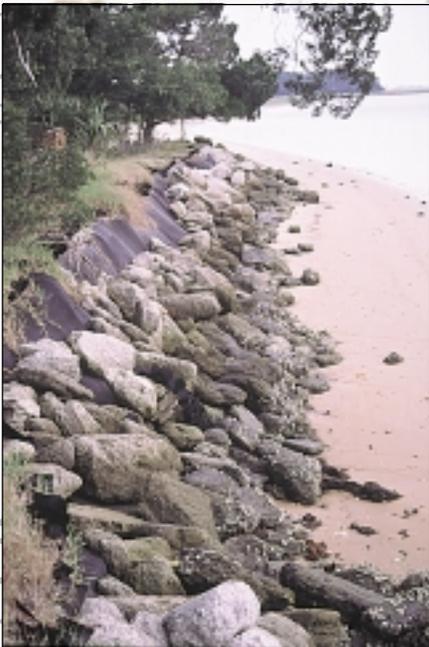
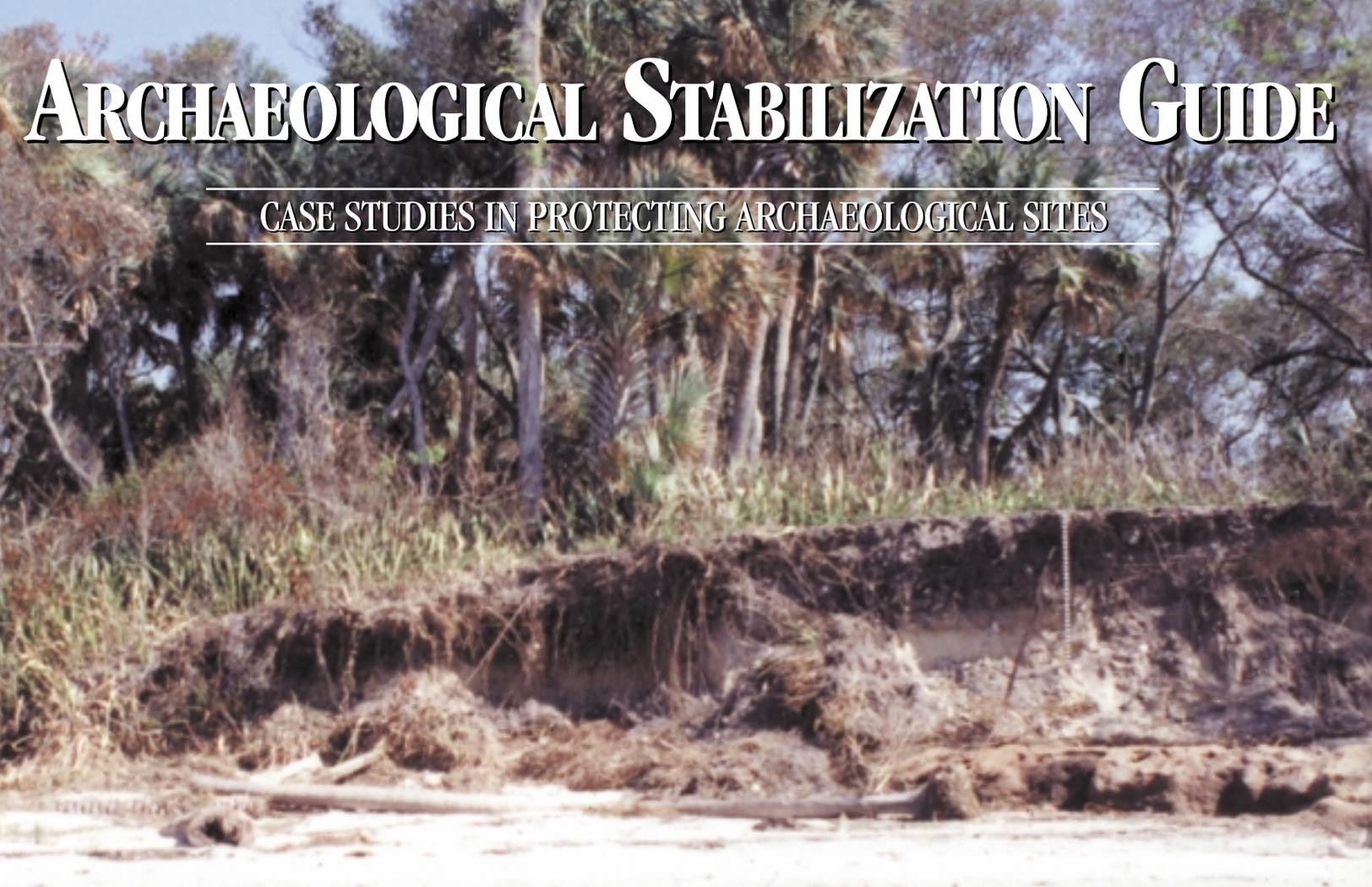


# ARCHAEOLOGICAL STABILIZATION GUIDE

CASE STUDIES IN PROTECTING ARCHAEOLOGICAL SITES



PRESERVING AND  
PROTECTING



FLORIDA'S ARCHAEOLOGICAL  
SITES FOR FUTURE GENERATIONS



FLORIDA  
HERITAGE





## ACKNOWLEDGMENTS

The Archaeological Stabilization Guide was prepared as part of a larger project entitled Cultural Resource Protection in the Coastal Zone. The purpose of the project has been to develop and implement strategies for protecting sites on private land. The project was made possible by a subgrant from the Florida Department of Community Affairs, Florida Coastal Management Program, in cooperation with the U.S. Department of Commerce, National Oceanic and Atmospheric Administration.

The Guide was created by: Mary Glowacki, Jim Miller, Brenda Swann and Louis Tesar, updated in 2004 by Amanda Evans. However, it would not have been possible without the help of many individuals and organizations. From the Florida Division of Historical Resources, we thank the former Directors, George W. Percy and Dr. Janet Snyder Matthews. Jim Miller, formerly the Chief of the Bureau of Archaeological Research developed the proposal and administered the project. Additionally, we thank Henry Baker, Charly Branham, James Christie, Melissa Memory, Andrew Myers, Christine Newman, and Ryan Wheeler in the Bureau of Archaeological Research, and Susan Harp in the Bureau of Historic Preservation.

We also wish to thank the Florida Department of Environmental Protection (DEP), Bureau of Beaches and Coastal Systems for valuable information on erosion. Special thanks go to Steve Martin, Division of Recreation and Parks, Bureau of Natural and Cultural Resources, for recommending case studies and providing accompanying photos. We also thank Jeanne-Marie Warzeski of that office for loaning photos.

Robert Thorne of the National Clearinghouse for Archaeological Site Stabilization provided numerous published sources on site stabilization for which we are grateful.

Finally, we would like to acknowledge the assistance of the many land managers and other individuals who have provided us with information on specific case studies, and who have been personally involved in their stabilization. They include Bill Burger, Charles Dutoit, Sonia Gray, Jeff Mauch, Jeanne Parks and Benny Woodham. We additionally thank Bill Burger for supplying us with the front-cover photo of the eroded mound (8MA27), which so clearly shows the effects of erosion.



# **ARCHAEOLOGICAL STABILIZATION GUIDE:** *Case Studies in Stabilizing Archaeological Sites*

<b>INTRODUCTION</b> .....	<b>4</b>
<b>CASE STUDIES</b> .....	<b>5</b>
<b>BLOCK-STERNS (LE148)</b> .....	<b>5</b>
<b>CRYSTAL RIVER STATE ARCHAEOLOGICAL SITE (CI1)</b> .....	<b>6</b>
<b>EMERSON POINT/SNEAD ISLAND TEMPLE MOUND/PORTAVANT     INDIAN MOUND SITE (MA919)</b> .....	<b>7</b>
<b>FORT SAN MARCOS DE APALACHEE (WA26)</b> .....	<b>8</b>
<b>MILL POINT 3 (HI18)</b> .....	<b>9</b>
<b>MOUND AVENUE MOUND (VO240)</b> .....	<b>10</b>
<b>MOUND KEY (LL2)</b> .....	<b>11</b>
<b>MOUNT ELIZABETH (MT30)</b> .....	<b>12</b>
<b>MUNYON ISLAND SITE (PB79)</b> .....	<b>13</b>
<b>NOCOROCO AND MOUNT OSWALD (VO82)</b> .....	<b>14</b>
<b>PEACOCK SPRINGS SITE (SU121)</b> .....	<b>15</b>
<b>SHELL BLUFF LANDING (SJ32)</b> .....	<b>16</b>
<b>VELDA MOUND (LE44)</b> .....	<b>18</b>
<b>ORGANIZATIONS AND ASSISTANCE</b> .....	<b>19</b>
<b>REFERENCES</b> .....	<b>21</b>

# INTRODUCTION

**T**he *Archaeological Stabilization Guide* was created to assist private property owners to stabilize archaeological sites in their stewardship. The purpose of this guide is to present practical solutions to stabilization problems through case studies at public and private archaeological sites. The guide is divided into two parts—case studies and useful resources. The case studies illustrate some of the leading causes of site destabilization, corresponding stabilization solutions, and the effectiveness of these solutions in reducing or eliminating loss of sites. There are many factors that contribute to the destabilization of archaeological sites. Some of the most common in Florida are: shoreline water levels, currents, and surges; torrential rain and wind; vehicular and pedestrian traffic; invasive or intrusive vegetation; unauthorized digging; vandalism; and development. The second part of the guide provides a list of organizations and references to consult when faced with a particular stabilization problem.

The *Stabilization Guide* is part of a series of how-to guides for managing archaeological sites. Although written for private landowners, the principles of site protection are similar on public lands. For an overview of various threats and protective measures, see *Best Management Practices: An Owner's Guide to Protecting Archaeological Sites* also available from the Florida Division of Historical Resources. The Division and the Department of State manage a wide variety of programs to promote Florida's rich cultural heritage. For more information about archaeology, historic preservation, museums, and folklife, visit our web page at [www.flheritage.com](http://www.flheritage.com). Thank you for helping protect our unique and irreplaceable cultural resources.

## Project: Block-Sterns (LE148)



**Destabilization Issue:** *Unauthorized digging/looting*

**Location:** The Block-Sterns site is located in eastern Leon County, Florida, adjacent to Piney-Z Lake, an artificially created segment of Lake Lafayette.

**Site Description:** The Block-Sterns site complex consists of four earthen mounds, probably used as burial mounds, and an extensive associated village area. The site was occupied from at least the Middle Archaic through Fort Walton periods (ca., 7000 B.C.-A.D. 1600); however, it is most noted for its late Deptford through Weeden Island period occupations. Artifacts representing the late Paleoindian and Early Archaic (ca. 10,000-7000 B.C.) and later Leon-Jefferson and Territorial periods have also been found in the general area.

**Site Owner/Manager:** The City of Tallahassee, Leon County, and private individuals own various portions of this site complex. The Tallahassee-Leon County Parks & Recreation Department manages the publicly accessible portion of the site.

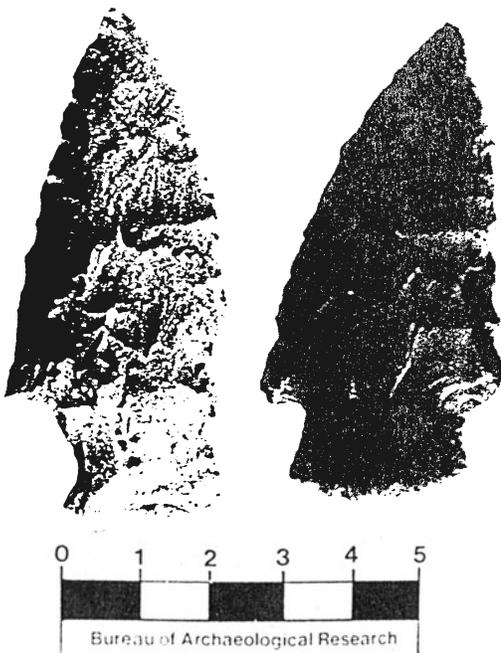
**Contributing Organizations:**

Tallahassee-Leon County Parks & Recreation Department; Florida Division of Historical Resources, Bureau of Archaeological Research; Florida Fish and Wildlife Conservation Commission; local concerned citizens.

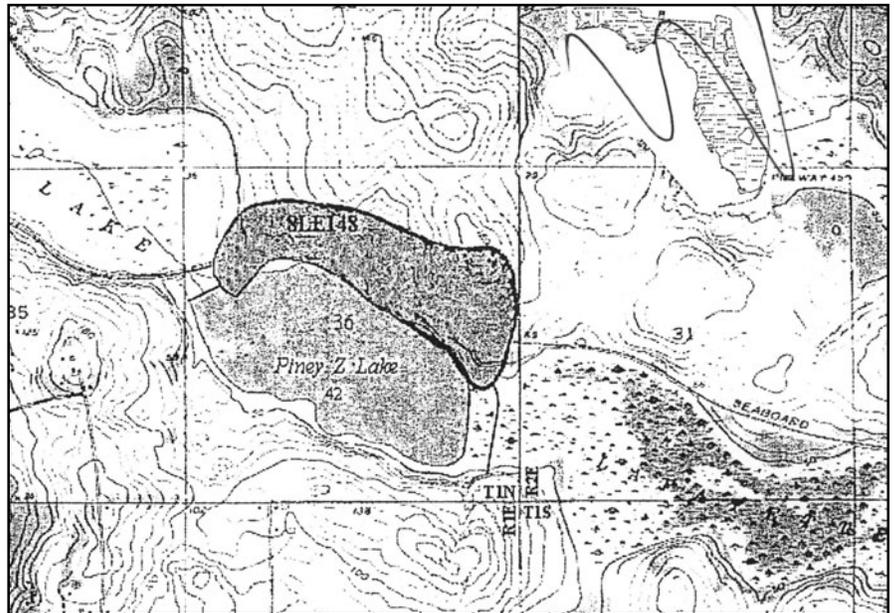
**Management Problems:** Unauthorized digging/looting.

**Management Solutions:** Warning signs have been posted at the mounds, and Florida Wildlife Officers patrol the site and have arrested and prosecuted some of the looters. Looter holes are backfilled to prevent further damage to the site, such as erosion and mound collapse. Removal of understory brush and vines that block the view of the mounds is planned. An interpretive trail, part of the Lafayette Heritage Trail, is planned in response to a growing public interest.

**Outcome:** Publicity from the arrest and prosecution of site looters has resulted in fewer incidents of illegal digging. Site managers expect increased public visitation to further reduce site looting incidents.

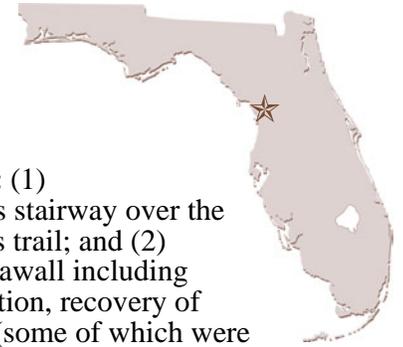


*Block-Sterns lithic artifacts. Looting archaeological sites destroys the context of artifacts and prevents reconstructing the culture and history associated with them.*



*Map of eastern Leon County, Florida, showing location of Block-Sterns site.*

## Project: Crystal River State Archaeological Site (CII)



**Destabilization Issues:** Foot traffic; shoreline erosion due to currents and boat wakes

**Location:** The site is situated on the north side of Crystal River, two miles west of the town of Crystal River, and four miles east of the Gulf of Mexico, in Citrus County, Florida.

**Site Description:** Crystal River is a prehistoric ceremonial complex and burial site consisting of ten temple, burial, shell, and sand mounds. The site was occupied during the Deptford, Weeden Island, and Safety Harbor periods (ca. 200 B.C.-A.D. 1000).

**Site Owner/Manager:** The State of Florida owns most of the site, and the Department of Environmental Protection, Division of Recreation and Parks manages the site.

**Contributing Organizations:** Department of State, Division of Historical Resources, Bureau of Archaeological Research; Department of Environmental Protection, Division of Recreation and Parks; Gulf Archaeology Research Institute.

**Management Problems:** (1) Erosion on mound slope due to uncontrolled pedestrian traffic, and (2) loss of archaeological deposits due to seawall collapse and needed repair. Boat wakes and natural shoreline erosion contribute to site loss that the seawall is intended to prevent.

### Management Solutions: (1)

Construction of an access stairway over the eroding pedestrian access trail; and (2) repair of the collapsed seawall including removal of the fallen portion, recovery of eroded cultural deposits (some of which were layered on the submerged seawall, while intact remains were discovered in the river bottom), the installation of steel support rods, and the excavation and backfill of the area where support rods were placed. The archaeological deposits are protected by the seawall.

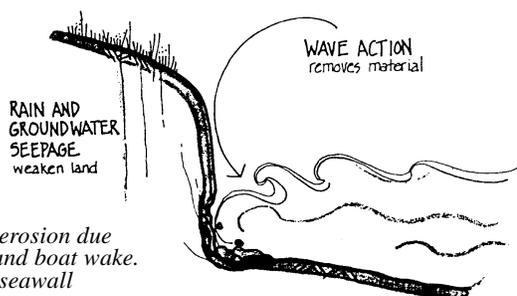
**Outcome:** (1) The stairway has stabilized the erosion problem on the mound and enhanced visitor access to it; and (2) seawall replacement revealed intact cultural remains and much less site disturbance than expected in the seawall area. The new seawall will serve to protect these remains and future researchers and site managers will know to consider the sensitive nature of this shoreline site area before initiating any resource management effort. A fence was installed along the river side of Temple Mound "A" to stop visitors from walking up the side of the mound. Additionally, a large tree that was located on the top of the mound was cut off at ground level to prevent the tree from falling down in a storm and the root system destroying part of the mound.



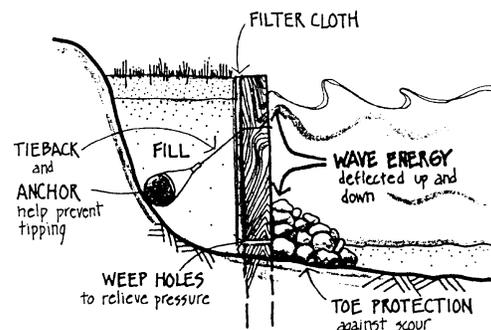
To the left is the seawall protecting the back face of Crystal River mound. A seawall is a structure separating land and water areas primarily to prevent erosion and other damage caused by wave action.



Above: Mound with access ramp, Crystal River State Archaeological Site.



Left: Diagram of erosion due to currents and boat wake.  
Right: Diagram of seawall



## Project: Emerson Point/Snead Island Temple Mound/ Portavant Indian Mound site (MA919)



**Destabilization Issues:** *Shoreline erosion; foot traffic; invasive vegetation; looting/unauthorized digging*

**Location:** The Emerson Point site is located on the southern shore of Snead Island, a Gulf Coast barrier island in northwestern Manatee County, along Florida's central Gulf Coast.

**Site Description:** The Emerson Point site complex consists of a flat-topped temple mound, a low platform mound, several midden mounds and shell ridges, and a plaza area. The site dates from the Late Manasota Period, Safety Harbor Period, and Leon-Jefferson Period (ca. A.D. 800-1748).

**Site Owner/Manager:** The State of Florida owns this site complex, and Manatee County Public Services Department manages it.

**Contributing Organizations:** Tampa Bay National Estuary Program; Southwest Florida Water Management District; Florida Department of Environmental Protection; Manatee County Public Services Department; Greiner Engineering; Manatee County Prison.

**Management Problems:** Shoreline erosion is damaging the Manatee River side of the Portavant Mound, and looting has occurred in erosion-exposed areas. Exotic vegetation and foot traffic have destabilized the site, particularly the mound areas.

**Management Solutions:** Exotic vegetation was manually removed from archaeologically sensitive areas. A staircase was constructed on the principal mound to avoid

destabilization from foot traffic. The staircase was constructed with four blocks at the base and laid directly on the side of the mound, causing as little intrusive damage as possible. Areas adjacent to the staircase that could have been affected by its installation were monitored for any possible exposure or disturbance of cultural material. A revetment, including re-vegetation of mangroves, on the shoreline of Portavant Mound has been proposed to decrease erosion and perhaps the looting caused by erosion.

**Outcome:** The exotic vegetation removal is ongoing and has decreased damage caused by the invasive vegetation. The staircase has been successful in reducing damage from pedestrian traffic. The revetment proposal has been approved by the managing agency, which is currently applying for grants to build the revetment. Until the revetment is constructed, erosion and looting will continue.

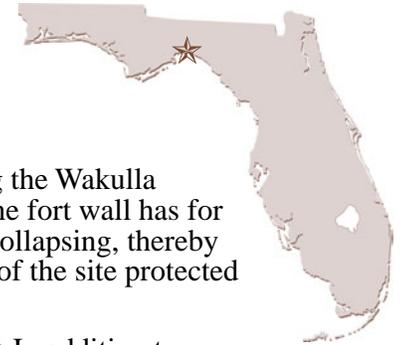


Shell midden showing damage due to foot traffic.

Aerial photo of Emerson Point



## Project: Fort San Marcos de Apalache (WA26)



**Destabilization Issues:** *Erosion due to water currents and boat wake; unauthorized digging/looting*

**Location:** Fort San Marcos de Apalache is located at the confluence of the Wakulla and St. Marks Rivers in Wakulla County, Florida.

**Site Description:** Fort San Marcos has been the site of two Spanish forts. The first was constructed of wood in the late 1600s. A sturdier limestone structure was built in the mid- to late-1700s.

**Site Owner/Manager:** The State of Florida owns the site, and the Department of Environmental Protection, Division of Recreation and Parks manages the site.

**Contributing Organizations:** Department of State, Division of Historical Resources, Bureau of Archaeological Research; Department of Environmental Protection, Division of Recreation and Parks; City of St. Marks.

**Management Problems:** The site is threatened by shoreline erosion, structural deterioration, and looting. Archaeological features of the fort are being eroded into the St. Marks and Wakulla Rivers, with erosion accelerated by oil barge and other boat traffic. Along the St. Marks River bank, archaeological features include wooden pilings and other structural members, and artifacts associated with an early to mid-19th-century wharf, marine ways, other structures, and possibly an

earlier barrel well. Along the Wakulla River side, a cut limestone fort wall has for years been eroding and collapsing, thereby threatening the integrity of the site protected by the wall.

**Management Solutions:** In addition to resource documentation, protective measures need to be planned and implemented along the St. Marks River. A bulkhead was constructed as a temporary measure for one portion of the cut stone fort wall along the Wakulla River shoreline.

**Outcome:** Along the Wakulla River, settling and washout of sand backfill behind the bulkhead are creating indentations on the surface, requiring routine filling. Sand is slowly being lost from the revetment, and it shows signs of movement, suggesting the need for structural design modifications.



*Shoreline erosion of fort wall, Fort San Marcos de Apalache, before construction of a protective bulkhead.*



*These photos show fort wall bulkhead construction during different phases.*



*A bulkhead is a structure that retains or prevents land from sliding into the water or protects it from wave damage. It functions much like a seawall (see Crystal River case study for seawall illustrations).*



## Project: Mill Point 3 (HI18)

**Destabilization Issue:** *Development causing ground disturbance*

**Location:** The site of Mill Point 3 is located on the north bank of the Alafia River, where the river is crossed by U.S. 41 in Williams Park, Hillsborough County.

**Site Description:** Mill Point 3 is a shell mound which is part of a larger archaeological complex of shell mounds, middens, and fields associated with the Weeden Island culture (ca. A.D. 450-1000).

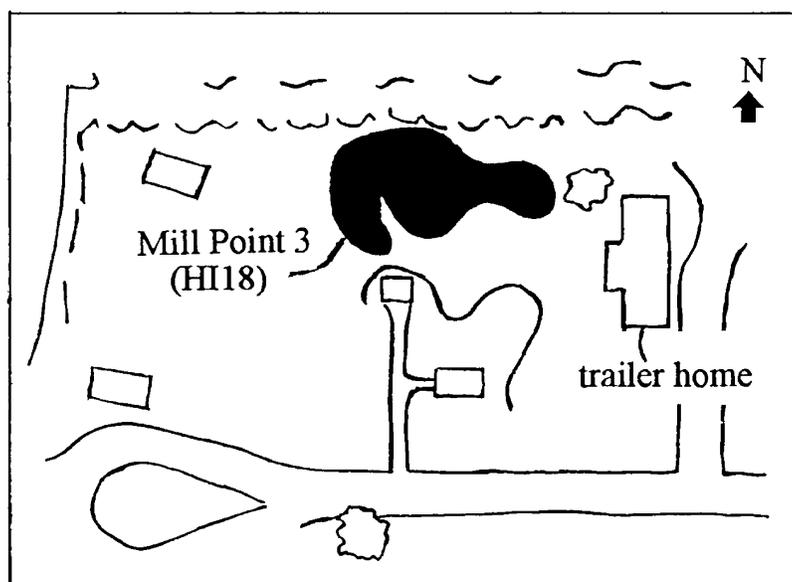
**Site Owner/Manager:** Hillsborough County

**Contributing Organizations:** Hillsborough County Parks and Recreation Department; Department of State, Division of Historical Resources, Bureau of Archaeological Research; Dr. Brent Weisman, Department of Anthropology, University of South Florida; Cargill Fertilizer plant; Kimmons Contracting Company.

**Management Problems:** Road construction and the development of the nearby Cargill fertilizer plant had disturbed much of the site complex. Mill Point 3 itself is situated in the vicinity of a previously abandoned trailer home with a septic tank, which Cargill Fertilizer used as a security facility during its ownership of the property. County park managers had been interested in removing the remains of the facility in developing the park. During the initial phase of this work, while removing a chain link fence surrounding the trailer, a precolumbian human jawbone was discovered. This prompted the involvement of the Bureau of Archaeological Research.

**Management Solutions:** Because the removal process was considered potentially damaging to the site, a scope of work was drafted with recommendations from Dr. Ryan Wheeler, Archaeology Supervisor in the Bureau of Archaeological Research. Dr. Wheeler visited the Mill Point site to assess the status of unmarked human burial remains. Recommendations were to dismantle and remove the trailer, and crush the septic tank and backfill it within a protective area, so as not to damage the mound. A safety fence with low impact posts would be erected to keep demolition activities inside the yard of the trailer. The work would also include removal of concrete pads, located next to the trailer, although leaving them in place could protect underlying site remains. A certified archaeological monitor was recommended to be present during the removal and stabilization processes, should any ground disturbing activities occur. Capping the site with a layer of organic soil and planting sod could help protect and stabilize the mound.

**Outcome:** On June 14, 1999, Kimmons Contracting Company removed the mobile home, pumped out and crushed the septic tank, and removed the orange safety fence surrounding the site. The concrete slab was left in place. Jill Lehman of Hillsborough County Parks and Recreation supervised the work. The area was mowed and grass allowed to spread to serve as a protective cover as well as to conceal the archaeological remains. The park plans to install posts around the perimeter of the area to keep out vehicles.



*Location of shell mound in relation to trailer home and septic tank.*

*Diagram by Ryan J. Wheeler*

## *Project: Mound Avenue Mound (VO240)*



**Destabilization Issues:** *Unauthorized digging/looting; residential development*

**Location:** The Mound Avenue Mound is located within the town of Ormond Beach near the western shoreline of Indian River in Volusia County, Florida.

**Site Description:** The Mound Avenue Mound is a multi-component site dating from St. Johns I through early historic times (ca. 500 B.C. - A.D. 1600). The mound is an elevated earthen feature used as a place of burial by generations of Native Americans occupying the surrounding village area. The site has been listed on the National Register of Historic Places and has been a National Historic Landmark since 1966.

**Site Owner/Manager:** Town of Ormond Beach/Ormond Beach Parks Department.

**Contributing Organizations:** Town of Ormond Beach; Volusia Anthropological Society (FAS chapter); Museum of Arts and Sciences, Daytona Beach; Department of State, Division of Historical Resources, Bureau of Archaeological Research.

**Management Problems:** The mound was subjected to unauthorized digging/looting. Some damage occurred during initial landscaping and site preparation for planned residential use in which the owner planned to level the mound.

**Management Solutions:** Limited archaeological excavation demonstrated to the private owners and the public that the mound contained undisturbed burials. The Town of Ormond Beach owned and managed shoreline portions of the adjacent village midden as a public park headquarters. The Volusia Anthropological Society (VAS) spearheaded a fund raising drive, which resulted in acquisition of the property and its conveyance to the Town of Ormond Beach for park purposes. The Bureau of Archaeological Research provided a staff archaeologist to work with Ormond Beach Parks Department and volunteers including VAS members, local residents, and Boy Scouts. They reburied previously excavated human remains in the area from which they had been removed, and spread a protective covering over the mound surface to restore its original appearance. Additionally, they installed irrigation pipe within the recent organic soil cap and layered squares of flower sod to protect the mound surface from erosion.

**Outcome:** The mound restoration project brought local and area residents together and created a better understanding of the cultural importance of the Native American remains, particularly the need to protect Native American burial locations with the same respect and dignity shown more modern cemeteries. There is a nearby parking area from which to view the mound.



*Above: Mound Avenue Mound being laid with sod.*



*Left: Mound Avenue Mound after the revegetation process was completed. Volunteers admire their work after revegetating the mound.*

## Project: Mound Key (LL2)

**Destabilization Issues:** *Flooding; foot traffic; vandalism; unauthorized digging/looting*

**Location:** The Mound Key site is located on an island in Estero Bay, Lee County, Florida.

**Site Description:** Mound Key includes burial mounds, shell ridges, shell mounds, canals, and water courts, which cover an area of roughly 125 acres. The site was occupied from at least Caloosahatchee I-V (ca., A.D. 100 to 1750). It was later used from 1750 until 1945 by Spanish-Cuban, Seminole, and European-American settlers. Mound Key was listed on the National Register of Historic Places on August 12, 1970.



**Site Owner/Manager:** The majority of the site is owned by the State of Florida; a few outparcels remain in the hands of individual private owners. The Department of Environmental Protection, Division of Recreation and Parks manages the site.

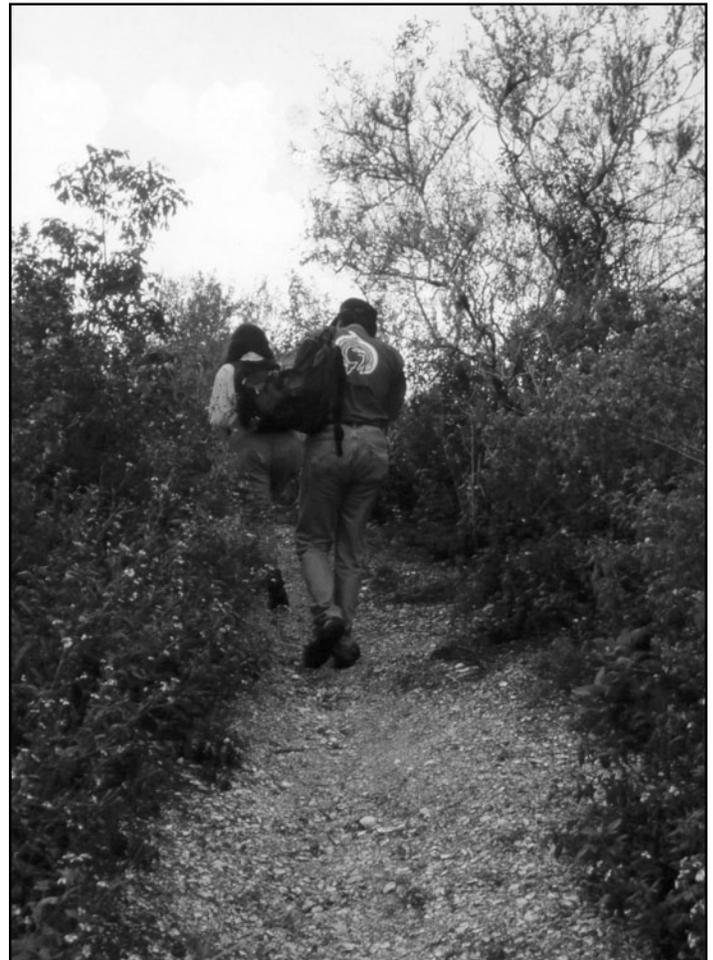
**Contributing Organizations:** Florida Division of Recreation and Parks; University of Florida, Randell Research Center; Department of State, Division of Historical Resources, Bureau of Archaeological Research; Ft. Myers Beach.

**Management Problems:** This site is primarily threatened by flooding during high tide, foot traffic, vandalism, and looting. Of special concern are erosion gullies along the trail crossing Mound 1, and looters' holes on this same mound as well as two others. Portions of the trail, such as along the dredge/borrow pit, are slumping, as are unfilled looter holes. There is minor erosion elsewhere including the southeast landing area and the area surrounding the interpretive kiosk.

**Management Solutions:** Suggestions have been made for the placement of two or more telephone pole stairways on top of the trail on the slope of Mound 1.

Prior to placing the stairway, the trail furrow (which is a historic trail) would be filled using a combination of sandbags and other fill material. This method has been used before by the Florida Division of Recreation and Parks at the Crystal River State Archaeological Site and has been very successful. Sandbags, backfill, and additional fill material also are recommended to fill looter's holes. A detailed topographic map of the site, documenting looting areas, has been prepared to use in planning restoration activities and site interpretation.

**Outcome:** Mound Key park manager, Jeanne Parks, has received funding from the State, and along with volunteers, is implementing stabilization efforts. She is considering employing a cement conveyer to transport sand directly to areas requiring fill. This would eliminate the need to walk across the shoreline where the mangroves, with large protruding roots, are located.



*Trail across Mound 1, Mound Key.*

## Project: Mount Elizabeth (MT30)

**Stabilization Issues:** *Erosion due to currents, boat wakes, storm surges, and high storm winds and heavy rain; vandalism*

**Location:** The Mount Elizabeth site is located on the west bank of the Indian River (the Intracoastal Waterway) in the Indian Riverside Park, Martin County, Florida.

**Site Description:** The site is a large, estuarine, coastal midden containing Late Archaic and early St. Johns prehistoric components (ca., 1000 B.C.-A.D. 1), with American 19<sup>th</sup>-and 20<sup>th</sup>-century occupations.

**Site Owner/Manager:** Martin County.

**Contributing Organizations:** Martin County; Southeast Florida Archaeological Society (SEFAS).

**Management Problems:** The site has sustained substantial damage, particularly due to vandalism, since it was first cleared in the late 19<sup>th</sup> century. The Indian River side of the site is eroding as a consequence of wave and storm action along the Intracoastal Waterway. Mount Elizabeth is particularly susceptible to damage caused by tropical storms and hurricanes, in addition to northeasters and periods of unusually severe weather patterns associated with El Niño.

**Management Solutions:** In their 1998 cultural assessment report on the site, the archaeological contract

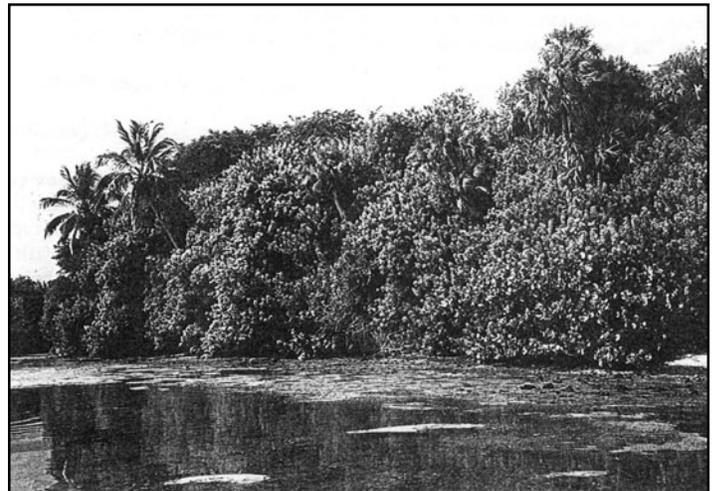
firm, Janus Research, recommended that the Mount Elizabeth site be designated as greenspace within the proposed larger public Indian Riverside Park. The firm recommended that the site be stabilized by revegetating it with select native plant species and possibly sod.

In 1999 Martin County received matching grant funds from the Division of Historical Resources to develop a stabilization plan to preserve the site. The County indicates that all attempts will be made to avoid or minimize ground-disturbing activities within both dense and sparse midden areas. Exotic plants in these areas will be removed by hand, when possible, and only to ground level. Stumps and roots will be destroyed using herbicides. Because erosion of the river will become more severe when the existing exotic vegetation is removed, replanting these areas with native ground cover is planned. If this does not provide sufficient support to reduce erosion, sod or grass matting will be used instead. Demolition or removal of buildings will be confined to areas that do not contain midden or that contain only redeposited midden.

**Outcome:** Martin County has hired contractors, an archaeologist and a coastal engineer to develop a specific work plan for site stabilization efforts. The work is slated for the summer and fall of 2000, with a 2001 completion date.



*The photo above shows deflation on the eastern side of Mt. Elizabeth, a condition where heavy artifacts are left in a thin layer after the soil matrix has blown or washed away.*



*East side of Mt. Elizabeth showing erosion of mound into the Indian River Lagoon. Note the exotic Brazilian peppers covering the mound.*

## Project: Munyon Island Site (PB79)

**Stabilization Issues:** *Invasive vegetation; vehicular traffic; water current and boat wake erosion; unauthorized digging/looting*

**Location:** The Munyon Island Site, located on Munyon Island in Lake Worth, is included within the boundaries of the John D. MacArthur Beach State Park in Palm Beach County, Florida.

**Site Description:** The site consists of three modest prehistoric shell middens and a historic homestead, as well as other structures dating to the 19<sup>th</sup> and 20<sup>th</sup> centuries. The island was visited by early Floridians, probably on a seasonal basis, for fish, game, and other resources. From the Third Seminole War onward, there was a series of non-Indian occupations. These included 19<sup>th</sup>- century homesteading; operation of the Hotel Hygeia, an early 1900s spa; WWII American military parade grounds; and a mid- to late 20<sup>th</sup>- century private residence.

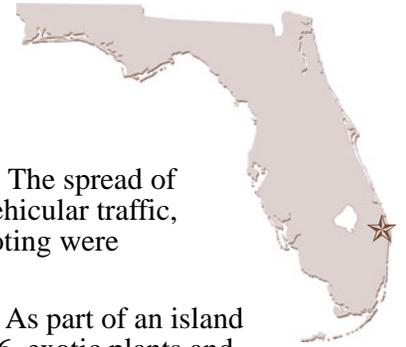
**Site Owner/Manager:** The State of Florida owns the property, and the Department of Environmental Protection, Division of Recreation and Parks manages the park.

**Contributing Organizations:** Florida Division of Recreation and Parks; Palm Beach County; Department of the Army, Corps of Engineers; Department of State, Division of Historical Resources, Bureau of Archaeological Research.

**Management Problems:** The spread of exotic plants and trees, vehicular traffic, shoreline erosion, and looting were destabilizing the site.

**Management Solutions:** As part of an island restoration project in 1996, exotic plants and trees were removed by basal bark herbicide treatment, and manual and mechanized methods. Herbicide and manual methods were employed in areas with historic architectural remains to avoid or minimize damage. To prevent erosion and restore the natural environmental setting, exposed areas of the historic island ground surface were covered with wood chips, creating a rich organic topsoil. Selected native vegetation was also planted in areas that would not disturb archaeological and historical sites. To counter shoreline erosion, riprap (rock placed on a streambank to prevent erosion) was placed along selected areas subject to wave action. The earthen causeway to the island was breached to restore tidal circulation and eliminate vehicular access.

**Outcome:** As of March 1999, Assistant Park Manager, Patrick Rash, reported that protective measures have been successful, although removal of exotic plants continues on a regular basis due to the productivity of their seedbeds. Riprap is also holding well.



*Historic seawall and dock area at Munyon Island.*



*Mulched area showing plant holes from vegetation effort, Munyon Island Site.*

## Project: Nocoroco and Mount Oswald (VO82)



**Stabilization Issues:** *Erosion due to water currents and boat wakes; unauthorized digging/looting; foot traffic*

**Location:** The Nocoroco site and Mount Oswald Plantation are located on the northern tip of the Tomoka peninsula in the northeastern part of Tomoka State Park, Volusia County, Florida.

**Site Description:** The Nocoroco site is represented by a black earth and shell midden comprising the remains of a Timucuan village, first reported by the Spanish explorer Alvaro Mexía in 1605. Ceramic styles from Orange, St. Johns I & II, and St. Augustine periods indicate that natives first inhabited the site around 1500 B.C. It was still occupied at the time of Mexía's visit. The site has been listed on the National Register of Historic Places since 1973. The remains of the Mount Oswald site include various 18<sup>th</sup>-century artifacts, including wrought iron nails and pearlware ceramic sherds. The Mount Oswald Plantation overlaps the site of Nocoroco and is named after Richard Oswald, who received a 20,000-acre land grant from the British government in 1774. Oswald used his land to cultivate indigo, for which he brought 34 skilled craftsmen and their families and 100 slaves to the site. Eventually, the number of slaves on Oswald's indigo plantation grew to 240.

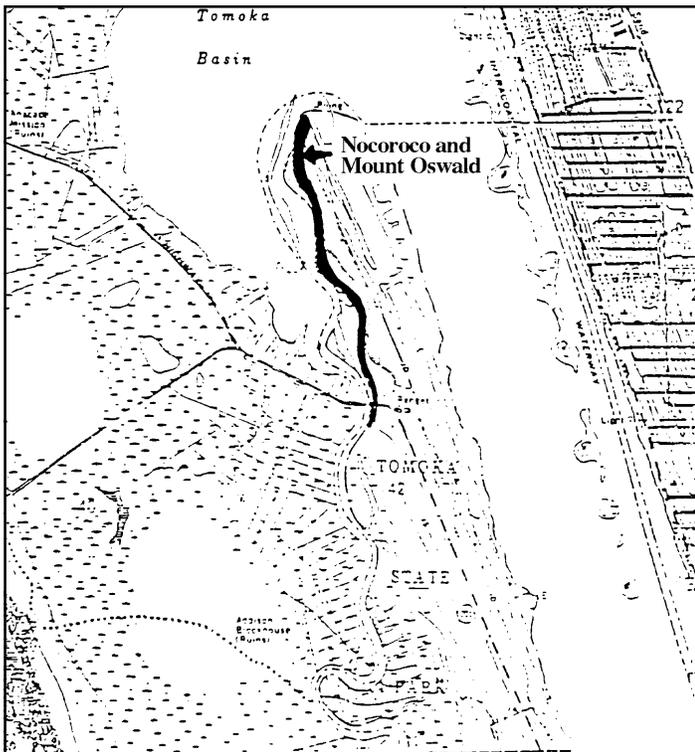
**Site Owner/Manager:** The State of Florida owns this site, and the Department of Environmental Protection, Division of Recreation and Parks manages the site.

**Contributing Organizations:** Florida Department of Environmental Protection, Division of Recreation and Parks.

**Management Problems:** Shoreline erosion has threatened much of the site. Pedestrian foot traffic also threatens the site, as does looting/unauthorized digging.

**Management Solutions:** Installation of geo-webbing (heavy, coarse fabric put down under sand or rock to prevent washout of sand materials) along the shoreline would help stabilize the shoreline, and recontouring the riverbank would also facilitate shoreline stabilization to protect the remaining site area from further loss. American Preservation Consultants, Inc., while investigating Mount Oswald, recommended in 1999, as Bruce Piatek and Associates had in 1992, that fill be added to pedestrian trails and public access to the sites be limited to prevent further damage due to foot traffic and looting.

**Outcome:** In 1995 an archaeological investigation was performed at the request of the Florida Department of Environmental Protection to determine that no archaeological remains would be disturbed during the installation of geo-webbing to stop river bank erosion. After completing the investigation, the contractor, Florida Archaeological Services, Inc., recommended that the project proceed, as midden was determined to be overlain by 80-160 cm of dredge fill, effectively protecting it against adverse impact. The geo-webbing has successfully reduced river bank erosion. Additionally, park managers added fill to walkways and have prohibited parking near the archaeological sites. Both of these actions have dramatically decreased damage from foot traffic and looting.



Map of site.



Damage from pedestrian traffic at the Nocoroco/Mount Oswald site.



## Project: Shell Bluff Landing site (SJ32)

**Stabilization Issues:** *Erosion due to tides, waves and wakes caused by boats*

**Location:** Shell Bluff Landing site is located along the eastern shoreline of the Tolomato River on the west side of the Guana River Peninsula in St. Johns County, Florida.

**Site Description:** The site is an extensive shell midden, containing materials dating from the Late Archaic Orange Period, the Florida Transitional Period, the St. Johns I & II periods, the 17<sup>th</sup>-century and early 19<sup>th</sup>-century Spanish occupations, and the American period, (ca. 2000 B.C. to the present). The site has been listed on the National Register since 1991.

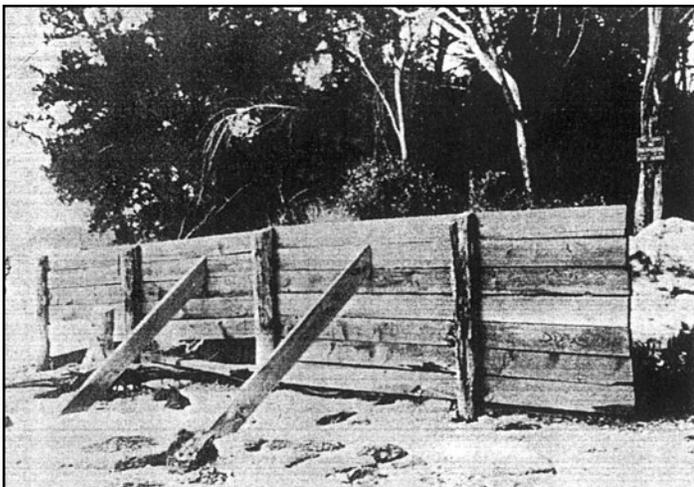
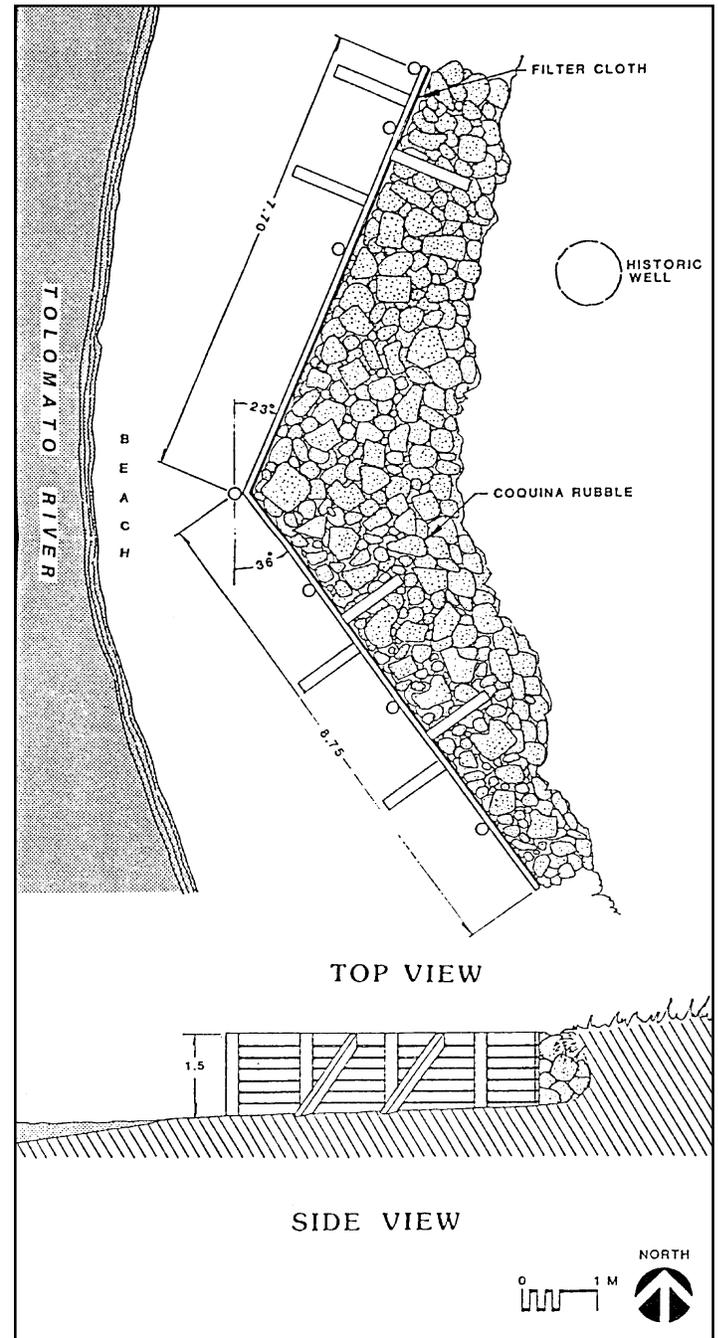
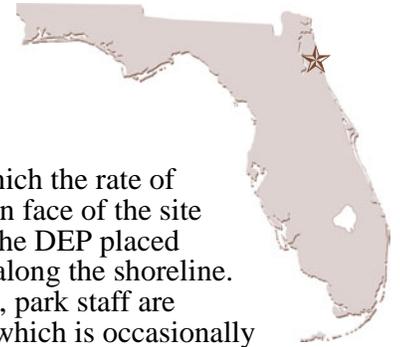
**Site Owner/Manager:** The State of Florida owns the site, and the Department of Environmental Protection, Division of Recreation and Parks manages the site.

**Contributing Organizations:** Florida Department of State, Division of Historical Resources, Bureau of Archaeological Research; Department of Environmental Protection, Division of Recreation and Parks; Florida Department of Transportation; U.S. Army Corps of Engineers Waterways Experiment Station.

**Management Problems:** This site is threatened by coastal tidal fluctuation, wave action resulting from boat traffic and wind, and to some degree, the continuing rise in sea level.

**Management Solutions:** From 1984 to 1985 the Department of Environmental Protection (DEP), Division of Recreation and Parks, built a wooden bulkhead as a temporary measure to protect a 19<sup>th</sup>-century coquina well within the site, located on the river shore. In 1987, the U.S. Army Corps of Engineers Waterways Experiment Station initiated an erosion-

monitoring project, in which the rate of erosion across the western face of the site was measured. In 1992, the DEP placed riprap and geo-webbing along the shoreline. To stabilize the shoreline, park staff are utilizing boulder riprap, which is occasionally renewed.



Storm-damaged bulkhead.

Plan of protective bulkhead. Diagram from U.S. Army Corps of Engineers Waterways Experiment Station 1990.

## Project: Shell Bluff Landing site (SJ32) continued...



The results of the Corps of Engineers study suggested that a “no wake” zone should be established along the Intracoastal Waterway from north of Shell Bluff to the confluence of the Tolomato and Guana Rivers. The project concluded that while the percentage of damage directly resulting from boat wakes, especially Intracoastal Waterway barge traffic, could not be accurately determined, the reduction of wake-related wave action could only have a beneficial effect in terms of site preservation. Recommendations for the next phase of this work include: 1) continuation of monitoring at six month intervals for at least two more years, fixed camera and photographic monitoring,

2) completion of an accurate topographic map of the site west of the baseline, 3) an interdisciplinary literature search to broaden the current view of erosion at Shell Bluff, and 4) the preparation of a long-term plan for site management addressing salvage and site testing, as well as other strategies for reducing the effects of erosion.

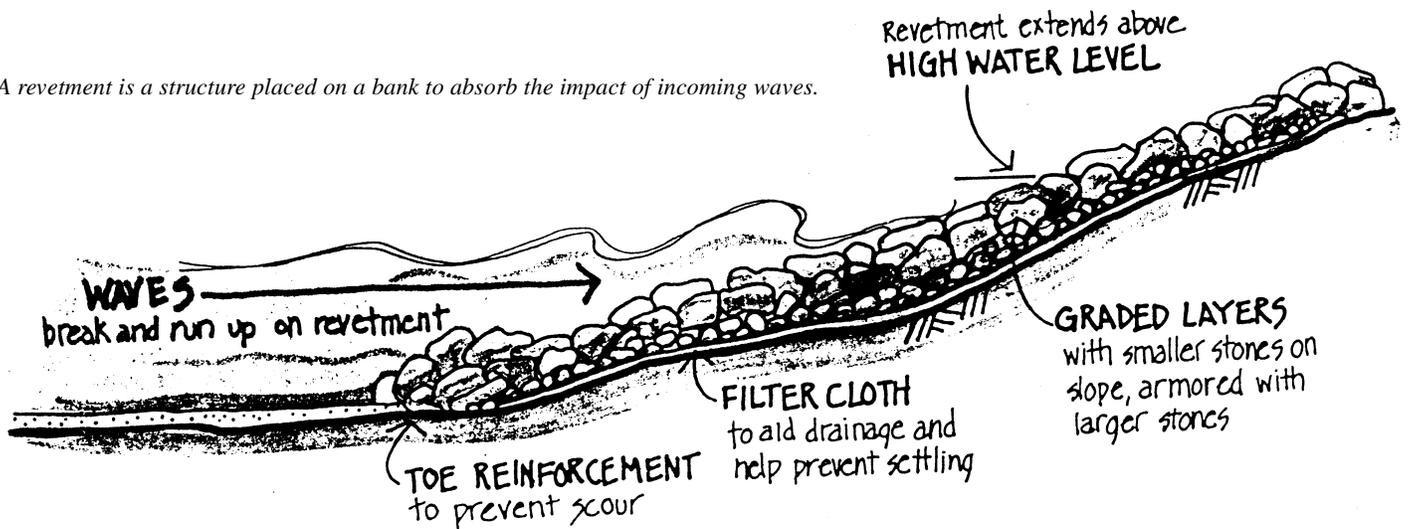
From 1991 to 1992, the Department of Environmental Protection, Division of Recreation and Parks, funded by a grant from the Division of Historical Resources, carried out stabilization efforts at Guana River State Park. This consisted of placing coquina riprap, filter cloth, and geo-webbing along the shoreline of the Shell Bluff site to control erosion. Shortly after the completion of this work, a major storm washed out roughly 75% of the erosion-protective material. The project would possibly have been more successful had more time elapsed between its completion and the storm. However, had the revetment not been created, erosional damage would probably have been far worse.

**Outcome:** Replenishment of the boulders will be an ongoing activity because of the relatively high energy coastline of the Tolomato River. How often this will have to be done will depend on natural forces and also on boat traffic along the river.

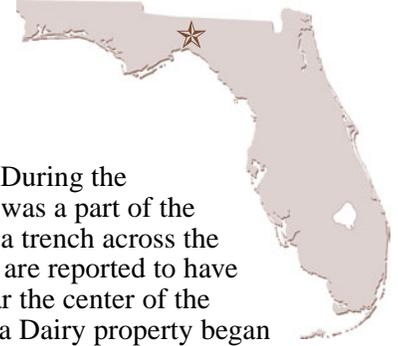


Riprap, or layers of stone placed along a shoreline to prevent erosion, and geo-webbing create a revetment for the Shell Bluff site.

A revetment is a structure placed on a bank to absorb the impact of incoming waves.



## Project: Velda Mound (LE44)



**Stabilization Issues:** *Unauthorized digging/looting; vandalism; residential development*

**Location:** Velda Mound is located in the Arbor Hill neighborhood, north of Tallahassee, in Leon County, Florida.

**Site Description:** During the occupation of the Velda Mound site by the Apalachee (ca. 1450 A.D. –1625 A.D.), the mound is believed to have served as the foundation platform for the residence of a village leader. Domestic residences with garden plots as well as communal fields would have occupied the area surrounding the mound, and the mound probably functioned much like a town hall for people living in the nearby countryside. It was abandoned around the beginning of the Spanish Mission Period (ca. 1565), probably due to the depletion of natural resources in the vicinity, such as trees used for firewood and building materials, and exhaustion of fertile soil for farming. No archaeological evidence of occupation in the area by colonial Spain or Britain exists, but they may have known about the mound. By the 1940s, the Velda Mound area became part of the Velda Dairy Farm.

**Site Owner/Manager:** The State of Florida owns this site, and Department of State, Division of Historical Resources, Bureau of Archaeological Research manages the site.

**Contributing Organizations:** Florida Department of State, Division of Historical Resources, Bureau of Archaeological Research; Panhandle Archaeological Society at Tallahassee (P.A.S.T.); Arbor Hill Neighborhood Association.

*The equipment (right) is filling in the trench to stabilize the mound. The mulch trail was laid across the filled portion of the mound to permit visitor access.*



*The photograph above shows damage to Velda Mound before it was restored to its current appearance. The trench (left portion of photo), cut through it by a bulldozer, was dug to recover artifacts, destroying a sizeable area along with information about the prehistoric occupation of the site.*

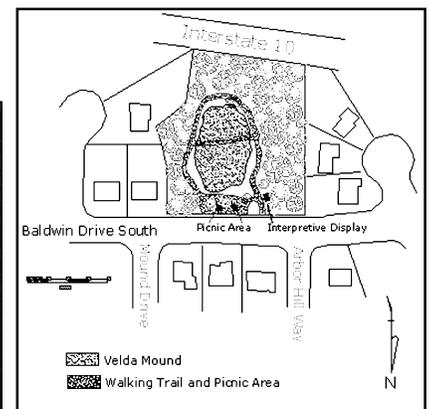


Velda Mound Park.

**Management Problems:** During the 1950s, while the property was a part of the dairy, someone bulldozed a trench across the mound. Later, pot hunters are reported to have excavated a large hole near the center of the mound. In 1973, the Velda Dairy property began to be developed into a housing complex known as Arbor Hill. Over the next decade, three developers sequentially owned the property. More recently, the site became an unauthorized trash dump.

**Management Solutions:** The trench bulldozed in the 1950s should be filled in to prevent wind and storm erosion from destroying the mound further. Turning the site into a publicly owned local neighborhood park will promote public awareness of the site, which will decrease looting and dumping of trash. Establishing a local site monitor will further decrease the likelihood of unauthorized digging and vandalism.

**Outcome:** In 1982 developers donated a 1.91-acre parcel containing the mound to the State for preservation. In 1999 the Bureau of Archaeological Research filled in the trench and began work to establish the Velda Mound Park within the 1.91-acre lot. P.A.S.T. volunteers helped clear the site of trash and debris. A mulch trail was added around the mound and over the top of the mound, directly above the filled-in trench. Picnic tables were installed, along with signs to direct visitors to stay on the path, to identify the park, and to interpret the site. P.A.S.T. and Arbor Hill Neighborhood Association have agreed to monitor the site for vandalism and looting activities, and will contact the Bureau should these activities take place. The establishment of a park and site monitors have increased local awareness of the significance of the mound and greatly decreased the chances of future looting and vandalism to the site.



Map with mulch trail.

---

# ORGANIZATIONS AND ASSISTANCE

There are many programs and organizations that private landowners can rely on for site preservation and management.

## *Florida Department of State*

---

Please feel free to contact the Department of State, Division of Historical Resources for help in deciding which of these programs or organizations may be appropriate for your archaeological site.

### *Division of Historical Resources*

*Address:* The Florida Department of State  
Division of Historical Resources  
Bureau of Archaeological Research  
500 South Bronough Street  
Tallahassee, FL 32399-0250

*Phone:* (850) 245-6444

*Internet:* [www.flheritage.com/archaeology](http://www.flheritage.com/archaeology)

### *Funding for Site Preservation*

---

State grants are available on a competitive basis to government agencies and not-for-profit organizations for site preservation including archaeological site stabilization. An individual property owner can cooperate with a not-for-profit organization to apply for matching funds. For further information, contact:

### *Historic Preservation Grants Program*

*Address:* The Florida Department of State  
Division of Historical Resources  
Bureau of Historic Preservation  
500 South Bronough Street  
Tallahassee, FL 32399-0250

*Phone:* (850) 245-6333

*Internet:* [www.flheritage.com/grants](http://www.flheritage.com/grants)

## *Organizations for Public Support and Education*

---

There is a broad array of archaeological expertise available through various private, state, and federal archaeological programs and organizations. Public archaeology programs increase awareness of the past, encourage respect for heritage resources, explain the importance of archaeological research and promote cultural resources to the public. A few are listed below:

### *Archaeological Resources Management Training Program (ARM)*

*Address:* The Florida Department of State  
Division of Historical Resources  
Bureau of Archaeological Research  
500 South Bronough Street  
Tallahassee, FL 32399-0250

*Phone:* (850) 245-6444

*Internet:* [www.flheritage.com/archaeology/education/training/](http://www.flheritage.com/archaeology/education/training/)

### *Society for Historical Archaeology (SHA)*

*Address:* 15245 Shady Grove Road, Ste. 130  
Rockville, MD 20850

*Phone:* (301) 990-2454

*Internet:* [www.sha.org](http://www.sha.org)

### *Society for American Archaeology (SAA)*

*Address:* 900 Second Street, N.E., Number 12  
Washington, D.C. 20002-3557

*Phone:* (202) 789-8200

*Internet:* [www.saa.org](http://www.saa.org)

### *Florida Anthropological Society, Inc. (FAS)*

*Address:* P.O. Box 608  
St. Petersburg, FL 33731

*Phone:* (813) 821-1455

*Internet:* [www.fasweb.org](http://www.fasweb.org)

The following organizations can be contacted to provide reference materials and professional assistance regarding management issues such as erosion control and vegetation removal.

### ***Department of Agriculture, Division of Forestry, Bureau of Forest Management***

*Address:* 3125 Conner Boulevard  
Tallahassee, FL 32399-1650  
*Phone:* (850) 488-4274  
*Internet:* www.fl-dof.com

### ***Florida DEP Coastal Management Program***

*Address:* 3900 Commonwealth Blvd, MS.47  
Tallahassee, FL 32399  
*Phone:* (850) 245-2161  
*Internet:* www.dep.state.fl.us/cmp

### ***Department of Environmental Protection, Beaches and Coastal Systems***

*Address:* 3900 Commonwealth Boulevard  
Tallahassee, FL 32399-3000  
*Phone:* (850) 487-4495  
*Internet:* www.dep.state.fl.us/beaches

### ***Florida Fish and Wildlife Conservation Commission***

*Address:* 620 S. Meridian Street  
Tallahassee, FL 32399-1600  
*Phone:* (850) 488-4676  
*Internet:* www.floridaconservation.org

### ***Register of Professional Archaeologists (RPA)***

*Address:* 5024-R Campbell Boulevard  
Baltimore, MD 21236  
*Phone:* (410) 933-3486  
*Internet:* www.rpanet.org

The RPA is a good resource, if you are looking for the assistance of an archaeologist. The organization's web site includes a membership list. The RPA can also provide you with a list of individuals working in your

particular area of Florida.

### ***Soil Conservation Service, Plant Material Center (for Florida)***

*Address:* 6335 U.S. 41 N.  
Brooksville, FL 33512  
*Phone:* (904) 796-9600

### ***U.S. Army Corps of Engineers, Jacksonville District***

*Address:* Prudential Bldg.  
701 SanMarco Blvd.  
Jacksonville, FL 32207  
*Phone:* (904) 232-1606

The Jacksonville district office serves all of Florida east of the Apalachicola River.

### ***U.S. Army Corps of Engineers, Mobile District***

*Address:* P.O. Box 2288  
Mobile, AL 36628-0001

The Mobile district office serves all of Florida west of the Apalachicola River.

### ***U.S. Army Engineer Waterways Experiment Station, Environmental Laboratory***

*Address:* P.O. Box 631

# REFERENCES

Phone: Vicksburg, MS 39180-0631  
(601) 634-5012

This is the U.S. Army Corps of Engineers publication derived from Thorne (1991) above.

## **General Archaeological Site Stabilization**

Aten, Lawrence E.

- 1986 "Planning the Preservation of Archaeological Sites" in *Rescue Archeology, Papers from the First New World Conference on Rescue Archaeology*. Edited by Rex L. Wilson and Gloria Loyola. National Trust for Historic Preservation, Organization of American States, The Preservation Press, Washington, D.C.

Fowler, Don D.

- 1986 *Conserving American Archaeological Resources in American Archaeology Past and Future*. Edited by David J. Mitzer, Don D. Fowler, and Jeremy A. Sabloff, pp. 135-162. Society for American Archaeology, Washington, D.C.

Thorne, Robert M.

- 1991 *Intentional Site Burial. A Technique to Protect Against Natural or Mechanical Loss*. U.S. Department of the Interior, National Park Service, Washington, D.C.

## **Internet Resources**

*Bibliography on Cultural Resource Management Publications*

[www.wes.army.mil/el/ccspt/civproj.html](http://www.wes.army.mil/el/ccspt/civproj.html)

This is a list of publications produced by the United States Army Corps of Engineers.

*Intentional Site Burial: A Technique to Protect Against Natural or Mechanical Loss*

[www.cr.nps.gov/aad/pubs/tch5.htm](http://www.cr.nps.gov/aad/pubs/tch5.htm)

## **Site Stabilization Information Resources**

[www.cr.nps.gov/aad/pubs/tch12a.htm](http://www.cr.nps.gov/aad/pubs/tch12a.htm)

This is a list of publications on archaeological site stabilization produced by the United States Army Corps of Engineers.

## **Soil Stabilization Products Company, Inc.**

[www.sspco.org/](http://www.sspco.org/)

The Soil Stabilization Products Company (SSPCo) supplies earthwork, environmental and transportation services.

## **General Shoreline Erosion**

Anonymous

- 1981 *Low Cost Shoreline Protection*. U.S. Army Corps of Engineers. Rogers, Golden & Harper, Inc., Philadelphia, Pennsylvania.

This brochure discusses effective and inexpensive ways to protect shorelines and archaeological sites located along them. It includes useful diagrams and a glossary.

Gilbert, S.

- 1986 "America Washing Away," *Science Digest* (94)8:29-79.

Hayes, Miles O.

- 1984 "Beach Erosion." In *Coastal Resource Management: Development Case Studies*, pp. 67-190, edited by John R. Clark. National Park Service, U.S. Department of the Interior and U. S. Agency for International Development. Research Planning Institute, Inc., Columbia, South Carolina.

## REFERENCES (*CONTINUED*)

Heede, Burchard H.

- 1989 "Control of Coastal Erosion to Protect Archeological Resources." In *The Archeological Sites Protection and Preservation Notebook*, ASPPN III-8, pp. 1-9. Environmental Impact Research Program, U.S. Army Corps of Engineers, Waterway Experiment Station, Vicksburg, Mississippi.

This publication has a useful table listing the advantages and disadvantages of different methods of shoreline protection.

Hemphill, R.W. and M.E. Bramley

- 1989 *Protection of River and Canal Banks: A Guide to Selection and Design*. Construction Industry Research and Information Association, Butterworths, London.

Hemphill and Bramley discuss bank failure, planning and design, natural bank protection, vertical bank protection, and revetments.

Walton, T.D., Jr.

- 1979 "Coastal Erosion—Some Causes and Some Consequences: With Special Emphasis on the State of Florida," *Shore and Beach* 47:7-12.

### **Internet Resources**

*International Erosion Control Association*

[ieca.org/](http://ieca.org/)

A non-profit, member organization that provides education, resource information and business opportunities for professionals in the erosion and sediment control industry.

Keown, Malcolm P.

- 1983 *Streambank Protection Guidelines*. U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi.

This publication is written in non-technical language to provide general information to the public on streambank stabilization. The nature of streams and reasons for streambank erosion and failure are discussed. A variety of standard streambank stabilization techniques are presented.

*Florida Department of Environmental Protection, Office of Beaches and Coastal Systems*

[www.dep.state.fl.us/beach/](http://www.dep.state.fl.us/beach/)

Provides information about shoreline erosion and control in Florida.

*National Oceanic and Atmospheric Association*

[state-of-coast.noaa.gov/default.html](http://state-of-coast.noaa.gov/default.html)

Provides general information about shoreline erosion and control in the United States.

Pilkey, O. H. Jr., D. C. Sharma, H. R. Wanless, L. J. Doyle, O. H. Pilkey, Sr., W. J. Neal, and B. L. Gruver

- 1984 *Living with the East Florida Shore*. Duke University Press, Durham, North Carolina.

*U.S. Army Corps of Engineers, Jacksonville District Office*

[www.saj.usace.army.mil/](http://www.saj.usace.army.mil/)

For local access to the U.S. Army Corps of Engineers, the Jacksonville District Office covers all of Florida east of the Appalachian River.

National Research Council

- 1990 *Managing Coastal Erosion*. National Academy Press, Washington, D.C.

*U.S. Army Corps of Engineers, Mobile District Office*

[www.sam.usace.army.mil/](http://www.sam.usace.army.mil/)

The Mobile District Office covers that part of Florida west of the Appalachian River.

Thorne, Robert M.

- 1988 *Guidelines for the Organization of Archeological Site Stabilization Projects: A Modeled Approach*. U.S. Army Corps of Engineers, Washington, D.C.

## REFERENCES (*CONTINUED*)

### *Mechanical Erosion Control*

Anonymous

- 1985 "Erosion Control Mesh Has Environmental Advantages" in *Grounds Maintenance*, p.50.

Describes the cost and use of Enkamat, a nylon mesh, as an alternative to concrete riprap and asphalt for lining ditches and covering embankments.

Federal Emergency Management Agency (FEMA)

- 1986 *Coastal Construction Manual*.  
FEMA-55/February.

This is a detailed manual on the construction of seawalls, revetments, and other forms of engineered coastal protection.

### *Natural Erosion Control*

Bates, A. Leon, Sidney S. Harper, Kenneth R. Kelley,  
David H. Webb

- 1997 *Banks and Buffers; A Guide to Selecting Native Plants for Streambanks and Shorelines*. Clean Waters Initiative Program, Environmental Research Center, Tennessee Valley Authority, Muscle Shoals, Alabama.

A guide for selecting native plants for stabilization of streambanks and shorelines in Tennessee and other parts of the eastern U.S.

Broome, S. W., E. D. Seneca, and W. W. Woodhouse, Jr.

- 1982 *Building and Stabilizing Coastal Dunes with Vegetation*. UNC Sea Grant College Publication UNC-SG-82-05, NOAA, U.S. Department of Commerce, Washington, D.C.

Heede, Burchard, H.

- 1989b "Control of Shoreline Erosion by Means of Revegetation." In *The Archeological Sites Protection and Preservation Notebook*, ASPPN V-2, pp. 1-6. Environmental Impact Research Program, U.S. Army Corps of Engineers, Waterways Experiment Station, Vicksburg, Mississippi.

- 1990 "Vegetation Management on Archeological Sites." In *The Archeological Sites Protection and Preservation Notebook*, ASPPN IX-2, pp. 1-4. Environmental Impact Research Program, U.S. Army Corps of Engineers, Waterways Experiment Station, Vicksburg, Mississippi.

Kautz, Harold M.

- 1969 "Streambank Protection" in *Engineering Field Manual for Conservation Practices*. U.S. Department of Agriculture Soil Conservation Service, Washington, D.C. (Reprinted 1985).

The author discusses streambank erosion and protection methods such as channel clearing and snagging, use of vegetation, willow poles, tree revetment, piling revetment with wire facing, sacks, brush mats and rock riprap.

- 1990 *Revegetation: The Soft Approach to Archeological Site Stabilization*. Technical Brief No. 8, Archeological Assistance Division, National Park Service, Washington, D.C.

This publication presents methods and benefits of revegetation for shoreline erosion control.

Thorne, Robert M.

- 1989 *Filter Fabric: A Technique for Short-term Site Stabilization*. Technical Brief No. 1. Archaeological Assistance Program, U.S. Department of the Interior, National Park Service, Washington, D.C.

Discusses filter fabrics and their uses in archaeological site stabilization.

Young, W.C.

- 1973 "Plants for Shoreline Erosion Control in Southern Areas of the United States." Modified by W.C. Ackerman, G.F. White, and E.B. Worthington in *Man-Made Lakes: Their Problems and Environmental Effects*. Geophysical Monograph Series No. 17, American Geophysical Union.

Discusses various species of plants used for stabilizing eroding shorelines.

## REFERENCES (CONTINUED)

### *Internet Resources*

#### *Filter Fabric: A Technique for Short-term Site Stabilization*

[www.cr.nps.gov/aad/pubs/tch1.htm](http://www.cr.nps.gov/aad/pubs/tch1.htm)

This is the U.S. Army Corps of Engineers publication derived from Thorne (1989) above.

### *Literature on Florida Plants*

[www.flmnh.ufl.edu/natsci/herbarium/bib/](http://www.flmnh.ufl.edu/natsci/herbarium/bib/)

A bibliography compiled by the University of Florida Herbarium of selected publications, which may be helpful to the study and use of the native, naturalized, and cultivated vegetation of Florida.

### *University of Florida Aquatic, Wetland and Invasive Plant Information Retrieval System*

[aquat1.ifas.ufl.edu/database.html](http://aquat1.ifas.ufl.edu/database.html)

A computerized bibliographic database of freshwater aquatic and wetland plants as well as terrestrial and aquatic invasive plants. The database includes citations for more than 51,000 research articles, books, and reports about aquatic plant ecology, physiology, utilization and control.

### *Florida Fish and Wildlife Conservation Commission, Land Cover Map showing vegetation types in Florida*

[www.state.fl.us/gfc/viewing/landcovers/Indcov.html](http://www.state.fl.us/gfc/viewing/landcovers/Indcov.html)

### *Bioengineering Group, Inc.*

[www.bioengineering.com/](http://www.bioengineering.com/)

A firm "with expertise in the use of vegetation for construction projects designed to optimize environmental benefits." It provides a full range of consulting services in the field of bioengineering for erosion control, water quality, and habitat restoration. Techniques employed are most successful in revegetating areas where flowing water or soil instability causes accelerated erosion. This firm is located in Salem, Massachusetts, but works nationwide.

### *Holmburg Technologies, Inc.*

[www.erosion.com](http://www.erosion.com)

Patented beach restoration technology that reverses erosion without the addition of artificial fill, and without causing adverse side effects to adjacent shorelines. This firm is located in Sarasota, Florida.

### *Foot Traffic*

MacDonald, Anne

1990 *Surface Erosion and Disturbance at Archeological Sites: Implications for Site Preservation*. U.S. Army Engineer Waterways Experimentation Station, Vicksburg, Mississippi.

This publication discusses surface erosion and other disturbances to archaeological sites and is available from National Technical Information Service.

### *Looting*

Ehrenhard, J. E. (editor)

1990 *Coping with Site Looting, Southeastern Perspectives: Essays in Archeological Resource Protection*. National Park Service, Interagency Archeological Services Division, Atlanta, Georgia.

Nickens, Paul R.

1993 *Use of Signs as a Protective Measure for Cultural Resource Sites*. Technical Report EL-93-6, U. S. Army Corps of Engineers, Waterways Experiment Station, Vicksburg, Mississippi.

Ryan, Jan S.

1991 *Preventing Cultural Resources Destruction: Taking Action Through Interpretation*. United States Department of the Interior, National Park Service, Washington, D.C.



*Notes*

---



*Notes*

---



## *Notes*

---

A publication funded in part by the Florida Department of Community Affairs, Florida Coastal Management Program, pursuant to National Oceanic and Atmospheric Administration Award No. NA97OZ0158. The views expressed herein are those of the author(s) and do not necessarily reflect the views of the State of Florida, NOAA or any of its subagencies. November 2004



A Publication of The Florida Department of State  
Division of Historical Resources, Bureau of Archaeological Research  
Copyright 2004, Florida Department of State

R.A. Gray Building • 500 South Bronough Street • Tallahassee, FL 32399-0250  
PH: (850) 245-6444 • FX: (850) 245-6436

WEB: <http://www.flheritage.com/archaeology>

