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Citizen Science

How Non-archaeologists Are Contributing to Site Interpretation and Mapping of a Revolutionary War Battle in Southern New Jersey

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The area surrounding the Mullica River in southern New Jersey was long inhabited by the Nanticoke Lenni-Lenape Tribe (the literal translation is “men of men,” which actually means “Original People”), often referred to by the British as the Delaware Indians (Trumbull 1871). An early map of what is now part of southern New Jersey states that the area is “Inhabited only or most by Indians,” and Native American longhouses are shown along the rivers (Herrman 1670). The inlets, harbors, and islands, one hundred years later, would become settlements and safe ports for privateer vessels during the American Revolution.

Many Native American hunting and travel foot trails that existed in the area became roads for increasing expansion by European colonists. While some evidence exists for local trade between Indians and colonists, the continued influx of settlers likely caused the Lenni-Lenape to migrate into other areas as many of their hunting grounds and dwelling places were becoming towns and farms in the mid- to late-eighteenth century. The Bead Wreck, discussed later in this chapter, was named for the many glass beads found by archaeologists in the 1975 discovery of the shipwreck. The beads were purportedly meant for trade with the local Indians (Kemp 1993).

Among the first Europeans to establish homes and farms in this area was Eric Pålsson Mullica (Erkki Mullikka), a Finnish settler who moved from



Figure 3.1. Mural on canvas by John Wanamaker of Philadelphia for Fred and Ethel Noyes, c. 1965. Artist's interpretation of the Battle of Chestnut Neck (Used by permission and credited to the Sons of the American Revolution, Somers Point Chapter, New Jersey).

the Philadelphia area to Little Egg Harbor. Many local geographic features, including the Mullica River, were named for him and his family. Other settlers, like the Leeds, Pitneys, and Somers, similarly helped to write colonial southern New Jersey (South Jersey) history by their actions, especially during the American Revolutionary War (Werner 1930).

The story of rediscovering the history that surrounds Revolutionary War battles, such as the Battle of Chestnut Neck, begins with descendants of the citizens who originally founded the area's towns and who fought, died, or were captured during this battle. Many of these descendants are now members of the Sons of the American Revolution (SAR) and the Daughters of the American Revolution (DAR); prospective members must provide proof of direct lineage to their Revolutionary War ancestors in order to join. SAR and DAR members generally have an intense interest in their own personal genealogy as well as a desire to share the history of Chestnut Neck and the battle fought there. DAR and SAR members were particularly interested in passing along details of their families' participation in this historic battle. These citizen scientists helped researchers from Stockton University gain a better understanding not only of what happened along the Mullica River in 1778 but also of where remnants of the battle might still be found. They were fully engaged with the Stockton researchers, relating their family heritage and stories passed down through family histories, and showing existing foundation remnants from some of the original buildings burned during the 1778 attack. By suggesting places to look, they helped marine archaeologists to reimagine the entire battlefield using aerial drones and modern sonar technology. In return, the locals had the opportunity to see images of shipwrecks and other physical artifacts of the events that happened in their town and involved their ancestors in early October 1778 (Figure 3.1).

Revolutionary War battles at sea were unique in that the navies of the British and other European countries were long developed, equipped, and trained, while the new American Continental Congress needed to build its

navy from scratch. Local ship captains could become privateers, a potentially lucrative endeavor that also provided the Continental Navy with information, supplies, and labor. American vessel owners could apply for a letter of marque, which enabled them to capture legally any vessel perceived as an enemy. In exchange for letters of marque, the Continental Congress took weaponry and cargo from captured vessels to support their army. The remaining cargo and vessel were then brought to auction, where the profits were split between the captain, the vessel's owner, and the vessel's crew. The fledgling colonial navy was greatly outgunned by the British fleet and never really generated much of a threat, so the privateers served as important adjuncts to colonial naval attacks on the British. Their success helped sustain the young nation, and the privateering effort caused strain for the British (Shomette 2016).

In 1776 Continental Congress Navy commanders instructed privateers to take prizes into the Chestnut Neck, Little Egg Harbor area to "seek safety from either inclement weather or enemy forces of superior size" (Shomette 2016:147–157). The town of Chestnut Neck itself consisted of only about twelve houses, a tavern, a few salt works, and several storehouses (Shomette 2016). The town was, however, important both geographically and strategically as it was near the valuable Batsto Iron Furnace as well as a major auction site known as "The Forks," making it an important stop on trade routes to and from New York. Chestnut Neck was also geographically ideal, tucked away in the marshes among the many winding, shallow bends of the Mullica River, making it difficult to reach by water, and surrounded by dense cedar and white pine forests protecting it by land. Privateer captains, operating under letters of marque issued by the Continental Congress, regularly sailed out of nearby Great Egg inlet in nimble armed sloops, confiscating British merchant ships as they passed along the coast. With few detailed charts, British merchant captains usually sailed close to shore, navigating by sight, making them easy prey for the knowledgeable captains of Chestnut Neck. This strangling of the British supply line by privateers severely impacted the British citizens and the commerce of the city of New York. During the summer of 1778, between June and September, at least eighteen vessels were captured and brought to auction (Kemp 1966:6), including the exceptionally valuable merchant trade ship *Venus of London* (Lee 1903:560). The capture of the brand-new *Venus of London* was the breaking point for the British Navy.

On 30 September 1778 orders were sent from Sir Henry Clinton to Captain Henry Collins in Staten Island, New York, to take Captain Patrick Ferguson along with 500 others to Chestnut Neck to "break up this nest of rebel pirates" (Kemp 1966:15). Inclement weather, rough waters, and fluctuating

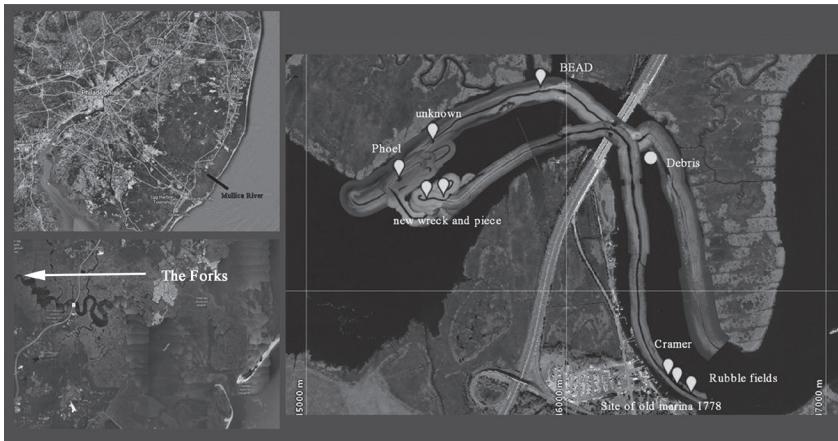


Figure 3.2. Location map and Historic District of Port Republic, New Jersey. The annotated map on the right depicts the possible shipwrecks and their positions (Image courtesy Stephen Nagiewicz, 2019).

tides slowed the British approach to Chestnut Neck, thus giving General George Washington's spies ample time to give notice to the privateers to move captured supplies and other usable equipment and materials from their prize vessels by barge upriver to the Forks. Rather than fight an overwhelming force, the local citizens abandoned the town. During this attack, British amphibious forces destroyed docks, homes, warehouses, and about ten prize vessels of British and French flag, which were burned and sunk at anchor at various parts of the river (Figure 3.2).

The Chestnut Neck Third Battalion, Gloucester County Militia, was no match for the British, but the impending presence of General Pulaski's colonial militia forced the British to abandon their incursions upriver and retreat. Although British troops did destroy some of the salt works surrounding Little Egg Harbor Bay, they were prevented from reaching and attacking the significantly more important Forks area, where several smaller streams fed into the Mullica River. This area contained the primary warehouse for goods seized by the privateers and prepared for sale at auction or distribution to Washington's troops. The Forks also contained the Batsto Furnace, one of the largest iron works supplying the militia (Shomette 2016:166).

British forces withdrew after two weeks, but sustained losses of their newest flagship, *HMS Zebra*, and two other ships that grounded in the shallows of the Mullica River near Great Egg Bay and had to be destroyed. The battle remains one of the first documented amphibious assaults by a foreign nation in South Jersey during the Revolutionary War period (Kemp 1966:8).

Citizens soon began rebuilding their destroyed homes and warehouses, and privateers resumed operations a few weeks later (Shomette 2016:166).

HISTORIC AREA

This history created a submerged battlefield along the winding bends of the Mullica River in what is now Port Republic, New Jersey. In addition to the rich maritime history, the area has many eighteenth- and nineteenth-century homes and farms of historic ownership, use, and architecture that have been designated by the State of New Jersey as a Historic District and are listed on the National Register of Historic Places (NRHP). The State of New Jersey-designated Chestnut Neck Battle Ground area along the riverfront includes 2.7 square kilometers of the Mullica River/Chestnut Neck Archaeological Historic District (ID#385) in Mullica Township, Atlantic County.

Of the ten supposed shipwrecks destroyed by the British, residents provided information that enabled scientists to locate three wrecks as well as an additional target and two other locations of interest. Objectives of the project were to find out as much information about the wreck sites as possible, even though we may never discover the original names of these ships. The vessels were burned or destroyed to the waterline and have been submerged in a harsh riverine environment for over 240 years. Part of coauthor Shannon Chiarel's master's thesis research was to identify the ships that may be in the Mullica River. Her archival research indicates that over one hundred ships passed through Chestnut Neck during 1778, but only thirty were unaccounted for in 1779 (Chiarel 2018). Our collaboration with local citizen scientists was intended to determine whether any of these shipwrecks are the remains of vessels destroyed in the Battle of Chestnut Neck.

For over a century this battle was nearly forgotten. In October 1911 men and women from the Colonel Richard Somers Chapter of the SAR, in cooperation with the General Lafayette Chapter of the DAR, created a memorial for members of the Chestnut Neck community who served in the American Revolution. The Battle of Chestnut Neck was not fought by randomly selected colonial soldiers but by members of the Chestnut Neck community. That same Gloucester County community is the only reason the battle is remembered today.

ARCHAEOLOGY, ARTIFACTS, AND SONAR MAPPING

In 1954 professional diver James Kendall recovered a swivel cannon and some artifacts from a shipwreck he discovered in the Mullica River, which he

described as broken into two parts (Kemp 1966:184). Decades later, in 1974, the availability of recreational scuba diving equipment led divers and archaeologists back to the Mullica to search for this wreck and others near Cramer's marina, resulting in their first professional archaeological mapping, 196 years after the battle (Kemp 1966:187). The Nautical Archaeological Associates of Maryland (NAA), led by Donald Shomette, collected artifacts through a series of dives on two sites, known as the Bead Wreck, named for the many glass and porcelain beads recovered, and the Cramer Wreck, named after the owner of the boatyard where it is located. Two years later the study was taken over by the New Jersey State Museum, at which point a mix of professionals and volunteers from the Council of New Jersey Diving Clubs and the NAA, supervised by Gordon Watts, collaborated to survey using a side scan sonar, a fathometer, and scuba diving to relocate the Bead Wreck, find artifacts, and create maps and drawings of the wreck (Mathewson 1985). Watts suggested these wrecks might be historic examples of privateering. The Bead Wreck was revisited in 1985 and 1994 in conjunction with the Atlantic Alliance for Maritime Heritage Conservation (AAMHC), led by Jack Fullmer, Duncan Mathewson, Daniel Koski-Karell, James Sinclair, and Janet Fittipaldi (Fullmer 1998:8). In 1988 underwater archaeologist Duncan Mathewson and the AAMHC, along with local New Jersey scuba divers, again mapped the Bead Wreck and nominated it to the NRHP (Fullmer 1988:12).

In 2008 Stockton College researchers, including coauthor Peter Straub, Marine Field Station manager Steve Evert, sonar expert Vince Capone, and adjunct faculty and NOAA Fisheries scientist William Phoel, sonar mapped a previously undiscovered shipwreck in the Mullica River. In late 2017 researchers conducted a more comprehensive sonar mapping of the Mullica River and specifically the Chestnut Neck Battle area. A Stockton University general studies course for the non-scientist, named Underwater Science and Technology and taught by coauthor Stephen Nagiewicz, was designed to show students how remote sensing equipment can be used to explore the oceans and to map underwater maritime history. After a field trip on the river to demonstrate how side scan sonar can be a useful tool for studying maritime remains, a few students became interested and volunteered their spare time for learning the scientific process of sonar surveying and researching local history. Finding the shipwrecks was relatively easy compared to researching their history. While much is known and has been written about the Chestnut Neck Battlefield, it is largely unknown to the public; even a search on the State of New Jersey's own history website has little mention of the historic battle.¹ Students wanted to know why this significant event has been all but forgotten, except for a monument and memorial to the militia

killed in the battle, erected by the DAR and SAR organizations a short distance away from the battlefield in 1978–1980 (Kemp 1966:188). Hearing about an earlier discovery of an unknown third shipwreck sparked additional research that spanned several university courses.

Faculty, staff, and students named the newly discovered third shipwreck for its discoverer, the late Stockton Adjunct Professor Dr. William Phoel. Research began in earnest in 2018 as opportunity and equipment were made available. A diverse cross section of university students, from a variety of fields including business, communications, criminal justice, hospitality, liberal arts, and health as well as the marine science program, volunteered their time to study the wreck sites using university boats and sonar equipment. Students' personal cultural heritage included Native American, African, Caribbean, Hispanic, Asian, and Caucasian. This student group created an interesting dynamic working largely with senior, and white, descendants of the original families who settled in the South Jersey area more than 250 years ago, yet the local people enthusiastically shared their knowledge with the students while relying on them to help uncover the stories of the sunken wrecks in the Mullica River.

Groups like the SAR contributed historical background, while students added to that research with internet and library searches to understand the context of the wrecking event. Norman Goos, a member of the local SAR chapter and historian for the Atlantic County Historical Society (ACHS), and Earl Cain, another SAR member, conducted personal research on the site, including preservation of an anchor found at the Cramer Wreck site that became part of the memorial for the Battle of Chestnut Neck. Cain and Goos talked about how viewing sonar images of the shipwrecks brought home to them more of their ancestral history related to the battle, and they especially liked the fact that Stockton University and its students were helping to preserve that history. So few people visit the memorial site each year, in part because of its off-the-road location, and the history of the battle is not generally known. This research is helping to change that. For example, Stockton University separately produced a video for broadcast to its alumni, with Norman Goos discussing the history and importance of the battle. The SAR members were appreciative: “We thank Stockton for that” (Earl Cain and Norman Goos 2020, pers. comm.).

Local residents Vicki and Gary Cantell live a few hundred feet downstream from the Chestnut Neck Marina in Port Republic, New Jersey. Their home is near both the remains of an earthen mound that protected the port town in 1778 and the Cramer Wreck, one of the three known wrecks of the battle. The Cantells knew all about this history and became involved as citizen scientists

in a much different way. They found a long piece of wood floating near their riverside home in late 2019. Mr. Cantell (2020, pers. comm.) told the authors he first noticed the large piece of wood in late 2017, partially buried in the creek behind his house, and had been keeping an eye on it.

The Cantells contacted several local historical organizations, including Stockton University, to verify if it could be a piece of the shipwreck from the nearby marina and therefore part of the Battle of Chestnut Neck. Several historians, including Norman Goos, have since examined the find and suggested that it is a partial keel from a wooden schooner, possibly an American privateer vessel destroyed by the British in 1778 in this area. Mr. Cantell offered the artifact to Stockton University, but the university declined as it did not have the necessary conservation labs for the large wooden artifact, although it was fully documented and recorded. Wanting to preserve what could be a part of local history, he asked for advice for conserving it from several archaeological sources, including the authors. Mr. Cantell's plan was to conserve and display it for people who would like to see the piece of local history. It was already attracting a lot of attention from historical societies and residents. As a conserved artifact, the keel could be donated to a museum or institution later. Mr. Cantell's work and enthusiasm for this restoration was later highlighted on New Jersey News 12 in an interview about this historical find and what he learned (Donohue 2018). Mrs. Cantell, a DAR member, credits her husband for helping to reveal the area's history. By creating a setting where members of the public, in this case the Cantells, could participate in the preservation of history—literally conserving the keel—in an informative, supervised setting, we were able to curate “a careful balance between providing opportunities and hospitality for visitors and protecting often fragile resources” (Little 2002:14).

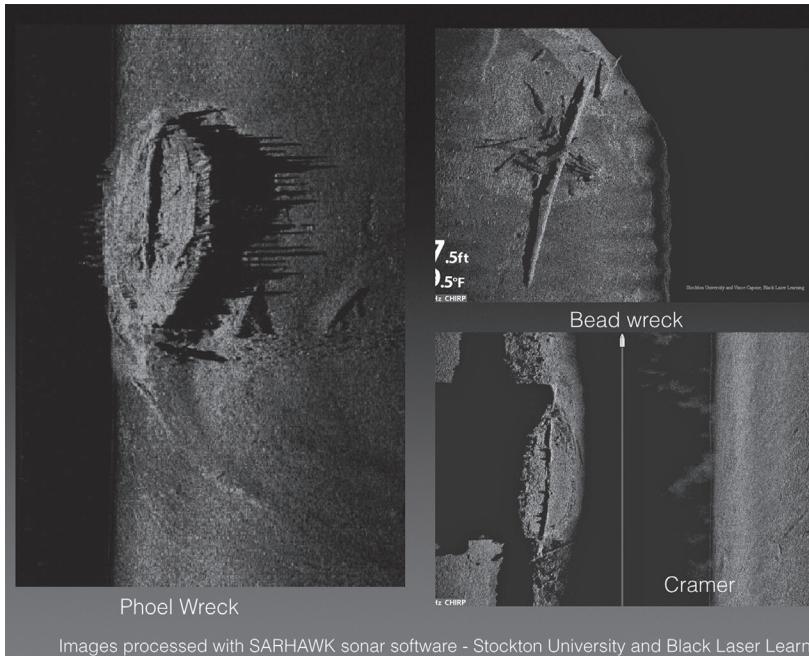
Many of the citizen scientists involved with this project were personally connected to the history of this battle and area of southern New Jersey. The students who volunteered, however, became increasingly connected through their research and conversations with residents, and it resonated for them every time they saw sonar images of the submerged shipwrecks and learned more about the history the wrecks represented. A large debris field of what has been identified by sonar data from several surveys to be ship wreckage is very close to the Cantell home (Figure 3.2) (Nagiewicz et al. 2020). It was not unexpected that severe storms and a fast-moving river might deposit debris or artifacts near their home. The sonar-surveyed debris field may account for some of the ship wreckage that should be found in the river resulting from the ten destroyed vessels described in archived contemporary reports. One intact shipwreck, however, the Cramer Wreck, lies just 12 meters outside the

marina. The current marina is in almost the exact location of the main pier for the warehouses and docks of Chestnut Neck in 1778, as shown in Figure 3.1.

Local lore as told by several residents claims that until the 1900s, wrecks were visible at dead low tide. Owners of the Chestnut Neck boatyard state they used to put rocks around the wrecks to make them easier to spot. They are no longer visible, likely due to scavenging and natural deterioration by shoreline erosion, severe coastal storms, and strong river and incoming tidal currents. Extensive sonar surveying has thus far documented the location of the Bead Wreck, now listed on the NRHP; the Cramer Wreck; the Phoel Wreck; evidence of multiple severely disarticulated vessels yet to be explored and possibly linked to this battle; and what is believed, based upon magnetometer and side scan sonar data, to be an additional Revolutionary War-era shipwreck, which to date has not been fully investigated (Figure 3.3). The project to image the entire battlefield will include the known wrecks and a continuing sonar search effort to identify other possible sites or associated debris so that the entire battlefield can be re-imagined as it would have been in 1778. This includes data and any identifiable artifacts from the Bead, Cramer, and Phoel shipwreck sites. The plan is to record the shipwrecks via sonar every six months and, where possible, to monitor environmental conditions that might affect the sites.

As part of the survey project, undergraduate students conducted data collection, analyzed images, and worked alongside faculty experts. Some students wanted to learn how sonar could provide data about the wrecks and volunteered their time to learn how side scan sonar works, how to drive a small boat, and how to use the data collected in post-processing software to produce images of the shipwrecks. The sonar images helped students and scientists locate the ships; however, firsthand examination via scuba diving was needed to confirm the sonar data. The Mullica is a fast-moving tidal river and the muddy water limited visibility, making diving the wrecks difficult at best. Undergraduate student Jessica DiBlasi, who was part of the summer intensive research course with Peter Straub, and coauthor Nagiewicz were the first to dive at the Phoel Wreck to establish baseline measurements, document ship construction, and recover artifacts that would help identify the wreck and confirm whether it was part of the historic battle.

Working under the direction of the New Jersey State Historical Preservation Office (SHPO) between 2018 and 2019, our main goal was to verify that the Phoel Wreck was one of those sunk by the British in the 1778 battle. The SHPO, based upon data supplied from our initial investigations of the Phoel Wreck and in our research permit application, designated the Phoel Wreck



Images processed with SARHAWK sonar software - Stockton University and Black Laser Learning

Figure 3.3. Mullica River shipwrecks (Image courtesy Stephen Nagiewicz, 2019).

as an archaeological site. The SHPO indicated that any artifacts would need to show damage or charring from the fire and of course be artifacts typical of the period. The team made three dives on the Phoel Wreck, recovering twenty-four glass, ferrous metal, brick, and wood artifacts.

Fourteen glass artifacts seemed to have originally been dark green glass, and two appeared to have partial pontil marks indicative of British or American bottles from the eighteenth century (Society for Historical Archaeology [SHA] 2020). Approximately ten of the samples had developed a multicolored, rainbow-esque sheen or turned blue because of devitrification or “glass-sickness,” caused by minerals in the glass breaking down over time (Gormley 2007:49). This process may have been accelerated by prolonged exposure to high heat, such as during burning to sink the ships, which may also have caused some glass artifacts to become deformed.

The brick artifacts are hand-struck and unglazed brick, consistent with brick made before the nineteenth century (Sanjurjo-Sánchez 2016). The grouping in which the bricks were found may indicate that they were part of the Phoel Wreck’s galley. Some wooden artifacts recovered had soft black portions from either charring or wood rot; when divers originally recovered these pieces, they said the wood still smelled burned. One wood sample

appeared to have a possible trunnel hole. These signs support the idea that the Phoel Wreck was one of the vessels scuttled and burned during the Battle of Chestnut Neck. Data from these dives and sonar mapping enabled researchers to have the Phoel Wreck listed as a state archaeological site with the eventual goal of nominating the Phoel Wreck and Cramer Wreck to the NRHP.

Once cleaned, weighed, measured, photographed, and analyzed, the artifacts were prepared for their semi-permanent home in a display case in the Unified Science Building at Stockton University (Figure 3.4). The State of New Jersey is the owner of the artifacts and the shipwrecks as they lie within state waters; however, the wreck materials are on loan to the university at present. Before being placed on display, the artifacts were taken to several local elementary schools to inspire younger students. A selection of artifacts was brought to several classes of students in first to eighth grades to bring this history to life for some inquisitive minds. Students were engaged and excited to see something over two hundred years old that may have been on a Revolutionary War vessel. This was a wonderful opportunity for the teachers, students, and archaeologists involved because it embodied the idea that “the dynamic character of archaeological research has the potential to help make archaeology more interesting to the public” (Lipe 2002:24).

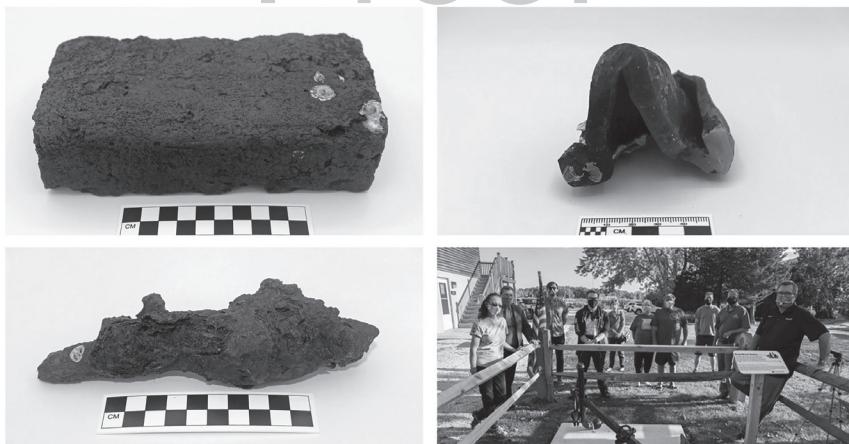


Figure 3.4. Mullica River artifacts: *top left*, hand-made brick; *bottom left*, piece of charred hull from the Phoel Wreck; *top right*, deformed and discolored black glass, likely a piece of a bottle; *bottom right*, students, staff, and public members of the shipwreck project (Image courtesy Stephen Nagiewicz, 2019).

ANCHOR

Although used more for recreational purposes currently, the Mullica River is an active waterway with fisheries for oysters, crabs, and finfish. The river is a breeding area for many fish species and serves as a field study area for several universities. On a marsh biodiversity research trawl, an anchor was accidentally tangled in the trawl net at the site of the Bead Wreck. The unlucky group of marine scientists recorded their exact geo-position as they would have for the marsh trawl and proceeded back to the dock. A few days later a request came to Stockton inquiring if we might be interested in an anchor or have knowledge about the proper procedure for either conserving it or returning it. Because the artifact was recovered from the NRHP-listed Bead Wreck site in state waters, it was reported to the New Jersey State SHPO. The SHPO, after consultation with the state museum, approved the conservation plan suggested by the authors and authorized Stockton to conserve the artifact. The conservation process proved to be a teaching experience for Stockton students and for some in the local community. There were many questions, including whether the anchor was associated with the Bead Wreck and if it dated to the late eighteenth century.

This provided another opportunity for students and residents to collaborate on restoring a piece of local history. The anchor was obviously old—it was covered by river sediment and concretion, in many places several inches thick, along with oyster shell and marine plant life. It was also partially broken, although, surprisingly, not by the trawl net's extraction process. The stock arm was broken off right at the "keep pin" and was missing completely. The break was corroded, indicating that it had happened many years previously, possibly a result of the battle or weather. Late eighteenth- to early nineteenth-century anchors frequently were damaged by use and design flaws (Curryer 1999). Designing a sturdy anchor that would hold under frequent, hard use was a constantly evolving process.

Measurements were taken of the anchor prior to conservation. The assumption that the anchor was associated with the Bead Wreck was initially based on its recovered location, as latitude and longitude coordinates matched the wreck site exactly. The anchor was recovered farther into the marsh than the position of the actual wreckage.² This makes sense because if the anchor were used to moor the ship, it would be placed nearer the shallow marsh and upstream from the river flow and wreck position. If associated with the Bead Wreck, the fact that the anchor survived the burning and salvage process lends further evidence that it was deployed rather than stored

aboard. Salvaging useful tools like an anchor would have been a priority of the raiders where possible (Kemp 1966:93).

While much of the existing research on anchors is focused on naval vessels, it may also be applied to merchant vessel anchors and can be used to define and identify the Bead Wreck anchor (Van Horn 2004). The Bead Wreck anchor is a kedge-type or stream-type, meaning it was used for mooring, anchoring, and, in some cases, navigating the ship through a winding river. The style of the Bead Wreck anchor, however, is inconsistent with anchors of the late eighteenth century. Although the anchor fits in the Admiralty pattern tradition, the iron sliding stock dates it to the middle of the nineteenth century (Cotsell 1856). It likely was deposited and lost at the exact site of the Bead Wreck by way of fouling on the submerged site, which remained a viable anchorage location into the early twentieth century.

The SAR Colonel Richard Somers Chapter, located in southern New Jersey, maintains the Battle of Chestnut Neck Memorial in Port Republic, New Jersey. They offered Stockton University researchers information to help our identification of the anchor. This organization conserved a kedge or stream-type anchor, similar in size and shape to the Bead Wreck anchor; it is on display as part of the memorial. That anchor, according to Earl Cain (2018, pers. comm.), was recovered by SAR members from the marina, near the site of the battle, likely from the Cramer Wreck or part of the adjacent rubble field, and its provenance was confirmed by state experts in the late 1980s. Further research may shed more light on local maritime activities to validate our theories.

During the process of conserving the anchor and other recovered artifacts, we looked for clues to the construction and age of the shipwrecks. We needed to find places where the artifacts we collected could be tested to verify their ages and thereby perhaps provide dates for the wreck sites. Dr. Amy Mitchell-Cook, professor and chair of the Department of History and Philosophy at University of West Florida, was recommended by Dr. James Delgado as an expert in wood material analysis. Mitchell-Cook agreed to help, analyzing several wood samples that were determined to be white oak (*Quercus alba*). We suspected that the merchant ships used by the British may have been constructed in America, and while there is no confirmation of this, we at least knew that the wrecked ships were built using white oak, which was commonly used for ship construction in North America (Carroll 1981). It made sense to us economically: why build and transport merchant ships from across the Atlantic when they could be built locally?

Part of the archaeological process included testing some of the metal artifacts with X-ray fluorescence spectroscopy (pXRF). This technique measures



Figure 3.5. Student volunteers learn to use remote sensing technology to survey for shipwrecks (Image courtesy Susan Allen, 2020).

and analyzes samples excited by incident radiation. It is a non-destructive method of material characterization, allowing for accurate investigations into the elemental and chemical make-up of metals, ceramics, geological samples, and historical items (Linden 2013). We had part of the anchor we were conserving, an iron fastener, and an iron nail from the Phœl shipwreck tested. The data results showed 92 percent to 94.5 percent iron (steel) with traces of carbon, phosphorus, sulfur, tin, and lead, which the testers called “dirty” metal, meaning it contained many impurities. While this may be consistent with merchant ships built in the late eighteenth century, much depends upon where the objects were forged, and we have no comparative data from which to base conclusions about the metal content of artifacts from these wrecks.

As a result of the research project, anchor conservation, and artifact testing, the Battle of Chestnut Neck garnered more interest in local and state newspapers and media sources; it appeared in the university’s News Page (Allen 2018) and the story was featured on a New Jersey news television channel (Donohue 2018). As a result of their interest and help with understanding the history of the event, Stockton students and staff were extended the honor of being invited to attend the yearly memorial for the men who participated in the battle, held annually at the memorials in Port Republic on 6 October (Figure 3.5).

CONCLUSION

This project began as a volunteer field exercise, teaching interested students outside of their coursework how side scan sonar can be used to find shipwrecks and help us understand local maritime heritage, and how remote sensing technologies can be applied to marine research. It has blossomed into a search for history, having logged over 1,550 working hours donated by 24 students, local historical society volunteers, and university staff and faculty. These engaged volunteers were both surprised and fascinated by the underwater sonar images of the shipwrecks and amazed that they could really “see” the ships they had previously only read about. All were excited to help find answers, and their involvement helped define this history in a way seldom done before. Private citizens, almost all non-professional scientists, worked alongside Stockton University students and staff to research, conserve, and display the history of the battle from their own personal perspectives. What was once only a story about their ancestral history is now very real for everyone. They can see, touch, and understand the legacy of this moment in history because they became an essential part of discovering it.

In future our goal is to add information about the contributions of local Indigenous groups and other underrepresented people in this area. For example, while slavery was common at this time, few papers or books detail Black experiences in the Revolutionary War, and much less in this particular battle. However, a section of the 1855 book by William C. Nell, *The Colored Patriots of the American Revolution*, tells of young James Forten, the fourteen-year-old son of a free Black Philadelphia family. Forten enlisted on Stephen Decatur’s privateer as a powderboy in 1780. We are heartened at discovering this knowledge and look forward to more rigorous research about the backgrounds of the crews serving on these local privateers.

It was also apparent that we need specifically trained divers to work with mapping the shipwrecks. The diving platform is a university research vessel and, as such, there are specific legal obstacles in allowing non-university-trained research divers access to diving from the vessel, let alone access to diving historic shipwrecks. Engaging existing groups, such as Diving With a Purpose or the Maritime Archaeological and Historical Society, would be helpful in having trained citizen science divers as cooperative partners. These divers already are trained to use archaeological methods and are capable of safely diving and completing complex mapping in low-visibility diving conditions. While Stockton’s Marine Field Station is very well equipped with various types of remote sensing technologies and operates several capable research vessels, the upcoming introduction of a master’s degree program

in Coastal Zone Management will provide graduate-level training in scuba diving and research.

While we were quite satisfied with the local cooperation and interest that connected residents from the area with the research and with Stockton students, we also considered that to continue this research best, having definable goals, a specific timetable for field research and data collection, and a little more archaeological background for students would be helpful. Stockton has several excellent programs for attracting underserved students from the area, and one of our goals is to find opportunities for these students that promote interest and future careers in maritime archaeology, marine science, maritime history, and remote sensing technologies for exploration of the oceans.

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NOTES

1. <https://nj.gov/nj/about/history/>.
2. When first mapped in 1975, the Bead Wreck was in 3 meters of water about 15 meters from the marsh. Currently, the wreck is slipping into deeper water as marsh drainage channels and river flow have undercut the marsh, almost totally disarticulating the wreck.

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