GEORGIA
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COASTAL RESOURCES DIVISION
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January 2, 2018

GADNR – Coastal Management Program
Ms. Jordan Dodson, Coastal Permit Coordinator
1 Conservation Way
Brunswick, Georgia, 31520

RE: Modification of Coastal Marshlands Protection Act Permit No. 682 for Georgia Department of Natural Resources 15 Inshore Artificial Reef Sites

Dear Ms. Dodson:

Enclosed please find an application for the modification Coastal Marshlands Protection Act Permit No. 682 for the enhancement of fifteen (15) public inshore artificial reefs in the following counties: Chatham, Bryan, Liberty, McIntosh, Glynn, and Camden. The proposed artificial reefs will enhance saltwater fishing opportunities for Georgia's anglers and will be enhanced in the same manner as the sites were originally permitted, see attachment. If you have any questions or concerns regarding this application please contact either myself or Patrick Geer at the address and phone number indicated above.

Thank you for your assistance with this application.

Sincerely,

January Murray

January Murray
Habitat Unit Leader
GADNR / Coastal Resources Division

Attachment:

- Modification of Coastal Marshlands Protection Act Permit No. 682 for Georgia DNR's Inshore Artificial Reef Program

cc: Patrick Geer, GADNR Chief of Marine Fisheries
Bradley Smith, GADNR Environmental Protection Division
Sarah E. Wise, USACE Regulatory Specialist
William Rutlin, USACE Regulatory Specialist

Application for the Modification of Georgia's Coastal Marshlands Protection Act Permit No. 682 for Georgia DNR's Inshore Artificial Reef Program

TABLE OF CONTENTS

Application for the Modification of Georgia's Coastal Marshlands Protection Act Permit No. 682 for Georgia DNR's Inshore Artificial Reef Program

Project Summary

The Georgia Department of Natural Resources (GADNR) initiated an inshore artificial reef development program (hereinafter referred to as Program) in the 1960's in order to provide fisheries managers the ability to enhance fisheries resources in estuarine areas lacking suitable habitat and to provide an increase of accessible habitat to coastal anglers. In 1984, GADNR began artificial reef development efforts in the State's tidal creeks and rivers in response to coastal growth and a rapidly growing inshore recreational fishery. Working in partnerships with 1) fishermen; 2) sport fishing clubs; 3) conservation groups such as the Coastal Conservation Association of Georgia; donors; national, State, and local governmental and, fisheries management agencies; 4) research and educational institutes; 5) oversight bodies, including GADNR Coastal Resources Division (CRD) Saltwater Advisory Council, legislative committees, and other advisory groups; and 6) other private interests the Program has since constructed two sub-tidal reefs in Glynn County and thirteen inter-tidal reefs in seven of the State's major estuaries (Table 1 and Appendix I). These fifteen existing estuarine artificial reefs have come to play an important role in the State's growing marine fisheries and coastal economies, enhancements within existing footprints are required to sustain the substantial biological benefits generated by these highly productive comminutes.

A State Program for artificial reef construction is an integral part of any comprehensive State / federal effort to protect, restore or enhance habitats that are essential to valuable commercial and recreational fisheries. Georgia's Program goals include: 1) the creation and long-term enhancement of fisheries habitat; 2) the development of recreational fishing opportunities; and 3) the enhancement of local and regional fisheries management. Increasing demands on fish stocks by both commercial and recreational fishermen and losses of benthic habitat due to development, fishing pressure, and pollution, have had substantial effects on many reef-associated fish species. Properly constructed and strategically sited, artificial reefs can enhance fish habitats, provide increased access to quality fishing grounds, benefit fishermen and the economies of shore communities, increase total fish biomass within a given area, and provide managers with another option for the conservation and management of fishery resources. The Program takes into account the needs of both boat-based anglers in inshore waters as well as recreational fishing access from bridges (Little River reef site) and piers (Jekyll Island Pier reef site). Enhancement of shore-based angling can have particular social and economic significance to coastal communities with heavy tourist traffic and can help to expand public support for the Program's development.

Since Georgia's recreational fishery overwhelmingly targets inshore waters by boat or from the shore (Knowlton, 2012 personal communication: Marine Recreational Information Program), interest continues in the enhancement and development of estuarine artificial reefs. Strong currents and turbid waters generated by tidal extremes and outputs of numerous freshwater river systems characterize Georgia's coastal and near shore environments. Many fish species such as spotted sea trout (*Cynoscion nebulosus*), red drum (*Sciaenops ocellatus*), sheepshead (*Archosargus probatocephalus*), southern flounder (*Paralichthys lethostigma*), and other important sport fish are dependent on estuarine habitats for food and/or shelter from predation and currents. Habitat

associations may be long-term or only temporary, as many fish rely on several different habitat types throughout their life cycles. GADNR-CRD conducts fisheries dependent / independent monitoring and statistics programs for the implementation of socio-economic surveys, assessments, monitoring, and similar activities which can assist in the characterization and evaluation of Georgia's artificial reefs and other habitats. Creel surveys are implemented to quantify use and harvest as well as ascertain associated socio-economic values and parameters at or near Program sites. GADNR-CRD Fisheries Statistic Unit has surveyed coastal access points in Georgia since 1992 with trends showing fishing effort remaining inshore (Figures A - C). Results of the inshore artificial reef Program include: 1) improved quality of fishing in estuarine environments; 2) enhancement of fishery resources to the maximum extent practicable; 3) alleviation of fishing pressure on more congested sites; 4) facilitation of access and use by U.S. recreational fishermen; 5) abatement of user conflicts; 6) stimulation of local economies; 7) adjustments to changes in fishing patterns and techniques; 8) increased fishing safety; and 9) decreased fuel consumption per trip as constituents no longer need or can afford to make long trips offshore.

Site Selection and Evaluation

Effective site selection and evaluation is critical in meeting artificial reef development and habitat enhancement goals. Multiple physical, biological, socio-economic, and fiscal parameters require consideration in site selection. Some physical parameters requiring evaluation are substrate type, site topography, water depths, currents and hydrology, wave action, salinities, and water quality. Physical site evaluations also require determination of the possible presence of historical wrecks and artifacts in order to prevent damage to these cultural resources. Added concerns for inshore Program evaluations include immediate and adjacent property ownership; property lines; landfills; and jurisdictional boundaries. Biological considerations include the life histories and habitat characteristics of targeted fish species and an understanding of associated ecosystems and their requirements. The identification and characterization of existing habitat at and adjacent to proposed sites are also critical biological factors that will determine subsequent development or enhancement efforts.

Social, economic, and constituency factors were all considered in the creation of the Program in order to accommodate a full range of recreational fishing needs. In addition to public input, important socio-economic factors include: 1) the characteristics, resources, and demographics of the targeted user groups; 2) costs for acquisition, cleanup, modifications, transportation, and deployment; 3) safety; 4) accessibility; 5) existing use and other restrictions; 6) regulations; and 7) potential conflicts with navigational interests, shipping, military, and existing fisheries. Economically, artificial reefs can generate significant benefits for relatively low investments. All of these factors were considered when each site was originally permitted. Currently all 15 sites are considered productive inshore artificial reefs hence the State's request of a Programmatic General Permit to continue this Program's habitat enhancement through addition of materials to the previously permitted footprints.

Figures A-C. Inshore fishing effort trends in CRD-Fisheries Statistic Unit coastal access surveys:

Figure A.

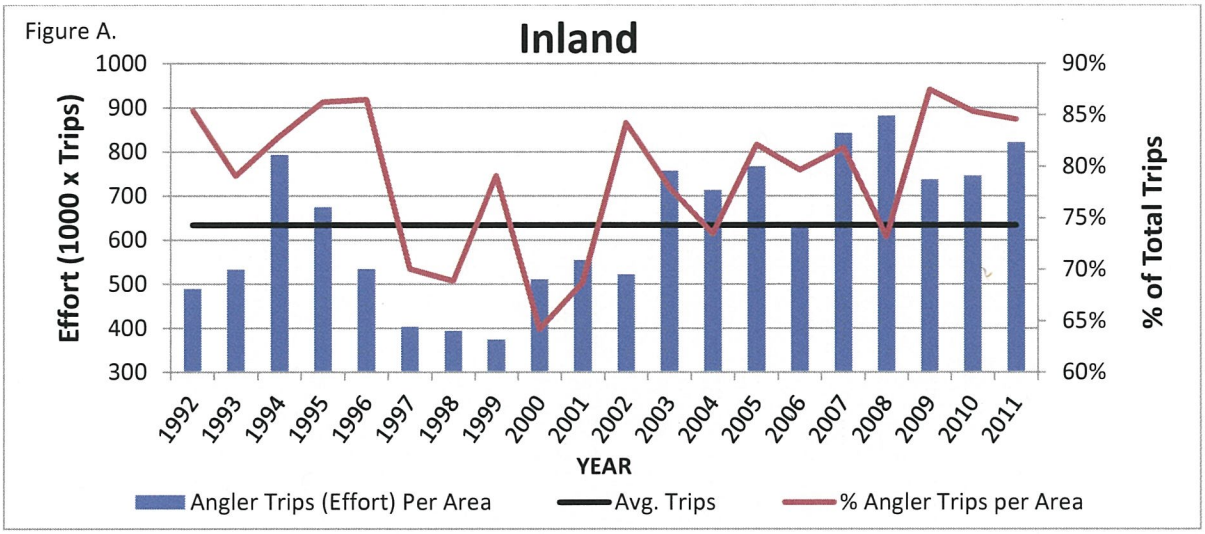


Figure B.

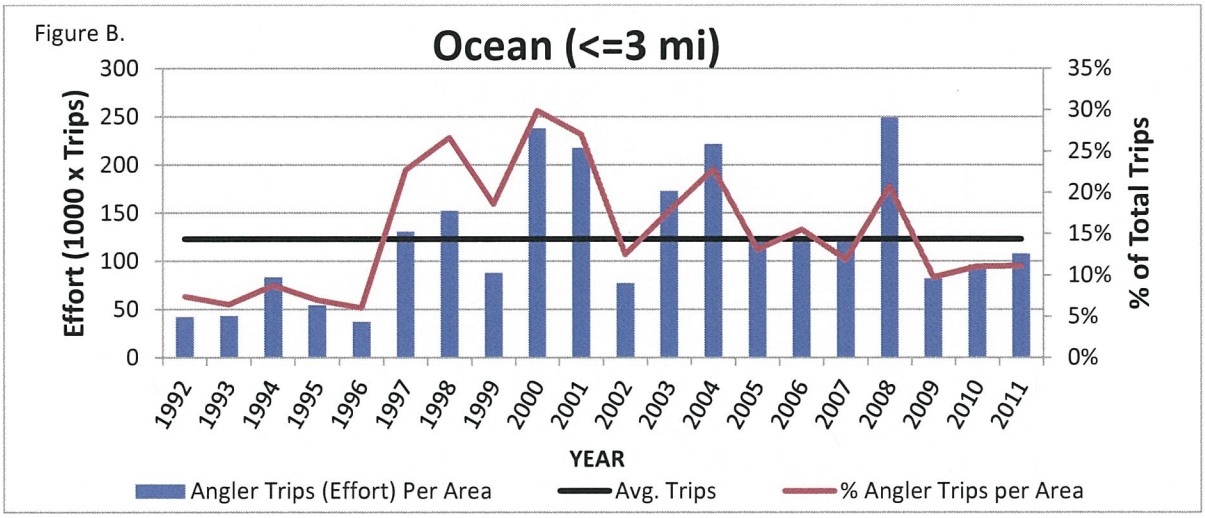
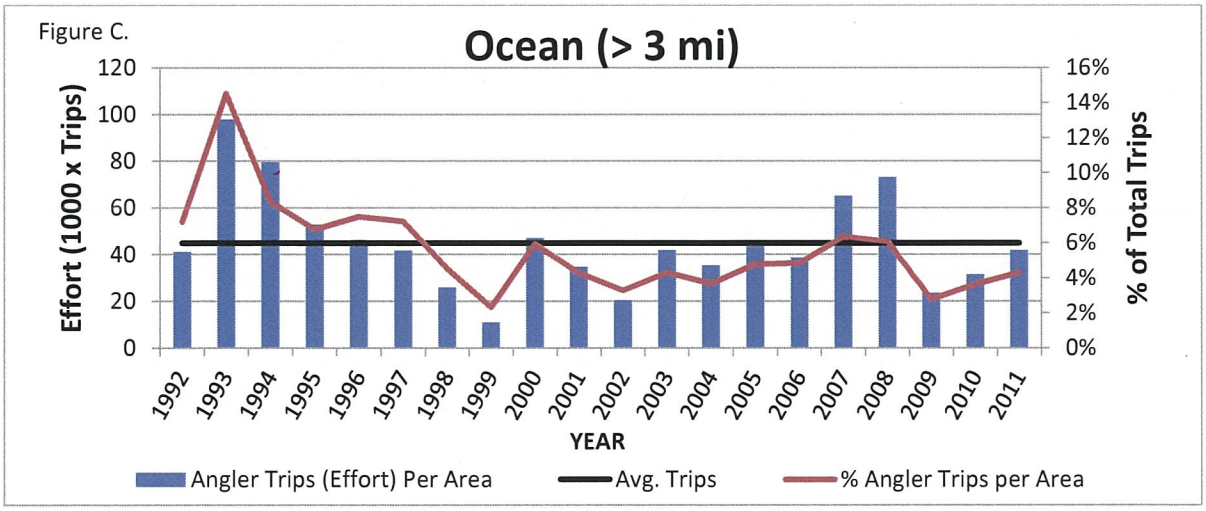


Figure C.



Deployments

The Program is currently the only entity in the State of Georgia with the capability to fund and coordinate development of new and existing reefs in order to enhance fisheries habitat and recreational fishing opportunities. Any materials to be deployed will be inspected by a representative of the GADNR-CRD or its designated official prior to deployment to ensure materials are free of exposed rebar, are environmentally safe and free of toxic contaminants or pollutants, and materials meet the terms and conditions in the permit under which the artificial reef is developed. Materials and development activities will satisfy environmental, physical, and other conditions specified in U.S. Army Corps of Engineers (USACE) and State permits, as well as by the U.S. Fish & Wildlife Service, United States Coast Guard (USCG), the Environmental Protection Agency (EPA), Coastal Zone Management, and other State/federal agencies.

Materials have been deployed via marine contractor or directly by Program personnel at the 15 previously permitted Program sites. Heavy equipment is typically used to move materials on a barge which is then towed to a site where materials are placed in the water. The frequency of deployments is dictated by the Program's fiscal parameters which typically allow for GADNR to conduct deployment of materials one to two times per year at designated reef sites, but this frequency could increase if materials of opportunity and/or additional funding are obtained. Materials of opportunity are typically donated and require quick action by GADNR in order to secure the materials. No natural reefs or similar resources occur or will be impacted by reef development activities. Endangered or threatened marine mammals, turtles, or Atlantic sturgeon will not be impacted by the enhancement of Program sites, and in general, feeding and foraging opportunities may significantly improve development of these communities. State employees involved with deployment activities will receive endangered species training on: 1) sea turtles; 2) Atlantic sturgeon; 3) manatees; 4) other endangered, threatened, or listed species; and 5) will be present on site when materials are deployed.

Materials Overview

Suitable natural as well as manmade materials properly sited in estuarine areas can provide the stable foundation needed for the development of estuarine habitats and ecosystems. A variety of non-toxic materials are utilized in the construction of artificial reefs and vary considerably, depending on specific Program goals and other criteria, such as stability, durability, rugosity, surface area, vertical relief, profile, and other features that maximize habitat and long-term fisheries values. While materials of opportunity or secondary use materials are utilized, planned, and focused for artificial reef development, this does not constitute ocean dumping. Inshore habitat development and enhancement in Georgia has relied primarily on materials of opportunity including but not limited to 1) designed materials: such as concrete pallet balls, historical fish aggregating device (FAD) units consisting of Polyvinyl chloride (PVC)/concrete units and new FAD units consisting of Polyvinyl chloride (PVC)/concrete units placed inside of a metal transport tote; 2) concrete materials: pallet/oyster balls, culverts, forms, pilings, rubble, concrete pyramids, and transmission line poles and bases; 3) metal materials: bridge supports and similar heavy metal structures, culvert, poultry transport cages (PTCs), metal transport totes, and other metal forms

(Appendix II). Natural materials such as recycled oyster shells and rock like granite and limestone have also been used.

Properly sited and strategically deployed, these materials can be extremely effective in creating productive fisheries habitat and generating substantial, long-term recreational opportunities for comparatively low costs. However, the sporadic availability of materials of opportunity can be problematic, especially for long-term planning and budgeting. As a result the Program also employs specifically designed units to support the long-term development of functional marine ecosystems and associated fisheries. Commercially available, designed units represent an important material source and planning option for reef and habitat development programs.

Per permitting and other requirements, all materials utilized in artificial reef construction must be free of floatables and toxins to ensure no degradation of the current water quality. Materials utilized at the reef sites will also be of significant density and composition to ensure stability and durability following placement. Adverse environmental impacts will be minimal at the fifteen proposed sites, as non-toxic and thoroughly cleaned materials with will be used in reef development.

Materials Criteria and Specific Requirements

Inshore artificial reef materials will not create hazards to navigation or the marine environment and will not create the potential to trap marine vertebrates. Materials are required to be: 1) extremely durable in seawater and where possible non-subsiding in sediments; 2) have suitable substrate characteristics and ample surface area for fouling organisms; 3) create vertical profile and structural complexity to encourage species diversity; 4) ensure adequate water circulation; 5) provide refuge for animals; 6) do not contain exposed rebar or other protruding steel components; and 7) maximize the Program's benefit-to-cost ratio. Additionally all materials used in construction must be free of asphalt, petroleum, other hydrocarbons, and toxic substances that may be harmful to humans, animals or other aquatic life; substances attributed to municipal, industrial, or other discharges producing color, odor or other conditions in such degrees as to create a nuisance; loose free-floating materials; and material producing turbidity will be minimized.

Approved Material Types (Reference Appendix II)

As described above, approved material types will consist of natural (shell and rock) and manmade materials (designed materials, concrete, PVC, and metal). Multiple approved material types may also be combined to create designed units and fish aggregating device (FADs) units.

Natural Materials Include but are not Limited to:

- **Shell** - Shell materials, such as clam and oyster shell, are naturally occurring in the marine environment and pose no threat to the environment or associated living resources. For example, loose oyster shells can be bagged and placed on top of wooden pallets along an inter-tidal mudflat to build an oyster reef (Figure D). These traditional materials are biodegradable and pose no threat to the environment or associated living resources.

- **Rock** - Rock is a naturally occurring, stable material that poses no threat to the marine environment or associated living resources. For example, surfaces of "natural" rock such as limestone and granite are irregular and rough, making them attractive to attaching organisms.

Manmade Materials Include but are not Limited to:

- **Designed Materials** - The use of designed materials are deemed compatible with the marine environment and pose no threat to living marine resources. Such designed materials will adhere to the other basic criteria of function, stability, and durability. Designed materials may consist of one approved material type or could be a combination of multiple approved material types used together. An example of a commercially constructed designed material using one approved material type are "Pallet or Reef Balls" (Figure E). Pallet balls are made by pouring concrete into a fiberglass mold containing a central Polyform buoy surrounded by various sized inflatable balls to make holes. Pallet balls units measure 3 to 5 feet in diameter. An example of designed materials consisting of a combination of approved material types used together are historical and new FAD units. The 1990's historical FAD units consisted of concrete bases and PVC pin-cushion style arms (Figure F). During 2016, GADNR modified and tested a new FAD design to enhance fish and oyster habitats. The new FAD units also consisted of a concrete base with PVC pin-cushion style arms but this structure was placed inside a metal transport tote in order to reduce subsidence (Figure G). This new design has shown to enhance oyster reef habitat while also providing structurally complex fish habitat.
- **Concrete** - Concrete is a dense stable material that is environmentally compatible, often readily available, and can be used in designed structures. For example, Pallet Balls (Figure E), historical and new FAD units (Figures F and G), Oyster Balls (Figure H), Concrete Pyramids (Figure I), and other forms like culvert (Figure J), pilings, transmission line poles and bases, or as rubble (Figure K).
- **Culvert Materials** - Concrete (Figure J) and plastic (PVC, HDPE) culvert of various sizes and diameters. Figure J shows concrete culvert loaded on a barge for deployment and a diagram of a piece of culvert.
- **Rubble** - Rubble consists of concrete material of various sizes that has been cleaned to EPA standards and is free from rebar and toxins. For example, razed buildings, parking lots, road beds, bridges, and other sources typically contain rubble (Figure K).
- **PVC** - Polyvinyl chloride (PVC) is a stable material and poses no threat to the marine environment or associated living resources. For example, PVC is used as a component of historical and new FAD units as these structures contain a 3" concrete slab with PVC spikes arranged vertically, pin cushion style (Figures F and G). PVC poles are also used to mark individual materials as well as deployment and/or monitoring locations. In addition, PVC spat sticks (dipped in concrete or non-dipped) placed along inshore artificial reef inter-tidal banks can promote oyster recruitment. Figure L shows an example of oyster recruitment on concrete dipped PVC spat sticks.
- **Metal** – Metal is a stable material that is environmentally compatible and poses no threat to the marine environment or associated living resources. Examples of metal materials are bridge supports and similar heavy metal structures, PTCs with approximate dimensions 8' L x 4' W x 4'

H (Figure M), historical and new FADs, metal culverts, metal transport totes (Figure G), and other metal forms.

Disapproved Material Types

Railroad boxcars; Subway cars; Steel and wood-hulled ships; Boats; Barges; Manufactured materials using coal fly ash; Military hardware; Vehicle tires; Wood; Automobiles and other vehicles and their associated parts; Aircraft; Fiberglass; White Good (household appliances).

Program Monitoring and Historical Insights

Monitoring has provided a mechanism to evaluate and learn from the efforts of past projects and to prepare for future reef construction / development techniques and activities. Long-term success of the Program is due to site selection and reef materials deployed which have remained in place over the years and continue to provide a durable, safe, and effective substrate for the foundation of the reef community itself. Stability and structural integrity are critical factors involved in evaluating the success of a particular type of reef material from an engineering standpoint. Due to differing water dynamics and substrate properties at individual sites some reefs have been more successful than others. Program materials are designed to be functional, compatible, stable, and durable for each site location. Each reef was designed with a low profile to replicate naturally occurring oyster beds and other relief for suitable habitat of more demersal/ benthic species. Design criteria also took into account interstitial space and total surface area. Adequate interstitial spaces, numerous holes, crevices, walls and overhangs in a reef structure, are necessary to establish a rich diversity of motile invertebrates as well as numerous cryptic fish species. In low profile benthic reefs, the total biomass that can be supported on an artificial reef will be directly related to the quantity and quality of effective surface area available to sessile marine organisms.

Successful materials deployed by GADNR show recruitment of fish, long-term compatibility with the aquatic environment, and consist of: 1) various types of concrete materials such as bridge rubble and railings, culvert, pilings, historical and new FAD units, commercially constructed FAD units known as "Pallet or Reef Balls," and experimental pyramid shaped FAD units; 2) plastic (PVC) culvert pipes of various sizes and diameters, and 3) finally metal PTCs and metal transport totes. The only materials to have failed, completely subsided into the substrate, are concrete walkways placed at Mud Creek and metal PTCs at the Timmons River site. It should also be noted that historical FAD units are highly productive materials but at a few sites concrete bases have subsided into the substrate, and PVC pin cushion style arms have broken, however GADNR feels that this material meets acceptable standards for continued use within the Program. By placing historical (PVC/concrete) FAD units inside of a metal transport tote, as described in the approved material types section, incidence of subsidence and breakage of PVC arms have been substantially reduced.

Program Compliance

This Program will adhere to all conditions and restrictions of the Coastal Marshlands Protection Act (CMPA) Permit No. 682 as well as comply with all Federal, State, and local statues,

ordinances and regulations. Project descriptions and location maps will be provided to GADNR-CRD-Coastal Management Section (CMS) in order to obtain a letter of acknowledgement for the deployment of materials at the fifteen inshore artificial reef sites authorized under the Coastal Marshlands Protection Act Permit No. 682. Site-specific details will be provided for each individual location as they are identified per fiscal year and a letter of acknowledgement will be obtained prior to commencement of work at each location. Certification of Compliance will also be submitted to CMS within 30 days following completion of the permitted activity.

Under USACE and State permitting requirements for the development of Program reefs, the State of Georgia assumes responsibility for all sites and materials subsequently deployed. As permittee, it is the State's responsibility to ensure ongoing compliance with permit specifications, including the stability of deployed materials and structures. Regular compliance surveys and mapping of artificial reef sites and materials occur to ensure adherence to permit specifications, and also to identify and offset potential liabilities that may exist post-placement or develop over time as reef structures deteriorate. Under USACE Programmatic General Permit (PGP) No. 37, the State is also required to submit a compliance report by September 1st of every year. The compliance report includes: 1) a project summary providing an overview of activities per year; 2) site selection and evaluation criteria used; 3) dates of deployments; 4) staff training and on site deployment activities, contractor used; 5) types of materials deployed per site and any specific requirements of materials; 6) the GADNR-CRD-CMS letter of acknowledgement; and 7) Program maintenance activities such as side scan sonar readings per site evaluated and aerial over-flight photography.

Baseline compliance surveys and specific activities completed previously at the State's 15 estuarine artificial reef sites include: include post-deployment surveys / verifications; material evaluations; performance monitoring efforts; directed inspections and assessments and other activities needed to support Program planning, permitting, and field operations. Survey designs, site variables, and techniques employed at each site differ due to limitations of the side-scan sonar equipment's use over shallow inter-tidal reefs and sites where maneuverability is restricted. The Program's use of side-scan sonar technology has significantly enhanced compliance and monitoring capabilities by providing baseline information needed for permitting, material quantifications, and future comparisons. The equipment's wide lateral coverage allows for more rapid surveys of existing and potential reef sites and has proven especially useful in turbid inshore waters. In addition to sonar, helicopter over-flights or unmanned aerial vehicle (UAV) flights have been conducted at mean low waters to photograph, video, and document material locations and orientations.

Program Maintenance

Each Program reef site is clearly delineated by concrete/wooden pilings with signage warning for navigational interests of reduced water depths and hazards thereby assisting anglers (Figure N). All pilings have been permitted through the USCG as "Aids to Navigation" or "Special Purpose Marks" as inter-tidal reefs may be slightly submerged at times, the potential risks to navigational

interests operating in inland waterways is evident. Typically two to four pilings with appropriate hazards and Program signage are placed and maintained at each inshore reef site by Program personnel or via a marine contractor. As officially designated private aids to navigation significant penalties may be imposed if these aids are not maintained as specified, in addition to the significant liabilities associated with an improperly maintained or missing navigational aid, especially in shallow and heavily utilized waters. Assessments are performed at all reef sites to re-examine and re-evaluate marking requirements, existing systems, identify ongoing hazards / liabilities, and potential or needed improvements. Ongoing monitoring of potential wear and deterioration to the inshore reef marker pilings occurs during annual maintenance inspections of pilings and hazards signage; and replacements of damaged and worn signage and pilings occurs.

To date, inshore reef maintenance activities have been largely limited to replacements of missing, damaged, or faded hazards and Program signage. However, the loss of a corner piling from the Troupe Creek Artificial Reef (Glynn County) in 2008 raised concerns regarding the condition of pilings in place at the estuarine reef sites. Primarily wooden, some marker pilings have been in place for 20+ years. Subsequent Program inspections have noted some deterioration and thinning of other wooden pilings elsewhere. In light of the potential liabilities associated with missing inshore markers and errant pilings, eventual systematic replacement of all wooden pilings with concrete units is required. In order to remain within annual maintenance Program budgets, a phased approach for piling replacements will take place over several years due to fiscal constraints. The Program currently maintains 35 pilings with signage at the State's 15 inshore reef sites including 13 inter-tidal reefs that are largely exposed at low tide; one entirely submerged sub-tidal reef at the Little River Site; and one entirely submerged sub-tidal reef at the Jekyll Island Pier site where no pilings currently exist as the Jekyll Pier restricts boat traffic near shore.

Project Drawings, Site Plans, and Descriptions

Table 1. Location of Georgia Inshore (Estuarine) Artificial Reefs

Appendix I: Map of Georgia's 15 Inshore Artificial Reef Sites

Appendix II: Examples of Approved Materials and Signage Deployed (Figures D - N)

Appendix III: Forms, Letters, Certifications, and Licenses

Each Appendices IV to XVIII includes:

- Figure 1: Nautical chart with reef sites shown in red
- Figure 2: Aerial photographs highlight materials, footprints, existing pilings, and the southernmost piling is outlined in red for navigational purposes
- Table 2: GPS coordinates of each piling, southernmost piling in bold font, and total area of each proposed project footprint
- Figure 3a: Cross sectional views of the project plans
- Figure 3b: Existing materials present at each site
- Figures 4a and 4b: Aerial over-flight site reference photographs

Appendix XIX: Inshore Artificial Reef Program Historical Overview

Forms and Letters (Reference Appendix III):

Appendix III includes: 1) State of Georgia Revocable License Request; 2) project approval statements for the fifteen reef sites from the local zoning authorities stating that this proposal is in compliance with any zoning laws; 3) a landfill or hazardous waste statement that the proposed project is not over landfill or hazardous waste sites and that the site is otherwise suitable for the proposed project; 4) a copy of the Water Quality Certification issued by the Environmental Protection Division; and 5) a statement certifying that the project will be conducted in compliance with applicable erosion and sediment control responsibilities.

Alternative Analysis:

A. Alternative Actions

(1) No Action

This action would not address the needs of Georgia's growing marine recreational fishery targeting spotted seatrout (*Cynoscion nebulosus*), red drum (*Sciaenops ocellatus*), (*Archosargus probatocephalus*), southern flounder *(Paralichthys lethostigma)*, and other sport fish in the State's inshore estuaries.

(2) Having Reefs Developed by another Agency

No other agencies or government entities in Georgia has the funding, ability, or interest in undertaking artificial reef development activities coast wide, as needed to address all anglers' needs. The United States Army Corps of Engineers (USACE) permitting for inshore artificial reef development is largely limited to governmental agencies due to long-term liability requirements. If cost-effective, private contractors are employed by the State Program for actual development operations. These considerations are applicable to artificial reef development activities.

B. Alternative Actions, Emphasizing Critical Elements

(1) No Action

There would be no environmental issues or associated site development concerns if the State Program undertook no action. Potentially, significant, long term environmental and socio-economic benefits, however, would be lost through this alternative.

(2) Having Reefs Developed by another Agency

There would be no environmental issues or associated site development concerns since this option is not currently viable.

(3) Discontinuing the Existing Fifteen Inshore Artificial Reef Sites

This action would not be economically or environmentally feasible due to large quantities of materials that would have to be removed thereby destroying existing habitats. Reef sites were originally established in conjunction with recommendations from local sport fishing groups familiar with the general areas and fisheries. These reef sites currently provide greater accessibility for a larger percentage of anglers in small boats that are unable to safely venture offshore. No benefits would be obtained from discontinuing existing reef sites.

(4) Enhancement of the Existing Fifteen Artificial Reef Sites by the State of Georgia

The State Program is currently the only entity with the capabilities to fund and coordinate development of existing and new reefs in order to enhance fisheries habitat and recreational fishing opportunities.

Public Interest Statement:

The development of fifteen inshore artificial reefs continues to be a highly popular Program among Georgia's recreational fishermen. Artificial reef technology is a management tool that can be used successfully to meet growing recreational needs and provide essential fish habitat. The granting of this permit will assist in enhancing conservation efforts of fish, shrimp, oysters, crabs, clams, and other marine and wildlife resources. Endangered or threatened marine mammals and turtles will not be impacted by the enhancement of the inshore reef sites and in general feeding and foraging opportunities may significantly improve development of these communities.

Since non-toxic and thoroughly cleaned materials with limited existing footprints are used in reef development, adverse environmental impacts of artificial reef development at the fifteen sites will be minimal. While materials of opportunity or secondary use materials are utilized, planned, and focused for artificial reef development this does not constitute ocean dumping. Per permitting and other requirements, all materials utilized in artificial reef construction must be free of floatables and toxins to ensure no degradation of the current water quality. No unreasonably harmful or increased erosion, shoaling of channels or stagnant areas of water will be created through the implementation of this proposal. Materials utilized at the reef sites will also be of significant density and composition to ensure stability and durability following placement. No natural reefs or similar resources occur or will be impacted by reef development activities.

Although proximal to navigational waterways, transient vessel traffic will not be impacted since reef sites will not extend into channels. No unreasonably harmful obstruction to or alteration of the natural flow of navigational water within the affected areas will arise as a result of this proposal. Furthermore, each corner occurring on the channel side boundary of each reef site will be marked with a piling displaying USCG authorized signage warning of underwater obstructions and hazards.

Table 1. LOCATIONS: Georgia Inshore (Estuarine) Artificial Reefs

Reef Name / Original Permit Number & Year	County/Nearest Town	Southernmost Piling Latitude/Longitude	Description	Reef Type/Depth	Marked By
Halfmoon River, Year: 1987 #074 OYN 006559	Chatham/ Savannah	31.962667° 80.942617°	mouth of Halfmoon River, Wassaw Sound	Inter-tidal[2] 0-3' MLW	4 Pilings
Romerly Marsh Creek (Joe's Cut), Year: 1987, #074 OYN 006560	Chatham/ Savannah	31.931617° 80.987800°	mouth of Romerly Marsh Creek Wassaw Sound	Inter-tidal[2] 0-3' MLW	1 Piling
Ogeechee River,Year: 1998 #980001990	Chatham/ Richmond Hill	31.869550° 81.153017°	0.6 nm N of Ogeechee River marker G"1A," along Harveys Island, Ossabaw Estuary	Inter-tidal[2] 0-3' MLW	2 Pilings
Bear River, Year: 1999 #990011330	Bryan/ Sunbury	31.745333° 81.155050°	mouth of Newell Creek St. Catherines Estuary	Inter-tidal[2] 0-3' MLW	2 Pilings
Van Dyke Creek, Year: 1994 #940008210	Liberty/ Sunbury	31.685450° 81.198167°	0.58 nm NNW of ICW[3] marker G"121," at mouth of Van Dyke Creek, St. Catherines Estuary	Inter-tidal[2] 0-3' MLW	2 Pilings
Timmons River, Year: 1994 #940008170	Liberty/ Sunbury	31.677383° 81.215250°	0.87 nm W of ICW[3] marker G"121," on North side Timmons River, St. Catherines Estuary	Inter-tidal[2] 0-3' MLW	2 Pilings
Four- Mile Island, Year: 1994 #940005700	McIntosh/ Eulonia	31.536283° 81.290550°	0.30 nm NE of Four-Mile-Point Sapelo Sound	Inter-tidal[2] 0-3' MLW	2 Pilings
High Point, Year: 1999 #990011320	McIntosh/ Eulonia	31.524700° 81.242267°	West of High Point, Sapelo Island Sapelo Sound	Inter-tidal[2] 0-3' MLW	4 Pilings
Troupe Creek,Year: 1995 #950013520	Glynn/ Brunswick	31.229117° 81.440617°	0.30 nm NE of Troupe Creek Marina Troupe Creek, St. Simons Sound	Inter-tidal[2] 0-3' MLW	2 Pilings
Jove Creek, Year: 1990 #074 OYN 006977	Glynn/ Brunswick	31.216383° 81.425617°	Opposite ICW[3] marker R"238" at mouth of Jove Creek, St. Simons Sound	Inter-tidal[2] 0-3' MLW	4 Pilings
Henry Vassa Cate (Twin Sisters), Year: 1987, #074 OYN 006422	Glynn/ Brunswick	31.103383° 81.426667°	0.87 nm SW of Jekyll Island fishing pier, West of Jekyll Island, St. Simons Sound	Inter-tidal[2] 0-3' MLW	4 Pilings
Mud Creek, Year: 1998 #980002530	Camden/ St. Marys	30.904667° 81.469500°	juncture of Mud, Cumberland (ICW[3]), and Brickhill Rivers, St. Andrews Estuary	Inter-tidal[2] 0-3' MLW	2 Pilings
Stafford Island, Year: 1997 #970000900	Camden/ St. Marys	30.818917° 81.488850°	near (ICW[3]) marker G"71" Cumberland Sound	Inter-tidal[2] 0-3' MLW	2 Pilings

[1] MLW = Mean Low Water

[2] Inter-tidal Reef - Most of the structures are partially exposed during ebb-low tides.

[3] ICW = Intracoastal Waterway

[4] Sub-tidal Reef - All structures are submerged at all times.

Table 1. (Continued) LOCATIONS: Georgia Inshore (Estuarine) Artificial Reefs

Reef Name/ Original Permit Number & Year	County/Nearest Town	General Latitude/Longitude	Description	Reef Type/Depth	Marked By
Little River West Bank, Year: 1984	Glynn/	31.167550°	0.01 nm South of Little River Bridge, St.	Sub-tidal[4]	1
#074 OYN 005645	Brunswick	81.436333°	Simons Island Causeway, St. Simons Sound	8-12' MLW	Piling
Little River East Bank, Year: 1984	Glynn/	31.167700°	0.01 nm South of Little River Bridge, St.	Sub-tidal[4]	1
#074 OYN 005645	Brunswick	81.435817°	Simons Island Causeway, St. Simons Sound	8-12' MLW	Piling
Jekyll Island Pier West Arm	Glynn/	31.116696°	mouth of St Simons Sound	Sub-tidal[4]	No
Year:1984, #074 OYN 005646	Brunswick	81.418431°	St Simons Sound	5-6' MLW	Pilings
Jekyll Island Pier East Arm	Glynn/	31.117506°	mouth of St Simons Sound	Sub-tidal[4]	No
Year:2013, PGP37	Brunswick	81.417463°	St Simons Sound	5-6' MLW	Pilings

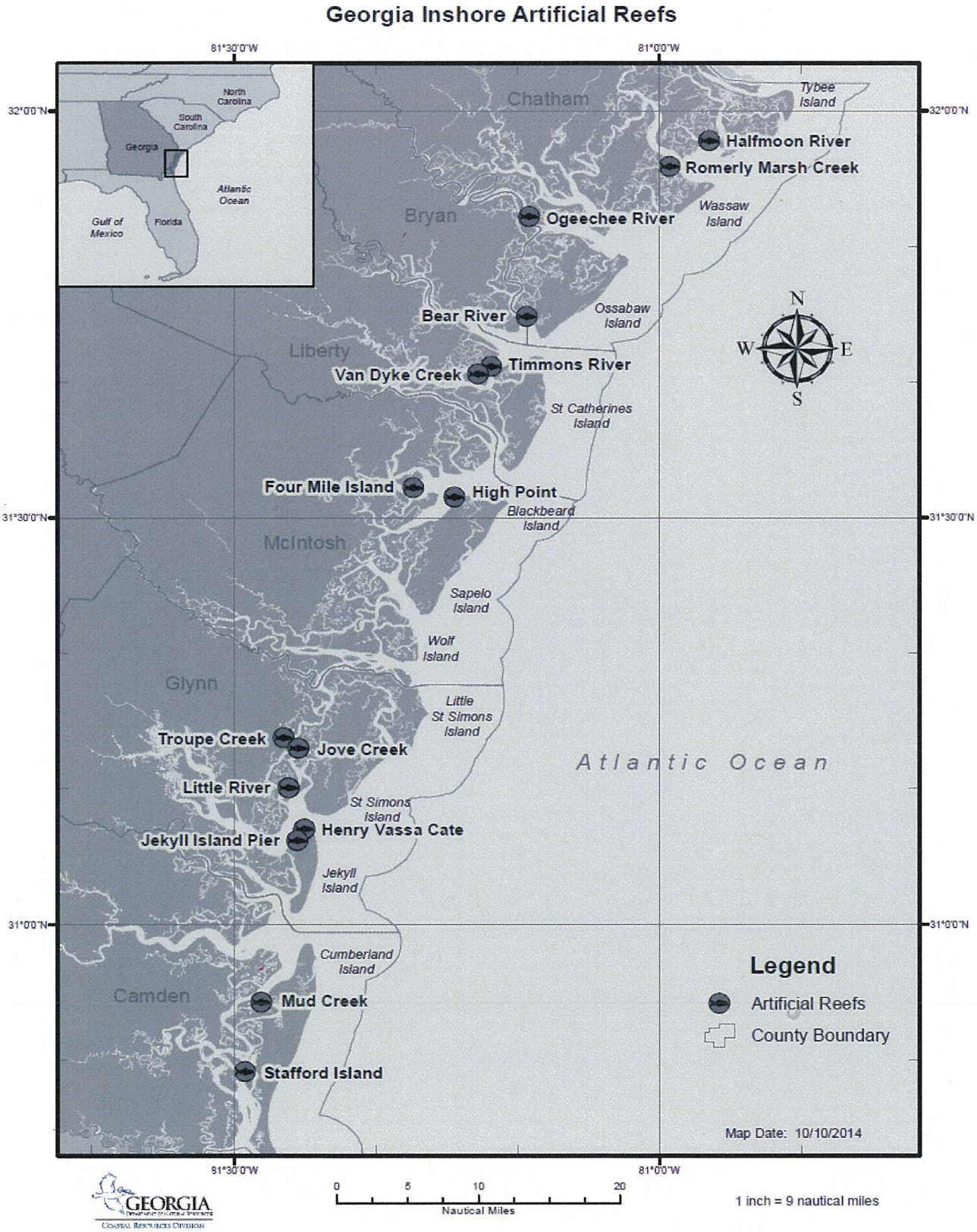
[1] MLW = Mean Low Water

[2] Inter-tidal Reef- Most of the structures are partially exposed during ebb-low tides.

[3] ICW = Intracoastal Waterway

[4] Sub-tidal Reef- All structures are submerged at all times.

APPENDIX I-Map of Georgia's 15 Inshore Artificial Reef Sites



APPENDIX II-Examples of Approved Materials and Signage Deployed

As described above, approved material types will consist of natural (shell and rock) and manmade materials (designed materials, concrete, PVC, and metal). Multiple approved material types may also be combined to create designed units and fish aggregating device (FADs) units.

Natural Materials Include but are not Limited to:

- **Shell** - Shell materials, such as clam and oyster shell, are naturally occurring in the marine environment and pose no threat to the environment or associated living resources. For example, loose oyster shells can be bagged and placed on top of wooden pallets along an inter-tidal mudflat to build an oyster reef (Figure D). These traditional materials are biodegradable and pose no threat to the environment or associated living resources.

Figure D.

- **Rock** - Rock is a naturally occurring, stable material that poses no threat to the marine environment or associated living resources. For example, surfaces of "natural" rock such as limestone and granite are irregular and rough, making them attractive to attaching organisms.

Manmade Materials Include but are not Limited to:

- **Designed Materials** - The use of designed materials are deemed compatible with the marine environment and pose no threat to living marine resources. Such designed materials will adhere to the other basic criteria of function, stability, and durability. Designed materials may consist of one approved material type or could be a combination of multiple approved material types used together. An example of a commercially constructed designed material using one approved material type are "Pallet or Reef Balls" (Figure E). Pallet balls are made by pouring concrete into a fiberglass mold containing a central Polyform buoy surrounded by various sized inflatable balls to make holes. Pallet balls units measure 3 to 5 feet in diameter. An example of designed materials consisting of a combination of approved material types used together are historical and new FAD units. The 1990's historical FAD design consisted of concrete bases and PVC pin-cushion style arms (Figure F). During 2016, GADNR modified and tested a new FAD design to enhance fish and oyster habitats. The new FAD units also consisted of a concrete base with PVC pin-cushion style arms but this structure was placed inside a metal transport tote in order to reduce subsidence (Figure G). This new design has shown to enhance oyster reef habitat while also providing structurally complex fish habitat.

APPENDIX II-Examples of Approved Materials and Signage Deployed

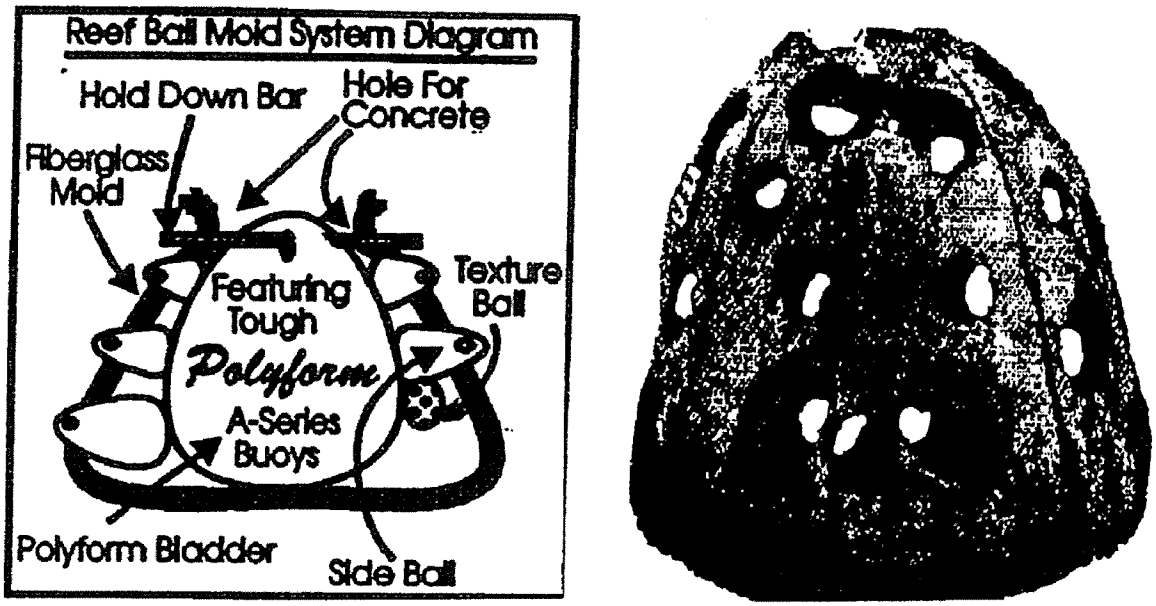


Figure E. Commercially constructed designed units, by Reef Innovations, currently exist on site and are proposed for future reef materials. "Pallet or Reef Balls" are made by pouring concrete into a fiberglass mold containing a central Polyform buoy surrounded by various sized inflatable balls to make holes. Pallet balls units measure 3 to 5 feet in diameter.

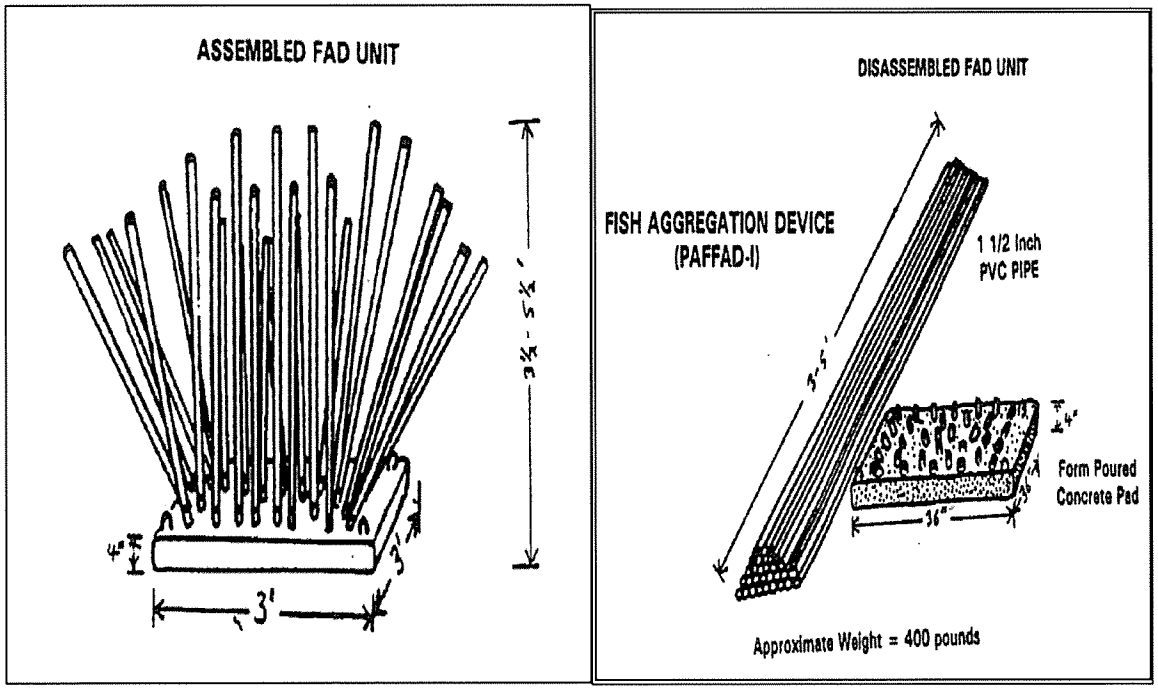


Figure F. The 1990's historical FAD units consisted of a 3-foot square, 4 inch thick concrete pad with 1 ½ inch diameter PVC protruding from the surface of pad, constructed by Department personnel. (New FAD units were created in 2016 that incorporate the concrete base and PVC arms inside a metal transport tote, shown in Figure G).

APPENDIX II-Examples of Approved Materials and Signage Deployed

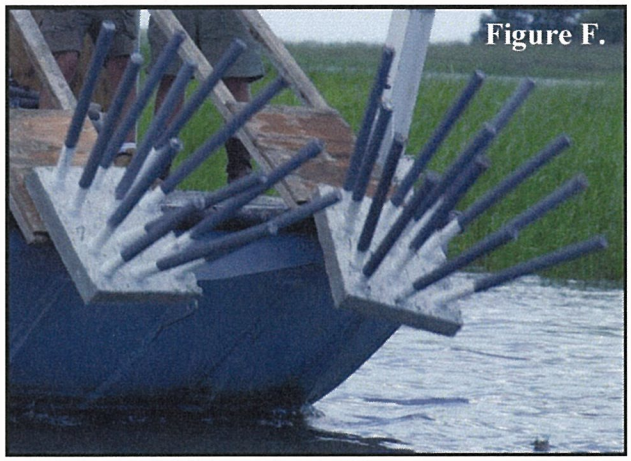


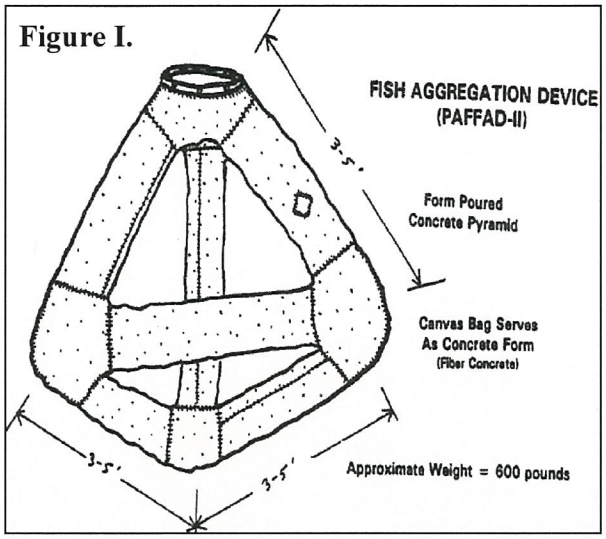
Figure F.


Figure G.

- **Concrete** - Concrete is a dense stable material that is environmentally compatible, often readily available, and can be used in designed structures. For example, Pallet Balls (Figure E), historical and new FAD units (Figures F and G), Oyster Balls (Figure H), Concrete Pyramids (Figure I), and other forms like culvert (Figure J), pilings, transmission line poles and bases, or as rubble (Figure K).

Figure H.

APPENDIX II-Examples of Approved Materials and Signage Deployed



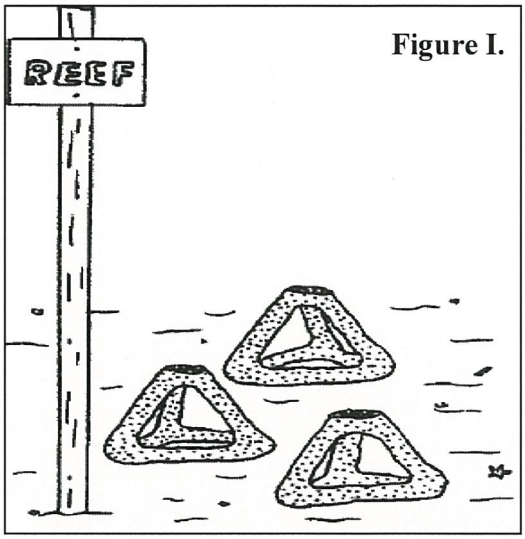
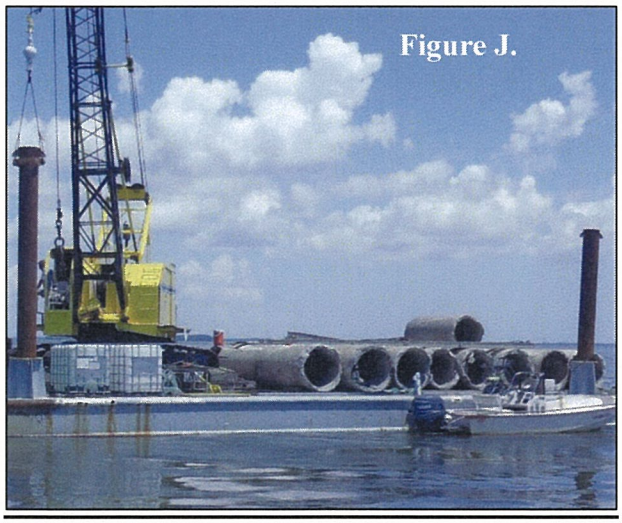
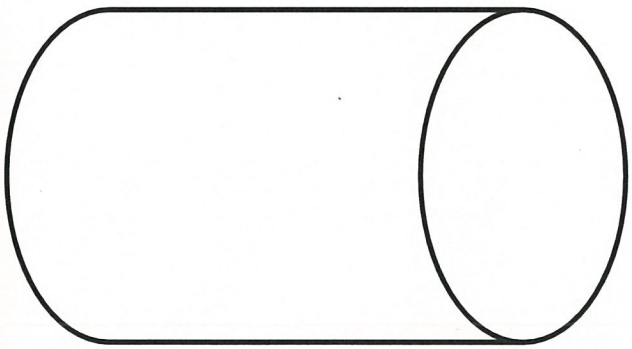


Figure I. Concrete pyramids, experimental FADs, were constructed by Department personnel and deployed at multiple reef sites throughout the Program's history. These units consist of a three to five foot high concrete pyramid constructed by pouring fiber concrete into a suspended canvas bag. Pyramid heights range from three to five feet with the diameter of pyramid legs ranging from six to eight inches. GADNR does not foresee deploying this experimental material type in the future as it no longer meets acceptable standards. Some units were damaged on site or subsided below the mudline while others remain exposed and functioning (Appendix XV, Figure 4a).

- **Culvert Materials** - Concrete (Figure J) and plastic (PVC, HDPE) culvert of various sizes and diameters. Figure J shows concrete culvert loaded on a barge for deployment and a diagram of a piece of culvert.





- **Rubble** - Rubble consists of concrete material of various sizes that has been cleaned to EPA standards and is free from rebar and toxins. For example, razed buildings, parking lots, road beds, bridges, and other sources typically contain rubble (Figure K).

APPENDIX II-Examples of Approved Materials and Signage Deployed

Figure K.

- **PVC** - Polyvinyl chloride (PVC) is a stable material and poses no threat to the marine environment or associated living resources. For example, PVC is used as a component of historical and new FAD units as these structures contain a 3" concrete slab with PVC spikes arranged vertically, pin cushion style (Figures F and G). PVC poles are also used to mark individual materials as well as deployment and/or monitoring locations. In addition, PVC spat sticks (dipped in concrete or non-dipped) placed along inshore artificial reef inter-tidal banks can promote oyster recruitment. Figure L shows an example of oyster recruitment on concrete dipped PVC spat sticks.

Figure L.

- **Metal** – Metal is a stable material that is environmentally compatible and poses no threat to the marine environment or associated living resources. Examples of metal materials are bridge supports and similar heavy metal structures, PTCs with approximate dimensions 8' L x 4' W x 4' H (Figure M), FADs, metal culverts, metal transport totes (Figure G), and other metal forms.

APPENDIX II-Examples of Approved Materials and Signage Deployed

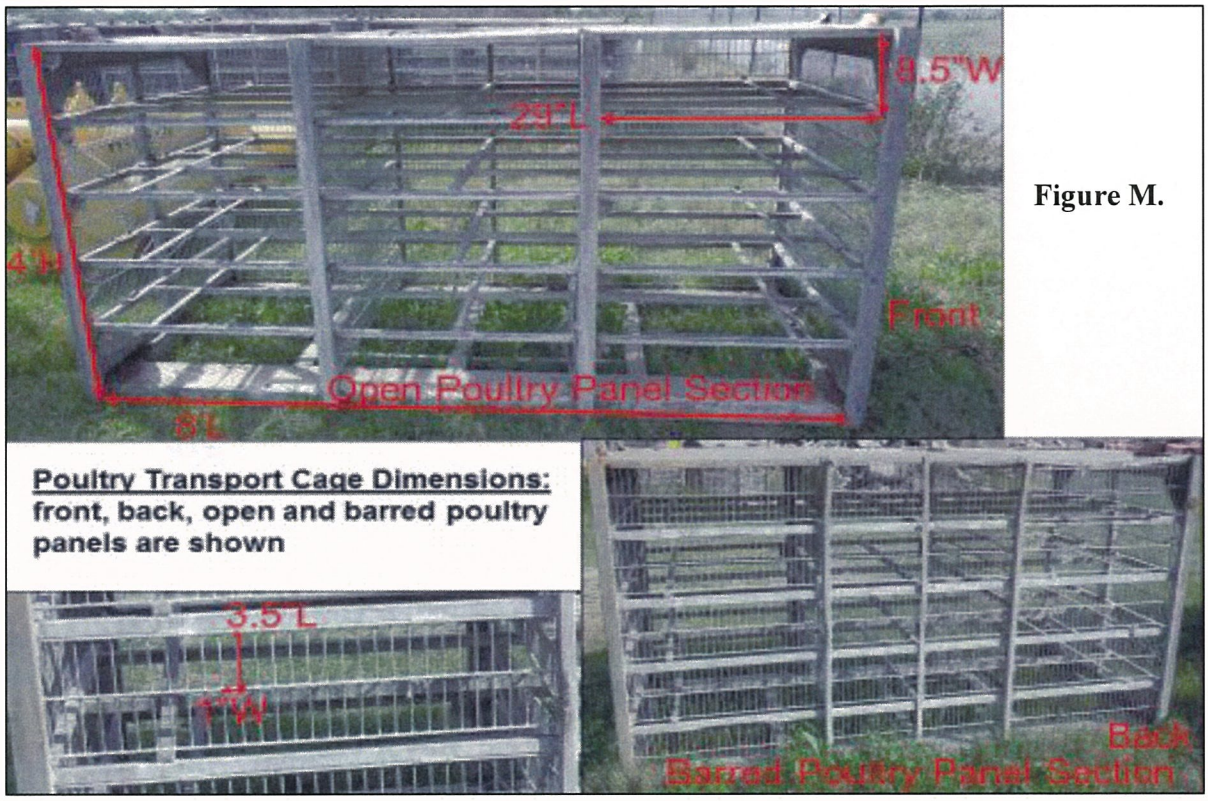


Figure M.

Signage: Submerged reef warning signs (Figure N) are constructed of 0.80 gauge aluminum. Signs measure 36" x 36" and have a 2" thick reflective orange border and a reflective white background. The words "DANGER SUBMERGED REEF" are presented in black letters.

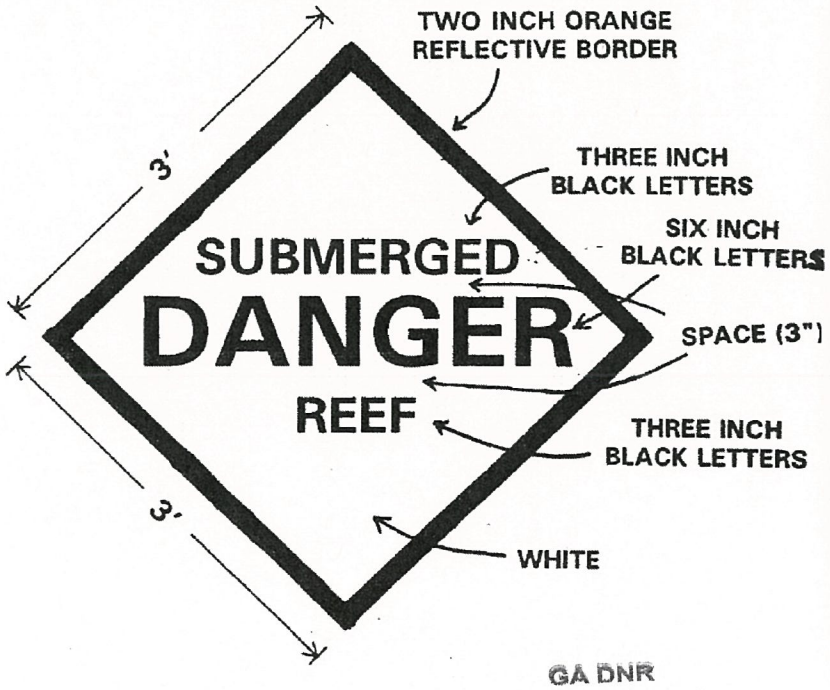


Figure N.

GA DNR

JAN 0 2 2018

Marsh & Shore Mgt. Program

CHATHAM COUNTY
DEPARTMENT OF BUILDING SAFETY & REGULATORY SERVICES
P.O. BOX 8161
SAVANNAH, GEORGIA 31412-8161

MEMBER ICC
INTERNATIONAL CODE COUNCIL

Gregori S. Anderson, CBO
Director

Ph: 912-201-4300
Fax 912-201-4301

Clifford Bascombe, CBO,CFM
Assistant Director

December 6, 2017

January Murray
Coastal Resources Div.
Ga. DNR
1 Conservation Way
Brunswick, Ga. 31520

RE: Enhancement of three public inshore artificial reefs in Chatham County

Dear Ms. Miller:

The proposed project is in compliance with Chatham County Zoning laws.

If you have any questions, I can be reached at 912-201-4307.

Sincerely,

Robert Sebek, Zoning Administrator
Chatham County

BRYAN COUNTY
PLANNING & ZONING DEPARTMENT

51 North Courthouse Street
P.O. Box 1071
Pembroke, Georgia 31321
912-653-3893
(Fax)653-3864

66 Capt. Matthew Freeman Drive
Suite 201
Richmond Hill, Georgia 31324
912-756-7962
(Fax)756-7951

December 20, 2017 *via email*

Ms. January Murray, Habitat Unit Leader
Georgia DNR CRD
One Conservation Way
Brunswick, Georgia 31520

Re: Georgia DNR
Bryan County
Enhancement of Bear River Public Inshore Artificial Reef
Letter of Compliance

Dear Ms. Murray:

We are in receipt of your November 30, 2017 correspondence regarding the above-referenced project. The project scope as presented does not violate any current zoning regulations in Bryan County. We applaud your efforts to enhance the ecosystem that is such a vital part of our quality of life and which is enjoyed by many of our residents.

Should you have any questions or require further information regarding the above, please do not hesitate to contact me at the office at (912) 756-7953 or email at *kcroasmun@bryan-county.org*.

Sincerely,

Kirk D. Croasmun

Kirk D. Croasmun, PE, CFM
Bryan County Planning Director

Liberty Consolidated Planning Commission
100 Main Street, Suite 7520
Hinesville, Georgia 31313
Phone: 912-408-2030
Fax: 912-408-2037

Jeff Ricketson, AICP
Executive Director

December 5, 2017

Georgia Department of Natural Resources
January Murray
One Conservation Way
Brunswick, GA 31520

RE: Enhancement of Van Dyke Creek and Timmons River public inshore artificial reef sites in Liberty County

Dear January Murray:

Your proposed activities per your letter dated November 30, 2017, to enhance artificial reef sites in Liberty County in the Van Dyke Creek and in the Timmons River are not against any Liberty County zoning regulations.

Liberty County does not have any zoning regulations or districts on rivers running through the marshes.

Please let me know if I can be of further assistance.

Sincerely,

Gabriele Hartage

Gabriele Hartage, Zoning Administrator
Liberty Consolidated Planning Commission
(912) 408-2034
ghartage@thelcpc.org
http://thelcpc.org/
www.facebook.com/thelcpc

McIntosh County Building and Zoning Inspector

Post Office Box 2694
Darien, GA 31305

Art Crews, Inspector
Glenda Davis, Secretary
Donna Moody, Code Enforcement

Phone: 912-437-6603
FAX: 912-437-5088

December 18, 2017

Georgia Department of Natural Resources
One Conservation Way
Brunswick, Georgia 31520

RE: Two public inshore artificial reef sites in McIntosh County
Four Mile Island Reef and High Point Reef

To Whom It May Concern:

Please be advised that the above referenced proposed activity is in compliance with all zoning regulations for McIntosh County and requires no permits or inspections by the this office..

Please feel free to contact me if you have any further questions.

Sincerely,

Donna Moody

Donna Moody
McIntosh County
Building & Zoning Inspector

A Golden Past.
A Shining Future.

COMMUNITY DEVELOPMENT DEPARTMENT
1725 Reynolds Street, Suite 200, Brunswick, GA 31520
Phone: 912-554-7428/Fax: 1-888-252-3726

December 19, 2017

January Murray
Georgia Department of Natural Resources
One Conservation Way
Brunswick, GA 31520

Dear Ms. Murray:

Pursuant to your request, as the zoning authority in Glynn County, I acknowledge that the proposed inshore artificial reef projects proposed by the Georgia Department of Natural Resources (Troupe Creek, Jove Creek, Little River, Henry Vassa Cate, and Jekyll Pier) are in compliance with zoning ordinance of Glynn County. The proposed project sites are located in inter-tidal waterways, which are managed under the jurisdiction of the State of Georgia.

Should you have any additional questions, please feel free to contact me at sleif@glynncounty-ga.gov or 913-554-7428.

Sincerely,

Stefanie Leif

Stefanie Leif, AICP
Planning Manager

GA DNR

JAN 0 2 2018

Marsh & Shore Mgt. Program

Board of County Commissioners

Office of Planning & Development

107 N. Gross Road Suite 3 • Kingsland, GA 31548

Phone: (912) 729.5603 • Fax: (912) 729.5543 • www.co.camden.ga.us

Georgia DNR
Coastal Resources Division
Att: January Murray
One Conservation Way
Brunswick GA 31520

RE: CMPA682

To Whom It May Concern,

This letter is in response to your zoning inquiry the modification of an artificial reef project (CMPA682) in unincorporated Camden County. The proposed request is in compliance with zoning requirements.

The Camden County Unified Development Code can be found at the following address for more information: http://www.co.camden.ga.us/760/Organization-of-the-Code

If I can assist in any other way please feel free to contact me.

Thank you,

Eric Landon
Director of Planning & Development
Camden County Board of Commissioners
Office: 912-510-4313 / Cell: 912-464-7964
www.co.camden.ga.us

GA DNR
JAN 09 2018
Marsh & Shore Mgt

GA DNR
JAN 09 2018
Marsh & Shore Mgt. Program

"Award-Winning Government"

APPENDIX III - Forms, Letters, Certifications, and Licenses

Camden Letter to be included at a later date.

APPENDIX III - Forms, Letters, Certifications, and Licenses

Landfill or Hazardous Waste Statement:
The following websites were referenced to determine that the fifteen (15) proposed artificial reef sites, located within six (6) Georgia coastal counties, have never been used as a land fill or have been found to contain any hazardous waste materials, soil or sediment contamination, or past hazardous waste disposal activity hence these sites are suitable for the proposed project. The State of Georgia also owns the adjacent uplands, inter-tidal, and submerged lands at each of the fifteen estuarine reef sites.
http://www.gaepd.org/documents/hazsiteinv.html
http://www.gaepd.org/documents/regcomm_lpb.html#sw

Erosion and Sedimentation Statement:
The proposed activity does not involve filling or clearing and will not require a soil erosion and sedimentation plan. In addition, all activities will be performed in a manner to minimize turbidity in each river. The project will be conducted in compliance with all applicable erosion and sediment control responsibilities and best management practices as prescribed by State law.

Water Quality Certification: Not required for this project.

APPENDIX XIX- Inshore Artificial Reef Program Historical Overview

Program Summary:

In the mid 1980's as inshore saltwater fishing's popularity grew in Georgia so did the need for additional 'fishing drops'. The Georgia Department of Natural Resources (GADNR), Coastal Resources Division (CRD) recognized this and through Sport Fish Restoration, State, and private funds, established an inshore artificial reef Program (hereinafter referred to as Program). Sites were surveyed for depth, substrate suitability, and distance to navigable traffic channels and accessibility to boating access sites. Once Program sites were selected materials of opportunity such as donated old road beds; bridge railings; metal PTCs and metal transport totes; concrete rubble, culvert, forms; and designed modules such as historical and new FAD units were used in deployments. By 1999 fifteen Program sites along six coastal counties located in seven of the State's estuaries had been permitted by the United States Army Corps of Engineers (USACE). Thirteen of the reefs were placed in inter-tidal waters, 0-3' mean low water (MLW), where reefs were designed to replicate natural occurring oyster beds and other 'drops' providing small vessel anglers additional resources. Conversely, two reef sites: Little River (8-12' MLW) and Jekyll Island Pier (5-6'MLW) were placed in sub-tidal areas. Both inter-tidal and sub-tidal sites were marked with pilings for easier recognition and to comply with United States Coast Guard (USCG) navigational aid regulations. Appropriately worded, plainly visible and legible, reef warning signage were posted and maintained on each piling. Annual helicopter over-flights, versus on the water side scan sonar (SSS) surveys, were primarily conducted to document and monitor marker piling conditions, signage, material settling rates, and movement of sandbars and mudflats at all 15 sites. CRD creel clerks also survey angler's dockside for species catches at nearby boat ramps and marinas, if inshore artificial reef sites are not accessible by land.

Due to differing water dynamics and substrate properties at individual sites, some reefs have been more successful than others. Successful reefs and materials include the historical FAD units deployed at the Halfmoon River reef, concrete rubble and historical FAD units located at the Henry Vassa Cate reef and metal PTCs at located at Jove Creek. All of these materials have sustained structural longevity, provided substrate for oyster and barnacle growth, as well as provided Essential Fish Habitat (EFH) and angling opportunities. Meanwhile, materials placed at other unproductive sites include metal PTCs at the Timmons River site, and the historical FAD units located at the Romerly Marsh Creek site which have sunk below the mud line all but disappearing. It should also be noted that the historical FAD units with Polyvinyl chloride (PVC) arms arranged vertically, pin cushion style, have been subject to breakage where only a portion of the PVC arms and/or the 3" concrete slab remains. It is assumed that vessels drove over the historical FADs causing the breakage.

The creation of thirteen inter-tidal artificial reefs have established areas of "Essential Fish Habitat (EFH)" along the Georgia coast. EFH is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." The secondary benefits of creating inshore artificial reef sites are the potential for oyster recruitment and shoreline stabilization. Inter-tidal oyster beds are considered EFH by South Atlantic Fisheries Management Council (SAFMC)

and National Marine Fisheries Service. SAFMC also designates oyster aggregations and tidal inlets as Habitat Areas of Particular Concern, a subset of Essential Fish Habitat occurring in Georgia's tidal waters.

In 1984, two inshore reefs were permitted: Little River and Jekyll Island Pier. In June of 1984, the Little River Program site was permitted and materials were placed along the Little River at the FJ Torras Causeway in Glynn County. This sub-tidal site consists of both east (260' x 60') and west (330' x 60') bank footprints where concrete bridge rubble and railings from old causeway bridges were deployed. This site is highly active as it is accessible by land from the Little River Bridge making it one of the more popular inshore artificial reef fishing sites and it is also accessible by water from the Mackay River boat ramp or several nearby marinas. Creel surveys are performed randomly throughout the year by CRD creel clerks who have noted that sheepshead (*Archosargus probatocephalus*) and whiting (*Menticirrhus americanus*) are the most frequently caught species in addition to some spotted seatrout (*Cynoscion nebulosus*) in the fall. Though sub-tidal, side scan sonar (SSS) surveys as recent as summer 2017 have shown significant piles of rubble on each bank. Over-flights are conducted annually to document and monitor the condition of each bank's single marker piling and signage. The last deployment conducted at this site was in May 2014 where 26 concrete transmission line poles were deployed along the east bank.

Also in June 1984 the Jekyll Island Pier Program site was permitted with a 175' x 150' footprint. Bridge rubble and railings from the FJ Torras Causeway were deployed on the south side of the "T" at Jekyll Island Pier (west arm area) in a lattice box configuration and a single layer design. The reef was marked by a single concrete piling with signage. In 2003 a barge collision with the piling and pier subsequently knocked the piling over. Fathometer transects found no trace of the marker piling and given the reef's close proximity to the pier a request was submitted to USCG Private Aids to Navigation for the discontinuation of the marker. Over-flights are not conducted for this site as it is sub-tidal and the marker piling no longer exists. The Program reef is accessible from the pier or by water from the nearby Mackay River or Jekyll Creek boat ramps.

In November of 1987, three inshore reefs were permitted: Romerly Marsh Creek also known as Joe's Cut, Halfmoon River, and Henry Vassa Cate formerly known as Twin Sisters. The Joe's Cut Program site is located at the mouth of Romerly Marsh Creek, Wassaw Sound, in Chatham County and consists of an overall site footprint of 550' x 250'. This site is only accessible by boat and materials deployed consisted of historical and new FAD units as well as two oyster test plot areas. SSS surveys performed in summer 2015 showed breakage of a large number of historical FAD PVC arms leaving only the concrete bases which are spread throughout the reef site and settling. Over-flights to document and monitor the single pilings' condition, signage, material settling rates, and movement of mudflats have been annually conducted since 2004. Angler site surveys have not been performed, however the nearby Turners Creek boat ramp is randomly surveyed by CRD creel clerks.

APPENDIX XIX- Inshore Artificial Reef Program Historical Overview

The Halfmoon River Program site is also located in Chatham County, Wassaw Sound, at the mouth of the Bull and Halfmoon Rivers. This site is accessible only by boat and the reef consists of 176 historical FAD units which are visible at low tide and do not appear to have subsided during 25+ years. The Halfmoon River area is highly productive, actively used by the fishing community, considered a multi-used site, and is one of the more successful inshore artificial reef sites. Just outside of the GADNR reef footprint (800' X 400'), the University of Georgia has placed several experimental clam beds which are visible at low tide. Annual over-flights have been conducted since 2004 to document and monitor conditions of the four marker pilings', signage, and material settling rates versus the use of SSS surveys which are nearly impossible due to the density of materials on this site. Angler site surveys have not been performed; however the nearby Turner's Creek boating access facility is randomly surveyed by CRD creel clerks.

Henry Vassa Cate (HVC), formerly known as Twin Sisters, is located in St. Simons Sound one mile southwest of the Jekyll Island Pier in Glynn County. Accessible only by boat HVC was originally permitted for historical FAD units. The permit was modified in 1992 to include approximately 30 concrete pilings placed in a lattice box configuration, partially visible at mean high water. Most of the materials are visible at low tide and remain stable without any signs of settling. Due to the density of materials at this highly productive site, SSS surveys are typically very difficult to perform within the 400' x 400' reef footprint. However, over-flights have been conducted annually since 2004 to document and monitor the condition of the four marker pilings', signage, material settling rates, and movement of sandbars and mudflats. In November 2015, the four wooden marker pilings on site were replaced with four concrete pilings. Angler site surveys have not been conducted but the nearby Mackay River and Lanier boat ramps are randomly surveyed by CRD creel clerks.

The Jove Creek Program site, opposite Intracoastal Waterway (ICW) marker R"238" in Glynn County was permitted in November 1990 with a 600' x 150' footprint. Accessible only by boat the reef was originally permitted for historical FAD units. In 1992 the permit was modified to allow the addition of metal PTCs, donated by Gold-Kist of Douglas Georgia. Historical FAD units and PTCs can currently be seen on the bank at low tide and SSS surveys were conducted in 2017 showing materials scattered throughout the reef. Over-flights are conducted annually to document and monitor the four marker pilings' condition, signage, material settling rates, and movement of mudflats. Angler site surveys have not been conducted but the nearby Mackay River boat ramp is randomly surveyed by CRD creel clerks. In September 2014 13 metal transport totes and 23 concrete transmission line poles were deployed at the Jove Creek reef. In April 2017 natural clutch materials, oyster shell bags placed on top of wooden pallets, were deployed along the inter-tidal bank of this site as a materials test plot. In June 2017 all four wooden marker pilings were replaced with concrete pilings.

In 1994, three inshore reefs were permitted: Four Mile Island, Van Dyke Creek, and Timmons River. In July of 1994, the Four Mile Island Program site was permitted with an overall footprint of 800'x 200' for the following materials: historical FAD units, donated metal PTCs and concrete

fabricated Pallet Ball units. This reef is located in McIntosh County 0.30 nautical miles (nm) northeast of Four-Mile-Point in Sapelo Sound. Annual over-flights document and monitor conditions of the two marker pilings', signage, and settling rates have shown materials sinking in sand with little visibility at low tide and the creation of a sand bar on the west end of the reef. SSS surveys are conducted annually. Angler site surveys have not been conducted but the nearby Shellman's Bluff Fish Camp boating access facility is randomly surveyed by CRD creel clerks.

The Van Dyke Creek Program site consists of an overall 800' x 200' footprint and is located in Liberty County 0.58 nm north northwest of ICW marker G"121" at mouth the of Van Dyke Creek, St. Catherines Estuary. This site is considered to be one of the more successful inshore reefs because materials have remained structurally viable. In October of 1994, Van Dyke Creek was permitted for Gold-Kist metal PTCs and historical FAD units. Annual over-flights monitor conditions of the two marker pilings', signage, and have documented visible materials during low tide and materials scattered into deeper waters. SSS surveys are conducted annually. The Half Moon Marina is a nearby boating access facilities that is randomly surveyed by CRD creel clerks and the Sunbury public boat ramp is also a nearby access point.

Also permitted in October 1994, was the Timmons River Program site (800' x 200') located in Liberty County 0.87 nm west of ICW marker G"121" on the north side of the Timmons River, St. Catherine's Estuary. This site was similarly permitted for donated Gold-Kist metal PTCs which proved to be an unproductive material as aerial surveys revealed cages subsided into the mud. Over-flights conducted annually document and monitor the condition of two marker pilings', signage, material settling rates, and movement of mudflats. SSS surveys are conducted annually. The Half Moon Marina is a nearby boating access facility that is randomly surveyed by CRD creel clerks and the Sunbury public boat ramp is also a nearby access point.

In December of 1995 an inshore artificial reef in Troupe Creek, Glynn County was permitted 0.30 nm northeast of Troupe Creek Marina in St. Simons Sound. The reef footprint consists of 600' x 100' and is made up of historical and new FAD units as well as concrete rubble and culvert which are visible at low tide. SSS surveys in the summer of 2017 indicated small concentrations of rubble spread out in the deeper water. Annual over-flights at low tide are completed to appraise the condition of materials, the two marker pilings', and signage. The nearby Mackay River boat ramp is randomly surveyed by CRD creel clerks. In April 2016, 50 new FAD units were deployed at the Troupe Creek site. In June 2017 two wooden marker pilings were replaced with concrete pilings.

In March of 1997 an 800' x 200' Program site was established on the west side of Stafford Island in Camden County on the ICW just east of marker "70". This reef was permitted for historical FAD units. Annual over-flights document and monitor the conditions of the two marker pilings', signage, material settling rates, and movements of sandbars and mudflats. Previous over-flights at low tide have documented historical FAD units clearly visible and spread over the reef site. SSS surveys are conducted annually. The nearby Crooked River State Park boating access

facility is randomly surveyed by CRD creel clerks. In November 2017, approximately 57 square concrete pilings were deployed at this site to enhance fish habitat.

In 1998, two inshore reefs were permitted: Ogeechee River and Mud Creek. In April 1998, the Ogeechee River 800' x 200' Program site (known by some as Harvey's Island) was permitted for concrete culvert. This site is located in Chatham County 0.6 nm north of the Ogeechee River marker G"1A" along Harvey's Island in the Ossabaw Estuary. Culvert materials were deployed on a very muddy bottom, remain stable after 14+ years, and are visible during low tide. Several piles of culvert in the deeper part of the reef are visible at low tide and most materials placed along the bank are always visible. SSS surveys (2015) showed sparse material spread throughout the reef. The nearby Red Bird Creek boat ramp is randomly surveyed by CRD creel clerks. Over-flights conducted annually document and monitor the condition of two marker pilings', signage, material settling rates, and movements of sandbars and mudflats.

Also permitted in April 1998 was the Mud Creek Program site (600' x 200') in Camden County located at the mouth of the Brickhill River south of ICW marker "41" in the St. Andrews Estuary. The reef consists of concrete culvert, concrete pyramids, historical FAD units, and concrete walkways. SSS surveys (2017) showed the walkways have subsided into the mud but a large pile of concrete culvert is still visible in deeper water at low tide and a few of the historical FAD units are also visible along the bank. Over-flights are conducted annually to document and monitor the condition of two marker pilings', signage, material settling rates, and movements of sandbars and mudflats. The nearby Crooked River State Park boating access facility is randomly surveyed by CRD creel clerks.

In November of 1999, two inshore reefs were permitted: Bear River and High Point. The Bear River site in Bryan County was permitted with a 1,000' x 800' overall footprint for deployment of concrete culvert and is located at the mouth of Newel Creek north on the ICW, St. Catherine's Estuary. Culvert material is visible on the site bank at low tide and the remainder of the materials are found in deeper water, rarely exposed. SSS survey (2017) results showed substantial piles of stabilized material providing valuable habitat at this site. The nearby Kilkenny Fish Camp boating access sites is randomly surveyed by CRD creel clerks. Over-flights are conducted annually to document and monitor the condition of two marker pilings', signage, material settling rates, and movements of sandbars and mudflats. One of the two wooden marker pilings at the Bear River site was damaged during Hurricane Matthew in October 2016. In January 2017 the damaged marker piling at the Bear River site was replaced with a composite piling.

The High Point Program site (1,200' x 700') in McIntosh County was permitted in November 1999. High Point is located almost one mile southeast of ICW marker "143" at the northern end of Sapelo Island. Materials permitted for this site consists of concrete culvert and pilings with some materials visible at low tide. SSS surveys are conducted annually. The nearby Shellman's Bluff Fish Camp boating access facility is randomly surveyed by CRD creel clerks. Over-flights are annually performed to document and monitor the condition of the four marker pilings', signage,

material settling rates, and movement of sandbars and mudflats. In August 2017, approximately 22 concrete culverts were deployed at this site to enhance fish habitat.