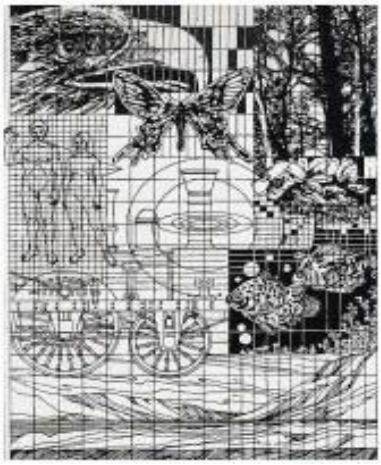


Environmental Consulting
INSIGHTS

Stream Bank Stabilization and Shoreline Protection

"Green Shorelines" Get an A+

(printer friendly version uses Acrobat Reader)

An Electronic Newsletter of EEA's Environmental Consulting Activities
Winter 2007

EEA, Inc.
55 Hilton Avenue,
Garden City, New York 11530

(516) 746-4400, (212) 227-3200
(800) 459-5533
additional New York offices:
Stony Brook
(631) 751-4600
Altamont
(518) 861-8586
Asheville, NC
(828) 777-0610

e-mail addresses:
General:
mailto:eea@eeaconsultants.com

Individual:
First initial and last name
@eeaconsultants.com

EEA services include Phase I ESAs, Haz-Mat Testing and Remediation, Wetlands Delineation and Creation, Natural Resources Inventories, Marine Ecology Studies, Air Quality and Noise studies, and Environmental Management System (ISO 14000) implementation.

***Visit our web site** at*
http://www.eeaconsultants.com/

With growing concerns about increasing human population, the constant rising of sea level and associated wetland losses, and the future of fresh water supplies, protecting our waterways and water resources has never been more critical. The importance of the natural processes and the natural functions performed along the banks and shorelines of streams, ponds and oceans can not be underestimated.

Recently more and more professionals and government agencies are acknowledging the relationship between human actions and the natural system and the benefits of integrating new policies and design approaches which seek to conserve and protect the environment and its natural resources. This enriches mans' experience of the built environment, increasing the ecological value of the place as a habitat as well as the visual quality associated with the place and its surroundings. Although government agencies, such as the New York State Department of Environmental Conservation (NYSDEC), NYS Department of State (NYSDOS), US Fish & Wildlife Service (USF&WS) and US Army Corps of Engineers (USACE) typically can not dictate what measures are to be used for a specific project, they are supportive advocates when it comes to solutions which conserve and protect the local natural resources.

The Natural Process

Erosion along streambanks and shorelines are a natural process when water regularly interacts with the base of the bank. Wave activity, wind and natural precipitation initiate a process of erosion along streambanks and shorelines. Streams naturally erode their banks along the outer toe of a meander bend while depositing sediment along the inner meander bend, forming point bars. As more impervious surfaces are created in watersheds, the flow regime changes, routing more runoff to streams and less into the ground. The result is an increase in stream velocity and energy and a subsequent increase in streambank erosion.

The shorefront fringe and its adjacent wetlands represent one of earth's natural ways of protecting its own resources and benefiting from natural erosion and sedimentation. The freshwater wetland and tidal marsh fringe along the shorefront perform many important functions including nutrient and organic matter production and transport, nutrient and contaminant removal, reduction of wave energy during storms, flood water storage, and sediment trapping. Salt marsh areas also provide critical habitat for the

larval and juvenile stages of many fish and invertebrate species, and are used for spawning by adults of these species. Both freshwater and salt marshes are important feeding and nesting grounds for many birds and other vertebrate species.

For information or quotes, contact:

Phase I ESAs
Richard Fasciani

Phase II/III Haz-Mat Testing and Remediation
Nicholas Recchia, VP, CPG

Dredge Management Testing
Jeffrey Shelkey

EAS/EIS Studies
Janet Collura, CWS

Wetlands Studies and Design
Laura Schwanof, RLA

Marine Ecology
Michelle Nannen

Terrestrial Ecology
Denise Harrington, AICP

Air Quality and Noise
Victor Fahrer, P.E.

Environmental Management Systms (ISO 14000)
Robert Clifford

Director of Strategic Planning
James McAleer

Director of Business Development
Brian Duggan, JD

EEA, Inc. –
Founded in 1979

Principals

Leland M. Hairr, Ph.D.
President

Allen Serper, M.S., P.E.
Vice President

Roy R. Stoecker, Ph.D.
Vice President

Fresh Kills Landfill Restoration

Human Actions

Human actions, policies and perceptions, such as the need for hygiene, irrigation, sewer systems and stormwater discharges; construction and development; recreational and commercial boating, to name just a few, intentionally or un-intentionally, accelerate the degradation of the worlds water resources. Protecting and restoring our resources, allowing the natural processes to work for us, can be beneficial to the publics' health and needs as well as the health of the natural environment. Aesthetics, recreation, public education, and commercial benefits are only some of the potential values derived from restoration activities and are important in garnering initial and possible long term public and political support for any project.

The Natural Approach

The 'natural approach' to streambank and shoreline protection is part of a growing trend in which designers and other professionals seek to restore the hydrological and ecological balance to a site by applying innovative integrated solutions that are structurally sound, economical feasible and ecologically sustainable.

There are two main forces at work which affect the deterioration of a shoreline, the force of the water against a streambank or a shoreline and the resilience of the shoreline to external impacts - natural or not. In order to restore and achieve a sustainable solution both forces must be recognized as one system.

Restoration and Protection

Streambank and shoreline protective measures can be grouped into three main categories and are often used in combination to achieve maximum effectiveness (US Army Corps of Engineers, 1981)

1. Vegetative plantings - Vegetative measures for shoreline stabilization generally include installation of adapted plants or seed mixtures applied alone on shallow slopes, flatter than 3 foot horizontal to 1 foot vertical.

2. Soil bioengineering - Applied on steeper slopes, plants are typically used in conjunction with soil bioengineering systems or other means of soil erosion control. Soil bioengineering is a system that utilizes living plant materials as structural components. Under this technique, adapted types of woody vegetation are installed in specified configurations that offer immediate soil protection and reinforcement. Additionally, soil bioengineering systems create resistance to sliding or shear displacement as they develop fibrous root systems (USDA Natural Resources Conservation Service, 1996).

3. Structural measures - Traditional structural measures such as stone revetments, wooden or steel bulkheads and concrete sea walls may be viable options or the only solution along very exposed high energy shorelines. Structural methods of shoreline protection are the least encouraged options. An order of preference has been promulgated by regulatory agencies, listing vertical structures such as bulkheads as the least preferred method of shoreline protection.

According to the NYSDEC, the presence of bulkheads initiates a cycle where toe scour causes a deepening of the water directly in front of the bulkhead; wave heights and flooding may increase; and wetland areas that would naturally attenuate wave energy and store flood waters are eroded away.

Structural measures that integrate new erosion control technology together with vegetated measures are often preferred. In fact, the NYSDEC now has requirements for dock width and placement in inter-tidal marshes, flats, and adjacent areas. Careful consideration must be given in the selection of innovative measures and products versus more conventional treatments.

Practice selection, design, sizing and installation are site specific and priority should be given to measures that will restore the hydrologic and ecological balance as well as to ensure longevity and diversity along streambanks and shorelines.

Vegetative Plantings

A good example of the use of vegetation alone for tidal wetland restoration is the successful Hempstead Harbor Cove

Project in Port Washington, Long Island. This project included site cleanup, development and implementation of restoration plans for a 5-acre tidal cove located on the south side of the Town of North Hempstead's Bar Beach Park. The overall plan designed by EEA *Inc.* called for the removal of the existing layer of rock, rubble and assorted debris. In order to reintroduce a viable and sustainable tidal regime, the rubble debris and *Phragmites* rhizomes were excavated and a layer of clean topsoil was applied and graded carefully, providing a favorable planting medium. Native vegetation introduced to the area was carefully selected to achieve maximum diversity, longevity and overall success.

This project is also a good example of how policies, in addition to a joint effort of the government agencies, the local community and the design professionals all worked to restore a healthier and aesthetically pleasing environment. This restoration was accomplished as off-site mitigation for a required cleanup of the Shore Realty Superfund Site located on the opposite shoreline of Hempstead Harbor. The project was partially funded through a NOAA/NMFS (National Oceanic & Atmospheric Administration/National Marine Fisheries Service) community assistance grant, with in-kind support from the Town of North Hempstead. EEA *Inc.* designed and prepared the site plans, obtained the wetland permits, then conducted construction inspection, and assisted with on-site training and overseeing the volunteers through the completion of the planting phase. EEA *Inc.* is currently involved in the long-term monitoring for this project.

Soil Bioengineering


PLANTING PHASE

Most recently installed and completed was a wetland creation at Fresh Kills Landfill for New York City Department of Sanitation (DSNY)**.** Soil bio-engineering was applied here as a part of a mitigation process. The project site is adjacent to a new truck-to-rail facility that has been constructed north of Little Fresh Kill and Fresh Kills Creek within the Fresh Kills Landfill. This represented a significant mitigation ratio for anticipated losses associated with construction of a proposed railway crossing and installation of storm water filtration devices.

The project itself entailed removal of approximately 10 feet of mixed refuse from the landfill shoreline and the creation of a 3.1-acre tidal wetland with maritime shrub and grassland plantings in the adjacent area. Specially blended organic granular soil was placed and graded according to specifications in the areas to be restored. Coconut fiber logs were placed along the newly constructed shorelines to minimize the natural bank erosion expected from the anticipated tidal fluctuation. Heavy duty degradable erosion control blankets, also known as geo-textiles, were place on steeper slopes to help stabilize the slope, protecting seeds and soil in place while allowing for the new vegetation to establish. Waterfowl exclusion fences were also installed to allow for the salt marsh vegetation to establish.

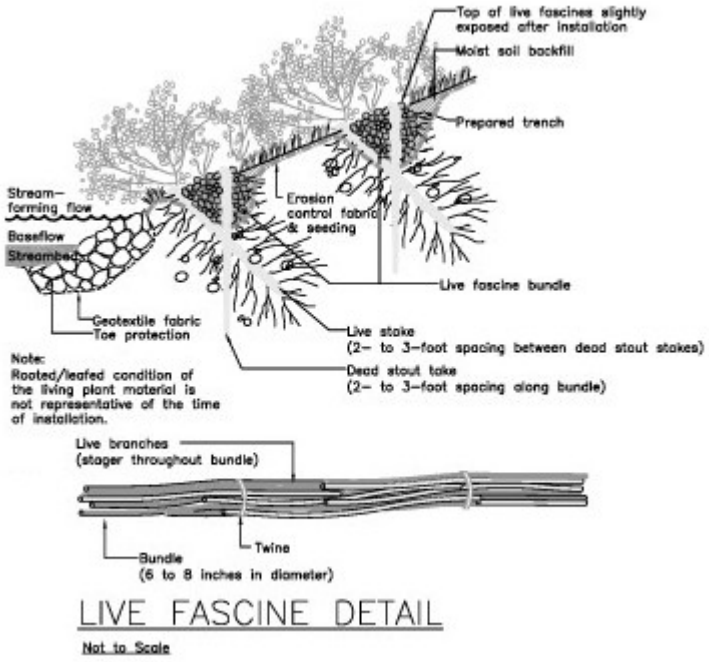
EEA *Inc.* provided the site plans as well as oversight of the wetland planting for DSNY as a technical sub-consultant to HDR Engineering. Typically tidal wetland permits granted by the NYSDEC require an additional 5-year monitoring period. Due to the initial success of the project, the agency has unofficially reduced the length of monitoring time requirements.

The Tidal Cove Brushmattress Installation at Spy Coast Farm in Setauket, NY was another form of applied bioengineering, which replaced a more traditional structural approach using stone revetment. This innovative "green shoreline" solution was embraced by NYSDEC as a natural alternative.


INSTALLATION


3 MONTHS LATER

to conventional shoreline hardening structures. While this bioengineering technique is typically applied in fresh-water riverine settings, it was adapted to suit the tidal cove conditions at this project site. EEA *Inc.* designed and assisted with the installation of the brushmattress to stabilize the bluff face of the tidal cove. A mixture of dormant, live willow stakes were bundled into **fascines** at the toe of the bank and also staked onto the bluff face. Sapling salt shrubs were installed through the brushmattress at the lowest elevation on the bank that is subject to periodic tidal inundation. A specially blended salt-tolerant seed mixture was applied to the bluff face and native maritime shrubs were planted through and above the spring tide zone to naturalize and blend the treated slope into the adjacent native plant communities and wetland areas.



Source: USDA Natural Resource Conservation Service. 1996. Streambank and Shoreline Protection (Chapter 16– Engineering Field Handbook). 210-vi-EFH.

Structural measures are unavoidable in certain cases, however, designers

are now using new technology integrated with vegetated measures to create ecologically viable, safe and sound, engineered solutions. A good example of this approach was a project designed by EEA *Inc*. on Staten Island, in which they first conducted a feasibility determination for relocating a 1500-foot section of a tidal creek, Purdy Creek, receiving waters from a nearby pond, Wolf Pond. Purdy Creek Wetlands Creation and Stream Relocation

Project included plans to upgrade the sanitary sewer lines in the area and accommodate the development of a new gated residential community on the waterfront. NYCDEP and NYSDEC approved the Stream Relocation Plan. The EEA wetland team completed the planting design and specifications, and conducted periodic inspections during installation to meet agency performance criteria requirements. The original design included gabion baskets and coir palettes to help stabilize the steep walls of the creek. During the construction process a field decision was made to replace the gabion baskets with geogrid covered by the coir palettes. EEA performed this work as an ecological sub-consultant to AKRF. This project cleaned up hazardous materials within the creek, improved water quality, enhanced wetland habitat, and provided project mitigation.

Additional Internet Links of Interest:

Shoreline Stabilization Guidelines

NOAA Office of Ocean and Coastal Resource Management : Shoreline Management Resources

Living Shorelines

02/14/07