

MONITORING AND MAINTENANCE PLAN
for
Reef Ball Shoreline Stabilization, Epifaunal and Fish
Habitat
Swan Creek Mitigation Wetland
ANNE ARUNDEL COUNTY, MARYLAND

1.0 PURPOSE

This plan has been developed to obtain data on the use of Reef Ball structures for shoreline stabilization and benthic and fish habitat. Data obtained from this project can be used for future projects utilizing Reef Balls for mitigation and shoreline stabilization through living shoreline systems.

2.0 INTRODUCTION

Natural reefs can provide sufficient shoreline protection by attenuating the wave energy and modifying this energy to assist in accretion of sand on the leeward side of the reef. Reef Ball technology can be used in this manner for shoreline stabilization. This requires the reef structure to serve as a submerged breakwater, with the crest of the reef in close proximity to the water surface.

The design and performance of submerged breakwaters are evaluated in terms of the wave attenuation and shoreline stabilization provided, with special design considerations for safety and stability and the environmental enhancement provided by these structures.

The Swan Creek Mitigation Wetland (SCMW) is located adjacent to the South Cell of the Cox Creek Dredged Material Containment Facility (CCDMCF), which is located on Kembo Road in northern Anne Arundel County on the Patapsco River. To compensate for the loss of 4.87 acres of Patapsco River shallow open water habitat utilized in the renovation of the CCDMCF, a mitigation plan was developed to enhance approximately 11.13 acres of wetlands in the neighboring Swan Creek watershed. Prior to restoration and enhancement, much of the area was devoid of tidal influence. Construction of the mitigation area occurred in 2003. The mitigation project created a tidal marsh environment that includes areas of open water, low marsh interspersed with non-vegetated tidal flats, saltbush assemblages and a preserved and enhanced beach/bar habitat.

The SCMW is located in an area prone to high energy from southeast winds. These winds accumulate over a 17-mile fetch between Anne Arundel County and Queen Anne County on the eastern shore of Maryland. With such a large fetch the beach/bar is currently vulnerable to moderate to severe erosion. In December 2006, Reef Balls were installed as shallow water habitat structures to assist in reducing this wave energy.

3.0 MONITORING PLAN ELEMENTS

Maryland Environmental Service (MES) on behalf of the Maryland Port Administration (MPA) will monitor the 57 Reef Ball structures placed 20 yards offshore of the northern section of the SCMW beach berm. The specific tasks under the monitoring plan include: detecting any movement of the Reef Balls from their original placement location, collecting quantitative data on sand accretion and biological community, and preparation of an annual report.

3.1 MOVEMENT OF REEF BALLS

MES personnel will conduct weekly observation of Reef Balls to determine possible movement and damage. Observations will be conducted at low tide. If movement is determined, MES will move the affected Reef Balls to their original location. If movement frequently occurs, MES shall implement alternative anchoring methods.

3.2 SAND ACCRETION

Moffatt and Nichol (M&N) will conduct, pending MPA approval, a hydrographic analysis to evaluate the effectiveness and durability of Reef Ball breakwaters. This analysis will include wave force calculations and short and long term energy absorption. Upon completion M&N will submit a report to MES with results. MES will conduct surveys to determine the progress of sand accretion on the leeward side of the Reef Balls. This includes obtaining water depths through survey techniques and plotting the data in CAD software. Surveys will be conducted in predetermined intervals to determine accretion rates. For the first three months after deployment, surveys will be conducted every 30 days. Afterwards, surveys will then be conducted every 60 days up to one year after deployment. If accretion rates are determined beneficial, additional reef ball structures may be installed.

MES personnel will conduct monthly photographic documentation of the affected beach location. (See Figure 2) Photographs will be conducted in the same location with the same focal length every month from fixed photo stations. These photos can be obtained in conjunction with the SCMW monitoring plan photo documentation.

3.3 BIOLOGICAL COMMUNITY ANALYSIS

Biological community analysis will be conducted within one year after deployment. Analysis will then be conducted annually until determined otherwise by MPA. Biological community analysis will include species identification and density of the epifaunal and fish community.

- 3.3.1 Epifaunal community is defined as any organisms that live attached to, but above, the substrate. Analysis will be completed once a year within one year after deployment. The Reef Balls will be sampled during Cox Creek Exterior Monitoring sampling events for epifaunal. Reef Ball epifaunal invertebrates will be identified

as far as possible and counted from within a 30 cm square placed upon the Reef Ball surface. Six samples will be collected from 3 Bay Balls and 3 Mini-bay balls. The sampling method will yield quantitative data to calculate relative density and relative abundance.

- 3.3.2 Fish community analysis will be conducted utilizing active fish capture methods. A beach seine will be used for capturing fish utilizing the Reef Balls. Seining activity will occur on the eastern aspect of the Reef Balls during high tide. The net will be drawn from the beach outward to the exterior of the Reef Balls and back to the beach. (See Figure 2) This action will be duplicated for each sampling event. A total of two seine passes are required for each sampling event.

Data will be collecting on species composition and size. Counting and identifying species captured will determine species composition as well as relative abundance and relative density. Fish captured for each species will measure Maximum Standard Length. (See Figure 3)

3.4 ANNUAL REPORT

A annual monitoring report will be submitted to MPA by December 31st of each year.. The annual report will document parameters discussed in Section 3.1,3.2, and 3.3. The annual report will include:

- A description of the mitigation site and the adjacent land and waters.
- A description of Reef Ball movement if any, sand accretion rates, level of progress obtained on reducing erosion, and biological analysis.
- Photographic documentation.

3.5 MAINTENANCE

The mitigation area is located in an urban / industrial area, and garbage washes into the mitigation area. Trash may affect the targeted area, possibly modifying sand accretion. Personnel from the adjacent CCDMCF regularly clean trash from the beach and will also monitor the trash accumulating around the Reef Balls and remove all trash that is safely accessible. After extreme weather events, Reef Balls will be surveyed to determine movement. If movement occurs, alternative anchoring methods will be utilized.

Figure 1

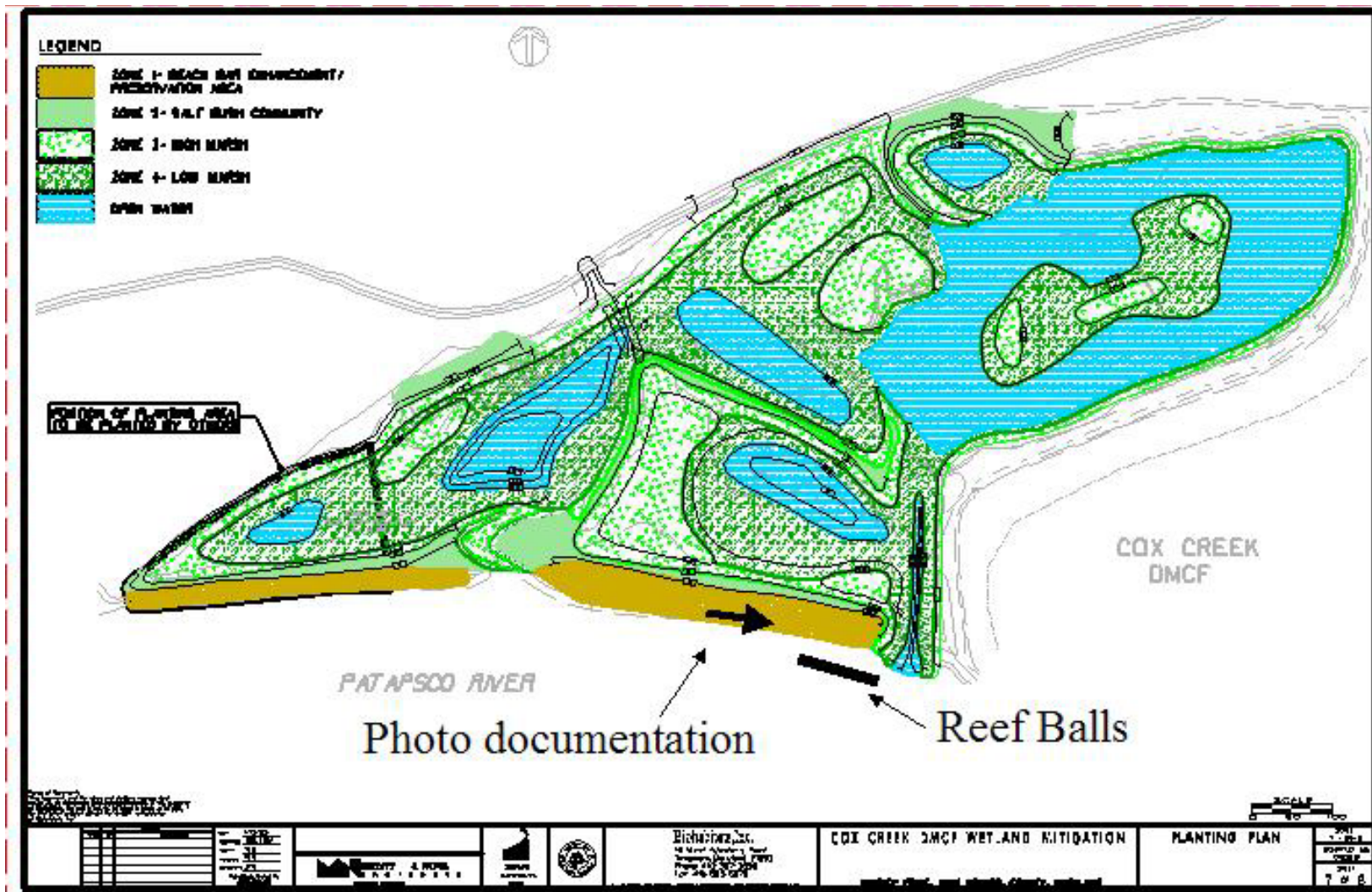


Figure 2

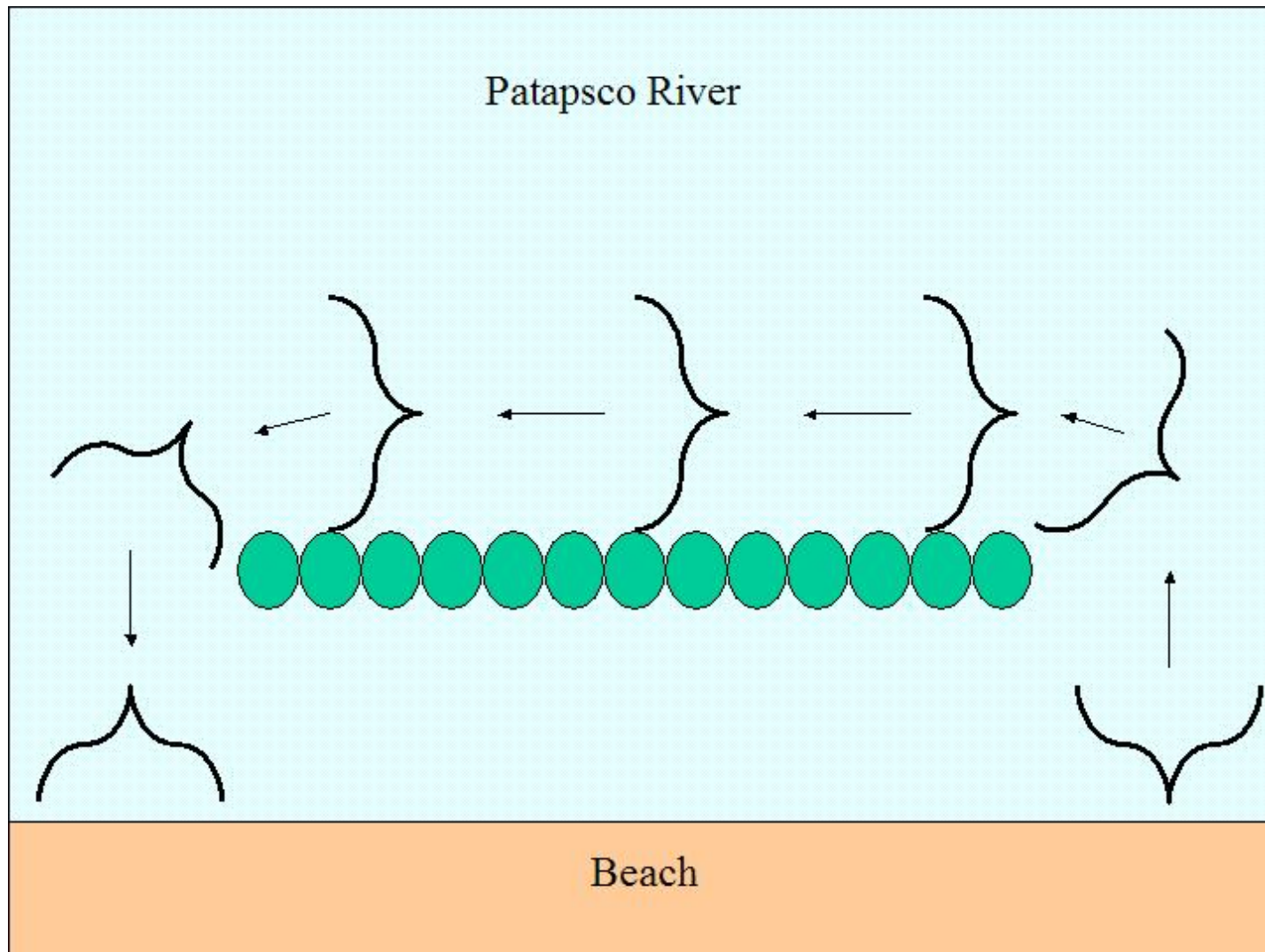
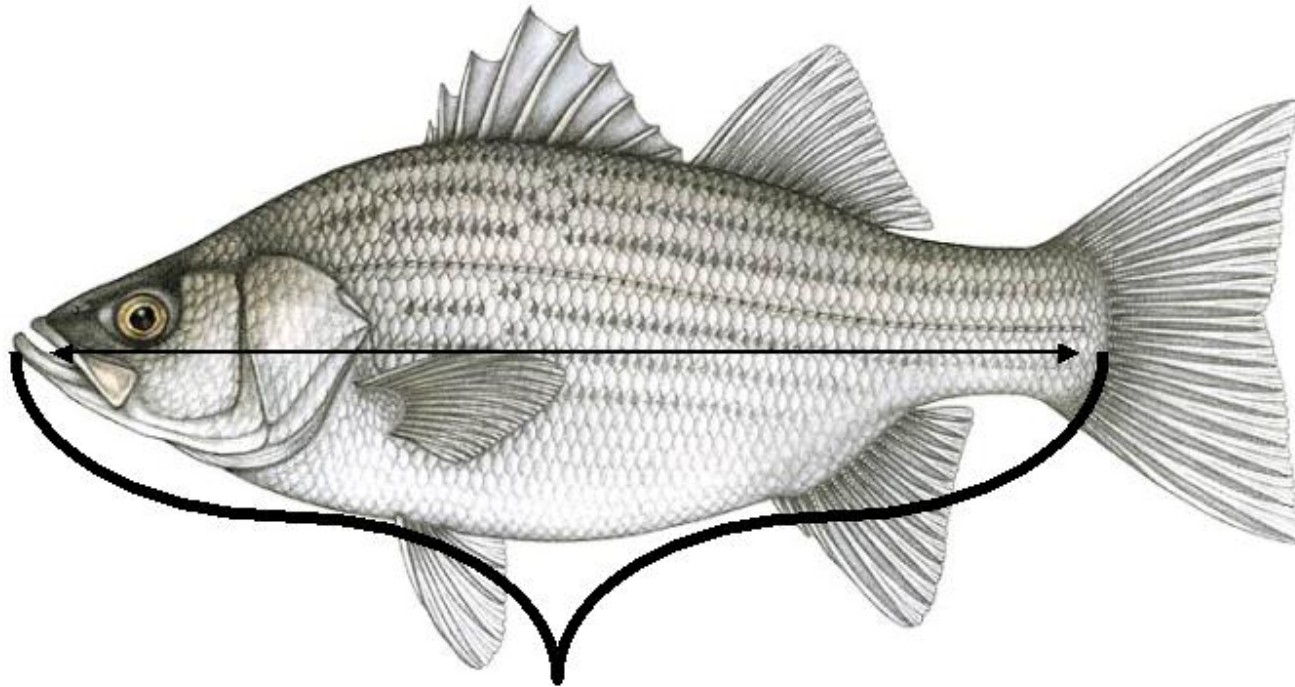


Figure 3



Maximum Standard Length