty Was Quite Arduous": History and Archaeology of the Civil War on Little Folly Island, South Carolina. Charleston Museum *Leaflet* 32. Martha A. Zierden, Steven D. Smith and Ronald W. Anthony. *Historical Archaeology* 30(4):108-109.

The Forts of Pemaquid, Maine: Archaeological and Historical Study. Robert L. Bradley and Helen B. Camp. *Historical Archaeology* 30(4):115-116.

Tidecraft William C. Fleetwood. *Tributaries* 6:29.

1995 *Look to the Earth: Historical archaeology and the American Civil War* Clarence R. Geier and Susan E. Winter. *Choice* July/August.

The Maple Leaf, edited by Keith V. Holland, Lee B. Manley and James W. Towart. *Military Collector and Historian* XLVII (3):142

The Seaman's Vade-Mecum and Defensive War by Sea: Containing a Maritime Dictionary. William Montaine. *Military Collector and Historian* XLVI (3):143.

America's National Battlefield Parks: A Guide. Joseph E. Stevens. *Historical Archaeology* 29(1):126.

Boats: A Manual for Their Documentation. Paul Lipke, Peter Spectre, and Benjamin A. G. Fuller, editors. *Historical Archaeology* 29(2):100-132.

1995 *New Perspectives on Maryland Historical Archaeology* by Barbara J. Little and Richard J. Dent. *Historical Archaeology* 29(2):106-107.

The Fortifications of Ile aux Noix: A Portrait of the Defense Strategy on the Upper Richelieu Border in the 18th and 19th Centuries. Andre Charbonneau. *Historical Archaeology* 29(3):111-112.

Maryland Archaeology. Barbara J. Little and Richard J. Dent. *Historical Archaeology* 29(2):106-107.

1994 *The Battle of Lundy's Lane* Donald E. Graves. *Choice* February.

Southern Campaigns of the American Revolution. Dan L. Morrill. *Choice* March.

Confederate Hospitals on the Move: Samuel H. Stout and the Army of Tennessee. Glenna R. Schroeder-Lein. *Choice* April.

1993 *Decision in the West: The Atlanta Campaign of 1864*. Albert Casteel. *Choice* February.

Return to Bull Run: The Campaign and Battle of Second Manassas. John J. Hennessy. *Choice* March.

While Washington burned: the battle for Fort Erie, 1814. Joseph Whitehorne. *Choice* May.

An American Profession of Arms: The Army Officer Corps, 1784-1861. William B. Skelton. *Choice* June.

Industry and Technology in Antebellum Tennessee: The Archaeology of Bluff Furnace. R. Bruce Council, Nicholas Honerkamp, and M. Elizabeth Will. *American Anthropologist* 95:480.

Collector's Illustrated Encyclopedia of the American Revolution. by George C. Neuman and Frank J. Kravic. *Historical Archaeology* 27 (3):129-30.

Revolution Downeast. James S. Leamon. *Choice* October.

Nathan Bedford Forrest. Jack Hurst. *Choice* December.

1992 *War for America: The Fight for Independence*. Jeremy Black *Choice* June.

1991 *Historical Archaeology of Plantations at Kings Bay, Camden County, Georgia*. William H. Adams. *Historical Archaeology* 25(2):107-108.

General John Winder, CSA. Arch F. Blakey. *Choice* May.

1990 *A Hessian Diary of the American Revolution*. edited by Bruce Burgoyne. *Choice* November.

Fortress America: The Corps of Engineers, Hampton Roads, and United States Coastal Defense. David A Clary. *Choice* July/August.

1989 *The Material Basis of the Postbellum Tenant Population*. Charles E. Orser. *Atlanta Historical Quarterly* XXXIII(4):44-45.

The Role of Federal Military Forces in Domestic Disorders. Robert W. Coakley. *Choice* December.

1988 *Archaeological Insights into the Custer Battle*. Douglass Scott and Richard A. Fox Jr. *Military Collector and Historian* XL (1):45-46.

1988 *A Guide to Relics of the French Army in America during the Revolutionary War.* Deborah A. Sprouse. *Military Collector and Historian* XL(1):46.

Historical Archaeology of Plantations at Kings Bay, Camden County, Georgia. William H. Adams. *Southeastern Archaeology* 7(1):69-70.

War and Society in Revolutionary America. Don Higginbotham *Choice.*

South Carolina Loyalists in the American Revolution. Robert S. Lambert. *Choice* April.

Appalachee. John Hamm. *Atlanta Historical Journal* XXXIII (1):61.

1987 *Drums and Shadows: Survival Studies among the Georgia Coastal Negroes.* by Georgia Writers Project *Atlanta History* XXXI (1-2):74-5.

In Pursuit of Reason. Noble E. Cunningham. *Choice* November.

Stoddert's War. M. A. Palmer. *Choice.*

1986 *Tangled Machinery and Charred Relics Archaeological Investigation of the C. S. S. Nashville.* Franklin N. Chance, Paul C. Chance and David L. Topper *Military Collector and Historian*

Roots of Conflict: British armed forces and Americans. Douglas E. Leach. *Choice* October.

George Washington and the American Military Tradition. Don Higgenbotham. *Choice.*

1985 *This Destructive War: The British Campaign in the Carolinas, 1780-1782.* John Pancake. *Choice* May-June.

Alabama and The Borderlands edited R.R. Badger and L.A. Clayton. *Atlanta Historical Journal* XXX(4):110-111.

Outposts of the war for empire: The French and English in western Pennsylvania. Charles M. Stotz. *Choice* November.

1984 *Forts and supplies: The role of the army in the economy of the southwest.* Robert W. Frazer. *Choice* May.

The Virginia Militia in the Seventeenth Century. William L. Shea *Choice* February.

Arms and Independence: The Military Character of the American Revolution. Edited by Ronald Hoffman and Peter J. Albert. *Choice* July-Aug.

1983 *Officers and Gentlemen: Historic West Point in Photographs* Jeffrey Simpson. *Choice* April.

1982 *Artifacts and the American Past* Thomas J. Schlereth. *Georgia Historical Quarterly* LXVI:98-99.

Charleston Blacksmith: The Work of Philip Simmons John M. Vlach. *Georgia Historical Quarterly* LXVI(2):258-9.

Relic Hunter: The Field Account of Civil War Sites Howard R. Crouch. *Military Collector and Historian* XXXIV(1):46-7.

The Salisbury Prison - A Case Study of Confederate Military Prisons Louis A. Brown. *Military Collector and Historian* XXXIV (1):47.

Investigating the Remains of the USS Monitor Gordon P. Watts, Jr. *Military Collector and Historian* XXXIV (3):142.

1981 *Weapons: An International Encyclopedia from 5000 BC to 2000 AD* by Diagram Group *Choice* May.

PAPERS and SYMPOSIA PRESENTED

1999 Preliminary Thoughts on the Militia at Guilford Court House. Paper presented as part of Lecture Series 218th Anniversary Commemoration of the Battle of Guilford Courthouse National Military Park, Greensboro, North Carolina on 12 March 1999.

Eighteenth Century British Sailor's Clothing. "Back to our Roots" - The Impact of Immigration and Trade on the Development of 18th Century American Dress. Tidy's Symposium, University of Delaware, Newark, DE.

1785 British Sailor's Clothing: This is What buttons Can Teach Us. Thirteenth Annual Nautical Archaeology Symposium, North Carolaina Maritime Museum, Beaufort, NC.

1998 I Just Know it's a Pirate. Conference on Underwter and Historical Archaeology, Society for Historical Archaeology, Atlanta, GA

1997 Families and Boats: Locating Maritime Archaeological Sites through Survey and Oral Interview. 8th International Symposium on Boat and Ship Archaeology, Gdansk.

(w/Annalies Kjorness) A Derelict Small Boat Survey, Pamlico Drainage, North Carolina, USA. 8th International Symposium on Boat and Ship Archaeology, Gdansk.

Confederate Earthen Fortifications, Mass, Mobility, and Manpower Requirements on the Southeast Atlantic Coast: A Strategic Assessment. Thirteenth Naval History Symposium, Annapolis, MD.

1996 (w/Annalies Kjorness) From Credle to Grave and Around the Point. Conference on Underwater and Historical Archaeology, Society for Historical Archaeology, Cincinnati, Ohio.

(w/Harry Pecorelli, III and Michael B. Alford) A Working Definition of Periauger. Conference on Underwater and Historical Archaeology, Society for Historical Archaeology, Cincinnati, Ohio.

(W/Annalies Kjorness) Investigations of Vessel Depository Sites: A New Approach. Museum Small Craft Association. Beaufort, NC.

Confederate Earthworks in Eastern North Carolina. First Annual East Carolina University Civil War Symposium. Greenville, NC.

1995 Organizer and Chair of Symnposium - The Maple Leaf: Interim Report on the Union Transport Maple Leaf The Conference on Underwater and Historical Archaeology, Society for Historical Archaeology, Washington, DC.

The Frustration of Jane Bones. Session in Forensic Archaeology, Conference on Underwater and Historical Archaeology, Society for Historical Archaeology, Washington, DC.

1994 Organizer and Chair - The Maple Leaf "PX" - A Preliminary Reporting on the Union Transport Maple Leaf, Conference on Underwater and Historical Archaeology, Society for Historical Archaeology, Vancouver, BC.

Will the Real Housewife Please Stand Up: Femnists, Campfollowers and Housewives on Military Sites. Conference on Underwater and Historical Archaeology, Society for Historical Archaeology, Vancouver, BC

1993 The Maple Leaf - A Civil War Site Extraordinaire. Coastal Georgia Archaeological Society, July Meeting, Savannah.

Military Archaeological Sites in the Southeast. Society for Historical Archaeology Conference on Underwater and Historical Archaeology, Kansas City, MO.

Of No Significance? Revolutionary War Continental Army Camps in the Carolina Piedmont. Southeastern Archaeological Conference, Raleigh.

1990 Organizer and Chair of Symposium "Earthen Fortifications as Artifacts" Annual Meeting, Society for Historical Archaeology, Richmond, VA.

Permanent Civil War Earthworks: Overview with Examples from Savannah, GA. Annual Meeting, Society for Historical Archaeology, Richmond, VA.

1989 Reconstructing the Private Soldier 1775-1984: Archaeology, Living History and Interpretation. First Joint Archaeological Congress, Baltimore, MD.

The Cannon Vessel: A Vernacular Coastal Vessel from Georgia. Conference on Underwater Archaeology, Baltimore, MD (w/Rick Leech).

The Civil War Defenses of Savannah. Conference on Northeastern Historical Archaeology, Morristown, NJ.

Prehistoric Artifacts as Evidence for Historic Houses, Southeastern Archaeological Conference, Charleston, SC.

1988 Identifying Low Focus - Low Visibility Sites, Annual Meeting, Society for Historical Archaeology, Reno.

Implications of the Custer Dig - An East Coast View. IN War and Peace: A Conference on Battlefield Preservation and Interpretation, Gettysburg, PA.

1987 Confederate Earthworks and Bombproof at Causton's Bluff, Savannah, Georgia. 20th Annual Meeting, Society for Historical Archaeology, Savannah, GA (w/ Rick Leech).

Preliminary Report on the Cannon Vessel. Society for Georgia Archaeology, Savannah. (with Rick Leech)

1986 Of Pickups and Computers, Or Topsey Made me do it. Fall Conference, University System Computer Network, Rock Eagle, GA.

The Georgia Salzburgers at Ebenezer, Old and New. Fall Meeting, Eastern Historical Geographers Association, Savannah.

Fortifications: An Overview. Symposium on Low Country Fortifications, Savannah.

1985 Blitzing a Bombproof: Civil War Fortifications on Causton's Bluff, Coastal Georgia Archaeological Society, Savannah
Excavations at the Central of Georgia Train Shed: Continuity Buried, Southeastern Archaeology Conference, Birmingham
Cartographic Archaeology: Confederate Defenses on Causton's Bluff, Society for Georgia Archaeology, Fall Meeting, Savannah, GA.
1984 Oral Tradition and Eighteenth Century Cartography: Archaeology's Role in a Seaport City. 17th Annual Meeting, Society for Historical Archaeology, Williamsburg, VA.
Modern Regional Landscape Terminology and the Interpretation of an Archaeological Site. 49th Annual Meeting, Society for American Archaeology, Portland, OR.
1982 Fort Dobbs on the Carolina Frontier. 15th Annual Meeting, Society for Historical Archaeology, Philadelphia, PA.
1981 Forts and Privies - Why Bother? November Meeting, Coastal Georgia Archaeological Society, Savannah, GA.
1980 Trash and Disease in the Eighteenth Century; and, Cultural Transmission: A Military Example in the Eighteenth Century. 13th Annual Meeting, Society for Historical Archaeology, Albuquerque, NM.
Military Central Place Theory and Historic Sites Archeology. 45th Annual Meeting, Society for American Archaeology, Philadelphia, PA.
Papers, Privies and the Patterned Record. 21st Annual Meeting, Conference on Historic Sites Archaeology, Wilmington, NC.
1979 Preliminary Indications of Ethnic Groups at an Eighteenth Century Military Post, Fort Butts, Portsmouth, RI. 12th Annual Meeting, Society for Historical Archaeology, Nashville, TN
Possible Hessian Remains at British Fort Butts, Portsmouth, RI. Council for Northeast Historical Archaeology, Kingston, NY.
1975 Archaeology at the Reed Gold Mine. 8th Annual Meeting, Society for Historical Archaeology, Charleston, SC.

HONORS

1996 Guest Faculty Coach, East Carolina University Softball Team
1995 McCann-Taggert Lectureship in Underwater Archaeology, American Institute of Archaeology
1992 Life Member, Coastal Georgia Archaeological Society
1990 History Medal - National Society, Daughters of the American Revolution
1990 Curmudgeon Award, Armstrong State College, Savannah, GA (Awarded by Faculty Committee)
1985 H. Dean Probst Award, Outstanding Faculty Member, Armstrong State College, Savannah, GA (Awarded by Students)
1981 Phi Alpha Theta
1960 Eagle Scout, Silver Explorer

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Society for Historical Archaeology
North American Society for Oceanic History
Nautical Archaeology Society
Company of Military Historians
Southeastern Archaeological Conference
Archaeological Society of North Carolina
North Carolina Council of Professional Archaeologists
Coastal Georgia Archaeological Society

LIVING HISTORY ORGANIZATIONS

First Maryland Regiment (Revolutionary War) (1967-present)
Second Maryland Regiment (Civil War) (1997-present)
Saint Mary's Cittie Militia (17th Century) (1985-present)
Lloyd's Blewe Regiment of Foote (English Civil War (1989-present)
Savannah & James River Squadrons (Civil War Navy) (1984-present)

OTHER EXPERIENCE

1996-1997, 1992-1993 Spring Semester - Acting Director, Program in Maritime History and Nautical Archaeology, East Carolina University, Greenville, NC

1982-1992 Director, Coastal Heritage Society (Secretary 1982-1984, 1987-1992)

1982-1988 Director-Center for Low Country Studies

1982-1987 Acting Director, Museum and Preservation Studies Program, Armstrong State College, Savannah

1971-1985 Sports Writer
Diamondback, University of Maryland, College Park 1971-1973
Buena Vista News, Buena Vista, VA 1980-1981
Georgia Gazette, Savannah, GA 1984-1985

1966-Present - Rugby player, coach (Level 1) and referee (Masters - ex-B3)

RESUME

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Severna Park, Maryland 21146
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June 1999

Project Reports and Professional Contributions:

1999

Analysis of Flotation-Recovered Plant Remains from Mechanics Court (18BC132), Juvenile Justice Data Recovery Project, Baltimore, Maryland. Submitted to R. Christopher Goodwin and Associates, Inc. Frederick, Maryland.

Analysis of Flotation-Recovered Plant Remains from the Wilton Site (44HE493), Henrico County, Virginia. Submitted to the College of William and Mary, Williamsburg, Virginia.

Analysis of Marine Timbers from the Chesapeake and Ohio Canal at Crescent Lawn. Submitted to Alexandria Conservation Services & John Milner Associates for the National Park Service.

Results of Analysis: Flotation-Recovered Botanical Remains from the Ford Farm Site (7K-C-386E). Submitted to Louis Berger and Associates, Inc., for the Delaware Department of Transportation.

Analysis of Flotation-Recovered Macrobotanical Remains. Culloden Point Project, Montauk, Long Island. Submitted to Greenhouse Consultants, Inc., Atlanta, Georgia.

Analysis of Wood Fibers from Philadelphia Sites. Submitted to Alexandria Conservation Services & John Milner Associates for the National Park Service.

Results of Analysis: Flotation-Recovered and Water Screen-Recovered Botanical Remains from the Partridge Creek Site (44AH193), Amherst County, Virginia. Submitted to the Virginia Department of Historic Resource, Richmond, Virginia.

Archeobotanical Analysis, Sites 44RU30 and 44RU33. Submitted to the College of William and Mary, Williamsburg, Virginia.

Analysis of Food Plant Remains from Shipwreck Kentucky (16BO358). Submitted to R. Christopher Goodwin and Associates, Frederick, Maryland.

Flotation-Recovered Plant Remains from Quiet Lodge (18HA242). Submitted to R. Christopher Goodwin and Associates, Frederick, Maryland.

Preliminary Paleoethnobotanical Investigations at the Hickory Bluff Site (7K-C-411), Kent County, Delaware. Submitted to Parsons Engineering Science, Inc., for the Delaware Department of Transportation.

Historic Landscape Analysis, Hancock's Resolution, Anne Arundel County, Maryland. Submitted to the Friends of Hancock's Resolution.

Analysis and Interpretation of Flotation-Recovered Plant Remains from Rumney's Tavern Cellar, London (18AN48), Anne Arundel County, Maryland. Submitted to the Lost Towns Project, Anne Arundel County Archaeology, Annapolis, Maryland.

Ethnographic Survey of Human-Plant Relations in the Delaware River Valley. Submitted to Louis Berger and Associates, Inc., for the Delaware Department of Transportation.

1998 Historic Landscape Assessment of the Arundel Mills Site, Anne Arundel County, Maryland. Submitted to R. Christopher Goodwin and Associates, Frederick, Maryland.

Analysis of Flotation-Recovered Plant Remains from the Bianco Site, Long Island, New York. Submitted to Tracker Archaeology Services, Babylon, New York.

Archeobotanical Studies at the Thomas Dawson House Site (7K-C-414), Kent County, Delaware. Submitted to Louis Berger and Associates, Inc., for the Delaware Department of Transportation.

Archeobotanical Investigations - Site 44IE165. Submitted to the College of William and Mary, Williamsburg, Virginia.

Paleoethnobotanical Analysis, Site 33CO725, Columbiana County, Ohio. Submitted to R. Christopher Goodwin and Associates, Frederick, Maryland.

Analysis of Hand-Collected and Flotation-Recovered Plant Remains from Independence Pipeline, Pennsylvania Segment, Sites 36CL121 and 36CL168. Submitted to R. Christopher Goodwin and Associates, Frederick, Maryland.

Analysis of Marine Timbers from Two Canal Boats (Site 44HE466), City of Richmond, Virginia. Submitted to Gray and Pape, Inc., Richmond, Virginia.

Identification of Rampart Wood Circa 1812 from Chalmette, Louisiana. Submitted to Earth Search, Inc., New Orleans, Louisiana.

Contributions to Experimental Archaeology at the Hickory Bluff Site(7K-C-51), Kent County, Delaware. Submitted to Parsons Engineering Science, Inc., Fairfax, Virginia.

Identification of Wooden Artifacts Recovered from the Lee Street Site (44AX180), Alexandria, Virginia. Submitted to Alexandria Archaeology,

Alexandria, Virginia.

Analysis of Marine Timbers from Kentucky (16BO358). Submitted to R. Christopher Goodwin and Associates, Frederick, Maryland.

Analysis of Flotation-Recovered Botanical Remains from Cross Creeks Sites 40SW333, 40SW228, 40SW319 and 40SW340. R. Christopher Goodwin and Associates, New Orleans, Louisianna.

Archeobotanical Analysis of Flotation-Recovered Remains from Dumfries Phase III (44PW855). Submitted to Parson's Engineering Science, Inc. Fairfax, Virginia.

Analysis of Water-Screen Recovered Macro-Botanical Remains from Rumney's Tavern Cellar, London (18AN48). Submitted to the Lost Towns of Anne Arundel County, Annapolis, Maryland.

Paleoethnobotanical Investigations at Chapman's Landing (18CH380), Charles County, Maryland. Submitted to R. Christopher Goodwin and Associates, Frederick, Maryland.

Paleoethnobotanical Investigations within Extended Phase II Archaeological Testing of the Puncheon Run Site (7K-C-51), Locus 1&2, Puncheon Run Connector, Kent County, Delaware. Submitted to Louis Berger and Associates, Inc., for the Delaware Department of Transportation.

Analysis of Flotation Recovered Plant Remains from Tudor Hall (18ST677), St. Mary's County, Maryland. Submitted to R. Christopher Goodwin and Associates, Frederick, Maryland.

Archeobotanical Studies at Tree Tops Terrace (18MO463), Montgomery County, Maryland. Submitted to Elizabeth Anderson Comer for the National Institute of Health.

Archeobotanical Contributions to an Understanding of Acadian and Plantation-Period Subsistence: Data from the Wilton Plantation Site (16SJ20). Paper presented at the Louisiana Archaeological Society Conference, Baton Rouge, Louisiana. January, 1988

Analysis of Archeobotanical Remains from the Old Baltimore Site (18HA30). Submitted to R. Christopher Goodwin and Associates, Inc., Frederick, Maryland.

Analysis of Oyster Shell Remains from the Old Baltimore Site (18HA30). Submitted to R. Christopher Goodwin and Associates, Inc., Frederick, Maryland.

Paleoethnobotanical Investigations within Extended Phase II Archaeological Testing of the Puncheon Run Site (7K-C-51), Locus 3, Puncheon Run Connector, Kent County, Delaware. Submitted to Louis Berger and Associates, Inc., for the Delaware Department of Transportation.

Archeobotanical Remains from the Augustine Creek South Site, New Castle County, Delaware. Submitted to Louis Berger and Associates, Inc., for the Delaware Department of Transportation.

1997 Potomac Creek Archeobotany: Analysis of Additional Flotation Recovered Plant Remains from the Potomac Creek Site (44ST2). Submitted to the Center for Archaeological Research, College of William and Mary, Williamsburg, Virginia.

Archeobotanical Contributions to an Understanding of Acadian and Plantation-Period Subsistence: Data from the Wilton Plantation Site (16SJ20). Paper presented at the Southeastern Archaeological Conference, Baton Rouge, Louisiana. November 1997.

Archeobotany on the Acadian Coast: Analysis of Flotation-recovered Plant Remains from the Wilton Plantation Site (16SJ20). Submitted to Earth Search, Inc. for River Consulting.

Analysis of Flotation Recovered and Hand Collected Plant Macrofossils from Sites 31ON624 and 31ON625, Marine Corps Air Station, Jacksonville, North Carolina. Submitted to Gray and Pape, Inc. for United States Department of Defense.

Historic Landscape Assessment and Initial Archeobotanical Analysis at Henry House, New Castle County, Delaware. Submitted to Louis Berger and Associates, Inc., for the Delaware Department of Transportation.

Archeobotanical Remains from 51NW122, Washington D.C. Submitted to Elizabeth Anderson Comer for Keener Management, Inc.

Analysis of Flotation Recovered Plant Remains from the Knoll Site (18MO462). Submitted to Elizabeth Anderson Comer for the National Institute of Health.

Analysis of Flotation Recovered Plant Remains from SONAT Sites 1MG715 and 1MG724. Submitted to R. Christopher Goodwin and Associates, Inc. for Southern Natural Gas Company North Alabama Pipeline Project.

Archeobotany of a Virginian Plantation: Analysis of Flotation Recovered Plant Remains from 44HT44. Submitted to the Center for Archaeological Research, College of William and Mary.

Identification of Coffin Wood from the Hampstead Hill Cemeteries (18BC111), Baltimore, Maryland. Submitted to the Center for Urban Archaeology, Baltimore City Life Museum for Johns Hopkins University.

Potomac Creek Archeobotany: Analysis of Flotation Recovered and Hand Collected Plant Remains from the Potomac Creek Site (44ST2). Submitted to the Center for Archaeological Research, College of William and Mary, Williamsburg, Virginia.

Analysis of Hand-Recovered Plant Remains Collected During Phase II Evaluation of Site 44CS201, NSGA Northwest, Chesapeake, Virginia. Submitted to R. Christopher Goodwin and Associates, Inc., Frederick, Maryland.

Late Woodland Archeobotany on the Chariton River, Macon County, Missouri, Sites 23MC544 and 23 MC545. Submitted to Archaeological Research Center of St. Louis for the Missouri Department of Transportation.

Examination of Flotation Recovered Plant Remains from Smithsonian Pier (18AN284). Submitted to James G. Gibb, Annapolis, Maryland.

1996 Examination of Flotation Recovered Plant Remains from the Reiff Site (18WA454). Submitted to James G. Gibb, Annapolis, Maryland.

Archeobotanical Analysis of Plant Remains from Interior of Schifferstadt House (18FR134) and Archeobotanical Analysis of Remains from Privy Feature. In Phase III Archaeological Investigations at the Schifferstadt Site (18FR134), Frederick, Maryland. Report in preparation for the Frederick County Landmarks Association, Inc., Frederick, Maryland.

1995 Archeobotanical Analysis of Remains from the Harper Terraces (46JF237). In Archeological Investigation of the Harper Terraces: A Nineteenth Century Domestic Yard and Garden, Harpers Ferry National Historical Park. Mia T. Parsons, Editor. U.S. Department of the Interior, National Park Service, Harpers Ferry National Historical Park, Harpers Ferry, West Virginia.

Archeobotanical Investigations at 8JE102 and 8JE878. Report submitted to R.C.Goodwin and Associates, Inc., New Orleans, Louisiana.

Botanical Analysis of Plant Remains during Phase III Archeological Investigations in the Florida Panhandle, 8JE104b. Report submitted to R.C. Goodwin and Associates, Inc., New Orleans, Louisiana.

Oyster Shell Analysis at Pooles Island (site 18HA19 and others). Submitted to R. Christopher Goodwin and Associates, Inc.

Results of Paleoethnobotanical Analysis: Cultural Resource Investigations at 22PR533. Report submitted to R.C. Goodwin and Associates, Inc., New Orleans, Louisiana.

Flotation Recovered Plant Remains from 44CS187. Report submitted to R.C. Goodwin and Associates, Inc., Frederick, MD.

1994 Paleoethnobotanical Analysis. In Cultural Resource Management Plan, Peluchia Creek Mississippi. (with Clifford Brown, Thomas Fenn, R. Christopher Goodwin).

1993 Cultural Resource Management Plan, Aberdeen Proving Ground, Maryland (with John Mintz, Michelle T. Moran, Thomas Davis, and Donald Maher). Submitted to U.S. Army Corps of Engineers, Baltimore District.

Phase I and Phase II Archeological Investigations for the Villages of Lyonsfield Run, Baltimore County, Maryland (with Jeffrey H. Maymon, Michael A. Simons, Christopher R. Polglase and Hugh McAloon). Submitted to Westinghouse Credit Corporation, Pittsburgh, Pennsylvania.

Phase I Archeological Investigations of Portions of Pemberton Historical Park Wicomico County, Maryland (with Suzanne L.C. Sanders and Michelle T. Moran). Submitted to Wicomico County Department of Recreation and Parks, Salisbury, Maryland.

Phase I Archeological Survey of the Beards Creek Estates Subdivision, Anne Arundel County, Maryland (with John J. Mintz, Michelle T. Moran, Colby A. Child, Thomas W. Davis and Christopher R. Polglase). Submitted to Mandrin Construction Company, Inc.

Phase III Archeological Data Recovery at Russett Site 5 (18AN665) Anne Arundel County, Maryland (with Christopher R. Polglase, Jeffrey H. Maymon and Kathleen Child). Submitted to Russett Center Limited Partnership, Columbia.

Archeological Investigations at Carlisle Barracks, Pennsylvania (with John Mintz, Martha Williams, Christopher Polglase and Kathleen Federline). Submitted to the U.S. Army Corps of Engineers.

Phase II Archeological Investigations at Fort George Meade, Maryland (with John Mintz, Katherine Grandine, Michelle T. Moran and Christopher R. Polglase). Submitted to U.S. Army.

Ethnobotanical Analysis. In Archeological Investigations at Gotts Court, Annapolis, Maryland (with Suzanne Sanders, Martha Williams and Pamela Crane).

Ethnobotanical Analysis. In Archeological Investigations at Camden Yards, Baltimore, Maryland (with Suzanne Sanders, Christopher Polglase, Pamela Crane and Martha Williams). Submitted to the Maryland Stadium Authority, Baltimore, Maryland.

Phase IB Archeological Investigations of the proposed Dalecarlia Reservoir to Chain Bridge Water Supply Main, Washington D.C. and Mongomery County, Maryland (with John J. Mintz, Martha Williams, and Suzanne L. Sanders). Prepared for Gannet Flemming, Inc. Newport News, Virginia.

Phase I and II Archeological Investigations at Benjamin Bannaker Historical Park. Baltimore County, Maryland. With Suzanne L. C. Sanders, Michelle T. Moran, Martha R. Williams and Michael A. Simmons. Submitted by R. Christopher Goodwin and Associates, Inc. to Baltimore County Office of Central Services, Baltimore, Maryland.

1992 Phase II Archival and Archeological Investigations at the Wallace's Mill Site (18AN432), Anne Arundel County, Maryland (with John J. Mintz, Martha R. Williams, Alice Crampton, Christopher R. Polglase, and Kathy Federline).

Submitted to Whitman, Requardt and Associates, Annapolis, Maryland.

Phase I Archeological Survey of the Colonial Beach Wastewater Treatment Facility, Westmoreland County, Virginia (with Thomas W. Neumann, Martha R. Williams, and Colby Child). Submitted to Patton Harris, Rust and Associates, prepared for U.S. Environmental Protection Agency (EPA) and Virginia State Water Control Board.

Phase I Archival and Archeological Investigations of the Proposed Courts of Belle Point Subdivision, Anne Arundel County, Maryland. With John Mintz and Katherine Grandine. Submitted by R. Christopher Goodwin and Associates to New England Developers Inc.

Phase II Archeological Evaluations of site 18CV61 and 18CV62 Calvert County, Maryland. With Thomas W. Davis, Leo Hirrel, Thomas W. Neumann, Timothy Silva, Kathleen Federline and Christopher Polglase. Submitted by R. Christopher Goodwin and Associates, Inc. to Baltimore Gas and Electric Company, Baltimore, Maryland.

1991 Paleoethnobotanical Study: Rio Verde Formitive Project. In *Formative Period Occupation in the Lower Rio Verde Valley, Oaxaca, Mexico: Interregional Interaction and Social Change*, by A.A. Joyce, Appendix 3. Unpublished Ph.D. dissertation, Department of Anthropology, Rutgers University, New Brunswick.

1989 Ethnobotanical Investigations: Proyecto Rio Verde Formitivo. In Results del Proyecto Rio Verde Formitivo by Art Joyce and Marcus Winter. INAH, Oaxaca, Mexico.

1988 Botanical Remains from the Marshall, White, and Indian Camp Lake sites, In Archaeological Investigations in Carlisle, Hickman, and Fulton counties, Kentucky: Site Survey and Excavations, by Tom Sussenbach and R. Barry Lewis. WKY Research Report No. 7. University of Illinois, Urbana.

1987 Botanical Remains from the Burcham and Rice Sites. In Second Order Communities in Western Kentucky: Site Survey and Excavations at Late Woodland and Mississippian Period Sites, by Paul P. Kreisa. WKY Research Report No. 4. University of Illinois, Urbana.

1987 *The Role of Polygonum Erectum in pre-Maize Horticultural Systems.* Examination of the Indicators for Cultivation in the Eastern Woodlands of North America. Honors Thesis. University of Illinois, Urbana.

Related Work Experience:

1994-present Consulting Ethnobotanist. Analysis of plant macrofossils from archeological contexts, extant vegetational surveys and landscape interpretation for projects throughout the eastern and southern United States.

1992-1994 Ethnobotanist. R. C. Goodwin and Associates, Inc. Company naturalist for international archaeological research and mitigation firm. Paleoethnobotanical

analysis of archaeologically recovered botanical remains and composition of reports regarding findings. Vegetational survey of archaeological sites, landscape interpretation. Design and reconstruction of period gardens. Authorship of natural setting chapters in company site reports.

1990 - 1992 Assistant Director. Chesapeake Audubon Society, Pickering Creek Environmental Center.

1989-1990 Archaeology and Ecology Education Specialist. Alice Ferguson Foundation and the National Park Service.

1989 Historic Agriculture Specialist. Jefferson Patterson Park and Museum.

1988 Project Ethnobotanist. Proyecto Rio Verde Formativo, Oaxaca, Mexico. Excavation Supervisor. Proyecto Rio Verde Formativo.

1987 Technical Illustrator and Cartographer. Preparation of illustrations for professional papers and publications.

Laboratory Assistant. Western Kentucky Archaeological Project. Artifact processing, data entry and cartography.

1986-1987 Report Production. FAI-270 Archaeological Mitigation Project, Illinois Department of Transportation.

Education:

1985-1987 University of Illinois at Champaign-Urbana. Major: Anthropology; Minor: Spanish. B.A., Highest Departmental Distinction, May 1987.

1983-1985 Illinois State University, Normal, Illinois.

CHARLENE A. KECK, M.A. LABORATORY SUPERVISOR

Education

Bachelor of Arts in Anthropology, State University of New York at Oswego, 1990.

Master of Arts in Anthropology, University of Georgia, Athens, 1997.

Honors, Awards, and Fellowships

1996 Southern Anthropological Society Graduate Student Paper Award.

1995 - 1996 Graduate Assistantship, Department of Anthropology, University of Georgia, Athens.

1990 State University of New York at Oswego Honors Colloquium Student Paper Award.

Area of Research

Faunal analysis, North American prehistoric and historic archaeology, subsistence and nutrition, bioarchaeology, cultural resource management, collections management

Professional Experience

Faunal Analysis Project Manager, Zooarchaeology Laboratory, Museum of Natural History, University of Georgia, Athens, 1996.

Faunal Analysis Technician, Zooarchaeology Laboratory, Museum of Natural History, University of Georgia, Athens, 1994 - 1995.

Collections Manager, Laboratory of Archaeology, Department of Anthropology, University of Georgia, Athens, 1994.

Bioarchaeologist, Southeastern Archaeological Services, Athens, Georgia, 1992 - 1996.

Field Technician, New South and Associates, Hiawassee, Georgia, 1993.

Field Technician, Louis Berger & Associates, East Orange, New Jersey, 1992.

Laboratory Technician, Garrow and Associates, Atlanta, Georgia, 1991.

Field Technician, Garrow and Associates, Athens, Georgia, 1990 - 1991

Field Technician, U. S. Army Garrison, DEH, Environmental & Energy Control Division, Ft. Drum, New York, 1990.

Manuscripts, Publications and Papers Presented

1990 *Literary Anthropology: Melville and Science in a Mixed Genre.* Honors Colloquium, State University of New York at Oswego.

1995a *Faunal Analysis and Nutritional Inference at the Parkin Site.* Contemplating Food: Representation, Reconstruction, Interpretation. Invitational symposium sponsored by Rutgers University Department of Anthropology, New Brunswick, New Jersey.

1995b *Nutritional Inference From Faunal Remains at the Parkin Site.* Fifty-second Annual Meeting of the Southeastern Archaeological Conference, Knoxville, Tennessee.

1995c Faunal Analysis and Nutritional Inference at the Parkin Site. In *Crosscurrents: The Journal of Graduate Research in Anthropology* 7:65-80.

1996a *The Nutritional Status of a Late Mississippian Population.* Thirtieth Annual Meeting of the Southern Anthropological Society, Baton Rouge, Louisiana

1996b The Nutritional Status of a Late Mississippian Population. In *Southern Anthropologist* 23(1):30-57.

1996c *Vertebrate Fauna from Spradley Hollow (3NW623) Rockfall Shelter* (with Elizabeth J. Reitz). Submitted to the Arkansas Archeological Survey, Fayetteville, Arkansas.

1996d *Animal Use Through Time at the Eagle's Ridge Site (41CH252)* (with Elizabeth J. Reitz). Submitted to Geo-Marine, Inc., Plano Texas.

1996e *Vertebrate Analysis from the Tarver Site (9JO6).* Submitted to Southeastern Archaeological Services, Athens, Georgia.

1997a *Vertebrate Subsistence, Nutrition and Health in the Late Mississippian-Early Historic Transition at the Parkin Site.* Unpublished Master's Thesis, Department of Anthropology, University of Georgia, Athens.

1997b *Phase I Cultural Resources Survey and Inventory of the Proposed Discovery Gas Transmission LLC 20 in O.D. Residue Pipeline Project, Lafourche, Louisiana* (with Luis M. Williams, Jr., J. Cinder Griffin Miller, Roger Saucier, Sean Faulkner, Ralph Draughon, Jr., Jeremy Pincoske, and Dave D. Davis). Submitted by R. Christopher Goodwin & Associates, Inc., to Discovery Gas Transmission LLC.

1998a *Cultural Resources Overview of the Proposed Ozark/NOARK Expansion Project, Sebastian and Franklin Counties, Arkansas* (with Scott E. Simmons, Ralph B. Draughon, Jr., Matthew J. Keelean, Michael B. Godzinski, Paul J. Hughbanks, and Dave D. Davis). Submitted by R. Christopher Goodwin & Associates, Inc., New Orleans, Louisiana, to ENSR Consulting and Engineering, Houston, Texas.

1998b *Phase I Cultural Resources Survey and Inventory of Temporary Workspaces Associated with the Proposed Southern Natural Gas Company 22 in. O.D. North Main Line Replacement Pipeline Project, Lowndes County, Mississippi* (with Christopher G. Davies, Jon Berkin, Ralph Draughon, Jr., Scott Simmons, Patrick P. Robblee, Julienne Crawford, David Stitcher, Matthew J. Keelean, Cinder Griffin Miller, Thomas Fenn, Nathanael Heller, Michele Williams, and Dave D. Davis). Submitted by R. Christopher Goodwin & Associates, Inc., to Southern Natural Gas Company.

1998c *Phase I Cultural Resources Survey and Inventory of 21 Temporary Workspaces Associated with the Proposed Southern Natural Gas Company 20 in O.D. North Main Line Replacement Pipeline Project, St. Clair, Talladega, and Cleburne Counties, Alabama* (with Christopher G. Davies, Jon Berkin, Ralph Draughon, Jr., Scott E. Simmons, David Stitcher, Julienne Crawford, Christine Herman, Jeremy Pincoske, Cinder Griffin Miller, Patrick P. Robblee, Glenn Walter, and Dave D. Davis). Submitted by R. Christopher Goodwin & Associates, Inc., to Southern Natural Gas Company.

1998d *Eagle's Ridge: A Stratified Archaic and Clear Lake Period Shell Midden, Wallisville Lake Project Area, Chambers County, Texas* (edited by H. Blaine Ensor). Prepared for the U.S. Army Corps of Engineers, Galveston District. Wallisville Lake Project Technical Series, Reports of Investigations No. 4.

1998e *Phase II Evaluatory Testing of Site 3FR289 within the Proposed Ozark/NOARK Expansion Project Dual 20 in O.D. Pipeline Corridor, Franklin County, Arkansas* (with Randy Lichtenberger, Andrea Stillwell, Angele Montana, Julienne Crawford, and William P. Athens). Submitted by R. Christopher Goodwin & Associates, Inc., to ENSR Consulting and Engineering.

ANTHONY G. RANDOLPH JR, B.S., B.A.

CREW MEMBER
ARCHEOLOGIST II
ASSISTANT CONSERVATOR

EDUCATION

OSHA Confined Spaces/Trench Safety Training. Hazmat T.I.S.I., Columbia, MD. February 1997

Openwater SCUBA diver-NAUI, Hilo, HI. 1987.

Northstar Global Positioning Systems (GPS) Training. R. Christopher Goodwin & Associates, Inc., Frederick MD, November 1997.

Imagenex Digital Color-Imaging Side Scan Sonar Training. R. Christopher Goodwin & Associates, Inc., Frederick MD. November 1997.

Hypack Hydrographic Survey Software (version 6.4) Training. R. Christopher Goodwin & Associates, Inc., Frederick MD. November 1997.

Geometrics Magnetometer Training. R. Christopher Goodwin & Associates, Inc., Frederick, MD. November 1997.

WEB Underwater Mapping Program Training. R. Christopher Goodwin & Associates, Inc., Frederick, MD. August 1997.

Bachelor of Arts in Anthropology, The University of Pittsburgh, PA,1992

Bachelor of Science in Neuroscience, The University of Pittsburgh, PA,1992

Field School, University of Maryland at College Park,1994

EMPLOYMENT

Field Archaeologist, University of Maryland, June 1994-September 1994

Archaeologist II, R. Christopher Goodwin & Associates, Inc., Frederick, Maryland, January 1995-1999.

Currently a graduate student at Texas A&M University.

PROFESSIONAL EXPERIENCE

Archaeological Conservator, *Kentucky* Shipwreck Mitigation, Shreveport,LA. Responsible for assisting in the documentation, stabilization, treatment, and preservation of entire artifact assemblage. Conducted by R. Christopher Goodwin & Associates, Inc. October 1997-present.

Archaeological Conservator, Juvenile Justice Phase I,II and III investigations, Baltimore, MD. Responsible assisting in the for documentation, stabilization, treatment and preservation of selected artifacts. June 1998-present.

Archaeological Conservator, Old Baltimore Phase I and II investigations, Aberdeen Proving Grounds, MD. Responsible for assisting in the documentation, stabilization, treatment and preservation of selected artifacts. October 1997-present.

Archaeological Conservator, Spencer Carbine project, R. Christopher Goodwin and Associates, Inc., Frederick MD. Responsible assisting in the treatment, documentation and preservation of 1863 Spencer Carbine Rifle. November 1997- February 1998.

Archaeological Conservator, Dugout Canoe project, R. Christopher Goodwin and associates, Inc., Frederick MD. Responsible assisting in the documentation, stabilization, treatment and preservation of a prehistoric dugout canoe. July 1998-present.

Crew Chief, TEC Housing Phase I archaeological survey. A phase I Archaeological survey of Naval Station Roosevelt Roads, Ceiba, Puerto Rico. Conducted by R. Christopher Goodwin & Associates. June 1998.

Crew Chief, Vieques Island Phase I archaeological survey. A phase I archaeological survey of NADS Roosevelt Roads on Vieques Island Puerto Rico. Conducted by R. Christopher Goodwin & Associates. April 1998-June 1998.

Field Archaeologist, Vieques Island Phase I archaeological survey. A phase I Archaeological survey of NADS Roosevelt Roads on Vieques Island, Puerto Rico. Conducted by R Christopher Goodwin & Associates. February 1997-June 1997.

Field Archaeologist, Sabana Seca Phase II cultural resource evaluation of an archaeological site located on Naval Security Activity Group, Sabana Seca, Puerto Rico. Conducted by R. Christopher Goodwin & Associates. February 1997-March 1997.

Field Archaeologist, Roosevelt Roads Phase I archaeological survey. A Phase I archaeological survey of Naval Station Roosevelt Roads, Ceiba Puerto Rico. Conducted by R. Christopher Goodwin & Associates. June 1996-August 1996.

Field Archaeologist, Roosevelt Roads Phase I archaeological survey. A phase I survey of various antennae installations throughout Puerto Rico. Conducted by R. Christopher Goodwin & Associates. October 1995

Field Archaeologist, Roosevelt Roads Phase I archaeological survey and Phase II cultural resource evaluation. A phase I archaeological survey of Naval Station Roosevelt Roads, Ceiba, Puerto Rico. Conducted by R. Christopher Goodwin & Associates. January 1995- April 1995.

Nautical Archaeologist, *Kentucky* Shipwreck Mitigation, Shreveport,LA. Responsible for field curation of assemblage, the digital mapping of the shipwreck and assisting in the documentation of the Kentucky`s remains. Conducted by R. Christopher Goodwin & Associates, Inc. August 1998-October 1998.

Publications

1998a *Inventory and Conservation Needs Assessment for Artifacts from the Civil War Shipwreck Kentucky* (with Andrew Madsen and Martha Williams). Submitted to U.S. Army Corps of Engineers, Vicksburg District.

1999a *Phase I Archeological and Architectural Survey at Naval Weapons Station Yorktown, York County, James City County, and the City of Newport News, Virginia* (with Nora B. Sheehan, Michael B. Hornum, Katherine Grandine, Martha R. Williams, Steven A. Mallory, Liza Rupp, and Brian Stone). Prepared for Atlantic Division, Naval Facilities Engineering Command.

1999b *Phase I Archeological Survey for the Montpelier Ridge Development, Prince George's County, Maryland* (with Katherine Grandine, Ellen Saint Onge, and Thomas W. Davis). Submitted to Coscan/Adler Limited Partnership.