

**U.S. Fish and Wildlife Service  
South Florida Coastal Program Office  
Coastal Program Request for Financial Assistance 2010 Final**

**Project Title:** Restoration of Mangroves at Fruit Farm Creek Within the Rookery Bay  
National Estuarine Research Reserve, Collier County, Florida. Phase 1.

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**Project Objectives:**

Rookery Bay National Estuarine Research Reserve (RBNERR) is located in Naples, Florida and was created in 1978 after years of public involvement and environmental conservation to preserve approximately 110,000 acres of mixed coastal uplands and wetlands, 45,845 acres of which are subtropical mangrove forest. Within the USFWS "Strategic Landscape Conservation Approach," we suggest that mangrove forests of southwest Florida including the Ten-Thousand Islands and the RBNERR, are focal areas and should be a geographic priority. The successful

restoration of mangroves in this area will serve as a model for similar efforts in south Florida, the Gulf of Mexico and the Caribbean Sea. With the problems of global climate change and sea level rise facing all the mangroves of these areas, improved hydrology to allow for adaptation to rising water levels is an essential part of the management of these ecosystems, and a healthy hydrologic system supports these adaptations.

Within the RBNERR there is an area of approximately 250 acres of mangroves that are currently dead, dying, or severely stressed, and approximately 800 acres of the adjacent estuary that are impaired due to the lack of full connectivity to these mangroves. This is believed to be the result of a roadway that prohibits adequate hydrologic connection and tidal flow (Lewis, R.R., personnel observation). Surface water levels are significantly higher and the hydroperiod is significantly longer in the damaged mangrove area than in adjacent reference sites. Extended periods of flooding within the damaged area have resulted in an expansion of the area of mangrove forest die-off (Worley, K., personnel observation). Furthermore, the movement of fish and invertebrates into and out of the area is very restricted, and the export of detrital material to the adjacent estuary is substantially reduced. As a result, the ecological function this area of RBNERR has been lost or impaired. Following completion of the project, direct measurement of the increased function of restored fish and invertebrate habitat will be made as part of this proposed science-based restoration program.

In addition, the mangrove die-off area can be easily seen from the SR 92, and this has in some regard raised public awareness of the problem. However, residents of the local area have little or no knowledge why forest is dying, how the RBNERR is planning to overcome the problem, or how mangroves benefit their local community at large. Investigators propose to address these problems with two project phases over a five-year period:

***Phase One:***

- 1) Facilitate a coordinated restoration effort among identified project stakeholders;
- 2) Perform background characterization tasks, such as topographic surveys, hydrologic modeling, and historical change detection, and prepare maps and reports from these tasks;
- 3) Prepare a cost effective restoration plan to restore the hydrology to the largest possible area of damaged mangroves and impaired estuarine habitat;
- 4) Prepare and submit a Joint Environmental Resource Permit (ERP) and Federal Dredge and Fill permit application to the South Florida Water Management District (SFWMD) and the U.S. Army Corps of Engineers (USACOE).
- 5) Coordinate permitting with the City of Marco, Collier County and the Florida Department of Transportation as needed
- 6) Coordinate permitting and review agency comments and respond to requests for additional information (RAIs) through the issuance of the ERP and Federal Dredge and Fill permits.
- 7) Conduct a three-day workshop on "Mangrove Forest Ecology, Management and Restoration" on-site for interested stakeholders. Workshop conducted by Coastal Resources Group, Inc., in conjunction with the RBNERR.
- 8) Incorporate up to ten (10) "young professionals" from area schools, colleges and/or universities in an on-going program to develop hands-on capabilities in restoration project design, implementation and monitoring for the life of the project.

***Phase Two: (to be the subject of separate funding applications)***

- 1) Prepare construction drawings for the permitted project.
- 2) Assist with bidding and contractor selection for the actual restoration work.
- 3) Supervise construction work and compliance reporting.
- 4) Conduct monitoring of the project in conjunction with the "young professionals" team.
- 5) Make adjustments to the restoration plan as data on the success of vegetation establishment and faunal use are collected and analyzed.

**Project Location and Description:**

RBNERR is located in the West Florida subregion of the West Indian Biogeographic Region and within the physiographic region of the Ten Thousand Islands. The mangrove die-off area of concern is located along State Road 92 (also known as San Marco Road) approximately one mile west of the town of Goodland adjacent to Fruit Farm Creek, in Collier County, in southwest Florida (Township 52 South, Range 26 East, and primarily Sections 14 and 15 but also portions of Sections 10, 11, 13) between Latitude 25.9397 and 25.9242, Longitude 81.6552 and 81.6866 (See Figure 1).

Three clearly visible mangrove die-off areas have been identified comprising approximately 100 acres, but are expanding. These areas are characterized by dead trees that remain standing and are most visible on south of State Road 92, but also exist on the north of State Road 92 (See Figure 2). The area surrounding the visibly dead forest is stressed from extended flooding and has been estimated to be 250 acres and is growing, again predominately on the south side of State Road 92. The estuarine mangrove area to benefit from hydrological restoration of the site is estimated to be approximately 800 acres (see Figure 3 and 4).

The project will occur in two phases. This proposal focuses on and requests funds for Phase One only, but describes and estimates work that is expected to occur in Phase Two.

### ***Phase One:***

#### **Task 1. Establish Restoration Steering Committee**

At the onset of the project the Restoration Team consisting of the project investigators will meet and form a Restoration Steering Committee comprised of stakeholders and project partners. These will include RBNERR staff and representatives from USFWS South Florida Ecological Services Office, Collier County Transportation and Environmental Services Departments, the Conservancy for Southwest Florida, the Florida Fish and Wildlife Conservation Commission and the City of Marco Island, as well as representatives of the adjacent residential developments, Key Marco and Stevens's Landing. This Restoration Team will work with the Steering Committee to confirm the project goals and roles of each partner/stakeholder. Subsequent meetings will be held during the development of the project.

#### **Task 2. Gather and synthesize existing information on the Fruit Farm Creek restoration area.**

#### **Task 3: Prepare Restoration Plan**

A topographic and bathymetric survey will be completed in order to characterize the existing conditions of the site. Hydrology and tidal flow within the areas of concern will be described based upon the placement of three hydrologic monitor devices in the closest unimpacted (control) creek system, the flow way into the mangroves from the existing single culvert, and a third in the dead mangrove area. In addition, other biological, physical and permitting constraints within the project site will be identified, including the presence of non-native vegetation that will be removed as part of the final restoration plan. Once the site is characterized, restoration alternatives will be considered via hydrologic modeling and evaluated based on cost efficiency and likelihood of meeting project goals. A preferred alternative will be selected and permit drawings prepared.

#### **Task 4: Permitting**

Based on the preferred alternative, a Joint Environmental Resource Permit (ERP) and Federal Dredge and Fill permit application will be prepared and submitted to the SFWMD and the USACOE. Coordination with the U.S. National Marine Fisheries Service is anticipated regarding the endangered smalltooth sawfish.

### ***Phase Two:***

#### **Task 1: Implement Restoration Plan**

The restoration plan is likely to comprise recommendations for improvements to the existing culvert along State Road 92, and possibly installation of other culverts. The restoration team will work with Collier County and the Florida Department of Transportation to plan, design and install the minimum cost effective means of restoring tidal flows and allowing natural restoration processes to begin per the principles of Ecological Mangrove Restoration (EMR) as outlined in Lewis (2005, 2009) and Lewis et al. (2006).

#### **Task 2: Environmental Review and Compliance Monitoring**

The restoration plan developed in Phase One will include a full restoration monitoring program including a Time Zero report, and Time Zero plus 3, 6, 9, 12, 24, 36, 48 and 60 months reports.

### **Project Benefits to Coastal Ecosystems:**

Mangrove and estuarine habitats provide critical nursery areas for a number of larval and juvenile finfish and shellfish species of commercial and recreational importance. Many fish species take shelter and feed within mangrove habitats as well. Some fish species that will benefit from this project include the endangered fish species the smalltooth sawfish (*Pristis pectinata*) which is reported at its smallest sizes using "... shallow (<2.4 m) protected mangrove areas..." (Poulakis and Seitz 2004) and important recreational and commercial fish and

shellfish species such as snook (*Centropomus undecimalis*), sheepshead (*Archosargus probatocephalus*), mangrove snapper (*Lutjanus griseus*), tarpon (*Megalops atlanticus*), red drum (*Sciaenops ocellatus*), spotted seatrout (*Cynoscion nebulosus*), stone crabs (*Menippe mercenaria*), blue crabs (*Callinectes sapidus*), pink shrimp (*Farfantepenaeus duorarum*) and oysters (*Crassostrea virginicus*). An estimated 75% of the game fish and 90% of the commercial fish species in south Florida depend on mangrove systems.

Restoration of the mangrove die-off areas and the associated mangroves and estuarine system will provide additional foraging and roosting areas for shore and wading birds such as the roseate spoonbill (*Ajaia ajaia*), frigatebird (*Fregata magnificans*), double-crested cormorant (*Phalacrocorax auritus*), great blue heron (*Ardea herodias*), snowy egret (*Egretta thula*), green heron (*Butorides virescens*), reddish egret (*Egretta rufescens*) and migratory birds such as the brown pelican (*Pelecanus occidentalis*).

### **Contributing Partners:**

The principle investigator from the Coastal Resources Group, Inc. (CRG) Mr. Roy R. Lewis III, Professional Wetland Scientist (PWS) will donate half of his time spent on the project and Dorothea Zysko, PWS, co-investigator from CRG will donate one-quarter of her time spent on the project

RBNERR staff is committed to contribute staff time and technical support with each task involved in reaching the project goals, including playing a primary role on the core restoration team, assisting in the topographic survey, creation of mapping documents throughout the planning and implementation phases using information generated during the topographic and other surveys, and monitoring the biological resources, including fish and bird species. In addition, the RBNERR's Trimble GeoExplorer® unit, GIS computer, and statistical software for data analysis will be used during survey work and the preparation of the restoration plan.

Collier County Transportation and Environmental Services Departments have been contacted and are expected to contribute staff time and materials to repair existing infrastructure, staff time in the restoration planning, and technical support and staff time in the planning and installation of the public education display along State Road 92.

The Conservancy of Southwest Florida staff have conducted work and made important contacts over the past several years characterizing the mangrove-die off areas. They have agreed to participate as a member of a restoration steering committee and in this regard will contribute staff time and technical support over the course of the project, including a primary role in any investigations performed to assess restoration success through pre and post physical, vegetative, and wildlife monitoring. In addition the Conservancy of Southwest Florida's biological sampling equipment and other resources will be used during monitoring.

City of Marco has been contacted and is expected to contribute staff time and technical expertise in characterizing the existing biological conditions of the site and in the public education and outreach components of the project.

Representatives of the residential developments adjacent to the die-off areas have expressed concern and willingness to participate in resolving the mangrove die-off problem because it has direct visual and odor impacts on their properties. These representatives will be contacted and engaged to become members of the steering committee. In addition, the developments will be requested to make a cash donation to the implementation phase of work and directly assist in the public education outreach component of residents living in their communities.

### **Project Costs:**

Total costs to implement Phase One of the project, and estimates to complete Phase Two are contained in the project budget attached. The total requested funding for Phase One is \$124,395.85.

### **Statement of Products:**

Phase One (First 18 months) will result the following products:

- Restoration plans for 250 acres of dead, dying or stressed mangroves and 800 acres of impaired estuarine mangrove habitat including tidal creeks.
- Completed ERP application submitted within six months, and final issued permits to perform the proposed restoration received within one year of submittal (total 18 months)

Phase Two (Years 2 - 8) will result in the following products:

- Three interpretive panels with graphics that describe: 1) hydrologic considerations regarding mangroves, 2) the factors contributing to mangrove die-off and 3) plans for restoration of die-off areas. Panels will be installed at a pull out along State Road 92, at the RBNERR Environmental Learning Center, and the Conservancy of Southwest Florida Nature Center.
- 250 acres of restored mangroves and 800 acres of restored estuarine mangrove habitat for wildlife, as per the Restoration Plan completed in Phase One.
- Post restoration evaluation monitoring reports and final report, evaluation and workshop.

#### **Time Frame:**

A timeline for implementation of Phase One is provided in Attachment 3.

#### **Actions to Date:**

Evaluation and characterization of the site has been underway for the past five years by Robin Lewis of CRG. Kathy Worley of the Conservancy of Southwest Florida and the Florida International University have conducted work under a fellowship from NOAA's NERR program over the last ten years. The RBNERR staff has compiled historic aerial images of the die-off site. Two stakeholder/partner meetings have been held at RBNERR.

#### **Permits:**

An Environmental Resource Permit and Federal Dredge and fill permit will be required from the South Florida Water Management District and the U.S. Army Corps of Engineers, respectively. Local construction and Right-of-Way permits from the City of Marco and Collier County will be required after construction drawings are prepared. This Phase One proposal anticipates final receipt of the WMD and Corps permits.

#### **List of Attachments**

|                     |                                                                  |
|---------------------|------------------------------------------------------------------|
| <b>Attachment 1</b> | Figure 1. Location Map                                           |
|                     | Figure 2. Photo of Mangrove Die-off Area                         |
|                     | Figure 3. Restoration Area Vicinity Map                          |
|                     | Figure 4. Restoration Area Site Map                              |
| <b>Attachment 2</b> | Proposed Project Budget                                          |
| <b>Attachment 3</b> | Project Timeline                                                 |
| <b>Attachment 4</b> | Summary of Qualifications for Investigators and Co-investigators |
| <b>Attachment 5</b> | Literature Cited                                                 |

## **ATTACHMENT 1. Maps and Figures**

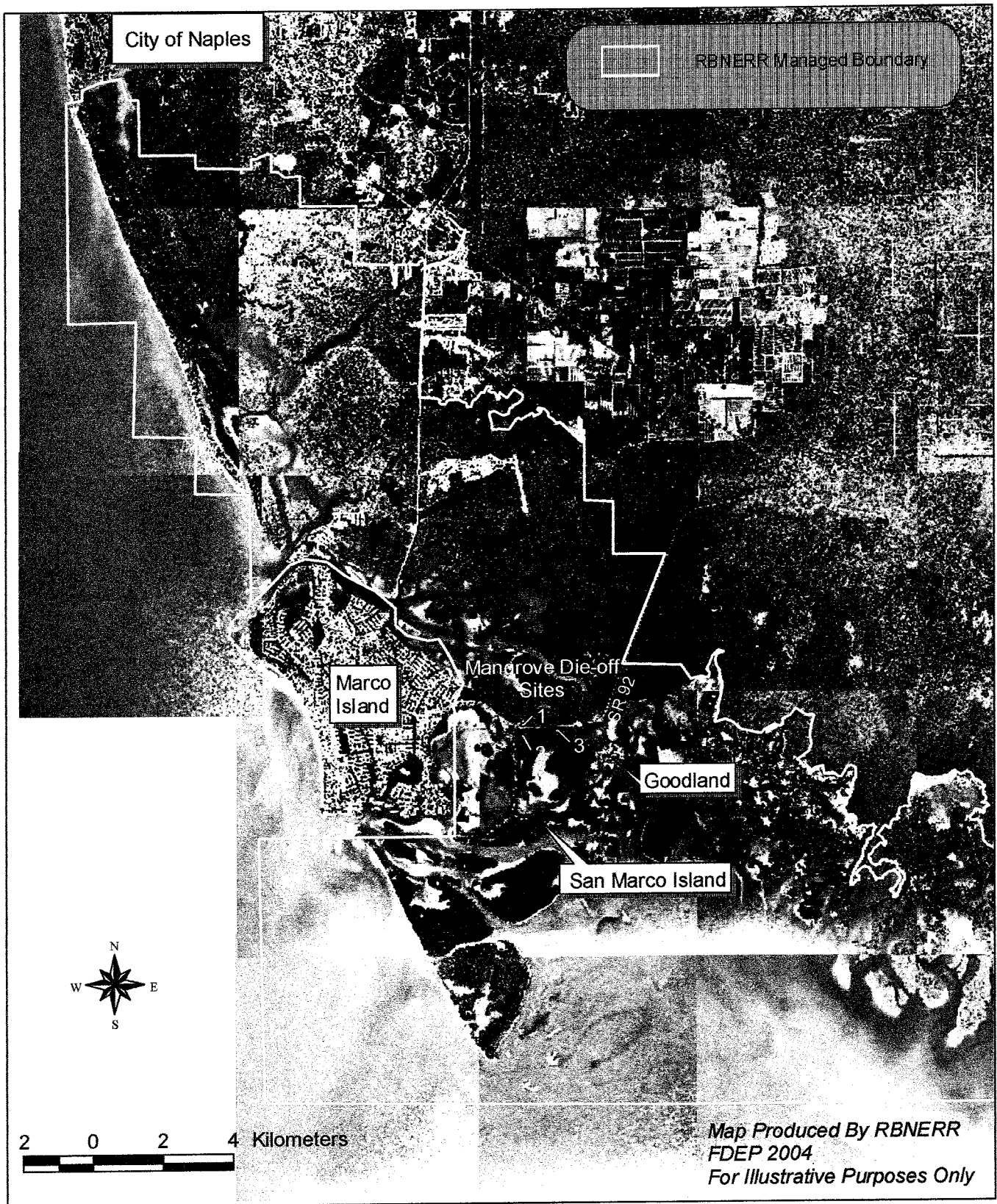


Figure 1. Location map, mangrove die-off areas 1, 2, and 3 within the Rookery Bay National Estuarine Research Reserve, Collier County, Florida.



Figure 3. Ground level view of mangrove die-off area 2,  
February 27, 2004.



Figure 3. Estuarine Mangrove Restoration Project Site.



**Figure 4. Proposed Rookery Bay NERR restoration sites 1, 2 and 3 with adjacent habitats.**

**ATTACHMENT 2. Proposed Project Budget**

Man Hour Estimates  
Restoration of Mangroves at Fruit Farm Creek within the Rookery Bay National Estuarine Research Reserve

| Task No.                                                          | Task Title                                      | Engineering Principal |                   | Professional Surveyor |                    | Engineer  |                    | Principal Investigator |                    | Associate Scientist |                    | USF      |
|-------------------------------------------------------------------|-------------------------------------------------|-----------------------|-------------------|-----------------------|--------------------|-----------|--------------------|------------------------|--------------------|---------------------|--------------------|----------|
|                                                                   |                                                 | Hours                 | Cost              | Hours                 | Cost               | Hours     | Cost               | Hours                  | Cost               | Hours               | Cost               |          |
| <b>RATES</b>                                                      |                                                 |                       | \$155.00          |                       | \$ 135.00          |           | \$ 115.00          |                        | \$ 150.00          |                     | \$ 100.00          |          |
| <b>1.0 General Consultation</b>                                   |                                                 |                       |                   |                       |                    |           |                    |                        |                    |                     |                    |          |
|                                                                   | Attend 5 Meetings over Eighteen months          | 20                    | \$3,100.00        | 20                    | \$ 2,700.00        | 20        | \$ 2,300.00        | 20                     | \$ 3,000.00        | 30                  | \$ 3,000.00        | 0        |
|                                                                   | Mangrove Training Workshop                      | 0                     | \$0.00            | 0                     | -                  | 0         | -                  | 40                     | \$ 6,000.00        | 4                   | \$ 400.00          | 0        |
|                                                                   |                                                 | <b>20</b>             | <b>\$3,100.00</b> | <b>20</b>             | <b>\$ 2,700.00</b> | <b>20</b> | <b>\$ 2,300.00</b> | <b>60</b>              | <b>\$ 9,000.00</b> | <b>34</b>           | <b>\$ 3,400.00</b> | <b>0</b> |
| <b>2.0 Research and Data Collection</b>                           |                                                 |                       |                   |                       |                    |           |                    |                        |                    |                     |                    |          |
|                                                                   | Field Investigations                            | 16                    | \$2,480.00        | 8                     | \$ 1,080.00        | 16        | \$ 1,840.00        | 40                     | \$ 6,000.00        | 40                  | \$ 4,000.00        | 22       |
|                                                                   | Obtain Current and Historic Aerials             | 1                     | \$155.00          | 0                     | -                  | 4         | \$ 460.00          | 2                      | \$ 300.00          | 2                   | \$ 200.00          | 0        |
|                                                                   | Obtain Permits for Adjacent Properties and SR92 | 2                     | \$310.00          | 0                     | -                  | 8         | \$ 920.00          | 0                      | -                  | 0                   | -                  | 0        |
|                                                                   | Obtain P,G, and Drainage Plans Adj. Properties  | 1                     | \$155.00          | 0                     | -                  | 4         | \$ 460.00          | 0                      | -                  | 0                   | -                  | 0        |
|                                                                   | Primary GPS horizontal and Vertical Control     | 0                     | \$0.00            | 4                     | \$ 540.00          | 1         | \$ 115.00          | 0                      | -                  | 0                   | -                  | 0        |
|                                                                   | Station San Marco for 2,700-If                  | 0                     | \$0.00            | 6                     | \$ 810.00          | 2         | \$ 230.00          | 0                      | -                  | 0                   | -                  | 0        |
|                                                                   | Cross Sections for San Marco                    | 0                     | \$0.00            | 2                     | \$ 270.00          | 2         | \$ 230.00          | 0                      | -                  | 0                   | -                  | 0        |
|                                                                   | Establish Baseline on Tidal Creeks              | 0                     | \$0.00            | 4                     | \$ 540.00          | 2         | \$ 230.00          | 0                      | -                  | 0                   | -                  | 0        |
|                                                                   | 3 Topo Cross Sections for each creek            | 0                     | \$0.00            | 2                     | \$ 270.00          | 2         | \$ 230.00          | 0                      | -                  | 0                   | -                  | 0        |
|                                                                   |                                                 | <b>4</b>              | <b>\$3,100.00</b> | <b>18</b>             | <b>\$ 3,510.00</b> | <b>25</b> | <b>\$ 4,715.00</b> | <b>42</b>              | <b>\$ 6,300.00</b> | <b>2</b>            | <b>\$ 4,200.00</b> | <b>0</b> |
| <b>3.0 Feasibility Analysis, Report &amp; Public Presentation</b> |                                                 |                       |                   |                       |                    |           |                    |                        |                    |                     |                    |          |
|                                                                   | Feasibility Report Support                      | 8                     | \$1,240.00        | 1                     | \$ 135.00          | 24        | \$ 2,760.00        | 10                     | \$ 1,500.00        | 24                  | \$ 2,400.00        | 0        |
|                                                                   | Preliminary Opinions of Probable Cost           | 16                    | \$2,480.00        | 1                     | \$ 135.00          | 16        | \$ 1,840.00        | 0                      | -                  | 2                   | \$ 200.00          | 0        |
|                                                                   |                                                 | <b>24</b>             | <b>\$3,720.00</b> | <b>2</b>              | <b>\$ 270.00</b>   | <b>40</b> | <b>\$ 4,600.00</b> | <b>10</b>              | <b>\$ 1,500.00</b> | <b>26</b>           | <b>\$ 2,600.00</b> | <b>0</b> |
| <b>4.0 Design Development</b>                                     |                                                 |                       |                   |                       |                    |           |                    |                        |                    |                     |                    |          |
|                                                                   | Design Alternatives                             | 20                    | \$3,100.00        | 2                     | \$ 270.00          | 18        | \$ 2,070.00        | 0                      | -                  | 4                   | \$ 400.00          | 0        |
|                                                                   | Prepare Opinion of Probable Cost                | 4                     | \$620.00          | 2                     | \$ 270.00          | 16        | \$ 1,840.00        | 0                      | -                  | 1                   | \$ 100.00          | 0        |
|                                                                   |                                                 | <b>24</b>             | <b>\$3,720.00</b> | <b>4</b>              | <b>\$ 540.00</b>   | <b>34</b> | <b>\$ 3,910.00</b> | <b>0</b>               | <b>-</b>           | <b>5</b>            | <b>\$ 500.00</b>   | <b>0</b> |
| <b>5.0 ERP Application Preparation</b>                            |                                                 |                       |                   |                       |                    |           |                    |                        |                    |                     |                    |          |
|                                                                   | Pre-Application Meeting/joint with COE          | 4                     | \$620.00          | 4                     | \$ 540.00          | 4         | \$ 460.00          | 4                      | \$ 600.00          | 4                   | \$ 400.00          | 0        |
|                                                                   | Modeling                                        | 12                    | \$1,860.00        | 0                     | -                  | 24        | \$ 2,760.00        | 10                     | \$ 1,500.00        | 0                   | -                  | 0        |
|                                                                   | ERP Application & UMAM                          | 6                     | \$930.00          | 2                     | \$ 270.00          | 32        | \$ 3,680.00        | 5                      | \$ 750.00          | 40                  | \$ 4,000.00        | 0        |
|                                                                   |                                                 | <b>22</b>             | <b>\$3,410.00</b> | <b>6</b>              | <b>\$ 810.00</b>   | <b>60</b> | <b>\$ 6,900.00</b> | <b>19</b>              | <b>\$ 2,850.00</b> | <b>44</b>           | <b>\$ 4,400.00</b> | <b>0</b> |
| <b>6.0 ERP Application Support</b>                                |                                                 |                       |                   |                       |                    |           |                    |                        |                    |                     |                    |          |
|                                                                   | Sufficiency One                                 | 6                     | \$930.00          | 4                     | \$ 540.00          | 18        | \$ 2,070.00        | 5                      | \$ 750.00          | 24                  | \$ 2,400.00        | 0        |
|                                                                   | Sufficiency Two                                 | 2                     | \$310.00          | 1                     | \$ 135.00          | 12        | \$ 1,380.00        | 5                      | \$ 750.00          | 24                  | \$ 2,400.00        | 0        |
|                                                                   |                                                 | <b>8</b>              | <b>\$1,240.00</b> | <b>5</b>              | <b>\$ 675.00</b>   | <b>30</b> | <b>\$ 3,450.00</b> | <b>10</b>              | <b>\$ 1,500.00</b> | <b>48</b>           | <b>\$ 4,800.00</b> | <b>0</b> |
| <b>7.0 Federal Wetland Permitting Application</b>                 |                                                 |                       |                   |                       |                    |           |                    |                        |                    |                     |                    |          |
|                                                                   | Drawing Transfer                                | 0                     | \$0.00            | 0                     | -                  | 1         | \$ 115.00          | 0                      | -                  | 0                   | -                  | 0        |
|                                                                   | Dredge Fill Calculations                        | 2                     | \$310.00          | 2                     | \$ 270.00          | 12        | \$ 1,380.00        | 0                      | -                  | 4                   | \$ 400.00          | 0        |
|                                                                   |                                                 | <b>2</b>              | <b>\$310.00</b>   | <b>2</b>              | <b>\$ 270.00</b>   | <b>13</b> | <b>\$ 1,495.00</b> | <b>0</b>               | <b>-</b>           | <b>4</b>            | <b>\$ 400.00</b>   | <b>0</b> |

Man Hour Estimates  
Restoration of Mangroves at Fruit Farm Creek within the Rookery Bay National Estuarine Research Reserve

| Task No.    | Task Title                                   | Engineering Principal |                    | Professional Surveyor |                    | Engineer      |                     | Principal Investigator |                     | Associate Scientist |                     | USF         |             |
|-------------|----------------------------------------------|-----------------------|--------------------|-----------------------|--------------------|---------------|---------------------|------------------------|---------------------|---------------------|---------------------|-------------|-------------|
|             |                                              | Hours                 | Cost               | Hours                 | Cost               | Hours         | Cost                | Hours                  | Cost                | Hours               | Cost                | Hours       | Cost        |
| <b>8.0</b>  | <b>Federal Permit RAI</b>                    |                       |                    |                       |                    |               |                     |                        |                     |                     |                     |             |             |
|             | Sufficiency One                              | 2                     | \$310.00           | 1                     | \$ 135.00          | 6             | \$ 690.00           | 4                      | \$ 600.00           | 16                  | \$ 1,600.00         | 0           | 0           |
|             | Sufficiency Two                              | 0                     | \$0.00             | 0                     | -                  | 0             | -                   | 4                      | \$ 600.00           | 16                  | \$ 1,600.00         | 0           | 0           |
|             |                                              | <b>2</b>              | <b>\$310.00</b>    | <b>1</b>              | <b>\$ 135.00</b>   | <b>6</b>      | <b>\$ 690.00</b>    | <b>8</b>               | <b>\$ 1,200.00</b>  | <b>32</b>           | <b>\$ 3,200.00</b>  | <b>0</b>    | <b>0</b>    |
| <b>9.0</b>  | <b>City of Marco ROW Application</b>         |                       |                    |                       |                    |               |                     |                        |                     |                     |                     |             |             |
|             | Pre-application meeting                      | 4                     | \$620.00           | 0                     | -                  | 0             | -                   | 2                      | \$ 300.00           | 2                   | \$ 200.00           | 0           | 0           |
|             | Application Preparation                      | 4                     | \$620.00           | 1                     | \$ 135.00          | 24            | \$ 2,760.00         | 0                      | -                   | 2                   | \$ 200.00           | 0           | 0           |
|             |                                              | <b>8</b>              | <b>\$1,240.00</b>  | <b>1</b>              | <b>\$ 135.00</b>   | <b>24</b>     | <b>\$ 2,760.00</b>  | <b>2</b>               | <b>\$ 300.00</b>    | <b>4</b>            | <b>\$ 400.00</b>    | <b>0</b>    | <b>0</b>    |
| <b>10.0</b> | <b>City of Marco ROW Application Support</b> |                       |                    |                       |                    |               |                     |                        |                     |                     |                     |             |             |
|             | Sufficiency One                              | 4                     | \$620.00           | 2                     | \$ 270.00          | 16            | \$ 1,840.00         | 1                      | \$ 150.00           | 4                   | \$ 400.00           | 0           | 0           |
|             | Sufficiency Two                              | 2                     | \$310.00           | 0                     | -                  | 8             | \$ 920.00           | 1                      | \$ 150.00           | 4                   | \$ 400.00           | 0           | 0           |
|             |                                              | <b>0</b>              | <b>\$930.00</b>    | <b>2</b>              | <b>\$ 270.00</b>   | <b>24</b>     | <b>\$ 2,760.00</b>  | <b>2</b>               | <b>\$ 300.00</b>    | <b>8</b>            | <b>\$ 800.00</b>    | <b>0</b>    | <b>0</b>    |
| <b>11.0</b> | <b>Reimbursables</b>                         |                       |                    |                       |                    |               |                     |                        |                     |                     |                     |             |             |
|             |                                              |                       | \$1,250.00         |                       | \$ 250.00          |               | \$ 650.00           |                        | \$ 2,500.00         |                     | \$ 750.00           |             |             |
|             | <b>TOTAL COSTS :</b>                         | <b>114.00</b>         | <b>\$22,330.00</b> | <b>61.00</b>          | <b>\$ 9,565.00</b> | <b>276.00</b> | <b>\$ 34,230.00</b> | <b>153.00</b>          | <b>\$ 25,450.00</b> | <b>207.00</b>       | <b>\$ 25,450.00</b> | <b>0.00</b> | <b>0.00</b> |
|             | <b>LESS DONATED TIME</b>                     | 29                    | \$4,417.50         | 15                    | \$ 2,058.75        | 69            | \$ 7,935.00         | 85.5                   | \$ 12,725.00        | 51.75               | \$ 6,362.50         |             |             |
|             | <b>NET TOTAL COST</b>                        |                       | <b>\$17,912.50</b> |                       | <b>\$ 7,506.25</b> |               | <b>\$ 26,295.00</b> |                        | <b>\$ 12,725.00</b> |                     | <b>\$ 19,087.50</b> |             |             |

Man Hour Estimates  
Restoration of Mangroves at Fruit Farm Creek within the Rookery Bay National Estuarine Research Reserve

| Field Crew  | USF Tech |           | Engin. Tech II |             | Proj Coordinator III |           | 2-Man Field Crew |              | Survey Tech |             | Total |             |
|-------------|----------|-----------|----------------|-------------|----------------------|-----------|------------------|--------------|-------------|-------------|-------|-------------|
|             | Hours    | Cost      | Hours          | Cost        | Hours                | Cost      | Hours            | Cost         | Hours       | Cost        | Hours | Cost        |
| \$ 120.00   |          | \$ 80.00  |                | \$ 105.00   |                      | \$ 55.00  |                  | \$ 110.00    |             | \$ 105.00   |       |             |
|             |          |           |                |             |                      |           |                  |              |             |             |       |             |
| \$ -        | 0        | \$ -      | 2              | \$ 210.00   | 2                    | \$ 110.00 | 0                | \$ -         | 0           | \$ -        | 114   | \$14,420.00 |
| \$ -        | 0        | \$ -      | 0              | \$ -        | 2                    | \$ 110.00 | 0                | \$ -         | 0           | \$ -        | 46    | \$6,510.00  |
| \$ -        | 0        | \$ -      | 2              | \$ 210.00   | 2                    | \$ 220.00 | 0                | \$ -         | 0           | \$ -        | 160   | \$20,930.00 |
|             |          |           |                |             |                      |           |                  |              |             |             |       |             |
|             |          |           |                |             |                      |           |                  |              |             |             |       |             |
| \$ 2,640.00 | 0        | \$ -      | 0              | \$ -        | 0                    | \$ -      | 8                | \$ 880.00    | 0           | \$ -        | 128   | \$18,920.00 |
| \$ -        | 0        | \$ -      | 2              | \$ 210.00   | 0                    | \$ -      | 0                | \$ -         | 0           | \$ -        | 7     | \$1,325.00  |
| \$ -        | 0        | \$ -      | 0              | \$ -        | 8                    | \$ 440.00 | 0                | \$ -         | 0           | \$ -        | 18    | \$1,670.00  |
| \$ -        | 0        | \$ -      | 0              | \$ -        | 0                    | \$ -      | 0                | \$ -         | 0           | \$ -        | 5     | \$615.00    |
| \$ -        | 0        | \$ -      | 0              | \$ -        | 0                    | \$ -      | 12               | \$ 1,320.00  | 2           | \$ 210.00   | 19    | \$2,185.00  |
| \$ -        | 0        | \$ -      | 0              | \$ -        | 0                    | \$ -      | 10               | \$ 1,100.00  | 2           | \$ 210.00   | 20    | \$2,350.00  |
| \$ -        | 0        | \$ -      | 0              | \$ -        | 0                    | \$ -      | 60               | \$ 6,600.00  | 10          | \$ 1,050.00 | 74    | \$8,150.00  |
| \$ -        | 0        | \$ -      | 0              | \$ -        | 0                    | \$ -      | 20               | \$ 2,200.00  | 4           | \$ 420.00   | 30    | \$3,390.00  |
| \$ -        | 0        | \$ -      | 0              | \$ -        | 0                    | \$ -      | 20               | \$ 2,200.00  | 4           | \$ 420.00   | 28    | \$3,120.00  |
| \$ 2,640.00 | 0        | \$ -      | 2              | \$ 210.00   | 8                    | \$ 440.00 | 122              | \$ 14,300.00 | 22          | \$ 2,310.00 | 329   | \$41,725.00 |
|             |          |           |                |             |                      |           |                  |              |             |             |       |             |
|             |          |           |                |             |                      |           |                  |              |             |             |       |             |
| \$ -        | 0        | \$ -      | 8              | \$ 840.00   | 6                    | \$ 330.00 | 8                | \$ 880.00    | 0           | \$ -        | 89    | \$10,085.00 |
| \$ -        | 0        | \$ -      | 8              | \$ 840.00   | 4                    | \$ 220.00 | 0                | \$ -         | 0           | \$ -        | 45    | \$5,715.00  |
| \$ -        | 0        | \$ -      | 16             | \$ 1,680.00 | 10                   | \$ 550.00 | 8                | \$ 880.00    | 0           | \$ -        | 134   | \$15,800.00 |
|             |          |           |                |             |                      |           |                  |              |             |             |       |             |
|             |          |           |                |             |                      |           |                  |              |             |             |       |             |
| \$ -        | 0        | \$ -      | 16             | \$ 1,680.00 | 8                    | \$ 440.00 | 8                | \$ 880.00    | 4           | \$ 420.00   | 76    | \$9,260.00  |
| \$ -        | 0        | \$ -      | 8              | \$ 840.00   | 4                    | \$ 220.00 | 4                | \$ 440.00    | 2           | \$ 210.00   | 40    | \$4,540.00  |
| \$ -        | 0        | \$ -      | 24             | \$ 2,520.00 | 12                   | \$ 660.00 | 12               | \$ 1,320.00  | 6           | \$ 630.00   | 116   | \$13,800.00 |
|             |          |           |                |             |                      |           |                  |              |             |             |       |             |
|             |          |           |                |             |                      |           |                  |              |             |             |       |             |
| \$ -        | 0        | \$ -      | 0              | \$ -        | 1                    | \$ 55.00  | 0                | \$ -         | 0           | \$ -        | 13    | \$2,675.00  |
| \$ -        | 6        | \$ 480.00 | 8              | \$ 840.00   | 2                    | \$ 110.00 | 0                | \$ -         | 0           | \$ -        | 52    | \$7,550.00  |
| \$ -        | 0        | \$ -      | 32             | \$ 3,360.00 | 6                    | \$ 330.00 | 0                | \$ -         | 0           | \$ -        | 78    | \$13,320.00 |
| \$ -        | 6        | \$ 480.00 | 40             | \$ 4,200.00 | 9                    | \$ 495.00 | 0                | \$ -         | 0           | \$ -        | 143   | \$23,545.00 |
|             |          |           |                |             |                      |           |                  |              |             |             |       |             |
|             |          |           |                |             |                      |           |                  |              |             |             |       |             |
| \$ -        | 0        | \$ -      | 24             | \$ 2,520.00 | 4                    | \$ 220.00 | 8                | \$ 880.00    | 2           | \$ 210.00   | 66    | \$10,520.00 |
| \$ -        | 0        | \$ -      | 16             | \$ 1,680.00 | 4                    | \$ 220.00 | 0                | \$ -         | 0           | \$ -        | 35    | \$6,875.00  |
| \$ -        | 0        | \$ -      | 40             | \$ 4,200.00 | 8                    | \$ 440.00 | 8                | \$ 880.00    | 2           | \$ 210.00   | 101   | \$17,395.00 |
|             |          |           |                |             |                      |           |                  |              |             |             |       |             |
|             |          |           |                |             |                      |           |                  |              |             |             |       |             |
| \$ -        | 0        | \$ -      | 2              | \$ 210.00   | 0                    | \$ -      | 1                | \$ 110.00    | 0           | \$ -        | 4     | \$435.00    |
| \$ -        | 0        | \$ -      | 8              | \$ 840.00   | 0                    | \$ -      | 0                | \$ -         | 2           | \$ 210.00   | 26    | \$3,410.00  |
| \$ -        | 0        | \$ -      | 10             | \$ 1,050.00 | 0                    | \$ -      | 1                | \$ 110.00    | 2           | \$ 210.00   | 30    | \$3,845.00  |

Man Hour Estimates  
Restoration of Mangroves at Fruit Farm Creek within the Rookery Bay National Estuarine Research Reserve

| Field Crew  | USF Tech |           | Engin. Tech II |              | Proj Coordinator III |             | 2-Man Field Crew |              | Survey Tech |             | Total |              |
|-------------|----------|-----------|----------------|--------------|----------------------|-------------|------------------|--------------|-------------|-------------|-------|--------------|
|             | Hours    | Cost      | Hours          | Cost         | Hours                | Cost        | Hours            | Cost         | Hours       | Cost        | Hours | Cost         |
|             |          |           |                |              |                      |             |                  |              |             |             |       |              |
| \$ -        | 0        | \$ -      | 4              | \$ 420.00    | 1                    | \$ 55.00    | 0                | \$ -         | 2           | \$ 210.00   | 16    | \$4,020.00   |
| \$ -        | 0        | \$ -      | 2              | \$ 210.00    | 0                    | \$ -        | 0                | \$ -         | 0           | \$ -        | 2     | \$2,410.00   |
| \$ -        | 0        | \$ -      | 6              | \$ 630.00    | 1                    | \$ 55.00    | 0                | \$ -         | 2           | \$ 210.00   | 18    | \$6,430.00   |
|             |          |           |                |              |                      |             |                  |              |             |             |       |              |
| \$ -        | 0        | \$ -      | 0              | \$ -         | 1                    | \$ 55.00    | 0                | \$ -         | 0           | \$ -        | 5     | \$1,175.00   |
| \$ -        | 0        | \$ -      | 0              | \$ -         | 6                    | \$ 330.00   | 16               | \$ 1,760.00  | 2           | \$ 210.00   | 53    | \$6,015.00   |
| \$ -        | 0        | \$ -      | 0              | \$ -         | 7                    | \$ 385.00   | 16               | \$ 1,760.00  | 2           | \$ 210.00   | 58    | \$7,190.00   |
|             |          |           |                |              |                      |             |                  |              |             |             |       |              |
| \$ -        | 0        | \$ -      | 0              | \$ -         | 3                    | \$ 165.00   | 0                | \$ -         | 2           | \$ 210.00   | 27    | \$3,655.00   |
| \$ -        | 0        | \$ -      | 0              | \$ -         | 2                    | \$ 110.00   | 0                | \$ -         | 0           | \$ -        | 12    | \$1,890.00   |
| \$ -        | 0        | \$ -      | 0              | \$ -         | 5                    | \$ 275.00   | 0                | \$ -         | 2           | \$ 210.00   | 39    | \$5,545.00   |
| \$ 291.60   |          |           |                | \$ 1,250.00  |                      | \$ 100.00   |                  | \$ 650.00    |             | \$ 250.00   |       | \$ 7,941.60  |
| \$ 2,931.60 | 6.00     | \$ 480.00 | 140.00         | \$ 15,950.00 | 62.00                | \$ 3,620.00 | 167.00           | \$ 19,900.00 | 38.00       | \$ 4,240.00 | 1128  | \$164,146.60 |
|             |          |           | 35             | \$ 3,675.00  | 6                    | \$ 341.00   | 17               | \$ 1,837.00  | 4           | \$ 399.00   |       | \$39,750.75  |
| \$ 2,931.60 |          | \$ 480.00 |                | \$ 12,275.00 |                      | \$ 3,279.00 |                  | \$ 18,063.00 |             | \$ 3,841.00 |       | \$124,395.85 |

**ATTACHMENT 3. Project Timeline**

**TABLE 1. PHASE 1 FRUIT FARM CREEK RESTORATION TIME LINE**

| TASK                                                                                                                                                                                                                   | MONTHS 1-3 | MONTHS 4-6 | MONTHS 7-9 | MONTHS 10-12 | MONTHS 13-15 | MONTHS 16-18 |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|------------|------------|--------------|--------------|--------------|
| 1. Facilitate a coordinated restoration effort among identified project stakeholders;                                                                                                                                  | X          |            |            |              |              |              |
| 2. Perform background characterization tasks, such as topographic surveys, hydrologic modeling, and historical change detection, and prepare maps and reports from these tasks;                                        | X          | X          |            |              |              |              |
| 3. Prepare a cost effective restoration plan to restore the hydrology to the largest possible area of damaged mangroves and impaired estuarine habitat;                                                                | X          | X          |            |              |              |              |
| 4. Prepare and submit a Joint Environmental Resource Permit (ERP) and Federal Dredge and Fill permit application to the South Florida Water Management District (SFWMD) and the U.S. Army Corps of Engineers (USACOE). |            | X          |            |              |              |              |
| 5. Coordinate permitting with the City of Marco, Collier County and the Florida Department of Transportation as needed                                                                                                 |            |            | X          | X            |              |              |
| 6. Coordinate permitting and review agency comments and respond to requests for additional information (RAIs) through the                                                                                              |            |            |            | X            | X            | X            |

[illegible]

**ATTACHMENT 4:** Summary of Qualifications for Investigators and Co-investigators

**ROY R. (ROBIN) LEWIS III, M.A., C.E.P., P.W.S.**

**President, Principal Ecologist**

### **Education**

|      |                                    |         |      |
|------|------------------------------------|---------|------|
| B.S. | University of Florida, Gainesville | Biology | 1966 |
| M.A. | University of South Florida, Tampa | Zoology | 1968 |

### **Professional Experience**

President, Coastal Resources Group, Inc., A Florida Not-for-Profit and 501(c)(3) Corporation, 2003-  
President, Lewis Environmental Services, Inc., Tampa; Florida, 1989 - present.  
Vice-President, Director of the Environmental Division, Proctor & Redfern, Inc., Tampa; 1987-1989.  
President, Mangrove Systems, Inc., Tampa; 1975-1987.  
Hillsborough Community College, Tampa:  
    Professor of Biology and Scientific Advisor, Environmental Studies Center, 1974-1982.  
    Professor and Chairman, Department of Biology, 1973-1974.  
    Instructor, Department of Biology, 1970-73

### **Professional Certification**

Certified Professional Wetland Scientist No. 725, Society of Wetland Scientists  
Certified Environmental Professional No. 1611, National Association of Environmental Professionals  
Certified Senior Ecologist, Ecological Society of America  
Certified Prescribed Burn Manager No. 932194, Florida Division of Forestry

### **Honors and Awards**

Lead Consultant, USFWS Pelican Island 2003 Restoration Team, an Official Project of the Save America's  
    Treasures Program, Designated by the White House Millennium Council (Former First Lady Hillary  
    Rodham Clinton, Honorary Chair) and the National Trust for Historic Preservation, August 1999)  
State of California Governor's Environmental and Economic Leadership Award awarded to Cargill Salt for transfer  
    of 10,000 acres of former salt ponds to the Napa Marsh Wildlife Reserve (Project design by R. Lewis of  
    LES and M. Josselyn of WRI)  
Honorable Mention, 1994 National Wetlands Awards (U.S. Environmental Protection Agency and  
    Environmental Law Institute)  
Ecological Society of America Corporate Award, for Tampa Electric Company Environmental Stewardship  
    Program - 1993.

### **Recent Publications**

Lewis, R.R. 2009. Methods and criteria for successful mangrove forest restoration. Chapter 28., pages 787-800 in  
    GME Perillo, E Wolanski, DR Cahoon, and MM Brinson (eds.) Coastal Wetlands: An Integrated  
    Ecosystem Approach. Elsevier Press.

Bosire, J.O., F. Dahdough-Guebas, M. Walton, B.I. Crona, R.R. Lewis III, C. Field, J.G. Kairo and N. Koedam.  
    Functionality of restored mangroves: A review. 2008. Aquatic Botany 89:251-259.

Lewis, R.R., and R. G. Gilmore. 2007. Important considerations to achieve successful mangrove forest restoration  
    with optimum fish habitat. Bull. Mar. Sci. 80(3):823-837.

Lewis, R.R. III. 2005. Ecological engineering for successful management and restoration of mangrove forests.  
    Ecol. Eng. 24(4 SI): 403-418.

## **Dorothea P. Zysko**

### **Education:**

|      |                                        |                            |      |
|------|----------------------------------------|----------------------------|------|
| B.A. | University of South Florida, Tampa, FL | Natural Sciences/Education | 1970 |
| M.A. | University of South Florida, Tampa, FL | Botany                     | 1975 |

### **Professional Experience:**

Associate Scientist, Coastal Resources Group, Inc., 2009-present  
President/Principal Ecologist, The Ecology Group, Inc., Punta Gorda, FL, 2004- present  
Resource Protection Department Manager, Sarasota County, Sarasota, FL, 2002-2004  
SW Florida Regional Manager/Ecological & Water Resources, WilsonMiller, Inc., Naples/Ft. Myers, FL, 1993-2002  
Project Ecologist, Dames & Moore, Tallahassee, FL, 1991-1993  
Wetland Jurisdictional Specialist, Florida Department of Environmental Protection, Tallahassee, FL, 1991  
Biologist, Florida Environmental, Inc., (EarthBalance) Pt. Charlotte, FL, 1989-1991  
Public Communications Manager & Interagency Coordinator, Southwest Florida Water Management District, Brooksville, FL, 1981-1985  
Biologist, Environmental Studies Center/Cockroach Key, Hillsborough Community College, Tampa, FL, 1976-1981  
Naturalist, Parks and Recreation Department, City of St. Petersburg, FL, 1975-1976  
Biology Instructor, Hillsborough County School System, Tampa, FL, 1970-1973

### **Professional Certifications:**

Certified Ecologist, Ecological Society of America  
Professional Wetland Scientist No. 1137, Society of Wetland Scientists  
Florida Master Naturalist/Coastal Systems, University of Florida IFAS  
Florida Registered Environmental Professional (Biology and Systems)  
U.S. Army Corps of Engineers Certified Wetland Delineator  
Professional Mangrove Trimmer, Florida Department of Environmental Protection  
Authorized Gopher Tortoise Agent #GTA-09-00238, Florida Fish and Wildlife Conservation Commission  
Open Water SCUBA Diver, PADI

### **Professional Affiliations:**

Society of Wetland Scientists  
Ecological Society of America

### **Publications:**

Brown, T.R., T.O. Hillestad, S. Means, D. Zysko, D. Tackney, R. Lewis, S. Snedaker, M. Hatcher, and B. Lorenz. **Clam Bay Restoration and Management Plan, 1988.** Clam Bay Restoration and Management Plan. Presented to Collier County Pelican Bay Services Division and WCI Communities. Akerman, Senterfitt, and Eidson, P.A. Orlando, Florida.

D. P. Cole, Editor, Proceedings of Fourth through Seventh Annual Conferences on Wetlands Restoration and Creation, Hillsborough Community College. Tampa, FL. 1978-1981.

### **Recent Similar Project Experience:**

Clam Bay Mangrove Restoration and Management Plan, Pelican Bay Services Division, Collier County, FL:  
Assisted in the environmental analysis and field investigations, preparation of restoration management plan, and state and federal environmental permitting to restore an area of black mangrove die-off in Clam Bay, Naples, FL.

Tarpon Bay Hydrologic Restoration, Rookery Bay National Estuarine Research Reserve, Collier County, FL:

# Jeffrey A. Carter

[jeffrey.a.carter@dep.state.fl.us](mailto:jeffrey.a.carter@dep.state.fl.us), (239) 417-6310 ext. 212

## Education

**Undergraduate** - Major: Biology (Zoology)

Georgia College & University: Milledgeville, Georgia.

**Graduate** - Biology (Ethology)

Georgia Southern University: Statesboro, Georgia.

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## Professional Experience

Natural Resources Stewardship Coordinator, Rookery Bay NERR, Naples, FL, November 2008 - Present

Animal Collections Manager, Naples Zoo at Caribbean Gardens, Oct. 2002 – Oct. 2008

Collier County Habitat Conservation Plan Advisory Council, Collier County Govt., Feb. 2007 – Dec. 2009

Herpetology Division Supervisor, The Australian Reptile Park (NSW Australia), July 2001 – August 2002.

## Publications

- 1992: Brannen, N., J.A. Carter, B. Winn, et al. Coastal Georgia Field Guide to Sea Turtle Research. Georgia Southern University Press, Statesboro,
- 1993: Fitch-Snyder, H., Carter, J.A. Tool use to acquire drinking water by a free-ranging group of lion-tailed macaques (*Macaca silenus*). Laboratory Primate Newsletter; 1993.
- 1996: Pung, O.J. Ph.D., Spratt, J. M.S., Clark, C.G. Ph. D., Norton, T. D.V.M. and Carter, J.A. B.S. *TRYPANOSOMA CRUZI* INFECTION OF FREE-RANGING NONHUMAN PRIMATES ON ST. CATHERINE'S ISLAND, GEORGIA, USA. Journal of Zoo Veterinary Medicine, 1998.
- 2001: Carter, J.A., Lepera, G. Identification and Tagging Procedures of Crocodilians. In Vliet, K.A., et al (eds.) AZA Croc School Teaching Manual: *Crocodilian Management In Captivity and the Wild*. 2002

## Funding Awards

|                                                                      |          |
|----------------------------------------------------------------------|----------|
| New York Zoological Society, Sept. 1992 - March 1993,                | \$4,000. |
| Community Foundation of Collier County, June 2005,                   | \$5,000. |
| National Wildlife Federation, August 2007                            | \$2,500. |
| U.S. Fish and Wildlife Service - South Florida Coastal Program, 2009 | \$50,000 |
| Florida D.E.P./NOAA – Coastal Partnership Initiative, 2010           | \$60,000 |

## Training

AZA Professional Management School, Crocodilian Biology & Captive Management, June 2004

Florida Master Naturalist Program, Coastal Ecosystems Module Graduate, RBNERR, June 2005

AZA Professional Management School, zoological Management Program, 2006

## Professional Affiliations

Friends of the Florida Panther National Wildlife Refuge, Board of Directors

Society for the Study of Amphibians and Reptiles

Beta Beta Beta Biological Honor Society

Gopher Tortoise Council

Florida Reptile & Amphibian Working Group

# Victoria Vazquez

[victoria.vazquez@dep.state.fl.us](mailto:victoria.vazquez@dep.state.fl.us), (239) 417-6310 ext. 402

## Education

|       |                                                         |                         |      |
|-------|---------------------------------------------------------|-------------------------|------|
| Ph.D. | The University of Georgia, Athens, GA                   | Plant Biology           | 2008 |
| M.S.  | Tufts University School of Vet. Med., North Grafton, MA | Animals & Public Policy | 2002 |
| B.A.  | Dartmouth College, Hanover, NH                          | Biology                 | 1999 |

## Professional Experience

Research Coordinator, Rookery Bay NERR, Naples, FL, November 2010-Present  
Contributing Author, Got2BeGreen.com, March-July 2009  
Conservation Medicine Program Officer, Wildlife Trust, Palisades, NY, June 2001-June 2003

## Peer-Reviewed Publications

Alworth, L. C. and **V. M. Vazquez** (2009). A novel system for individual housing of bullfrogs. *Lab Animal*. 38(10):329-333.

**Vazquez, V. M.**, B. B. Rothermel, and A. Pessier (2009). Experimental infection of North American plethodontid salamanders with the fungus *Batrachochytrium dendrobatidis*. *Diseases of Aquatic Organisms*. 84:1-7.

Rothermel, B. B., S. C. Walls, J. C. Mitchell, C. K. Dodd, Jr., L. K. Irwin, D. E. Green, **V. M. Vazquez**, J. W. Petranks, and D. J. Stevenson (2008). Widespread occurrence of the amphibian chytrid fungus *Batrachochytrium dendrobatidis* in the Southeastern United States. *Diseases of Aquatic Organisms*. 82:3-18.

**Vazquez, V. M.** and D. Porter. *In Preparation*. Experimental infection of the Peruvian marsupial frog *Gastrotheca peruana* with *Batrachochytrium dendrobatidis*.

**Vazquez, V. M.**, L. K. Reinert, L. Rollins-Smith, M. J. Yabsley, K. Smith. *In Preparation*. Role of cutaneous peptides in protection against *Batrachochytrium dendrobatidis* infection in *Rana catesbeiana*.

## Grants

|                                                                                   |           |
|-----------------------------------------------------------------------------------|-----------|
| Consortium for Conservation Medicine Grant, PI, August 2003-August 2008,          | \$12,000. |
| Palfrey Small Grants Travel Funding, University of Georgia, November 2007,        | \$1000.   |
| Graduate School Student Travel Funding, University of Georgia, August 2007,       | \$300.    |
| Declining Amphibian Population Task Force Seed Grant, Co-PI, May 2006-March 2007, | \$2000.   |
| Palfrey Small Grants, University of Georgia, PI, April 2006-November 2007,        | \$1000.   |

## Training

Habitat Management Guidelines Training Workshop, Arnold Air Force Base, Tennessee, October 2007.  
Advanced Training in Amphibian Population Decline Research, La Selva, Costa Rica, January 2004.  
Protocol for isolating and culturing *Batrachochytrium dendrobatidis* and euthanizing frogs, University of Maine, October 2003.

## Professional Affiliations

Society for the Study of Reptiles and Amphibians  
Ecological Society of America  
American Society of Ichthyologists and Herpetologists

# **Kathy B. Worley**

## **EXPERIENCE AND EXPERTISE**

Kathy Worley has more than 20 years experience in field research and has worked at the Conservancy for 15 years, serving as the co-director of environmental science as well as a staff biologist, Geographic Information System (GIS) specialist and quality assurance officer. She has conducted water quality research for the past 14 years, incorporating both laboratory and field data analysis. For the past eleven years, Worley has managed mangrove research projects evaluating causes of die-offs adjacent to development and assessing mangrove restoration projects for long-term success. She has served as manager and quality assurance officer for numerous terrestrial and aquatic field studies that evaluated the impact of pesticides on various fauna in Florida, Hawaii, Iowa and Pennsylvania. She has co-authored various papers and technical reports on mangrove ecology, sea turtles and water quality, as well as ecotoxicological reports evaluating hazards to wildlife.

## **EDUCATION**

M.S. Biological Science, 2006 Florida International University

B.S. Biology, 1989 Colorado State University, Fort Collins, Colorado

Associate Degree of Applied Science in Electronic Technology 1986 - Denver Institute of Technology, Denver, Colorado

## **PROFESSIONAL EXPERIENCE**

2006 – Present Co-Director of Environmental Science Division, The Conservancy of Southwest Florida, Naples, FL

1995 - 2006 Staff Biologist, The Conservancy of Southwest Florida, Naples, FL

1991 - 1994 Site and Field Supervisor, Wildlife International Ltd.

1991 Site Supervisor, Wildlife International Ltd.

1990 Research Biologist, Wildlife International Ltd.

1987-1989 Electronics Technician. Colorado Video, Inc.

## **REFEREED PUBLICATIONS**

Worley, K. 2005. Mangrove Assessments as an Indicator of Estuarine Conditions in Restoration Areas. In: *Estuarine Indicators*. Bortone, S.A. (eds). CRC Press LLC. Boca Raton. 247-259

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**ATTACHEMENT 5: Literature Cited**

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