

Strategic Habitat Conservation: Restoration and Protection of Vital Estuarine Tidal Marsh Habitat on Sawpit Island, George Crady Bridge Fishing Pier State Park, Duval County, Florida



Fig. 1: Sawpit Island located in the Nassau Sound, just south of the Duval/Nassau County Line

The Talbot Islands State Parks (TISP), in conjunction with the Bureau of Natural and Cultural Resources (BNCR), designed this project following the SHC framework developed by the U.S. Fish and Wildlife Service and U.S. Geological Survey. Sawpit Island (Fig. 1) is an island located in the Nassau Sound, just south of the Duval/Nassau County Line in Northeast Florida.



Fig. 2: Estuarine Tidal Marsh on Sawpit Island

This island consists of important natural communities such as beach, salt flats, coastal grasslands, and estuarine tidal marsh, which are vital to a wide range of species. Since the creation of Gunnison Cut to the Atlantic Intracoastal Waterway (AIWW), Sawpit Island has transitioned from an accreting island to an eroding island.

The most abundant natural community found on Sawpit Island is estuarine tidal marsh (Fig. 2). This natural community is under extreme influence from the erosional forces influencing the island. Erosion has had several effects on the estuarine tidal marsh on Sawpit Island. Most likely a



Fig. 7: Formed Sand Embankment Altering Hydrology

result from Tropical Storm energy, such as T.S. Fay, the sliver of upland and the shoreline along the north point and northeast face of the island has faced the brunt of these high energy events. The east portion of the northeast face (Fig. 5) has fared quite well due to the presence of energy reducing components such as *Spartina alterniflora* (Salt Marsh Cordgrass), as well as, *Crassostrea virginica* (Eastern Oyster). The western portion of

the northeast face of Sawpit Island (Fig. 4) has suffered extensive erosion (Fig. 3). Erosion has led to the near-complete loss of sand along it's shoreline leaving the hard-pan below exposed to the same erosional forces (Fig. 6). Some of this eroding sand has been forced into the estuarine tidal marsh community (Fig. 7), resulting in altered hydrological flow through the community. This change could have profound impacts such as shifting the floral and faunal pattern throughout the estuarine tidal marsh community.



Fig. 3: Example of Erosion on Sawpit Island



Fig. 6: Loss of Shoreline Sand Increases Level of Erosion



Fig. 5: Eastern Section of Northeast Face



Fig. 4: Western Section of Northeast Face

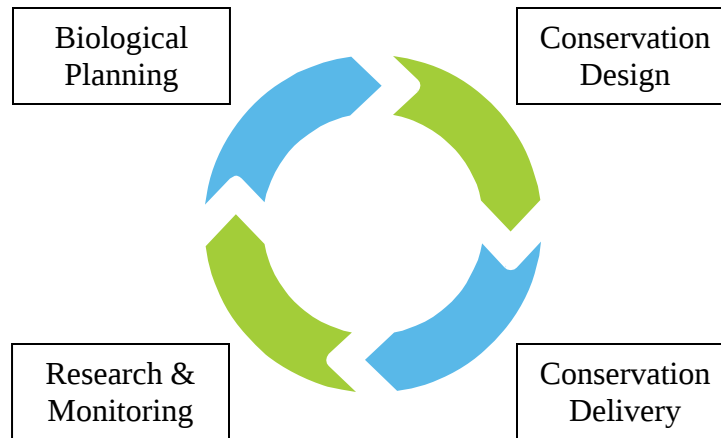


Fig. 8: Elements of Strategic Habitat Conservation (SHC)

The goal of this Strategic Habitat Conservation plan is to gain a better understanding of ecological processes occurring on Sawpit Island, restore the health and integrity of Sawpit Island's natural communities, provide protection, through specific restoration goals, from future impacts such as sea level rise, and monitor the success of the project. Strategic Habitat Conservation (SHC) is a process containing four essential elements (Fig. 8): biological planning, conservation design, conservation delivery, and research & monitoring. For the purposes of completing this project efficiently and effectively, the starting point will be research & monitoring and proceed through the other elements and concluding with a second research & monitoring element. These elements will be described in detail throughout the course of this SHC project proposal. Furthermore, this project will be broken down into phases. Phase 1 will consist of research & monitoring, to better understand the ecology of Sawpit Island, and biological planning. Phase 2 will consist of conservation design and conservation delivery. Phase 3 will consist of a second research & monitoring element.

Phase I

Success is determined by the results of the outcomes of a project. However, success is defined by the start of a project. Phase I starts with what could be considered the last step in the SHC process. TISP has a standing practice of constant evaluation in any task it is charged with. Thus, the final step in one project is often the first step in another. Applying this model to the framework of SHC, it makes sense to begin with monitoring and research.

Prior to November 29, 2004, Sawpit Island was under the management of the Florida Department of Transportation (FDOT). On this date, FDOT filed a "Quit Claim Deed" with the State of Florida, Board of Trustees of the Internal Improvement Trust Fund, thus relinquishing control of the property back to the State of Florida. On September 14, 2007, the Board of Trustees of the Internal Improvement Trust Fund of the State of Florida leased the same properties to the Florida Department of Environmental

Protection. The lease agreement, #4562, to George Crady Fishing Pier State Park gave management authority to TISP. The term of this lease ends on September 13, 2057, when it will be up for renewal.

1. Monitoring and Research

As stated by lease #4562, TISP has incorporated Sawpit into its overall management plan. Due to the short duration of active management TISP is still establishing an overall picture of the ecology and use of Sawpit Island as it pertains to George Crady Bridge Fishing Pier State Park and TISP as a whole. To this point limited ecological sampling and monitoring has taken place on Sawpit Island. The initial element of this project will be to identify biological populations for inhabiting flora and fauna utilizing Sawpit Island.

a. Target Research to Provide the Highest Value to Resource Management

Prior to TISP acquisition of Sawpit Island, minimal surveys of any kind were performed on the island. FDOT had a cultural survey completed in February of 1992 and found Site #8Du8097 located on the northeast face of the island approximately midway between Gunnison Cut and Old A1A (George Crady Bridge Fishing Pier State Park). Site #8Du9087 is a shell midden approximately 200 square meters with a depth of 40 cm of shell refuse dominated by oyster and clam from an unspecified historic American period. FDOT recommendations for the site were: Further phase I survey and several larger test units necessary to test site integrity. FDOT deemed the site to lay outside of their project limits meaning it will not be involved in their continuing projects during their management of the island.

The only other known survey and monitoring project to occur on Sawpit Island has been done by the University of North Florida (UNF). UNF has on occasion monitored the nesting colony of Carolina Diamondback Terrapins, *Malaclemys terrapin centrata*. UNF monitored terrapin nesting on the island in 1997, 2000, and 2009. In 2009, TISP led the monitoring efforts, assisted by UNF.

Aerials from a variety of years past have also been looked at to see what processes are at work on Sawpit Island. The goal of this first element is to establish what ecological processes are at work on Sawpit and at what rate. Floral and faunal species will be identified as to presence and population.

b. Establish Monitoring Activities to Support Inferences

TISP plans to accomplish the task mentioned in 1.a. by partnering with BNCR, UNF, Jacksonville University (JU), Florida Coastal and Aquatic

Managed Areas (CAMA), and The Nature Conservancy (TNC), all of which have expressed interest in assisting with monitoring efforts. Other possible resources may come from Florida Natural Areas Inventory (FNAI), Watershed Action Volunteers (WAV), among others as the project develops.

c. Use Monitoring and Research in a Feedback Loop

All information from the first element (monitoring & research) will be evaluated further in the next element. Depending on the interpreted results the first element may need to be revisited, especially, in cases where there are gaps in the data field. For example, based on what is known about estuarine tidal marshes, if certain species have not been documented or monitored, then, the first element will be revisited to ensure “missing” species were not overlooked or if they are truly absent from the community.

2. Biological Planning

TISP, in conjunction with partnering agencies and organizations, will utilize information gathered from the first element to complete the second element: biological planning. At this point the only species with recorded information is that of the Carolina Diamondback Terrapin, *Malaclemys terrapin centrata* (Fig. 9).



Fig. 9: Carolina Diamondback Terrapin

Since the early 1990's, the nesting population of Carolina Diamondback Terrapins has been monitored off and on for nesting success and depredation by UNF (1997, 2000). As mentioned previously, management of Sawpit Island by TISP was established in November of 2007. In 2008, TISP, assisted by UNF, began monitoring the nesting colony of Carolina Diamondback Terrapins.

a. Identify Priority Species

Priority species will be established after element 1 is completed. Carolina Diamondback Terrapin, Fig. 9, is a priority species for TISP as this colony is not only the lone colony nesting within TISP boundaries but is the only known nesting colony in Northeast Florida as well. Continued loss of nesting habitat and the degradation of the salt marsh, which is utilized by hatchlings, on Sawpit Island could lead to the extirpation of the local population. One of TISP's goals is to prevent this from occurring.

b. Select a Subset of Priority Species

A complete subset of priority species can not be established until the completion of element 1. These species have been observed utilizing Sawpit Island: Wood Stork (*Mycteria americana*), Bald Eagle (*Haliaeetus leucocephalus*), Piping Plover (*Charadrius melodus*), Wilson's Plover (*Charadrius wilsonia*), Least Tern (*Sterna antillarum*), Cooper's Hawk (*Accipiter cooperii*), Osprey (*Pandion haliaetus*), American Oystercatcher (*Haematopus palliatus*), Roseate Spoonbill (*Platalea ajaja*), White Ibis (*Eudocimus albus*), Tricolored Heron (*Egretta tricolor*), Snowy Egret (*Egretta thula*), Reddish Egret (*Egretta rufescens*), Great Egret (*Ardea alba*), Little Blue Heron (*Egretta caerulea*), Great Blue Heron (*Ardea herodias*), Willet (*Catoptrophorus semipalmatus*), Sanderling (*Calidris alba*), Eastern Glass Lizard (*Ophisaurus ventralis*), Six-lined Racerunner (*Cnemidophorus sexlineatus*), Eastern Oyster (*Crassostrea virginica*), Marsh Periwinkle (*Littoraria irrorata*), Blue Crab (*Callinectes sapidus*), Red-jointed Fiddler Crab (*Uca minax*), Sand Fiddler Crab (*Uca pugilator*), Atlantic Marsh Fiddler Crab (*Uca pugnax*), and Grass Shrimp (*Palaemonetes pugio*).

However, the status, level of use, and populations for these species have yet to be identified. There are many other species of flora and fauna that have not been identified on Sawpit Island. Again, these species will be identified and documented in element 1.

c. Formulate Population Objectives

TISP's objective for this project is to maintain, protect, and restore the natural resources on Sawpit Island to the return Sawpit Island to its pre-erosional condition. This will ensure the proper balance among all floral and faunal populations and help maintain the health of the natural communities within Sawpit Island.

d. Current Status

Malaclemys terrapin centrata is not a listed species in the State of Florida, nor is it federally. There are 7 subspecies of *Malaclemys terrapin* and 3 of those subspecies are federally listed: Texas Diamondback Terrapin (*Malaclemys terrapin littoralis*), Mississippi Diamondback Terrapin (*Malaclemys terrapin pileata*), and the Northern Diamondback Terrapin (*Malaclemys terrapin terrapin*).

The 2009 nesting season resulted in 329 nests for the Carolina Diamondback Terrapin on Sawpit Island. Of those 329 nests, 316 nests were depredated, a rate of 96.0%. This depredation rate was substantially higher than the last monitored year, 2000, where the depredation rate was a staggering 86.5%.

Given the findings of element 1, current status for other priority species, established earlier in element 2, will be determined.

e. Identify Limiting Factors

Overall, the general limiting factor is the loss and/or alteration of healthy usable habitat for floral and faunal species on Sawpit Island. Floral and faunal species utilizing the natural communities described earlier have specific needs that need to be maintained. Erosion has resulted in their being less beach/shoreline habitat. The coastal strand community is disappearing at an alarming rate. Some sand that use to occupy the beach community has been pushed into the estuarine tidal marsh community altering the hydrological flow threw the system.

Altered hydrology has resulted in some areas retaining higher levels of water while other areas of the estuarine tidal marsh are starved for water. Sawpit Island is tidally influenced and many floral species found within the estuarine tidal marsh require some sort of periodic inundation to thrive. On the opposite spectrum, some floral species in flooded areas are receiving too much inundation and thus are suffering as a result. Of course this situation applies itself to faunal species. As the floral community is altered, the presence of faunal species changes depending on water level and vegetation type. Altered hydrology has provided a limiting factor to a great number of species on Sawpit Island.

Loss of usable habitat is also a limiting factor. Carolina Diamondback Terrapins provide the perfect example. Diamondback Terrapins are the only North American turtle that lives and prefers brackish water. Thus their needs and plights are similar to those of sea turtles, which are strictly marine. Coastal development such as building construction and waterway construction has severely reduced the amount of quality nesting habitat preferred by these turtles. Diamondback Terrapins generally choose sandy beaches in close proximity to salt marsh. Adults and successful hatchlings seek refuge and forage in these salt marshes.

Due to usable nesting habitat is becoming increasingly rare, the nesting beach on Sawpit Island has a much higher value. Erosion is greatly reducing the amount of usable habitat for nesting, as well as, lowering it's quality. This will be described in greater detail in component "f".

f. Compile and Apply Models Describing Population-Habitat Relationships

This component will only be able to be completed after element 1 is completed. TISP, assisted by it's partners, will be able to model and analyze the relationship between species populations and habitat use. To

this point, modeling/analysis can be shown in regards to the Carolina Diamondback Terrapin.

The 2009 nesting numbers are significantly lower than those of 2000 and 1997 (Table 1). In 2000, there were 475 nests laid with 411 nests being depredated, a rate of 86.5%. In 1997, there were 454 nest laid with 372 nests being depredated, a rate of 81.9%.

Table 1: Carolina Diamondback Terrapin nesting effort and nest depredation (w/ rates)

Year	1997	2000	2009
Total Nests	454	475	329
Depredated Nests	372	411	316
Depredation %	81.9%	86.5%	96.0%

The area of nesting habitat for the Carolina Diamondback Terrapin has, also, been reduced over during this time (Table 2). In 2008, the area of nesting habitat was 4.91 acres. In 2004, there was 5.26 acres of nesting habitat followed by 7.62 acres in 1999, and 8.00 acres in 1994.

As the available area for nesting has decreased, the depredation rate during the same time period has increased.

Table 2: Carolina Diamondback Terrapin nesting effort and available nesting acres

Year	1994	1997	1999	2000	2004	2008	2009
Nests	-	454	-	475	-	-	329
Nesting Acres	8	-	7.62	-	5.26	4.91	-

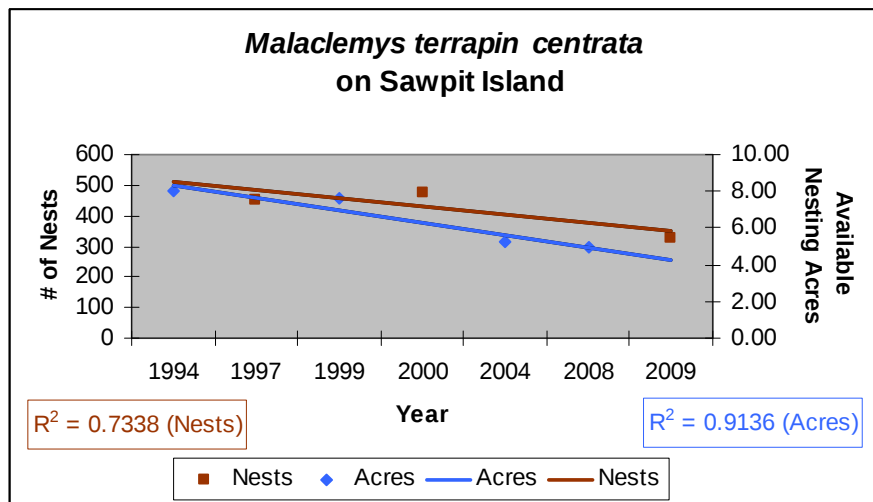


Chart 1: Chart showing correlation between # of nests per year, as well as, available nesting acres per year

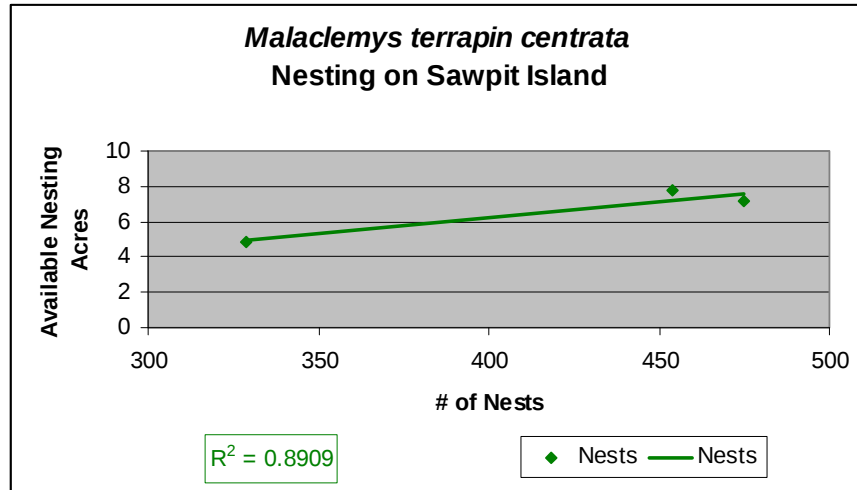


Chart 2: Correlation between # of nests and available nesting acres

There is a strong correlation between the number of nests laid by Carolina Diamondback Terrapins and the amount of available acreage for nesting (Chart 2). Unfortunately, both the number of nests laid and the available nesting acreage have decreased over time (Chart 1).

3. Conservation Design

The last component of Phase I is for TISP to have an environmental engineer assess Sawpit Island and develop a scope of work for the project. The general idea for the project will be discussed in this component but the environmental engineer will analyze the island for feasibility, cost, and necessities to achieve project goals.

a. Develop Species Habitat Decision Support Tools



Fig. 10: Change in nesting area over time

TISP has mapped Sawpit Island utilizing ArcGIS 9.3 utilizing aeries from 2008, 2004, 1999, and 1994. Using the current park boundary for George Crady Bridge Fishing Pier State Park for reference, TISP has mapped the erosional effects to usable nesting habitat for Carolina Diamondback Terrapin occurring on Sawpit Island starting in 1994, in order to demonstrate what is happening to the natural communities (Fig 10).

b. Designate Priority Areas

The patterns shown in Fig. 10 show the areas of beach on Sawpit Island most affected by erosion, thus diminishing the area usable for nesting by Carolina Diamondback Terrapins. The change in usable nesting area displays the change erosion has caused to the Island.

c. Formulate Habitat Objectives

Objectives of this proposal are to reverse the damage done by erosion on unprotected portions of Sawpit Island (Fig. 11). The proposed project would restore approximately 3.44 acres of previously eroded areas of shoreline habitat including the beach, shellfish reefs, and aquatic vegetation, back to the state the island was in during the mid-to-late 1990's. Also, sand intrusion into the estuarine tidal marsh will be reversed correcting the hydrological flow throughout the system.



Fig. 11: Project Restoration Area

Phase II

The need for Phase I is to get the overall project to a point where the restoration component can be eligible for funding opportunities with NOAA. NOAA grants will be used to complete the restoration portion of the project within Phase II. The rest of Phase II will be to evaluate the changes the restoration has on Sawpit Island by continuing to monitor and survey the island. From the monitoring and survey portion of Phase II, TISP can then evaluate the overall success over the project, adjustments needed for future restoration projects, and “touch-ups” to the existing project. (Touch-ups refers to any extra work or adjustments needed to complete this project)

Phase II will consist of three components: conservation delivery, monitoring & research, and a final project evaluation. The final project evaluation will only be completed after the SHC framework has satisfactorily been completed.

4. Conservation Delivery

This component houses the actual restoration work designed at the end of Phase I for Sawpit Island. Objectives are to restore the shoreline along the northeast face of Sawpit Island (along the Nassau Sound), alleviate the

amount of sand intrusion into the salt marsh to restore the natural hydrological flow, and to reduce future impacts from erosion and sea level rise by establishing shellfish (oyster) beds along the restored shoreline, as well as, planting native vegetation. The project area is shown in Fig. 11.

Part of Phase I calls for an environmental engineer to take a look at Sawpit Island for feasibility of the project and to formulate a proper course of action to achieve the overall goals of the project. At this juncture, the proposed LSL project consists of creating an oyster shell sill parallel to the shoreline along the beach area identified in Fig 11. Sand fill, compatible with the island's existing substrate, would be obtained from dredge spoil sites maintained by the Florida Inland Navigation District (FIND) and used to backfill the beach area landward of the oyster sill. If this fill can be obtained during an offloading event (when the FIND disposal sites are "emptied" through a US Army Corp of Engineers project), then, the project cost of the fill could be partial transportation costs only. Use of this disposal site fill by the LSL project would satisfy a conservation goal of FIND: to effectively utilize fill material that was cut from AIWW channels for restoring and controlling erosion of adjacent beaches. The fill would be transported by barge or trucks and spread between the oyster sill and beach escarpments. The oyster reef and fill placement will be designed to essentially restore and stabilize the 1994 beach profile area illustrated in Fig. 10. Ideally, the fill would be placed in the late winter months and allowed to equilibrate for several weeks prior to a spring planting of native vegetation.

The final stage of the constructed LSL project involves planting native vegetation. Marsh grasses, such as *Spartina alterniflora*, would be planted along these backfilled erosional areas to help anchor the sediments and dissipate wave energy. Native marsh grasses, and perhaps some upland vegetation, would be cultivated from existing native cuttings/plugs/seedlings collected from the island or adjacent TISP areas. It is expected that a local area nursery would be contracted to collect specimens, cultivate to a specific maturity or pot size, and then plant the vegetation in the project fill areas during the spring, prior to the onset of Carolina Diamondback Terrapin nesting. Survivability of the plantings will be monitored and additional plants may be ordered if needed to help stabilize the area.

While Sawpit Island cannot be restored to its pre-disturbance profile because of Gunnison Cut, which is part of the AIWW, this project will restore eroded nesting area and establish a natural protection barrier to dissipate energy causing erosion. The final product of this project will result in highly eroded areas closely resembling the least eroded areas and/or area of no erosion on the island. The least erosional areas of Sawpit Island are under the same erosional processes. However, due to the protection of oyster and marsh vegetation, these areas do not succumb to these erosional patterns. Of note, the addition of native vegetation to limit erosional impacts will add a layer of

protection to nesting females looking to emerge for their nesting attempts, as well as, newly emerged hatchlings. By restoring the nesting beach of Sawpit Island, a minimum of 92.84 acres of combined estuarine tidal marsh, beach, coastal grassland, and maritime hammock will be protected from heavy salt intrusion which would result in significantly more saline water lowering the quality of the estuarine salt marsh.

5. Monitoring & Research

As with most projects of this nature, success will be determined based on a positive response of target species to the actions proposed for this project. Due to the initial component of Phase I, a basis for comparison will be compiled for analysis of this component. Comparing post-restoration observations with pre-restoration observations will provide TISP and its partners valuable insight into how the restoration project has affected floral and faunal species utilizing the various natural communities, hydrological flow (including patterns, flow rates, and water quality), and the various natural communities themselves.

TISP will utilize the same partnerships from the first monitoring & research component. Monitoring & research will be conducted in the same manner as before.

a. Target Research to Provide the Highest Value to Resource Management

Post-restoration data will be collected in the same manner as pre-restoration data. Monitoring & research will be geared towards collecting data on samples (population) of floral and faunal species, hydrological flow rate, water height (low and high tides), habitat (niche) utilization (are species now utilizing different area than pre-restoration period), # of nests laid (for nesting species including reptiles and birds), spawning events, etc.

b. Establish Monitoring Activities to Support Inferences

TISP plans to accomplish the task mentioned in 5.a. by partnering with BNCR, UNF, Jacksonville University (JU), Florida Coastal and Aquatic Managed Areas (CAMA), and The Nature Conservancy (TNC), all of which have expressed interest in assisting with monitoring efforts. Other possible resources may come from Florida Natural Areas Inventory (FNAI), Watershed Action Volunteers (WAV), among others as the project nears completion.

c. Use Monitoring & Research in a Feedback Loop

This monitoring & research component will collect data similar to the first component in Phase I, with the major difference being temporal, after the restoration event. Post-restoration data will be collected and analyzed in the same manner the pre-restoration data was. The two different sets of data (pre-restoration and post-restoration) will be compared to each other via statistical analysis to provide information into how the ecology of Sawpit Island has responded to the restoration project.

6. Final Evaluation

After all post-restoration data has been collected, analyzed, and statistically compared to pre-restoration data, a final evaluation of the project as a whole will be completed. Evaluation questions will include but are not limited to:

1. How many acres were restored? Which natural communities?
2. How many native plants were planted? Which species?
3. What is the size/s of the oyster shell sills established?
 - i. Has recruitment on the oyster shell sills taken place?
 - ii. How many individuals?
 - iii. What is the distribution?
4. How much fill was placed on Sawpit Island as part of this project?
5. How much sand was removed from intrusion on salt marsh?
6. What was the hydrological flow rate for each monitored area of the estuarine tidal marsh prior?
 - i. Prior to restoration event?
 - ii. After the restoration event?
 - iii. How do these compare?
7. How has Carolina Diamondback Terrapin nesting responded?
 - i. How has nesting effort changed?
 - ii. Is there a higher successful nest rate?
 - iii. Is there a lower depredation rate?
8. Were pictures taken before, during, and after?
 - i. How do they compare?
9. Are there any other actions needed? (i.e. predator control)
10. Was a project summary prepared?
11. Was a scientific research paper (Case Study) written or will one be written?

Is this a technical assistance project? If yes, can a restoration component be added to the scope of work?

This is a technical assistance project containing a restoration component.

Is there a long term conservation or protection plan in place or is one being developed for the project area?

The restoration area on Sawpit Island is within George Crady Bridge Fishing Pier State Park which is under the management of the Talbot Islands State Parks administration. The Talbot Islands State Parks are under the Division of Recreation and Parks which is part of the Florida Department of Environmental Protection.

Sawpit Island was leased to George Crady Bridge Fishing Pier State Park late in 2007 under Lease #004562, dated September 14, 2007. TISP is currently playing catch up on learning about the biological function and processes at work on Sawpit Island. These management practices deriving from this project will be considered for incorporation in to the next Unit Management Plan for George Crady Bridge Fishing Pier State Park.

Is the project part of an existing-based community plan, a species recovery plan, a watershed restoration plan or other management plan?

This project lends itself to fulfilling management plan goals for TISP. The Unit Management Plan for Amelia Island State Park, Big Talbot Island State Park, Little Talbot Island State Park, and George Crady Bridge Fishing Pier State Park states the following management objectives:

1. Monitor and protect designated species breeding or overwintering in, or migrating through, Amelia and Talbot Islands. (pg. 6)
2. Document impacts from increased recreational use of estuarine areas, and seek ways to reduce, eliminate or mitigate documented and predicted impacts. (pg. 7)
3. Continue to monitor coastal sediment transport processes and coordinate with other agencies in developing and implementing erosion control projects and sediment management plans. (pg. 7)
4. Survey, document, protect and interpret the cultural resources of Amelia and the Talbot Islands.
5. Evaluate impacts on surface water and groundwater systems.
Develop and implement plans for restoration of natural hydrology.

There are other goals that this project encompasses, however, the three listed above are the main focus. This project helps to fulfill #1 as this project is designed to protect Carolina Diamondback Terrapins and their nesting grounds. After the project is completed monitoring will continue on the population. This project helps to fulfill #3 by developing a strategy and implementing this strategy

by creating new oyster beds, backfilling (replacing) areas of lost beach, and planting native vegetation to provide stabilization and correct function of the habitat. Sediment aggregation should occur, wave energy dissipated, water filtration increasing water quality, and protective habitat (hiding niches) for a wide variety of species. After, the project has been completed and established, impacts from recreational use will be limited by the function energy dissipation of the oyster beds and native vegetation. These areas will also provide pivotal habitat niches to hide from, not only predators, but from human recreational use as well. There is an archaeological site, 8Du8097, located on the east side of the project area. This project would help protect this site and work towards fulfilling #4. A major aspect of this project is to restore the natural hydrological flow to the Estuarine Tidal Marsh, which will increase the health of entire community, as well as, fulfilling #5.

A secondary target species of this project is the federally endangered wood stork, *Mycteria americana*, would benefit from this project. Numerous individuals of wood storks have been observed foraging in the salt marshes associated with Sawpit Island. Restoring the erosion on Sawpit Island's beaches for the Carolina Diamondback Terrapin would protect the salt marsh from degradation due to increased salinity and hydrological flow. Nesting colonies of wood storks are located nearby at the Jacksonville Zoo and Pumpkin Hill Creek Preserve State Park. The U.S. Fish and Wildlife Service's Wood Stork 5-Year Review states, "Wood storks are a wetland dependent species and loss of foraging wetlands continues to be the primary threat to this population," found on page 12.

Another species, the bald eagle, *Haliaeetus leucocephalus*, benefits as well. Protecting the shallow waters around Sawpit Island and the salt marsh contained within, important feeding grounds for the bald eagle will be sustained in accordance with Bald Eagle Management Plan established by the Florida Fish and Wildlife Conservation Commission on April 9, 2008. This plan states, "Most prey is captured from the surface of the water....Throughout their range, bald eagles use forested habitats for nesting and roosting, and expanses of shallow fresh or salt water for foraging (page 3)." Bald eagles have consistently been observed soaring over the Nassau Sound, where Sawpit Island is located. There is a pair of bald eagles nesting every year in Pumpkin Hill Creek Preserve State Park, which is located nearby and is under the management of TISP.

Describe how the project incorporates impacts of future sea level rise or other aspects of global climate change.

Stated earlier, coastal communities are among the most dynamic communities in the world. This project takes into consideration sea level rise. By establishing new oyster beds and planting native vegetation, such as *Spartina alterniflora*, will limit erosion. Due to the nature of littoral sand movement along the coast, these apparatuses should capture sediment moving littorally through the Nassau Sound.

Upon establishment these apparatuses should begin to capture said sediment, improve water quality, dissipate wave energy, protect from storm surge, and limit erosion. As sea level rises, more sediment should begin to move littorally, thus, resulting in a build up of the coastline along Sawpit Island. With the creation of a proper foundation, all of the functions listed above should occur naturally, as there is a general sway range of 5 feet to 8 feet in the sea level due to fluctuations between high tide and low tide.

Project start and end date:

Carolina Diamondback Terrapin nesting season generally starts the last week of April and runs through the last week of October. The end of the season can be earlier depending on the offset of nesting and nest survivorship of the final nests laid in a season. We would want to avoid disturbance to the nesting population of Carolina Diamondback Terrapins on Sawpit Island. The major disturbance will be the sediment backfilling. Depending on availability of funds and sediment, we would try to have the backfilling completed prior to April 23, 2010. Otherwise, major disturbance activities will need to wait till approximately November 1, 2010. A rough estimate of the project would be April 1, 2010 to April 1, 2011.

Monitoring & research components can be and should be done throughout the year to create a better understanding and a more balanced data set. Thus, this aspect will begin at the end of April 2010 or beginning of May 2010. An environmental engineer will be brought in over the summer 2010 to fulfill part of the biological planning component of SHC

Depending on availability of resources this could be a multi-year project when considering design, implementation, and evaluation. Also, when dealing with processes such as oysters taking to new beds and vegetation taking hold in newly planted habitats, time tables need to be flexible. More than one attempt at any of these two actions may be required.

Habitat restored:

The planned project will result in direct restoration of the natural community types "Mollusk Reef*" and "Tidal Marsh*," and protection of a very thin sliver (approx. 3 acres) of upland habitat that could be characterized as "Coastal Strand*" (*see *Florida Natural Areas Inventory [FNAI]* definitions). As described in the "Conservation Delivery" portion of this application, this Coastal Strand protects a much larger expanse of estuarine grass beds, south and west of the proposed project area. If an erosion control/protection project is not implemented, the coastal strand will likely be breached in the next few years. Significant grass bed losses are possible if this breach occurs.

Estuarine Tidal Marsh, Coastal Strand, and Beach Dune are ranked by FNAI on their Global Rank Scale as G3/S2. G3 is a code meaning: either very rare and local throughout its range (21-100 occurrences or less than 10,000 individuals) or found locally in a restricted range or vulnerable to extinction from other factors. S2 is a code meaning: imperiled in Florida because of rarity (6-20 occurrences or less than 3000 individuals) or because of vulnerability to extinction due to some natural or man-made factor.

Funding requested:

See Budget Attachment

Partners involved and their contribution:

TISP has begun seeking advice and guidance from TNC in regards to a living shoreline project. TNC employee, Anne Birch, is TISP/BNCR's contact with TNC for information and advice in planning this project. BNCR is also assisting TISP with this project (co-leadership).

TISP has met onsite with JU representative, Mr. Dan McCarthy, who offered assistance. Mr. McCarthy (JU) expressed interest in assisting with this project by assisting with monitoring & research components, which will provide JU students an opportunity to practice and develop field techniques. This partnership lends itself to other projects with in the park as well.

TISP has contacted CAMA and spoke with Mr. George Myers who is eager to help in any capacity with this project as it benefits CAMA's Northeast Aquatic Preserves, as well as TISP property. Because of a small boat slip (marina) being constructed by a private entity within the preserve, \$10,000 to \$50,000 may be available as mitigation for the marina construction.

TISP has contacted FNAI and spoke with Mr. Dan Hipes. Mr. Hipes expressed willingness to assist with the project, but FNAI's services may be a cost. FNAI is under contract with DEP which may present a financial obligation for their assistance.

WAV has offered volunteer support to TISP for purposes regarding this project.

UNF will provide support volunteer hours in biological monitoring of nesting activity of the Carolina Diamondback Terrapin on Sawpit Island. Monitoring of the population is a must in order to evaluate the success of the project and future management practices. From late April till the end of October, UNF provides, on average, approximately 6 hours of biological monitoring each day in regards to nesting activity of Carolina Diamondback Terrapins on Sawpit. Monitoring activities include: looking for and counting crawls, marking nests, recording GPS locations of nests (marked and depredated), capture/marketing/release of

individuals, recording shell size/dimensions/weight/marked number for each captured/released terrapin, daily observations, etc.

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Does the project have a conservation benefit for any federally classified candidate species and/or federally listed threatened and endangered species?

Although there has not been an extensive survey of plants and animals on Sawpit Island, TISP staff members have observed federally listed threatened and endangered species utilizing Sawpit Island. Those species observed include: piping plover (*Charadrius melodus*), green sea turtle (*Chelonia mydas*), wood stork (*Mycteria americana*), and red knot (*Calidris canutus rufa*).

Again, others may occur as species richness and diversity is high among invertebrates and plants utilizing the salt marsh community.

Is the local community engaged in this project or are there plans to involve them in the future?

A major part of our mission statement is to interpret natural resources to our visitors. Since Sawpit Island has only recently come under the management of TISP, biological assessment and monitoring, cultural surveys, ADA evaluations, and safety evaluations need to be conducted to assess the needs of the biota utilizing Sawpit Island. Currently, the island is utilized by boaters, fisherman, crabbers, and kayakers. Depending on the results of the above listed surveys, protection needs will be established and public interaction will be based off those findings.

Currently, community involvement includes periodic cleanups involving community members, local school groups, biology clubs, and special work groups. As stated early, undergraduate biology students from UNF and JU are able to gain and log valuable field experience by helping to conduct biological monitoring surveys. Volunteers from the community, such as Friends of Talbot Islands State Parks, TISP volunteers, WAV, etc. will be involved.