MOBILE RIVER SHIPWRECKS SURVEY
BALDWIN AND MOBILE COUNTIES, ALABAMA

FINAL REPORT

PREPARED FOR

THE ALABAMA HISTORICAL COMMISSION,
THE PEOPLE OF AFRICATOWN,
NATIONAL GEOGRAPHIC SOCIETY,
AND THE SLAVE WRECKS PROJECT

BY

SEARCH

MAY 2019

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PREPARED FOR
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EXECUTIVE SUMMARY

This report presents the findings of a marine remote-sensing survey and diver investigation conducted by SEARCH in July 2018. The purpose of the investigation was to locate and document potential historic shipwrecks located within portions of the Mobile River, Baldwin and Mobile Counties, Alabama. SEARCH conducted an archaeological investigation of a previously unsurveyed and undredged section of the river with a high potential to contain multiple shipwrecks. One of the focal points of the investigation was to identify potential shipwrecks that might share characteristics similar to that expected from the two-masted schooner *Clotilda,* the last vessel to transport slaves to the United States. In addition to the survey, the study also aims to assess the results of the report findings, both as a maritime cultural landscape and as a series of resources potentially eligible for inclusion in the National Register of Historic Places (NRHP).

This investigation had two distinct survey areas, which are referred to as the "Mobile River Shipwrecks Survey Area" and the "Ironclads Survey Area." Both survey areas were located within close proximity to Twelvemile Island, an uninhabited island approximately 14 kilometers (km) (9.0 miles [mi]) north of Mobile Bay. The Mobile River Shipwrecks Survey Area consisted of an 88-hectare (ha) (217-acre [ac]) survey area located in the eastern channel of the Mobile River at Twelvemile Island. The survey area was previously determined (Delgado et al. 2018) to be the location of a historic ships' graveyard, an area that has the potential to contain additional previously unrecorded shipwrecks, potentially including *Clotilda*.

The second survey area, the Ironclads Survey Area, consisted of a 9.3-ha (23-ac) survey area at the confluence of the Mobile River and Spanish River. A portion of the survey area contains the remains of two scuttled Confederate ironclad vessels, CSS *Huntsville* (1Mb557) and CSS *Tuscaloosa* (1Mb558), which were intentionally sunk to avoid capture at the end of the American Civil War.

Funding was made possible by the Alabama Historical Commission (AHC) and by the National Geographic Society, which provided additional assistance as well as photographic and video documentation of the investigation. Additional support was provided by the Slave Wrecks Project (SWP), the Smithsonian Institution's National Museum of African American History and Culture (NMAAHC), and the National Park Service (NPS).

This report serves as a follow-up investigation to the March 2018 study (Delgado et al. 2018), which documented a previously unrecorded shipwreck partially submerged near Twelvemile Island, Alabama. The shipwreck had been suggested as a candidate to be *Clotilda*. Through archaeological analysis, the March 2018 investigation determined that the vessel was not *Clotilda*. However, the study determined that the previously unrecorded shipwreck does exist within an environment known as a historic ships' graveyard, an area that contains multiple historic shipwrecks, some of which are submerged below the waterline and were not subject to investigation during the March 2018 study.

At the request of AHC, SEARCH conducted a Phase I maritime archaeological investigation, including archival research and marine remote-sensing survey, for the Mobile River Shipwrecks Survey Area and Ironclads Survey Area. SEARCH also reviewed the historic background of the region, with specific attention paid to the maritime history of the Mobile River and Mobile Bay. SEARCH identified previous archaeological investigations and documented sites within the area to guide the development of the project research design. SEARCH collected magnetic data, as well as side-scan sonar and sub-bottom profiler imagery, to assess the presence or absence of potential submerged cultural resources.

SEARCH identified 70 magnetic anomalies or anomaly clusters, 30 acoustic contacts, and 35 unique acoustic reflectors in the Mobile River Shipwrecks Survey Area. SEARCH identified 14 remote-sensing targets with similar characteristics to known shipwrecks (**Table 1**). SEARCH, in consultation with AHC, examined each target for its acoustic and/or magnetic signatures compared to what would be detected for a vessel of similar characteristics as *Clotilda*. SEARCH selected four targets for diver investigations (Targets 001 [1Ba699], 005 [1Ba704], 010 [1Ba706], and 011) based on this consultation. Diver investigation results identified three previously undocumented shipwrecks, two with an iron hull and one with a wooden hull.

Table 1. Summary of Mobile River Shipwrecks Survey Area Targets.

Target	Anomaly Designation(s)	Anomaly Type	Diver Investigation Completed	Object Source	Additional Research Recommended
Target 001	Contact MR.001S	Acoustic	Yes	Shipwreck (1Ba699)	Yes
Target 002	Anomaly MR.020M/ Contact MR.004S	Magnetic and Acoustic	No	Unknown	Yes
Target 003	Anomaly MR.070M/ Contact MR.006S/ Reflector MR.014R	Magnetic, Acoustic, and Reflector	No	Unknown (possible shipwreck) (1Ba702)	Yes
Target 004	Anomaly MR.056M/ Contact MR.007S	Magnetic and Acoustic	No	Unknown (1Ba703)	Yes
Target 005	Contact MR.005S	Acoustic	Yes	Shipwreck (1Ba704)	Yes
Target 006	Anomaly MR.062M/ Contact MR.008S	Magnetic and Acoustic	No	Shipwreck (Twelvemile Island Wreck – 1Ba694)	Yes
Target 007	Anomaly MR.063M/ Contact MR.009S	Magnetic and Acoustic	No	Unknown	Yes
Target 008	Contact MR.016S	Acoustic	No	Unknown (possible shipwreck) (1Mb566)	Yes
Target 009	Contact MR.025S	Acoustic	No	Unknown (1Ba705)	Yes
Target 010	Anomaly MR.069M/ Contact MR.010S	Magnetic and Acoustic	Yes	Shipwreck (1Ba706)	Yes
Target 011	Anomaly MR.030M/ Contact MR.011S	Magnetic and Acoustic	Yes	Natural	No
Target 012	Anomaly MR.046M/ Contact MR.029S	Magnetic and Acoustic	No	Shipwreck (Harms Wreck – 1Ba697)	Yes
Target 013	Anomaly MR.015M	Magnetic	No	Unknown	Yes
Target 014	Anomaly MR.038M	Magnetic	No	Unknown	Yes

AHC requested that the diver investigations be conducted within the Mobile River Shipwrecks Survey Area, with emphasis on identifying targets that may represent *Clotilda*. Dives were conducted on targets with the highest potential to be *Clotilda*, based on the remote-sensing data. SEARCH conducted a total of six dives on four targets from July 11 to July 13, 2018, and again on August 6, 2018.

Target 005 (MR.005S; 1Ba704) is the only target with spatial characteristics similar to that expected of a vessel like *Clotilda*. Target 005 (1Ba704) is the only observed shipwreck with the same dimensions as those historically recoded for *Clotilda*; the hull shape is consistent with a shallow-draft schooner of the region and period. Wood analysis indicates Target 005 (1Ba704) was built of White Oak (*Quercus spp.)* and Southern Pine (*Pinus spp*.). Both of these timber species are local to Southern states and also those archivally recorded as being used to construct *Clotilda*. There is a match between the archival record and the Target 005 (1Ba704) wood analysis: the oak for the frames and the pine for the hull planking. Visual observation of timbers and iron hull fasteners were consistent with a vessel of the mid- to late nineteenth century.

Further study, namely excavation, which was beyond the scope of this project's authorization (i.e., USACE permit), is necessary to attempt a more refined identification of Target 005 (1Ba704) to determine if it is *Clotilda*. At this point, it cannot be ruled out nor confidently identified as *Clotilda*. SEARCH will work with AHC and the National Geographic Society for funding to prepare a follow-up research design, permit application, and conduct a two-day projected field test excavation of Target 005 (1Ba704) within the confines of the remaining funding provided for this project. SEARCH also recommends additional research on all 14 targets listed in **Table 1**.

SEARCH identified 20 magnetic anomalies or anomaly clusters, 11 acoustic contacts, and four unique acoustic reflectors in the Ironclads Survey Area. SEARCH recommends additional research on three targets (**Table 2**) to verify object source(s), material, size, and structural characteristics.

Table 2. Summary of Ironclads Survey Area Targets.

Target	Anomaly Designation(s)	Anomaly Type	Object Source	Additional Research Recommended
Target 015	Contact IC.002S	Acoustic	Unknown (possible jetty) (1Mb567)	Yes
Target 016	Anomaly IC.004M/ Reflector IC.003R	Magnetic and Reflector	Shipwreck (CSS *Huntsville*) (1Mb557)	Yes
Target 017	Anomaly IC.005M/ Reflector IC.002R	Magnetic and Reflector	Shipwreck (CSS *Tuscaloosa*) (1Mb558)	Yes

It is the opinion of SEARCH that multiple cultural resources recorded within the study areas are potentially eligible for the NRHP as either a district or a multiple property submission. First, the Twelvemile Island ships' graveyard within the Mobile River Shipwrecks Survey Area is potentially eligible for nomination as a historical and archaeological district to the NRHP under Criteria A and D. These abandoned and wrecked vessels represent the region's working

watercraft and highlight the importance of the Port of Mobile to oceanic and inland maritime commerce. SEARCH also believes that the buried, but essentially intact with a high level of integrity, Confederate ironclads CSS *Huntsville* and CSS *Tuscaloosa* also are potentially eligible for nomination to the NRHP under Criteria A and D, due to their connection with the Civil War and as examples of Confederate naval design and ship construction.

ACKNOWLEDGEMENTS

Many individuals and organizations greatly contributed to the success of this project. Most notably, the community members of Africatown, for whom we would like to extend our utmost gratitude, as they have allowed us to perform a small role in aiding in the narrative of the people of Mobile River and the State of Alabama. We would like to thank archaeologist Dr. Fredrik Hiebert of the National Geographic Society and Senior Electronics Technologist Arthur Clark, writer Joel K. Bourne Jr., and Young Explorer Asha Stuart of National Geographic for their assistance and coverage of the project and the multidimensional landscape. Additional recognition goes to the Smithsonian Institution and the Slave Wrecks Project of the Smithsonian's National Museum of African American History and Culture (NMAAHC), George Washington University, and the National Park Service (NPS) for their support of this project, and in particular, we thank Paul Gardullo, Steve Lubkemann, Mary Elliott, and Kamau Sadiki for their ongoing support. We would also like to extend our recognition and gratitude to the staff at the Alabama Historical Commission (AHC), specifically Lisa D. Jones (Director), Stacye Hathorn (State Archaeologist), Clara Nobles (Assistant Executive Director), Lee Anne Wofford (Deputy State Historic Preservation Officer, Historic Preservation Division Director), and Jacqulyn Kirkland, Eleanor Cunningham, and Dorothy Walker, whose tireless contributions allowed the project to run smoothly throughout the entirety of the operation. We are grateful for Senator Vivian Figures for her continued involvement with this operation; her dedication to the project is a testament to her character as a person and to how much she cares about the people of the State of Alabama.

We are indebted to Harbor Master Terry Gilbreath and Mike Smitherman of the City of Mobile for access to the convention center boat ramp and parking lot for project vehicles and boats, and Alabama Department of Conservation and Natural Resources officers Sgt. George Miller, Pete Mitchum, and Jeremy Doss, who provided operational support and transportation for team members while on the water in Mobile. Mr. Gilbreath also assisted with repositioning barges near Twelvemile Island to permit safe diving conditions within the river. We also acknowledge the contributions from the team at the University of Southern Mississippi's (USM) School of Ocean Science & Technology, who surveyed the Mobile River off Twelvemile Island prior to SEARCH's project. The collaboration and data sharing augmented SEARCH's survey and assisted with an assessment of potential submerged resource locations. We would like to recognize Monty Graham, Director; Maxim van Norden, Coordinator Hydrographic Science programs and project team lead; Anand Hiroji, Assistant Professor and data lead; Kandice Gunning, PhD student and bathymetry data processor; Jennifer Rhodes, Graduate Assistant; Marvin Story, hydrographic technician and boat driver; and Ashley Boyce, Graduate Assistant and data processor.

We would also like to extend our gratitude to Alabama news reporter Ben Raines, whose investigations in the Mobile River and ongoing enthusiasm to keep history alive led to this and previous work on the Twelvemile Island wreck in the Mobile River. We also thank Dr. Amy Mitchell-Cook, University of West Florida, who provided laboratory analysis and identification

of wood samples taken from the wreck site, and historian John Cloud for research assistance and knowledge of historical charts and mapping efforts by the US Coast and Geodetic Survey in the Mobile region.

This report is the result of the combined efforts of multiple specialists who completed background research, analysis, and authorship in their various specializations. Fieldwork crew consisted of Archaeologists Dr. James Delgado, Kyle Lent, Joseph Grinnan, Alex DeCaro, Deborah Marx, Raymond Tubby, and Barry Bleichner, historian Dr. John Cloud, Creative Designer and Cinematographer Daniel Fiore, and Drone Videographer Timothy King of SEARCH; Stacye Hathorn of AHC; Slave Wrecks Project (SWP) representative Kamau Sadiki; as well as the rest of the abovementioned AHC team. Dr. Delgado was the project Principal Investigator. Mr. Grinnan served as archaeologist, diver, dive safety officer, and led dive operations. Mr. Lent and Mr. DeCaro served as archaeologists and divers; Ms. Marx, Mr. Tubby, and Mr. Bleichner served as archaeologists. Dr. Delgado, Mr. Lent, and Ms. Marx were SEARCH's lead contributors for reporting of the investigation. In-house SEARCH support included Raymond Tubby (GIS), Abigail Bleichner (GIS), Katy Harris (Lead Technical Editor), and Rasha Slepow (Technical Editor).

Our knowledge of current maritime landscapes and the historic context of the Mobile River was enhanced by time shared with historian and author John Sledge. Finally, we would like to thank the AHC for their continued efforts in overseeing the preservation of Mobile River's rich cultural heritage.

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INTRODUCTION

The Alabama Historical Commission (AHC) contracted SEARCH to conduct a comprehensive archaeological remote-sensing survey and diver investigation in portions of the Mobile River. The purpose of the survey was to identify submerged cultural resources within the Mobile River and assess their eligibility for listing in the National Register of Historic Places (NRHP). After data collection, dive targets were identified during data analysis and prioritized based on comparisons to characteristics that may be expected of the slave schooner *Clotilda.* A total of four targets were subjected to diver investigation as part of this study. Funding for this investigation was made possible by AHC and the National Geographic Society, who provided financial assistance as well as photographic and video documentation of the investigation. This investigation serves as a follow-up investigation to fieldwork conducted by a joint partnership between SEARCH, AHC, the National Park Service (NPS), the Smithsonian Institution's National Museum of African American History and Culture (NMAAHC), and the Slave Wrecks Project (SWP) in March 2018 (Delgado et al. 2018).

The current project is divided into two distinct sections of the Mobile River north of Mobile, Alabama (**Figure 1**). The first survey area, the "Mobile River Shipwrecks Survey Area," consisted of an 88-hectare (ha) (217-acre [ac]) area along the east channel of the Mobile River at Twelvemile Island. This survey area was previously determined to be the location of a possible ships' graveyard (Delgado et al. 2018). Historical documentation suggests this area could also be the potential location of the scuttled schooner, *Clotilda*. The second survey area, the "Ironclads Survey Area," consisted of a 9.3-ha (23-ac) area at the confluence of the Mobile River and Spanish River. This survey area is the location of two Civil War ironclad vessels, the CSS *Huntsville* (1Mb557) and CSS *Tuscaloosa* (1Mb558), which were scuttled in the vicinity to avoid Union capture after serving as floating batteries for the defense of Mobile Bay (Saltus and Schell 1985; Still 1985). The survey focused on relocating both ironclads to gather more detailed positions and determine if the wrecks are exposed above the river bottom. Additional support for this portion of the project was provided by the SWP, the NMAAHC, and the NPS.

This project was conducted in accordance with the Secretary of the Interior's *Standards and Guidelines for Archeology and Historic Preservation* (36 CFR Part 61) and in compliance with the National Historic Preservation Act (NHPA) of 1966, as amended (Public Law [PL] 96-515), and its implementing regulations (36 CFR Part 800); the Archeological and Historic Preservation Act, as amended (PL 93-291); the Archaeological Resources Protection Act (ARPA) of 1979, as amended (PL 96-95); and the Abandoned Shipwreck Act of 1987. The investigation was performed by professional archaeologists who meet the qualifications established in the Secretary of the Interior's *Standards and Guidelines for Archeology and Historic Preservation*. SEARCH designed the investigation to identify the presence/absence of potential submerged cultural resources and draft recommendations regarding the potential eligibility of properties for listing in the NRHP, in accordance with the NHPA. SEARCH methodologies and technologies exceeded the guidelines established in the AHC's Administrative Code for Archaeological Investigations (Chapter 460-X-9).

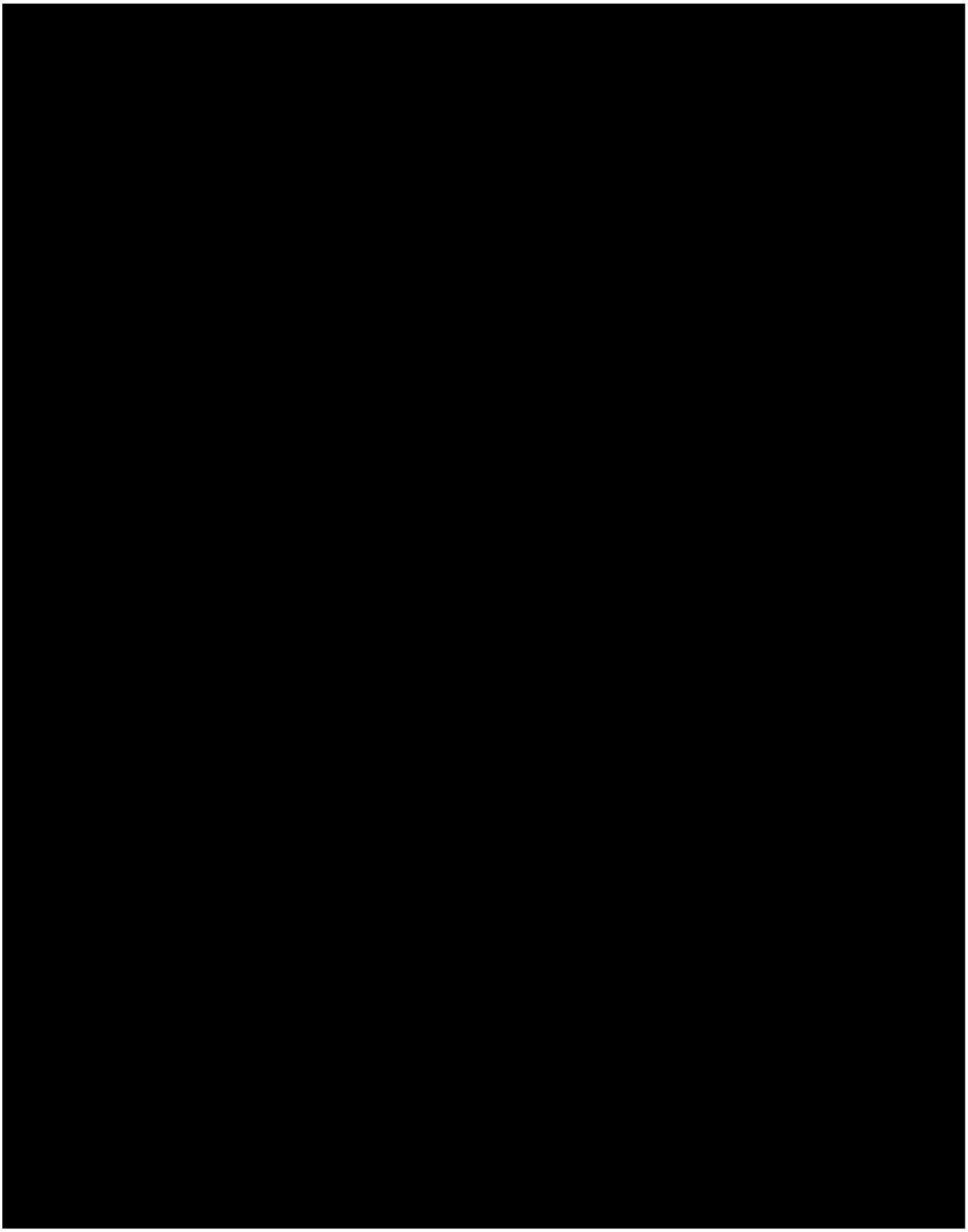

Figure 1. Location of the Mobile River Shipwrecks and Ironclads Survey Areas.

PROJECT BACKGROUND

On January 23, 2018, reporter Ben Raines of AL.com published a story that suggested a wreck on the Mobile River near Twelvemile Island might be *Clotilda*, the last known ship to bring human cargo bound for slavery to the United States. The report noted that an assessment of the visible portions of the wreck by University of West Florida archaeologists Dr. John Bratten and Dr. Greg Cook and shipwright Winthrop Turner indicated the wreck was of a nineteenth-century craft, and there were visible indications of the craft having been burned—features Raines noted were consistent with his theory that the wreck might be *Clotilda*. The story noted that archaeologists had stressed there was no conclusive documentation of the wreck's identity and that further research was needed (Raines 2018).

Following widespread international media coverage, AHC contacted and formed a partnership to investigate the wreck site. This investigation was conducted by a joint partnership between SEARCH, AHC, SWP, NPS, Southeastern Archaeological Center (SEAC), the NPS Submerged Resources Center (SRC), Diving with a Purpose (DWP), and the Smithsonian Institution's NMAAHC. The survey goal was to assess the site in an effort to determine whether or not the wreck was *Clotilda*. The first phase was conducted on March 1-4, 2018 (Delgado et al. 2018). The survey documented the newly recorded Twelvemile Island Wreck site (1Ba694) and concluded, based of archaeological evidence, that the wreck site in question was not *Clotilda*. 1Ba694 is recorded as a 56-meter (m) (183-foot [ft]) long, late nineteenth-century to early twentieth-century, West Coast built sailing vessel.

Delgado et al. (2018), through historic aerial imagery, located five targets (**Figure 2**). This resulted in the identification of four additional shipwrecks, recorded as Hicks wreck (1Ba695), Dobbs wreck (1Ba696), Harms wreck (1Ba696), and Kennedy wreck (1Ba698). The final target was a natural feature consisting of trees. The presence of these cultural resources suggested the area surrounding Twelvemile Island was part of a larger historic ships' graveyard.

PROJECT EXPECTATIONS

Mobile River Shipwrecks Survey Area

Following the initial survey of 1Ba694, AHC contracted SEARCH to conduct a detailed and systematic remote-sensing survey of the Mobile River on Twelvemile Island's eastern side. This part of the river holds the remains of several vessels; some are century-old iron barges, while others, like the previously discovered wreck (1Ba694) examined in March 2018, are wooden-hulled schooners. As such, the March 2018 investigation concluded that there were potentially more submerged cultural resources present within the survey area. Because of this, the March 2018 investigation recommended additional work be conducted in the area surrounding 1Ba694.

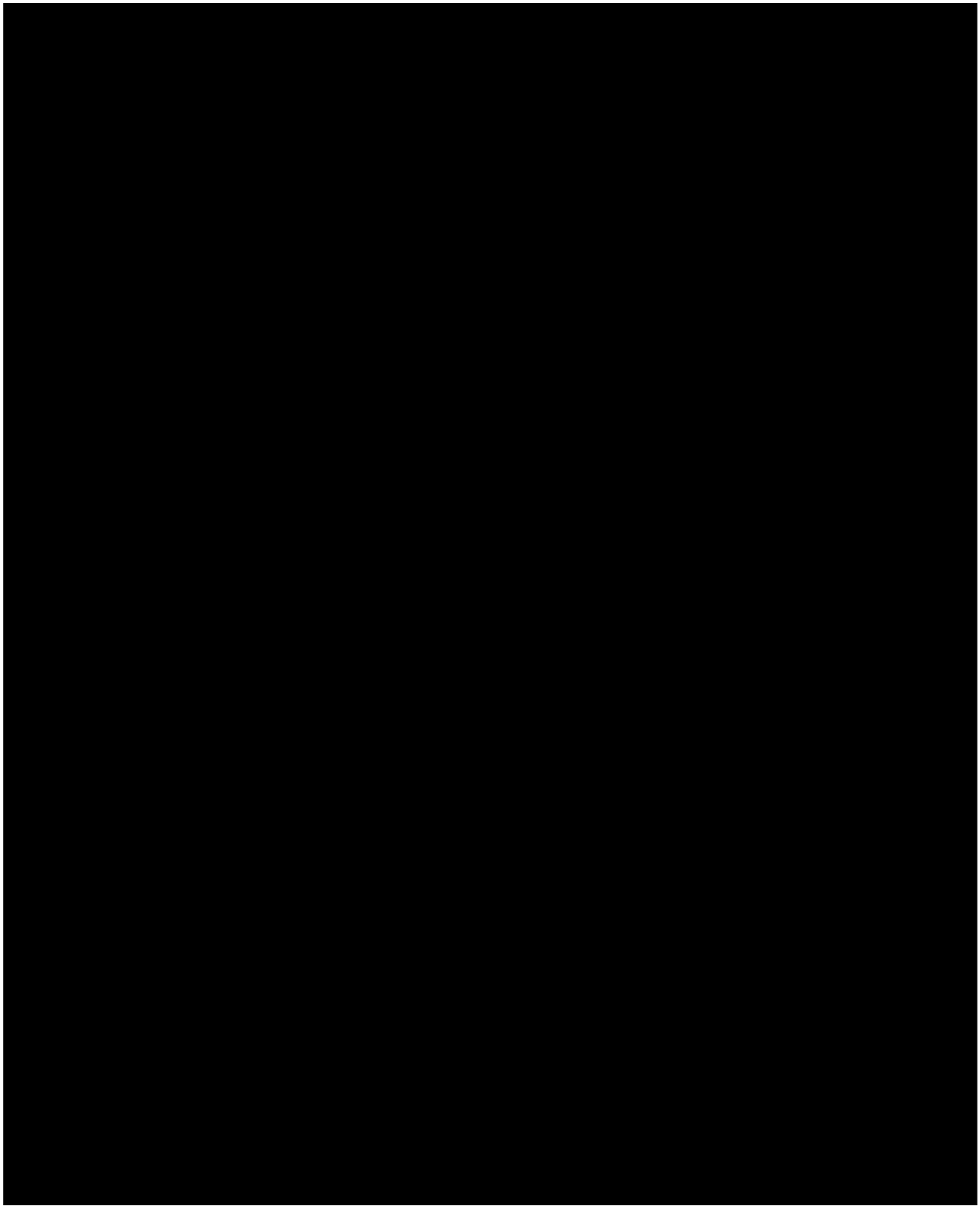

Figure 2. Twelvemile Island Wreck (1Ba694) and additional five target areas investigated by SEARCH in March 2018, Mobile River, Alabama (Delgado et al. 2018).

Following the results of the March 2018 investigation, AL.com reporter Ben Raines contacted members of the University of Southern Mississippi (USM) Hydrographic Science Department to conduct an independent remote-sensing survey of a portion of the Mobile River Shipwrecks Survey Area in June 2018. The team collected magnetometer and side-scan data, which produced 43 SonarWiz contacts and one SonarWiz mosaic. During personal communications with SEARCH, USM representatives noted the presence of submerged watercraft and reported identifying wrecks in the area surrounding Target 005 (1Ba704) and 1Ba694 (Twelvemile Island Wreck). As a result of their efforts, USM and reporter Ben Raines documented and investigated Target 005 (1Ba704) prior to SEARCH's comprehensive survey. The target was noted to be a potentially historic shipwreck that appeared to date to the nineteenth century. USM provided the survey results to SEARCH to supplement the current project. Based upon a preliminary review of the USM data and the findings from the March 2018 survey, SEARCH archaeologists expected to locate additional resources within the Mobile River that were not observed during the March 2018 investigation.

Ironclads Survey Area

In addition to the Mobile River Shipwrecks Survey, AHC contracted SEARCH to resurvey the location of the remains of two Confederate Civil War ironclads, the first being the 45-m (150-ft) long ironclad floating screw battery CSS *Huntsville,* and the second being the 46-m (152-ft) long ironclad stem screw ram CSS *Tuscaloosa*. A portion of the 9.3-ha (23-ac) survey area is depicted on a hand-drawn 1866 map of Confederate defenses and obstructions (Merrill 1866), which also indicates the presence of several historic jetties that were erected in the 1850s to control the flow of the Mobile River (**Figure 3**). The ironclads were reported to lie just outside the main navigation channel and most likely have not been impacted by dredging operations. Both submerged vessels were relocated in 1985 with the aid of a magnetometer near the location on the Merrill map (Saltus and Schell 1985; Smithweck 2016). Subsequent dives found a section of the CSS *Huntsville*'s stern and deck (Gaines 2008:3).

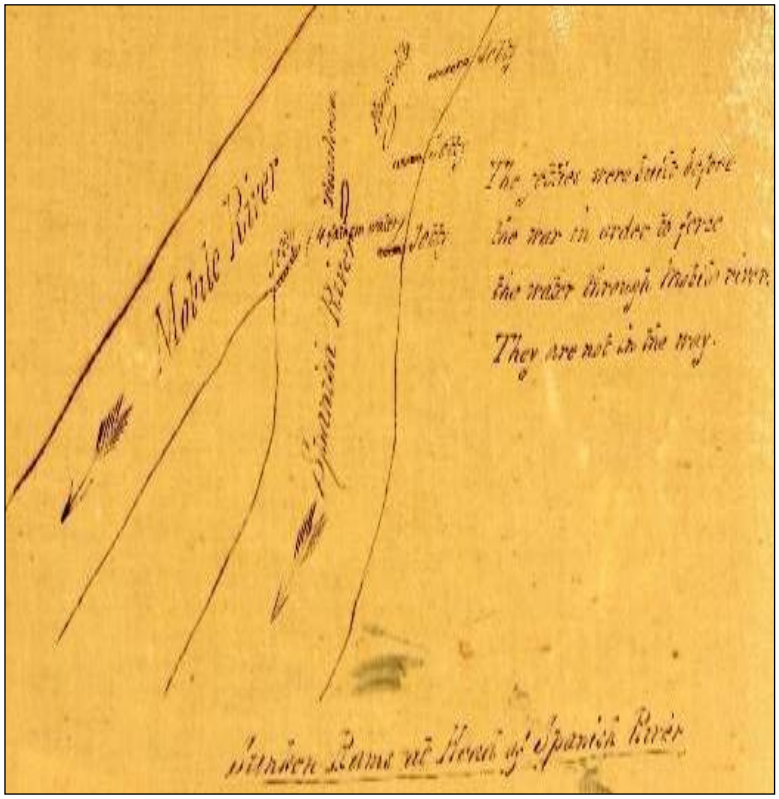

Figure 3. 1866 map by Merrill showing the location of CSS *Huntsville* and CSS *Tuscaloosa* (Merrill 1866).

PERSONNEL

James P. Delgado, PhD, RPA, served as SEARCH's Project Manager and Principal Investigator. Alexander J. DeCaro, MA, RPA; Kyle Lent, MA, RPA; Joseph Grinnan, MA, RPA; Deborah E. Marx, MA, RPA; Raymond Tubby, MA, RPA; and Barry Bleichner, MS, JD, assisted as Project Archaeologists. Creative Designer and Cinematographer Daniel Fiore and Drone Videographer Timothy King assisted with field videography and photography. The investigation was done in collaboration with representatives from AHC, including Lisa D. Jones (Executive Director), State Historic Preservation Officer (SHPO) Stacye Hathorn, and Clara Nobles, Lee Anne Wofford, Jacqulyn Kirkland, Eleanor Cunningham, and Dorothy Walker; DWP and SWP personnel Kamau Sadiki; and members of the Africatown, Alabama, community. Additional assistance in the field was provided by Dr. Fredrik Hiebert of the National Geographic Society and Senior Electronics Technologist Arthur Clark, writer Joel K. Bourne Jr., and Young Explorer Asha Stuart of National Geographic. Archaeological and historical characterization was provided by Dr. Delgado, Mr. Lent, and Ms. Marx. In-house support included John Cloud, PhD; Jeffrey M. Enright, MA, RPA (Maritime Project Manager); Shawn Joy (Submerged Prehistoric); Nick Linville (Research Historian), MA; Raymond Tubby, MA, RPA (GIS); Abigail Bleichner, MA (GIS); Katy Harris, MS (Lead Technical Editor); and Rasha Slepow, BS (Technical Editor).

ENVIRONMENTAL SETTING AND CONDITIONS

Weather and environmental conditions during remote-sensing and dive operations were favorable and sunny with a light breeze (**Figure 4**). Air temperatures averaged 32-37° Celsius (C) (90-100° Fahrenheit [F]) with water temperatures averaging 32°C (90° F). Underwater visibility was extremely limited due to high amounts of sediment within the river. Tidal patterns consisted of high tide in the morning, gradually decreasing as the day progressed. Water salinity near Twelvemile Island is brackish and varies based on the tidal cycle. Bottom composition within the Mobile River is silt and clay, with survey area water depths ranging from 0.9 m (3.0 ft) to 6.0 m (20 ft).

The environmental conditions of the Mobile River impact the site formation processes of shipwrecks and other submerged cultural resources. The salinity at Twelvemile Island is sufficient to support colonization of wooden timber by small marine borers, such as *bankia* and *limnoria*. Algal and bacteriological colonization lead to decay, while fresh water can introduce dry rot. Bird droppings on exposed wooden timbers also hasten decay. The cumulative effect of these impacts on vessel timbers can result in the eventual failure of the hull at the waterline just above the mud. The vessel's upper portions will likely either collapse or be dislodged, sometimes falling into the hull or alongside the wreck on the river bank. The consumption of the wood by natural factors can mimic burning, and the corrosion of the metal fasteners will deposit a black residue and stain wood, which can be mistaken as evidence of burning. While wooden-hulled vessels are more quickly impacted by decay and deterioration, metal hulls also are subject to environment impacts. The brackish water, high temperatures, and shallow

Figure 4. SEARCH survey vessel at Twelvemile Island, Mobile River, Alabama.

depths, subject to tidal flow and weather events, speed up the normal corrosion rates. Metal-hulled vessels typically last longer than wooden-hulled vessels, but also will corrode and collapse. The most well-preserved or intact vessel features are likely buried in sediment where they are more protected from environmental factors.

HISTORIC CONTEXT

Mobile Bay is a body of water that is 48 kilometers (km) (30 miles [mi]) long and 19 km (12 mi) wide. Due to the bay's large size and prominence along the coast of the Gulf of Mexico, the area has played an important role in the history of the region. The Mobile River is formed by the confluence of the Tombigbee and Alabama Rivers, about 64 km (40 mi) north of the city. Several smaller rivers connect the bay to the interior, which eventually flow south, entering into the bay via two channels: the Mobile River itself and the Tensaw River (Amos 1990:114-116). The various waterways flowing into the bay ultimately lead to the Gulf at Mobile Pass and Grant's Pass. From the colonial period until the present, the bay and its waterways have been important avenues of commerce and influential to the course of history.

SPANISH EXPLORATION

European explorers noted the broad waters of Mobile Bay early in the sixteenth century with the Spanish becoming the first to become familiar with the area, which they dubbed *Bahia de Filipina*. The earliest confirmed exploration of Mobile Bay was under Spaniard Alonso Álvarez de Pineda in 1519. He departed Jamaica with four vessels, circumvented the Gulf of Mexico, and entered Mobile Bay, naming it *Bahia del Espiritu Santo*. The voyage mapped the bay's waters and documented the local indigenous populations (Scaife 1892:149). Additional voyages by Spanish mariners occurred during the sixteenth century, including those of Juan Ponce de Leon, Diego Miruelo, Pánfilo de Narváez, and Francisco Maldanado. In 1540, Hernando de Soto entered Mobile Bay and encountered the Native Muscogee people, leading to de Soto's men destroying the town of Mauvila, also spelled Maubila, from which the name Mobile was derived. It was not until 1558 that much attention would be paid again to Mobile Bay. Guido de Las Bazares commanded a fleet of three vessels from Vera Cruz, tasked with locating a suitable place to establish a colony along the Gulf of Mexico's northern shoreline. He recorded a description of the bay, including its suitability for safe navigation and anchoring along with an abundance of trees for shipbuilding (Nuzum 1971:29). A year later, in 1559, the Tristán de Luna y Arellano expedition, including 13 vessels, stopped in Mobile Bay while on the search to establish a permeant colony for Spain near Pensacola, Florida (Hudson et al. 1989). Many of the early Spanish explorers noted an abundance of timber, wildlife, and other natural resources around the bay. They also noted Native American villages along the shore (Kirkland 2008a). This would be the last push for a while by Spain for possession of territory in the Gulf of Mexico until foreign competition from France renewed their interests in the seventeenth century.

FRENCH COLONIZATION

European interest in the Gulf of Mexico and Mobile was next focused around the failed attempt of Rene-Robert Cavelier, Sieur de La Salle, to expand France's territory of Louisiana in 1685. He

attempted to have a colony on Matagorda Bay in eastern Texas, but could not find the Mississippi River mouth. France's interest in once Spanish-held land spurred Spain to again tighten their hold on the Gulf of Mexico, but France explorers were persistent. In 1689, Pierre Le Moyne, Sieur de Iberville, commanded an expedition to the Mississippi River mouth to find a place for a new colony. He found that the Spanish had a strong hold on Pensacola, so he stopped in Mobile Bay and then to Biloxi. He must have liked Mobile and conveyed that to his brother, Jean Baptiste Le Moyne, Sieur de Bienville, who, in 1702, established a permanent presence in the Mobile Bay Area at Port Dauphin (Foscue 1989).

Within four years, there were four permanent sites in Mobile Bay/River at Dauphin Island, Dog River, Fort Louis de la Louisiane, and the current site of the City of Mobile. This first site of the city was located near Twenty-Seven Mile Bluff on the Mobile River. The French later relocated the settlement to the mouth of the Mobile River due to flooding, disease, and Indian conflict that plagued the original site. The new Mobile emerged as a coveted location along the upper Gulf of Mexico due to its large bay and connecting rivers. The city served as the capital of French Louisiana until 1720 (Kirkland 2008a). Mobile quickly became a center for government and commerce, with the first five governors of Louisiana residing in Mobile.

The early maritime trade of the colony consisted of immigration of colonists and along with the importation of supplies and trade good to sustain and grown the endeavor. The water depth at the bay's entrance was only around 3.0 m (10 ft), so deeper draft vessels would anchor at the mouth and passengers and goods were offloaded and carried up river. Export goods were in turn lightered down river, out to waiting ships. The capital was moved to Biloxi and in 1722 moved again to New Orleans. Despite the capital moving out of Mobile, France still valued Mobile for is military significance and as a deterrent from Spanish intrusion from Florida and English incursion from Georgia. Mobile was a beneficial location despite the shallowness of its channel, which necessitated that large vessels lighter their cargoes to port from Dauphin Island. The cargoes were landed at the King's Wharf, a wooden pier at the town. Fort Conde was established to protect Mobile (Kirkland 2012).

Europeans utilized an array of vessel types during their exploration and colonization efforts of the Gulf Coast. Luna's 1559 fleet, for example, included larger galleons, *naos*, and caravels, as well as smaller *barcas* and *frigatas* designed for shallow bay and river exploration (Smith et al. 1995:12). Luna's *barcas*, although comparatively smaller, were reported to be 100-ton vessels. Larger, transatlantic *chalupas* (shallops) also were employed by the Spanish in the sixteenth century that were as large as 19 m (64 ft) long and 5.3 m (17.5 ft) abeam (Baker 1966:8). After 1563, it was a requirement that all fleets included vessels less than 60 tons to investigate inlets and bays ahead of larger ships (Smith et al. 1998:17).

> It was common practice for sixteenth-century explorers to carry on their ships, in addition to the normal complement of boats, a shallop or some other type of small craft in pieces ready to be assembled upon arrival at their base of operations—'chaloupe en fagot' as the French termed it (Baker 1966:1).

Perhaps the first marine dictionary published—the *Instruction Nauthica* printed in Mexico City in 1587—stated that every ship also needed a *batel* to set and recover anchors, load and unload cargo, and tow ships in and out of port (Baker 1966:8).

Mobile Bay's shallow waters prohibited the entrance of larger vessels, such as the galleons and *naos*; therefore, any exploration of the bay and rivers likely occurred onboard *barcas*, *frigatas*, *batels*, and shallops. These four vessels were small, wooden watercraft, usually double-ended, open and undecked, and with low freeboard to allow oarsmen to operate in addition to one or two sailing masts. *Instruction Nauthica* established a relationship of 1:0.75 between the *batel* and *chalupa*, dependent upon the size of the mother ship and available space on deck. Baker's (1966:12) studies located references to English longboats (*batels*), measuring 12 m (40 ft) to 15 m (50 ft) by 3.3 m (11 ft) to 3.6 m (12 ft) by 0.94 m (3 ft), (**Figure 5**), while the corresponding shallops measured 7.6 m (25 ft) to 9.1 m (30 ft) by 1.98 m (6.5 ft) to 2.1 m (7.0 ft) by 0.73 m (2.0 ft 4.0 in) to 0.85 m (2.0 ft).

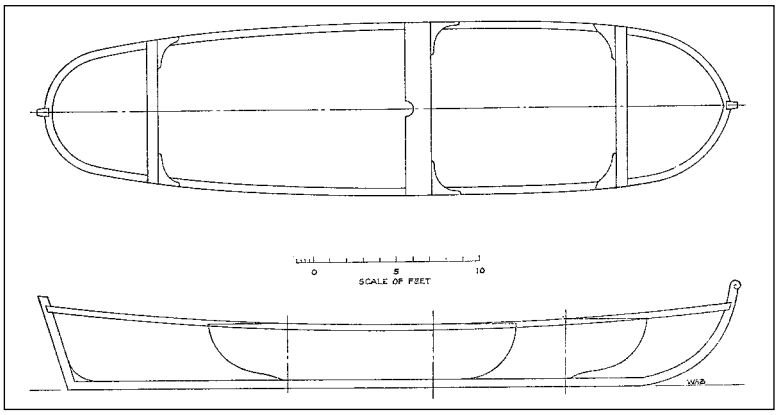

Figure 5. Early seventeenth-century Portuguese *batel* (Baker 1966:10).

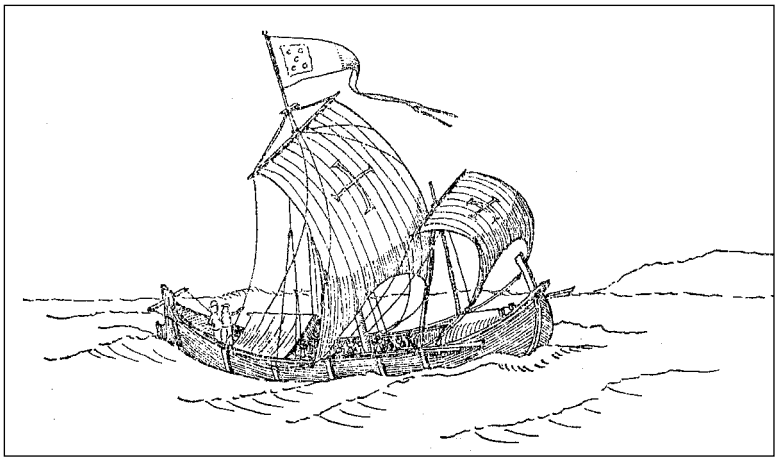

Figure 6. Mid-fifteenth-century Portuguese *barca* (Oliveira 1940, adapted from Baker 1966:14).

Barcas employed around the coasts of Spain and Portugal in the seventeenth century were undecked vessels measuring 9.1 m (30 ft) to 12.1 m (40 ft) by 2.4 m (8.0 ft) to 2.7 m (9.0 ft) by 1.4 m (4.0 ft) to 1.5 m (5.0 ft) (**Figures 6 and 7**). They were propelled by a single sail on short voyages, while it was customary to step a second mast in the bow for longer passages. Alternately, *barcas*

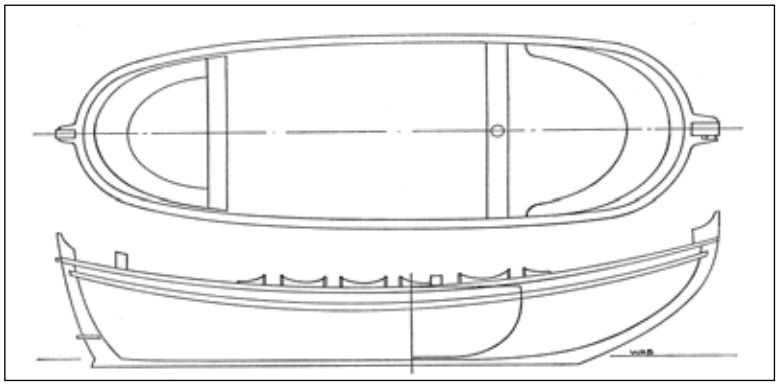

Figure 7. Early seventeenth-century Portuguese *barca* (Baker 1966:17).

could be propelled with oars. Likewise, the *frigata* was an open, undecked longboat propelled with both sail and oars. *Frigatas* would have been ideally suited to the shallow bays and rivers along the Gulf Coast (Smith et al. 1995:10).

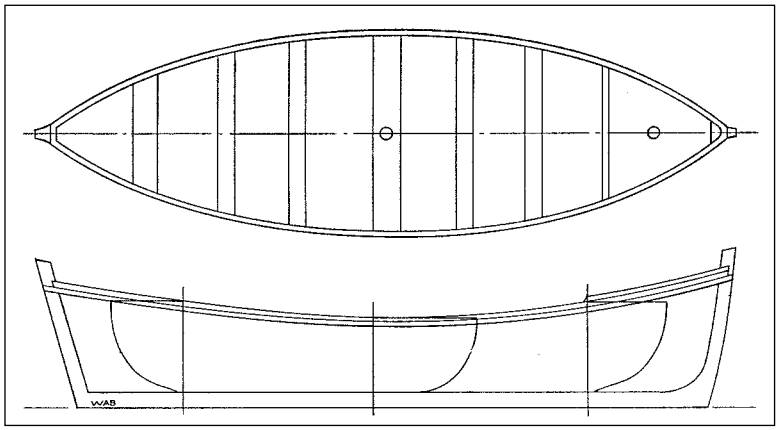

Figure 8. Mid seventeenth-century Dutch *chaloupe* (Baker 1966:34).

Lightering and fishing in the bay during the early eighteenth century likely were accomplished onboard shallops and similar shallow-draft vessels, such as bateaux, pinks, scows, and sloops. Shallops in Mobile Bay throughout the seventeenth century, for instance, were utilized for fishing loading and unloading ships, trading voyages, military expeditions, and as pilot boats (Baker 1966:4). The majority of these shallops measured less than 9.1 m (30 ft) in length, with some 12-ton shallops reaching 12.1 m (40 ft) or more (Baker 1966:23). Chapelle (1951:21) determined from various sources that most shallops of the eighteenth century ranged in keel length between 5.4 m (18 ft) and 8.5 m (28 ft). They were proportionately wider to other small craft, which increased their suitability to lightering cargos (**Figure 8**). Even the 12-ton shallops might not have been deeper than 1.2 m (4.0) ft, with one account of 1.3 m (4.0 ft 5.0 in), making them ideally suited to Mobile Bay.

EARLY BRITISH AND AMERICAN PERIOD

After the British defeated the Spanish and the French in the Seven Years' War (1756–1763), the British created the province of West Florida, which included most of Alabama south of Birmingham. Along with the provincial capital of Pensacola, Mobile was the only other sizable town in the territory, which included parts of Florida, Mississippi, and Louisiana. Most of Mobile's population was military personnel who occupied Fort Conde. The trade that developed was reliant on deerskins harvested by Native Americans, who traded for muskets, textiles, hardware, and rum (Axtell 1997; Braund 1993; Ethridge and Hudson 2002; Hudson and Tesser 1993). A 130-ton vessel arrived annually during the period of British rule to collect hides for sale in England. Immigrants laid out indigo, tobacco, and rice plantations, although timber products proved to be the most profitable exports (Fabel 2007).

The American Revolutionary War threatened British control of Mobile and, ultimately, contributed to their loss of the colony. The disruption of the war period (1775–1783) halted the population growth of recent years, except for Loyalist refugees who fled to Mobile and other parts of British West Florida from revolting colonies. American privateer activity

aggravated trade from the port of Mobile. Finally, fighting arrived at Mobile's doorstep. In 1778, James Willing and a US naval force laid waste to the plantations of West Florida. Spain was drawn into the conflict in 1779, siding with the Americans. Bernardo de Gálvez, the Spanish governor of Louisiana, besieged Mobile's Fort Charlotte (known to the French as Fort Conde and to the Spanish as Fuerte Carlota) in 1780. In 13 days, the small British force surrendered. The following year, the territory of West Florida surrendered. In the negotiations at the end of the war, Spain acquired West Florida (Fabel 2007).

Spain ruled West Florida, including Mobile, between 1780 and 1813. The trade of the period was similar to that of the British period. In general, Spain was not able to sponsor the development of the territory; therefore, it remained vulnerable to outside influences, particularly the United States, throughout this period. In the context of the War of 1812, American forces captured Mobile from the Spanish in March 1813. At Mobile Point on the lower end of the bay, they established Fort Bowyer. The British attacked the fort twice, first in 1814 and again in 1815. The latter attack came after the British defeat at New Orleans and was one of the last military engagements of the conflict (Smith 1997:59-60).

Early Statehood and Antebellum Period

After the War of 1812, Mobile and the surrounding river communities, now part of the United States' Mississippi Territory, began a half-century period of rapid expansion and prosperity. When Mississippi became a state in 1817, Mobile became part of the new Alabama Territory, which in turn became the twenty-second state in the Union in 1819. Mobile sat on the second largest river system in the country and exemplified an American port with a diverse population, industrious merchants, growing industries, and a wide-reaching transportation system. The influx of new settlers and ample land for development was made possible by the city's prime location along the river system with two-way navigation to inland waterways. Before steamboats dominated the scene, transportation along the river was carried out by flat-boats and barges or keel boats. They loaded upriver and used the current to assist them with the slow, labor intensive downstream transit. A typical 15.2-m (50-ft) long, 1.8-m (6-ft) wide, with a 1.8-m (6-ft) draft keel boat carried a capacity of 100 barrels. A typical cargo from 1821 included flour, whiskey, apple brandy cider, dried fruit, feathers, and a four-wheeled carriage. To make it back home, they polled their way back or sold their craft for lumber and returned on foot (Frazer 1907:1). Steamboats would eventually put these smaller operations out of business.

In the years leading up to the Civil War, Mobile was the South's busiest port aside from New Orleans. Mobile was the commercial center of Alabama and the state's only port. Eli Whitney's new cotton gin, patented in 1793, made cotton profitable. Other inventors followed with their own versions, all contributing to making cotton production cheaper (Beckert 2014:102-104). That coincided with the explosive growth (and increased demand) from Britain's textile industry (Dattell 2009:35-37). Entrepreneurs eager for previously unheard of profits demanded expanses of land to grow cotton, slaves to plant, tend to, harvest and process it, and ships to carry it to market; this "cotton fever," as it was known in contemporary times, spurred the rise of Mobile.

As the new states quickly developed vast cotton plantations, the forced migration of slaves "down the river" brought more than 35,000 people to Alabama between 1810 and 1819, and another 54,000 the following decade, peaking at more than 96,000 between 1830 and 1839; that same decade, nearly 102,000 enslaved people were forcibly relocated to Mississippi, five times more than in the previous decade of 1820–1829 (Baptist 2014:3; Tadman 1989:12), all part of forced removal of at least 875,000 and perhaps a million slaves from the upper to the lower south in that period (Pargas 2015:19). Propelled by "King Cotton," slavery doubled in Alabama in that period (Dattell 2009:52; Dupre 1997; Pargas 2015:19).

The result was an explosive growth in cotton production and fortunes. Southern cotton production, in just five decades, increased from 178,000 bales in 1810 to nearly 4 million bales by 1860, "the nation's primary export product" (Pargas 2015:21). At the same time, 20 percent of Britain's raw imports was cotton, and nearly half of its exports were cotton textiles (Dattell 2009:37). In terms of exports, the American share of the British cotton market climbed from 28 percent in 1800 to 88 percent in 1860 (Dattell 2009:37). Getting that product to market relied on water transportation. Most cotton plantations were located along navigable rivers, and steamboats brimming with bales, each one weighing 500 pounds, made their way down to the sea. By 1850, South Alabama was producing 350,297 bales of cotton; in 1851, that had increased to 451,697 bales, and by 1860, on the eve of the Civil War, cotton production stood at 843,012 bales (Jordan 1948:198). To carry that cotton from plantations spread along the banks of the rivers, and steamboat construction blossomed. Merchant shipping on "western" American rivers grew from 9,930 tons in 1816 to 167,739 tons by 1860 (Hugill 1997:169).

While up 40 miles from the open Gulf of Mexico, Mobile prospered because it "lay at the mouths of two rivers which drained a rich hinterland into which cotton planting rapidly spread after Alabama became opened up as a territory" (Albion 1938:59). Bolstered by investment from New York bankers, Mobile boomed, and by 1840 was the principal cotton exporting port in the American south (Albion 1938:60). The means of getting the cotton from Mobile (and other ports) was through large capacity ocean carriers known as "packet ships." Beginning in 1825, regular service by packet connected New York with Mobile (Albion 1938:60).

The trade grew, and as it did, the trade opened up between Mobile and European ports, developing "into a triangle," although "while Mobile was regularly supplied with New York goods," cotton from Mobile bypassed New York and went directly to British and other European markets (Albion 1938:60). They also carried passengers, all part of a regular routing by various packet "lines." By 1850–1851, Mobile shipping connected the port not only to Britain and France, but to other European ports on the continent, in the Baltic, the Mediterranean, the Caribbean, and to New York, Boston, Providence, Baltimore, and New Orleans (Jordan 1948:198). Mobile's antebellum trade reflected the centrality of cotton. In the 1850s, cotton was 99 percent of the total value of exports from the port. The remainder consisted of lumber. Foreign goods came into Mobile predominantly from the northeastern ports of the United States (Amos 1990:114-118). While cotton flowed downriver to Mobile, upriver went corn, flour, and whiskey, as well as manufactured goods (Bergeron 1991:4-6).

Ships entered the bay via two channels, one to the east of Dauphin Island (Main Ship Channel) and the other on the west of the island (Grant's Pass). Until after the Civil War, large oceangoing vessels could not reach the City of Mobile due to the shallow nature of the channels into the bay; therefore, they anchored at Mobile Point on the east side of the Main Ship Channel and lightered their cargoes to the city (Amos 1990:114-118). Numerous types of vernacular craft utilized for lightering should be expected throughout the eighteenth and nineteenth centuries, but most likely were variations of shallow-draft, single-masted skiffs and sloops, or two-masted schooners. Francaviglia (1998:174) notes that photographss and engravings captured during the mid-nineteenth century depict ports dominated by the masts of sloops and schooners. Prior to the mid-seventeenth century, "sloop" referred to many small vessel types, regardless of sailing rig. Vessels built along the eastern seaboard of America for coastal sailing, particularly in the Chesapeake Bay region, established the sloop by 1665 as, "a single-masted vessel having a fore-and-aft mainsail with a boom" (Baker 1966:59). The mainsail was either Bermuda or gaff-rigged and a single jib was flown from the boom, or bowsprit. By the 1820s sloops were shallow-draft for navigating around the shoal waters and oyster reefs of the bay, and had few deck structures to increase cargo capacity (**Figure 9**). They typically were 16.7 m (55 ft) long and 6.0 m (20 ft) abeam, and were equipped with leeboards or centerboards (Baker 1966:139). These features were "boards" that could be lowered over the side (leeboard) or dropped through the hull (centerboard) to provide better lateral resistance and improved sailing qualities to windward in shallow-draft vessels. They were retractable to allow navigation in extreme shallow water.

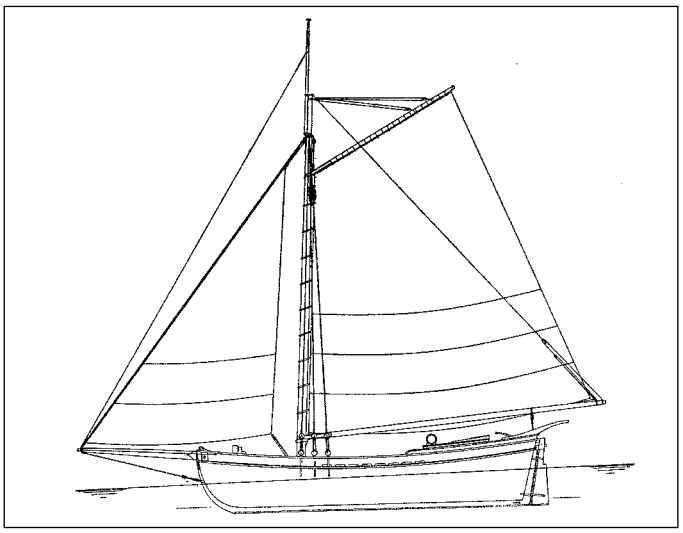

Figure 9. Sail plan of an early nineteenth-century East Coast sloop (Baker 1966:152).

The Gulf region eventually adopted the Chesapeake Bay sloop, with design variations driven by the extreme shallow lagoons and coastal bays. The evolution in hull design developed down the Atlantic Coast as inland Carolina farmers transported cotton and tobacco to market onboard scow sloops and schooners, which became popular after 1840 (Chapelle 1951:332). Perhaps many resembled the Texas scow sloop (sometimes referred to as a Port Isabel scow sloop) that became popular for fishing and lightering cargoes along the Gulf Coast. This sloop was a maneuverable vessel with a centerboard and a flat or nearly flat scow hull that could draw less than 0.6 m (2.0 ft) of water (**Figure 10**). What the hull design lacked in speed, it made up for in stability and payload (Francaviglia 1998:172).

The schooner also was originally developed along the Atlantic Coast of the United States. The term refers to any vessel of two or more masts that are rigged fore-and-aft throughout. Like the sloop, this vessel type was designed for shallow water and was equipped with a

centerboard, but unlike the sloop, it was larger and more seaworthy for coastal navigation (**Figure 11**). Schooners frequented Mobile Bay traveling to and from Gulf Coast ports such as Galveston and New Orleans, or as far away as New York. Schooners designed for lightering may have had scow hulls similar to the Texas scow sloop. The Gulf Coast builders developed a V-bottom Gulf scow schooner, which may have been a purely local innovation (Chapelle 1951:332-333). The vessel type had a flat or nearly flat scow hull, usually measured between 9.7 m (32 ft) and 15.2 m (50 ft) long, and sailed faster than the sloop (**Figure 12**).

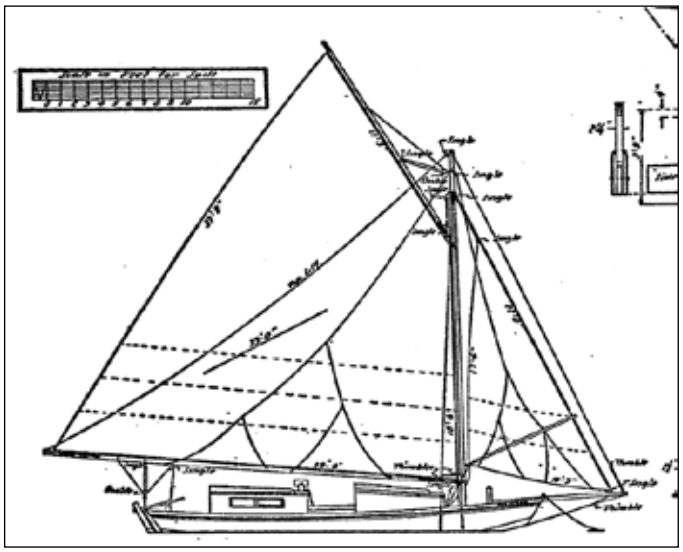

Figure 10. Texas scow sloop (gaff-rigged) (Chapelle 1951:335).

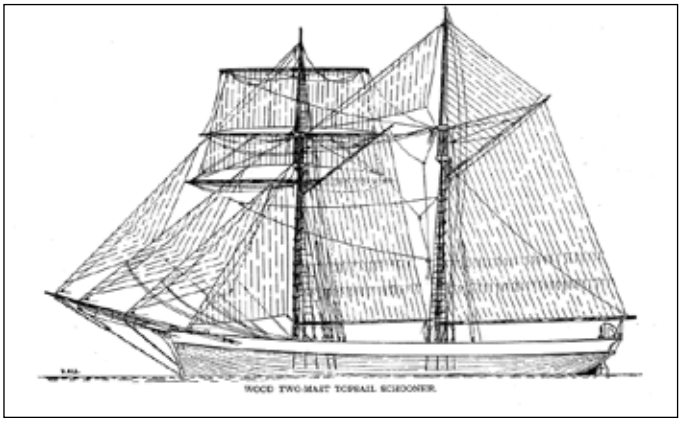

Figure 11. Sail plan of a two-masted topsail schooner (Underhill 1988:56).

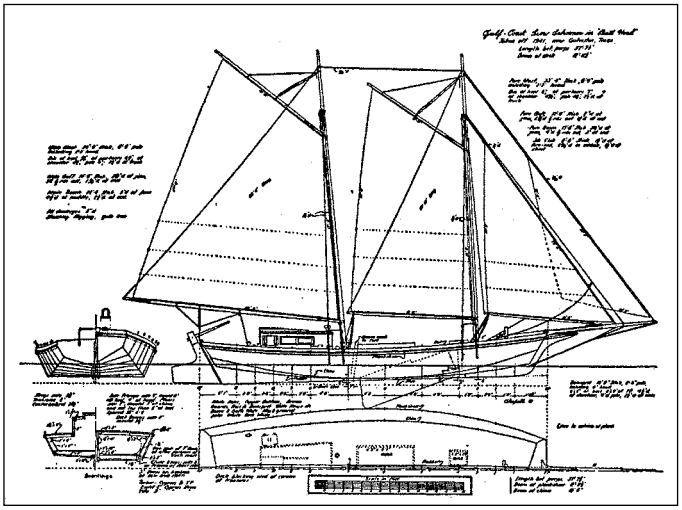

Figure 12. Gulf scow schooner (Chapelle 1951:333). Note the centerboard illustrated in the deployed position.

STEAMBOATS, PACKETS, AND PLANTATIONS

American innovators experimented with steam propulsion in waterborne transportation beginning as early as 1778. Steamboats were the most important factor to the economic development of regions beyond the Appalachian mountain chain due to the vast distances needed for cargos to travel between the east and west (Stills et al. 1993:63). Steamboat activity on the Mobile River ushered in growth in Mobile, resulting from the rich agricultural lands and abundant natural resources occurring inland. Alabama's rivers were the major thoroughfares, heightened by the emergence of paddle wheel steamboats that could manage the shallow waters, muddy bottoms, upstream currents, and levee landings at plantations dotting the river's edge.

> It was a matter of public congratulation that this river which had wound its way silently and unprofitable to the ocean for centuries, through one of the most fertile regions on the globe, now bore on its bosom the products of every quarter of the world and scattered profusely among those who lived thousands of miles away from the countries where they produced (Frazer 1907:6).

As a result of the reliance on the rivers, the state's most important towns grew up along the steamboat routes. Western river steamboats plied the shallower transportation arteries flowing into the Gulf of Mexico, such as the rivers comprising the Mobile-Tensaw river delta at the head of Mobile Bay. The first steamboat on the Alabama River was the *Alabama* launched in 1818 by the St. Stephens Steamboat Company (Frazer 1907:3). Early efforts were unsuccessful with steam engine incapable of winning against the upstream current, and it was not until 1821 that a steamboat reached Montgomery (Frazer 1907:3). While steamboats up until 1861 were side-wheelers, the stern wheel emerged as the more favorable style and is an icon for inland river steam navigation. A typical side-wheeler of the time was 60 m (200 ft) long by 9.1 m (30 ft) wide with a shallow draft barge-like hull to accommodate the engine, paddle wheels, and boiler. Paddle wheels at the stern were adopted to free up valuable deck space for additional cargo. They were also less vulnerable to snags and could pull up closer to levees for loading and unloading. Several decks allowed both passengers and cargo to co-exist and provide increased profits. Cotton ultimately assisted steamboat development by financing the technological developments and providing an immediate need for the vessels constructed.

Five hundred eighty-four steamboats would operate on Alabama rivers between 1818 and 1932, including the Mobile-to-Montgomery route via the Alabama River. Steamboats operating on these rivers were similar in structure and machinery to those on the Mississippi/Ohio system, but smaller, with fewer decks and as little draught as possible (**Figure 13**).

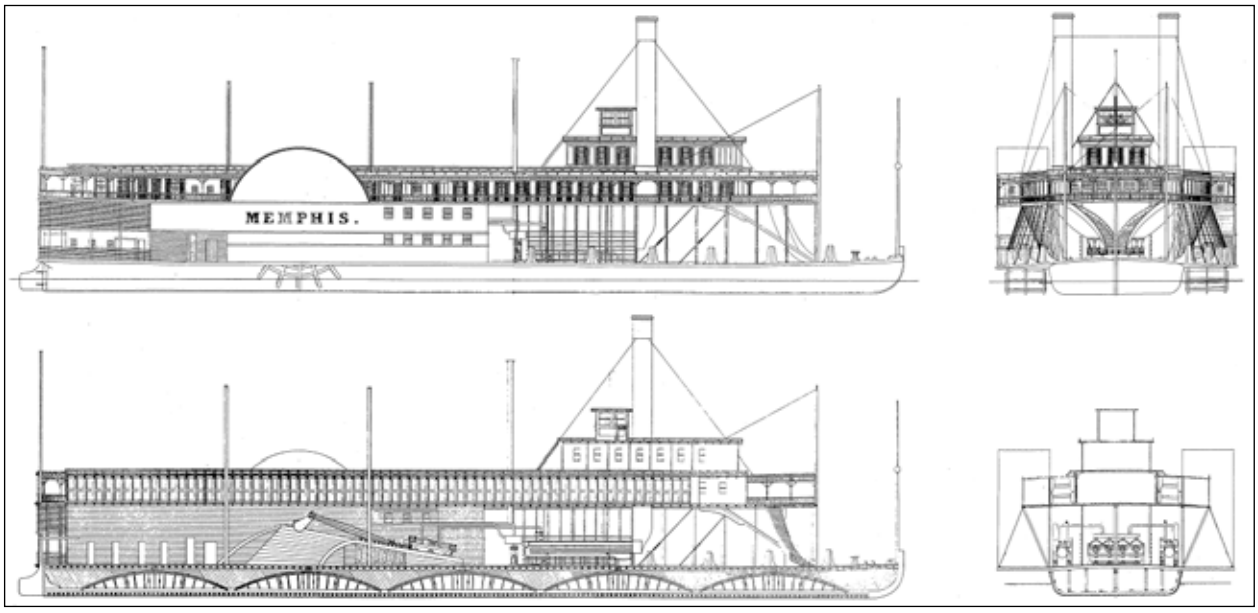

Figure 13. Typical western river side-wheel steamboat (Transactions of the Institution of Naval Architects, Volume II [1861], adapted from Stills et al. 1993:64–65).

> By 1860 the average smaller steamboat of 100-125 tons was [40 m] 132 ft in length, [7.0 m] 24 ft in beam. Its average draught had decreased from [1.9 m] 6.3 ft to [1.1 m] 3.7 ft (Stills et al. 1993:65).

The Mobile River soon came alive with the steamboat calliope. For the next 80 years, the plantation-based cotton economy partnered with the steamboats and packets to provide the financial influx for Montgomery, Selma, and Mobile to become dominate port cities (**Figure 14**). On upriver transits, the steamboats supplied cities with dry-goods, groceries, hardware, and manufactured items, while downriver trips carried raw materials, including cotton, lumber, and turpentine. Businesses and residents began to depend on steamboats for necessities and luxury items, liquor, molasses, sugar, coffee, and wine to name a few. The advertised, regular, and timely steamboat schedule put demands on the industry to deliver. Harbor and channel improvements, such as dredging, resulted in a 3.0-m (10-ft), well-maintained channel from the lower bay to Mobile by 1857 (Panamerican Consultants 2001:10).

It is of note that early steamboat travel was filled with hazards due to unreliable steam machinery, collisions, fires, river snags, and human errors. One of the worst early steamboat disasters occurred 10 miles above Mobile in 1847. The stern wheel steamboat *Tuscaloosa*, built in Tuscaloosa by local merchant and steamboat owner and master James H. Dearing, was an early loss and one of the most tragic. Heavily laden with approximately 60 passengers, 40 crew, and freight, *Tuscaloosa* departed Mobile on the evening of January 28, 1847, for an upriver trip to Tuscaloosa when its two boilers violently exploded off Twelvemile Island. The steamboat caught fire then suffered another explosion when 20 kegs of black powder on board ignited. As the burning wreck drifted, it struck the bank, and remained stuck, while the stern drifted into the channel. It then burned for three hours as some passengers escaped by sliding down ropes into a yawl, while others took the water on a makeshift raft of wreckage. *Tuscaloosa* was a total loss with at least 30 of the passengers and crew killed (*Alabama Planter* January 30, 1847; *New York Weekly Tribune* February 13, 1847). Among them were veterans of the then-raging Mexican War, including Abraham Flinn, a 37-year-old member of the Eutaw Rangers. His body was recovered, and he is buried in the historic Mesopotamia Cemetery in Eutaw.

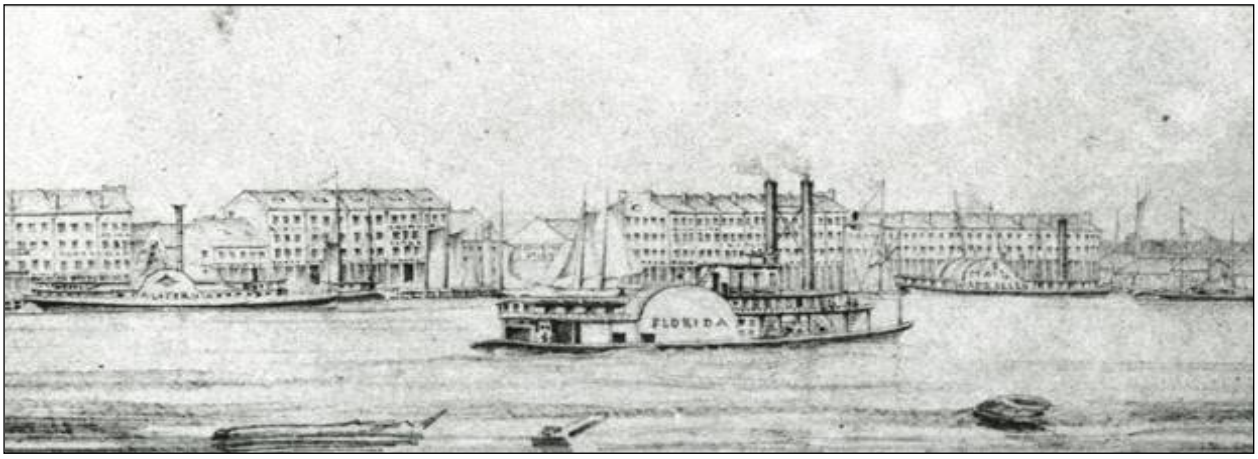

Figure 14. View of Mobile in 1851 (History Museum of Mobile).

It was not coincidence that plantations sat near rivers, as that made easy access to move out their products. Plantation operations and the antebellum slave society peaked during the late 1850s and 1860s at the same time European and US steam-powered textile mills increasingly purchased cotton from Southern suppliers due to mechanization allowing faster production at decreased costs. Large-scale cotton production required a tremendous amount of labor, and the resulting slave populations grew at an enormous rate to keep the plantations running. Rough estimates place almost a half a million slaves in Alabama at the start of the Civil War. "Some estimates say that the Deep South was exporting two-thirds of the world's cotton supply at one point" (Hale 2009). Once steamboats deposited their cargoes from upriver plantations at Mobile, they were reshipped to all corners of the world.

At the other end of the cotton field was Mobile, where fleets of sailing packet ships waited as their holds were filled to the maximum. New York shipping merchants with 200- to 500-ton New England built ships dominated the cotton trade and Mobile surpassed Savannah and equaled Charleston as a port in the 1830s. The triangle trade brought ships departing Mobile for New York and then beyond. Between 1826 and 1840, there were 166 northbound coastal trips from Mobile to New York (Fairburn 1955:1140-1141). The cotton business was influential and vast, including compressors, buyers, commission merchants, manufacturers, and dealers (Land 1884:29). Annual cotton exports in 1818 equaled less than 10,000 bales, in 1822 45,000 bales, in 1830 100,000 bales, and in 1840 300,000 bales. By 1860, more than 500,000 bales left Mobile annually, making it only second in importance to New Orleans as a major Gulf shipping port. Lumber greatly contributed to the wealth with one million board feet exported in 1830, growing to 10 million board feet by the 1850s (Reynolds 1868:7).

As steam-powered vessels became a regular site along the Gulf Coast beginning in the late 1830s, oceangoing steamships came on scene, providing faster and more reliable service. Deeper-draught, eastern-built side-wheel steamships, like those of the Charles Morgan line, conducted trade with ports as far away as New York, while shallower-draft steamboats bridged the gap between deep-water ports and bay communities such as Mobile. The transition from wooden hulls to iron hulls and more economical marine steam engines and boilers allowed the transportation of goods and people between Gulf ports to continue to prosper through the advent of more dependable networks.

US Coast and Geodetic Survey

Mobile Bay and the surrounding waters rose to the attention of the US Coast and Geodetic Survey (USC&GS) in the late 1840s and early 1850s when the first efforts to survey and chart the area were undertaken (**Figure 15**). The need for safe unobstructed passage in and out of the harbor for larger, deeper draft sailing ships and eventually oceangoing steamships was in order to support the shipment of the region's commodities. Survey vessels like the steamer *Robert J. Walker* and schooner *Forward* mapped the seafloor while survey teams on land filled in the shore side components to make accurate and scientific navigation charts (Marx et al.

2014). Shipping companies and large warehouses lined the port's waterfront and relied on the constant maritime traffic, which benefitted greatly from the new knowledge of the region's waterways and ocean highways.

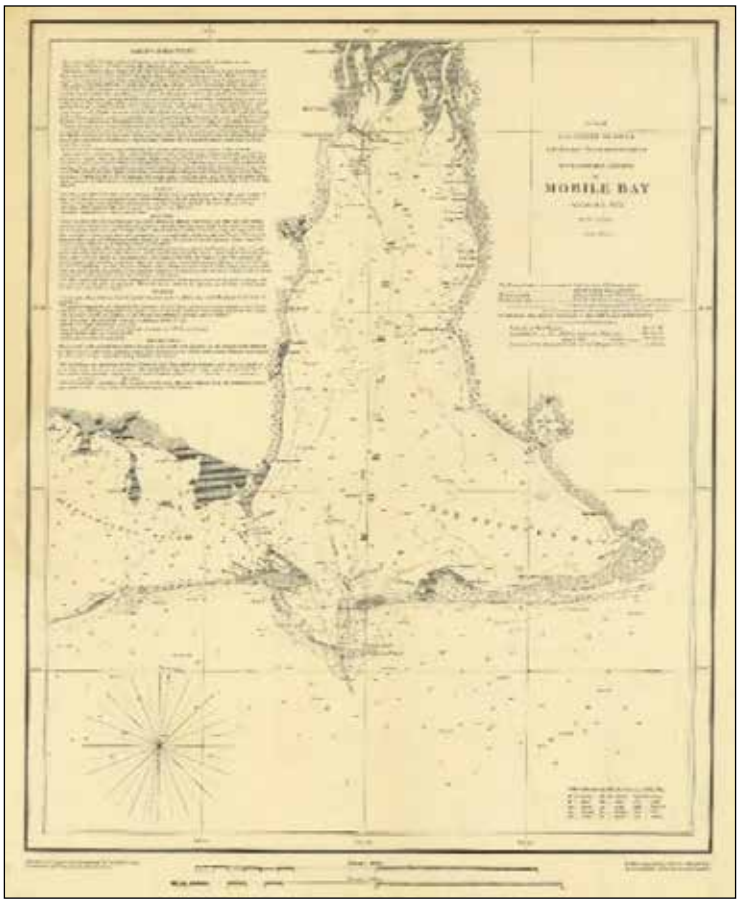

Figure 15. 1852 USC&GS chart of Mobile Bay (NOAA's Historical Map & Chart Collection).

Prior to 1860, Tennessee, Alabama, and Mississippi used Mobile almost exclusively as their outlet for trade (Land 1884:28). It was clear the Mobile was on the map during this period of national expansion. The continued attention focused on the port would remain throughout the coming Civil War. In 1860, more than 330 vessels cleared the port of Mobile. The international nature of the port's trade was reflected in the 16 foreign consulates in the city. Domestic traffic in agricultural products reached Mobile over the Tombigbee and Alabama Rivers, which together form the Mobile River at a point about 40 miles north of the city. Foundries, mills, and factories funneled their products to the city's large wharf (Diouf 2007:9). By the outbreak of the Civil War, Mobile was the third largest seaport in the United States, centered on its exports and overall the third largest city in the South.

THE CIVIL WAR

The Civil War affected the maritime commerce in Mobile and its bedroom ports. When Alabama seceded from the Union on January 7, 1861, Confederates were deeply concerned with protecting the port of Mobile from Union occupation (Bergeron 1991:7). The Confederacy maintained possession of the port of Mobile for most of the Civil War, primarily because the Union was hesitant to attempt an invasion and instead focused on other areas of the South. Across the bay, the Confederate Army worked to strengthen defenses. They laid obstructions at various points in the bay, including torpedoes, piles, and sunken ships, with the hope that they would arrest any potential naval invasion. The US Navy blockaded the port, as well as the entire Gulf Coast, in an attempt to interrupt the flow of trade (Bergeron 1991:18).

After the Union established a blockade of Mobile and the southern coastline in April 1861, a small industry of blockade running arose. Often with great daring, these vessels attempted to slip by Union patrols to bring valuable cargo in and out of Mobile. An estimated 32,000 to 35,000 bales of cotton were shipped from Mobile between February 1862 and August 1864 onboard blockade runners (Young 2008). In 1864, 22 attempts were made by steamers to reach Mobile; 19 were successful, and none were captured leaving the bay (Young 2008). Many of the blockade runners were British vessels. On January 20, 1862, the British blockade runner *Andrietta* incited a ruckus along the outer bay. Union vessels sighted the ship en route to the bay, forcing the British crew to ground and abandon their ship near Fort Morgan. Union forces tied ropes to the ship in an attempt to seize it, but a Confederate cavalry attack drove them away. Later, the Union returned and was able to seize *Andrietta* (Bergeron 1991:118).

The story of *Andrietta*, however, was not typical of blockade runners, according to Bergeron (1991:124), who found that most of the attempts at blockade running into Mobile were successful due to the weakness of the Union blockade in the area for most of the war. The *Florida*, a blockade runner under the command of Captain John Moffitt, provides an example of a successful mission (**Figure 16**). Bound from Havana to Mobile with armament for the Confederates at Mobile, the ship survived gunfire from USS *Oneida* when it drew near the bay and successfully reached Mobile. Another blockade runner, the *Alabama*, made at least five successful voyages from Mobile before it was captured at Chandeleur Island in September 1863 (Bergeron 1991:119-124).

A variety of vessel types were utilized for blockade running, including locally-owned sloops, schooners, small steamers, and riverboats. Many of the early blockade-running steamers were large, deep-draft British merchant ships that were suitable for transatlantic crossings between Europe and the South. Eventually, most of the larger transoceanic steamers began the practice of offloading supplies to sleeker, faster, and shallower-draft steamers in Bermuda, Nassau, or Havana. The British and Confederates sought fast steamers designed for coastal mail and passenger service to complete the journey from these neutral island towns to commercial

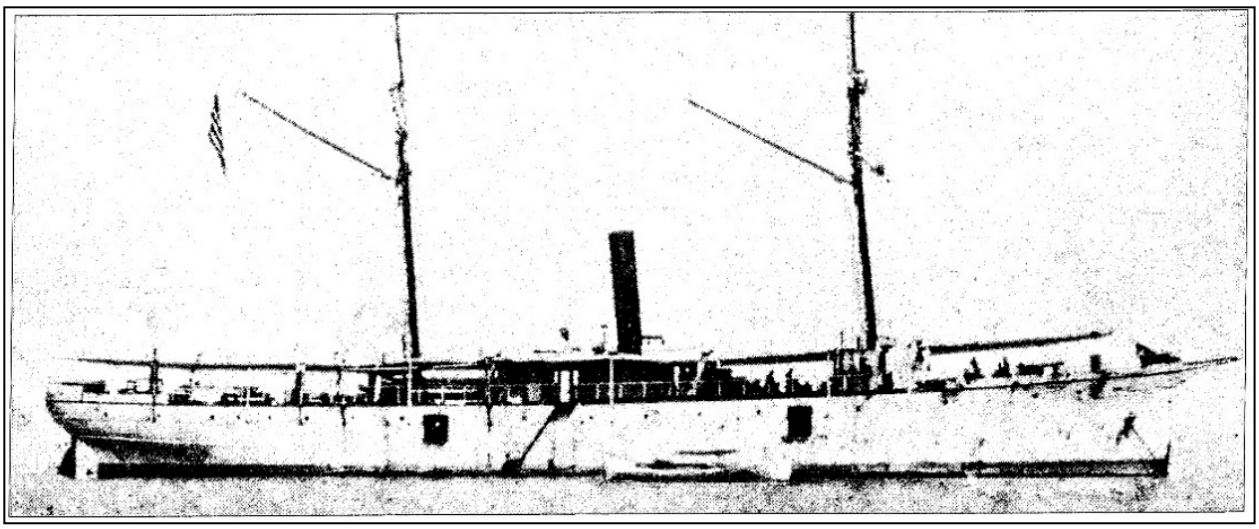

Figure 16. Blockade runner *Florida* (US Naval Historical Center, adapted from Konstam 2004:10).

centers in the South (Watts 1988:217). The 55-m (182-ft), side-wheel coastal paddle steamer *Denbigh* (built by Laird and Sons and operated by the North Wales Steam Packet Company) is an example of a repurposed English steamer operating in the Gulf of Mexico. The *Denbigh's* first blockade run was to the Port of Mobile. She tallied a total of seven trips in and out of Mobile Bay in 1864, the final of which was the last run by any blockade runner out of Mobile Bay (Arnold et al. 1998). The portrait in **Figure 17** is dated July 29, 1864, and depicts *Denbigh* running the blockade of Mobile Bay with a full cargo of cotton; in the distance, a Union blockading vessel fires a shot.

Figure 17. *Denbigh* running the blockade (private collection 1864, adapted from The Denbigh Project [Arnold et al. 1998]).

As the war progressed and vessels were captured or shipwrecked, British shipyards produced purpose-built steamers for blockade running, such as the 65-m (214-ft) steel side-wheel steamships *Banshee* and *Banshee II*, built in Liverpool. The *Banshee* became the first steel ship to cross the Atlantic Ocean. Great Britain increased its production of vessels in order to take advantage of the lucrative business of running the blockade. By December 1864, the US consul at Liverpool stated that nine-tenths of vessels engaged in blockade running were owned by Englishmen and were built and outfitted in England by Englishmen with English capital (Watts 1988:218).

The Confederate Ordnance Department began commandeering, purchasing, and operating blockade runners beginning in 1862 in an effort to circumvent lofty British freight rates. Steamers were renamed and many painted dirty white or dark colors for camouflage. Charles Morgan's Southern Steamship Company relinquished 12 of its Gulf of Mexico steamers in 1862 to Confederate privateering and blockade running. Individual Confederate states also began operating their own vessels or purchasing a percentage of interest in ships owned by commercial firms (Watts 1988:219). The first three blockade runners out of Mobile Bay—*Alabama, Cuba,* and *Fanny*—were locally-owned vessels (Young 2008).

The *Alabama* and *Fanny*, along with the aforementioned *Denbigh*, were part of a stable of blockade runners employed in running cotton and supplies between Havana and Mobile (Arnold et al. 2001:232). In August 1863, private blockade running was forced to sacrifice for the Confederacy when commanders, including those at Mobile, were instructed that all private blockade runners must allot one-half outward cargo space to the Confederacy (Watts 1988:219). Blockade runners made daring attempts to enter and exit the bay, but the US Navy's effort was largely successful, and the once-booming port was cut off from trade. Admiral David Farragut led a Union naval expedition against Mobile in August 1864. The resulting Battle of Mobile Bay was the last major naval engagement of the Civil War and a Union victory (Bergeron 1991:18).

The port of Mobile was in no condition to participate in trade in the months following the Union takeover. After Union forces captured the bay, one of the first steps the new government took was to officially close the port to foreign trade. In truth, foreign trade had practically ceased due to the blockade. In May 1865, a fire destroyed the wharves at Mobile after an ordnance depot exploded, further increasing the poor situation of the port. The closure of the port was not lifted until after the war in August 1865 (Amos 1990:118).

Defense of Mobile

This discussion places the Mobile River in the broader context of the Civil War on Mobile Bay. Obstructions played a crucial role in Confederate control of the bay throughout the war and are considered an archaeological signature of the Ironclads Survey Area focused on CSS *Huntsville* and CSS *Tuscaloosa*. This discussion also details the post-war effort to remove the obstructions.

Early War Years, 1861–1862

Early in the Civil War, the Confederate States of America mounted an intensive effort to develop a defense of Mobile that lasted through the duration of the war. The Confederate Congress formed its own Corps of Engineers in March 1861 and sent a string of officers to Mobile to oversee the work. President Jefferson Davis first assigned Major Daniel Leadbetter to Mobile to improve and develop defenses. In August, Captain Samuel E. Lockett replaced Leadbetter. The focus of improvements in this early period of the war was on building works to protect the city and water batteries to protect the channels of the bay. Fort Morgan and Fort Gaines, which guarded the main channel into Mobile Bay (Mobile Pass), were key defenses and subject to improvement. The forts were built in 1821 and 1834, respectively. Neither had sufficient weaponry; therefore, additional guns were installed in them (Bergeron 1991:7-10). Another entryway into the bay passed between the northwestern side of Dauphin Island and the mainland at Cedar Point. Confederate engineers considered the area, known as Grant's Pass, poorly defended. They developed a battery named Fort Powell in 1862 on the mainland side of this pass and took other defensive measures in the area (Bergeron 1991:52).

After the brick forts of New Orleans and Savannah performed poorly against the Union Navy in 1862, the Corps of Engineers at Mobile believed that the forts alone could not protect the harbor. They expanded their harbor defense plan to include solid obstructions and floating mines (Irion and Bond 1984:62-63). Captain Charles Liernur, who replaced Lockett as Chief Engineer, initiated the plan to install obstructions on Mobile Bay in the spring of 1862. One of his first projects was to load vessels with brick and sink them near a shallow area of the channel known as the Dog River Bar. The Confederacy purchased the proposed vessels in mid-May, and by the end of June, they had been placed. A gap was placed where the channel flowed through the area to allow Confederate vessels and blockade runners to navigate. In an emergency, this gap could be closed by sinking barges and brick-filled flats (Irion and Bond 1984:68; von Scheliha 1868:189). Near the sunken vessels, the Confederates developed batteries that could rain shots on an enemy ship that found itself trapped (Irion and Bond 1984:63-65; von Scheliha 1868:189-190).

By July 1862, the occupation of New Orleans and the overall Union effort to control the Mississippi River drew the Union Navy's focus away from an invasion of Mobile. Plans for a large-scale invasion of Mobile thus were postponed. Though focused elsewhere, the Union Navy nevertheless maintained some pressure on the lower end of Mobile Bay. They continued the naval blockade and occasionally engaged the enemy. Until August 1864, engagements between the Union and the Confederacy at Mobile were limited to several minor naval skirmishes along the southern part of the bay where it entered the Gulf of Mexico (Bergeron 1991:126-133).

Sand Island, located south of Mobile Point, was the setting of one such engagement in January 1862. The Union had been using the lighthouse on the island to monitor Confederate activities. Confederates, on a mission to destroy the lighthouse, set out from Fort Gaines. The USS *Pembina* was patrolling nearby and opened fire on the Confederates, forcing their abandonment of the mission. A year later, a similar Confederate attempt to destroy the lighthouse was successful (Bergeron 1991:64, 66).

In May 1862, the Union Navy launched a preliminary naval expedition against Mobile. Admiral David Farragut, commander of Union naval forces in the area, ordered his ships, which consisted of a squadron of mortar and gunboats, to place buoys at the mouth of the bay to help guide Union ships for a future invasion. The Confederate guns at Fort Morgan engaged the Union squadron, forcing a vessel aground near the fort. Unable to accomplish their mission due to harassment from the fort, the Union vessels retreated (Bergeron 1991:36-37).

Confederates Expand Defenses, 1863–1864

The Union's lack of attention at Mobile gave the Confederates ample time to expand their defenses around the bay (Bergeron 1991:40-44). By 1863, thousands of Confederate soldiers reinforced the city (Bergeron 1991:74). Defensive positions, established during the opening years of the war, were being updated and maintained. Batteries were situated primarily around the City of Mobile and the entrance to the bay. Renamed in 1863 (new names in parentheses), they included Apalachee Battery (Battery Tracy), Blakely Island/Gindrat Battery (Battery Huger), Pinto Island Battery (Battery Gladden) (**Figure 18**), Floating Battery (Tilghman), Lighthouse Battery (Battery McCulloch), Spanish River Battery (Battery McIntosh), and the fort at Grant's Pass (Fort Powell). The Confederates also expanded their naval force at Mobile by seizing privately-owned vessels and building new vessels. By the

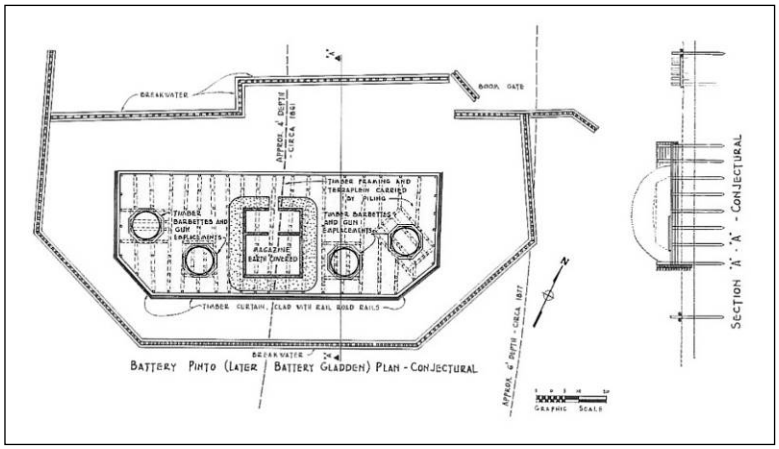

Figure 18. Conjectural sketch of Battery Pinto (Trickey et al. 1986:48).

summer of 1863, two ironclad floating batteries, CSS *Hunstsville* and CSS *Tuscaloosa*, both built upriver at the Confederate Navy Yard and Arsenal in Selma, were operational (Silverstone 2001: 155). Under construction at Selma and Montgomery were two ironclad rams, *Tennessee* and *Nashville* (Bergeron 1991:70; Silverstone 2001:156) (**Figure 19**).

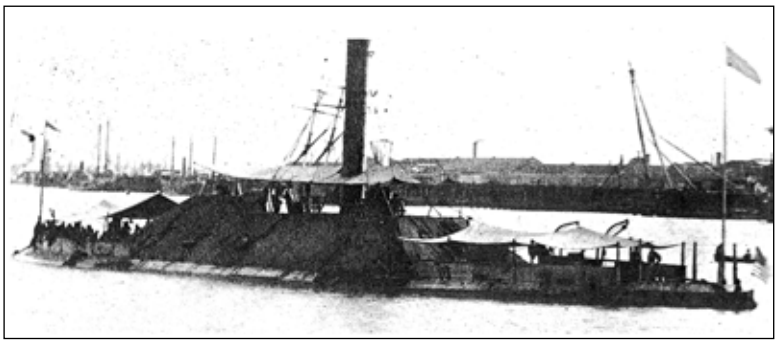

Figure 19. Ironclad ram *Tennessee* (US Naval Historical Center, adapted from Silverstone 1989:208).

Various other types of obstructions were laid at strategic points in the bay in the 1863–1864 period. Nine rows of pilings were placed in the water between the batteries of the upper bay at Choctaw Point, Pinto Island (Battery Gladden), and Spanish River (McIntosh Battery). Also, in this period, the line of sunken vessels at Dog River Bar was bolstered. Rows of pilings were installed that ran north from either end of the line of sunken vessels. Other pilings in the bay were placed in Garrows Bend and on the lower bay at Grant's Pass (Bergeron 1991:52, 66-75; Irion and Bond 1984:66-68). Much of our knowledge on the specifics of the Mobile obstructions comes from the writings of Lieutenant Colonel Viktor Ernst Karl Rudolf von Scheliha. A Prussian serving with the Confederacy, he served as an engineer at Mobile.

Von Scheliha was a key figure in the development of submerged defenses at Mobile (Gray 2004:29; Lonn 1940:177, 363). After the war, he wrote *A Treatise on Coast Defence* (1868), in which he provided rare details of the defenses at Mobile. He extensively discussed pilings, the type of obstruction Confederate engineers preferred "over all others" (von Scheliha 1868:191). The Confederates at Mobile and elsewhere generally used yellow pine for pilings. Von Scheliha (1868) wrote that they were always set with their bark on, and the piles had a diameter from 27 centimeters (cm) (12 inches [in]) to 38 cm (15 in). The pile obstructions were laid in several rows of at least 15 piles apiece and chained together. Some of the piles were capped with iron. Von Scheliha (1868:194) also wrote that railroad iron was used for pilings. Fort Powell, located on Grant's Pass, was one of the sites where Confederate engineers used railroad iron for pilings. The railroad iron piles were installed in early 1864 to supplement other piles that had been installed earlier. The railroad iron piles were laid in a *cheval-de-frise* style that featured sharpened stakes driven at right angles into logs (Bergeron 1991:90). Regardless of the material, the gaps between the rows of piles were to be filled with heavy materials such as brick or stone that were held on flats until needed. A drawback of this type of pile formation was that they blocked the natural channel, creating a new and swift channel. Also, they sometimes injured ships other than those of the enemy. At some point during the war, the Confederate gunboat *Selma* accidentally ran into such pilings, severely damaging the vessel (von Scheliha 1868:192-193) (**Figure 20**).

Further describing the use of pilings, von Scheliha described the process of laying them. Although pile-drivers were available under normal circumstances, another method employed

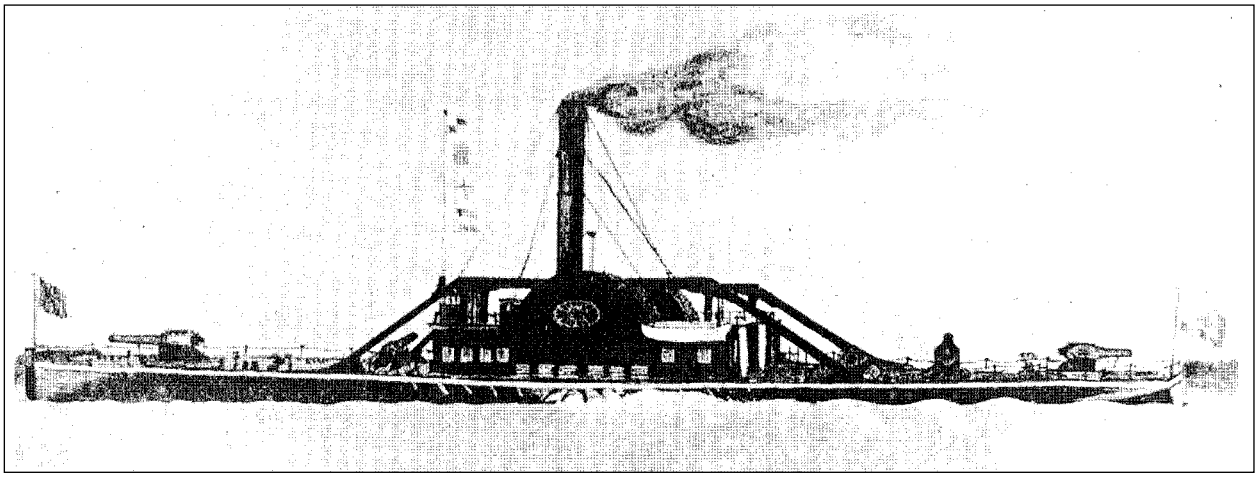

Figure 20. Gunboat *Selma* (US Naval Historical Center, adapted from Silverstone 1989:236).

offered greater expediency. A 2-in hose was attached to the boiler of the steamboat that carried the piles. A valve allowed one to control the steam pressure in the hose, which had a nozzle at its unattached end. The pile was attached to the nozzle, and the steam pressure pushed away the water and mud, allowing the pile to be inserted into the bottom. This method allowed the Confederates at Mobile to set a "whole line of pile-obstructions" in "incredibly short time" (von Scheliha 1868:191-195). The steamboat *Natchez* was used in this manner to set some of the pilings around the bay (Irion and Bond 1984:66).

Confederate engineers received a valuable defensive tool in May 1863: torpedoes. Torpedoes of the period were stationary mines that floated on or below the water surface (**Figure 21**). Filled with gunpowder, they exploded on contact with ships. They had recently been used in the Mississippi River near Vicksburg and also in Charleston. The Confederates installed the deadly weapons at various points in the bay. At Grant's Pass, they installed nearly a dozen. Others sites where they were placed included the Spanish River Battery and the Apalachee and Blakely Rivers (Bergeron 1991:66-75).

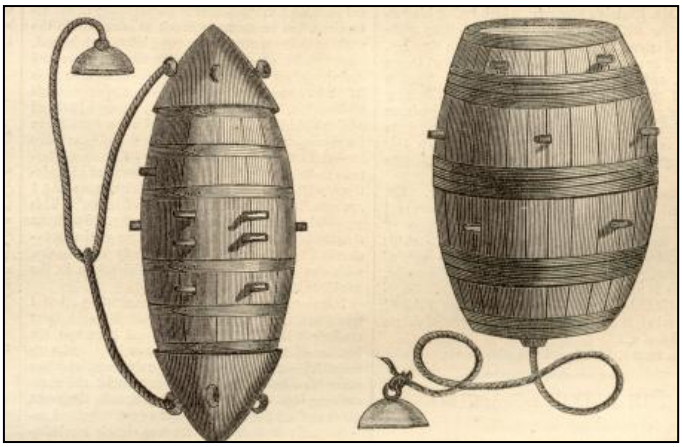

Figure 21. 1865 illustration of Confederate 60-pound charge (left) and 100-pound charge (right) torpedoes that were used on Mobile Bay (*Harper's Weekly*, April 29, 1865).

In January 1864, von Scheliha was promoted to Chief of Engineers at Mobile. One of his goals as Chief was to strengthen defenses at Mobile Pass. There, he ordered the installation of a floating rope obstruction that ran across a shallow area between the eastern tip of Dauphin Island to the edge of the deep main channel. The rope obstruction consisted of rope entwined with large wooden blocks, a simple setup that could entangle the wheels of a steamer. Von Scheliha also ordered the installation of cheval-de-frise-style pilings, but these fell apart in short

time (Irion and Bond 1984:69). These obstructions at the lower bay left open the main channel into the bay. The Confederates needed this opening to allow blockade runners to use the bay. Moreover, the main channel off Mobile Point and Fort Morgan was too deep to obstruct with piles or sunken vessels. Von Scheliha, however, was concerned that the channel needed better protection. In June 1864, he ordered torpedoes to be installed across part of the channel. A buoy marked the end of the torpedoes (Irion and Bond 1984:70-71; von Scheliha 1868:104-105). Also, in early 1864, von Scheliha devoted attention to the obstructions of the upper bay. He ordered the expansion of the battery at Pinto Island (renamed Battery Gladden) and the battery at Spanish River (renamed Battery McIntosh). These batteries were crucial to protecting the sunken vessel obstruction at Dog River Bar. Von Scheliha also ordered the improvement of batteries at Choctaw Bluff and Oven/Owen Bluff on the Tombigbee as well as Battery Tracy on the Apalachee River and Battery Huger on the Blakely River (Irion and Bond 1984:70-71).

The Union Invades, August 1864

By the summer of 1864, the Union had the upper hand across the South and was finally willing to launch a full-scale attack on Mobile. Rear Admiral David Farragut of the US Navy, the famed victor of the naval attack on New Orleans, was to lead the initial thrust against Mobile by gaining control of the Gulf entrances to the bay—Grant's Pass and, most importantly, the main ship channel through Mobile Pass. His plan was to silence Forts Gaines and Morgan, which protected Mobile Pass, and also to silence Fort Powell on Grant's Pass. Once in the bay, his force of ships would destroy the Confederate Navy that protected the bay. Simultaneous to the naval invasion, Union ground troops would land and proceed against the forts (Bergeron 1991:138; Friend 2014).

On August 5, Rear Admiral Farragut made his push into Mobile Bay through Mobile Pass (**Figure 22**). Consisting of 14 wooden gunboats and four monitors, his force faced the guns of Forts Morgan and Gaines, a torpedo field, and the Confederate Navy. The gunboats were *Oneida, Galena, Ossipee, Itasca, Monongahela, Kennebec, Lackawanna, Seminole, Port Royal, Richmond, Metacomet, Hartford* (Farragut's flagship), *Octorara,* and *Brooklyn.* Farragut ordered the wooden gunboats to be joined in pairs with the strongest ships on the side closest to Fort Morgan. The iron-plated monitors (*Chickasaw, Winnebago, Manhattan,* and *Tecumseh*)

Figure 22. 1864 illustration of the US Navy invading Mobile Bay (*Harper's Weekly*, August 20, 1864).

led the way. At the front of the line was *Tecumseh*. As the Union ships pressed through the pass, Forts Morgan and Gaines opened fire, but did little damage. The Union vessels returned fire. Within 45 minutes, Farragut's vessels had made it through the pass. Approximately 170 Union sailors were lost in the action of breaching the pass, compared to less than half that number of Confederate troops in the forts. Still, this turn of events was disastrous for the Confederates. Engineer von Scheliha resigned as Chief of Engineers, although he remained on duty in Mobile, as Lockett replaced him (Bergeron 1991:139-141).

Amazingly, the Union lost only two ships in breaching the pass, and neither loss was owed to the firing from the forts. The monitor *Tecumseh*, which led the pack, struck a torpedo and sank within minutes. The surviving crew was picked up by other vessels, but an estimated 120 men perished (von Scheliha 1868:122). Later, Union sailors commented that many a torpedo failed to ignite. The other loss was the side-wheel steamer *Philippi*, which struck a shoal on the west edge of the channel. The crew abandoned ship, and the Confederates burned it (Bergeron 1991:139-140).

Once through Mobile Pass, Farragut and his squadron faced the Confederate Navy under Buchanan (**Figure 23**). The Union ships overwhelmed the Confederate ship *Gaines*, forcing the crew to beach the vessel near Fort Morgan. Other Confederate vessels, *Morgan* and *Selma*, retreated after a brief engagement with their overwhelming enemy. The *Morgan* hid under the guns of its namesake fort and eventually reached Mobile City. As the *Selma* attempted to run up the bay, the gunboat *Metacomet* gave chase. A deadly exchange of gunfire ensued until the Confederates surrendered the ship. With these ships in retreat or otherwise disabled, the Confederate naval force consisted only of the ram *Tennessee*. Aboard was Buchanan. The vessel fought against the large Union naval force for an hour until Farragut's guns rendered it inoperable, and the *Tennessee* surrendered (Bergeron 1991:140-141). Bergeron (1991:150) attributes the Confederate Navy's defeat at Mobile to the inferior size of its fleet, which in part was a consequence of the state of incompletion of the ironclad *Nashville* and the two floating batteries CSS *Huntsville* and CSS *Tuscaloosa*.

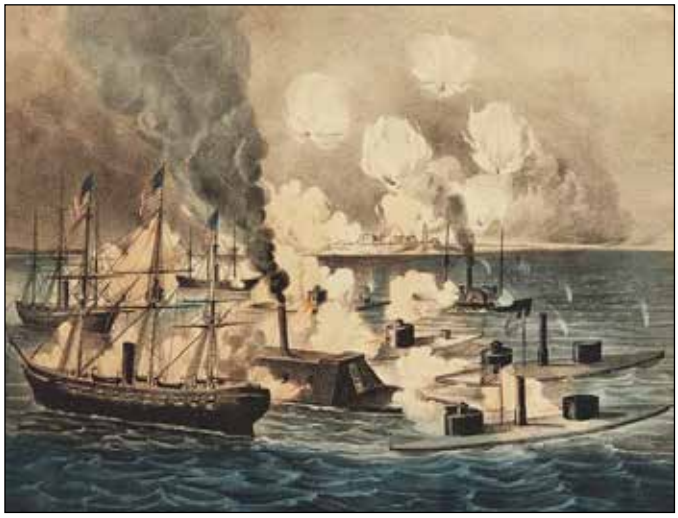

Figure 23. Ca. 1864 lithograph illustrating Union monitors and sloops at battle with Confederate ships and the ram CSS *Tennessee* near Mobile Pass. Fort Morgan is illustrated in the distance (Library of Congress).

While Farragut fought through Mobile Pass on August 5, seven gunboats in the Gulf and nearly the same number in Mississippi Sound protected the landing of the Union infantry on Dauphin Island. This force eventually won the surrender of Fort Gaines (Bergeron 1991:138). Also, a brief engagement at Grant's Pass ensued. The Confederates were overcome by their enemy

and abandoned Fort Powell (Bergeron 1991:146). Fort Morgan was the last remaining Confederate stronghold on the lower bay. Union ships besieged the fort beginning on August 9. In the meantime, Union ground troops were landed to the east of the fort and pushed against it. The Union also turned the guns of the captured Confederate ram *Tennessee* against the bastion. By the end of August, Fort Morgan had surrendered, and the Union unquestionably controlled the mouth of Mobile Bay (Bergeron 1991:149-150).

With a large Union force anchored in the lower bay, the Confederates at Mobile hastily made last-minute preparations to deflect a final invasion that seemed inevitable. All available men, military and civilian, were called to duty. The remnants of the Confederate naval force, now under the command of Ebenezer Farrand, stood on the ready. Farrand opted to put the floating batteries CSS *Huntsville* and CSS *Tuscaloosa* into service despite the fact their iron plating was incomplete. The ironclad *Nashville* and the gunboat *Morgan* filled out the force (Bergeron 1991:153-154).

The Confederates at Mobile felt that now was the time to close the gap in the sunken vessel obstructions at the Dog River Bar. In doing so, they hoped to prevent a naval invasion of Mobile. On August 7, Brigadier General E. Higgins ordered *Phoenix*, an ironclad floating battery, to be sunk in the gap (**Figure 24**). When sunk, the vessel not only closed the gap, but could double as a battery. The Confederates' plan was nearly ruined when a covert Union mission loaded powder kegs aboard the vessel and blew off the upper deck. Von Scheliha, who had objected to the use of the *Phoenix* for anything more than an obstruction, then ordered the vessel burned to the water line (von Scheliha 1868:190). Apparently, the *Phoenix* was not broad enough to close off the channel at Dog River Bar, so flats loaded with brick were towed to the site and sunk in August 11 (Irion and Bond 1984:78).

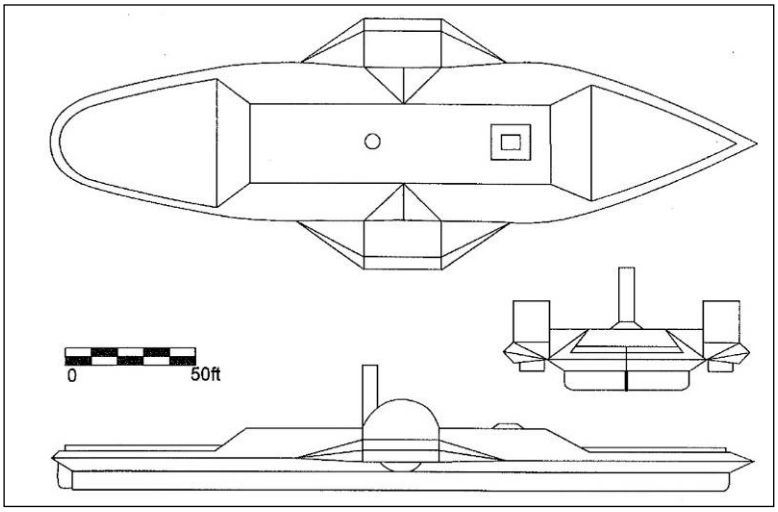

Figure 24. Nashville class hull design, which included the *Phoenix* (Holcombe 1993, adapted from Ball 1998:55).

On August 15, 10 days after his force had blasted through Mobile Pass and secured the lower bay, Farragut ordered a reconnaissance of the obstructions near the City of Mobile. When his ships went up the channel, the Confederate vessel *Selma* opened fire on them, pushing the Union back. Nevertheless, the Union had gained enough information to know that the channel into Mobile was completely obstructed and impassable. The obstructions in the channel had effectively deterred a full-scale naval attack on the City of Mobile. Nevertheless, the Union was

determined to bring the city to its knees and would launch a land campaign in 1865 (Bergeron 1991:156).

The Fall of Mobile, 1865

Between August 1864 and March 1865, the Confederates at Mobile had yet another window of time to improve and expand the defenses around the city and in the bay. Through September, the Confederates also worked to further obstruct the various rivers at the upper bay with pilings and torpedoes. On September 29, the Union received a report that 3,000 to 5,000 slaves "were laboring incessantly night and day upon [Confederate] fortifications, sinking flats, scows, and every species of craft to be obtained, across various channels." Some of the bricks had been obtained from the rubble of the Mobile courthouse, which had burned earlier in the war (Irion and Bond 1984:78). It is unclear if the sinking of flats pertained also to the sunken vessel obstructions at Dog River Bar.

Despite the Confederate's preparations, the Union made only light raids and feint attacks in this period. In January 1865, the Confederates initiated a new, yet short-lived, weapon of war—the torpedo boat *St. Patrick*. The vessel was completed at Selma, Alabama, in 1864 and sent to Mobile. The vessel was equipped with an extra-long spar on the bow to which a torpedo could be attached. The *St. Patrick* skirmished indecisively with the Union vessel *Octorora* in January, but never again saw action. Bergeron (1991:169-170) believes the vessel was destroyed.

By January, General Ulysses S. Grant in Virginia and General William Tecumseh Sherman in Georgia had won important victories, leaving Mobile as one of the last Confederate strong points in the South. With the Union Navy unable to gain control of the upper bay and thus strike at the City of Mobile, the Union Army closed in on the environs of the city from the north and the east. Confederate troops held strong against their enemy's pressure, but gradually lost ground. The east bay stronghold of Spanish Fort was the first to fall to the Union. In April 1865, the fighting moved northward to the eastern shore stronghold of Blakely. Here, the Confederate Navy ships *Huntsville*, *Nashville*, and *Morgan* assisted Confederate ground troops, although Blakely ultimately fell to the Union on April 8. By this point, the City of Mobile did not have the power to withstand a pitched battle against Union forces, having sent many of their men against the outskirts of town. The Confederates decided to abandon the city (Bergeron 1991:165-190).

In the course of abandoning the city in early April 1865, the Confederates took numerous actions to stall the incoming flood of Union forces. Admiral Farrand of the Confederate States Navy chose to scuttle the floating batteries CSS *Huntsville* and CSS *Tuscaloosa* in the Spanish River at its intersection with the Alabama River north of Mobile (Irion and Bond 1984:84). The remaining vessels, including *Morgan* and *Nashville*, proceeded up the Tombigbee River. The Union troops moved into Mobile on April 12, finding the batteries and other fortified locations abandoned. By this time, General Lee had surrendered at Appomattox Courthouse in Virginia, and the Civil War was over (Bergeron 1991:191-192).

OBSTRUCTION STUDY AND REMOVALS

The Civil War left behind Union vessels sunk by mines and Confederate vessel scuttled intentionally within the bay and nearby rivers, including CSS *Tuscaloosa* and CSS *Huntsville*, both located just south of Twelvemile Island in the Spanish River (Merrill 1866). The obstructions, whether pilings or sunken vessels, were a hindrance to navigation on Mobile Bay for many decades after the Civil War. Numerous US Army Corps of Engineers (USACE) projects aimed to clear the obstructions around the bay to prevent accidents. Irion and Bond (1984) found that several vessels were damaged in the October 1865 through February 1866 period. In this period, the steamer *Jackson* sank, but was recovered. Other damaged vessels included the schooners *Lady Delight* and *Hermit* and the steamers *Annie* and *Lizzie*. Another steamer, *Annetta*, was destroyed after hitting the obstructions. Certainly, the injuries continued into later years.

Colonel W. E. Merrill's Study

For Mobile to emerge from the ashes of war, maritime traffic needed to pass freely through the bay. Less than a year after the war's end, the USACE sponsored a study of the obstructions around Mobile and the best way to open the harbor. In 1866, Colonel W. E. Merrill, Captain of Engineers, conducted a survey of Mobile Harbor and its environments for obstructions, in consultation with Lieutenant Colonel von Scheliha and other ex-Confederates. In February 1866, he presented maps and reports on the condition of the harbor and waterways, along with a cost estimate for removal of the obstructions (**Figure 25**). The types of obstructions included pilings, torpedoes (mines), and wrecks. While he covered the waters around Fort Gaines and Fort Morgan, he wrote an area of importance was the junction of Spanish and Mobile Rivers. His report stated:

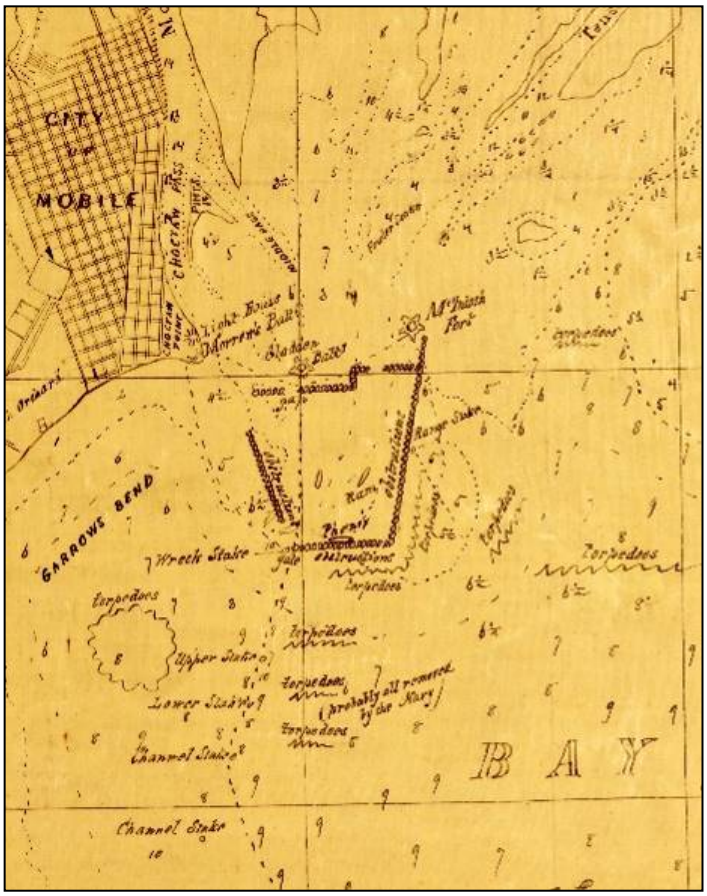

Figure 25. Merrill's map of Mobile Bay's obstructions (Merrill 1866).

> These are two sunken iron-plated rans and gunboats, the Huntsville and the Tuscaloosa. They are plated with 4-inch iron, are casemated, are 120 feet long,

> draw 9 feet of water, and are armored with two Brook's rifled 32 pounders, and two 42 pounders a piece. They are sunk with guns and machinery aboard and with additional filling (Merrill 1866:2-3).

Merrill felt they would be difficult to raise, but their armor, machinery guns, and hull are valuable. His estimate was $10,000 to remove them from the river. He went on to describe the outer line of obstructions, upper and inner line of obstructions, and torpedoes. Merrill felt the only way to clear the outer line of obstructions consisting of pilings and wrecks, filled with building debris, was to blow them up and remove the material with a dredge. The upper and inner line of obstructions, including an ironclad battery and pilings, would be easier to deal with. Finally, all the torpedoes (mines) from Mobile Bay should be cleared. Merrill's total cost including the CSS *Huntsville* and CSS *Tuscaloosa*, equaled $91,208 (Merrill 1866:3-4).

RECONSTRUCTION

The Civil War impacted Mobile and much of the South by leaving the region and its populations in economic ruins. In the years following the war, Mobile attempted to revive the once-booming cotton trade, but as the years passed, cotton production declined in the Black Belt. Mobile's business community sought to diversify and organized a Board of Trade that focused on importing coffee from Latin America. Though the venture did not last, it extended a trade relationship that flourished as the nineteenth century progressed (Kirkland 2012).

The Civil War's influence was not only felt on land with the destruction of buildings, infrastructure, and amongst families and friends, the shoreline and river highway were greatly impacted. Shipwrecks, obstructions, and shoaling hampered commercial navigation, slowing maritime traffic. A major issue that stifled post-war trade in the port of Mobile was the condition of the bay. The port was inferior in comparison to New Orleans and Pensacola. The bay was littered with abandoned Confederate obstructions that hindered navigation. Additionally, the channels of the bay were not deep enough to accommodate the largest of ships. The USACE took on the clearing of the waterways and installation of breakwaters, jetties, and levees to stabilize the harbor, an effort that continued for decades. In the 1880s, USACE conducted an extensive dredging project that deepened the ship channel to 5.1 m (17 ft) by 1886 and 7.0 m (23 ft) by the end of the decade, allowing deep-draft vessels to dock at Mobile's port (Kirkland 2012). The need to lighter cargoes at Mobile Point had been eliminated. River improvements along the Tombigbee and Alabama systems contributed to the growth of commerce. Mobile became one of the largest importers of Latin American fruit and coffee in this period. Shipbuilding also grew in the late nineteenth century (Amos 1990:120-121).

Despite the negative effects from the war, the year with the highest receipts and total value of cotton moved through Mobile, between 1847 and 1883, was 1865–1866 totaling almost $89 million (Land 1884:29). As the railroads infiltrated Mobile and the surrounding area, the dependence on maritime transportation to move cotton and timber declined. By 1882–1883,

the total value of cotton at Mobile was only just over $15 million (Land 1884:29). A more regional approach was taken to get cotton from field to factory that was less dependent on inland river routes and Mobile as a key receiver and trans-shipment point. A movement to coal, iron, and steel replaced the agricultural products with tugs/towboats and barges replacing the floating palaces [steamboats] of the nineteenth century. The system of locks and dams up river allowed more traffic to flow in places previously too dangerous. The USACE opened the Gulf Intracoastal Waterway between 1936 and 1943, spurring on barge traffic to a new level. Cotton production never regained the dominant position it once held. This position instead was held by lumber, which served both the domestic and foreign market (Amos 1990:119-120).

Inland steam navigation continued to hang on into the early twentieth century despite the development of railroads. Sternwheel steamboats, along with towboats and barges, provided a viable connection between Mobile and upriver ports upriver, including Selma, Claiborne, and Montgomery (**Figure 26**). They were a big draw to wealthy planters and merchants who desired a luxurious way to travel. An interesting model the steamboats followed was that due to the variable river depth, there were "winter" and "summer" steamboats that had different drafts to be able to navigate in high or low water. A steamboat owner might need two boats to make a year-round profit. One example of this success was the Quill Line of steamboats along the Alabama River operated by Captain John Quill at the beginning of the 1870s through 1900s. He eventually merged with a competitor and was later known as the People's Line. Steamboats associated with Captain Quill included the *Mary*, *John Quill*, and *Nettie Quill*. A typical trip for the steamboat *Mary* from Montgomery to Mobile in 1876 consisted of 775 bales of cotton, 15 sacks cotton seed, freight, and passengers (*The Mobile Daily Tribune* 1876). The newspaper article went on to brag about the *Mary*'s elegant and comfortable staterooms and magnificent saloon suitable for special ladies and gentlemen to take passage in. The next generation of notable Mobile-owned steamboats fell under Captain Owen Burke. He ran several vessels under the Burke Packet Company along the Mobile-Tombigbee river system, such as *Capitol*,

Figure 26. A waterfront scene at Mobile with sternwheel packets, from left to right: *American, Mary S. Bleus*, *City of Mobile*, and *John Quill*, ca. 1910 (http://digital.library.wisc.edu/1711.dl/LaCrosseSteamboat).

Sunny South, *Helen Burke*, and *Burke Jr* starting in the 1910s (*The Montgomery Advertiser* 1949).

LUMBER AND RAILROADS

Naval stores, coal, wool, fish/oysters, and the lumber trade replaced cotton starting in the 1880s as the dominate drivers in the Mobile economy. The time period between the end of Reconstruction and into the 1920s was one of revival and transition tied to new opportunities and exploitation of the region's vast timber resources. Freed slaves and ex-plantation owners faced a new reality of changing social and political conditions. The agrarian way of life had been replaced by the industrialized economy, and a new market sought extractive activities. The lumber market, with small upfront capital that needed a lot of unskilled labor available, was a perfect fit to revitalize the South. There was certainly a lumber industry prior to the Civil War, but it was locally driven for shipbuilding and building purposes. The Mobile River Delta, comprised of the Alabama and Tombigbee Rivers, was home to a large supply of pine (long leaf, shortleaf, and loblolly), cypress, willow, and black gum. The Alabama River provided easy access for lumberman to move the cut trees down to Mobile where they were processed at sawmills and shipped on. Logs or timbers were tied together to form rafts and ferried downstream. A majority of lumber from Mobile was for the export market, particularly in Latin America. Southern yellow pine was one of the key species harvested along the Alabama River. It was well suited for structural uses when long lengths and strength was required, such as railroad ties and mine strengthening timbers (Massey 1960).

The lumber industry was supported by locally-owned and -operated shipping fleets with many of them engaged in the lumber trade with large multi-masted schooners (**Figure 27**).

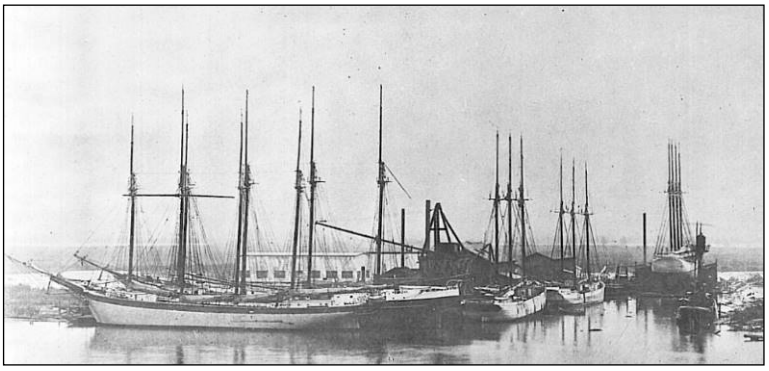

Figure 27. Three- and four-masted schooners at Mobile, ca. 1900 (Mistovich et al. 1983:49).

At the turn of the nineteenth century, iron and steel shipbuilding commenced in United Kingdom shipyards. By the mid-nineteenth century, the more advanced shipbuilding techniques expanded to other European and American yards, replacing wooden vessels with larger, stronger vessels capable of deep-ocean carrying, especially with larger bulk cargoes. While this shipbuilding revolution was global, much of it centered in the United Kingdom, as it had the industrial capacity; while American yards, with an abundance of natural timber, continued to focus on wooden ships, especially schooners, which includes the Twelvemile Island Wreck. Beginning in the 1860s and especially after the 1880s, steel replaced iron, and large sailing vessels, colloquially termed "windjammers," emerged to represent the

twilight of sail on ocean cargo routes. As the end of the line for commercial sail, these ships were employed heavily in bulk trades—grain, lumber, phosphate, coal, guano, and other low-value freight were shipped where capacity, not speed, was required. The construction heyday of windjammers lasted through the early twentieth century, and a number remained in use through the first half of the century, although many had vanished from global shipping routes by the 1930s (Gibbs 1987).

A large number of these vessels were employed in the Gulf, and a certain number regularly sailed from Mobile, either under charter or, in time, purchased to form fleets, such as that of lumber merchant James J. Feore & Company of Mobile in the World War I period. Feore's fleet of 23 vessels, starting in 1918, included seven iron- and steel-hulled windjammers. Feore, of Irish descent, had been born in Quebec, moved to the United States and settled around Pascagoula. The family business was lumber, with the men initially working as stevedores and expanding into shipping. They had followed the lumber business from the St. Lawrence to the Gulf and to benefit from the late nineteenth-century Southern Pine boom in the lumber trade.

At the same time, the Whitney/Bodden family, also from Mobile, ran 20 lumber schooners between 1913 and the 1920s, and the Scott Brothers owned a fleet of six lumber schooners from 1914 to 1924 (Feore 2018). Yellow pine exports were a mainstay of Mobile's exports. In 1916, during a five-week period in February/March, the port shipped out more than 1,828,800 m (6,000,000 ft) of lumber with 16 cargoes for Cuba, totaling 1,432,519 m (4,699,868 ft) of lumber. Other ports receiving a majority of the lumber were Spain, Puerto Rico, and Martinique. Wales, England, and Ireland also received large amounts of timber and crossties from Mobile during that period *(The St. Louis Lumberman* 1916:65).

The growth of railroads as a means of transportation was drawing business away from the port. The businessmen of the port worked to compete with railroads. They also harnessed the political power necessary to attract federal dollars that would improve their bay (Kirkland 2012). Maritime traffic on Mobile Bay began a sharp decline during this period as the railroad decreased the need for maritime shipping, and navigation improvements eliminated lightering and further funneled vessels into a narrow transportation corridor. Deeper-draft three- and four-masted schooners, ships, steam-driven steamships, and tugboats became a regular sight docked at the Port of Mobile. Commercial and recreational fishing became the dominant maritime force outside of the navigation channel. Vessels employed in this endeavor, however, likely remained the same as those utilized for lightering—small, shallow-draft luggers, skiffs, sloops, and schooners with some small, steam-powered vessels. Perhaps steam-powered and, later, gasoline-powered launches also ferried supplies, people, and mail around the bay.

EARLY TWENTIETH CENTURY, WORLD WAR II, AND POST-WORLD WAR II

One of the most important events of the early twentieth century on Mobile Bay was World War I (1917–1918). The war caused a general demand for lumber, steel, and other products

that flowed out of Mobile (**Figure 28**). The war also expanded the shipbuilding industry of the bay that had its roots in the nineteenth century. In 1916, several small dry-dock companies combined to form the Alabama Dry Dock and Shipbuilding Company (ADDSCO), which would be a fixture on the bay for decades to come. During World War I, the federal government awarded the company several shipbuilding contracts that were aimed at increasing the national Merchant Navy. The company had yet to complete the necessary facilities for such projects; therefore, only one vessel (the freighter *Banago*) was completed during the war period. Nevertheless, the company hired thousands to take on the work. Pinto Island was the site of the main facility. After the war, in the 1918 to 1921 period, the functionality of the company was reflected in its production of 50 ships (Kirkland 2012).

Figure 28. Large square-rigged ships and tramp steamships along the Mobile water front at the turn of the twentieth century (Mobile Seamen's Bethel, Mobile Public Library).

The post-World War I era brought new energy to the port of Mobile. In 1919, Mobile businessmen John Waterman, Walter Bellingrath, and C. W. Hempstead founded Waterman Steamship Corporation, a shipping company that would become one of the largest in the world and an economic driver. The company influenced the expansion of port facilities. In addition, the State of Alabama established docks at Mobile in 1922 on a 202-ha (500-ac) site north of the city's waterfront (Kirkland 2012).

In the late 1920s and 1930s, the port of Mobile was a gateway for the industries and natural resources of Alabama and the adjacent region as far north as Indiana. A 1938 description of the port read:

> Through this gateway, iron and steel industries of the Birmingham district receive raw material and ship manufactured products, while timber from the forests is rafted and barged to the port for shipment beyond, either directly or after manipulation into the form of lumber manufactures (Board of Engineers for Rivers and Harbors 1938:160).

The vast majority of commerce, foreign as well as domestic, was outgoing. For the 1927 to 1936 period, the percentage of exports was estimated at 91 percent. The comparatively small import percentage (9 percent) consisted primarily of fertilizer and ore by volume. After these, bananas, molasses, iron and steel, sugar, paper, and manufactures also made up a considerable volume of incoming cargoes. Foreign imports arrived from the Caribbean, South and Central

America, and Europe. Mobile's massive volume of exports primarily consisted of lumber and lumber manufactures. Cotton and cotton manufactures, petroleum, iron and steel manufactures, and coal were exported in nearly equal numbers. Other exports included naval stores and grain products. Exports were principally bound to the United Kingdom, followed by eastern European countries, South America, and the Mediterranean (Board of Engineers for Rivers and Harbors 1938:129-130).

Mobile had extensive waterfront facilities by the 1930s. There were 55 piers, wharves, and bulkheads at the port (Board of Engineers for Rivers and Harbors 1938:35). The western, or city, shore of Mobile continued to be the main wharf area of the bay. More than 6,096 m (20,000 ft) of wharves and piers, stretching from the mouth of the Mobile River to Three Mile Creek, were located here. Railroads and private interests occupied half of these facilities. The City of Mobile's 470-m (1,542-ft) wharf lay on the west side of the Mobile River between Dauphin and State Streets. Rail facilities at the city wharf allowed for quick transfer of incoming and outgoing cargo. Between Poe Street and Three Mile Creek, the Alabama State Docks Commission had completed three piers and a marginal wharf that handled 600 tons per hour. An industrial canal connecting One Mile and Three Mile Creeks, in addition to transfer tracks, expedited the landing of freight. Blakely Island, 1.6 km (1.0 mi) north of Mobile on the east side of the river, was the site of a coal and ore handling plant and a US Shipping Board fuel-oil station, both of which had extensive wharves (Board of Engineers for Rivers and Harbors 1938:2-5).

Five railroads connected with the port: the Southern Railway System, Louisville and Nashville Railroad, Mobile and Ohio Railroad, Gulf Mobile and Northern Railroad, and Alabama Tennessee and Northern Railroad (Board of Engineers for Rivers and Harbors 1938:73). Thirty-seven steamship lines served the port, including 31 that operated internationally, two in the intercoastal trace trade, and four in the coastwise trade (Board of Engineers for Rivers and Harbors 1938:87). A Quarantine Station was located on Sand Island below the mouth of the Mobile River near the ship channel. Mobile also had a Marine Hospital, operated by the Public Health Service, on St. Anthony and Bayou Streets (Board of Engineers for Rivers and Harbors 1938:2-5).

After the lumber industry's decline by the 1930s due to overharvesting, it was replaced by naval stores as a key Mobile export product. In 1940, turpentine, resin, and gum barrels sat in the holds of one third of all ships leaving Mobile (Federal Writers Project 1941:207). When the United States entered World War II in December 1941, Mobile was poised to become a bastion in the shipbuilding effort of the war. More than 200 ships were built on Mobile Bay during the war period. Port facilities expanded at an unprecedented pace. ADDSCO received extensive federal contracts to build and repair ships. The company employed nearly 30,000 workers midway through the war. Their output included 20 Liberty ships and 102 oil tankers. The company refitted some 2,800 vessels (Kirkland 2008b).

State and federal projects aimed at enhancing the port of Mobile and regional shipping took place in the 1970s and 1980s. The State of Alabama constructed a $16 million coal terminal on

McDuffie Island in 1971. The state also invested $45 million into the expansion and improvement of its docks. Also, between 1971 and 1984, the federal government spent $2 billion to construct the Tennessee-Tombigbee Waterway, also known as the Tenn-Tom, a 376-km (234-mi) man-made waterway that provided the Tennessee River with an outlet to the Gulf of Mexico via Mobile. Coal and timber were the main products shipped along the waterway (Kirkland 2012).

In recent decades, Mobile has held the position as one of the top 10 largest ports in the United States. Coal, aluminum, iron, steel, lumber, wood pulp, and chemicals feature prominently in its imports and exports. The State Docks, to cite one example, shipped 23 million tons of material from Mobile in 2010. Shipbuilding continues to be a strong industry. The bay also continues to be the site of a large coal terminal (McDuffie Island). A US Coast Guard training facility is located on Little Sand Island. For several years, the Choctaw Point Container Terminal has been under development. The terminal is intended to transport at least 75,000 containers yearly, contributing significantly to the growth of the port of Mobile (Kirkland 2012). Commercial fishing vessels continued the transition in the twentieth century to gasoline- and diesel-powered motors. Sail- and steam-powered vessels were converted, and vessels out of the shipyards were equipped exclusively with internal combustion engines. Hulls were constructed of wood, iron, and steel.

MOBILE RIVER SHIPWRECKS SURVEY AREA

The Mobile River, passing by Twelvemile Island, is only one part of a larger network of inland waterways known as the Mobile-Alabama-Coosa River system. This 72-km (45-mi) river system runs from Mobile Bay, at the mouth of the Gulf of Mexico, up through Alabama, Mississippi, Georgia, and Tennessee. Twelvemile Island, given its name since it is 19 km (12 mi) from Mobile Bay's mouth, sits at the intersection of Mobile River and Big Bayou Canot. The earliest reference to Twelvemile Island by name in a newspaper occurred in 1843 during an article about hunting a panther (*The Times-Picayune* December 17, 1843). The navigable channel flows around the island's western side following Bayou Sara while the Mobile River continues along the eastern side, but is too shallow to be used for commercial river traffic.

Twelvemile Island is an uninhabited island that sits 8.8 km (5.5 mi) north of Mobile along a transportation route that has been utilized for hundreds of years. Mobile's position as a center of industry, commerce, and shipping would not have occurred without its easy access for steamboats coming downriver with raw commodities and the ability of oceangoing sailing and steamship to carry those products out to the larger markets.

In the nineteenth century, Twelvemile Island's western channel was chosen to be the preferred navigational waterway and has since been maintained for river travel through dredging and snag clearings, a position it still keeps today. Department of Commerce records indicate the first navigational light at Twelvemile Island's was installed in 1918 (Department of Commerce

1918:590). While Twelvemile Island's eastern channel has not historically or not presently used for commercial navigation, it was nonetheless a key part of the river's use during the industrial area. The environmental location of the channel, and its relatively shallow river depths, would become an eventual disposal site for old vessels nearing or at the end of their working lifespan. This disposal process is referred to historically as a ships' graveyard and is similar to that of a junkyard for automobiles.

Refuge from Storms

Historical sources reference Twelvemile Island for a variety of reasons, but the most numerous is related to its position as a place of refuge from storms. Between 1901 and 1948, newspaper stories mention many occurrences of vessels heading up river to Twelvemile Island or behind Twelvemile Island to ride out bad weather. In 1933, the water depth in the lee shore of the island permitted vessels drawing less than 4.2 m (14 ft) of water a place to shelter (Secretary of War 1933:18). The types of crafts known to anchor there included a tug, steamboats (like the eastern shore steamers *Apollo* and *Daphne*), "bay boats," and "small boats" (*Tuscaloosa News* 1917). Two strong storms in September 1906 (**Figure 29**) and 1917 provided reporters with an account of shipping headed up river for shelter.

Figure 29. Historic postcard showing some of the aftermath of the Great Storm of Sept. 27, 1906. Souvenir Post Card.

> This afternoon and tonight there was a general exodus of river steamers, tugs, yachts and launches for the creeks and twelve mile island, and north on Mobile rive, where safe haven is assured (*The Montgomery Advertiser* 1906).
>
> Taking advantage of the first warnings of the approaching hurricane, shipping sought a safe place behind Twelve Mile Island. There every manner of craft from big pile drivers, barges and bay steamers down to the tiniest motor boats rode through to safety, swinging from the end of mammoth hawsers made fast to large trees on the river banks. So many craft tied up to the island that is resembled a large port (*The Montgomery Advertiser* 1917).

In September 1948, the tugboat *James B. Cobb* beached itself on Twelvemile Island after high water from a storm pushed it ashore. The Coast Guard rescued two of its crew after it filled with water (*The Montgomery Advertiser* 1948). The island sat only slightly above mean tide, except in the bayous; therefore, any vessels affected by usually high storm tide was susceptible of being left high and dry when water receded.

Excursions and Recreation

During historic times, Twelvemile Island was also viewed as a destination for the general public for river excursions, fishing, hunting, and recreational pursuits. The island's scenic beauty allowed Mobile's residents an escape from the city to refresh and take in the natural world. Several examples chronicling the use of the area for relaxation are present in the historical records. The oldest newspaper story found during this study refers to the hunting of a large panther by Mobile resident Chas. Perry Esp. in December 1843. The big cat weighed 350 to 400 pounds (*The Times-Picayune* 1843). In 1906, Mr. And Mrs. Harry Ingo honored Mrs. Coleman of Mobile by organizing a trip for 20 of their friends on the tug *Zoe* to see the sights of the Mobile River up to Twelvemile Island (*The Montgomery Advertiser* 1906). Shortly after, Mr. and Mrs. A. S. McDonald, Mr. and Mrs. J. F. Autry, and Mr. J. I. Jones accompanied Miss Gertrude Howell of Mobile on a boat ride up the river as far as Twelvemile Island, where they landed and enjoyed refreshments (*Wilcox Progressive Era* April 8, 1915).

In February 1922, Mr. W. H. Brown ran a trip for the Methodist church in Fairhope onboard the steamboat *Bay Queen* to Mobile and Twelvemile Island. Fairhope, located southeast of Mobile on the bay, was a smaller fishing town, so the trip permitted its citizens a chance to go shopping and lunch in "the city" with the proceeds going to the church's M. E. Parsonage Fund. The "grand excursion" was also marketed to people in Daphne, situated across the river and slightly south from Mobile (*Fairhope Courier* 1922a, 1922b). In more recent years, sportsmen visited the waters around Twelvemile Island for recreational fishing purposes. The commonly caught species in the area were flounder, redfish, bream, bass, bluegills, shellcrackers, and shrimp (*Mobile Register* 1971, 1976).

Lumber Trade

Beginning in the eighteenth century, flourishing in the nineteenth century, and continuing well into the twentieth century, the lumber business thrived along the Mobile River. This industry produced a number of naval stores, including timber and wood products rendered from pine trees, such as resin, tar, and turpentine. In the mid- to late nineteenth century, these activities were not large-scale industrial enterprises partly due to the undefined river channel. While this channel would have provided shallow-draft barge access to small-scale facilities, such as stands of pines being tapped for resin, it was not ideal for larger vessels (Gamble 1921; Outland 2004). By the late nineteenth century, large-scale logging and lumbering, involving railroads and mills, necessitated a well-defined, deep channel that the USC&GS determined in 1888 should be the western channel around Twelvemile Island.

The only report of activity directly on Twelvemile Island references a man cutting cross ties for the Hieronymus Brothers in 1894 (*The Daily Picayune* 1894). When Twelvemile Island was surveyed as a possible navy yard in 1918, the report stated that the 364-ha (900-ac) island contains 1,737,360 m (5,700,000 ft) of gum and cypress trees (US House of Representatives 1918:190). It is not until 1948 that the island is again linked to the region's lumber trade. In

July of that year, the S. B. Adams Lumber Company of Mobile purchased Twelvemile Island from Mark S. Porter and Hazel F. Porter for $125,000. The island contained heavy stands of trees with no buildings or improvements (*The Montgomery Advertiser* 1948). The lumber company owned large amounts of land in Mobile and Baldwin County, along with a mill and warehouses just north of Mobile (*The Tennessean* 1928). The company is also noted for being a furniture grade hardwood lumber manufacturer (Smith 2008:208).

Specifics about how Twelvemile Island was used or who owned the land in the nineteenth century are vague, but the prominent Meaher family of Mobile have been connected to Mobile River Delta since around 1836 and are still presently one of the largest land holders in the area. Captain Timothy Meaher, along with his father, James, and brothers, James M. and Patrick, moved from Maine and became involved in the maritime trade, plantations, lumbering, and the sawmill business. In 1859, their sawmill cut 609,600 m (2,000,000 ft) of lumber and 1,200,000 shingles (De Bow 1859:81). The family business, JM & T Meaher, included a landing along the Mobile River, Meaher's Wharf, where their products were loaded onto schooners and steamboats (Neville 1964). The Meaher's owned several steamboats and shipped cargoes between Mobile and Montgomery along with being a successful shipbuilder. Timothy is most associated with the *Clotilda* as the originator of a bet with its captain to illegally import slaves from Africa. Historical records suggest Timothy kept 30 of the *Clotilda* slaves for use on his own plantation, located 5 km (3 mi) north of Mobile near present-day Africatown (O'Meagher 1890:176-177).

"Meaher Marker"

The prominent Meaher family of Mobile has property adjacent to the Mobile River Shipwrecks Survey Area along Mobile River's eastern channel, marked with a red cement marker labeled "Meaher." Google Earth aerial imagery shows two buildings along the river near Jim's Creek dating back to 1998. By 2001, only one building is left. In 2018, a building, smaller out buildings, and cement marker is present along the water's edge (**Figure 30**) (Delgado et al. 2018). Property tax records for Baldwin County indicate the land is owned by Chippewa Lakes, LLC, a land holding company of the Meaher family (Baldwin County Revenue Commission n.d.; Murtaugh 2011). The Meaher family is linked to *Clotilda*'s story throughout the vessel's entire lifespan. Timothy Meaher, a wealthy slave-owning planter and steamboat captain, built the schooner *Clotilda* and remained its owner through its destruction near Twelvemile Island by Captain Foster. The historical and current ties of the Meaher family to the area provide an important part of the region's maritime cultural landscape and the *Clotilda* story.

Navy Yard Survey of 1918

In 1918, a Congressional report on siting a proposed navy and submarine base discussed Twelvemile Island as a possible location. It noted that "the river channel on either side of the island is used by the river craft with ample water at all seasons" (US House of Representatives 1918:190). It clarified that "the channel has never been dredged … so that the approaches are

Figure 30. Meaher property (left) and marker (right) adjacent to the Mobile River Shipwrecks Survey Area.

shallow" and recommended the site not be considered given its distance from the city and the "undredged channel ways" (US House of Representatives 1918:55). The western channel, "swampy," as the 1918 report suggests, and without high banks, was navigated by small and shallow draft vessels. These were likely seeking access for fishing, hunting, or the harvesting of the bordering forest as part of Alabama's forest products industry. The wetlands around Twelvemile Island were one of many locales in which these industries operated. Evidence of this is provided in the historic name of the river tributary Bayou Sara, which at one time was known as Sawmill Creek (Alabama Department of Environmental Management 2003:33).

Oil and Gas Exploration

The most recent newsworthy happenings near Twelvemile Island deal with the oil and gas exploration by Chevron Oil Company in 1975. The USACE issued a permit for dredging a 243-m (800-ft) long by 60-m (200-ft) wide by 2.4-m (8.0-ft) deep rectangular cutout on the island's eastern river channel for a self-contained inland drilling barge (*Mobile Register* 1975). The barge drilled a well into the swamp to look for petroleum reserves with a set maximum depth of 5,562 m (18,250 ft) (Chevron Oil Company 1975; *Mobile Register* 1976). The results of the drilling are unknown, but Chevron's findings did not result in any further work. The indentation in the swamp made by the dredging and drilling operations are visible today (**Figure 31**).

Lay Up and Disposal Site: A Ships' Graveyard

The waters surrounding Twelvemile Island, not too far from Mobile, but far enough to be out of sight, made it an ideal place to temporarily lay-up, dispose of, or intentionally abandon vessels. With the island's western side designated safe for navigation, the eastern side was left open as a ship anchorage area or graveyard. As seen at other disposal sites through the archaeological record, once vessels began getting left at a particular location, the numbers grew as others followed suit and deposited their derelicts in the same place. In many instances, there is a large timeframe of this disposal activity, which spans tens to hundreds of years, and indicates there might have been a word of mouth on where a suitable place to deliberately discard vessels

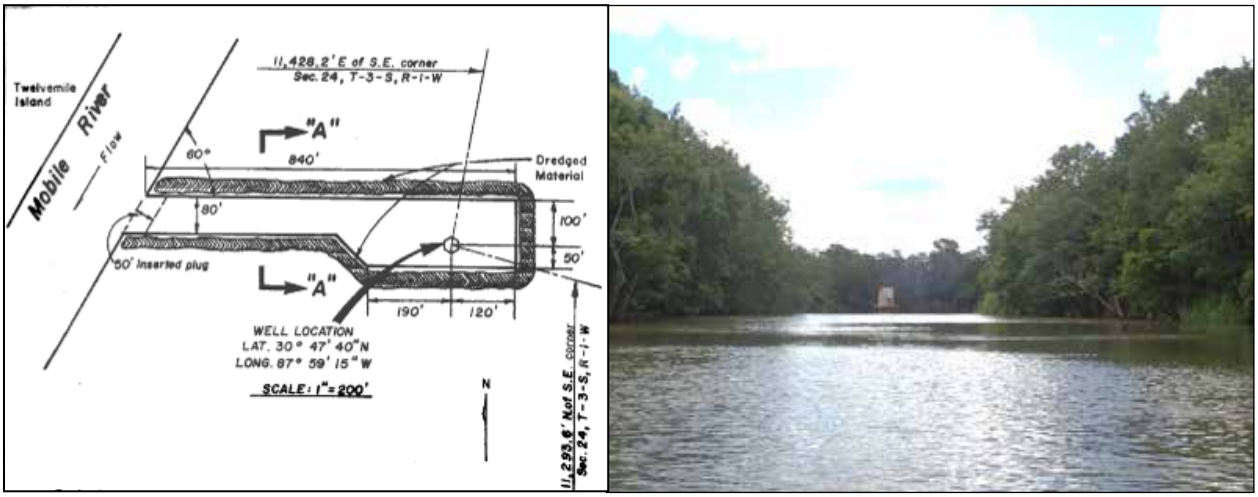

Figure 31. Test well location depicted by Chevron Oil in 1975 (left) and the same area in 2018 (right) (Chevron Oil Company 1975).

might be (Richards and Seeb 2013:2). The image in **Figure 32** is dated 1912 and is reported to be taken near Twelvemile Island. The image documents various vessels at anchor outside of a navigational channel and shows extensive cultural material buildup along the riverbank, both of which are consistent with historical accounts of the area surrounding Twelvemile Island, suggesting that the area has an extensive and diverse maritime landscape.

Figure 32. Photograph (ca. 1912) taken near Twelvemile Island showing a number of vessels in the vicinity (Roche 1914:102).

Between 1860 and the 1930s, newspapers report six instances of vessels being taken to the island to be burned, broken up, or left to decay. These activities are rarely covered in the historical records because the activities are not always legal and people engaged in the actions do not want attention drawn to them. Simply put, it was much easier to move a worn-out vessel up river, pull it up on a marsh or river bank, and leave it at a location than to deal with the logistics and costs of breaking it up. Of all the vessels suggested to be near Twelvemile Island, the most famous is the schooner *Clotilda,* which brought the last known illegal shipment of 110 slaves into the United States during 1860. *Clotilda*'s Captain, William Foster, is reported to have set the schooner on fire and opened the sea cocks to dispose of the evidence of this illegal activity near Twelvemile Island. In addition to the now infamous *Clotilda*, four steamboats or steamships and one lifeboat were also burned or possibly intentionally sunk near Twelvemile Island. These vessels are recorded as the *Northern Light*, *John Quill*, *Burke Jr*., and *Greypoint*. During one instance, three idle Steel Line

steamers were moored at Twelvemile Island when pirates looted them, subsequently stealing $20,000 worth of property and a lifeboat (*Orlando Sentinel* 1926).

The World Wars

During World War I, numerous shipyards and shipbuilding companies, such as the Emergency Fleet Corporation, frantically constructed wooden and composite ships in an effort to offset losses during warfare. At the war's end, the United States found themselves with a surplus of supply vessels that were no longer needed. Mobile's strategic location to the Gulf of Mexico provided an ideal place for excess vessels to be moored and laid up. As a result, more than 60 steamships were moored up the Mobile River at Twelvemile Island's southern end until being scrapped or sold (*Montgomery Advertiser* 1929; Olliff 2008:138).

Mobile River was again called upon shortly after World War II when another fleet of excess vessels were moored there. The "Ghost Fleet" or "Reserve Fleet" were mothballed and moored on the Mobile and Tensaw Rivers waiting to be sold or scrapped (**Figure 33**). During the same time, the sailing training ship *Joseph Conrad* and merchant sailing ship *Tusitala* joined the Mobile River fleet (Mystic Seaport purchased *Joseph Conrad* and *Tusitala* was scrapped) (*Tampa Bay Times* 1946). By 1973, the Liberty ships, freighters, tankers, and tugs were gone with many sunk offshore as artificial reefs. More than 800 vessels passed through Mobile after World War II on the way to a new life (*Mobile Press Register* November 24, 2006).

Figure 33. World War II vessels moored south of Twelvemile Island (Getty Images).

IRONCLADS SURVEY AREA

The confluence of the Spanish River and Mobile River, south of Twelvemile Island, is the location of the wrecks of the scuttled CSS *Huntsville* (1Mb557) and CSS *Tuscaloosa* (1Mb558). The Spanish River begins at Blakeley Island's northern tip where it splits off from the Mobile River and continues north for 13 km (8.0 mi). It has always had a naturally deeper depth and more uniform channel then the Mobile River. The earliest recorded depth of the Spanish River

is 2.4 m (8.0 ft) versus 1.6 m (5.5 ft) over the Mobile River Bar. The deeper water resulted in vessels coming into Mobile Bay, then north up the Spanish River, making a turn back south down the Mobile River to the city's docks prior to government improvements (Sherrill 1913:2).

US Army engineer William H. Chase studied the port to improve navigation in the Mobile River starting in November 1852. He analyzed the build-up of silt and early failed dredging efforts to recommend a new dredging system to meet the demands of the new maritime system. Engineer and scientist Albert Stein countered Chase's view on dredging and felt there was a better way to control the rivers. He charted the waters form the southern tip of Twelvemile Island to Choctaw Point and determined a solution to straighten the channel and regulate water flow by blocking or reducing the flow of the Spanish River and Pinto Pass. With private funding, he helped install more than 1,000 piles into the river bed with alternating layers of brush and wood and brick or ballast stones laid between them. Three jetties were built in three sections, 36 m (120 ft) to 121 m (400 ft) long. One jetty was above One Mile Creek, one at the Spanish River, and one across Pinto Pass (Sledge 2015:170).

During the Civil War, the Spanish River was part of the Confederate network of defensive batteries and fortifications put into place in early 1861. Confederate engineers placed two rows of pile obstructions near the river mouths, but left openings for vessels transiting up the Spanish River and Mobile River. The engineers built artificial islands for Battery McIntosh at the Spanish River's southern mouth and Battery Gladden at the channel's elbow. However, these defensive efforts were not utilized, as Federal forces did not penetrate far into Mobile Bay after the fall of Fort Morgan and Fort Gaines (Sherrill 1913:14). The Spanish River was seen as a strategically important location to further prevent access, and Confederate forces deliberately sunk the CSS *Huntsville* (1Mb557) and CSS *Tuscaloosa* (1Mb558) to block the river and prevent the capture of the vessels by Union troops (see **Figure 3**).

RESEARCH DESIGN

SEARCH developed a predictive model for potential submerged cultural resources within the project areas based on Mobile River's prehistoric and historic context. The predictive model was utilized to help determine the potential for locating historic shipwrecks and structures within the project area, as well as their likely design, composition, and age. The remote-sensing data collected for this project were then processed in a manner that facilitates identifying potential submerged cultural resources. The predictive model provided a historical context for the interpretation of the processed remote-sensing data and a tool to help identify potential submerged cultural resources.

With regard to potential shipwreck sites, SEARCH has improved upon previous remote-sensing data interpretation hypotheses to understand the characteristics that various vessel types and construction ages will produce in the remote-sensing record. SEARCH applied this research to the data collected during the remote-sensing survey, cognizant of those shipwreck types expected in the Mobile River by the predictive model, to determine whether these potential submerged cultural resources exist within the project area. Finally, SEARCH reviewed databases of reported shipwrecks, cartographic records, aerial photographs, secondary sources, and previous maritime archaeological investigations conducted in the region to identify shipwrecks or previously documented magnetic/acoustic signatures potentially indicative of submerged cultural resources. These data were correlated with the current survey data to assist in identifying potential submerged cultural resources.

CARTOGRAPHIC REVIEW

USC&GS' early efforts to chart Mobile Bay seldom covered much detail in the survey areas as they fall too far north. The earliest coverage of the Ironclads Survey Area is an 1851 chart showing a preliminary sketch of Mobile Bay (**Figure 34**). Little details are present beside the river's general shape. It was not until 1854 that soundings are printed within the Ironclads Survey Area up to the intersection of the Spanish River and Mobile River (**Figure 35**). The next chart of Mobile Bay in 1856 included more information, but still stopper prior to the Mobile River Shipwrecks Survey Area at Twelvemile Island (see **Figure 35**).

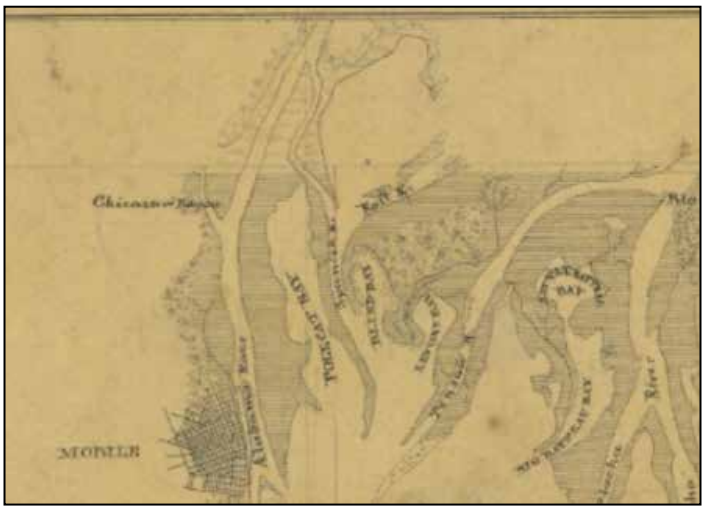

Figure 34. Excerpt from an 1851 preliminary sketch of Mobile Bay showing the Ironclads Survey Area (NOAA's Historical Map & Chart Collection).

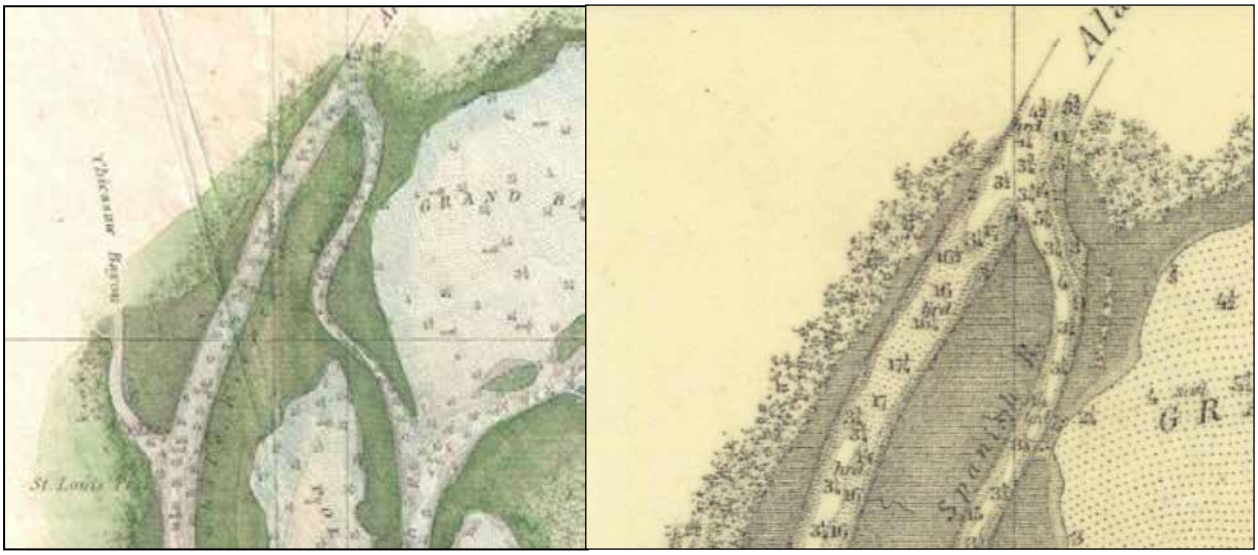

Figure 35. Excerpt from an 1854 hand-colored Mobile Bay chart (left) and 1856 Mobile Bay chart (right) showing the Ironclads Survey Area (NOAA's Historical Map & Chart Collection).

Hydrographic work continued throughout the mid- to late nineteenth century to expand and more carefully triangulate and chart the Alabama River's waters. As early as 1861, the USC&GS' staff had noted that, in the context of the very complex system of the Mobile Bay delta, there was one preferred channel of the Mobile River that was most used for navigation between Mobile and Mobile Bay, and the confluence of the Tombigbee and Alabama Rivers (USC&GS 1862). The Civil War hampered the hydrographic charting operations and expansion of their work up the Alabama River. It was not until after the war's end that survey vessels resumed normal work with the next published chart of Mobile dating to 1877 (**Figure 36**). In 1888, the USC&GS was assigned to map the major navigational channel of the Mobile River system, starting above the lower "main stem" above Mobile, at Twelvemile Island, Mobile River Shipwrecks Survey Area. The assistant in charge of the party was J. Henry Turner. Turner's instructions were to:

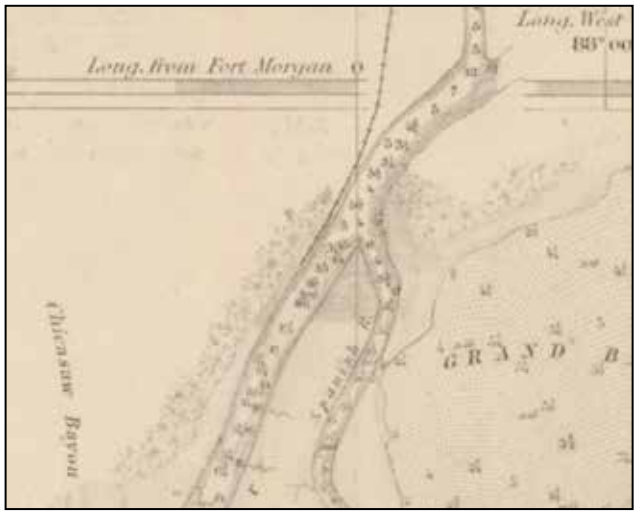

Figure 36. Excerpt from an 1877 Mobile Bay chart up to Twelvemile Island's southern tip (NOAA's Historical Map & Chart Collection).

> Make a rapid survey of that river from the limits of the topographical sheets at Spanish River, near Mobile, up to and including the junction of the Alabama and Tombigbee Rivers. The topography along the river banks only was to be delineated, all the bluffs and their heights being shown, and special attention was to be given to the hydrography (USC&GS 1889a:52).

The survey produced nine original hand-drawn H-sheets ("H" for hydrography), numbered 1909 through 1917, with H1918 presenting the footprints of the nine maps and a Descriptive Report describing the work in greater detail (**Figures 37 and 38**). Turner's hand-written Descriptive Report presents very salient data about the commonly frequented portion of the river system and channels, as well as those that were less often utilized. The report provides insight into the challenges, and in particular, demonstrates that only the western channel around Twelvemile Island was hydrographically surveyed. The eastern channel, locally known as a portion of Big Bayou Canot, was not hydrographically surveyed.

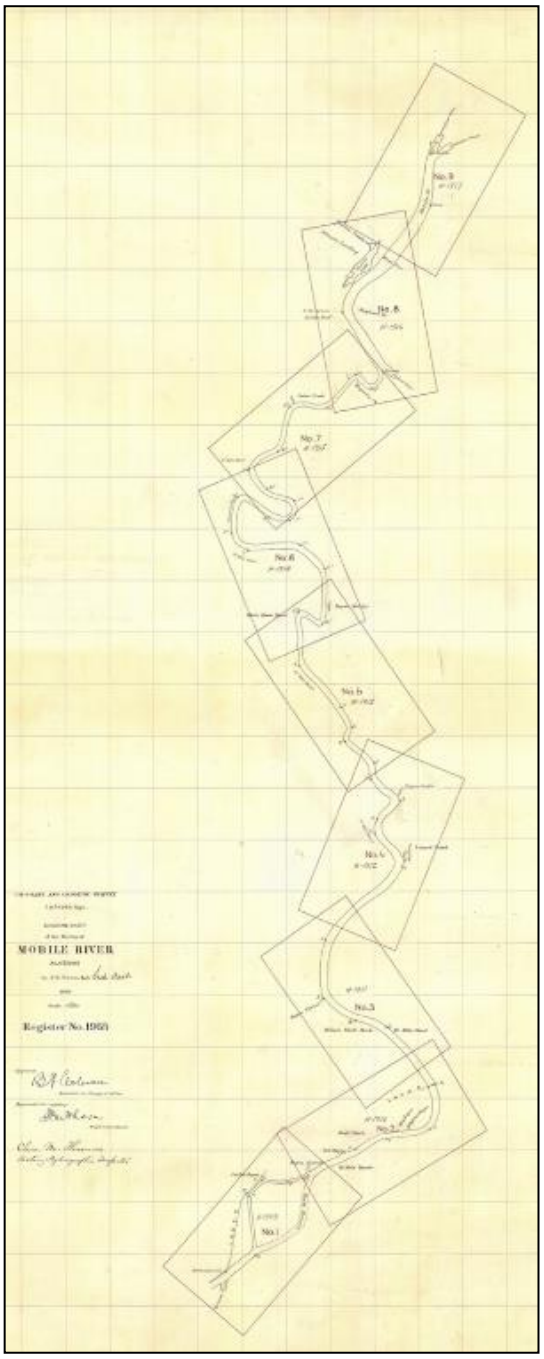

Figure 37. H1918 diagram of the Mobile River surveys (USC&GS 1889b).

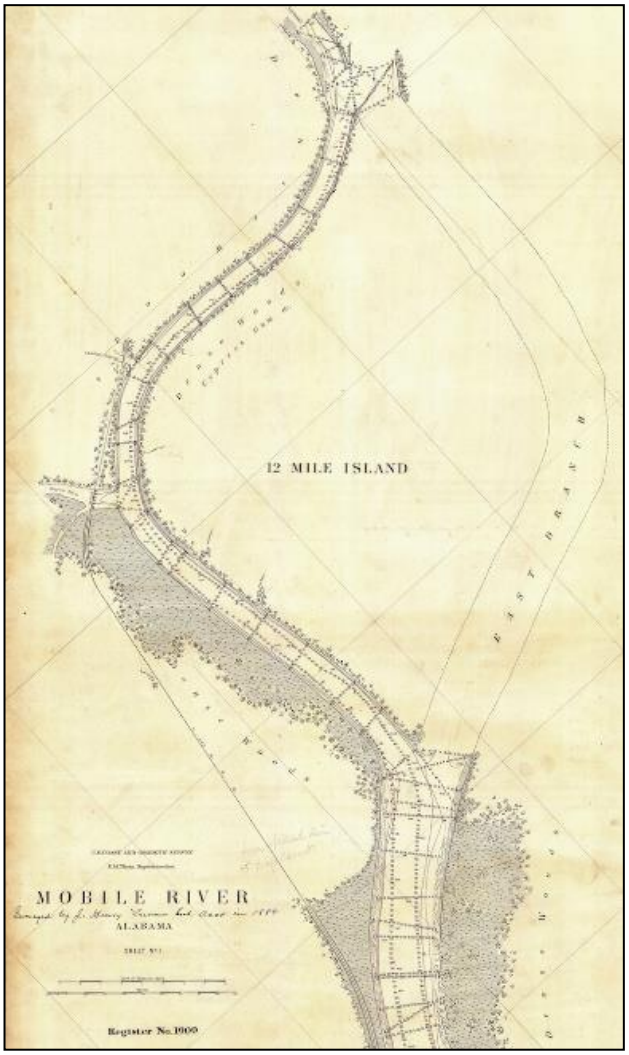

Figure 38. H1909 showing the navigationally-preferred side of Twelvemile Island (USC&GS 1888).

The participation of USC&GS personnel in mapping the Mobile River system ended with the 1888 mapping project. Often, such USC&GS mapping was a prelude to subsequent navigational improvements by the USACE. The USC&GS apparently did not return for additional mapping, and an 1898 Notice to Mariners notes that the Twelvemile Island Chart No. 491 had been canceled (USC&GS 1898:9). The 1889 survey has apparently since served as the effective base for all subsequent charts. Despite extensive research, the team has located no field surveys or notes post-1889 that provide updated data for this section of the river.

Navigational charts of Mobile Bay continued to include only up to the head of Twelvemile Island until the late 1950s. The versions between 1892 and 1958 vary only slightly with what is shown for the Ironclads Survey Area (**Figure 39**). Charts contain soundings information and bottom composition, but little additional details such as wreck locations. With the advent of more accurate seafloor mapping equipment after World War II, the USC&GS was now able to more precisely survey the river bottom. Subsequent charts showed a lot more information about the seafloor, channels, land features, navigational aids, and hazards.

The 1958 nautical chart covers Twelvemile Island, the Mobile River Shipwrecks Survey Area, for the first time within the standard Mobile Bay chart. The Ironclads Survey Area is also included (**Figure 40**). Four sunken wreck symbols are indicated on Twelvemile Island's east channel along the eastern river bank. One is at the southern mouth and the other three are clustered end-to-end a little way to the north. The type of symbol indicates that they are a sunken wreck and not hazardous to surface navigation. No wrecks are shown in the Ironclads Survey Area, but one is located farther south. By the 1966, the wreck symbols have changed, but the location of the sites in the Mobile River Shipwrecks Survey Area have not. Four shipwrecks are depicted, but with a different symbol. The symbol indicated a wreck showing any portion of the hull or superstructure above sounding datum.

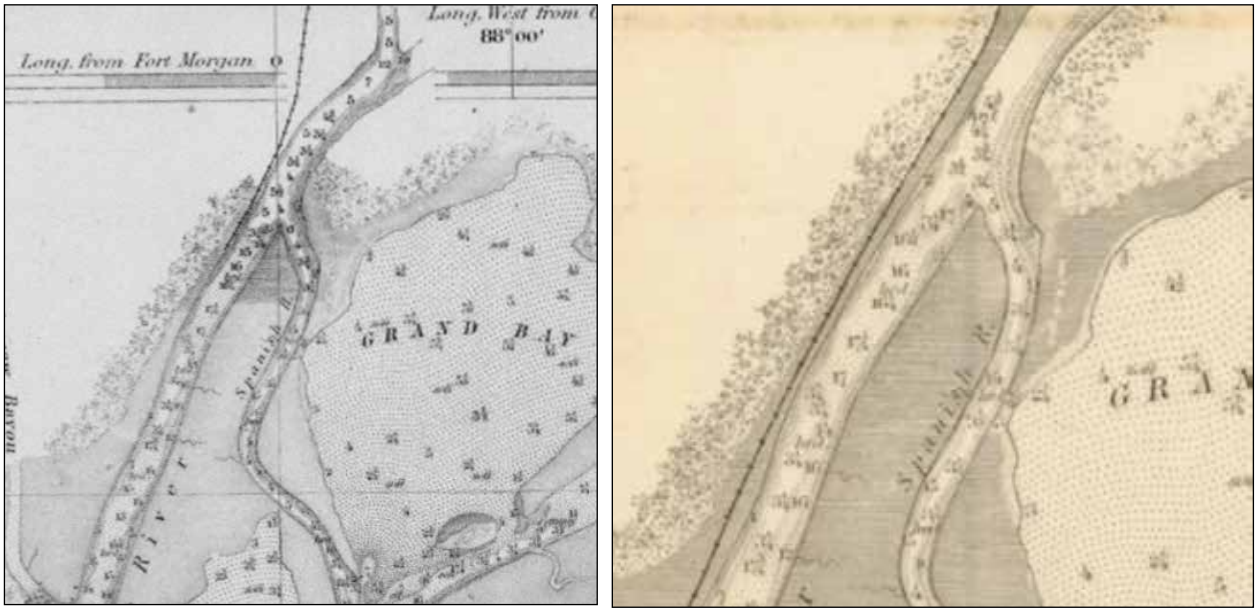

Figure 39. Excerpt from an 1892 (left) and 1917 (right) Mobile Bay chart showing the Ironclads Survey Area (NOAA's Historical Map & Chart Collection).

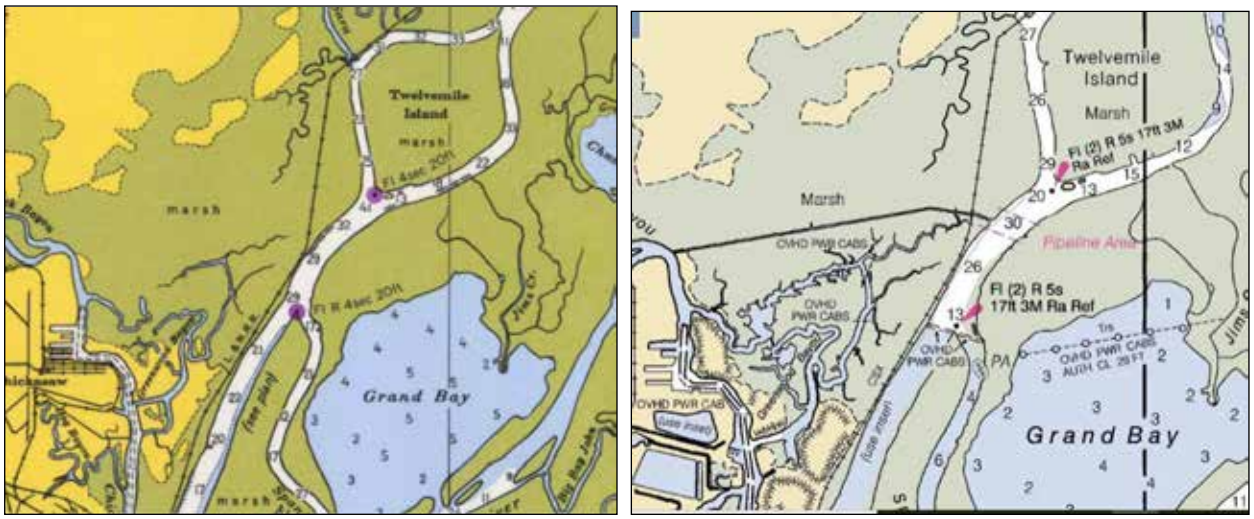

Figure 40. Excerpt from a 1958 (left) and 2001 (right) Mobile Bay chart showing the Mobile River Shipwrecks and Ironclads Survey Areas (NOAA's Historical Map & Chart Collection).

The wreck symbols in the Mobile River Shipwrecks Survey Area remained on the National Oceanic and Atmospheric Administration (NOAA) nautical charts until 2001 (see **Figure 40**). The 2001 chart no longer shows any indications of shipwrecks near Twelvemile Island. It is likely that the wrecks deteriorated to a point that they no longer protruded above the surface and, since that side of the island was not navigable, it was decided that they did not need to include them anymore. The most current nautical chart for the area dates to 2015 and does not show any changes to the environment. The USACE also published charts of inland waters, including the Mobile River. Current Chart Nos. 1 and 2 do not show any wrecks in the survey areas. The electronic chart does not fully cover the Mobile River Shipwrecks Survey Area, but does show several snags in the Ironclads Survey Area (**Figure 41**).

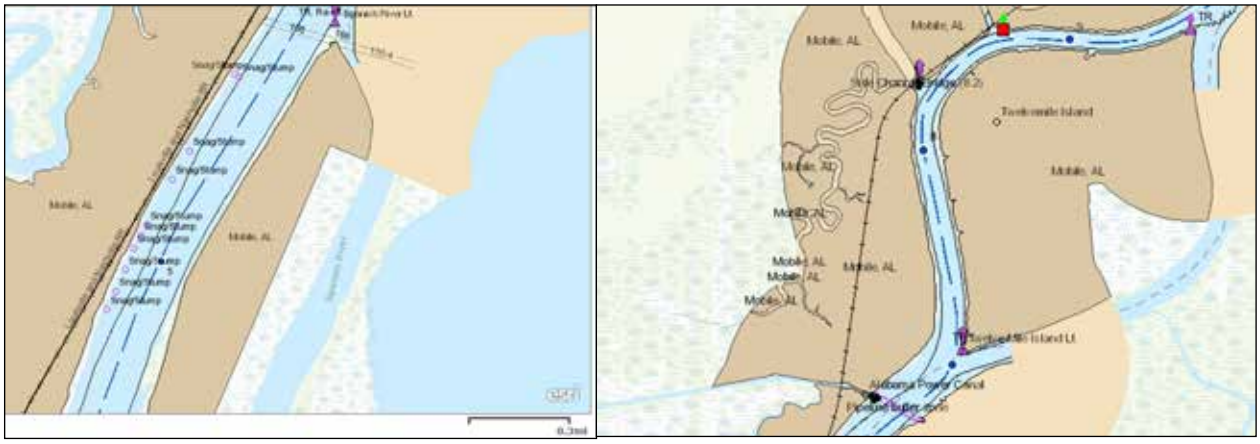

Figure 41. USACE Inland Electronic Chart for the Ironclads Survey Area (left) and the Mobile River Shipwrecks Survey Area (right).

TOPOGRAPHIC MAPS

Mobile River Shipwrecks Survey Area

Topographic maps are available for the Mobile River Shipwrecks Survey Area starting in 1941. Since the survey area bisects two counties, Mobile and Baldwin, a combination of maps is required to see the entire survey area. The first topographic map from 1941 (Creola and Bay Minette) does not indicate the presence of any shipwrecks near Twelvemile Island. It is not until the 1953 maps that shipwrecks are observed along the eastern channel's eastern side (**Figure 42**). The map also shows a cross-shaped clearing that was dredged into Twelvemile Island, which may have been associated with the lumber activities of the late 1940s. The 1953, 1967, and 1974 Chickasaw and Hurricane maps all show the same four shipwreck symbols on the eastern channel's eastern side. These locations roughly coincide with the locations of wrecks observed on historic nautical charts.

The next topographic map from 1982 continues to illustrate four shipwreck locations as with previous years (see **Figure 42**). New features on the map include the boundary of the Mobile Corporation running along the eastern channel, as well as two black dots on either side of Jim's

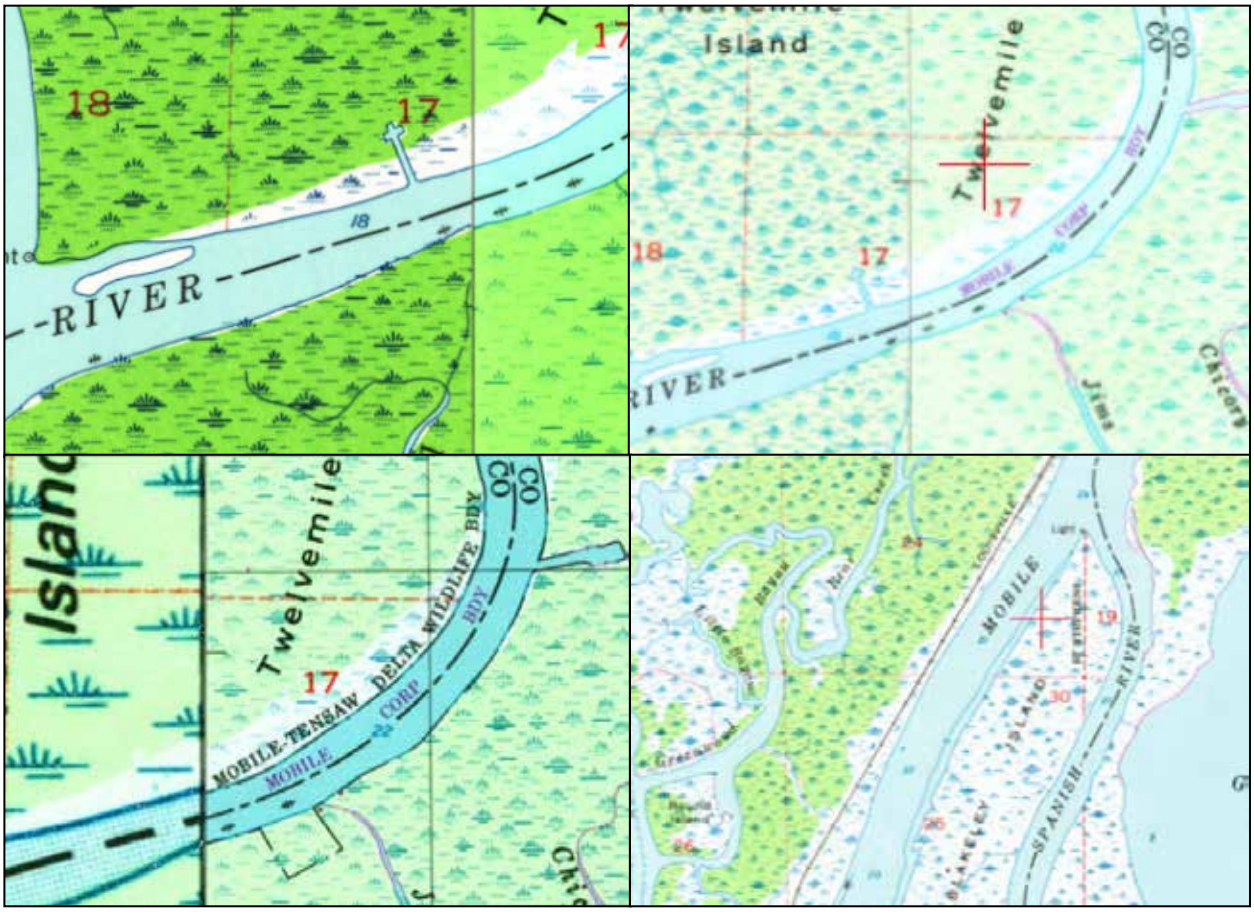

Figure 42. USGS topographic excerpts from Chickasaw and Hurricane, 1952 (top left); Chickasaw and Hurricane, 1982 (top right); Mobile, 1994, and Hurricane, 1997 (bottom left); and Chickasaw, 1967 (bottom right).

Creek; dots represent tanks. The map also shows the dredged area to facilitate the Chevron Oil Corporation's test wells dug in 1975. The last set of older topographic maps date to 1994 and 1997 (see **Figure 42**). The maps show two shipwrecks south of Jim's Creek. The third wreck location is absent, but that map shows less detail than previous versions. The final new feature is a black, box-shaped line just south of Jim's Creek. The line indicates a boundary, but its context is unknown. The current 2018 topographic maps do not show any shipwrecks or other features next to this portion of the river.

Ironclads Survey Area

As with the Mobile River Shipwrecks Survey Area, topographic maps are available from 1941 to present. No shipwrecks or notable features are shown within the Ironclads Survey Areas. The closest shipwreck is documented to the south, appearing on the Chickasaw 1967 edition (see **Figure 42**). It remains on the map through the 1982 version, but is not on the 2018 version.

AERIAL PHOTOGRAPHS

Mobile River Shipwrecks Survey Area

Numerous aerial photographs are present for the Mobile River Shipwrecks Survey Area, a majority of which are archived by the University of Alabama, Department of Geography (2018). This archive has three sets of maps that document the survey area, dating from 1938, 1952, and 1974. In addition, Google Earth has 14 sets of aerial photographs dating from 1997, 2002, 2005–2008, and 2011–2017. These maps confirm the presence of cultural resources and document site formation processes and environmental changes near Twelvemile Island.

The 1938 aerial appears to have been taken at a time of low tide. In the aerial, two shipwrecks are visible next to each other at the southern end of the island's eastern channel (**Figure 43**). A third shipwreck is visible further up along the eastern channel. A 1983 reconnaissance survey of cultural resources noted, "the remains of a number of unidentified, abandoned barges and steamboats … in the lower Mobile River and in Bayou Sara. Other vessels are known to be present" (Wilson et al. 1983:viii). The report also noted:

> Photographs in the University of South Alabama Photographic Archives further indicate the litter of river, bay and ocean vessels and various materials along the sides of the Mobile River… here is probably so much discarded material it will be very difficult to sort it all out, although the remains of some important historic vessels are present (Wilson et al. 1983:34).

The 1952 aerial photograph shows two shipwrecks at the southern end of Twelvemile Island's eastern channel, while the two shipwrecks and one possible shipwreck observed in the 1938 view are no longer visible (**Figure 43**). The 1974 aerial photograph shows five possible

Figure 43. Aerials of Mobile River's eastern channel show potential shipwrecks, 1938 (top left), 1952 (top right), and 1974 (bottom) (University of Alabama, Department of Geography 2018).

shipwrecks or obstructions along the island's eastern channel (see **Figure 43**). Three are clustered together to the north with another one or two to the south. It is unknown if these are moored vessels, snags, or shipwrecks.

The Google Earth aerial photographs begin in 1997 and show shipwrecks along the eastern channel's eastern river bank. The first year to clearly see the vessels is in 2002 (**Figure 44**), where possibly six are present, potentially four barges and two wooden vessels (see **Figure 44**). The vessels continue to appear on the Google Earth photographs, but with each subsequent

Figure 44. Google Earth aerial photograph from 2002 shows several derelict vessels in Mobile River's eastern channel.

year, there are less visible remains. By 2015, there is little to indicate their location as almost nothing sticks up out of the water.

Ironclads Survey Area

The only historic aerial photograph of the Ironclads Survey Area dates to 1950 and does not have visible shipwrecks or obstructions. The more modern Google Earth photographs do not show any shipwrecks, although trees are sporadically located along the river's western bank.

HISTORIC PHOTOGRAPH REVIEW

Mobile River Shipwrecks Survey Area

The earliest known photographic evidence of a shipwreck in what appears to be the Mobile River Shipwrecks Survey Area, at Twelvemile Island, dates to ca. 1912 (Roche 1914) (**Figure 45**). The photograph's caption suggests it to be the remains of *Clotilda*, but further investigation suggests the vessel is most likely that of the Twelvemile Island wreck (1Ba694). Of interest in the photograph, the image depicts a barge to the south, as well as a presumed barge landing delineated by pilings and fill. There are also two oceangoing vessels at anchor in the middle of the river, which suggests the vessels are outside of the navigation channel and may be at anchor along the eastern side of Twelvemile Island.

Figure 45. Historic photograph (ca. 1912) showing remains identified as *Clotilda* (Roche 1914:102).

An undated photograph shows the steamboat *John Quill* in a deteriorated state near Twelvemile Island (**Figure 46**). Historical accounts state that the steamboat was towed to the island in 1929 and abandoned. The photograph likely dates to after 1929, and based on the hull condition, it appears that the vessel has been derelict for some time, as the deck house's planking has either rotted away or was salvaged. It also appears that the machinery was removed, as there is no evidence of the stern paddle wheel or engine.

Figure 46. Steamboat *John Quill* at the lower end of Twelvemile Island on the Mobile River (Alabama Department of Archives and History 2018).

In addition to the historic 1912 photograph, a 1965 newspaper article identifies the remains of a wooden vessel in a photograph as that of *Clotilda* (**Figure 47**). The article reports that the "Rotting Hulk of Schooner Clotilde, last 'slaver' yields museum piece" (*Alabama on the Go* 1965:29). A comparative analysis between the available historic photographs and historic aerials suggest that the ca. 1912 photograph and the ca. 1965 photograph may potentially be the same wreck site, which was relocated and identified by Raines (2018).

Figure 47. "Rotting hulk of schooner *Clotilde.*" (*Alabama on the Go* 1965:29).

Ironclads Survey Area

No historic images have been located showing the Ironclads Survey Area at the head of Blakeley Island.

REPORTED SUBMERGED CULTURAL RESOURCES

SEARCH reviewed cartographic images, aerial photographs, secondary sources (e.g., Berman 1972), and databases of reported shipwrecks to complement the predictive model by identifying reported submerged cultural resources within or adjacent to the project areas. Several desktop reviews, cultural resource reconnaissance studies, and environmental assessments have addressed the potential for submerged cultural resources within the Mobile Bay and Mobile River region, including Delgado et al. (2018), Futato (1989), James and Krivor (1998), Irion (1985, 1986), Irion and Bond (1984), Lydecker et al. (2001), Lydecker and Krivor (2003), Mistovich et al. (1983), Panamerican Consultants, Inc. (1993, 2001), Saltus (1978), and Saltus and Schell (1985).

The database sources include the following:

- Bureau of Ocean Energy Management (BOEM) Archaeological Resource Information Database
- Global GIS Data Services, LLC, Global Maritime Wrecks Database (GMWD)
- NOAA Automated Wreck and Obstruction Information System (AWOIS)
- NOAA Electronic Navigational Charts (ENC)
- Alabama State Site File at University of Alabama

Table 3 and **Figure 48** illustrate shipwrecks that have been reported within 1.6 km (1.0 mi) of the Mobile River Shipwrecks and Ironclads Surveys Areas. Several reported shipwrecks occur within or directly adjacent to the survey areas. It is important to note that position accuracy for historic shipwrecks is tentative at best in most instances. Historic shipwrecks generally are plotted based on contemporary records, maps, or oral histories. Many shipwreck databases provide a range of position accuracy or an accuracy reliability scale. It must be assumed, therefore, that **Table 3** does not constitute an exhaustive list of reported shipwrecks potentially within the 1.6-km (1.0-mi) buffer zone around the project areas, nor can it be assumed that every shipwreck truly resides where it is depicted. **Table 3** includes the previously documented sites recorded during the 2018 investigation (Delgado et al. 2018).

Table 3. Shipwrecks Reported within 1.6 km (1.0 mi) of the Survey Areas.

Map Number	Survey Area	Name	ID number	Date Sunk	Source
1	Ironclads	Unknown	GMWD 40541	1980	ENC, GMWD
2	Ironclads	Unknown (barge)	AWOIS 7174	Unknown (pre-1989)	AWOIS, GMWD
3	Ironclads	CSS *Tuscaloosa* (ironclad)	1Mb558	1865	Saltus and Schell (1985)
4	Ironclads	CSS *Huntsville* (ironclad)	1Mb557	1865	Saltus and Schell (1985)
5	Mobile River Shipwrecks	Harms Wreck (composite wreck)	1Ba697	Unknown	Delgado et al. (2018)
6	Mobile River Shipwrecks	Unknown	GMWD 40450	1980	GMWD
7	Mobile River Shipwrecks	Hicks Wreck (barge)	1Ba695	Unknown	Delgado et al. (2018)
8	Mobile River Shipwrecks	Twelvemile Island Wreck	1Ba694	Unknown (late 19th or early 20th century)	Delgado et al. (2018)
9	Mobile River Shipwrecks	Unknown	GMWD 40539	1980	GMWD
10	Mobile River Shipwrecks	Kennedy Wreck (barge)	1Ba698	Unknown	Delgado et al. (2018)
11	Mobile River Shipwrecks	Unknown	GMWD 40947	1980	GMWD
12	Mobile River Shipwrecks	Dobbs Wreck (barge)	1Ba696	Unknown (1980)	Delgado et al. (2018), GMWD
13	Mobile River Shipwrecks	Unknown	GMWD 40945	1980	GMWD
14	Mobile River Shipwrecks	Unknown	GMWD 40944	1980	GMWD
15	Mobile River Shipwrecks	Unknown	GMWD 40943	1980	GMWD
16	Mobile River Shipwrecks	Unknown	GMWD 40550	1980	GMWD
17	Mobile River Shipwrecks	Unknown	GMWD 40946	1980	GMWD

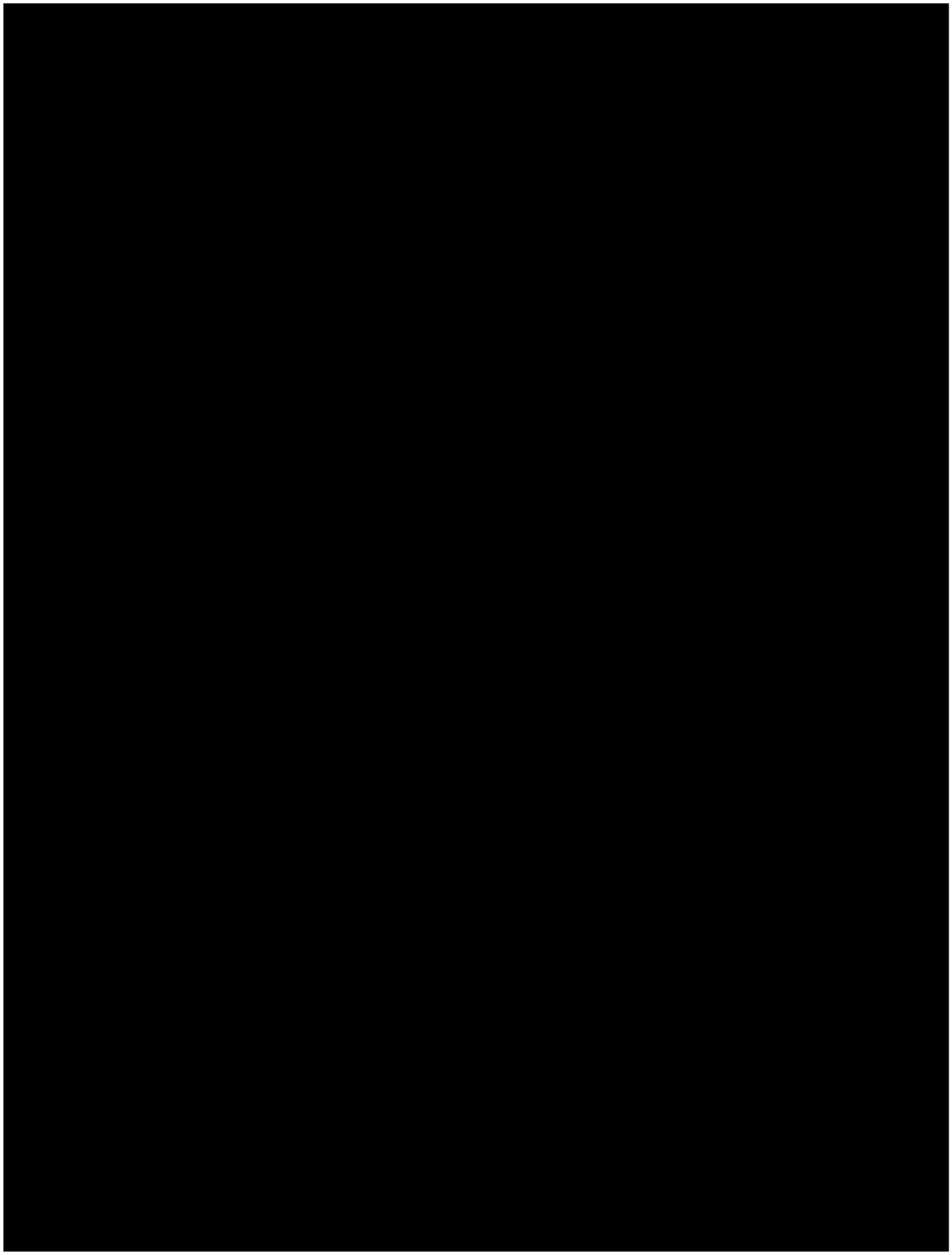

Figure 48. Shipwrecks reported within 1.6 km (1.0 mi) of the Survey Areas.

A number of shipwrecks are reported in the Mobile River by secondary sources, including newspapers. These wrecks lack accurate geographic positioning. **Table 4** includes shipwrecks with general locations (e.g., "Twelvemile Island"), with a main focus of the Mobile River near Twelvemile Island. Interpretation of every suspect magnetic anomaly and acoustic contact must consider the numerous shipwrecks reported in the Mobile River and the inherent position accuracy of those that retain spatial data.

Table 4. Shipwrecks Reported in the Region.

Name	Date Sunk	Location	Source
Clotilda (schooner)	1860	Near Twelvemile Island, Bayou Corne	Roche (1914), Raines (2018)
Lilly (steamboat)	1889	Near Twelvemile Island	*The Times-Picayune* Sept. 19, 1889
Unknown (lifeboat/small boat)	1926	Twelvemile Island	*Orlando Sentinel* Oct. 12, 1926
Northern Light (steamer)	1927	Twelvemile Island Anchorage Basin	*Montgomery Advertiser* May 20, 1931
John Quill (steamboat)	1929	Twelvemile Island	University of WI La Crosse, Special Collections
Burke Jr. (steamboat)	1930s	Twelvemile Island	Neville (1964)
Greypoint (steamer)	1930	Twelvemile Island	*Pensacola News* July 5, 1930
Helen Burke (steamboat)	1932	Twelvemile Marsh	University of WI La Crosse, Special Collections
James B. Cobb (tug)	1948	On Twelvemile Island	*Montgomery Advertiser* Sept. 5, 1948
Tuscaloosa (steamer)	1847	10 or 12 miles above Mobile	*Alabama Planter* Jan. 30, 1847
Charles May (steam side wheel)	1916	Mobile River, Alabama	Berman (1972)
City of Mobile (steam side wheel)	1898	Mobile River, Alabama	Berman (1972)
Helen Burke (steam stern wheel)	1932	Mobile River, Alabama	Berman (1972)
Jas. A. Carney (steam side wheel)	1916	Mobile River, Alabama	Berman (1972)
Martha H. Hennan (steam side wheel)	1916	Mobile River, Alabama	Berman (1972)
Olive (schooner)	1906	Mobile River, Alabama	Berman (1972)

PREVIOUS MARITIME INVESTIGATIONS

SEARCH identified four previous maritime investigations to supplement the research design, which are considered pertinent to the project and the potential for previously unidentified submerged cultural resources. The scarcity of comparable archaeological remote-sensing data and diver investigations near the survey areas increases the importance of SEARCH's investigations, as they provide insight into remote-sensing signatures found in the Mobile River, as well as their archaeological analysis and interpretation. The following briefly describes the results of these investigations.

- Hathorn et al. as reported in Delgado et al. (2018)
- James and Krivor (1998)
- Lydecker and Krivor (2003)
- Saltus and Schell (1985)

Three of the four investigations focus on the schooner *Clotilda* (Delgado et al. 2018; James and Krivor 1998; Lydecker and Krivor 2003). Two of the three investigations overlap with the current study area (Delgado et al. 2018; Saltus and Schell 1985). The projects also provide additional information about the historic use of the Mobile River and the extent of its maritime cultural landscape.

The James and Krivor (1998) study focused on portions of Big Bayou Canot, Little Bayou Canot, and Bayou Sara to locate *Clotilda*. Panamerican Maritime, LLC, conducted remote-sensing and diver investigations based on historical accounts of the vessel being burned in the vicinity. Panamerican stated that their results indicate the presence of potentially significant submerged cultural resources within the bayou system. Panamerican located 17 magnetic anomalies, with one being a barge and three identified as modern and not significant. Five anomalies were not recommended for further assessment. The remaining eight anomalies were prioritized for diver investigations. Side-scan sonar located only two acoustic contacts of interest. All potential targets were inspected and probed by divers. Panamerican recommended additional work on Target 012 in Big Bayou Canot, where buried cut wood timbers and ferrous metals reside, as well as two targets in Big and Little Bayou Canot. They also recommended a diver inspection around the Louisville and Nashville train bridge.

The Lydecker and Krivor (2003) study conducted a relocation and refinement remote-sensing survey, along with a diver investigation, of three previously located magnetic anomalies in Big Bayou Canot in an effort to located *Clotilda*. A hydro probe was used to determine the presence or absence of buried materials to a depth of 6.0 m (20 ft). One target (Target 12) was identified as a steel 55-gallon drum and the other two remain unidentified (Targets 15 and 16). The study recommends further investigations on Targets 11 and 13.

The Hathorn et al. study (reported in Delgado et al. 2018) focused on a shallow water investigation and diver evaluation of the Twelvemile Island Wreck, 1Ba694, at Twelvemile Island, Mobile River, Alabama. The Phase I survey assessed a previously unrecorded resource in an effort to determine the identification of the wreck and assess its eligibility for listing in the NRHP. The wreck, recorded as 1Ba694, was initially suggested to be that of the *Clotilda*. The survey concluded that while the wreck was a historic wooden sailing vessel, it was not that of *Clotilda*. Scientific evidence such as hull dimensions, hull structure, and wood analysis provided results that differed from the known structural elements and dimensions of *Clotilda*. During the investigation, archaeologists located four additional historic shipwrecks within the immediate vicinity of 1Ba694, which lead to the identification of the wreck, and surrounding wrecks, existing as part of a larger ships' graveyard.

The Saltus and Schell investigation (1985) included a marine remote-sensing investigation with a magnetometer, fathometer, and diver investigation. The purpose of the investigation was to locate and identify CSS *Huntsville* (1Mb557) and CSS *Tuscaloosa* (1Mb558), two Civil War ironclad vessels that had been scuttled (Smithweck 2016). The project was conducted for the Mobile Jaycees and USACE; it was funded by the City of Mobile, Alabama. The investigation located two magnetic anomalies and two discontinuities in the river bottom in approximately 3.6 m (12 ft) of water. The location and orientation matched historical accounts of where the two vessels were scuttled, with the CSS *Huntsville* (1Mb557) lying upriver from the CSS *Tuscaloosa* (1Mb558). Divers confirmed the presence of both ironclads, positively identifying various hull characteristics, armor plating, casemate structures, and bow features of the vessels. Based on their findings, the northernmost portion of the northern vessel appeared more intact than the southernmost portion of the vessel, which was recorded as being broken with exposed hull construction features. At the time of the investigation, the southernmost vessel had approximately 11 m (39 ft) of bow section exposed. Structural elements recorded on the southernmost vessel included a breakwater, hawse pipe, chock, and pyramid shaped iron ram. The vessel was reported as being broken with additional buried remains located upwards of 9.0 m (30 ft) aft of the break.

PREVIOUSLY RECORDED ARCHAEOLOGICAL SITES WITHIN THE PROJECT AREA

Mobile River Shipwrecks Survey Area

Twelvemile Island Wreck (1Ba694)

The Twelvemile Island Wreck consists of the remains of a mid- to late nineteenth-century three-masted, wooden-hulled sailing ship. The vessel is located on the eastern channel of the Mobile River, nearest Twelvemile Island (**Figures 49**). The partially submerged shipwreck measures roughly 56 m (183 ft) in length, with a beam of approximately 11 m (35 ft). Currently, the wreck lists approximately 20 degrees to port. The majority of the remaining hull structure is buried in soft, silty mud. The wreck's visible remains suggest that it is fairly intact below the mudline. Visible hull features included frames, inner and outer

Figure 49. Twelvemile Island Wreck (David W. Morgan).

planking, fasteners, stem elements, and exposed chain plates. Wood samples collected on site consist of a combination of Douglas Fir and Larch, a lumber typically grown and harvested in the Pacific Northwest region of the United States (Delgado et al. 2018). The wreck was observed on historic aerials and charts as early as 1938, and the first photographic occurrence of the Twelvemile Island Wreck (1BA694) is believed to come from a ca. 1912 photograph published in 1914 by Emma Langdon Roche (1914:102).

Hicks Wreck (1Ba695)

Hicks Wreck was recorded in March 2018. The wreck consists of the remains of a small, 9.1 m (30 ft) x 12 m (40 ft) in size, iron-riveted barge that had presumably been abandoned at the stretch of river near Twelvemile Island (**Figure 50**). Identifiable features of the barge include the barge's southeast bollard and southwest corner. The frames of the barge are still visible, despite being partly overgrown and sediment-filled. Approximately half of the barge is submerged, extending into the Mobile River (Delgado et al. 2018).

Figure 50. Hicks Wreck (David W. Morgan).

Dobbs Wreck (1Ba696)

Dobbs Wreck was recorded in March 2018. The remains consist of a riveted iron barge, partially visible against the grasses along the eastern channel of the Mobile River, near Twelvemile Island (**Figure 51**). Visible structural elements within the wreck site are representative of early twentieth-century barge construction. Identifiable features include a vent shaft protruding above the water's surface. Archaeologists reported a substantial amount of cement poured into the iron barge. Soils were observed as a dense muck and canebrake surrounding barge (Delgado et al. 2018).

Figure 51. Dobbs Wreck (David W. Morgan).

Harms Wreck (1BA697)

Harms Wreck was recorded in March 2018. The completely submerged wreck consists of a composite wood and iron shipwreck, [redacted]. Archaeologists were unable to locate the vessel's bow or stern, but did note the presence of cultural features, such as iron and fabricated wood. The wreck did not appear to be a barge (Delgado et al. 2018).

Kennedy Wreck (1BA698)

Kennedy Wreck was recorded in March 2018. The wreck consists of two portions of a semi-submerged, iron-riveted barge (**Figure 52**). Archaeologists used hand probes to define the boundaries of the wreck site and found numerous hard contacts of wood, metal, and gravel. Exposed features along the southwestern-most portion of the barge appear to be a reinforced feature that looks to be a potential push point. Archaeologists noted that the iron frameworks were filled with concrete rubble. Probing along the visible flat iron protruding above the ground surface suggested the area was the southern edge of the barge. Based on the numerous returns and orientations observed during field investigation, it may be possible that the site contains more than one vessel (Delgado et al. 2018).

Figure 52. Kennedy Wreck (David W. Morgan).

CSS Huntsville *(1Mb557)*

CSS *Huntsville* was a partially armored gunboat in the Confederate States Navy. The vessel was launched from the Selma Navy Yard in February 1863 and taken to Mobile for completion. With defective engines, it was capable of only being moored as floating batteries deployed to Mobile Bay (Silverstone 2001:155). On April 12, 1865, Confederate forces scuttled the vessel to prevent capture by Union forces (**Figure 53**). The vessel was first recorded during a 1985 survey (Saltus and Schell 1985). The recorded remains are approximately 45 m (150 ft) long by 12 m (40 ft) wide. The ironclad is recorded at the intersection of the Mobile River and Spanish River, north of Mobile, buried in approximately 3.6 m (12 ft) of water, lying upright relatively intact on the river bottom (Saltus and Schell 1985).

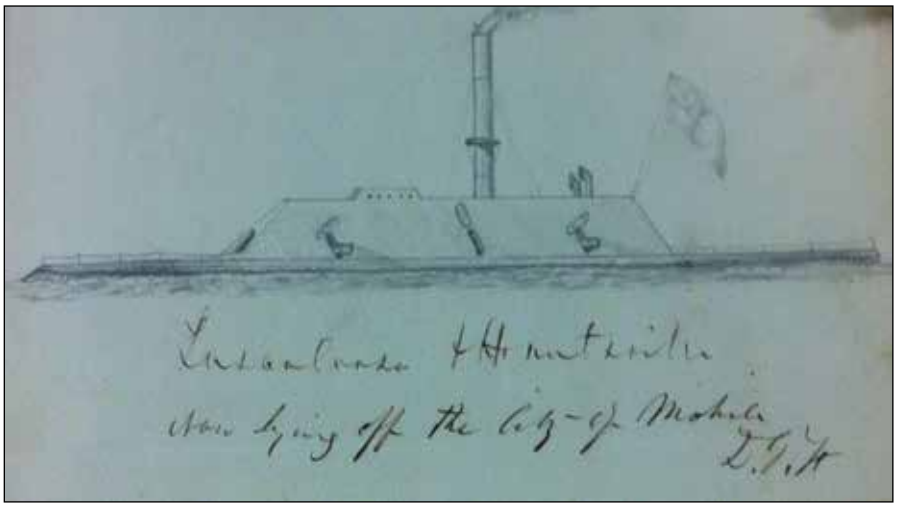

Figure 53. Drawing of CSS *Huntsville* and CSS *Tuscaloosa* (National Archives of the United States, Record Group 45, David G. Farragut to Gideon Welles, September 26, 1864).

CSS Tuscaloosa *(1Mb558)*

CSS *Tuscaloosa* was a sister ship of CSS *Huntsville* and was a partially armored gunboat in the Confederate States Navy (see **Figure 53**). The vessel was launched from the Selma Navy Yard in February 1863 and deployed to Mobile for completion with Huntsville. With a defective engine, it was also relegated to use as a floating battery for the defense of Mobile Bay, and shortly thereafter, was intentionally scuttled on April 12, 1865 (Silverstone 2001:155). The vessel was first recorded during a 1985 survey and is currently located at the intersection of the Mobile River and Spanish River, north of Mobile, buried under deep sand in approximately 3.6 m (12 ft) of water. The vessel is located up river, lying upright relatively intact on the river bottom, according to Saltus and Schell (1985).

REMOTE-SENSING SURVEY FIELD METHODOLOGY

The first step in protecting submerged cultural resources is to locate them, which requires detection and recognition in the marine remote-sensing record. A suite of remote-sensing instruments is available to the maritime archaeologist to accomplish this task, and the most important of these are the side-scan sonar and marine magnetometer. The side-scan sonar utilizes acoustic signals to produce an image of the seafloor and any objects protruding above it. This image is ideal for detecting and recognizing submerged cultural resources exposed above the sediment. The best tool available to the maritime archaeologist for detecting buried submerged cultural resources not visible in the side-scan sonar record is the magnetometer. The magnetometer detects anomalies in the earth's magnetic field produced by ferrous objects. The copious amount of iron utilized in the construction and operation of historic vessels affords the magnetometer the opportunity to detect most shipwrecks, if the maritime archaeologist designs a proper data collection methodology. Although magnetic detection of buried submerged cultural resources can be accomplished, recognition of a resource in the magnetic record is more complicated. This requires knowledge of magnetic theory and how it applies to maritime archaeology, as well as examples of verified shipwreck magnetic signatures with which to compare current data.

SEARCH conducted Phase I maritime archaeological remote-sensing survey of the Mobile River Shipwrecks Survey Area on July 9-10, 2018, and Ironclads Survey Area on July 14, 2018, during the course of approximately 12 survey hours. The research design incorporated parallel survey lines spaced 15 m (50 ft) apart to survey 100 percent of the project areas. The research design required approximately 64-line km (40-line mi) for the Mobile River Shipwrecks Survey Area and 8-line km (5-line mi) in the Ironclads Survey Area. Data acquisition and processing were treated as distinct endeavors between the survey areas for better organization and presentation of remote-sensing data.

Summer weather in Mobile created favorable survey conditions, with warm weather and calm winds. The project was not affected by any weather that delayed the operations or affected data quality. The Mobile River Shipwrecks Survey Area's planned survey lines were affected by hazards in the river that caused a deviation in the planned line to avoid entangling or damaging survey equipment. In the Mobile River Shipwrecks Survey Area, there were several large metal unpowered barges moored in Twelvemile Island's eastern channel. The barges caused a deviation in the planned survey lines and interfered with the magnetometer data.

SEARCH conducted the survey from two platforms. For the Mobile River Shipwrecks Survey Area, SEARCH utilized a 6.4-m (21-ft) aluminum, flat-bottomed Rhino vessel powered by a 90-horsepower outboard motor (**Figure 54**). For the Ironclads Survey Area, SEARCH conducted the survey from an 8.5-m (28-ft) aluminum-hull VC Commander vessel (**Figure 55**). These vessels are ideally suited for the project location and environmental conditions. The vessels had ample deck space to conduct remote-sensing operations and are equipped with all the necessary safety equipment, including the appropriate number of life jackets, marine radio,

Figure 54. Mobile River Shipwrecks Survey Area vessel.

Figure 55. Ironclads Survey Area vessel.

horn, fire extinguisher, and visual distress signals. SEARCH archaeologists and utilized HYPACK, Inc. hydrographic navigation software for vessel guidance.

Instrumentation for the survey included a Trimble SPS356 differentially corrected global positioning system (dGPS) receiver (**Figure 56**) with GA830 global navigation satellite system antenna, a Geometrics G-882 cesium-vapor marine magnetometer (**Figure 57**), an EdgeTech 4125 dual-frequency (600/1,600 kilohertz [kHz]) CHIRP side-scan sonar (**Figure 58**), and an EdgeTech 3100 sub-bottom profiler with a SB-424 sensor ("towfish") (**Figure 59**). A Garmin Fishfinder 240 Blue was used only during the Ironclads Survey. The Trimble dGPS utilizes MSK beacon or the Satellite Based Augmentation System to enhance the GPS positioning for improved, sub-meter-accurate real-time positioning.

Figure 56. Trimble dGPS and navigation computer.

The G-882 magnetometer utilizes a cesium vapor to obtain absolute accuracy less than 3 gammas throughout its operating range of 20,000 to 100,000 gammas. It is capable of collecting up to 20 samples per second with a counter sensitivity of less than 0.0004 gammas. The 4125 side-scan sonar system utilizes CHIRP technology to provide higher-resolution imagery at ranges up to 50 percent greater than traditional continuous-wave systems operating at

Figure 57. Geometrics magnetometer.

Figure 58. EdgeTech side-scan sonar system.

Figure 59. EdgeTech sub-bottom profiler system.

the same frequency. At 600 kHz, the 4125 is capable of obtaining resolution across track of 1.5 cm (0.6 in); resolution improves to 0.6 cm (0.2 in) at 1,600 kHz. The EdgeTech 3100 sub-bottom profiler towfish utilizes full spectrum CHIRP technology to provide high resolution imagery of the buried substrate with penetration up to 100 m (328 ft), depending upon towfish option and water and sediment conditions. The SB-424 towfish operates between 4 and 24 kHz and is capable of achieving vertical resolution between 4.0 and 8.0 cm (1.6 and 3.1 in). The Garmin Fishfinder 240 Blue is a non-survey-grade echosounder and was used only for vessel guidance and for planning possible future archaeological diver investigations.

SEARCH maintained consistent altitude of all instrument towfish during survey so that data acquisition met optimal archaeological standards. It is ideal to collect magnetic data at an altitude from the seafloor of no greater than approximately 6.1 m (20 ft). Side-scan sonar acoustics should image 100 percent of the surveyed area, which includes the blank nadir region beneath the towfish, while maintaining an altitude above the seafloor between 10 and 20 percent of the selected range. This is achieved through a combination of instrument frequency and range, as well as towfish altitude. SEARCH towed the magnetometer towfish behind the vessel at distances and speeds that could maintain proper altitude. The magnetometer was towed 15 m (50 ft) behind the survey vessel with assistance of supplemental buoyancy floats to keep the towfish at the surface due to the shallow water depths. SEARCH deployed the side-scan sonar and sub-bottom profiler towfish close to the vessel, as water depths in the survey areas not significant enough to adjust the altitude of these instruments. Vessel speed varied as well, but did not exceed 5 knots whenever possible, which maximized the data collection of each instrument, and oftentimes slower to maintain proper instrument altitude.

HYPACK navigation software, interfaced with the dGPS, maintained vessel and equipment positioning with sub-meter accuracy by means of layback calculations and logged real-time positional, magnetic, and bathymetric data. SEARCH collected magnetic data at a rate of 2 hertz (Hz) and bathymetric data at a rate of one Hz. Bathymetric data was only collected during the Ironclads Survey. SEARCH collected side-scan sonar imagery at a frequency of

600 kHz with a range of 60 m (197 ft) (i.e., total swath width=120 m [394 ft]) and 1,600 kHz with a range of 30 m (98 ft) (i.e., total swath width=60 m [197 ft]). This range accomplished sufficient imagery overlap between adjacent survey lines. The combination of survey line spacing, range, vessel speed, and cable out allowed for 100 percent imagery coverage, including the nadir region beneath the towfish path. The dGPS was interfaced with the side-scan sonar topside acquisition computer operating EdgeTech Discover software, which embedded positional data into the raw imagery and allowed for geo-rectification of the side-scan sonar record during processing. Sub-bottom profiler imagery was acquired at a varying frequency of 4-20 kHz and a pulse rate of 10 milliseconds for the entire area surveyed. Side-scan sonar and sub-bottom profiler imagery were collected in a constant stream. The survey was conducted in the State Plane coordinate system (Alabama West Zone) based on the NAD83 datum. All project data were incorporated into a GIS geo-database for organization, scientific analyses, and archiving. A copy of the survey notes can be found in **Appendix A.**

REMOTE-SENSING DATA PROCESSING AND INTERPRETATION METHODOLOGY

The first step in determining the presence of submerged cultural resources is to locate them, which requires detection and recognition in the marine remote-sensing record. A suite of remote-sensing instruments is available to accomplish this task, and the most important of these are the side-scan sonar and marine magnetometer. The side-scan sonar utilizes acoustic signals to produce an image of the seafloor and any objects protruding above it. This image is ideal for detecting and recognizing resources exposed above the sediment. The best tool available to the survey specialist for detecting buried resources not visible in the side-scan sonar record is the magnetometer. The magnetometer detects anomalies in the earth's magnetic field produced by ferrous objects. Although magnetic detection of buried resources can be accomplished, recognition of a resource in the magnetic record is more complicated. This requires knowledge of magnetic theory.

Side-Scan Sonar

SEARCH reviewed each line of raw side-scan sonar imagery from the survey to locate acoustic contacts indicative of man-made features and potential submerged cultural resources protruding above the seafloor. Each contact was assigned a unique identifier, and descriptive information was collected and tabulated (e.g., length, width, dGPS position, possible identification, etc.). SEARCH also generated a mosaic image of the Survey Areas comprising all raw sonar imagery. The ability to mosaic the imagery was made possible with embedded positional data from the dGPS utilizing Chesapeake Technology, Inc., SonarWiz 6 sonar processing software. High-frequency imagery files (1,600 kHz) were imported into the software utilizing settings adjusted for the EdgeTech 4125 acquisition methods. Following importation of the raw imagery, bottom tracking was performed to identify the first acoustic return, which determines the altitude of the towfish above the seafloor, creates a slant-range-corrected record, and removes the water column from the nadir region. Gain, color, and contrast settings

were adjusted for each file in order to produce an optimal and even image across the entire mosaic. Returns from overlapping files were averaged. Thus, if a contact contrasts well on one trackline, but not on an adjacent line, averaged returns from both lines ensure significant contrast for contact detection. The mosaic was exported as multiple geo-rectified images (geotiff format) with a resolution of 0.15 m/pixel (0.5 ft/pixel) and imported into ArcGIS 10.5 so that it could be layered with other project data (e.g., magnetic contour map, project boundary, etc.) and facilitate archaeological analysis.

Sub-Bottom Profiler

Raw sub-bottom profiler imagery was processed and reviewed using Chesapeake Technology, Inc.'s SonarWiz 7 processing software with settings adjusted for the Edgetech 3100 CHIRP acquisition methods. Following the importation of raw imagery, bottom tracking was performed to identify the first acoustic return, a representation of the river bottom. Subsequent gain, color, contrast, and swell filtration adjustments were applied to produce imagery for optimal interpretation. The resulting cross-section of data was reviewed trackline by trackline to identify man-made and natural features, including potential submerged cultural resources on or buried beneath the river bottom. Upon identification, each reflector was assigned a unique identifier and descriptive information was tabulated (e.g., water depth, reflector depth, dGPS position, possible identification, etc.). SEARCH then exported reflectors via ArcGIS 10.5 so it could be layered with other project data (magnetic contour map, project boundary, etc.).

To understand sub-bottom profiler analysis, it is necessary to comprehend the properties of sound. Sub-bottom profilers emit vertical sound waves into the water column and collect the return signal once they reflect back to the instrument. Sound waves reflect back to the instrument once they encounter a boundary of different acoustic impedance (McGee and Ballard 1995). Acoustic impedance is a value that expresses how easily sound travels through a material. A materials density determines its acoustic impedance. In sub-bottom profiler imagery, acoustic reflectors are recognizable when sound waves are reflected by subterranean materials of differing acoustic impedance. A high acoustic impedance material, such as iron, reflects more sound waves than a material of low impedance, such as sand. Higher impedance materials display darker in the sub-bottom imagery and prevent the continued vertical transmittance of the acoustic signal (**Figure 60**).

Sub-bottom imagery is fairly limited in scope as data collected represent the narrow swath of river bottom located directly beneath the towfish. The vertical range of data collection was set prior to acquisition to ensure that the river bottom and secondary return are clearly evident in the data. The range is unique for each survey and dependent on bottom substrate and sediment compactness. To account for these factors, the Principal Investigator must determine the appropriate frequency at which the sub-bottom profiler will operate to ensure its effectiveness as an archaeological instrument. A low frequency setting, such as 4-16 kHz, will achieve greater penetrate into the river bottom, but provides low-resolution imagery.

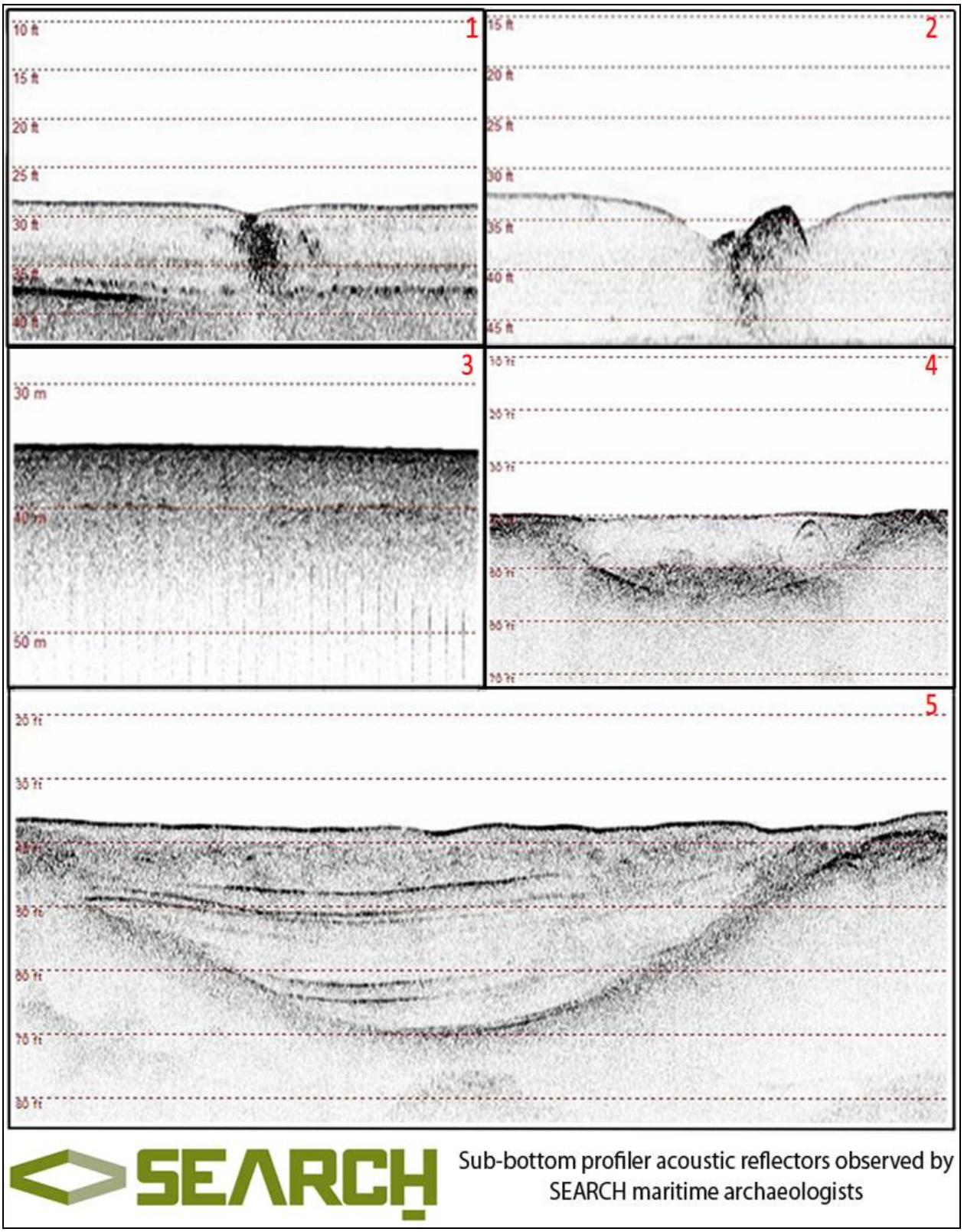

Figure 60. Processed sub-bottom imagery with examples of acoustic reflectors.

Conversely, a high frequency setting, such as 4-24 kHz, will provide higher resolution imagery, but achieves less vertical penetration below the river bottom.

SEARCH has adopted five reflector types useful for interpreting the subterranean imagery and identify potential submerged cultural resources (see **Figure 60**): unknown buried reflective feature (**Panel 1**), unknown surface reflective feature (**Panel 2**), buried horizon (**Panel 3**), scour and fill (**Panel 4**), and relict channel (**Panel 5**). Unknown buried or surface reflectors are characterized as general areas of increased reflectivity that sharply contrasts to the adjacent sediments and can be used to describe all sub-bottom reflectors (Davies et al. 1992; Nordfjord et al. 2006) (see **Panels 1** and **2**). Further classification of unknown buried or surface reflectors is achievable once single trackline imagery is paired with multiple adjacent trackline imagery, as well as additional data sets, such as processed magnetic data and sonar imagery (Pletts et al. 2007).

Buried horizon is a classification of reflector used when unknown buried reflectors are spatially wide spread and likely indicative of a change in stratigraphy (see **Panel 3**). A stratigraphic transition is illustrated by contrasting imagery as the boundary between two sediment densities results in a light and dark interface. These lengthy horizons are often identified on multiple adjacent tracklines centralized around a loci.

Unknown reflectors caused by erosional unconformity related to variations in bottom currents and sediment migration are classified as scour and fill reflectors (Stoker and Cramp 1998). Scour and fill reflectors may exist beneath or atop the river bottom. **Panel 4** illustrates a prototypical scour and fill reflector caused by dredging and sediment refill operations. This scour and fill reflector indicates the maximum depth of dredging and reveals an additional unknown buried reflector within the refilled sediment. Using the scientific law of superposition, archaeologists are able to deduce the chronology of this specific section of river bottom. Additionally, surface scour and fill reflectors may indicate the presence of an object that is affecting sediment migration caused by bottom currents. The magnitude of a surface scour (see **Panel 2**) may provide insight to the general length of time an object has existed in its defined position. The final classification of sub-bottom reflector, relict channel, is used for an unknown buried reflector illustrating a convex parabolic shape accompanied by buried horizons extending from either side of the vertex (see **Panel 5**). Similar to a scour and fill reflector, relict channel reflectors illustrate the displacement of sediment. Relict channels are remnant footprints of a pre-existing river or stream that has become inundated and buried due to sea level rise and sediment migration. The archaeological record suggests the potential utilization of such channels and their associated landscapes by prehistoric people given the propensity for prehistoric sites to exist near freshwater sources (Faught 2014).

Knowledge of the survey area and comparison with other remote-sensing data can assist in the appropriate classification of submerged cultural resources identified in the sub-bottom profiler record. For example, some unknown buried reflectors can be identified as submerged pipelines or cables when paired with magnetic data and cartographic research, as shown by the concave unknown buried reflector in **Panel 4**. It is important to reiterate the limited scope of sub-

bottom imagery and understand its limitations as an archaeological tool. A common occurrence in sub-bottom imagery is the "masking" of data due to submerged vegetation and subsurface gaseous sediment. The presence of gases may cause acoustically transparent zones in the data record due to the near nonexistent acoustic impedance or air (Ergun et al. 2002). This type of imagery may inhibit, or limit, the detection of potential cultural resources.

As an independent data set, sub-bottom profiler imagery does not identify artifacts or other physical evidence of prehistoric occupation, but rather aids in the identification of paleolandscapes or geomorphological features that have a potential to contain prehistoric archaeological sites. With regard to historic submerged resources, sub-bottom profiler imagery can reveal the existence of historic remains buried beneath the river bottom or corroborate side-scan sonar imagery when an object rests atop the river bottom. Ultimately, sub-bottom profiler imagery is a supplemental tool to be used in conjunction with magnetic and side-scan sonar data sets when attempting to identify remote-sensing targets. Further archaeological investigation, such as coring or diving, is required to identify the source of any acoustic reflector.

Magnetometer

Magnetic data were reviewed in a profile image similar to an echogram in order to identify and edit errant data. The raw magnetic data (x, y positional coordinates + z magnetic values) were then processed into a contour map, which allows the best representation of three-dimensional data on a two-dimensional plane, and facilitates interpretation of the interaction of a magnetic source with the earth's magnetic field. The process involved with creating this contour map consists of removing the diurnal variation from the data, creating a regularly spaced grid of the irregularly-spaced data points, and generating contours that are visually concise and accurately represent anomalies in the earth's magnetic field.

The earth's background magnetic value at any particular geographic location fluctuates slightly from day to day and throughout each day (diurnal variation). This variation is evident in the raw magnetometer data (z value) and results in a cluttered map when contoured. In order to overcome this, SEARCH filtered the raw magnetometer data through a mathematical algorithm. The algorithm defines each raw z value as either higher than the magnetic background (positive) or lower than the magnetic background (negative). The algorithm replaces the raw z value with this positive or negative number, which is relative to the magnetic background at the particular date, time, and geographic location it was recorded. The diurnal variation is easily identified and removed from the relative z values, which facilitates contouring and provides a "clean" contour map. More importantly, this process affords a direct one-to-one comparison of magnetic amplitudes and negative-to-positive ratios of anomalies no matter when or where they were recorded, or to what extent the magnetic background varied—something that is not possible with raw magnetic values.

The x, y, and relative z data were imported into Golden Software, Inc.'s Surfer contouring and three-dimensional surface mapping software (v14). SEARCH instructed Surfer to grid the

processed magnetic data based on data collection methodology and magnetic theory as it applies to the correlation between source amplitude and its distance from the magnetometer sensor. SEARCH first filtered the data to one Hz, which is a more manageable dataset for the relatively large survey area and sufficient data for archaeological purposes. The inline distance between raw data points, based on the filtered rate of collection (one Hz) and the average survey vessel speed during data collection (5 knots), equates to approximately 2.6 m (8.4 ft). Data were collected along parallel survey lines spaced approximately 15 m (50 ft) apart. Based on these parameters, SEARCH's Surfer gridline geometry was set at 2.6 m (8.4 ft) between nodes, with a search ellipse of 1.5 times the survey line distance (i.e., 23 m [75 ft]). SEARCH selected a gridding interpolation method following the magnetic theory that magnetic amplitude decreases inversely proportional to the cube of the distance between the source and the magnetometer sensor (Breiner 1999). The resulting magnetic data grid consists of regularly-spaced data nodes interpolated from the irregularly-spaced magnetometer data. SEARCH next contoured the filtered relative magnetometer data using the interpolated magnetic data grid. The initial contour interval was set at 5 gammas with 100-gamma index contours. Positive contours are depicted in orange (5-gamma interval) and red (100-gamma index), while negative contours are light blue (5-gamma interval) and dark blue (100-gamma index).

Previous research concerning magnetic theory, as it applies to archaeological resources and remote-sensing survey (e.g., Breiner 1999; Enright 2009; Enright et al. 2003, 2006; Garrison et al. 1989; Gearhart 2004, 2011; VonFrese 1986), assisted SEARCH's interpretation of the processed magnetic data and helped to identify the presence or absence of potential shipwreck anomalies. Research has demonstrated that the complex distributions of the many ferromagnetic components of a typical vessel tend to cancel one another in the shipwreck's contoured magnetic signature and present a relatively simple pattern as a whole. The composite magnetic signature of a complex source such as a shipwreck consists of the permanent magnetism of each individual ferromagnetic component plus the relatively weaker induced magnetism caused by the earth's magnetic field. Even though the permanent magnetism of the individual components alone would dominate the weaker earth-induced magnetism, a complex concentration of numerous magnetic anomalies overlapping one another tends to minimize or negate the permanent magnetism of individual ferromagnetic objects, leaving a composite anomaly dominated by the earth-induced signature. As such, a shipwreck anomaly tends to exhibit a general dipolar pattern (i.e., a positive lobe and a negative lobe) where the polar axis is dominated by the earth-induced portion of the composite and, therefore, aligns itself with the earth's magnetic field, regardless of site orientation (anomalies are generally characterized as dipolar, monopolar, or multicomponent [**Figure 61**]). As such, the majority of negative contours are oriented in the northern hemisphere of a shipwreck anomaly, while the majority of positive contours are situated to the south. The polar axis of the principal dipole (the magnetic vector from positive peak to negative peak) is oriented toward magnetic north, within ±26 degrees (the magnetic declination in the Study Area at the time of survey was -2.37 degrees, ±0.33 degrees). **Figure 62** illustrates this characteristic. This figure is a collection of verified shipwrecks recorded previously by SEARCH

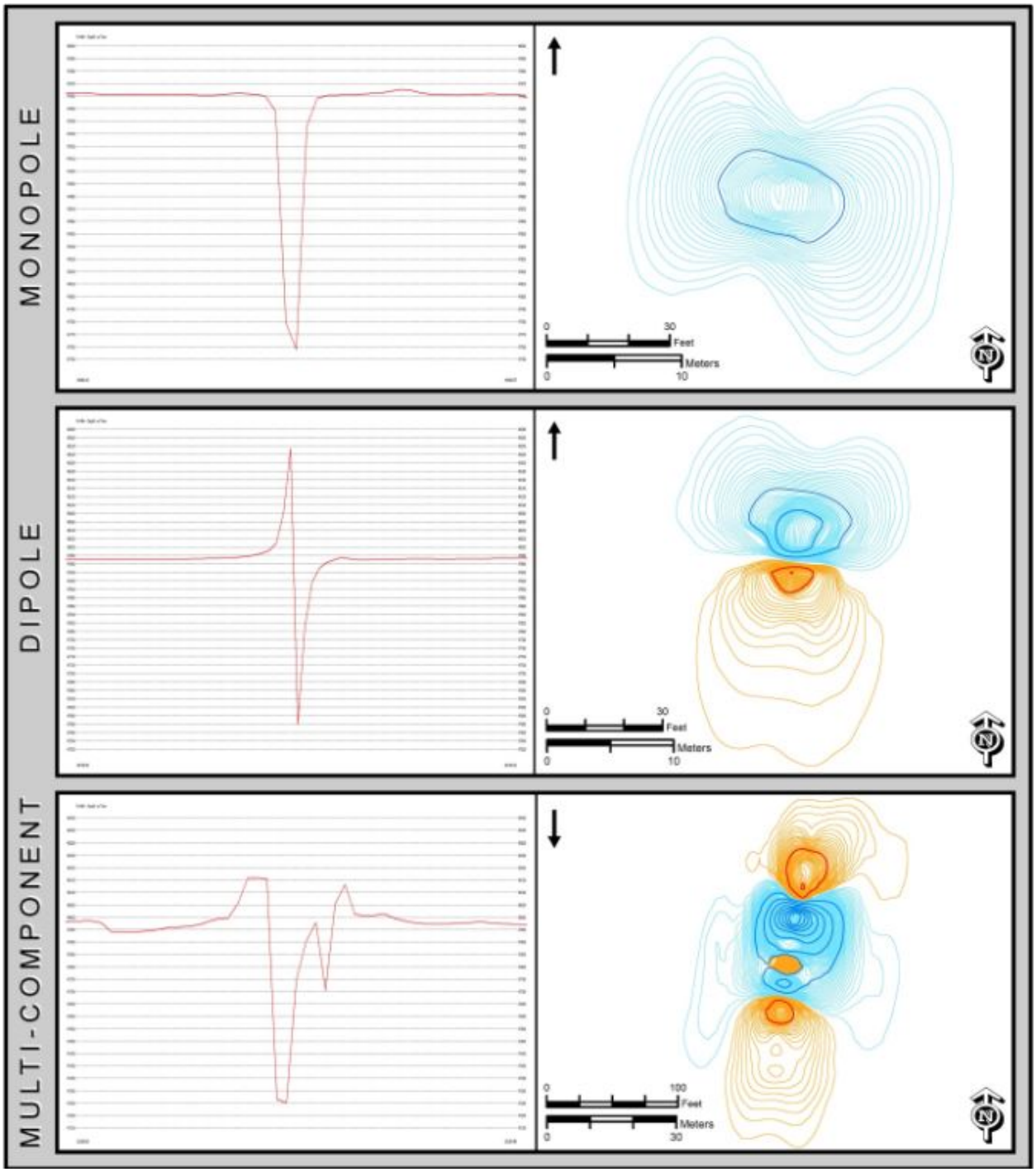

Figure 61. Examples of magnetic anomaly complexity.

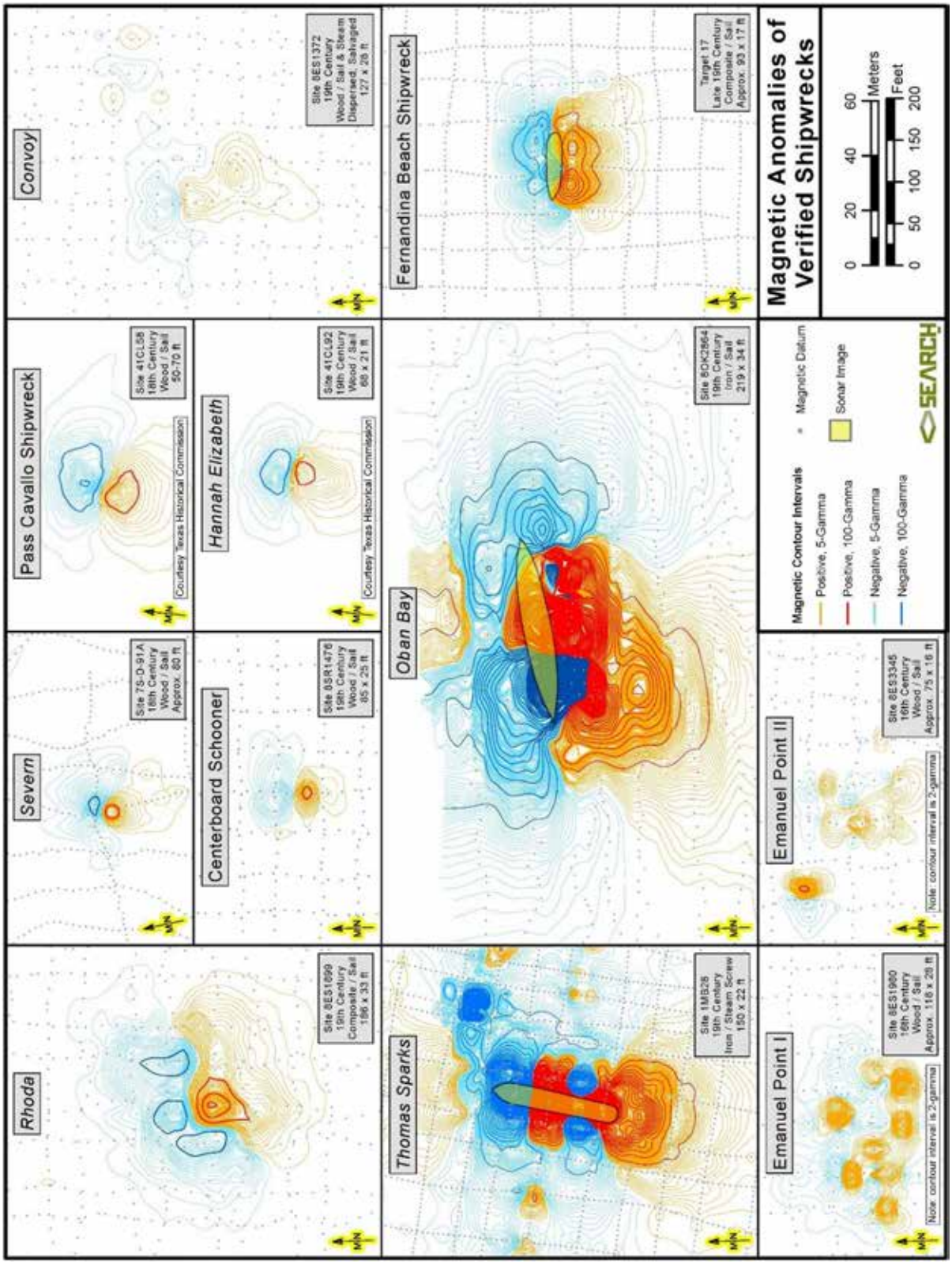

Figure 62. Magnetic anomalies of verified shipwrecks.

maritime archaeologists. Contour interval is identical in all images, except two (discussed below), and scale is the same in all images.

Site formation processes and decreased distance between sensor and source will alter this arrangement somewhat and induce a more complex anomaly. Surveys that decrease the sensor-to-source distance (e.g., shallow-water survey) will produce a complex, multicomponent anomaly comprising multiple monopoles and dipoles within the induced anomaly pattern. This occurrence is amplified with shipwrecks consisting of copious amounts of cast iron or large ferrous construction features or machinery (e.g., an iron-hull steamship). Gearhart (2011:104) states that when magnetic survey occurs "in close proximity to a shipwreck, localized amplitude peaks associated with large individual ferromagnetic components may contrast with the surrounding induced anomaly pattern of the shipwreck as a whole." However, the anomaly will still exhibit the broader, underlying induced pattern described above. This is illustrated with *Oban Bay* (8OK2864) and *Thomas Sparks* (1MB28) in **Figure 62**, both of which are iron-hull vessels in shallow water that were surveyed with a minimal sensor-to-source distance. *Thomas Sparks* (1MB28) additionally contains steam engine components, which create localized high and low amplitudes.

Site formation processes also can induce complexity outside of the principal dipole. For example, a large iron feature, such as a boiler, that has been deposited away from the main shipwreck site can produce a separate magnetic signature that adds complexity to the characteristics of the shipwreck anomaly as a whole; or a site formation process that has included radical seabed movement (referred to as scrambling devices) that results in what Muckelroy (1978:196) terms a "discontinuous site" can alter anomaly patterns. Scrambling devices that can produce a discontinuous site include strong tidal currents and extreme wave action, occurrences exacerbated in shallow water, as well as salvage and explosion. Such a site can produce widely distributed ship components and anomalies with large areal extents. Depending on the level of distribution, a principal dipolar anomaly may or may not exist for a discontinuous site.

Polar alignment and complexity of the anomaly are perhaps the most important characteristics to consider when interpreting magnetic data for potential shipwrecks. Other characteristics that help distinguish shipwreck magnetic signatures from other signatures (e.g., capped petroleum wells and debris) include the peak-to-peak amplitude gradient, the negative-to-positive amplitude ratio, and continuity. Continuity helps to differentiate a shipwreck, which is a complex distribution of objects, from debris fields, which also are complex distributions of objects. Shipwrecks possess more continuity among their central dipoles than do debris fields. Known examples of shipwreck magnetic signatures from Gearhart (2004) possess relatively even amplitude distribution between their poles (ratios of negative-to-positive amplitudes) of less than 1:4. Examples of wooden-hull sailing vessels possess gradients between their poles from 4.5 to 9.0 gammas/ft, and examples of iron/steel and/or steam/gasoline-powered vessels possess gradients above 30 gammas/ft (Gearhart 2004). SEARCH has documented wooden-hull sailing vessels with gradients as high as 19 gammas/ft. Finally, Enright et al. (2006:147) have suggested that 20-m (66-ft) survey line spacing, which SEARCH exceeded during survey of the

current APE, would result in "detection of a near 100 percent sample of small wooden hull sailing vessel anomalies on two adjacent lines."

SEARCH has documented magnetic anomalies produced by shipwrecks dating to the early European exploration of the Gulf of Mexico (i.e., sixteenth century). Anomalies from these shipwrecks exhibit the characteristics described above but at markedly weaker amplitudes and lower gradients (see **Figure 62,** Emanuel Point I and II). To compensate, SEARCH contoured these anomalies at a 2-gamma interval. A potential cause may be the level of degradation of the sites more than 450 years and the resulting lack of architectural remains. Smith et al. (1995:58) state that all iron fasteners documented on Emanuel Point I (8ES1980) "are heavily encrusted with corrosion products, and most have lost their original metal composition." Concretions had lost the original material, and iron had become "black iron-sulfide slush" over the centuries of submersion in salt water (Smith et al. 1995:125). The archaeological excavation of Emanuel Point I (8ES01980) also involved the removal of numerous artifacts, including an iron anchor, prior to SEARCH's recent survey of the site. In the case of Emanuel Point II (8ES03345), archaeological investigation to date has identified comparable iron ship fittings in the construction but a notable lack of large iron artifacts (e.g., anchors) (Dr. Gregory Cook, personal communication, December 5, 2012).

Another hypothesis involves the prevalence of wrought-iron ship fittings and artifacts on the sites. Iron objects were forged, prior to the widespread use of cast iron, by slowly smelting the iron at low temperatures to the point of malleability. Maximum temperature never reached the point necessary to melt the iron. At this relatively low temperature, iron is formed by hammering it into shape. Heavy impact will alter the magnetic properties of iron and perhaps influence its resulting magnetic anomaly. Iron also can become demagnetized over time due to sudden impact or when affected by another magnetic source, as with a typical shipwreck site. It is probable that this has occurred with the Emanuel Point I and II (8ES01980 and 8ES03345) shipwrecks, especially given the archaeological findings. It is therefore important to consider age, construction techniques, and material composition of shipwrecks that might have occurred in any project area when processing and analyzing magnetic data. This is particularly important when shipwrecks from this early time period are known to exist within the region. It also is an indicator that characteristics such as anomaly amplitude and gradient might not be as important to consider in shipwreck signatures when the vessel predates the widespread use of cast iron and/or has been submerged long enough for iron to break down.

SURVEY EXPECTATIONS

SEARCH created models of expected remote-sensing signatures related to potential submerged cultural resources, particularly shipwrecks, likely to occur within the survey areas based upon the maritime context of the river, cartographic research, and the potential for occurrence discussed above. Defining the signatures of various potential submerged cultural resources is

not meant to insinuate that SEARCH believes all categories may be located within the Mobile River, but rather to prepare for the potential during data processing and interpretation.

Native Americans living in the Mobile Bay and Mobile River employed structures such as fish weirs and rock dams for nearshore fishing and wooden canoes for water transportation. This category of submerged cultural resource would not produce an anomaly in the magnetic record. The likelihood of remains surviving intact above the river floor to produce an acoustic image is extremely low, given the propensity of exposed wood to deteriorate rapidly in a marine environment, particularly in shallow water where wood-boring organisms thrive, and a sufficient passage of time to bury any remaining structure. The best chance of survival is burial within marine sediments. If this occurred, then the sub-bottom profiler is the only instrument capable of detecting remains of this resource. Recognition, however, would be difficult given that the signature would be relatively small and ambiguous.

Early European activity on the Mobile River likely relied upon smaller wooden craft, such as ships' boats (e.g., longboat, pinnace, shallop, or yawl). The category of a small wooden shipwreck, propelled with either sail or oar, will appear in the remote-sensing data as relatively smaller, lower-amplitude magnetic anomalies with lower-amplitude gradients. There would likely be little to no acoustic contact associated with this vessel type due to the reasons presented with the native canoe discussion above.

Increased maritime activity in Mobile Bay during the seventeenth and eighteenth centuries included larger oceangoing ships regularly anchoring outside the bay, while small lighters moved cargoes and people to and from plantations and towns. Oceangoing sailing ships constructed of wood will produce little to no acoustic contact. The corresponding magnetic anomaly, however, will exhibit a larger areal extent and higher amplitudes, owing to the larger amount of ferrous components in their construction and operation. Smaller sloops and schooners supporting maritime transport and fishing within the bay will likely account for a significant portion of historic shipwrecks in the vicinity of the survey areas during this period. The remote-sensing signature of these craft will follow that of ships' boats, with some increase in amplitude and areal extent as local shipyards constructed larger vessels suitable to the environment.

The introduction of steam vessels on the Mobile River introduced a new category of potential shipwreck in the nineteenth century. Wooden-hulled steamboats, with their iron machinery, will produce a magnetic anomaly that is spatially larger and higher in amplitude with corresponding amplitude gradient and localized high and low amplitudes associated with large, ferrous engine components. An acoustic contact could exist for this vessel type and might consist of exposed individual or complex concentrations of iron steam-engine components. This image may not be identifiable as a shipwreck due to a lack of surviving exposed hull. The use of iron and steel in hull construction soon followed steam technology in the nineteenth century. Whether propelled by sail or steam, a vessel with an iron or steel hull will produce a larger and higher-amplitude magnetic anomaly. It is more likely that the hull has remained intact enough to create a recognizable acoustic contact.

The twentieth-century workboat, towboat, push boat, or barge is another category of shipwreck that should be expected within the survey areas. Many of these shipwrecks will be located in close proximity to navigation channels. The magnetic anomaly of an iron or steel vessel propelled with a steam or gasoline engine would be strikingly large and intense, with a much higher amplitude gradient than other historic vessels. The hull and machinery are more likely to have survived in some form above the sediment level; therefore, a high potential of recording a recognizable acoustic contact exists. The modern recreational vessel, although not considered a submerged cultural resource, could be a vessel type documented in the survey areas. The magnetic signature associated with this vessel type will be relatively small and low in amplitude due to the fiberglass hull and the increased use of aluminum in modern marine motors. An acoustic contact will likely exist for this vessel type due to the recent deposition and durability of fiberglass.

Finally, SEARCH expected a significant amount of modern debris in the Surveys Areas owing to the plethora of military, commercial, and recreational vessels that frequent the area and the presence of maintained shipping channels. Debris often is jettisoned from vessels, whether purposely or unknowingly, and tends to collect in high-traffic areas (e.g., inside and adjacent to navigation channels, fishing hotspots, anchorages, etc.). SEARCH has documented similar debris accumulating along the navigation channels and shore faces of numerous other archaeological surveys. The challenge, which is partially addressed with proper background research and cartographic analysis, is to differentiate between a debris item and a potential historic resource.

DIVE METHODOLOGY

DIVE EQUIPMENT AND VESSEL

Dive operations in the Mobile River were conducted using Self-Contained Underwater Breathing Apparatus (SCUBA) equipment with full-face masks (complete with diver-to-surface tethered communications). SCUBA allowed divers to effectively investigate the remote-sensing targets and maintain maneuverability to navigate around the river bottom (**Figure 63**). All dive operations were conducted under standards outlined by the American Academy of Underwater Sciences (AAUS). This includes the appropriate level of diver's certification satisfied by the AAUS Scientific Diving exemption; current Cardiopulmonary Resuscitation (CPR), First Aid, and Oxygen Administration certifications; a current diver physical signed by a licensed physician; and the requisite experience and training consistent with SEARCH scientific diving standards. All dive equipment utilized by SEARCH during dive operations is maintained according to AAUS standards, and all diver and equipment certifications were up to date for the duration of the current investigation. Certified equipment includes regulators, SCUBA cylinders, and all depth and pressure gauges.

Figure 63. SEARCH archaeological diver prepares to investigate a target in the Mobile River.

SEARCH conducted all dive operations from a 6.4-m (21-ft) aluminum, flat-bottomed Rhino vessel powered by a 90-horsepower outboard motor (see **Figure 54**). This vessel is ideally suited for the project location and environmental conditions. The vessel had ample deck space to conduct safe diving operations and is equipped with all the necessary safety equipment, including the appropriate number of life jackets, marine radio, horn, fire extinguisher, and visual distress signals. SEARCH displayed a diver-down safety flag in order to alert nearby vessels to the presence of divers in the water.

ANOMALY RELOCATION

SEARCH used a Trimble dGPS and Hypack Navigation software to relocate the targets slated for diver identification. The dGPS provides sub-meter positional accuracy and Hypack navigation software allowed the survey team to accurately navigate to each target. SEARCH deployed a buoy to guide divers to each target location. SEARCH personnel then anchored the survey

vessel upriver from each target so divers could float downstream to the buoy. Due to the limited underwater visibility, only one diver was in the water at a time with tethered communication and a standby diver remained on the boat ready to assist. This practice allowed surface personnel to communicate with the diver underwater and retrieve a diver if needed. The diver maintained constant contact with the topside team during the visual and tactile search of the river bottom. The Dive Supervisor also maintained visual contact with the divers' bubbles on the surface to monitor a diver's location. No live boating was conducted during this investigation.

Additional underwater equipment was utilized to assist in relocating, identifying, and delineating all remote-sensing targets. This included a hand probe to located buried structures. Due to zero visibility conditions, circle searchers were conducted around the anomaly location. Diver arcs or circles were conducted at 3.0-m (10-ft) intervals, and all findings were reported to the Dive Supervisor via tethered communications. Potentially diagnostic artifacts were recovered, photographed on the surface, and then returned onsite. Wood samples and cores were taken to assist supplement diver site assessments.

A dive log was completed each time a diver entered the water. The dive logs identified the Dive Supervisor, Primary Diver, Standby Diver, Tender, purpose of the dive, and type of breathing air source used (SCUBA). The divers conveyed dive conditions, including water depth, water temperature, current, visibility, bottom type, and any other pertinent observations to the Dive Supervisor at the conclusion of each dive. The dive log also identifies equipment used by the diver during the dive. Most importantly, this form recorded each diver's time in, time out, air in (psi), air out (psi), and maximum water depth attained during the dive. This form also provides space to describe work accomplished, as well as notes and observations made during the dive. All dive logs are presented in **Appendix B**.

REMOTE-SENSING RESULTS

Remote-sensing data were processed following the methodology described above. SEARCH applied the knowledge gained from the historical research when interpreting the remote-sensing survey results. The research, methodologies, and hypotheses described in the Research Design section guided the archaeological analysis and developed the results and recommendations presented below. SEARCH established an amplitude threshold of ±10 gammas when analyzing magnetic anomaly significance. Any anomaly not meeting this threshold was not investigated as it may represent noise caused by towfish heading error during inclement weather or an artifact of contouring. Actual sources producing such low-amplitude anomalies likely represent relatively small, insignificant debris sources or isolated occurrences. For the remaining magnetic anomalies, SEARCH analyzed the characteristics of each anomaly and made comparisons with verified shipwreck magnetic signature examples.

SEARCH reviewed side-scan sonar imagery to identify acoustic contacts and created a mosaic image of the entire survey area. This allowed archaeologists to layer the mosaic with other project data for analysis. Acoustic contacts representing natural features were not typically captured, except for a few representative features. SEARCH reviewed sub-bottom profiler imagery to delineate buried reflectors within the data, which have the potential to help identify cultural features. These reflectors may be correlated to magnetic anomalies and/or have the potential to represent relic paleo-channels, which may hold potential evidence of prehistoric use or occupation within the survey areas. Sub-bottom profiler survey within the study areas achieved, on average, approximately 4.6 m (15 ft) to 9.1 m (30 ft) of vertical penetration within the sediment column. SEARCH generated unique identifiers for remote-sensing anomalies, contacts, and reflectors that include the abbreviation of each survey area ("MR" for Mobile River Shipwrecks Survey Area and "IC" for Ironclads Survey Area), a target number, and the letter "M" to designate a magnetic anomaly, "S" for acoustic contact, or "R" for acoustic reflector. For example, MR.001M is the first magnetic anomaly within the Mobile River Shipwrecks Survey Area. The following discussion presents an illustration of potential submerged cultural resources without disseminating locational information.

Within the Mobile River Shipwrecks Survey Area, SEARCH identified 70 magnetic anomalies or anomaly clusters (meeting the 10-gamma threshold), 30 acoustic contacts, and 35 unique acoustic reflectors. SEARCH identified 14 remote-sensing targets with similar characteristics to known shipwrecks (**Figure 64**). Within the Ironclads Survey Area, SEARCH identified 20 magnetic anomalies or anomaly clusters, 11 acoustic contacts, and four unique acoustic reflectors. SEARCH recommends additional research on three targets to verify object source, material, size, and structural characteristics shipwrecks (**Figure 64**). Tables of findings and illustrations depicting survey results, including magnetic anomaly statistics, magnetic contour maps, side-scan sonar mosaics, acoustic contact reports, and buried reflectors are presented in **Appendix C** (NOT FOR PUBLIC DISCLOSURE).

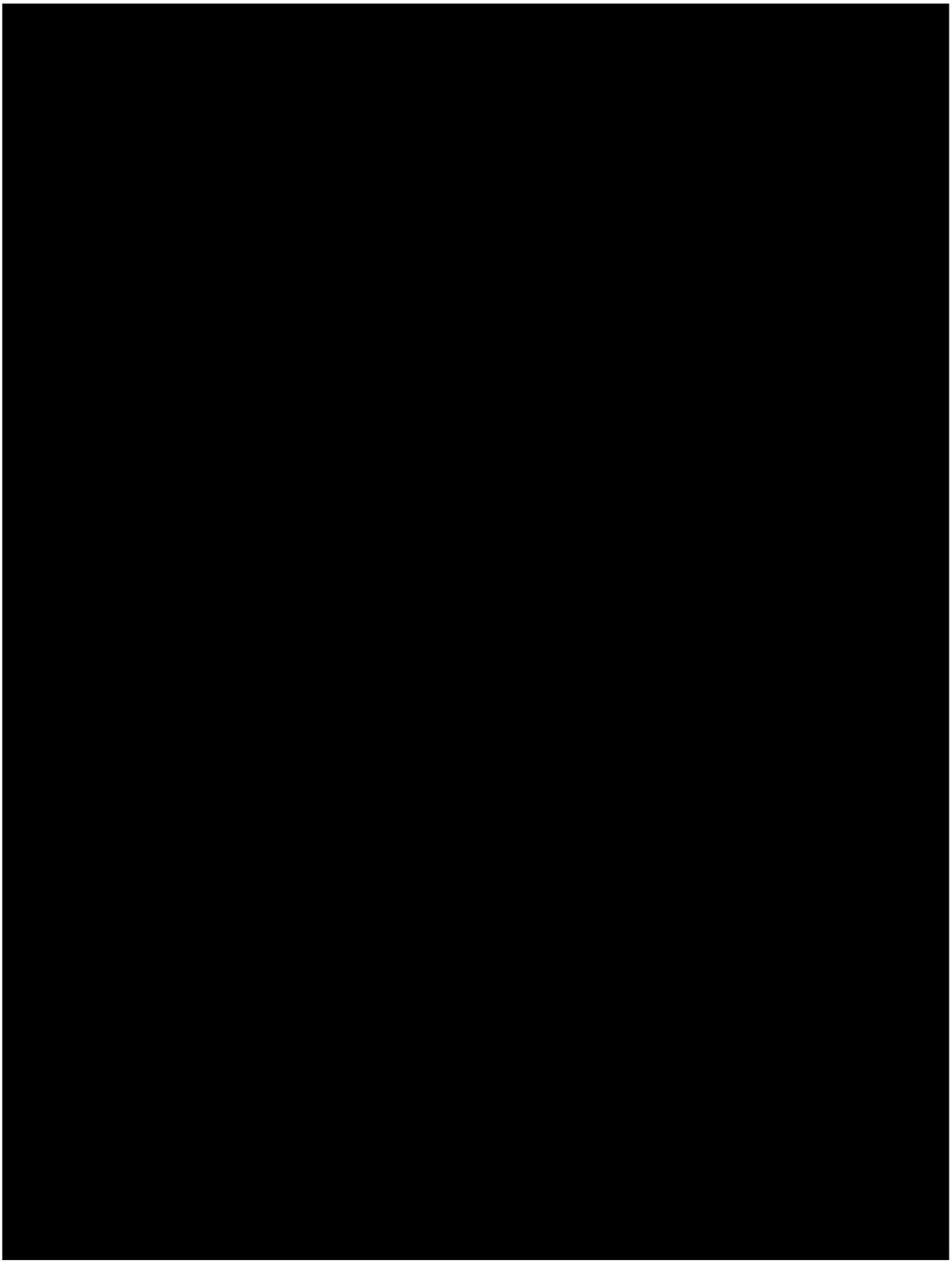

Figure 64. Remote-sensing targets identified in the Mobile River Shipwrecks and Ironclads Survey Areas.

MOBILE RIVER SHIPWRECKS SURVEY AREA

SEARCH identified the following 14 targets within the Mobile River Shipwrecks Survey Area. These targets were chosen for further discussion based on characteristics that indicate they may potentially be a shipwreck. SEARCH recommends additional research on the 14 targets to verify object source, material, size, and structural characteristics. SEARCH, in consultation with AHC, examined each target to see if its acoustic and/or magnetic signatures was similar to what would be detected for a vessel with characteristics as *Clotilda*, a mid-nineteenth-century wooden-hulled, two-masted centerboard schooner with iron fastenings measuring 26 m (86 ft) long by 7.0 m (23 ft) wide (Delgado et al. 2018).

Target 001 (1Ba699)

Target 001 is acoustic Contact MR.001S. It is located in the Mobile River's eastern channel, [redacted]. During the survey, multiple derelict barges were moored in the vicinity of Contact MR.001S. These iron barges greatly influenced the magnetic data of the area and may have masked any potential magnetic signature attributed to Contact MR.001S. A majority of the contact rests in [redacted] of water on a sloping riverbank. As illustrated in the acoustic imagery, Contact MR.001S shares characteristics of a shipwreck, including a bow-like structure, potential starboard gunwale, frames or deck beams, and what may be indicative of cargo hatch (**Figure 65**). Contact MR.001S measures approximately 69 m (228 ft) by 9.4 m (31 ft). The target appears to display a bowlike feature pointing upriver. The current condition of the target may be serving to stabilize the river bank from eroding into the center channel and is considered a hazardous environment in its current state. Acoustic imagery shows a substantial amount of tree debris intermixed and built up around the target. There also appears to be wooden pilings extending vertically upward from the river bottom near the target. These timber features are visible protruding upwards from the water column. SEARCH recommends additional research on the target. This target was identified as a high priority target to verify object source, material, size, and structural integrity. Contact MR.001S appeared to have similar characteristics as a vessel like *Clotilda*, including hull shape, but the presence of barges in the area masked any magnetic signature and affected survey vessel track lines associated with gathering acoustic data. For that reason, this target was selected for dive analysis, as will be seen in the next section.

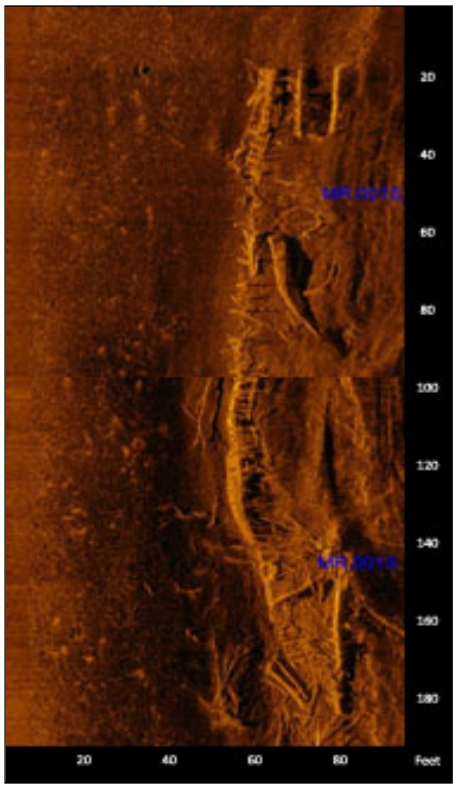

Figure 65. Acoustic imagery of Contact MR.001S.

Target 002

Target 002 is Anomaly MR.020M/Contact MR.004S. It is located in Mobile River's eastern channel [redacted] (see **Figure 31**). SEARCH identified Anomaly MR.020M across two survey transects. This anomaly is of dipolar complexity with its negative lobe oriented in the northern hemisphere; however, [redacted], it lacks vital characteristics shared by magnetic signatures of verified shipwrecks. MR.020M is associated with Contact MR.0004, illustrated along a sloping river bank. As illustrated in the acoustic imagery, MR.004S shares characteristics of a man-made object, including linear features and 90-degree angles. MR.004S measures approximately 17 m (56 ft) by 3.0 m (10 ft) with 0.7 m (2.6 ft) of vertical relief (**Figure 66**). SEARCH recommends additional research on the target. The collection of remote-sensing data provided sufficient information for identifying the source as a potential shipwreck **not** matching the characteristics of a vessel like *Clotilda*.

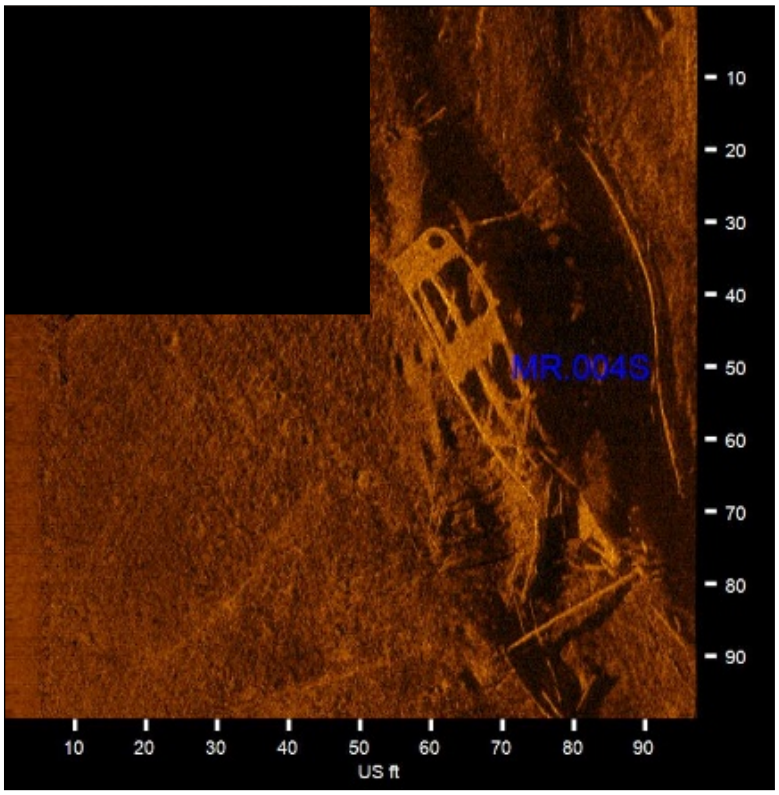

Figure 66. Acoustic imagery of Contact MR.004S and Anomaly MR.020M.

Target 003 (1Ba702)

Target 003 is Anomaly MR.070M, Contact MR.006, and Reflector MR.014R. It is located in Mobile River's eastern channel, [redacted]. Magnetic data in the vicinity of this remote-sensing target were altered by numerous ferrous shoreline objects. Anomaly MR.070M was recorded across five survey transects in [redacted] of water. MR.070M shares many characteristics of verified shipwreck magnetic signatures, including spatial extent, general dipolar complexity, and an amplitude ratio less than 1:4 (**Figure 67**). The major negative lobe of the anomaly is oriented [redacted], which may have been influenced by ferrous debris along the shoreline. Anomaly MR.070M is associated with Contact MR.006S. This contact, as illustrated in the acoustic imagery, measures approximately 72 m (237 ft) by 7.9 m (26 ft). Contact MR.006S has a discernable vessel shape (see **Figure 67**). Contact MR.006S was also identified in

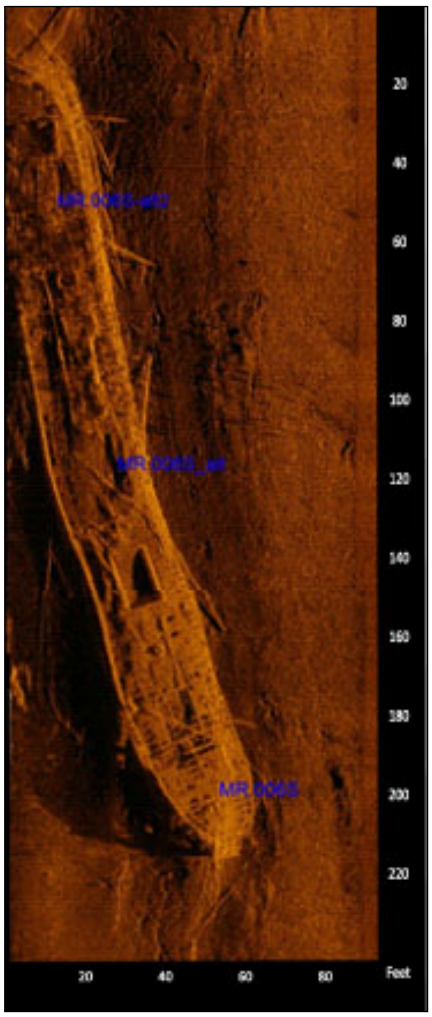

Figure 67. Acoustic imagery of Anomaly MR.070M and Contact MR.006S.

the sub-bottom profiler data and is represented by reflector MR.014R (**Figure 68**). The sub-bottom imagery indicates that Contact MR.006S has a height of approximately 4.3 m (14 ft). Additionally, the sub-bottom imagery illustrates an approximate 0.8-m (2.5-ft) scour downriver of the contact. The degree of scour suggests the source has existed in a dynamic environment for a long enough period of time to become partially buried and subject to significant sediment movement. SEARCH recommends additional research on the target. The collection of remote-sensing data provided sufficient information for identifying the source as a shipwreck **not** matching the characteristics of *Clotilda*.

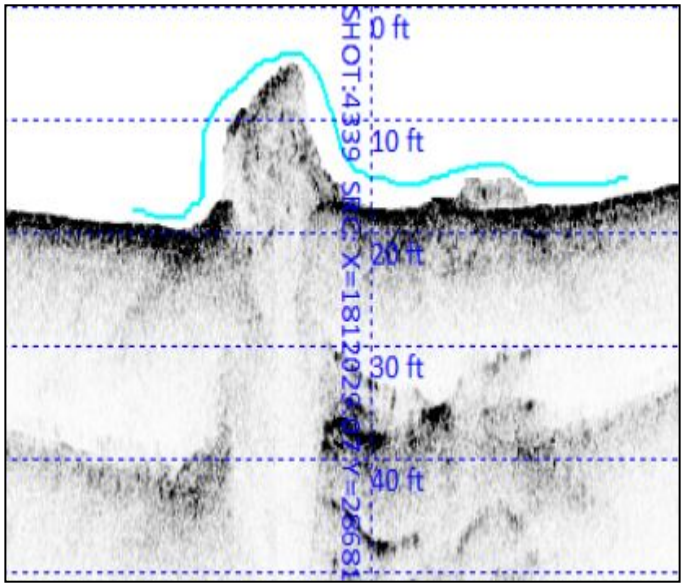

Figure 68. Acoustic imagery of Reflector MR.014R.

Target 004 (1Ba703)

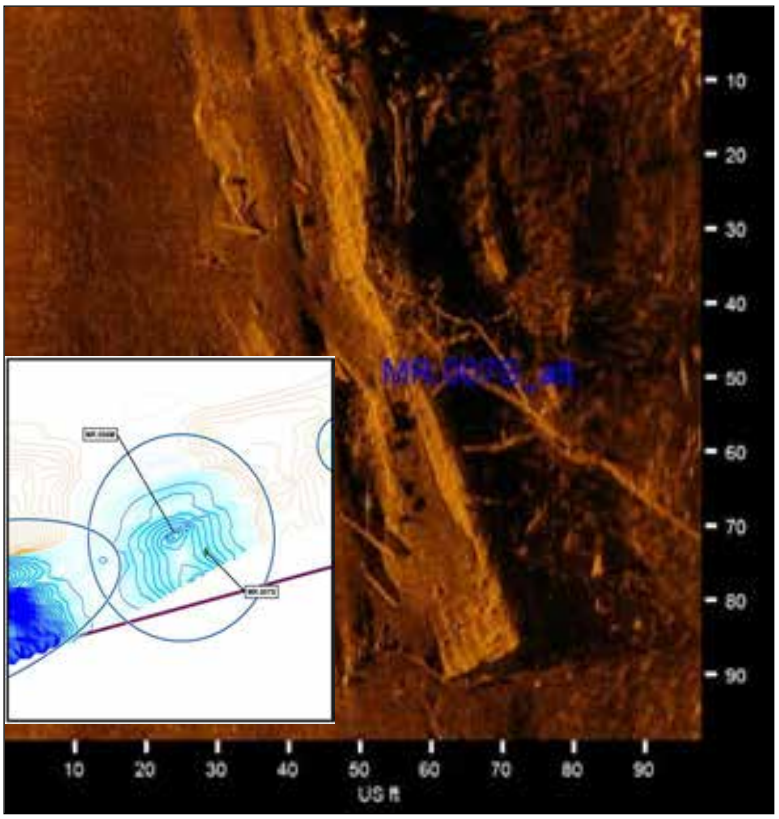

Figure 69. Acoustic imagery of Contact MR.007S and Anomaly MR.056M.

Target 004 is Anomaly MR.0056M and Contact MR.007S. It is located in Mobile River's eastern channel, [redacted]. The Contact is [redacted] from the river bank and located immediately west of the previously recorded Hicks Wreck site. SEARCH identified Anomaly MR.056M across three survey transects. MR.056M does not share characteristics of verified shipwreck magnetic signatures; however, MR.056M is a high amplitude monopolar anomaly associated with Contact MR.0007 (**Figure 69**). As illustrated in the acoustic imagery, Contact MR.007S shares characteristics of a man-made object with straight lines and 90-degree angles. Contact MR.007S measures approximately 24 m (81 ft) by 10 m (36 ft). The overall size and shape of MR.007S is indicative of a vessel (see **Figure 69**). SEARCH recommends additional research on the target. The collection of remote-sensing data provided sufficient information for identifying the source as a potential shipwreck **not** matching the characteristics of *Clotilda*.

Target 005 (1Ba704)

Target 005 is Contact MR.005S. [redacted]. The magnetic record is not discernable in the vicinity of Contact MR.005S due in part to the large magnetic signature of nearby submerged and shoreline objects and modern debris. SEARCH identified Contact MR.005S along the sloping river bank. A majority of the contact rests in 1.5 m (5.0 ft) of water. Contact MR.005S shares acoustic characteristics of a shipwreck, including a raised bow-like structure, visible port and starboard gunwales, and numerous loose linear (timber-like) objects around the contact (**Figure 70**). As illustrated in the acoustic imagery, Contact MR.005S measures approximately 25 m (78 ft) by 6.4 m (21 ft) in length. SEARCH recommends additional research on the target. This contact was identified as a high priority target to verify object source, material, size, and structural integrity. The collection of remote-sensing data provided sufficient information for identifying the source as a potential shipwreck matching the

characteristics of *Clotilda*, including hull shape and dimensions. For that reason, this target was selected for dive analysis, as will be discussed in the next section.

Target 006

Previous SEARCH documentation of a shipwreck at this location was conducted in March 2018. The site was named the Twelvemile Island Wreck (1Ba694) (Delgado et al. 2018). Target 006 is Anomaly MR.062M and Contact MR.008S. It is located in Mobile River's eastern channel, [redacted]. The anomaly is located [redacted] from shore. Magnetic data in the vicinity of this remote-sensing target were altered by numerous ferrous shoreline objects. SEARCH identified Anomaly MR.062M across three survey transects. MR.062M does not share characteristics of verified shipwreck magnetic signatures; however, MR.062M is a high amplitude monopolar anomaly associated with Contact MR.008S (**Figure 71**). SEARCH identified Contact MR.0008S along a sloping river bank. Visible extents of contact MR.008S measures approximately 31 by 9.4 m (104 by 31 ft). Contact MR.008S shares acoustic characteristics of a shipwreck, including a bow-like structure and exposed planking (**Figure 72**). SEARCH recommends additional research on the target. The collection of remote-sensing data provided sufficient information for identifying the source as a potential shipwreck **not** matching the characteristics of *Clotilda,* including hull shape and dimensions.

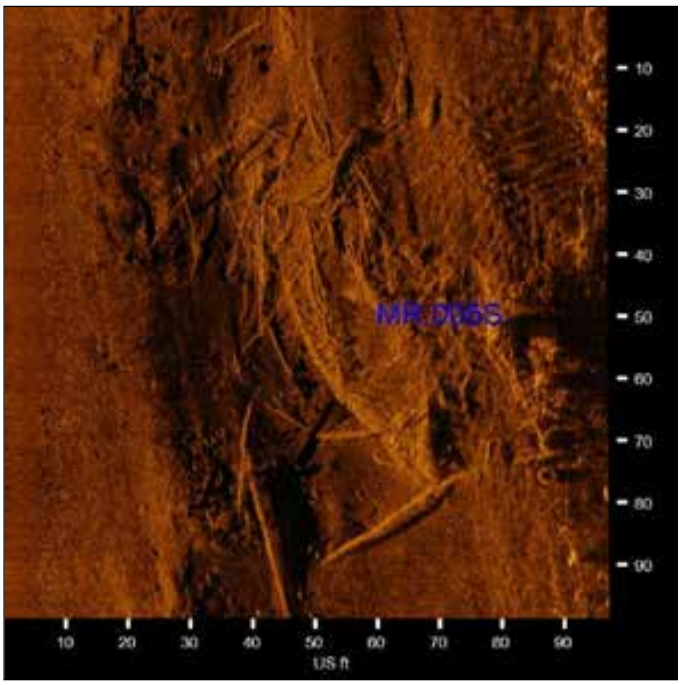

Figure 70. Acoustic imagery of Contact MR.005S.

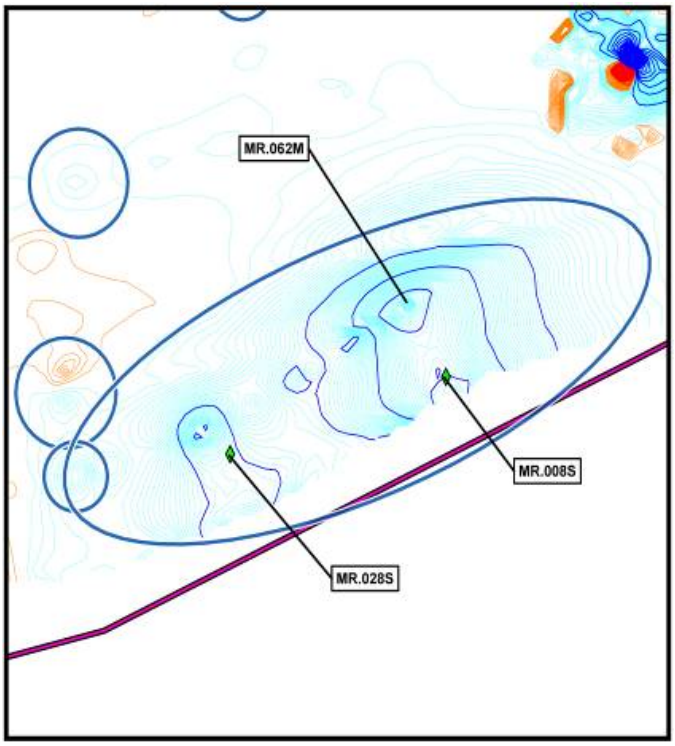

Figure 71. Anomaly MR.062M.

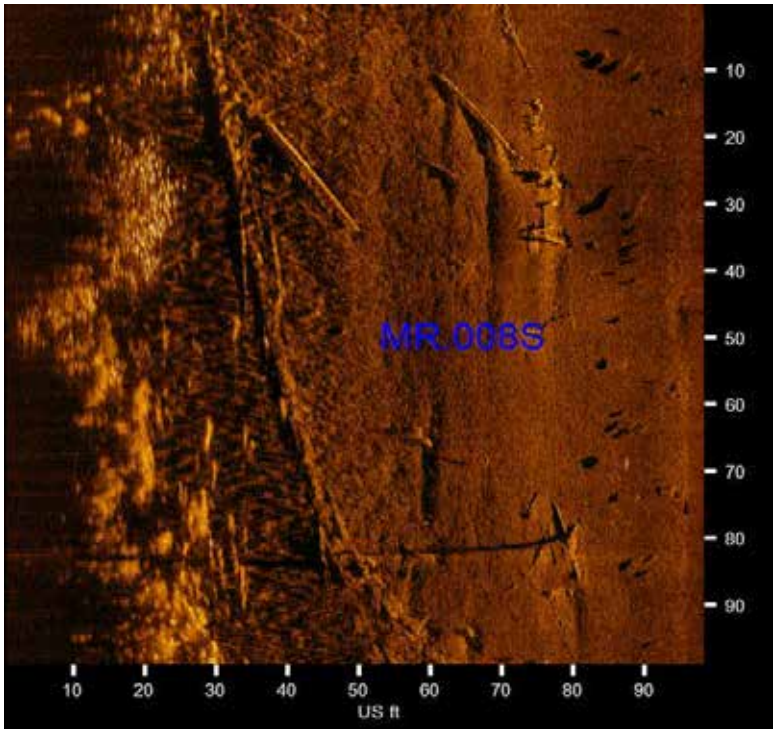

Figure 72. Acoustic imagery of Contact MR.008S and Anomaly MR.062M.

Target 007

Target 007 is Anomaly MR.063M and Contact MR.009S. It is located in Mobile River's eastern channel, [redacted]. The Anomaly is [redacted] from a sloping riverbank. SEARCH identified Anomaly MR.063M across four survey transects. MR.063M shares characteristics of verified shipwreck magnetic signatures, including spatial extent and general dipolar complexity; however, the main negative lobe of the anomaly is oriented [redacted] from magnetic north. MR.063M is associated with Contact MR.009S. As illustrated in the acoustic imagery, Contact MR.009S shares characteristics of a man-made object with straight lines and 90-degree angles, possibly indicative of a barge or sailing vessel later used as a barge (**Figure 73**). Contact MR.009S measures approximately 7.6 m (25 ft) by 2.1 m (7.0 ft). SEARCH recommends additional research on the target. The collection of

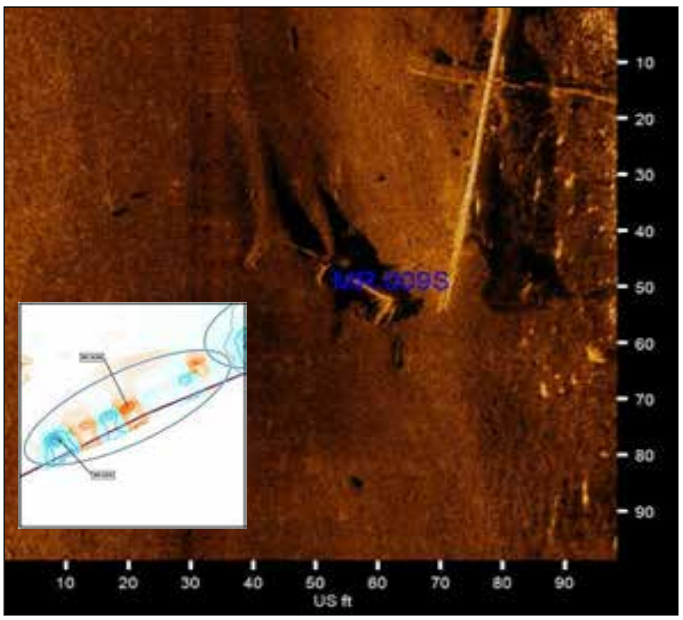

Figure 73. Acoustic imagery of Contact MR.009S and Anomaly MR.063M.

remote-sensing data provided sufficient information for identifying the source as a potential shipwreck **not** matching the characteristics of *Clotilda*.

Target 008 (1Mb566)

Target 008 is Contact MR.016S. It is located in Mobile River's eastern channel, [redacted]. The source of MR.016S did not produce a discernable magnetic signature. As illustrated in the acoustic imagery, MR.016S shares characteristics of a man-made object with straight lines and 90-degree angles, possibly indicative of a barge (**Figure 74**). Contact MR.015S measures approximately 7.3 m (24 ft) by 3.0 m (10 ft). SEARCH recommends additional research on the target. The collection of remote-sensing data provided sufficient information for identifying the source as a potential shipwreck **not** matching the characteristics of *Clotilda*.

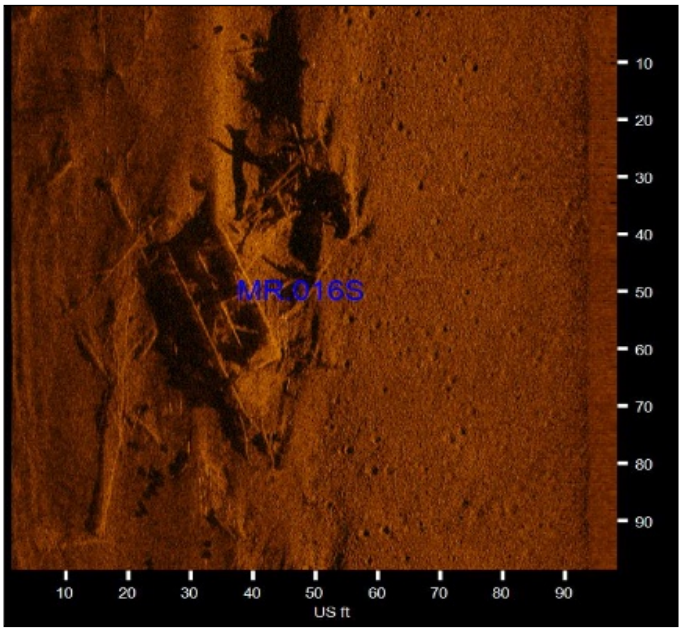

Figure 74. Acoustic imagery of Contact MR.016S.

Target 009 (1Ba705)

Target 009 is Contact MR.025S. It is located in Mobile River's eastern channel [redacted]. Numerous derelict barges moored in the vicinity of MR.025S inhibited the identification of a magnetic signature associated to the contact. MR.025S shares acoustic characteristics of a possible shipwreck, including linear features and 90-degree angles, possibly associated with a barge (**Figure 75**). As illustrated in the acoustic imagery, Contact MR.025S measures approximately 10 by 6.7 m (33 by 22 ft).

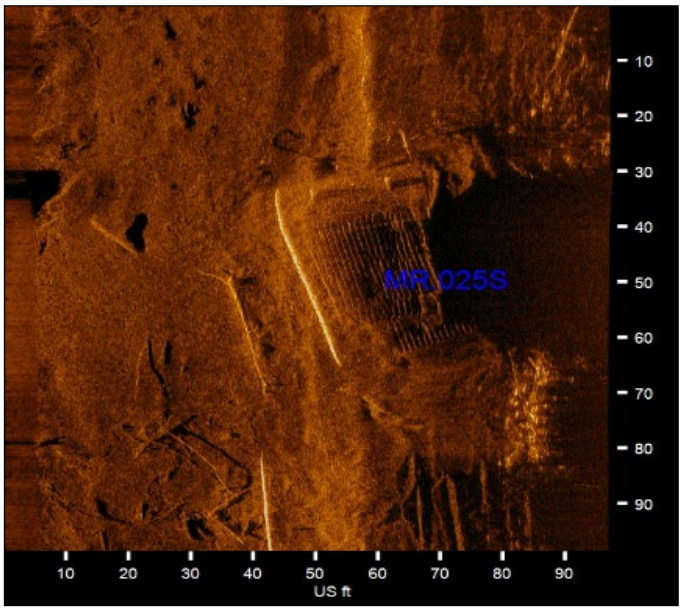

Figure 75. Acoustic imagery of Contact MR.025S.

SEARCH recommends additional research on the target. The collection of remote-sensing data provided sufficient information for identifying the source as a potential shipwreck **not** matching the characteristics of *Clotilda*.

Target 010 (1Ba706)

Target 010 is Anomaly MR.069S and Contact MR.010S. It is located in Mobile River's eastern channel, [redacted] SEARCH identified MR.069M across four survey transects. MR.069M shares many characteristics of verified shipwreck magnetic signatures, including general dipolar complexity and an amplitude ratio of 1:0.6; however, with an orientation of [redacted], it lacks the vital orientation characteristic shared by verified shipwreck magnetic characteristics (**Figure 76**).

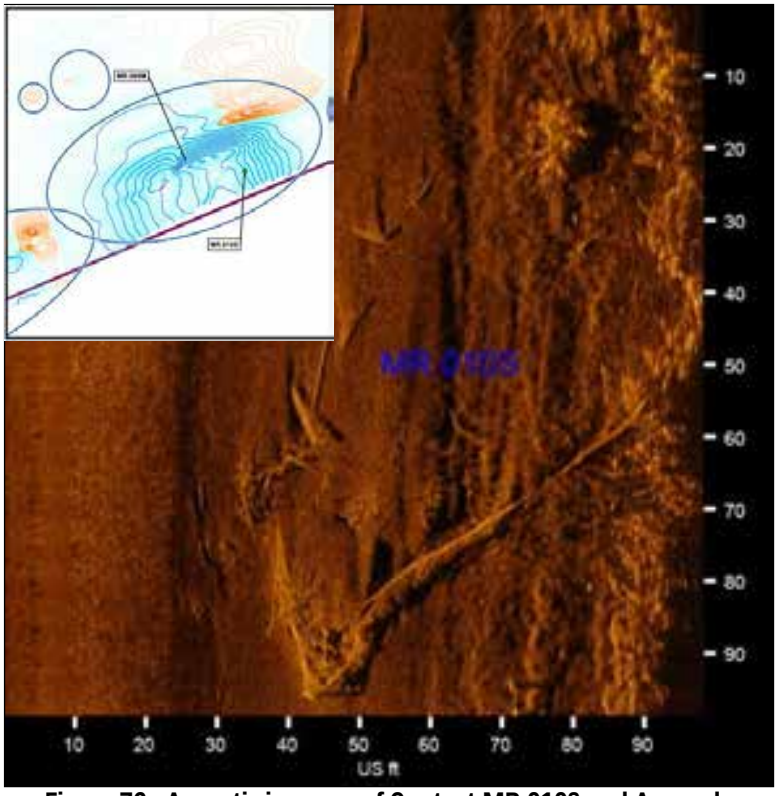

Figure 76. Acoustic imagery of Contact MR.010S and Anomaly MR.069M.

Anomaly MR.069M is associated with Contact MR.010S, which shares acoustic characteristics of a possible shipwreck, including a raised bow-like structure, hull-shaped outline, and numerous loose linear (timber-like) objects (see **Figure 76**). As illustrated in the acoustic imagery, Contact MR.010S measures approximately 28 by 7.0 m (95 by 23 ft). This target was identified as a high priority target to potentially verify object source, material, size, and structural integrity. The collection of remote-sensing data provided sufficient information for identifying the source as a potential shipwreck possibly matching the characteristics of *Clotilda*, including hull shape and dimensions. For that reason, this target was selected for dive analysis, as will be discussed in the next section.

Target 011

Target 011 is Anomaly MR.030M and Contact MR.011S. It is located in Mobile River's eastern channel, [redacted]. SEARCH identified MR.030M across two survey transects. MR.030M shares characteristics with magnetic signatures of verified shipwrecks, including spatial extent and general dipolar complexity; however, with the major negative lobe [redacted] (**Figure 77**). MR.030M is associated with Contact MR.011S.

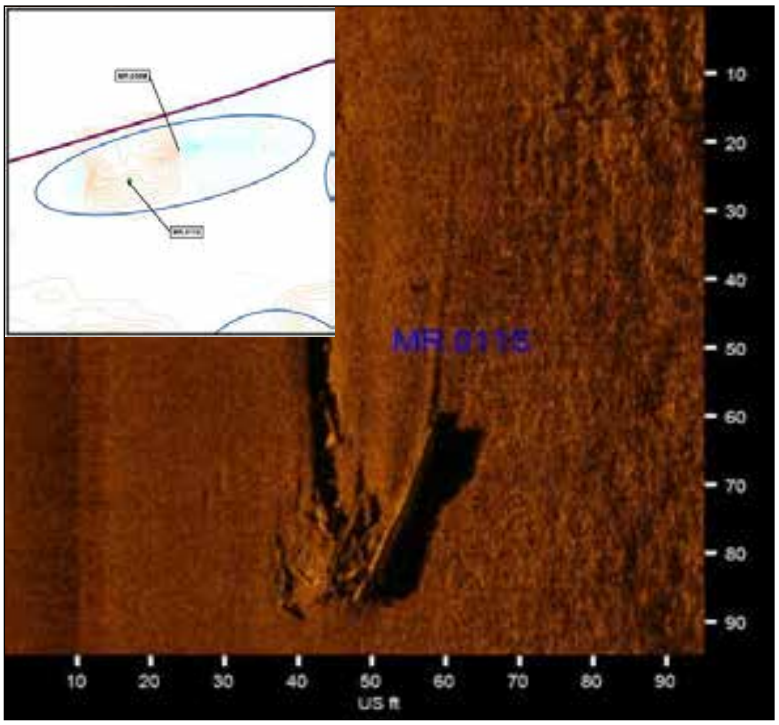

Figure 77. Acoustic imagery of Contact MR.011S and MR.030M.

A majority of the contact rests in [redacted] of water. Contact MR.011S shares acoustic characteristics of a possible shipwreck, including a bow-like structure and planking or frame ends forming a hull-shaped outline (see **Figure 77**). As illustrated in the acoustic imagery, MR.011S measures approximately 28 by 7.0 m (54 by 17 ft). SEARCH recommends additional research on the target. This target was identified as a high priority target to potentially verify object source, material, size, and structural integrity. The collection of remote-sensing data provided sufficient information for identifying the source as a potential shipwreck possibly matching the characteristics of *Clotilda*, including hull shape and dimensions. For that reason, this target was selected for dive analysis, as will be discussed in the next section.

Target 012

Previous SEARCH documentation of a shipwreck at this location was conducted in March 2018. The site was named Harms Wreck (1Ba697) (Delgado et al. 2018). Target 012 is Anomaly MR.046M and Contact MR.029S. It is located in Mobile River's eastern channel [redacted]. SEARCH identified MR.046M across three survey transects as a high amplitude anomaly with monopolar complexity. MR.046M does not share characteristics of verified shipwreck magnetic anomalies (**Figure 78**). MR.046M is associated with Contact MR.029S, which shares acoustic

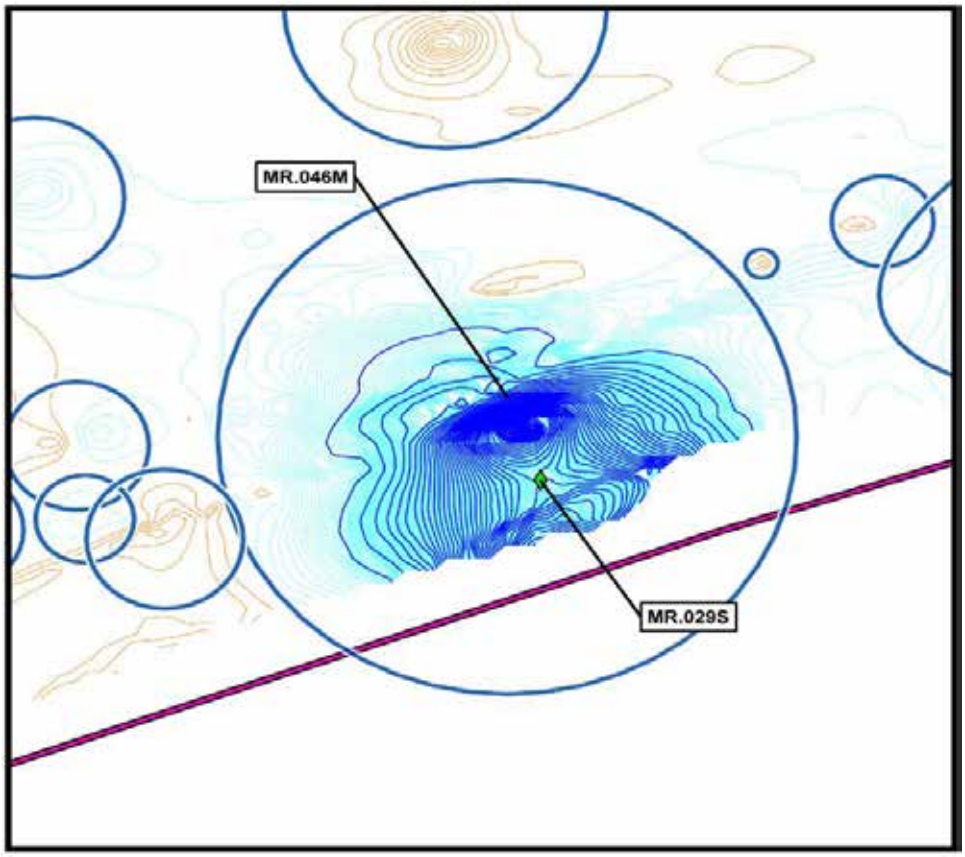

Figure 78. Acoustic imagery of Anomaly MR.046M.

characteristics of a possible shipwreck, including a bow-like structure with disarticulated linear features (**Figure 79**). As illustrated in the acoustic imagery, Contact MR.015S measures approximately 13 by 5.4 m (45 by 18 ft). SEARCH recommends additional research on the target. SEARCH did not designate the target a high priority dive target, as the collection of remote-sensing data provided sufficient information for identifying the source as the potential shipwreck **not** matching the characteristics of *Clotilda*.

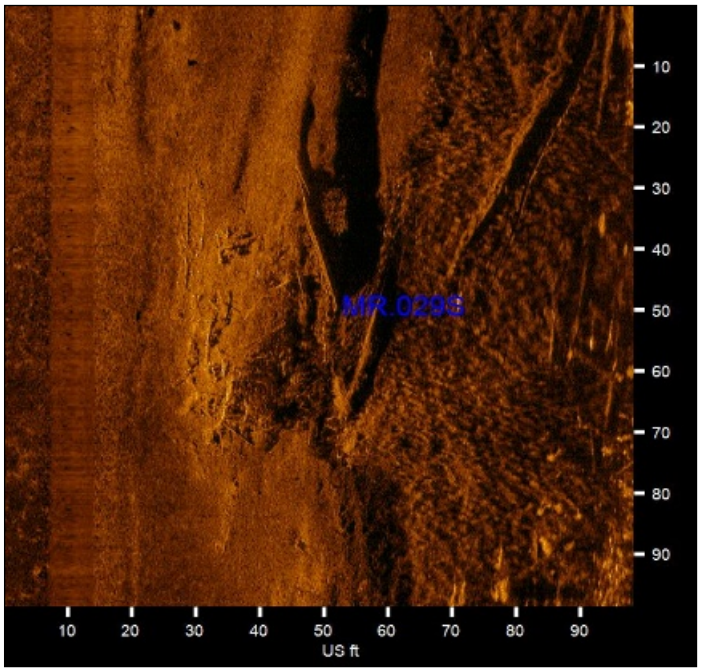

Figure 79. Acoustic imagery of Contact MR.029S.

Target 013

Target 013 is Anomaly MR.015M. It is located in Mobile River's eastern channel [redacted]. SEARCH identified MR.015M across three survey transects (**Figure 80**). MR.015M shares many characteristics with magnetic signatures of verified shipwrecks, including spatial extent, general dipolar complexity, main negative lobe orientation [redacted]. MR.015M does not have an associated acoustic contact, suggesting the source of the anomaly is buried. SEARCH recommends additional research on the target. SEARCH did not designate the target a high priority target as no visible remains were present to help determine if the source is a potential shipwreck.

[redacted]

Figure 80. Anomaly MR.015M.

Target 014

Target 014 is Anomaly MR.038M. It is located in middle of Mobile River's eastern channel [redacted]. SEARCH identified this anomaly across three survey transects (**Figure 81**). MR.038M shares many characteristics with magnetic signatures of verified shipwrecks, including spatial extent, dipolar complexity, main negative lobe orientation [redacted]. MR.038M does not have an associated acoustic contact, suggesting the source of the anomaly is buried. SEARCH recommends additional research on the target. SEARCH did not designate the target a high priority target as no visible remains were present to determine if the source is a potential shipwreck.

[redacted]

Figure 81. Anomaly MR.038M.

IRONCLADS SURVEY AREA

SEARCH identified the following three remote-sensing targets within the Ironclads Survey Area. These targets were chosen for further discussion based on characteristics that indicate they may potentially be a shipwreck or submerged cultural resource. SEARCH recommends diver investigation of the three targets to verify object source, material, size, and structural characteristics.

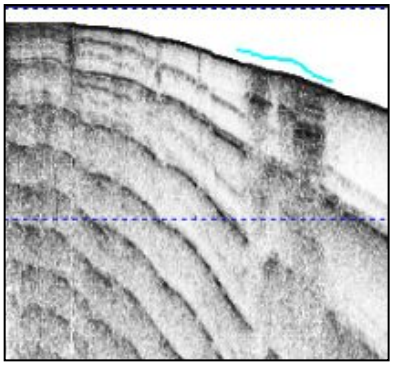

Figure 83. IR.002R in two dimensions. Light blue traces the buried reflector.

Target 015 (1Mb558)

Target 015 is Anomaly IC.005 and Reflector IC.002R. SEARCH recorded Anomaly IC.005M across seven survey transects in approximately 2.1 m (7.0 ft) of water (**Figure 82**). [redacted] (see **Figure 3**). Anomaly IC.005M shares many characteristics with verified shipwreck magnetic signatures, including spatial extent, general dipolar complexity with the main negative lobe oriented [redacted]. The maximum extent of Anomaly IC.005M is 131 m (433 ft).

[redacted]

Figure 82. Anomaly MR.004M and MR.005M.

Anomaly IC.005M is accompanied by Reflector IC.002R (IC.002.1R-IC.002.11R), but is not illustrated in the side-scan sonar acoustic imagery, indicating the source is buried (**Figure 83**). Reflector IC.002R was identified at a minimum and maximum burial depth of 0.9 and 2.4 m (3.0 and 8.0 ft). IC.002R is characterized by high intensity (dark) acoustic returns below the river bed that inhibits further vertical penetration of the acoustic wave. These characteristics are indicative of a buried material with high density variant to its surroundings. **Figure 83** illustrates IC.002R in two dimensions. SEARCH recommends additional research on the target.

Target 016 (1Mb557)

Target 016 is Anomaly IC.004M and Reflector IC.003R. SEARCH recorded Anomaly IC.004M across 11 survey transects in approximately [redacted] of water (see **Figure 82**). Its location, [redacted] (see **Figure 3**). Anomaly IC.004M shares many characteristics with verified shipwreck magnetic signatures, including spatial extent, dipolar complexity with the main [redacted]. The maximum extent of Anomaly IC.004M is 111 m (365 ft).

Anomaly IC.004M is accompanied by Reflector IC.003R (IC.003.1R-IC.003.9R), but is not illustrated in the side-scan sonar acoustic imagery, indicating the source is buried. Reflector IC.003R was identified at a minimum and maximum burial depth of 1.2 and 1.8 m (4.0 and 6.0 ft). IC.003R is characterized by high intensity (dark) acoustic returns below the river bed that inhibits further vertical penetration of the acoustic wave. These characteristics are indicative of a buried material of high density variant to its surroundings. IC.003R is represented two dimensionally similar to **Figure 83**, or three dimensionally in **Figure 84**. SEARCH recommends additional research on the target.

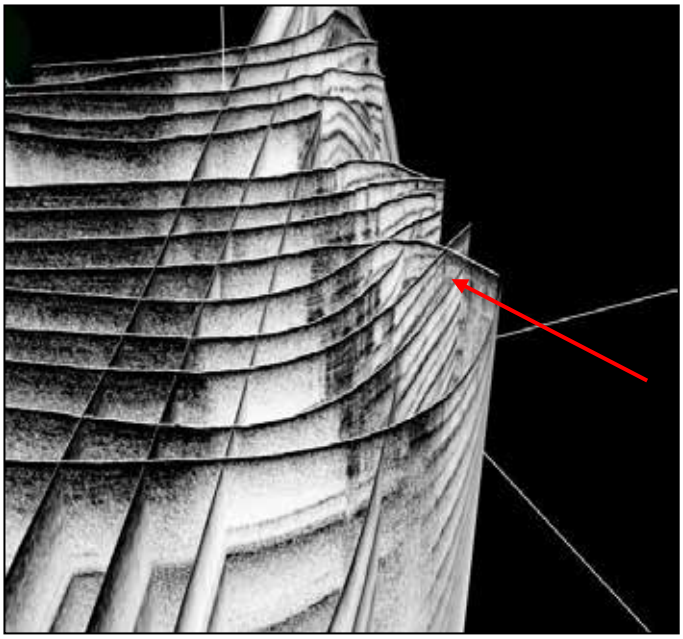

Figure 84. Three-dimensional view of sub-bottom profiler data. Red arrow points to buried reflector IC.003R.

Target 017 (1Mb567)

Target 017 is Contact IC.002S. It is located in the Mobile River [redacted]. SEARCH identified Contact IC.002S approximately [redacted]. Contact IC.002S measures approximately 64 by 5.7 m (210 by 19 ft). As illustrated in the acoustic imagery, Contact IC.002S has characteristics of a jetty with four rows of parallel pilings sitting vertical in the water column and unidentified debris associated with it (**Figure 85**). The pilings extend above the riverbed approximately 1.0 m (3.4 ft) and likely exist as part of network of pre-Civil War-era jetties near the mouth of the Spanish River. The jetty is featured on a historic 1866 map (see **Figure 3**) (Merrill 1866). SEARCH recommends additional research on the target.

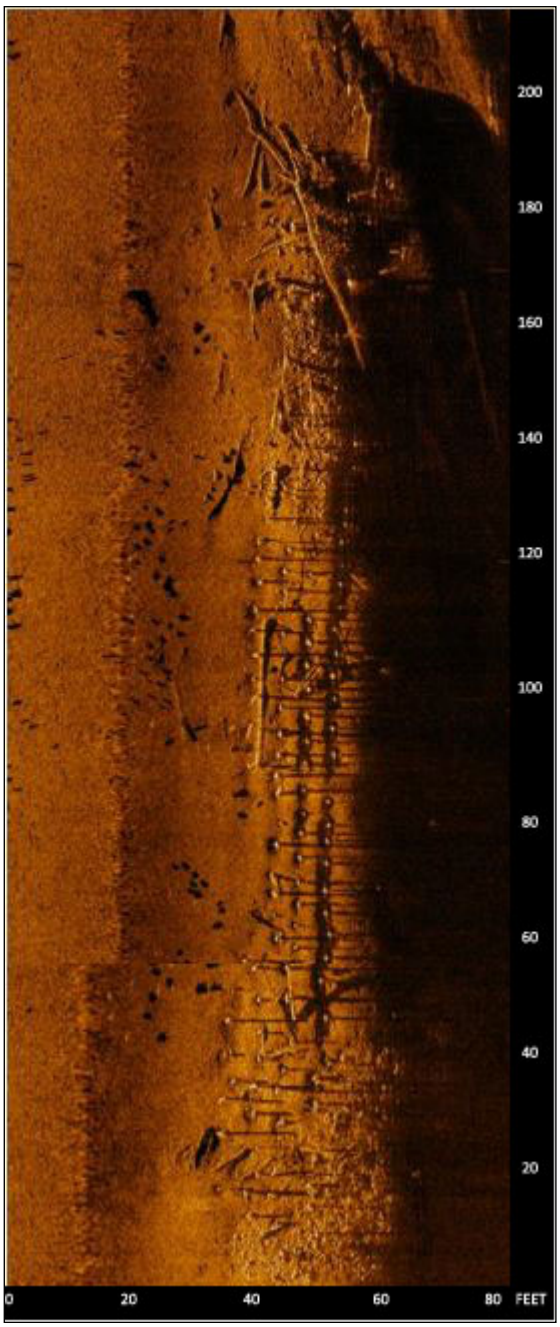

Figure 85. Acoustic imagery of the Spanish River Jetty, IC.002S.

DIVE RESULTS

Based on a preliminary investigation of the 14 remote-sensing targets, SEARCH, in consultation with AHC, chose four targets as high priority targets for further investigation by divers. This decision was based on the target's acoustic and/or magnetic signatures compared to what would be detected for a vessel of similar characteristics as *Clotilda*, a wooden-hulled centerboard schooner with iron fasteners measuring 26 m (86 ft) long by 7.0 m (23 ft) wide (Delgado et al. 2018). Magnetic anomalies that did not show up in the side-scan sonar data as acoustic contacts were not chosen as dive targets as they were buried below the sediment level with no observed visible features.

Four targets were chosen for diver investigations: Targets 001 (1Ba699), 005 (1Ba704), 010 (1Ba706), and 011. The remaining 10 targets do not appear to represent a shipwreck similar to *Clotilda*, but are important to determining potential eligibility to the NRHP as a historic and/or archaeological district. SEARCH recommends additional research on those 10 targets to verify object source, material, size, and structural characteristics. SEARCH conducted a total of five dives from July 11 to July 13, 2018, and one dive on August 6, 2018, for a total of six dives.

MOBILE RIVER SHIPWRECKS SURVEY AREA

Target 001 (1Ba699)

Target 001 (MR.001S) is located in the Mobile River's eastern channel [redacted] (**Figure 86**). [redacted] Target 001 is [redacted]. The target parallels the shore and is resting on a ledge, sloping inward toward the river channel. The target appears to display a bowlike feature pointing upriver with tree debris surrounding and within the hull stricture.

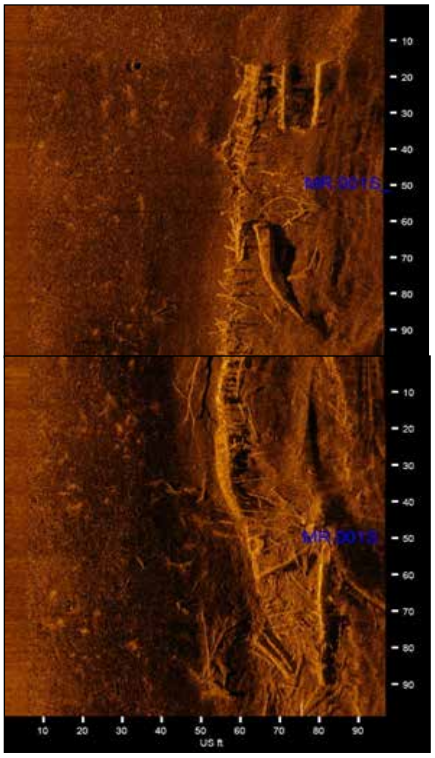

Figure 86. Diver Target MR.001S.

Figure 87. Diver Target 001 marked by SEARCH buoys for the diver investigation. View looking upriver (left) and underwater photograph of Target 001 (right).

On August 6, 2018, SEARCH divers conducted one 35-minute SCUBA dive on Target 001. Water depth at the dive location was noted at [redacted] with 15 cm (6.0 in) of visibility. Water temperature was 29°C (85°F) with a mud bottom composition. The diver located a vessel with an iron hull protruding up from the river bottom. The exposed hull section measured 0.9 m (3.0 ft) to 1.8 m (6.0 ft) long by 7.0 cm (3.0 in) wide. Metal hull plating measured approximately 0.6 cm (0.25 in) thick (**Figure 87**). Based on the iron present on site, Target 001 is believed to represent an iron-hulled shipwreck of unknown type and historical context. The resource appears to be mostly buried in the sediment. The diver noted portions of the vessel's iron hull plating exposed. Target 001 may represent the late-life reuse of an older oceangoing cargo ship. In addition to the exposed iron, multiple linear features are present on the southern portion of acoustic contact of Target 001. These features appear to exist protruding from the riverbed and into the water column. This may represent the remnants of a culturally altered feature such as a jetty or pilings. Additional research is warranted to more fully assess the extents of the features present at Target 001. A large amount of tree debris is on top and around the remains, making navigation hazardous. SEARCH recommends additional research on Target 001. Target 001 does **not** match the characteristics as a vessel similar to *Clotilda*.

Target 005 (1Ba704)

Target 005 (MR.005S) is located in Mobile River's eastern channel on the eastern [redacted]. The target was noted in the sonar as likely representing a historic shipwreck, with a visible bow feature pointing toward shore in an easterly direction. Acoustic imagery showed a substantial amount of tree debris intermixed and built up around the target.

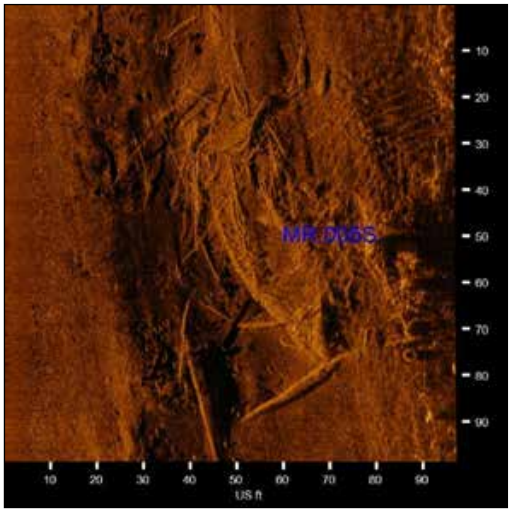

Figure 88. Diver Target 005.

On July 11, 2018, SEARCH divers conducted one 45-minute SCUBA dive on Target 005 (**Figures 88 and 89**). Water depth at the dive location was 3.3 m (11 ft) with 15 cm (6.0 in) of visibility. Water temperature was 31°C (88°F) with a mud bottom composition. The diver reported the presence of a wooden hulled shipwreck, with approximately 1.5 m (5.0 ft) of hull structure exposed above the sediment on the port side of the vessel. Hull components present on site included the ceiling planking and frames along with iron fasteners, with a portion of planking measuring approximately 11 cm (4.5 in) in width. No copper sheathing was observed on the initial dive. The construction methods and fasteners are consistent with a mid- to late nineteenth-century date of construction.

Figure 89. Target 005 marked by SEARCH with a buoy for the diver survey. View looking downriver.

Three wood samples were taken and recovered for analysis. One sample was collected from a frame, one from the ceiling planking, and one from a loose piece of wood with a fastener embedded into it. Dr. Amy Mitchell-Cook, University of West Florida, conducted wood analysis and determined the frame sample to be White Oak (*Quercus spp.)*, the ceiling to be Southern Pine (*Pinus spp*.), and the fastener with wood to be Southern Pine (*Pinus spp*.).

The results of the wood analysis, based on three samples collected from the vessel, indicate that Target 005 is a Southern-built vessel constructed with regionally available woods. The type of wood and the specific use of different woods for the planking and framing are consistent with the archival record for *Clotilda*. That being said, *Clotilda* was not a unique vessel in its construction. It was the product of experienced shipwrights working locally and regionally with not only available materials, but execution in shipbuilding consistent with local practice.

Target 005, of all the targets, is the only target that matches some of the characteristics of a vessel like *Clotilda*. It is essentially the right size, shape, and probable age, and the wood used in its construction is a match. That being said, at this juncture, there is insufficient evidence to identify Target 005 as *Clotilda*, just as there is also no definitive evidence to say that this is not *Clotilda*. What SEARCH recommends is further research, including partial excavation of Target 005. This was beyond the scope of this project, as excavation requires a research design and a USACE permit. SEARCH has reserved National Geographic funds for a two-day excavation of Target 005. SEARCH is in the process of completing a research design and will work with the AHC to submit an USACE permit application for excavation of two discrete units to determine if there is evidence of masts/rigging configuration, a center board, destruction by fire, or other artifactual evidence that could assist in determining an identity for Target 005.

Core Sample

While on Target 005, National Geographic Society requested that a sediment core be collected from the target. The purpose of the sediment core was to potentially identify remnant DNA that may be associated with the shipwreck. The sample was collected on July 7, 2018, from inside Target 005's hull and is being processed for preserved extracellular relict DNA analysis. Due to the shallow water depth of the vessel, archaeologists were able to collect the sample through scientific snorkeling. At the time of this report, that analysis, conducted separately for National Geographic, has not been completed.

As part of the coring process, a control sample was also collected. The purpose was to confirm or deny the presence or absence of remnant DNA in the surround environment. This second core was taken from the bottom of Mobile River's eastern channel at a location that was away from any known cultural materials or potential shipwreck targets, and was taken to a depth of 152 cm (59 in) below sediment surface. The core was collected at a depth of 3.9 m (13 ft) of water at slack tide. The single 20-minute dive collected 1.8 m (6.0 ft) of sediment within the core (**Figure 90**). Radiocarbon analysis determined the samples conventional radiocarbon date is 2510 +/- 30 BP (**Appendix D**). The sample suggests that this portion of the river has not been subject to previous dredge related activities, as suspected from the notation on the 1889 Army Corps survey of it as being "unnavigable."

Core Methodology

Sediment cores are utilized to identify a wide range of prehistoric conditions, including environment, sea-level changes, dispositional environments, and dating. Cores are also used in concert to sub-bottom profiler data to identify stratum reflectors. Coring is the most suitable process for identifying submerged stratigraphy. Core tubes consist of a 7.6-cm (3.0-in) diameter aluminum pipe that average 3.0 m (10 ft) to 7.3 m (24 ft) in length, depending on water depth and amount of sediment. Core tubes are lowered for the boat to the extraction site, and the location is recorded by GPS. Cores are driven into the sediment until termination at impasse or the full extent of the core tube has been embedded to its maximum depth. The length of the drive is measured to calculate the level of compaction once the core is extracted. Divers then cap the core tube end to maintain a vacuum to avoid the loss of sediment during extraction. In the event that the core has not been driven below the water surface, the top side crew will cap the core tube. As the core is extracted from the sediment, divers will cap the bottom of the core tube to ensure there is minimal sediment loss. Once the core is aboard the vessel, a measuring tape is lowered into the top of the core to measure the amount of sediment collected. The difference between the core drive and sediment measurements represents the level of compaction. Excess core tube not containing sediment will be removed, and the core will be packed and sealed for transportation. Excessively long core tubes maybe cut into section for ease of transportation and storage. End caps will be labeled with the core number and which end is the top and bottom. Arrows will also be drawn on the core tube indicating the direction of the drive. During transportation, the core tube will be stored at no less than a 30-degree angle to avoid disturbing the stratigraphic context. The level of

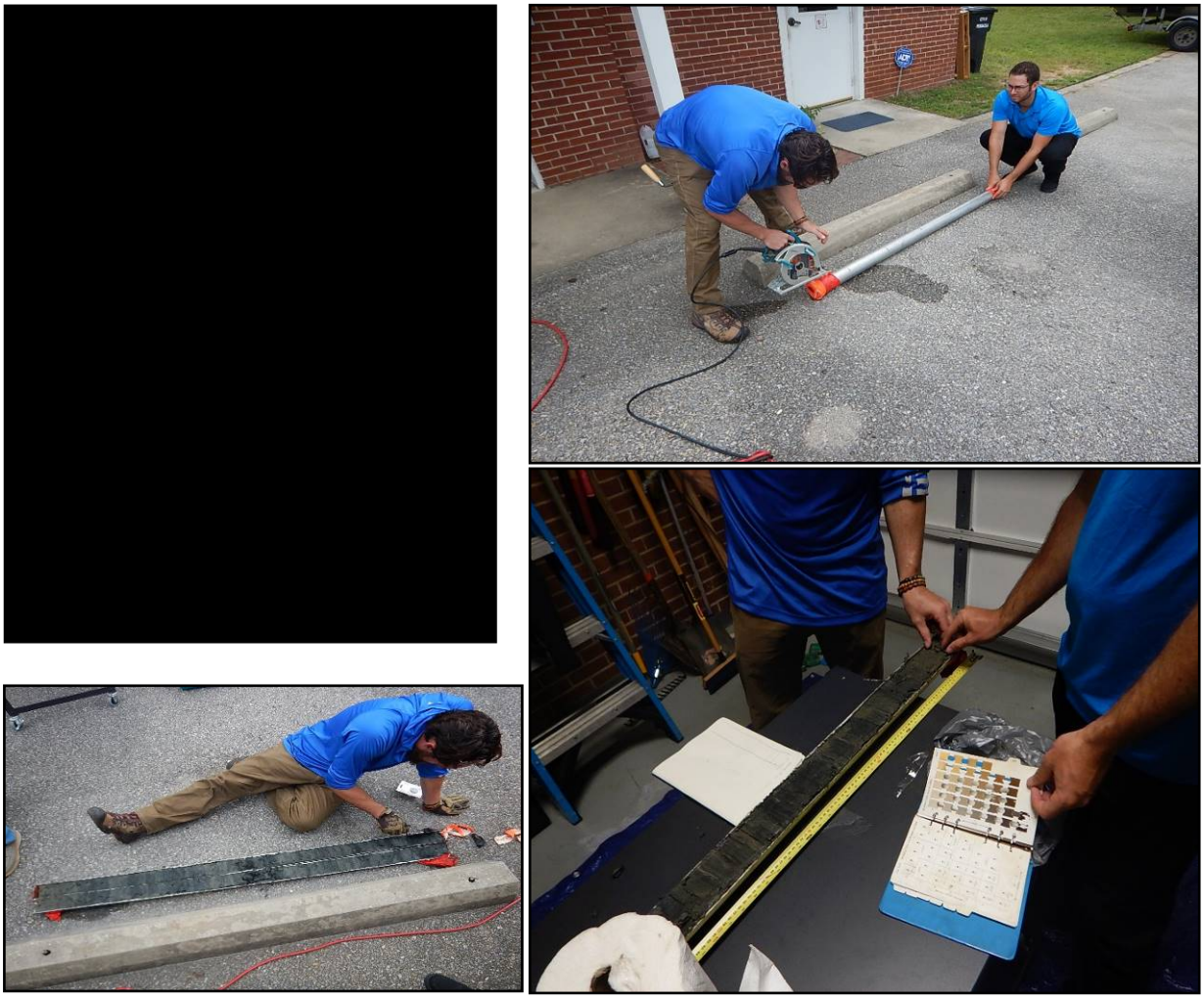

Figure 90. Clockwise from left: Archaeologists collecting a sediment core from MR.005S. Mobile River Channel control core being cut at SEARCH office. Control Core being processed at SEARCH office. Control core sediments and stratigraphy being analyzed at SEARCH office.

compaction and stratigraphic context will play a key role in the identification of stratigraphic levels in the sub-bottom data.

Core Analysis

Processing the core tubes involves cutting the tubes in half lengthwise, while avoiding inter-stratum contamination. First, the core tube is secured in a vice. The tubes are cut using a circular saw with a demolition blade. The depth of the blade is set to the thickness of the core tube wall to avoid cutting into the sediment. Two lengthwise cuts are made parallel to each other on opposite sides of the core tube. Once the tube is cut, the sediment is cut using a wire. The wire is placed within the cut of the tube and pulled straight through, similar to a wire cheese knife. Cutting the sediment using this method avoids cross contamination throughout the core. Once the sediment has been cut, the core is opened, revealing the stratigraphic profile. Once the core has been separated, the two sides are scanned or photographed. One side of the core is then reserved for radiocarbon and pollen sampling, and the other is utilized

as the "working core" for sediment descriptions and grain size analysis. Stratigraphic units within the core are described according to sediment color and texture. Radiocarbon samples are collected from the top and bottom of each stratigraphic unit, or where available. Core that will be conserved will be wrapped in sterile plastic wrap and stored in a refrigerated unit for future analysis.

Target 010 (1Ba706)

Target 010 (MR.010S) is located in Mobile River's eastern channel, [redacted] (**Figure 91**). Acoustic imagery shows a substantial amount of tree debris intermixed and built up around the target.

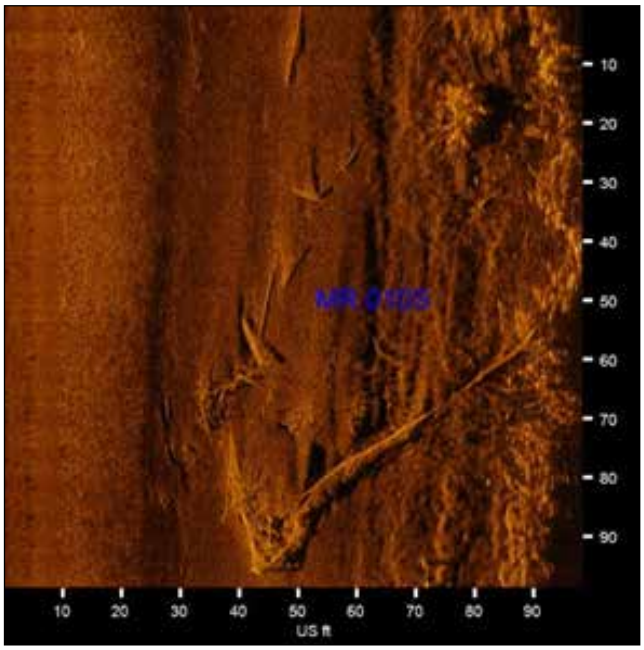

Figure 91. Diver Target 010.

On July 11, 2018, SEARCH divers conducted one 20-minute SCUBA dive on Target 010. Water depth at the dive location was [redacted] with 15 cm (6.0 in) of visibility (**Figure 92**). Water temperature was 31°C (88°F) with a mud bottom composition. The diver located portions of an iron-hulled shipwreck with approximately 1.8 m (6.0 ft) of hull exposed above the sediment. The vessel's bow was visible above the mudline and was located at the site's upriver end. A variety of structural elements, including possible wooden timbers outside the hull, were noted, but visibility did not allow a thorough investigation. A concreted iron fastener was removed from site, photographed (**Figure 93**), and placed back on site. Target 010 likely represents a potentially historic iron-hulled shipwreck of unknown type and historical context, which is mostly buried in sediment. Portions of the vessel's bow and hull plating are exposed

Figure 92. Target 010 marked by SEARCH with a buoy for the diver survey. View looking downriver.

Figure 93. Target 010 diagnostic artifact recovered, photographed, and placed back on site.

above the mudline and protrude into the water column. The form of the raked bow appeared to be more like that of an oceangoing sailing vessel as opposed to a barge, and the form of the visible structure in the sonar record suggests that this wreck may be that of an iron- or steel-hulled sailing vessel of the late nineteenth or early twentieth century. While seemingly incongruous in the setting of a freshwater river, this type of resource is not unexpected given the setting of Mobile as one of the major American ports on the Gulf, the changing patterns of shipping and ship types, and the seeming use of this section of the river as a ship graveyard. Like 1Ba694 (Twelvemile Island Wreck), which is non-Gulf built oceangoing vessel, possibly a three- or four-masted wooden schooner, and in that case, seemingly constructed in the Pacific Northwest, Target 010 may represent the late-life reuse of an older oceangoing cargo ship. SEARCH recommends additional research on Target 010. Target 010 does **not** match the characteristics as a vessel similar to *Clotilda*.

Target 011

Target 011 (MR.011s) is located in Mobile River's eastern channel on Twelvemile Island's [redacted]. Target 011 is recorded as being parallel to shore with a possible bowlike structure visible in the data, pointing upriver. Acoustic imagery shows tree debris surrounding the target.

Target 011 was selected as a candidate for diving based off the target's acoustic contact, which suggests it may be linear (**Figure 94**). On July 12, 2018, SEARCH divers conducted two SCUBA dives on the target, totaling 45 minutes. Water depth at the dive location was [redacted] with 0.3 m (1.0 ft) of visibility. Water temperature was 31°C (88°F) with a mud bottom composition. SEARCH divers conducted circle searches out to 6.0 m (20 ft) in diameter. The object protruding from the mudline was encountered on the second dive, and it was determined the target was tree debris, not of cultural origin. Target 011 does not warrant any further investigations.

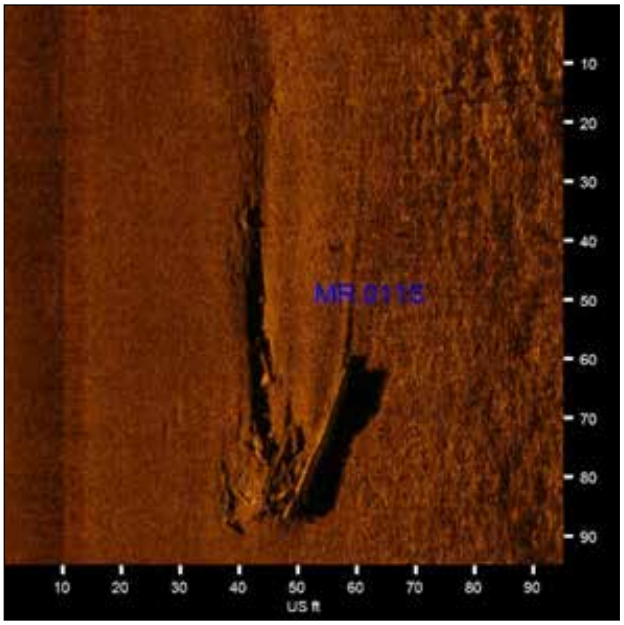

Figure 94. Diver Target 011.

PRELIMINARY CONCLUSIONS

Preliminary results of diver investigations at Targets 001 (1Ba699), 005 (1Ba704), 010 (1Ba706), and 011 confirm the presence of submerged cultural resources in the project area. Three of the four dive targets were positively identified as a shipwreck site (Targets 001 [1Ba699], 005 [1Ba704], and 010 [1Ba706]), and one target (Target 011) was determined to be tree debris. The shipwreck locations are consistent with historical accounts that depict this portion of the river as a ships' graveyard. SEARCH recommends additional research on Targets 001 (1Ba699), 005 (1Ba704), and 010 (1Ba706). Of the three shipwrecks that were dived during this current investigation, one (Target 005 [1Ba704]) is the only one with some of the characteristics that would be expected for the remains of the vessel *Clotilda*. Again, at this stage, there is insufficient information to further determine the identity of Target 005 (1Ba704), but a plan and approach are being formulated for the next step, which is to make a detailed assessment of Target 005 (1Ba704).

NRHP ELIGIBILITY

MOBILE RIVER SHIPWRECKS SURVEY

The waterway along the Mobile River is an important and tangible element of maritime commerce and maritime trade within the Delta, the Mobile River, the City of Mobile, Alabama, and the larger American South as a whole. A portion of the Mobile waterway, nearest the channel split just south of Twelvemile Island, contains the remains of numerous historic shipwrecked vessels. All of which appear to exist within, and are part of, a historic ships' graveyard. The ships that make up this graveyard span multiple decades, some of which were wrecked, abandoned, or intentionally scuttled.

To date, teaming efforts involved with the project have confirmed the presence of eight historic vessels located on the eastern channel of the Mobile River nearest Twelvemile Island. These vessels include five wreck sites documented in March 2018 and three shipwreck sites that have been positively identified during this investigation. These recorded resources are of state and possibly national significance due to Mobile's important role in the history of the Gulf region and the American South. As such, the ships' graveyard as a district merits a comprehensive evaluation and a nomination to the NRHP. Such a nomination, with boundaries extending into the Mobile River to incorporate known and suspected submerged and buried features and artifacts, is key not only for recognizing the area's significance, but also for asserting that what lies in the Mobile River is important and should be seen as archaeological resources that will add to a more detailed understanding of the activities and people who worked there.

The archaeology of watercraft abandonment has emerged as an active area of research within the larger discipline of maritime archaeology (Richards and Seeb 2013). "Frequently, the act of secret and uncelebrated discard leads to the loss of identity of a ship and hence the loss of its history and significance-until somehow rediscovered" (Richards and Seeb 2013:2). SEARCH's historical research and archaeological surveys have uncovered an area rich in heritage, allowing the diversity of how the Mobile River was historically utilized and continues to be used as the lifeblood for inland and oceanic commerce to be rediscovered and recognized. The re-awakening to Twelvemile Island's role as a ships' graveyard and its connections to *Clotilda*'s story permit an opportunity to educate the public about important stories of our shared heritage. The archaeological resources present within the Mobile River are the tangible connections to this heritage and can be used as a mechanism to nominate the waters off Twelvemile Island.

Criteria and Period of Significance

NRHP eligibility should include all the known and potential wreck sites at Twelvemile Island's ships' graveyard. As stated in National Register Bulletin No. 15, *How to Apply the National Register Criteria for Evaluation,* a property must meet one or more of the four National Register criteria:

A. Be associated with events that have made a significant contribution to the broad patterns of our history; or
B. Be associated with the lives of persons significant in our past; or
C. Embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
D. Yield, or likely to yield, information important in prehistory or history (NPS 2002)

It is SEARCH's opinion that the Twelvemile Island ships' graveyard is eligible for nomination to the NRHP under Criteria A and D as a historical and archaeological district. The district should include the waters of Twelvemile Island's eastern channel, encompassing the eight known wrecks discovered during SEARCH's March and July/August 2018 investigations, and any potential wrecks that may exist within the boundaries that have not yet been documented. The portion of the Mobile River remains a part of the ongoing industrial use of the river and as a "back lot" for the port. Further research will likely show that the area played a vital role in shaping of Mobile River commerce. That may be as a staging area for barge traffic or as an area used to load barges during periods when this section of the river and Twelvemile Island were being logged as part of Alabama's lumber industry.

The group of wrecks identified through the team's efforts reflects the use of this section of the river as a convenient location to lay up and abandon vessels. In some circumstances, ship-breakers also have used industrial, non-public areas of urban ports, as well as "rural" settings for the partial or near-complete dismantling and recycling of vessels. This practice is not unique to the Mobile River. A number of waterways in the United States and abroad also reflect this type of maritime activity.

While individual shipwrecks sites at Twelvemile Island are potentially eligible for listing in the NRHP on their own accounts, it is the combination of sites at Twelvemile Island that makes it significant. The diversity of vessel type and time periods demonstrate the continued use of the waterway to support Mobile's maritime pursuits. Mobile River's working watercraft, sunk off Twelvemile Island, may yield, or are likely to yield, significant preservation characteristics that may lead to information important to Mobile's history. Research on Twelvemile Island sites will further knowledge about topics such as the development of the American barge, the role steamboats played along the Mobile River as evidenced by the wrecking or abandonment practices, and uses of wooden and iron-hulled sailing ships. In addition, smaller artifacts that remain submerged and protected by the soft mud anaerobic environment lining the Mobile River may yield, or are likely to yield, significant preservation characteristics that provide information important to Mobile's history.

Historic aerial photographs confirm that the Mobile River, and in particular fewer active parts of the river and its surrounding watershed, was utilized for the laying up or abandonment of vessels (Wilson et al. 1983). Whereas today's archaeological sites are mostly below the water's

surface, historic imagery supplements the visible extent of the ships' graveyard by showing the location and condition of vessels over time and allowing more details to be known about how the waterway was utilized.

Based upon the shipwrecks investigated so far at Twelvemile Island, with the period of significance as the mid-nineteenth century to mid-twentieth century, a strong case can be made for its continued significance as barges are still moored there. Beginning in the eighteenth century and continuing through the modern era, the sites represent reuse, selective repair, and ongoing adaptation and scuttling of additional vessels in the area as the portion of the river appears to have been subject to more marine traffic as developments along the waterway progressed.

Other ship graveyards have been assessed, listed, or determined eligible for the NRHP. These include the ship graveyard off Wilmington, North Carolina, and the ship graveyard at Mallows Bay in the Potomac River, Maryland. Following an assessment of this section of the Mobile River and concurrent and follow-up archival research, SEARCH believes a nomination for the Twelvemile Island ships' graveyard, under Criteria A and D, would result in a determination of eligibility and/or a listing in the NRHP.

Site Integrity

An important aspect of nomination to the NRHP involves site integrity. The definition of integrity (as it relates to listing on the NRHP) is the ability of the property to convey its significance. Although subjective, integrity "must always be grounded in an understanding of the property's physical features and how they relate to its significance" (NPS 2002:44).

The seven aspects of integrity include location, design, setting, materials, workmanship, feeling, and association. A property must retain several of these aspects of integrity to convey significance. In the case of an archaeological site, the relevant aspects to be considered are location, setting, materials, and association.

As stated in Section VIII (How to Evaluate the Integrity of a Property), "Location is the place where the historic property was constructed or the place where the historic event occurred" (NPS 2002:44). When applied to the Twelvemile Island ships' graveyard in the Mobile River, the shipwreck sites retain integrity of location since they have not been moved from their intended final disposition. The unceremonious abandonment of vessels in the Mobile River created a deposit of cultural material. Research to date has been able to place some dates on vessels wrecked or disposed at Twelvemile Island. This information, combined with aerial photography, can generally determine a time period of greatest use. With the case of the *Clotilda*, historical accounts state that the vessel was burned and sunk, but never moved; therefore, it would remain in its original 1860 location.

"Setting is the physical environment of a historic property" (NPS 2002:45). This can include natural or man-made features, including topographic features, vegetation, and relationships

between buildings, features, or open spaces. Twelvemile Island's setting, or cultural landscape, was defined by the river, which was a highway for the movement of goods by water. The Mobile River is also the setting for shipwrecks and placement of abandoned vessels. The Mobile River and its link to Mobile Bay also made it a highway for inland maritime transportation. The area has integrity for its setting and for the archaeology of that setting. The archaeological sites are all located in the Mobile River or partially on the Mobile River bank upriver from the port of Mobile.

> Materials are the physical elements that were combined or deposited during a particular period of time and in a particular pattern or configuration to form a historic property (NPS 2002:45).

Historic research and archaeological surveys have identified physical elements deposited in the Mobile River near Twelvemile Island to form a ships graveyard of wrecked and abandoned vessels. The full extent of the use of the island's eastern channel as a disposal location is unknown. Review of local newspapers reported nine vessels being lost or taken intentionally to Twelvemile Island. Archaeological surveys documented eight vessels resident in the Mobile River. The likelihood is there are additional material buried in the sediment based on magnetometer data raising the level of material integrity. Association is:

> The direct link between an important historic event or person and a historic property. A property retains association if it is the place where the event or activity occurred and is sufficiently intact to convey that relationship to an observer (NPS 2002:45).

The Twelvemile Island ships' graveyard may be considered of state or possibly national significance under Criterion A. However, a broader context must be considered. The link between Twelvemile Island and the port of Mobile is evidenced by the number and type of vessels historically lost or taken there. Aerial photographs confirm the presence of sites on the eastern channel's river bank. While the exact reason for using Twelvemile Island as a graveyard is unknown, its proximity to Mobile, its closeness to the main deep-water channel, and available open space for pulling a vessel aground or tying it to a tree are possible factors. It is also possible that land owner(s) sanctioned or profited from a vessel's disposal. Land ownership deeds have not been researched, but the Meaher family still has property in the vicinity of the graveyard, dating back to 1860 when *Clotilda* was sunk nearby.

The NPS further clarifies the steps necessary to assess integrity. These include:

- Define the essential physical features that must be present for a property to represent its significance.
- Determine whether the essential physical features are visible enough to convey their significance.
- Determine whether the property needs to be compared with similar properties. And,

- Determine, based on the significance and essential physical features, which aspects of integrity are particularly vital to the property being nominated and if they are present (NPS 2002:45).

For eligibility under Criterion D, less attention to the essential physical features of Twelvemile Island is given than if the site was being considered solely under Criteria A, B, or C. The NRHP recognizes that archaeological properties are often an exception and do not require visible features to convey significance (NPS 2002:46). It is also understood that few archaeological properties are exclusively undisturbed and the constant occupation of a site can result in a complex stratigraphic situation. It is understood that cultural and natural processes can alter deposited materials and their spatial relationships. The vessels in the Mobile River have been affected by both natural and man-made formation processes. Natural processes that have likely impacted the sites include river current, the rise and fall of seasonal water levels, and movement of sediment. Man-made processes, such as the bank stabilization efforts and barge moorage, may have impacted the sites to unknown degrees. However, more importantly, integrity is based on the property's potential to yield specific data that addresses important research questions.

Similar Properties

A more direct analogy for this section of the Mobile River may be seen with a series of sites on North Carolina's Pamlico River (Rodgers and Richards 2006) and Pasquotank River (Smith 2015) and off Cape Fear (Seeb 2013) and Wilmington Beach (Lawrence 1985). Additional sites also reside at Green Jacket Shoal, Rhode Island; Mallows Bay, Maryland (Marx and Shomette 2014); and Arthur Kill, New York, and are similar property types. Only three of these sites have been listed on the National Register:

- Castle Island Ships' Graveyard, Pamlico River, North Carolina: East Carolina University documented 11 wrecked and abandoned watercraft near Castle Island in the Pamlico River off Washington, North Carolina. Vessels include flat boats, schooner, sharpie schooner, steamboat, oyster sloops, motor boat, and sailing log canoe. The sites represent a diver cross section of North Carolina's vernacular working watercraft in coastal and river environments. The site has not yet been formally assessed for its National Register eligibility.
- Pasquotank River, Elizabeth City, North Carolina: East Carolina University's research and archaeological surveys indicate as many as 60 vessels were abandoned near Elizabeth City, the most extensive collection of abandoned vessels located so far in the state. Vessel types include wooden- and iron-hulled barges, schooners, and steamers. The site has not yet been formally assessed for its National Register eligibility.
- Cape Fear Civil War Shipwreck Discontinuous District, Wilmington Beach, North Carolina: A historic district of 295 ac that encompasses a collection of as many as 21 Civil War shipwrecks (blockade runners and military vessels) was listed on the National Register in 1985 (NR# 85002195). Its period of significance is 1850–1874 with areas of

significance being Engineering, Architecture, Transportation, Commerce, and Historic Archaeology.

- Wilmington National Register District, Wilmington, North Carolina: 37 shipwreck and vessel abandonment sites are within the National Register district (NR# 74001364). Vessel types include steamboats, tugs, small craft, barges, and ferries. The 1,070-ac district was listed in 1974 with a boundary increase in 2003. The Cape Fear River is included as a contributing resource, but is not the focus of the period or areas of significance.
- Green Jacket Shoal, East Providence, Rhode Island: David S. Robinson and Associates, Inc. is currently documenting the largest ships' graveyard in Rhode Island. The waters near Providence include 29 vessels ranging from coastal steamships, harbor steamers, sailing ships, and barges. The site is currently being assessed for its eligibility to the National Register.
- *Mallows* Bay-Widewater Historic and Archeological District, Potomac River, Maryland: The district includes 124 vessels, vessel debris piles, and associated infrastructure (berms, slipway, and wharf). The main features are the 101 World War I wooden steamships making up the 11,347-ac district added to the National Register in 2015 (NR# 15000173). The ships' graveyard is linked to the shipbreaking activities that burned and salved materials from the US Shipping Board's Emergency Fleet Corporation vessels. The period of significance is 1917–1945 with its areas of significance being Maritime History, Military, Engineering, Architecture, Transportation, and Historic Archaeology.
- Staten Island Boat Graveyard, Arthur Kill, New York: An unknown number of historic and modern vessels reside near Rossville, associated with several generations of scrap yards and ship breakers dating back to the 1930s. Vessel types including tugboats, barges, ferries, military vessels, and a fireboat have been documented there. The site has not yet been formally assessed for its National Register eligibility.

Recommendations

SEARCH recommends the nomination of the Twelvemile Island ships' graveyard as a historical and archaeological district because the collection of submerged vessels is an important, tangible, and NRHP-eligible element of maritime commerce for the City of Mobile and the American South during the nineteenth and early twentieth centuries. Like other ship graveyard examples across the country, the maritime landscape of the site is of state and potentially national significance, and it merits a comprehensive evaluation for inclusion in the NRHP. Such a nomination, with boundaries extending the area around the length of the Mobile River along Twelvemile Island's eastern side, should incorporate submerged resources and potential features and artifacts associated with the vessels to protect the currently identified and unidentified shipwrecks within the area. This nomination is key not only for recognizing the area's significance, but also providing a tool for legal protection and asserting what lies in the Mobile River is important and should be seen as archaeological resources that can and will add to a more detailed understanding of the activities and people who worked there. In doing so,

this district nomination may assist with the protection of the currently unidentified location of the remains of the slave ship *Clotilda*, which, from historic and archival research, suggests that it may exist within the boundaries of the proposed district area. In summary, the proposed district area is part of a significant site under both Criteria A and D of the NRHP and retains integrity of location, setting, materials, and association, all key aspects for a historical and archaeological district.

IRONCLADS SURVEY

CSS *Huntsville* (1Mb557) and CSS *Tuscaloosa* (1Mb558) were surveyed in the Ironclads Survey Area, were both constructed in the State of Alabama, and were important components to Alabama and the United States' history. The vessels inception, use, and disposal are intimately tied to the Civil War and Alabama's role in the conflict. The shipwrecks, lying on the bottom of the Mobile River where it intersects with the Spanish River at the Head of Blakeley Island, are a physical link to our shared maritime heritage. Historical research has indicated that the vessels were not salvaged, and therefore, they can provide important archaeological information about mid-nineteenth-century naval warfare. The vessels are significant archaeological sites that will yield important information about hull design and construction, engine and machinery design and construction, development of naval armament, and life onboard Confederate vessels at a time when modern-day iron warships were in their infancy. An assessment of their NRHP potential eligibility is based on Saltus and Schell's (1985) study findings, as well as the results of SEARCH's remote-sensing survey to relocate the vessels. The combination of the remote-sensing surveys and diver investigations provides enough information to confirm their location and integrity. The ironclads are considered a sunken US military craft and are subsequently protected by the Sunken Military Craft Act of 2004, which is administered by the US Navy.

Criteria and Period of Significance

NRHP eligibility should include CSS *Huntsville* and CSS *Tuscaloosa* together as one site due to their historical context and their close proximity in the Mobile River. As stated in National Register Bulletin No. 15, *How to Apply the National Register Criteria for Evaluation,* a property must meet one or more of the four National Register criteria:

A. Be associated with events that have made a significant contribution to the broad patterns of our history; or
B. Be associated with the lives of persons significant in our past; or
C. Embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
D. Yield, or likely to yield, information important in prehistory or history (NPS 2002).

It is SEARCH's opinion that CSS *Huntsville* and CSS *Tuscaloosa* are eligible for nomination to the NRHP under Criteria A and D due to their historical and archaeological significance. The property boundary should be a site encompassing both vessels with a buffer to capture any material surrounding the vessels on the river bottom.

Based upon the CSS *Huntsville* and CSS *Tuscaloosa*'s association with the Civil War in Alabama, the period of significance is 1860 through 1865. This covers the lead up, succession, and outbreak of hostilities along with construction of CSS *Huntsville* and CSS *Tuscaloosa*, Battle of Mobile Bay, scuttling of the CSS *Huntsville* and CSS *Tuscaloosa*, fall of Mobile, and surrender of Robert E. Lee at Appomattox. As well, both wrecks represent vessels that are very poorly documented in the historical record. The most recent assessment of this type of craft (Bisbee 2018) notes that with *Tuscaloosa* "in-depth investigation of this valuable Civil War archaeological resource has the potential to uncover a wealth of new data" (Bisbee 2018:146), while with CSS Huntsville, "even less is known about this second Selma ironclad" (Bisbee 2018:146).

Many Civil War-era shipwrecks have been located, but only few have been listed or determined eligible for the NRHP. Excluding the CSS *Hunley*, these include one in Alabama, three in Georgia, one in Mississippi, three in North Carolina, and two in federal waters off North Carolina and Texas. Vessels listed are four Confederate vessels and five Union vessels. A more detailed discussion of similar properties follows. SEARCH believes a nomination for the CSS *Huntsville* and CSS *Tuscaloosa*, under Criteria A and D, would result in a determination of eligibility and/or a listing in the NRHP.

Site Integrity

An important aspect of nomination to the NRHP involves site integrity. The definition of integrity (as it relates to listing on the NRHP) is the ability of the property to convey its significance. Although subjective, integrity "must always be grounded in an understanding of the property's physical features and how they relate to its significance" (NPS 2002:44).

The seven aspects of integrity include location, design, setting, materials, workmanship, feeling, and association. A property must retain several of these aspects of integrity to convey significance. In the case of an archaeological site, the relevant aspects to be considered are location, setting, materials, and association.

As stated in Section VIII (How to Evaluate the Integrity of a Property), "Location is the place where the historic property was constructed or the place where the historic event occurred" (NPS 2002:44). When applied to the CSS *Huntsville* and CSS *Tuscaloosa* in the Mobile River, the shipwreck site retains integrity of location since they have not been moved from their scuttling location. The unceremonious intentional sinking and abandonment of the two ironclads in the Mobile River on April 12, 1865, created a deposit of cultural material. The historic event linked to the shipwreck sites' integrity of location is the end of the Civil War and the rush by Confederate forces to leave Mobile and destroy assets to prevent them coming into Union

hands. There are no records to indicate that the vessels were salvaged or disturbed until the survey in 1985, which confirmed their location.

"Setting is the physical environment of a historic property" (NPS 2002:45). This can include natural or man-made features, including topographic features, vegetation, and relationships between buildings, features, or open spaces. The CSS *Huntsville* and CSS *Tuscaloosa*'s setting, or cultural landscape, is the intersection of the Spanish River and Mobile River, upriver of Mobile and Mobile Bay. These are the only bodies of water the two vessels operated on and are directly tied to them during their short two-year career. The vessels sit near Blakeley Island's northern end, an active highway for inland maritime transportation at the time of the Civil War. The area has integrity for its setting and for the archaeology of that setting.

> Materials are the physical elements that were combined or deposited during a particular period of time and in a particular pattern or configuration to form a historic property (NPS 2002:45).

Historic research and archaeological surveys have identified physical elements of CSS *Huntsville* and CSS *Tuscaloosa* in the Mobile River. Results of the 1985 magnetometer and diver survey and SEARCH's 2018 side-scan, magnetometer, and sub-bottom survey confirm the presence of two mostly buried vessels matching the characteristics of CSS *Huntsville* and CSS *Tuscaloosa*. Data indicate the site has a high level of material integrity as the vessels were scuttled in 1865 and never intentionally disturbed. Other archaeological examples, such as USS *Cairo* and USS *Tecumseh*, have shown through survey and recovery that vessels lost and left in these conditions remain essentially intact, even if partially collapsed. They represent Confederate vessels built specifically for the Civil War, used during the war, and sunk at the war's end with no repurposing or reuse. Association is:

> The direct link between an important historic event or person and a historic property. A property retains association if it is the place where the event or activity occurred and is sufficiently intact to convey that relationship to an observer (NPS 2002:45).

CSS *Huntsville* and CSS *Tuscaloosa* may be considered of state or possibly national significance under Criterion A due to its association with the Civil War and the efforts by the Confederacy to build and operate vessels around Mobile Bay. Both vessels were launch in Selma, upriver of their current location, and both vessels served around Mobile Bay, down right of their present location. The Mobile River served as a maritime highway during the Civil War and was strategically important for the Confederacy to hold or the Union to take. The shipwreck site has integrity of association as it is directly linked by the Mobile River to the reason the ironclads were built and utilized, as well as disposed.

The NPS further clarifies the steps necessary to assess integrity. These include:

- Define the essential physical features that must be present for a property to represent its significance.
- Determine whether the essential physical features are visible enough to convey their significance.
- Determine whether the property needs to be compared with similar properties. And,
- Determine, based on the significance and essential physical features, which aspects of integrity are particularly vital to the property being nominated and if they are present (NPS 2002:45).

For eligibility under Criterion D, less attention to the essential physical features of CSS *Huntsville* and CSS *Tuscaloosa* was given than if the site was being considered solely under Criteria A, B, or C. The NRHP recognizes that archaeological properties are often an exception and do not require visible features to convey significance (NPS 2002:46). It is also understood that few archaeological properties are exclusively undisturbed and the constant occupation of a site can result in a complex stratigraphic situation. It is understood that cultural and natural processes can alter deposited materials and their spatial relationships. The vessels in the Mobile River have been affected by natural and man-made formation processes. Natural processes that have likely impacted the sites include river current, the rise and fall of seasonal water levels, and movement of sediment. Man-made processes, such as the bank stabilization efforts, barge moorage, or dredging, may have impacted the sites to unknown degrees. However, more importantly, integrity is based on the property's potential to yield specific data that addresses important research questions.

Similar Properties

Not counting CSS *H. L. Hunley*, there are seven Civil War-era shipwreck sites, comprised of eight vessels, that are listed on the National Register. Three sites are Confederate vessels and four are Union vessels. Only one site is located in Alabama: USS *Tecumseh,* sunk during the Battle of Mobile Bay. A summary of those seven sites is as follows:

- USS *Tecumseh*, Mobile, Alabama: A *Canonicus*-class monitor built in 1862 for the Union Navy in New Jersey and sunk after hitting a mine off Fort Morgan on August 5, 1864. Listed on the National Register in 1975 (NR# 75000306).
- CSS *Muscogee* and CSS *Chattahoochee*, Columbus, Georgia: CSS *Muscogee* was a Confederate ironclad ram launched in 1864 in Georgia. It was scuttled by Union forces during Wilson's Raid of Georgia (1865). CSS *Chattahoochee* was a Confederate steam powered gunboat launched in 1863 in Georgia. Confederate troops scuttled it in 1864 to avoid capture as Union troops neared Columbus. Both vessels' remains were raised in the 1960s and reside at the National Civil War Naval Museum in Columbus. They were listed on the National Register in 1987 (NR# 86003746).
- CSS *Georgia*, Savannah, Georgia: An ironclad Confederate warship built in Georgia in 1862. Its crew scuttled it to prevent capture during Sherman's March to the Sea in

1864. It was partially salvaged and dynamited in 1866 and later impacted from modern dredging operations. Recent efforts have recovered a majority of the vessel, which is undergoing conservation. It was listed on the National Register in 1987 (NR# 86003746).

- USS *Cairo*, Pascagoula, Mississippi: A *Union City*-class gunboat built in Illinois in 1861. While clearing mines in the Mississippi River, it was sunk by one detonated by solider positioned along the river bank. The vessel was located in 1956 and raised in pieces throughout the 1960s. It resides at the Vicksburg National Military Park and was listed on the National Register in 1971 (NR# 71000068).
- CSS *Neuse*, Kinston, North Carolina: A Confederate steam powered ironclad ram built in North Carolina in 1863. It was burned and scuttled by its crew to avoid capture by Union forces in 1865. Portions of its hull were recovered in the 1960s, which reside at the CSS *Neuse* Interpretive Center State Historic Site in Kinston. It was listed on the National Register in 2001 (NR# 00000444).
- USS *Peterhoff*, Fort Fisher, North Carolina: A British ship captured by Union forces and repurposed as a gunboat in 1863. It was rammed and sunk by a fellow Union gunboat that mistook its identity. Divers confirmed its location in 1963 off Kure Beach. Portions of the ship are on display at Fort Fisher State Historic Site. The shipwreck was listed on the National Register in 1975 (NR# 750001283).
- USS *Monitor*, Cape Hatteras, North Carolina: A Union ironclad warship built in New York in 1862. It was the first ironclad warship with a rotating gun turret. It was undertow south to Beaufort, North Carolina, from the Washington Navy Yard, when it sank off Cape Hatteras during a storm. It was located in 1949, listed on the National Register in 1974 (NR# 74002299), designated a National Marine Sanctuary in 1975, and designated a National Historic Landmark in 1986. Portions of the vessel were recovered and reside at the Mariner Museum in Virginia.

The list does not consider the 21 shipwrecks within the Cape Fear Civil War Shipwreck in North Carolina, as those sites were listed not as individual properties, but as a collection of vessels all stranded along a beach or on inlet shoals.

Recommendations

SEARCH recommends the individual nomination of both CSS *Huntsville* and CSS *Tuscaloosa* for the NRHP because the vessels are important, tangible, and NRHP-eligible elements of Alabama's role in the American Civil War and the vessels' connections to the City of Mobile. The significant sites merit a comprehensive evaluation for inclusion in the NRHP. Such a nomination would confine boundaries solely in the Mobile River and would extend a buffer around both vessels in efforts to encompass a possible debris field. This nomination is important not only for preserving and recognizing the vessels' significance, but also for what it signifies for that of the City of Mobile, Mobile Bay, and Mobile River's significance during the Civil War. The listing would also provide a tool for legal protection and asserting that what lies in the Mobile River is important and should be seen as archaeological resources. In summary,

the CSS *Huntsville* and CSS *Tuscaloosa* are significant under both NRHP Criteria A and D, possibly Criteria C, and retain integrity of location, setting, materials, and association, all key aspects for an archaeological site.

CONCLUSION AND RECOMMENDATIONS

MOBILE RIVER SHIPWRECKS SURVEY

Mobile River's eastern channel near Twelvemile Island is a ships' graveyard comprised of a variety of abandoned, derelict, or wrecked vessels. In addition to the previously documented Twelvemile Island Wreck (1Ba694), Hicks Wreck (1Ba694), Dobbs Wreck (1Ba696), Harms Wreck (1Ba697), and Kennedy Wreck (1Ba698), this survey ground-truthed and confirmed the presence of three additional shipwrecks, Targets 001 (1Ba699), 005 (1Ba704), and 010 (1Ba706). Target 001 (1Ba699) is a metal-hulled sailing vessel, 69 m (228 ft) long, of unknown type. Target 005 (1Ba704) is a wooden-hulled sailing vessel, 25 m (79 ft) long, of unknown type. Target 010 (1Ba706) is a metal-hulled shipwreck, 28 m (95 ft) long, of unknown type. Remote-sensing data suggest there are other possible shipwrecks that warrant further work to confirm their characteristics. SEARCH recommends additional research on eight targets that were not subject to diver investigations, as well as additional research on Twelvemile Island Wreck (1Ba694), Hicks Wreck (1Ba694), Dobbs Wreck (1Ba696), Harms Wreck (1Ba697), and Kennedy Wreck (1Ba698).

Out of the four targets investigated by SEARCH divers, Target 005 (1Ba704) is the only observed shipwreck within the Mobile River Shipwrecks Survey Area with the approximate dimensions as those historically recoded for *Clotilda*; the hull shape is consistent with a shallow-draft schooner of the region and period. Wood analysis indicates Target 005 (1Ba704) was built of White Oak (*Quercus spp.)* and Southern Pine (*Pinus spp*.). Both timber species are local to Southern states and also those archivally recorded as being used to construct *Clotilda*. Visual observation of timbers and iron hull fasteners are consistent with a vessel of the mid- to late nineteenth century. Further study is necessary to attempt a more refined identification of Target 005 (1Ba704).

SEARCH recommends additional work that would add to an understanding of the resources near Twelvemile Island:

1. A follow-up investigation of Target 005 (1Ba704) for limited test excavations to record structures buried under the sediment. Additional characteristics of Target 005 (1Ba704) that would add information to its identity include presence or absence of cultural artifacts, a centerboard, or evidence of burning. A more detailed documentation of hull features uncovered during the test excavation would provide clues to the vessel's type and age.
2. Additional research on eight anomalies that may be potential shipwrecks located during this project. Target 006 should be a priority for a diver investigation. The collection of remote-sensing data provided sufficient information for identifying the source as a potential shipwreck. Targets 013 and 014 should also be investigated with probing to determine their extents, as there are no visible remains exposed.
3. Additional research on Twelvemile Island Wreck (1Ba694), Hicks Wreck (1Ba694), Dobbs Wreck (1Ba696), Harms Wreck (1Ba697), and Kennedy Wreck (1Ba698).

4. A detailed, archive-focused research project on the mid-nineteenth- to mid-twentieth-century commerce and trade along the Mobile River waterway to better understand the maritime landscape that encompasses the area.
5. A comprehensive NRHP nomination or determination of eligibility for the ships' graveyard of archaeological sites located in the Mobile River off Twelvemile Islands' eastern side.
6. Focused archival research on the slave ship *Clotilda* to better understand its construction, use, and the events surrounding its last voyage, including oral interviews with Africatown community members and descendants.

This section of the Mobile River contains a variety of vessel types and ages recorded through historic imagery, remote-sensing data, and archaeological investigations. Wooden-hulled and metal-hulled vessels dating to the nineteenth and twentieth century reside in the Mobile River Shipwrecks Survey Area. To date, vessels types documented there include sailing vessels and barges, although historical records indicate steamboats may also be located there. While many vessels are exposed with remains above the river bottom, as indicated by side-scan sonar and diver surveys, magnetometer and sub-bottom profiler surveys indicate the possible presence of buried anomalies/reflectors that may be submerged cultural resources. Eight shipwrecks have been located in Mobile River's eastern channel (**Table 5; Figure 95**).

Table 5. Table of Confirmed Shipwrecks in the Mobile River Shipwrecks Survey Area.

Name	AL Site Number	Vessel Type	Associated SEARCH Designation(s)
Target 001	1Ba699	Metal-hulled vessel	Contact MR.001S
Target 005	1Ba704	Wooden-hulled vessel	Contact MR.005S
Target 010	1Ba706	Metal-hulled vessel	Anomaly MR.069M/Contact MR.010S
Twelvemile Island Wreck	1Ba694	Wooden-hulled probable schooner (later 19th or early 20th century)	Anomaly MR.062M/Contact MR.008S
Hicks Wreck	1Ba695	Barge (20th century)	Target 1 (Delgado et al. 2018)
Dobbs Wreck	1Ba696	Iron-hulled Barge	Target 3 (Delgado et al. 2018)
Harms Wreck	1Ba697	Composite-hulled shipwreck	Anomaly MR.046M/Contact MR.029S, Target 4 (Delgado et al. 2018)
Kennedy Wreck	1Ba698	Iron-hulled barge(s)	Target 5 (Delgado et al. 2018)

IRONCLADS SURVEY

SEARCH recommends work that would add to an understanding of the Ironclads Survey Area:

1. Additional research on three targets that may be potential shipwrecks or submerged cultural resources located during this project.
2. A comprehensive NRHP nomination or determination of eligibility for the CSS *Huntsville* and CSS *Tuscaloosa* sites located in the Mobile River off Blakeley Island. This would include research on the role and importance of Alabama in the Civil War, with a focus on Confederate ship design and construction, along with naval warfare to better place the two vessels in the overall context of the period.

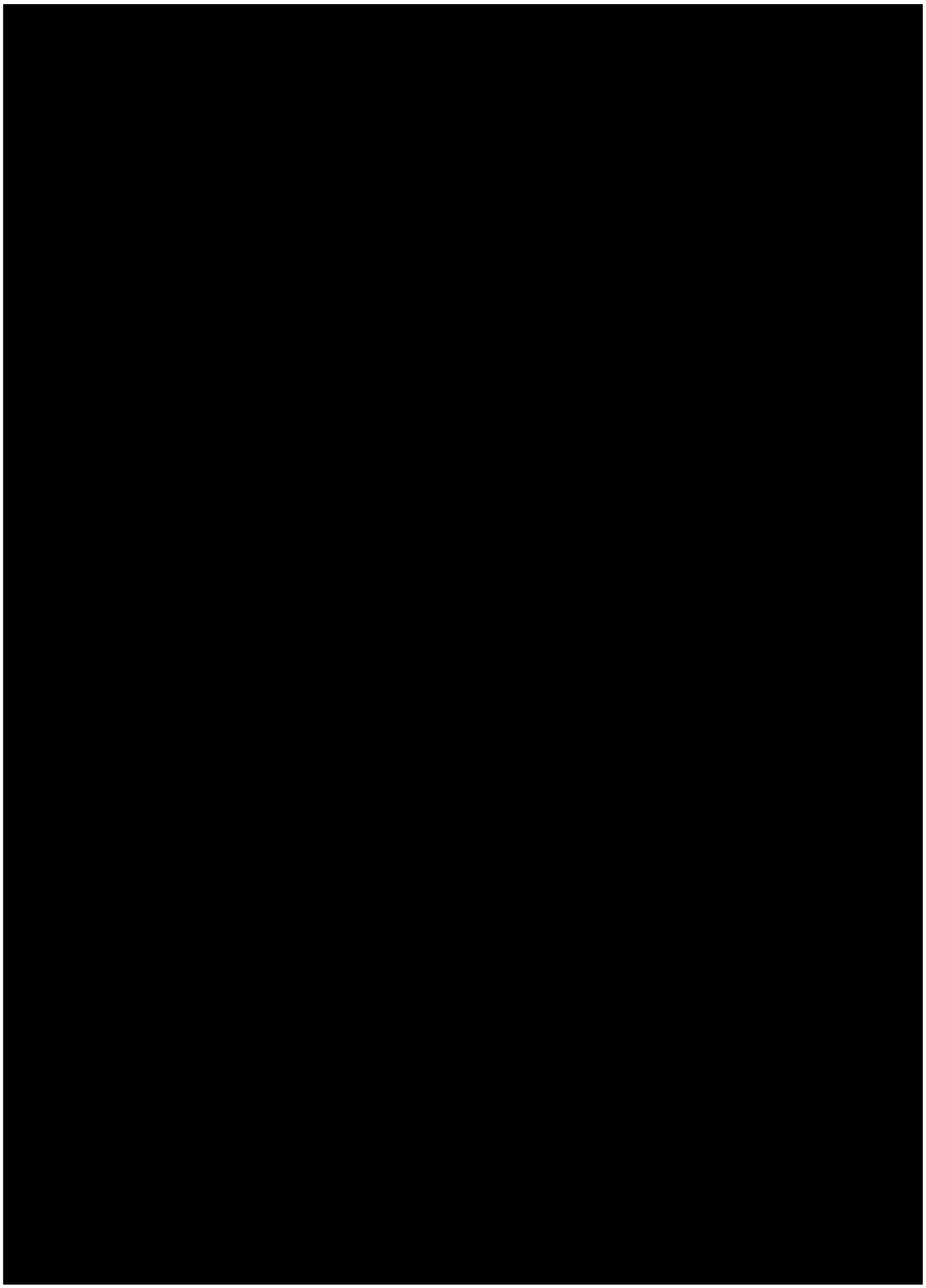

Figure 95. Confirmed shipwrecks in the Mobile River Shipwrecks Survey Area.

REFERENCES CITED

Alabama Department of Environmental Management
2003 Technical Report: A Survey of the Bayou Sara Watershed. Electronic document, http://www.adem.state.al.us/programs/water/wqsurvey/2003BayouSaraWatershed.pdf, accessed April 26, 2018.

Alabama on the Go
1965 Fort Gaines Museum Acquires "Anchor Eye" of Last Slave Schooner. Jun. 1965, p. 29.

Alabama Planter
1847 Terrible Disaster. January 30:69. Mobile, Alabama.

Albion, Robert Greenhalgh
1938 Square-*Riggers on Schedule: The New York Sailing Packets to England, France and the Cotton Ports*. Princeton University Press, Princeton and London.

Amos, Harriet
1990 From Old South to New South in Mobile, 1850–1900. *Gulf Coast Historical Review.* 5(2):114–127.

Arnold, J. Barto, et al.
1998 The *Denbigh* Project. Electronic document, http://nautarch.tamu.edu/PROJECTS/denbigh/, accessed October 29, 2013.

Arnold, J. Barto, III, Thomas J. Oertling, and Andrew W. Hall
2001 The *Denbigh* Project: Excavation of a Civil War Blockade-Runner. *The International Journal of Nautical Archaeology* 30(2):231–249.

Axtell, James
1997 *The Indians' New South: Cultural Change in the Colonial Southeast.* Louisiana State University Press, Baton Rouge.

Baker, William A.
1966 *Sloops and Shallops*. University of South Carolina Press, Columbia.

Baldwin County Revenue Commission
n.d. Revenue Mapping. Electronic document, http://baldwincountyal.gov/Government/revenue/divisions/mapping, accessed September 18, 2018.

Ball, David A.
1998 *Phoenix*, and the Confederate Obstructions of Upper Mobile Bay, Alabama (1MB28). Master's thesis, Department of Anthropology, Florida State University, Tallahassee.

Baptist, Edward E.
2014 *The Half Has Never Been Told: Slavery and the Making of American Capitalism*. Basic Books, New York.

Beckert, Sven
2014 *Empire of Cotton: A Global History*. Vintage Books, New York.

Bergeron, Arthur W.
1991 *Confederate Mobile*. University Press of Mississippi, Jackson.

Berman, Bruce D.
1972 *Encyclopedia of American Shipwrecks*. The Mariners Press, Inc., Boston.

Bisbee, Saxon T.
2018 *Engines of Rebellion: Confederate Ironclads and Steam Engineering in the American Civil War*. University of Alabama Press, Tuscaloosa.

Board of Engineers for Rivers and Harbors
1938 *The Port of Mobile, Alabama.* Port Series No. 3. Government Printing Office, Washington, DC.

Braund, Kathryn E. Holland
1993 *Deerskins and Duffels: The Creek Indian Trade with Anglo-America, 1685–1815*. University of Nebraska Press, Lincoln.

Breiner, Sheldon
1999 *Applications Manual for Portable Magnetometers*. Geometrics, San Jose.

Chapelle, Howard I.
1951 *American Small Sailing Craft: Their Design, Development, and Construction*. W. W. Norton and Company, Inc., New York.

Chevron Oil Company
1975 Draft Environmental Statement. Permit Application by Chevron Oil Company. Dredging of a Slip to Accommodate a Drilling Barge for Gas and Oil Exploration. Mobile River Delta, Baldwin County, Alabama. Submitted to the US Army Corps of Engineers, Mobile District, Mobile, Alabama.

The Daily Picayune
1894 Mobile Budget. October 3:2. New Orleans, Louisiana.

Dattell, Gene
2009 *Cotton and Race in the Making of America: The Human Costs of Economic Power*. Ivan R. Dee, Lanham, Maryland.

Davies, T. A., J. A. Austin Jr., M. B. Lagoe, and J. D. Milliman
1992 *Late Quaternary sedimentation off New Jersey: Results using 3-D seismic profiles and cores*. *Marine Geology* Vol. 108. P. 323-343.

De Bow, James Dunwoody Brownson (editor)
1859 *De Bow's Review and Industrial Resources, Statistics, etc*. Volume 26. J.D.B. De Bow, New York and New Orleans.

Delgado, James P., K. Lent, J. Grinnan, Hathorn, S., D. Morgan, and D. Conlin
2018 Report on a Mid-to-Late Nineteenth-Century Wooden Shipwreck in the East Channel of the Mobile River Suggested as a Candidate for the 1855 Schooner *Clotilda,* Baldwin County, Alabama. Report prepared for the Alabama Historical Commission.

Department of Commerce
1918 *Reports of the Department of Commerce, 1918. Report of the Secretary of Commerce and reports of bureaus*. Serial Set Vol. No. 7531. Report: H. Doc, 1621. Government Printing Office, Washington D.C.

Diouf, Sylviane A.
2007 *Dreams of Africa in* Alabama. Oxford University Press, Oxford.

Dupre, Daniel S.
1997 *Transforming the Cotton Frontier: Madison County, Alabama, 1800-1840*. Louisiana State University Press, Baton Rouge.

Enright, Jeffrey M.
2009 *Maritime Archaeological Data Review and Phase II Underwater Investigations for the Denbury Green Pipeline Project, Galveston Bay, Texas*. Submitted to SWCA Environmental Consultants, BIO-WEST, Inc., Rosenburg, Texas.

Enright, Jeffrey M., Jenna Watts, and Robert L. Gearhart
2003 *Marine Remote-Sensing Survey and Diving Assessment for Historic Properties Investigations, Corpus Christi Ship Channel Improvements and La Quinta Ship Channel Extension, Corpus Christi Bay, Texas*. Submitted to US Army Corps of Engineers, Galveston District. PBS&J, Austin.
2006 *Study to Conduct National Register of Historic Places Evaluations of Submerged Sites on the Gulf of Mexico Outer Continental Shelf.* Submitted to Minerals Management Service. PBS&J, Austin.

Ergun, M., D. Dondurur, and G. Cifci
2002 Acoustic evidence for shallow gas accumulations in the sediments of the Eastern Black Sea. *Terra Nova* v. 14, No. 5, 313-320.

Ethridge, Robbie, and Charles M. Hudson (editors)
2002 *The Transformation of the Southeastern Indians, 1540–1760.* University Press of Mississippi, Jackson.

Fabel, Robin
2007 British West Florida. Encyclopedia of Alabama. Electronic document, www.encyclopediaofalabama.org, accessed August 19, 2013.

Fairburn, William Armstrong
1955 *Merchant Sail*. Volume II. Fairburn Marine Educational Foundation, Inc., Center Lovell, Maine.

Fairhope Courier
1922a Advertisement for a Grand Excursion. January 27:1. Fairhope, Alabama.
1922b Another M.E. Church Excursion. February 3:1. Fairhope, Alabama.

Faught, M. K.
2014 Remote Sensing, Target Identification, and Testing for Submerged Prehistoric Sites in Florida: Process and Protocol in underwater CRM projects. In *Prehistoric Archaeology of the Continental Shelf: A Global Review*, edited by J. Flatman, A. Evans and N. Flemming, pp. 37-52. Springer, New York.

Federal Writers Project
1941 *Alabama: A Guide to the Deep South*. Compiled by the Workers of the Writers' Program of the Works Public Administration in the State of Alabama. The Alabama State Planning Commission, Alabama.

Feore, Michael P.
2018 Basic Sketch of Mobile's Founding and Development, 1702-Present. Electronic document, http://www.mobile.org/mobile-charm/history/, accessed July 20, 2018.

Foscue, Virginia O.
1989 *Places Names in Alabama*. The University of Alabama Press. Tuscaloosa, Alabama.

Francaviglia, Richard V.
1998 *From Sail to Steam: Four Centuries of Texas Maritime History 1500–1900*. University of Texas Press, Austin.

Frazer, Mell A.
1907 "Early History of Steamboats in Alabama." *Alabama Polytechnic Institute Historical Studies* 3(1):1-31.

Friend, Jack
2014 *West Wind, Flood Tide: The Battle of Mobile Bay*. Naval Institute Press, Annapolis.

Futato, Eugene M.
1989 *An Archaeological Overview of the Tombigbee River Basin, Alabama and Mississippi*. University of Alabama, State Museum of Natural History, Division of Archaeology, Report of Investigations 59. University.

Gaines, W. Craig
2008 *Encyclopedia of Civil War Shipwrecks.* Louisiana State University Press, Baton Rouge.

Gamble, Thomas, editor
1921 *Naval Stores: History, Production, Distribution and Consumption*. Review Publishing and Printing Company, Savannah, Georgia.

Garrison, E. G., C. P. Giammona, F. J. Kelly, A. R. Tripp, and G. A. Wolff
1989 *Anomalies from Remote-sensing Surveys and Historic Shipwreck Patterns Within the Northern Gulf of Mexico, Reevaluation of Historic Shipwreck Studies of the Northern Gulf of Mexico, Volume II*. Prepared for Minerals Management Service.

Gearhart, Robert
2004 Marine Remote-sensing: The Next Generation. Symposium presented at the Society for Historical Archaeology, 37th Conference on Historical and Underwater Archaeology, St. Louis.
2011 Archaeological Interpretation of Marine Magnetic Data. In *The Oxford Handbook of Maritime Archaeology*, edited by Alexis Catsambis, Ben Ford, and Donny L. Hamilton, pp. 90–113. Oxford University Press, New York.

Gibbs, Jim
1987 *Windjammers of the Pacific Rim*. Schiffer Publishing, Ltd., West Chester, Pennsylvania.

Gray, Edwyn
2004 *19th Century Torpedoes and Their Inventors.* Naval Institute Press, Annapolis.

Hale, Jennifer
2009 *Historic Plantations of Alabama's Black Belt.* The History Press, Charleston, South Carolina.

Harper's Weekly
1864 Mobile Bay images. August 20. New York. Electronic document, http://www.sonofthesouth.net/, accessed August 16, 2013.
1865 The Siege of Mobile. April 29. Electronic document, http://www.sonofthesouth.net/, accessed August 16, 2013.

Hudson, Charles M., and Carmen Chaves Tesser (editors)
1993 *The Forgotten Centuries: Indians and Europeans in the American South, 1521–1704*. University of Georgia Press, Athens.

Hudson, Chales, Marvin T. Smith, Chester B. DePratter, Emilia Kelly
1989 *The Tristan de Luna Expedition, 1559-1561*. In *First Encounters, Spanish Explorations in the Caribbean and the United States*, 1492-1570, Jerald T. Milanich and Susan Milbrath, editors. University of Florida Press, Gainesville.

Hugill, Peter J.
1997 *World Trade Since 1431: Geography, Technology and Capitalism*. Johns Hopkins University Press, Baltimore and London.

Irion, Jack B.
1985 *Archaeological Testing of the Confederate Obstructions, 1MB28, Mobile Harbor, Alabama*. Prepared for the US Army Corps of Engineers, Mobile District. Espey, Huston and Associates, Inc., Austin.
1986 *Underwater Archaeological Investigations Mobile Bay Ship Channel, Mobile Harbor, Alabama.* Prepared for the US Army Corps of Engineers, Mobile District. Espey, Huston and Associates, Inc., Austin.

Irion, Jack B., and Clell L. Bond
1984 *Identification and Evaluation of Submerged Anomalies, Mobile Harbor, Alabama.* Prepared for the US Army Corps of Engineers, Mobile District. Espey, Huston and Associates, Inc., Austin.

James, Stephen and Michael Krivor
1998 Summary of Investigations, The Search for Slave Ship *Clotilda*. Panamerican Maritime, LLC. Prepared for the Alabama Historical Commission, December 1998.

Jordan, Weymouth T.
1948 *Hugh Davis and His Alabama Plantation*. University of Alabama Press, Tuscaloosa.

Kirkland, Scotty E.
2008a Mobile. Encyclopedia of Alabama. Electronic document, www.encyclopediaofalabama.org, accessed August 19, 2013.
2008b Alabama Dry Dock and Shipbuilding Company. Encyclopedia of Alabama. Electronic document, www.encyclopediaofalabama.org, accessed August 19, 2013.
2012 Port of Mobile. Encyclopedia of Alabama. Electronic document, www.encyclopediaofalabama.org, accessed August 19, 2013.

Konstam, Angus
2004 *Confederate Blockade Runners, 1861–65*. Osprey Publishing, Ltd., Osceola, Wisconsin.

Land, Jno E.
1884 *Mobile: Her Trade, Commerce, and Industries 1883-4*. Jno E. Land. Mobile, Alabama.

Lawrence, Richard
1985 Underwater Archaeological Sites in the Wilmington Historical District. North Carolina Division of Archives and History, Kure Beach. Electronic document, https://files.nc.gov/dncr-arch/PDF/Wilmington_Historic_District_Addendum.pdf, accessed February 7, 2018.

Lonn, Ella
1940 *Foreigners in the Confederacy.* Republished 2002. University of North Carolina Press, Chapel Hill.

Lydecker, Andrew D. W., Michael C. Tuttle, and Stephen R. James Jr.
2001 *Underwater Remote-sensing Survey Dog River, Mobile County, Alabama*. Prepared for the US Army Corps of Engineers, Mobile District. Panamerican Consultants, Inc., Memphis.

Lydecker, Andrew D. W. and Michael Krivor
2003 *Report of Findings. Additional Investigations for the Slave Ship Clotilda*. Prepared for the Museum of Mobile. Panamerican Consultants, Inc.

Marx, Deborah, Matthew Lawrence, and James Delgado.
2014 ROBERT J. WALKER, Shipwreck and Remains. National Register of Historic Places nomination. Listed 19 March 2014. NRHP reference # 14000064. On file with the NOAA Office of National Marine Sanctuaries, Silver Spring, MD.

Marx, Deborah and Donald Shomette
2014 Mallows Bay-Widewater Historic and Archaeological District. National Register of Historic Places nomination. On File with NOAA's Office of National Marine Sanctuaries. Silver Spring, Maryland. Listed April 24, 2015.

Massey Jr., Richard W.
1960 History of the Lumber Industry in Alabama and West Florida, 1880-1914. Thesis submitted to Vanderbilt University, Nashville, Tennessee.

McGee, R. G., and R. F. Ballard Jr.
1995 *A Technique to Assess the Characteristics of Bottom and Subbottom Marine Sediments.* Dredging Research Program Technical Report. Submitted to the US Army Corps of Engineers by Caulfield Engineering Group. On File, US Army Engineer Waterways Experiment Station Library.

Merrill, W. E.
1866 *Report on the Present Conditions of the Harbor of Mobile*. Army Corps of Engineers Annual Report 1860. Manuscript on file, National Archives and Records Administration.

Mistovich, Tim S., Vernon J. Knight Jr., George M. Lamb, and Eugene M. Wilson
1983 *Cultural Resources Survey of Mobile Harbor, Alabama*. Prepared for the US Army Corps of Engineers, Mobile District. OSM Archaeological Consultants, Moundville, Alabama.

The Mobile Daily Tribune
1876 Untitled article. February 8:1. Mobile, Alabama.

Mobile Press Register
2006 Ancient Mariners. November 24:6. Mobile, Alabama.

Mobile Register
1971 Fishing Report. September 22:2. Mobile, Alabama.
1975 Chevron ask permit to dredge. April 30:25. Mobile, Alabama.
1976 2 wildcat wells abandoned. February 28:13. Mobile, Alabama.
1976 Fishing Report. August 15:2. Mobile, Alabama.

The Montgomery Advertiser
1906 Mrs. Phares Coleman Complimented. May 3: Montgomery, Alabama.
1906 Untitled article. September 26:1. Montgomery Alabama.
1917 Storm Disastrous. September 30:1. Montgomery, Alabama.
1929 Ships for Sale Cheap. February 14:11. Montgomery, Alabama.
1931 Seaman Bares Ship Scuttling in Court at Mobile. May 20:1. Montgomery, Alabama.
1948 Mobile Lumber Firm Buys Entire Island. April 9:2. Montgomery, Alabama.
1948 Tugboat Beached. September 5:1 Montgomery, Alabama.
1949 Steamboat Days. August 26: 10. Montgomery, Alabama.

Muckelroy, Keith
1978 *Maritime Archaeology*. Cambridge University Press, London.

Murtaugh, Dan
2011 Mobile port agrees to $2.5 million sale of oil tanks. Electronic document, http://blog.al.com/press-register-business/2011/07/mobile_port_agrees_to_25_milli.html, accessed September 18, 2018.

National Park Service (NPS)
2002 *National Register Bulletin 15: How to Apply the National Register Criteria for Evaluation*. US Department of the Interior, National Park Service, Cultural Resources. US Government Printing Office, Washington, DC.

Neville, Bert
1964 *Directory of steam, some motor, towboats and U. S. Engineer Department vessels on the Mobile Alabama, Tombigbee, Warrior Rivers, 1881-1947.* Selma, Alabama.

New York Weekly Tribune
1847 Awful Steamboat Explosion. February 13:1. New York, New York.

Nordfjord, S., J. A. Goff, J. A. Austin, Jr., S. P. S. Gulick
2006 *Seismic Facies of Incised-Valley Fills, New Jersey Continental Shelf: Implications for erosion and Preservation Processes Acting during Latest Pleistocene-Holocene Transgression*. Journal of Sedimentary Research, v. 76. P. 1284-1303.

Nuzum, Kay
1971 *A History of Baldwin County*. Eastern Shore Publishing Company. Fairhope, Alabama.

Olliff, Martin T. (editor)
2008 *The Great War in the Heart of Dixie: Alabama During World War I*. University of Alabama Press, Tuscaloosa, Alabama.

O'Meagher, Joseph Casimir
1890 *Some Historical Notices of the O'Meaghers of Ikerrin*. American Edition. New York City, NY.

Orlando Sentinel
1926 Mobile Policeman Seeking Pirates. October 12:2. Orlando, Florida.

Outland, Robert B. III
2004 *Tapping The Pines: The Naval Stores Industry in the American South*. Louisiana State University Press, Baton Rouge.

Panamerican Consultants, Inc.
1993 *Historic Resources Assessment, Tennessee-Tombigbee Waterway Wildlife Mitigation Project, Mobile and Tensaw River Deltas, Alabama.* Prepared for the US Army Corps of Engineers, Mobile District, Mobile, Alabama.
2001 *Underwater Remote-sensing Survey, Dog River, Mobile County, Alabama*. Prepared for the US Army Corps of Engineers, Mobile District, Mobile, Alabama.

Pargas, Damian Alan
2015 *Slavery and Forced Migration in the Antebellum South*. Cambridge University Press, New York.

Pensacola News
1930 Steamer Burns off Pensacola. July 5:1. Pensacola, Florida.

Pletts, R., J. Dix, A. Bastos and A. Best
2007 Characterization of buried inundated peat on seismic (Chirp) data, inferred from core information. *Archaeological Prospection* 14(4):1-12.

Reynolds, Bernard A.
1868 *Sketches of Mobile*. 1971 reprint. Tipton Printing and Publishing, Bossier City, Louisiana.

Raines, Ben
2018 Wreck found by reporter may be last American slave ship, archaeologists say. *AL.com*. Electronic document, http://www.al.com/news/mobile/index.ssf/2018/01/alcom_reporter_may_have_found.html, accessed January 30, 2018.

Richards, Nathan and Sami Kay Seeb (editors)
2013 The *Archaeology of Watercraft Abandonment*. Springer. New York, New York,

Roche, Emma Landgon
1914 *Historic Sketches of the New South*. The Knickerbocker Press, New York.

Rodgers, Bradley A. and Nathan Richards
2006 *The Castle Island Ships' Graveyard: The History and Archaeology of Eleven Wrecked and Abandoned Watercraft.* East Carolina University, Greenville, North Carolina.

Saltus, Allen R., Jr.
1978 *Performance of a Cultural Resources Survey Pinto Pass Disposal Area, Mobile Bay, Mobile, Alabama.* Prepared for the US Army Corps of Engineers, Mobile District. Archeological Research and Survey, Prairieville, Louisiana.

Saltus, Allen, and Sidney H. Schell
1985 The CSS *Huntsville* and CSS *Tuscaloosa* Project, Mobile River, Alabama. Prepared for Mobile Jaycees and US Army Corps of Engineers.

Scaife, Walter B.
1892 *America: Its Geographical History, 1492-1892*. The John Hopkins Press. Baltimore, Maryland.

Secretary of War
1933 Chickasaw Creek, Mobile County, Ala. Letter from the Secretary of War, transmitting a letter from the Chief of Engineers, United States Army, dated February 2, 1933. Serial Set Vol. No. 9758. Report: H. Doc. 47. Government Printing Office, Washington D.C.

Seeb, Sami Kay
2013 Cape Fear's Forgotten Fleet: The Eagles Island Ship Graveyard, Wilmington, North Carolina. In *The Archaeology of Watercraft Abandonment*, edited by Richards and Seeb, pp. 215-238. Springer, New York.

Sherrill, Captain C. O.
1913 "Mobile Harbor, Alabama" *in Professional Memories: Corps of Engineers, United States Army, and Engineer Department at Large.* January-February 1913. No 19: 1-27.

Silverstone, Paul H.
1989 *Warships of the Civil War Navies*. Naval Institute Press, Annapolis.
2001 *Warships of the Civil War Navies*. Naval Institute Press, Annapolis, Maryland.

Sledge, John S.
2015 *The Mobile River*. University of South Carolina, Columbia, South Carolina.

Smith, Gene A.
1997 Fort Bowyer. In *The Encyclopedia of the War of 1812*, edited by David S. Heidler and Jeanne T. Heidler, pp. 59–60. Naval Institute Press, Annapolis.

Smith, Robert Leslie
2008 *Gone to the Swamp: Raw Materials for the Good Life in the Mobile-Tensaw Delta*. The University of Alabama Press, Tuscaloosa, Alabama.

Smith, Roger C., John R. Bratten, and Della Scott-Ireton
1995 The Emanuel Point Ship: Archaeological Investigations, 1992-1995. Report of Investigations 68. Archaeology Institute, University of West Florida, Pensacola.

Smith, Roger C., John R. Bratten, J. Cozzi, and Keith Plaskett
1998 The Emanuel Point Ship Archaeological Investigations 1997–1998. Report of Investigations 68. Archaeology Institute, University of West Florida, Pensacola.

Smithweck, David M.
2016 *In Search of the CSS Huntsville and CSS Tuscaloosa: Confederate Ironclads*. CreateSpace Independent Publishing Platform.

Souvenir Post Card Company
1906 15359 – The Great Storm of Sept. 27, 1906, wrecked Vessel. Mobile, Alabama.

Still, William N. Jr.
1985 *The Story of the Confederate Armorclads.* University of South Carolina Press, Columbia, South Carolina.

Stills, William N., Gordon P. Watts, and Bradley Rogers
1993 Steam Navigation and the United States. In *The Advent of Steam: The Merchant Steamship before 1900*, edited by Basil Greenhill. Naval Institute Press, Annapolis.

The St. Louis Lumberman
1916 "Mobile Letter." *The St. Louis Lumberman*. Volume LVII. No. 6. March 15, 1916.

Stoker, M. S., and A. Cramp
1998 *Geological Processes on Continental Margins: Sedimentation, Mass-wasting and Stability*. Geological Society of London.

Tadman, Michael
1989 *Speculators and Slaves: Masters, Traders, and Slaves in the Old South*. University of Wisconsin Press, Madison.

Tampa Bay Times
1946 Untitled article. June 30_23. St. Petersburg, Florida.

The Tennessean
1928 Untitled article. December 30:19. Nashville, Tennessee.

The Times-Picayune
1843 Hunting Trip. December 17:1. New Orleans, Louisiana.
1889 Loss of Steamboat Lillie. September 19:2. New Orleans, Louisiana.

Trickey, E. Bruce, Nicholas H. Holmes Jr., and Janet R. Clute
1986 Archaeological and Historical Investigations at Pinto Battery or Battery Gladden, Site 1MB17, Mobile Bay, Alabama. *Journal of Alabama Archaeology* 32(1).

Tuscaloosa News
1917 September Storm. September 27:5. Tuscaloosa, Alabama.

Underhill, Harold
1988 *Masting and Rigging in the Clipper Ship & Ocean Carrier.* Brown, Son & Ferguson Ltd., Glasgow, UK.

University of Alabama, Department of Geography
2018 Alabama Maps. Electronic document, http://alabamamaps.ua.edu/, accessed September 24, 2018.

US Coast and Geodetic Survey (USC&GS)
1862 US Coast and Geodetic Survey Annual Report for 1861. Electronic document, ftp://ftp.library.noaa.gov/docs.lib/htdocs/rescue/cgs/001_pdf/CSC-0010.PDF, accessed September 26, 2018.
1888 Historical Image Display: Mobile River: Twelve Mile Island. Electronic document, https://historicalcharts.noaa.gov/historicals/preview/image/3NUM491, accessed April 2018.
1889a *Report of the Superintendent of the US Coast and Geodetic Survey, Showing the Progress of the Work, During the Fiscal Year Ending with June, 1888*. Government Printing Office, Washington, DC.
1889b Manuscript Hydrographic Chart H-1918, from Records of the Charts Division (23.3.6), National Archives Records Group 23, Records of the Coast and Geodetic Survey, National Archives, College Park, Maryland.
1898 *Notice to Mariners, No. 240*. Government Printing Office, Washington, DC.

US Geological Survey (USGS)
1938 Mobile Bay aerial photographs. Earth Explorer. Electronic document, earthexplorer.usgs.gov, accessed September 6, 2013.
1952 Mobile Bay aerial photographs. Earth Explorer. Electronic document, earthexplorer.usgs.gov, accessed September 6, 2013.

US House of Representatives
1918 *Preliminary Report No. 6 of the Commission on Navy Yards and Naval Stations: Navy Yards, Submarine, and Aviation Bases on the Atlantic Coast South of Cape Hatteras and on the Gulf of Mexico, House Document No. 1946, Part 6, 64th Congress, 2nd Session*. Government Printing Office, Washington, DC.

von Scheliha, Viktor Ernst Karl Rudolf
1868 *A Treatise on Coast Defense Based on the Experience Gaines by Officers of the Corps of Engineers of the Army of the Confederate States, and Compiled from Official Reports of Officers of the Navy of the United States, made During the Late North American War from 1861 to 1865.* E. and F. N. Spon, London.

VonFrese, R. R. B.
1986 Magnetic Investigations of Structurally Complex Archaeological Sites. Paper presented at the Annual Meeting of the Geological Society of America, San Antonio.

Watts, Gordon P., Jr.
1988 The Civil War at Sea: Dawn of an Age of Iron and Engineering. *In Ships and Shipwrecks of the Americas: A History based on Underwater Archaeology*, edited by George F. Bass. Thames and Hudson, Ltd., London

Wilcox Progressive Era
1915 Untitled Article. April 8:1. Camden, Alabama.

Wilson, Eugene M., Philippe Osziscik, Cailup B. Curren, Jr., and JoAnn Luker
1983 *Cultural Resources Reconnaissance Study of the Black Warrior-Tombigbee System Corridor, Alabama, Volume IV, Special Topics.* Report Submitted to the US Army Corps of Engineers, Mobile District, Contract DACW01-81-C-001, electronic document, http://www.dtic.mil/dtic/tr/fulltext/u2/a133020.pdf, accessed February 7, 2018.

Young, Matthew
2008 Blockade Running in the Civil War. In *Encyclopedia of Alabama*. Electronic document, http://www.encyclopediaofalabama.org/face/Home.jsp, accessed October 28, 2013.

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APPENDIX A.

REMOTE-SENSING SURVEY NOTES

APPENDIX B.

DIVE LOGS

APPENDIX C.

REMOTE-SENSING SURVEY RESULTS (NOT FOR PUBLIC DISCLOSURE)

APPENDIX D.

WOOD SAMPLES AND CORE RESULTS