

Geophysics Background Information

- How do archaeologists know where to dig? Archaeologists do not randomly dig holes and excavation units in hopes of finding artifacts. Instead, sites need to be methodically surveyed first before full excavations can take place.
- Traditionally, archaeologists surveyed a site by digging uniformly spaced shovel width holes called “shovel test pits”. In a shovel test, the dirt is screened, and artifacts are collected and recorded. On a map, archaeologists make note of which shovel tests contained artifacts (positive) and which did not (negative). Areas with artifact clusters indicate the location of an archaeological site and might be examined further with large scale excavations.
- In the past, the only way for archaeologists to know what was beneath the ground would be through excavation. Excavation is, by its very nature, a destructive process. Because of this, archaeologists are very meticulous in data collection when they excavate a site.
- Geophysics has become an important part of modern archaeology because it allows archaeologists to “see” what is beneath the ground without digging it up.
- Like shovel testing, geophysical survey data is collected along established grid lines. This is so scientists uniformly cover the survey area and have an accurate underground map of the site. Data is collected by a variety of instruments, which is then processed by a computer and analyzed by a trained geophysicist. Geophysical experts are looking for anomalies in the collected data, which indicates an unnatural change in the surrounding subsurface.
- Three commonly used geophysical techniques are ground penetrating radar, electrical resistivity, and magnetometry.
 - o Ground Penetrating Radar (GPR): In GPR, a radar signal is sent into the ground. When the radar pulse encounters a physical change in the subsurface, it bounces back to a receiver at different strengths and time intervals.
 - o Resistance Survey: In a resistance survey, an electrical current is passed through the ground at regular points on the survey grid. Electrical resistance (measured in ohms) in the soil varies and patterns of resistance are recorded, plotted, and interpreted.
 - o Magnetic Gradiometry: In a gradiometer survey, a device is used to detect changes in the local magnetic field, which indicates past human activity. The data collected is used to map magnetized features and objects beneath the ground’s surface.
- While geophysical data is a great tool for archaeologists, it has its limitations. Certain soil conditions can make it difficult to get accurate readings from the instruments, and tall grass or difficult walking conditions makes it difficult to create a reliable site map. Furthermore, anomalies in the data that might appear to be man-made, may in fact be natural rock or soil formations. The only way to confirm the results from a geophysical survey is start digging, or “ground- truthing”.

Pockoy Background Information

- Pockoy Island is a remote South Carolina barrier island, part of the Department of Natural Resource's Botany Bay Heritage Preserve / Wildlife Management Area. The property is located on the northeast corner of Edisto Island in Charleston County.
- Botany Bay is one of the largest relatively undeveloped wetland ecosystems on the Atlantic Coast, providing a critical habitat for a number of wildlife species.
- The cultural resources of Botany Bay are equally important, with sites dating from approximately 4,000 years ago to the nineteenth century. Several sites are listed on the National Register of Historic Places, including the outbuildings from Bleak Hall Plantation, granite markers from the 1850 Alexander Bache U.S. Coast Survey, and the Fig Island Shell Rings.
- The shell ring on Pockoy Island was first identified in early 2017 by analysts studying Hurricane Matthew's effect on South Carolina's coastline. When studying maps produced by aerial light detection and ranging, or LiDAR, the analysts noticed strange circular features on the coast of Pockoy Island, indicating the presence of a shell ring. Shovel testing began in the summer of 2017, which confirmed the ring's existence. Radiocarbon dating conducted on recovered animal bone revealed that the site was approximately 4,300 years old, making it the oldest known shell ring in South Carolina.
- Testing continued in late 2017, with large scale excavations taking place in May and December of 2018.
- Shell rings are mysterious structures found along the coasts of South Carolina, Georgia, Florida, and Mississippi. These sites date to the Late Archaic period (roughly 5,000 – to 3,000 years ago) and are the earliest significant examples of people living on the southeastern U.S. coast. Dates suggests that the shell ring on Pockoy Island was built over a relatively short period of time, around 20 – 30 years.
- As the name indicates, shell rings are large circular or semi-circular structures made from piled shell. Some are C-shaped and U-shaped, while others are irregularly shaped or made up of multiple shapes. Pockoy is doughnut shaped. Shell rings are primarily composed of oyster shell, but cockles, periwinkles, clams, and whelk shells are also commonly found. They range in size from 30 to 250 meters and are between 1 and 6 meters high. Pockoy's shell ring is approximately 60 meters in diameter.
- Another key feature of a shell ring is a central area called a plaza, which is devoid of shell. Archaeologists speculate that this area was maintained for ceremonial purposes or contained some sort of structure.
- Archaeologists have been studying shell rings for decades but there is still a lot we do not know.
- Archaeologists are unsure if shell rings were intentionally built or not. Some argue that shell rings were inadvertently created from piles of discarded shell following meals over a long period of time. Others believe shell rings were planned structures built from leftover shells of feasts and other quarried shell.
- Archaeologists are also unsure what shell rings were used for. Some believe shell rings were sites of general human occupation, while others theorize shell rings were ceremonial structures only used for specific purposes at specific times.
- Archaeologists have recovered thousands of artifacts from Pockoy and other shell rings. The most common artifacts are pottery, shell, and animal bone.

o The pottery found at Pockoy belongs to the earliest types of ceramics found in South Carolina. Many of the potsherds found at Pockoy are decorated with punctations, incised lines, or stamped designs. The people who created this pottery used shells, reeds, and other natural materials to produce these effects.

o Shells were not only used to build the ring, they were also used as tools and for decoration. The ancient inhabitants of Pockoy modified whelks and other shells to create hammers, awls, adzes, hoes, and other necessary tools for everyday life. They also turned shells into jewelry by shaping them into beads.

o Animal bone is normally not well preserved because of the acidity of South Carolina's soil. However, bone is plentiful at Pockoy because the calcium from the shell raises the soil's pH level, preserving the bone. Worked bone is frequently found and at Pockoy archaeologists have recovered numerous finely decorated bone pins.

- What archaeologists do not find at a site can also tell them a lot about the people that lived there. Very little stone has been found at Pockoy, telling archaeologists that the people that once lived there did not rely on stone tools. Some archaeologists interpret this as evidence that the shell ring was not a site of human occupation, but others propose that this is reflective on the environment – good stone is hard to find on the coast so the people living there adapted by making their tools out of shell and bone.

- Due to Pockoy's location along the coast, the site is vulnerable to coastal erosion and rising sea levels. With a rate of 9.5 meters of coastline lost per year, Pockoy is expected to be completely engulfed by the ocean by 2024.

- Climate change, or "heritage at risk", poses a serious challenge to archaeologists, and Pockoy is not the only site facing destruction. According to a report by DINAA (The Digital Index of North American Archaeology), a one-meter rise in sea level would result in the loss of 13,583 archaeological sites across the Southeastern United States. It is imperative to salvage, protect, and study these vulnerable sites before they are gone.

Vocabulary

- **Archaeological Site:** A place where human activity occurred, and material remains were deposited.
- **Archaeologist:** An anthropologist (social scientist) who studies the material remains of past human activity.
- **Archaeology:** The scientific study of past human cultures by analyzing the material remains (sites and artifacts) that people left behind.
- **Artifact:** Any object made, modified, or used by people.
- **Cultural Resources:** Evidence of past human activity. They include archaeological sites, historic homes, battlefields, burial grounds, shipwrecks, historic and prehistoric artifacts.
- **Excavation:** The systematic digging and recording of an archaeological site.
- **Feature:** Material remains that cannot be removed from a site such as roasting pits, fire hearths, house floors or post molds.
- **Geophysical Survey:** a number of non-invasive remote sensing techniques used in archaeological investigations to determine the presence of cultural resources.
- **Ground Penetrating Radar (GPR):** A geophysical method that uses radar pulses to collect and record information about what is below the surface of the ground (only near-surface).
- **Magnetometry:** A geophysical technique that measures and maps patterns of magnetism in the soil.
- **Resistivity:** A geophysical technique where an electrical current is passed through the ground at regular points to measure and map the electrical resistance of the soil.
- **Shovel Test Pit:** A pit or hole dug to determine site depth, stratigraphic sequences, and so forth, prior to excavation.
- **Stratigraphy:** The layering of deposits in archaeological sites. Cultural remains and natural sediments become buried over time, forming strata. General principle is that more recent artifacts are on the top, and the oldest artifacts are on the bottom.
- **Survey:** The close examination of an area prior to land alteration activities in order to see if there are any sites present that might be damaged or destroyed.