Habitat Workshop

Proceedings of the Mid-Atlantic NEP Habitat Workshop
January 16-17, 2003 Ocean City, MD

Association of National Estuary Programs

Mid-Atlantic National Estuary Programs
Albemarle-Pamlico Sounds
Barnegat Bay
Delaware Estuary
Delaware Inland Bays
Maryland Coastal Bays

Proceedings of the

Mid-Atlantic National Estuary Programs

Habitat Workshop

Held
January 16-17, 2003
Carousel Resort Hotel and Condominiums
Ocean City, Maryland

With funding from US Environmental Protection Agency through a grant to:

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EXECUTIVE SUMMARY

The Mid-Atlantic National Estuary Programs, the Association of National Estuary Programs, and the United States Environmental Protection Agency sponsored a workshop in Ocean City Maryland, January 16-17, 2003 at the Carousel Resort Hotel and Condominiums. At the workshop more than 50 participants came together to listen to formal presentations, meet in organized discussions sessions, and interact informally. The participants came from 5 states and the District of Columbia, and was comprised of Federal, state and local regulators and resource managers; NEP staff, volunteers, and board members; university staff and students; consultants; representatives of NGOs; private citizens and others.

This document, "*Proceedings Of The Mid-Atlantic National Estuary Programs Habitat Workshop"* summarizes the activities of this workshop. Included in this volume are the list of presentations, author contact information, the notes gleaned from the discussion sessions, the abstracts for the formal presentations given, and contact information for the authors of formal presentations. This "*Proceedings"*… document is meant as a companion volume to the main product of the Workshop, *"Producing Habitat Plans and Habitat Restoration Plans."*

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12:15 – 1:30	Luncheon – Maryland Room – Special Presentation: ***Buildout Around the Bay*** Kent Mountford, Estuarine Ecologist And Environmental Historian
1:30 – 3:00	Presentations – Delaware Room
3:00 – 5:00	How to write a restoration plan – Introduction (Roman Jesien, Science Coordinator, Maryland Coastal Bays Program). – Delaware Room Workshop Sessions: 1. Who should be involved /Who identifies areas for restoration? (Moderator: Eric Buehl, Habitat Coordinator, Delaware Inland Bays) Room Number 611 2. How do we identify habitat for restoration or protection? (Moderator: Kent Mountford, Estuarine Ecologist And Environmental Historian) Room Number 610 3. How do we set restoration goals? (Moderator: Chris Spaur, US Army Engineers, Baltimore District) Room Number 609
3:00 – 4:30	Maryland Sensitive Habitat Working Group - Room Number 608
5:00 - 6:30	Maryland Coastal Bays Science and Technical Committee Meeting. Room Number 610
5:00 – 6:30	Meetings among interested parties - Room Numbers TBA and Seasons Lounge

Friday January 17

9:00 – 10:30	Presentations – Delaware Room
10:30 - 12:00	Workshop Sessions 1. How do we evaluate restoration activities? (Moderator: Kent Mountford) Room Number 609 2. How do we measure successful attainment of restoration goals? (Moderator: Eric Buehl) Room Number 610 3. When should our measurements be made?(Moderator: Roman Jesien) Room Number 611
12:00 - 1:30	Luncheon – Maryland Room Working Lunch Summary of Breakout Sessions and Consensus Building

MID-ATLANTIC NEP HABITAT WORKSHOP AGENDA

Thursday January 16

PRESENTATIONS

Welcome and Introductions
David Blazer, Executive Director, Maryland Coastal Bays Program

Workshop Goals
Dr. Tom Jones, Chair, Scientific and Technical Advisory Committee, Maryland Coastal Bays Program

The Need for Estuarine Habitat Restoration
Steve Emmett-Mattox, Vice President and Program Director, Restore America's Estuaries

Federal Role in Habitat Protection and Restoration
Greg Colianni US EPA Headquarters representative to the Estuary Habitat Restoration Council.

The Value Of Partnerships In Habitat Plan Development
Eric Buehl, Habitat Coordinator, Delaware Center for the Inland Bays

What Resources Should We Protect - MD Sensitive Areas Initiative
(Mary Conley, Maryland Dept. of Natural Resources).

Which Areas Should We Restore – More Bang for the Buck in Tributary Restoration Selection Strategy
Dr. Frederick W. (Rick) Kutz, Consultant in Environmental Science.

Build-out Around The Bay
Kent Mountford, Estuarine Ecologist And Environmental Historian

Habitat Goals Could be a Moving Target – Sea-Level Change and Habitat Loss
Christopher Spaur Army Corps of Engineers, Baltimore District

Not all the Habitat May be Under Our Control – Reestablishing Wetland Functions in the Estuarine Landscape: Balancing the Challenge of Invasive Species with Wetland Estuarine Connectivity
Mike Weinstein, New Jersey Marine Sciences Consortium/NJ Sea Grant.

Habitat Planning - Opportunities for the Future
Bruce Nichols, NRCS

GROUP DISCUSSION SESSIONS

How to write a restoration plan – Introduction, Roman Jesien, Science Coordinator, Maryland Coastal Bays Program).

Who should be involved /Who identifies areas for restoration? (Eric Buehl, Habitat Coordinator, Delaware Inland Bays)

How do we identify habitat for restoration or protection? (Kent Mountford, Estuarine Ecologist And Environmental Historian)

How do we set restoration goals? (Chris Spaur, US Army Engineers, Baltimore District)

PRESENTATIONS

The Models might not be accurate predictors - Identification and Assessment of Fish Nursery Habitats: Examples of Hypoxia Impacts from Delaware's Inland Bays
Kevin L. Stierhoff & Damian C. Brady, University of Delaware Graduate College of Marine Studies

Tools That Might Help - US Army Corps of Engineers Environmental Restoration Program Authorities
John Brady and William Mueller, US Army Engineers, Philadelphia District

Another Tool - Delaware's Invasive Species Council
Bruce Richards, Director Delaware Inland Bays)

How Can You Tell You're Done – A Case Study
Ken Smith, Maryland Department of Natural Resources

GROUP DISCUSSION SESSIONS

How do we evaluate restoration activities? (Moderator: Kent Mountford)

How do we measure successful attainment of restoration goals? (Moderator: Eric Buehl)

When should our measurements be made? (Moderator: Roman Jesien)

Summary of Breakout Sessions and Consensus Building (Moderator: Frank Reilly)

PRESENTATION SUMMARIES

The following pages contain abstracts, summaries, and handouts that some of the presenters provided. Due to the informality of a workshop like this one, the presenters were not required to submit an abstract, and many chose not to do so in order to allow freedom to make their presentations interactive. Please do not quote or use any of the materials found here without first having the courtesy to consult with the listed authors and obtain their permission.

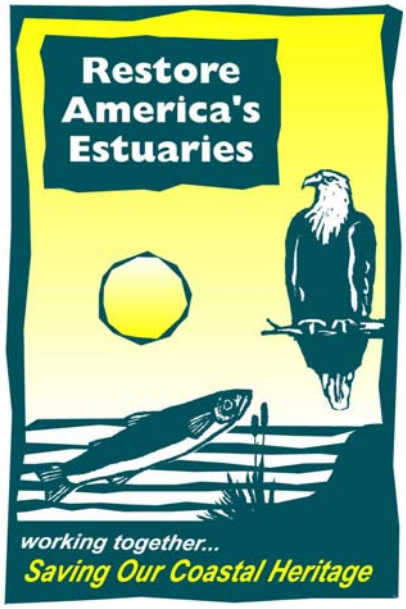
The Importance of Restoration and Restoration Planning

Steve Emmett-Mattox
Restore America's Estuaries

No place on earth more directly embodies the challenge of balancing human needs and the needs of other species than estuaries. By 2025, 75% of our population will live within 50 miles of the coast. We must learn how to develop our own habitat while also protecting and restoring the very essence of what binds us to the coasts. Estuaries nurture not only shellfish, fish, and wildlife, but also nourish the human spirit. We are from the sea, and we are continually lured back to its edge, reinforcing the kinship we share with this place as we sail, fish, swim, and relax near a glistening bay or a rocky shore.

Estuary habitat restoration planning guides our actions, increases our effectiveness, maximizes the use of limited resources, and motivates communities. On-the-ground habitat restoration projects are most effective when they are part of a larger planning effort that sets goals and priorities. Good planning involves stakeholders, educates community members, and builds long-term commitment to estuary protection and restoration.

Most regions of the country have not completed substantial coastal habitat restoration planning. In light of the Estuary Restoration Act, which requires funded restoration projects to be consistent with estuary restoration plans, planning should become a priority throughout the coastal United States.



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The Value Of Partnerships In Habitat Plan Development

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The development of a comprehensive habitat plan requires the skills and knowledge of a variety of individuals and the groups they represent. Without this broad representation, habitat plans may not offer the most practical or best solutions for restoration success. Partners involved in the planning process can bring more than just knowledge of a particular resource; they may have access to funding, historical data, or contact with other groups or associations that can assist in a variety of ways. But like wine or a marriage, partnerships can take time and work to be successful. A little preparation and commitment to communication with your partners can help ensure successful habitat planning.

What Resources Should We Protect? - MD Coastal Bays Sensitive Areas Initiative

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In 1999, the Maryland Coastal Bays Comprehensive Conservation Management Plan was completed. The plan included a Recreation and Navigation Goal to "Balance Resource Protection with Recreational Use." This goal stemmed from concerns that water-use activities, including boating and jet skiing, could have negative impacts on the aquatic resources in the coastal bays. The goal set three primary actions: (1) to identify sensitive resources, (2) to evaluate the risks from specific recreational activities, and (3) to develop appropriate management tools to mitigate those threats.

This presentation focuses on the efforts of the Sensitive Areas Technical Task Force. The task force worked to: (1) identify and describe sensitive aquatic resources in the coastal bays, (2) map the resources, (3) create a map of sensitive areas based on resource rankings, (4) identify gaps in information, and (5) evaluate the relationship between aquatic resources and water-based threats. The result is a draft Coastal Bays Sensitive Areas Report, which will be used to evaluate and develop management options.

Discussion will include how the resources were identified and mapped, including difficulties and gaps in the process. The goal is to provide an example of how this process can be done and to get feedback on the method. There will also be a brief

overview of how the information can be used in management decisions, including land-use planning, water use management and habitat restoration.

Some Strategic Considerations For Habitat Restoration And Preservation

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Ecological restoration is a general term applied to activities that attempt to preserve or restore critical ecological functions and services to a geographic area of land/water usually in reference to a watershed. Ecological restoration or preservation has many aspects: wetlands, riparian buffer, forests, etc. The term can be applied to any ecological resource that delivers services or functions. One characteristic that is frequently overlooked in restoration/preservation activities is time. The restoring or preserving of ecological functions and services often is a matter of decades.

The two most common types of ecological restoration and preservation are restoring forested riparian buffers and restoring wetlands.

Increased sediments, nutrients, and other contaminants in streams in the Mid-Atlantic region contribute to environmental problems ranging from stream degradation and blank instability to serious problems in downstream estuaries. **Restoring riparian areas** - the filters between terrestrial watersheds and aquatic ecosystems - represents a cost-effective, environmentally sound approach for reducing these contaminants loads. Additionally, riparian buffer areas are also important in reducing the risk of floods. Riparian buffers also provide other ecological functions important for environmental quality.

Wetland restoration also addresses many of the same issues. Wetland areas provide numerous ecological services including reducing flood risk, providing a rich habitat for many plants and animals, reducing sediment and nutrients, detoxifying contaminants, storing water, etc.

The goal of this short article is to outline some strategic considerations for ecological restoration and preservation and some thoughts on how to implement it in cooperation with Federal, State, Local and private organizations. It is vital to realize that an important step in this approach is to better understand how ecological resources, i.e. riparian buffers and wetlands function, particularly when placed at different locations in the watershed, develop predictive tools and provide design guidance that can be used to implement watershed management and protection programs.

Elements of Approach

Alliance Formation. Many organizations are interested in restoration and preservation activities. These parties should be invited to join into the activities, so that all can contribute. The group should include such diverse organizations as Federal, State, and Local agencies; corporations; and non-government environmental groups. This group will form the nucleus for future activities, including developing a strategy for restoration/preservation as well as selecting what type of activities will be undertaken.

Preparation of a **Restoration/Preservation Strategy**. A strategy needs to be prepared to indicate the scope and extent of activities. Important considerations include what type of restoration/preservation will be accomplished, and the identification of goals and objectives. After specific details have been established, the next step is to review published studies to determine what has been done in the past. Some consideration should be given to preparing an inventory of what ecological restoration/preservation activities have been conducted in the past, what activities are presently ongoing and their outcome.

Economic Considerations also are included in the strategy step. In addition to ecological functions and services, particular economic advantages may accrue to help defy the cost of the restoration/preservation activities. Past studies have neglected to appreciate these economic incentives, such as sale of hunting rights, production of tree nut crops, participation in Federal programs paying incentives for preserving /restoring certain types of property, etc.

Targeting/characterization paradigm should be developed to identify specific, high priority sites for intensive consideration. Past restoration efforts usually were performed at sites of convenience, that is, sites where owners volunteer land, etc. By using geographic information technologies, it is will be possible to consider a variety of environmental factors that will identify the areas where restoration or preservation will be the most beneficial.

Evaluation and **predictive tools** will be developed both for diagnosing problems and for predicting possible future conditions under different management activities. It is imperative that study sites be observed over long periods of time to insure that the restoration/preservation activities are having the desired effects. Because of this time frame, it would be important to mentor younger personnel in the study of these issues so they can continue the efforts over time.

Management guidance will be the final element in this process. It provides the information for environmental managers to use in future restoration/preservation activities. Integral in this element is the continuous evaluation of the performance of the restoration, and estimation of the economic benefits of restoration.

Buildout Around The Bay

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BUILDOUT: Rightful concern about sprawl development, and the land-use concept of "buildout" occupies manger and citizen in many jurisdictions throughout America. Using the Chesapeake watershed as example, there were a seried of "buildout" thresholds in history where the lanscape has been saturated with human uses, each level relies on importing energy and ideas to exploit (and usually degrade) the next level of ecological function. Will we be able to reverse this before we lose all the amenities our natural world provides?

Habitat Goals Could be a Moving Target – Sea-Level Change and Habitat Loss

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To protect the existing resource base, coastal wetlands are strictly regulated from losses that would otherwise occur from direct human disturbance. However, the coastal wetlands resource base is highly vulnerable to indirect losses in developed estuaries. Indirect losses occur as a consequence of a negative balance between the processes that cause coastal wetlands loss and the processes that would naturally create coastal wetlands. Losses continue to occur from the natural processes of shoreline erosion and drowning in place. The loss of landward migration space to development and restriction of ocean and estuarine shoreline dynamics by engineering measures limit formation of new coastal wetlands. Measures to ensure ongoing creation and maintenance of coastal wetlands need to be incorporated into regional policies if the management objective of maintaining the coastal wetlands resource base is to be achieved. Potential management measures to maintain the resource base should be applied as a function of coastal wetland landscape position, and include ensuring landward migration space, creating new intertidal substrate upon which coastal wetlands can be built, and maintaining existing intertidal substrate upon which coastal wetlands occur. Each measure will invariably produce environmental and social tradeoffs that require consideration in formulating strategies to maintain the coastal wetlands resource base.

Re-establishing Wetland Functions in the Estuarine Landscape: Balancing the Challenge of Invasive Species with Estuarine Wetland Connectivity

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A recent "model" of the interaction among estuarine habitats (including those invaded by *Phragmites australis*) in the support of fisheries production posits integrated subsystems linked by an overlying water column that mediates functional processes across subsystem boundaries. Nutrient and organic matter flux associated with the movements of animals, especially juvenile marine transients, was also recognized as an important vector transcending system boundaries. The question of whether specific habitats, including those dominated by *P. australis*, confer disproportionate survival advantage to young marine transients is still being rigorously debated. In our view, both the movements of animals and the flux of nutrients and organic matter by tidal action (including pulsed events) create an estuarine "bouillabaisse" that marine transients can access virtually throughout the estuary. On a landscape scale, some marine transients appear to treat estuaries as fine-grained and will readily utilize all habitats. Others including estuarine residents may be marsh obligates and treat the landscape as increasingly coarse-grained. The implications of these various life history strategies and scale influences on marine transients will be discussed in terms of *Phragmites* presence, trophic linkages, recruitment success and secondary production.

How to write a restoration plan – Introduction

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1. **Executive Summary**
2. **Habitat Restoration workgroup: Background, Purpose and Objectives**

The Habitat Restoration Plan is in response to the Estuary Restoration Act of 2000, title I of Pub.L. 106-457 which has four purposes:

- Promotion of estuary habitat restoration

- Development of a national strategy for creating and maintain effective estuary habitat restoration partnerships
- Provision of federal assistance for estuary habitat restoration projects
- Development and enhancement of monitoring and research capabilities to ensure that estuary habitat restoration efforts are based on sound scientific understanding and innovative technologies

The Habitat Strategy calls for restoration activities that improve degraded estuaries or estuarine habitat or those that create estuarine habitat with the goal of attaining a self sustaining system that is integrated in to the surrounding landscape

Habitats that are included in the Strategy consist of estuarine and freshwater habitats that form the complex physical and hydrologic features and living organisms within estuaries and their associated ecosystems

Estuarine habitats include salt and freshwater coastal marshes, coastal forested wetlands and other coastal wetlands, maritime forestests, coasatal grasslands , tidal flats natural shoreline areas, shellfish beds , seagrass meadows, and river stream corridors under tidal influence

Freshwater habitats that are estuarine associated ecosystems include: palustrine forested wetlands such as forested swamps or riparian zones; palustrine shrub wetlands and pluatine emergents including inland marshes and wet meadows

Section 104 (c) of the Act contains four required elements and seven selection factors to be considered by the Secretary of the Army when determining which projects to fund

The required Elements include

1. Contribution to meeting restoration needs identified in an estuary plan
2. Consistency with this strategy
3. Monitoring plan
4. Nonfederal sponsor has adequate authority and resources

Selection Factors include:

1. the participation in an approved Federal plan,
2. technical feasibility and Scientific merit,
3. Encouragement of increased cooperation among government agencies,
4. Fostering of public-private partnerships
5. Cost effectiveness and
6. Dedicated source of funding from state

2. **The goal of this Plan is to establish a framework on which to base the habitat restoration**,

Habitat Goals

Can be numeric or narrative ("fullest extent possible")

1. SAV – increase in acreage, indicator of water quality encompass nutrient levels, light attenuation, suspended solids
2. Measure of restoration would be viewed relative to changes to the following parameters (8 digit watershed, i.e., Assawoman Bay, is probably too large a scale for sensitivity to changes)

Landuse (percent of watershed/acreage) in Urban, Agriculture, Forest, Wetland, Barren
Percent impervious Surface
Population Density
Tidal Index of Biotic Integrity
Nontidal stream Index of Biotic Integrity
Monitored Nutrient concentration
Monitored Water Quality

The question when have we accomplished our goals depends on how and what we set as our goals

3. **Habitat Background information**
   a. Habitats of the coastal bays (from coastal bays website)
      SAV
         Locations/distribution acres
            What we know and what we need to know
         Habitat trends,
            In coastal bays 2134 a in 1986 increased to 6853 in 2000
      Barrier Islands/sand bars
      Lagoon/shallow open water
      Shellfish growing areas – oysters, clams
      Beach/dune – beach replenishment
      Sand/mud/salt flats
      Salt/brackish marsh
      Freshwater marsh
      Scrub/shrub
      Non-wetland forest
      Riparian/riverine
4. **Evaluation (screening) process, based on worksheet (Appendix)**
5. **Priority Restoration Projects**
6. **Priority Restoration Habitat (Types based on Sensitive Areas Workgroup)**
   A. Benthic Organisms (non-commercial)
   B. Intertidal
   C. Shellfish (Hard Clams and Scallops)
   D. Blue Crab
   E. Colonial Waterbirds
   F. Diamondback Terrapin
   G. Finfish
   H. Horseshoe Crabs
   I. Rare, Threatened and Endangered
      Rare species are defined by the unique habitats where they are found. In the Coastal Bays, unique habitats include
      a. coastal sandy beaches,

b. salt and brackish marshes,
c. fresh-tidal marshes,
d. alluvial hardwood forests,
e. pine flatwoods,
f. pine barrens/savannahs,
g. Delmarva bays (seasonal depressional freshwater nontidal wetland)
h. seepage slope herbaceous communities,
i. bogs and sea-level fens.

I. Shorebirds
J. Submerged Aquatic Vegetation - Seagrasses
K. Tidal Wetlands

7. **Special Topics: Eelgrass restoration**
   Summaries of restoration activities in the Coastal Bay and may contain research literature to indicate the extent of knowledge that is available. Development of Eelgrass Management Plan which will include discussion of the role of eelgrass in the coastal bays ecosystem as a primary producer, source of habitat for other organisms (ie., crabs, juvenile fish, forage organisms) importance in the detrital food web.
8. **Special Topics: Open marsh water management**
   Summaries of restoration activities in the Coastal Bay and may contain research literature to indicate the extent of knowledge that is available
9. **Special Topics Common reed - Phragmites**
   Summaries of restoration activities in the Coastal Bay and may contain research literature to indicate the extent of knowledge that is available
10. **Special Topics: Dead –end canals**
    Summaries of restoration activities in the Coastal Bay,
    may contain research literature to indicate the extent of knowledge that is available
10. **Special Topics: alternatives to shoreline hardening**
11. **Special topics: selecting and using reference sites**
12. **Special topics: volunteer-based projects**
13. **Potential sources of habitat restoration funding**
14. **Environmental protection fund awards for habitat restoration planning**
15. **Project tracking and data storage**

Appendix

Restoration Site Ranking Worksheet (From Peconic Estuary Program)

Ecological considerations	**100 points**
Logistical considerations	**100 points**
Public/Economic Benefit Considerations	**50 points**

Ecological considerations 100 points

LOST Habitat value (negative effects o f project)	-30
Endangered species (*project will negatively affect endangered species)*	-30
Threatened species	-20
Special concern Species	-1
Level of Degradation	30
Severe (*little to no ecological value at site for the habitat to be restored)*	30
Medium (*limited ecological function)*	15
Low (*some ecological function present, but habitat could be enhanced, i.e., ditched marshes)*	5
Historical Justification	8
Well documented (*evidence of habitat prior to disturbance)*	8
Some documentation (*anecdotal reports)*	4
No information	0
Proposed project size	10
0 – 3 acres	4
3 – 10 acres	5
10 – 50 acres	7
> 50 acres	10
Habitat contiguity/Adjacent land use	20
Complete contiguity with protected areas	20
Partial	15
Complete contiguity with undevel. areas	8
Partial continuity with undevel areas	4
No contiguous habitat	0
Unabated impacts from adj land use	-10
Target restoration functions (additive)	5
Nutrient retention (*proposed restoration will contribute to the function)*	1
Species diversity	1
Groundwater protection	1
Food chain support	1
Fish/wildlife corridor	1
Promotes habitat diversity in the landscape	6
Yes (*proposed restoration will increase or maintain habitat types that are being degraded or lost in the region)*	6
Provides benefits to state-listed species	16
Endangered species (*proposed restoration is required by endangered species*	16
Threatened species	12
Special concern species	8

In/adjacent to state or locally designated areas	5
Yes	5

Logistical considerations **100 points**

Ownership	18
Public	18
Private/acquired	12
Private/easement	12
Private/no protection	?
Relationship to larger planning efforts	10
Yes (*proposed restoration has been identified by local, regional, federal planning effort)*	10
Current state of planning	17
Permits obtained or pending	17
Planning completed	12
Planning underway (*no surveys of written plan have been accomplished)*	6
Funding process	10
Funding committed/leveraged	10
Some funding committed	5
Probability of success	25
Knowledge & technology high (*proposed restoration methods commonly undertaken and normally successful)*	25
Knowledge & technology medium	13
Knowledge & technology low	0
Community & user group support	5
Significant support (*at least one group, other than nominating group, has voiced support or endorsement)*	5
No opposition	0
Significant opposition (*strongly opposed by at least one group)*	-5
Post-restoration maintenance	15
No maintenance required	15
Minor maintenance required (*periodic during first 5 years)*	10
Major maintenance required (*regular, i.e., mowing, burning)*	0

Public/Economic Benefit Considerations **50 points**

Enhances public access & awareness (additive)	10
Enhances appropriate public access	5
Enhances public awareness of the resource (*specific provisions for education and public outreach)*	5

Enhances commercial & recreational uses	20
Historical, low impact uses (*proposed restoration helps t support resources which have been used in low impact way, i.e., small scale shellfishing, herring runs)*	20
New low impact uses (*kayaking, birding, hiking)*	15
Medium impact uses*(cumulative impacts of multiple uses)*	5
New, minor infrastructure required *(boardwalk, observation platform*	1
New, major infrastructure required *(parking lot, boat ram, bathrooms)*	-10

Benefit to recreational & commercial species	20
Direct benefit to 2 or more species	20
Direct benefit to 1 species	10
Indirect Benefit to any species of this type	2

Identification and Assessment of Fish Nursery Habitats: Examples of Hypoxia Impacts from Delaware's Inland Bays

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Identification, protection, and restoration of Essential Fish Habitat, or those habitats necessary for the spawning, breeding, feeding, or growth to maturity of fishes, is of high priority following the reauthorization of the Magnuson-Stevens Fishery Conservation and Management Act, through the Sustainable Fisheries Act of 1996. Estuaries are not only critical areas for growth and production of young fishes, but also habitats whose watersheds are subject to intense human activity including industry, agriculture and recreation. Thus, these habitats are often impacted by anthropogenic pollution and eutrophication. Delaware's Inland Bays are no exception. These shallow, poorly-flushed estuaries experience considerable N and P inputs that promote nuisance algal blooms, which in turn can cause hypoxia or a reduction in dissolved oxygen (DO). Field and laboratory research in our laboratory has focused on the describing the DO dynamics in Delaware's Inland Bays, and how DO dynamics impact the distribution, abundance, movements, growth and behavior of several species of regionally important fishes.

Results of our ongoing laboratory growth studies suggest that low DO ($\leq$ 3 mg O_2 l^{-1}, ~40% saturation) causes significant reductions in growth rate in several species tested. However, field and laboratory investigations on movement and avoidance behavior demonstrate that these fishes can detect and avoid areas of low DO when possible. Therefore, it is unclear if, and how, low DO affects these fishes in the wild. We are currently incorporating our laboratory and field data into a spatially explicit individual-based models to predict the effects of low DO on movements, growth and survival of two species; summer flounder (*Paralichthys dentatus*) and weakfish (*Cynoscion regalis*).

Furthermore, we will be measuring recent, *in situ,* growth rate and condition of these two species in relation to synoptically measured environmental parameters (i.e. temperature, salinity, DO) in the field. We will also be measuring how low DO conditions affect swimming performance (swimming speeds and costs) of these fishes. We anticipate that the results of these present studies will provide habitat and fisheries managers with more useful and powerful information to aid in the identification and protection of important nursery habitats.

Environmental Restoration Program

Improving Our Nation's Ecosystems

US Army Corps of Engineers

Philadelphia District

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Purpose

The objective of Section 1135 and 206 projects is the restoration of degraded ecosystem structure, function, and the resulting dynamic processes to provide a less degraded, more natural condition.

Authority and Scope

Section 1135(b) of the Water Resource Development Act of 1986, as amended, provides authority for the U.S. Army Corps of Engineers (Corps) to investigate, study, modify, and construct **project modifications for improvement of the environment**. This authority is applicable where degradation is attributable to water resource projects previously constructed, funded, or operated by the Corps. Project modifications are limited to a Federal cost of $5 million per project. It must be established that the restoration would result in improvements to the environment, which are significant, and in the general public interest. This authority extends only to projects constructed under normal Corps authorities and not include emergency operations.

Section 206 of the Water Resources Development Act of 1996 provides authority for the Corps to investigate, study, modify, and construct projects for **aquatic ecosystem restoration**. There is no connection to a previous Federal Project. The sponsor must also demonstrate that the project is cost effective and contributes to an improved environment that is in the general public interest. These projects are also limited to a Federal cost of $5 million per project.

How to Request Assistance

The Corps will initiate a preliminary investigation upon a written request for a study by a prospective non-Federal sponsor. During the preliminary investigation, an additional
letter from the potential sponsor must be provided to the Corps, which clearly identifies its

intent to provide the required local cooperation.

Process
The process begins with the preliminary investigation, which at Federal expense defines the scope of effort and determines Federal interest. This is followed by a combined single planning and design analysis for smaller projects or feasibility and design phases for projects over a $1 million Federal cost. The final step is hiring a contractor (using Federal contracting procedures), to be paid for by Federal funds and any non-federal sponsor's cash contribution.

Funding
Section 1135 – the sponsor is required to contribute a non-federal match of **25%** of the total project cost. The sponsor must contribute a minimum of **5%** of the non-federal match in **cash** while the remaining match can be met through in-kind service contributions.
Section 206 – the sponsor is required to contribute a non-federal match of **35%** of the total project cost. No minimum cash requirement exists. The entire non-federal match can be met through **in-kind service contributions** or through a combination of in-kind service and cash contributions.

Local Cooperation
The sponsor will be required to demonstrate financial capability to achieve the non-federal match and be willing to fund/perform all operations and maintenance activities associated with the restoration project. The sponsor is responsible for all lands, easements, rights of way, and relocations necessary for the construction of the project; however, these costs may be credited as an in-kind service contribution. The sponsor's in-kind services may also include a portion of the project design and construction efforts.

For More Information
Contact the U.S. Army Corps of Engineers, Wanamaker Building, 100 Penn Square East, Special Studies Section, Philadelphia, PA 19107, (215) 656-6580.

Another Tool - Delaware's Invasive Species Council

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The Delaware Invasive Species Council (DISC) has organized in order to examine the problem with invasive exotic species, and to begin to develop a plan for dealing with invasive species. Examples of comprehensive, statewide, invasive species management plans are few and far between. If you'd like to review an example, the only one readily

accessible is that from Florida, which you can find at http://www.dep.state.fl.us/lands/invaspec/2ndlevpgs/ISWG.htm (available only as a download of a large .pdf file). There is also the national plan, at http://www.invasivespecies.gov/council/nmp.shtml, which obviously has a somewhat different perspective than a state plan. Finally, there are many plans out there for aquatic invasives; a link to some of them can be found at http://www.anstaskforce.gov/mgtplans.htm.

Any Invasive Species Management Plan should have certain guiding principles. An effective management program for invasive alien species integrates prevention, eradication, control, and restoration measures; sets priority for action; and is routinely modified to reflect new information. Efforts to manage invasive alien species are most effective when focused on clearly defined, measurable goals; proactive; based on current biological and socioeconomic information; applied rapidly (even when "perfect" knowledge is lacking); benefit a diversity of stakeholders, and are integrated across all spatial and temporal scales. A comprehensive strategy for preventing the spread of invasive alien species addresses the intentional, unintentional, authorized, and unauthorized movement of organisms among and within states, as well as the establishment and spread of alien species as a result of environmental degradation. Policies that address the problem of invasive alien species will be most effective if they are comprehensive and consistent across taxonomic groups, as well as invasion pathways and modes.

Control methods should be socially, culturally, and ethically acceptable; efficient; nonpolluting; and should not adversely affect native flora and fauna, human health and well being, domestic animals, or crops. Inventory, monitoring, applied research, and the development of new management methods and technologies (including for prevention and exclusion) are fundamental components of an effective program for managing invasive alien species.

Everyone has a stake in the management of invasive alien species and therefore needs to be involved in efforts to address the problem; education and outreach needs are large and diverse. The risk of invasion can be significantly reduced if stakeholders work cooperatively to undertake applied, interdisciplinary research on the biology on invasions (including invasion pathways and modes); develop and apply cost-effective, practical methods and technologies to manage invasive alien species; and make this information easily accessible so that it is incorporated into management and policy decision making. In order to be effective, local, state and national goals and actions relevant to the management of invasive species need to be congruent, integrated, and mutually supportive. Education and outreach efforts will be most effective when they target the information needs of specific audiences, indicate that positive progress can be made, and recommend specific actions.

DISCUSSION SESSION SUMMARIES

The following are notes provided by Discussion Session Moderators and their note takers. They are provided to give a flavor of the discussions that took place at the Workshop. The Presentations and these Summaries were combined to produce the other product of this workshop. It is a companion Volume entitled, "*Producing Habitat Plans and Habitat Restoration Plans*"

Who should be involved / Who identifies areas for restoration? (Eric Buehl, Habitat Coordinator, Delaware Inland Bays)

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Question 1: Who Should be involved in making restoration decisions and choices?

Filters (find people to fit these descriptions)	Plus
Local Knowledge	Science Background
GIS skills	Implementers
Funding	Personalities (compatibility)
Commitment	Political considerations
Local Contacts	Power to stop/start the project
Design Capability	

Include as many as required to complete the above list of needed contributions to the project.
John Kennel related a story about a planning process in Delaware derailed at the last stages because a key player, in this case the transport oil industry, was not included in the process.
Woody Francis suggests being more inclusive in the beginning. Allow groups to remove themselves from the process, reducing the ability to object later on.
Rich Kutz suggests laying out the ground rules early in the process.
Reilly visits, says we are developing a blue print for writing a habitat plan. That is the outcome of this process/conference. We are deciding how to get the names, how to decide whom to include.
New problem statement: How to determine who should be involved.
Need a balance of the following people types:
Dreamer/Visionary
Communicator/Facilitator
Someone who knows the rules
Manager
Doer (multiple)
Implementers.

Woody Francis noted that changes in who represents a particular agency can wreak havoc with a process, if the new person is less supportive, or has a different agenda, than the original representative. Long-term, high level commitment is required from participating organizations. Also needed, a safety valve to extract non-contributing or disrupting participants from the process.

Question 2: How to determine who identifies areas for restoration.

1. Who's got the money (largest vested interest, deepest pockets)
2. Work is mandated by some law or program, and therefore there are few decisions to be made.
3. The convened group decides
4. Cost/Benefit analysis.
5. Practical Necessity.

How do we identify habitat for restoration or protection? (Kent Mountford, Estuarine Ecologist And Environmental Historian)

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As the Group expressed points:

Multiple starting points

- Take Opportunity Start with a short list of
  - Cooperators / available sites- fit them into plan
  - Does this give people sense of fait accompli?
  - Need to inventory what's there
  - how fit into landscape- on scale suitable to local action but,
  - connected to global
- Gap Analysis- since early 90s Federally Mandated arising out of USGS ideas
  - map information using GIS; what's protected; look for voids in speies or programs
  - This shows what IS; not necessarily what might be restored.
- From this try inventory of projects
- How do we get at restoration- Historical data into play
  - scale questions, general abundances; this isn't site specific
- You can use data, or even model it to get guidance.
- Overlay the Pressures or stressors; overlay the opportunities
  - for this, an overview provides a template
  - especially if earlier products exist; USE THEM

- *Be prepared to adaptively change your initial cuts.
- Watch WHICH: science, or the policy / politics or economics drives the process!
- Once lists from contributors come together, how do you set priorities?
    - We supported the priority process, but BE ADAPTIVE
    - Surveys can help, but can be driven by the choice of questions.
- You need to allow for change; the "Natural components too" at least you have to have the historical context / inventory / timeline to do this.
- The human perspective is hazardous - our biases tend to choose what we use/harvest
- Maybe use he food web to connect with useable resources so you can argue for the components we perceive, study or model a the bases. : i.e.: nutrient to fisheries.
- Validate the scientific community's expertise.
- Gap analysis says now's the time to select critical habitat types -represented adequately, so you don't miss the opportunity to set priority
- This was an excellent group, with some participation by each member.

I present this not in the order discussed but as the group ended up envisioning its application. I tried to get the group to follow the pattern of Roman Jesian's draft straw person, but the group wanted to follow its own course.
We worked on process, rather than specific elements of ecosystem and function. I present this product in eight points:

1. Use what's gone before -products already available from prior efforts and expertise "stand on the shoulders of others" to reach a new level. You don't have to invent everything.
2. Start also with the short list of cooperators-- this does risk the appearance of having outsiders think you've done a fait accompli, but...
3. Take what this group can produce as a straw man, subject it to...
4. Gap analysis as envisioned by USGS and later federally mandated since early 90s. This helps you determine the framework of what's out there; not necessarily what might be restored. You want to identify the voids, not just focus on those in areas of human bas, which leans towards the species we humans see or harvest, and are biased towards.
Gap analysis helps ensure critical habitat elements are adequately represented so they are included in the ...
5. Priority setting process, to assist which the group members suggested public input polls could be useful. --though these CAN be used to drive the process by selection of the questions.
6.There was some consensus to use an overlay process in priority setting, possibly including a food web approach, as well as some of the landscape and GIS mapping we saw in the morning sessions. This would include SCALE questions and necessarily invoke as much historical --even anecdotal-- data as possible. Models are a possibility here, exploring interconnections (an example: marsh-detritis-plankton-menhaden to predators. This was mentioned as a representative chain).
7. A strong point made was in selecting sites to seek out opportunities: funding synergy, available public program initiatives, popular support, willing landowners...

This is often the fastest way to get projects on the ground and producing measures that help satisfy GPRA. Such documentation helps later projects along.
8. Whatever approach used managers should be ready for-- and look for-- critical decision points (as suggested by Dr. Mark Luchenbach, earlier today) . Watch for changing natural conditions and environmental drivers. (It's useless for example to hand plant SAV when there are massive schools of cow nosed rays or mute swans about.)

As a bottom line in this discussion, always keep an eye on which element: Science, Economics, or the Policy / Politics mix is DRIVING the process. You'd better understand this or your project will be remembered for its mistakes.

How do we set restoration goals? (Chris Spaur, US Army Engineers, Baltimore District)

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How do we evaluate restoration activities? (Moderator: Kent Mountford)

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As the group recorded discussion points: (Thanks to Bruce Richards as recorder)

1. Start with targets to satisfy these groups:
    a. Public and interest groups-- communicate a sense of value.
    b. The funding source --did you do what you claimed, accountability, timeliness
    c. Scientific --function, quality, data record
2. Establish measurable criteria to chart success.
    a. Goals that are in the plan (Like acres of SAV)
    b. Flagship Species (like blue crabs)
    c. Secondary species (more fish)
3. Implement monitoring plan
4. Staged measures, short and long-term.
5. How do we evaluate restoration activities?

- Monitoring --criteria
- Reference site? Success measures
- Know what your end point is (begin with the end in mind)
- Relate set criteria to set goals
- Site Specific
- Biodiversity and Species Richness

6. Species in area, genetics, community
7. Evaluated in regional context
    - Public component: Satisfaction of users
8. "Buy-in of Jurisdictions"
    - Budget
    - Score the system against goals GPRA considerations.
    - How we evaluate Level of success
9. Scientific: rigorous measures
10. Public Consumption these measures are more forgiving
11. Accountability to the Funding organization
12. Flagship Species and species of value
13. Secondary benefits of project --permit a fallback position and product if the primary goal is less successful. You should anticipate them early in project.

SUMMARY BY MOUNTFORD ON BEHALF OF THE GROUP

1. Start with clear targets, which are directed at satisfying information requirements of the following three user groups:

a. The Public and related interest groups. This can assist with "buy in" by project neighbors or cognizant jurisdictions. Presentation of these can be more informal, forgiving and suitable for the media.

b. Your project's funding source (granting authority) .

c. Scientific evaluators (those concerned with elements like ecosystem function, data quality and integrity of the information base used to evaluate the project. These measures of success need to have more rigor than "a" above.

Note: The group had an extensive side discussion on biodiversity and species richness. Consensus was that species richness might be useful in many projects as a success measure; biodiversity was too diffuse to be easily quantified, because it properly involves intricate measures such as genetic variability and community measures that might be better looked at on a wider regional, rather than project specific scale..

2. Establish measurable criteria to chart success or measure progress towards it.

a. Focus on goals that are laid out in the original plan (Like acres of SAV, miles of buffer) Relating these to accomplishments in the project outcome is important.

b. Include "flagship species", those which use the habitat (like blue crabs and SAV), which will prosper as the program moves forward, or which are outright targets (oyster density on restored beds)

c. Document secondary objectives. Projects, like oyster reef creation, may involve initial settlement of the target species, but diseases independent of the project itself can cause die-off. Organizers should pre-plan to measure secondary functions of the structure as

refugia and habitat for other organisms, so that evaluators understand the habitat
created has utility for secondary purposes. Identify these early in the project.

3. Implement a monitoring plan: objectives of this should be pre-established clearly, and the measures chosen to assure the data will answer the questions posed.

a. Criteria should be set to meet the objectives. A reference site could be useful where appropriate. What you establish should be site specific where possible. Be mindful of the value of GPRA compatible measures of success.

b. The endpoint should be clearly identifiable: "begin with the end in mind"

c. Budget cannot be avoided, especially where protracted maturation of a restoration is likely. Be certain the resources are committed to do the full job needed.

How do we measure successful attainment of restoration goals? (Moderator: Eric Buehl)

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- Numeric Goal With Some Allowance/Variability:
  - Time
  - Spatial
  - Confidence Interval
  - Natural Variability
- Consider Multiple Frequencies And Intervals
- Site Specific Contributes To Watershed/Ecosystem Improvements
- Do Pluses Outweigh Minuses?
- Re-Evaluate Original Goals At The End
- Make Sure When Setting Goals That All Impacts Are Identified And Tracked For Re-Evaluation, Both Planned And Unplanned
- How Did Others Measure Success?
- Political And Economic Reality
- The Potential Value Or Ability Of Self-Sustainability Should Be Determined For Each Project

When should our measurements be made? (Moderator: Roman Jesien)

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There are many variables involved in determining the measurement of success. Funding groups may well specify a time to completion for example. Some activities such as approval of engineering drawings, or hiring of contractors can be clearly set. However, the environmental scale of the change MUST be taken into account when setting measurement intervals. For example the time to attain a goal of percent coverage in a grass-dominated marsh is much shorter than the same goal in a forested wetland. It is probably prudent to set interim measurement goals in order to satisfy habitat managers and funding sources that progress is being made. These interim measurements also allow for mid-course corrections.

Consensus Building (Moderator: Frank Reilly, The Reilly Group)

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I. What is the USE of this document?
- Funding
- Discretion
- Consistency
- Prioritization
- Measure success

Why is this document needed?
- Requirement
- Watershed/Ecosystems
- Ensure success
- Economic Engine
  - Tourism
  - Fisheries
- Aids Efficiency

II. Who is the audience for this document?
- Funding
- Public ?
- Plan Users
- Restorers

*The Plan does have to allow public input.

III. What parts are needed in this document?
- Introduction

Background
General Goals
e.g. Improve H2O quality.
Actions (Plans)
Methodology
Time Line
Measurements/Monitoring
USERS
Supporting/scientific justification rationale
Impacts
Eco & economic- no detail, just concept.
Alternatives
Priority Areas
Not as specific as location.
ID Resource/Study Area
Habitat Types
Sp. of interests
Historic habitat perspective: functional
Include how you evaluate proposed projects.
Option
Budget appendix
Living Document
No section or amending

IV. What should happen to this document?
No extra guidance
Send to NEPS, ANEP, HQ

Association of National Estuary Programs

"Advocating the protection and restoration of America's Bays and Estuaries."

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