Western
Garcon Point
Project

Project Summary

Applicant Organization: Bay Area Resource Council/ West Florida Regional Planning Council.
Project Title: *Recovery Act restoring Western Garcon Point Shoreline with Oyster Breaks and Shoreline Vegetation.*
Site Location: The site is located at the southwest end of the Garcon Point peninsula just west of the northern bridge abutment. The area consists of a county property with a boat ramp, 800 linear feet of county road and eleven single-family residences on the opposite side of the county road. The site is approximately 6.3 acres with approximately 1260 linear feet of shoreline and is located in Section 3, Township 2S, Section 28W, Latitude: 30 26' 40" N Longitude: -87 06' 06" W. The roadway has been rebuilt and the shoreline hardened numerous times after storm events.
Land Owner(s): Santa Rosa County, Florida
On-the-Ground Implementation Start Date: May 27th, 2012 – May 26th, 2014.
Number/types of jobs created or maintained, labor hours/anticipated duration for each:

Type of job/Title	Positions (NO.)	Labor hrs	Duration of position
Project Manager	1	960	12 months
Biologist	1	960	12 months
Videographer	1	1797	12 months
Breakwater Construction	24	480 hrs each	60 days
Barge-Crane-Bobcat	1 each	480 hrs each	60 days
UWF Monitoring	2	1044 ea	12 months
Biological Monitor	1	480	60 days
Total jobs stimulated	**33**		

Coastal and marine habitats to benefit from the project: Many estuarine species, including those harvested recreationally and commercially are dependent on protected shallow water habitats as nursery and forage areas. Oyster reefs and marshes are well known to provide this type of ecosystem support. In addition, biotic and abiotic filtration from reefs and marshes has been documented to improve water quality. Species of special concern that would utilize the living shoreline include the Least Tern *(Sterna antillarum),* and Gulf Diamondback Terrapins (*Malaclemys centrata*), and Atlantic Gulf Sturgeon *(Acipenser oxyrhynchus.* Storm waves and storm surges have prompted hardening of the shoreline on Garcon point by both Santa Rosa County and private landowners. This project on the Santa Rosa County boat ramp property and its approach road will restore the littoral and nearshore shallow water habitat utilized by numerous estuarine species. It will also establish a visible example of living shorelines as an alternative to shoreline hardening for protection of shoreline property by landowners further north along this shoreline and elsewhere.

Project Scope, Project Outputs/Outcomes, and Project Timeline

Task 1: Oyster Reef Creation/Breakwater
Technique: The 5x5x5x30" high triangle oyster reef units will be spatially distributed to allow for Atlantic Gulf Sturgeon *(Acipenser oxyrhynchus)* movement, flushing, habitat diversity, and not to impede navigation. Quarterly monitoring will be conducted on oyster reef spat settlement and reef biodiversity.
Outputs: To create oyster reefs/breakwaters in an effort to provide a habitat for resident species of shellfish and finfish, providing feeding resources for transient fishes, and improved water quality via the filter-feeding bivalves. In addition, the oyster reefs/breakwaters will provide erosion prevention and stabilization along the shoreline.

Outcomes: Creation of oyster reefs/breakwaters will provide economic benefits to local residential & commercial fishing with the harvesting of fish& crab from the reefs/adjacent areas. In addition, the deflection of waves and wave energies will protect shorelines and inland waters from erosive forces, and promote sedimentation and establishment of submerged aquatic vegetation within the project site.
Timeline: Construction will between May- September due to Gulf Sturgeon Migration. Construction shall take between 30-45 days. Monitoring for success will precede and continue during and after construction.
Task 2: Shoreline Vegetation/Erosion Control: Approximately 1,260 linear feet of shoreline will be planted with emergent vegetation.
Technique: Where possible, planting will occur close to the shore along a gentle slope to allow for the plant's maximum nutrient absorptive capacity. All plantings will be done by hand. Vegetation will be planted on 18-inch centers and spatially distributed. Quarterly monitoring of shoreline vegetation will be conducted to ensure successful survival and growth. Additional planting will occur as needed.
Outputs: To plant emergent vegetation along the shoreline in order to stabilize the soil while protecting it from waves and erosion. In addition, the planting of vegetation will promote the establishment of Best Management Practices (BMPs) of soft alternatives using natural vegetation for shoreline protection as an alternative to hardening of the shoreline.
Outcomes: Natural vegetation will assist in the uptake of nutrients and/or pollutants from runoff thus preventing these components from entering the waterbody thereby contributing to improved water quality. In addition, the natural vegetation will establish and provide shelter and food for wildlife as well as supporting spawning beds for fish.
Timeline: Vegetation will be established within a two-year period. Monitoring for success will precede and continue during and after planting.
Task 3: Restoration of littoral slope: Approximately 1,260 linear feet of the littoral zone will be restored to natural conditions.
Technique: Emergent vegetation will be planted behind existing riprap and allowed to stabilize before removing the riprap.
Outputs: To increase the abundances and diversity in benthic and the water column communities.
Outcomes: The restoration of this area will reestablish itself as an important transitional zone for water purification and serve as habitat for aquatic plants, fish, bird, insects, and other aquatic life.
Timeline: Removal of riprap and restoration of the littoral zone will occur within a two-year to four-year period.
Permits and Approvals: A pre-application meeting was held on Friday, March 27th. The planting of emergent vegetation meets the criteria as set forth in 18-21.005(1)(c) 5, F.A.C. (Florida Administrative Code) Forms of Authorization, Letter of Consent for use of Sovereignty Submerged Lands. The applicant will obtain a Standard Short Form Permit as outlined in 62-312.060, F.A.C. from Florida's Department of Environmental Protection. In addition, planting along the shoreline for shoreline stabilization, would qualify for a Nationwide (NW) 13 under the jurisdiction of the U.S. Army Corps of Engineers. Oyster Reef/Breakwater creation will possibly require a NW 4 and/or 27 from the U.S. Army Corps of Engineers.

Federal Funds Requested: $1,183,790.00, **Non-Federal Match Anticipated:** $47,750.00
Overall Project Cost: $1,231,540.00

Project Narrative

The Western Garcon Point Project is located within the Garcon Point Peninsula Santa Rosa County, Florida. The Peninsula lies between East Bay and Escambia Bay. The eastern portion of the peninsula includes the Yellow River Aquatic Preserve that encompasses 17,000 acres of state-owned submerged lands. The southern portion of the peninsula includes approximately 3,245 acres of land currently owned by the Northwest Florida Water Management District.

The Northwest Florida Aquatic Preserves (NWFLAP) office, an entity of the State of Florida's Coastal and Aquatic Managed Areas (CAMA) is currently seeking funding for a project located within the Aquatic Preserve that utilizes creation of an oyster reef breakwater, submerged aquatic vegetation, and tidal marsh habitat. This project site is located within East Bay.

The Western Garcon Point Project is located within Escambia Bay, which is fed by the Escambia River. The southern westernmost portion of the peninsula belongs to Santa Rosa County. The county owns and maintains a public boat launch at the southernmost point of Glen Gibson Road, on the west side of the canal. In addition to the boat launch, the county owns and maintains the road and waterfront leading to the boat launch, approximately 0.24 miles.

1. Importance and Applicability

The Western Garcon Point Project will address coastal habitat preservation and restoration, oyster habitat creation, and shoreline stabilization in Escambia Bay. The project will reestablish coastal habitats that have been lost to either natural/anthropogenic causes while improving water quality through the uptake of nutrients and/or pollutants from runoff from the planting of shoreline vegetation. In addition, the project will establish essential habitat for a wide array fish and bird species through the placement and creation of oyster reefs/breakwaters. The restoration of the littoral zone will reestablish the abundances and diversity in benthic and the water column communities. The proposed project will support inclusion of the "living shoreline" approach of shoreline protection by ecological enhancement instead of shoreline hardening seawalls that degrade or eliminate crucial shallow water and intertidal habitat.

The project site provides food and habitat for numerous fish, reptiles and amphibians, birds, mammals and benthic invertebrates. The general species to occur in the project area are: Aquatic Species: Black Drum, Red Drum, Summer Flounder, Southern Flounder, Gray Snapper, Gag Grouper, Sheepshead, Blue Crab, and Stone Crab. Birds: American Oystercatcher Osprey, Common Loon, Pied-bill Grebe, Horned Grebe, American White Pelican, Double-crested Cormorant, Lesser Scaup, Magnificent Frigatebird, Great Blue Heron, Great Egret, Snowy Egret, Tricolor Heron, Green Heron, Yellow-crowned Night-Heron, White Ibis, Ruddy Turnstone, Black Scoter, Clapper Rail, Black-bellied Plover, Semi-palmated Plover, Killdeer, lack-necked Stilt, Greater Yellowlegs, Lesser Yellowlegs, Willet, Spotted Sandpiper, Whimbrel, Sanderling, Gray Kingbird, Semipalmated Sandpiper ,Short-billed Dowitcher , Loggerhead Shrike, Herring Gull, Caspian Tern, Royal Tern, Sandwich Tern, Common Tern, Forster's Tern, Black Tern, Black Skimmer, Belted Kingfisher, Yellow-billed Cuckoo, Eastern Phoebe, Eastern Kingbird, Palm Warbler, Marsh Wren, Tree Swallow, Northern Rough-winged Swallow. Reptiles: American Alligator, Gulf Saltmarsh Snake and Alligator Snapping Turtle.

Eventually, it is the intent of this group and partners to include this project site into the Yellow River Aquatic Preserve Area. The Yellow River Marsh Aquatic Preserve encompasses portions of Yellow River, Blackwater River and East Bay. The upper most portions of the preserve are bordered by local Water Management District, and Eglin Air Force Base. Yellow River Marsh Aquatic Preserve was designated as an Aquatic Preserve in 1970. The preserve consists of over 2,000 acres of marsh, forested wetlands, and seagrass beds; these provide filtration from pollutants and serve as flood control. Recreational and commercial fishing are major activities within the preserve with fisherman catching variety of fish including: bass, brim & bluegill, catfish, redfish, flounder, blue crab, mullet, and over 100 other types of fresh and brackish water fish. It is very common to see several different types of snakes and turtles along with an occasional alligator on a trip down the Yellow River.

Established by state statute, Aquatic preserve (AP) areas are submerged lands of exceptional beauty, which are to be maintained in their natural or existing conditions for future generations. The first AP was established in Estero Bay in 1966. In 1975 the Florida Aquatic Preserve Act was passed and the existing preserves were brought under a standard set of management criteria.

Oyster Reef Creation/Breakwater

The oyster reef/breakwater creation will provide a habitat for historically resident species of shellfish and finfish, providing feeding resources for transient fishes, and improved water quality via the filter-feeding bivalves. The oyster reefs will also provide valuable shelter and habitat to these species and others while improving water quality and reducing shoreline erosion. In addition, the reefs/breakwaters will provide substantial habitat to a large assemblage of benthic organisms.

The oyster reef/breakwater will also provide erosion prevention and stabilization along the shoreline. The deflection of waves and wave energies will protect shorelines and inland waters from erosive forces, and promote sedimentation and establishment of submerged aquatic vegetation within the project site.

The 5x5x5x30" high triangle oyster reef units will be spatially distributed to allow for Atlantic Gulf Sturgeon *(Acipenser oxyrhynchus)* movement, flushing, habitat diversity, and to allow for navigation. The 600 lb units will each be anchored with an 8-foot auger. Coconut matting will be placed underneath each unit for settling purposes due to the silty substrate associated with the project site. Ecological benefits result from the improved water quality, erosion prevention, shoreline stabilization, and habitat services provided by the reefs (Wilber 2002). Economic benefits result from the economic services provided by oyster reefs, and are related to the harvest of fish, and crab from the reefs or adjacent areas, increased recreational use from cleaner water, and cost savings for bank stabilization and dredged material disposal.

Oyster shells will be collected from local restaurant participation until natural growth sustains the integrity of the reef structure. Quarterly monitoring will be conducted on oyster reef spat settlement and reef biodiversity.

Oyster reefs/breakwater creation will establish through successive reproduction and settlement of larvae. The planktonic larvae that develop require a hard substratum to settle upon in order to complete development to the juvenile stage, and prefer to settle on the shells of other oysters. Thus, over time, continued settlement and subsequent growth of generations of oysters may form massive reef structures consisting of staggering numbers of individuals. Luntz (1960) estimated that 5,895 oysters, the equivalent of 45 bushels, occurred within a single square yard of oyster reef.

As successive generations of oysters settle and grow, the reef will become highly complex, with many structural irregularities and infoldings that provide a wealth of microhabitats for many different species of animals. Beyond providing smaller organisms with habitat, oyster reefs also provide food to a wide variety of secondary consumers. Many species of fish prey upon oyster reef associates; while others such as the black drum (*Pogonias cromis*) and cow-nosed ray (*Rhinoptera bonasus*) prey upon oysters themselves. Other species that utilize oyster reefs for foraging and feeding include the xanthid crabs, also known as mud crabs; swimming crabs of the genus *Callinectes*; mollusks such as the thick lipped oyster drill (*Eupleura caudata*), the sharp-rib drill (*E. sulcidentata*), the Atlantic oyster drill (*Urosalpinx cinerea*), the Tampa drill (*U. tampaensis*), the knobbed whelk (*Busycon carica*), the lighthire whelk (*B. contrarium*), and the pear whelk (*B. spiratum pyruloides*); flatworms such as oyster leeches (*Stylochus* spp.); boring sponges (C*liona* spp.); and annelid worms (P*olydora* spp.).

Oyster reefs also contribute to improved water quality in areas where they occur. Oysters are filter feeders which strain microalgae, suspended particulate organic matter, and possibly dissolved organic matter from the water column over their gills in order to feed. Under optimal temperature and salinity conditions, a single oyster may filter as much as 15 liters of water per hour, up to 1500 times its body volume. Spread over an entire reef, for an entire day, the potential for oysters to improve water clarity is immense. Additionally, since oysters are sessile, and bioaccumulate some potential toxins and pollutants found in the water column, they have been used to assess the environmental health of some areas.

<u>Shoreline Vegetation/Erosion Control</u>

The grasses to be utilized for shoreline stabilization includes Smooth Cordgrass *(Spartina alterniflora),* Marsh-Hay Cordgrass *(Spartina patens)* and Black Needle rush *(Juncus romerianus). Spartina patens* will be planted above the MHW line and *Spartina alterniflora* and *Juncus romerianus* will be planted below the MHW line. Where possible, planting will occur close to the shore along a gentle slope to allow for the plant's maximum nutrient absorptive capacity. This will also allow for the successful establishment of the vegetation's root system and stabilization abilities. All plantings will be done by hand. Vegetation will be planted on 18-inch centers and spatially distributed. Quarterly monitoring of shoreline vegetation will be conducted to ensure success. Additional planting will occur as needed.

This project will not utilize dredging or excavation of any type. The planting of vegetation will be deemed successful when the project site has clearly demonstrated the natural propagation of the emergent vegetation.

The emergent vegetation will come from Milton High School and Navarre High School, two schools that currently participate in the Northwest Florida Grasses in Classes Program. The Partnership for Community Programs (PCP) and the West Florida Regional Planning Council received funding from the US Fish and Wildlife Service Coastal Program to promote the Living Shorelines Initiative in the Panhandle in 2007 and from Five-Star Restoration Grant Funding in 2008. The grass in classes program promotes stewardship of coastal and estuarine resources through the propagation, maintenance, planting and monitoring for success by high school students. The Project Manager, Santa Rosa County Marine Extension personnel and the Biologist will work with students in planting of grasses. The Biologist will also conduct the quarterly monitoring associated with the planting of emergent vegetation.

Restoration of the littoral zone:

The restoration of the littoral zone will allow for the influx of high plant and animal species diversity and open the area for fish reproduction and development to occur. Planting of emergent vegetation will increase the probability of establishing rooted emergent, floating, and submersed vascular plants (macrophytes) as well.

Aquatic macrophytes alter sediment, water quality, physical condition, and population dynamics of the ecosystem by plant growth, metabolism, and decay. Macrophytes also provide food, shelter, and substrate for a variety of organisms in the aquatic system. Bacteria, algae, protozoan, rotifers, and invertebrates inhabit underwater leaves and stems (Engel, 1990). Rotifers and small crustaceans filter bacteria, algae, and detritus from water flowing by the plants. Snails, certain leeches, and many insect larvae scrape algae and detritus on the foliate or beneath it. They in turn are consumed by other aquatic insects, fish, water birds, and some furbearers. Aquatic macrophytes alter the physical environment by intercepting water movements and sunlight. Dense vegetation provides relatively quiet area near shore and blocks turbulence from breaking waves, longshore currents, and runoffs. High-energy shores, exposed to erosion from winds and waves, become calm depositional plains after plant growth (Engel, 1990). Plants at the water surface blunt the wind, reducing its potential to stir the bottom. In terms of casting shade and blocking water movement, plant beds reduce the amount of heat transfer to the bottom. The foliage acts as a barrier to separate warm water at the surface and cool water at the bottom. Also, density differences between cold and warm water masses help maintain this separation. This temperature difference can reach 10ûC on hot summer days (Dale and Gillespie, 1977). The temperature gradients create warm and cool microclimates for colonizing organisms (Engel 1985). Animals unable to withstand warm water can approach the shore under macrophytes; others can be repelled by heat radiated from surface foliage. Cool bottom water can also reduce photosynthesis in lower leaves and delay hatching of fish eggs, whereas warm surface water can speed up the development of invertebrates. Microclimates that are caused by macrophytes growth thus restructure the ecosystem (Engel, 1990). Sediment supplies nitrogen (N), phosphorus (P), and micronutrients to aquatic macrophytes. Evidences from field studies suggest that rooted submersed macrophytes, e.g., Hydrilla verticillata and Myriophyllum spicatum, are capable of markedly depleting N and P in sediment. Researchers report that various species of freshwater aquatic macrophytes not only extract nutrients from the sediment but also release them into the surrounding water (Carignan and Kalff, 1980). As a result, high productivity and biomass turnover of rapidly growing macrophytes can result in high rates of sediment nutrient loss (Barko, 1993). Thus, nutrient uptake by aquatic macrophytes may significantly reduce sediment nutrient availability.

Aquatic macrophytes growth also alters the sedimentation rate of the water. Sedimentation rates are generally much greater in macrophyte beds than in the open water systems due to the filtering capacity of macrophytes (Barko, 1993). As a result, aquatic macrophytes not only reduce the turbulence in the water but also stabilize the sediment. As suspended sediment is removed from the water column, light penetration increases, so more light becomes available for photosynthesis by aquatic macrophytes. The value of pH increases in macrophyte beds during periods of photosynthesis. Elevated values of pH near the sediment surface tend to increase rates of phosphorus release from sediment, which can stimulate algal production. Algal production on macrophyte leaf surfaces becomes an excellent source of food for grazing invertebrate communities. The growth of invertebrate population can result in an increase in fish population. Besides, the structural complexity of macrophyte beds can influence fish communities of aquatic systems directly. These beds provide refugees for smaller fish, and are thus important in predator-prey relationships. To sum up, aquatic macrophyte communities can potentially influence bed geometry as well as biomass distribution in aquatic systems (Barko, 1993).

2. Technical/Scientific Merit

The restoration site represents 1,315 linear ft. of shoreline that due to increased wave activity has resulted in coastal flooding and shoreline lost. Historical aerial photography from the last 30 years shows that as seawalls, rock rip rap and shoreline revetments were installed on either side of the coastal property restoration site the natural transition zone of sandy beaches were lost resulting in the lost of the natural transition zone of the sandy beaches and water's edge. With increased hurricane activity, the coastline has completely lost its resiliency. If not restored and stabilized to protect against further coastal inundation adjacent coastal property and infrastructure will be susceptible to coastal flooding even with their respective shoreline revetments.

The project will involve the creation of an approximately 1,315 linear ft. vertical oyster reef using Reefblksm structures, designed by Coastal Environments Incorporated (CEI). The proposed structures will dissipate high wave energy by being placed at the 3 ft. contour line approximately 25 –50 ft. offshore from the shoreline, (see Attachment A). Each structure is based on a sacrificial metal framework that initially provides vertical support for bags filled with a total of 600 lbs. of recycled oyster shell cultch from area oyster houses. Currently within coastal areas of the United States there is a need to demonstrate processes that dissipate high wave energy coastal erosion accelerator to create essential fish and bird habitat. The oyster reef structures have been used in a number of areas along the gulf coast states. Specifically, The Nature Conservancy in Galveston, Texas used these structures in 2003 to stop the erosion of their Mad Island preserve. Within two years the structures were able to dissipate wave energy and create an emergent marsh vegetative barrier.

The project also addresses the decline of shellfish populations in the Escambia Bay system where we have lost more than the fisheries and economic activity associated with fishing. A growing body of research in recent decades has illuminated the profoundly important ecological roles that shellfish play in coastal ecosystems. These roles include filtering water as bivalves feed on suspended algae, providing a structured habitat refuge for other species, and protecting shorelines from erosion by stabilizing sediments and dampening waves. In fact, many bivalve shellfish have been labeled "ecosystem engineers" (Jones et al 1994; Lenihan 1999) in recognition of the multiple roles they play in shaping the environments in which they live. Development of a reef in this location would also provide a source of oyster larvae for the rest of the Escambia River/Escambia Bay system. The project would be located in an area of the bay that has been designated as a highly suitable habitat for the American Oyster (*Crassostrea virginica*).

The ability of benthic filter feeding invertebrates to significantly affect planktonic phase biogeochemistry has been well documented. This benthic-pelagic coupling has been dramatically observed recently where invasions of zebra mussels (*Dreissena polymorpha*) have occurred. Development of zebra mussel beds has reduced phytoplankton biomass and overall seston, resulting in a shift from pelagic phytoplankton production to benthic macrophytic production in the great lakes and Hudson River (Klerks et al., 1996; Strayer et al., 1999; MacIsaac, 1996).

Filter-feeding bivalves are often identified as the primary agents in the transfer of seston to the benthos due to their high clearance rates and ability to sequester both inorganic and organic particulate material of a wide size range (Dame, 1996). Materials are sorted by food value. Inorganic material and unrecognized organic material are deposited to the sediments in a mucus matrix (pseudofeces). Ingested particles are digested, with the unassimilated fraction excreted. From the assimilated fraction excess nutrients as a result of respiration are excreted, and the remainder is sequestered into new biomass. Feeding experiments in these organisms have defined particle size retention and clearance rates (Haven & Morales, 1970), and nutrient excretion rates (Dame et al., 1984). These data that have been used by others to extrapolate to ecosystem scale processes and suggest control of phytoplankton production (Officer, et al., 1982; Newell, 1988; Gerritsen, et al., 1994)

Only one ecosystem level investigation has taken the approach of examining entire oyster reef communities and mussel beds directly for their total impact on suspended particles and dissolved nutrients rather than rely on extrapolations (Dame & Libes, 1993). This work examined the effect of removing oysters from replicate tidal creeks, resulting in an inferred change in the turnover time of the phytoplankton community without change in biomass that leads to nutrient retention in tidal creeks. The dominant effect may be the pumping and filtration by oysters. However, these communities are comprised of a variety of filter feeders including bacterivorus protists, bryozoans, barnacles and mussels in addition to the oysters themselves. Similar communities have been described from artificial reefs in the Choctawhatchee Bay system (Martin & Bortone, 1997), where at least 90 taxa were recorded associated with or attached to the substrate after 12 months of development.

The community as a whole may effectively trap a wide range of particle sizes. Physical trapping of particulate matter may occur within the structural matrix of the community and the associated biopolymers, in similar fashion to the filtration effect of water passing through marsh grasses. Biological flocculation of dissolved organics and suspended particulate matter by polymer production occurs at all levels, from microbial interactions (Biddanda, 1985; Curds, 1963; Robertson, et al., 1982) to the production of pseudofeces by macrofauna (Dame, 1996). Diagenesis of flocculated and sedimented material, combined with the tendency for estuarine dynamics to trap nutrients, may be the key to understanding whether these systems can act as a sink or source of nutrients.

Oyster reef communities have been demonstrated to be significant contributors of dissolved ammonia to the water column as a result of their concentrating and respiring suspended material (Dame et al., 1984; Dame & Libes, 1993). Thus, oyster filtration activity stimulates phytoplankton by two mechanisms: 1) harvest that relieves nutrient and light limitations on growth and 2) returning nutrients to the water column that were previously bound up in phytoplankton biomass. Increasing the growth rate of the phytoplankton population increases nutrient uptake rates and $C0_2$ fixation rates. With either no increase or a decrease in the standing crop of phytoplankton, the flux rate of nutrients through the phytoplankton pool increases.

Restoring shellfish populations to our coastal waters, therefore, represents a powerful way to restore the integrity and resilience of these ecosystems. The proposed project is expected to grow an established living oyster reef, which would enhance estuarine habitat, estuarine emergent vegetation and estuarine water column at the Escambia Bay project area to accommodate various life stages of fish species. Besides the juvenile fish habitat, shell liberated from the oyster reef from grazing of larger fish will wash onto the shore to form a beach. Shore birds prefer shell beaches as nesting areas since shell drains quickly and retain heat for egg incubation. This project will demonstrate the ability to combine a successful technique of creating vertical reef habitat to dissipate wave energy, and to create essential fish and bird habitat.

Evaluation of the project success will involve documenting the development of oyster reef, and dependent biota as the structure matures. Additionally, water quality, analysis and functional aspects of the reef structure will be addressed. This monitoring would be budgeted for two to five years after placement. These monitoring efforts will be prepared into a manuscript to submit these results to a peer-reviewed journal.

Success Criteria for Monitoring Created Oyster Habitat

Water Quality. Water quality parameters will be recorded at every site visit and sampling event by handheld multimeter (YSI 85 or equivalent) for Temperature (T), Salinity (S), and Dissolved Oxygen (DO) at the surface and bottom at the center of the reef site. Four stations in Escambia Bay will also be sampled quarterly using a SeaBird CTD (S, T, DO, fluorescence, turbidity) to characterize the water column structure of the open bay and any bottom water hypoxia. Light attenuation profiles will be recorded to calculate extinction coefficients (k) using Li-Cor deck and depth light sensors. Quarterly samples will also be taken for analysis of water chemistry parameters: *Enterococcus* plate counts, TK Nitrogen, Total Phosphorous, dissolved NO_2+ NO_3, Ammonium, and orthophosphate, particulate Carbon and nitrogen by elemental analysis, Chlorophyll a & c by fluorescence. *Enterococcus* and wet nutrient chemistry will be conducted in the Wetlands Research Laboratory at the University of West Florida (UWF) holding NELAP certification for the necessary methods. Data generated by the project will be uploaded to Florida Storet (http://storet.dep.state.fl.us/WrmSpa/) for archival storage. Additional water quality analyses will be taken in conjunction with reef community production/metabolism estimations (see below).
Samples will be processed for total nutrient analysis (TKN, TP) by pouring unfiltered water into a pre-labeled 125 mL polypropylene bottles, preserved with 0.4 mL of concentrated H_2SO_4.

Samples for dissolved nutrient analysis (NH_4^+, NO_3^-, NO_2^-, PO_4^{-3}, SiO_2) will be filtered through a 27 mm ashed (500 °C for 1 hour) Whatman® GF/F filter held in a stainless steel Swinnex® filter holder. Filtrate will be collected in a pre-labeled 40 mL polypropylene bottle. Samples for Chlorophyll analysis will be collected on 27 mm ashed GF/F filters and the volume filtered will be recorded. Filters will be folded over, blotted dry, and stored in labeled foil envelopes. Samples for CN elemental analysis are similarly collected on 13 mm ashed GF/F filters. All samples are kept on ice in the field and stored in a lab freezer (-80 °C for pigments and CN, -20°C for nutrients) until analysis.

Nutrients will be analyzed on a 2-channel Bran-Luebbe® AutoAnalyzer 3 with Compact Sampler, multitest manifolds and Bran-Luebbe® Digital Colorimeter using EPA standard methods (US EPA, 1993; US EPA, 1983). Total nutrient (TP, TKN) samples will be acid digested in a fume hood on a 50 place AI Scientific® AIM500 Programmable Digestion System with a BD50 Microprocessor Control. 20 mL of preserved sample or 2 g (wt) is placed into 100 mL borosilicate glass tubes in the AIM500. Digestion occurs at 350 °C for 3.5 hours. National Institute of Standards and Technology (NIST) traceable solutions are used in the preparation of all quality control samples and standards. For each analytical batch, one standard source is used for the calibration standards (either LabChem® or Ricca®) and a different source was used for calibration verification (either LabChem® or Ricca®). Matrix spikes are made from either source, purchased at a concentration of 1000 mg / L and diluted to the required analytical concentrations. Matrix spikes are run every 10 samples to check the recovery of known amounts.

Functional Parameters

Oyster Recruitment. Bags of clean oyster shells will be deployed for bi-weekly and yearlong soak periods. Bags will be constructed of 25 mm size plastic aquaculture. Biweekly shell samplers will be retrieved and examined with a stereomicroscope. Live spat and dead spat shells will be enumerated and measured. Seasonal or yearlong bag deployments will be retrieved in winter to evaluate recruitment of oysters into adult stage and mortality by enumeration and measurement of live and dead shells.

Nekton Utilization. Procedures for assessment of nekton utilization of the reef structure will roughly follow those of Stevenson (2007). Biweekly samples will be taken using a 15.24 m beach seine net with 6.35 mm mesh wings and a 1.82 x 1.82 x 1.82 m bag with 3.17 mm mesh in the middle. Net tows will be made along the offshore side of the reef. A net tow of similar duration and depth will be made along adjacent shoreline lacking reef structure. Collected biota will be identified to species (or lowest possible taxon as appropriate), enumerated and measured for biomass estimates.

Chamber experiments. Chambers to determine community production and community respiration, particle removal rates, and nutrient fluxes associated with whole reef modules (5ft x5ft x 5ft triangles, 30 inches high) will be constructed out of 1/4 inch acrylic plate, reinforced at the seams with additional acrylic strips, and fitted with stirring devices and sampling ports. Basic protocols will be as followed by Allison (2006). One chamber will be clear. One will be painted black. YSI 6600 data sondes with conductivity, temperature, DO, fluorescence, and turbidity sensors will be attached to inside of each chamber. Samples will be taken at time zero and at time intervals determined optimal by trial runs during incubations and at the end of incubations to verify oxygen concentrations by Winkler titration and to determine any changes in nutrients, following protocols previously outlined.

Planktonic primary production and respiration will be determined as changes in oxygen concentration by Winkler titration of ambient water in 300 mL BOD bottles, to isolate reef fluxes from water column fluxes. Samples for Winkler analysis will be fixed in the field and placed on ice. All samples will be transported to the University of West Florida, Wetlands Research Laboratory (WRL) for further analysis. In the lab, BOD bottles are acidified with concentrated H_2SO_4, mixed well to dissolve the flocculent, and titrated with a 0.0125N sodium thiosulfate ($Na_2S_2O_3$) solution (LabChem Inc®). A potato starch indicator solution (Fisher®) is added once the sample turns a pale-straw color as an endpoint indicator. Winkler analyses will be completed within 12 hours of sample collection.

In situ incubation allows production and respiration to occur under natural light regimes and ambient temperature conditions. Phytoplankton O_2 production and planktonic O_2 consumption in the overlying water inside the chamber is subtracted to obtain the net O_2 flux as a measure of net benthic primary production. Net benthic primary production (mg C · m^{-2} · h^{-1}) can be calculated from dissolved oxygen (DO) concentration changes in light chambers using the formula for non-standard sample volumes (Strickland & Parsons, 1972).

Equation 1: $NBPP = (([DO]t_2 - [DO]t_1) * V * 12) / (PQ * H * A)$ where:
NBPP = net benthic primary production in mg C · m^{-2} · h^{-1}
$[DO]t_2$ = dissolved oxygen concentration in mmol / L at the end of incubation
$[DO]t_1$ = dissolved oxygen concentration in mmol / L at the beginning of incubation
12 = the atomic weight of carbon
PQ = photosynthetic quotient (mol O_2 evolved / mol C fixed), 1.2 is recommended (Strickland & Parsons, 1972)
H = incubation time in hours
A = area under the benthic chamber.
Benthic respiration will be determined from Equation 1 with the exception that the respiration quotient (RQ) was 1.0, as recommended by Strickland & Parsons (1972).

In addition to fluorescence and turbidity changes recorded by the sondes, samples will be taken to determine suspended chlorophyll and CN concentrations, analyzed as above under water quality analyses.

Paired light and dark chamber experiments will be replicated a minimum of three times during summer months and again during winter. Utilization of *in situ* chambers to estimate ecosystem functional aspects of the reef units will document not only the filtration and nutrient dynamics routinely cited as benefits of these structures, but also the added micro and macro algal production associated with the reef that supports secondary production attracting nekton to the reef as a foraging area.

The Bay Area Resource Council will provide funding for the permits. Rebol-Battle & Associates located in Pensacola, Florida will do design and engineering of the project pro bono. The biologist will conduct all biological monitoring associated with the planting of emergent vegetation. The Project Manager will work with the Biologist and University in the preparation of a manuscript for submission of results to a peer-reviewed journal.

The University of West Florida will conduct monitoring for placement of material for marsh plantings in addition to, post monitoring for sedimentation rates for two years after. The University of West Florida and the project team will monitor oyster-spat recruitment at the site for up to five years. Permits needed are from the United States Army Corps of Engineers (USACOE) and the Florida Department of Environmental Protection. The project has completed its pre-application phase. The proper permits will be obtained. The structures will be placed 25 ft. to 50 ft. from shore, in water 36 to 48 inches in depth, this makes the site in the vicinity of critical sturgeon habitat. A biological opinion has already been submitted earlier this year for another site within the Pensacola Bay system using the exact same constructed wave breaks. It will take no more that 45 days to construct the structures to begin immediately upon receiving the funds. The structures are prefabricated and upon completion of construction will take no more than 45 days to install in the area for placement. Ideally, when working with oyster reef building one must place the structures in the water during natural spring and fall spat dispersal to avoid the non-target barnacle fouling. Coastal areas all along the Gulf Coast of Florida will be potentially affected by Hurricanes from the months of June-November. All construction and placement of structures will provide Category 3 storm surge. This will include anchoring the structures down to minimize the effects of storm damage. Even without any recruitment of oysters, anchoring the total weight of the structures will be up to 100 tons.

In the southeast, intertidal oyster reefs serve critical roles for many fish, bird and mammal species. They protect fringing *Spartina alterniflora* marshes from erosion caused by both natural and anthropogenic processes. There are few "reference" data sets for natural oyster reefs prior to their decline, hampering one's ability to gauge restoration progress and ultimately "success". Also, critical are explicit goals and appropriate metrics for reef assessment. Some ecologically derived restoration benefits are evident immediately after material (cultch) is planted, many benefits come only after populations are well established with oysters at or near their natural densities. Other longer-term reef restoration projects are only just reaching potential maturity at 5-10 years of age, with many larger-scale ecosystem benefits yet to be assessed. In March 2007 a Florida Oyster Reef Restoration Workshop was held to begin dialogue among agencies to address the "ecosystem services" oyster reefs play. In addition to, a Living Shoreline Initiative Committee was formed to develop Best Management Practices for dune, estuarine and stream habitat restoration practices in the Florida panhandle. The purpose of these two events was to scientifically establish that living shorelines are an effective, ecologically sound and economically way to protect eroding shorelines with proof, benefits and justification analysis. The final evaluation of this report will be submitted to a peer review journal to disseminate this knowledge of oyster reef restoration and their "ecosystem services".

3. Overall Qualifications of Applicants:

Program Manager: **Kathleen Ahlen** is currently a Regional Planner with the West Florida Regional Planning Council. Her responsibilities include staff support to Homeland Security related grants and contracts, which include the Local Emergency Planning Committee (LEPC);

Hazardous Materials Preparedness Grant (HMEP); Small Quantity Generator Program (SQG); and Hazardous Analysis (HA) contracts; and any additional state or local First Responder and Emergency Management training and exercise contracts. She also is responsible for the Planning Council's housing rehabilitation technical assistance grants and environmental education projects. She also provides staff services to the Bay Area Resource Council (BARC) and its subcommittees (Technical Advisory Committee and Environmental Education Coordination Team (EECT)).

Kathy received her Bachelor Degree in Environmental Studies and Master in Public Administration from the University of West Florida. She worked for the University of West Florida in the Chemistry Department as the Scientific Stores Manager for seven years. She worked for two years with Fisher Scientific as Sales Representative before accepting a position in 2005, as Regional Planner with the West Florida Regional Planning Council.

Kathy is currently on the executive board member of the North American Hazardous Materials Management Association (NAHMMA).

Biologist: Heather Reed currently owns her own consulting company, Ecological Consulting Services, Inc., specializing in habitat restoration, environmental permitting, living shorelines, and marine research, environmental assessments, vegetation mapping, sampling, and monitoring, wildlife/fish surveys and management/monitoring plans, aquaculture design and planning, seagrass surveying, retrieval, planting, mapping and monitoring, coral reef surveying, mapping and monitoring, salt marsh restoration, community and education outreach, field crew development and management, long term monitoring, project specific best management practices. Previous experience includes Florida Department of Environmental Protection permitting section and Ecosystem Restoration Section specializing in shoreline stabilization, seagrass and oyster restoration. Environmental Protection Agency researching seagrasses, viruses, fish and corals. Other employment included a Natural Resource Specialist for SRGII consulting firm in Honolulu developing coral reef management plans and watershed impairment studies for Marine Corp Base Hawaii. Ms. Reed was also the Oahu district science manager of Black Pearl, Inc. station out of Hilo Hawaii researching Black Pearl Oysters, research assistant and research diver for Hawaii Institute of Marine Biology focusing on coral reef research and monitoring. Education includes A.A.S. Marine Technology, B.S. Marine Biology and M.S. Environmental Science focusing on Environmental management.

University of West Florida Scientist: Dr. Richard A. Snyder is Professor of Biology and the Director of the Center for Environmental Diagnostics and Bioremediation (CEDB) with the University of West Florida (UWF) located in Pensacola, Florida. Dr. Snyder began his career at UWF as a Research Associate in 1991 with CEBD and was promoted to Director in 2008. Prior to his work at UWF, Dr.\ Snyder was a Post-Doctoral Fellow from 1989-1991 with the Department of Applied Microbiology at the University of Saskatchewan and the Environment Canada National Hydrology Research Institute. Dr. Snyder was a Research Associate at Scripps Institution of Oceanography in 1989. Dr. Snyder has worked on numerous grants, some which include Wet Prairie Habitat Restoration: Evaluation and Management Strategies. R.A. Snyder, Northwest Florida Water Management District (1999-2008); and Tracking Source of Fecal Contamination in Environmental Waters (Co-PIs: *J. Lepo and R. Snyder*), Florida Department of Health, Escambia County Health Department, 2007 –2008. In addition, Dr.

Snyder has numerous publications, the latest include Stability and change in estuarine biofilm bacterial community diversity. *Applied and Environmental Microbiology* 72:5679-5688, work conducted with JA Moss, A Nocker, J Lepo, (2006) and Accumulation of organic and inorganic contaminants in shellfish collected in estuarine waters near Pensacola, Florida: Contamination profiles and risks to human consumers. *Environmental Pollution* 145:474-488, work conducted with N. Karouna-Reiner, and KR Rao (2007). Dr. Snyder has an M.S. and Ph.D in Zoology from the University of Maryland and B.S. in Biology from the College of Charleston, Charleston, South Carolina.

Videographer: Liz Watkins (Director and Producer) has a Bachelor of Art in Communications with an emphasis in production from the University of West Florida. Her local experience includes being a Production Assistant WSRE-TV (1983-1987); Producer/Director WSRE-TV (1987-1995) and owner of Watkins Productions Inc. from 1992 until the present. Ms. Watkins professional experience includes being a Field Producer/Videographer for ABC News, CBS News, NBC News, MSNBC, BBC, HGTV, Harpo Productions, Inside Edition, German TV, Austrian TV, Extra, Hard Copy, St. Joe Company, BAE Systems, Court TV. Ms. Watkins television series credits include "Gourmet Cooking with Earl Peyroux" (1981-98) Aired on 120 PBS affiliates, Camera – 1982-87, Producer/Director 1988-89, distributed to PBS for 15 years from affiliate WSRE-TV. "Open Forum" (1988-present) One-hour live public affairs program. Camera 1982-87, Director 1987-95. Locally broadcast live on WSRE-TV. "UpLink" (1991-93) One-hour community issues program. Co-Producer/Director. Locally broadcast via live remote on WSRE-TV.

4. **Project Cost:**

See a detailed budget narrative under Attachment B.

Type of job/Title **Personnel**	**# of Positions**	**Labor hrs**	**Total hours**	**Rate/hour**	**Total cost**	**Duration of position**
Project Manager	1	960	960	NA	$48,000	12 months
Biologist	1	960	960	20	$25,000	12 months
Videographer	1	1797	1797	NA	$135,000	12 months
					$208,000	
Contractual	**# of Positions**	**Labor hrs**	**Total hours**	**Rate/hour**	**Total cost**	**Duration of position**
University Monitors	2	1044 ea	2088	20	$41,760	12 months
Breakwater Construction Laborers	24	480 ea	11520	15	$172,800	60 days
Barge Operator	1	480	480	150	$72,000	60 days
Crane Operator	1	480	480	150	$72,000	60 days
Bobcat Operator	1	480	480	150	$72,000	60 days
Biological Monitor	1	480	480	20	$9,600	60 days
Total jobs stimulated	33				**$440,160**	
Volunteers						
High School Students	30	100 ea	3000	11	$33,000	12 months
SR County Marine Extension	1	100	100	20	$2,000	12 months

Matching Contributions					$35,000	

5. **Outreach and Education:**

The existing public access located off Glen Gibson Road currently consists of a stabilized parking area that is capable of holding fifteen vehicles. Recommended enhancements include adding an interpretive kiosk outlining and discussing the proposed project, the species and habitats that it will affect, and the importance it has on the environment. Funding for the kiosk will be obtained through other grant opportunities.

Liz Watkins with Watkins Productions will Direct and Produce an hour long documentary that will cover the multi-stages of the restoration project and area. The documentary will cover at a minimum oyster reef placement, the planting of shoreline vegetation, and the establishment/ reestablishment of the coastal habitat. The documentary will also include underwater footage showing reef biodiversity once reef placement has been completed and established.

The production of a DVD covering the topics of coastal habitat preservation and restoration, oyster habitat creation, and shoreline stabilization will created based on the documentary. The DVD will be a part of an a successful environmental education video and DVD series that is broadcast on local cable channels including WUWF-TV Ch. 4, Cox Communications, Gulf Coast Network Ch. 27 Mediacom, Bay Access TV 10 Knology, Cape Cod Community Media Center, Tampa Bay Community Network, and Ft. Walton Beach Channel 4. The new DVD will be used within participating schools as part of their Grasses in Classes Program curriculum.

Students from each participating school will write articles in the school newspaper on the project and on the principles and scientific relevance of oyster habitat restoration and shoreline stabilization as a means of educating other students. Brochures about the project site will be created and distributed from funding from other grant funding opportunities. As previously mentioned, the Project Manager will work with the Biologist and University in the preparation of a manuscript for submission of results to a peer-reviewed journal.

References Cited

Allison, JG. 2006. Dynamics of estuarine microphytobenthos in a shallow water sand bottom habitat. MS Thesis, University of West Florida. 99pp.

Bartol IK' R Mann and M Luckenbach. 1999. Growth and mortality of oysters (*Crassostrea virginica*) on constructed intertidal reefs: effects of tidal height and substrate level. J. Exp Mar Biol. Ecol. 237:157-184.

Biddanda, B.A. 1985. Microbial synthesis of macroparticulate matter. Mar. Ecol. Prog. Ser. 20:241-251.

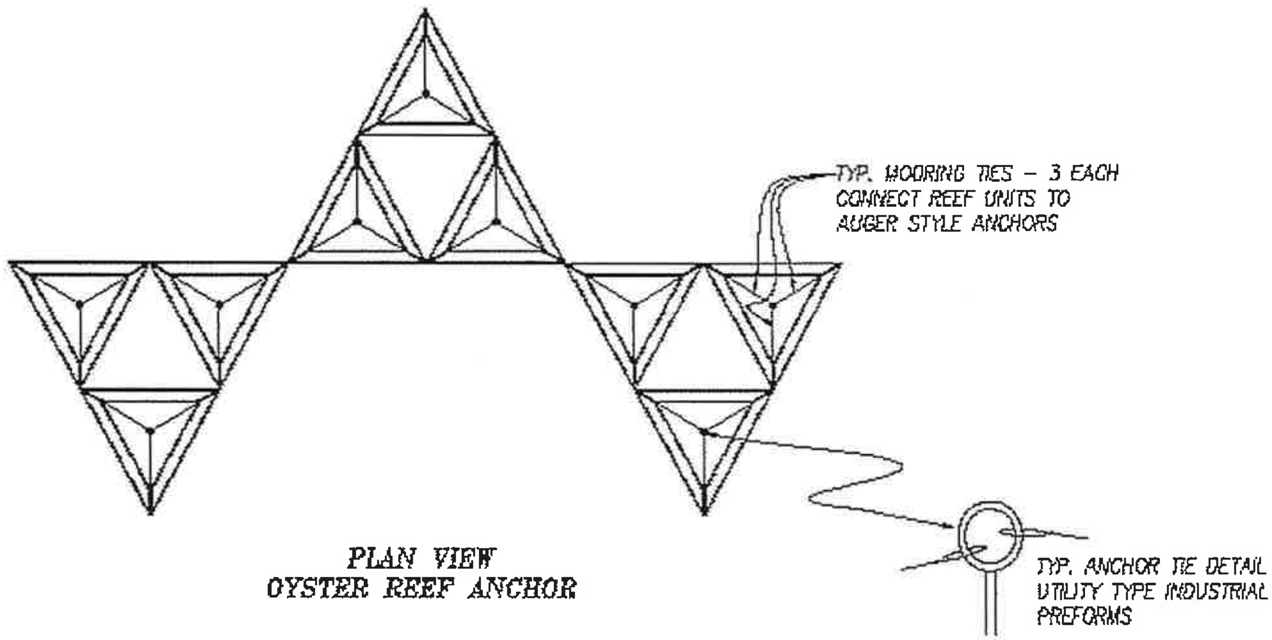
Dame, R.F. 1996. Ecology of Marine Bivalves: An Ecosystem Approach. CRC Press, Inc., Boca Raton, FL. 254 pp.

Dame, R.F. & S. Libes. 1993. Oyster reefs and nutrient retention in tidal creeks. J. exp. Mar. Biol. Ecol. 171:251-258.

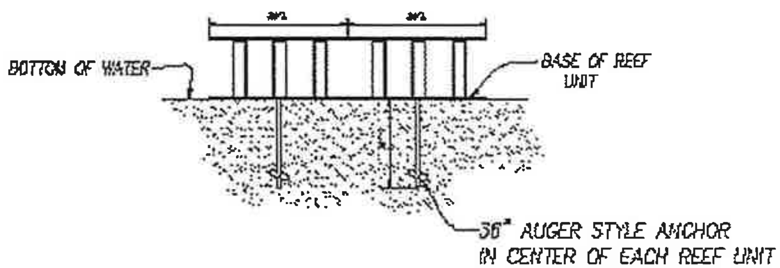
Dame, R.F., R.G. Zingmark, L.H. Stevenson & E. Haskin. 1984 Oyster reefs as processors of estuarine materials. J. exp. Mar. Biol. Ecol. 83:239-247.
Gerritsen, J., A.F. Holland, & D.E. Irvine. 1994. Suspension-feeding bivalves and the fate of primary production: an estuarine model applied to Chesapeake Bay. Estuaries 17:403-416.
Haven, D.S. & Morales-Alamo, R. 1970. Filtration of particles from suspension by the American oyster Crassostrea virginica. Biol. Bull. 139:248-264.
Klerks, P.L., Fraleigh, P.C., & Lawniczak, J.E. 1996. Effects of zebra mussels (Dreissena polymorpha) on seston levels and sediment deposition in western Lake Erie. Can. J. Fish. Aquat. Sci. 53:2284-2291.
MacIsaac, H.J. 1996. Potential abiotic and biotic impacts of Zebra mussels on the inland waters of North America. Amer. Zool. 36:287-299.
Martin, T.R. & Bortone, S.A. 1997. Development of an epifauna assemblage on an estuarine artificial reef. Gulf of Mexico Science 15:55-70.
Möbius, Karl. 1877. Die Auster und die Austernwirtschaft. Berlin. Translated into English and published in: Rept. U.S. Fish Comm., 1880, pp683-751.
Newell, R.I.E. 1988. Ecological changes in Chesapeake Bay: are they the result of overharvesting the American Oyster, Crassostrea virginica? Proceedings of "Understanding the Estuary: Advances in Chesapeake Bay Research". 29-31 March, Baltimore, MD.
Officer, C.B., T.J. Smayda, & R. Mann. 1982. Benthic filter feeding: a natural eutrophication control. Mar. Ecol. Prog. Ser. 9:203-210.
Robertson, M.L., A.L. Mills, & Zieman, J.C. 1982. Microbial synthesis of detritus-like particulates from dissolved organic carbon released by tropical seagrasses. 7:279-285.
Stevenson, CST. 2007. Enhancement of recruitment and nursery function by habitat creation in Pensacola bay, Florida. MS Thesis, University of West Florida, 105 pp.
Strayer, D.L., Caraco, N.F., Cole, J.J., Findlay, S., & Pace, M.L. 1999. Transformation of freshwater ecosystems by bivalves. Bioscience 49:19-27.
Strickland JDH, Parsons TR. 1972. A practical handbook of seawater analysis. Fishery Research Board, Canada, 310p.

ATTACHMENT A

OYSTER REEF UNITS/PLACEMENT



PLAN VIEW
OYSTER REEF ANCHOR



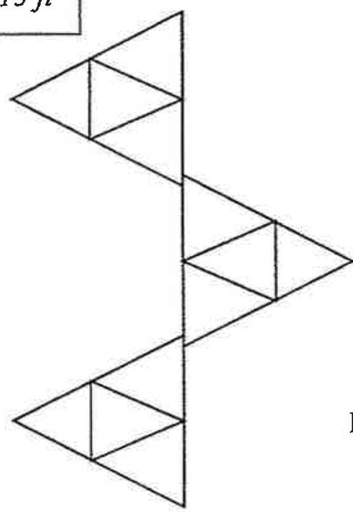
PROFILE VIEW
OYSTER REEF ANCHOR

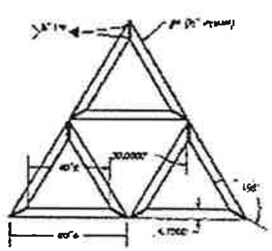
REEFBLK
Oyster Reef

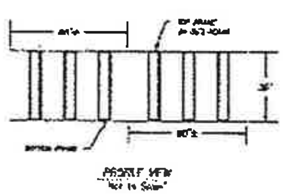
ANCHORING SYSTEM
for
REEFBLK OYSTER REEF UNITS

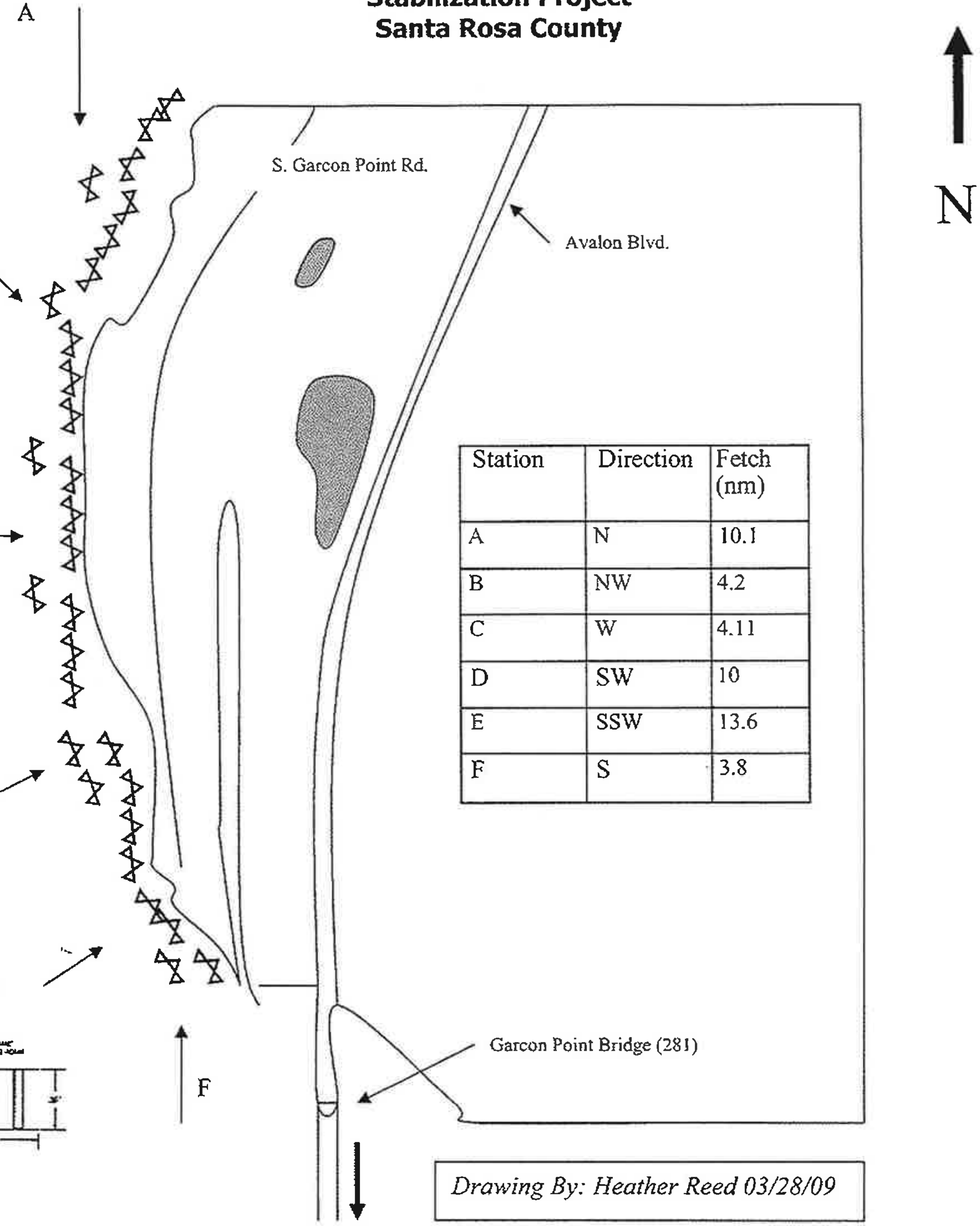
Coastal Restoration Demonstration
Garcon Point Shoreline
Stabilization Project
Santa Rosa County

Site length is approximately 0.25 miles- 1315 ft



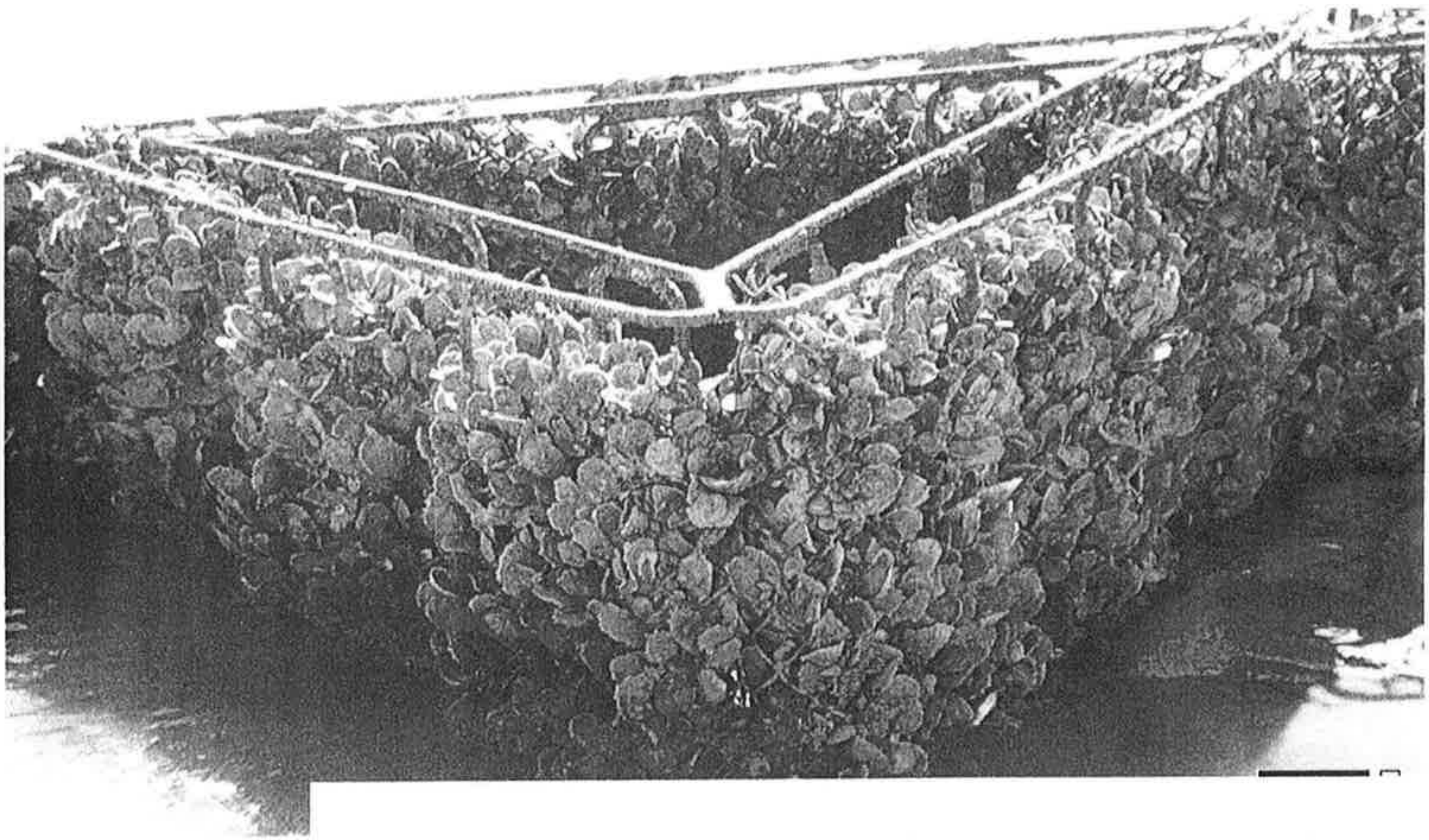






Station	Direction	Fetch (nm)
A	N	10.1
B	NW	4.2
C	W	4.11
D	SW	10
E	SSW	13.6
F	S	3.8

Drawing By: Heather Reed 03/28/09

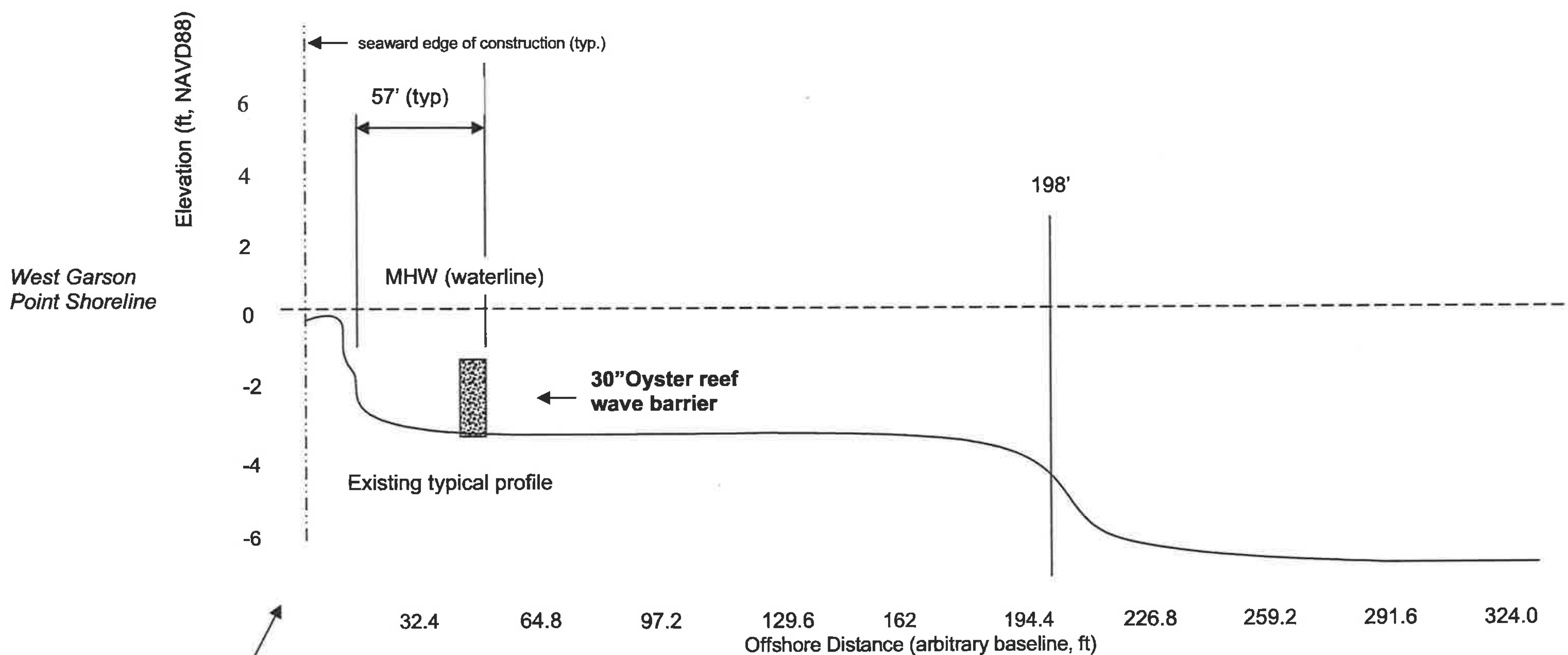


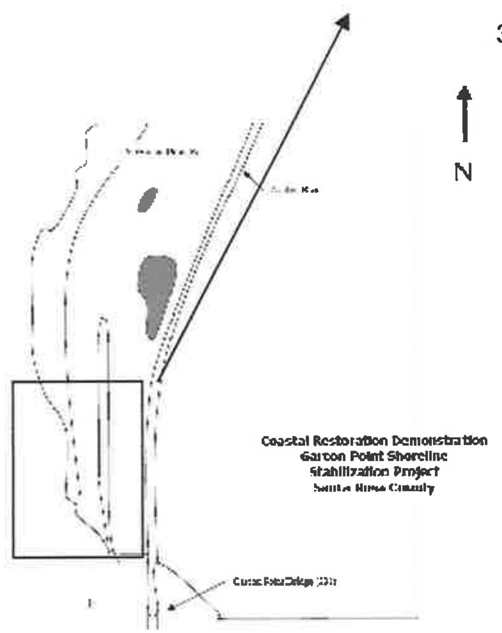
Profile View

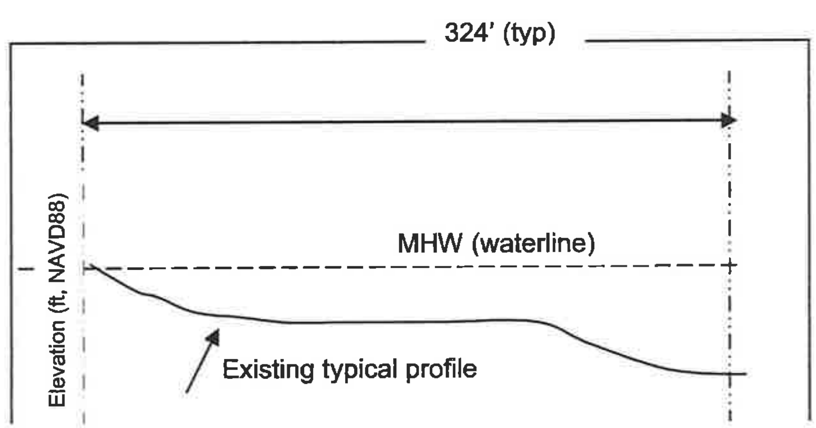
Post Reef Deployment

MHW 0.95' NAVD88

SANTA ROSA COUNTY, FL







ECS
Ecological Consulting Services Inc.
38 S Blue Angel Hwy #346
Pensacola FL 32506

Drawn by: Heather Reed 4/02/09

ATTACHMENT B

SUPPLEMENTAL BUDGET INFORMATION

BUDGET INFORMATION-Non-Construction Programs

SECTION A-BUDGET SUMMARY

Grant Program Function or Activity (a)	Catalog of Federal Domestic Assistance Number (b)	Estimated Unobligated Funds		New or Revised Budget		
		Federal (c)	Non-Federal (d)	Federal (e)	Non-Federal (f)	Total (g)
1. NOAA Coastal and Marine Habitat restoration Project Grant		$	$	$ 1,183,790.00	$ 47,750.00	$ 1,231,540.00
2.						
3.						
4.						
5. Totals		$	$	$1,183,790.00	$47,750.00	$ 1,231,540.00

SECTION B-BUDGET CATEGORIES

6. Object Class Categories	GRANT PROGRAM OR ACTIVITY				Total (5)
	(1) NOAA Coastal	(2)	(3)	(4)	
a. Personnel	$ 208,000.00	$	$	$	$ 208,000.00
b. Fringe Benefits					
c. Travel	$ 5,000.00				$ 5,000.00
d. Equipment					
e. Supplies					
f. Contractual	$ 967,790.00				$ 967,790.00
g. Construction					
h. Other	$ 3,000.00				$ 3,000.00
i. Total Direct Charges (sum of 6a-6h)	$1,183,790.00				$1,183,790.00
j. Indirect Charges					
k. TOTALS (sum of 6i and 6j)	$ 1,183,790.00	$	$	$	$ 1,183,790.00
7. Program Income	$	$	$	$	$ 0.00

SECTION C-NON-FEDERAL RESOURCES

(a) Grant Program	(b) Applicant	(c) State	(d) Other Sources	(e) TOTALS
8. Volunteers	$	$	$ 35,000.00	$35,000.00
9. Supplies: Plants			$ 8,750.00	$ 8,750.00
10.				
12. TOTAL (Sum of lines 8-11)	$	$	$	$ 47,750.00

SECTION D – FORECASTED CASH NEEDS

	Total for 1st Year	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
13.Federal	$ 1,183,790.00	$ 295,947.50	$ 295,947.50	$ 295,947.50	$ 295,947.50
14. Non-Federal	$ 47,750.00	$ 11,937.50	$ 11,937.50	$ 11,937.50	$ 11,937.50
15. Total (sum of lines 13 and 14)	$ 1,231,540.00	$ 307,885.00	$ 307,885.00	$ 307,885.00	$ 307,885.00

SECTION E- BUDGET ESTIMATES OF FEDERAL FUNDS NEEDED FOR BALANCE OF THE PROJECT

(a) Grant Programs	FUTURE FUNDING PERIODS (Years)			
	(b) First	(c) Second	(d) Third	(e) Fourth
16.	$	$	$	$
17.				
18.				
19.				
20. Total (sum of lines 16-19)	$	$	$	$

SECTION F - OTHER BUDGET INFORMATION

21. Direct Charges	22. Indirect Charges:
23. Remarks:	

ATTACHMENT C

LETTERS OF SUPPORT

Florida Association of Environmental Professionals
Northwest Chapter

Letter of Support for NOAA Project Title: *Recover Act restoring Western Garcon Point with Oyster Breaks and Shoreline Vegetation*

26 March 2009

Pat Montanio, Director
Office of Habitat Conservation
NOAA Fisheries
Suite 14828
Silver Springs, MD 20910

The Northwest Chapter of the Florida Association of Environmental Professionals is pleased to support shoreline stabilization projects in our local coastal waters, such as the one currently being proposed to NOAA. Projects which serve to allow coastal areas to increase their natural resilience by dissipating wave energies have been proven effective, as was observed at the Project GreenShores site after Hurricane Ivan came ashore in 2004.

The conservation and restoration of our coastal ecosystems is becoming more important as growth and development threaten our remaining resources in the Panhandle of Florida. Restoration projects in high profile areas, such as the Western Garcon Point Site, will also serve to passively showcase the benefits of restoration efforts to a portion of the community not generally targeted, i.e. retired individuals.

Sincerely,

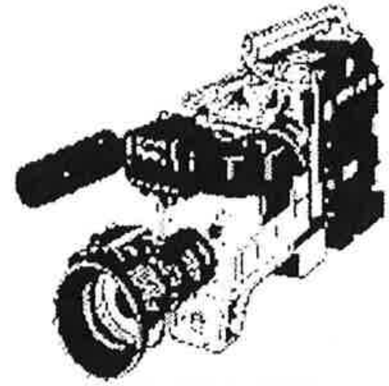
Barbara Albrecht
President,
FAEP NW Chapter

Watkins Productions

PO Box 4208
Pensacola, FL 32507

850-516-1380 cell

watkinsvideo@cox.net
www.watkinsvideo.com



March 26, 2009

Pat Montanio, Director
Office of Habitat Conservation
NOAA Fisheries
Suite 14828
Silver Spring, MD 20910

Dear Mr. Montanio:

On behalf of Watkins Productions please accept this letter of support for the Recovery Act restoring Western Garcon Point Shoreline with Oyster Breaks and Shoreline Vegetation.

I understand that Bay Area Resource Council is requesting funds on behalf of NOAA to address coastal habitat preservation and restoration, oyster habitat creation, and shoreline stabilization in Escambia Bay in Santa Rosa County, Florida. The project will reestablish coastal habitats that have been lost to either natural/anthropogenic causes while improving water quality through the uptake of nutrients and/or pollutants from runoff from the planting of shoreline vegetation, restoring approximately 1,260 linear feet of shoreline. In addition, the project will establish essential habitat for a wide array fish and bird species through the placement and creation of oyster reefs/breakwaters. The restoration of the littoral zone will reestablish the abundances and diversity in benthic and the water column communities.

I am confident that the Bay Area Resource Council team is capable of ensuring that this project comes to fruition.

Please feel free to contact me at (850) 516-1380 so that we may demonstrate further support of this grant application.

Sincerely,

Elizabeth J. Watkins

Elizabeth J Watkins

SANTA ROSA COUNTY
BOARD OF COMMISSIONERS

Santa Rosa Administrative Offices
6495 Caroline Street, Suite M
Milton, Florida 32570-4592

JIM WILLIAMSON, District 1
ROBERT A. "BOB" COLE, District 2
W. D. "DON" SALTER, District 3
GORDON GOODIN, District 4
R. LANE LYNCHARD, District 5

HUNTER WALKER, County Administrator
THOMAS V. DANNHEISSER, County Attorney
JOEL D. HANIFORD, OMB Director

RECEIVED
MAR 3 0 2009

March 27, 2009

Pat Montanio, Director
Office of Habitat Conservation
NOAA Fisheries
Suite 14828
Silver Spring, MD 20910

Dear Mr. Montanio:

On behalf of the Santa Rosa Board of County Commissioners please accept this letter of support for the Recovery Act restoring Western Garcon Point Shoreline with Oyster Breaks and Shoreline Vegetation.

I understand that Bay Area Resource Council is requesting funds on behalf of NOAA to address coastal habitat preservation and restoration, oyster habitat creation, and shoreline stabilization in Escambia Bay in Santa Rosa County, Florida. The project will reestablish coastal habitats that have been lost to either natural or anthropogenic causes while improving water quality through the uptake of nutrients and/or pollutants from runoff from the planting of shoreline vegetation, restoring approximately 1,260 linear feet of shoreline. In addition, the project will establish essential habitat for a wide array of fish and bird species through the placement and creation of oyster reefs/breakwaters. The restoration of the littoral zone will reestablish the abundances and diversity in benthic and the water column communities.

As Chair of the Bay Area Resource Council, I know they are capable of ensuring this project comes to fruition.

Please feel free to contact me if necessary to demonstrate further support of this grant application.

Sincerely,

Bob Cole
Santa Rosa County Commissioner

University of West Florida

Research and Graduate Studies
11000 University Parkway
Pensacola, FL 32514-5450

March 27, 2009

Patricia A. Montanio, Director
Office of Habitat Conservation
NOAA Fisheries Service
1315 East West Highway Ste 14828
Silver Spring MD 20910

Program Title:	NOAA Coastal and Marine Habitat Restoration Project Grants under the American Recovery and Reinvestment Act of 2009
Reference:	NOAA-NMFS-HCPO-2009-2001709
Proposal Title:	Recovery Act Restoring Western Garcon Point Shoreline with Oyster Breaks and Shoreline Vegetation (UWF Prop 2009-086R)
Principal Investigator(s)	Lead PI: Ms. Mary F. Gutierrez, West Florida Regional Planning Council UWF PI: Dr. Richard A. Snyder, Center for Environmental Diagnostics and Bioremediation

Dear Ms. Montanio:

This letter is to notify you of the commitment of the University of West Florida to participate in the proposal referenced above as a collaborator to the lead proposal submitted by the West Florida Regional Planning Council/Bay Area Resource Council. The statement of work as provided by Dr. Richard Snyder and the budget supporting this proposal is authorized as submitted.

The University meets all required conditions for award of federal, state or private funds and certifications will be provided upon request. The University is audited as an entity of the State of Florida for purposes of A-133 compliance. The latest report is available from State Auditor General website at http://www.state.fl.us/audgen/pages/subjects/university.htm. Other documents verifying eligibility are available upon request.

Should this request be approved, please transmit the notification directly to Ms. Carol Rafalski in this office. If you need any additional documents or certifications, please contact her at 850-474-2825 or fax to 850-474-2082 or by e-mail at crafalsk@uwf.edu.

Sincerely,

Richard S. Podemski

Richard S. Podemski, PhD
Associate Vice President for Research and
Dean of Graduate Studies

Phone **850.474.2824/2825** Fax **850.474.2082**
Web **research.uwf.edu**
An Equal Opportunity/Equal Access Institution

March 31, 2009

Pat Montanio, Director
Office of Habitat Conservation
NOAA Fisheries
Suite 14828
Silver Spring, MD 20910

The Marine Advisory Committee of Santa Rosa County wants to express its support for the proposed Western Garcon Point Project. Our board is committed to seeking every opportunity to restore, rebuild, or replenish our valuable waterways and marshlands.

The Garcon Point area is a critical habitat for Escambia Bay. Escambia Bay is in desperate need of projects to restore and replenish this great waterway. Stabilizing the shoreline and providing oyster to shell to grow, nurture, and feed our wildlife and fishery will benefit our citizens for generations to come!

Sincerely,

J L Marker

Jeff Marker
Chairman
Santa Rosa County
Marine Advisory Committee

ECS

Ecological Consulting Services, Inc.
38 S Blue Angel Pkwy #346
Pensacola FL 32506

March 31, 2009

Pat Montanio, Director
Office of Habitat Conservation
NOAA Fisheries
Suite 14828
Silver Spring, MD 20910

I would like to express my support in the West Garcon Point shoreline stabilization and oyster breakwater project. Development of the Garcon Point/ East Bay area has increased and natural resources are being depleted due to erosion, sedimentaion and scouring. This project protects and sustains some of the few areas that are still being maintained as a living shoreline. Stabilization projects without industrial development and impact are not common which makes this project unique and more important when it comes to protecting natural resources. The oyster breakwater will not only add stabilization to the shoreline to promote living shorelines, but will increase the fish population due to the additional habitat and marine species biodiversity. This is a great project to help future generations enjoy the natural resources of Garcon Point.

Sincerely,

Heather Reed

Heather Reed
Natural Resource Specialist
President, Ecological Consulting Services Inc.

Gulf Coastal Plain Ecosystem Partnership

8831 Whiting Field Circle
Milton, FL
32570

31 March 2009

Dear Pat Montanio,

The Gulf Coastal Plain Ecosystem Partnership (GCPEP) is pleased to support shoreline stabilization projects in our local coastal waters, such as the ones currently being proposed to NOAA by several of our Partners. Projects which serve to allow coastal areas to increase their natural resilience by dissipating wave energies have been proven effective, as was observed in our region at the Project GreenShores site after Hurricane Ivan came ashore in 2004.

Historically, oyster reefs were documented in Pensacola Bay and supported a large local fishery through the 1950's. Present research has acknowledged oysters as effective water quality enhancers. The conservation and restoration of our coastal ecosystems is becoming more important as growth and development threaten our remaining resources in the Florida Panhandle.

We hope that NOAA will consider the following projects essential to the health of the coastline and support these proposals.

The following proposals are being submitted for review:

- *Recovery Act restoring Western Garcon Point Shoreline with Oyster Breaks and Shoreline Vegetation*
- *Yellow River Marsh Aquatic Preserve and State Park Restoration*
- *The City of Gulf Breeze Deadman's Island Restoration Project 2009*

Thank you for your consideration,

Vernon Compton

Vernon Compton
Project Director
Gulf Coastal Plain Ecosystem Partnership

recycled paper

REBOL-BATTLE & ASSOCIATES
Civil and Environmental Engineers

April 1, 2009

Pat Montanio, Director
Office of Habitat Conservation
NOAA Fisheries
Suite 14828
Silver Springs, MD 20910

RE: Letter of Support for NOAA Project Title: *Recover Act restoring Western Garcon Point with Oyster Breaks and Shoreline Vegetation*

Dear Pat:

Rebol-Battle & Associates is a civil and environmental consulting firm located in Pensacola, Florida. We are pleased to support shoreline stabilization projects in our local coastal waters, such as the one currently being proposed to NOAA. Projects which serve to allow coastal areas to increase their natural resilience by dissipating wave energies have been proven effective, as was observed at the Project Green Shores site after Hurricane Ivan came ashore in 2004.

The conservation and restoration of our coastal ecosystems is becoming more important as growth and development threaten our remaining resources in the Panhandle of Florida. Restoration projects in high profile areas, such as the Western Garcon Point Site, will also serve to passively showcase the benefits of restoration efforts.

Sincerely,
Rebol-Battle & Associates, LLC

Paul A. Battle, PE

214 E. Church St • Pensacola, Florida 32502 • 850.438.0400 • Fax: 850.438.0448

Florida Department of
Environmental Protection
NWF Aquatic Preserves Office
1600 Garcon Point Road
Milton, Fl 32583

Charlie Crist
Governor

Jeff Kottkamp
Lt. Governor

Michael W. Sole
Secretary

Date: April 1, 2009

To: Pat Montanio, Director
Office of Habitat Conservation
NOAA Fisheries
Suite 14828
Silver Springs, MD 20910

The Northwest Florida Aquatic Preserve office would like to support the Western Garcon Pt. shoreline restoration and protection project. This project is adjacent to the Yellow River Marsh Aquatic Preserve and Yellow River State Park where numerous listed species, including the endangered Flatwoods Salamander and the pitcher plant wet prairie, will benefit. The habitat on the western portion of Garcon Pt. that will be restored is a showcase of "living shoreline" approaches to coastal resiliency. The entire area Pensacola watershed will benefit from this project where two aquatic preserves are located.

Thank you for the opportunity to support the funding request for this project.

Respectfully yours,

Shelley Alexander

Shelley Alexander, Manager
Northwest Florida Aquatic Preserve Office