



Overall Purpose and Goal

The primary purpose of the Coastal Alabama Comprehensive Oyster Restoration Strategy is to: Develop a long-term plan to yield sustainable and resilient eastern oyster populations in coastal Alabama and guide future oyster restoration efforts. The overall goal is to: Create new reefs and restore, replenish, or enhance existing reefs to improve connectivity and establish a network of intertidal and subtidal oyster resources in Coastal Alabama that, collectively, are more resilient against variability in environmental conditions and other factors to support sustainable harvest and provide ecosystem services now and into the future.

Specific Goals

The specific goals of this Oyster Strategy Document are to:

- Identify strategies to yield sustainable and resilient oyster populations in coastal Alabama;
- Prioritize potential restoration and enhancement strategies for implementation in the next 3-5 years;
- Identify science and/or data gaps that could help inform future restoration efforts; and
- Identify adaptive management strategies to address uncertainties associated with changing environmental conditions and/or project implementation.

Approach to Restoration

Alabama's managers approach restoration by considering the

major drivers and stressors affecting oysters, ecosystem response to those drivers and stressors, and the resulting effects on oysters. Managers then consider specific restoration actions to address adverse effects of drivers and stressors on oysters.

- **Technique 1:** Restore or create oyster reefs through placement of cultch in nearshore and subtidal areas.
- **Technique 2:** Construct living shorelines.
- **Technique 3:** Enhance oyster reef productivity through spawning stock enhancement projects such as planting hatchery-raised oysters, relocating wild oysters to restoration sites (relaying), oyster gardening programs, and other similar projects.
- **Technique 4:** Develop a network of oyster reef spawning reserves.

Restoration Needs and Implementation Strategy

To achieve the overarching goal of this restoration strategy, managers and restoration planners must: (1) be able to identify optimal sites for placement of new reefs with consideration of changing environmental conditions; (2) continue to support existing reefs, enhancing connectivity within the larger network of reefs; and (3) understand how existing and potential future reefs would be connected by larval transport within the network. The following sections describe these needs and propose specific actions that can be implemented to achieve the overarching goal of this restoration strategy.



Alabama's Oyster Restoration STRATEGY: *Lending a* HELPING HAND

| Tim L. Gothard, Executive Director

Identifying Suitable Locations for New Reefs

Identification of potential sites for construction of new oyster reefs must be based on a suite of suitable conditions including substrate type and quantity, proximity to existing oyster resources including intertidal reef areas, water quality, and larval supply (based on both proximity to existing oyster resources and flow regime). Restoration planners must also consider changing environmental conditions to facilitate long-term success and resiliency. Alabama MRD would consider the following actions to identify optimal locations for new oyster reefs.

- **Identify Areas with Potentially Suitable Substrates for Future Oyster Reefs** - Side-scan sonar surveys in Mobile Bay will help locate existing and relic subtidal oyster resources and identify areas with suitable substrate for potential oyster restoration, including construction of new reefs. Alabama MRD has identified ongoing substrate mapping as a high priority restoration need.
- **Identify and Survey Existing Intertidal Reef Areas** - In addition to providing potentially suitable habitats for oyster restoration, existing intertidal reefs may contribute significantly to the larval supply in Mobile Bay. Therefore, surveying existing oyster resources in Alabama's intertidal waters would provide important data for management of existing oyster resources and long-term restoration planning. Alabama MRD considers identification of existing intertidal

Editor's Note: AWF's relic oyster reef restoration work over the last year has been significant. When asked how we determine what projects to pursue, my answer is simple. We work closely with Alabama Marine Resources Division professionals and identify the projects based on their guidance and project fit with the priorities of "Coastal Alabama Comprehensive Oyster Restoration Strategy." This 78-page document, updated in 2021 by the Alabama Department of Conservation and Natural Resources, Marine Resources Division (MRD) and the National Oceanic and Atmospheric Administration (NOAA), outlines a well thought-out game plan for improving Alabama's oyster resources in Mobile Bay and Mississippi Sound. That document is designed to help meet the Deepwater Horizon Trustees Natural Resources Damage Assessment goals and strategic framework for oyster restoration. This article seeks to share, in a shorter, more digestible way, excerpts from the report, highlight key points, and expand among our members an understanding of Alabama's overall and comprehensive approach to oyster restoration. The Comprehensive Report is a public document and AWF encourages our members to locate it online for a deeper dive into this impressive strategy and effort in Alabama.

oyster resources to be a high priority restoration need.

- **Monitor Water Quality at Potential Future Reef Locations** - Although Alabama MRD routinely monitors water quality on some existing reefs, additional water quality monitoring is needed and should focus on sites identified as high priority restoration areas based on the results of substrate mapping surveys. Parameters to be monitored should include, at a minimum: DO, salinity, temperature, and pH. These parameters are most often limiting factors for oyster survival or reef success in Alabama. Alabama MRD considers water quality monitoring at potential future reef locations to be a high priority restoration need.
- **Assess Potential Water Quality Improvement Activities at High Priority Restoration Sites** - Oyster restoration efforts may benefit indirectly from water quality improvement projects that have been or may be implemented through restoration funding streams that do not specifically target oyster restoration and recovery. Alabama MRD has identified assessment of potential water quality improvement activities through non-oyster funding sources as a high priority restoration activity.
- **Expand Knowledge of Larval Supply** - Larval supply is a key consideration for siting new reefs to increase the likelihood they will be self-sustaining from a recruitment perspective and have adequate connectivity to function within the network of reefs that Alabama MRD seeks to establish. New reefs must be

Cedar Point Beach Reef Project



AWF's Bender Austral, Lynn Dent Boykin, Dog River Reef Balls, and Cedar Point Beach Oyster Restoration Projects directly support the "Restore and Replenish Existing Reefs" and Connectivity Among Existing and Future Reefs" elements of Alabama's Comprehensive Oyster Restoration Strategy.

placed in areas with sufficient connectivity to source reefs that can supply larvae and net velocity must be such that larvae are able to settle on the new reef before being transported out of the area.

- **Develop Climate Change/Future Conditions Model** - Identification and prioritization of sites for future oyster restoration must also consider how climate change and other changing environmental conditions are likely to affect site suitability over the long term. Alabama MRD has identified completion of the initial model and potential further development to create a final climate change/future conditions model for Mobile Bay as a medium priority restoration need.

Provide Continued Support for Existing Reefs

Continued support for existing oyster reefs in Alabama is critical to the overall success of future oyster restoration efforts. Supporting and enhancing existing reefs will help to maintain their connectivity within the larger network of reefs that Alabama MRD seeks to establish. Alabama MRD would consider the following actions to support and enhance existing oyster reefs:

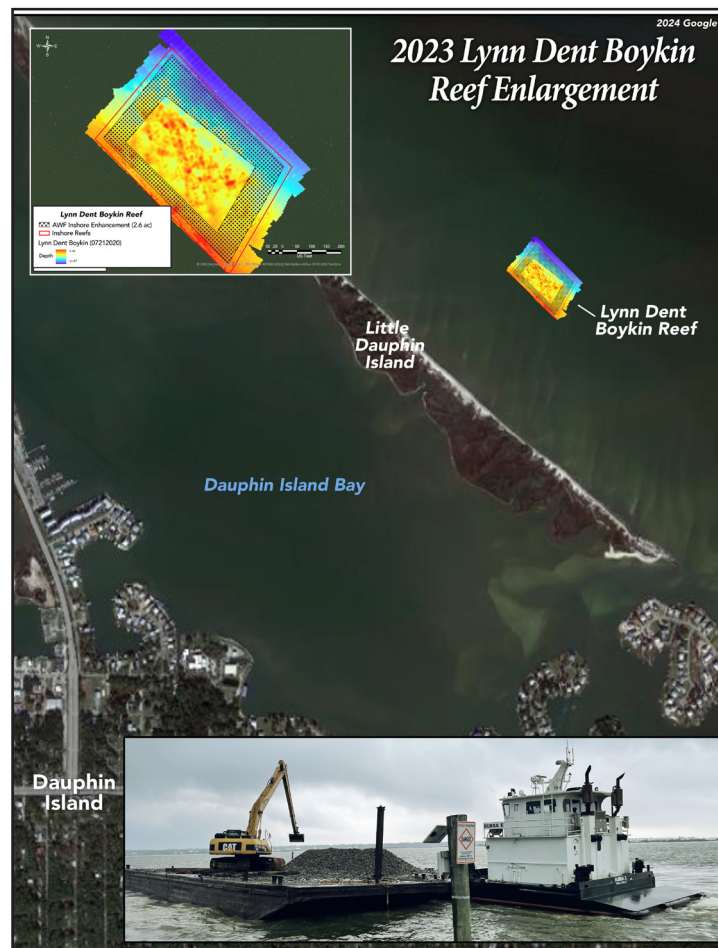
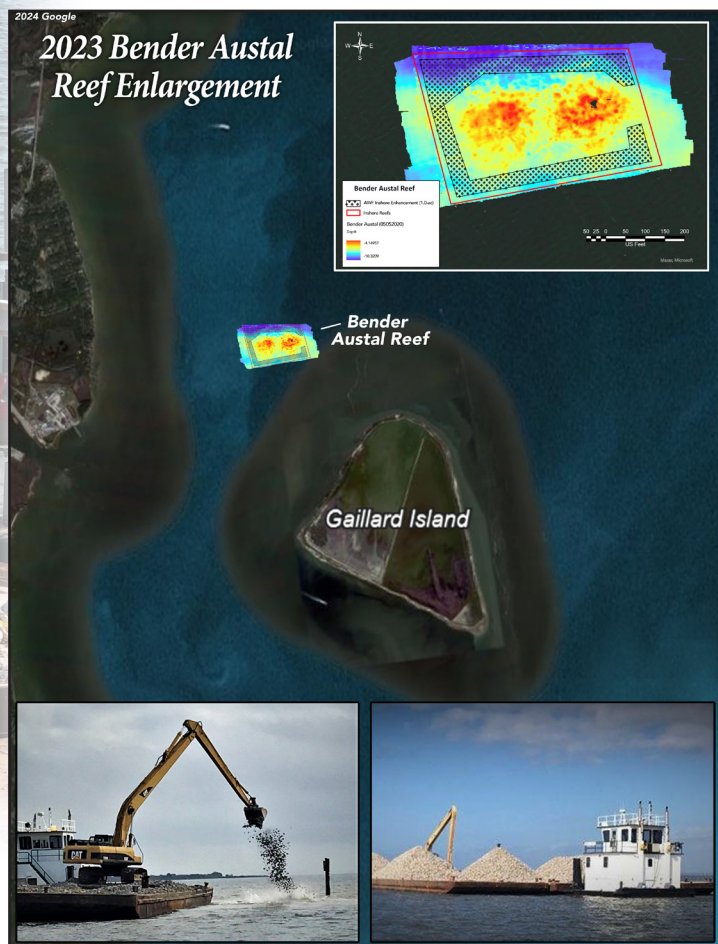
- **Restore and Replenish Existing Reefs Through Cultch Planting, Oyster Relay, and Spat Deployment** - Alabama MRD has supported existing oyster reefs through restoration and enhancement activities, consisting mostly of cultch planting and to a lesser extent placement of relayed oysters, since the early 1970's. Although it has become clear that cultch planting and oyster relaying alone are not sufficient to meet Alabama's restoration needs, it is still critically important to continue to support existing reefs, as they will play a vital role within the network of reefs that Alabama seeks to create.

Alabama MRD considers enhancement of existing reefs at Cedar Point and Heron Bay to be a high priority restoration need.

- **Conduct Additional Water Quality Monitoring at Existing Reef Areas** - Enhancing Alabama MRD's capacity to conduct water quality monitoring including continuous monitoring at existing sites and increasing the number of sites monitored would provide valuable information about current conditions on Alabama's oyster reefs and inform adaptive management decisions if corrective actions are needed to meet restoration performance goals. Alabama MRD has identified additional/continuous water quality monitoring at existing reef areas as a high priority restoration need.
- **Conduct Additional Harvest Management Activities** - The collection of more refined data is needed to optimize Alabama MRD's harvest management strategy and facilitate harvest management on a finer scale. Alabama MRD's harvest management strategy could be improved by increasing sample size, having a more random spacing of sample locations, and improving the accuracy of location reporting data. Alabama MRD has identified additional harvest management activities, including additional data collection and refinement of collection methods, as a medium priority restoration need.

Enhance Understanding of Connectivity Among Existing and Potential Future Oyster Reefs

Understanding reef connectivity in terms of larval supply, transport, sources, and sinks is essential for developing a sustainable and resilient network of oyster reefs in Alabama. Adequate larval supply is a key consideration for siting new reefs. Understanding



larval supply and flow dynamics is also beneficial for identifying and prioritizing restoration and enhancement needs (e.g., cultch planting) at existing reef areas. Although some preliminary studies have been conducted to better understand larval transport in Mobile Bay, significant knowledge gaps remain. Alabama MRD would consider the following actions to gain a more robust understanding of reef connectivity.

- **Develop System-wide Flow Model** - Flow modelling is a necessary first step to understanding larval transport and reef connectivity. The appropriate study should model flow dynamics throughout the entire Mobile Bay system. This would help determine if connectivity between reef areas on the western and eastern shores could exist under present conditions. Expanding the existing knowledge of flow dynamics in Alabama's coastal and estuarine systems would contribute to the understanding of connectivity among existing oyster reefs and help identify actions that could be implemented to enhance connectivity. Ultimately, results of flow modelling studies would serve as inputs to larval transport models described below. Alabama MRD has identified flow modelling studies as a high priority restoration need.
- **Develop Larval Transport Model** - The current understanding of larval transport dynamics in the Mobile Bay system is limited. Developing a better understanding of larval transport throughout Alabama's coastal and estuarine systems will benefit restoration planning for enhancing existing reefs, constructing new reefs, and improving connectivity among existing and potential future reefs to facilitate a network of reefs that would improve the

sustainability and resiliency of Alabama's oyster resources over the long term. Alabama MRD has identified larval transport modelling studies as a high priority restoration need.

Factors Influencing the Likelihood of Success

The success of the restoration strategy outlined above will be influenced by many factors. Some of the main factors that could influence restoration success include managers' abilities to locate new reefs in desired locations, support from stakeholders and the general public, and the ability to adapt to changing environmental and social conditions. The following sections briefly describe these factors and propose specific actions to address each.

- **Ability to Locate New Reefs in Areas Where Needed to Achieve Outcome** - The likelihood of success for a comprehensive oyster restoration strategy is influenced by various factors, including Alabama MRD's ability to locate new reefs in strategic areas based on the factors described above, which could include areas that are not currently approved for shellfish harvest. Barriers posed by existing policy, jurisdictional conflicts among agencies, and limitation of resources (e.g., monitoring and/or enforcement funding) could prevent Alabama MRD from placing new reefs in some strategic areas that could be key to optimizing restoration success. Alabama MRD would consider the following actions to expand its ability to locate new reefs at preferred strategic locations.
- **Develop Coordination Strategy for Engaging Other Agencies and Partners** - The closure of certain areas to harvest due



The Point Clear Reef monitoring project and Data Sonde provided by AWF directly supports the “Conduct Additional Water Quality Monitoring at Existing Reef Areas” element of Alabama’s Comprehensive Oyster Restoration Strategy.



to public health concerns is a potential barrier to Alabama MRD’s ability to establish a network of reefs across a gradient of environmental conditions. Alabama MRD seeks to engage with both ADPH and law enforcement to better understand sampling and enforcement capabilities, limitations, and needs, including the need for long-term funding, with the eventual goal of expanding Alabama MRD’s ability to locate new reefs where needed to achieve create a resilient and sustainable network of reefs. Alabama MRD has identified initial discussions between ADPH and Alabama MRD enforcement as a high priority need. Based on those initial discussions, potential future data sharing, management recommendations, policy changes, and funding efforts are a medium priority over the long term.

- **Determine Restoration Site Suitability** - To identify the most strategic locations for conducting restoration activities, including construction of new oyster reefs, Alabama MRD would develop a methodology for evaluating site suitability. Potentially suitable sites for restoration activities would be evaluated based on the attributes including substrate type, water quality, larval supply, and connectivity to existing reefs. The purpose of the restoration

site suitability determination is to develop a tool for evaluating the overall suitability of potential restoration sites based on multiple quantitative and qualitative factors. Alabama MRD managers would incorporate the output of this tool into the decision-making process along with other considerations to select the final sites for restoration activities. Alabama MRD has identified developing a methodology for determining site suitability as a high priority restoration need.

Summary of Key Points: Oyster Restoration Goals and Implementation Strategy

- The overall goal of Alabama’s restoration strategy is to create a network of oyster reefs across a gradient of environmental conditions to improve connectivity and enhance resiliency over the long term.
- To achieve this restoration goal, managers and restoration planners must (1) be able to identify optimal sites for placement of new reefs; (2) continue to support existing reefs, enhancing their connectivity within the network; and (3) understand how existing and potential future reefs would connect within the network.
- Factors that could influence restoration success include the ability to locate new reefs in desired locations, support from stakeholders and the general public, and the ability to adapt to changing environmental and social conditions.
- The actions proposed in Alabama’s comprehensive oyster restoration strategy would collectively support Alabama’s overall restoration goal by providing managers with the information, tools, and support needed to implement successful oyster restoration throughout Alabama’s coastal waters. 🌊



PHOTO BY JASON HERRMANN

Intertidal oyster in Dauphin Island Bay.

Source: Excerpts in this article were taken directly from *Coastal Alabama Comprehensive Oyster Restoration Strategy, 2021 Revision*, Alabama Department of Conservation and Natural Resources, Marine Resources Division and the National Oceanic and Atmospheric Administration. Published by the Deepwater Horizon Alabama Trustee Implementation Group.