Delaware's Drainage and Water Management Practices

The Need for Water Management

The average annual rainfall in Delaware usually exceeds plant needs and evaporation rates. The result is drainage and flooding problems for agricultural areas, as well as towns, cities, rural communities and transportation facilities.

Approximately 37 percent of Delaware's soils are poorly drained, typically due to clay-type soils with low permeability. Without proper drainage, these soils become over-saturated, or have standing water on them. This situation often results in timely agricultural operations being delayed or prohibited. Adverse effects on crop production include: inability to prepare soils for planting; delays beyond optimum planting dates; inhibited plant growth; and restricted or limited harvests.

In addition, crops impacted by flooding or poor drainage often under-utilize nutrients, thereby creating potential excess nutrient issues in downstream areas.

Proper water management plays a vital role in optimizing farming operations. The existence of stable drainage systems plays a large role in determining the economic success of most farming operations. In addition to farming concerns, many rural roads depend on proper drainage outlets to control flooding and to minimize upkeep.

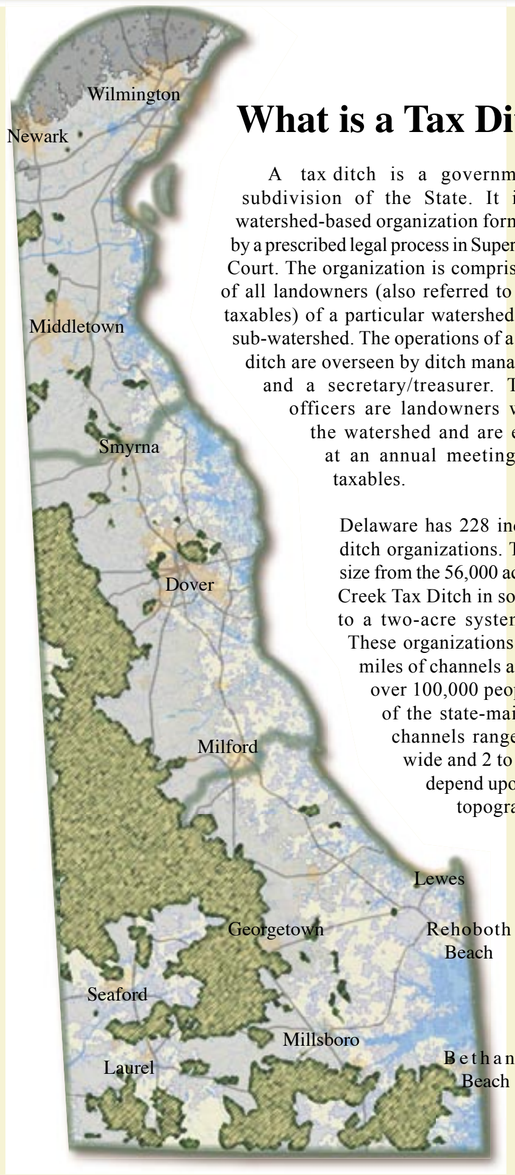
For urban communities, controlling surface water runoff is critical. Basements, yards, septic systems, streets, recreational areas, stormwater facilities, parking lots, schools and businesses all depend on effective drainage systems.

Historic Channel Construction

Historically, the planning and construction of water management systems was accomplished by only considering the administrative steps required to organize a tax ditch. The traditional program had a single purpose that focused primarily on drainage issues. Little consideration was given to environmental issues such as wildlife habitat or wetlands. As Delaware addressed the more obvious environmental concerns related to industrial and municipal discharges, development and other areas, the environmental focus eventually progressed beyond these areas to other activities now recognized as also having potentially "significant environmental impacts." Drainage of lands through tax ditches was one such activity.

Various environmental groups and regulatory agencies began to question the potential impacts these projects were having on natural resources. For example, interpretation of the Army Corps of Engineers and State wetland regulations became a frequent, ongoing process used by groups in an attempt to halt or minimize projects. Regulatory exemption requirements for channel construction were tightened and/or eliminated, and wetland/habitat mitigation was more frequently required.

In response to these environmental concerns and issues, changes in the water management program were initiated in order to make projects more environmentally friendly. Additionally, Governor Castle's Executive Order No. 56 (1988) mandated State agencies to achieve projects with a no-net-loss of wetlands. It was recognized that natural resource impacts resulting from the reconstruction of drainage systems can and should be minimized.



What is a Tax Ditch?

A tax ditch is a governmental subdivision of the State. It is a watershed-based organization formed by a prescribed legal process in Superior Court. The organization is comprised of all landowners (also referred to as taxables) of a particular watershed or sub-watershed. The operations of a tax ditch are overseen by ditch managers and a secretary/treasurer. These officers are landowners within the watershed and are elected at an annual meeting by the taxables.

Delaware has 228 individual tax ditch organizations. They range in size from the 56,000 acre Marshyhope Creek Tax Ditch in southern Delaware to a two-acre system in Wilmington. These organizations manage over 2,000 miles of channels and provide benefits to over 100,000 people and almost one-half of the state-maintained roads. Tax ditch channels range in size from 6 to 80 feet wide and 2 to 14 feet deep. The dimensions depend upon the acreage being drained and topography.

Areas Managed by Tax Ditch Organizations

Formation of a Tax Ditch

The Delaware General Assembly enacted the 1951 Drainage Law to establish, finance and maintain drainage organizations (tax ditches). Formation of a tax ditch can only be initiated by landowners who petition Superior Court to resolve drainage or flooding concerns.

This petition results in the Conservation District requesting an investigation by the Division of Soil and Water Conservation to "…determine whether the formation of the tax ditch is practicable and feasible, and is in the interest of the public health, safety and welfare." If so determined, the Conservation District files the petition in Superior Court and the Board of Ditch Commissioners (as directed by the resident judge) prepares a report on the proposed tax ditch.

This report contains information such as drainage ditch locations, needed rights-of-way, associated costs, and is the basis for a hearing that is held for the affected landowners. At the conclusion of the hearing, a referendum is held for the landowners to approve or disapprove formation of the tax ditch. The Board of Ditch Commissioners files the results of the hearing and referendum in Superior Court. The Court then holds a final hearing for any interested person to object to the formation of the tax ditch.

Following the outcome of the final hearing, and if deemed appropriate, the Superior Court judge issues a Court Order establishing the tax ditch organization. The Court Order establishes permanent rights-of-way for the tax ditch organization for construction and maintenance operations. It also empowers the organization with taxation authority to collect, from all affected landowners, funds to perform this construction and maintenance. The taxation amount for individual properties is also established through the Court Order.

Environmentally Friendly Channel Construction

For more than 15 years the Department has focused on constructing environmentally-friendly water management projects. This initiative has resulted in the development of a list of proven practices that, when implemented, minimizes environmental impacts from the construction and maintenance of tax ditches. This list has evolved into Delaware's Tax Ditch Best Management Practices (BMPs). Some of the more significant practices include:

- *Perform one-sided construction*
- *Minimize clearing widths through forested areas*
- *Relocate channels around sensitive and significant habitat or wetland areas*
- *Minimize construction of downstream outlets*
- *Block off old channels that drain only wetland areas*

Install structures to control water levels in the channels

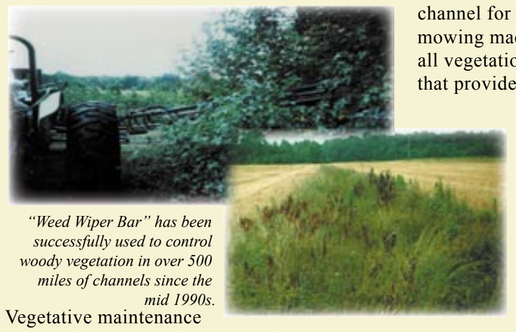
Save trees within the construction zone

Install berm along channel with inlet pipe to maintain historical water levels in adjacent wetlands

To ensure implementation of these BMPs, the Department routinely provides wetland/ environmental training sessions for both technical and administrative staff members.

The Department has constructed many projects incorporating these BMPs to test their effectiveness. These projects have resulted in the establishment of demonstration and education sites that have effectively shown that drainage and environmental quality do not have to be mutually exclusive.

Tax Ditch Maintenance



"Weed Wiper Bar" has been successfully used to control woody vegetation in over 500 miles of channels since the mid 1990s.

Vegetative maintenance on tax ditches is performed to allow access to channels for the removal of accumulated sediments, commonly referred to as "dip outs." Dipping out a channel is done using a hydraulic excavator that removes approximately one to two feet of material from the channel bottom. This allows the channel to remain fully functional and provide the level of drainage intended by its original design. Dip outs generally occur once every 15 to 20 years.

Vegetative maintenance traditionally involves the use of rotary mowing machines to control trees and large shrubs. Failure to perform this maintenance will result in the growth of large trees and prohibit access to the channel for dip-out purposes. Unfortunately, mowing machines are not selective and cut all vegetation including shrubs and grasses that provide desirable food and habitat for wildlife. Recent attempts have focused on the development of viable alternative methods for controlling vegetation. One successful method is the "weed wiper bar." This machine applies herbicides to targeted species by using a wiping bar that leaves most desirable species untouched.

An experimental maintenance practice to promote increased wildlife habitat involves the establishment of tree clusters along the edge of the ditch. This practice yields numerous environmental benefits as it increases tree canopy, reduces forest fragmentation, provides shade thereby lowering water temperature, and increases the dissolved oxygen in the water.

Traditional Tax Ditch Mowing

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 302-645-7325.

CENTER FOR THE INLAND BAYS

Dr. Bruce Richards
Executive Director

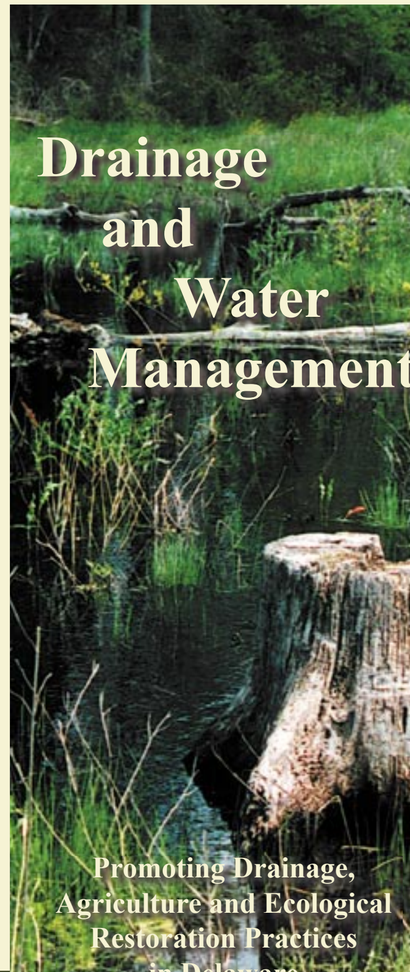
DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL

John A. Hughes
Secretary

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 at 302-739-4411 or the Center for the Inland Bays at 302-645-7325.

Production of this document was funded by a U. S. Environmental Protection Agency grant to the Center for the Inland Bays. Photographs and text were provided by DNREC's Ecological Restoration Managers Tom Barthelmeh and Steve Williams.



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Promoting Drainage, Agriculture and Ecological Restoration Practices in Delaware