

**WETLAND RESTORATION IN
DELAWARE: A Landowner's Guide**
PART 2: RESOURCES FOR RESTORATION

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Prepared by: **Anthony Jackson**, Environmental Educator
Delaware Aquatic Resources Education Center

With review, editing, and content contributions from the following Delaware Department of Natural Resources and Environmental Control (DNREC) staff:

Gary Kreamer - Division of Fish and Wildlife, Aquatic Resources Education
Amy Jacobs - Division of Water Resources, Watershed Assessment Section
Mark Biddle - Division of Water Resources, Watershed Assessment Section
Stephen Williams - Division of Soil and Water Conservation, District Operations
Tom Barthelmeh - Division of Soil and Water Conservation, Drainage Section
Shelley Tovell-DiBona - Division of Fish and Wildlife, Private Lands Assistance
Rebecca Rothweiler - Division of Water Resources, Watershed Assessment Section
Alison Rogerson - Division of Water Resources, Watershed Assessment Section
Andrew Howard - Division of Water Resources, Watershed Assessment Section

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Important note for users of this guidebook! The techniques and approaches showcased in the pages to follow were designed and implemented by restoration professionals. We strongly advise that landowners wishing to undertake such activities contact an appropriate agency (through the contacts provided in the back of this manual) to ensure that: 1) methods are appropriately applied, 2) there is compliance with any regulations or permitting requirements, and 3) available sources of funding and technical support are optimized.

How-to Guide to Wetland Restoration



A natural wetland is a marvel of complexity and diversity that takes centuries to develop and provides a wealth of services to humans and the environment. By restoring and enhancing wetlands, we attempt to replace or replicate some of the essential services that natural wetlands provide. Depending on the character of the land and the vision of the landowner, there are a wide range of project possibilities for doing this, and many resources available to help you get started.

This section of the guidebook is offered as a guide for landowners interested in what those possibilities are and some of the methods available through restoration professionals to help implement them. It begins with a photo-based portfolio of wetland restoration approaches, including: before-and-after views of various projects, do's and don't's for best management practices, and tried-and-true tips and techniques appropriate to different situations. Information on methods used for stream restoration is also offered. Rounding out the material is a piece dealing with problem invasive plants, and suggestions for native plant alternatives - key elements of long-term restoration project success.

As with any undertaking relating to giving something back - the rewards of doing are almost always greater than the effort put forth. And there are various levels of involvement depending on your situation and circumstances. One can start out small, with simple “let-it-be” approaches - such as cutting back on mowing the margins of wetlands and waterways to allow natural vegetation to reclaim its vital buffering role. Or one can go a step further and get involved in removal of invasive plants and replanting native ones to enhance habitat benefits for wildlife. Or, for most of the techniques covered here (as well as the restoration stories profiled in part 1 of this guidebook), a landowner should enlist the technical expertise of an appropriate agency in taking on a more ambitious restoration project. Read on to learn more about approaches and sources of help available.

“We cannot command Nature except by obeying her.”

~ Sir Francis Bacon

Restoration options and opportunities

By working with nature, these restoration alternatives to traditional approaches are able to provide improved functions and enhanced benefits. Beside being attractive, the restored environments reduce excess nutrients and sediments, increase water infiltration (soaking in), and enhance habitat for wildlife. Once put in place, these alternatives are typically cheaper to maintain as well. **Note:** Many of the techniques described in this section (and the pages following) are dependent on appropriate on-site soil conditions, based on consultation/evaluation by a technical expert.

Existing situations



Ag wet spot: typically has low productivity, can bog down equipment, and require extra work-around. These areas are often inefficient to till, especially for irregularly-shaped fields.



Wet spot near woods: This section of field in the Blackbird forest area was too wet to farm, and had limited use as wildlife habitat. But its nearness to the woods presented a prime opportunity for restoring wildlife habitat.

Restoration options



Water quality wetland: Plants and microbes in the wetland cleanse water running off the land. Adjacent fields often produce better due to improved drainage. Good habitat for wildlife.



Habitat for wildlife: Close-up of Blackbird wet spot after restoration. The new wetland now provides vital habitat for a variety of wildlife, including rare salamanders and treefrogs, which need both woods and wetlands to survive.



Drainage ditch: Traditional approach to managing drainage. Limited wildlife and water quality benefits. Conveys runoff to downstream areas, but with minimal water quality benefits.



Environmentally-friendly drainage system: Creates wider, more natural floodplain. Slows flow. Improves water retention and nutrient uptake. Enhances wildlife habitat.



Drainage swale: Conveys runoff. With some configurations, can become difficult and costly to mow and maintain.



Wet meadow swale: Conveys runoff, but allows more water to soak in and replenish the groundwater. Vegetation provides filtering.



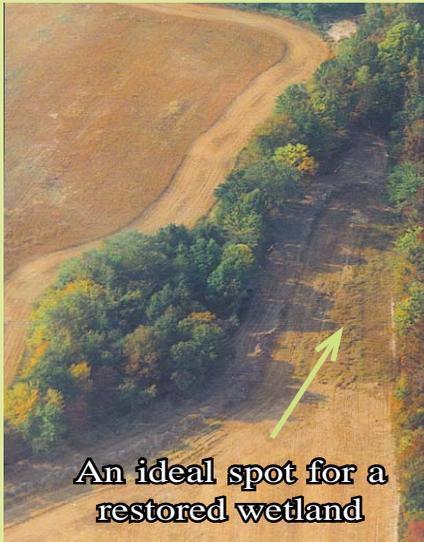
Retention pond: Retains runoff from developed land, but fluctuating water levels can increase the likelihood of invasive plant and mosquito problems. Costly to mow.



Infiltration wetland: Retains runoff, but also cleans the water and recharges groundwater. Attracts wildlife and blends in well with the natural landscape. No mowing is needed.

Construction Techniques for Restoring Wetlands

Wetland restoration projects utilize techniques that promote greater variety in habitat conditions, which translates to higher plant and animal diversity. A lot of the work involves using materials from nature in ways that replicate natural wetland processes. Key aspects of the process include:



An ideal spot for a restored wetland



This wet field edge is a prime site for a wetland project

Locating your site:

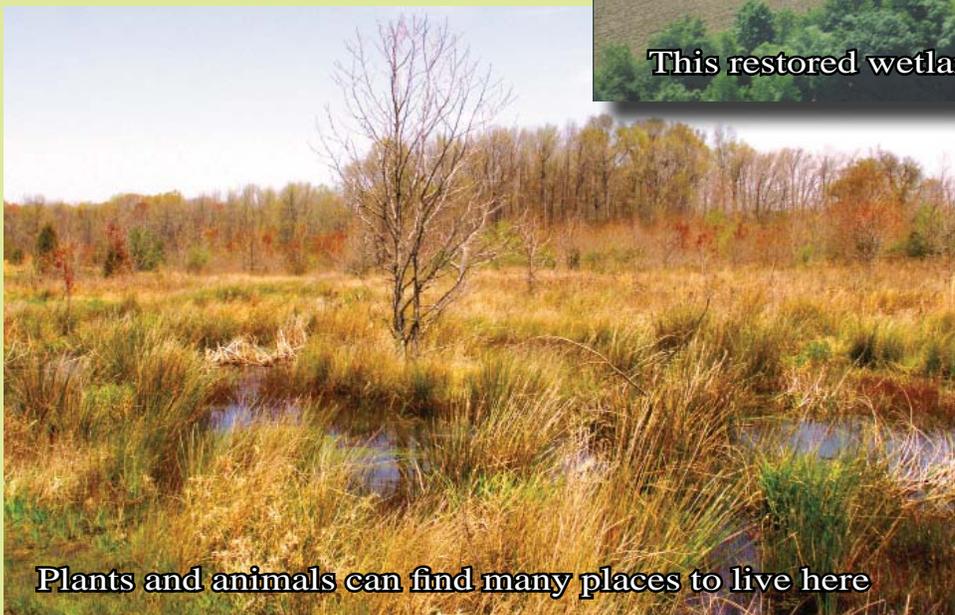
Look for that low-lying, poorly drained section of a field, especially the awkward corner or odd-shaped area. Such areas are often hard to cultivate and harvest, and typically do not produce well.

Irregular shapes and edges:

Wetlands with irregular edges are not only more natural looking, but they also provide enhanced benefits. This includes a greater surface area for absorbing nutrients running off the land, and more nooks and crannies for aquatic life.



This restored wetland offers good habitat variety



Plants and animals can find many places to live here

Varying the topography:

When a wetland is restored, moving the soil around to create lots of humps and bumps and varying water depths promotes greater plant and animal diversity, resulting in higher quality aquatic habitat.

Organic matter: A newly restored wetland can benefit from added structure to help get life going. One way of doing this is to add organic matter, in the form of straw, low-quality hay or horse bedding. This supplies materials needed to kick-start the microbial life at the base of the wetland food chain.



Adding organic matter gets the food chain going



Brush piles provide habitat in water or on land

Coarse woody debris: Stumps, logs and other woody materials - either recovered on-site or from nearby areas - provide additional shelter and surfaces for animals to bask, rest, and hide.



Logs serve as resting areas for wetland wildlife



Transplanting a tree to a restored wetland

Planting the wetland: Although many restored sites will vegetate naturally, in some situations, selective planting of native trees, shrubs and other wetland plants can speed the process along. Scattering a wetland seed mix or baled-up grasses that have gone to seed (from a natural wetland) offers another way to get plants started.

Environmentally-Friendly Water Management

Historically, water management systems in Delaware were approached with a ditch and drain focus, as a means of reducing flooding problems in agricultural fields, roads and communities. In recent years, as efforts have shifted to managing water in more environmentally friendly ways, alternative designs for drainage systems have been developed that maintain the drainage benefits, but do so in ways that are more in tune with nature. These projects feature an emphasis on techniques that improve water quality and enhance wildlife habitat, as described in the following:



Giving a once straight ditch a more natural look

Restructure ditches to enhance benefits:

Transform that straight deep ditch to the more naturally-winding look of a coastal plain stream and its adjacent floodplain. This spreads water flow over a wider area, reducing erosion and providing improved filtering of runoff from adjacent lands.

Create or restore adjacent wetlands:

Adding wetlands to a water management project creates a natural floodplain for absorbing drainage. Wetlands also retain water on the land - an important benefit in times of drought. They also clean the water and provide great wildlife habitat.



Avoid ecologically-sensitive areas:

In planning a drainage project, steer clear of areas that provide unique habitat, or that would bisect or fragment forests and other natural ecosystems. If a tree canopy is present, minimize clearing. Trees stabilize ditch banks. They also provide shade to keep waters cooler and better aerated.



Preserve adjacent habitat wherever possible

Utilize water control structures:

Installing structures at appropriate locations along a ditch offers a powerful tool for managing drainage. This allows for adjustment of water levels seasonally to optimize drainage during wet times and retain water during dry spells. It can also be used to divert and control water as part of a wetland restoration strategy.



A properly-designed water control structure offers a flexible tool for managing drainage



Low-tech water management system

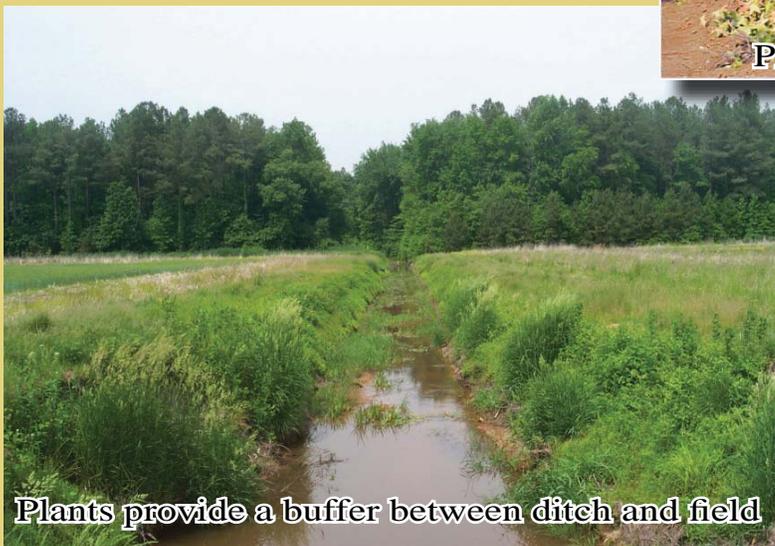
Low tech solutions: Drainage structures don't have to be costly and complicated. In the project pictured at left, a simple piece of PVC, with a notch cut out of the end, controls water levels in this ditch.

Maintain ditches for minimal impact:

Access for maintenance is only needed on one side of the ditch. Work around trees wherever possible. Rotate maintenance, such as bush-hogging, from year to year so that undisturbed sections of the ditch banks filter runoff from disturbed sections.



Protecting the trees that protect the ditch



Plants provide a buffer between ditch and field

Promote plant buffers: Where trees or shrubs are lacking, plant a tall grass buffer between the ditch and bordering lands. Mowing a lawn or ag field right up to the edge of a ditch is not good for water quality. A buffer planted with warm season grasses - even if only a few feet wide - provides many water-filtering benefits. But remember, the wider the better.

Techniques for Stream Bank Stabilization

Stream and wetland restoration projects rely heavily on Bioengineering: the use of 'soft' materials, such as trees, plants, logs, and other woody debris. Bioengineering is functional and cost effective. Plants have many advantages over 'hard' structures or rip-rap in that they can quickly 'heal' disturbed areas, stabilize the finest sediments, slow floodwaters, and are relatively easy to install. Placed rocks, anchored logs or other hard structures are sparingly used to armor spots where tree roots might not hold. (Note: As with all restoration projects, consult with a technical expert to ensure proper use of techniques, and that any permitting requirements are properly addressed.)

Live Stakes - Restoration doesn't get any easier or cheaper than this: stakes are cut from water-tolerant trees (black willow or red maple work well) and driven in along the stream bank. Stakes should be cut prior to spring bud-break (e.g. in winter or early spring) and used as soon as possible thereafter. Live stakes are often used to help secure other structures in place.



Live stakes are easy to install!



Branch packing quickly vegetates banks.

Branch Packing - Along much of the stream bank, live cuttings are planted between layers of soil and coarse burlap. Note in the other photos how branch packing backs-up other placed structures.

Fiber rolls - Flexible 'logs' made of durable plant matter, such as coconut husks, are commercially available. The rolls are staked at the waterline and quickly accumulate sediments and seeds, thus providing a stable surface for anchoring plants.



Angled fiber rolls accumulating sediments



Log toe between a root wad and rock toe

Rock Toe - Large rocks lining the waterline from the drought water level to the rainy season water level deflect the force of the water flow. Trees and plants are essential to secure sediments and prevent erosion around the rock toe.



Protecting roots from stones washing by



Trickling falls reduce erosion.

Root Wads - Typically used on an outside bend, a rootwad deflects a great deal of the force of the current. A length of the trunk is buried in the bank with the roots facing upstream. When properly installed, the rootwad looks as though it resulted from a natural event of a tree falling over the bank. It also creates valuable sheltering habitat for fish and other aquatic animals.

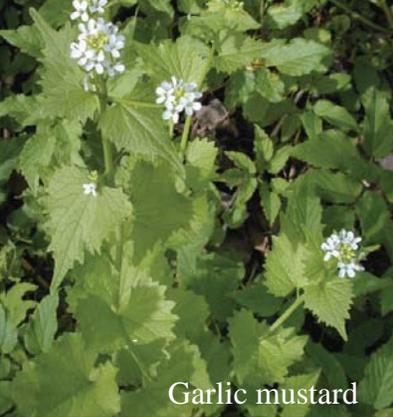


Root wads deflect current along a bend.

Log Toe - Laid at the water's edge, a log toe can control everyday erosion for many years. By the time the log deteriorates, the bank will be well stabilized by mature trees and dense plant growth. It is essential that logs are securely anchored into the bank so that they don't become dislodged during a flood and turned into a battering ram.

Outfall Boulders & Logs - Ease water from one system into the next to reduce erosion along the grade. Stair-like pools reduce velocity and allow for migration of aquatic animals both upstream and down. Flow should merge in at an angle.

10 Least Wanted Wetland Invasives



Garlic mustard

Garlic mustard, *Alliaria petiolata* – The heart-shaped, toothed-edged leaves give off a garlic odor when crushed. Flower clusters are made up of white cross-shaped blossoms.



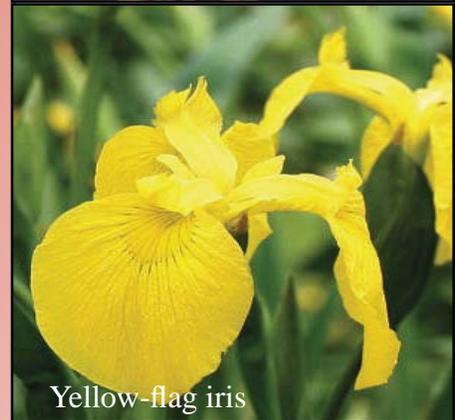
Sweet autumn clematis

Oriental bittersweet, *Celastrus orbiculata* – This woody climbing vine is easily confused with our native American bittersweet (*C. scandens*), with which it hybridizes. The invasive form smothers native plants wherever it grows.



Oriental bittersweet

Sweet autumn clematis, *Clematis terniflora* - This semi-woody vine can reach 4" in diameter and climb over anything up to 30' high. The dark green compound leaves have 3 or 5 long glossy leaflets. The fragrant white flowers are about 1" in diameter.



Yellow-flag iris



Japanese stilt grass

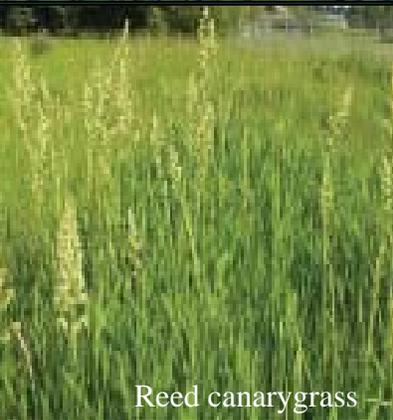
Yellow-flag iris, *Iris pseudacorus* – When not in bloom, it may be recognized by dense clumps of fanned out 3-4' tall leaves with a distinct mid-rib.

Japanese stilt grass, *Microstegium vimineum* – Growing to 3½' tall with pale green, lance-shaped leaves, stilt grass bears some resemblance to bamboo. The 3" leaves feature a distinctly shiny mid-rib.



Mile-a-minute weed

Mile-a-minute weed, *Persicaria perfoliata* - Thorns arm the underside of the light green triangular leaves and stems of this annual trailing vine.



Reed canarygrass

Reed canarygrass, *Phalaris arundinacea* - This tall, perennial grass commonly forms extensive single-species stands along the margins of lakes and streams and wet open spaces, particularly in disturbed areas.



Lesser celandine

Lesser celandine, *Ranunculus ficaria* – Resembling our native marsh marigold, Lesser celandine can be distinguished by heart-shaped leaves, roots with tubers or bulblets, and its tendency to sprawl.



Multiflora rose

Multiflora rose, *Rosa multiflora* - This all too common rose forms impenetrable thickets. The base of each leaf stalk bears a pair of fringed bracts.

Common reed, *Phragmites australis* - The alien strain has tenacious, acid-producing roots that chokes out everything around it.



Common Reed

10 Most Wanted Wetland Natives

Cardinal flower, *Lobelia cardinalis* – 2-4' tall flowering plant of freshwater tidal and nontidal marshes, swamps, seeps, and pond/river/stream banks. A favorite of hummingbirds and butterflies.

Cardinal flower

Winterberry, *Ilex verticillata* – 6-12' tall shrub of fresh tidal swamps, shrub swamps, and forested wetlands. The berries provide valuable winter food.

Winterberry

Soft rush, *Juncus effusus* – 1-4' emergent grass, grows in clumps within fresh tidal and non-tidal marshes, shrub swamps, wet meadows, and ditches.

Soft rush

Blue flag, *Iris versicolor* – 3' tall native iris of fresh or slightly brackish marshes, wet meadows, shores, swamps, and forested wetlands. Supports waterfowl, songbirds, and small mammals.

Blue flag

Sweet pepperbush, *Clethra alnifolia* – 6-12' shrub of forested wetlands, shrub swamps, bogs, and coastal river floodplains. Valuable to butterflies, bees, songbirds, waterfowl, and small mammals.

Sweet pepperbush

American groundnut, *Apios americana* – 15-20' vine of low damp bottomland or riparian woods and thickets. Supports song birds and small mammals.

American groundnut

Swamp chestnut oak, *Quercus michauxii* – Stretching up to 80' it is one of the tallest native wetland trees. It's acorns are a favorite of wood ducks and tree holes provide valuable nesting sites.

Swamp chestnut oak

Arrow arum (duck potato), *Peltandra virginica* – 2' tall emergent of fresh to slightly brackish marshes, swamps, and pond shallows. The roots are a valuable food source for waterfowl and small mammals.

Arrow arum

Swamp rose, *Rosa palustris* – single pink blooms unlike the masses of blooms of invasive multiflora rose. The berry-like rose hips are an important vitamin C source for songbirds, small mammals, and beneficial insects.

Swamp rose

Joe-pye weed, *Eupatorium dubium* – 2-5' tall flowering plant of swamps, bogs, marshes, and swales. Supports songbirds, butterflies, bees, and other beneficial insects.

Joe-pye weed

Controlling Invasives

One of the greatest and often overlooked threats to wetlands is the invasion of non-native species. Over 625 species of plants have been introduced to Delaware either accidentally or intentionally and now make up 28% of the state's plant species. Native plants have difficulty competing with invasives that grow faster, reproduce quicker, handle extreme conditions better, and in the absence of natural predators, proliferate unchecked.



Control of invasive plants is a critical part of any wetland restoration or enhancement project, and it doesn't have to involve heavy equipment and huge costs. As with any environmental project, contacting an agency with expertise in the area before starting is highly recommended. Critical steps in the process include:

Identification - Identify the problem invasives, as well as any desirable native plants that appear similar. The latter, and any other ecologically-sensitive features, will need to be protected. The links below offer useful identification guides, but verification by an expert is critical before initiating control measures.

Prevention - Promptly replant disturbed areas with desirable native species to minimize risks of invasion. If invasives move in, kill them before their seeds mature. Properly dispose of any seeds or pieces that may take root. Ensure that invasives and their seeds are not spread by equipment, livestock, clothes, shoes, etc.

Control - Control methods and timing of treatment will vary with the species present. Often a combination of methods is needed for different areas or seasons. For instance, on dense patches of invasives, judicious use of herbicides may work best, while in areas where desirable plants are mixed in, pulling or cutting by hand is a better strategy. Each method requires care be taken not to damage desirable native species. Note: Consultation with an expert should be a prerequisite for use of herbicides, both for safety reasons, and to ensure that no harm is done to desirable plants, wildlife and other elements of the habitat.

Restoration - Once invasive plants have been removed, native species will often find their own way to a restoration site. But extra help is sometimes needed to reestablish areas that have become especially isolated or denuded. In these situations, consultation with an expert and/or some of the references listed below, may be needed to select appropriate native plants to use in repopulating the habitat.

Monitoring - Even with native regrowth, remaining invasive roots and seeds, as well as those brought in by wind or birds, are likely to rise again. Ongoing vigilance and monitoring are crucial to long-term control.

Additional Help:

www.delawareinvasives.net - features information specific to Delaware invasives.

www.maipc.org - offers resources for the Mid Atlantic region, including the latest research.

www.nps.gov/plants/alien/ - provides great fact sheets and species identification profiles.

www.delawarenativeplants.org - excellent guide to desirable native species with clear profiles.

www.delawarenatureociety.org/CertifiedWildlifeHabitat - backyard wildlife habitat.

www.nps.gov/plants/pubs/chesapeake/ - source of excellent booklet on native plants for wildlife habitat

Resources for Restoration

By now you hopefully have a sense of some prospects and possibilities for restoration projects on your land. So where do you go from here? There are federal agencies, state agencies, county agencies, and non-governmental organizations (NGOs). There are grants, cost-share programs, land preservation options, sources of technical support, and so on. A key goal of this guidebook was to sift through the various sources and forms of project support and bring together in one place a clear compilation of where to go for what. This section represents the results of that effort.

It begins with some basic FAQs for landowners about wetlands and wetland restoration. From there it offers basic suggestions for preparing yourself to navigate the different options available for agency support of land restoration and preservation projects. Lastly, it provides an annotated directory and list of contacts for the programs and agencies that you are most likely to find helpful.

Because the number and kinds of programs are so numerous, we've purposely trimmed down the list to make it more manageable. So please be aware that what follows is only a partial inventory. Many more programs and agencies are out there than are covered here. But these are key ones to get you going. Oftentimes, the primary agency point of contact will direct landowners to other appropriate agencies and programs as you move forward with a project. When it's all said and done, you will hopefully find all the help you need to make your land restoration a reality.

“We abuse land because we regard it as a commodity belonging to us. When we see land as a community to which we belong, we may begin to use it with love and respect.”

~ Aldo Leopold



FAQ's for Landowners about Wetlands and Wetland Restoration

For much of Delaware's history, wet places were viewed as waste places ... smelly, mucky, murky, insect-infested areas to be avoided ... hindrances to agriculture, transportation, and other human activities ... suited to draining or filling whenever and wherever possible. As a result, over the last 300 years, Delaware lost over 200,000 acres of its native wetlands. In recent years - as we've learned to appreciate the many services wetlands provide - there has been a growing interest in restoring these natural treasures. Read on to find out more about what you can do help.

Why should I care if I have a wetland on my property?

Wetlands are among the most biologically vital ecosystems on earth. They dramatically improve water and air quality, reduce flooding, prevent erosion, provide essential habitat for fish and wildlife, and offer places of exceptional beauty and recreational enjoyment. In Delaware, well over two-thirds of the habitat types of conservation concern are wetlands, and the majority of these occur on privately-owned lands. Consequently, the role of landowners in preserving, protecting and restoring Delaware wetlands is absolutely crucial.

How do I know if I have a wetland on my property?

Unless you plan activities that would drain, fill or otherwise harm a wetland, you need not consult complicated maps, seek expert consultations or have expensive delineations done to determine if you have a wetland on your property. The list at right offers some tell-tale signs to look for, any one of which can indicate the presence of a wetland.

You may have a wetland on your property if:

You have a standing area of shallow water present for prolonged periods of time.

You see shallow depressions on your land where water pools during wet periods.

The ground is often soggy underfoot.

There are watermarks or stains on trees or other plants from prior standing water events.

Leaves on the ground are matted and blackened due to previous submergence.

There are areas you avoid with heavy equipment because you know you'll get stuck.

There are signs of crop stress due to excess moisture in areas where you farm.

There are cattails, reeds, skunk cabbage or other wet-tolerant plants growing there.

What should I do if I have a wetland on my property?

The simplest answer to this question – especially for a natural wetland area that's been there all along, supports healthy plant and animal communities, and appears relatively undisturbed by human activities – is to let it be. Nature can and will do a good job of taking care of itself, and preservation is the key. But if your land once had wetlands that have since been lost, or if what you have is threatened by surrounding development pressures, pollution, invasive species, or other stressors, it may be a good candidate for restoration or enhancement projects.

Where can I go to find out more about doing a wetland restoration project on my property?

There are numerous state/federal/private agencies and programs that offer technical support, cost-share incentives, and other forms of assistance with wetland restoration projects. This manual is packed full of project success stories, how-to guidelines, resource directories (see pages 16-21) and other information to help get you started.

How difficult is it to create or restore wetlands on my property?

This depends on the type of wetland you have, and which values (water quality, flood control, wildlife habitat, etc.) you wish to enhance. Projects that utilize existing water sources, such as restoring tidal flow to a coastal marsh, or replenishing groundwater by rerouting water flowing off a field from a ditch to a wetland, have high success rates. Wetlands created in low-lying edges of farm fields to help uptake nutrients, or those aimed at enhancing wildlife use, also do well. Careful planning is required to restore wetlands with a precise hydrology and other specialized conditions to meet the habitat needs of water-level sensitive plants and rare and threatened wildlife species.

What techniques are available to restore, create or enhance wetlands on my property?

A wide array of techniques are available, depending on which type of wetland is being restored or created, the existing size and condition of the restoration site, and the particular wetland functions targeted. Examples include: filling or rerouting drainage ditches, excavating fill, restoring stream or tidal flow, adjusting water flow to minimize erosion, removal of invasive species, and replanting with native species for wildlife cover and forage.

Does putting in a pond qualify as a wetland restoration project?

No. Wetlands are shallow-water habitats with water levels that ebb and flow with the tides, groundwater, rainfall and/or other inputs. Many appear wet at the surface for only a short time. This creates special habitat conditions for plants and animals living there. Ponds, by definition, are deeper open-water habitats that hold water year-round.

Will undertaking a wetland restoration project subject me to government regulations?

There are many land use projects, including wetland ones, which require permits before any actions may be taken. Regulations are in place to protect people and our natural resources, and they delineate rights, both individual and group ones. Wetland restoration projects are undertaken with careful planning and do not subject landowners to loss of their lands or diminished control over what goes on with their lands. Unless restoration activities involve draining, filling or otherwise impairing existing wetlands, permits may not be required for doing projects.

Will doing a wetland restoration project result in more mosquitoes around my land?

Restoring most wetland areas to a more natural state creates habitat conditions that support a diversity of life, including the natural predators of mosquito larvae and adults. Research has shown that such projects do not create an abundance of mosquitoes, and in cases where an impaired habitat is restored to a higher quality habitat, populations of mosquitoes may actually decline.

How much would a wetland restoration cost and what incentives are available for doing it?

Project costs vary by size, scope, and type of wetland restored. Some farmland wetlands have been restored for as little as \$300/acre by simply filling drainage ditches or crushing tiles. By contrast, complex flood control projects in urban areas can cost many times that much. In any case, various cost-share programs (see pages 18-19) are available, to reduce or negate financial burden to the landowner, and in some cases, even provide financial incentives. Many side-benefits can also be realized, from improved productivity in farm fields adjacent to wetlands and better filtration of nutrients running off the fields, to lower mowing expenses for the homeowner.

What are the ongoing obligations and maintenance responsibilities after doing a project?

For most restoration projects, obligations are minimal, and what is required will be clearly spelled out from the start by the agency supporting the project. The Delaware Landowner Incentive Program, for example, works with landowners in developing a project management plan, which typically includes landowner responsibility for control of invasive species, with tracking via annual compliance checks. Some programs require maintenance of a vegetated buffer around the site, with restrictions on mowing in that buffer area or up to and around the wetland.

What kind of benefits can I expect to see on my land if I complete a wetland restoration?

“If you build it, they will come” hits to the heart of what landowners enjoy most about doing these projects. Viewing songbird species not seen before, waterfowl nesting, various mammals coming in to drink and feed, a dazzling array of butterflies and dragonflies, spring choruses of calling frogs, and beautiful wildflowers of all kinds – provides an ever-changing spectacle of “back to nature” experiences right in your own backyard. Add to that, pride in knowing your wetland helps improve water quality in your watershed and for people downstream, while adding much-needed habitat connectivity for wildlife, makes the rewards of doing these projects well-worth the effort.

Wetland Restoration Assistance Options for Landowners

Landowners are not on their own in restoring a wetland. There are many government and non-profit agencies that offer various forms of assistance. While some of these agencies provide services that seem to overlap, there are often differences in what kinds of assistance and support they offer, as well as what they expect of the landowner in return. So, it's a good idea to investigate a number of options to ensure a good fit. The resource directory to follow provides a good starting place.

Agencies work with limited pots of money and try to accomplish the greatest good with what they have. Most grants are competitive, so a flexible landowner is more likely to find support for their project. Also, many agencies share similar goals and actively seek opportunities to pool resources. Feel free to ask an agency representative about other agencies to contact and about the availability of additional funding or services. Seeking additional resources increases the odds of success for the project.

Familiarize yourself with the terms that follow, and as you make contacts with various agencies, make note of what aspects of each apply to the programs that may plug into your project.

Services – Agency representatives can help with assessment, planning, design, and other services, often without any commitment or cost from the landowner.

Grants – Many funding sources are available, the contingencies for timeframe, cost-share ratios, project management provisions, and easement options varying with the agency/grant source.

Cost-share – Organizations often require matching funds or in-kind services to be provided by the landowner or by other organizations. The value of services performed by the landowner or other agencies may count as match, so letting agencies know up-front what parts of the restoration and maintenance you have the expertise and equipment to complete can increase the likelihood of funding. It also indicates landowner 'buy-in' for completing the project.

Rental payments – Some programs assist farmers by 'renting' sections of cropland to be left fallow or naturalized. Different programs have different rates and requirements but typically require a 5 year or more commitment.

Maintenance agreements - As part of their agreement with a supporting agency, landowners may be required to perform certain routine on-site maintenance tasks, such as: keeping overflow structures clear, bush-hogging designated areas, invasives removal, or natives plantings.

Easements – An easement is an agreement negotiated between a landowner and an organization that allows for certain activities on a parcel of land. Conservation easements ensure the landowner and the agency that the land will be kept in a natural condition. Maintenance easements enable an agency to inspect and help maintain a restoration site, especially in instances where neighboring properties may be affected.

Do some research in advance so you can describe your site and the restoration goals you have in mind. Use the resource directory on pages 18-21 to help narrow down your contact options. Programs and funding availability change frequently, so check back periodically if at first you don't succeed.

Landowner Considerations for Wetland Preservation

Many landowners care deeply for the land in which they've invested a great deal of time and effort nurturing. They not only would like to see their land preserved, but perhaps also have it become a critical link in a greater conservation effort. All across Delaware, concern to preserve open space and provide corridors of connectivity for wildlife habitat conservation have spawned many opportunities for partnerships geared to better protection of the land for future generations.

Of course, landowners will want to weigh these goals against the necessities of assuring a secure financial future for themselves and their families. In some instances, the tax benefits and other incentives that come with the preservation options may actually reduce the tax burden on property that is passed on to a landowner's heirs. Such matters are hardly simple, and the situations far too varied, to make meaningful generalizations. An agency representative can help get you started, but you may also wish to consult with an estate attorney, tax accountant or real estate appraiser as the situation warrants. Together they can explain to you the benefits and drawbacks of each option.

Before considering your options, you may want to familiarize yourself with the following terms:

Fair Market Value (FMV) – The open market price a buyer and seller typically come to agree on. The seller has no control over what happens to the property after the sale.

Bargain Sale – Selling for less than the FMV may be done to transfer title to an agency or conservation organization for preservation purposes. In consideration of the reduction in price, the seller may receive some designated benefits in return. Also, the difference from FMV may be claimed as a charitable deduction.

Conservation Easement – a legally-binding agreement between a landowner and a qualified conservation organization or government agency. The landowner and organization together craft an individually-tailored plan to protect a property's unique habitats, natural features and open spaces, and specify allowable future activities. The property owner retains ownership of the land, voluntarily limiting the amount or type of development that may take place there. In return for selling or donating these rights, landowners may receive charitable deductions or payments. The land may be sold or inherited, but the easement remains with the property in perpetuity. The conservation organization monitors the property to ensure the terms are upheld.

Bequest – To give property through a will, such as to a conservation or preservation agency.

Charitable Remainder Trust (or Life Estate) - An arrangement in which property is donated to a charity, but the donor continues to use the property and/or receive income from it as long as the designated donor(s) are living.

Charitable Gift Annuity - The property is donated in exchange for a lifetime annual income from the charity and a partial tax deduction.

The pages to follow list key agencies/programs for preserving/restoring wetlands in Delaware.

Primary Contacts for Wetland Restoration

DNREC, Division of Soil and Water Conservation, Wetland and Stream Restoration

www.swc.dnrec.delaware.gov/district/Pages/Restoration.aspx

www.swc.dnrec.delaware.gov/Drainage/Pages/TaxDitchRestoration.aspx

The goal of the Ecological Restoration and Protection Team is to restore and protect streams, drainage ditches, wetlands, and riparian corridors, with emphasis on projects that enhance water quality, provide stream-bank protection, reduce erosion, and establish wildlife habitat. Wetland restoration occurs in a variety of settings, with a special focus on marginal agricultural fields and schoolyards. Stream restoration is targeted toward existing tax ditches and degraded natural stream systems. Qualified projects receive funding, technical support in project design and implementation, and coordination of site preparation and construction work.

Stream projects: Steve Williams, District Operations, (302) 739-9921, stephen.williams@state.de.us

Wetland/channel restoration: Tom Barthelmeh, Drainage Section, (302) 739-9921, thomas.barthelmeh@state.de.us

DNREC, Division of Fish & Wildlife, Private Lands Assistance Program

www.dnrec.delaware.gov/fw/dplap

The Delaware Landowner Incentive Program (DELIP), provides private landowners with technical and financial incentives to protect, enhance and restore habitat for species-at-risk. Project examples include: creating shallow water wetland habitat for migratory shorebirds, controlling invasive species in bog turtle habitats, and planting trees for the Delmarva fox squirrel. Although DELIP funds target species-at-risk, habitat work also translates to benefits for many other species, including game animals. For restoring marsh habitats overrun by the invasive reed, *Phragmites australis*, there is the Phragmites Control Cost-Share Program, which provides matching funds to qualified landowners for two consecutive years of herbicide spraying of 5-200 acre undeveloped land parcels.

DELIP: Jason Davis, Division of Fish and Wildlife, (302) 735-3600, jason.davis@state.de.us

Phragmites: Bill Jones, Division of Fish and Wildlife, (302) 284-4795, william.jones@state.de.us

U.S. Fish and Wildlife Service, Partners for Fish and Wildlife Program and Coastal Program:

www.fws.gov/chesapeakebay/partners.html

These two programs provide technical and financial assistance to private landowners interested in restoring wetlands, as well as riparian, grassland and upland forest habitats. When available, funding requires landowners to sign an agreement to protect the public investment for a minimum of 10 years. Priority is given to agreements that are longer than 10 years and/or that restore threatened and endangered species habitats in priority geographic focus areas. Assistance is also available to landowners who are interested in applying for grants to preserve large wetland areas that have high wildlife value.

PFW Program: Al Rizzo, Chesapeake Bay Field Office, Annapolis, (410) 573-4500, al_rizzo@fws.gov

Coastal Program: Rick McCorkle, Delaware Bay Estuary Project, (302) 653-9152, richard_mccorkle@fws.gov

DE Division of Fish & Wildlife, Mosquito Control Section, Northern DE Wetland Rehabilitation Program

www.dnrec.delaware.gov/fw/mosquito/Pages/NDWRP.aspx

The Northern Delaware Wetland Rehabilitation Program (NDWRP) was established by DNREC in the early 1990's to restore wetland function and wildlife habitat to marshes in the northern urbanized areas of the state. Since then, the NDWRP, through partnerships with civic and business leaders, scientists, resource managers and private landowners, have restored thousands of acres of wetlands along the Christina and Delaware rivers.

NDWRP: Tom Moran, Northern DE Office of Mosquito Control, (302) 836-2555, thomas.moran@state.de.us

and/or Preservation Programs in Delaware

The Nature Conservancy (TNC) Landowner Conservation Programs:

www.nature.org/wherewework/northamerica/states/delaware/misc/

TNC buys and/or accepts donations of land and conservation easements from landowners, with a priority for areas sufficiently large and rich in biodiversity to ensure long-lasting and meaningful conservation results. TNC works with landowners to develop options that meet their long term land management, financial, and estate planning goals.

TNC Land Conservation Programs: Sarah Cooksey, Milton Office, (302) 664-1218, sarah.cooksey@tnc.org

Ducks Unlimited (DU) Habitat Stewardship Program & Conservation Reserve Program:

www.ducks.org/media/Conservation

Ducks Unlimited (DU) offers comprehensive wetland protection, restoration, enhancement, and technical assistance to landowners, including up to 90% cost-share to restore wetlands and upland habitat buffer strips. A unique component of DU is the integrated team effort between biologists and engineers in delivering the complete package, from planning and design to contracting, construction and monitoring of projects. DU also accepts donated easements, termed or in perpetuity through its Wetlands American Trust. A legal agreement is formed between DU and the landowner, restricting the type and amount of development on the property and protecting valued natural resources, while allowing the landowner to retain ownership and continue use of the land.

DU Landowner Programs: Kurt Anderson, Ducks Unlimited Annapolis Office, (410) 224-6620

Natural Resources Conservation Service (NRCS) Agricultural Conservation Easement Program (ACEP)

<https://www.nrcs.usda.gov/wps/portal/nrcs/detail/de/programs/easements/acep/?cid=stelprdb1249152>

The Agricultural Conservation Easement Program (ACEP) Wetland Reserve Easements (WRE) component provides financial and technical assistance to help conserve wetlands and their related benefits. NRCS may enroll eligible land through permanent or 30-year easements. In exchange for the easements, landowners may receive a payment equal to 75 percent or more of the fair market value. And in addition, NRCS will pay 75-100 percent of the restoration costs.

ACEP-WRE: Thomas Wiltbank, NRCS State office, 302-678-4169, thomas.wiltbank@de.usda.gov

Farm Service Agency (FSA) Conservation Reserve Enhancement Program (CREP)

https://www.nrcs.usda.gov/wps/portal/nrcs/detail/de/technical/?cid=nrcs144p2_024822

The Conservation Reserve Enhancement Program is a cooperative program between USDA and State Government to improve and protect water quality of streams and wildlife habitat in the watersheds of the Chesapeake, Delaware and Inland Bays. Annual rental and cost-share payments are paid by both USDA and the State (DNREC-NPS) on 10-15 year contracts.

NRCS Technical Contact, CREP: Sally Kepfer, NRCS State Office, (302) 678-4182, sally.kepfer@de.usda.gov

Delaware Forestry Service, Forestland Preservation Program and Forestland Enhancement Program:

<http://dda.delaware.gov/forestry/>

The Preservation Program protects forestlands through conservation easements, providing permanent deed restrictions prohibiting activities like development, while allowing landowners to retain property ownership. To be eligible, the property to be preserved must: include at least 10 acres of forestland, be zoned for agricultural use, have no major subdivision recorded, and be located outside of Delaware's designated growth areas. The Enhancement Program provides cost-share of up to 50% for reforestation, water quality improvement, watershed protection, fish and wildlife habitat, invasive species control and other special practices related to forest lands. To be eligible, landowners must have at least five acres of non-industrial forestland and agree to maintain the practice for a period of 10 years.

Forestlands: Jim Olson, Redden State Forest Office, Georgetown, (302) 856-2893, james.olson@state.de.us

Additional Contacts for Restoring, Preserving

Delaware Department of Agriculture, Farmland Preservation Program:

<http://dda.delaware.gov/aglands/index.shtml>

The Delaware Agricultural Lands Preservation Foundation offers preservation options and incentives for farmlands, including those that feature wildlife habitats, wetlands, forests, and other important environmental features,

Farmlands: Michael McGarth, DE Dept. of Agriculture, Dover, (302) 698-4529, michael.mcgrath@state.de.us

County Conservation Districts:

The Conservation Districts provide technical and financial assistance to landowners and property managers interested in implementing conservation practices to control soil erosion, improve water quality, manage agricultural and animal waste, enhance stormwater basins and restore wildlife habitat. These practices and cost-share rates vary by district. For more detailed information, contact the Conservation District in your county.

Sussex Conservation District: Georgetown, (302) 856-3990 ext 3, <http://sussexconservation.org/>

Kent Conservation District: Dover, (302) 741-2600 ext 3, <http://kentcd.org/>

New Castle Cons. District: Newark, (302) 832-3100 ext 3, <http://newcastleconservationdistrict.org/>

Natural Resources Conservation Service (NRCS) Environmental Quality Incentives Program:

www.de.nrcs.usda.gov/programs/

EQIP provides financial and technical assistance to agricultural producers in order to address natural resource concerns and deliver environmental benefits such as improved water and air quality, conserved ground and surface water, reduced soil erosion and sedimentation or improved or created wildlife habitat. Contracts can last up to ten years in duration.

EQIP & WHIP: Timothy Garrahan, NRCS Dover Office, (302) 678-4260, Timothy.Garrahan@de.usda.gov

Nanticoke River Watershed Conservancy:

The Nanticoke River Watershed Conservancy is a land trust that offers easements, land purchases, and life estates specifically targeting lands and landowners in the Nanticoke watershed.

NRWC: Marlene Mervine, (302) 337-8847, mhmervine@aol.com or Rick Tull (302) 629-9543

Delaware Nature Society, Land Preservation Program: www.delawarenaturesociety.org/land_preservation.html

DNS's Land Preservation Program focuses on conserving sites critical to Delaware's biodiversity and water resources, including stream corridors, woodlands, connectors between protected lands, and small sites with unique features. Landowners of such sites are urged to consider permanent preservation by gifts of land or conservation easements.

DNS Land Preservation Program: Ginger North, (302) 239-2334 ext. 100

Partnership for the Delaware Estuary (PDE), Corporate Environmental Stewardship Program:

www.delawareestuary.org/corporations

The CESP provides businesses in the Delaware Estuary with technical expertise to help them better manage and enhance their lands through the use of native species and the restoration of natural habitat.

CESP: Debbie Heaton, PDE, Wilmington, (800) 445-4935 x120, dheaton@DelawareEstuary.org

and/or Conserving Wetlands in Delaware

Delaware Nature Society (DNS), Backyard Wildlife Habitat™ program:

www.delawarenaturesociety.org/bwh.html

DNS's Backyard Habitat program is conducted through a partnership between the Delaware Nature Society and the National Wildlife Federation. It provides official certification for properties that meet four criteria necessary for wildlife habitat: food, water, cover, and places for wildlife to raise young. Through this program, landowners can receive a sign to designate their land as a Certified Backyard Habitat area, along with free technical assistance from the Society's Habitat Stewards to help evaluate their property for ways to attract wildlife and improve water quality.



DNS: Backyard Habitat Coordinator, 302-239-2334 x142

Delaware Center for the Inland Bays (CIB) habitat restoration & schoolyard habitat programs

www.inlandbays.org/projects-and-issues/habitat-restoration/

The CIB provides assistance to landowners in the Inland Bays area with various land protection and restoration initiatives, often through working with other agencies to optimize resources and funding sources available to accommodate both the landowner's desires and the goals of each restoration program. Projects include: tidal and non-tidal wetland restoration, creation, and enhancement; reforestation; wooded and native grass buffers on streams and ditches; upland habitat creation and enhancement; the control of non-native invasive plant species; agricultural land and forest preservation; and the purchase of land for public access. The CIB also has a special program to assist schools in the watershed in developing schoolyard wetlands and other habitat areas.

CIB Habitat Restoration: Dr. Marianne Walch, Science & Restoration Coordinator, science@inlandbays.org

CIB Schoolyard Habitat: Sally Boswell, Education & Outreach Coordinator, outreach@inlandbays.org

DNREC's Tributary Action Teams (TAT): www.dnrec.state.de.us/water2000/Sections/Watershed/ws/

Delaware's Tributary Action Teams engage citizens in developing strategies aimed at reducing pollution in each of the state's watersheds. Teams in the Appoquinimink, Broadkill, Inland Bays, Murderkill, Nanticoke, St. Jones, Mispillion, and Upper Chesapeake watersheds are currently active. Some teams are further along in this process than others, depending on when and if pollution limits were set. Other teams will be formed in the near future. To find out more about how to get involved with a Tributary Team in your area, check out the link above or contact:

Tributary Action Teams: DNREC Watershed Section, Lyle Jones, (302) 739-9939, Lyle.Jones@state.de.us

DNREC, Delaware Adopt-a-Wetland (AAW) Program:

Delaware Adopt-a-Wetland was initiated by a Sussex County farmer, Dot White, in the late 1980's, in recognition of the key role wetlands play in reducing land use impacts on the watershed. Since that time, AAW has grown to encompass more than 100 groups, and more than a thousand individuals, stewarding thousands of wetland acres across the state. A wealth of informational resources, video programs, monitoring kits, and hands-on workshops are available for people seeking to learn more about Delaware wetlands and how they can care for them.



Unfortunately, this program is no longer active.

Delaware Wetland Types

(photographs courtesy of DE Natural Heritage Program and DE Watershed Assessment Section)

Delaware's landscape is rich in variety of wetland habitats, with each type supporting unique communities of plants and animals. What follows is an attempt to acquaint you with the most prominent kinds, including ones you are most likely to 'bump into' in your travels throughout the state, and may even have an example of on your land.



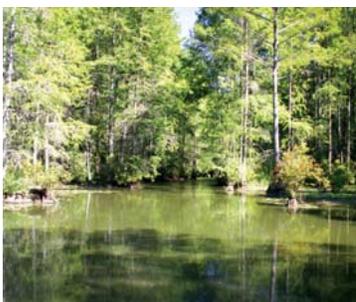
Salt and brackish marshes cover Delaware's coast from the upper margins of Delaware Bay south to the Inland Bays. Flooded twice daily by tidal waters carrying salt water from the ocean and bay, these habitats are strongly influenced by salinity, becoming less salty the further up bay, river and stream. Dense stands of *Spartina* grasses characterize the treeless landscape. A more varied flora and fauna can be found as the water becomes less salty. Salt marshes provide critical nursery habitat for fish and shellfish, vital resting areas for migratory waterfowl and wading birds, and protect us from impacts of coastal storms and floods. Historically, many coastal marshes were drained or ditched for agriculture or mosquito control. Restoring tidal flow is a key restoration focus. Unexplained vegetation dieback is a current concern.

Freshwater tidal marshes are becoming rare in Delaware due to salt water intrusion from sea-level rise, with the best remaining examples occurring upstate along the Christina River and downstate along the upper reaches of the Nanticoke. Like salt and brackish marshes, they are flooded daily with tidal inputs, but are so diluted by freshwater sources that their salinity levels are negligible. These conditions foster a high diversity of wetland plants, including: spatterdock, pickerelweed, arrowhead, cattail, wild rice, water-willow, buttonbush and others. Because freshwater tidal marshes have become scarce, and since what remains supports numerous rare and threatened plant species (many of which are being displaced by invasives such as *Phragmites*), these habitats merit a high priority for preservation and restoration.



Scrub-shrub wetlands may occur as isolated wet thickets fed by seasonal high water tables (non-tidal situations) or in tidally-fed river bank areas along coastal waterways (e.g. Spring Creek, Cedar Creek, and the St. Jones, Murderkill and Broadkill Rivers). As the name implies, shrubs are prominent in the flora, including: buttonbush, red maple, black willow, smooth alder, marsh elder, high-tide bush, and others, the mix depending on the level of salinity influence. Scrub-shrub wetlands help stabilize stream banks and provide cover for birds and other wildlife. Although not as strongly impacted by human activities as many other wetland habitats, certain scrub-shrub wetland subtypes (red maple/ash tidal swamps and smooth alder/silky dogwood swamps) are listed as habitats of special conservation concern in Delaware.

Atlantic White Cedar swamps can be found mainly in Sussex County, where they occur in poorly-drained, acidic, highly organic soils, either along river floodplains (including Cedar Creek, the Mispillion River and the Nanticoke River), or in the headwaters of mill ponds. They feature a white cedar tree canopy with deciduous (typically maple/gum) trees mixed in. A unique community of sphagnum moss and carnivorous plants occupies the forest floor. Prior to extensive timbering and drainage during the 1800's and 1900's, white cedar swamps were abundant in Delaware, including hundreds of acres within the Great Cypress Swamp. Though now scarce in Delaware, cedar swamps provide critical habitat for certain species (sun-dews, pitcher plants, dragonflies, salamanders, etc.) found in few other places in the state.



Bald Cypress swamps in Delaware are the northernmost examples in the United States, and thus comprise an especially unique ecosystem to this region. Easily distinguished by the presence of the evergreen, knobby-kneed Cypress trees, these swamps can be found within forested floodplains of some southern Delaware rivers and creeks, including the James Branch near Trap Pond, Trussum Pond, the Great Swamp, and a small stand near Killens Pond. In addition to supporting unique plant and animal communities and providing wetland benefits to the watershed, Delaware's Bald Cypress swamps are among the most scenic and serene places to explore by canoe or kayak, with Trap Pond State Park being a prime point of entry.

Seasonal freshwater wetlands: The wetlands on this page share several features. They are largely freshwater (lack tidal inputs), usually fed by seasonal rains or high groundwater levels, and appear wet at the surface for only part of the year (typically winter through early spring). They also feature some of our most vital habitats for biodiversity in the state (including many species found nowhere else), and are also the ones most vulnerable to loss through human impacts.



Wet flatwood swamp forests are one of the most important, but least well-recognized wetland types in Delaware. Also called “winter wet woods”, they occur as mixed hardwood forests in the headwaters of many coastal plain streams, and as Loblolly Pine/maple-gum swamps in areas fringing the Inland Bays. Due to their seasonally-wet nature, a variety of other wetland and upland plants also share the habitat. Flatwoods provide large areas that can filter pollutants coming off the surrounding lands before they reach the stream, and are thus critical to maintaining water quality downstream. As with the other freshwater wetlands featured here, their seasonality makes wet flatwoods especially vulnerable to human impacts, and thus a critical focus for preservation efforts.

Floodplain hardwood swamps, also called ‘riparian’ or ‘riverine’ swamps, occur along the more downstream portions of some of the major rivers and their tributaries in Delaware. Historically, many were dammed to form impoundments (e.g. Killens Pond on the Murderkill, Haven Lake on the Mispillion, and Collins Pond on the Nanticoke). Those remaining feature a mix of deciduous trees, including: red maple, sweet gum, black gum, willow oak, pin oak and others. As their name implies, floodplain swamps play a critical role in absorbing runoff reaching rivers and streams, thus reducing the impacts of floods and storms. Like the other wetland types on this page, floodplain swamps also provide vital wildlife habitat, adding to their conservation value.

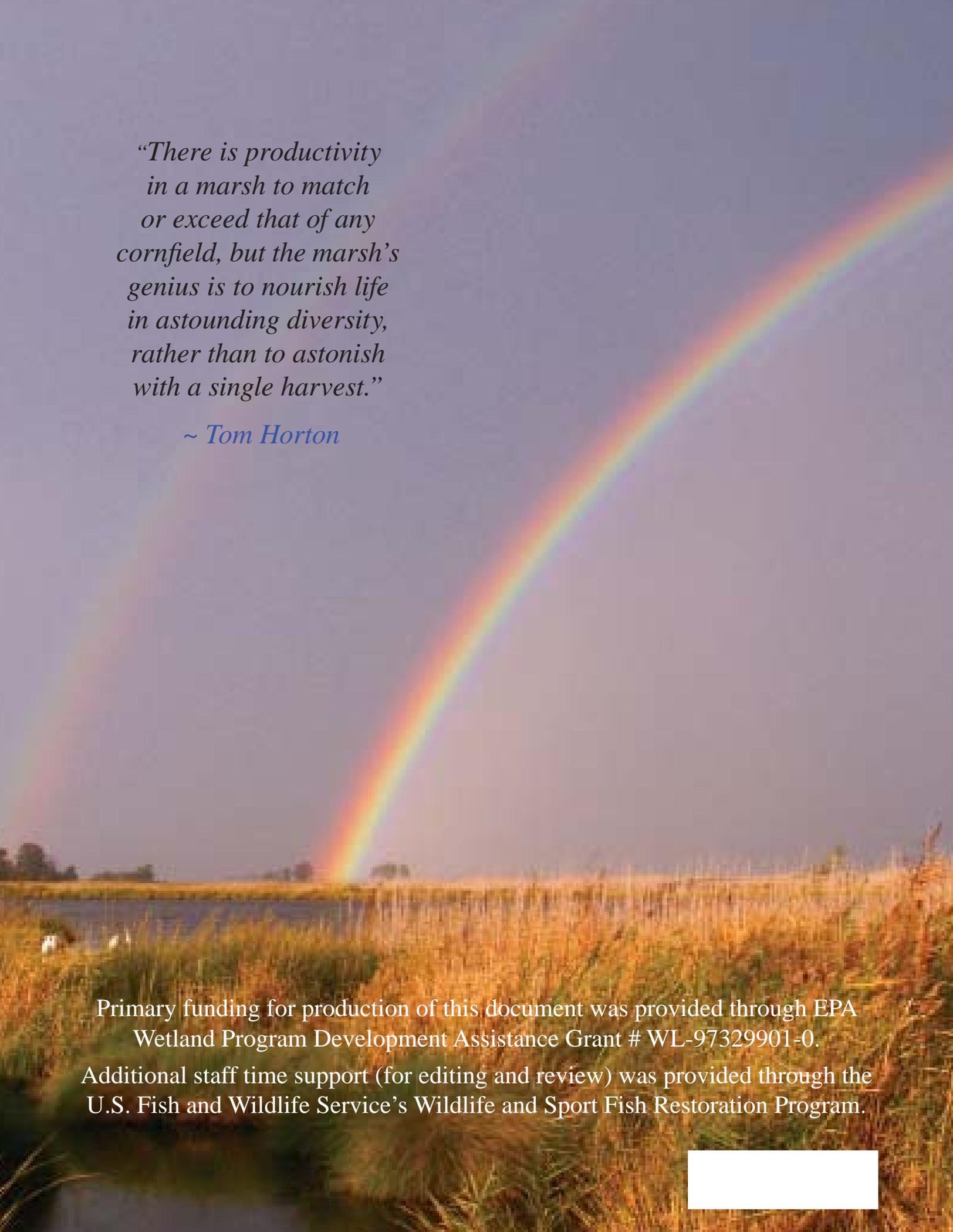


Wet meadows are another freshwater wetland type that may escape notice for not appearing wet over much of the year. But they do receive sufficient groundwater, rainwater and/or snow melt to show standing water at the surface on a seasonal basis. Just below the surface, soils remain waterlogged for longer periods, supporting development of a plant community that includes a variety of reeds, sedges, rushes, asters, goldenrods and other soggy-soil adapted plants. Wet meadows also support unique wildlife species, most notably, the endangered bog turtle. Because they appear dry at the surface for the better part of the year, wet meadows have often been viewed as non-wetland in nature and thus vulnerable to filling and draining for other uses. Where water source and soil conditions allow, wet meadows restoration projects are easily done.

Coastal plain ponds, also called Delmarva Bays, are isolated, small, shallow, seasonally-wet areas, often circular/elliptical in shape, fed by groundwater/rainfall/snow melt in winter/spring and drying up in summer/fall. Over a thousand of these exist in the state, concentrated in inland parts of lower New Castle and upper/middle Kent counties. Often surrounded by woodlands, the inner (wetter) zones feature a variety of low shrubs (e.g. buttonbush) and non-woody plants. Despite their isolated, seasonal nature, coastal plain ponds provide critical habitat to many rare and threatened plants and animals, and are especially vital to frog and salamander breeding. Many of these habitats have been lost already, and those remaining are vulnerable to development. Preservation of adjacent contiguous forested habitats is a high conservation priority.



Other unique wetland types: The recent Delaware Comprehensive Wildlife Conservation Strategy recognizes at least 119 habitat types in the state, of which 79 are of the wetland variety. This includes several subtypes of the above-described categories, as well as various other small, but specialized, wetland types far too numerous to distinguish here. Although the latter – featuring such catchy names as interdunal swales, sea level fens (pictured at left), and Piedmont streamside seeps – typically comprise small, off-the-beaten path kind of places – they also offer habitats unique and essential to some of our most rare and threatened species, and are thus of critical conservation concern to Delaware’s natural heritage.



*“There is productivity
in a marsh to match
or exceed that of any
cornfield, but the marsh’s
genius is to nourish life
in astounding diversity,
rather than to astonish
with a single harvest.”*

~ Tom Horton

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