WAYNE YOUNG ! **4410 WOODCHUCK COURT** ! **ANNANDALE, VIRGINIA 22003**

December 5, 2009

Ms. Dottie Marshal
Superintendent, George Washington Memorial Parkway
700 George Washington Memorial Parkway
Park Headquarters, Turkey Run Park
McLean, VA 22101

Dear Superintendent Marshal:

This letter is with reference to the Dyke Marsh restoration initiative and the National Park Service's (NPS) ongoing preparation of an Environmental Impact Statement (EIS). Although I didn't learn of the project until after the public scoping meeting earlier this year, I would nevertheless like to identify my concerns and offer observations in support of a balanced, multi-objective restoration project. I also wish to express strong concern that a large-scale marsh restoration to the pre-Smoot excavation historical footprint would have:

- substantial adverse environmental and public use impacts at the expense of significant current uses and user groups;
- significant potential to result in further degradation of the existing marsh due to physical and technical issues if not fully responsive to associated issues and impacts; and
- high construction costs relative to restored surface area due to large quantity of material that would be required to fill formerly dredged areas to suitable marsh elevations.

Converting open water and deep water fisheries habitat to restore the marsh would substantially impact locally valuable fisheries habitat for largemouth bass as well as fishing and boating access recreational fishing, recreational boating access and use, and existing waterfowl hunting arrangements. These competing use factors argue for a restoration project that strikes a reasonable balance among all competing uses while still serving Congressional intent for restoration of the Dyke marsh ecosystem. The potential impacts to competing uses and users also argue for consideration of significant mitigation measures as a compensating offset.

After reviewing results of the public scoping process, it was evident that there was very limited input from the recreational boating and fishing communities. A focused outreach to these communities would be appropriate to encourage completeness of public review opportunity for the draft EIS, when available. My comments are offered, in part, as a recreational boater and fisherman who uses the Dyke Marsh water area.

Also noted was limited input regarding project alternatives and alternatives to the project. Therefore, my observations are also offered as a marine environmental professional with 15 years of recent hands-on experience in researching, planning, designing, building, and operating marine habitat restoration and reef development projects in the Maryland portion of the Chesapeake Bay. The historical frame of reference for my comments is an 1864 drawing that is available through NOAA's website (Enclosure 1).

A copy of this correspondence in PDF format is forwarded herewith. I request that NPS post this correspondence on its Dyke Marsh EIS webpage with the other public input that has been received and is posted. Please include me on your electronic notification list for announcement of the public comment period for the draft EIS (Email: fishhawk@cox.net).

RESTORATION POTENTIAL

Restoration of the marsh to physical conditions that pre-existed physical changes over the past century is not practicable. The well-documented dramatic changes to the marsh as a consequence of sand and gravel excavation, the filling of the wetlands and residential and commercial developments west of the parkway in the Hunting Creek watershed, the channelization and constriction of Hunting Creek and its outlet, and associated changes in hydrology have irreparably altered the local environment that resulted in Dyke Marsh formation and nourishment. Nevertheless, substantial opportunity exists for stabilizing and restoring marsh habitat in and in vicinity of the Dyke Marsh park boundary to restore intertidal and high marsh acreage and functions within the context of existing physical conditions, including the relationship of the marsh to Hunting Creek. But, the benefits of marsh restoration notwithstanding, it should be recognized up front that any significant restoration of marsh acreage also would involve conversion of locally valuable near-shore and shoreline fisheries habitat for largemouth bass and associated loss of recreational fishing opportunity.

A narrowly conceived restoration project (and associated EIS) limited to the park boundary would run the danger of achieving a suboptimal solution, missing a large potential marsh restoration opportunity that lies immediately outside of the park boundary, and would not address the restoration in the context of the local ecological system. Therefore, **the EIS needs to examine and consider alternatives inside and outside of the park boundary in order to identify and optimize the restoration potential within the context of watershed of which the marsh is a part, achieve a favorable return on investment, minimize construction difficulties, and to equitability balance the competing public uses that presently characterize the public interest in the park.** Furthermore, large-scale marsh restoration would likely require borrow material sources from outside the park boundary for construction of retention structures and for suitable sediment for filling wetland restoration cells to marsh elevations.

RESTORATION EXPECTATION MANAGEMENT

The frame of reference for marsh restoration is often a natural marsh. But, a natural exterior boundary is typically not a practicable outcome. As a result of coastal engineering and construction considerations for marsh restoration in open and deep water areas, any wetland restoration that is exposed to physical energy from surface waves and currents will require combined protective, retention, and water control structures. Such structures protect against erosion and contain material used as fill to achieve suitable substrate elevations necessary to support intertidal and high-marsh vegetation while controlling water levels during construction and operation. Figure 1 shows a demonstration marsh at the Poplar Island Environmental

Restoration Project[1] that is typical of the type of restoration cell character – a fully functional marsh <u>inside a protective containment</u>.

The EIS needs to effectively convey to the stakeholders and public the prospective character of a marsh restoration project that converts open and deep water areas to marsh habitat. I would also encourage NPS to conduct outreach presentations on the character of marsh restorations technically suitable for consideration at Dyke Marsh so that public expectations as to what might be capable of being accomplished are matched with the realities of restoration construction and prospective results.

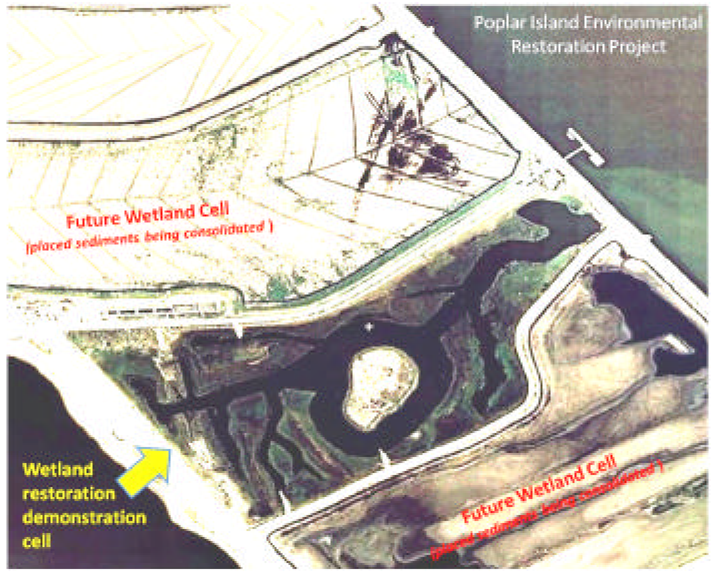

Figure 1 Initial wetland demonstration cell at Poplar Island Environmental Restoration Project. Fully functional marsh and intertidal habitat inside an armored sand dike enclosure. Culverts with a sufficient cross section relative to circulation needed enables unrestricted natural tidal conditions but precludes access by watercraft.

Typically, retention structures take the form of an armored sand dike with water control structures (e.g. weirs, spillways) such as proposed for a Dyke Marsh demonstration project in *Feasibility Study for Dyke Marsh Demonstration Area, Potomac River*, Virginia (Palermo and Ziegler, 1976). The conceptual drawings and graphic depictions in that report are generally consistent with the project concepts and current state of practice in marine marsh restoration projects in the Chesapeake Bay region.

A marsh created on the inside of the retention structure would be a fully functional wetland if properly designed and constructed with traditional aesthetic value when viewed from its perimeter. However, the perimeter would necessarily be artificial in character rather than a natural shoreline, and would thus not resemble a natural marsh intersection with open water. The perimeter could, however, be designed to provide elevated viewing access. Outreach should convey the potential for developing a naturally functioning marsh protected from erosion as well as the potential for enhanced viewing opportunities from retention structures. The need for water control structures during consolidation of sediments and potentially thereafter to maintain an appropriate water budget and hydrodynamic flow would preclude vessel access for recreational boating, hunting, and fishing should also be conveyed.

Marsh development at Poplar Island offer nearby examples of marsh within a retention structure and fringe marsh within areas protected by shoreline stabilization and protection structures. Although the physical energy there is far greater than at Dyke Marsh, the underlying construction and marsh development principles would apply. **The EIS should discuss these nearby examples and assess the lessons learned for potential application to Dyke Marsh.**

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[1] Mr. Young previously coordinated and provided planning, design, construction, operation, and marsh creation support for the Poplar Island Environmental Restoration Project.

NPS and stakeholder visits to these sites offer an opportunity to ascertain factors that merit consideration in forming a project at Dyke Marsh.

ALTERNATIVES

Pursuant to the National Environmental Policy Act (NEPA) and its implementing regulations, **EIS alternatives should consider a broad suite of alternatives including the proposed action with various options for accomplishing Congressional intent as well as alternatives to the proposed action.** The latter should include marsh restoration alternative at alternative locations along the tidal Potomac River.

Congressional intent for restoration to benefit fish and wildlife does not obviate the need for an EIS that fully informs the decision-making process. A narrow EIS scope that only looks at alternatives for accomplishing restoration within the existing NPS Dyke Marsh park boundary would not effectively inform policy decision makers as to the best use of public resources or best outcome for the local environment. By taking a more holistic perspective, the broader restoration potential can be identified. In this regard, leveraging the expansive delta that has formed at the mouth of Hunting Creek between the park and Jones Point, combined more modest marsh restoration and marsh stabilization measures for the existing marsh in the southern two thirds of the park, offer a potential for substantial marsh restoration while preserving the full suite of public uses of the park and surrounding waters.

Enclosure (2) offers a suite of alternatives, identified below, for NPS consideration in preparing the EIS.

Suggested Alternatives for Dyke Marsh Stabilization and Restoration

- Shoreline Stabilization and Protection
- Spray Dredging
- Fringe Marsh Restoration
- Marsh Restoration within Dyke Marsh Park Boundary
- Large-Scale Marsh Restoration to Historical Footprint
- Marsh Restoration Outside Existing Dyke Marsh Park Boundary
- Multi-Objective Marsh Restoration

Suggested Alternatives to the Proposed Action

- No Action
- Restoration of Craney Island
- Mid-River Island with Upland and Marsh Habitat in Proximity to Dyke Marsh
- Island and Marsh Creation on Blue Plains flats

Mitigation Alternatives

- Structural Fish Habitat Enhancements
- Vessel Landings and Wildlife Viewing Stations
- Improved Tow Vehicle and Vessel Access to Gravely Point Boat Ramp

ENVIRONMENTAL ISSUES AND IMPACTS

The following section identifies and discusses environmental impact and other issues, and provides technical observations for your further consideration in developing the EIS.

Jurisdiction

Jurisdiction for Dyke Marsh Restoration Projects. Some or all of the restoration options may lie outside of or straddle the NPS park boundary. Any conflicting jurisdiction issues should also be clearly identified and assessed. Restoration options could also have the effect of or necessitate extending NPS jurisdiction to areas that NPS does not now have or does not exercise jurisdiction. **Jurisdictional issues needed to be identified and assessed in the EIS.**

Any change in NPS jurisdiction associated with restoration options should be clearly stated and assessed, as should any policy and use changes that may be associated with changes in jurisdiction and area control.

Biological Conditions

Multi-Season Biological Assessment. Multi-season (4 season) biological sampling and assessments should be performed to establish existing baseline conditions. Biological assessments should be performed for resident and transient fish species (including, but not limited to, largemouth bass, striped bass, perch, Shortnose Sturgeon, and Atlantic Sturgeon) and other wildlife.

Habitat for Endangered and Threatened Species. Documentation of two recent pre-spawning migrations by an electronically tagged sturgeon suggests that the tagged fish proceeded directly past this reach of the river while migrating to Little Falls. However, the physical conditions created by the Smoot excavations may potentially be suitable for foraging by Shortnose Sturgeon during pre-spawning migration runs. The documentation indicates that spawning had a low probability of success due to the apparent absence of males of the species. The bottom conditions in portions of the Dyke Marsh water areas may, in some locations, be consistent with spawning needs of this species. Given that a limiting factor for spawning was reported as the apparent absence of males, **the EIS needs to assess the potential of the Dyke Marsh water areas to support Shortnose Sturgeon foraging and, if males were present, spawning, even if this location is less than ideal with respect to other physical factors such as currents.**

Physical Conditions

Hydrology. It is well documented that the sand and gravel excavations, the filling of the wetlands and residential and commercial developments west of the parkway in the Hunting Creek watershed, and the constricting of Hunting Creek outlet altered the local hydrologic conditions that were fundamental to marsh formation, quality, sustainment, and natural functions. Also documented is the contribution of marsh hydrology by the river. Any marsh restoration/creation project will need to insure that the project itself does not adversely affect hydrologic conditions needed to support the existing marsh while also providing for hydrologic conditions necessary for development and sustainment of marsh in restoration cells.

<u>Marsh Circulation Hydrodynamics</u>. A restoration project, in order to replicate existing marsh conditions and functions and avoid stagnation, needs to include adequate circulation to existing and created marsh and thus within marsh restoration cells, and also must provide for a natural rise and fall of tidal elevations consistent with the rise and fall of the tidal Potomac. There needs to be sufficient channels within the marsh, configured to approximate the form of a natural marsh, to provide intertidal marsh and adequate circulation to preclude stagnation and provide nourishment to all marsh served. If maintenance-free inlets/outlets (such as culverts) are used, they need to be designed with sufficient cross-sectional area to allow for sufficient flow to support circulation inside the enclosure. If water control structures are used, they need to be designed to provide equivalent function to inlet/outlet structures.

<u>Hydrodynamic Affects to Surrounding Water Body</u>. Hydrodynamic modeling should be performed to establish existing baseline conditions. Hydrodynamic modeling for each marsh restoration project configuration should also be performed to assess configuration affect on the existing marsh, shorelines, currents, shallow water areas, sediment regimes in the area, and navigation channels. Earlier documentation suggests that much of the surrounding water area is depositional, albeit at low rates. Hydrodynamic modeling should be designed to supplement and validate and update prior work regarding sedimentation rates in and in vicinity to the marsh.

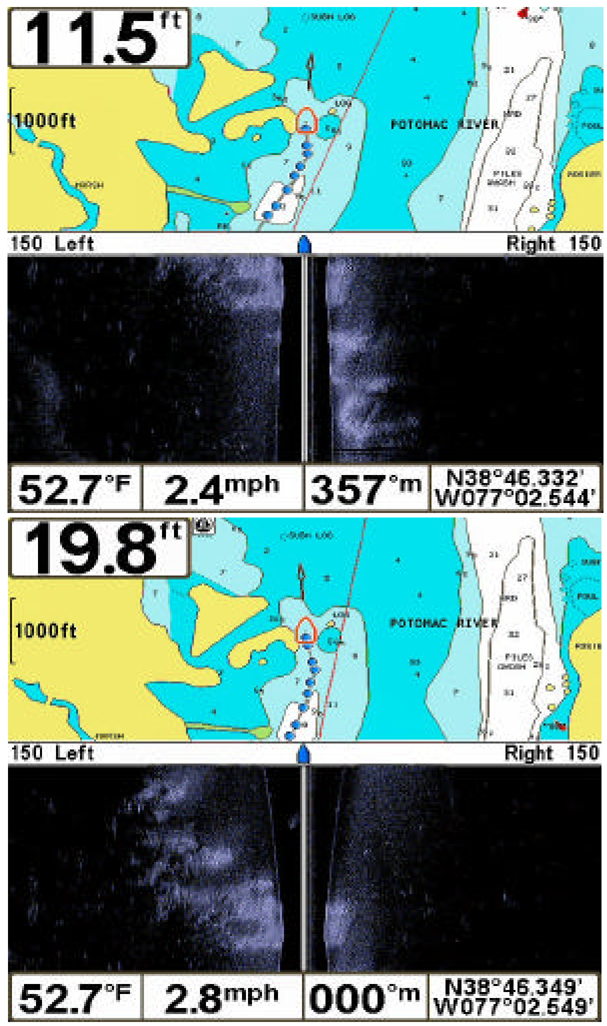


Figure 2 Example side-scan sonar images showing underwater features. Bottom image shows significant depth variation from charted depths. Estimated postion error of images is 20 feet.

<u>Bathymetry</u>. The depth and obstruction data on nautical charts are not complete and thus not reliable for the waters surrounding Dyke Marsh (per on-site observations using personal side-scan sonar equipment – see Figure 2). Bathymetric contours on topographic charts and the partial bathymetric data shown in Palermo and Ziegler (1976) are more representative of actual local bathymetry, although dated. However, depths appear to be less than shown throughout much of the area (based on personal on-site observation), which is consistent with existing documenter in earlier reports that much of the area is depositional in character. Comprehensive side-scan sonar and depth surveys should be conducted to establish

the current bathymetric contours and underwater features and structures, particularly those with potential historic significance and those many underwater and partially submerged structures, including those along the shorelines, which provide structural fisheries habitat.

<u>Causes of Marsh Erosion</u>. Some of the available documentation attributes erosion of the marsh to wakes from boats. This is a broad general characterization that does not accurately convey the effect of boat wakes from various size vessels and their operation and the actual contribution of wake-related erosion relative to wind driven waves and river currents. The wakes from small vessels such as bass boats is, quite frankly, insignificant, because the normal operation of such vessels does not generate large swells. Furthermore, high speed operation along the shoreline doesn't help fishing and exposes vessels to significant operational danger from striking shoals, rocks, and other underwater structures. High speed operation by such vessels is typically more of less perpendicular to the shoreline until offshore and away from underwater structures.

Large swells that carry all the way to the shoreline and which have more potential to displace shoreline materials are more closely associated with large, displacement hull vessels including tour vessels (such swells are operating dangers we small boat operators have to watch for when we are fishing shoreline structure). Such swells are single rather than prolonged events. The predominant and persistent cause of shoreline erosion is most likely wind driven waves that generate significant physical forces over long periods and have potential to displace significant quantities of shoreline sediments. The EIS should avoid broad, disparaging generalizations about the effects of small vessel operations on shoreline erosion. Instead, it should carefully characterize the causes of erosion and accurately characterize the potential for wake damage from different types of vessels and the relationship of wake-caused erosion relative to natural erosion.

<u>Foundation Conditions and Borrow Material</u>. A substantial quantity of borrow material will be needed for construction if sand and gravel dikes are used as retention structures. A preliminary geotechnical boring program should be undertaken to determine foundation conditions and potential sources of on-site and off-site borrow materials for retention structures and filling. Prior geotechnical data collection and assessments should be used as a planning resource. However, considering the physical changes that have occurred in the area, revalidation of the earlier data would be appropriate. The geotechnical information is essential to assessing locations most suitable for the installation of retention structures and the local availability of construction materials which in turn will help define the practical extent of marsh restoration potential and prospective costs.

The mouth of Hunting Creek (cove east of the parkway) should be sampled to ascertain whether or not or to what extent sand and gravel deposits suitable for dike construction may be present. The deposited sediments in this cove should also be sampled and assessed to ascertain their suitability as indigenous fill for marsh restoration. Additional sources of fill materials should also be examined, including areas within the Hunting Creek/Cameron Run watershed west of the parkway, Dogue Creek channel access the Fort Belvoir Marina, and other nearby tidal creeks with indigenous fine sediments that need periodic dredging to support recreational navigation.

Retention Structures. Considering the range of physical conditions where retention structures would be needed, the EIS should examine a range of retention structure alternatives including armored and unarmored (with rock) sand dikes, sheet piles (as retention structures and as cores for combined structures), geotubes, and bulkheads. Retention structures will be needed as containment to enable filling and consolidation to achieve surface elevations suitable for establishment of marsh vegetation; to provide settling ponds needed to reduce water quality impacts associated with filling and consolidation; and to protect the restoration cell from erosion. In order to conserve resources and minimize disturbance of restored areas, retention structures should be designed to concurrently serve as permanent shoreline protection.

Permanent protection will be needed against the threat of high physical energy to the marsh. Furthermore, new marsh does not have the subsurface vegetative structure that characterizes old marsh, and would be more susceptible to physical forces that cause erosion. The retention structure should be designed to minimize the need for subsequent construction of protection structures. Retention structure height for filling is typically higher than elevations necessary for final protective structures. Lowering of the retention structures once restoration is completed so as to present a less artificial, less obtrusive appearance may be possible, per Palermo and Ziegler (1976).

Water Control Structures. The EIS should examine requirements and methods for controlling discharges of effluent during filling and to provide water levels needed to restore and sustain restored marshes. The EIS should examine a variety of structures including spillways, weir boxes, and culverts. Once restoration is completed, it may be practicable to remove water control structures and replace them with culverts or other outlet structures of sufficient design to enable a natural flow of water and natural ambient tidal elevations.

Competing Uses and Associated Impacts

Locally Valuable Fisheries Habitat and Recreational Fishing

The areas dredged by Smoot unintentionally created a suite of locally valuable fisheries habitat conditions with associated fishing opportunities including largemouth bass and striped bass. The habitat that resulted from Smoot's excavations provides highly variable bottom structure, enhanced by toppled trees which provide excellent cover for largemouth bass. The near shore shallow water materials provide spawning habitat for largemouth bass, while also providing contiguous deep water habitat used by this species during high pressure and cold water conditions.

The fisheries habitat and bass fishing potential of the Dyke Marsh area is well documented by *Tidal Potomac River Fishing Bible* (Penrod, 1994). Although the bathymetry has changed somewhat, that publication which remains a reliable descriptor of the Dyke Marsh – Belle Haven Cove – Hunting Creek/Cameron Run area for recreational fishing.

Recreational Boating Accessibility and Marina-Related Impacts.

Prior sand and gravel excavations had the side effect of creating conditions that enabled development of significant competing interests for use of the Dyke Marsh area. These include traditional upland and marsh use by wildlife; public wildlife viewing opportunities; waterfowl hunting; recreational boat ramp direct access to the park and Potomac River; marina operations with moorage and anchorage; wide range of fisheries habitat and fisheries utilization; vessel and shore-based recreational fishing throughout and in proximity to the park; and, professional fishing guide service staging and local fishing.

A full-scale restoration of the marsh to the footprint that pre-existed the Smoot excavations would benefit traditional marsh values and use while adversely impacting fisheries habitat as well as marine recreational and fishing guide service activities. Water areas inside restoration cells would not be expected to be accessible to recreational fishing vessels.

The marina provides valuable recreational boating public access, moorage, sheltered anchorage, and boat storage on the Virginia side of the tidal Potomac River, all of which are in very short supply in Northern Virginia. The dredged cove (Belle Haven Cove) immediately south of Belle Haven Marina not only provides anchorage for many sailboats, but also provides a range of prime fisheries habitat, making it an important fishing destination, especially during strong westerly and northerly wind conditions.

Any reduction in the current available recreational boating opportunity would constitute a major impact because there is extremely limited potential for mitigation through establishment of offsetting access, wet moorage, protected anchorage, or storage capacity. The limited potential to mitigate for a reduction or loss of boat ramp access at the Belle Haven Marina through improved tow vehicle and vessel waterside access at the Gravely Point boat ramp is included in Enclosure (2) as a mitigation alternative.

Waterfowl Hunting Impacts.

Dyke Marsh provides one of the relatively few waterfowl hunting opportunities in this region of the tidal Potomac in Northern Virginia. Restoring marsh area might increase hunting opportunities to the extent allowed by NPS rules and regulations. On the other hand, the need to install retention structures for marsh restoration purposes would likely require a complete enclosure with water control structures that would certainly necessitate restricted access during the construction and restoration process. Access thereafter by small boat would only be possible if permanent outlets were designed with small access as part of design criteria (unless boats were small enough to haul over top of the structure).

Any restoration involving construction of containment cells would likely adversely impact waterfowl hunting, which might temporarily or permanently be precluded by construction and long-term site reconfigurations. Any waterside access would necessarily have to take into consideration the susceptibility of the restored marsh to damage. Considering that the surface of a retention structure may provide greater accessibility than natural conditions, the EIS should include an assessment of the pros and cons of allowing hunter access to certain areas or certain restoration cells, or limit use to duck blinds situated so as to minimize safety issues relative to wildlife viewing.

Waterside Wildlife Viewing Impacts.

Although water access to the Dyke marsh area must be accomplished with consideration caution due to the present of numerous submerged objects that also provide fisheries habitat structure throughout the area, the marsh is nevertheless accessible by small boat (e.g., bass boats, john boats, runabouts, and similar outboard boats with shallow draft) to view wildlife. Waterside viewing (and recreational fishing) activities and the presence of underwater obstructions (e.g. fallen timber, ballast piles, rocks, snags, piles) are not conducive to high speed vessel operations close to the marsh.

A marsh restoration project involving retention and water control structures would be expected to preclude vessel access as noted above. Therefore, as mitigation for this loss of access, landings and viewing stations should be considered.

I trust that this correspondence with enclosures will be of assistance to the NPS in identifying and assessing a practical approach to restoring Dyke Marsh consistent with Congressional intent while also providing a reasonable and appropriate balance among all competing uses.

Very truly yours,

/s/

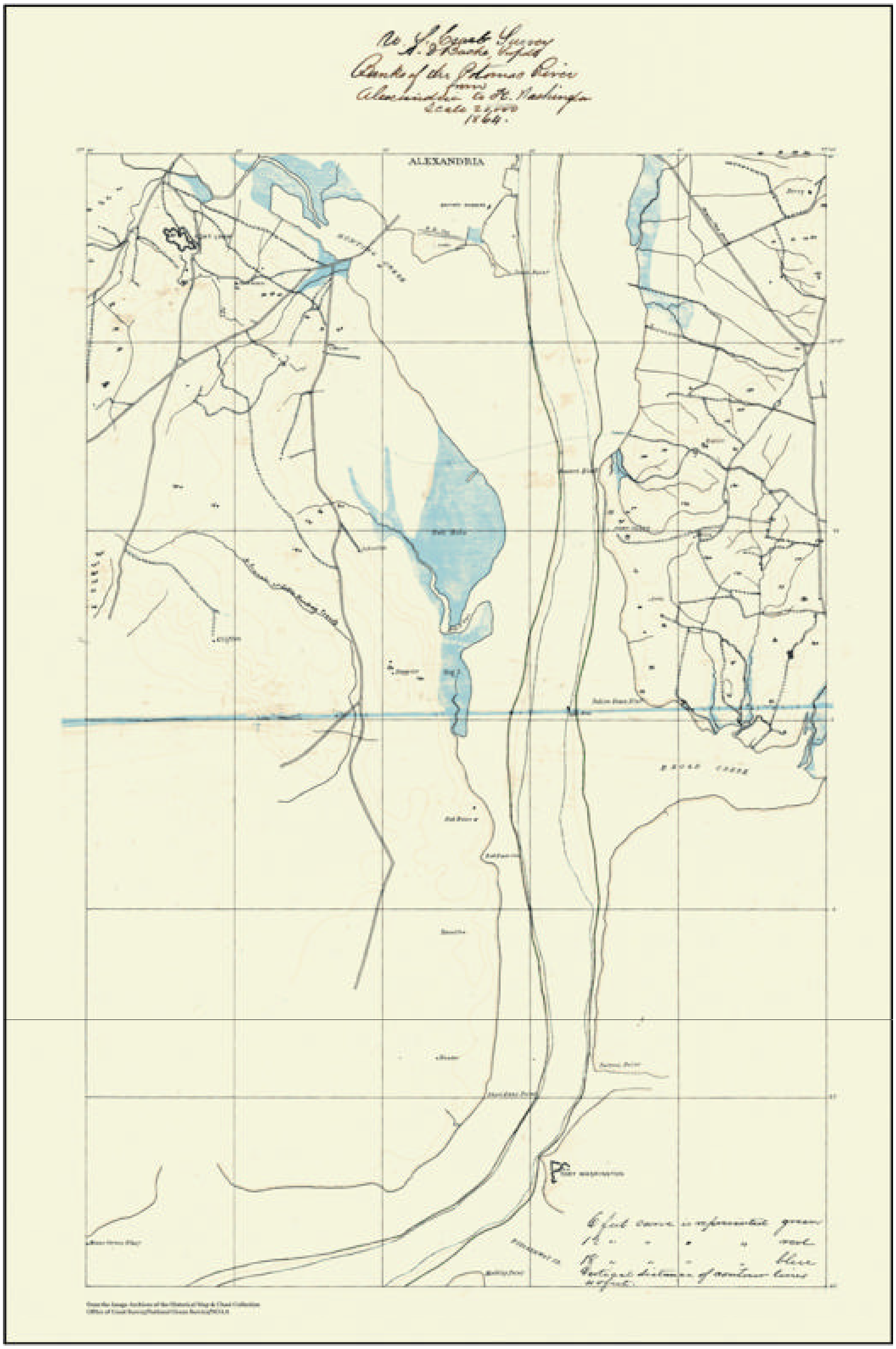
Wayne Young

Encl: (1) 1864 Area Drawing
(2) Suggested Alternatives for NPS Consideration in Dyke Marsh Restoration EIS

cc: Brent Steury, Supervisory Biologist, Natural Resources Program Manager National Park Service
The Honorable Sharon Bulova, Chair, Fairfax County Board of Supervisors
Ms. Glenda Booth, Chair, Fairfax County Wetlands Board
Raymond Fernand, Nongame and Environmental Programs, Virginia Department of Game and Inland Fisheries
Potomac Bassmasters
CAPT Steve Chaconas, National Bass Guide Service
CAPT Ken Penrod, Life Outdoors Unlimited
Todd Barber, Reef Ball Foundation
Angus Phillips, Washington Post

ENCLOSURE 1 to W. Young letter dtd 12/5/09

1864 AREA DRAWING



ENCLOSURE (2) to W. Young Letter dtd 12/5/09

SUGGESTED ALTERNATIVES
FOR NPS CONSIDERATION IN DYKE MARSH RESTORATION EIS

The EIS should address a broad suite of alternatives to accomplishing marsh restoration as well as alternatives to the project. The following suite of alternatives is offered for consideration but should not be viewed as complete. However, such a suite of alternatives is needed to demonstrate the pros and cons of the proposed action and to inform the selection process of the best approach to achieving Congressional intent. It should be recognized that any significant marsh restoration would have substantial impacts to fisheries habitat and recreational fishing opportunity because the shorelines that would be affected provide prime largemouth bass habitat. The EIS should examine mitigation for impacts to competing uses, including conversion and loss of valuable fisheries habitat including fallen trees and wrecks that provide exceptional largemouth bass habitat and associated fishing opportunity.

Dyke Marsh Shoreline and Marsh Stabilization and Protection Alternatives

<u>Shoreline Stabilization and Protection</u>. The remaining marsh provides valuable waterfowl habitat, viewing opportunities, and waterfowl hunting opportunities. However, without stabilization, the existing marsh is in serious danger of breaches in the protecting shoreline facing the river and accelerated erosion thereafter as breakthroughs expose more surface area to wave energy and currents. Additionally, Goldies Island, and especially Crescent Island, are exposed to erosion. Much of Crescent Island has already been lost.

In order to preserve the remaining marsh for its inherent environmental value and as a core for future restoration projects and the uplands and protective value of Goldies and Crescent Islands, **the EIS should examine the need for immediate shoreline protection and stabilization projects as well as the need for similar but permanent structures as part of any marsh restoration that occurs. The EIS should also examine the potential for restoration alternatives that can combine near-term and permanent shoreline structures insofar as** practicable in order to achieve project objectives while reducing overall installation costs. In this regard, designed reef structures with demonstrated shoreline stabilization capabilities should be considered.

A wetland habitat restoration project at the Cox Creek Dredged Material Containment Facility in Baltimore and a shoreline stabilization project at Chesapeake Ranch Estates in southern Maryland, both using large Reef Balls, are of particular interest relative to Dyke Marsh. Each of these reefs was placed near shore at intertidal elevations. In each case, the units have served to dissipate wave energy, creating a quiescent area between the reefs and the shoreline except under conditions of extreme high water conditions. The effect has been to stabilize the shoreline while leaving the natural shoreline and natural functions intact. A further advantage of such structures is that they hold potential for relocation to serve as fisheries habitat structures once a project's permanent structures are installed *(see Structural Fish Habitat Enhancements under mitigation alternatives).*

Spray Dredging. A thin veneer of sediments can be sprayed over a marsh to provide nourishment where former replenishment sources have been cut off or reduced below the level needed and/or to increase marsh elevations in relation to relative sea level rise. This approach was attempted at the Blackwater National Wildlife Refuge in an effort to rebuild marsh habitat to compensate for the loss of sediment inflow from the watershed. The consequence was that areas of the marsh became unable to support marsh vegetation and collapsed from the inside *(see related comments later regarding construction issues).* **The EIS should consider spray dredging as an option for replenishing the existing marsh if the natural sediment budget is insufficient to enable the marsh to sustain itself.**

Dyke Marsh Habitat Restoration Alternatives

Fringe Marsh Restoration. A historical map of the area that is posted in the David Rumsey Collection depicts what appears to be a narrow fringe marsh that ran along the entire cove north of the marsh well into Hunting Creek. **Restoration of fringe marsh along the shoreline in the cove south of the marina and along the shoreline extending from the marina would be consistent with the historical conditions, and would provide valuable intertidal habitat for fish and wildlife, and should be considered by the EIS.** Temporary retention structures would be required for construction and establishment of vegetation. Permanent protection in the form of geotubes, breakwaters (segmented or unbroken), or a combination would be required where fringed marshes would be exposed to wave driven energy and strong currents. Attachment 1, drawings #1-3 include fringe marshes concepts for your further consideration.

Marsh Restoration within Dyke Marsh Park Boundary. Attachment 1, drawings #2-3 depict for your further consideration two modest marsh restoration cells at locations that would protect the existing marsh. **The EIS, in examining marsh restoration cells, needs to assess the effect of the cells on the existing marsh, particularly with respect to the effects on hydrology, hydrodynamics/circulation, and sediment budget needed to sustain the marsh. The EIS would also need to identify and assess the conversion/loss of prime largemouth bass habitat and fishing opportunity associated with this alternative, including the loss of substantial structure in the form of fallen trees along much of the shoreline as well as sunken barges.** The configuration shown in the drawings maintains the existing outlet.

An outlet of sufficient cross section is needed so that the water circulation in the interior marsh is not constricted so that the sediment budget is not reduced and the water does not stagnate. The northernmost restoration cell shown in drawing #2 is informed by Palermo et al. (1976), although closing off the creek providing access to the marina from the south is not included. The two configurations butt up to shoreline and to formerly interior marsh that was exposed to wave energy by the Smoot excavations. These configurations also would coincide primarily with relative shallow waters, thereby reducing the quantity of borrow materials that would be needed to fill to marsh elevations.

Large-Scale Marsh Restoration to Historical Footprint. The configuration is self-explanatory, and a conceptual drawing is not included. **Major issues that the EIS would need to consider for this alternative include, but are not limited to the following:**

- effects on hydrology, hydrodynamics / circulation, and sediment budget needed to sustain the marsh;
- availability of suitable sediments / borrow materials in sufficient quantity to construct the project;
- environmental issues associated with aquatic borrow sources; conversion of locally valuable fisheries habitat including structural habitat and wrecks, potential effects on Shortnose Sturgeon foraging and pre-spawning migration and the effects on potentially suitable spawning habitat;
- loss of recreational fishing opportunity;
- disruption and/or loss of recreational hunting opportunity;
- loss of recreational boating and hunting waterside access resulting from installation of retention and water control structures, and in the case of hunting, safety issues during restoration and with respect to persons engaged in wildlife viewing.

Configuring a project to the historical marsh footprint would necessitate construction of retention structures in or around the deep water areas of the original marsh footprint to protect and contain placed sediments; sourcing, hauling, and huge cost of placing substantial quantities of suitable materials that would be necessary to progressively fill the containment to achieve suitable marsh elevations; and, substantial effort, extended time frame and cost that would be associated with consolidating placed sediments to suitable marsh surface elevations.

Practical field examples in this region that demonstrate the complexity of building marshes under varying physical conditions include the Poplar Island Environmental Restoration Project, the perched wetland marsh creation project at the Hart-Miller Island Dredged Material Containment Facility north of Baltimore at the mouth of the Back River, and the wetland mitigation project at the Cox Creek Dredged Material Containment Facility near Baltimore's Key Bridge. The latter was damaged by Tropical Storm Isabel, demonstrating the need for shoreline stabilization or protection for marsh restoration projects exposed to physical forces.

In addition to converting locally valuable fish habitat to marsh with associated impacts to fish and recreational fishing, an extended time frame numbered in years would be necessary to progressively fill and consolidate loose sediments placed in the deep water areas. Use of solid fill materials such as concrete rubble for deeper areas might accelerate building foundation layers, but the need for suitable sediments for marsh establishment most likely will necessitate using dredged indigenous material. This material would still need to be consolidated over a number of years to achieve suitable elevations after consolidation.

Marsh Restoration Outside Dyke Marsh Park Boundary. Attachment 1, drawings #2 & #3, include for your further consideration, several large-scale marsh restoration concepts that would leverage existing physical conditions to jump start marsh restoration and reduce fill requirements relative to marsh surface area. **The EIS would need to identify and assess the conversion/loss of fisheries habitat and fishing opportunity associated with this alternative, including the**

loss of access to a sunken steel vessel in the general vicinity of the now submerged Pomegranate Island.

Portions of the existing delta outside of the Hunting Creek outlet are already being colonized by aquatic vegetation which, on face value, is encouraging for continued evolution to a natural marsh habitat. This delta area, albeit extending outside of the existing NPS boundary and crossing multiple local jurisdictions, has what appears to be the greatest potential for a rapid conversion to marsh with associated intertidal wetlands and prospects for a favorable benefit-cost ratio. The very shallow depths substantially reduce the quantity of suitable sediments that would be needed to (1) construct retention structures (e.g. dikes), and (2) fill the containment to suitable marsh elevations (after sediment consolidation).

The conceptual drawings are configured to generally approximately the trend of the historic shoreline, albeit shifted to the north into the cove, but south of the Fairfax County border with Alexandria. The area on the north side of the cove and the silted in marina located at the residential high rise offer prospective contiguous borrow areas with suitable marsh quality fine sediments. This area could be dredged as a borrow source, restoring deepwater habitat and improving flow out of Hunting Creek, although periodic dredging may be necessary if heavy sedimentation from Hunting Creek continues. The prospective development potential of the delta is in contrast with the significantly more challenging development requirements that would be necessary to configure a project to the historical footprint of Dyke Marsh, as described above in the "Large-Scale Marsh Restoration to Historical Footprint" alternative.

<u>Multi-Objective Marsh Restoration Alternative</u>. **The EIS needs to examine combined and multi-objective alternatives in order to effectively convey the range of restoration opportunity. The EIS would also need to identify and assess the conversion/loss of prime largemouth bass habitat and fishing opportunity associated with this alternative.** An example of a multi-objective project that balances competing uses is described in the bullets below and depicted in attachment 1, drawings #2 & #3 for your further consideration. Conceptual features of this alternative as drawn include:

- Near-term measures to physically protect the remaining marsh such as installation of structural protection which could include geotextile tubes and designed reef structures which could potentially be removed or relocated in conjunction with construction of a permanent restoration project.

- Near-term measures to stabilize the exposed island shorelines along the northern end of the park. This can be also accomplished with structural protection, including a combination of permanent structures such as segmented breakwaters and designed reef structures (geotubes would problematic due to bottom conditions and proximity to vessel operating areas with potential for propeller cuts).

- A modest marsh restoration consisting of multiple cells along the existing southern two thirds of the park, extending offshore into the area excavated by Smoot, converting approximately 20-30% of that area from fisheries habitat to marsh, extending out to intersect with the western shoreline of the small offshore islet and north to and intersecting with the shoreline immediately south of the islands at the north end of the park, along with installation of designed reef structures along the exterior of the marsh restoration project to mitigate the loss of extensive fisheries habitat structures.

- Preservation of the eastern shoreline of the aforementioned islet off of the southern half of the park which offers significant structure as fisheries habitat, including remnants of at least 9 sunken barges. These remnants have helped stabilize the shoreline in addition to providing structural habitat. Stabilization or the eastern shoreline and ends of the islet can be accomplished with structures, and there is considerable potential to accomplish this with designed reef structures that would also provide structural reef habitat.

- Preservation of deep water areas offshore of the islet, maintaining fisheries habitat value and fishing opportunities.

- Preservation of the existing islands, channels, and coves in the north half of the park, thereby preserving recreational boating access, moorage, and anchorage, and recreational fishing opportunities in this area.

- Construction of a major marsh restoration project in the cove immediately north of the park at the mouth of Hunting Creek, taking advantage of and leveraging the existing heavy sedimentation and formation of a large delta that is already being colonized aquatic vegetation. The existing conditions favor a project that could increase marsh acreage well beyond the area lost due to the Smoot excavations. Although this area is outside the park boundary, crosses multiple jurisdictions, and would require multi-jurisdiction engagement and support, it offers the best opportunity to optimize surface area with substantially less cost than attempting to construct and fill an armored containment around the Smoot excavations. There is substantial potential for near-term marsh development as a result of existing conditions. A large-scale project could also potentially extend far enough to the east to offer at least partial protection to the northwest section of the park.

Mitigation Alternatives

<u>Structural Fish Habitat Enhancements</u>. **The EIS should examine the installation of artificial reef structures as mitigation for loss of fisheries habitat structure associated with a marsh restoration project.** Artificial reefs can be constructed through use of designed reef structures, rock piles, and suitable materials of opportunity. Designed reef structures with documented successful performance offer potential for high value structural habitat colonized by various aquatic species while also being capable of being fabricated on site by volunteers and deployment by various means. For certain designed reef structures, such as Reef Balls, the units can even be floated into position. This technique can be used where access by vessels with lift capabilities is impractical or shoreline areas are very fragile.

The use of lightweight, multi-piece fiberglass molds of various sizes has resulted in worldwide use of Reef Ball technology in volunteer and commercial applications, and the number of these units and volunteer pours has grown significantly in the Chesapeake Bay region. A local example is a Reef Ball pour that I conducted with a Freshman biology class at Annandale High School (AHS), Annandale, Virginia, during 2004.[1] The reef structures from that pour were subsequently placed in the Magothy River as part of an oyster restoration project. A copy of a flyer documenting the AHS pour is included with this enclosure as an example of the potential for hands-on volunteer engagement in activities that could be applied marsh stabilization and fisheries enhancements.

The biological performance of Reef Ball technology in this region is documented by environmental monitoring reports by the Maryland Environmental Service which managed installation of about 300 units as part of a habitat restoration project at the Cox Creek Dredged Material Containment Facility in Baltimore as well as field reports and diver inspections conducted at other area locations. Although biological performance will vary in the upper tidal Potomac from Chesapeake Bay applications due to differing physical conditions and species, high biological performance relative to ambient conditions would be expected.

Other designed reef products have also been used at various artificial reef sites throughout the Chesapeake Bay. Performance data is limited for other technologies in this region, especially with respect to performance in shoreline stabilization applications. Module performance varies by unit configuration, composition, layout and other factors among the various designed reef structures. Nevertheless, anecdotal information is generally favorable for artificial reef applications where foundation and ambient environmental conditions are suitable for their installation.

<u>Vessel Landings and Wildlife Viewing Stations</u>. **The EIS should examine the installation of waterside lands and viewing stations along the exterior of marsh restoration projects to compensate/mitigate for the loss of water access by vessels for wildlife viewing purposes**.

<u>Improved Tow Vehicle and Vessel Access to Gravely Point Boat Ramp</u>. The Gravely Point boat ramp provides sheltered public access to the upper tidal Potomac. However, this location is less suitable as an access point for activities below the Wilson Bridge due to transit distances and a speed zone along the Alexandria waterfront. Although there is some reserve capacity for recreational boater access during most weeks (albeit not on most Spring and Summer weekends), use of the site during the week is also complicated by parking limitations during workdays. Road access to the boat ramp is difficult because of the need to run the gauntlet of northbound traffic on the Parkway. Water access is limited because of very shallow flats between the outlet and the main river channel.

Should the boat ramp at Belle Haven Marina be closed or its use restricted as an outcome of a Dyke Marsh restoration project, **the EIS should consider mitigation measures including improved vehicular access and parking for boat trailers and tow vehicles, and by dredging an access channel from the boat ramp to deep water in the river**. As part of this alternative,

[1] Mr. Young coordinated the introduction and use of Reef Ball designed reef structures in the artificial reef program for the Maryland portion of the Chesapeake Bay which he previously administered. Since completing service in that program, Mr. Young has provided volunteer service in support of various Reef Ball Foundation non-profit initiatives.

consideration should be given to construction of direct vehicular access from the southbound lanes of the parkway.

Alternatives to the Proposed Action

The EIS should examine other restoration alternatives to compare and contrast their potential contribution to environmental objectives and their impacts relative to Dyke Marsh restoration alternatives. Suggested alternatives for your consideration include the following.

No Action Alternative

<u>No Action</u>. No action would maintain existing natural and recreational uses of the site, albeit, at the expense of further deterioration of the existing marsh. No action would continue the progressive conversion of marsh and shoreline habitat to fisheries habitat. At the same time, open deep water areas would likely act as sinks for eroded sediments, and if net depositional, would progressively reduce the extent of deepwater habitat. Although recreational fishing and recreational boating use of the marina and anchorage cove would be preserved, wildlife would be impacted by continued loss of marsh habitat. Although accretion may be sufficient for the existing marsh to sustain itself relative to sea level rise, slow but steady erosion resulting from primary physical forces – currents and storm waves – will be expected to eventually breach the shoreline and accelerate further deterioration of the marsh.

Alternative Creation and Restoration Opportunities

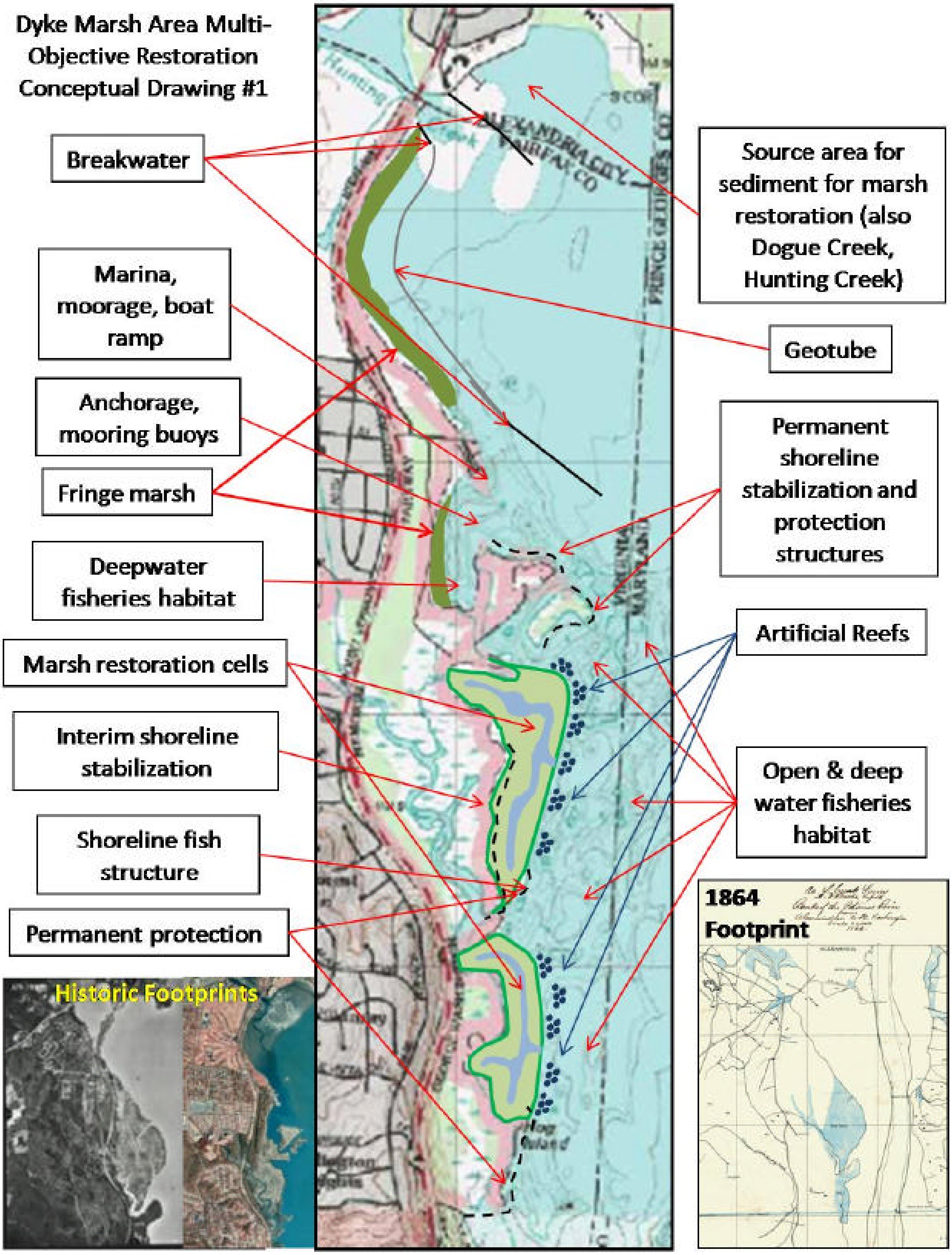
<u>Restoration of Craney Island</u>. The existing islet remnant of Craney Island southeast of Hallowing Point and the mouth of Gunston Cove is reported to have been on the order of 20 acres in size in the Colonial period. The waters surrounding the islet are very shallow. An island restoration project consisting of uplands and marsh enclosed by an armored dike could be constructed to provide protected upland nesting habitat, nesting islands, and marsh habitat. The previous existence of the island at this location is, on face value, favorable relative to foundation conditions for a retention structure.

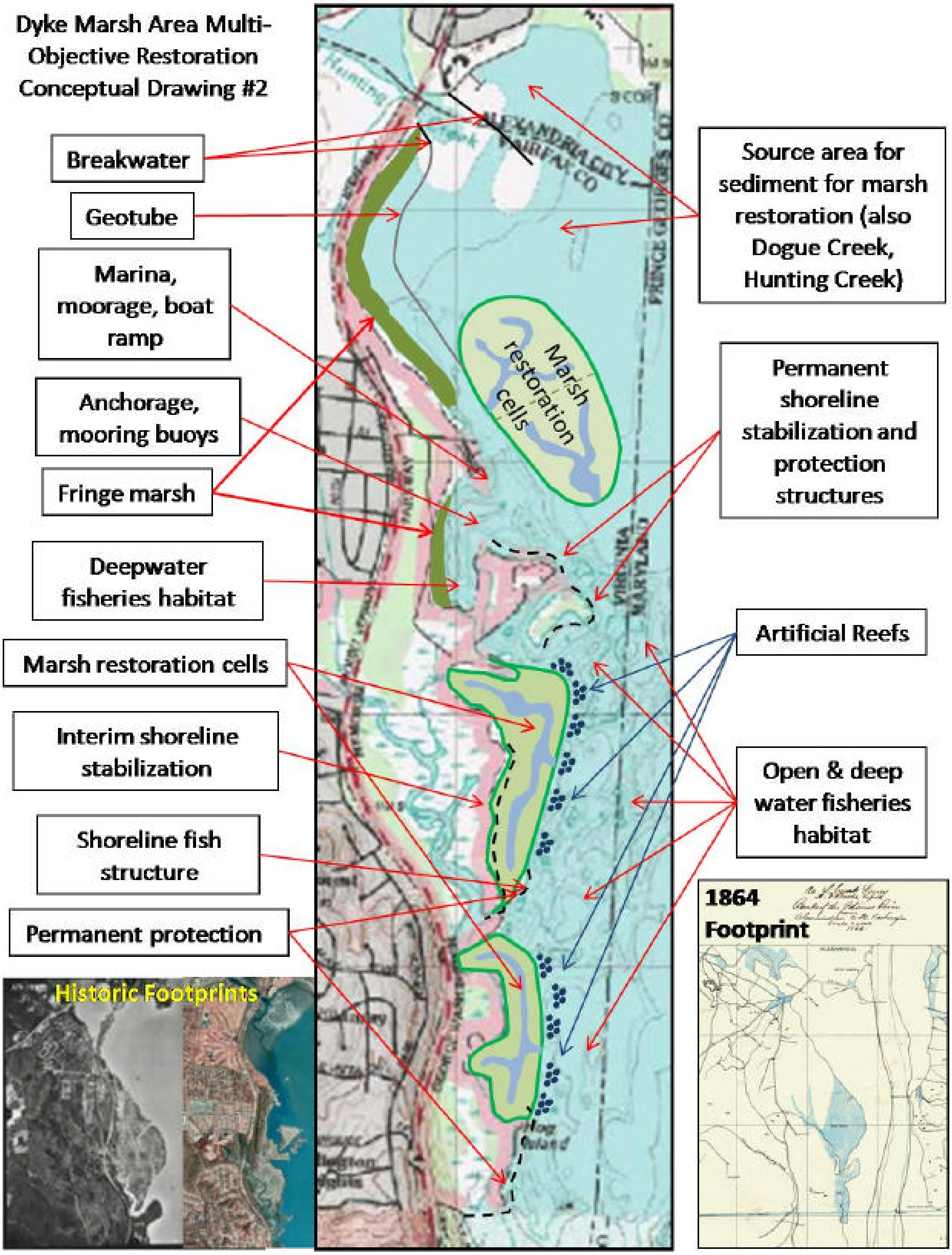
<u>Mid-River Island with Upland and Marsh Habitat in Proximity to Dyke Marsh</u>. An island restoration project in the shallow area easterly of the Smoot excavations off Dyke Marsh could potentially be developed inside of an armored dike for the purpose of establishing uplands, nesting islands, and marsh. The very shallow depths would minimize the quantity of fill needed to reach marsh elevations. Foundation conditions would need to be assessed through geotechnical borings and tests. The fact that Smoot did not excavate this area suggests that the sand and gravel deposit they were mining may not have extended through this area.

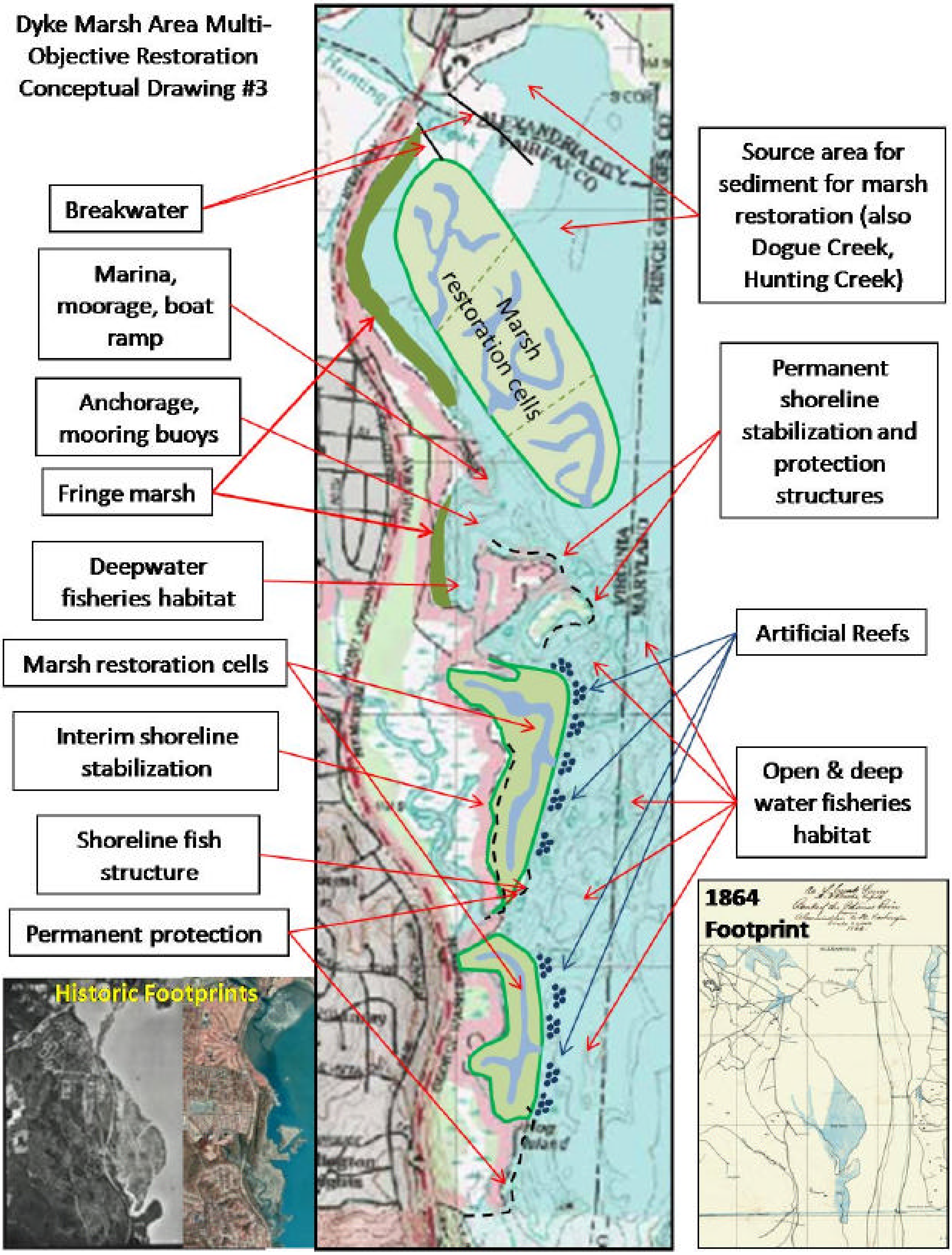
<u>Island and Marsh Creation on Blue Plain Flats</u>. An island restoration project in the shallow area southwest of the Blues Plains treatment plant could potentially be developed inside of an armored dike for the purpose of establishing uplands, nesting islands, and marsh. The very shallow depths would minimize the quantity of fill needed to reach marsh elevations. However,

this area has heavy sedimentation, presumably from fines from the treatment plant. Foundation conditions would need to be assessed through geotechnical borings and tests.

There are various high-value structural habitat features along in extending our from the DC and Maryland shorelines east of the Blue Plain flats. The flats themselves also provide habitat for largemouth bass and other species. Historically, this portion of the tidal Potomac extending upriver experienced significant fill and conversion of wetlands to disturbed uplands. Further conversion in this section of the river is not appropriate in my view, but is noted here for completeness.


Dyke Marsh Area Multi-Objective Restoration Conceptual Drawing #1
Breakwater
Marina, moorage, boat ramp
Anchorage, mooring buoys
Fringe marsh
Deepwater fisheries habitat
Marsh restoration cells
Interim shoreline stabilization
Shoreline fish structure
Permanent protection
Source area for sediment for marsh restoration (also Dogue Creek, Hunting Creek)
Geotube
Permanent shoreline stabilization and protection structures
Artificial Reefs
Open & deep water fisheries habitat
ALEXANDRIA CITY
FAIRFAX CO
PRINCE GEORGES CO
VIRGINIA
MARYLAND
Historic Footprints
1864 Footprint


Dyke Marsh Area Multi-Objective Restoration Conceptual Drawing #2
Breakwater
Geotube
Marina, moorage, boat ramp
Anchorage, mooring buoys
Fringe marsh
Deepwater fisheries habitat
Marsh restoration cells
Interim shoreline stabilization
Shoreline fish structure
Permanent protection
Historic Footprints
Source area for sediment for marsh restoration (also Dogue Creek, Hunting Creek)
Marsh restoration cells
Permanent shoreline stabilization and protection structures
Artificial Reefs
Open & deep water fisheries habitat
1864 Footprint


Dyke Marsh Area Multi-Objective Restoration Conceptual Drawing #3
Breakwater
Marina, moorage, boat ramp
Anchorage, mooring buoys
Fringe marsh
Deepwater fisheries habitat
Marsh restoration cells
Interim shoreline stabilization
Shoreline fish structure
Permanent protection
Historic Footprints
Marsh restoration cells
Source area for sediment for marsh restoration (also Dogue Creek, Hunting Creek)
Permanent shoreline stabilization and protection structures
Artificial Reefs
Open & deep water fisheries habitat
1864 Footprint

Maryland Environmental Service

Annandale High School, Virginia
Freshman Biology Class
Reef Ball Pour – May 2004

Annandale High School (AHS) hosted a demonstration Reef Ball pour for three freshman biology classes. Students produced 9 Reef Balls in various sizes. The events were designed to support the School's efforts to provide enhanced environmental education opportunities. Planning and coordination were provided by AHS freshman biology teacher Jessica Doll and MES Artificial Reef Coordinator and Annandale resident Wayne Young. AHS provided concrete in ready mix bags and MES made its Reef Ball resources and staff available to support the event. The pour was preceded by Mr. Young's lecture in Fall 2003 to introduce Chesapeake Bay restoration needs to biology students as residents in the Bay watershed.

Reef Ball molds for the pour were obtained with grant support from the Chesapeake Bay Trust and Fish America Foundation, Exxon-Mobil Foundation, and Reef Ball Foundation and program research and development support from MES.

The Reef Balls produced by the students will support several reef development activities during Summer-Fall 2004. These include work by the Magothy River Association (MRA) to develop fishing reefs at multiple locations in the Magothy River. This projects is being conducted in cooperation with the Maryland Department of Natural Resources (DNR) and MES. Some of the Reef Balls produced will also be deployed to one of several permitted "fish havens" in the upper Chesapeake Bay that MES administers.

The Reef Balls used in these projects can be up to 400 pounds apiece and are several feet high. Each Reef Ball provides complex reef structure for attachment by marine organisms including filter feeders and vegetation. The modules will be placed in clusters to magnify their biological effectiveness relative to use by fish populations. The Reef Balls will be monitored to assess their performance.

MES previously installed 225 medium sized Reef Balls at 5 oyster reef sanctuaries under DNR's sponsorship. These modules are field testing the technology's capability to support the oyster recovery program. MES, with assistance from the Reef Ball Development Group, and Reef Ball Foundation are working cooperatively to bring Reef Balls to the artificial fishing reefs in support of reef and oyster restoration activities. MES has established a modest local production capability to support introduction of the technology for developing and enhancing fish habitat and to provide sport fishing opportunities.

Grant support for the development of fish habitat and fishing opportunities using Reef Balls has been graciously provided by the Chesapeake Bay Trust, Abell Foundation, Exxon-Mobil Foundation, Fish America Foundation, and Reef Ball Foundation. In-kind support is being provided by various reef partners.

Check the MES website at www.menv.com for additional information about the Maryland Environmental Service and the agency's environmental restoration work involving oyster recovery, the Poplar Island Environmental Restoration Project, Hart-Miller Island South Cell Habitat Development and artificial fishing reefs. Information about Reef Balls can be found at www.reefball.com

June 1, 2004

Annandale High School Reef Ball Pour

Demonstration Pour, Annandale High School, Annandale, Virginia, May 27, 2004

Reef Ball "Hatching," Annandale High School, Annandale, Virginia, May 28, 2004