FLORIDA GULF OF MEXICO RESTORATION

PROJECT SUBMITTAL FORM

Form Purpose and Instructions:

- To assist the project proposal and review process, please complete this Submittal Form. Completion of the Form will contribute to the appropriate information being completely and accurately submitted for each project.
- Take as much space as needed for each question, but please keep responses as focused as possible. It may assist you to review all the questions before addressing any one question.
- Please submit one Form per project, if you have multiple projects - please submit one Form for each project.
- Please submit completed Forms to Restoration.Projects@dep.state.fl.us. Once your Form is successfully submitted, you will receive a confirmation email from the Florida Department of Environmental Protection.

Project Name:

Resource Restoration in Apalachicola Bay, Florida

REVISED AND REPLACES PROJECT #961 (confirmation # 301-011414)

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PROJECT LOCATION:

Figure 1. Regional restoration area with study sites including Gum Drift and Maddox sloughs (Gulf County – affecting Franklin County) and Apalachicola Bay (Franklin County – affecting historic *regional* fishery resources). Inset shows regional study area (red box) along the Big Bend of Florida's Gulf coast. Source map modified from USGS, with labeling, scale, inset and (red) highlighting to show Gulf County restoration areas.

Table 1. Project work areas by watershed, and county and restoration/work site.

Watershed:

- Apalachicola and Chipola, including the Apalachicola, Chattahoochee, Flint Basin (ACF Watershed)

	Latitude	Longitude
Franklin County		
• Apalachicola Bay	29.673056N,	-84.961944W
Gulf County		
• Gum Drift Slough	30.069444N,	-85.172500W
• Maddox Slough	30.083633N,	-85.176412W

PROJECT DESCRIPTION

Executive Summary

This project focuses on ecological restoration along the Big Bend region of Florida's Gulf Panhandle, with emphasis on restoring Apalachicola Bay (AP Bay) resources. AP Bay is a productive, shallow estuary that is home to an iconic Gulf oyster fishery that supports fishers from 14 Florida counties. The AP Bay oyster industry employs over 2,500 people, and supports one of Florida's few remaining heritage fisheries that contributes approximately 90% of Florida's and 13% of the nation's oyster harvest. *AP Bay is one of Florida's treasures associated with priceless Gulf beauty, world-class seafood, and substantial revenue associated with fisheries, tourism and retirement living.* AP Bay is a designated National estuarine research reserve based on its diversity of fauna and unique habitats. Critical habitats in the project region include some of the richest biodiversity in all of North America, including the world's largest natural Tupelo forest associated with the region's unique ecology and Tupelo honey production.

The need for ecological restoration in the Big Bend region is a result of environmental instability and reduced water flow that has severely degraded critical natural resources. This collaborative project brings together a unique set of expertise from state and local management agencies, academia, and community partners to address serious ecological restoration needs of the region in a functional and sustainable way based the following specific aims:

- **Specific Aim 1:** Implement larger-scale, longer-term restoration of oyster resources in AP Bay through a closely-monitored, science-directed shelling program;
- **Specific Aim 2:** Monitor oyster recruitment, health, growth and mortality throughout AP Bay as related to water quality, management and restoration efforts;
- **Specific Aim 3:** Implement small-scale oyster cage culture experiment to better discern feasibility of off-bottom culture, and determine water column effects on production, predation and health of oysters at restoration sites;
- **Specific Aim 4:** Create community capacity building and shell recycling programs;
- **Specific Aim 5:** Provide ecological restoration of key watershed areas in Gulf County relative to AP Bay productivity and restoring the region's unique Tupelo trees. This aim will re-open key watershed surface drainage sources, Maddox Slough and Gum Drift Slough, to enhance needed water and nutrient flow supportive of AP Bay productivity and native Tupelo trees.

Coastal restoration and environmental monitoring efforts described in this proposal launch a new era for sustainable management of the AP Bay resource and its heritage oyster fishery. These efforts provide a needed model for the sustainable restoration of this ecologically and economically important oyster fishery for generations, and will provide ecological and community resilience for the unique coastal resources and communities in the region.

Introduction

CareerSource Gulf Coast is pleased to submit this RESTORE proposal entitled "***Resource Restoration In Apalachicola Bay, Florida***." This project will provide needed and timely support for the sustainable restoration of a heritage oyster fishery and critical habitat in the Big Bend region of Florida's Gulf coast, with a focus on Apalachicola Bay (AP Bay) resources. AP Bay resources include the AP Bay physical environment, its historic oyster fishery, and the seafood worker communities that depend on the Bay's resources for harvesting oyster and other seafood products. Restoration efforts will include the development of adaptive

management strategies to provide long-term support for the resource, using a science-based approach to guide the overall process.

The regional service area for this project focuses on Franklin and Gulf counties, however ***a sustainably restored AP Bay resource will support fishers and communities from 14 Florida counties*** including: Franklin, Bay, Gulf, Wakulla, Calhoun and Liberty Counties (>100 commercial harvesting licensees/county), as well as Alachua, Baker, Charlotte, Citrus, Dixie, Duval, Escambia and Gadsden Counties (<100 commercial harvesting licenses/county)[1].

The proposed restoration needs have been identified, and will be facilitated based on several important functional concepts:

- The multi-county nature of this project brings regional expertise and resources to this restoration partnership, and diversifies restoration efforts and expertise based on the functional needs of this ecologically unique area of Florida's Gulf Panhandle;
- The proposed efforts are based on restoration needs as identified by regional citizen groups, county commissioners and environmental managers;
- The proposed efforts will provide oyster fishery and habitat restoration, environmental education to support sustainable restoration outcomes, and job opportunities and leadership training; and
- Recent $4.1M research support from National Fish and Wildlife Foundation (NFWF) to FWC, UF-ORT and FDACS. Outputs from this restoration research will provide critical and timely information to help guide this effective, large-scale RESTORE Act-funded oyster reef restoration program.

The need to restore and preserve: The need for ecological restoration in AP Bay and the Big Bend region has resulted from environmental instability that has degraded critical environmental resources. Federal, state, and academic evidence indicates that a combination of climatological, hydrological, and changes in human interactions with coastal resources has led to degraded inshore habitats critical for many species of wildlife. Apalachicola Bay has been designated a National Estuarine Research Reserve based on the diversity of fauna and its unique habitats. Critical habitats in our project region include the ecosystems of the Apalachicola/Chattahoochee/Flint (ACF) drainage basins. This unique watershed includes a diversity of upland forests, swamps, marshes, and floodplain wetlands, and some of the richest biodiversity in all of North America. The floodplain forests of this region are home to more than 250 species of vertebrates, including over 50 species of mammals, not counting fish, and represents one of the most important animal habitats in the Southeastern United States. The highest species density of amphibian and reptile species in North America thrives in the upper reaches of the watershed. The ACF river system alone supports over 300 species, including striped bass, occurring in the Gulf only in the Apalachicola River, and the endangered Gulf sturgeon. The flora of this project region includes over 1,100 plant species, including 28 threatened and 30 rare species. *The area includes the largest natural stand of Tupelo trees in the world.* Tupelo tree stands in this region have been declining due to a combination of anthropogenic stressors associated with land and water use changes.

Coastal communities that have lived along this *Forgotten Coastline* for generations, and who have made this region a part of Florida's living history, have been devastated by indirect oil spill impacts, the collapse of major fisheries that support these communities and the region, and severe economic challenge. This project will engage communities in a large-scale restoration and follow-up monitoring program that will benefit the region and the state for generations to

[1] Based on 10-year data from Florida Fish and Wildlife Conservation Commission, 2013

come. Such Community-Academic-Agency engagement is designed to provide *sustainable* restoration that impacts Gulf inshore ecology and coastal community resiliency.

Approach in a Complex Situation

Evidence indicates that oyster resource decline in AP Bay is associated with changing environmental conditions, primarily low water flow and resultant elevated salinity. This evidence is based on historical records of Apalachicola oyster fishery response to drought, and data from UF's Oyster Recovery Team showing recent low river flow coincided with increased AP Bay salinity and high levels of oyster disease and parasitism. Oysters (*Crassostrea virginica*) prefer mid-range salinities. Sustained high salinity hinders growth and resilience for oysters, and it favors oyster pathogens and parasites (e.g., *Perkinsus, Polydora, Cliona*), and predators (e.g., *Melongena* and *Stromonita*). In other words, high salinity has multiple direct and indirect adverse impacts on oysters.

Low-flow river issues have been influenced by historic drought in the ACF basin and to some degree (not fully determined) by consumptive upstream use in that basin for agricultural and urban needs. The drought in 2012 directly affected the Flint and Chattahoochee Rivers that flow into and feed the Apalachicola River, that provides needed freshwater to Apalachicola Bay. This freshwater input is critical to define the estuary-like environmental conditions that support the remarkable natural resource diversity that makes AP Bay a National Reserve, and the productivity of the famous oyster fishery that currently remains at a remarkably low level.

The situation is still further complex. We know that oyster bars remain vital and sustainable when there is sufficient and suitable substrate for spat to settle upon; assuming that there is sufficient reproductive capacity and more recruitment than mortality (natural and from fishing). In an active oyster fishery, where product is removed from the Bay through licensed fishing activity (i.e., shell/substrate from natural mortality is removed from the Bay as part of the harvested product), shell planting (i.e., "shelling") is required to supplement oyster bars, and help to maintain their stability in the face of currents, surge and sedimentation. This is true for other many oyster fisheries, including our northern neighbor, Chesapeake Bay.

Shelling generally provides renewed vitality to oyster bars, allowing for spat settlement and production. Previous shelling efforts have yielded cost benefit ratios of 1:3.5 within two years with a projection of 1:9.2 after five years (FDACS). *We estimate that well-planned shelling efforts, with close oversight, monitoring and adaptive management, will yield a cost benefit ratio closer to 1:20. Further, the indirect benefits of this revitalized fishery in recreational licenses, tourism and regional development will also greatly benefit. The multigenerational rewards from such restoration to the fisheries, coastal communities and the region will be enjoyed for generations.*

Since most oysters harvested in AB are sold in the half-shell market, and the harvest process removes both the product and part of the underlying substrate, some of the largest and most productive oyster bars in the bay have been degraded over time to the point where they no longer provide suitable substrate for settlement of spat and longer-term stability of the physical oyster bar. Now that river flows have returned to the normal range, substrate availability is the major limiting factor for recovery of the Bay's oyster population, as noted in the UF-ORT's 'Oyster Situation Report' of April 2013. That report recommended shelling of up to 1,000 acres in order to recover the oyster population and associated industry.

The proposed restoration efforts in AP Bay focus on a large shelling effort that will be coupled with a systematic and dynamic monitoring of oyster responses (spat settlement, growth and production) in different production regions of the Bay. The monitoring also will include ongoing water quality monitoring and oyster health assessments. This level of monitoring and oversight

is unprecedented in Apalachicola Bay, and will be essential in understanding how to sustain the resource over time through both science and management.

- **Specific Aim 1:** Implement larger-scale, longer-term restoration of oyster resources in AP Bay through a closely-monitored, science-directed shelling program;
- **Specific Aim 2:** Monitor oyster recruitment, health, growth and mortality throughout AP Bay as related to water quality, management and restoration efforts;
- **Specific Aim 3:** Implement small-scale oyster cage culture experiment to better discern feasibility of off-bottom culture, and determine water column effects on production, predation and health of oysters at restoration sites;
- **Specific Aim 4:** Create community capacity building and shell recycling programs;
- **Specific Aim 5:** Provide ecological restoration of key watershed areas in Gulf County relative to AP Bay productivity and restoring the region's unique Tupelo trees. This aim will r*e-open key watershed surface drainage sources, Maddox Slough and Gum Drift Slough, to enhance needed water and nutrient flow supportive of AP Bay productivity and native Tupelo tree stand restoration.*

Unique support for this restoration project will be the scientific and management data provided through NFWF-funded pilot restoration efforts by FWC, UF-ORT and FDACS. Our state agency-academic team is joined by community partners, including Franklin's Promise and the Seafood Management Assistance Resource and Recovery Team (SMARRT, representing seafood workers and dealers from multiple AP Bay fisheries), to support the more sustainable large-scale restoration efforts as proposed. Community input, as part of this restoration process, involves capacity building and implementation of a regional shell recycling program. Each of these constructs are reflected in the specific aims below, with deliverables that will support the resource restoration, and provide critical data and infrastructure to sustain effective management involving both state agencies and seafood workers for years to come.

Project Lead, Partners and Collaborators: This project requires a multidisciplinary, collaborative approach in order to implement the specific aims and address goals as set forth by Gulf coast resource managers, citizen groups, and the Gulf Coast Ecosystem Restoration Council[2]. The partnerships described below, under the leadership of CareerSource Gulf Coast, represent a diversity of regional expertise that, together, will provide the needed synergy paramount to the success of this project.

Project Lead: CareerSource Gulf Coast (CSGC), Kimberly L. Bodine, Executive Director. CSGC is one of 24 regional workforce boards throughout the state of Florida. CSGC's mission is to provide leadership, oversight, guidance and assistance to institutions and agencies delivering training and workforce services to meet economic development and employment needs of Bay, Gulf, and Franklin Counties. Its supervisory board members represent a broad cross-section of industry, economic development, government, and education partners to bring management and policy expertise to community workforce services. CSGC's Job Center provides employer and job seeker services, and selects service providers and job seekers who are best suited for ensuring that community workforce employment needs are met. CSGC has

[2] The document put forward by the Gulf Coast Ecosystem Restoration Council, *Path Forward to Restoring the Gulf Coast: A Proposed Comprehensive Plan, can be access from* www.restorethegulf.gov

extensive experience in managing large-scale projects, workforce teams, and associated fiscal responsibilities through their charter. When the fishery failure became apparent in 2012, CSGC marshaled resources to operate large-scale temporary employment programs and re-training opportunities for impacted workers. CSGC also secured non-federal dollars to provide emergency shelter assistance and access to a counselor for individuals and families under duress from the disaster. CSGC will serve as the lead agency for this project, with project partners listed and described below:

- University of Florida Oyster Recovery Team (UF-ORT)
- Florida Fish and Wildlife Commission (FWC)
- Apalachicola National Estuarine Research Reserve (ANERR) /FDEP
- Florida Department of Agriculture and Consumer Services (DACS)
- Seafood Management Assistance Resource and Recovery Team (SMARRT)
- Franklin's Promise Coalition (FPC)
- City of Apalachicola
- County Commissions of Franklin and Gulf counties

University of Florida - Oyster Recover Team (UF-ORT). UF-ORT represents a unique group of research scientists with diverse backgrounds in adaptive fishery management, ecology, oyster health and disease, water quality and watershed monitoring, environmental education and community outreach. The UF-ORT has been actively engaged in monitoring the hydrology, water quality, productivity and harvests of the Apalachicola Bay oyster fishery for the past two years. These efforts have included state management agencies (FWC, FDACS, FDEP and the Northwest Florida Water Management District), and the regional seafood workers who make their living from the AP Bay resource. This team produced the aforementioned Oyster Situation Report for the community-at-large. Efforts since then continue to include development of a dynamic model to predict oyster yields based on varying environmental and management conditions, and oyster productivity and health monitoring. The team includes:

Andrew Kane, MS, PhD, associate professor of Environmental and Global Health, and director UF Aquatic Pathobiology Laboratories. Dr. Kane has over 20 years experience in aquatic pathobiology and environmental health research, and has directed multiple, multidisciplinary research teams on federally-funded projects, including community-based environmental research in the Gulf of Mexico. Dr. Kane's role on the project will be to coordinate efforts between the UF-ORT and CSGC, and state agencies and seafood workers in the design, implementation and monitoring of the science-based shelling programs and outcomes. Kane will oversee a project manager, technical support, two doctoral students, and a local workforce of seafood workers who will assist with the oyster monitoring and water quality programs. He will also conduct health assessments for AP Bay oysters throughout the restoration project relative to variations in shelling type and density, spat recruitment, survivorship and productivity, water quality and management. Kane and other project partners will also collaborate with **Dr. Mary Christman** (consulting biostatistician) to amass environmental data sets, and analyze and visualize results for the many managers and stakeholders involved. Dr. Christman is an adjunct senior statistician in UF's Biology and Statistics departments, and previously has provided research support for multiple oyster research, restoration and monitoring efforts in Chesapeake Bay.

Karl Havens, PhD, professor of fisheries and aquatic sciences at UF, has over 30 years of experience conducting research related to water quality and food web dynamics in shallow ecosystems including estuaries, lakes and wetlands. Dr. Havens also is Chair of the UF Oyster Recovery Team, and directs the Florida Sea Grant College Program, a state-wide program of research, education and outreach addressing issues critical to a sustainable coastal economy

and environment in Florida. Dr. Havens will work with Drs. Kane and Christman, and state agency managers to facilitate data analyses, data interpretation, and presentation on issues related to effects of water quality, and project-manipulated parameters relative to AP Bay oysters and benthic communities.

Tracy Irani, MS, PhD, is a professor of Family Youth and Community Science at UF; and is the Director for UF's Center for Public Issues Education. Dr. Irani brings over 25+ years experience in agricultural communications, organizational change management, and community-based participatory research. Dr. Irani will provide long-range planning and infrastructure to facilitate capacity building within the community resource component of the sustainable restoration plan.

Angela Lindsey, MS, PhD, is a research associate with the UF Center for Public Issues Education, with expertise in issues management in resource-dependent communities. Dr. Lindsey will orchestrate the many community interactions that bridge the resource restoration proposed in this project. These interactions will involve state agencies, seafood workers, SMARRT members, seafood dealers, and community and academic partners, all of which are critical partners in the restoration objectives in this project.

State Environmental, Public Health, Management and Enforcement Agencies include the Apalachicola National Estuarine Research Reserve (ANERR), Florida Department of Agriculture and Consumer Services (DACS) Aquaculture Division, and Florida Fish and Wildlife Conservation Commission (FWC), with partnering representatives described below:

Kal Knickerbocker is Director, Florida Department of Agriculture and Consumer Services (FDACS) Aquaculture Division. FDACS is responsible for monitoring and regulating the AP Bay shellfish harvesting water classifications, shellfish processing plant certifications, and sanitary inspections to assure food safety for the consuming public. Since 2000 FDACS has also supported AP Bay shelling restoration efforts based on available funding. As part of the project support team FDACS will play an important role in this mutual restoration effort by providing permitting oversight for the deposition of shell/substrate on existing oyster bars, and providing historical insights relative to past restoration efforts. Further, the agency will continue seafood safety monitoring activities, and share harvesting and water quality testing results.

Jim Estes is Deputy Division Director of Florida Fish and Wildlife Conservation Commission's Division of Marine Fisheries Management. The Division of Marine Fisheries Management develops regulatory and management recommendations to ensure the long-term conservation of Florida's unique and valuable marine fisheries resources. FWC uses its research, management and regulatory expertise to addresses complex and emerging conservation issues including multi-species habitat management programs that affect numerous species, with a decision-making process that includes public input.

The Division of Marine Fisheries Management will support this project by providing oversight for the shelling operations, and coordination of monitoring efforts with UF-ORT relative to the oyster habitat and fishery restoration outcomes throughout the project. Project outcomes will include positioning the Division with enhanced adaptive management technology, enforcement capacity, and a functional relationship with seafood workers to support the sustainable resources in Apalachicola Bay. The Division will also develop and provide oversight for enforcement activities relative to effecting fishery closures and harvests as relevant to the proposed restoration efforts. Enforcement support through RESTORE cannot be used by FWC directly, hence coordination of fiscal agreements pertaining to field officers will involve CSGC as liaison.

Jenna Harper is the new Manager of the Apalachicola National Estuarine Research Reserve (ANERR), Department of Environmental Protection, located in Eastpoint, FL. She has many years of previous experience as Research Coordinator for the ANERR with monitoring and

resource management programs for AP Bay, and is both knowledgeable and dedicated to the long-term restoration of the Bay's oyster fishery. ANERR will participate in the experimental design of this project and help to facilitate the long-term salinity and temperature monitoring and sonde maintenance for the treated oyster bars restored in this project. ANERR will provide QA/QC on water quality data collected from their continuous monitoring data sondes to the UF-ORT for incorporation into the larger database for biostatistical analyses. These, and all project data, will be made publically available.

Seafood Management Assistance Resource and Recovery Team (SMARRT) represents Franklin County seafood workers and all sectors of the AP Bay seafood industry, including oystermen, shrimpers, fishermen, crabbers, clammers, guide and charter boat operators. The team also represents dealers and wholesalers, including managers and owners of the seafood houses that buy and re-sell the harvested seafood. Formed in 2012 in response to the AP Bay fisheries failure, SMARRT's membership is actively developing consensus-based governance infrastructure for AP Bay fisheries. As part of this proposed restoration effort SMARRT members will continue their efforts to develop a management plan for the AP Bay fishery, with support and facilitation from UF-ORT, FWC, DACS and ANEER (specifically Specific Aim 5, but addresses Specific Aims 1, 2 3, 4 and 6 as well).

Joe Taylor is Executive Director for Franklin's Promise Coalition. As Franklin County's community coalition, the mission is to improve the quality of life for residents, serve as an advocate for the community and provide a forum for collaborating with service providers, churches, institutions, and volunteers to improve access to quality services and eliminate disparities; streamline and prevent duplication/fragmentation of services; identify unmet needs and determine strategies to meet those needs; educate individuals on challenges, resources and opportunities; promote positive youth development; and serve as the lead agency for Emergency Support, facilitating the Un-met Needs Committee, and serving as the Long Term Recovery Coalition. Designated as a 501(c)(3) corporation in 2002, FPC is highly valued by the community. The Coalition has built strong relationships with regional organizations and has a multi-year history of collaborative projects within the panhandle counties. In the last 15 months, the Coalition has served as the local lead agency for the response to the fisheries failure declared by the US Department of Commerce. Over 400 volunteers have been critical in addressing this crisis through community projects, the A-Hand-Up Volunteer Assistance Program and the SMARRT initiative. Staff and volunteer leaders received recognition in 2013 from the Florida Association of Volunteer Resource Managers and the Volunteer Florida Governor's Champion of Service Award. The Director, staff and Board of Directors are trained in cultural competency, asset-based community development, and nonprofit capacity building. Current programs and services are focused on building meaningful relationships across socio-economic, geographic, and cultural barriers to bridge social capital and strengthen individual and community resiliency. Mr. Taylor's championship of this project is a great asset to this project, as he is committed to facilitating portions of the capacity building efforts related to the AP Bay restoration (Specific Aim 6) and the Buy-it-Back program (Specific Aim 7).

Betty Webb is Administrator for the City of Apalachicola and Lead Facilitator for SMARRT. The City of Apalachicola has been a major supporter and partner for all aspects of the preservation and protection of the AP Bay and River system, and is committed to providing payroll-processing services for this project in coordination with CareerSource Gulf Coast. Ms. Webb has 28 years experience in a leadership capacity with the City of Apalachicola, and will serve as liaison between the CSGC and the City Commission. Ms. Webb has provided facilitation services for SMARRT since it's inception. This role has now expanded into providing assistance to other local seafood-related organizations. Being a life-long resident of Franklin County, she will be instrumental in serving as the local contact for agencies, education- and capacity-building efforts, and coordination for Franklin County stakeholder groups.

PROJECT OBJECTIVE

This project embraces three inter-related constructs: fishery and habitat restoration, monitoring and outcome-driven research to provide science-based management for the AP Bay resource and oyster fishery; and coastal sustainability – ecologically and community-based – past the project period for generations.

Specific Aim 1: Implement large-scale, sustainable restoration of critical oyster habitat in AP Bay through a controlled, science-directed shelling program. This aim represents the largest effort described in this project. This aim is directly supported by monitoring efforts in Specific Aim 2 that covers monitoring of oyster productivity, health & disease and water quality.

Management agencies and UF-ORT reports have investigated multiple factors to discern root causes associated with oyster and other fishery declines in Apalachicola Bay region. These factors included: suboptimal water quality; insufficient substrate for larval oysters to attach and grow; disease, suboptimal health and predation; suboptimal conditions for larval production; and overharvest and management inadequacy. Although multiple factors may have contributed to the current collapse of the AP Bay oyster fishery, extended low river flow and resulting high salinity conditions (with cascading effects on increased disease, predation, etc.), and insufficient substrate are likely the primary limiting factors for restoration of the oyster fishery. While flow from the Apalachicola River is complex, and based on climatic, hydrologic and hydraulic factors, science-based management and substrate/shelling programs can be optimized for current and near-future climate and flow conditions.

Substrate for larval oysters to settle upon and transform into "baby oysters" (spat) is also known as cultch. Natural cultch is composed of oyster shell generated on healthy oyster reefs (or bars) by the normal cycle of living and dying on the reef. Due to the typically high quality and epicurean nature of AP Bay oysters, oysters are harvested but the majority of harvested shell is never returned to the bay, where it can serve as valuable cultch. The natural life cycle of the shells within the Bay's system, therefore, is circumvented due to market demand. Existing, old shell and cultch material on the oyster reefs can become less effective substrate due to biofouling by micro- and macro-organisms (Figure 2a) that prohibits spat from settling and maturing. Further, currents and surge, coupled with intense tonging effort by oystermen, can destabilize and possibly mechanically degrade shell quality over time.

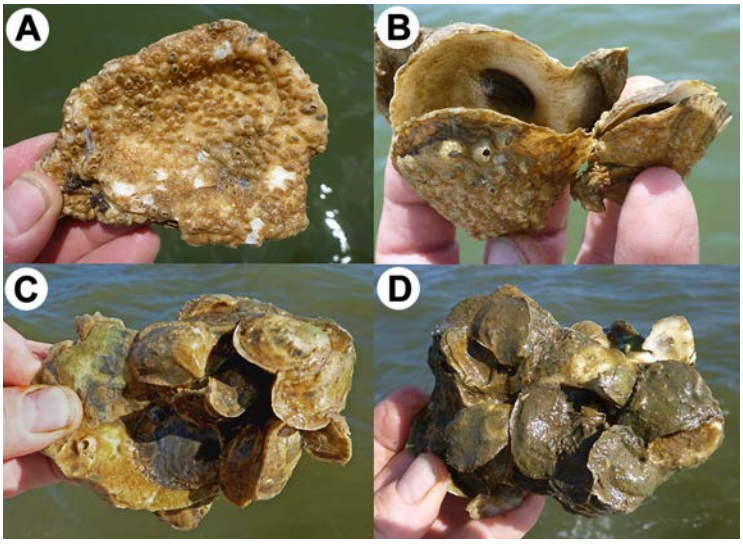

Figure 2. Spat settlement outcomes on recycled shell substrate can vary dramatically based on shell placement, timing, density and survival. **Panel A** shows notable biofouling with barnacles, indicative of high salinity, leaving little settlement space for spat. Bryozoans, hydrozoans and other higher-salinity organisms (not seen in this image) also take up valuable real estate and interfere with both spat settlement and food availability. **Panel B** shows dead young oysters taken from same high salinity area after freshet of freshwater caused rapid salinity change. **Panels C and D** show examples of excellent spat settlement with 15-25 spat per shell. Although observations like these are reassuring, good health, oyster bar stability and survival to reproductive and harvest size requires monitoring to discern the longer-term outcomes.

CSGC will utilize RESTORE Act support to operate a long-term oyster habitat restoration program to replenish oyster beds and foster a sustainable oyster population in Apalachicola

Bay. This is a form of extensive aquaculture whereby effort is put into shelling and relay programs to support the oyster fishery. "Fresh" shells from local processors, and seafood restaurants across the Florida Panhandle will be applied to rebuild existing oyster bars. Based on the large amount of cultch required to functionally restore specific oyster beds, additional substrates will be used as available, including oyster shell from the Franklin County limestone quarry. Placing this critical substrate on oyster bars provides the needed substrate for larval oysters to settle on, have a good "spat set" (Figure 2C & D), and grow to harvestable size. This will also contribute to positive growth in the amount of shell material available as oyster populations increase and naturally die, leaving their shells for future generations to settle and grow.

Plantings of shell substrate ("shelling") will be scheduled annually for the spring months before the summer spat season. CSGC will coordinate with FWC, UF-ORT and seafood workers to secure closure of freshly shelled oyster bar areas in Apalachicola Bay. Based on current models, and assuming that there is not another historic drought or a tropical storm that impacts the bay, these closures will facilitate the replenishment of oyster stock in the shelled areas in a shorter period of time (3-5 years versus 7-10 or more years).

Large-scale application of substrate will be done using two commercial strategies. These include an intensive application approach using a barge and water cannon, and an extensive high volume approach supported by regional oystermen with boats, a transfer barge and a hydraulic clamshell excavator. While these intensive application approaches are needed to affect the large-scale project shelling needs and provide some efficiency of cost, additional precision application by oyster fishers is needed to restore reefs in shallower areas of the bay, and will support, educate and engage the seafood worker community in the restoration process (Specific Aim 5). Active engagement of seafood workers in the restoration process throughout this project also will reduce fishing pressure to a degree probably not possible through regulation. Engagement in the restoration process will provide the needed holistic approach that includes the community in the long-term stewardship of their resource. This process will help to divert fishing pressure to gainful employment during the project period, and for some seafood workers, provide retraining that involves environmental technology and resource management.

Engagement of seafood workers with the shelling and monitoring activities also provides modest, but much needed jobs in the community. With oversight from CSGC and UF-ORT, seafood workers will assist with hand-application of this cultch, and water quality and health monitoring of oyster beds throughout AP Bay. It is intended that this renewed sense of ownership and stewardship by the seafood worker community, along with increased regulation, will address over-fishing concerns that compound the primary issues associated with substrate availability, low-flow, high salinity, disease and predation.

Community engagement, therefore, is paramount to the success of this project (with additional focus in Specific Aim 4). It will provide a nexus between the seafood workers, managers and the academic/research support team, and needed economic stability for those workers committed to the long-term, sustainable goals of this restoration project. All citizen participants contributing to this project must meet eligibility requirements to work on this project under CSGC guidelines.

CSGC has experience in operating shelling programs in which large numbers of seafood workers are screened for eligibility to participate, monitored, and paid for their labor. All seafood workers who participated in the CSGC's shelling project were screened for illegal drug use, required to complete OSHA training, and directly supervised.

While CSGC will provide management and oversight of the large-scale and hand application of cultch substrate, University of Florida scientists will support these activities by working with state management agencies, including FWC, FDACS and DEP, to provide guidance and technical

input based on adaptive management and good science practices, and the best interests of the fishery. State agencies will, of course, ultimately manage the bay and fishery resources during the restoration, and in the long-term.

Guidance on shelling site locations and substrate density will be based on data from UF-ORT's Oyster Situation Report (April 2013[3]), Apalachicola Community Listening Session (October 2014[4]), FWC, SMARRT, and input from NFWF-supported restoration research. *Approximately nine oyster bar areas, 50 acres in size, will be selected for shell treatment in different regions within Apalachicola Bay*. The frequency of shell application will be based on data from initial NFWF studies. Selected areas will be based on salinity and water flow/quality gradients, extending from the mouth of the Apalachicola River and throughout the conditional harvest areas of the Bay.

Much of the experimental data needed to optimize shelling density by location will be made available from the NFWF restoration research project. These important data will guide and inform substrate density application in this large-scale restoration effort. Nevertheless, density of substrate application by region will be evaluated throughout the project period in order to optimize efforts and conserve substrate material.

A modified BACI (before-after control-impact) and proportional differences approach will be used to examine oyster replenishment in shelled and adjacent "control" areas of each treated bar[5]. Oyster bars will be surveyed using standard monitoring techniques already developed specifically for Apalachicola Bay, starting with pre-restoration sampling to represent time=0 for each area restored. Through coordination with FWC and the fishing communities, shell-treated and adjacent control areas will be closed for fishing. Closure enforcement will be provided by project-supported FWC officers by boat, with daily engagement on the water throughout the project. Shell-treated bars will be surveyed quarterly to track spat settlement density, oyster growth, disease, and mortality, cultch condition, and oyster predators. Quarterly monitoring would be done prior to shell re-application at the site in order to retain biological data trends throughout the year. Oyster bars will be monitored based on standardized FWC methodology using trained personnel supervised by the UF-ORT under the direction of Dr. Kane. Although these monitoring efforts will be done in coordination with FWC, UF-ORT oversight is required since current support and personnel cannot be extended through FWC during this project period. This project, however, will provide critical management and biological response data to leverage direct agency efforts in out-years. This same construct is true for fishery regulation/enforcement provided during this restoration effort, with longer-term support to continue in this assigned role as per FWC mission.

As oyster bars achieve a minimum number of legal size oysters per square meter, they will be opened for fishing. UF will conduct bimonthly surveys to track oyster density on these reefs after being opened for harvest. Based on NFWF project data input, reefs will be opened based on the level of restored oyster density. This approach, with monitoring, will also yield critical information on how rapidly oyster reefs recover to harvestable levels.

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[3] Available online https://www.flseagrant.org/images/PDFs/tp200_apalachicola_oyster_situation_report.pdf

[4] Available online http://aquaticpath.phhp.ufl.edu/apbay/ap_listening_session.pdf

[5] [Weller DE, TE Jordan, KG Sellner, KL Foreman, KE Shenk, PJ Tango, SW Phillips, and MP Dubin. 2010. Small Watershed Monitoring Designs: A report prepared for the Chesapeake Bay Program Scientific and Technical Advisory Committee (STAC), STAC Publ. #10-004, Annapolis, MD. 18 pp]; [Lincoln-Smith MP, Pitt KA, Bell JD and Mapstone BD. 2006. Using Impact Assessment Methods to Determine the Effects of a Marine Reserve on Abundances and Sizes of Valuable Tropical Invertebrates. Can J Fish Aquat Sci 63:1251-1266]; and [Conquest LL. 2000. Analysis and Interpretation of Ecological Field Data using BACI Designs: Discussion. J Agric Biol Environ Statistics 5(3):293-296].

Cultch material is becoming increasingly difficult and expensive to obtain, and reef restoration, including "shelling" of cultch continues to be necessary based on the nature of this fishery and the export of native shell material associated with non-local product distribution. It is for this reason that we will explore outcomes using different density and cultch materials in order to realize sustainable, long-term fishery management.

Specific Aims 2, 3 and 4, below, describe the biological and water quality monitoring programs to support the needed understanding of the restoration outcomes. Research scientists from the UF Oyster recovery team, with coordinated input from FWC, will implement these efforts. This multidisciplinary team has been actively engaged in working with the region's oyster fishery, environmental resources, and the seafood worker community that fishes the bay for a living. Data derived from these monitoring efforts will be collected based on FWC protocols for future agency application toward developing a successful adaptive management strategy based on changing environmental conditions.

Specific Aim 2: **Monitor oyster recruitment, health, growth and mortality throughout AP Bay as related to water quality, management and restoration efforts.**

Oyster population density, size distribution frequency and live: dead ratio will be determined on shelled oyster plots in order to discern spat settlement, growth and survivorship based on varying shelling densities and environmental conditions. We will use a standardized tonging method to estimate oyster numbers and sizes of both live and dead oyster. This method will engage 4-6 trained oyster harvesters dedicated to this task (and providing water quality monitoring assistance). Briefly, each oysterman's arm span width, the length of the oyster tongs, the width of the tong rakes, water depth, and GPS coordinates are used to geometrically estimate the area being sampled. Each triplicate sampling effort is then based on the number of minutes and tong hauls ("licks") to harvest 30 legal size (3-inch) oysters (termed "up to 30 count" technique). All oysters (regardless of size) and cultch material that comes up with the tongs is evaluated. The size of each live and dead oyster will be recorded in millimeters. Spat will be counted and measured from both live and dead oyster, as well as cultch.

Initial efforts in 2012-2013 conducted by the UF-ORT demonstrated that this technique is robust, in terms of including all size classes having good within-site repeatability. The repeatability factor is remarkable, based on the substantial heterogeneity of oysters that is common on oyster bars (Figure 3). These data will continue to be evaluated against the "gold standard" using FWC SCUBA methodology to collect oyster from 0.25-meter quadrats.

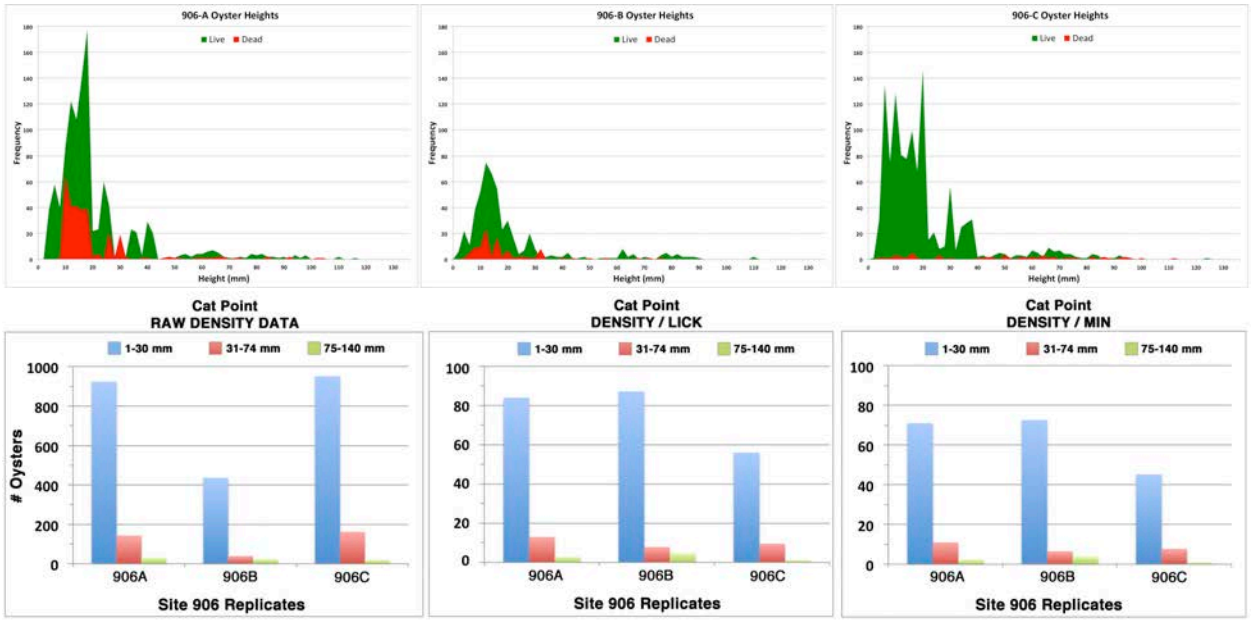


Figure 3. **Top area graphs** show numbers (height of areas) of live (green) and dead (red) oysters collected from triplicate samples (left, middle and right) taken at Cat Point oyster bar in November 2012. There are far more small oysters (i.e., spat) seen on the left in each graph) than larger oysters (more to the right in each graph) associated with a combination of natural and harvest mortality, disease and predation. **Bottom left bar graph** summarizes data from the three area graphs, revealing trends in numbers and size distributions for live oysters. Bottom middle and right bar graphs show the same data normalized by "catch per unit effort," (CPUE) i.e., based on the number of oysters per tong lick (middle graph) and time (number of oysters per minute; right graph). This technique with just three replicates demonstrates excellent accuracy between replicates. Normalizing the data based on CPUE revealed that the density and size distribution of oysters at each of the three replicate sites was statistically not dissimilar (p=0.93).

Advantages of implementing the "up to 30 count" tonging technique is that (a) robust monitoring can be accomplished without the expense and challenge of SCUBA collections, (b) this standardized but random approach may provide more accurate representation of standing crop and population status, and (c) involves use of oyster harvesters engaged in the scientific restoration process – doing what they do (Figure 4).

Figure 4. Harvesting oysters at sunrise. Oysters are raked from the bottom using tongs (like two rakes on scissor-hinged poles). Tonging is a traditional method of oyster harvesting in Apalachicola Bay dating back generations.

Water quality. Water quality sampling at each of the restoration areas will be coordinated through UF-ORT, and conducted by a trained team of scientists and community workers. Recorded parameters will include depth, temperature, salinity, turbidity, chlorophyll and dissolved oxygen data. Data will be amassed continuously using deployed water quality sondes, and hand-held and laboratory bench instrumentation. These data will be used to reconstruct conditions associated with the shelled oyster plots, as best as possible, and will be essential to discern potential differences in oyster growth and health dynamics under varying shelling and water quality conditions.

Due to the dynamic nature of Apalachicola Bay and the importance of salinity for the health and production of oysters, salinity will be monitored on a continuous basis to provide a best representation of conditions at specific shelled locations within the Bay. The Reserve currently maintains 4 water quality sensors that sample temperature, salinity, dissolved oxygen, pH, turbidity and water level at 15-minute intervals. This

interval has been shown to accurately represent the dramatic changes in salinity that may occur over a normal tidal cycle. For this project, it is proposed to primarily monitor temperature and salinity at this resolution to provide an accurate assessment of the influence of Apalachicola River flow on restored areas.

To meet this goal, the Apalachicola National Research Reserve will deploy up to 12 additional water quality sensors for temperature and salinity. The sensors will be installed in protective cages on the bottom to best represent environmental conditions germane to the oysters in that area. Sensors will be switched out every 2-3 weeks to ensure that fouling or battery failure has not occurred. Sensors will be deployed for the duration of the project. Temperature, salinity and water level data will be recorded every 15-30 minutes. These data will be downloaded by the Reserve, maintained in a database, have primary quality assurance checks performed, and provided to other researchers on this project for their use. The Reserve will utilize NERRS System-Wide Monitoring Program protocols that have been tested and accepted by NOAA and the NERR system.

Additional monitoring will be conducted in Gulf County at the restoration sites of Maddox Slough and Gum Drift Slough. This monitoring will discern anticipated outcomes in surface water quality in the Chipola River area that supports the region's unique Tupelo tree stands, and downstream water quality and quantity returning to the Apalachicola River. Water flow and chemistry will be monitored at the confluence of these sloughs at the point of downstream entry back into the Chipola River.

Water quality data amassed from these efforts and throughout AP Bay will be consolidated with complementary data sets collected through UF-ORT and ANERRS project partners. Data will be input into a database for use by Dr. Christman (biostatistician), all project partners for the restoration efforts, the water management district, and the public.

Oyster condition and health. Condition and health of oysters on each restored bar will be assessed quarterly by examining ten to fifteen live oysters from each experimental bar plot. Condition indices will include (1) standard condition (dry weight of meat :: internal shell volume), (2) ranked meat condition (meat volume, translucency/creaminess, uniformity, plumpness), and (3) internal shell disfiguration associated with boring organisms such as *Polydora* worms, *Diplothyra* clams and *Cliona* sponges (Figure 5).

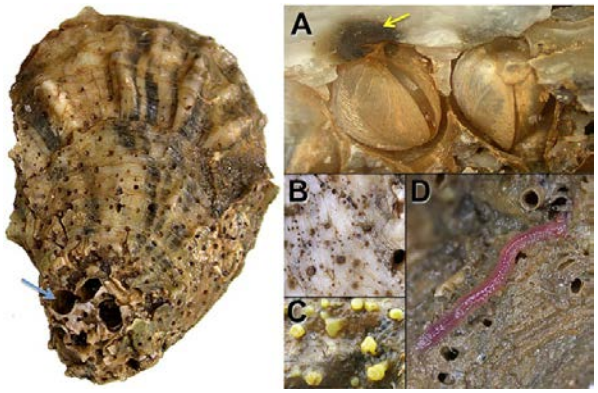


Figure 5. Shell parasites found on and in oyster shells in Apalachicola Bay. Left photo: Whole oyster shell with parasitic damage from boring clams (blue arrow) and boring sponges (numerous small holes). Right photo panel shows: two boring clams at the edge of a shell that was fractured to reveal the parasites. Note the black spot (yellow arrow) associated with the clam's activity on the inner layer of the shell. Close up of exterior shell holes bored by *Cliona* sponge. In life, this sponge organism is yellow and protrudes from the shell holes as shown in panel C. (D) *Polydora* worm. *Photos courtesy A. Kane, UF Aquatic Pathobiology Laboratories.*

Prevalence and severity of the parasitic oyster disease *Perkinsus marinus* (a.k.a. Dermo; Figure 6) will also be discerned as part of routine health monitoring throughout the project. This disease, ubiquitous in Apalachicola Bay oysters at minimal to severe severity (and common in many oyster species globally), is exacerbated by stressful conditions, particularly high salinity, and is associated with oyster die-offs. Preliminary evidence

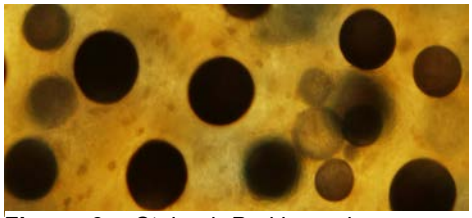
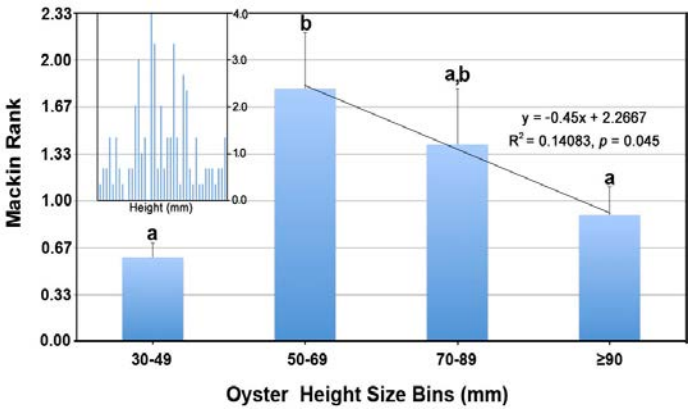


Figure 6. Stained *Perkinsus* hypnospores from AP Bay oyster observed under the microscope reveals the presence and number of parasites in sampled mantle tissue. Scale bar = 100µM. *Photo courtesy A. Kane, UF Aquatic Pathobiology Labs.*

suggests that *Perkinsus* infection in AP Bay oysters is associated with oyster mortality as a function of host size. Figure 7 presents data from 40 oysters sampled from a single site in AP Bay in 2013. Infection severity increases with age/size, and then decreases after oysters reach approximately 60mm height. There is no evidence that infection intensity is reduced over time in healthy oysters, therefore a plausible explanation is that oysters with a higher severity of infection die, and those with lower infection intensities remain part of the sampled data set. The more robust sampling efforts in the proposed study will have sufficient size-specific weighted prevalence data for *Perkinsus*, along with live/dead ratios, to discern actual effects of *Perkinsus* on oyster survival in different environments over time.

Live oysters will be processed for *Perkinsus* using standardized techniques. Briefly, prevalence and severity of the disease will be diagnosed from 0.5 cm sections of mantle tissue incubated in Ray's fluid thioglycollate media (RFTM) with Streptomycin and Penicillin. Infection severity will be discerned by observing stained *Perkinsus* hypnospores using light microscopy.

Figure 7. Weighted prevalence (Mackin rank) for Dermo disease from four size bins of oyster collected from a single site. Large spat and juvenile oyster (30-49mm) had the lowest ranks, whereas the next larger size bin (50-69mm) had significantly higher severity ranks. Thereafter, infection severity decreases as oyster size increases above the 50-69mm size bin ($p<0.05$), suggesting that infection is either cleared with increasing size, or that animals with more severe infections die and are removed from the sample live count. Size bin rank means (± SE) with different letters are statistically different from each other ($p<0.01$). Inset graph shows Mackin ranks for all 40 oysters, revealing a bell-shaped distribution of infection intensities with a middle value at 61mm. Data from Kane Lab.



Condition data, including meat and shell indices (Figure 8), and disease and parasite data, will be amassed in a database along with water quality monitoring data. Condition and health indices will be examined graphically and statistically in order to discern relationships between environmental factors and biological outcomes affecting oyster reef productivity.

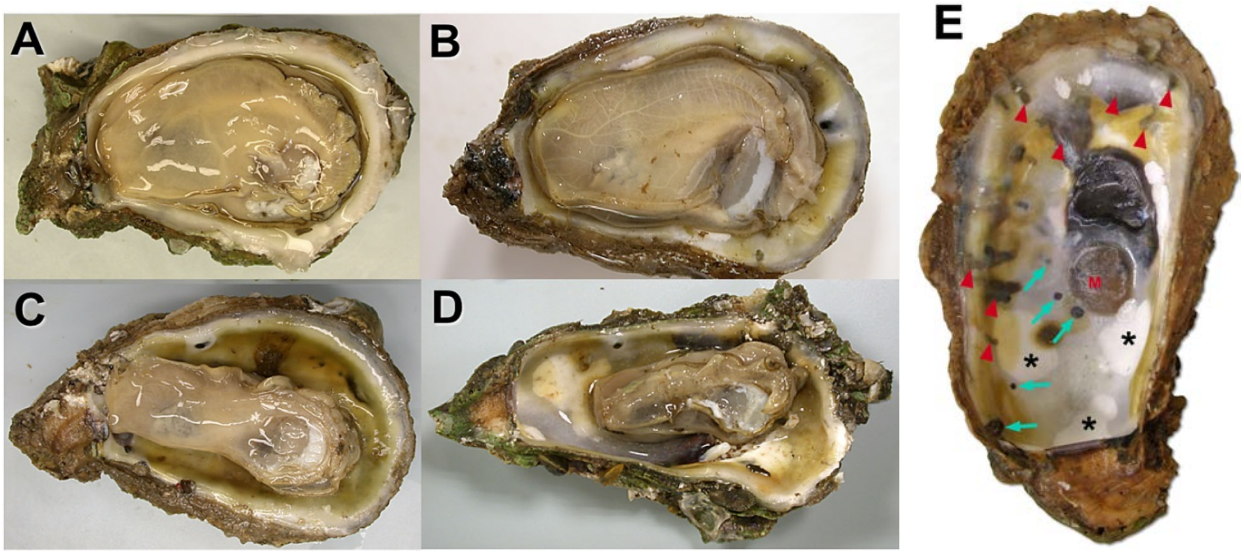


Figure 8. Oyster observations. Images A-D depict examples of varying oyster meat condition index scores. Oysters are photographed and scored on a scale of 1-5 based on physiological and aesthetic variables (see text for description), score of 1 represents a poor quality/moribund animal, whereas a score of 5 would be a "perfect oyster." Oyster meat ranks of 3 and above are considered in relatively good health and "darn nice oysters" for the valued AP Bay oyster half-shell market. Ranked meat scores in Panels A, B, C and D, above, are 4.5, 3.0, 2.0 and 1.0,

respectively. Image E exemplifies marked to severe internal shell damage associated with various parasites. These observations are also scored and analyzed in relation to meat condition, disease and growth as part of the health and health diagnostic efforts. This type of comprehensive monitoring has not been carried out for this important AP Bay oyster fishery to date. Green arrows (→) point to *Diplothyra* clam holes; red arrowheads (►) point to *Polydora* worm tubes; just beneath the "eye" of the shell (site of adductor muscle attachment) "M" reveals a mud blister associated with a *Polydora* worm tube encased by the oyster's defense and deposition of new nacre; asterisks (*) indicate areas of chalky deposits. Careful observation reveals boring *Cliona* sponge holes in between the three asterisks.

Lastly, in an effort to address concerns about potential oyster herpesvirus (Ostreid herpesvirus-1; OsHV-1) impact in AP Bay, we will survey oysters from different regions of the bay for OsHV-1 and closely related viral pathogens. OsHV-1 is a disease agent that primarily affects Pacific oysters (*Crassostrea gigas*) and other commercially important bivalves around the world (OIE 2012). Viral screening as part of the proposed health studies will (a) help to rule in, or rule out, this important pathogen, and (b) provide the only baseline data for this point in time that may be relevant to future studies.

Specific Aim 3: Implement small-scale oyster cage culture experiment to discern feasibility of off-bottom culture, and determine water column effects on production, predation and health of oysters at restoration sites.

Oyster productivity is known to increase, and effects of oyster disease and predation decrease, in association with optimal (mid-range) salinity and greater availability of phytoplankton food resources. In AP Bay, the prospect of off-bottom (i.e., sub-surface) oyster cage culture has appeal for these exact reasons, since average salinity is lower in upper portions of the water column, predator accessibility to oysters would be lower, and phytoplankton food resources should be more readily abundant. There is only anecdotal evidence, however, to support such an enterprise in AP Bay based on (a) biological feasibility, (b) seafood worker acceptance, and (c) existing management resources. Without actual field trials in AP Bay, economics of off-bottom oyster culture appears a challenging prospect[6,7], and is difficult, if not impossible to discern.

This specific aim will investigate off-bottom oyster cage culture on a limited scale, in association with treated (restored) portions of existing bars for generating comparative on-bottom versus off-bottom culture monitoring outcomes. It will also take advantage of available management and enforcement efforts provided through this restoration project. We will deploy triplicate off-bottom cage culture units in three distinct regions of the Bay being restored, with triplicate cage system replication (i.e., 9 areas for within and between region comparisons). Native AP Bay oyster seed will be commercially produced and used for this portion of the project.

Cage systems will be anchored to the bottom over a small portion of the oyster reefs being restored. Cages will be placed such that effects of change in water flow and water quality do not effect productivity on the bottom reef. Appropriate markers and lighting will be stationed with the cage systems to provide sanctioned navigation aid as per US Coast Guard permitting[8]. The Division of Aquaculture, FDACS, will apply for, and maintain, the permit from the US Coast Guard 7th District. Two full-time licensed oyster fishers and 25% oyster aquaculture extension agent effort will be dedicated supporting this specific aim within the project partnership.

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[6] Walton, W. 2013. Development of off-bottom oyster farming gear and methods for the northern Gulf of Mexico. Presented 26-27 September 2013, Introduction To Intensive Oyster Culture Workshop, St. Teresa and Cedar Key, FL (http://shellfish.ifas.ufl.edu/workshop_2013_oyster.html).

[7] Sturmer, L. 2013. Introduction to intensive oyster aquaculture. Presented 26-27 September 2013, Introduction To Intensive Oyster Culture Workshop, St. Teresa and Cedar Key, FL (http://shellfish.ifas.ufl.edu/workshop_2013_oyster.html).

[8] Navigation marking of off-bottom oyster culture leases. FDACS-P-01857.

Water quality parameters as described in Specific Aim 3 will be assessed both on- and off-bottom oyster production; production, health, disease and predation metrics assessed as per Specific Aims 2 and 4. Data will be amassed by UF-ORT faculty and Dr. Christman (project biostatistician) and will be shared with Florida Sea Grant Program oyster aquaculture extension experts and other colleagues focusing on supporting Gulf oyster aquaculture. Experimental cage deployment and data sets amassed will be designed to optimize outcomes in support of discerning biological and ecological feasibility of off-bottom oyster aquaculture in AP Bay.

Specific Aim 4: Build community capacity and shell recycling programs. Project partner expertise to support this aim include Joe Taylor (Franklin's Promise Coalition), and Tracy Irani and Angela Lindsey (UF Department of Family, Youth and Community Sciences).

The sustainability and community capacity components of the project will be delivered through a partnership composed of CareerSource Gulf Coast, Franklin's Promise Coalition, the University of Florida and Florida Sea Grant. Integral to the overall success of the resource restoration, this component will engage the AP Bay community in addressing resource management needs, embrace issues paramount to the Bay's health and continued recovery, increase individual and community resiliency for disaster preparation and recovery, and reduce over-harvesting through labor force diversification, enhanced understanding of the values of a healthy bay ecosystem and regional attitude change.

Franklin's Promise Coalition (FPC), in partnership with the University of Florida, will facilitate capacity-building among three vital stakeholder groups. These groups include Franklin County Seafood Workers' Association (FCSWA), Franklin County Dealers Association (FCDA), and the newly-formed Seafood Management Assistance Resource and Recovery Team (SMARRT).

Efforts within this aim include development and implementation of community education programs to empower seafood harvesters to properly respect newly-shelled and experimental plots within various oyster bars, and launch an oyster recycling program. The final development and launching of an oyster recycling program are also integrated into these capacity building efforts with stakeholders.

Collaborative efforts and resource synergy will yield greater probability of reaching pre-determined objectives and goals. In addition, as these groups work with different segments of the Apalachicola Bay population, access to a larger and more diverse segment of the region is possible. As such, this specific aim will help to develop, monitor and effectively manage project collaborations in partnership with Florida Fish and Wildlife Conservation Commission, Florida Department of Agriculture and Consumer Services, and academic and scientific support through the University of Florida Oyster Recovery Team.

Evaluation of the project will be accomplished by traditional and project-specific assessment measures including curriculum development and implementation; student achievement such as grades, project assignments, testing, retention; satisfaction surveys; responses to research questions and reports; and annual reviews by project leaders and advisory board. Knowledge gained will be shared with the educational community and aquaculture industry through workshops, reports, professional publications, and a robust project website.

The restoration project website will be developed collaboratively through the UF Aquatic Pathobiology Laboratory, and include content development and outreach expertise from UF's Center for Public Issues, Florida Sea Grant, FWC, ANERRS, DACS, SMARRT and others. Project partners roles, objectives, approach(es), results and conclusions will serve as content for a dedicated website maintained through the University of Florida. Content will be developed at the 8th grade reading level and be graphically-driven to maintain interest and foster viewer interaction and understanding. These constructs will facilitate a visually appealing, content-rich outreach opportunity that will be of value to multiple audiences including managers, scientists, politicians, educators, students, seafood workers and the general public.

Implement and optimize landscape-scale shell reclamation program associated with panhandle oyster harvest resale. To facilitate the necessary interactive relationship between the Franklin County Dealers Association and Franklin County Seafood Workers Association, this specific aim focuses on engagement with the SMARRT group, representing both dealers and harvesters. This engagement takes the form of the "Bring it Back" (BIB) program that will return Apalachicola Bay oyster shells from retail locations to the waters from which they were harvested. SMARRT will develop and implement the oyster shell recycling program through partnerships with regional seafood retail outlets. The reclamation of shell is expected to result in less overall expense for shelling restoration efforts, and use of native substrate on the bars.

The University of Florida team will provide educational programming on the restoration work being done and its benefit to the community. Environmental education content focused on bay/oyster bed restoration will be developed and delivered to the community through SMARRT meetings and organized, regular community meetings. Programs will highlight the BIB project and importance of the program to restoring the Bay. Programs will be held monthly and will rotate between regional counties. University of Florida will work closely with project and community partners on developing content and participant recruitment for the BIB program. Programs will also be implemented so as to dovetail with ongoing events related to Apalachicola Bay environmental education. In addition to educational programs, educational outreach products, in-store/restaurant displays, tabletop pieces, key messages on menus, etc. will be distributed to program partners and seafood retail outlets participating with the BIB program.

The final piece to this objective will be the responsibility of the CSGC. Labor force diversification is intended to relieve the pressure on the fishery by training workers for non-harvesting occupations. Currently, academic basic skill levels among the population are low (the illiteracy rate among adults aged 25 or older is above 40%); so raising skill levels is imperative before we can begin to retrain. CSGC will continue to work with the Franklin County School District to increase these skill levels using a mix of grant and other funds. The CSGC will administer federal funds for employment and training activities, including training eligible citizens for demand occupations. The CSGC has a long-standing partnership with Gulf Coast State College (GCSC) and has worked with them in the past to stage classes for Franklin County. The remoteness of Franklin County to the nearest training institution (two hours drive time to Panama City's GCSC or to Tallahassee's state college) necessitates creativity and additional effort to affect the delivery of training. Although GCSC has a satellite campus in Port St. Joe (30 minutes from Apalachicola, one hour from Carrabelle), the population of students isn't large enough to warrant the regular offering of vocational training suitable to the seafood harvesters' needs or abilities. The CSGC arranged for a skill-specific welding course to be started at GCSC in late 2012 and spring of 2013 to provide workers with needed, portable skills. The CSGC has also offered on-the-job training to encourage employers to hire individuals who may not be perfect skill matches in exchange for wage subsidies.

Specific Aim 5. **Provide ecological restoration of key watershed areas in Gulf County relative to AP Bay productivity and restoring the region's unique Tupelo trees.** This aim will r*e-open key watershed surface drainage sources, Maddox Slough and Gum Drift Slough, to enhance needed water and nutrient flow supportive of AP Bay productivity and native Tupelo tree stand restoration.*

Gum Drift Slough and Maddox Slough (Figure 9), located in the northwestern portion of Gulf County (see map, Figure 1), provide unique surface water drainage into the Apalachicola River Basin. These drainages resources, however, have been severely degraded. The mouths of both sloughs have been blocked with sand and debris, preventing drainage and flow through the Tupelo Gum mud flats. These mud flats, in turn, drain into the Chipola River, an important

tributary of the Apalachicola River. The nutrients from the mud flats filter into AP Bay and provide critical nutrients to support oyster growth, and the development of healthy oyster beds.

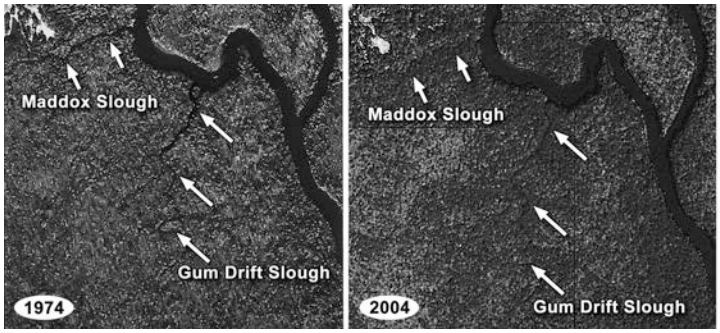

Figure 9. Aerial surveillance images of Maddox and Gum Drift sloughs from 1974 and 2004. Both sloughs are fed from the Chipola River, and subsequently meander through surface woodlands and historic Tupelo tree stands, prior to rejoining the Chipola that drains into the Apalachicola River. Manipulation of these waterways in this timeframe has all but closed the mouths of these important sloughs, with reduced overall surface flow and nutrient contributions downstream into Apalachicola Bay. Arrows provide scaled reference points for both sloughs on the two maps.

Healthy mud flats provide habitat for Tupelo forests that provide the unique blooms that lead to the region's production and sales of the renowned Tupelo honey valued at $9,000,000 to $14,000,000 annually. An annual festival celebrating the product draws approximately five thousand visitors to Wewahitchka each May.

Figure 10. Tupelo gum trees (*Nyass ogeche*) in Gulf County are renowned for their blossoms that attract bees to produce world-famous tupelo honey. The Tupelo tree blossom starts out as a round bud, about the size of a small pea. It then swells into what looks like a miniature cauliflower. Finally, it explodes with dozens of little spikes. The nectar is at the base of each spike. Pollen and nectar gathered by bees tended by generations of farmers in the region yields the honey product that is light, unique and delicious. The fructose:glucose ratio is so high in this varietal honey that it will not crystalize. Each year the demand for Tupelo honey increases.

Gum Drift Slough and Maddox Slough have historically provided nutrient-rich water to the Apalachicola Bay via the Chipola River. These vital surface water features have been nearly drained due to dredging done by the Army Corps of Engineers between 1940 and 2005. These dredging efforts disrupted the flow of water through these important sloughs and deprived downstream nutrient flow and critical freshwater sustenance for the area's Tupelo tree stands. We propose to re-open the mouths of these two sloughs through a gradual effort of human and natural interventions. Using a barge and a backhoe, workers will begin the process of removing blockage caused by the dredging. The restoration will be gradual to allow for a natural shaping of the rejuvenated slough. This approach is the method recommended by the Apalachicola Riverkeeper.

CONNECTIONS TO STRATEGIC GOALS:

Restore and Conserve Habitat. The application of substrate to oyster reefs will restore habitat for oysters and marine life that also depends on that environment for survival. The reclamation of oyster shell will provide a low cost alternative to the purchasing of cultch and contribute to long-term maintenance of the oyster fishery. Water quality and oyster health monitoring throughout the project period will provide needed data relative to resource dynamics reflected by watershed hydrology, flow, climatic conditions, and management.

Restore Water Quality. Increasing the amount of reef substrate is expected to increase the Bay's population of oysters. Mature oysters can filter 30-50 gallons of water per individual per day. This filter-feeding provides essential algal nutrition for the oysters and helps to control water column nutrients and algae, reducing the likelihood of algal blooms and hypoxia in the system. It will also help to increase water clarity to restore sea grass beds.

Replenish and Protect Living Coastal and Marine Resources. Reduced harvest pressure on the fishery, alongside labor force diversification and community development (Specific Aims 5 and 6) will support the replenishment of oyster, crab, and juvenile fish stocks, and reduce overall harvest pressure on the fisheries.

Enhance Community Resilience. CareerSource Gulf Coast's efforts to diversify the workforce through job training will reduce the segment of the county dependent on the AP Bay for their livelihood. Currently, fishery failures due to drought or storms cause catastrophic impact on the local economy. Developing the infrastructure of local stakeholder groups is expected to create a community change in attitudes towards managing the resources of the Bay thoughtfully with long-term health of the economy in mind.

Restore and Revitalize Gulf Economy. Tourism and seafood are the two pillars of the coastal Gulf economy and interdependent on each other. The efforts of this project are intended to develop a scientifically-based method for substrate restoration that determines the amount of cultch needed for the maximum return on investment. During that process, dislocated seafood workers will be paid to participate in the laying of substrate, assist University of Florida staff in sampling test areas, and clean fossilized cultch. CSGC will provide training for entrepreneurial, GED, and occupational skills to facilitate the movement of the labor force towards non-harvesting occupations. While the former will increase (or restore) the spending ability of displaced seafood workers, the latter will help direct those who are interested (and capable) to occupations less directly dependent on the Bay. The movement of a segment of the harvesting population towards other occupations will, in addition to reducing fishing pressure on the Bay, introduce a more stable spending pattern from workers on a regular pay schedule.

ESTIMATED PROJECT COSTS *(Describe estimated costs of the project, including assumptions for contingency and ongoing operations/maintenance. Identify other secured funding sources such as matching funds, in-kind contributions or state/federal dollars. In addition, if possible, complete and submit the Cost Appendix Sheet associated with this Form)*:

Total estimated project costs for all aims over 5 years is $32,544757. This includes support for large-scale fishery restoration in Apalachicola Bay and related resources in the ACF Basin, science-based monitoring, management and training, and community engagement critical for resource restoration that can be sustained for generations. The estimated budget breakdown is provided below:

Resource Restoration in Apalachicola Bay and Florida's Big Bend Region Estimated 5-Year Project Costs:	YR01	YR02	YR03	YR04	YR05	TOTAL
OYSTER Fishery Restoration (Specific Aims 1-3):						
Cultch (shell material)	$1,375,000	$1,375,000	$1,375,000	$1,375,000	$1,375,000	$6,875,000
Hand application (labor)	1,501,500	1,501,500	1,501,500	1,501,500	1,501,500	$7,507,500
Hand application equipment	240,000	240,000	240,000	240,000	240,000	$1,200,000
Aquaculture cage systems, supplies, permitting	110,000	40,000	40,000	40,000	40,000	$270,000
Watermen (4@50%) to work cage culture systems	149,700	149,700	149,700	149,700	149,700	$748,500
Enforcement (Private)	191,625	195,458	199,367	203,354	207,421	$997,224
Administration/staffing	130,000	130,000	130,000	130,000	130,000	$650,000
Watermen (8@50%) for water quality & biology	239,400	255,360	255,360	255,360	255,360	$1,260,840
Water Quality Technician	43,887	44,764	45,660	46,573	47,504	$228,387
Water quality materials and misc	5,000	5,000	5,000	5,000	5,000	$25,000
Boat Time ($200/day * 30 days)	6,000	6,000	6,000	6,000	6,000	$30,000
Water quality sondes and cages (24)	70,000	0	0	0	0	$70,000
Research boat, trailer & maintenance	65,000	4,500	4,500	4,500	4,500	$83,000
Research van, insurance, maintenance	46,500	3,500	3,500	3,500	3,500	$60,500
Oyster Fishery Restoration Subtotal:	**$4,173,612**	**$3,950,782**	**$3,955,586**	**$3,960,487**	**$3,965,485**	**$20,005,951**
Shell Reclamation (BIB Program) and Community Capacity-building Projects (Specific Aim 4):						
Staffing	52,000	53,560	55,167	56,822	58,526	$276,075
Office /Operation Expenses	10,000	10,000	10,000	10,000	10,000	$50,000
Transportation	10,000	10,000	10,000	10,000	10,000	$50,000
Travel	5,000	3,000	3,000	2,500	2,000	$15,500
CSGC Travel	10,000	10,000	10,000	10,000	10,000	$50,000
SMARRT Support	22,500	22,500	22,500	22,500	22,500	$112,500
Betty Webb (SMARRT Facilitator)	15,000	15,000	15,000	15,000	15,000	$75,000
Shell Reclamation & Franklin Co Subtotal:	**$124,500**	**$124,060**	**$125,667**	**$126,822**	**$128,026**	**$629,075**
Gulf County Restoration (Specific Aim 5):						
Gulf County (In-county; monitoring costs thru UF)	927,776	657,526	688,576	0	0	$2,273,879
Gulf County Subtotal:	**$927,776**	**$657,526**	**$688,576**	**$0**	**$0**	**$2,273,879**
Research Support (UF Oyster Recovery Team):						
UF Oyster Recovery Team (Specific Aims 1-4)	1,228,280	1,065,145	1,093,800	1,079,086	1,111,153	5,577,463
UF Oyster Recovery Team (Specific Aim 5)	111,750	97,500	100,425	103,438	106,541	519,654
UF Oyster Recovery Team Subtotal:	**$1,340,030**	**$1,162,645**	**$1,194,225**	**$1,182,523**	**$1,217,694**	**$6,097,117**
PROJECT SUBTOTAL	**$6,565,917**	**$5,895,013**	**$5,964,054**	**$5,269,832**	**$5,311,206**	**$29,006,022**
Contingency (2%)	$131,318	$117,900	$119,281	$105,397	$106,224	**$580,120**
Subtotal including contingency	$6,697,236	$6,012,913	$6,083,335	$5,375,228	$5,417,430	$29,586,142
CareerSource Gulf Coast IDC (10%)	$669,724	$601,291	$608,334	$537,523	$541,743	**$2,958,614**
PROJECT TOTAL	**$7,366,959**	**$6,614,204**	**$6,691,669**	**$5,912,751**	**$5,959,173**	**$32,544,757**

OTHER FUNDING *(Indicate if the project is submitted for any potential funding or if it may be used to leverage additional funding, if so please describe the funding source [e.g. State/Federal Grants])*:

Complementary portions of the proposed restoration efforts in Specific Aims 1-5 will be supported by a grant from the National Fish and Wildlife Foundation (NFWF). This NFWF project will be led by the Florida Fish and Wildlife Conservation Commission (Jim Estes, RESTORE project partner), in partnership with UF-ORT and FDACS, and its outputs will support the broader, regional-scale RESTORE Act proposal efforts. The NFWF project includes small (up to 18 acres), experiment-scale shelling at different densities, locations, and with different levels of fishing pressure in order to identify the optimal approaches for large-scale shelling in different areas of AP Bay to obtain sustainable oyster bars. In addition, a NRDA award to Florida Department of Agriculture and Consumer Services was funded for a small shelling restoration effort in Apalachicola Bay. CSGC has received a Fishery Failure grant from the US Department of Commerce via the state of Florida that is currently supporting a shelling project. Pending the timing of RESTORE Act support, the Fishery Failure award will supplement a small portion of Specific Aim 1 by helping to secure valuable, locally-available substrate for the shelling efforts.

TECHNICAL FEASIBILITY *(Describe the technologies involved and any relevant past experience or proven success with similar projects)*:

Oyster reef restoration in AP Bay has enjoyed various degrees of success over the past 30 years, based largely on the amount of oversight and monitoring provided (like most oyster fisheries). CareerSource Gulf Coast has successfully administered large-scale shelling and relaying efforts in AP Bay, documenting the importance of oversight and monitoring, and has demonstrated capacity to provide needed oversight for shelling and restoration projects in AP Bay. We look forward to the science-based management of this proposed project to gain needed insights relative to optimizing substrate application rates based on environmental and management considerations, and strategies for sustainable return on investment.

Restoration of Maddox and Gum Drift sloughs will restore ecological balance to important wetlands in the Chipola River watershed. Making these sloughs functional again will promote the health of the tupelo forest; and add critical freshwater and nutrients downstream through the Chipola and Apalachicola Rivers that will have a positive effect on the Apalachicola Bay fishery.

ENVIRONMENTAL BENEFITS *(Describe the nature, magnitude, and timing of any environmental benefits attributable to the project. If possible, describe potential environmental performance measures [e.g. pollutant reduction]. Please address any potential environmental impacts associated with implementing or maintaining the project [e.g. loss of a habitat or conversion of habitat from one type to another during implementation])*:

In addition to the benefits directly related to the oyster industry and spin-off economic benefits for the local community, this project has large-scale environmental benefits. Oysters act as a natural filtering device near the mouths of rivers entering the Gulf, removing particulate material (phytoplankton) from the water that contains nutrients, and depositing it on the bottom in a relatively inert form. They also sequester a large amount of carbon into long-lasting shell material that can be used as substrate for future restoration projects in this and other regions of the Gulf. Oysters bars provide habitat for a large number of organisms including juvenile fish of many species important to the Gulf ecosystem.

Oyster bars also provide coastal protection along Florida's Gulf Coast by dissipating wave energy. The community of Apalachicola, occurring at a low elevation relative to mean sea level, is particularly susceptible to waves and surge during storms – healthy reef structure attenuates some of this impact, providing ecological resilience and stability.

Restoration of Maddox and Gum Drift sloughs will restore ecological balance to important wetlands in the Chipola River portion of the watershed. Re-functionalizing these sloughs will promote the needed health of the Tupelo forest, enhance and stabilize the regional bee (pollinator) population needed for the health of the region, and provide fresh water and nutrients downstream through the Chipola and Apalachicola Rivers. Increased nutrient-rich freshwater flow will have a measured, positive effect on the Apalachicola Bay fisheries.

ECONOMIC AND SOCIAL BENEFITS *(Describe economic and social benefits including those related to the project's improved ecosystem services and any estimates on jobs created or preserved)***:**

Previous shelling efforts have yielded cost benefit ratios of 1:3.5 within two years with a projection of 1:9.2 after five years. *We anticipate that this project's oversight and monitoring efforts will support restoration outcomes with a cost-benefit ration of closer to 1:20*. Immediate dollars in the pockets of seafood workers performing restoration, aquaculture and water quality monitoring work will go directly into the local economy. Long-range efforts such as labor force diversification, drop-out prevention, and community development are expected to increase the economic and social stability of the region's citizens. Labor force diversification will mean the end of the "feast or famine" lifestyle of the families that take advantage of job training provided by CareerSource Gulf Coast. Keeping young people in school will reduce the number of students that drop out to work on the bay. Exploration of educational opportunities provided through Specific Aim 4 and Sea Grant Extension efforts dedicated to informing and engaging the community in this project, will encourage some students to consider other occupations that will allow them to work on the water in non-harvesting jobs.

It is expected that the described efforts will impact the region well past the project period – to ensure future generations of thriving coastal communities, and a strong and more diverse regional economy. While this project primarily focuses on the restoration of the heritage oyster fishery in AP Bay, it will also provide an immense benefit to related regional industries, particularly the seafood industry. *Apalachicola Bay shrimpers average more than a million pounds per year, nearly 20% of the state's shrimp supply. The AP Bay fishing community also produces nearly 10 percent of the hard-shell blue crabs landed in Florida.* Other tourism sectors including recreational fishers, birders, scallopers, sea turtle watchers will also enjoy the benefits of the successful AP Bay restoration, as these sectors are directly tied to the health of the bay ecosystem.

The project also creates up to 75 jobs in Gulf County. It is anticipated that the results of this restoration project will increase the profitability of the Tupelo Honey makers by restoring the Tupelo forest habitat. Further, this region is home to some of the top beaches in the *country*[9], where AP Bay restoration and marketing will boost visitor numbers, and increase tourism dollars coming into the region.

[9] Gulf County ranked #1 in the nation by Dr. Stephen Leatherman (aka *Dr. Beach*) for 2002 (http://www.drbeach.org/top10beaches.html).

COMMUNITY RESILIENCE *(Describe if the project assists Florida's ability to anticipate, withstand, or recover from hazards or threats [e.g., hurricane preparedness, establishing living shorelines])***:**

This project emphasizes collaboration, stakeholder engagement and maximizing resources for the *effective and sustainable long-term benefits*. The proposed objectives and aims will foster and further develop relationships between communities, organizations, and agencies; uniting local, regional and state resources. *These relationships provide resiliency and access to resources that, in turn, will build capacity within effected populations during and after disasters.* The project provides unique opportunity for a broad range of interests to work collaboratively to develop best management practices for AP Bay. Collaboration between project partners serves as the foundation for proactive future projects focused on natural and man-made disasters. In addition, restoration steps within this project will provide partners with information and tried-and-tested tools that will help in preparing for future disasters in the Bay. By involving stakeholders, teaching best practices and engaging them with managing agencies, the long-term management of the Bay will be optimized and economic stability for the region will be stronger in the event of crisis.

Support of community-based organizations that represent the stakeholders of Apalachicola Bay and their support systems, specifically but not limited to SMARRT, FCSWA, FCDA is critical to long term community resiliency. Jobs and vocational training in Franklin and Gulf counties will provide jobs and needed opportunity for the region. Collaborative efforts combine resources, increase capacity and improve probability of reaching pre-determined objectives and goals. As these groups work within and across the different segments of the Apalachicola Bay population, the strength of a larger, unified and more diverse group will enable the community to respond and recover. Working with these organizations allows for two-way communication with valuable stakeholders of Apalachicola Bay.

CONFLICTS OR COMPLEMENTS TO EXISTING EFFORTS *(Describe any ongoing activities in the project implementation area, if the project is part of another plan, and why the project does or does not interfere with that work. Please consider how the project may complement existing local, regional, and state efforts/plans/objectives)***:**

No conflicts. Complementing the proposed efforts, CareerSource Gulf Coast has been working closely with the City of Apalachicola, Franklin and Gulf County Commissions, and FDACS on smaller restoration projects, and a small-scale version of this proposed project. NFWF and NRDA support will provide complementary support for the proposed efforts (see previous section on *Other Funding*).

COMPLIES WITH FEDERAL, STATE, LOCAL, AND TRIBAL LAWS/REGULATIONS *(Describe any concerns or potential conflicts)***:**

Franklin County: In order to conduct the restoration in an adaptive management framework, it will be necessary to have new rules in place regarding the spatial and temporal aspects of oyster fishing. The Florida Fish and Wildlife Conservation Commission sets and enforces these rules, and has indicated that they will support this project through both rule adjustment and enforcement actions.

Gulf County: There are no concerns, permitting notwithstanding, regarding applicable laws and regulations.

READINESS FOR IMPLEMENTATION *(Describe if the project has had any design or permitting work started or completed [attach permits or design work]. Please address any issues that may delay start or finish of the project)***:**

Franklin County: Franklin County partners can launch grant activities within a month of notice of funding. Infrastructure within CSGC is in place to continue efforts with Franklin's Promise Coalition, SMARRT, ANEERS and the City of Apalachicola based on other recent and ongoing projects. This would include securing functional liaisons with the other project partners including UF-ORT, FDACS and FWC.

Gulf County: Slough restoration will require permitting, surveying, and engineering, which may take 6-12 months.

PUBLIC ACCEPTANCE *(Describe any known or potential public approval or opposition to the project)***:**

Franklin County: This project expands on existing efforts by the primary partners. These efforts have been accepted by the population.

Gulf County: The importance of the Tupelo forest to the citizens of Gulf County cannot be understated, and is reflected by the annual Tupelo Honey Festival. The prospect of new employment opportunities in this small county is always welcome.

ADDITIONAL INFORMATION YOU WISH TO PROVIDE *(Please include any maps, designs, drawings, photos, or background resources that may assist in completely and accurately understanding the project)***:**

This project focuses on regional restoration needs along the Big Bend coastline of Florida that directly address critical strategic goals of the Gulf Coast Restoration Plan. These needs were identified by county commissions and citizen groups and described to Gulf Coast Workforce Board in the >12 months of proposal development time leading up to this submission. As such, the proposed ecological efforts range from beach renourishment and surface waterway restoration associated with native Tupelo stands and downstream nutrient enrichment, to large-scale fishery and resource restoration in Apalachicola Bay. These projects were selected based on greatest ecological restoration yield per dollar invested, and potential sustainability of project outcomes.

Franklin County: Viability of the specific aims described in this project, and the expected sustainability of outcomes, is based on technical feasibility and the commitment of multiple stakeholders at the project table, working together. The work plan includes collaboration with state agencies, county commissions, seafood workers and academic experts to support science-based restoration efforts along the Big Bend portion of Florida's Panhandle. Florida Fish and Wildlife Conservation Commission (FWC) is the state agency responsible for both resource management and enforcement. Florida Department of Agriculture and Consumer Services (FDACS) is responsible for overseeing the AP Bay oyster harvests relative to public health. Florida Department of Environmental Protection, through its Apalachicola National Estuarine Research Reserve, ANERRS, monitors the status of this national reserve at various levels within the resource. Input from the Water Management District will also be included. Collaborative efforts within this project will provide needed assistance to the resource managers in order to functionally support their roles in restoring and sustainably maintaining the AP Bay resource, and to monitor longer-term outcomes of restoration efforts in Gulf County.

Thanks to initial efforts supported by the Franklin County Seafood Workers Association, the Franklin County Dealers Association, the UF Oyster Recovery Team, Franklin's Promise Coalition, and the city of Apalachicola, the Seafood Management Assistance Resource and Recovery Team, SMARRT, was organized and has engaged in consensus-based stewardship issues regarding the AP Bay fisheries. Through SMARRT, state agencies (FWC, FDACS and ANERRS) and the UF Oyster Recovery Team have been participating in community discussions about the AP Bay resource – reopening a critically-needed dialog to build trust and functionally

share the burden of informed management of the oyster fishery. This exciting evolution of multi-stakeholder involvement is key to the success of Objective 1, based on the need for sustainable outcomes in a dynamic environmental and political climate.

The collaborative physical restoration and monitoring efforts associated with the Apalachicola Bay oyster fishery will launch a new era for sustainable management of this heritage resource. It will provide a model for monitoring critical environmental variables associated with sustained restoration and will discern degrees of success in different regions based on shelling densities, application methods, and physical, environmental and management factors. Such monitoring approaches and outcomes will have application for future oyster restoration efforts in the Gulf of Mexico, Chesapeake Bay, and elsewhere.

Gulf County: Environmental restoration in Gulf County will ameliorate anthropogenic perturbations. Dredging of Maddox and Gum Drift sloughs has, over time, nearly destroyed these two vital surface drainage features. Restoring these sloughs to health using human and natural methods will support efforts to increase Tupelo forest habitat and replenish Apalachicola Bay's decimated oyster population. This restoration effort is expected to be a one-time investment that will result in improved health of the gum flats, stability of regional pollinators, as well as providing freshwater and necessary nutrients back into the Chipola and Apalachicola Rivers, and into Apalachicola Bay.