Recipient: Town of Oriental
Grant Number: 2P40 P011
Grant Title: Fishing Opportunity Enhancement of Oriental Reef, AR-396
Grant Award Period: 07/01/12 - 06/30/13

Project Costs:

<table>
<thead>
<tr>
<th></th>
<th>CRFL Budgeted</th>
<th>CRFL Expenditures</th>
<th>Donated Reef Material and Brochures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Materials</td>
<td>$32,400</td>
<td>$32,400</td>
<td>$13,550 Reef Material</td>
</tr>
<tr>
<td>Contractor</td>
<td>$35,000</td>
<td>$29,638</td>
<td>$186 Brochure Printing Cost</td>
</tr>
<tr>
<td>TOTALS</td>
<td>$67,400</td>
<td>$62,038</td>
<td>$13,736</td>
</tr>
</tbody>
</table>

Steve Speciale (right) is one of the early inspirations for revitalization of Oriental Reef. Steve and a fishing partner are giving the reef a chance to give one up.

Description of Work:

This artificial reef enhancement project provided further development for 3.41 acres of the 63 acre Oriental Reef (AR-396), artificial reef in the lower Neuse River, 1.6 nm east of Oriental. This project used 360 Bay size Reef Balls®, funded under this contract and the matching material of 36 Layer-Cake Reef Balls® and 10 Ultra Reef Balls® funded by the $10,000 donated by The Harold H. Bate Foundation, Inc. (Appendix 5), local recreational fishermen and business interest through the Town of Oriental (Appendix 4). The NC Division of Marine Fisheries (DMF) donated 3 Pallet size Reef Balls® for added structure complexity.

The objective of this project was to develop different fisher friendly patch reefs on Oriental Reef as well as enhanced habitat for juvenile finfish and oysters. The design of the patch reef layout was developed by local fishermen and DMF artificial reef staff. The DMF is the permit holder for this reef location and secured all initial permits and permit modifications for this project (on file DMF).
CRFL Directive Objectives:

Project Status/Work Accomplished:
The CRFL Strategic Plan Management Goal, Strategy and Research Need Listed in RFP and identified in the proposal are as follows:

The Management goal is “People”, Activities related to public outreach and education, and improving public fishing access and fishing opportunities.

The Strategy is P.1.4, Coordinate the siting of artificial fishing reefs and oyster reefs with the locations of access structures to increase utilization by the recreational fishing community.

The Research Need is “Build or enhance artificial reefs in state waters”

Additionally, Strategy P.1.5. “Increase the function of artificial reefs through refinement of materials and techniques based on research and monitoring” will be accomplished by the incorporation of different concrete surface textures and variable Bay Reef Ball® placement densities. (Table 1 and 2)

Material Description:

Table 1. The physical characteristics of reef material used in this project are shown below. Data provided by The Reef Ball Foundation, http://www.reefball.org/brochure.htm, excluding Layer-Cake Reef Ball®.

<table>
<thead>
<tr>
<th>Style</th>
<th>Photo</th>
<th>Width</th>
<th>Height</th>
<th>Weight</th>
<th>Concrete Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bay Ball®</td>
<td><img src="image" alt="Bay Ball" /> 3 feet</td>
<td>2 feet</td>
<td>720 lbs.</td>
<td>0.10 yard³</td>
<td></td>
</tr>
<tr>
<td>Layer-Cake Ball®</td>
<td><img src="image" alt="Layer-Cake Ball" /> 4 feet</td>
<td>3.0 feet</td>
<td>1500 - 2200 lbs.</td>
<td>0.33 – 0.55 yard³</td>
<td></td>
</tr>
<tr>
<td>Pallet Ball®</td>
<td><img src="image" alt="Pallet Ball" /> 4 feet</td>
<td>3.0 feet</td>
<td>1700 lbs.</td>
<td>0.33 yard³</td>
<td></td>
</tr>
<tr>
<td>Ultra Ball®</td>
<td><img src="image" alt="Ultra Ball" /> 5.5 feet</td>
<td>4.3 feet</td>
<td>3800 lbs.</td>
<td>0.9 yard³</td>
<td></td>
</tr>
</tbody>
</table>
Table 2. As part of the interest by DMF in this project are the exterior concrete texturing and the placement array of the Bay Ref Balls®. These patch reef elements will be included in DMF’s biological sampling to evaluate oyster spat recruitment and juvenile and adult finfish attraction.

**Patch Reef Pattern and Treatment Elements:** Experimental component of Reef Ball® material

<table>
<thead>
<tr>
<th></th>
<th>PR #1: 36 Bay Balls</th>
<th>PR #2: 36 Bay Balls</th>
<th>PR #3: 36 Bay Balls</th>
<th>PR #4: 36 Bay Balls</th>
<th>PR #5: 36 Bay Balls</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a</td>
<td>18 Bay Balls, as singles 5’ apart</td>
<td>36 Bay Balls 10’ apart, even spacing of columns and rows</td>
<td>3a and 3b: Each 16 Bay Balls, as singles 5’ apart, in two crescent shape two ball wide arrays, balls offset</td>
<td>4a and 4b: Each 16 Bay Balls, as singles 5’ apart, in two crescent shape two ball wide arrays, balls offset</td>
<td>36 Bay Balls, 10’ spacing in rows that are 5’ apart on offset columns</td>
</tr>
<tr>
<td>1b</td>
<td>18 Bay Balls, as singles 5’ apart in square, including center ball</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>PR #6: 72 Bay Balls</th>
<th>PR #7: 36 Bay Balls</th>
<th>PR #8: 72 Bay Balls</th>
<th>PR #9: 36 Layer-Cake Balls</th>
<th>PR #10: Ultra Balls &amp; 3 Pallet Balls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Three sub-patch reefs of 24 balls each. Ball spacing is 10’ in rows that are 5’ apart on offset columns</td>
<td>Paired balls touching centered 10’ apart by columns and rows</td>
<td>Four sub-patch reefs. 16 balls each. &gt; 8aW and 8aE 18 pairs of balls set 5’ apart on rows 10’ apart &gt;8bW and 8bE 18 balls each set 10’ apart on offset columns</td>
<td>Set on 20’ centers on offset columns, rows are 5’ apart</td>
<td>Set on 20’ centers on offset rows and columns</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>PR #6: 36 Bay Balls</th>
<th>PR #7: 36 Bay Balls</th>
<th>PR #8: 72 Bay Balls</th>
<th>PR #9: 36 Layer-Cake Balls</th>
<th>PR #10: Ultra Balls &amp; 3 Pallet Balls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regular Finish</td>
<td>Striped Finish</td>
<td>Regular Finish</td>
<td>Regular Finish</td>
<td>Regular Finish</td>
<td>Regular Finish</td>
</tr>
</tbody>
</table>
Project Location:

AR-396 is located on the Neuse River off of Oriental, NC at GPS coordinates

35° 01.67' N – 76° 39.74' W

Figure 1: Google earth image showing the proximity of the DMF South River Facility to the Oriental Reef location. Approximate distance is 7 nm.

Deployment Requirements for Contractor:

- The Reef Balls® were to be moved from the staging area by the contractor using his equipment and loaded by the contractor onto his equipment (vessel) at the Division of Marine Fisheries (DMF) facility at South River. The material staging area is within 150 to 400 feet of the shore.

- Each contractor bidding this job must visit the DMF facility at South River prior to submitting a bid. You must call DMF 24 hours in advance at 252-808-8063 (office) or 252-241-2931 (cell) to arrange a visit. No one is allowed on site without a DMF representative.

- The Reef Balls listed above must be placed (lowered) in an upright position to the seafloor bottom and not dropped at any point above the seafloor.

- DMF will place buoys or poles at the location for each reef ball. Each reef ball is to be placed right adjacent to the buoy or pole. The diagram below of the material layout indicates the proposed deployment arrangement.
Deployment Requirements for Contractor, cont:

- The North Carolina Division of Marine Fisheries has over fourteen years experience in handling and deploying Reef Balls© and other module units. The Reef Ball© manufacturer, Reef Innovations is also a recommended source of information for the handling and deployment of these materials. A discussion of deployment operations should be discussed and is encouraged with DMF artificial reef representatives before bidding. Call Artificial Reef Coordinator, Jim Francesconi @ 252-808-8063 (office) or 252-241-2931 (cell) or email jim.francesconi@ncdenr.gov.

- DMF will supervise the placement of each reef ball. We anticipate the deployment to be relatively straightforward. However, based on weather conditions, changes in the underwater landscape, etc, some variations in the deployment may occur. Any major changes will be discussed and reconciled prior to deployment. The contractor is expected to be “flexible” to any minor changes that don’t significantly impact his costs.
Figure 2. This map depicts the overview of Oriental Reef (AR-396), showing that each corner of this reef site is marked with a yellow can buoy demarcated with AR-396 and the letters A, B, C and D. The original material on this site includes tires (22,000), limestone fossil rock and scrap steel. The enhancements done over the past three years that are joined by this project includes concrete pipe (1,500 tons), limestone fossil rock (450 tons), and various sized Reef Balls® (758) set arrays designed for study considerations.
Figure 3. Plan view of this project’s material. Each Patch Reef is identified by number and further described in Table 2. Each grid square is 10 ft x 10 ft.
Final Project Summary:

This CRFL project by the Town of Oriental provides enhancement of the Oriental artificial reef, AR-396. It has been completed ahead of time and below budget. Through the purchase of 360 Bay size Reef Balls® with CRFL funds and the contributions of 36 Layer Cake Units and 10 Ultra Balls (Reef Innovations®) with matching funds and contracting of deployment operations the Town of Oriental has completed the requirements of this grant. The objective was to have a portion of the reef site developed with materials that are both consistent with material presently in use and also of a unique design through the creation of an area presented in a fisher friendly plan.

Reef design under this grant was performed by Oriental Reef partners (fishers) in conjunction with the NC Division of Marine Fisheries (DMF), Artificial Reef Program to present a combination of both fishing stations for anglers and habitat unique for oyster and finfish nursery considerations. Material deployment coordination was conducted by DMF artificial reef staff and vessels using methods consistent with other reef development projects in North Carolina river estuarine waters. Additional oversight of administration and project documentation was performed by Town of Oriental project partners.

This project has created ten unique fishing habitats covering four acres that when viewed in totality has created over twenty new angler stations to increase angler satisfaction with the artificial reef experience.

### Table 3. Purchased and donated Reef Balls® deployed under this CRFL Grant. See Appendix 1 and 2.

<table>
<thead>
<tr>
<th>Material Description</th>
<th>Funding Source</th>
<th>Quantity</th>
<th>Patch Reefs</th>
<th>Sub-Patch Reefs</th>
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<tbody>
<tr>
<td>Bay Ball</td>
<td>CRFL</td>
<td>360</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td>Ultra Ball</td>
<td>Town of Oriental</td>
<td>10</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>Layer Cake Ball</td>
<td>Town of Oriental</td>
<td>36</td>
<td>1</td>
<td>36</td>
</tr>
<tr>
<td>Pallet Balls (w/ Ultra Balls)</td>
<td>DMF</td>
<td>3</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Totals</td>
<td></td>
<td>409</td>
<td>10</td>
<td>62</td>
</tr>
</tbody>
</table>

Deviations:

None reported.

Public dissemination of information:

Information on the outcome of this project will be disseminated through local fishing clubs, Town of Oriental, and material developed by the DMF and a future CRFL Grant funded Reef Guide to the recreational fishers throughout the state. A brochure/map depicting the plan of this enhancement and the materials used is presented herein, (Figure 4). This brochure/map will be available through the Town of Oriental, Lower Neuse Anglers Club, presented to other area fishing interest and DMF. It will also be presented as a portion of the entire 63 acre reef.
Figure 4. This guide indicating positions where no material was deployed is one method which the public will have enhanced access to the work covered under this grant.
Reef Ball Production at DMF South River Facility
by Reef Innovations, Inc.

Bay (size) Reef Ball® forms setup awaiting the
cement truck delivery. Sixteen balls are poured
at a time. The task are are performed by two to
three people daily. (above)

Each morning, the previous day’s cast are
released and rinsed. The molds are reassembled
for the afternoon concrete pour. (above)

As the concrete begins to cure, the air inside the
interior bladder heats up from the heat generated by
the concrete. Once the concrete has set and is
holding shape the bladder air is released to prevent
fracturing the Reef Ball®. Here the site Reef
innovations, Inc. supervisor Harry Rolff is releasing
the heating bladder air on an equally hot day. (left)

Part of the project’s uniqueness was the use of
Layer-Cake Reef Balls®. These were part of
the contributing materials for the project. (right)
Layer-Cake and Ultra Ball modules

Community Support Exemplified

- The most interesting part of this reef project was the Layer-Cake and Ultra Ball modules.
- These modules were the donated components of this project costing $13,550.
- This match consisted in a grant from the Harold H. Bate Foundation and the grass root efforts of many individuals raising funds and administrating the donations by the Town of Oriental.

Layer-cake Reef Balls® loaded on the spud barge “Brian Scott”. Because nothing could be stacked on them the Bay Balls® make up the bottom layer on this second to the last load. (left)

Due to their weight (3800 lb) the contractor used the CAT 320 Long Reach excavator to load the Ultra Reef Ball® (right)
Loading Operations

- The contractor (Coastal Dredging LLC, Sneads Ferry, NC) was responsible for the loading operations.
- DMF provided direction in loading sequence of the different test textures of the balls.
- Loading usually required a full day to accomplish.

The Reef Balls® were staged near the loading zone at the DMF facility in South River, NC. The deployment contractor used their equipment to load the material. (above and right)

Reef Balls® are loaded five – six across and up to three high onboard the spud barge “Brian Scott”. (left)
COASTAL RECREATIONAL FISHING LICENSE FINAL REPORT

Deployment Phase

- Load Tuesday, Deploy Wednesday, January 23
- Load Thursday, Deploy Friday, January 25
- Load Saturday, Deploy Monday, January 28
- Short Load Tuesday morning and Deploy same Tuesday, January 29

The contractor Coastal Dredging LLC, (Appendix 3) was able to quickly deploy the Bay Balls and during peak deployment rates a single ball could be deployed every 1-1/2 minutes. Repositioning was required 2 to 3 times per patch reef. The DMF support vessel maintained pace ahead of ball placement by deploying the next Patch Reef’s poles. The day on the water for the DMF support boat started shortly after sunrise and ended usually after sunset. The deployment vessel was both two hours to and from the reef site and DMF’s facility in South River.

As required by the deployment contract, all reef balls were to be “placed” on the sea floor not dropped from above the bottom. The CAT 320 Long Reach excavator was ideal for this application. Here a Bay Ball® is deployed by a reference pole. (left)

The Ultra Ball® was at the maximum weight the excavator could deploy at full extention. (above and left)
An extended Base Pallet Ball® is deployed as Ron Zielinski, CRFL Grant development creator and long time AR-396 Oriental Reef project inspiration checks in on project progress from the “Reel-Lucky III” (right).

Being able to deploy the Layer-Cake Reef Ball® gently on the bottom was essential in this project. (left)

On Patch Reef #7 the Bay Ball were deployed in pairs to increase density and improve attraction by increasing cover for fish. (above)
NC Division of Marine Fisheries Roll

As partner with the Town of Oriental in this CRFL Grant the role of DMF included technical support during the application process, planning and design layout of materials, site and project permitting (on file), mapping, material production inspection, and the onsite involvement of placing the poles and assuring of the adherence to project plans and this report's preparation..

The DMFs interest in this project is strong when considering the needs of recreational fishermen in this and future artificial reef development projects in North Carolina estuarine waters. Many material usage aspects of estuarine artificial reef building are similar to ocean reef building; however there does seem to be more differences than similarities when comparing the two environments physical parameters and the effects on construction considerations. Shallow depths, varying sediment types, the affect of shallow water environment high energy events on the reef materials, and user preferences for typical inshore fishing methods have all required a new approach to artificial reef construction. This project lends itself to explore new design and deployment methods, while also capitalizing on many recently explored artificial reef construction techniques.

This project will provide the opportunity to have an active fishing community provide feedback on the different configurations of material and material types and also serve as a study location for the artificial reef oyster community as a foundation for finfish attraction and as juvenile finfish habitat.

Acknowledgements

Acknowledgements are in order for Ron Zielinski whose extreme fondness of the recreational fishing experience continues to inspire this reef’s re-construction progress. Wyatt Cutler is also thanked for his project management abilities making the funding collection process work and Town of Oriental staffer Heidi Artley for the long time involvement in developing the “New” Oriental Reef. Thank you DMF staff Biologist Gregg Bodnar, Steve Springle and Marine Technicians Curt Weychert and Gretchen Lauriat for preparation activities, marking the reference positions each day on the water and performing the Side scan operations presented in this report.
Figure 5. Final Side Scan MOSAIC Image of project. By comparison of the Side Scan MOSAIC and the plan views in Figures 3 and 4, the pattern for each patch reef and sub-reef is clearly evident.
Appendix 1: Invoice for 10 Ultra Balls®, from Reef Innovations, Inc.

![Invoice Image]

<table>
<thead>
<tr>
<th>REF NO.</th>
<th>QTY</th>
<th>DESCRIPTION</th>
<th>PRICE EACH</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>UB-1</td>
<td>10</td>
<td>Ultra Balls</td>
<td>275.00</td>
<td>2750.00</td>
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</table>

For Orental Artificial Reef Project.

P.O. #1021

SUBTOTAL: 2,750.00

SHIPPING & HANDLING:

PAYMENTS:

PLEASE PAY THIS AMOUNT: 2,750.00

TERMS: Net 30 days
Appendix 2. Invoice for 36 Layer-Cake Reef Balls®, from Reef Innovations, Inc

![Invoice Image]

<table>
<thead>
<tr>
<th>P.O. Number</th>
<th>Terms</th>
<th>Rep</th>
<th>Ship</th>
<th>Via</th>
<th>F.O.B.</th>
<th>Project</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Due on receipt</td>
<td>LB</td>
<td>7/13/2012</td>
<td></td>
<td></td>
<td>Oriental Artificial Reef</td>
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<table>
<thead>
<tr>
<th>Quantity</th>
<th>Item Code</th>
<th>Description</th>
<th>Price Each</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>36</td>
<td>PBLC</td>
<td>Pallet Layer Cake Sales Tax</td>
<td>300.00</td>
<td>10,800.00T</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.00%</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Total $10,800.00

PAID

Signed:
Appendix 3.  Invoice from Coastal Dredging LLC, Sneads Ferry, NC

---

**Coastal Dredging**  
PO Box 295  
Sneads Ferry, NC 28460

**Invoice**

<table>
<thead>
<tr>
<th>Date</th>
<th>Invoice #</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/31/2013</td>
<td>1516</td>
</tr>
</tbody>
</table>

**Bill To**  
Town of Oriental  
PO Box 472  
Oriental, NC 28571  
Attn: Heidi - Oriental Artificial Reef  
townhall@townoforiental.com

<table>
<thead>
<tr>
<th>P.O. No.</th>
<th>Terms</th>
<th>Project</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Due on receipt</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Description</th>
<th>Rate</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Oriental Artificial Reef-Deployment &amp; Placement of 406</td>
<td>29,638.00</td>
<td>29,638.00</td>
</tr>
<tr>
<td></td>
<td>Reef Balls-Neuse River</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

It's been a pleasure working with you!

**Total**  
$29,638.00

Phone #  
Jonathan 910-389-7604 / Charles 910-389...
Appendix 4: Photos and newspaper clipping highlighting the Rain Barrel sale to raise reef funds.

Artificial Reef Fund Raiser
Pickle Rain Barrels
2010

Improvements to Water Quality and Recreational Fishing go hand-in-hand during this Rain Barrels for Artificial Reefs fund raiser.
Appendix 5: Copy of award from Harold H. Bate foundation for $10,000. Though this donation indicates a November 2010 award the Harold H. Bate foundation was willing to extend the grant award as reef construction planned activities had changed.

The Harold H. Bate Foundation, Inc.

November 12, 2010

Ms. Heidi Artley
Interim Town Manager
Town of Oriental
P.O. Box 472
Oriental, NC 28571-0472

Reference Grant Number: 10-050

Dear Ms. Artley:

At its recent meetings the Board of Directors of the Foundation approved a grant of $10,000 for your Oriental Artificial Reef Phase 2 project as described in your application. To accept this grant, sign and date the acceptance statement (the second page of the enclosed copy of this letter) and then return the copy of the letter with the attached, signed acceptance statement within 30 days.

Grant funds will be paid as soon after January 15, 2011 as administratively feasible or later if you are not yet ready to utilize them as indicated on the enclosed acceptance agreement. Please check one space at the top of the second page of the enclosed copy of this letter, indicating when you wish to receive the funds. Grant Awards are valid for one year from the date of this letter.

At a later time during your grant, we will require your organization to complete program/project and expenditure reports. The information needed for these reports will be based on the information presented in your application. Appropriate report forms will be sent to you prior to the report due date.

You may publicize the grant in any manner you feel appropriate. Please incorporate the enclosed information about the Foundation in your publicity. We would appreciate receiving a copy of any releases you distribute.

Your grant number is 10-050. Please refer to this number in all communication regarding this award.

The Board of Directors is pleased to participate in this important program/project and wish you and your organization much success.

Sincerely,

Joyce H. Hendricks
Director of Operations

Enclosures