WATER MANAGEMENT

PAST AND PRESENT ISSUE

Delaware has community and private drainage systems dating back to the 1700s, when lands were initially drained to provide farmland to feed armies and war-ravaged countries; to curb wetland-related diseases; and to enable essential timber harvesting. Resulting drainage systems essentially extended natural drainage patterns into poorly drained upland flats.

In 1935, the Sussex County Levy Court boosted drainage infrastructure development by authorizing the sale of bonds for drainage improvements, as well as by assuming responsibility of care and maintenance operations. Formation of the federal Works Progress Administration (WPA) and the Civilian Conservation Corps (CCC) in the 1930s and 1940s substantially facilitated drainage projects, with their primary function being to establish drainage facilities. Reconstruction of drainage channels was further augmented under the 1954 passage of the "Watershed Protection and Flood Protection Act."

Over 200 years of channel work has established a basic drainage system throughout Delaware. System maintenance over this time, however, remained largely unaddressed and—at best—took place voluntarily. Hydraulic capacity of channels has thus slowly been reduced—due to sediment accumulation and vegetation overgrowth in the channels, and obstruction caused by fallen trees.

Rural Settings. Channels were constructed to better manage soil and water resources, and to provide flood protection. Without effective drainage soils become saturated or flooded, thereby preventing efficient farming operations. Adverse effects on crop production include:

- inability to prepare soils for planting;
- delays beyond optimum planting dates;
- inhibited plant growth due to excess water in the soil profile; and
- restricted harvests and/or the inability to harvest.

In addition, crops impacted by flooding or poor drainage often under-utilize nutrients, contributing to downstream nutrient runoff.

Urban Settings. For residential and industrial areas, controlling surface water runoff is crucial. Basements, septic systems, streets, recreational areas, stormwater facilities, parking lots, schools, and businesses all depend on an effective drainage system. Numerous programs—again dating back as far as the 1700s—address drainage and flooding issues. In fact, nearly every volume of the *Laws of Delaware* references specific drainage corporations, drainage laws, or drainage incorporation laws.

TAX DITCH ORGANIZATIONS

The Delaware General Assembly enacted the 1951 Delaware Drainage Law to establish ditch organizations and to resolve related financial and maintenance issues.

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.

TAX DITCHES: The Process

- *Formation of a tax ditch to alleviate drainage or flooding concerns occurs only by landowner petition to Superior Court. (Governmental agencies do not initiate the formation process.)*
- *Conservation District requests investigations 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, Conservation District files petition in Superior Court, and Board of Ditch Commissioners (as directed by resident judge) prepares report on proposed tax ditch.*
- *Board's report contains all information per* Title 7, *Chapter 41, and is basis for hearing held for affected landowners.*
- *Upon conclusion of hearing, referendum is held for landowners to approve/disapprove formation of tax ditch.*
- *Board of Ditch Commissioners files results of hearing and referendum in Superior Court, and Court holds final hearing for any person to object to formation of tax ditch.*
- *Following outcome of final hearing, and if deemed appropriate, Superior Court issues Order establishing tax ditch organization.*
- *Court Order grants permanent rights-of-way to tax ditch organization for construction & maintenance operation, and empowers organization with taxation authority to collect, from all affected landowners, funds to perform construction & maintenance.*

To date, 228 individual tax ditch organizations have been formed statewide—ranging from the 56,000-acre Marshyhope Creek Tax Ditch to a two-acre system in suburban Wilmington; managing over 2,000 miles of channels; and directly or indirectly benefiting some 100,000 people, and nearly half the State-maintained roads.

The primary purpose of tax ditches is to establish channel outlets for drainage and flood protection. Individual landowners can construct private channels from these ditches to manage their own lands and to implement various conservation best management practices.

Dependable drainage and flood protection in the Inland Bays/Atlantic Ocean Basin is essential for the management of many resources, with currently:

- 48% of Basin has poorly-drained soils,
- 44 tax ditch organizations (19% of state total) located in the Basin,
- 920 miles of rights-of-way established for tax ditch management,
- 55,225 acres (26% of Basin area) is under water management, and
- 550 additional miles of private channels.

Beyond tax ditch requests, the DNREC's Division of Soil and Water Conservation, Drainage Section also responds to requests (mostly from legislators) for public ditches. ***Public ditches*** are generally smaller drainage systems involving a few, mutually-cooperative landowners. For public ditches, landowners voluntarily grant temporary construction easements—usually to a Conservation District or a town/city—and without perpetual maintenance mechanisms. Many isolated drainage problems have been resolved in the Inland Bays/Atlantic Ocean Basin utilizing this "one-shot" approach.

ENVIRONMENTAL CONCERNS

Historically, planning and construction of water management systems was accomplished with only administrative considerations from governmental agencies. As Delaware began to address concerns such as industrial and municipal discharge and development, the environmental focus progressed to other activities

now recognized as also having potentially "significant environmental impacts"—such as tax ditch systems.

As various environmental groups and regulatory agencies began to consider potential natural resource impacts, scrutiny of federal and State wetland regulations became a means whereby tax ditch projects could be halted or minimized. Accordingly, regulatory exemption requirements for channel construction were tightened, and wetland/habitat mitigation was more frequently required.

Recognition of natural resource impacts prompted changes in the water management program, including Governor Castle's Executive Order No. 56 mandating State agencies to achieve projects with a "no net loss of wetlands." For the past 10 to 15 years, numerous governmental agencies have rigorously reviewed proposed projects and incorporated the resulting comments in project plans. Such extensive reviews minimize environmental impacts and ensure compensation for those deemed unavoidable .

BMPs. This process has enabled the development and routine utilization of Delaware's Tax Ditch Best Management Practices (BMPs) by resource managers and planners on all water management projects, including:

- Minimization of clearing widths;
- Relocation of channels around sensitive areas;
- One-sided construction;
- Preservation of existing trees within the construction zone;
- Reduced construction of downstream outlets;
- Installation of berms along wetlands, with side inlet pipes at/above biological benchmarks; and
- Blockage of old channels which drain only wetland areas.

To complement this effort, the Drainage Section has held wetland/environmental training sessions for both technical and administrative staff.

The most significant environmental impact from channel construction is the fill and drainage of forested wetlands. *Fill* results from clearing operations and disposal of excavated materials. *Drainage* occurs when wetland areas are not protected from surface flow into the channel. Loss or alteration of these wetlands is compensated through the creation or restoration of freshwater wetlands, usually in marginally-productive agricultural fields.

Drainage channels essentially link upland farms, cities, industrial sites, etc. to receiving bodies of water. Although channels themselves produce very little nutrients or sediment, they do represent a transport mechanism for these parameters.
Sediment load in drainage channels usually represents a short-term problem that occurs during reconstruction or maintenance events. Once stabilized—six months to one year after construction—channels discharge minimal amounts of sediment and actually act as sediment traps, as vegetation covers channel bottoms and sides.

Short-term sediment-load problems can be lessened if sediment traps and water control structures are added. Such practices slow water flow and provide areas for sedimentation and nutrient uptake by plants. Use of water control structures, however, raises the concern that phosphorus attached to sediment trapped upstream of these structures may be re-suspended through saturation. Current studies by Delaware State University on this situation are nearing conclusion.

Adherence to planning principles, policies, and conservation management practices over the past decade has minimized environmental impacts, and has provided long-term economic and environmental stability.

Innovative Techniques. The Drainage Section also tests new construction techniques and establishes demonstration/education sites, including constructing most channels with techniques to minimize clearing and spoil disposal. Such sites incorporate new construction techniques with wetland restoration in adjacent agricultural fields and riparian buffer strips along ditches to filter contaminant-laden runoff. Statewide, several demonstration projects effectively show that drainage and environmental quality can co-exist.

FURTHER INNOVATIONS

The Drainage Section has become increasingly involved in "Geomorphic" streambank restoration/rehabilitation. Geomorphic design concepts evaluate the natural characteristics of area streams which promote channel stabilization. The Pratt Farm Water Management demonstration project (Kent Co.) illustrates these concepts, with construction of a floodplain and sinuous low-flow channel in a marginal agricultural field to replace a straight channel. This Geomorphic approach requires special conditions and receptive landowners.

IMPLEMENTATION ISSUES

Resolution of nutrient problems within the Basin will hinge on controlling and managing the source of nutrients through effective use of BMPs for land management in cities, agricultural fields, rural areas, and industrial sites. For drainage channels themselves, increased use of current and new BMPs for tax ditch construction and maintenance will facilitate the reduction of sediments and nutrients delivered by drainage channels.

Maintenance. Once tax ditch channels are constructed, maintenance is the primary function of each individual tax ditch organization. Maintenance consists of:

- routine control of vegetation within rights-of-way, and/or
- periodic removal of accumulated sediment in channel bottom (Control of woody vegetation adjacent to and within the channel is needed to retain access to the channel for future dip-outs of sediment.).

Traditional hand labor—utilizing tools such as bushaxes—has been replaced by rotary mowers and boom-arm mowers. Unfortunately, mowing machines are not selective, and cut all vegetation—including shrubs and grasses desirable for wildlife habitat. Mowing is generally performed every-other-year on established channels.

The Drainage Section and Conservation Districts continually search for viable alternative methods for maintenance such as herbicide control. As they are developed, practicable alternative techniques for maintenance are slowly incorporated into tax ditch maintenance plans through educational and promotional efforts.

TYPICAL COSTS

ACTIVITY	DESCRIPTION	COST *(per linear foot)*
Traditional Construction	6-foot bottom, trapezoid ditch cut	$4
Maintenance Dip-out	Remove 1 foot of sediment from bottom of 6-foot bottom-width ditch	$1 to $2
Implement BMP	Leave trees; sensitive construction for habitat and nutrient reduction	3X normal cost (approximately)

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INLAND BAYS WATERSHED

This fact sheet was prepared by the Delaware Department of Natural Resources and Environmental Control's Whole Basin Team, at the request of the Inland Bays Tributary Action Teams, for citizens and stakeholders interested in one of Delaware's most environmentally and economically attractive areas—the Inland Bays and its surrounding lands, surface and ground waters.

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