**Project Name**: Oyster Reef Restoration in the Apalachicola Bay System

**Organization**: Florida Department of Agriculture and Consumer Services

**Project Narrative:** Productive oyster reefs in the Apalachicola Bay System play an essential role in sustaining ecological relationships within the estuarine ecosystem, as well as the Gulf of Mexico (GOM). Beyond the fact that oysters and oyster reef communities represent important food sources for many species of commercially important fish and invertebrates, functioning oyster reefs are also recognized as critical structural and community components which stabilize and sustain a broad array of ecological relationships. When oysters, oyster reef habitat, and oyster population dynamics are injured, impaired or damaged, the result can be widespread throughout broader ecosystems and extend beyond local geographical boundaries. Many commercially valuable, recreationally important, and ecologically critical species within the GOM depend upon or spend a portion of their life cycles associated with oyster reef communities. Because of this complexity of food webs and life cycles, restoring functioning oyster communities is the cornerstone for any broad-scope aquatic resource restoration plan and a prudent management decision. This project will replace substrate and re-establish elevation using 18,000 cubic yards of processed oyster shell on debilitated oyster reefs in Apalachicola Bay, St. Vincent Sound and St. George Sound, Franklin County, Florida. Placing substrate or "cultch" in bays where natural reproduction occurs, is the most effective technique used throughout the GOM to 1) create three-dimensional reef structure, 2) stimulate spat setting, 3) sustain oyster fisheries, 4) enhance community functions, 5) increase natural productivity and 6) accelerate the recovery process. The Florida Department of Agriculture and Consumer Services (DACS) has been involved in rehabilitating oyster reefs for more than sixty years and provides a multi-dimensional approach built on decades of experience. DACS has the equipment, staff and expertise to obtain, stockpile, transport and deposit suitable substrate materials (processed shell) to successfully restore the structure and function of debilitated oyster reefs.

DACS has a history of completing restoration projects following devastating natural disasters, such as hurricanes, floods and droughts {Management of Oyster Resources in Apalachicola Bay Following Hurricane Elena, *Journal of Shellfish Research*. (1988)*;* Biological and Economic Assessment of an Oyster Resource Development Project in Apalachicola Bay, Florida, *Journal of Shellfish Research* (1990); and Final Report - Restoration of Oyster Reefs Impacted by Hurricanes (2008)}. DACS is uniquely positioned to provide a single operational unit, with the infrastructure in place to effectively complete oyster reef construction projects; is currently engaged in multi-faceted programs to restore oyster habitat in numerous Florida estuaries; and manages a network of contractors with the knowledge, skills, ability and equipment to work effectively. This experience ensures that all critical components, including biological, environmental, hydrological, physical, logistical and operational parameters are considered.

Restoring the foundation and structural integrity of estuarine habitat should be a priority and a critical piece of the GOM restoration strategy. Restoring oyster habitat acts as an essential building block to offset the potentially injurious impacts from petroleum-based pollutants on estuarine and marine trophic systems. Rebuilding oyster reef infrastructure contributes to a "bottom up approach" to repairing injured, impaired and damaged natural resources along Florida's Gulf Coast. Improved habitat will form the foundation for oysters, as an engineering species, to contribute to wide reaching fishery and ecological benefits throughout estuarine, coastal and open Gulf ecosystems. Economic benefits are realized through harvesting, processing, and marketing fishery products and felt locally and regionally by all who enjoy high-quality, wholesome Florida seafood; depend upon commercial fisheries for employment and income; and recreate in Florida's waters. Ecological benefits are realized through an array of ecological services in the form of increased fishery and wildlife habitat; increased biodiversity and trophic dynamics; increased filtering capacity to improve water quality and recycle nutrients; and increased structural stability to reduce coastal erosion and to protect near shore resources.

**Modified Scope of Work**

The Department of Agriculture and Consumer Services (DACS) will act as the primary contractor for the NRDA project in the Apalachicola Bay System. DACS will be responsible for the administration, planning, implementation, management, and successful completion of all aspects of the proposed project. DACS will also be responsible for developing, implementing, and completing a monitoring program to assess the success and benefits of the restoration activities.

Administration

DACS will be responsible for all financial actions involved in the project, including: selecting subcontractors, vendors and service providers, executing contracts, purchase orders and agreements, reviewing invoices and making payments for services provided, and verifying accounting practices.

Planning

DACS will be responsible for planning all components of the proposed project, including: the review and approval processes for selecting subcontractors (bid quotes, contractual agreements); developing the scope of work for the entire project and for individual components and subcontractors; allocating staff time and equipment to participate and manage project operations; select suitable sites for restoration; and schedule on the ground restoration operations. Staff will schedule meetings with subcontractors to establish project schedules and timelines, logistics, operating parameters, and job-related responsibilities.

Implementation and Management

DACS will review, evaluate and select subcontractors that can provide the required services to implement the project, establish schedules for operations, and manage project logistics. DACS staff will maintain on-site project management and supervision; delineate project boundaries, and ensure the operations conform to the terms and conditions of contract agreements and purchase orders.

Completion

DACS will be responsible for approving work upon completion to determine if the project was completed in accordance with contract provisions and job specifications. Staff will verify that all jobs listed in the scope of work are completed before approving invoices for payment.

Monitoring

DACS will be responsible for developing a post-completion monitoring program to assess and report on the project's progress and success. Restored reefs may become productive in as few as 3 to 6 months under optimal conditions, with oyster reaching market size in 12 to 18 months. However, since recruitment and survival can be highly variable, some reefs may not become productive for 2-5 years. It has been shown that restored reefs can remain productive for more than 10 with little additional maintenance (dragging to re-expose shell material and substrate enhancement). Based on the expected longevity of the restored reefs, DACS will conduct a monitoring program which will assess oyster population parameters for ten years.

DACS has conducted oyster resource surveys on oyster-producing reefs since 1982, and this information is used by resource managers to reliably predict trends in oyster production; to monitor oyster population dynamics, including recruitment, growth, natural mortality, standing

stocks; and to determine the impacts of climatic events such as hurricanes, floods, and droughts on oyster resources.

Oyster Restoration Monitoring Plan

DACS will be responsible for effectively assessing the status of oyster resources on reefs that are restored during this project. Staff will develop and apply specific metrics to delineate reef locations and reef area, measure population parameters, and estimate production potential.

The proposed monitoring schedule will include collecting samples following project completion on all restored reefs and establishing a sampling schedule based on expected recruitments cycles. All restored reefs will be sampled twice a year from year-one through year-five and once a year from year-six through year-ten. Sampling intervals may be modified to assess significant events which may affect oyster population dynamics. A total of sixteen sampling trips are planned for each restored reef.

Staff will establish and describe the parameters and metrics required to accurately assess oyster reef habitat and populations on restored reefs. Staff will measure and delineate the restored oyster reefs to determine the surface area and reef boundaries, and estimate the coverage forming available reef habitat. DACS has been engaged in monitoring since 1982 and data analyses have allowed resource managers to develop a scale using defined sampling protocol to determine the relative condition of oyster resources based on estimated production parameters. Staff will apply the Standard Oyster Resource Management Protocol to establish baseline and serial oyster population data to measure and report changes in oyster populations and oyster population dynamics.

The Standard Oyster Resource Management Protocol is based on collecting oyster samples from quadrats established at specific sampling locations on restored reefs. Samples are collected by divers using current standard procedures and returned to the laboratory for analyses. Live oysters collected during replicated samples are individually measured, dead oysters and recent boxes are counted, predators are identified and counted, and the general condition of the reef is recorded. The numbers and size of live oysters are converted to size frequency distributions that are used to develop population parameters, such as density, production levels, recruitment, growth, and survival, which in turn, can be applied to predict population trends and identify adverse impacts from events such a hurricanes, floods and drought.

The Standard Oyster Resource Management Protocol provides that estimated production exceeding 400 bags of oysters per acre indicates healthy oyster reefs capable of sustaining commercial harvesting. Accordingly, oyster populations are 1) capable of supporting limited commercial harvesting when stocks exceed 200 bags/acre, 2) below levels necessary to support commercial harvesting when stocks fall below 200 bags/acre, and 3) considered depleted when marketable stocks are below 100 bags/acre (Berrigan, 1990). Generally, the protocol has been an accurate indicator of oyster production in Apalachicola Bay.

**Estimated Project Costs Oyster Restoration Project: Apalachicola Bay System**

Assumptions:

Volume Delivered = 18,000 cubic yards (15,000 ton @ 1.2 cu yd/ton)
Total Capacity = 375 cubic yards per trip
Deck Barge (375 cubic yards of material)
Number of Trips = 48 (24 trips each season for 2 years)
Acres Restored = 90 acres (200 cu yds per acre)

Expenses

| Activity | Hours | $/ Hour | Cost |
|---|---|---|---|
| Planning (Mapping) | 240 | $27.00/hr | **$ 6,480** |
| | | | |
| Loading barge | 24 | $12.00/hr | $ 288 |
| Planting (1 barge) | 24 | $18.00/hr | $ 432 |
| Preparation | 16 | $18.00/hr | $ 288 |
| Support (2 days) | 16 | $25.00/hr | $ 400 |
| Total (per Trip) | 80 | $18.60/hr | $ 1,488 |
| **Total (48 trips)** | | | **$ 71,424** |

Monitoring (16 monitoring trips: 1 post-project; 2/yr for years 1-5; 1/yr for years 6-10)

| | | | |
|---|---|---|---|
| Post Project | 120 | $27.00 | $ 3,240 |
| (2 x annual) | 1200 | $27.00 | $ 32,400 |
| (1 x annual) | 600 | $27.00 | $ 16,200 |
| | | | **$ 51,840** |

Equipment

| | | |
|---|---|---|
| Barge (*Oysterhog*) | @ $6,500 per month x 24 | $ 156,000 |
| Tug (*Shellfish Mariner*) | @ $5,000 per month x 24 | $ 120,000 |
| Trucks, Tractors, Pumps | @ $1,000 per month x 24 | $ 24,000 |
| Support Vessel | @ $ 250 per day x 48 | $ 12,000 |
| Sea Hawk (Monitoring) | @ $ 250 per day x 100 | $ 25,000 |
| Vehicles (Monitoring) | @ $ 100 per day x 100 | $ 10,000 |
| | | **$ 347,000** |
| Replacement Equipment | (10-year monitoring project) | **$ 120,000** |

| | |
|---|---|
| Material Costs (18,000 cu yds processed oyster shell @ $30/yd) | $ 540,000 |
| Delivery (18,000 cu yds @ $5.00/cu yd) | $ 90,000 |
| Expenses (Fuel and lubes @ $250 per trip x 48 | $ 120,000 |
| | **$ 750,000** |
| OPS (4,160 hr x $16.00) | **$ 66,560** |
| | |
| Subtotal | $1,413,304 |
| Administration, Misc expenses (15%) | $ 212,000 |
| **Total Project Cost** | **$1,625,304** |

**Projected Restoration Sites in Apalachicola Bay System**

**Bayou Flats (Site #1):** Reef is comprised primarily of a natural and planted oyster shell matrix in St. Vincent Sound, near Big Bayou in an Approved Shellfish Harvesting Area (SHA) (Map #16).

| | |
|---|---|
| L/L Coordinates: | 29:42.87N / 85:04.41W |
| Proposed Restoration Area/Depth: | 5 - 10 acres/ 2'-6' |
| Proposed Restoration: | Improve substrate, re-establish elevations |
| Cultch Material: | Processed oyster shell |
| Cultch Deposition Method: | High pressure water stream |
| Deposition rate: | 200-400 cubic yards per acre |

**Fish hawk (Site #2):** Reef is comprised primarily of a natural oyster shell matrix in Apalachicola Bay, off the eastern shoreline of St. Vincent Island, north of West Pass in a Conditionally Approved Harvesting Area (SHA) (Map #16).

| | |
|---|---|
| L/L Coordinates: | 29:39.52N / 85:04.81W |
| Proposed Restoration Area/Depth: | 5 - 10 acres/ 4'-6' |
| Proposed Restoration: | Improve substrate, re-establish elevations |
| Cultch Material: | Processed oyster shell |
| Cultch Deposition Method: | High pressure water stream |
| Deposition rate: | 200-400 cubic yards per acre |

**Cabbage Top (Site #3):** Reef is comprised primarily of a natural and planted oyster shell matrix in St. Vincent Sound in a Conditionally Approved Harvesting Area (SHA) (Map #16).

| | |
|---|---|
| L/L Coordinates: | 29:41.60N / 85:05.29W |
| Proposed Restoration Area/Depth: | 5 - 10 acres/ 3'-6' |
| Proposed Restoration: | Improve substrate, re-establish elevations |
| Cultch Material: | Processed oyster shell |
| Cultch Deposition Method: | High pressure water stream |
| Deposition rate: | 200-400 cubic yards per acre |

**North Spur (Site #4):** Reef is comprised primarily of a natural and planted oyster shell matrix in western Apalachicola Bay, in a Conditionally Approved Harvesting Area (SHA) (Map #16). The reef habitat has been restored.

| | |
|---|---|
| L/L Coordinates: | 29:40.75N / 85:03.38W |
| Proposed Restoration Area/Depth: | 5 - 10 acres/ 2'-6' |
| Proposed Restoration: | Improve substrate, re-establish elevations |
| Cultch Material: | Processed oyster shell |
| Cultch Deposition Method: | High pressure water stream |
| Deposition rate: | 200-400 cubic yards per acre |

**Green Point (Site #5):** Reef is comprised primarily of a series of constructed reefs around a natural reef complex; portions of the reef have received extensive restoration. The substrate is primarily a natural and processed oyster shell matrix in Apalachicola Bay, in the vicinity of Green Point in a Conditionally Approved Harvesting Area (SHA) (Map #16).

| | |
|---|---|
| L/L Coordinates: | 29:41.22N / 85:02.29W |
| Proposed Restoration Area/Depth: | 10 acres/ 5'-7' |

| | |
|---|---|
| Proposed Restoration: | Improve substrate, re-establish elevations |
| Cultch Material: | Processed oyster shell |
| Cultch Deposition Method: | High pressure water stream |
| Deposition rate: | 200-400 cubic yards per acre |

**Norman's Bar (Site #6):** Reef is comprised primarily of a natural and planted oyster shell matrix in Apalachicola Bay, in a Conditionally Approved Harvesting Area (SHA) (Map #16).

| | |
|---|---|
| L/L Coordinates: | 29:41.44N / 84:56.19W |
| Proposed Restoration Area/Depth: | 5 - 10 acres/ 2'-6' |
| Proposed Restoration: | Improve substrate, re-establish elevations |
| Cultch Material: | Processed oyster shell |
| Cultch Deposition Method: | High pressure water stream |
| Deposition rate: | 200-400 cubic yards per acre |

**Lighthouse (Site #7):** Reef is comprised primarily of a natural and planted oyster shell matrix in Apalachicola Bay, in a Conditionally Approved Harvesting Area (SHA) (Map #16).

| | |
|---|---|
| L/L Coordinates: | 29:42.35N / 84:54.62W |
| Proposed Restoration Area/Depth: | 5 - 10 acres/ 2'-6' |
| Proposed Restoration: | Improve substrate, re-establish elevations |
| Cultch Material: | Processed oyster shell |
| Cultch Deposition Method: | High pressure water stream |
| Deposition rate: | 200-400 cubic yards per acre |

**Cat Point (Site #8):** Reef is a prominent natural feature comprised primarily of a natural and planted oyster shell matrix in Apalachicola Bay, in the vicinity of East Point, in a Conditionally Approved Harvesting Area (SHA) (Map #16).

| | |
|---|---|
| L/L Coordinates: | 29:42.75N / 84:54.06W |
| Proposed Restoration Area/Depth: | 5 - 10 acres/ 4'-6' |
| Proposed Restoration: | Improve Substrate, re-establish elevations |
| Cultch Material: | Processed oyster shell |
| Cultch Deposition Method: | High pressure water stream |
| Deposition rate: | 200-400 cubic yards per acre |

**Hotel Bar (Site #9):** Reef is a large consolidated natural oyster complex; portions of the reef have received extensive restoration. The substrate is primarily a natural and processed oyster and clam shell matrix in Apalachicola Bay, south of the ICWW along the southern shore of St. George Island, in a Conditionally Approved Harvesting area (SHA) (Map #16).

| | |
|---|---|
| L/L Coordinates: | 29:40.40N / 84:53.10W |
| Proposed Restoration Area/Depth: | 10 - 20 acres/ 5'-7' |
| Proposed Restoration: | Improve substrate, re-establish elevations |
| Cultch Material: | Processed oyster shell |
| Cultch Deposition Method: | High pressure water stream |
| Deposition rate: | 200-400 cubic yards per acre |

**Bulkhead (Site #10):** Reef is a natural oyster complex. The substrate is primarily a natural and processed oyster and clam shell matrix in Apalachicola Bay, in the vicinity of the Bryant Patton Bridge in a Conditionally Approved Harvesting Area (SHA) (Map #16).

| | |
|---|---|
| L/L Coordinates: | 29:41.19N / 84:52.49W |
| Proposed Restoration Area/Depth: | 5 - 10 acres/ 4'-6' |
| Proposed Restoration: | Improve substrate, re-establish elevations |
| Cultch Material: | Processed oyster shell |
| Cultch Deposition Method: | High pressure water stream |
| Deposition rate: | 200-400 cubic yards per acre |

**East Hole (Site #11):** Reef is a natural oyster complex. The substrate is primarily a natural and processed oyster and clam shell matrix in St. George Sound, south of the ICWW along the shore of St. George Island, in a Conditionally Approved Harvesting Area (SHA) (Map #16).

| | |
|---|---|
| L/L Coordinates: | 29:41.19N / 85:52.49W |
| Proposed Restoration Area/Depth: | 5 - 10 acres/ 5'-7' |
| Proposed Restoration: | Improve substrate, re-establish elevations |
| Cultch Material: | Processed oyster shell |
| Cultch Deposition Method: | High pressure water stream |
| Deposition rate: | 200-400 cubic yards per acre |

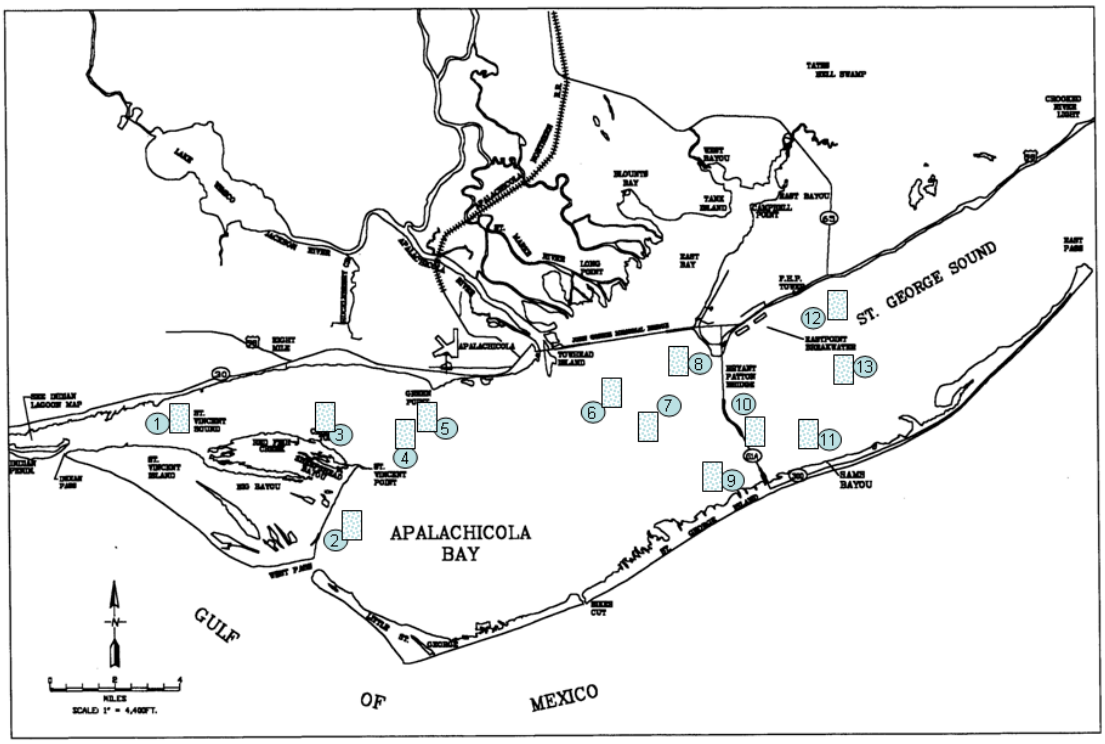
**Porter's Bar (Site #12):** Reef is a natural oyster complex. The substrate is primarily a natural and processed oyster and clam shell matrix in Apalachicola Bay, offshore of mainland in St. George Sound in Conditionally Approved and Approved Harvesting Areas (SHA) (Map #16).

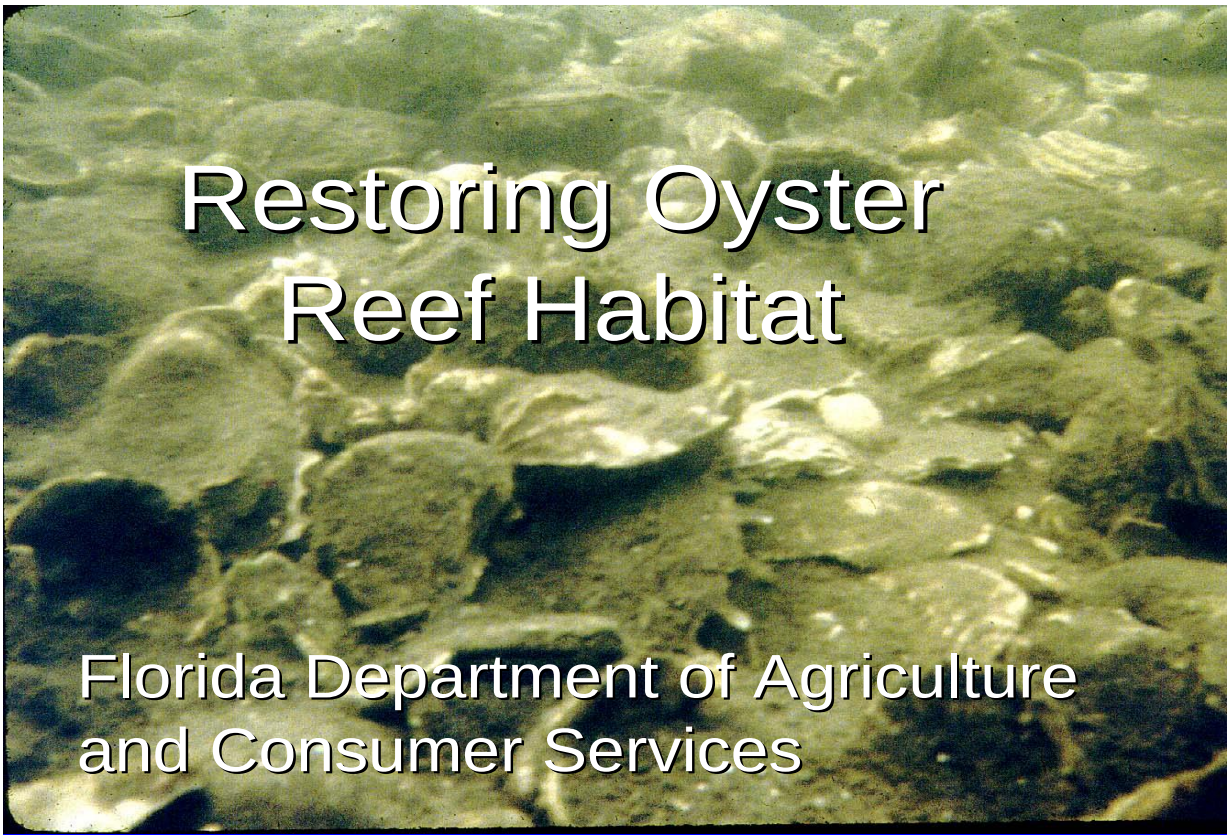
| | |
|---|---|
| L/L Coordinates: | 29:44.25N / 84:50.13W |
| Proposed Restoration Area/Depth: | 5 - 10 acres/ 6'-8' |
| Proposed Restoration: | Improve substrate, re-establish elevations |
| Cultch Material: | Processed oyster shell |
| Cultch Deposition Method: | High pressure water stream |
| Deposition rate: | 200-400 cubic yards per acre |

**Platform Bar (Site #13):** Reef is a large natural consolidate oyster complex. The reef shows marked elevation in some areas and is a prominent feature in St. George Sound. The substrate is primarily a natural and processed oyster shell matrix, north of the ICWW in an Approved Harvesting Area (SHA) (Map #16).

| | |
|---|---|
| L/L Coordinates: | 29:42.00N / 84:49.15W |
| Proposed Restoration Area/Depth: | 5 - 10 acres/ 2'-6' |
| Proposed Restoration: | Improve substrate, re-establish elevations |
| Cultch Material: | Processed oyster shell |
| Cultch Deposition Method: | High pressure water stream |
| Deposition rate: | 200-400 cubic yards per acre |

Map 1 Showing Oyster Reef Restoration Locations in Apalachicola Bay System, Franklin County Florida




Restoring Oyster
Reef Habitat
Florida Department of Agriculture
and Consumer Services