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Living Shoreline Marine Contractor Training Workshop

Camden County College Blackwood Campus
Wednesday, June 10th
9:00 am -4:00 pm

9:30 Welcome and Introductions, Karen Duhring, Virginia Institute of Marine Science

Angela Padeletti welcomes the group.

Karen Duhring from the Virginia Institute of Marine Science (VIMS) at the College of William and Mary is the facilitator for the day. VIMS has been doing living shorelines work since the 1980s, and in 2006 organized a Living Shoreline Summit.

An initiative called the Living Shorelines Academy, funded by Restore America's Estuaries, is focused on making training available to a larger group of people. Michael Oates and Jeanne Coveret from 302 Stories are present to film a part of the day in support of this work.

9:45 State of the State, Steven Jacobus, NJ Dept. of Environmental Protection

NJ DEP began working on a permit for living shorelines in 2011, and looked to other states for ideas. The agency realized that, in order to truly make living shorelines work, it needed to make a commitment to long-term monitoring. Long-term monitoring would give the agency a better understanding of what would work and what wouldn't, and then that information could be fed back into the regulations.

Change was happening slowly, and then Superstorm Sandy hit. From Sandy, we learned that natural areas absorbed flood waters, dampened flood waves, and minimized damages to manmade structures. As a result, on June 17, 2013, NJ adopted the Emergency Coastal Zone Management and Permit Program Rules, revisions to coastal regulations to encourage and promote habitat creation, restoration, enhancement, and living shoreline activities. Following this, NJ DEP started a workgroup that was originally comprised of 6 people, but has expanded to about 40. The workgroup is trying to further develop the concept. NJ DEP has worked with Stevens Institute of Technology to create engineering design guidelines for living shorelines.

NJ DEP describes a living shoreline as "a shoreline management practice that addresses the loss of vegetated shorelines, beaches, and habitat in the littoral zone by providing for the protection, restoration or enhancement of these habitats. This is accomplished through the strategic placement of plants, stone, sand, or other structural and organic materials." The regulations now focus on habitat protection and creation. Previous to this, in NJ, regulations had been about avoiding damage to habitat, not about restoration. Now, the general permit has folded living shorelines into habitat restoration work.

Last year, the DEP formalized a wetlands program for the state. They're working to create a website that will inform residents about wetlands and living shoreline options in New Jersey.

Question: Where do we stand on the need for engineering certification for small projects (which might be costly).

Answer: Right now- if you're going to do it, you need a signed and sealed plan by a professional engineer.

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Question: has any of the work that the state has done in the past help you to understand where things can actually grow back? I know some homeowners are trying to mitigate using other land.

Answer: Yes, we do have a handle on going in and doing habitat restoration. We get into overlap area where, depending on size of project, is it habitat restoration or living shoreline? They're basically the same thing, but living shorelines are limited to littoral zone. Living Shorelines are stabilization for the habitat restoration. We do have a volume of knowledge based on what we've done and know where and what does and does not work. But there are areas we need to get more data. As far as habitat, it's not just getting the vegetation back, but we're also looking at fish habitat, SAV. We've just started, so we're learning.

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Question: If an engineering certification is necessary for projects, shouldn't ecological enhancement projects require some sort of an ecological certification, as well?

Answer: While you don't need any type of ecological certification for projects, we recognize that that's important. It's not in the regulations, but whether or not there is an ecologist onboard influences the process.

10:30 Shoreline Erosion: Problems and Approaches, Karen Duhring

Causes of shoreline erosion vary depending on geography and conditions. Erosion occurs on different parts of properties. Some erosion is good/natural. Erosion can be a source of sand for estuary beaches. It's also a source of sediment for marshes. But we're concerned about other types of erosion- when erosion threatens lucrative waterfront land, when infrastructure is at risk, and when it's causing pollution. We're increasingly concerned with interior marsh degradation (from increased nutrients and sea level rise). If there are flooding or erosion risks, we have to protect coastal development.

Typically, the approach to shoreline protection is that all erosion can be stabilized, and that stabilization can be achieved with structural solutions so long as it is necessary and impacts are minimized. Minimizing impacts normally refers to unavoidable impacts needed to be compensated through on-site, off-site, a mitigation bank, or an in-lieu fee.

Karen spoke about the different types of direct, secondary, and cumulative impacts of types of erosion prevention structures, including bulkheads, revetments, and general shoreline hardening. These types of

interventions create a number of issues, including interrupting natural habitat shifts, degrading water quality, fragmenting habitat, and contributing to stormwater runoff.

Living shorelines, which combat shoreline erosion, also help to continue the flow from the land to the water. Living shorelines are not a new idea. Vegetative stabilization for marsh edges has been going on since the 1970s. A well-established planted marsh can be an effective method of abating shoreline erosion. But offshore wave attenuation structures are sometimes necessary for planted marsh success. The idea behind living shoreline treatments is that nature-based features are supposed to dominate. Many coastal states now have active living shoreline programs due to concerns for shoreline hardening trends.

11:00 Break

11:20 Living Shoreline Definitions and Descriptions

What' the difference between habitation restoration and living shorelines?

Habitat restoration- primary purpose is to create and replace lost natural habitat for its intrinsic value. Human presence is minimal if not absent.

Living Shorelines- primary purpose is to solve a problem: reduce erosion risk, site remediation, beneficial use of dredged material. Human presence is normal.

Living shorelines for erosion protection are alternatives to bulkheads and revetments where erosion cannot be tolerated and some type of action is necessary. The point is to mimic or protect existing native habitats, both on shore and offshore.

There are many definitions of living shorelines. NJ has a definition for regulatory purposes. Maryland has a waiver process where you have to do a living shoreline unless you can prove it won't work. All definitions focus on solving a problem related to erosion.

There are two basic types of living shorelines: non-structural or bio-based (also known as a 'soft' approach), and hybrid approaches (engineered structures required to achieve desired level of protection. Necessary where wind-waves and boat wakes are too extreme for a softer approach). Karen spoke about different types of both non-structural and hybrid living shorelines.

Karen walked participants about characteristics, elements, and considerations and issues with each type of non-structural and hybrid living shoreline. Examples of structural living shorelines included: marsh toe revetments, living reefs (where oysters or mussels are used), marsh sills, and low profile bulkheads with planted marshes.

More information on different types of living shorelines can be found on the NOAA living shorelines website, the 2013 Mid-Atlantic Living Shorelines Summit, and the Partnership for the Delaware Estuary's website.

12:00 Lunch

12:30 Living Shoreline Example and Lessons Learned, *Danielle Kreeger, Partnership for the Delaware Estuary*

The Delaware Estuary is characterized by fringing coastal wetland habitats. Tidal wetlands provide an abundance of ecosystem services. They improve water quality, provide fish and wildlife habitat, help with flooding vulnerability, improve property values, attract ecotourism, are important for fisheries and shellfisheries, filter contaminants (including legacy pollutants), and capture carbon. Living shorelines are not just for erosion control- in some areas, they are important as a capping and containment opportunity.

One of the top goals for Delaware Estuary is to stem the loss of tidal wetlands. There are two major ways that the Estuary has been losing tidal wetland—through edge erosion, and through interior drowning. Of the tidal wetlands in the Delaware Estuary, roughly 90% are net eroding. Not many are net accreting.

PDE has been working on living shorelines with colleagues at the Rutgers Haskin Shellfish Research Laboratory since 2007. Recently, scientists in the region have seen a troubling pattern- people are using the wrong materials for living shorelines (subbing ribbed mussels for oysters where ribbed mussels can't live), and calling projects 'living shorelines' when they're not (like adding potted plants to bulkheads). Similarly, sometimes people mistake the purpose of living shorelines, and assume that installing a living shoreline is about restoring an area to its natural conditions. This is not the case. A living shoreline is an engineered design structure meant to achieve some goal that includes some type of ecological uplift.

In other regions, people installing living shorelines often integrate oysters in their designs. However, in the Delaware Estuary, oysters traditionally do not grow intertidally, because the winters are too cold. As a result, PDE and Rutgers decided to use a different species, ribbed mussels, instead. (Please note- the Delaware Estuary is beginning to see intertidal oysters because of climate change.)

Over the last year, PDE, with help from partners, has installed four living shorelines: in Money Island, NJ; on the Lewes Canal in DE; in the Indian River Inlet in DE; and at the mouth of the Mispillion River, in DE. PDE has conceptual designs for dozens of additional projects, waiting in the wings for good funding opportunities.

Recently, PDE revisited its original living shoreline sites—'failed' ones that were installed at the onset of its living shoreline program in 2007. Even though the coir logs had disappeared, the shell bags are still there, and seemed to allow for accretion to occur and vegetation to fill in, while nearby control sites have continued eroding rapidly. An unexpected challenge that's proved difficult is ice in winter—ice sheers away logs and degrades the installation. Ice issues can necessitate augmentation of a living shoreline site after it has melted away.

Lessons learned from installing living shorelines include:

- Every site is unique, tailor design to goals.
- Install in phases, can take 2 years.

- Site may look bad before it looks good.
- Allow for modifications, augmentation
- Expect to maintain a site like a garden. (This is a business opportunity- you can create a service agreement for maintenance.)
- Permitting is evolving, expect the unexpected.

For additional information on the plant-mussel tactic and other PDE living shoreline efforts, please visit http://delawareestuary.org/living-shorelines.

Question: How do you handle project planning around your windows of timing as it relates to the permit?

Answer: Since most of our projects are research projects, we have the ability to go two full years.

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Question: Instead of doing the castles, have you ever considered a sheet pile in sections- it's not so high so ice wouldn't rip it away.

Answer: Maryland Coastal Bays has done that as wave attenuation. If your goal is an oyster reef, that's not in play.

1:30 Survey and Design, *Amy Williams, Stevens Institute of Technology*

Stevens Institute of Technology worked with NJ DEP to create engineering guidelines for living shorelines. The objectives of the guidelines were to provide guidance to engineers and contractors, provide a common starting place to ensure consistency, and reduce the number of failures due to poor engineering and/or construction.

In order to create guidelines, Stevens looked at the components of living shoreline design—system parameters (like erosion history), ecological parameters (like soil type), hydrodynamic parameters (like wind waves), and terrestrial parameters (like shoreline slope)—and created a chart that indicates which approach is appropriate for which level of system parameter. Another chart recommends numbers for criteria.

The factors in the analysis of a given site include:

- System Parameters
    - Erosion History- how is the site eroding? Fast, slow? Where?
    - Sea Level Rise- local and average global sea level rise. Sea level rise is critical to understand in regards to where you're planting/what types of plants you're planting where.
    - Tide Range- high and low water levels impact where to put your plants.
- Hydrodynamic Parameters
    - Wind waves- fetch analysis and SMB analysis will inform this.

    - Wakes- difficult to discern from wind waves. May represent a force as large or larger than wind waves. Difficult to collect data because if people see you they slow down.
    - Currents- can uproot vegetation, transports ice and debris, scour.
    - Ice- known to be important, but not much data available. Been noticing impacts of ice on project sites.
    - Storm surge- surge can be less important because water overtops the structure. Can flood structure. Depends on the structure you have and how high the storm surge is.
- Terrestrial parameters.
    - Upland slope- measured from approximately spring high water to a point at which upland levels off
    - Shoreline (or intertidal) slope- important for marsh/beach development
    - Width
    - Nearshore slope- influences nearshore waves and currents, influence depth at structure, stable platform required for structure
    - Offshore depth- influences nearshore waves, influences size of structure and amount of fill
    - Soil bearing capacity- must be sufficient to resist settling. (Go out and walk on the site, see how far you sink.)
- Ecological Parameters
    - Water quality- impacts growing conditions for both flora and fauna. Dissolved oxygen (produced by photosynthesis, consumed during respiration), varies seasonally, daily, tidally, and with depth.
    - Soil Type- match what's naturally there.
    - Sunlight exposure- this impacts water quality, and is required for terrestrial vegetation.
- Additional Considerations
    - End effects
    - Width/Space: need ~30 feet to let the marsh naturally grow.
    - Constructability: how do you get the materials you need to the site?
    - Native/invasive: Phragmites australis. Over time it changes the structure and tidal flows of the marsh.
    - Debris impact
    - Monitoring: need to try to build monitoring into budgets.

The parameters are now finalized, and NJ DEP now is working to add these to the website.

2:15 Living Shorelines and Permitting

Steve Jacobus, NJ DEP

The General Permit (GP) was modified to address the fact that the rules, as written, prevented habitat creation. Living shorelines are defined in such a way that they are linked with habitat restoration in the rules.

Steve strongly encouraged participants to speak with permitting before submitting a project. That way, everyone can get on the same page, and an appropriate sponsor can be found.

Under the old regulations, 'protecting a special area' meant that you did not touch it. Under the new regulation, the department may approve a reduction in the size of a special area in order for the permitted project to disturb part of the area if, in the long run, it can be proven that there will be environmental benefit in the final product. If the proposed project does not meet the requirements of the General Permit, a CAFRA or Waterfront Development Individual permit and/or a Coastal Wetlands permit will be required. Individual permits are much more involved than the GP.

Looking forward, the hope is that lessons learned will be rolled back into coastal policy and regulation. The entire rule doesn't have to change—there can be some spot changes. Policy will trump written rules. Regulatory groups will do what they can to stretch their interpretations to let good projects in, but there's a limit to what they can do.

> *Question*: In the urban core, there is already lots of fill in protected areas. Is it still considered 'fill' if you manipulate the positioning of existing fill to better allow for natural sediment trapping?
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> *Answer*: if you're moving it around, it's still fill. Also, if you're moving it around and disturbing the sediment, that could also release contaminants.
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> *Question*: Are there any rules against moving around ribbed mussels?
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> *Answer*: For the PDE work, the ribbed mussels were all in the immediate area. You don't want to move mussels around across sub-watersheds. If you're operating within the same area, you're ok. Wouldn't hurt to ask for a particular process.

2:45 Jim Boyer, USACE

The US Army Corps of Engineers (USACE) is involved in permitting activities in tidal areas and coastal areas immediately adjacent to coastal wetlands. In tidal areas, USACE jurisdiction is up to the mean high water line.

Nationwide Permits are a type of general permit, and they are an alternative to the USACE individual permitting process. There are about 50 nationwide permits (NWP) in total. Pre-construction notification (PCN) means that a given project needs a written response in order to proceed. Types of Nationwide Permits that contractors interested in living shorelines may be interested in:

- Nationwide Permit 3: Maintenance, focus on storm reconstruction, adding new riprap to protect structures.
- Nationwide Permit 13: Bank stabilization, cannot be granted for wetlands, and cannot impair flow.
- Nationwide Permit 18: small amounts of fill permitted.
- Nationwide Permit 27: what most people need when they come in for a living shoreline permit. This includes removal of sediments, water control structures, current deflectors, riffle/pool structures, habitat structures, and habitat restoration.

The best advice for a good permitting process is to be clear in your goals when you apply. USACE does not have a specific living shoreline permit. NJ does not have a joint permit process.

3:00 Contractor Experiences with Living Shorelines

Bethany Bearmore, Louis Berger

During her time with NOAA, Bethany worked on the New Jersey Living Shoreline initiative. Now she is a consultant with Louis Berger.

Bethany walked the group through the process through which a consultant is contacted by an entity to create a living shoreline through to its design and permitting.

Case Studies:

- South Valley Stream
- Dutch Kills
- Hoffman Park Stream Restoration

Doug Janiec, Sovereign Consulting, Inc.

Doug began by showing the group the impact of Superstorm Sandy on two different types of systems—an engineered one (Mantoloking, NJ) and a more natural system (Little Egg Inlet, NJ). The more natural system was more resilient.

Before installing anything, it is important to understand wave energy. Wave energy cannot be destroyed. However, it can be changed, moved, or stored. Wave attenuation can take focused energy (from waves) and break it up into smaller units. It can also create a destructive environment so that wave energies become out-of-phase.

Doug showed the group how wave energy changes depending on system design through conceptual cross sections.

Case Studies:

- DELSI Hybrid at the Mispillion Lighthouse, DE
- Cupped Wave Spreader at the Loop Canal, Bethany Beach, DE

- Tidal Vegetated Mud Sill at the Marshyhope Creek in Federalsburg, MD
- Passive accretion at Cape Charles, VA

Types of wave attenuating products include:

- Oyster Castles- for low to moderate wave energy
- Wayfarers- for low to moderate wave energy
- Wave Attenuating Devices (WADs)- for moderate to high wave energy

Question: Do the structures ever get buried by sand?

Answer: No, they are baffles in the design, and the project was designed to self-cleanse. So far, they have made it through every storm and none of them have been buried.

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Question: I'm curious about fish use in the area when you have the WADs. Can the fish get behind there? Has there been any pre- or post- monitoring of fish?

Answer: The WADs function as reefs and are set a foot apart. There has not been pre- or post-monitoring of fish at most of these sites. In the gulf, though, studies have shown that biomass is 30% higher with these. With PDE's coir log installations there has been pre- and post-monitoring. The hope is that with time there will be more emphasis on before and after and monitoring.

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Question: what should we be monitoring for?

Answer: Depends on the project and the project goals. New monitoring framework is currently being built for both New Jersey and Delaware. PDE has resources on its website. To determine what to monitor, think about project goals. Then consider financial ability. Then consider regional goals. Monitoring will be a concern for nonprofits and state and federal agency staff to figure out/get money for—this will not be built into the cost for the homeowner.

3:40 Discussion and Final Thoughts

Karen provided a synopsis of the workshop, saying that ecological uplift is the unifying thought of the day, across all definitions of living shorelines. Ecological uplift doesn't have to be directly vegetation-related- you don't just have to plant grass. A change in the physical environment can provide that ecological uplift.

4:00 Adjourn