

**PALM BEACH COUNTY
BOARD OF COUNTY COMMISSIONERS**

AGENDA ITEM SUMMARY

Meeting Date: March 17, 2009 Consent Regular
 Workshop Public Hearing

Department

Submitted By: Environmental Resources Management
Submitted For: Environmental Resources Management

I. EXECUTIVE BRIEF

Motion and Title: Staff recommends motion to approve: Amendment No. 1 to the Contract (R2008-0404) with Harbor Branch Oceanographic Institute at Florida Atlantic University (FAU/HBOI) to conduct oyster monitoring in Lake Worth Lagoon (LWL), and to extend the contract twelve (12) months to June 30, 2010 at an increase of \$74,000.

Summary: The Amendment No. 1 authorizes FAU/HBOI to monitor three (3) oyster reef sites located within the Lake Worth Lagoon (LWL), for an additional year, as part of the monitoring efforts described in the revised Lake Worth Lagoon Management Plan (LWLMP) 2007. In south Florida, restoration of oyster populations is an important component and metric for the northern estuaries within Comprehensive Everglades Restoration Program (CERP). Funding is provided through the Florida Department of Environmental Protection (FDEP) Contract No. LP6046 (R2006-0583, R2007-2279). The fifty percent (50%) required match is provided through in-kind staff time. Countywide (SF)

Background and Justification:

The eastern oyster is abundant throughout much of the Atlantic and Gulf of Mexico coasts. This commercially valuable species prefers shallow, moderate salinity waters, and attaches to both hard and soft substrata. It has been the subject of farming and aquaculture since the 1800's and, more recently, the focus of restoration.

In south Florida, restoration of oyster populations is an important component and metric of the northern estuaries CERP (Comprehensive Everglades Restoration Program) and is a matter of prime importance for local governments, environmental organizations, educational institutions, and the general public. Because of its wide distribution, historical context, and essential habitat value, the Eastern Oyster has been selected as a target species for monitoring within the LWL.

Attachments:

1. Amendment No. 1
2. Certificate of Insurance
3. Contract (pages 1, 11, 12, 16 and 17)

Recommended by: Richard E. Wabuly 2/20/09
 Department Director Date

Approved by: [Signature] 3/5/09
 County Administrator Date

II. FISCAL IMPACT ANALYSIS

A. Five Year Summary of Fiscal Impact:

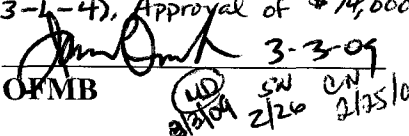
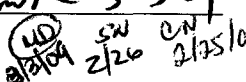
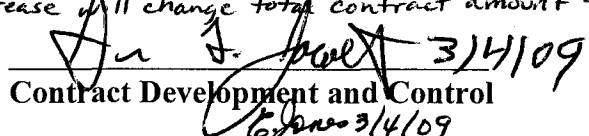
Fiscal Years	2009	2010	2011	2012	2013
Capital Expenditures					
Operating Costs	<u>18,500</u>	<u>55,500</u>			
External Revenues	<u>(9,250)</u>	<u>(27,750)</u>	<u>-0-</u>	<u>-0-</u>	<u>-0-</u>
Program Income (County)	<u>-0-</u>	<u>-0-</u>	<u>-0-</u>	<u>-0-</u>	<u>-0-</u>
In-Kind Match (County)	<u>-0-</u>	<u>-0-</u>	<u>-0-</u>	<u>-0-</u>	<u>-0-</u>
NET FISCAL	* <u>9,250</u>	<u>27,750</u>	<u>-0-</u>	<u>-0-</u>	<u>-0-</u>
# ADDITIONAL FTE POSITIONS (Cumulative)					

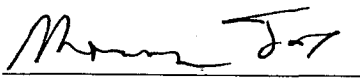
Is Item Included in Current Budget? Yes XX No
 Budget Account No.: Fund 1229 Department 380 Unit 3057 Object 3401
 Program 3057ex
 Revenue: 1229 380 3057 Rev 3439

B. Recommended Sources of Funds/Summary of Fiscal Impact:
 FDEP Contract LP6046

C. Department Fiscal Review: 

III. REVIEW COMMENTS

A. OFMB Fiscal and /or Contract Dev. and Control Comments:
 * Original agreement for \$67,200 was approved on March 11, 2008 (Agenda item 3-1-4). Approval of \$74,000 increase will change total contract amount to \$141,200.
 3-3-09
 OFMB 
 3/4/09
 Contract Development and Control
 6/2/09 3/4/09

B. Legal Sufficiency:

 Assistant County Attorney
This amendment complies with our review requirements.

C. Other Department Review:

 Department Director

**CONTRACT FOR CONSULTING/PROFESSIONAL SERVICES
BETWEEN PALM BEACH COUNTY AND
THE HARBOR BRANCH OCEANOGRAPHIC INSTITUTE
AT FLORIDA ATLANTIC UNIVERSITY
CONTRACT #R2008-0404**

AMENDMENT NO. 001

**CONSULTANT
THE HARBOR BRANCH OCEANOGRAPHIC INSTITUTE
AT FLORIDA ATLANTIC UNIVERSITY, INC.
5600 U.S. 1 North
FORT PIERCE, FLORIDA 34946**

THIS AMENDMENT NO. 001 TO THE CONTRACT, entered into on the 11th day of March, 2008 (R2008-0404), is hereby revised as follows:

- Article 2 of the Contract is hereby revised to extend the date for completion of all services to June 30, 2010.
- Article 3 (A) of the Contract is hereby revised to increase the maximum compensation amount of the Contract from \$67,200 to \$141,200 (an increase of \$74,000).
- Exhibit A of the Contract is hereby replaced with the Revised Scope of Work attached hereto as Exhibit A, and all reference in the Contract to Exhibit A shall refer to the Revised Scope of Work attached hereto.

All other terms and conditions of the Contract shall remain unchanged, and in full force and effect.

ATTEST:
Sharon R. Bock, Clerk & Comptroller

**PALM BEACH COUNTY
BOARD OF COUNTY COMMISSIONERS:**

By: _____
Deputy Clerk

By: _____
John F. Koons, Chairman

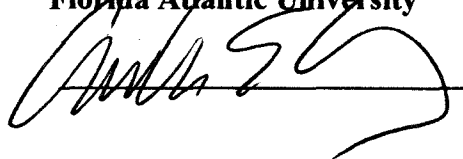
WITNESS:

Gina Niemi
Signature

Gina Niemi
Name (type or print)

CONSULTANT:

Harbor Branch Institute at
Florida Atlantic University



Camille E. Coley, JD
Asst VP for Research
Florida Atlantic University

**APPROVED AS TO FORM
AND LEGAL SUFFICIENCY**

By _____
County Attorney

**APPROVED AS TO FORM
AND LEGALITY** *JBK*
General Counsel *1/29/09*
Florida Atlantic University **3**

**APPROVED AS TO
TERMS AND CONDITIONS**

By *Richard E. Walesky*

Richard E. Walesky, Director

Department of Environmental Resources Management

EXHIBIT A
REVISED SCOPE OF WORK
Oyster monitoring in Lake Worth Lagoon

1.0 BACKGROUND

The eastern oyster, *Crassostrea virginica* (Gmelin, 1791), is abundant throughout much of the Atlantic and Gulf of Mexico coasts of the U.S. (Carriker and Gafney 1996). This commercially valuable species prefers shallow, moderate salinity waters, and attaches to both hard and soft substrata (Shumway 1996). It has been the subject of farming and aquaculture since the 1800's and, more recently, the focus of restoration.

In south Florida, restoration of oyster populations is an important component and metric of the northern estuaries CERP (Comprehensive Everglades Restoration Program) and is matter of prime importance for local governments, environmental organizations, educational institutions, and the general public. Because of its wide distribution, historical context, and essential habitat value, the Eastern Oyster has been selected as a target species for monitoring. Changes in health and abundance will be monitored within the Lake Worth Lagoon (LWL).

This is 2 year contract between the Palm Beach County and selected consultant (Consultant) for the collection, analysis and summary of oyster data from three sites within the LWL. Analysis of data generated from samples collected under this scope of work (SOW) will be used to guide management decisions affecting oyster restoration projects. Oyster monitoring sites are listed below:

- 1: Snook Island
- 2: Ibis Island
- 3: John D. MacArthur Beach State Park

The County reserves the right to either proceed with subsequent phases of work or conclude work for this SOW. This decision to be communicated in writing will be based on performance of the Consultant.

2.0 OBJECTIVES

In order to fulfill the objectives required by this SOW, the Consultant shall:

- a) Assemble and manage staff ensuring capacity to complete all tasks in this SOW
- b) Provide all transportation required to access all monitoring stations in this SOW;
- c) Provide sampling equipment and supplies required to complete monitoring;
- d) Perform field collection and;
- e) Deliver verified data on the specified due dates.

3.0 POINT OF CONTACT

5

All communication associated with this work order shall be through Palm Beach County Environmental Resources Management Department (ERM) **Contract Manager, Alessandra Medri telephone: (561) 233-2512, Email: amedri@co.palm-beach.fl.us** . In the event Ms. Medri is unavailable, Julie Bishop (561-233- 2446) will act as an alternate contact.

All communication between ERM and the Consultant shall be done through the contract manager unless directed otherwise by the contract manager for project specific issues. The role of the contract manager is to ensure that communication between ERM and the Consultant is frequent, consistent, and documented. This includes gathering and disseminating documentation and deliverables, schedule review, and invoice review and approval.

4.0 SCOPE OF WORK

This SOW is for the collection, analysis and summary of oyster data from three sites within the LWL. All tasks associated with this SOW shall be conducted by the Consultant in accordance with established techniques outlined within this SOW.

The primary goal of this study is to determine recruitment, survival, growth rate, reproduction, and condition index of established oysters at three locations in the LWL. Oyster vitality will also be related to incidence of the diseases dermo and MSX.

5.0 WORK BREAKDOWN STRUCTURE

Task 1: Adult Oyster Sampling

At each site, 15 1/4-m² quadrats will be randomly deployed on the reef. All oysters within each quadrat will be harvested for determination of the number of live and dead oysters with articulated shells. Shell height will be measured from a maximum of 30 random live oyster (SH = shell height, which is the maximum linear distance from umbo to ventral shell margin) for each quadrat (max n=450 oyster measured/site). Quadrat location on the reef will be noted as low, intermediate or top. Adult sampling will be conducted twice per year: Spring (April) and Autumn (October). Water quality parameters of temperature, salinity, dissolved oxygen, pH and turbidity will be taken at each sampling period using a Yellow Springs Instruments meter and secchi disk. Weather conditions (air temp, wind direction, approx wind speed, and cloud cover) will be noted.

Task 2: Spat Recruitment

Oyster recruitment will be monitored at each site by using axenic adult oyster shells collected from relict oyster reefs or from other appropriate sources. At each site, three replicate spat monitoring arrays will be deployed vertically along the edge of the reef facing open water and within 2-3 m of the reef depending upon local conditions and security. Each array will consist of two sets of 6 oyster shells (5.5 – 7.5 cm SH) strung together on a nylon cord or galvanized wire. Shells will be oriented with their inner surface facing down when suspended off the bottom, and oyster recruitment will be estimated by counting the number of settled spat on both the top and bottom for each

strung shell. Each monitoring array will be deployed and recovered monthly for the duration of the study.

Task 3: Reproductive and Disease Monitoring

Oysters will be collected on a monthly basis for analysis of condition index, reproductive stage, and prevalence and intensity of the oyster diseases *Perkinsus marinus* ("dermo") and *Haplosporidium nelsoni* (MSX) (Wilson et al. 2005). A sample of 10 oysters from each site will be transported live to HBOI for processing. Each individual will be measured (SH), shucked, and the tissues processed for reproductive stage, disease status, and physiological condition according to the methods described below.

For condition index, five (5) oysters from each site will be processed by thoroughly cleaning each individual, measuring the shell height, weighing the whole animal, then shucking each oyster and obtaining wet and dry weight of the tissues and shells. Condition index is calculated as the ratio of tissue dry weight to shell dry weight. The remaining five (5) animals collected from each site will be processed for reproductive and disease analyses.

For reproductive analysis, a 3-10 mm thick band of tissue will be cut transversely with a razor blade from the oyster. The tissue will be fixed in Davidson's fixative for 48-72 hr before being transferred to 70% ethanol for subsequent histological preparation (Wilson et al. 2005). Histological preparation will consist of dehydrating each gonad in 95% ethanol for a minimum of three hours, then embedding the gonad in paraffin. At least two 3.5 micrometer sections will be cut from each embedded sample using a microtome mounted with a glass knife, maintaining a minimum separation of 60 micrometers (the approximate maximum diameter of an oocyte) between sections. Thin sections will be stained with hematoxylin and eosin, then mounted on pre-labeled glass slides for analysis. Resultant slides will be examined at 200-400x on a compound microscope and each sample assigned to a reproductive stage following a classification scheme (Table 1) modified from the work of Fisher et al. (1996). Qualitative reproductive data will be plotted and the patterns of gonad development and spawning compared among sites.

The tissue that remains following the extraction of the gonad will be utilized for assessment of disease condition. Dermo prevalence and intensity will be diagnosed using Ray's fluid thyocollate method (RFTM), as described by Bushek et al. (1994). Small pieces (~1 cm²) of gill and mantle tissue will be incubated in RFTM with antibiotics for seven days at room temperature (20-25°C). Tissue pieces will then be placed on glass microscope slides, macerated with a razor blade, stained with Lugol's, and examined at 40x for the presence of hypnospores. Parasite density (infection intensity) will be ranked using the Mackin scale, which ranges from 0 (no infection) to 5 (heavy infection). Average parasite densities will be calculated for each sample. Remaining oyster tissue will be placed in Dietrich's fixative and processed for histopathology (Barber, 1996). Finished slides will be examined at 100x for the presence of MSX and other parasites. MSX and other parasites will be quantified, unless too numerous to count, in which case infection will be classified as either light, moderate, or heavy. Mean prevalence (i.e., 17

proportion of oysters infected) will be calculated for each site. Infection prevalence and intensity will be statistically compared among sample dates and locations with the non-parametric Friedman's Test (Zar, 1984).

Table 1. Qualitative reproductive staging criteria for oysters, *Crassostrea virginica*, collected from Florida waters.

Value	Observations
0	Neuter or resting stage with no visible signs of gametes
1	Gametogenesis has begun with no mature gametes
2	First appearance of mature gametes to approximately one-third mature gametes in follicles
3	Follicles have approximately equal proportions of mature and developing gametes
4	Gametogenesis progressing, but follicles dominated by mature gametes
5	Follicles distended and filled with ripe gametes, limited gametogenesis, ova compacted into polygonal configurations, and sperm have visible tails
6	Active emission (spawning) occurring; general reduction in sperm density or morphological rounding of ova
7	Follicles one-half depleted of mature gametes
8	Gonadal area is reduced, follicles two-thirds depleted of mature gametes
9	Only residual gametes remain, some cytolysis evident
10	Gonads completely devoid of gametes, and cytolysis is ongoing

Task 4: Juvenile Growth Monitoring

Twenty five axenic oyster valves will be anchored to 12.5 mm wire mesh during spring (April) and deployed at each site. The arrays will be placed horizontally at the lowest point at each reef site and be kept off the bottom by 1-4"-diameter PVC pipes. These juvenile growth arrays will be examined once per month afterward during regular field sampling and the shell height of 30 random oyster recruits (or all oysters if <30) will be measured. Water quality parameters of temperature, salinity, dissolved oxygen, pH and turbidity will be taken at each sampling period using a Yellow Springs Instruments meter and secchi disk. Weather conditions (air temp, wind direction, approx wind speed, and cloud cover) will be noted.

6.0 DELIVERABLES

Task 1: Adult Sampling

Statistical evaluation of oyster density, vertical distribution and size shall be made for each site and sampling event. Appropriate parametric or non-parametric statistical tests

will be utilized (Zar, 1984). Data will be tested to meet assumptions of the underlying tests; if data do not meet assumptions, appropriate data transformations will be undertaken. It is anticipated that density and size will be compared among sites using one-way ANOVA followed by a means test (e.g., Tukey-Kramer). Vertical distribution analysis for density and size will be descriptive (graphed) to visualize if there is any apparent trends.

Task 2: Spat Recruitment

Statistical evaluation of settled oyster number shall be made for each site and sampling event. Appropriate parametric or non-parametric statistical tests will be utilized (Zar, 1984). Data will be tested to meet assumptions of the underlying tests; if data do not meet assumptions, appropriate data transformations will be undertaken. It is anticipated that settled oyster number will be compared among sites using one-way ANOVA followed by a means test (e.g., Tukey-Kramer).

Task 3: Condition Index, Reproductive Stage, and Disease Monitoring

Summary data and, as a complete data set is acquired, statistically inferred estimates of variation (ANOVA and means test) for condition index, gonadal development and disease prevalence among sites will be provided. Reproductive stage will be classified according to the previously described scheme and the resultant data plotted and compared between sites. Condition index will be compared by one-way ANOVA. Disease prevalence and intensity will be statistically compared among sample dates and sites with the non-parametric Friedman's Z Test (Zar, 1984) or other appropriate parametric or non-parametric approaches.

Task 4: Juvenile Growth Monitoring

Statistical evaluation of growth of settled oysters shall be made for each site and sampling event. Appropriate parametric or non-parametric statistical tests will be utilized (Zar, 1984). Data will be tested to meet assumptions of the underlying tests; if data do not meet assumptions, appropriate data transformations will be undertaken. It is anticipated that growth of settled oysters will be compared among sites using one-way ANOVA followed by a means test (e.g., Tukey-Kramer).

Due Dates: Quarterly summary reports of Tasks 1, 2, 3 and 4 are due 30 days after each quarter (June, September, December 2008 and 2009, and March 2009 and 2010), in both hard copy and electronic format. An annual report is due no later than 90 days after the February 2009 sampling. A completed final report is due no later than 90 days after the final sampling in February 2010 and shall summarize all the data collected since March 11, 2008.

Reporting

All data shall be maintained in a Microsoft Excel spreadsheet and reports shall be submitted in Microsoft Word. The Consultant shall submit quarterly reports consisting of the following:

- A summary of work performed on each site, including the dates of site visits, water quality physical parameters, and weather conditions;

9

- A summary of statistically evaluated density, vertical distribution, and size estimates in adult sampling and spat recruitment for each site;
- A summary of reproductive and disease monitoring for each site that occurred during the quarter;
- A summary of juvenile growth monitoring for each site that occurred during the quarter;
- Graphics and tables of summary statistics and data;

The final report shall be cumulative and shall summarize all data collected for the twenty-four months period of the study and shall have a discussion section of the analytical results, and an assessment of limiting factors for reef success.

Payment

Invoices will be submitted along with quarterly reports. Upon acceptance of the 2008/2009 quarterly and final reports, the CONSULTANT shall be compensated \$13,440 for each report, for a total of \$67,200 for year 1. Upon acceptance of the 2009/2010 quarterly and final reports, the CONSULTANT shall be compensated \$14,800 for each report for a total of \$74,000 for year 2.

REFERENCES

- Barber, B.J., 1996. Gametogenesis of eastern oysters, *Crassostrea virginica* (Gmelin, 1791) and Pacific oysters, *Crassostrea gigas* (Thunberg, 1793) in disease-endemic lower Chesapeake Bay. *J. Shellfish Res.* 15: 285-290.
- Bushek, D., S.E. Ford and S.K. Allen, 1994. Evaluation of methods using Ray's fluid thioglycollate medium for diagnosis of *Perkinsus marinus* infection in the eastern oyster, *Crassostrea virginica*. *Ann. Rev. Fish Diseases* 4: 201-217.
- Carriker, M.R. and P.M. Gaffney. 1996. A catalogue of selected species of living oysters (Ostreacea) of the world, pp 1-18. In: Kennedy, V.S., Newell, R.I.E. and Eble, A.F. (eds), *The Eastern Oyster Crassostrea virginica*. Maryland Sea Grant Book, College Park, MD, 734 pp.
- Fisher, W. S., J. T. Winstead, L. M. Oliver, H. L. Adminston and G. O. Bailey, 1996. Physiological variability of eastern oysters from Appalachicola Bay, Florida. *J. Shellfish Res.* 15: 543-555.
- Shumway, S. 1996. Natural environmental factors, pp 467-513. In: Kennedy, V.S., Newell, R.I.E. and Eble, A.F. (eds), *The Eastern Oyster Crassostrea virginica*. Maryland Sea Grant Book, College Park, MD, 734 pp.
- Wilson, C., Scotto, L., Scarpa, J., Volety, A., Laramore, S. and Haurert, D. 2005. Survey of water quality, oyster reproduction and oyster health status in the St. Lucie Estuary. *J. Shellfish Res.*, 24: 157-165.
- Zar, J.H., 1984. *Biostatistical Analysis*, Second Edition. Prentice Hall, Englewood Cliffs, New Jersey, 718 pp.

10



CHIEF FINANCIAL OFFICER
STATE OF FLORIDA

ALEX SINK
STATE RISK MANAGEMENT TRUST FUND

CERTIFICATE OF COVERAGE

Policy Number: GL-08-0201 GENERAL LIABILITY
Name Insured: FLORIDA ATLANTIC UNIVERSITY

General Liability Coverage provided pursuant to Chapter 284, Part II, Section 768.28, Florida Statutes, and any rules promulgated thereunder.

Coverage Limits:

General Liability: \$100,000.00 each person
\$200,000.00 each occurrence

Inception Date: 7/1/08

Expiration Date: 7/1/09

Handwritten signature of Alex Sink in cursive.

Chief Financial Officer

DI4-863
(REV. 3/01)



CHIEF FINANCIAL OFFICER
STATE OF FLORIDA

ALEX SINK
STATE RISK MANAGEMENT TRUST FUND

CERTIFICATE OF COVERAGE

Policy Number: WC-08-0201 STATE EMPLOYEE WORKERS'
COMPENSATION and EMPLOYER'S
LIABILITY

Name Insured: FLORIDA ATLANTIC UNIVERSITY

Coverage Limits:

Coverage A - Compensation coverage is provided to comply with the applicable State Workers' Compensation, Occupational Disease Laws and any rule promulgated thereunder.

Coverage B \$100,000.00 each person
 \$200,000.00 each occurrence

Inception Date: 7/1/08

Expiration Date: 7/1/09

Alex Sink

Chief Financial Officer

D14-867
(REV. 3/01)

12

R2008 0404

CONTRACT FOR CONSULTING/PROFESSIONAL SERVICES

This Contract is made as of the MAR 11 2008 day of , 2008, by and between Palm Beach County, a Political Subdivision of the State of Florida, by and through its Board of Commissioners, hereinafter referred to as the COUNTY, and Harbor Branch Oceanographic Institute at Florida Atlantic University, a state university authorized to do business in the State of Florida, hereinafter referred to as the CONSULTANT, whose Federal I.D. is 65-0385507.

In consideration of the mutual promises contained herein, the COUNTY and the CONSULTANT agree as follows:

ARTICLE 1 - SERVICES

The CONSULTANT'S responsibility under this Contract is to provide research and consultation services in the area of oyster monitoring, as more specifically set forth in the Scope of Work detailed in Exhibit A.

The COUNTY'S representative/liason during the performance of this Contract shall be Richard E. Walesky, telephone no. 561-233-2400.

The CONSULTANT'S representative/liason during the performance of this Contract shall be as specified in Article 26.

ARTICLE 2 - SCHEDULE

The CONSULTANT shall commence services upon receipt of the COUNTY's written Notice to Proceed and complete all services by June 30th, 2009.

Reports and other items shall be delivered or completed in accordance with the detailed schedule set forth in Exhibits A.

ARTICLE 3 - PAYMENTS TO CONSULTANT

- A. The total amount to be paid by the COUNTY under this Contract for all services and materials including, if applicable, "out of pocket" expenses (specified in paragraph C below) shall not exceed a total contract amount of Sixty-seven thousand, two hundred, Dollars (\$67,200). The CONSULTANT shall bill the County quarterly in accordance with Exhibit A.
- B. Invoices received from the CONSULTANT pursuant to this Contract will be reviewed and approved by the COUNTY's representative, to verify that services have been rendered in conformity with the Contract. Approved invoices will then be sent to the Finance Department for payment. Invoices will normally be paid within thirty (30) days following the COUNTY representative's approval.

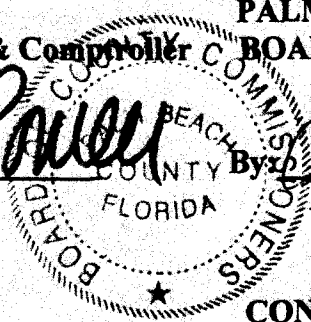
13

IN WITNESS WHEREOF, the Board of County Commissioners of Palm Beach County, Florida has made and executed this Contract on behalf of the COUNTY and CONSULTANT has hereunto set its hand the day and year above written.

R 2008 0404

ATTEST: Sharon R. Bock, Clerk & Comptroller PALM BEACH COUNTY MAR 11 2008 BOARD OF COUNTY COMMISSIONERS:

By: Mary Power Deputy Clerk By: Addie L. Greene Addie L. Greene, Chairperson



WITNESS: [Signature]

CONSULTANT: Harbor Branch Institute at Florida Atlantic University

Signature JOHN SCARPA
Name (type or print)

[Signature]
Signature

~~Signature~~
Name (type or print)

Diane R. Glickman
Typed Name Associate Director
Sponsored Research, DOR
Title

APPROVED AS TO FORM AND LEGAL SUFFICIENCY
By [Signature]
County Attorney

APPROVED AS TO FORM AND LEGALITY
General Counsel
Florida Atlantic University
11/29/08

(corp. seal)

APPROVED AS TO TERMS AND CONDITIONS
By Richard E. Walesky
Richard E. Walesky, Director
Department of Environmental Resources Management

14

EXHIBIT A
SCOPE OF WORK
Oyster monitoring in Lake Worth Lagoon

1.0 BACKGROUND

The eastern oyster, *Crassostrea virginica* (Gmelin, 1791), is abundant throughout much of the Atlantic and Gulf of Mexico coasts of the U.S. (Carriker and Gafney 1996). This commercially valuable species prefers shallow, moderate salinity waters, and attaches to both hard and soft substrata (Shumway 1996). It has been the subject of farming and aquaculture since the 1800's and, more recently, the focus of restoration.

In south Florida, restoration of oyster populations is an important component and metric of the northern estuaries CERP (Comprehensive Everglades Restoration Program) and is matter of prime importance for local governments, environmental organizations, educational institutions, and the general public. Because of its wide distribution, historical context, and essential habitat value, the Eastern Oyster has been selected as a target species for monitoring. Changes in health and abundance will be monitored within the Lake Worth Lagoon (LWL).

This is 1 year contract between the Palm Beach County and selected consultant (Consultant) for the collection, analysis and summary of oyster data from three sites within the LWL. Analysis of data generated from samples collected under this scope of work (SOW) will be used to guide management decisions affecting oyster restoration projects. Oyster monitoring sites are listed below:

- 1: Snook Island
- 2: Ibis Island
- 3: John D. MacArthur Beach State Park

The County reserves the right to either proceed with subsequent phases of work or conclude work for this SOW. This decision to be communicated in writing will be based on performance of the Consultant.

2.0 OBJECTIVES

In order to fulfill the objectives required by this SOW, the Consultant shall:

- a) Assemble and manage staff ensuring capacity to complete all tasks in this SOW
- b) Provide all transportation required to access all monitoring stations in this SOW;
- c) Provide sampling equipment and supplies required to complete monitoring;
- d) Perform field collection and;
- e) Deliver verified data on the specified due dates.

3.0 POINT OF CONTACT

All communication associated with this work order shall be through Palm Beach County Environmental Resources Management Department (ERM) Contract Manager, 15

tests; if data do not meet assumptions, appropriate data transformations will be undertaken. It is anticipated that density and size will be compared among sites using one-way ANOVA followed by a means test (e.g., Tukey-Kramer). Vertical distribution analysis for density and size will be descriptive (graphed) to visualize if there is any apparent trends.

Task 2: Spat Recruitment

Statistical evaluation of settled oyster number shall be made for each site and sampling event. Appropriate parametric or non-parametric statistical tests will be utilized (Zar, 1984). Data will be tested to meet assumptions of the underlying tests; if data do not meet assumptions, appropriate data transformations will be undertaken. It is anticipated that settled oyster number will be compared among sites using one-way ANOVA followed by a means test (e.g., Tukey-Kramer).

Task 3: Condition Index, Reproductive Stage, and Disease Monitoring

Summary data and, as a complete data set is acquired, statistically inferred estimates of variation (ANOVA and means test) for condition index, gonadal development and disease prevalence among sites will be provided. Reproductive stage will be classified according to the previously described scheme and the resultant data plotted and compared between sites. Condition index will be compared by one-way ANOVA. Disease prevalence and intensity will be statistically compared among sample dates and sites with the non-parametric Friedman's Z Test (Zar, 1984) or other appropriate parametric or non-parametric approaches.

Task 4: Juvenile Growth Monitoring

Statistical evaluation of growth of settled oysters shall be made for each site and sampling event. Appropriate parametric or non-parametric statistical tests will be utilized (Zar, 1984). Data will be tested to meet assumptions of the underlying tests; if data do not meet assumptions, appropriate data transformations will be undertaken. It is anticipated that growth of settled oysters will be compared among sites using one-way ANOVA followed by a means test (e.g., Tukey-Kramer).

Due Dates: Quarterly summary reports of Tasks 1, 2, 3 and 4 are due 30 days after each quarter (June, September, December 2008, and March 2009), in both hard copy and electronic format. A completed final report is due no later than 90 days after the final sampling in February 2009.

Reporting

All data shall be maintained in a Microsoft Excel spreadsheet and reports shall be submitted in Microsoft Word. The Consultant shall submit quarterly reports consisting of the following:

- A summary of work performed on each site, including the dates of site visits, water quality physical parameters, and weather conditions;
- A summary of statistically evaluated density, vertical distribution, and size estimates in adult sampling and spat recruitment for each site;
- A summary of reproductive and disease monitoring for each site that occurred

- during the quarter;
- A summary of juvenile growth monitoring for each site that occurred during the quarter;
 - Graphics and tables of summary statistics and data;

The final report shall be cumulative and shall summarize all data collected for the twelve months period of the study and shall have a discussion section of the analytical results, and an assessment of limiting factors for reef success.

Payment

Invoices will be submitted along with quarterly reports. Upon acceptance of the quarterly reports and the final report, the CONSULTANT shall be compensated \$13,440 for each report for a total of \$67,200 for this project.

REFERENCES

Barber, B.J., 1996. Gametogenesis of eastern oysters, *Crassostrea virginica* (Gmelin, 1791) and Pacific oysters, *Crassostrea gigas* (Thunberg, 1793) in disease-endemic lower Chesapeake Bay. J. Shellfish Res. 15: 285-290.

Bushek, D., S.E. Ford and S.K. Allen, 1994. Evaluation of methods using Ray's fluid thioglycollate medium for diagnosis of *Perkinsus marinus* infection in the eastern oyster, *Crassostrea virginica*. Ann. Rev. Fish Diseases 4: 201-217.

Carriker, M.R. and P.M. Gaffney. 1996. A catalogue of selected species of living oysters (Ostreacea) of the world, pp 1-18. In: Kennedy, V.S., Newell, R.I.E. and Eble, A.F. (eds), The Eastern Oyster *Crassostrea virginica*. Maryland Sea Grant Book, College Park, MD, 734 pp.

Fisher, W. S., J. T. Winstead, L. M. Oliver, H. L. Adminston and G. O. Bailey, 1996. Physiological variability of eastern oysters from Appalachicola Bay, Florida. J. Shellfish Res. 15: 543-555.

Shumway, S. 1996. Natural environmental factors, pp 467-513. In: Kennedy, V.S., Newell, R.I.E. and Eble, A.F. (eds), The Eastern Oyster *Crassostrea virginica*. Maryland Sea Grant Book, College Park, MD, 734 pp.

Wilson, C., Scotto, L., Scarpa, J., Volety, A., Laramore, S. and Haurert, D. 2005. Survey of water quality, oyster reproduction and oyster health status in the St. Lucie Estuary. J. Shellfish Res., 24: 157-165.

Zar, J.H., 1984. Biostatistical Analysis, Second Edition. Prentice Hall, Englewood Cliffs, New Jersey, 718 pp.

STATE OF FLORIDA, COUNTY OF PALM BEACH
 I, SHARON R. BOCK, Clerk and Comptroller
 certify this to be a true and correct copy of the original
 filed in my office on March 4, 2008
 dated at West Palm Beach, FL on 3/17/08
 By: Diane Bogan
 Deputy Clerk

