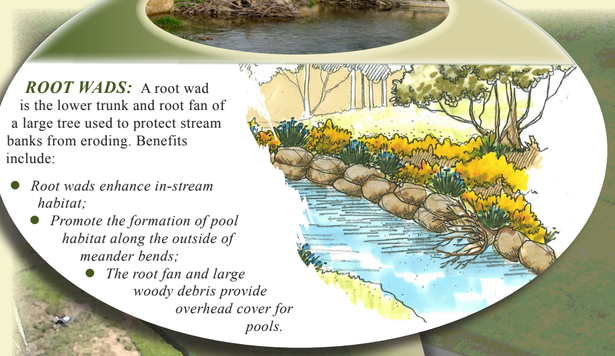
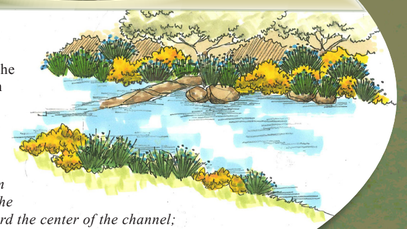
Stream and Wetland Restoration in Delaware



ROOT WADS: A root wad is the lower trunk and root fan of a large tree used to protect stream banks from eroding. Benefits include:

- *Root wads enhance in-stream habitat;*
- *Promote the formation of pool habitat along the outside of meander bends;*
- *The root fan and large woody debris provide overhead cover for pools.*

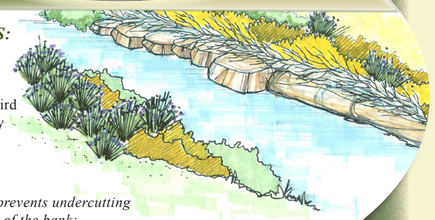


LOG OR ROCK VANES: Vanes are linear, single-arm structures that extend out from the stream bank into the stream in an upstream directions that remain partially submerged even during low flows. Benefits include:

- *Vanes are used to reduce erosion along the stream bank by redirecting the stream flow toward the center of the channel;*
- *Vanes enhance the habitat through the creation of downstream scour pools.*

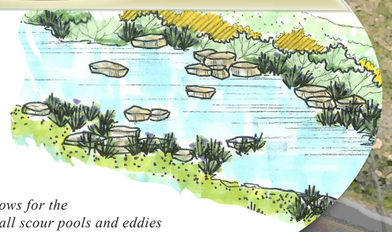
ROCK GRADE CONTROL: A rock sill is constructed perpendicular to the stream flow to prevent down-cutting and maintain a desired streambed elevation. Benefits include:

- *Grade controls create a "hardpoint" along the channel preventing the streambed from degrading below the top elevation of the structure.*



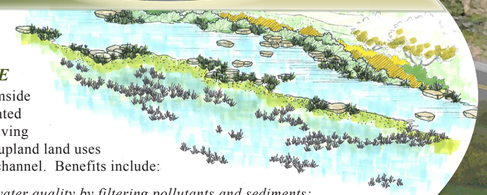
LOG & ROCK TOES: Toe protection consists of a series of logs and/or rocks placed at the toe of a stream bank. The lowest third of the stream bank typically experiences the highest erosive forces. Benefits include:

- *Toe protection prevents undercutting and erosion of the bank;*
- *Erosion reduction enhances habitat and water quality by reducing influx of sediments into the stream.*



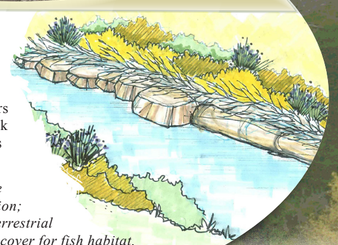
RANDOM BOULDER PLACEMENT: Boulders are placed singly or in clusters in a random pattern throughout the stream channel. Benefits include:

- *Boulders promote riffles and pools to improve habitat for aquatic life and provide in-stream habitat cover;*
- *Boulder placement allows for the development of small scour pools and eddies which can be used as spawning areas for fish.*



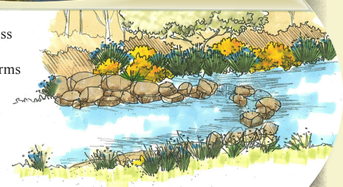
FRINGE WETLANDS & VEGETATIVE BUFFER: Streamside wetlands and vegetated buffers provide a living cushion between upland land uses and the stream channel. Benefits include:

- *Protect water quality by filtering pollutants and sediments;*
- *Capture sediment, keep native soils intact, provide habitat;*
- *Contribute to ground-water recharge;*
- *Preserve the floodplain.*



LIVE BRANCH LAYERING: A mattress of live but dormant woody riparian vegetation consisting of willow, alder, or dogwood branch cutting is transplanted between layers of compacted soil to provide long-term bank stabilization and erosion control. Benefits include:

- *Live branch layering promotes the propagation of natural vegetation;*
- *Provides shade, detritus, terrestrial insects, and overhead cover for fish habitat.*



ROCK CROSS VANE: A rock cross vane consists of a rock sill constructed perpendicular to the stream flow. Two arms of the sill extend downstream along the banks, rising in elevation to the bank-full height. Benefits include:

- *Rock cross vanes provide grade control to prevent down-cutting and redirect stream-flow energy toward the center of the channel;*
- *Cross vanes promote pool formation downstream and the narrowing/deepening of the base-flow channel.*

Wetland Restoration in Marginal Agricultural Fields

Agricultural operations throughout the State of Delaware are performed on a variety of fields with varying shapes, sizes and soil types. These variables are all considered in the management of a farming operation as these factors will affect crop productivity and farming efficiency. Perhaps the most important factor is soil type. Poorly-drained soils are often more difficult to cultivate than well-drained soils. This becomes a problem when both types of soils exist within the same field. In addition to soil types, odd field shapes, such as "points" and "corners," result in areas that are hard and inefficient to till. These types of situations, when evaluated from an environmental perspective, lend themselves as perfect opportunities for wetland restoration. In most instances these poorly-drained portions of fields were historically forested wetlands.

Organic matter creates substrate for macroinvertebrate habitat

Restoring these areas creates wildlife habitat, increases biodiversity and improves water quality. Restoration efforts like these result in more productive and efficient farming operations because portions of marginal and non-productive fields are taken out of production.

Traditional wetland restoration was performed by the construction of open-water ponds that resulted in projects with minimal plant and animal diversity. Current efforts focus on wetland restoration techniques that promote a variety of plant and animal species. This results in the creation of a diverse and fully functioning ecosystem. These restoration techniques include the construction of micro-topography (humps and bumps), addition of organic matter, placement of coarse woody debris, relocation of live trees and shrubs, and the creation of irregular shapes. Implementation of these restoration techniques accelerates the ecological processes and results in projects which replicate natural functioning ecosystems.

Relocating live trees and shrubs jumpstarts restoration projects

Woody debris provides basking and loafing areas for wildlife

Micro-topography results in varying water depths which promote diversity in plant and animal communities

Benefits of Wetland Restoration

- Increase and enhance aquatic and wildlife habitat
- Trap and uptake nutrients and sediments to improve water quality
- Promote the establishment of native plant species and control invasive species
- Protect rare and endangered species

- Increase recreational opportunities - bird watching and hunting
- Aesthetics and education
- Ground-water recharge, water storage and flood control

Restored wetlands provide excellent habitat for a variety of wildlife

Stream Corridor Restoration

Activities such as agriculture, road-building, residential and commercial development, and drainage have resulted in the degradation of much of Delaware's streams and riparian (the area within and adjacent to a stream) habitat. These activities have significantly altered the state's aquatic habitats, water-dependent species and surrounding upland environments. The Department has estimated that 90 percent of Delaware's streams and rivers have been significantly modified.

Traditional tax ditch restored to replicate a natural floodplain with sinuous low-flow channel

To address these concerns, the Department has initiated an effort to restore stream corridor systems. The purpose of stream corridor restoration projects is to restore highly disturbed and/or degraded streams and their surrounding riparian areas to natural, stable stream channels with environmentally functional ecosystems.

To date, stream corridor restoration efforts have been implemented when private landowners have requested restoration projects or when Department personnel have located potential sites on state-owned lands. These restoration projects have been highly successful in restoring wetland and upland habitat and providing natural stream channel stability.

The objectives of stream corridor restoration are:

- Restore degraded stream channels to a natural stream morphology;
- Reestablish biological diversity;
- Increase wildlife habitat;
- Stream bank stabilization; and
- Protect and improve water quality.

Recent projects have focused on restoring straight, steep-sided tax ditch channels. In these instances, the goal is to reestablish a natural flood plain and sinuous low-flow channel using geomorphic approaches. Other efforts have focused on degraded natural streams in which restoration has been performed to provide long-term stability and improve ecological value.

Education & Outreach

The importance of stream and wetland restoration is readily accepted throughout the environmental community. However, the general public may not recognize the need for ecological restoration. Therefore, the Department has implemented an educational outreach program targeting a broad cross-section of citizens in "The First State." This initiative is being accomplished by many Divisions in the Department who have created educational displays that are featured at public functions throughout Delaware. Additionally, numerous students and teachers participate in the planting of native trees and shrubs in newly constructed stream and wetland restoration projects. A fully-functioning ecosystem creates the perfect outdoor classroom to teach the fundamental principles of ecology and the importance of environmental stewardship.

Planting events typically take place in the spring and fall. If interested, there may be an opportunity for you to participate in a project near you. For more information, call the Department at 302-739-4411 or the Center for the Inland Bays at 302-226-8105.

Delaware Coastal Zone Program — Center for the Inland Bays — Rehoboth · Indian River · Little Assawoman

Department of Natural Resources and Environmental Control

United States Environmental Protection Agency

Ecological restoration through the protection of streams, drainage ditches, wetlands and riparian corridors is a very important mission for the Center for the Inland Bays and the Department of Natural Resources and Environmental Control. Projects are being implemented utilizing new and innovative wetland and stream restoration techniques and concepts. Wetland restoration is taking place in marginal agricultural fields to create additional wildlife habitat, improve water quality and increase the efficiency of farming operations. Stream restoration is being targeted toward existing tax ditches and degraded natural stream systems to provide long-term stability and improve ecological value by reestablishing natural flood plains and sinuous low-flow channels using geomorphological approaches.

For more information or copies of this brochure, please contact DNREC's Division of Soil & Water Conservation at 302-739-9921.

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Biohabitats

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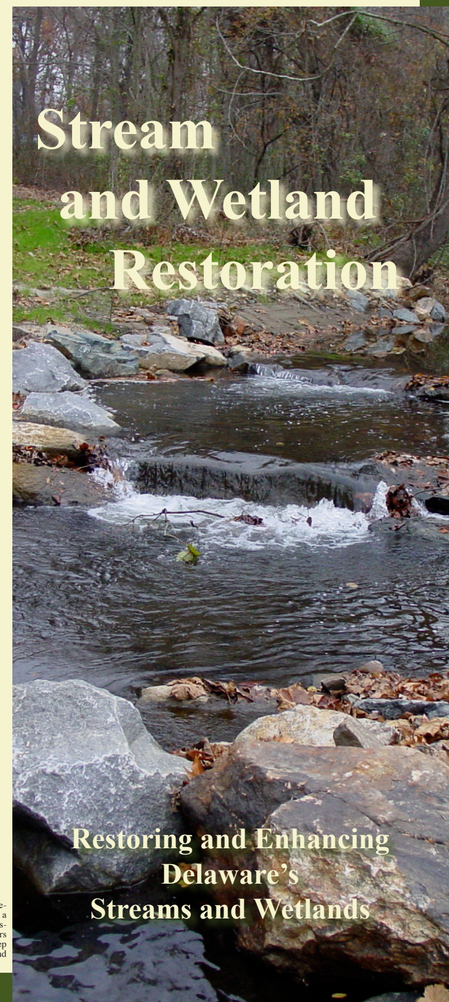
Cover: Step Pools consist of a series of structures designed to dissipate energy in steep-gradient sections of a stream. Step-pool channels are characterized by a succession of channel-spanning steps formed by large boulders that separate pools containing finer bed sediments. Step pools generally function as grade control structures and provide for fish passage by creating flow diversity.