NEW ENGLAND DISTRICT COMPENSATORY MITIGATION GUIDANCE

U.S. ARMY CORPS OF ENGINEERS
NEW ENGLAND DISTRICT
REGULATORY DIVISION

9-7-2016
Permittee-Responsible Mitigation: Wetland Creation

Key issues & challenges:
• High potential for failure / Poor performance
• Selection of suitable sites
• Long-term liability
• Costs / Financial Assurances
Permittee-Responsible Mitigation: Wetland Restoration

- Address what caused historic adverse impact
- Consider endpoint of restoration and if current & near future physiographic conditions will sustain the restored site
- Restore natural processes
Permittee-Responsible Mitigation: Wetland Enhancement

- Manipulation of physical, chemical, or biological characteristics
- Goal is to heighten, intensify, or improve a specific aquatic resource function
- May gain a selected aquatic resource function, but may also lead to a decline in another function(s) / value(s)
Mitigation Planning & Monitoring Pitfalls

- Inappropriate design for site conditions
- Incorrect depth, duration, timing for sustaining hydrology
- Changing hydrologic conditions
- Planting mortality
  - Plant selection (more than just shopping for natives!)
  - Proper genetic stock
  - Herbivory (insects and animals)
- Invasive species
- Sedimentation & Erosion control
Ecological Considerations for Mitigation monitoring and Selection of Performance Metrics

- Use of non-native vs. native genotypes
- Role of symbiosis in community development
- Lack of pristine reference sites
- Creation of novel habitats will likely have less benefit to native spp.
- Replacing Functions & Values or cover type may not address all ecological impacts
- Role / Importance of special habitat attributes
- Dispersal ability and gene flow
- Natural mortality rates
- Role of abiotic v. biotic factors
- Role & timing of disturbance factors
Five Empirical Factors Influencing Wetland Plant Communities

1) Hydrology (upland v. wetland)
2) Soil pH (acidic vs. basic)
3) Soil Texture (organic vs. mineral)
4) Salinity (freshwater vs. saline)
5) Photoperiod (sunny vs. shade)
How Many Combinations of these Five Factors with Opposing (Mutually Exclusive) Variables are there?

• If \( p \) = no. of variables, and \( n \) = no. of factors,
  then total no. of combinations = \( p^n \)

• 2 variables and 5 factors = \( 2^5 \) or 32 combinations

Question:
Does 32 combinations = 32 different plant communities?
Consider the variation that occurs along a continuum that influences plant ecology at the community level (zonation)
How many different natural wetland communities do occur in your state?

A) <15

B) >30

C) >60

D) >90?
<table>
<thead>
<tr>
<th>Variable</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Hydrology</td>
<td>Tidal vs. non-tidal; temporarily vs. permanently saturated; lotic vs.</td>
</tr>
<tr>
<td></td>
<td>lentic, etc.</td>
</tr>
<tr>
<td>2) pH</td>
<td>Basic, neutral, acidic</td>
</tr>
<tr>
<td>3) Soil Texture</td>
<td>Organic vs. mineral; clay, silt, sand, loam</td>
</tr>
<tr>
<td>4) Salinity</td>
<td>Saline, brackish, fresh</td>
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<tr>
<td>5) Photoperiod</td>
<td>Shade, partial shade, full sun</td>
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</table>
Adaptive Modes and Wetland Zonation

**Short Term Saturation**
- **Dense Graminoids**
  - Calamagrostis canadensis
  - Carex lacustris, Glyceria grandis

**Long Term Saturation**
- **Broad Leaved Rhizomatous**
  - Aster novae-angliae, Cichorium intybus
  - Eupatorium maculatum, E. purpureum
  - Solidago rugosa, S. graminifolia

**Draw Down Zone**
- **Aerophytic Perennials**
  - Alisma plantago-aquatica, Sagittaria latifolia
  - Scirpus americanus, S. validus, Sparganium
  - Typha, Iris pseudacorus, Acorus calamus

**Ordinary High Water**
- **Submerged Aquatics**
  - Ceratophyllum demersum
  - Potamogeton pectinatus
  - Vallisneria americana

**Ordinary Low Water**
- **Floating Leaved Aquatics**
  - Brasenia schreberi
  - Nuphar, Nymphaea

**Emergent Woody Plants**
- Cephalanthus occidentalis
- Salix discolor, S. purpurea

**Trees & Shrubs**
- Acer rubrum, Cornus stolonifera
- Fraxinus pennsylvanica

**Floating Stemmed Aquatics**
- Hydrilla verticillata
- Elodea canadensis

Source: Southern Tier Consulting
Fig. 2.

**INTERTIDAL ZONATION**

Balanoid-Thallophyte Biome

- **Sea Roach**
- **Little Gray Barnacle**
  - Ivory Barnacle
  - Rock Barnacle
- **lichens**
- **blue-green algae**
- **periwinkles**
- **green weeds**
- **Rock Barnacle**
- **Blue Mussel**
- **rockweeds**
- **Knotted Wrack**
- **Irish Moss**
- **Tufted Red Weed**

- **red wees hydroids sponges**
- **kelp and small red weeds**

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*Source: Gosner, 1978*
New England Wetmix (Wetland Seed Mix)


Source: [http://newp.com/catalog/seed-mixes/#wetland](http://newp.com/catalog/seed-mixes/#wetland)
Case Study: Lordship Pt, CT

Coastal Restoration at the former Remington Arms Gun Club
Site of Open House

Remington Arms Gun Club in Lordship is the site of an open house on September 23, to observe National Hunting and Fishing Day. The program will begin 9:00 a.m., and continue until 5:00 p.m.
Intertidal Lead Shot Remediation
Intertidal remediation resulted in loss of salt marsh. Subsequent replanting of cordgrass failed.
Goals of Restoration Activities

- **Coastal Estuarine Restoration**: Create a functional integrated coastal habitat
  1. Coastal woodland/shrubland
  2. Coastal grassland
  3. Coastal dune
  4. Fringe *Spartina* marsh
Coastal Erosion
Fringe
*Spartina*
Marsh at Milford Point
Dune Construction

Dec 2011

- Geotubes - underlying soft erosion control structures
- Beach Grass planting
Dune Installation

Jan 2012 to June 2012
“Hurricane” Sandy Oct 2012
Importance of **Spartina** Fringe Reefs
Fig. 4 Zonation of a composite Jamaican bank/barrier reef — cross section; coral colonies and vertical dimensions exaggerated.

Kaplan, 1982
Goal of Restoration Activities (re-visited)

- **Coastal Estuarine Restoration**: Create a Functional integrated coastal habitat
  1. Coastal woodland/shrubland
  2. Coastal grassland
  3. Coastal dune
  4. Fringe *Spartina* marsh
  5. Shellfish Reef
Goals of Restoration Activities (re-phased)

• Coastal Estuarine Restoration: Create a Functional integrated coastal habitat

  1. Shellfish Reef
  2. Fringe *Spartina* marsh
  3. Coastal dune
  4. Coastal grassland
  5. Coastal woodland/shrubland
EXISTING SHORELINE REINFORCEMENT
(FILTERMX FILTERSOX AND SAND SOCKS)

NOTES:
1. ELEVATIONS SHOWN HEREIN REFER TO THE NATIONAL GEODETIC VERTICAL DATUM OF 1988 (NGVD) IN FEET.
2. DEFINITION OF TERMS:
   A. CUL = COASTAL JURISDICTIONAL LIMIT (ANNUAL HIGH TIDE)
   B. MHW = MEAN HIGH WATER
   C. MLW = MEAN LOW WATER
3. INDIVIDUAL REEF BALL (PALETTE BALL) SPECIFICATIONS:
   A. 4' DIAMETER
   B. 3' HEIGHT
   C. 3,500 - 3,800 LBS.
   D. 4 SUPPORT PLINTHS
4. SUPPORT PLINTHS SHALL BE CONSTRUCTED TO A LENGTH CAPABLE OF PROVIDING ADEQUATE INTERFACE WITH THE REEF BALL STRUCTURE WHILE SHOWNING INSIGHT FROM FURTHER DEPTH INDICATIVE OF A COMPETENT SUBSTRATE. THE REEF BALL MATERIAL MINIMUM SETTLEMENT DEPTH INTO A COMPETENT SUBSTRATE SHALL BE 12 INCHES. SUPPORT PLINTHS SHALL BE HINCHIED WITH NAILS AS SPECIFIED BY THE MANUFACTURERS. MARRIAGE BETWEEN PLINTHS AND REEF BALL SHALL BE CONSTRUCTED AS SPECIFIED BY THE MANUFACTURERS.
5. BASED ON AVAILABLE SOIL INFORMATION, IT IS ASSUMED THERE IS A 3" DEEP LAYER OF SAND ON THE SURFACE WITH APPROXIMATELY 5 FEET OF WATER BELOW THE SAND. THESE DIMENSIONS SHALL BE FIELD VERIFIED AND ADJUSTMENTS TO THE REEF BALL SUPPORT PLINTHS SHALL BE MADE ACCORDINGLY.
6. REEF BALL BOTTOM ELEVATION WILL VARY, BUT AN AVERAGE ELEVATION OF +0.5 FEET WAS ASSUMED FOR CALCULATIONS AND ASSESSMENT PURPOSES.
7. THE PROTECTION LAYER SHALL CONSIST OF 3" TO 5" MIDNIGHT BLUE STONE THAT IS PLACED ALONG THE OFFSHORE FACE OF THE MOST SEAWARD ROW OF REEF BALLS. THIS PROTECTION LAYER SHALL BE 4" TO 6" THICK AND EXTENDS APPROXIMATELY 3 FEET FROM THE TOP OF THE REEF BALL BEARNA.
8. THIS FIGURE IS FOR PERMITTING PURPOSES ONLY; IT IS NOT TO BE USED FOR SETTING OR CONSTRUCTION PURPOSES.
Stratford Point *Spartina* Marsh Restoration – What Performance Metrics are Suitable?

Year One Monitoring results

• Habitat (Qualitative - General observations regarding plant community development), & Quantitative Measurements including:
  o Vegetation structure (percent cover, stem density, stem height)
  o Vegetation conditions

• Bathymetric Response
  o Erosion / accretion - measured using a Real Time Kinematic (RTK) survey system

• Wetland Acreage
  o Extent of tidal wetland vegetation coverage
Stratford Point Coastal Restoration Site

*Spartina* Coverage (Left) and Density (Right) at Planted and Reference Plots

Source: Sacred Heart University. ILF Interim As-Built and Y1 Monitoring Report – Stratford Pt. Living Shoreline (J. Mattei, 2018)
Stratford Point - Extended Reef Creation & *Spartina* re-planting

December 2016 - 4 Months Prior to Planting

September 2017 - 5 Months After Planting
Figure 8: Bathymetric Response (June 2017 to December 2017)
Stratford Point Coastal Restoration: An Ecosystem Approach

• Shoreline stabilization
• Habitat enhancement
• Sediment deposition from Housatonic River
• Nutrient sequestration
• Water filtration by plants/shellfish
Case Study No. 2:
New Dam Rd Wetland Compensation Site – Sanford, ME
New Dam Road Compensation Site – Sanford, ME
### New Dam Road Compensation Site – Sanford, ME

<table>
<thead>
<tr>
<th>Cover Type</th>
<th>Goal (acres)</th>
<th>2006 Results (acres)</th>
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<tbody>
<tr>
<td>PFO/PSS</td>
<td>16.91</td>
<td>Negligible</td>
</tr>
<tr>
<td>PEM</td>
<td>5.98</td>
<td>1-2</td>
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<tr>
<td>PAB</td>
<td>2.57</td>
<td>2-3</td>
</tr>
<tr>
<td>POW</td>
<td>0.46</td>
<td>20</td>
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Source: HNTB, 2017 Presentation to SWS – New England Chapter
Questions?