

# Green Infrastructure Primer for Delaware: Resources

## Regulatory Assistance

### **Stormwater Requirements**

#### **DNREC Sediment and Stormwater Program**

*(302) 739-9921*

DNREC Sediment and Stormwater Program is responsible for all aspects of administration of the state sediment and stormwater management program under the Delaware Sediment and Stormwater Law and Regulations, issuance of National Pollutant Discharge Elimination System (NPDES) Construction General Permit, and plan review, construction inspection, and maintenance inspection of State and Federal projects.

The following agencies have delegation of Sediment and Stormwater Program elements consisting of plan review, construction inspection, and maintenance inspection for their geographic boundaries:

#### **Delaware Department of Transportation**

*(302) 760-2251*

800 Bay Road

P.O. Box 778

Dover, DE 19903

<http://deldot.gov/information/business/drc/stormwater.shtml>

## **NEW CASTLE COUNTY**

#### **New Castle County Department of Land Use**

*(302) 395-5400*

87 Reads Way, Corporate Commons

New Castle DE 19720

<http://www.nccde.org/174/Land-Use>

**Delegated Area:** All unincorporated areas of New Castle County

#### **New Castle Conservation District**

*(302) 832-3100, Ext. 3*

2430 Old County Road

Newark DE 19702

<http://newcastleconservationdistrict.org/>

**Delegated Area:** All incorporated areas of New Castle County (except City of Newark, City of Wilmington, and Town of Middletown).

#### **City of Newark**

*(302) 366-7040 or (302) 366-7045*

Public Works & Water Resources Department

220 S. Main Street

Newark DE 19711

<http://www.cityofnewarkde.us/index.aspx?NID=237>

**Delegated Area:** City of Newark

#### **Town of Middletown**

*(302) 378-9120*

19 West Green Street

Middletown DE 19709

<http://www.middletownde.org/>

**Delegated Area:** Town of Middletown

#### **City of Wilmington**

*(302) 576-3060*

Department of Public Works

800 North French Street

Wilmington, DE 19801

<http://www.ci.wilmington.de.us/government/publicworks>

**Delegated Area:** City of Wilmington

## KENT COUNTY

### **Kent Conservation District**

*(302) 741-2600 (Ext. 3)*

800 Bay Road, Suite 2

Dover, DE 19901

<http://kentcd.org/>

**Delegated Area:** Kent County

## SUSSEX COUNTY

### **Sussex Conservation District**

*(302) 856-7219*

23818 Shortly Road

Georgetown DE 19947

<http://www.sussexconservation.org/programs/sediment-and-stormwater>

**Delegated Area:** Sussex County

## Permitting Information

### ***Delaware Department of Natural Resources and Environmental Control***

#### **Regulatory Advisory Service**

*(302) 739-9909*

The Regulatory Advisory Service (RAS) provides an opportunity for developers or business owners seeking to relocate or expand within the state to consult with DNREC agencies about environmental permitting and design considerations. The RAS provides a one-stop shop for information about necessary permits and regulations but can also help individuals understand and mitigate potential future flood risk at a particular site.

<http://www.dnrec.delaware.gov/SBA/Pages/RegulatoryAdvisoryService.aspx>

### **Wetlands and Subaqueous Lands Section**

*(302) 739-9939*

The Wetlands and Subaqueous Lands Section provides permitting services for activities in Delaware's wetlands, bays, rivers, streams, lakes, ponds, and other waterways that might require a permit pursuant to Delaware law. These activities include marina construction and operation, as well as the construction of docks and piers, shoreline stabilization projects, dredging, filling, bridge or culvert construction, utility crossings of streams, and myriad other projects that could affect Delaware's waters and wetlands.

Permits are required for activities in tidal wetlands as well as tidal and nontidal waters.

<http://www.dnrec.delaware.gov/wr/Services/Pages/WetlandsAndSubaqueousLands.aspx>

Authorization under the Statewide Activity Approval (SAA) for Shoreline Stabilization Projects is available for living shorelines in Delaware. For projects under 500 linear feet using native marsh vegetation, this expedited permitting process costs half the regular price and is issued sooner than standard permits. A federal permit is also required, meeting the requirements to be permitted using Army Corps Nationwide Permit No. 27 for "Aquatic Habitat Restoration."

<http://de.gov/wetlandpermits>

## Planning and Technical Assistance

### ***Delaware Department of Natural Resources and Environmental Control***

#### **Flood Mitigation Program**

*(302) 739-9921*

DNREC's Flood Mitigation Program provides flood-related assistance to individuals and communities to reduce the state's vulnerability to flood damages. Specifically, the program helps communities comply with floodplain standards and flood insurance requirements. It also assists individuals and communities in obtaining funding for projects that reduce vulnerability to flooding. <http://www.dnrec.delaware.gov/swc/drainage/pages/flooding.aspx>

#### **Shoreline and Waterway Management Section**

*(302) 739-9921*

DNREC's Shoreline and Waterway Management Section regulates coastal construction and implements beach and dune management practices. Their mission is to protect and enhance the state's beaches for recreational use and to improve resilience to storm events and erosion. The section has a variety of resources and publications to assist communities and individuals in understanding and adapting to coastal hazards, including sea level rise. <http://www.dnrec.delaware.gov/swc/Shoreline/Pages/Shoreline.aspx>

#### **Private Lands Assistance Program**

*(302) 284-4795*

The DNREC Private Lands Assistance Program assists private landowners in improving and protecting their lands for wildlife. The program's biologists are dedicated to informing landowners about available programs, providing technical assistance for developing habitat projects, and securing financial assistance as incentives for participation. Landowners faced with inundation issues on their property who wish to choose a natural adaptation method are encouraged to

consult with program scientists for ideas and funding. <http://www.dnrec.delaware.gov/fw/dplap/Pages/default.aspx>

#### **Delaware Coastal Programs**

*(302) 739-9283*

The DNREC Delaware Coastal Programs office provides technical assistance, guidance, data, training, and grants for a wide range of coastal issues, including planning and adapting to sea level rise. Technical assistance is available to communities, nongovernmental organizations, government agencies, and universities, and specific training for these audiences is announced periodically. Communities and agencies seeking to begin a planning process for sea level rise and coastal vulnerability or to develop specific adaptation solutions to existing flooding issues are encouraged to contact the program for assistance. [www.dnrec.delaware.gov/coastal](http://www.dnrec.delaware.gov/coastal)

#### **Wetland Monitoring and Assessment Program**

*(302) 739-9939*

The Wetland Monitoring and Assessment Program's (WMAP) goal is to assess the health of wetlands and the functions and ecosystem benefits that they provide. This information is used to inform the citizens of Delaware and to improve upon existing education, restoration, protection, and land use planning efforts. <http://de.gov/delawarewetlands>

#### **Species Conservation & Research Program**

*(302) 735-8658*

The SCRCP is the state's most comprehensive, centralized source of information on rare plants, animals, and vegetation communities. This information is used by research scientists, conservation organizations, consulting firms and agencies to plan for the conservation of habitat for rare species and vegetation communities. <http://www.dnrec.delaware.gov/fw/NHESP/services/Pages/EnvReviewRequests.aspx>

## ***Delaware Department of Agriculture***

### **Delaware Forest Service**

*(302) 698-4500*

The Delaware Forest Service provides a wide range of services to help Delawareans manage and improve their forest resources. These services are divided into three categories: conservation, protection, and education.

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

## ***University of Delaware***

### **Delaware Sea Grant Marine Advisory Service**

*(302) 645-4235*

The Delaware Sea Grant Marine Advisory Service is a resource provided by the University of Delaware that advocates for the wise use, conservation, and development of marine resources. Information and planning assistance is available to address flooding and sea level rise, as well as other coastal issues, including water quality, resource management, and sustainable communities. The Marine Advisory Service transfers science-based information and expertise of the university's researchers to local citizens, resource managers, and business owners in a variety of ways, such as workshops, publications, trainings, and consultations. <http://www.deseagrant.org/outreach>

### **Delaware Cooperative Extension**

*(302) 831-2501*

Cooperative Extension supports Delaware's agricultural sector through education, research, and outreach. Resources are available for agriculture and natural resources, lawn and garden, 4-H youth development, and family and consumer sciences. <http://extension.udel.edu/>

## **Funding Resources**

### ***Financing Approaches***

Green infrastructure projects can be funded through a variety of financing approaches, including:

- Taxes and general funds
- Fees
- Stormwater utilities
- Credits and Incentive programs
- Bonds
- Grants
- Loans
- Public-private partnerships

These funding options are described, with examples, in a recent EPA report:

US Environmental Protection Agency. 2014. Getting to Green: Paying for Green Infrastructure Financing Options and Resources for Local Decision-Makers. [http://www2.epa.gov/sites/production/files/2015-02/documents/gi\\_financing\\_options\\_12-2014\\_4.pdf](http://www2.epa.gov/sites/production/files/2015-02/documents/gi_financing_options_12-2014_4.pdf)

### ***Delaware Funding Resources – Grants and Loans***

## **DELAWARE DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL (DNREC)**

### **Green Project Reserve**

*(302) 739-9941 – contact Terry Deputy*

The DNREC Environmental Finance offers below-market rate loans for state, county, and municipal agencies to assist with the planning and construction of green infrastructure, water efficiency, and environmentally innovative projects. A wide range of adaptation strategies could be funded through this program. To be eligible, projects must first be placed on the Project

Priority List; development of the list begins in January each year. <http://www.dnrec.delaware.gov/fab/Pages/Green-Project-Reserve.aspx>.

### **Surface Water Matching Planning Grants**

*(302) 739-9921 – contact Jim Sullivan*

The DNREC Environmental Finance provides competitive grants of up to \$50,000 annually for planning and engineering design of projects that seek to improve surface water quality within the state. Adaptation projects that have a water quality component, including stormwater retrofits, wetland restoration, drainage plans, and green infrastructure, would qualify for funding through this program. Funding is available to state, county, and municipal agencies. A 1:1 cash match is required for the grant. <http://www.dnrec.delaware.gov/fab/Pages/Surface-Water-Matching-Planning-Grants.aspx>.

### **Wastewater Matching Planning Grants**

*(302) 739-9941 – contact Greg Pope*

The DNREC Environmental Finance provides competitive grants of up to \$50,000 annually to municipal and county wastewater utilities for wastewater planning projects. Projects that propose to modify facilities to adapt to sea level rise would qualify for funding under this program. A 1:1 cash match is required for the grant. <http://www.dnrec.delaware.gov/fab/Pages/Wastewater-Matching-Planning-Grants.aspx>.

## **DELAWARE DEPARTMENT OF AGRICULTURE (DDA)**

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

### **Urban and Community Forestry**

*(302) 698-4500*

The Delaware Forest Service administers an Urban and Community Forestry grant program that provides funding to cities, towns, communities, developers, and local governments. Grant funding can be utilized for urban tree

planting and/or tree management. This program is offered annually and generally allocates approximately \$40,000-\$80,000 in funding.

### **Forest Land Enhancement Program**

*(302) 698-4500*

The Delaware Forest Service's Stewardship Program offers forest landowners cost share funding to help with reforestation, afforestation, agroforestry implementation, water quality protection and other special practices related to forestry. Property owners must have less than 1,000 acres and at least 5 acres of non-industrial forest land.

## **DELAWARE EMERGENCY MANAGEMENT AGENCY (DEMA)**

### **Pre-Disaster Mitigation Program**

*(302) 659-2213*

The Federal Emergency Management Agency offers competitive grants for projects seeking to reduce risk to people and structures from hazard events, including storms and inundation. These grants are available to states, territories, tribal governments, local communities, and universities. The application period is June through December each year. In most cases, applicants for funding must provide matching funds no less than 25 percent of the total project cost. <http://www.fema.gov/pre-disaster-mitigation-grant-program>.

## **SUSSEX CONSERVATION DISTRICT**

*(302) 856-3990*

Sussex Conservation District, in cooperation with DNREC – Division of Water Resources and Division of Watershed Stewardship are providing cost-share assistance for vegetative shoreline stabilization. <http://www.sussexconservation.org/programs/cost-share-program>

## Technical Guidance References

- US Environmental Protection Agency. 2014. **Coastal Stormwater Management through Green Infrastructure: A Handbook for Municipalities.** [http://water.epa.gov/type/oceb/nep/upload/MassBays\\_Handbook\\_combined\\_508-opt.pdf?utm\\_source=listserv&utm\\_medium=email&utm\\_campaign=product](http://water.epa.gov/type/oceb/nep/upload/MassBays_Handbook_combined_508-opt.pdf?utm_source=listserv&utm_medium=email&utm_campaign=product)
- US Environmental Protection Agency. 2014. **Enhancing Sustainable Communities with Green Infrastructure: A Guide to Help Communities Better Manage Stormwater While Achieving Other Environmental, Public Health, Social, and Economic Benefits.** <http://www2.epa.gov/smart-growth/enhancing-sustainable-communities-green-infrastructure>
- US Environmental Protection Agency. 2015. **Green Infrastructure Opportunities that Arise During Municipal Operations.** [http://epa.gov/owow/ocpd/green\\_infrastructure\\_roadshow.pdf](http://epa.gov/owow/ocpd/green_infrastructure_roadshow.pdf)
- Delaware Department of Natural Resources and Environmental Control. 2013. **Post-Construction Stormwater BMP Standards and Specifications.** <http://www.dnrec.delaware.gov/swc/pages/sedimentstormwater.aspx>
- Delaware Sea Grant and US Environmental Protection Agency. 2009. **Protecting Water Quality with Smart Growth Strategies and Natural Stormwater Management in Sussex County, Delaware.** <http://www.deseagrant.org/products/protecting-water-quality-smart-growth-strategies-and-natural-stormwater-management-sussex>
- Delaware Sea Grant. 2014. **Natural Hazard and Climate Change Adaptation Tool Kit for Delaware Communities.** <http://www.deseagrant.org/products/natural-hazard-and-climate-change-adaptation-tool-kit-delaware-communities>
- National Oceanic and Atmospheric Administration. 2015. **Economics of Green Infrastructure: A Guide to Assessing Green Infrastructure Costs and Benefits for Flood Reduction.** <http://coast.noaa.gov/digitalcoast/publications/gi-cost-benefit>
- Clean Water America Alliance. 2011. **Barriers and Gateways to Green Infrastructure.** <http://www.uswateralliance.org/pdfs/gireport.pdf>
- Center for Neighborhood Technology. **Rain Ready: Ten Actions for Cities and Towns.** <http://rainready.org/for-cities-and-towns>
- Center for Watershed Protection. **On-line library of stormwater and watershed resources.** [http://www.cwp.org/online-watershed-library/cat\\_view/63-research](http://www.cwp.org/online-watershed-library/cat_view/63-research)
- University of Massachusetts Extension. 2007. **Restoring Old-Growth Characteristics** [http://harvardforest.fas.harvard.edu/sites/harvardforest.fas.harvard.edu/files/publications/pdfs/Damato\\_umassextension\\_2007.pdf](http://harvardforest.fas.harvard.edu/sites/harvardforest.fas.harvard.edu/files/publications/pdfs/Damato_umassextension_2007.pdf)
- University of Delaware. **Flora of Delaware.** online database: <http://www.wra.udel.edu/de-flora/Introduction>

## Resources for Site Scale Practices

- Bioretention/  
rain gardens
- University of Delaware – Cooperative Extension  
**Fact sheet – Rain Gardens** (2009) – 8 pages  
[http://ag.udel.edu/udbg/sl/hydrology/Rain\\_Gardens.pdf](http://ag.udel.edu/udbg/sl/hydrology/Rain_Gardens.pdf)
- Rain Ready: Techniques for Capturing Rainwater**  
[http://rainready.org/sites/default/files/factsheets/Factsheet-RainReady-CapturingRainwater\\_0.pdf](http://rainready.org/sites/default/files/factsheets/Factsheet-RainReady-CapturingRainwater_0.pdf)
- Connecticut NEMO Program  
**Rain Gardens: A Design Guide for Homeowners**  
<http://nemo.uconn.edu/tools/publications.htm>
- Tree trenches  
and tree boxes
- Delaware Department of Natural Resources and Environmental Control  
**Post-Construction Stormwater BMP Standards and Specifications**  
<http://www.dnrec.delaware.gov/swc/pages/sedimentstormwater.aspx>
- New Jersey Cooperative Extension  
**Green Infrastructure Practices: Tree Boxes**  
<https://njaes.rutgers.edu/pubs/fs1209/>
- City of Lancaster Green Infrastructure Plan  
**Fact sheet – Tree Trench**  
[http://www.dcnr.state.pa.us/cs/groups/public/documents/document/dcnr\\_004822.pdf](http://www.dcnr.state.pa.us/cs/groups/public/documents/document/dcnr_004822.pdf)
- Vegetated swales
- Delaware Department of Natural Resources and Environmental Control  
**Fact sheet – How to maintain private roadside swales**  
<http://www.dnrec.delaware.gov/swc/SiteCollectionDocuments/Soil/Sediment%20Stormwater/SwaleBrochure.pdf>
- Green roofs
- University of Delaware – Cooperative Extension  
**Fact sheet on Green Roofs**  
[http://ag.udel.edu/udbg/sl/hydrology/Green\\_Roofs.pdf](http://ag.udel.edu/udbg/sl/hydrology/Green_Roofs.pdf)
- US EPA – **green roof info**  
<http://www.epa.gov/heatisland/mitigation/greenroofs.htm>
- Green Roofs for Healthy Cities: Green Roofs policy brochure**  
<http://greenroofs.org/index.php/about/green-wall-benefits/2-uncategorised/328-policy-brochure-2014>

Rain barrels, cisterns, and downspout disconnections	University of Delaware Cooperative Extension <b>Fact Sheet: Rain Barrels</b> <a href="http://ag.udel.edu/udbg/sl/hydrology/Harvesting_Water.pdf">http://ag.udel.edu/udbg/sl/hydrology/Harvesting_Water.pdf</a>
	University of Delaware – Sea Grant <b>Report on Natural Stormwater Management</b> <a href="http://www.deseagrant.org/products/protecting-water-quality-smart-growth-strategies-and-natural-stormwater-management-sussex">http://www.deseagrant.org/products/protecting-water-quality-smart-growth-strategies-and-natural-stormwater-management-sussex</a>
Riparian buffers	University of Delaware – Sea Grant <b>Delaware NEMO Guide: Chapter 3 – Maintaining Riparian Areas and Wetlands</b> <a href="http://nemo.udel.edu/manual.aspx">http://nemo.udel.edu/manual.aspx</a>
	Delaware Riverkeeper <b>Fact sheet: Riparian Buffers</b> <a href="http://www.delawariverkeeper.org/resources/Factsheets/Riparian_Buffers.pdf">http://www.delawariverkeeper.org/resources/Factsheets/Riparian_Buffers.pdf</a>
Living shorelines	Delaware Department of Natural Resources and Environmental Control (DNREC) <b>Living Shorelines of Delaware Tour</b> (on-line story map) <a href="http://dnrec.maps.arcgis.com/apps/MapJournal/?appid=371a244682084370a78d0a54c5edb27a">http://dnrec.maps.arcgis.com/apps/MapJournal/?appid=371a244682084370a78d0a54c5edb27a</a>
	Partnership for Delaware Estuary <b>Living Shorelines in the Delaware Estuary: Best Practices and Lessons Learned</b> (2013) <a href="https://delawareestuary.s3.amazonaws.com/pdf/Living%20Shorelines/living_shorelines_best_practices.pdf">https://delawareestuary.s3.amazonaws.com/pdf/Living%20Shorelines/living_shorelines_best_practices.pdf</a>
	National Oceanic and Atmospheric Administration (NOAA) <b>Living Shoreline Planning and Implementation</b> <a href="http://www.habitat.noaa.gov/restoration/techniques/limplementation.html">http://www.habitat.noaa.gov/restoration/techniques/limplementation.html</a>
	Chesapeake Bay Foundation <b>Living Shorelines for the Chesapeake Bay Watershed</b> <a href="http://www.cbf.org/Document.Doc?id=60">http://www.cbf.org/Document.Doc?id=60</a>

## Resources for Watershed/Landscape Scale Practices

### Floodplains

The Nature Conservancy

**A Flood of Benefits: Using Green Infrastructure to Reduce Flood Risks**

<https://www.conservationgateway.org/ConservationPractices/Freshwater/HabitatProtectionandRestoration/Documents/A%20Flood%20of%20Benefits%20-%20J.Opperman%20-%20May%202014.pdf>

Delaware Department of Natural Resources and Environmental Control

**Delaware Floodplain and Drainage Standards and Recommendations**

<http://www.dnrec.delaware.gov/swc/Shoreline/Documents/Floodplain%20and%20Drainage%20Code%20WG/FDAC%20Report%20Rev%20032613.pdf>

### Wetlands

Delaware Department of Natural Resources and Environmental Control

**Wetland Restoration in Delaware: A Landowner's Guide**

Part 1: Restoration Stories

<http://www.dnrec.delaware.gov/Admin/DelawareWetlands/Documents/restoration%20guidebook%20part%201%20all%2024%20pages.pdf>

Part 2: Resources for Restoration

<http://www.dnrec.delaware.gov/Admin/DelawareWetlands/Documents/restoration%20guidebook%20part%202%20all%2028%20pages.pdf>

Delaware Natural Resources and Environmental Control

**Wetland Monitoring and Assessment Program** - Education and Outreach web page

[http://www.dnrec.delaware.gov/Admin/DelawareWetlands/Pages/Library\\_Education\\_Outreach.aspx](http://www.dnrec.delaware.gov/Admin/DelawareWetlands/Pages/Library_Education_Outreach.aspx)

### Forests

Delaware Forest Service

**Delaware Urban and Community Forestry**

<http://delawaretrees.com/>

tree canopy maps: <http://delawaretrees.com/publications-2/tree-canopy-maps/>

urban tree grant program: <http://delawaretrees.com/programs-and-services/urban-grant-program/>

Delaware Center for Horticulture

**Community Tree Program**

<http://www.thedch.org/what-we-do/community-trees>

US Environmental Protection Agency

**Stormwater to Street Trees: Engineering Urban Forests for Stormwater**

<http://water.epa.gov/polwaste/green/upload/stormwater2streettrees.pdf>

## Mapping Resources

### *Delaware Department of Natural Resources and Environmental Control*

Delaware Environmental Navigator

<http://www.nav.dnrec.delaware.gov/DEN3/>

Delaware Sea Level Rise Inundation Map

[www.de.gov/slrmap](http://www.de.gov/slrmap)

### *National Oceanic and Atmospheric Administration (NOAA)*

NOAA Digital Coast - Coastal Flood

Exposure Mapper

<http://coast.noaa.gov/digitalcoast/tools/flood-exposure>