Regional Monitoring Design for Marsh Restoration and Modeling:

How can we best design monitoring across the region to assess effectiveness of restoration approaches and marsh resiliency?

- defining spatial and temporal scales
- defining decisions made at each scale
- what information we need at each scale for each decision
- defining thresholds and measures of success

Hurricane Sandy Tidal Marsh Resiliency Coordination Workshop USFWS Northeast Regional Office Hadley, Massachusetts December 8-9, 2014





FUNDAMENTAL OBJECTIVE: Persistent, healthy coastal systems, including species in them.





Sampling Universe:

- Hexagons
- NWI estuarine emergent marsh

Stratified by:

- Region
- State Lands
- Federal Lands (NPS & FWS)





Monitoring design – FWS Restoration sites

14 USFWS Refuges 85 Restoration project areas 356 Sample Points Selected (bird/veg)

Pre-restoration (2014) – bird/veg surveys

Pre/Post-restoration (2015/2016) – bird/veg surveys planned. Other metrics?? Incorporate additional project areas (FWS – EBF, NFWF, NPS)





2) Categorizing projects (geography, tidal range, estuary type, etc.)

Patch Attribute Data



13,332 Patches Defined

2) Categorizing projects (geography, tidal range, estuary type, etc.)

RESTORATION TECHNIQUE -

- 1. Thin Layer Deposition
- 2. Improving Hydrology
- 3. Living Shoreline
- 4. Invasive Species Control

Prime Hook NWR: Improving Hydrology



Eastern Neck NWR: Living Shoreline





Restoration Area

3) Defining Spatial Scales, decisions made at each scale, and the information necessary to make those decisions

What are the commonalities among projects?

Is there a common currency we can use to monitor responses to restoration techniques?

Local Scale = Restoration Site Questions

What is the initial condition?

What treatment is being applied?

What are the objectives of the restoration action?

What are the responses of metrics?



Restoration Techniques:

- 1. Thin Layer Deposition
- 2. Improving Hydrology
- 3. Living Shoreline
- 4. Invasive Species Control

Local Scale = Restoration Site Decisions

????

3) Defining Spatial Scales, decisions made at each scale, and the information necessary to make those decisions <u>Define Landscape Scale =</u>

Landscape Scale =

Questions =

Does local landscape context influence response to restoration action?



Landscape Scale =

Decisions =

????

Restoration Techniques:

- 1. Thin Layer Deposition
- 2. Improving Hydrology
- 3. Living Shoreline
- 4. Invasive Species Control

3) Defining Spatial Scales, decisions made at each scale, and the information necessary to make those decisions

Regional Scale

Questions =



Regional Scale

Decisions =

Restoration Techniques:

- 1. Thin Layer Deposition
- 2. Improving Hydrology
- 3. Living Shoreline
- 4. Invasive Species Control

See Spreadsheet Designed to Capture Groups Ideas......

End.



Fundamental∙ Objectives¤	Means · Objectives¤	Measurable-attributes¤	α
Environmental [.] Health¤	Restore natural tidal regime or hydrology¤	Tidal·range, duration, frequency¶ Salinity¤	a
	Restoreverticalaccretion¤	Positive change in marsh surface elevation [¤]	α
	Minimize contaminant levels ^x	Rate per acre chemical applied¤	α
	Improve·water·quality¤	Salinity¤	α
		Temperature⋅¤	α
Maintain-Biological [.] Diversity¤	Maintain⋅sustainable⋅populations⋅of⋅obligate⋅salt⋅ marsh⋅breeding⋅birds¤	Abundance.of.salt.marsh.breeding.birds.¤	a
	Maintain sustainable populations of wetland dependent migratory and wintering birds¤	Abundance of migratory/wintering birds¤	α
	Maintain·populations·of·natural·fish·communities¤	Fish·community·composition,·relative· abundance·by·species¤	α
	Maintain natural vegetation communities ¤	%·cover·by·species¤	α
	Minimize presence of invasive species ^a	Presence ·/ · absence · ¤	α
		%·cover·by·species¤	α
Biological [.] Integrity¤	Optimize primary production of native species ¤	%·cover·by·species¤	
	Maintain·invertebrate·communities¤	Abundance by taxon¤	α
			_







2) Categorizing projects (geography, tidal range, estuary type, etc.)

PATCH ID – unique ID for marsh patches. Patches were created by adding a 50m buffer to all NWI estuarine emergent marsh (NWI code: E2EM) polygons in the Northeast U.S. Patch buffers that intersected were considered the same patch.

GEOMORPHIC SETTING –

- Open Coast: Areas sheltered from waves and currents due to coastal topography or bathymetry.
- Back-barrier Lagoon Marsh: Occupies fill within transgressive back-barrier lagoons.
 - a. Back-barrier: Lagoonal side of a marine barrier.
 - b. Lagoonal fill: Occupies fill in a back-barrier lagoon.
 - c. Transgressive marsh: Transgressive marshes bordering uplands in a back-barrier lagoon.
- Estuarine Embayment: Shallow coastal embayments with some river discharge, frequently drowned river valleys.
 a. Saline fringe marsh: Transgressive marshes bordering uplands at the lower end of estuaries.
 b. Stream channel wetlands: Occupy estuarine/ alluvial channels rather than open coast.
- Estuarine Brackish Marshes: Located in vicinity of turbidity maxima zone.
 - a. Meander: Expansive marsh with meandering channels.
 - b. Fringing: Transgressive marshes bordering uplands.
 - c. Island: Island within estuarine channel.
- Tidal Fresh Marsh: Located above turbidity maxima zone; develop in drowned river valleys as filled with sediment.
- Nontidal Brackish Marsh: Transgressive marshes bordering uplands in estuaries with restricted tidal signal.





