

Connecticut Nonpoint Source Management Program Plan

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The Connecticut Nonpoint Source Program Plan Update is available on-line at:

<http://www.ct.gov/deep/nps>

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Table of Contents

| | | |
|----------|--|------------|
| 1 | NPS Management Program Overview | 1 |
| 1.1 | What is Nonpoint Source Pollution? | 1 |
| 1.2 | Connecticut Land Use and Land Cover Trends | 1 |
| 1.3 | NPS Management Program Goals | 6 |
| 1.4 | Why Update the NPS Management Program? | 6 |
| 1.5 | EPA Key Program Components | 7 |
| 1.6 | NPS Pollution Control | 7 |
| 2 | Connecticut's NPS Management Program Framework | 10 |
| 2.1 | Water Quality Planning and Management | 11 |
| 2.2 | Watershed Management | 14 |
| 2.3 | Coastal Nonpoint Pollution Control | 20 |
| 2.4 | Pollution Prevention | 22 |
| 2.5 | CT DEEP's Stormwater Program | 22 |
| 2.6 | Subsurface Systems | 23 |
| 2.7 | Agriculture | 23 |
| 2.8 | NPS Program Partners | 23 |
| 2.9 | Technical Assistance and Outreach | 25 |
| 2.10 | NPS Program Recommendations | 25 |
| 3 | Watershed Prioritization in Connecticut | 29 |
| 3.1 | Prioritization | 29 |
| 3.2 | Watershed Recommendations | 34 |
| 4 | Source-Specific Strategies to Address NPS Pollution | 39 |
| 4.1 | Major Sources | 39 |
| 4.1.1 | Runoff from Developed Areas | 39 |
| 4.1.2 | Transportation | 48 |
| 4.1.3 | Landscaping and Turf Management | 52 |
| 4.1.4 | Subsurface Sewage Disposal Systems | 57 |
| 4.1.5 | Agriculture | 63 |
| 4.1.6 | Hydrologic and Habitat Modification | 75 |
| 4.1.7 | Domestic Animals and Wildlife | 81 |
| 4.1.8 | Boating and Marinas | 84 |
| 4.2 | Other Sources | 87 |
| 4.2.1 | Land Disposal | 87 |
| 4.2.2 | Brownfields and Contaminated Sites | 90 |
| 4.2.3 | Forestry | 93 |
| 4.2.4 | Material Storage | 97 |
| 4.2.5 | Resource Extraction | 100 |
| 4.2.6 | Atmospheric Deposition | 102 |
| 5 | NPS Program Funding and Evaluation | 104 |

| | | |
|-----|------------------------------|-----|
| 5.1 | NPS Program Funding | 104 |
| 5.2 | NPS Program Evaluation | 106 |
| 6 | Climate Change | 108 |
| 7 | References..... | 113 |

| Tables | | Page |
|--------|--|------|
| 1-1 | How the Connecticut NPS Management Program Plan Addresses the EPA Key NPS Program Components | 7 |
| 2-1 | Designated Uses, Stressors, and Sources of Impairments in Connecticut Surface Waters | 11 |
| 2-2 | NPS Program, Partnerships, and Funding – Five-Year Objectives, Actions, and Milestones | 25 |
| 3-1 | Prioritization Framework Summary | 29 |
| 3-2 | Possible Restoration and Protection Metrics | 30 |
| 3-3 | Designated Uses by Assessment Unit Type | 31 |
| 3-4 | Impaired Uses and Common Impairments and Sources | 31 |
| 3-5 | Watershed Approach – Five-Year Objectives, Actions, and Milestones | 34 |
| 4-1 | Connecticut NPS Pollution Categories | 38 |
| 4-2 | Runoff from Developed Areas – Five-Year Objectives, Actions, and Milestones | 44 |
| 4-3 | Transportation – Five-Year Objectives, Actions, and Milestones | 50 |
| 4-4 | Landscaping and Turf Management – Five-Year Objectives, Actions, and Milestones | 54 |
| 4-5 | Subsurface Sewage Disposal Systems – Five-Year Objectives, Actions, and Milestones | 60 |
| 4-6 | Agriculture – Five-Year Objectives, Actions, and Milestones | 69 |
| 4-7 | Hydrologic and Habitat Modification – Five-Year Objectives, Actions, and Milestones | 79 |
| 4-8 | Domestic Animals and Wildlife – Five-Year Objectives, Actions, and Milestones | 82 |
| 4-9 | Boating and Marinas – Five-Year Objectives, Actions, and Milestones | 85 |
| 4-10 | Land Disposal – Five-Year Objectives and Actions | 88 |
| 4-11 | Brownfields and Contaminated Sites – Five-Year Objectives and Actions | 91 |
| 4-12 | Forestry – Five-Year Objectives and Actions | 94 |
| 4-13 | Material Storage – Five-Year Objectives and Actions | 98 |
| 4-14 | Resource Extraction – Five-Year Objectives and Actions | 100 |
| 4-15 | Atmospheric Deposition – Five-Year Objectives and Actions | 102 |
| 4-16 | Climate Change – Five-Year Objectives and Actions | 110 |

| Figures | | Page |
|---------|---|------|
| 1-1 | Statewide Change in Land Cover Between 1985 and 2006 | 3 |
| 1-2 | Statewide Change in Developed Land Cover Between 1985 and 2006 | 3 |
| 1-3 | Conservation & Development Policies Plan for Connecticut Locational Guide Map | 4 |
| 2-1 | Connecticut NPS Management Program | 9 |
| 2-2 | Conceptual Watershed | 14 |
| 2-3 | Connecticut’s Major Watersheds | 15 |
| 4-1 | Urbanized Areas and MS4 Regulated Communities | 41 |

| Figures | Page |
|--|-------------|
| 4-2 Connecticut's Existing Transportation System | 48 |
| 4-3 Sewer Service Areas in Connecticut | 57 |
| 4-4 Agricultural Land Use and Selected Animal Farms in Connecticut | 67 |
| 4-5 Riparian Zone Land Cover Change (1985 – 2010) | 76 |
| 4-6 Dams in Connecticut | 77 |

Appendices

| | |
|---|--|
| A | Legal Authority for Connecticut's Nonpoint Source Management Program |
| B | Minimum Elements of a Watershed-Based Plan |
| C | Connecticut Interim NPS Priority Watersheds List |
| D | Developed Area Runoff BMP Selection Matrix |
| E | Connecticut Nonpoint Source Management Program Funding Sources |

1 NPS Management Program Overview

1.1 What is Nonpoint Source Pollution?

Nonpoint source (NPS) pollution, unlike pollution from a pipe or other easily identifiable sources, comes from many diffuse sources spread across the landscape. NPS pollution is caused by rainfall or snowmelt moving over and through the ground. As the runoff moves, it picks up and carries natural and human-made pollutants, depositing them into lakes, rivers, streams, wetlands, estuaries, other coastal waters and ground water. Because NPS pollution comes from many different sources, it is often difficult to identify and quantify. In Connecticut, potential sources of NPS pollution can include but are not limited to:

- Non-regulated runoff from developed land and impervious surfaces (e.g., less than one acre of disturbed land)
- Agricultural runoff
- Waste from domestic animals and wildlife
- Malfunctioning septic systems
- Landscape and turf management activities
- Road maintenance activities
- Marinas and boating
- Atmospheric deposition
- Hydrologic and habitat modification

Nonpoint Source Pollution

In the 1970s, following adoption of the federal Clean Water Act, the term "nonpoint source pollution" was first used to describe water pollution that *is not discharged from an outfall pipe* or "point source." For the purposes of this plan, nonpoint sources include water pollution discharges that are not regulated under a CT DEEP discharge permit program. Common NPS pollutants and associated sources include:

- **Bacteria** from pet and waterfowl waste, malfunctioning septic systems, and animal operations such as horse or dairy farms
- **Nutrients** (phosphorus and nitrogen) from fertilizing lawns, golf courses, and athletic fields, and from farm operations
- **Sediment** from construction sites, soil erosion, and winter sanding
- **Chloride** (salts) from winter deicing
- **Heavy metals** (lead, zinc, cadmium) and other toxic fluids from motor vehicles and industrial operations

In spite of tremendous progress in water quality over the last several decades, largely due to the control of point sources of pollution, NPS pollution is now the source of the greatest number of water quality impairments in Connecticut and nationwide (CT DEEP, 2012 and EPA, 2014).

1.2 Connecticut Land Use and Land Cover Trends

Because NPS pollution generally results from rainfall runoff over the land surface, land use/land cover can strongly influence water quality and is a useful indicator of existing and potential NPS pollution. In Connecticut, analysis of land cover data from 1985 to 2006 by UConn's Center for Land Use and Education Research (CLEAR), as part of the ongoing "Connecticut's Changing Landscape" project, shows the dramatic changes in land cover that have occurred in Connecticut over the past several decades.

Since 1985, the area of developed lands (i.e., high-density built-up areas typically associated with commercial, industrial and residential activities and transportation routes) statewide has increased by approximately 145 square miles, representing 2.9 percent of the state's land area (**Figures 1-1 and 1-2**). In contrast, approximately 185 square miles of forested land (representing 3.7 percent of the state's land area) were converted to other land cover/uses during this same period. Similar land cover trends have been observed within stream corridors statewide, with increases in new development and corresponding loss of forest and agricultural fields within stream corridors (UConn, 2011).

The changes in land cover that have occurred in Connecticut over the past several decades through conversion of undeveloped land to higher-intensity uses, often in close proximity to surface waters, has impacted water quality as a result of NPS pollution. The link between land use, landscape alteration, and water quality has been well documented by the Connecticut Department of Energy and Environmental Protection (DEEP), as measured by watershed impervious cover and biological assessments of streams across the state (Bellucci, 2007): in general, the higher the percentage of impervious cover within a watershed, the lower the water quality

Future growth and development in Connecticut has the potential to further degrade or threaten water quality as a result of NPS pollution. The State's Conservation and Development Policies Plan (State C&D Plan) provides a statewide planning framework that identifies a number of Growth Management Principles, which reflect a balance between development and conservation priorities. The State C&D Plan identifies various types of priority funding areas and conservation areas throughout the state (**Figure 1-3**). Priority funding areas generally include urbanized areas and areas near existing or planned mass-transit, sewer service, or water service. Conservation areas are delineated based on the presence of factors that reflect environmental or natural resource values, including high-quality water resources.

The State C&D Plan promotes growth-related projects within priority funding areas. As shown on the Locational Guide Map in **Figure 1-3**, future growth is envisioned in and around existing developed areas throughout the state, further highlighting the importance of effective NPS management policy at the state, regional (i.e., watershed), and local levels to protect water resources from future NPS pollution impacts.

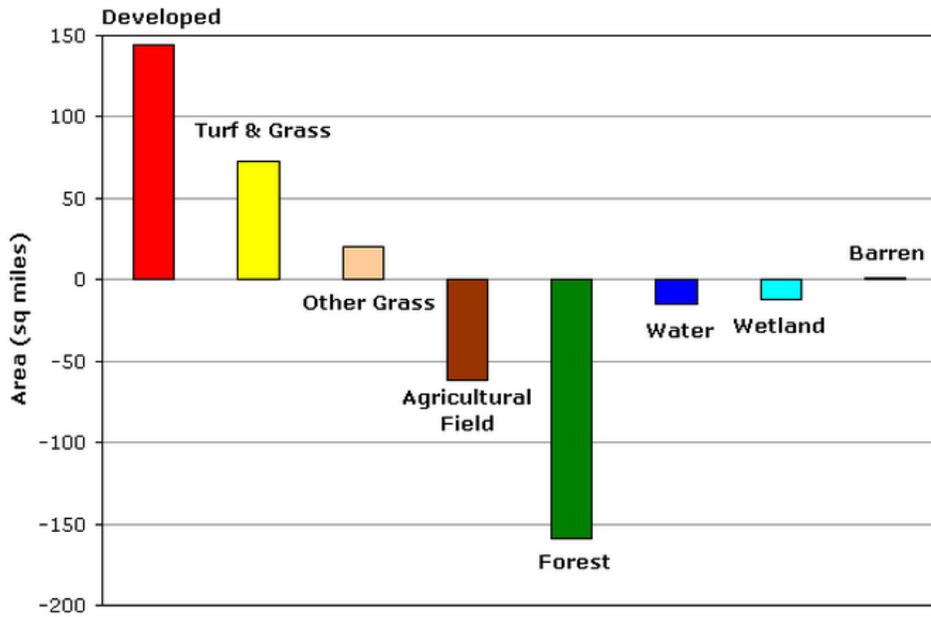


Figure 1-1. Statewide Change in Land Cover Between 1985 and 2006 (CLEAR, Connecticut's Changing Landscape, <http://clear.uconn.edu/projects/landscape/index.htm>).

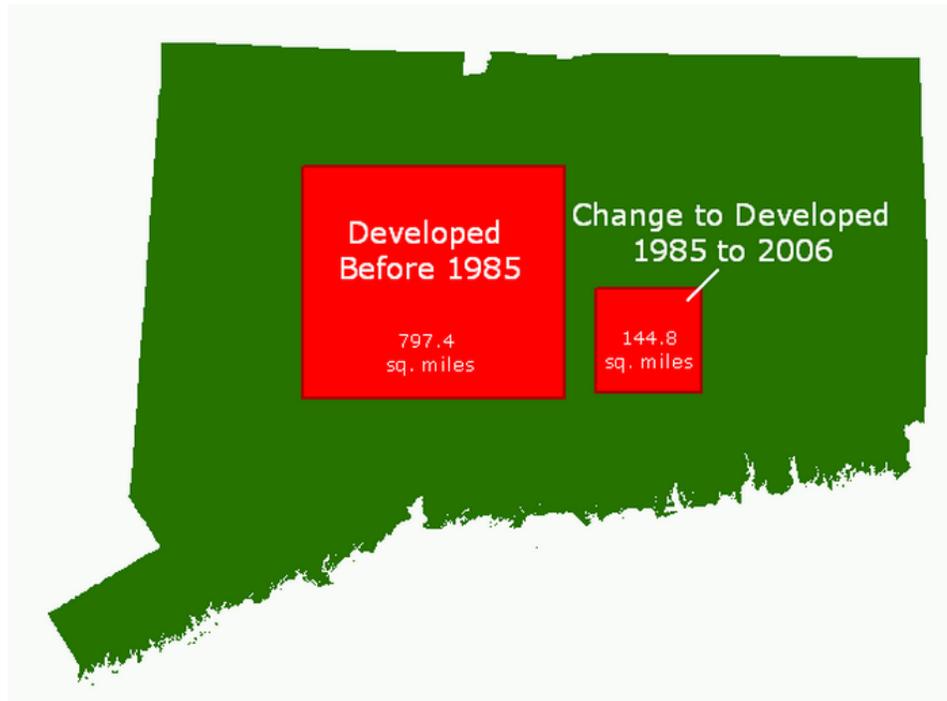


Figure 1-2. Statewide Change in Developed Land Cover Between 1985 and 2006. If all of the developed land in Connecticut was clumped together in a square, it would

cover the area shown. The smaller square represents all area that was changed to developed land cover between 1985 and 2006 (CLEAR, Connecticut's Changing Landscape, <http://clear.uconn.edu/projects/landscape/index.htm>).

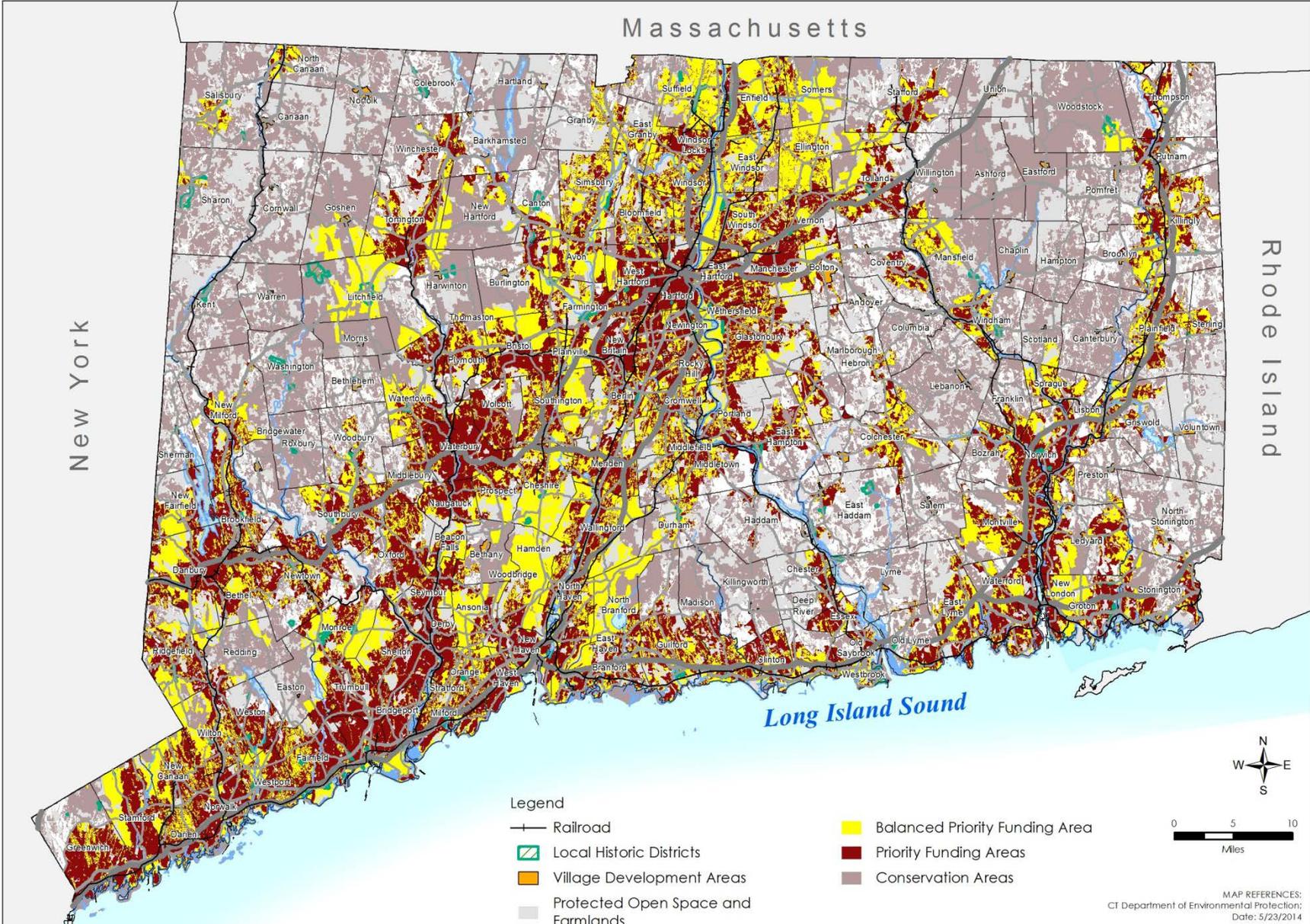


Figure 1-3. Conservation & Development Policies Plan for Connecticut Locational Guide Map
http://www.ct.gov/opm/lib/opm/igp/org/cdupdate/lgm_adopted.pdf

1.3 NPS Management Program Goals

DEEP's mission includes conserving, improving and protecting our natural resources and the environment. Connecticut's Nonpoint Source Program supports that mission by working to address known water quality problems and prevent significant threats to water quality from NPS pollution through improved management practices. The goals of this program are to:

- Protect the environment and public health from the impacts of NPS pollution
- Inform the public and NPS partners about the causes and impacts of NPS pollution in Connecticut
- Set priorities for addressing NPS pollution sources in Connecticut
- Identify long-term goals for protecting and restoring water resources in Connecticut that are threatened or impaired by NPS pollution
- Establish specific short-term goals, objectives, and measurable milestones for the next 5-years that will contribute to achieving long-term NPS program goals of restoring and protecting water quality

The 2014 Connecticut Nonpoint Source Management Program Plan serves as a non-regulatory roadmap to guide NPS program activities in the State of Connecticut.

1.4 Why Update the NPS Management Program?

CT DEEP is responsible for protecting water quality under a number of regulatory and non-regulatory programs, including the NPS Management Program (i.e., U.S. Clean Water Act, Section 319; hereinafter "Section 319").¹ Connecticut's first NPS Management Plan, titled *Nonpoint Source Pollution: An Assessment and Management Plan*, was approved by the EPA in 1989. That plan was updated in 1999 to address changes to national NPS guidance as well as Section 6217 of the Coastal Zone Act Reauthorization Amendments of 1990, which established a coastal nonpoint source pollution control component.

Who Implements the NPS Management Program Plan?

The Connecticut Department of Energy and Environmental Protection (CT DEEP) is responsible for implementing the NPS Management Program Plan. However, the success of NPS management activities in Connecticut relies on many groups including:

- Homeowners
- Businesses
- Municipalities
- Non-governmental organizations
- Other state and federal agencies

The 2014 Connecticut Nonpoint Source Management Program Plan updates the state's 1999 Plan and outlines Connecticut's approach to addressing NPS pollution for the next 5 years. In producing this update, we have taken a very broad view to identify various environmental concerns that relate to NPS pollution. We have presented such a broad approach as it allows a more holistic discussion of issues pertinent to NPS pollutant management. However, this broad view is presented

¹ The legal authority for Connecticut's Nonpoint Source Management Program is described in **Appendix A**.

with the understanding that while the NPS program intersects and partners with a variety of other programs, some regulatory and some not, not all of the concerns and activities identified within this report are germane for project funding under the 319 program. Again, this broad presentation is made to provide a better overall understanding of NPS program concerns and activities. CT DEEP will follow federal requirements when evaluating which activities are appropriate for funding under the federal NPS grant program.

In addition to providing an update to Connecticut's approach to addressing NPS over the next 5 years, the updated Program Plan is also consistent with EPA's recently revised guidelines for state NPS management programs (*Nonpoint Source Program and Grants Guidelines for States and Territories* issued April 12, 2013, hereinafter referred to as "FY14 NPS Guidelines").
www.epa.gov/nps/319

The Program Plan updates information on NPS pollution sources and control measures; identifies Connecticut's approach to prioritizing NPS management activities for the restoration and protection of specific waterbodies given limited resources; and outlines specific goals, objectives, and measurable milestones with a schedule for completion. The Program Plan is intended to be flexible, which will allow CT DEEP to modify its NPS management program over time in response to changes in NPS-related regulations, policy, and control measures.

1.5 EPA Key Program Components

EPA's FY14 NPS Guidelines describe the key components that characterize an effective state NPS management program. **Table 1-1** indicates how this Program Plan incorporates the key program components required by EPA. The complete EPA document is available at http://water.epa.gov/polwaste/nps/upload/key_components_2012.pdf.

1.6 NPS Pollution Control

NPS pollution is controlled primarily through the adoption of practical and cost-effective land management practices known as Best Management Practices (BMPs). BMPs allow for everyday activities while reducing or preventing NPS pollution. BMPs can be structural, involving actual infrastructure or non-structural, involving changes in practices or behaviors. The use of BMPs protects water quality while allowing for growth and maintaining the economic value of Connecticut's land resources.

Connecticut's approach to controlling NPS pollution includes both focused watershed projects and statewide initiatives. Watershed projects are important for reducing NPS pollution; they are designed to restore or protect water quality conditions in watersheds through BMP implementation. Watershed projects address diverse NPS concerns, utilize a variety of funding sources for BMP implementation, and may include water quality monitoring as a measure of success. Section 3 of this Plan describes the process for prioritizing watershed projects in Connecticut.

Statewide programs are an integral part of Connecticut’s strategy to reduce NPS pollution. Statewide programs help to raise public awareness about runoff pollution, provide technical information on BMPs, and develop and implement regulatory programs. Connecticut’s NPS Management Program uses both regulatory and nonregulatory mechanisms to achieve BMP implementation in watershed projects and statewide initiatives. Section 4 of this Plan describes statewide programs to address priority NPS pollutant categories.

| Table 1-1. How the Connecticut NPS Management Program Plan Addresses the EPA Key NPS Program Components | |
|--|--|
| EPA Key NPS Program Components | Connecticut NPS Management Program Plan |
| 1. The state program contains explicit short- and long-term goals, objectives and strategies to restore and protect surface water and ground water, as appropriate. | Sections 2 - 4 |
| 2. The state strengthens its working partnerships with and linkages to appropriate state, interstate, tribal, regional, and local entities (including conservation districts), private sector groups, citizens groups, and federal agencies. | Section 2 |
| 3. The state uses a combination of statewide programs and on-the-ground projects to achieve water quality benefits; efforts are well-integrated with other relevant state and federal programs. | Sections 3 and 4 |
| 4. The state program describes how resources will be allocated between (a) abating known water quality impairments from NPS pollution and (b) protecting threatened and high quality waters from significant threats caused by present and future NPS impacts. | Section 3 |
| 5. The state program identifies waters and watersheds impaired by NPS pollution as well as priority unimpaired waters for protection. The state establishes a process to assign priority and to progressively address identified watersheds by conducting more detailed watershed assessments, developing watershed-based plans and implementing the plans. | Section 3 and Appendix C |
| 6. The state implements all program components required by section 319(b) of the Clean Water Act , and establishes strategic approaches and adaptive management to achieve and maintain water quality standards as expeditiously as practicable. The state reviews and upgrades program components as appropriate. The state program includes a mix of regulatory, nonregulatory, financial and technical assistance , as needed. | Section 5 |
| 7. The state manages and implements its NPS management program efficiently and effectively, including necessary financial management. | Section 5 |
| 8. The state reviews and evaluates its NPS management program using environmental and functional measures of success, and revises its NPS management program at least every five years. | Sections 2 and 5 |

Like many states, Connecticut does not have sufficient resources to implement BMPs for all existing or potential NPS pollution problems. In order to maximize NPS pollution control efforts, technical and financial assistance from other federal, state, and local sources are cooperatively targeted to NPS priority watersheds and statewide programs. Section 5 of this Plan identifies potential sources of funding for NPS activities in Connecticut, including Section 319 of the federal Clean Water Act and other federal, state, and local sources.

2 Connecticut’s NPS Management Program Framework

Connecticut’s Nonpoint Source (NPS) Management Program interfaces and interacts with many programs administered by federal, state, and municipal agencies and organizations to address existing water quality impairments and prevent future degradation of water quality from NPS pollution (**Figure 2-1**).

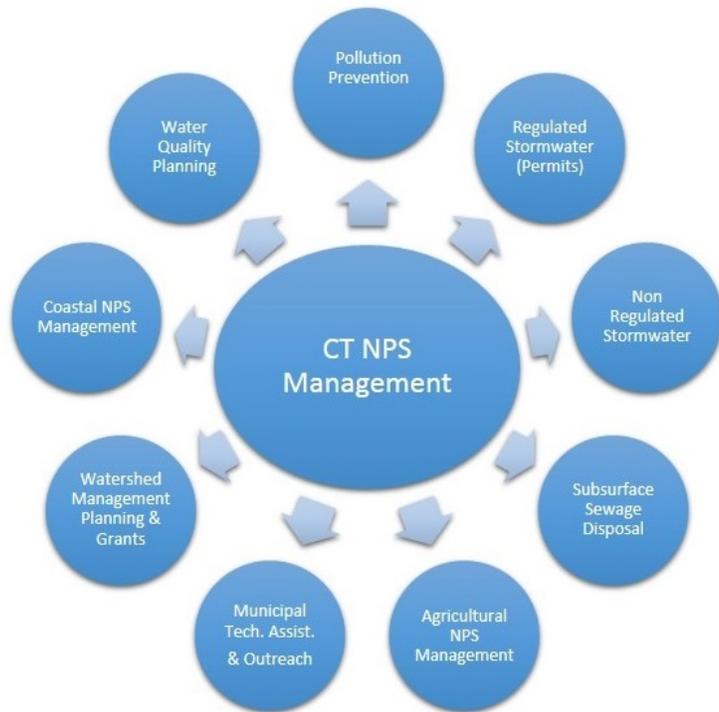


Figure 2-1. Connecticut NPS Management Program

Connecticut has been a national leader in an EPA sponsored “Visioning” process. Our goal is to collaborate to attain maximum effectiveness and efficiency between CT DEEP’s Nonpoint Source Program, TMDL Program, Stormwater Permitting Programs and other related Programs, while complying with necessary requirements that grant funding sources are used appropriately within guidelines, and not to implement activities that are required under NPDES Permits.

CT DEEP’s Nonpoint Source and Watershed and Lakes Management and Section is part of the Planning and Standards Division, within the Bureau of Water Protection and Land Reuse. The section interacts seamlessly with the other four sections within Planning and Standards: TMDL Criteria Assessment and Permit Assistance, Monitoring (Inland and Long Island Sound), Aquifer Protection Water Supply and Long Island Sound Study, and Municipal Facilities. The interrelationships and cooperation between these sections results in a great deal of efficiency in managing CT DEEP’s Water Quality Programs. The close relationship between DEEP’s Nonpoint Source program and Municipal Facilities will assure efficient utilization and community involvement in application of Clean Water State Revolving Funds for Green Infrastructure projects. Efforts to reduce Nitrogen through TMDL implementation, and to protect and restore streamflow through CT DEEP’s Streamflow Classification program are two more examples of effective and efficient program interaction through multi-sector implementation.

The other Divisions within the Bureau of Water Protection and Reuse are Long Island Sound Programs, Inland Water Resources, and Remediation. The Coastal Planning Section, within the Long Island Sound Program (OLISP), interacts with CT DEEP’s Nonpoint Source Program with Coastal NPS issues, and promotion of Green Infrastructure, and is also deeply involved with CT DEEP’s Climate Change initiatives. Inland Water Resources staff interact a great deal with NPS municipal partners in Wetland and Conservation Commissions as well as the Connecticut Association of

Conservation and Inland Wetland Commissions (CACIWC). The NPS and Watershed staff also coordinate extensively with the Remediation Division when planning and implementing riparian restoration, dam removal, green infrastructure and brownfields projects.

The Stormwater Permitting and Enforcement Section and the Subsurface and Agriculture Section are part of the Permitting and Enforcement Division within the Bureau of Materials Management and Compliance Assurance. There is a great deal of communication and cooperation between programs. The Nonpoint Source Program recently provided Low Impact Development (LID) Appendices for CT DEEP's Stormwater Manual, and Erosion and Sedimentation Control Manual.

CT DEEP's Pollution Prevention Section (P2) is part of the Office of Planning and Program Development within the Bureau of Central Services. The P2 Section recently produced a video promoting Organic Landcare practices. The Agency's Green Team meets monthly to discuss collaborative Pollution Prevention activities for CT DEEP, other State Agencies and statewide.

2.1 Water Quality Planning and Management

Water Quality Standards

The Connecticut Water Quality Standards (Sections 22a-426-1 through 22a-426-9, inclusive, of the Regulations of Connecticut State Agencies) form the foundation of Connecticut's water management programs. Required by Section 303(c) of the federal Clean Water Act, the Water Quality Standards articulate State policies regarding designated uses and related classifications of Connecticut's water resources, addressing both surface and ground waters, and the standards and criteria necessary to support such designated uses. The Water Quality Standards provide the context and underpinnings for environmental programs, informing actions such as National Pollution Discharge Elimination System (NPDES) permit issuance, water quality certification programs, remediation programs, as well as state-led monitoring and assessment programs and Total Maximum Daily Load development, among other programs and activities.

The Water Quality Standards are comprised of three components:

1. **CT DEEP's General Policies and Goals:** The water quality standards describe CT DEEP's general policies and goals for maintaining or restoring specified levels of quality for each use classification. The Standards describe discharges to ground and surface water consistent with CT DEEP's goals for each classification. The Standards also define the concept of a zone of influence for such discharges. Other key provisions of the standards include policies for protecting ground and surface water whose actual quality exceeds that quality associated with its classification. These policies are known as the anti-degradation principles. There are also policies and procedures that define the methods by which CT DEEP may alter an assigned classification. The Standards also include definitions, lake trophic classifications, bathing water standards and numerical criteria for aquatic toxicity.
2. **Water Quality Criteria:** The water quality criteria which: (i) describe limits to support the uses CT DEEP has designated as appropriate for each water quality classification; and (ii)

establish narrative and numerical factors used by CT DEEP to determine whether goals established in the standards are being met.

3. **Water Quality Classification Maps of the Connecticut's Water Quality Standards:** The Water Quality Classification Maps show the class assigned to each surface water and ground water resource throughout the state. The Water Quality Classification Maps have been adopted and are amended from time to time pursuant to the statutory process described in section 22a-426 of the Connecticut General Statutes. The maps are used to relate Designated Uses and the applicable Standards and Criteria for each class of surface and ground water resource to a specific location.

Monitoring and Assessment

The Connecticut Integrated Water Quality Report (IWQR) is prepared by CT DEEP pursuant to Sections 305(b) and 303(d) of the federal Clean Water Act (CWA). Section 305(b) requires each State to monitor, assess and report on the quality of its waters every two years. Water quality is assessed in terms of designated uses established by the WQS. Monitoring and assessment data indicate the attainment of designated uses when consistent with appropriate WQS. If data are not consistent with the standards, the waterbody is identified as “impaired” for a particular designated use. Section 303(d) requires each State to compile an Impaired Waters List identifying those waters not meeting WQS and to assign a priority for each impaired waterbody for development of a Total Maximum Daily Load (TMDL) analysis or other management action. The IWQR, which includes the assessment and listing methodology, the assessment results, and the Impaired Waters List, is submitted to EPA for review and approval. The latest IWQR is available at www.ct.gov/deep/iwqr.

The latest version of the IWQR (CT DEEP, 2012) identifies NPS pollution as a major contributor or cause of impairments to designated uses in streams, rivers, lakes, and estuaries statewide (Table 2-1). NPS-related pollutant sources are highlighted in the last column in the table.

| Table 2-1. Designated Uses, Stressors, and Sources of Impairments in Connecticut Surface Waters | | |
|---|---|---|
| Designated Use | Examples of Common Stressors | Examples of Common Pollutant Sources (NPS-related sources in bold) |
| Existing or Proposed Drinking Water | Bacteria | Runoff from Developed Areas , illicit discharges, agricultural runoff |
| Fish Consumption | Mercury, PCBs, Pesticides | Atmospheric deposition , industrial discharges, municipal wastewater treatment discharges, hazardous waste sites, oil and chemical spills, land use |
| Habitat for Fish, Other Aquatic Life and Wildlife | Habitat alterations, flow regime changes, Toxics, Nutrients, Interactions | Industrial discharges, municipal wastewater treatment discharges, |

| Table 2-1. Designated Uses, Stressors, and Sources of Impairments in Connecticut Surface Waters | | |
|---|---|--|
| Designated Use | Examples of Common Stressors | Examples of Common Pollutant Sources (NPS-related sources in bold) |
| | between multiple pollutants, Low Dissolved Oxygen | hazardous waste sites, oil and chemical spills, land use, Runoff from Developed Areas |
| Habitat for Marine Fish, Other Aquatic Life and Wildlife | Habitat alterations, flow regime changes, Toxics, Nutrients, Interactions between multiple pollutants, Low dissolved oxygen | Industrial discharges, municipal wastewater treatment discharges, hazardous waste sites, oil and chemical spills, land use, Runoff from Developed Areas |
| Recreation | Bacteria, nutrients | Runoff from Developed Areas , illicit discharges, agricultural runoff |
| Shellfish Harvesting for Direct Consumption Where Authorized | Bacteria | Runoff from Developed Areas , illicit discharges, agricultural runoff |
| Commercial Shellfish Harvesting Where Authorized | Bacteria | Runoff from Developed Areas , illicit discharges, agricultural runoff |

Source: CT DEEP, 2012

Total Maximum Daily Loads

A TMDL is a target pollutant level that must be met to restore the quality of the water and meet designated uses. It is a “pollution budget” that identifies the reductions in point and nonpoint source pollution that are needed to meet Connecticut water quality standards for a particular waterbody and a strategy to implement those reductions to restore water quality. TMDLs therefore provide the framework for restoring impaired waters. In Connecticut, TMDLs are implemented through National Pollutant Discharge Elimination System (NPDES) permits for point sources and watershed-based management plans for nonpoint sources.

What is an Impaired Water Body?

An impaired waterbody is a waterbody that does not meet water quality criteria that support its designated use, such as drinking, swimming, or fishing. For each impaired waterbody and associated pollutant, CT DEEP must develop a restoration target called a Total Maximum Daily Load (TMDL).

A NPDES permit contains water quality based limits and specifies other treatment and monitoring requirements to ensure that the discharge does not impact water quality. By law, NPDES permits must be consistent with TMDL allocations to point sources to ensure that WQS will be met.

TMDLs for waters impaired by nonpoint sources typically include recommendations to implement controls that include recommendations outlined in watershed management plan such as: reducing the use of fertilizers, herbicides, and pesticides; keeping septic systems in proper working order; planting appropriate vegetative buffers in riparian areas; discouraging the feeding of waterfowl;

proper pet waste management; and directing polluted runoff into the ground. Public education and local commitment to clean up impaired waters are key to reducing NPS pollution.

2.2 Watershed Management

Connecticut's Watershed Management Program

CT DEEP has developed a watershed management framework through a networked approach with federal, state, and municipal governments and non-government agencies and organizations to conduct watershed management and strengthen the state's ability to control NPS pollution

Connecticut's FY 2014 319 Funds support two full time Environmental Analysts in the Watershed/NPS Management Unit, approximately one full time employee in the Water Quality Management Program, and 80% of one full time employee in the Agricultural and Subsurface Disposal Program. State funding is provided for staff match in the Monitoring and Assessment program, the Water Quality Management Program, the Watershed and Nonpoint Source Program, and the Lakes Management Program.

Annual Request for Proposals

The State's Nonpoint Source Program works seamlessly within the Connecticut's Watershed Management Program. An annual Request for Proposals is developed to solicit Implementation Projects to meet CT DEEP's priorities toward restoration of designated uses of impaired water bodies. A minimum of fifty percent of Connecticut's overall Section 319 allocation is devoted to implementation projects. More information can be found at www.ct.gov/deep/nps.

Promotion of Collaborative Partnerships

In 1996, the Connecticut Department of Environmental Protection established a Watershed Management and Coordination Section within the Water Bureau's Planning and Standards Division to oversee the Department's watershed management efforts. CT DEEP subsequently created a Watershed Management Program to more effectively address water resource issues from an integrated watershed perspective. For purposes of water management, the State's eight Major Basins have been grouped into five watershed regions. CT DEEP Watershed Managers work within these five watershed regions to coordinate State actions and assist communities in forming partnerships, drafting watershed based plans, and implementing environmental projects to restore and protect Connecticut's water quality on a watershed-wide scale.

Connecticut's Nonpoint Source Program consists of three Watershed Managers and a Lakes Management Analyst. They work with the 169 municipalities in Connecticut and all of the Program partners listed above. The Watershed Managers have developed collaborative partnerships with Municipalities, Connecticut Conservation Districts, Watershed Organizations, Advocacy Groups, other NGOs and Citizens, and assist them with developing and implementing strategies to restore the waters of the State of Connecticut to meet Water Quality Standards and support Designated Uses. More details of the organizations we work with are presented in Connecticut's Nonpoint Source Program Annual Reports, available at www.ct.gov/deep/nps

Statewide Watershed Collaborative interaction is facilitated with assistance from the Rivers Alliance of Connecticut and the Connecticut Conservation Districts. The Rivers Alliance sponsors a day long

Watershed Conservation Network Conference twice each year. The Rivers Alliance has also administered a Watershed Assistance Small Grants Program with CT 319 Funding.

There are many examples of successful watershed groups and initiatives throughout Connecticut, which can serve as models for ongoing and future watershed planning efforts in other Connecticut watersheds. A partial listing of these watershed stakeholder groups is available on the CT DEEP website at www.ct.gov/deep/watershed.

What is a Watershed?

A watershed includes the area of land that drains water into a stream, river, lake, estuary, bay or other body of water.

A watershed is the area of land that drains or sheds water into a specific receiving waterbody, such as a lake or a river. As rainwater or melted snow runs downhill in the watershed, it collects and transports sediment and other materials and deposits them into the receiving waterbody (**Figure 2-2**). Watersheds do not follow political boundaries, so parts of the population of Maine, New Hampshire, Vermont, and Massachusetts and everyone in Connecticut lives in a watershed that drains to Long Island Sound.

Watershed Approach

Watershed management is a term used to describe the process of implementing land use and water management practices to protect and restore the quality of the water and other natural resources within a watershed. Watershed management helps to control pollution of water and other natural resources in the watershed by identifying the different kinds of pollution present in the watershed and how those pollutants are transported, and recommending ways to reduce or eliminate those pollution sources.

Watershed management is also important because the planning process results in a partnership among all affected parties across political boundaries in the watershed. That partnership is essential to the successful management of land and water resources since all partners have a stake

in the health of the watershed. It is also an efficient way to prioritize the implementation of watershed management plans in times when resources may be limited. Within

DEEP, watershed management also cuts across program boundaries, bringing together diverse programs to work together in a specific area to use their various powers to solve pollution and impairment problems that are very difficult to address without collaboration.

NPS pollution threats and impacts on water quality are diverse, widespread, and often interconnected. Each water body has distinct water quality characteristics, issues, and stakeholders. A watershed approach, which provides a flexible framework for managing water quality within hydrologically defined areas, is viewed as the most effective means to address water quality concerns on a comprehensive basis. This approach requires active stakeholder involvement, sound scientific analysis and quantification of causes and sources of water quality problems,

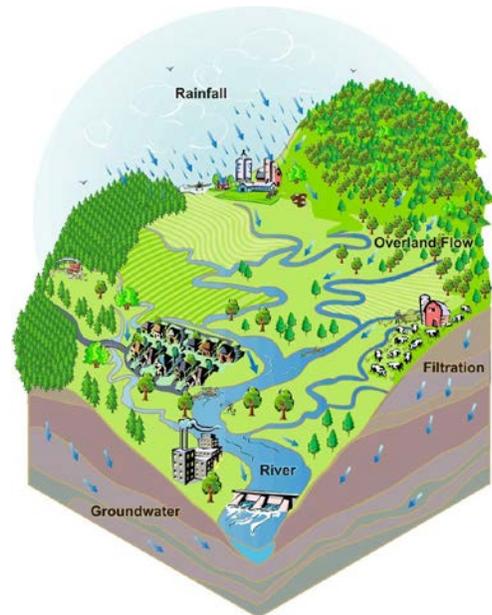
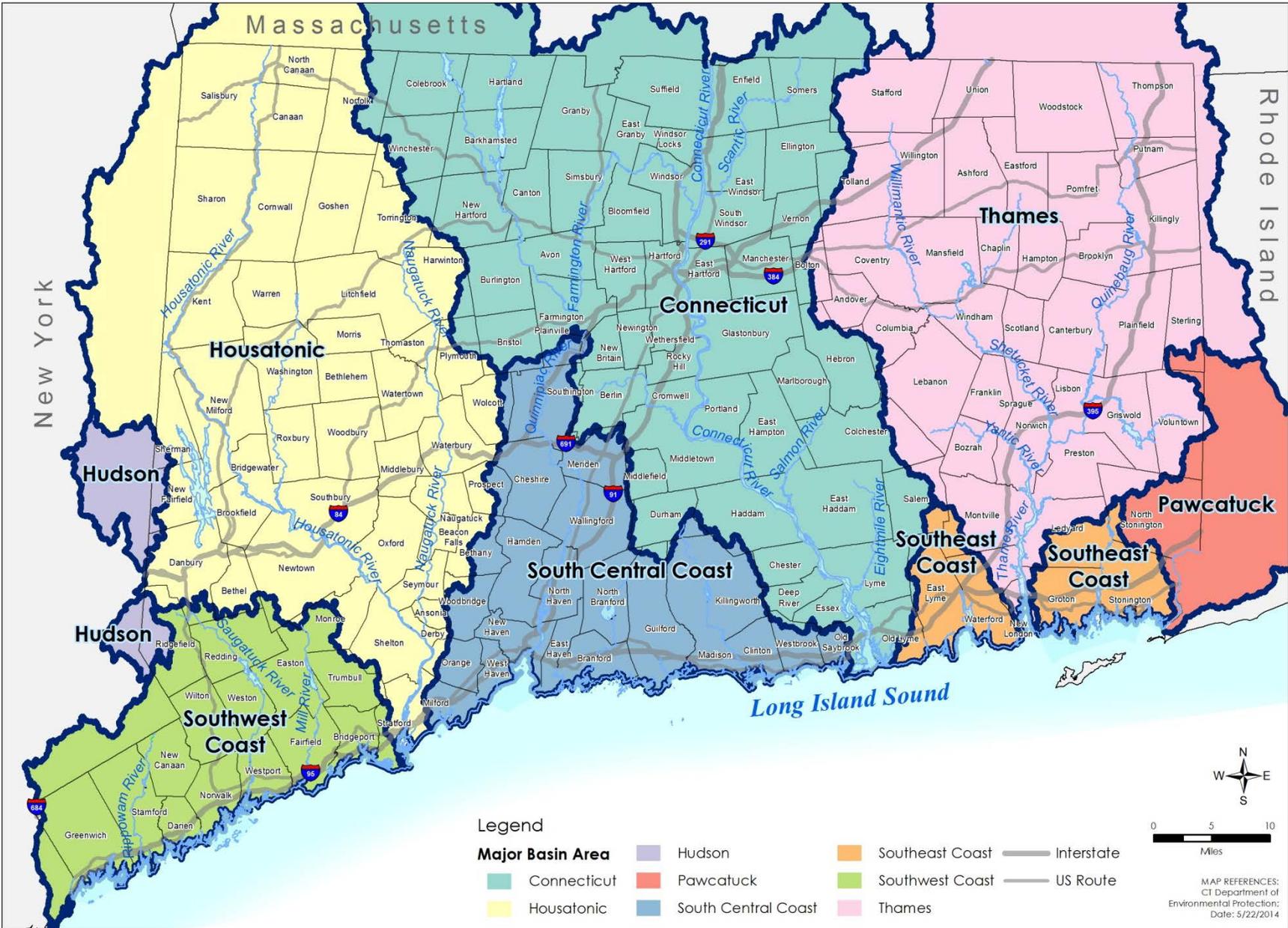


Figure 2-2. Conceptual Watershed



identification of measurable water quality goals, and specific actions needed to reach the watershed goals.

Watershed planning is a process that results in a plan or a blueprint of how to best protect and restore the water quality and other natural resources in a watershed. Since watershed boundaries often extend over political boundaries into adjacent municipalities and/or states, a comprehensive planning process that involves all affected municipalities located in the watershed is essential to successful watershed management. Typically, a planning process takes place first, which identifies an overall management strategy with implementation options that will achieve the water quality goals. The process is meant to be iterative, holistic, hydrologically defined, integrated, and collaborative.

The outcome of the watershed planning process is documented in a watershed plan. A watershed plan is a document that provides assessment and management information for a geographically defined watershed, including the analyses, actions, participants, and resources related to developing and implementing the plan.

CT DEEP and EPA recognize the need to focus on developing and implementing watershed plans for waters that are impaired in whole or in part by nonpoint sources. For these waterbodies it is imperative to provide overall management measures as well as select on-the-ground management measures and practices that will reduce pollutant loads and contribute in measurable ways to restoring of impaired waters to meet water quality standards. The watershed planning process can be used to restore impaired waters with or without approved TMDLs.

Healthy Waters

In some cases, stakeholders might want to protect high-quality or threatened waters that could potentially be affected by nonpoint source pollution but are not currently impaired. Of particular concern are high-quality waters that are threatened by changing land uses when unique and valuable aquatic resources are at serious risk of irreparable harm. Watershed plans can be developed for waters that are not impaired by nonpoint source pollution to ensure that they remain healthy or “unimpaired.” Healthy watersheds provide many ecosystem services and environmental benefits, including clean water, recreational opportunities, habitat for fish and wildlife, and reduced vulnerability to severe impacts such as flooding and climate change (US EPA, 2009). EPA’s Healthy Watersheds Initiative includes both watershed assessment and management approaches that encourage states, local governments, watershed organizations, and others to take a strategic approach to conserve healthy components of watersheds, and, therefore, avoid additional water quality impairments in the future.

Watershed Based Plans

Watershed planning is a critical precursor to watershed project implementation. Effective planning is always necessary to guide successful watershed restoration and protection efforts. In general, watershed plans identify: water quality goals; causes and sources of pollution; structural and nonstructural practices needed to address pollution sources; pollutant reduction goals; cost estimates for projects; project stakeholders and partners; and other important aspects of careful project management, including monitoring approaches to measure implementation results and water quality improvements.

In keeping with EPA guidelines, CT DEEP requires nine-element watershed based plans for restoration projects in impaired watersheds. The nine elements are outlined in Appendix B. For projects in unimpaired and healthy waters different plans are required. These plans, which are referred to as alternative watershed based plans, are also required for situations when impairments are not specific to a pollutant; when responding to a NPS pollution emergency, or when addressing an isolated, small-scale water quality problem.

EPA Nine Key Elements of Watershed Based Plans

1. Impairment
2. Load Reduction
3. Management Measures
4. Technical & Financial Assistance
5. Public Information & Education
6. Schedule
7. Milestones
8. Performance Criteria
9. Monitoring

CT DEEP encourages broadening the scope of watershed plans by addressing other water and land resource issues on a watershed scale, above and beyond specific water quality impairments. Implementation of locally-developed watershed based plans is one of the primary methods for achieving the CT DEEP NPS Management Program goals and objectives.

Under the direction of CT DEEP's Watershed Management Program, watershed management plans have been developed for watersheds throughout Connecticut since the mid-1990s. A number of EPA nine element watershed based plans have been completed in Connecticut since 2008, which serve as models for ongoing and future plan development and implementation in other watersheds. Implementation projects resulting from these watershed based plans, consisting of on-the-ground water quality restoration or protection projects, have been completed throughout the state with Section 319 and other sources of federal, state, local and private funding. Completed and ongoing watershed based plans and other watershed management plans are available on the CT DEEP website at www.ct.gov/deep/watershed.

Statewide NPS Pollutant-Specific Initiatives

Nutrients

Nutrient contamination is a water quality concern that is receiving attention on a national level. Nutrients, such as phosphorus and nitrogen, are naturally occurring elements and are essential to support plant growth. However, when present in excessive amounts, nutrients contribute to a process called "cultural eutrophication" that can impair both aquatic life and recreational use of Connecticut's water resources. Cultural eutrophication, or nutrient enrichment, is a serious threat to water quality in Connecticut.

Excessive loading of nutrients to surface waters as a result of discharges from industrial and municipal water pollution control facilities (WPCF), stormwater or nonpoint sources such as runoff from developed and agricultural lands, or other sources, can lead to algal blooms, including blooms of noxious blue green algae, reduction in water clarity, habitat modification, aquatic life impairments and in extreme cases depletion of oxygen and fish kills.

Understanding the potential sources of nutrient inputs to the environment informs both TMDL and other implementation plans to address the effects that excess nutrients can have on water quality. Nutrient reductions have been targeted for discharges of both phosphorus and nitrogen in order to address water quality concerns associated with nutrients in freshwater rivers, streams and impoundments as well as in Long Island Sound (CT DEEP, 2012).

In 2001, Connecticut and New York, along with EPA, completed a TMDL and implementation plan for the control of nitrogen to Long Island Sound to address the issue of hypoxia, or very low levels of dissolved oxygen, in the bottom waters of the western half of Long Island Sound. Since 2002, DEEP and municipalities that manage wastewater treatment plants throughout the State have been actively involved in the DEEP Nitrogen General Permit Program using state and federal Clean Water Act funding. Activities, including treatment plant upgrades, and the Connecticut Nitrogen Credit Exchange Program have been implemented to achieve significant reductions in nitrogen loads from wastewater treatment plants. Additional information on Connecticut's nitrogen control programs is available at www.ct.gov/deep/nitrogencontrol.

The discharge of phosphorus from point and nonpoint sources is also a water quality concern for inland surface waters. EPA Region 1 has mandated that all New England states establish limitations on phosphorus in wastewater discharge permits where the potential exists for the discharge to contribute to eutrophication and impair designated uses in downstream waters. In response, CT DEEP has adopted an interim strategy to establish water quality based phosphorus limits in non-tidal freshwater for industrial and municipal NPDES wastewater discharge permits until numeric nutrient criteria are established in the Connecticut Water Quality Standards.

CT DEEP is working with EPA and stakeholders on a statewide phosphorus control strategy that includes reductions in the discharge of phosphorus from point and nonpoint sources. Public Act 12-155 was passed in 2012 requiring CT DEEP to work collaboratively with several Connecticut municipalities to evaluate and make recommendations regarding a state-wide strategy to reduce phosphorus loading. A Coordinating Committee and three Workgroups, including a NPS Phosphorus Work Group, have been established to meet the PA 12-155 requirement that DEEP collaborate with municipalities to address the goals of the legislation. Recommendations of the statewide strategy relative to nonpoint source phosphorus will be incorporated into the State NPS Management Program Plan. Additional information on Connecticut's statewide phosphorus reduction strategy is available at www.ct.gov/deep/phosphorus.

Bacteria

In 2012, Connecticut completed a Statewide Bacteria TMDL addressing bacterial contamination of surface waters throughout the state, including impairments related to recreational use and shellfish consumption. As future bacteria-impaired segments are discovered, and additional data is generated on remaining impairments, new segments will be added to the TMDL. The load reductions required by the TMDL will be implemented through NPDES permits for permitted point sources and through watershed based planning and other voluntary control measures for nonpoint sources. Additional information on the Statewide Bacteria TMDL is available at www.ct.gov/deep/tmdl.

Low Impact Development (LID) and Green Infrastructure (GI)

CT DEEP NPS Program and Coastal Planning staff work to promote Green Infrastructure and Low Impact Development collaboratively with municipalities. Opportunities exist to develop Green Infrastructure Implementation Projects which will address Nonpoint Source Pollution as well as reducing urban runoff loads on Combined Sewer Outfalls (CSO). Connecticut has committed \$20

million dollars per year from its Clean Water State Revolving Funds for Green Infrastructure Project implementation in CSO communities in 2014 and 2015.

CT DEEP has focused on increasing awareness of LID and GI techniques for reducing stormwater runoff and NPS pollution. CT DEEP is working with partners at the federal, state and local levels to provide information, educational materials and technical assistance in the application of LID and GI techniques, building on existing programs such as the Governor's Responsible Growth Initiative, the University of Connecticut's Nonpoint Education for Municipal Officials (NEMO) program, and EPA's Smart Growth Program. The goal is to build better relationships and promote LID/GI management practices with local land use agencies, academic institutions, nonprofit groups, the building industry and the public. Incorporating LID/GI into land use plans and regulations can decrease impervious surfaces and limit runoff, leading to restored water quality and recharge of rivers, streams and ground water supplies.

Low Impact Development (LID) is a land use planning and site design strategy for the management of storm runoff that uses small scale controls integrated throughout a site to infiltrate, filter, store, detain, and evaporate precipitation close to its source, replicating the natural hydrology of a site. LID techniques decrease surface runoff, erosion, and NPS source pollution and conserve natural site features to restore water quality and regulate water quantity. Similarly, green infrastructure (GI) refers to broader systems or practices that use or mimic natural processes to manage storm runoff, often in an urban context.

Additional information on the CT DEEP LID and GI initiatives is available at www.ct.gov/deep/greeninfrastructure.

2.3 Coastal Nonpoint Pollution Control

Long Island Sound is one of Connecticut's most important natural and economic resources, serving as habitat to many aquatic marine invertebrates, fish, and wildlife populations, a commercial and recreational resource to the citizens of Connecticut and New York, and contributing an estimated \$8.5 billion annually to the regional economy (LISS, <http://longislandsoundstudy.net/about-the-sound/by-the-numbers/>).

NPS pollution contributes nutrients, bacteria and pathogens, sediments, toxic material and litter to Long Island Sound and the embayments located along the Sound. The effects of NPS pollution in the coastal environment can include beach closures, fishing and shellfishing restrictions and prohibitions, sedimentation of bottom habitats, and low dissolved oxygen (hypoxia), which in turn can cause fish kills and loss of other marine organisms. Large amounts of freshwater runoff discharged directly into saltwater tidal wetlands can also upset the delicate balance of fresh- and saltwater in the wetland ecosystem, often resulting in the invasion of freshwater plant species and the degradation of tidal wetlands. Failing or inadequate septic systems can cause localized water quality problems, releasing pathogens and nutrients to ground water and surface waters that ultimately discharge to Long Island Sound. Even properly functioning conventional septic systems can release nutrients that contribute to hypoxia problems.

CT DEEP Coastal Nonpoint Pollution Control Program

Connecticut's Coastal Nonpoint Pollution Control Program (CNPCP) established pursuant to Section 6217 of the Coastal Zone Act Reauthorization Amendments (CZARA), addresses several major categories of NPS pollution including agriculture, urban sources, marinas and recreational boating, hydromodifications, and wetlands and riparian areas. The CNPCP is a networked program that relies on several well-established and effective programs to reduce or eliminate NPS pollution affecting coastal waters, and several of them are administered or overseen by CT DEEP.

Connecticut's CNPCP is based primarily on the Connecticut Coastal Management Act, the Section 319 Nonpoint Source Pollution Control Program, and the state's broad Water Pollution Control Authority. In addition to these foundation programs, there are several networked programs and authorities that are used to implement each CNPCP program component.

The CT DEEP Office of Long Island Sound Programs (OLISP) is responsible for administering the CNPCP in conjunction with the Planning and Standards Division in the Bureau of Water Protection and Land Reuse. OLISP also is responsible for administering statutes related to coastal NPS problems, including the state's Tidal Wetlands Act and Structures, Dredging, and Fill Act.

Implementation of Connecticut's CNPCP is focused on:

- Controlling nitrogen and pathogens, especially from new development, existing urban sources, and runoff from marinas that are proximate to Long Island Sound and its major tributaries.
- Addressing NPS pollution control needs on both a case-by-case and a watershed basis through various methods including coastal site plan review, state regulatory authority (e.g., tidal wetlands and structures, dredging, and fill regulatory programs), Section 319 implementation projects, and broader watershed planning initiatives.
- Continuing technical assistance to municipalities to address nonpoint source impacts from new and existing development encouraging use of Low Impact Development and Green Infrastructure techniques.
- Protecting tidal wetlands and riparian areas, and promoting the use of Living Shorelines where appropriate.
- Improving the monitoring and tracking of septic system performance in areas impacting coastal waters.

Long Island Sound Study (National Estuary Program)

Other regional and federal groups are also working collaboratively to address coastal NPS pollution issues that affect Long Island Sound. EPA, Connecticut, and New York formed the Long Island Sound Study (LISS) in 1985, a bi-state partnership consisting of federal and state agencies, user groups, concerned organizations, and individuals dedicated to restoring and protecting the Sound. In 1994, the

The Long Island Sound Study

The Long Island Sound Study (LISS), one of 28 national estuary programs, is a cooperative effort involving researchers, regulators, user groups and other concerned organizations and individuals. These people are working together to protect and improve the health of the Sound by implementing the Sound's Comprehensive Conservation and Management Plan, which is focused on the following priorities:

- Hypoxia/nutrient management
- Habitat restoration
- Public involvement and education
- Water quality monitoring

LISS completed a Comprehensive Conservation and Management Plan (CCMP), which describes the Sound's water quality problem and a series of actions to address and solve these problems. The CCMP is currently being revised and is expected to be completed in 2015. More information can be found at <http://longislandsoundstudy.net/>.

2.4 Pollution Prevention

Pollution prevention emphasizes preventing or minimizing pollution, rather than controlling it once it is generated. Pollution prevention is the most effective NPS pollution control strategy and therefore plays a central role in the state's NPS Management Program, which is consistent with CT DEEP's commitment to pollution prevention. Pollution prevention is essential to restoring impaired waters and protecting high quality waters. Numerous pollution prevention practices are available for a variety of land uses and NPS pollution source categories, many of which are emphasized throughout the recommendations contained in this plan. CT DEEP has a Pollution Prevention Program that coordinates pollution prevention activities in cooperation with the NPS Program. Information can be found at www.ct.gov/deep/p2.

2.5 CT DEEP's Stormwater Program

In Connecticut, most stormwater pollution from developed areas that is collected in storm drains, or that discharges from construction, commercial, or industrial sites, is regulated by Stormwater General Permits, so is technically considered point source pollution. Stormwater permitting and compliance is conducted by the CT DEEP Water Permitting and Enforcement Division (WPED) under the authority of the CWA National Pollutant Discharge Elimination System (NPDES) Stormwater provisions and supporting state statutes and regulations. CT DEEP regulates Stormwater discharges from the following sources:

- Construction sites with land disturbance of one or more acres
- Industrial activities (includes marinas and boatyards)
- Commercial sites with more than five acres of impervious area
- MS4 (Municipal separate storm sewer system) discharges.

Note that a draft revised MS4 General Permit was issued by CT DEEP in July 2014 and is expected to be finalized in 2015.

Runoff that is not regulated by one of these general permit programs is considered nonpoint source pollution and is addressed by the State's NPS Management Program. Existing regulatory and non-regulatory programs in Connecticut that address point and nonpoint stormwater and runoff pollution are discussed in Section 4 of this plan

2.6 Subsurface Systems

Subsurface sewage disposal systems (i.e., septic systems) serve more than one million people in Connecticut, approximately 40 percent of the state's population. These systems, which are typically conventional septic systems, are utilized in rural and low-density suburban areas. Although decentralized sewage systems cause a disproportionately smaller percent of pollution/water quality impairments than their public sewer counterparts, inadequate or failed septic systems represent a significant threat to surface water, ground water, and environmentally sensitive areas.

In Connecticut, subsurface systems are regulated by local health departments, CT DEEP, or the Connecticut Department of Public Health depending on the design flow capacity and the type of treatment and disposal system. Structural and non-structural measures to minimize the potential for system failure and associated NPS pollution impacts are described in Section 4 of this plan.

2.7 Agriculture

Agricultural operations are a major contributor to nonpoint source pollution problems. Water quality contaminants associated with agricultural operations include nutrients (nitrogen and phosphorus primarily from fertilizers and animal wastes), pathogens and organic materials (primarily from animal wastes), sediment (from field erosion), pesticides, salts, and petroleum products. These pollutants enter watercourses through direct surface runoff or through seepage to ground water that discharges to surface water. Agriculture in Connecticut primarily includes crop land, livestock, forestry and forest products, bees, poultry, Christmas trees, vineyards, maple syrup, aquaculture, and orchards (CTFB, 2009).

Agricultural NPS pollution in Connecticut is addressed primarily through outreach and technical assistance programs provided by state and federal agencies including the USDA Natural Resources Conservation Service (NRCS), USDA Farm Service Agency, University of Connecticut Cooperative Extension System, Connecticut Conservation Districts, CT DEEP, and the Connecticut Department of Agriculture. CT DEEP is also developing a general permit program for Concentrated Animal Feeding Operations (CAFO), related requirements for Comprehensive Nutrient Management Plans (CNMPs), and alternative agricultural waste management technologies. Section 4 of this plan describes statewide NPS planning and management recommendations for agricultural practices in Connecticut.

2.8 NPS Program Partners

The Connecticut Department of Energy and Environmental Protection (CT DEEP) has formed strong partnerships with a wide range of public agencies, industry organizations, and citizen groups to implement NPS management. Connecticut's NPS Program is a network of many programs administered by numerous federal, state, and municipal government agencies and organizations. CT DEEP is designated by the U.S. Environmental Protection Agency (EPA) as the primary state NPS management authority. CT DEEP's Bureau of Water Protection and Land Reuse serves in a coordinating role for the various NPS programs and administers the state's Section 319 grant

program. Further networking occurs within each of these agencies and organizations. Collectively, these agencies and organizations establish long- and short-term goals, objectives, and milestones that effectively implement NPS pollution management.

The Goals, Objectives, and Measurable Milestones tables in Section 4 of this plan identify various NPS Program partners who will have a role in implementing this plan.

| NPS Program Partners in Connecticut | |
|--|---|
| Federal: | |
| U.S. Environmental Protection Agency | CT Department of Emergency Services and Public Protection |
| U.S. Department of Agriculture Natural Resources Conservation Service | CT Department of Administrative Services |
| U.S. Army Corps of Engineers | University of Connecticut NEMO, CLEAR, CIRCA, Sea Grant |
| U.S. Department of Commerce National Oceanic and Atmospheric Administration Fisheries, Ocean and Coastal Resource Management, National Weather Service | CT Agricultural Experiment Station |
| U.S. Department of Interior U.S. Fish and Wildlife Service U.S. Geological Survey National Park Service | Local/Regional: Municipalities Regional Councils of Government Conservation Districts Water Utilities & Water Pollution Control Authorities Local Health Districts CT Conference of Municipalities CT Council of Small Towns Neighboring State and County Governments |
| State: | Other: |
| CT Department of Energy & Environmental Protection | Private Colleges and Universities |
| CT Department of Public Health | Watershed Organizations |
| CT Department of Transportation | Advocacy Groups and other NGOs |
| CT Department of Agriculture/Aquaculture | Land Trusts |
| CT Office of Policy and Management | Industry Organizations |
| CT Department of Economic and Community Development | News Media Organizations Native American Tribes |

2.9 Technical Assistance and Outreach

In addition to CT DEEP, Connecticut’s Soil and Water Conservation Districts (Conservation Districts) and the University of Connecticut Nonpoint Education for Municipal Officials (NEMO) program, among other NPS Program partners, play a lead role in providing technical assistance and outreach on NPS management issues in Connecticut.

Conservation Districts

Conservation Districts deliver technical assistance and outreach to municipalities and landowners. Technical and educational services provided include erosion and sedimentation control, management and control of NPS pollution, management of stormwater runoff, and promotion of watershed management with recommendations for best management practices. Districts partner with various public and private stakeholders to develop and implement watershed management plans and local initiatives focused on protecting and restoring watershed health. Among others, partners include CT DEEP, NRCS, municipalities, regional planning entities, and natural resource and land preservation groups.

Connecticut NEMO Program

The NEMO program began in 1991 at the University of Connecticut, as a collaboration of the Cooperative Extension System, the Connecticut Sea Grant College Program and the Natural Resources Management and Engineering Department. The fundamental premise of the program is that education – not regulation – is the most efficient and cost-effective means of influencing land use decisions. Today, NEMO is a part of the Center for Land Use Education and Research (CLEAR) within the University of Connecticut College of Agriculture and Natural Resources. The NEMO program provides information, education and assistance to local land use officials and other community groups on how they can accommodate growth while protecting their natural resources and community character. NPS management issues addressed by the NEMO program and CLEAR include LID and green infrastructure, riparian buffers, and municipal plans and regulations that protect water quality.

2.10 NPS Program Recommendations

Table 2-2 identifies overall NPS Program direction for CT DEEP, including partnerships and funding. Five-year objectives, actions, and milestones and an associated schedule are detailed. NPS Program funding and evaluation are further discussed in Section 5 of this plan.

Table 2-2. NPS Program, Partnerships, and Funding – Five-Year Objectives, Actions, and Milestones

| Objectives | Actions | Milestones | Schedule | | | | |
|---|---|--|----------|------|------|------|------|
| | | | 2015 | 2016 | 2017 | 2018 | 2019 |
| 1. <u>Partnerships</u>: Build and strengthen partnerships of the lead agencies to coordinate efforts and effectively implement the CT NPS Management Program Plan. | 1. Create a State NPS Technical Committee made up of state, federal, regional and local agencies, and other stakeholders to continue the state NPS planning and implementation process. | Create NPS State Technical Committee by January 2015. | X | | | | |
| | 2. Meet annually with the NPS Technical Committee to coordinate and prioritize NPS planning and implementation efforts, report on progress with implementation of the CT NPS Management Program Plan, and identify new opportunities for further collaboration. | Meet with NPS State Technical Committee annually. | X | X | X | X | X |
| | 3. Work with Rivers Alliance of Connecticut to facilitate Watershed Conservation Network Meetings twice per year, addressing timely issues regarding water policy and planning, including the DEEP Nonpoint Source Pollution program's goals. | Participate in, and provide guidance at Watershed Conservation Network Conferences twice per year. | 2 | 2 | 2 | 2 | 2 |
| | <i>Lead Agency: CT DEEP Partners: Rivers Alliance of Connecticut, etc.</i> | | | | | | |
| 2. <u>Pollutant Reduction Tracking</u>: Assess the development of a statewide NPS management tracking system to quantify NPS pollution reductions and credits. | 1. Facilitate development of a statewide NPS management tracking system or program to quantify NPS pollution reductions and credits (i.e., BMPs implemented, areas applied, pollutant load reductions achieved). 2. Review similar credit/trading programs developed for the Chesapeake Bay nutrient | Evaluation: Evaluate applicability to CT. Report: Program feasibility and recommendations. | | X | X | | |

Table 2-2. NPS Program, Partnerships, and Funding – Five-Year Objectives, Actions, and Milestones

| Objectives | Actions | Milestones | Schedule | | | | |
|---|--|---|----------|------|------|------|------|
| | | | 2015 | 2016 | 2017 | 2018 | 2019 |
| | <p>TMDL and other states and their applicability to Connecticut.</p> <p>3. Work with NRCS to obtain program data.</p> <p>4. Develop a report outlining program feasibility and recommendations.</p> <p>5. Implement program, if determined to be feasible.</p> <p><i>Lead Agency: CT DEEP</i> <i>Partner Agency: NRCS, CT Conservation Districts, Municipalities, UConn Cooperative Extension,</i></p> | Implementation: Adopt tracking system. | | | | | X |
| 3. Program Administration: Continue to manage and implement the NPS Program to meet program goals and work towards addressing priority NPS-related water quality issues. | <p>1. Continue to employ appropriate programmatic and financial systems that ensure Section 319 funds are used efficiently and consistent with fiscal and legal obligations (Section 319 grant program guidelines, EPA-DEP Performance Partnership Agreement).</p> <p>2. Consistent with Clean Water Act Section 319(h)(8), provide EPA with sufficient information and data about Connecticut's 319 Program to determine whether the state's progress for the previous fiscal year was satisfactory.</p> <p><i>Lead Agency: CT DEEP</i></p> | Connecticut's program continues to achieve satisfactory progress determination from EPA annually. | X | X | X | X | X |
| 4. Funding: Develop and Implement Clean Water State Revolving | <p>1. Identify and evaluate potential opportunities to expand the eligibility of Green Infrastructure projects that can be funded through the Clean</p> | Evaluate CWSRF funding opportunities, develop | X | X | | | |

Table 2-2. NPS Program, Partnerships, and Funding – Five-Year Objectives, Actions, and Milestones

| Objectives | Actions | Milestones | Schedule | | | | |
|---|--|--|----------|------|------|------|------|
| | | | 2015 | 2016 | 2017 | 2018 | 2019 |
| Fund use for Green Infrastructure projects. | <p>Water Revolving Fund and funding delivery mechanisms.</p> <p>2. Develop recommendations and coordinate with the CWF program to approve and implement NPS projects.</p> <p>3. Track CWF projects and funding awarded to Green Infrastructure projects and produce an annual summary report.</p> <p><i>Lead Agency: CT DEEP</i></p> | <p>recommendations, and award funding.</p> <p>Annual report on CWSRF funding for Green Infrastructure projects. Coordinate with CWF Priority List Development.</p> | X | X | X | X | X |
| 5. Plan Update: Update NPS Management Program Plan | <p>1. Consult partner agencies and solicit public input to update the Connecticut NPS Management Program Plan for the next cycle.</p> <p>2. Review and update NPS Management Program Plan.</p> <p><i>Lead Agency: CT DEEP</i> <i>Partner Agencies: NPS Partners and the public</i></p> | An approved NPS Management Program Plan for the next cycle (including milestones for 2020-2024) will be in place by October 1, 2019 | | | | | X |

3 Watershed Prioritization in Connecticut

Prioritization is an important step in effective nonpoint source planning because it aids in the allocation of limited resources by identifying and ranking watersheds based on their potential for successful restoration and protection efforts. While the goal of the nonpoint source program is to restore water quality and restore all impaired waters to their designated uses, a combination of ecological, stressor, and social characteristics influence the successfulness of restoration and protection efforts. Consequently, a systematic approach for comparing and evaluating waters for focusing restoration and protection is necessary.

CT DEEP's current water quality assessment process identifies healthy and impaired waters in the State of Connecticut. This list of impaired waters formed the basis of an initial, interim list of priority watersheds to be targeted for restoration and protection efforts (see **Appendix C**) and was developed based on review by CT DEEP water resources professional staff knowledgeable in stream, lake, and marine water quality assessment and management. CT DEEP intends to update and refine this list using a multi-parameter approach, such as the EPA Recovery Prioritization Screening Tool (RPST) or similar methodology, adapted to state use, to inform the prioritization process.

This section outlines CT DEEP's approach to the prioritization process and the general steps to be taken to develop refined prioritization lists for both restoration and protection. It should be noted that the prioritization process will also be coordinated with CT DEEP's 303d Vision prioritization efforts. Although the 303d Vision process includes both nonpoint and point sources, the overall goal of that effort is also prioritization based on pollution sources and watershed stressors. Consequently, there is a logical connection and potential for synergistic collaboration between the two efforts.

3.1 Prioritization

The prioritization effort is guided by a framework that integrates ecological, stressors, and social criteria.

Table 3-1 summarizes key features of that framework. A fundamental criterion for inclusion on the NPS priority list is that nonpoint sources, not point sources or legacy pollution, are the primary cause of water quality impairment in the watershed. The adjacent text box lists common water quality impairments. In addition, the process will include consideration of the water quality status, public support and prior agency commitment to the watershed, alignment with other resource planning priorities, and a quantified potential for restoration or preservation. **Table 3-2** provides an example of the type of metrics commonly used to quantify restoration or protection potential.

Common Nonpoint Source Impairments

- Ammonia
- Biochemical Oxygen Demand
- Benthic Macroinvertebrate Bioassessments
- Chloride
- Chlorophyll-a
- Cyanobacteria
- Dissolved Oxygen Saturation
- Enterococcus, Escherichia Coli, & Fecal Coliform
- Excess Algal Growth
- Fish Bioassessments
- Habitat Assessment Low Flow Alterations
- Other Flow Regime Alterations
- Dissolved Oxygen
- Sedimentation/Siltation
- Total Suspended Solids
- Turbidity
- Nitrogen and Phosphorus

Table 3-1. Prioritization Framework Summary

| Criteria | Rationale for Selection |
|--|--|
| <p>Water Quality Status: What is the current and trending status of water quality in the watershed?</p> | <ul style="list-style-type: none"> • Impaired water (for restoration) • High quality water (for protection) • Declining status of water quality • Nonpoint source of impairment (existing or threat of) |
| <p>Streamflow Condition: What is the degree of alteration from natural hydrograph?</p> | <ul style="list-style-type: none"> • Class 1 Waters (for protection) • Class 3 or 4 Waters (for restoration) |
| <p>Agency Prior Commitment: Have agencies already committed resources to the watershed, providing a base for restoration/protection efforts?</p> | <ul style="list-style-type: none"> • Watershed Based Plan prepared or in preparation (EPA 9 Element WBP, EPA 9 Element Implementation WBP, or other watershed management plan) • Total Maximum Daily Load (TMDL) in draft or final form • Other initiatives to assess nonpoint source pollution in the watershed • Designated priority watershed for a partner agency |
| <p>Public Support: Are there active watershed partners that would improve the likelihood of action at the local level?</p> | <ul style="list-style-type: none"> • Presence of an active watershed group • Identification as a drinking water supply • Active, managed recreational area |
| <p>Restoration (or Preservation) Potential : What is the likelihood or potential that restoration (or protection) efforts will be successful in a particular watershed?</p> | <ul style="list-style-type: none"> • Identified Potential for restoration or protection based on one of several methodologies that consider multiple factors including ecological, stressor, and social to score or otherwise quantify the potential for successful restoration or protection efforts. These include but are not limited to: <ul style="list-style-type: none"> ○ EPA Recovery Potential Screening Tool (RPST), which can also be used in a Protection Potential mode ○ The CT Macroinvertebrate Multimetric Index (MMI) tool for stream health ○ Other EPA models adapted to state use ○ Other states' approaches adapted to CT use |
| <p>Alignment with Other Agency Priorities: Would restoration or protection efforts align with other priorities identified by CT DEEP or partner agencies?</p> | <ul style="list-style-type: none"> • Identified as a resource in one of several planning efforts <ul style="list-style-type: none"> ○ Statewide Comprehensive Outdoor Recreation Plan (SCORP) ○ Connecticut Green Plan ○ Connecticut Statewide Forest Resource Plan ○ Connecticut Conservation and Development Policies Plan ○ Farmland Preservation and Restoration Programs ○ Connecticut Aquifer Protection Area Program |

| Table 3-1. Prioritization Framework Summary | |
|---|--|
| Criteria | Rationale for Selection |
| | <ul style="list-style-type: none"> ○ Long Island Sound Study Comprehensive Conservation and Management Plan ○ Federal Wild & Scenic River Management Plans ○ Comprehensive Wildlife Conservation Strategy (Wildlife Action Plan) ○ Municipal Hazard Mitigation Plans |

| Table 3-2. Possible Restoration and Protection Metrics | | |
|--|---|---|
| Ecological Metrics | Stressor Metrics | Social Metrics |
| <ul style="list-style-type: none"> ● Watershed Size ● Maintenance of % Natural Cover ● Strahler Stream Order ≤ 3 | <ul style="list-style-type: none"> ● Watershed Size ● Watershed Aquatic Barriers ● Corridor Road Crossing Density ● Number of Impairment Causes Listed | <ul style="list-style-type: none"> ● Watershed Size ● Watershed Based Plan ● TMDL ● Jurisdictional Complexity (number of municipalities) ● Watershed Population ● Drinking Water Intakes (number of) ● Beach closures (number, frequency, duration)_ ● Shellfish bed closures |
| <p>Watershed Land Cover %</p> <ul style="list-style-type: none"> ● Within Connecticut ● Unimpaired Miles (Stream) ● Unimpaired Acres (Lake) ● Natural Cover ● Forest ● Wetlands ● Natural Services Network | <p>Watershed Land Cover %</p> <ul style="list-style-type: none"> ● Impervious Area ● Agriculture ● Pasture ● Developed ● Increased in Developed Classes | <p>Watershed Land Cover %</p> <ul style="list-style-type: none"> ● Miles Assessed (Stream) ● Acres Assessed (Lakes) ● Protected Land ● Agriculture ● Pasture |
| <p>Active River Area %</p> <ul style="list-style-type: none"> ● Natural Cover ● Forest ● Wetlands | <p>Active River Area %</p> <ul style="list-style-type: none"> ● Impervious Area ● Developed ● Pasture ● Developed | |

The prioritization process will use different assessment criteria for watersheds associated with three major categories of waterbodies – lakes and ponds, rivers and streams, and marine/estuaries. The starting point for all prioritization is the data assessed under the Connecticut Consolidated Assessment and Listing Methodology (CT CALM). This process documents the decision-making

process for the assessment and reporting in the Integrated Water Quality Report (IQWR) on the quality of surface waters of the state. The basic unit used in the development of the CALM is the water quality assessment unit (AU). Surface waterbodies, i.e., streams, lakes and estuaries, are divided into units with homogenous water quality (i.e., use support is uniform throughout the unit). As a result, the assessment units are classified as either supporting or not supporting designated uses or it is noted if there is insufficient information to make an assessment. **Table 3-3** lists the designated uses associated with the three assessment unit types. When a use is impaired, the impairment cause is identified. The sources of impairment may be varied and include point and nonpoint source pollution (**Table 3-4**). If nonpoint source pollution is the primary cause of impairment, then the AU is eligible for the prioritization process.

| Table 3-3. Designated Uses by Assessment Unit Type | | |
|--|--|--|
| Rivers and Streams | Lakes and Ponds | Marine/Estuaries |
| <ul style="list-style-type: none"> • Aquatic Life • Recreation • Fish Consumption | <ul style="list-style-type: none"> • Aquatic Life • Recreation • Fish Consumption • Drinking Water | <ul style="list-style-type: none"> • Aquatic Life • Recreation • Fish Consumption • Shellfish Harvesting |

| Table 3-4. Potential Stressor Type, Reason for Impairment, and Examples of Common Nonpoint Sources | | | | | |
|--|-------------------------|----------|------------|--|--|
| Designated Use | Potential Stressor Type | | | Reason for Impairment | Examples of Common Nonpoint Sources |
| | Physical | Chemical | Biological | | |
| Existing or Proposed Drinking Water | | X | X | Bacteria (Total Coliform); cyanobacteria | Runoff from developed areas; agricultural runoff |
| Fish Consumption | | X | | Mercury, PCBs, Pesticides | Runoff from developed areas; agricultural runoff; atmospheric deposition |
| Habitat for Fish, Other Aquatic Life and Wildlife | X | X | X | Habitat alteration, flow regime changes, toxics, nutrients, low dissolved oxygen, interactions between multiple pollutants | Runoff from developed areas; agricultural runoff |
| Habitat for Marine Fish, Other Aquatic Life and Wildlife | X | X | X | Habitat alteration, flow regime changes, toxics, nutrients, low dissolved oxygen, interactions between multiple pollutants | Runoff from developed areas; agricultural runoff |

| Table 3-4. Potential Stressor Type, Reason for Impairment, and Examples of Common Nonpoint Sources | | | | | |
|--|-------------------------|----------|------------|--|--|
| Designated Use | Potential Stressor Type | | | Reason for Impairment | Examples of Common Nonpoint Sources |
| | Physical | Chemical | Biological | | |
| | | | | | |
| Recreation | X | X | X | Bacteria (Enterococcus, E.coli); cyanobacteria; nutrients and eutrophication | Runoff from developed areas; agricultural runoff; pet waste & wildlife |
| Shellfish Harvesting for Direct Consumption Where Authorized | | X | X | Bacteria (Fecal Coliform); cyanobacteria | Runoff from developed areas; agricultural runoff |
| Commercial Shellfish Harvesting Where Authorized | | X | X | Bacteria (Fecal Coliform); cyanobacteria | Runoff from developed areas; agricultural runoff |

Lakes and Ponds

Nearly half of all 64,973 acres of Connecticut lakes are currently assessed. Of the approximately 30,000 acres and 180 AUs assessed, recreation is the use most commonly impaired. The prioritization process will assess if nonpoint source pollutant load reduction is likely to restore water quality in impaired lakes given the type and source of impairment. This may not be the case where nutrient cycling from accumulated lake or pond sediments has been determined to be the primary source of impairment. Priority will be given to watersheds with active local or agency involvement as demonstrated by a watershed based plan, local monitoring efforts, sanitary surveys, source water protection plan (for drinking water), a draft or completed TMDL, inclusion in statewide or regional planning efforts, and CT DEEP or partner agency involvement or priority planning.

Lakes meeting water quality will be considered in the protection priority ranking process based on their use (drinking water or high demand recreational use), identification as a priority by a partner agency, recent or increased development or impervious cover in the watershed, sensitivity to additional nutrient inputs, presence of reported cyanobacteria blooms, or declining trends in water quality linked to nonpoint sources.

Rivers and Streams

A total of 867 AUs within approximately 2,500 river miles are assessed in Connecticut out of the 5,830 miles in the state. As with lake watersheds, recreation is the most commonly impaired use. The prioritization process will assess if nonpoint source reduction is likely to restore water quality in impaired stream segments given the type and source of impairment. In addition, priority will be given to watersheds with active local or agency involvement as demonstrated by a watershed based plan, a draft or completed TMDL, inclusion in statewide or regional planning efforts, and CT DEEP or partner agency involvement or priority planning.

Unimpaired streams will be considered for the protection priority ranking based on the potential for increases in development or impervious cover in the watershed, identification as a priority by a partner agency, or declining trends in water quality linked to nonpoint sources.

Estuarine Waters

All estuarine AUs in the state are currently tracked within the IWQR. The most commonly impacted uses are shellfish harvesting in Class SA waters and recreational beach closures. The prioritization process will assess if nonpoint source reduction is likely to improve water quality in areas of shellfish harvesting or public beaches given the type and source of impairment. In addition, priority will be given to watersheds with active local or agency involvement as demonstrated by a watershed based plan, a draft or completed TMDL, inclusion in statewide or regional planning efforts, and CT DEEP or partner agency involvement or priority planning.

Watersheds draining to estuarine waters identified as unimpaired will be considered for the protection priority ranking based on the potential for increases in development or impervious cover in the watershed, identification as a priority or Stewardship Site by a partner agency, or declining trends in water quality linked to nonpoint sources.

3.2 Watershed Recommendations

Table 3-5 identifies NPS Program recommendations relative to watershed prioritization, planning, and restoration/protection. Recommendations include five-year objectives, actions, and milestones and an associated schedule. Statewide recommendations for specific nonpoint source categories are presented in Section 4.

Table 3-5. Watershed Approach – Five-Year Objectives, Actions, and Milestones

| Objectives | Actions | Milestones | Schedule | | | | |
|--|---|---|----------|------|------|------|------|
| | | | 2015 | 2016 | 2017 | 2018 | 2019 |
| 1. <u>Prioritization:</u> Develop full criteria and methodology used for prioritizing lakes, streams and marine waters (NPS Priority Watersheds list) | <ol style="list-style-type: none"> Review options for multimetric assessment and ranking of AUs for streams, lakes, and marine watersheds. Evaluate use of Recovery Potential Screening tool (RPST) or similar quantitative methods to assist with prioritization of impaired and unimpaired watersheds for restoration and protection, respectively. Coordinate effort with CT DEEP's 303d Vision prioritization process. Update current interim priority watersheds list incorporating model results, if appropriate. Coordinate with partners to investigate ways to improve the prioritization method as new data or methods becomes available. <p><i>Lead Agency: CT DEEP</i></p> | Revised NPS priority watersheds list evaluation criteria and methodology (report) | X | | | | |
| | | Updated NPS priority watersheds list and methodology. | X | X | X | X | X |
| 2. <u>Prioritization:</u> Evaluate NPS priority lists annually as new information on individual watersheds becomes available. | <ol style="list-style-type: none"> Annually evaluate NPS priority watersheds lists and provide opportunity for public comment. Update priority lists as needed - add or remove individual waterbodies to the priority lists as new information becomes available. <p><i>Lead Agency: CT DEEP</i></p> | Develop and publish annual NPS priority watershed list, as warranted | X | X | X | X | X |
| 3. <u>Planning:</u> Approve 5 additional nine element watershed based plans (WBP) for restoration of impaired waters. | <ol style="list-style-type: none"> Provide decision makers the information needed to develop sound WBPs including data necessary to determine the dominant stressors contributing to the impairment and sufficient watershed and stream corridor information to identify and | Nine element WBPs | 1 | 1 | 1 | 1 | 1 |

Table 3-5. Watershed Approach – Five-Year Objectives, Actions, and Milestones

| Objectives | Actions | Milestones | Schedule | | | | |
|---|---|--|----------|------|------|------|------|
| | | | 2015 | 2016 | 2017 | 2018 | 2019 |
| | <p>prioritize specific implementation activities needed to restore the waterbody.</p> <p>2. Provide technical support, guidance and, when available, funding for development of effective WBPs.</p> <p><i>Lead Agency: CT DEEP</i></p> | | | | | | |
| 4. Planning: Approve 4 alternative WBPs for restoration or protection of unimpaired waters. | <p>1. Working with partners, provide assistance and funding for watershed surveys to support the development of watershed-based plans for watersheds prioritized for restoration or protection. Consistent with EPA NPS program guidelines, secure EPA approval of all alternative WBPs.</p> <p><i>Lead Agency: CT DEEP</i></p> | Approved Alternative WBPs | | 1 | 1 | 1 | 1 |
| 5. Planning: Approve updates of 5 existing nine element WBPs. | <p>1. Working with partners, provide assistance to support updates of existing, previously-approved nine element WBPs, focusing on developing and enhancing project lists.</p> <p><i>Lead Agency: CT DEEP</i></p> | Number of approved updated project lists for WBPs. | 1 | 1 | 1 | 1 | 1 |
| 6. Restoration: Fully or partially restore NPS impaired waterbodies; Prepare NPS Success Stories that document the restorations. | <p>1. Provide support and funding through NPS Section 319 grant program to support implementation of WBPs for waters with high potential to be restored.</p> <p>2. Work with local municipalities and interest groups to resolve pathogen contamination problems on bacteria impaired waterbodies.</p> | Two (2) NPS success stories about full or partial restorations (WQ-10 measure) | | 1 | | 1 | |

Table 3-5. Watershed Approach – Five-Year Objectives, Actions, and Milestones

| Objectives | Actions | Milestones | Schedule | | | | |
|---|---|--|----------|------|------|------|------|
| | | | 2015 | 2016 | 2017 | 2018 | 2019 |
| | <ol style="list-style-type: none"> Collect targeted water quality and biological health information that can be used to determine the effectiveness of implementation efforts and guide modifications to the WBP. Evaluate available data to determine if water quality standards have been met or if there has been substantial incremental improvement in water quality and/or ecological conditions. Include information in NPS annual report. <p><i>Lead Agency: CT DEEP</i></p> | | | | | | |
| 8. Substantial Improvement: Demonstrate substantial improvement in water quality and/or ecological conditions in NPS impaired waterbodies. | <ol style="list-style-type: none"> Review water quality monitoring data for trends in aquatic life use support as a result of NPS activities utilizing tiered aquatic life use support and other indicators. Include information in NPS annual report. <p><i>Lead Agency: CT DEEP</i></p> | Report: Analysis of Integrated Water Quality Report | X | | X | | X |
| 9. Protection: Demonstrate effective protection of unimpaired threatened waterbodies. | <ol style="list-style-type: none"> Evaluate effectiveness of efforts to protect unimpaired/threatened waters. Provide technical support and funding through NPS Section 319 grant program to support implementation of WBPs. <p><i>Lead Agency: CT DEEP</i></p> | Report: Total CT stream miles classified as high quality waters based on aquatic life use support, and associated trend. | X | | X | | X |

Table 3-5. Watershed Approach – Five-Year Objectives, Actions, and Milestones

| Objectives | Actions | Milestones | Schedule | | | | |
|---|---|--|----------|------|------|------|------|
| | | | 2015 | 2016 | 2017 | 2018 | 2019 |
| 10. <u>Planning;</u> <u>Protection;</u> <u>Restoration:</u> Prevent or control NPS pollution within watersheds, or statewide, by participating in collaborative ventures | 1. Provide technical support to internal and external partners on plans, proposals, projects and issues with goal of addressing NPS problems - protecting healthy waters, implementing TMDLs and watershed-based plans to restore impaired waters. <i>Lead Agency: CT DEEP</i> <i>Partner Agency(ies): Varies; May or may not apply</i> | Categorized and descriptive list of yearly technical support provided in NPS Annual Report | X | X | X | X | X |

4 Source-Specific Strategies to Address NPS Pollution

This section presents statewide strategies for addressing specific sources of NPS pollution in Connecticut. The Connecticut NPS Management Program will give priority to those sources of NPS pollution that continue to cause or contribute to the most water quality impairments or pose the greatest threat to water quality in Connecticut. These categories of NPS pollution are referred to in this plan as “Major Sources.” Other categories of NPS pollution are those that have less potential to threaten water quality and are designated in this plan as “Other Sources.” **Table 4-1** lists the NPS pollution source categories that are addressed in this plan.

| Major Sources | Other Sources |
|--|--|
| <ul style="list-style-type: none"> • Runoff from Developed Areas • Transportation • Landscaping and Turf Management • Subsurface Sewage Disposal Systems • Agriculture • Domestic and Wild Animals • Boating and Marinas • Hydrologic and Habitat Modification | <ul style="list-style-type: none"> • Land Disposal • Brownfields and Contaminated Sites • Forestry • Material Storage • Resource Extraction • Atmospheric Deposition |

A description of the pollutant source category, key programs and partners, measures to control NPS pollution, and specific five-year objectives, actions, and milestones for Connecticut’s NPS program for the years 2015 through 2019 are provided for each NPS pollution source category.

While we have presented a broad identification of pollution sources which impact NPS pollution, the Connecticut NPS Management Program does not, in all cases, have primacy for addressing these pollution sources. As such, while we suggest milestones and activities, where we do not have control over these activities these milestones and activities should be considered more as recommendations. This information is provided within this plan to provide context for important sources which impact NPS pollution. We will continue to work with a broad range of partners to improve the NPS landscape within our state, but program efforts will ultimately be directed to those activities over which the Connecticut NPS Management Program has direct influence.

4.1 Major Sources

4.1.1 Runoff from Developed Areas

Background

In developed areas, large portions of natural landscape cover have been replaced with non-porous, or impervious, surfaces. Developed areas and associated impervious cover result in increased Runoff from Developed Areas volume and pollutant

Impervious Surfaces in Connecticut

Approximately 19 percent of the State of Connecticut consists of developed land cover – impervious surfaces such as roads, parking lots, and buildings – that prevents rainwater from soaking into the ground, causing increased runoff and nonpoint source pollution.

loads to receiving waterbodies. Impervious cover refers to surfaces such as roads, driveways, parking lots, and building rooftops that change the natural dynamics of the hydrologic cycle. Impervious surfaces change the character of runoff dramatically by causing water to remain on the land surface. Without slow percolation into the soil, water accumulates and runs off in larger quantities. This faster moving water washes soil from earth surfaces that are not securely held in place by structural means or healthy vegetation. When rain falls in developed areas, it flows quickly off these impervious surfaces, carrying soil, bacteria, nutrients, and other pollutants to nearby waterbodies (CT DEEP, 2012).

According to the *2012 State of Connecticut Integrated Water Quality Report*, developed land uses (along with agricultural lands) have been identified by CT DEEP as contributing to much of the NPS pollution affecting the State's inland water resources and Long Island Sound. Developed lands contribute suspended sediments and solids, nitrogen, phosphorus, hydrocarbons, heavy metals, pathogenic organisms (bacteria and viruses), and road salts that adversely affect the biotic health of aquatic systems and degrade water quality. Stormwater runoff contaminant concentrations vary considerably as a function of the storm and the type and intensity of land use. As would be expected, the more urbanized land uses, such as high density residential, commercial, and industrial, contribute greater pollutant loads than lower intensity uses, such as low density residential and forested land.

Development can also impact the timing and quantity of runoff discharging to streams. Compared to the pre-development conditions, post-development conditions can cause increases in the runoff volume and peak discharge, and decreases in the infiltration of precipitation to the ground, which thereby decreases baseflow in headwater streams and in wetlands. The changes to stream hydrology can have negative impacts on channel stability and the health of aquatic biological communities. Common problems include bank scour and erosion, increased downstream flooding, loss of in-stream habitat for macroinvertebrates, fish, and other organisms (CWP, 2008), and reduction in stream baseflow and streams running dry during periods of the year. These impacts not only affect the aquatic environment, but also affect the ability of people to use these areas for active and passive recreation. For example, runoff from developed areas commonly results in beach closures due to high bacteria and pathogen counts in the water.

New development and redevelopment activities pose a future threat to water quality, but also present an opportunity for the application of effective and innovative land use planning principles that can help avoid or minimize potential impacts from nonpoint sources of pollution.

Runoff from developed areas in Connecticut is managed through both regulatory and non-regulatory programs, as described in Section 2.5 of this plan. Runoff from regulated Municipal Separate Storm Sewer Systems (MS4) (see **Figure 4-1**) and stormwater discharges from certain construction, commercial, and industrial sites are considered point source discharges that are regulated by CT DEEP through Stormwater General Permits under the authority of the CWA National Pollutant Discharge Elimination System (NPDES) discharge permit program. Storm runoff that is not regulated by CT DEEP Stormwater General Permits (e.g., runoff from a construction site that disturbs less than one acre of land or runoff from outside urbanized or MS4 areas) is considered nonpoint source pollution and is addressed by the State's NPS Management Program. A

number of other State and Municipal regulatory programs address management of stormwater in Connecticut (see the Regulatory Programs listed at the end of this section).

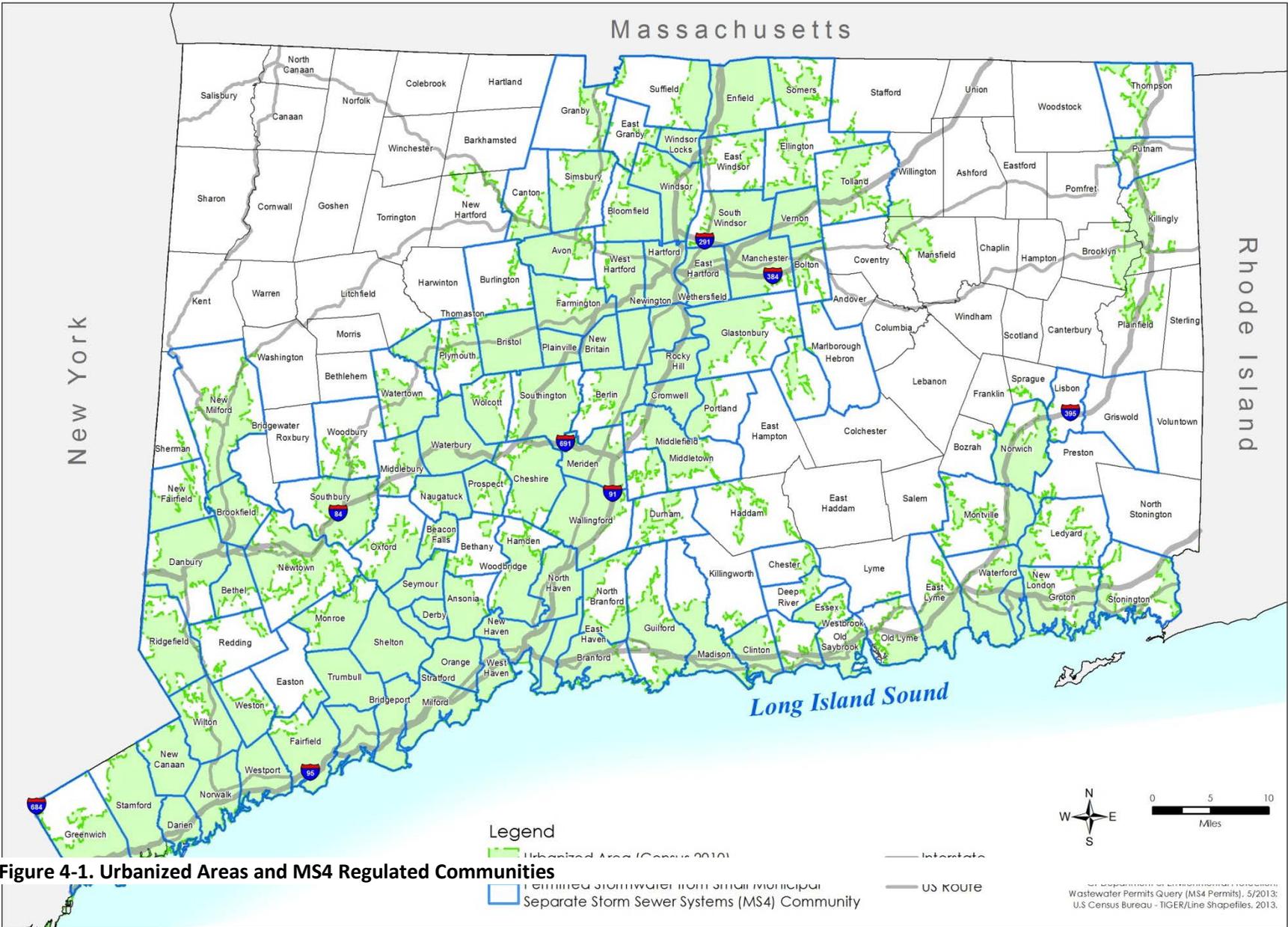
Addressing runoff from developed areas typically requires a combination of non-structural and structural controls, also referred to as Best Management Practices (BMPs). Source control and pollution prevention BMPs are recommended to reduce exposure of pollutants to rainfall and runoff. Effective site planning and design techniques such as Low Impact Development (LID) can reduce effective impervious cover, disturbed soils, and storm runoff volumes. Lastly, structural stormwater BMPs can be used to further detain, treat, or infiltrate the remaining runoff. Each of these approaches can be used to manage storm runoff associated with existing developed areas (i.e., retrofits), new development projects, and infill/redevelopment.

On the state level, CT DEEP provides guidance on protecting the waters of Connecticut from the impacts of post-construction storm runoff in the *2004 Connecticut Stormwater Quality Manual*. The manual is a design tool for site planning, source control, and stormwater treatment practices. CT DEEP developed the *Low Impact Development Appendix to the Stormwater Quality Manual* in 2011 to provide further guidance on the selection and use of LID techniques in Connecticut. Similar CT DEEP guidance documents exist for measures to address erosion and sedimentation from construction sites - *2002 Connecticut Guidelines for Soil Erosion and Sediment Control* and *Low Impact Development Appendix*.

LID (also referred to as “green infrastructure”) is the preferred approach to stormwater management and land development in Connecticut, as described in Section 2.6 of this plan, CT DEEP has focused on increasing awareness of LID techniques for reducing storm runoff and NPS pollution. CT DEEP is working with partners at the federal, state and local levels to provide information, educational materials and technical assistance in the application of LID techniques. CT DEEP Watershed Managers promote LID management practices as part of Watershed Based Planning with municipal land use agencies and public and private stakeholders in order to protect, conserve and restore water quality in Connecticut.

Since urban nonpoint sources of pollution are so closely related to land use, municipal land use authorities play a central role in implementing this key component of Connecticut’s NPS Management Program. CT DEEP also provides assistance to municipalities for incorporating LID into local plans of conservation and development and zoning, subdivision, and inland wetlands regulations, which are the primary local regulatory mechanisms for addressing stormwater and NPS pollution associated with new and redevelopment projects. This included a number of municipalities within the Farmington River Watershed. Through CT DEEP, grants were awarded to ten towns to review current land use regulations and ordinances to identify barriers to implementation of LID, and to revise the applicable land use regulations and ordinances to remove barriers and incorporate LID into municipal regulations, zoning, and subdivision approvals. Other municipalities across the state continue to adopt LID land use policy and regulations.

Communities across the nation, and here in Connecticut, are increasingly examining the option of Stormwater Utilities to fund municipal stormwater management programs. Much like water and sewer utilities, an equitable fee is collected for stormwater services provided. The revenue can be used to maintain and upgrade existing storm drain systems, develop drainage plans, construct flood



control measures, and cover administrative costs. Stormwater Utilities are seen as a fair way of collecting funds for stormwater management.

Several Connecticut communities have explored the feasibility of implementing a Stormwater Utility including State-funded pilot studies in New Haven, Norwalk, and New London, as well as completed and ongoing feasibility studies in Stonington and Bridgeport, respectively. Despite the passage of Stormwater Utility enabling legislation and the completion of feasibility studies, no Stormwater Utilities have been formed in Connecticut.

As described in Section 2.8 of this plan, the University of Connecticut Nonpoint Education for Municipal Officials (NEMO) program, in addition to other NPS Program partners, plays a lead role in providing technical assistance and education/outreach on NPS management issues in Connecticut. NEMO offers significant outreach materials, training, and research on stormwater management, including an LID atlas, an inventory of municipal LID land use regulations in Connecticut, rain garden outreach materials targeted at homeowners, and an award-winning rain garden “app” for mobile devices.

Control Measures

A Best Management Practices selection matrix is provided in **Appendix D** of this plan. The matrix is designed as a tool to assist NPS partner’s selection of appropriate structural and non-structural runoff management measures to address stormwater and NPS pollutant sources based on pollutant type, pollutant reduction effectiveness, relative cost, and other factors.

Regulatory Programs

- CT DEEP Stormwater General Permits (NPDES Permit Program for point source discharges of stormwater):
<http://www.ct.gov/deep/stormwater>
- CT DEEP Land Use Permits
 - Aquifer Protection Area
 - Inland Water Resources
 - Coastal (Office of Long Island Sound Programs)
- Connecticut Inland Wetlands and Watercourses Act
- Connecticut Soil Erosion and Sediment Control Act
- Coastal Site Plan Review
- Municipal Planning and Zoning
- Municipal Plans of Conservation and Development

Nonregulatory Guidance Documents and Educational Resources

- *2004 Connecticut Stormwater Quality Manual:*
http://www.ct.gov/deep/cwp/view.asp?a=2721&q=325704&deepNav_GID=1654
- *Low Impact Development Appendix to the Connecticut Stormwater Quality Manual:*
http://www.ct.gov/deep/lib/deep/water/nps/swgp/lid_apdx_ctstormwatermanual.pdf
- *2002 Connecticut Guidelines for Soil Erosion and Sediment Control and Low Impact Development Appendix:*

- http://www.ct.gov/deep/cwp/view.asp?a=2720&q=325660&deepNav_GID=1654%20
- Connecticut's Coastal Nonpoint Source Pollution Control Program - Urban Sources:
http://www.ct.gov/deep/cwp/view.asp?a=2705&q=323572&deepNav_GID=1709
- CT DEEP Municipal Outreach for Green Infrastructure and Low Impact Development:
http://www.ct.gov/deep/cwp/view.asp?a=2719&q=464958&deepNav_GID=1654
- CT DEEP Low Impact Development Resources Fact Sheet:
http://www.ct.gov/deep/lib/deep/water/watershed_management/wm_plans/lid/lid_resources.pdf
- CT DEEP Coastal Management Manual:
http://www.ct.gov/deep/cwp/view.asp?a=2705&q=323814&deepNav_GID=1622
- CT DEEP Coastal Nonpoint Source Pollution Control Program
http://www.ct.gov/deep/cwp/view.asp?a=2705&q=323554&deepNav_GID=1709
- University of Connecticut NEMO Program:
<http://nemo.uconn.edu/>
- University of New Hampshire Stormwater Center:
<http://www.unh.edu/unhsc/>
- Low Impact Development and Stormwater Manual for the Town of Newington:
http://www.newingtonct.gov/filestorage/78/118/156/2516/LID_Manual_-_with_Appendices.pdf
- Plainville Low Impact Development and Stormwater Management Design Manual:
<http://www.plainvillect.com/Downloads/plainville-LID-manual%20full%20-%202012-01-10%20rev%20to%202007-07-11%20-%20compressed-12-14-2011.pdf>
- Simsbury Stormwater Design Guidelines - A Companion Document to the Simsbury Stormwater Article and Simsbury Center Code:
http://www.simsbury-ct.gov/sites/simsburyct/files/file/file/sdc_draft_10-13-11.pdf
- Green and Growing Tool Box - inventory of policies, plans, or programs administered by Connecticut State Agencies represented on the Inter-Agency Responsible Growth Steering Council:
<http://www.dir.ct.gov/opm/IGP/Tools/index.asp>

Table 4-2. Runoff from Developed Areas – Five-Year Objectives, Actions, and Milestones

| Objectives | Actions | Milestones | Schedule | | | | | |
|---|---|--|----------|------|------|------|------|--|
| | | | 2015 | 2016 | 2017 | 2018 | 2019 | |
| 1. <u>Impervious Cover Response Plan Outreach: Develop outreach to municipalities in urbanized areas.</u> | <ol style="list-style-type: none"> 1. Develop an impervious cover “response plan” outreach effort for urbanized/developed communities where impervious cover (IC) and stormwater runoff are responsible for water quality impairments. 2. Build on the technical tools and outreach developed for the Eagleville Brook IC TMDL (i.e., responding to an Impervious Cover-Based TMDL, UConn NEMO/CLEAR Program, 2011) and CT DEEP’s initial efforts to develop a statewide IC Response Plan. <p><i>Lead Agency: CT DEEP</i> <i>Partners: UConn NEMO/CLEAR</i></p> | <p>Publish Guidance document</p> <p>Disseminate Guidance document to 20 communities.</p> | | X | | | | |
| 2. <u>Municipal GI/LID Outreach and Implementation: Enhance municipal outreach and implementation of GI and LID.</u> | <ol style="list-style-type: none"> 1. Maintain a website and listserve to share information. 2. Hold workshops or training to share and exchange information on green infrastructure (GI) and Low Impact Development (LID) approaches and techniques. 3. Develop municipal regulation guidance related to GI and LID. <p><i>Lead Agency: CT DEEP</i> <i>Partners: UConn NEMO/CLEAR</i></p> | <p>Revise and maintain website and Water Quality Planning listserv.</p> <p>Biennial workshops.</p> <p>Develop regulatory guidance and model regulations.</p> | X | X | X | X | X | |
| 3. <u>BMP Manuals: Regularly review/ solicit comment on</u> | <ol style="list-style-type: none"> 1. Solicit input every 2 years from the consulting community, UConn and the academic community, | Input received and workshop held. | | X | | X | | |

Table 4-2. Runoff from Developed Areas – Five-Year Objectives, Actions, and Milestones

| Objectives | Actions | Milestones | Schedule | | | | |
|---|---|--|----------|------|------|------|------|
| | | | 2015 | 2016 | 2017 | 2018 | 2019 |
| Stormwater BMP manuals. | <p>state agencies, and the regulated community through State NPS Technical Committee.</p> <p>2. Evaluate proposals for new or modified BMPs to more effectively address water quality impacts from urban runoff, including consideration of pollutant removal effectiveness, maintenance issues, and cost. This should target the most recently available research on BMP performance for reduction of nutrients and bacteria.</p> <p><i>Lead Agency: CT DEEP</i> <i>Partners: UConn NEMO/CLEAR, CT DOT, CT DCS, CT DECD, Consultants</i></p> | Continue to develop and refine online Developed Area Runoff BMP Selection Matrix for technical support to stakeholders and support UConn and others who track BMP efficiencies and costs | X | X | X | X | X |
| 4. <u>Regional Approaches:</u> Promote regionalization and municipal cooperation to address runoff-related water quality issues. | <p>1. Support the development of regional watershed partnerships to increase efficiencies of established watershed partnerships and provide capacity building tools for new partners.</p> <p><i>Lead Agency: CT DEEP</i> <i>Partners: 1 Regional Councils of Government, Municipalities, Rivers Alliance, NRCS, CCDs</i></p> | Two regional coalitions established. | 1 | | 1 | | |
| 5. <u>Urban Forestry:</u> Promote urban forestry as a key component of effective municipal green infrastructure programs. | <p>1. Provide incentive programs, education, model regulations, and examples of successful programs in Connecticut to promote the following practices:</p> <ul style="list-style-type: none"> a. Protect existing forests through land acquisition and conservation easements b. Amend site development regulations and zoning to encourage tree retention and | Number of communities amending local regulations or adopting tree ordinances, annually. Reporting by Forestry Division. | X | X | X | X | X |

Table 4-2. Runoff from Developed Areas – Five-Year Objectives, Actions, and Milestones

| Objectives | Actions | Milestones | Schedule | | | | |
|------------|--|---|----------|------|------|------|------|
| | | | 2015 | 2016 | 2017 | 2018 | 2019 |
| | maintenance, restrict tree removal, and require parking lot shading and landscaping using LID techniques c. Reforest public lands, where feasible, and encourage reforestation of private land d. Consider developing tree ordinances, especially for canopy protection within riparian corridors e. Establish realistic urban tree canopy goals and develop a plan to achieve those goals <i>Lead Agency: CT DEEP</i> <i>Partners: Municipalities, UConn Cooperative Extension System, Connecticut Fund for the Environment, WPCAs</i> | Number of communities conducting urban tree canopy assessments and related action plans, annually. Reporting by Forestry Division. | X | X | X | X | X |

4.1.2 Transportation

Background

The State of Connecticut owns and operates (through the Connecticut Department of Transportation or CT DOT) approximately 3,700 miles of highways, 3,900 highway bridges, 230 miles of rail track, 6 airports, a state pier complex, two ferries, and numerous buildings such as transit stations, highway garages, and highway rest stops. Additionally, Connecticut municipalities own and maintain an extensive transportation system that includes approximately 17,000 miles of local roads and 1,200 local bridges (CT DOT, 2011). **Figure 4-2** depicts the major elements of Connecticut's existing transportation system.

Transportation land uses are a potential source of NPS pollution, including storm runoff from impervious surfaces such as roads and highways; highway and road maintenance facilities and activities; winter deicing activities associated with roads, highways, and airports; and potential spills or releases during transport of materials throughout the state.

Roadways contribute a wide range of pollutants to surface water and ground water. Metals, hydrocarbons, bacteria, and chloride are common constituents of road runoff. Traditional curbing and piped drainage systems can result in the discharge of untreated road runoff to wetlands and watercourses, contributing to water quality impairments and erosion and flooding problems.

NPS pollution may result from road and bridge maintenance activities including road salt application, sanding, and sweeping of roads; paving; bridge cleaning and painting; vegetation control; inadequate sediment and erosion controls; and maintenance and storage of equipment. Excessively applied or improperly stored road salt may leach into drinking water supplies and other ground or surface waters. Snow can impact surface waters if improperly stored or disposed. Storm runoff may erode the soils of poorly managed roadsides, or transport fertilizers and pesticides from these areas to neighboring waterbodies.

Improper storage and handling of road salt can result in surface water and ground water contamination. Road salting is a significant source of chloride impacts to both surface water and ground water. The state's baseline chloride concentrations have increased by tenfold over the last century.

Application of road salt for winter deicing has been standard practice since the 1940s on Connecticut's transportation facilities: roads, bridges, highways, airports, parking lots and sidewalks, etc. In Connecticut, road salt was typically mixed with sand for application to roads. Sand had its own set of problems; it needed to be cleaned out of catch basins and swept off the roads in the spring, and it had the potential to impact stream habitat.

Beginning in 2006, CT DOT implemented a new program for snow and ice removal. The goal of this new program was to reduce the use of sand and to introduce new techniques in order to increase the effectiveness of salt to melt road ice and snow. CT DOT switched to pretreatment of highways with brine (sodium chloride) and eliminated the use of sand. The justification was that decreasing the use of sand was a benefit to waterways, and use of road salt (sodium chloride) and calcium or magnesium chloride would be more effective in clearing snow and ice from roads.

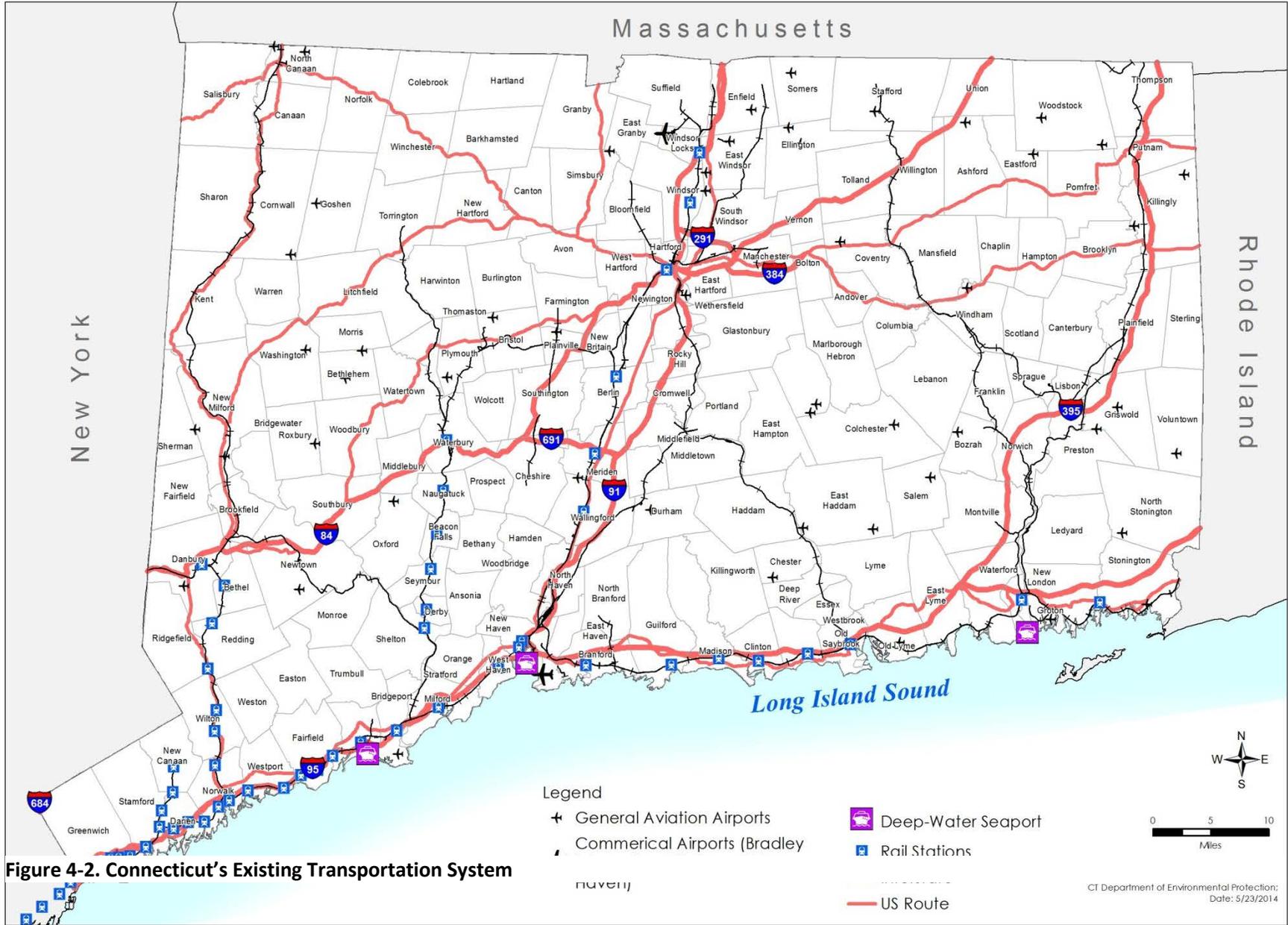


Figure 4-2. Connecticut's Existing Transportation System

Brine is sprayed onto road surfaces prior to storms as a form of pretreatment. The brine prevents snow and ice from bonding to pavement, reduces bounce/scatter of salt and keeps the material on the pavement, and provides plow drivers more time at the onset of a storm. Once the storm has begun, rock salt is again applied and may be wetted with calcium chloride and sometimes magnesium chloride to further enhance melting.

Many municipalities and institutions have followed suit by switching from sand to salt as the preferred deicing material. A recent unpublished survey of municipal deicing practices conducted by UConn indicates that most municipalities use salt (sodium chloride) and/or salt brine, while approximately 20% still use sand (Michael Dietz, personal communication, June 10, 2014). These enhancements to state and municipal deicing practices are more effective in terms of public safety and cost, but have led to increased concerns over chloride impacts to surface water and ground water.

Low Impact Development storm runoff practices, while effective for removing a wide variety of pollutants and reducing runoff volumes, are not effective for removing chloride. Reducing the amount of salt applied is one management step that has been taken by some municipalities and institutions, but they also need to balance pedestrian and vehicle safety concerns.

Until relatively recently, roadway salts were frequently stored outdoors and exposed to the elements where the dissolved pollutants could affect nearby ground water and surface water bodies. In response to the introduction of best management practices (BMPs) for road salt storage and application, all salt piles at CT DOT facilities are now kept undercover or within structures to reduce exposure to precipitation. Most municipalities have also implemented similar BMPs at their public works yards to reduce exposure of deicing materials to precipitation.

The state's 54 airports are another potential source of NPS pollution. The Connecticut Airport Authority is responsible for the operation of Bradley International Airport (the State's largest airport) and the state's five general aviation airports (Danielson, Groton-New London, Hartford-Brainard, Waterbury-Oxford, and Windham airports). Other airports in Connecticut are operated by municipal entities.

A water quality concern specific to airports, particularly major airports like Bradley, is the use of aircraft deicers (ethylene and propylene glycol) during the winter months to both remove and prevent the accumulation of snow and ice from aircraft and airfield surfaces. These chemicals may be used both in wet and dry weather conditions. If not contained, these chemicals may be introduced into surrounding waterbodies and ground water through runoff. Deicers can cause degradation of water quality particularly the oxygen carrying capacity of surface waters.

Control Measures

- Cary Institute of Ecosystem Studies - Road Salt Moving Toward the Solution (2010): http://www.caryinstitute.org/sites/default/files/public/reprints/report_road_salt_2010.pdf
- Source Water Protection Practices Bulletin Managing Highway Deicing to Prevent Contamination of Drinking Water. EPA 816-F-09-008. July 2009: www.epa.gov/safewater

Table 4-3. Transportation – Five-Year Objectives, Actions, and Milestones

| Objectives | Actions | Milestones | Schedule | | | | |
|---|---|--|----------|------|------|------|------|
| | | | 2015 | 2016 | 2017 | 2018 | 2019 |
| 1. Roadway Deicing Impacts on Water Quality: Document impacts of roadway deicing on water quality in Connecticut. | <p>1. Prepare a report summarizing the impacts of roadway deicing on water quality in Connecticut and recommendations to protect water quality while maintaining safe roads.</p> <p><i>Lead Agencies: CT DEEP and CT DOT</i> <i>Partners: Municipal DPW, UConn NEMO/CLEAR and Technical Assistance Center, CASE</i></p> | Summary report with recommendations. | | | X | | |
| 2. CT DOT Roadway Deicing Program: Continue to enhance state roadway deicing programs to address water quality. | <p>1. Continue to evaluate and implement enhancements to its roadway deicing program to reduce impacts to surface and ground water quality.</p> <p>2. Continue to investigate new products, technologies, and efficiencies to reduce the use of chlorides.</p> <p><i>Lead Agency: CT DOT</i> <i>Partners: CT DEEP, UConn NEMO/CLEAR and Technical Assistance Center</i></p> | Participate in regular meetings and workshops. | X | X | X | X | X |
| 3. Deicing at Commercial Facilities: Improve deicing and snow management practices at commercial facilities including airports to protect water quality. | <p>1. Review and evaluate deicing and snow management at commercial facilities.</p> <p>2. Develop recommendations for improved practices to protect water quality, and other incentives and outreach for smaller, unregulated commercial facilities.</p> <p><i>Lead Agency: CT DEEP</i> <i>Partners: CBIA, Industry Representatives</i></p> | Summary report with regulatory and non-regulatory recommendations. | | | | X | |

4.1.3 Landscaping and Turf Management

Background

The care and maintenance of lawns and other landscaped areas such as golf courses, cemeteries, athletic fields, and parks, can contribute significantly to NPS pollution and water quality impacts.

Nutrients, such as phosphorus and nitrogen, are one of the leading causes of water quality impairment in Connecticut's inland and coastal waters, as described in Section 3 of this plan, n. Phosphorus and nitrogen are naturally occurring elements and are essential to support plant growth but, when present in excessive amounts, contribute to eutrophication (i.e., nutrient enrichment or the growth of algae and aquatic plants, the decomposition of which causes low dissolved oxygen) that can impair both aquatic life and recreation and be harmful to human health. Nitrates are very soluble and have the potential to move extensive distances within ground water. Nitrate levels exceeding the federal and state standard in drinking water may be lethal to infants.

The use of fertilizers and pesticides on lawns contributes nutrients and toxic chemicals to surface waters and ground water. Fertilizer use on turf is a significant source of phosphorus and nitrogen input to Connecticut waters as approximately 8% of the state consists of turf and maintained grasses. Inputs of phosphorus from fertilizers are of particular concern in freshwaters, while inputs of nitrogen are the main concern for coastal waters and Long Island Sound.

Storage and disposal of fertilizer and lawn care chemicals is also a potential source of NPS pollution. Improper storage procedures are of concern when chemicals are located near critical resource areas. Disposal of leftover and unusable pesticides, as well as containers and rinse water, can have impact water quality if proper procedures are not followed.

Improper disposal of grass, leaves, and other yard wastes can also affect water quality in residential and commercial areas. Grass clippings, high in nitrogen, are of particular concern with respect to coastal waters, while leaves, which contain relatively high amounts of phosphorus, are of particular concern with respect to freshwaters. Grass clippings or leaves deposited in surface waters, wetlands, or drainage systems can contribute to nutrient loadings and drainage problems.

Pollution prevention and source controls are the most effective approaches for addressing NPS pollution associated with landscaping and turf management. A number of statewide and regional efforts are underway that mandate or promote improved lawn care and landscaping practices in Connecticut.

- The Connecticut law (P.A. 12-155) banning the application of fertilizers containing phosphorus on established lawns went into effect on January 1, 2013. The law requires that a soil test be performed within the previous two years indicating phosphate is needed

Turf in Connecticut

Approximately 8 percent of the State of Connecticut consists of turf and grasses, including residential lawns, parks, cemeteries, golf courses, turf farms, and other maintained grassy areas. Fertilizers and other chemicals used on these areas is a significant source of nonpoint source pollution to surface waters and ground water.

before phosphorus from fertilizer, amendments, or compost can be applied to established lawns. Regardless of testing results, fertilizers containing phosphate shall not be applied to established lawns between December 1 and March 15, near water resources, or to any impervious surface. Golf courses and agricultural land are exempt from this regulation.

- In 2009 and 2010, the Connecticut legislature passed a law (P.A. 09-56) banning lawn care pesticide applications on the grounds of day care centers, elementary and middle schools (grade 8 and lower) as a result of residents' concerns about children's health and the environment. Some Connecticut municipalities have gone beyond the requirements of the law and have stopped using pesticides to manage turfgrass on all their municipal properties.
- Organic lawn and turf care can maintain attractive lawns and turf without the use of excessive nutrients or toxic pesticides. Homeowners are encouraged to use environmentally-friendly lawn care practices such as reducing or eliminating fertilizer and pesticide usage through the use of slow release fertilizers and fertilizer application timing; utilizing alternative landscaping that decreases maintenance; soil testing and non-chemical lawn care measures. The UConn Cooperative Extension has a number of programs related to sustainable lawn care and gardening practices including the Home & Garden Education Center, Master Gardener Program, and "Sustainable Landscaping for Clean Waters" certification program. CT DEEP and the Connecticut Chapter of the Northeast Organic Farming Association are additional sources of information on organic lawn care resources in Connecticut.
- Connecticut has participated in the New England Governor's Turf Fertilizer Initiative through the New England Interstate Water Pollution Control Commission. The Northeastern Regional Turf Fertilizer Initiative was a collaborative effort, completed in January of 2014, that sought to engage the six New England states and New York State, EPA, and industry and non-industry stakeholders in discussion on the contribution of fertilizers applied to lawns to polluted runoff and water quality problems. This initiative developed mutually agreeable and scientifically sound regional guidelines related to the formulation and application of turf fertilizer.
- CT DEEP and other NPS partners continue to promote landscape stewardship by homeowners, businesses, and institutions. Extensive outreach programs and materials have been developed to encourage the creation of backyard habitat in residential areas near stream corridors, including the importance of maintaining healthy vegetated buffers to streams, ponds, and wetlands, and recognize the efforts of the public. Examples of existing programs include the Quinnipiac River Watershed Association's Streamside Landowners' Guide to the Quinnipiac Greenway, Audubon's backyard program the City of Milford's Freedom Lawn program, and programs from the EPA Long Island Sound Study and Connecticut Sea Grant.

Control Measures

Regulatory Programs

- Connecticut's law regulating the use of phosphorus on established lawns (P.A. 12-155):
<http://www.cga.ct.gov/2012/ACT/PA/2012PA-00155-R00SB-00440-PA.htm>
- Connecticut's law banning lawn care pesticide applications at day care centers and public elementary and middle schools (P.A. 09-56):
<http://www.cga.ct.gov/2009/act/Pa/pdf/2009PA-00056-R00SB-01020-PA.PDF>

Guidance Documents and Educational Resources

- CT DEEP, Organic Lawn Care website:
<http://www.ct.gov/deep/cwp/view.asp?A=2708&Q=382644>
- CT DEEP, Transitioning To Organic Land Care (OLC) In Your Town:
http://www.ct.gov/deep/cwp/view.asp?a=2708&q=379676&deepNav_GID=1763
- CT DEEP, Best Management Practices for Golf Course Water Use:
http://www.ct.gov/deep/lib/deep/water_inland/diversions/golfcoursewaterusebmp.pdf
- Connecticut Chapter of the Northeast Organic Farming Association:
<http://www.organiclandcare.net/>
- Final Report to the New England and New York State Environmental Agency
Commissioners: Regional Clean Water Guidelines for Fertilization of Urban Turf (NEIWPC):
<http://www.neiwpc.org/turffertilizer/turf-docs/finalreport.pdf>
- University of Connecticut, New England Regional Nitrogen and Phosphorus Fertilizer and
Associated Management Practice Recommendations:
http://www.lawntolake.org/PDFs/NE_WQ_Fert_Rec.pdf
- University of Massachusetts Cooperative Extension, Best Management Practices for Lawn
and Landscape Turf:
http://extension.umass.edu/turf/sites/turf/files/pdf-doc-ppt/lawn_landscape_BMP_2013_opt.pdf
- University of Connecticut Cooperative Extension, Sustainable Landscaping:
<http://www.sustainability.uconn.edu/sustain/turf/08.html>
- CT DEEP, BMPs for Grass Clipping Management:
http://www.ct.gov/deep/lib/deep/Permits_and_Licenses/Waste_General_Permits/grass_guidance.pdf
- University of Connecticut - Soil Nutrient Analysis Laboratory:
<http://soiltest.uconn.edu/>
- UConn Cooperative Extension System's Home & Garden Education Center:
<http://www.ladybug.uconn.edu/index.html>
- Homeowner sustainable lawn care incentive program developed by Lake Champlain
International (BLUE® Certification Program):
<http://www.mychamplain.net/blue-program>

Table 4-4. Landscaping and Turf Management – Five-Year Objectives, Actions, and Milestones

| Objectives | Actions | Milestones | Schedule | | | | |
|--|--|---|----------|------|------|------|------|
| | | | 2015 | 2016 | 2017 | 2018 | 2019 |
| 1. <u>Regional Turf Fertilizer Initiative:</u> Continue to participate in the Northeastern Regional Turf Fertilizer Initiative. | 1. Continue to participate in the Northeastern Regional Turf Fertilizer Initiative to set uniform formulation and application standards for the region, working cooperatively with the fertilizer industry, researchers, and other stakeholders. 2. Work with the CT Department of Agriculture to establish CT-specific standards or guidance. <i>Lead Agency: CT DEEP</i> <i>Partners: CT Department of Agriculture</i> | Ongoing participation in regional fertilizer initiative. Annual reporting on accomplishments. | X | X | X | X | X |
| | | Meet regularly with Dept. of Agriculture and others in NPS State Technical Committee, and provide recommendations to establish and fund an effective program to reduce pollution from lawn and landcare activities. | X | X | X | X | X |
| 2. <u>Homeowner Outreach:</u> Reduce water quality impacts from residential lawn care and landscaping activities. | 1. Provide additional outreach on Connecticut’s law regulating the use of phosphorus on established lawns. 2. Using existing educational materials and programs, and provide additional outreach to homeowners on sustainable lawn care and gardening practices and the creation and maintenance of backyard habitat, particularly in residential areas along waterbodies such as streams, lakes, and ponds. <i>Lead Agency: CT DEEP</i> <i>Partners: NOFA, UConn Extension, Connecticut Fund for the Environment, Connecticut Conservation Districts</i> | Identify appropriate partners to conduct outreach and assist them to seek funding to develop a program | X | | | | |

Table 4-4. Landscaping and Turf Management – Five-Year Objectives, Actions, and Milestones

| Objectives | Actions | Milestones | Schedule | | | | | |
|--|--|--|----------|------|------|------|------|---|
| | | | 2015 | 2016 | 2017 | 2018 | 2019 | |
| <p>3. Industry Outreach: Reduce water quality impacts from commercial lawn care and landscaping activities.</p> | <p>1. Identify and promote sustainable landscaper/homeowner certification programs. 2. Evaluate developing a statewide or regional sustainable lawn care recognition and incentive program.</p> <p><i>Lead Agency: CT DEEP</i> <i>Partners: Industry Representatives, UConn Extension, NOFA</i></p> | <p>Identify successful programs and evaluate feasibility of a regional or statewide incentive and/or certification programs. Report through State NPS Technical Committee.</p> <p>Develop and implement program, if warranted. Report through State NPS Technical Committee.</p> | | X | | | X | |
| <p>4. Municipal Outreach: Reduce water quality impacts from municipal lawn care and landscaping activities.</p> | <p>1. Identify existing guidance and educational resources targeted at municipal parks and playing fields managers. 2. Identify communities that have implemented water quality friendly practices as examples or success stories for other communities to follow. 3. Identify common barriers to implementing water quality friendly practices and potential cost savings of alternative practices. 4. Identify and promote municipal “recognition” programs for water quality friendly practices.</p> <p><i>Lead Agency: CT DEEP</i> <i>Partners: NOFA, UConn Extension, CT Conservation Districts</i></p> | <p>Identify existing resources, success stories, and common barriers. Report progress in NPS Annual Report.</p> <p>Provide municipal outreach. Report progress in NPS Annual Report.</p> | X | | | | | X |

4.1.4 Subsurface Sewage Disposal Systems

Background

Approximately 40 percent of Connecticut's population – over 1 million people – relies on subsurface sewage disposal systems for wastewater disposal. These systems, which are typically conventional septic systems, are primarily used in rural and low-density suburban areas (e.g., outside of areas served by sanitary sewers – see **Figure 4-3**), and generally serve individual homes, small residential communities, and commercial buildings. The typical septic system has four main components: a pipe from the home, a septic tank, a leaching system, and the soil. Microbes in the soil digest or remove most contaminants from wastewater before it intercepts ground water.

Common Causes of Septic System Failure

Several factors can contribute to failure or malfunction of a subsurface sewage disposal system:

- Age and design of system
- Lack of maintenance
- User habits
- Improper siting or installation
- High loading rate or uneven effluent distribution
- Lack of a mature biomat

Although decentralized systems cause a disproportionately smaller percent of water quality impairments than their public sewer counterparts, inadequate or failed subsurface sewage disposal systems represent a significant threat to ground water and surface waters in environmentally sensitive areas resulting from loadings of pathogens, nutrients, and other pollutants.

In Connecticut, subsurface systems are regulated by local health departments, CT DEEP, or the Connecticut Department of Public Health (CT DPH) depending on the design flow capacity and the type of treatment and disposal system. Unlike neighboring New England States (i.e., Massachusetts and Rhode Island), Connecticut does not currently require inspections and upgrades of subsurface sewage disposal systems when properties are sold.

Jurisdiction of on-site sewage disposal systems for design flows of 5,000 gallons per day and less lies with State and Local Health Departments, and is regulated by the Public Health Code (PHC) Section 19-13-B103 and the associated Technical Standards. Conventional systems with design flows less than 2,000 gallons per day are regulated by the local Health Department. Conventional systems with design flows greater than 2,000 gallons per day but less than 5,000 gallons per day are regulated by the Connecticut Department of Public Health Environmental Engineering – Subsurface Sewage Program (CT DPH).

The CT DEEP Subsurface Sewage Disposal Program regulates the following types of subsurface systems under both a general permit for existing facilities (as of May 2012 – the issuance date of the general permit) and individual permits for new facilities:

- Conventional systems with design flows greater than 5,000 gallons per day, including sites where multiple smaller systems on a single "lot" have a combined flow greater than 5,000 gallons per day
- Community sewerage systems (i.e., one subsurface sewage disposal system serving two or more residential buildings, regardless of system size)

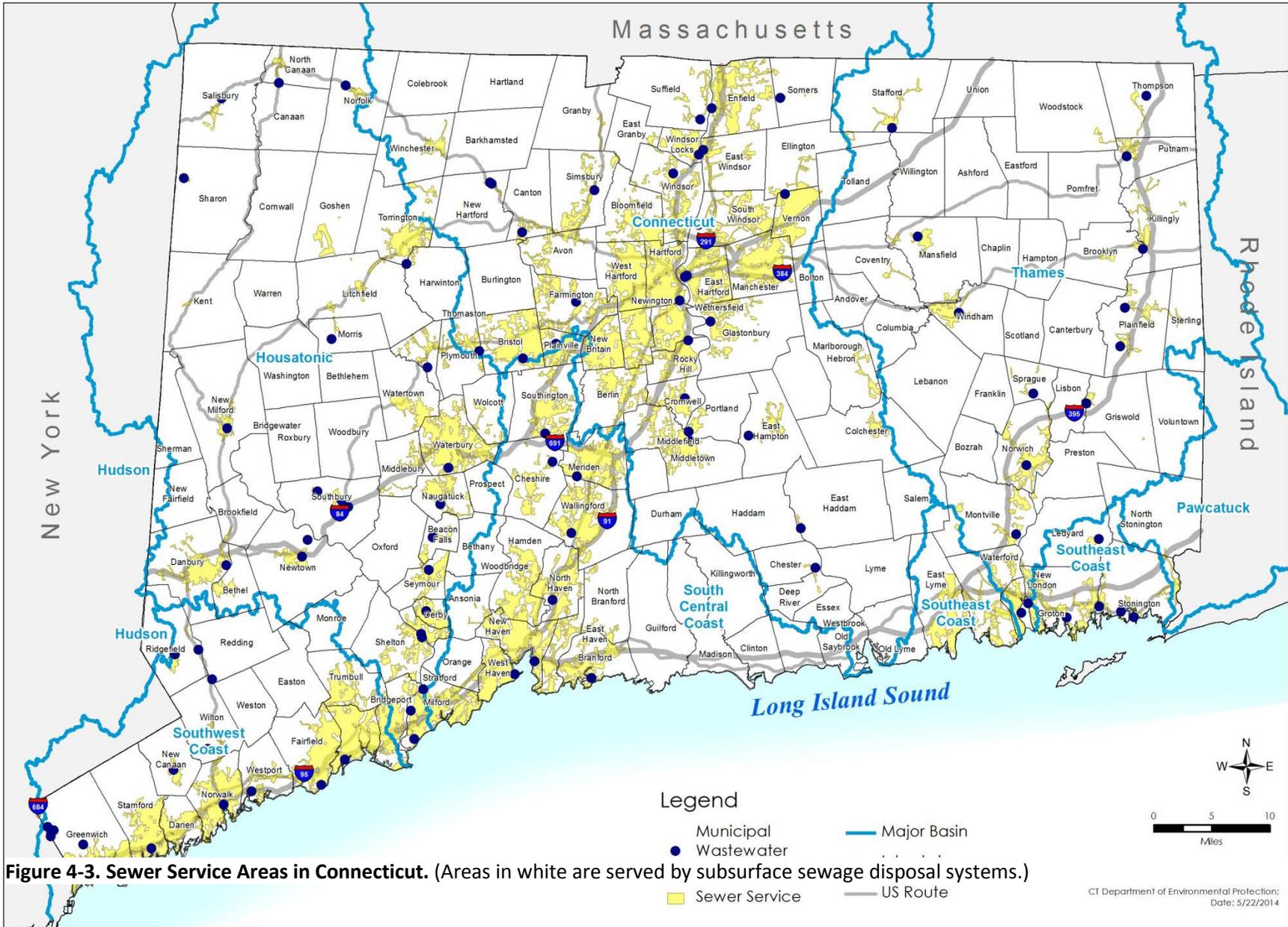


Figure 4-3. Sewer Service Areas in Connecticut. (Areas in white are served by subsurface sewage disposal systems.)

CT Department of Environmental Protection;
Date: 5/22/2014

- Any system utilizing alternative or advanced treatment, regardless of size.

Technical standards for subsurface sewage disposal systems in Connecticut have been in place since the early 1980s. CT DEEP design standards for larger systems were last revised in 2006, while the CT DPH design manual for smaller subsurface disposal systems was published in 1998. The Connecticut Public Health Code subsurface sewage disposal system regulations and technical standards are periodically updated, with the latest revisions occurring in 2011.

The CT DPH certifies, licenses, and regulates designers and installers of subsurface systems and also provides assistance to local health officials and updates training providers with periodic newsletters.

There has been significant attention nationally and in Connecticut on nutrient loading from septic systems due to ground water contamination and eutrophication of inland and near-shore coastal waters. In Connecticut, Section 6217 of the Coastal Zone Act Reauthorization Amendments (CZARA), addresses management measures for septic systems that deal with nitrogen reduction:

- **New Systems:** Where conditions indicate that nitrogen-limited surface waters may be adversely affected by excess nitrogen loadings from ground water, new regulations require the installation of Onsite Disposal Systems (OSDS) that reduce total nitrogen loadings by 50 percent to ground water that is closely hydrologically connected to surface water.
- **Existing Systems:** Consider replacing or upgrading OSDS to treat wastewater so that total nitrogen loadings in the effluent are reduced by 50 percent. This provision applies only: (a) where conditions indicate that nitrogen-limited surface waters may be adversely affected by significant ground water nitrogen loadings from OSDS, and (b) where nitrogen loadings from OSDS are delivered to ground water that is closely hydrologically connected to surface water.

Many Connecticut communities are faced with wastewater management challenges in existing developed areas with old, undersized, or malfunctioning septic systems and in newer developments that need high-performance treatment facilities to protect ground water and nearby lakes, rivers, streams, wetlands, and coastal waters. CT DEEP and several Connecticut communities such as Old Saybrook are evaluating and implementing comprehensive decentralized approaches to wastewater management as a cost-effective alternative to traditional centralized wastewater treatment, including local ordinances and wastewater management districts, technical standards for conventional septic system upgrades and advanced treatment systems, and operation and maintenance programs.

Control Measures

Regulatory Programs

- CT DEEP Subsurface Sewage Disposal System website:
<http://www.ct.gov/deep/subsurfacedisposal>

- CT DPH Subsurface Sewage website:
<http://www.ct.gov/dph/subsurfacesewage>

Guidance Documents and Educational Resources

- CT DEEP Guidance for Design of Large-Scale On-Site Wastewater Renovation Systems:
http://www.ct.gov/deep/lib/deep/water_regulating_and_discharges/subsurface/2006designmanual/designmanual2006.pdf
- CT DPH Design Manual Subsurface Sewage Disposal Systems for Households and Small Commercial Buildings:
http://www.ct.gov/dph/lib/dph/environmental_health/environmental_engineering/pdf/DESIGN_MANUAL_Part_1.pdf
- EPA Septic System Website:
<http://water.epa.gov/infrastructure/septic/>

Connecticut Department of Public Health (DPH) Circular Letters Dealing with Nitrogen Analysis

- Density of Developments:
http://www.ct.gov/dph/lib/dph/environmental_health/environmental_engineering/pdf/Circular_2000-01_Sewage_Updates.pdf
- Nitrogen Loading Design Considerations:
http://www.ct.gov/dph/lib/dph/environmental_health/environmental_engineering/pdf/Circular_2002-03_Updates_On-Site_Sewage_Disposal.pdf

Table 4-5. Subsurface Sewage Disposal Systems – Five-Year Objectives, Actions, and Milestones

| Objectives | Actions | Milestones | Schedule | | | | |
|---|---|--|----------|------|------|------|------|
| | | | 2015 | 2016 | 2017 | 2018 | 2019 |
| 1. <u>Regulatory, Planning and Funding Framework:</u> Improve effectiveness of existing regulatory, planning and funding framework for wastewater treatment and disposal in unsewered areas. | 1. Improve coordination with CT DPH to identify and discuss concerns pertaining to effective onsite wastewater treatment & disposal, ground water & surface water quality, existing Public Health Code requirements, and opportunities for improvements. Some points of concern where recommendations may be made include: <ul style="list-style-type: none"> a. Point-of-sale inspection and upgrade program for substandard systems. b. Siting design of both LID and onsite wastewater systems to reduce potential for conflicts. c. Identify or develop funding opportunities for enhanced management and tracking of onsite wastewater systems, and develop parameters for improved statewide management d. Planning and development for local onsite wastewater management programs that may include options such as centralized and clustered onsite systems. e. Potential source controls through material and technology modifications. | Evaluate alternative strategies to improve the effectiveness of existing programs, including inspection and maintenance. Describe progress in annual report | X | X | X | | |
| | | Evaluate the planning and implementation for local onsite wastewater management programs. Describe progress in annual report | X | X | X | | |
| | | Evaluate potential conflicts between onsite management programs and local land use regulations, including stormwater management requirements. Describe progress in annual report | X | X | | | |
| | | Meet annually with municipal representatives, CT DPH and industry representatives in NPS | X | X | X | X | X |

Table 4-5. Subsurface Sewage Disposal Systems – Five-Year Objectives, Actions, and Milestones

| Objectives | Actions | Milestones | Schedule | | | | |
|---|---|--|----------|------|------|------|------|
| | | | 2015 | 2016 | 2017 | 2018 | 2019 |
| | <p>f. Community wastewater decisions guide</p> <p>g. Evaluate enhanced nitrogen and phosphorus treatment technologies.</p> <p><i>Lead Agencies: CT DEEP and CT DPH</i> <i>Partners: Local Health Departments, Municipal and industry representatives, UConn, WPCAs, OPM</i></p> | <p>State Technical Committee. Describe progress in annual report.</p> <p>Provide phosphorus-specific recommendations for reducing pollution from garbage disposals, phosphate detergents, harmful septic system additives, and corrosion inhibitors for water and sewer systems in report.</p> | | | | | X |
| <p>2. Homeowner Education: Educate homeowners and homebuyers about proper use and maintenance of onsite wastewater treatment and disposal systems.</p> | <p>1. Discuss the need and opportunities for homeowner and homebuyer education with CT DPH.</p> <p>2. Identify and evaluate the effectiveness of existing educational resources and materials.</p> <p>3. Develop improved or expanded educational resources and materials for homeowners and homebuyers.</p> <p><i>Lead Agencies: CT DEEP, CT DPH, Local Health Departments, CT Conservation Districts</i> <i>Partners: Municipal and industry representatives</i></p> | <p>Seek appropriate partner(s) and support efforts to develop improved educational resources and materials to address system inputs, maintenance, and operational function of filters, distribution boxes and leaching fields. Disseminate through local Health Departments and CCDs.</p> | | X | X | X | X |

4.1.5 Agriculture

Background

In Connecticut, agriculture is broadly defined as:

- Cultivation of soil, dairying, forestry, and the raising or harvesting of any agricultural or horticultural commodity, including the care and management of livestock such as horses, bees, poultry, fur-bearing animals and wildlife
- Raising or harvesting of oysters, clams, mussels, other molluscan shellfish or fish or seaweed
- Production or harvesting of maple syrup or sugar
- Poultry/Egg production
- Harvesting of mushrooms
- Handling, planting, drying, packing, packaging, processing, freezing, grading, storing, or delivering to storage or to market any agricultural or horticultural commodity related to farming operations, or, in the case of fruits and vegetables, related to the preparation of such fruits and vegetables for market or for direct sale.

Agriculture in Connecticut

Agricultural uses such as crop production and/or active pasture account for approximately 7 percent of the state's land area (Figure 4-4). Water quality contaminants associated with agricultural operations include nutrients (nitrogen and phosphorus primarily from fertilizers and animal wastes), pathogens and organic materials (primarily from animal wastes), sediment (from field erosion), pesticides, salts, and petroleum products.

Working farms help define the Connecticut landscape and attract tourists to the state. With an average farm size of 85 acres, the state has the third smallest average in the U.S. More than half of the 4,000 farms in the state are fewer than 50 acres. The loss of farmland has led to increased farm fragmentation, requiring farmers to farm smaller parcels in multiple communities (American Farmland Trust and Connecticut Conference of Municipalities). To meet consumer demand, farmers are changing the products they raise and increasing direct-to-consumer retail sales. Connecticut farms produce and sell a diverse range of items, including: goat cheese, black currant juice, wine, eastern oysters, manure flower pots, ice cream, fruit brandy, potted flowers, wool, green beans and grass-fed beef.

Connecticut farms are repositioning to take advantage of new consumer trends including increasing demand for locally-grown agriculture products. Connecticut has the third highest average of per farm direct-to-consumer sales in the U.S. Other examples of this trend are the number of farmers' markets and Community Supported Agriculture (CSA) farms in the state. Agriculture tourism is one of the fastest growing segments of the Connecticut tourism industry, growing about 33 percent annually. Dairy farms are also joining together to create regional facilities to compost manure (American Farmland Trust and Connecticut Conference of Municipalities).

Agricultural operations in Connecticut contribute to nonpoint source pollution in some localities. Water quality contaminants associated with agricultural operations include nutrients (nitrogen and phosphorus primarily from fertilizers and animal wastes), pathogens and organic materials (primarily from animal wastes), sediment (from field erosion), pesticides, salts, and petroleum products. These pollutants enter watercourses through direct surface runoff or through seepage to ground water that discharges to surface water. The most common sources of excess nonpoint source nutrients in surface water are chemical fertilizers and manure from animal facilities. Such

ground water nutrients in high concentrations stimulate blooms of algae in surface waters. Overuse or improper use of irrigation water can exacerbate some of these pollution problems and also affect stream flows and ground water levels.

In addition to Connecticut farmland, Long Island Sound provides an additional 70,000 acres with potential for aquaculture, which is the cultivation of aquatic plants and animals. In Connecticut aquaculture includes a diverse range of operations such as growing shellfish on underwater leases in Long Island Sound and raising fish in inland freshwater tank farms. Shellfish aquaculture is environmentally beneficial as shellfish remove particulates, excess nutrients, organic material, viruses, and bacteria from the water column. The Connecticut Shellfish Program operates as part of the National Shellfish Sanitation Program in order to ensure the safety of molluscan shellfish. The Connecticut Department of Agriculture Bureau of Aquaculture is responsible for implementing the Connecticut Shellfish Program.

Agricultural NPS pollution in Connecticut is addressed primarily through outreach and technical assistance programs provided by federal and state agencies including the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS), USDA Farm Service Agency, Connecticut Department of Agriculture, University of Connecticut Cooperative Extension System, Connecticut Agricultural Experiment Station, Connecticut Conservation Districts, and CT DEEP. Connecticut offers technical and financial support to farm businesses in their farm waste efforts through the "Partnership for Assistance on Agricultural Waste Management Systems." Through this partnership, a farm business may obtain waste management planning, facility design, and qualify for financial assistance as well as help in procuring required permits. Technical assistance is also available in selecting and implementing agricultural BMPs and soil erosion control methods and technologies.

A number of financial and technical assistance programs are implemented by the NRCS through the federal Farm Bill. The Environmental Quality Incentives Program (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. Eligible program participants receive financial and technical assistance to implement conservation practices that address natural resource concerns on their land. Payments are made to participants after conservation practices and activities identified in an EQIP plan of operations are implemented. NRCS delivers conservation technical assistance through its voluntary Conservation Technical Assistance Program. Technical Service Providers (TSPs) are individuals or businesses that provide third-party technical expertise in conservation planning and design on behalf of NRCS.

Most agricultural discharges are considered to be nonpoint sources. Concentrated animal feeding operations (CAFOs), an important source of agricultural pollution, are defined as point sources and subject to the National Pollutant Discharge Elimination System (NPDES) program. A CAFO is a lot or facility where non-aquatic animals are held and fed for at least 45 days per year, and which is not also used for agricultural production. CT DEEP is developing a general permit program for CAFOs, related requirements for Comprehensive Nutrient Management Plans, and alternative agricultural waste management technologies. The proposed CAFO General Permit would regulate certain operations depending on the number and types of animals, and/or the potential for discharges

from the operation. In Connecticut, the CAFO General Permit would likely apply to approximately 10 large dairy and poultry farms, over 30 medium-sized dairy farms, and smaller animal farms with direct surface water discharges (see **Figure 4-4**).

A key requirement of the proposed CAFO General Permit is to develop and implement a Comprehensive Nutrient Management Plan (CNMP) to reduce the potential water quality impacts of facility operations such as ensuring adequate storage of manure and wastewaters, diverting clean water from production areas, methods for safe land application of manure and wastewaters, proper management of dead animals, and record keeping to document implementation.

The federal and state agencies described earlier in this section offer a variety of technical resources on agricultural BMPs including:

- Livestock exclusion fencing
- Manure collection and storage
- Nutrient management (remove, reuse, land application)
- Cover crops
- Vegetated buffers, filter strips
- Covered heavy use areas
- Diverting clean water
- Soil health

A number of alternative agricultural waste technologies have also emerged and are being implemented across Connecticut. These include volume reduction (solids removal); the production of value added products such as compost, mulch, and planting pots; and methane digesters which convert the energy stored in manure into methane used to produce energy for on-farm or off-farm use.

The sale and use of pesticides and pesticide certification and licensing in Connecticut is regulated by CT DEEP through its Pesticide Management Program, in conjunction with other regulatory and non-regulatory partner agencies including the Connecticut Department of Public Health, Connecticut Department of Agriculture (DoA), Connecticut Agricultural Experiment Station, and UConn Cooperative Extension Service (CES).

Integrated pest management (IPM) is a systematic method of managing pests using non-chemical methods and the judicious use of pesticides when pest populations exceed acceptable levels. When pesticide applications are necessary, priority is given to using the least toxic pesticide as first choice. Significant reductions in the volumes and toxicity of pesticides applied can be achieved when an IPM program has been implemented properly. The term Integrated Crop Management (ICM) is often used to describe a similar strategy that considers reducing excessive nutrient loadings, in addition to pesticides, to surface and ground waters, from agricultural lands. UConn Cooperative Extension Service is the lead agency in Connecticut to implement ICM and IPM as a common-sense approach to pest control in all environments from agricultural to residential, municipal, commercial, and campus settings. CT DEEP and DoA are cooperating state agencies with UConn CES.

National Water Quality Initiative (NWQI)

The NWQI was established as a joint initiative between USDA NRCS and EPA in 2012 to address agricultural sources of water pollution in priority watersheds throughout the country. In Connecticut, the NRCS State Conservationist has worked with CT DEEP, the NRCS State Technical Committee (STC), and other partners to select watersheds that would receive targeted, long-term investment of USDA funds in order to accelerate voluntary conservation efforts to improve water quality. Each state was required to identify at least one NWQI watershed in 2013 and provide sufficient Section 319 NPS resources to monitor instream changes in pollution resulting from implementation of farm BMPs funded by NRCS's EQIP funds, and coordinate with NRCS on selection of such watersheds. States are encouraged to select watersheds where NRCS was considering Edge-Of-Field (EOF) monitoring, and where feasible utilize existing monitoring and QA/QC approaches.

A NWQI work group of the NRCS STC, including representatives of EPA, NRCS and CT DEEP, was formed to conduct watershed priority selection. Selection criteria included review of past and current EQIP supported projects, water quality assessments, causes and potential sources of pollution, and a focus on dairy farming for selected agricultural and conservation practices.

The Little River watershed was selected as the NWQI basin in 2013. The following NPS planning and implementation projects exist in the watershed:

- Little River Source Water Protection Plan (2006)
- Muddy Brook and Little River Water Quality Improvement Plan (2009)
- Reduction of Farm Field Nutrients Project (southern Little River basin)
- Valleyside Farm Silage Leachate Collection Project
- Elm Farm Dairy Barn Roof Drainage Project
- Elm Farm Silage Leachate Collection Project
- No-Till multi-farm manure incorporation project (northern Little River basin)
- (Non-agricultural watershed plan implementation projects) Woodstock Historical Society/Palmer Arboretum bioretention installation project, and Roseland Park Golf Course vegetated riparian buffer enhancement project

Additional agricultural best practices are proposed for Section 319 NPS funds in 2014-2015:

- Dairy Livestock Mortality and Manure Aerated Composting Facility
- Mayhill Farm Multiple Farm Runoff Control Practices Project
- Roseland Lake Basin Water Monitoring and Nutrient Balance Project

A review was also made of the recent EPA Success Story for North Running Brook, Little River basin (Improving Agricultural Practices Restores North Running Brook, April 2013).

The NWQI work group continues to meet to review the NWQI status and further discuss technical guidance and funding support. CT DEEP and NRCS informally discussed MOUs and data sharing agreement(s), and each anticipate formal agreements in 2015. NRCS searched for willing cooperators and has encountered challenges finding a willing agricultural producer not maximized with cost-sharing and obtaining a cost share requirement waiver from NRCS headquarters. A monitoring plan continues to be assessed and is planned to begin in 2015. Monitoring will likely be

framed as a paired watershed study approach, and an interagency MOU/agreement will be developed by mid-2014. DEEP has committed to designing and conducting an in-stream ambient monitoring program to complement the eventual NRCS-funded BMP implementation and EOF monitoring project. DEEP will also provide technical review of the anticipated QAPP developed by the NRCS EOF monitoring contractor.

NRCS is required to devote a minimum of 5% of annual Environmental Quality Incentive Program (EQIP) appropriation to selected NWQI watersheds. In early 2014 the NRCS CT office was working to obligate at least 90% of its current EQIP cost share requests, making that office eligible for more regional NRCS equity funds. NRCS CT office has also requested the addition of other animal agriculture practices for cost share payment approval by NRCS HQ. Once approved, NRCS will then conduct a ranking tool on potential willing cooperator applications.

The NWQI work group continues to assess other Connecticut watersheds for future NWQI consideration in including the following:

- Mashamoquet Brook (011000010402)
- Quinebaug River -French River to Moosup River (011000010403)
- Quinebaug River – Moosup River to mouth (011000010704)
- Coginchaug River (010802050602)
- Broad Brook (010802050202)
- Scantic River (010802050203)
- Blackberry River (011000050303)
- Farm River (011000040206)



Figure 4-4. Agricultural Land Use and Selected Animal Farms in Connecticut

Control Measures

Regulatory Programs

- CT DEEP Concentrated Animal Feeding Operations (CAFO) General Permit (in progress)
- Connecticut Department of Agriculture Laws and Regulations:
<http://www.ct.gov/doag/cwp/view.asp?a=1366&Q=317762&PM=1&doagNav=>
- Connecticut Shellfish Program – Department of Agriculture Bureau of Aquaculture Regulatory Guidance:
<http://www.ct.gov/doag/cwp/view.asp?a=3768&Q=525654&PM=1>
- CT DEEP Pesticide Management Program:
<http://www.ct.gov/deep/pesticides>

Guidance Documents and Educational Resources

- CT DEEP Manual of Best Management Practices for Agriculture, Guidelines for Protecting Connecticut's Water Resources:
http://www.ct.gov/deep/lib/deep/aquifer_protection/bmps_agriculture.pdf
- Connecticut Chapter of the Northeast Organic Farming Association:
<http://www.organiclandcare.net/>
- Connecticut Agricultural Experiment Station:
<http://www.ct.gov/caes>
- Connecticut Department of Agriculture:
<http://www.ct.gov/doag/>
- Connecticut Farm Bureau Association:
<http://www.cfba.org/>
- Connecticut Farm Service Agency, U.S. Department of Agriculture:
<http://www.fsa.usda.gov/FSA/stateoffapp?mystate=ct&area=home&subject=landing&topic=landing>
- Connecticut Farmland Trust:
<http://www.ctfarmland.org/>
- Natural Resources Conservation Service, U.S. Department of Agriculture:
<http://www.ct.nrcs.usda.gov>
- University of Connecticut Cooperative Extension System, University of Connecticut and U.S. Department of Agriculture:
<http://www.extension.uconn.edu/>
- Horse Environmental Awareness Program – HEAP:
<http://easternrcd-ct.org/HEAP.htm>
- Good Horse Keeping, Best Management Practices for Protecting the Environment:
<http://easternrcd-ct.org/HEAP/GOODHORSEKEEPINGBMP-PROOF3.pdf>
- Integrated Pest Management in Connecticut:
<http://www.ct.gov/deep/ipm>

Table 4-6. Agriculture – Five-Year Objectives, Actions, and Milestones

| Objectives | Actions | Milestones | Schedule | | | | |
|--|---|--|----------|------|------|------|------|
| | | | 2015 | 2016 | 2017 | 2018 | 2019 |
| 1. Assistance to Farmers: Provide outreach and technical and financial assistance to farmers regarding agricultural NPS pollution and control measures. | <ol style="list-style-type: none"> Identify & prioritize the specific agricultural operations in need of technical assistance and use HEAP program as a model to develop new initiatives to target them with assistance. Identify & inventory existing agriculture BMPs that are targeted to specific types of agricultural operations, Identify existing sources of technical assistance available to farmers and evaluate need for additional technical assistance based on apparent risks to surface water and ground water quality. Provide online access to such BMPs and other technical assistance <p><i>Lead Agencies: CT DEEP and NRCS</i> <i>Partners: Connecticut Department of Agriculture, UConn Cooperative Extension, Connecticut Agricultural Experiment Station, Connecticut Conservation Districts</i></p> | <p>Identify and prioritize areas and agricultural operations. Report progress in annual report.</p> <p>Complete inventory of agricultural BMPs and identify other existing sources of technical assistance. Determine and implement the most effective methods for disseminating information.</p> <p>Evaluate need and strategies for additional technical assistance. Summary report.</p> | | | X | X | X |
| 2. NWQI: Implement National Water Quality Initiative Program with NRCS (Water Quality Monitoring) | <ol style="list-style-type: none"> Coordinate with NRCS to address agricultural sources of pollution in a priority watershed. Continue NWQI Workgroup Coordinate data sharing and monitoring responsibilities Implement water quality monitoring | <p>Meet twice per year.</p> <p>Develop a Memorandum of Understanding to define shared duties.</p> <p>Establish monitoring site.</p> | 2 | 2 | 2 | 2 | 2 |

Table 4-6. Agriculture – Five-Year Objectives, Actions, and Milestones

| Objectives | Actions | Milestones | Schedule | | | | |
|---|---|---|----------|------|------|------|------|
| | | | 2015 | 2016 | 2017 | 2018 | 2019 |
| <p>3. <u>Nutrient Management:</u> Promote and improve nutrient management practices at Connecticut farms.</p> | <ol style="list-style-type: none"> 1. Identify and prioritize areas in Connecticut where the livestock manure nutrient surplus poses a threat to ground water and/or surface water quality. 2. Coordinate with NRCS to discuss and evaluate existing capacity and opportunities for expanding such capacity to prepare Comprehensive Nutrient Management Plans (CNMPs) with farmers. 3. Evaluate feasibility of and formulate plan for developing a clearinghouse for nutrient management and soil erosion control innovations. <p><i>Lead Agencies: CT DEEP, NRCS, CT Conservation Districts, Connecticut Department of Agriculture, UConn Cooperative Extension, Connecticut Agricultural Experiment Station</i></p> | <p>Identify priority areas and evaluate existing capacity and opportunities for expanding capacity to prepare CNMPs. Document results through NRCS Technical Committee.</p> <p>Formulate plan for developing clearinghouse utilizing State NPS Technical Committee and CT Conservation Districts.</p> | | | X | | X |
| <p>4. <u>Regional Nutrient Management and Processing:</u> Develop and expand regional nutrient management technologies and approaches.</p> | <p>Work with stakeholders to discuss need, opportunities and strategies to develop/expand capacity for:</p> <ol style="list-style-type: none"> 1. Work with stakeholders to formulate a plan to identify & prioritize areas in CT where the livestock manure nutrient surplus can impact ground water and/or surface water quality. 2. Regional/cooperative digester, which may serve multiple purposes (manure, food & other organic wastes). | <p>Convene stakeholders.</p> <p>Report on strategies to develop/expand capacity for digesters and or other innovative strategies through NPS State Technical Committee.</p> | | X | | X | |

Table 4-6. Agriculture – Five-Year Objectives, Actions, and Milestones

| Objectives | Actions | Milestones | Schedule | | | | |
|--|---|--|----------|------|------|------|------|
| | | | 2015 | 2016 | 2017 | 2018 | 2019 |
| | 3. Regional/cooperative composting. 4. Other value-added products. 5. Cooperative strategies to maximize use of manure nutrients generated from Connecticut Farms. <i>Lead Agency: CT DEEP</i> <i>Partners: NRCS, Connecticut Department of Agriculture, UConn Cooperative Extension, Connecticut Agricultural Experiment Station, Connecticut Conservation Districts</i> | | | | | | |
| 5. Soil Health: Promote “Soil Health” as an agricultural BMP. | 1. Assist NRCS with a stakeholder workshop. 2. Participate in technical assistance efforts and promote through existing CT DEEP programs. <i>Lead Agency: NRCS</i> <i>Partner Agency: DEEP</i> | Hold stakeholder workshop with NRCS. Ongoing technical assistance and outreach: disseminate guidance on cover crops and no-till technologies and enumerate participation. | X | | | | |
| 6. Agricultural Certainty Program: Assess the creation of an agricultural certainty program in Connecticut. | 1. Evaluate the creation of an agricultural certainty program in Connecticut. Such a program would involve legislation offering farmers who voluntarily meet future water quality goals ahead of schedule regulatory flexibility when they meet potential new laws and regulations. The program offers certainty that farmers are actually reducing pollution on | Convene stakeholder workgroup through NRCS Technical Committee. Assess program feasibility and report recommendations through NRCS Technical Committee. | | X | | | X |

Table 4-6. Agriculture – Five-Year Objectives, Actions, and Milestones

| Objectives | Actions | Milestones | Schedule | | | | |
|---|---|---|----------|------|------|------|------|
| | | | 2015 | 2016 | 2017 | 2018 | 2019 |
| | <p>their farms, and also gives farmers business certainty once they meet all water quality standards.</p> <ol style="list-style-type: none"> Convene stakeholders and review programs established in other states. Evaluate the feasibility of such a program in Connecticut and develop recommendations. Implement program, if warranted. <p><i>Lead Agency: NRCS</i> <i>Partner Agencies: DOA, DEEP, UConn Cooperative Extension, Connecticut Agricultural Experiment Station, Connecticut Conservation Districts</i></p> | | | | | | |
| 7. Small Scale Farms: Provide guidance and outreach to protect water quality | <ol style="list-style-type: none"> Develop a process for evaluating small scale farms and providing outreach to owners on BMPs to reduce potential water quality impacts. <p><i>Lead Agency: CT DEEP</i> <i>Partner Agencies: DOA, UConn Cooperative Extension, Connecticut Conservation Districts, CT Agriculture Experiment Station.</i></p> | <p>Identify and evaluate BMP implementation on small farms in CT. Report with Department of Agriculture.</p> <p>Develop outreach program with CCDs.</p> | | | X | | X |
| 8. Horse Farms: Continue to provide and strengthen outreach to horse farms | <ol style="list-style-type: none"> Continue Horse Environmental Awareness Program (HEAP) Provide outreach and technical assistance for horse owners using existing BMP guidance and annual outreach events such as the Equine Affaire, agricultural fairs, etc. | <p>Increase in number of horse farms in the HEAP program annually. Reporting by NRCS.</p> | X | X | X | X | X |

Table 4-6. Agriculture – Five-Year Objectives, Actions, and Milestones

| Objectives | Actions | Milestones | Schedule | | | | |
|--|--|---|----------|------|------|------|------|
| | | | 2015 | 2016 | 2017 | 2018 | 2019 |
| | <i>Lead Agency: NRCS Partner Agencies: DEEP, CT RC&D, DOA, UConn Cooperative Extension, Connecticut Conservation Districts</i> | Continue outreach program. Reporting by NRCS. | | | X | X | X |
| 9. <u>Shellfish</u> Management: Work with partner agencies on addressing NPS issues in the revised Connecticut Shellfish Management Plan. | 1. Coordinate with the Connecticut Department of Agriculture, Bureau of Aquaculture to address NPS pollution control issues in the ongoing revision of the Connecticut Shellfish Management Plan (“Connecticut Shellfish Initiative”). <i>Lead Agency: CT DoA Aquaculture Division Partner Agencies: CT DEEP, Connecticut Sea Grant and UConn Extension</i> | Attend quarterly meetings and participate in plan development. Completed plan that addresses NPS pollution control issues. | X | X | | | |

4.1.6 Hydrologic and Habitat Modification

Background

Hydrologic and habitat modification refer to physical changes to aquatic resources caused by filling, draining, ditching, damming, or otherwise altering wetlands and watercourses. In this case, the pollution is not from a chemical contaminant, but it is from a human impact. Some examples of this pollution include lack of adequate flow, stream channelization, invasive species, and loss of riparian vegetation. Hydrologic and habitat modification can adversely impact water quality by causing downstream sedimentation, lowering dissolved oxygen, and increasing water temperatures. Degradation of existing wetlands and riparian areas can cause the wetlands or riparian areas themselves to become sources of nonpoint pollution in coastal waters. Such degradation can result in the inability of existing wetlands and riparian areas to treat nonpoint pollution. Physical obstructions can restrict migratory fish passage and alter natural stream flow. Combined, these impacts can degrade aquatic habitat and contribute to the loss of fish and aquatic organism populations. Further, hydrologic modifications can change the uniqueness, recreation, visual and aesthetic values of Connecticut's riparian corridors and shoreline.

The IWQR and impaired waters list identify stream segments that are impaired due to hydrologic and habitat modification. Current assessment protocols have not covered the entirety of waterbodies across the State of Connecticut to determine all impairments due to nonpollutant sources (CT DEEP, 2012).

Notable types of hydrologic and habitat modification in Connecticut include:

1. **Channelization and channel modification** includes straightening, widening, deepening, and dredging; flood control measures; water drainage; navigation; sediment control; infrastructure protection; stream channel mining; channel and bank instability; habitat improvement/enhancement; and flow controls.
2. **Streambank and shoreline erosion** occurs when the banks of water bodies are pulled away. Human-induced degradation of bank vegetation accelerates erosion when flowing waters overwhelm the soil and vegetation holding the bank in place. Streambank and shoreline erosion also occurs under natural erosion and sedimentation processes.
3. **Loss of riparian habitat and vegetation** occurs when natural areas along rivers and streams are converted to developed land uses. Riparian, or streamside, corridors are environmentally important areas critical to stream stability, pollutant removal, and both aquatic and terrestrial wildlife habitat. **Figure 4-5** depicts the results of a riparian land cover change analysis for the Podunk River subwatershed, showing a significant increase in developed land cover within the 300-foot riparian zone between 1985 and 2010.
4. **Dams and diversions** are engineered structures used for impounding or diverting water for flood control, power generation, irrigation, or navigation or to create ponds, lakes, and reservoirs. **Figure 4-6** shows the locations of the approximately 5,000 dams in Connecticut.

Many programs exist in Connecticut to protect and restore resources threatened or impacted by hydrologic and habitat modification. Activities affecting inland wetlands and watercourses are regulated at the local level under the Connecticut Inland Wetlands and Watercourses Act. Each town's municipal Inland Wetlands Agency regulates activities that affect inland wetlands and watercourses within their municipal boundaries. The Inland Wetlands Management Section of CT DEEP provides training, regulatory, and technical assistance to Connecticut's Municipal Inland Wetlands Agencies.

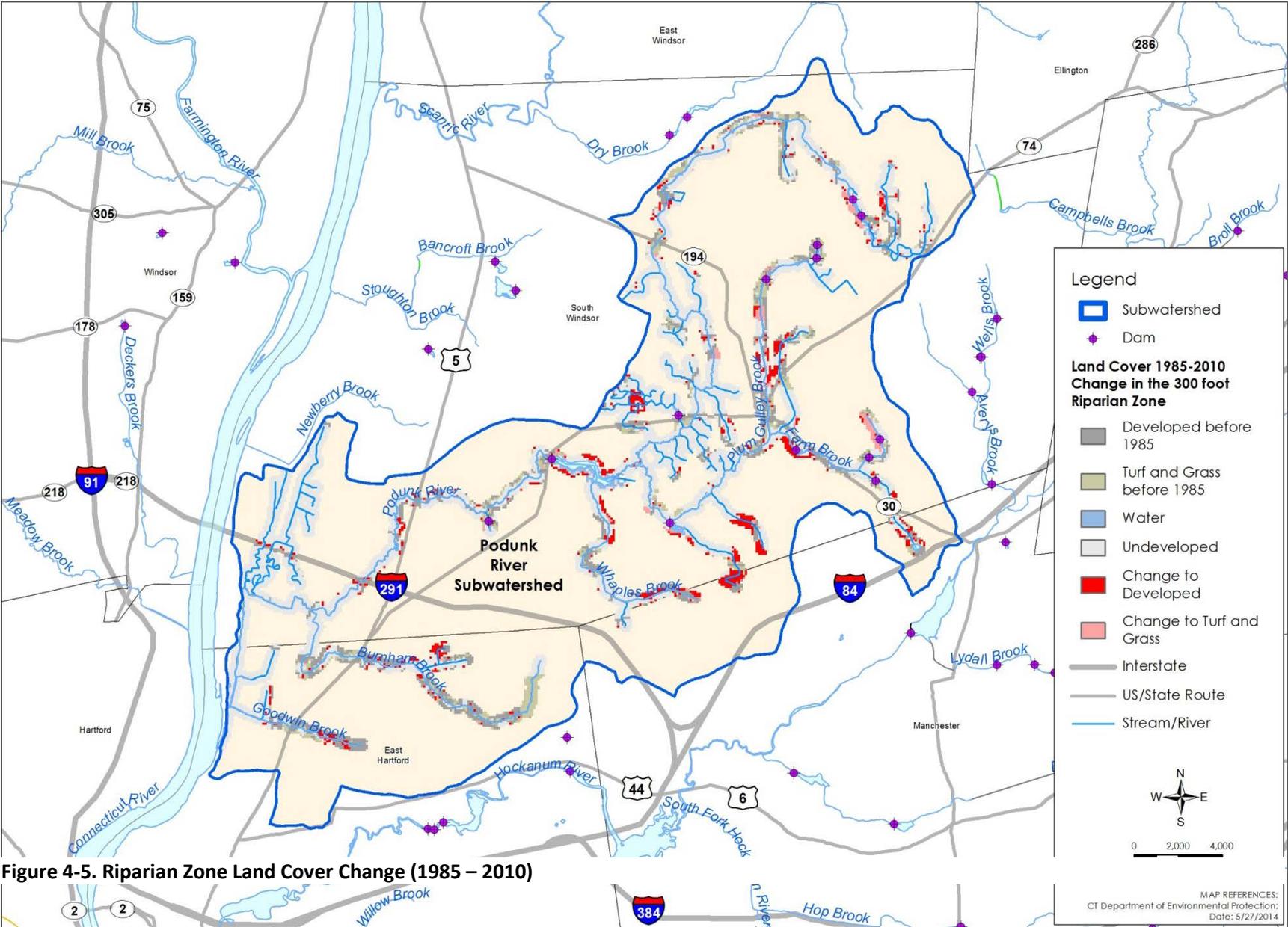
State activities potentially affecting inland water resources and wetlands are regulated by CT DEEP Bureau of Water Protection and Land Reuse's Inland Water Resources Division individual and general permit programs. The CT DEEP Bureau of Water Protection and Land Reuse's Office of Long Island Sound Programs (OLISP) regulates activities in tidal wetlands and in tidal, coastal or navigable waters of the state seaward of the coastal jurisdiction line. The U.S Army Corps of Engineers also regulates activities in inland waters and wetlands within the State of Connecticut and the boundaries of Mashantucket, as well as activities occurring within tidal, coastal and navigable waters.

Statewide stream flow standards and regulations went into effect in December 2011. The purpose of the regulations is to protect Connecticut's river and stream systems by establishing stream flow standards that apply to all river and stream systems in Connecticut through a classification process and require minimum releases from dams. The regulations balance the needs of humans use of water for drinking and domestic purposes, fire and public safety, irrigation, manufacturing, and recreation, with the needs of fish, wildlife and other biota that also rely upon the availability of water to sustain healthy, natural communities.

Habitat restoration is the process of returning a habitat (the place where a plant or animal lives) to the condition that existed prior to its being degraded by man's activities. Once restored, a habitat will resume its normal ecological functions. Habitats are vital not only to the plants and animals that depend on them, but also to all of Long Island Sound.

Connecticut began its first restoration work in the 1930s. Since the agency was created in 1971, CT DEEP has pioneered efforts to restore tidal wetlands, anadromous fish runs, and habitats for numerous plant and animal species. Several CT DEEP grant, advisory, and technical programs focus on restoration of tidal wetlands, coves and embayments, riverine migratory corridors, and coastal barrier beaches.

The CT DEEP Habitat Conservation and Enhancement (HCE) Program serves as a liaison between the CT DEEP Fisheries Divisions and other CT DEEP Program personnel who take primary responsibility in regulating permitted activities that potentially impact fish populations. HCE staff interacts directly with federal, state and local regulatory and planning agencies, as well as private conservation organizations, to provide information to conserve, restore and enhance the state's aquatic environments. Staff also provides site-specific guidance to private landowners managing freshwater and marine systems throughout the state.



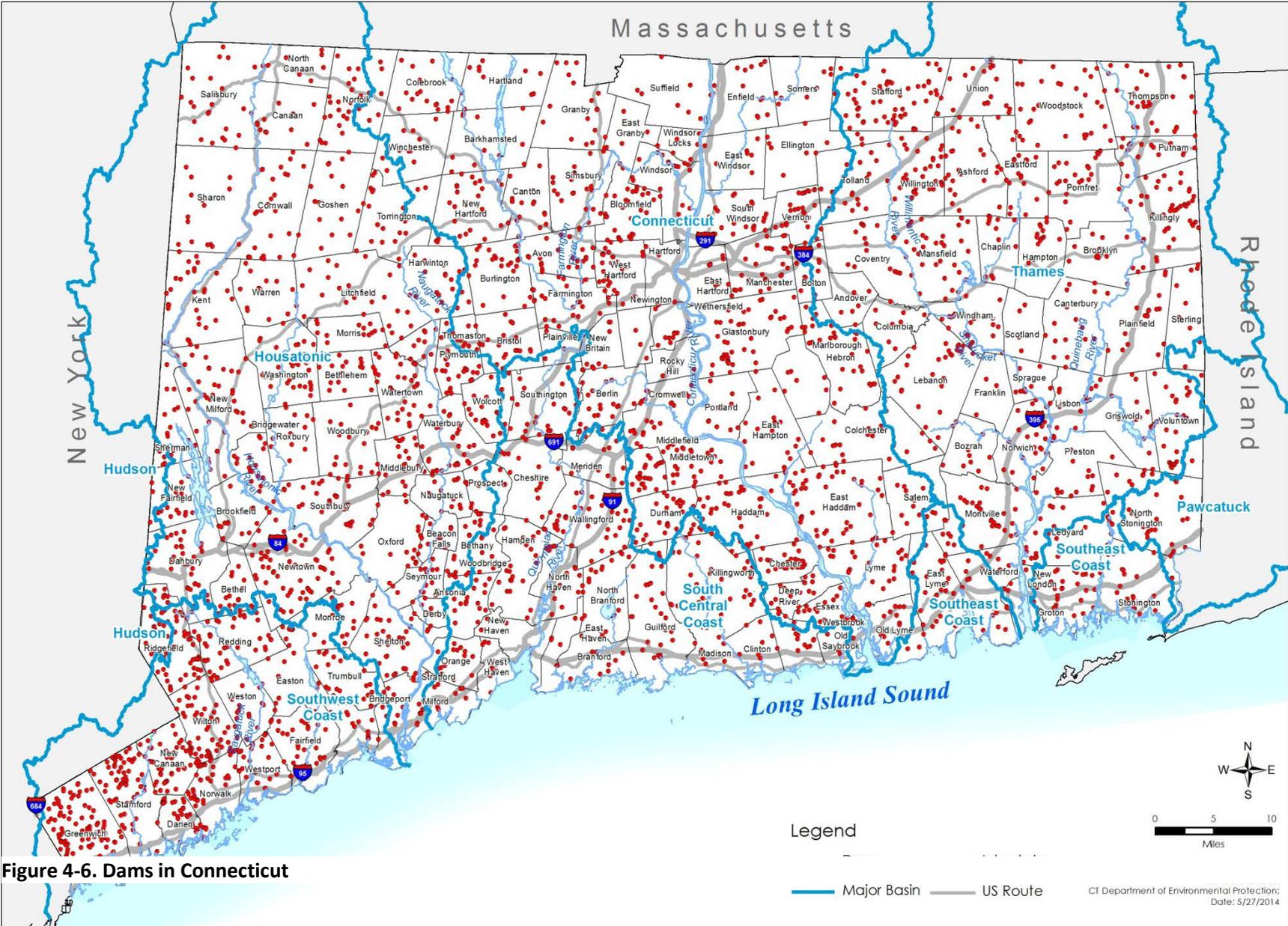


Figure 4-6. Dams in Connecticut

The CT DEEP Inland Fisheries Division maintains a riparian corridor protection policy to maintain biologically diverse stream and riparian ecosystems and to maintain and improve stream water quality and quantity. The policy also contains buffer zone guidelines for protection of perennial and intermittent streams. The Inland Fisheries Division also maintains a fact sheet on the importance of large woody debris to river ecosystems and guidance for its beneficial management, as well as stream crossing guidelines to promote unimpeded fish passage for resident and anadromous fish species and other wildlife.

CT DEEP continues to work with federal partners including NOAA and USFWS, municipalities, private land owners, and conservation groups such as The Nature Conservancy to selectively remove dams that no longer serve their historical purpose. These dam removal efforts are primarily intended to restore aquatic habitat and eliminate public safety hazards.

Control Measures

Regulatory Programs

- CT DEEP Inland Water Resources Division Permits:
<http://www.ct.gov/deep/inlandwaterpermitapps>
- CT DEEP Office of Long Island Sound Programs Permits:
<http://www.ct.gov/deep/lispermitapps>
- U.S. Army Corps of Engineers Connecticut General Permit:
http://www.nae.usace.army.mil/Portals/74/docs/regulatory/StateGeneralPermits/CT_GP.pdf
- Connecticut Stream Flow Standards and Regulations:
<http://www.ct.gov/deep/streamflow>

Guidance Documents and Educational Resources

- CT DEEP Coastal Management Manual:
http://www.ct.gov/deep/cwp/view.asp?a=2705&q=323814&deepNav_GID=1622
- CT DEEP Tidal Wetlands Buffers Guidance:
http://www.ct.gov/deep/lib/deep/long_island_sound/coastal_management/twbufferguidance.pdf
- CT DEEP Resident's Guide to Vegetated Riparian Areas:
http://www.ct.gov/deep/lib/deep/water/watershed_management/wm_plans/lid/what_is_a_vegetated_riparian_area.pdf
- CT DEEP Inland Wetlands and Watercourses Program:
<http://www.ct.gov/deep/inlandwetlands>
- CT DEEP Stream Habitat Restoration Projects:
http://www.ct.gov/DEEP/cwp/view.asp?a=2696&q=322734&deepNav_GID=1630
- CT DEEP Inland Fisheries Division Stream Crossing Guidelines:
<http://www.ct.gov/deep/lib/deep/fishing/restoration/streamcrossingguidelines.pdf>
- CT DEEP Inland Fisheries Division Large Woody Debris Fact Sheet:
<http://www.ct.gov/deep/lib/deep/fishing/restoration/largewoodydebrisfactsheet.pdf>

Table 4-7. Hydrologic and Habitat Modification – Five-Year Objectives, Actions, and Milestones

| Objectives | Actions | Milestones | Schedule | | | | |
|--|--|--|----------|------|------|------|------|
| | | | 2015 | 2016 | 2017 | 2018 | 2019 |
| <u>1. Fluvial Erosion and Internal Nutrient and Sediment Loading Program</u> | <ol style="list-style-type: none"> Review existing fluvial geomorphic assessment information for Connecticut. Identify priority areas for fluvial erosion and sedimentation, nutrient pollution, and floodplain functions. | Report recommendations for developing a fluvial erosion and sedimentation program and incorporating internal loading assessment elements into existing CT DEEP programs. | | | | X | |
| <u>2. Ecosystem-Based Restoration: Protect and restore water quality using streamflow-based protection and restoration.</u> | <ol style="list-style-type: none"> Work with state and federal natural resource agencies and advocacy groups to implement ecosystem-based habitat restoration approaches that will restore and protect water quality and streamflow. Examples include: <ol style="list-style-type: none"> Protection from coastal erosion through the use of living shorelines and coastal wetland restoration Restoration and creation of wetlands, eelgrass, and oyster beds Stream and riparian zone restoration Hydromodification such as dam removal Streamflow protections Promote such approaches in new and updated watershed based plans, implementation projects, and in community coastal resilience plans. | <p>Fund and promote five planning and implementation projects that utilize ecosystem-based approaches.</p> <p>Develop and implement streamflow standards for one Major Basin per year.</p> | 1 | 1 | 1 | 1 | 1 |
| | | | 1 | 1 | 1 | 1 | 1 |

4.1.7 Domestic Animals and Wildlife

Background

Domestic animals can be a significant source of NPS pollution. In residential and urban areas, pet waste fecal matter can be a major contributor of pathogens in runoff from developed areas (CT DEEP, 2012). Each dog is estimated to produce 200 grams of feces per day, and pet feces can contain up to 23 million fecal coliform colonies per gram (CWP, 1999). If the waste is not disposed of properly, bacteria can wash into storm drains or directly into waterbodies and contribute to bacteria impairments, beach closures, and contamination of commercial shellfish beds, and threaten public health. The nutrients in pet waste, notably nitrogen and phosphorus, can also make their way to ponds, lakes and streams and contribute to weed or algae growth and low dissolved oxygen.

Picking up after pets is important because it is a source of disease and an environmental risk. Many communities have local ordinances or regulations requiring pet owners to pick up pet waste in public places. Pet waste outreach campaigns such as the “Give a Bark” program developed by the Connecticut River Coastal Conservation District, combined with pet waste stations, can be effective in reducing bacteria levels at beaches and other surface waterbodies. Enforcement of such regulatory controls is difficult.

Fecal material from nuisance populations of waterfowl such as mute swans, Canada geese, ducks, and gulls is another significant source of NPS pollution. The common practice of feeding waterfowl tends to increase their concentrations in certain areas and convert migratory populations into year-round residents. Canada geese are persistent when they have become habituated to an area (CT DEEP, 2011). Reducing waterfowl nuisance populations can restore water quality by reducing bacterial and nutrient loadings, particularly in public parks, golf courses, and commercial areas along rivers, streams, and shoreline areas. Many communities also have existing bans on feeding of waterfowl. However, there are no easy solutions to nuisance waterfowl problems. A more effective nuisance waterfowl control strategy is needed, focusing on education and outreach and other proven control methods.

The CT DEEP Wildlife Division has published guidance on various nuisance waterfowl deterrent methods. Habitat modification and barriers/exclusion are methods designed to reduce feeding of waterfowl by the public, waterfowl nesting, and terrestrial waterfowl habitat. Creation of a vegetated buffer along ponds or streams as a form of habitat modification is recommended since it also provides value as a riparian buffer, which can further reduce NPS pollution.

Connecticut’s sizeable deer population is another source of NPS pollution. Connecticut’s Deer Management Program, which is run by CT DEEP, is intended to maintain deer populations at levels compatible with available habitat and land uses and to allow for a sustained yield of deer for use by hunters. Town governments and regional groups such as the Fairfield County Deer Management Alliance also play an active role in managing urban deer populations. An additional benefit of these programs is limiting NPS bacterial and nutrient loads associated with deer populations.

Control Measures

- Connecticut River Coastal Conservation District Pet Waste Outreach:
<http://conservect.org/ctrivercoastal/PetWaste/tabid/317/Default.aspx>
- “Give a Bark for a Clean State Park” Pet Waste Outreach Program:
<http://www.ct.gov/deep/lib/deep/p2/newsletter/p2viewfall08.pdf>
- CT DEEP Canada Geese management fact sheet:
http://www.ct.gov/deep/cwp/view.asp?a=2723&q=325984&deepNav_GID=1655
- CT DEEP Deer Management Program:
<http://www.ct.gov/deep/deerlottery>
- CT DEEP Resident’s Guide to Vegetated Riparian Areas:
http://www.ct.gov/deep/lib/deep/water/watershed_management/wm_plans/lid/what_is_a_vegetated_riparian_area.pdf
- Fairfield County Deer Management Alliance:
<http://www.deeralliance.com/>

Table 4-8. Domestic Animals and Wildlife – Five-Year Objectives, Actions, and Milestones

| Objectives | Actions | Milestones | Schedule | | | | |
|--|---|--|----------|------|------|------|------|
| | | | 2015 | 2016 | 2017 | 2018 | 2019 |
| 1. Strengthen pet waste technology transfer | <ol style="list-style-type: none"> Promote broader adoption and enforcement of pet waste regulatory mechanisms (i.e., pooper scooper regulations and ordinances) in municipalities that do not have such controls. Include dog parks and similar municipal/state parks frequented by dogs and other pets. <p><i>Lead Agencies: CT DEEP, Municipalities, CT DPH</i></p> | Implement outreach and disposal programs on public lands and greenways. | | X | X | X | X |
| 2. Provide information to municipalities on nuisance wildlife deterrent BMPs to enhance protection of water quality | <ol style="list-style-type: none"> Review and update current CT DEEP waterfowl and nuisance wildlife deterrent BMPs to reflect current research findings and successful approaches. Promote habitat modification approaches and the use of vegetated buffers, which have additional water quality benefits. Promote signage in public parks and other educational tools, in addition to enforcement of prohibitions on the feeding of waterfowl. Assist with management strategies in areas of special concern: airports, water supply reservoirs, parks and athletic fields with documented public health and safety concerns. <p><i>Lead Agencies: CT DEEP, Municipalities, Local Health Departments, CT DOT, airport authorities</i></p> | <p>Provide information to interested stakeholders to improve water quality by implementing BMPs.</p> <p>Work with DEEP Parks and Wildlife Divisions – meet annually.</p> | X | X | X | X | X |

4.1.8 Boating and Marinas

Background

Boating is a major recreational and commercial activity in Connecticut. In 2012, there were approximately 104,000 registered vessels in Connecticut, the majority of which were boats less than 26 feet in length. Pollutants associated with marina operations and boating activities are of concern in Long Island Sound and local coves and embayments. Untreated or poorly-treated human wastes, boat exhaust contaminants, oil, fuel, litter, antifouling materials, paint, and preservatives can contaminate waters directly, through washing of vessels, or by storm runoff from boat maintenance areas. Poor flushing at marinas may exacerbate localized water quality problems. These sources can contaminate shellfish beds and bathing beaches, lower aesthetics, and contribute to nutrient enrichment, sediment contamination, and hypoxia.

Sedimentation from upland NPS pollution can also negatively impact recreational boating. Marina basins and navigation channels accumulate sediment which can trigger the need for frequent and costly maintenance dredging. The Long Island Sound (LIS) Dredged Material Management Plan will likely contain information on CT's and NY's stormwater and NPS controls to reduce the source of sediments to LIS.

Marine Sanitation Devices (MSDs) are equipment installed on boats to receive, retain, treat, or discharge sewage. Under Section 312 of the federal Clean Water Act, "no-discharge" areas for MSDs can be designated to afford better protection for sensitive near-shore areas. All Connecticut coastal waters have been designated as No Discharge Areas (NDAs) as of June 15, 2007 when EPA issued approval of the final No Discharge Area from Branford to Greenwich. NDAs had already been established in Connecticut waters since August 12, 2003 – the Connecticut portions of the Pawcatuck River and Little Narragansett Bay, Stonington Harbor, and portions of Fishers Island Sound; September 27, 2004 – the coastal waters from Wamphassuc Point in Stonington to Eastern Point in Groton; and July 12, 2006 – Long Island Sound waters from Eastern Point in Groton to Hoadley Point in Guilford.

In 2012, CT DEEP was awarded \$1.5 million for boat sewage disposal facilities, or pump-out stations, on Fishers Island and Long Island Sound. The program was administered by the CT DEEP Office of Long Island Sound Programs with a grant from the U.S. Fish and Wildlife Service's Clean Vessel Act (CVA) Program. In 2012, funded marinas, boatyards, yacht clubs, and pump-out vessels removed close to 600,000 gallons of sewage from recreational boats in Connecticut.

The CT DEEP Boating Division is responsible for educating boaters about the need to keep boat sewage out of the water and for instructing boaters about the use of waste containment and disposal systems on boats and pumpout facilities. The Boating Division promotes the use of pumpout facilities and clean water along the coastline by distributing brochures and promotional items with the pumpout logo to marinas and boaters throughout the state to remind them of the available services and the harmful environmental effects of sewage discharges.

While this program has traditionally been active in the Sound, a pumpout boat was purchased by CT DEEP in 2012 under the CVA grant for use on Candlewood Lake, Connecticut's largest inland lake

located within the communities of Brookfield, Danbury, New Fairfield, New Milford, and Sherman. The vessel has been used for educational purposes and to provide a needed service on the lake.

Marinas are a potential source of polluted runoff to inland and coastal waterbodies. CT DEEP has developed a Clean Marina Program and a Clean Boater Program to comprehensively address the protection of habitat and water quality relative to marina and recreational boating activities.

Certified Connecticut Clean Marinas are recognized by CT DEEP for their voluntary efforts to operate at standards above and beyond regulatory compliance. Connecticut Clean Marinas have taken great strides to implement practices that minimize pollution from mechanical activities, painting and fiberglass repair, boat hauling and storage, fueling, facility management, emergency planning and boater education.

As a companion to the Clean Marina Program, the Clean Boater Program encourages the state's boaters to learn about and use clean boating techniques when operating and maintaining their boats.

The Connecticut Marine Trades Association has worked cooperatively with CT DEEP to build upon the Clean Marina and Boater Programs and develop additional guidance on recommended pollution prevention practices for marinas and boating facilities.

Control Measures

- CT DEEP Clean Marina Program:
<http://www.ct.gov/deep/cleanmarina>
- CT DEEP Clean Boater Program:
<http://www.ct.gov/deep/cwp/view.asp?a=2705&q=323526>
- CT DEEP Clean Vessel Act Program:
<http://www.ct.gov/deep/cva>
- EPA Long Island Sound Dredged Material Management Plan:
<http://www.epa.gov/region1/eco/lisdreg/lisdmmmp.html>
- Connecticut Marine Trades Association – Environmental Compliance:
<http://www.ctmarinetrades.org/environmental/index.html>

Table 4-9. Boating and Marinas – Five-Year Objectives, Actions, and Milestones

| Objectives | Actions | Milestones | Schedule | | | | |
|--|---|---|----------|------|------|------|------|
| | | | 2015 | 2016 | 2017 | 2018 | 2019 |
| <p>1. Seek continuation of and promote participation in the Clean Marina Program and the use of BMPs to protect water quality</p> | <p>1. Work with partners to continue to provide BMPs and training opportunities for marinas and the recreational boating community through existing resources maintained by CT DEEP (Clean Marina Program) and the Connecticut Marine Trades Association.</p> <p>2. Continue to assess the level of adherence by marinas to the minimum standards of the Clean Marina certification program.</p> <p><i>Lead Agency: CT DEEP</i> <i>Partners: CT Marine Trades Association, Municipalities, Stakeholders and User groups</i></p> | <p>Work with partners to extend the program into the future. Track participation on website.</p> | X | X | X | X | X |
| <p>2. Continue to promote use of marina pumpout facilities</p> | <p>1. Continue to work with partners to provide and promote the use of pumpout facilities.</p> <p>2. Evaluate the need for additional pumpout facilities for inland and coastal waterbodies.</p> <p><i>Lead Agency: CT DEEP Boating Division</i></p> | <p>Brochures and promotional items with the pumpout logo distributed to marinas and boaters statewide, annually.</p> <p>Provide funding for free pumpout service</p> <p>Evaluate the need for additional facilities, priority locations, and funding sources. Report annually to US Fish and Wildlife Service</p> | X | X | X | X | X |

4.2 Other Sources

4.2.1 Land Disposal

Background

Land disposal activities with the potential for NPS pollution impacts in Connecticut include landfills, septage disposal, and sludge management. Subsurface sewage disposal systems are addressed separately in Section 4.1.4 of this plan due to their importance as a significant source of NPS-related water quality impairments in Connecticut.

Land disposal activities can result in a variety of contaminants that have the potential to pollute ground and surface waters. As rain or snowmelt seeps through or runs off of disposal sites, it can collect contaminants produced by the deposited waste materials. This contaminated liquid, called leachate, can be produced by active or inactive land disposal areas including landfills and land application of septage and biosolids. Leachate is typically high in dissolved and suspended solids, including metals, and contains pathogens, organic constituents, and relatively high chemical oxygen demand.

In the case of landfills, the pathway of leachate through a disposal area is normally downward to the water table. Within the ground water system, the leachate forms a plume and flows with the ground water to surface water discharge points such as nearby streams or ponds. Where an impermeable surface such as hardpan or bedrock is present, the leachate may reach deeper ground water through fractures, or it may migrate laterally to surface waters. As leachate migrates from a landfill, it also undergoes certain physical, chemical, and biological reactions. These reactions alter and may decrease contaminant levels over time. Depending on the location and type of receptors, however, the potential exists for serious impacts to ground and surface waters.

Connecticut currently has 28 active landfills accepting municipal waste, bulky waste, industrial waste, municipal solid waste, and special waste (non-hazardous industrial wastes). Three of these landfills are no longer accepting waste but are not yet closed (CT DEEP, 2014). Landfills and other solid waste facilities in Connecticut are regulated by the CT DEEP Solid Waste Office through various solid waste management regulations and permitting programs. Stormwater runoff from landfills is also regulated under the CT DEEP Stormwater General Permit Program.

Approximately 40 percent of Connecticut's population disposes of their domestic sewage with on-site sewage disposal systems. Septage is the partially treated waste stored in these systems, typically a septic tank. In Connecticut, most septage is transported to and treated at publicly owned wastewater treatment plants. Other treatment/disposal methods such as land application, unlined lagoons, and innovative/alternative facilities are much less prevalent and therefore are considered a relatively minor source of NPS pollution.

Sludge or biosolids are the mostly organic solids resulting from the treatment of wastewater. Recycling, incineration, or landfill disposal are the primary options for managing biosolids. Decisions regarding management of local biosolids are made at the local public wastewater treatment facility. Although biosolids management has not resulted in serious water quality problems, improper recycling (i.e., land application as fertilizer and soil amendments) or landfill disposal could pose threats to water quality.

Control Measures

- CT DEEP Solid Waste Management Program:
<http://www.ct.gov/deep/solidwaste>
- CT DEEP Subsurface Sewage Disposal Program:
<http://www.ct.gov/deep/subsurfacedisposal>
- North East Biosolids and Residuals Association:
<http://www.nebiosolids.org/>

Table 4-10. Land Disposal – Five-Year Objectives and Actions

| Objectives | Actions |
|---|---|
| <p>1. Continue to implement the CT DEEP Solid Waste Management Program and Connecticut Solid Waste Management Plan</p> | <p>1. Improve residential and commercial waste management practices to reduce pollution to storm runoff. 2. Work with municipalities to ensure better waste management practices including efficient yard waste disposal that reduces inputs to wetlands and roadways.</p> <p><i>Lead Agency: CT DEEP</i> <i>Partners: Municipalities, Stakeholder Workgroups</i></p> |

4.2.2 Brownfields and Contaminated Sites

Background

Contaminated sites, including brownfields², can contribute to nonpoint source pollution through erosion of contaminated soils, the discharge of contaminated ground water to surface waters, and the effects of contaminated sediments carried downstream by flowing surface waters.

The CT DEEP The Remediation Division oversees the investigation and remediation of environmental contamination and the redevelopment of contaminated properties. Their goal is to clean up contaminated sites to meet Connecticut's Remediation Standard Regulations, which ensure that human health and the environment are protected. The Remediation Division, with the assistance of Licensed Environmental Professionals (LEPs), oversees the cleanup of contaminated sites across Connecticut in the context of numerous state and federal programs including:

- Brownfields and Urban Sites
- Property Transfer Program
- Voluntary Remediation Program
- State Superfund Program
- Federal Superfund Program
- RCRA Closure and Corrective Action
- Underground Storage Tank Clean-up Program
- Significant Environmental Hazard Program
- Potable Water Program.

In 2011, CT DEEP began the process of evaluating and transforming the State's cleanup laws and regulations with the goal of achieving more efficient and effective cleanups of contaminated sites. Working through a comprehensive stakeholder process, CT DEEP developed a draft proposal for a transformed cleanup process in 2013. The transformation proposal will create a clear means to ensure that spills and releases are addressed through the regulatory system. Cleanup standards will be refined to encourage prompt cleanups of new spills and to streamline long-term cleanup requirements while adding flexibility. Together, these changes will ensure that new spills are cleaned to the appropriate degree and that historical releases are addressed as they are identified

Contaminated Sites in Connecticut

Industrial contamination is persistent in Connecticut, which has had a long history of industrial activities such as textiles, firearms, glassware, metal finishing, and other industries. Historical contamination from many industrial activities contributed pollutants directly to surface waters and sediments as well as ground water, which eventually discharges to surface water. Many sites have been remediated by eliminating the contaminant source, but others remain or need further investigation to determine the contaminant(s) that may be present and may be contributing to impairments.

² A brownfield is defined by Connecticut General Statutes §32-9kk(a)(1) as "any abandoned or underutilized site where redevelopment, reuse or expansion has not occurred due to the presence or potential presence of pollution in the buildings, soil or ground water that requires investigation or remediation before or in conjunction with the restoration, redevelopment, reuse and expansion of the property."

– not years later by a new property owner or the State. The proposed regulatory reforms and statutory enhancements take into consideration information submitted to CT DEEP by external workgroup reports and extensive public feedback provided by hundreds of engaged stakeholders (CT DEEP, 2013).

Control Measures

- Connecticut’s remediation/site cleanup programs:
<http://www.ct.gov/deep/remediation>.
- CT DEEP Comprehensive Evaluation and Transformation of Connecticut’s Cleanup Laws:
<http://www.ct.gov/deep/remediation-transform>

Table 4-11. Brownfields and Contaminated Sites – Five-Year Objectives and Actions

| Objectives | Actions |
|---|--|
| <p>1. Promote brownfield restoration</p> | <p>1. Work with NGOs and municipalities to facilitate development options for brownfields. 2. Work with stakeholders to identify available funding sources for land restoration and water protection.</p> <p><i>Lead Agency: CT DEEP</i> <i>Partners: Municipalities, Stakeholder Workgroups</i></p> |

4.2.3 Forestry

Background

With close to 60 percent of its land in forest, Connecticut is one of the most heavily forested states in the nation. Connecticut is also one of the most densely populated states. Potential water quality concerns associated with forestry practices (also referred to as “silviculture”) involve erosion and sedimentation, which can result from road construction and use, timber harvesting, operation of mechanical equipment, and burning. Other potential impacts include increased water temperature and stream flow, caused by the removal of riparian zone vegetation, and water quality degradation caused by the accumulation of organic debris or chemical applications.

Commercial forestry operations in the state occur only on a small scale and, therefore, are a relatively minor source of NPS impacts. In fact, Connecticut’s Coastal NPS program received an exemption for the pollutants associated with forestry operations because forestry activities are adequately addressed through the state’s Forestry Program and are not considered a significant NPS concern. The CT DEEP Division of Forestry oversees certification of Forest Practitioners under the 1991 Forest Practices Act, which was amended in November 2013. In 2013, the State Statutes regarding tree wardens were also revised, requiring that each city and town appoint as either tree warden or deputy tree warden an individual who meets certain educational requirements or by being licensed as an arborist in Connecticut.

The potential impacts of forestry activities on inland wetlands and watercourses are also regulated by Town inland wetland agencies. In 1987, the state’s Inland Wetlands and Watercourses Act was amended to eliminate the silviculture exemption for clear-cutting in inland wetlands.

A more significant impact related to NPS pollution is the loss and fragmentation of forested land resulting from development. Forest cover, including natural forest soils with irregular topography, provides numerous benefits. In addition to providing habitat for terrestrial and aquatic wildlife, watershed forest cover also reduces nonpoint source pollution, runoff, and flooding, improves regional air quality, reduces stream and channel erosion, improves soil and water quality, and reduces summer air and water temperatures (USDA Forest Service, 2005). Through green infrastructure approaches, vegetation and natural systems are now considered a key tool in the protection and restoration of urban watersheds.

Forest Fragmentation in Connecticut

The ability of Connecticut’s forests to provide wildlife habitat, clean water, and economically viable forest products is at least partially dependent on the ability to maintain sizeable tracts of unfragmented forest. A Center for Land Use Education and Research (CLEAR) report found that Connecticut lost about 185 square miles of forest to development between 1985 and 2006—about 3.7% of the forest that existed in 1985. While much was converted directly to development, over 80% was degraded to patch or edge forest impacted by nearby development.

Programs within the CT DEEP Division of Forestry focus on working with partners to protect Connecticut’s forest resources. These programs:

- Encourage private land owners to practice responsible long-term forest management (private landowners own nearly 85% of Connecticut’s forest)
- Protect Connecticut’s forest resources from the effects of fire, insects, disease, and misuse
- Provide accurate and timely information about Connecticut’s forest resources

- Certify forest practitioners
- Manage the State Forests, in which exist many large blocks of unfragmented forest land
- Encourage local forest industry.

Connecticut's Forest Resource Assessment and Strategy is a guidance document for the CT DEEP Division of Forestry and forest conservation partners to promote forest conservation, protection, and enhancement strategies. Partners include:

- Connecticut Forest & Park Association
- University of Connecticut and UConn Cooperative Extension System
- Natural Resources Conservation Service of Connecticut
- Connecticut Agricultural Experiment Station
- Audubon Connecticut
- Yale University
- United States Department of Agriculture (USDA) Forest Service
- Land owners, practitioners, land trusts, municipalities, and non-profit organizations.

CT DEEP partners with the USDA Forest Service to implement the Forest Legacy Program. The Forest Legacy Program is used to identify and help conserve environmentally important forests from conversion to non-forest uses. The main tool used for protecting these important forests is conservation easements. The Forest Legacy Program protects working forests, which is defined as those that protect water quality, provide habitat, forest products, opportunities for recreation and other public benefits. The program encourages and supports acquisition of conservation easements, legally binding agreements transferring a negotiated set of property rights from one party to another, without removing the property from private ownership. Most FLP conservation easements restrict development, require sustainable forestry practices, and protect other values (CT DEEP, 2010).

Control Measures

- CT DEEP Division of Forestry:
<http://www.ct.gov/deep/forestry>
- CT DEEP Urban Forestry Program:
http://www.ct.gov/deep/cwp/view.asp?a=2697&q=322872&deepNav_GID=1631
- Connecticut Forest & Park Association:
<http://www.ctwoodlands.org/>
- UConn Cooperative Extension System – Connecticut's Urban Forestry Program:
<http://www.ctforestry.uconn.edu/UrbanForestry.html>

Table 4-12. Forestry – Five-Year Objectives and Actions

| Objectives | Actions |
|---|---|
| 1. Review and update the existing BMP manual, as warranted | <ol style="list-style-type: none"> 1. Review <i>Best Management Practices for Water Quality While Harvesting Forest Products</i> (2012 – field guide was reprinted in 2012) and solicit input from partner agencies and other interested stakeholders regarding the need to update the existing BMP manual to reflect the current best management practices. 2. Review the existing BMP manual and determine need for updating. Produce a work plan for updating the manual, if necessary. 3. Propose updates to the manual as determined, and solicit input through public comment. 4. Update manual, as warranted. <p><i>Lead Agency: CT DEEP Division of Forestry</i></p> <p><i>Partners:</i></p> <ol style="list-style-type: none"> 1. Connecticut Forest & Park Association 2. UConn Cooperative Extension System 3. Connecticut Agricultural Experiment Station 4. Natural Resources Conservation Service |
| 2. Improve the use and effectiveness of BMPs for forest harvesting | <ol style="list-style-type: none"> 1. Consider applying the northeast regional forestry BMP monitoring protocol to assess the use and effectiveness of forestry BMPs. 2. Apply protocol and develop a report on BMP use and effectiveness. <p><i>Lead Agency: CT DEEP Division of Forestry</i></p> |
| 3. Continue to provide education and outreach to private land owners and municipal officials | <ol style="list-style-type: none"> 1. With the majority of forest land in the state being privately owned, continue the existing education and outreach programs of the CT DEEP Division of Forestry. Focus on outreach and training to private land owners, municipal officials, and land use commissions in the value and importance of forests to water quality and protecting forest riparian areas and forest cover within watersheds. <p><i>Lead Agency: CT DEEP Division of Forestry</i></p> <p><i>Partners: Connecticut Forest & Park Association, UConn Cooperative Extension System, Connecticut Agricultural Experiment Station, Natural Resources Conservation Service</i></p> |

Table 4-12. Forestry – Five-Year Objectives and Actions

| Objectives | Actions |
|--|--|
| <p>4. Implement sustainable management practices in woodlands along utility corridors</p> | <ol style="list-style-type: none"> 1. Develop recommended BMPs for storm-related utility line tree cutting to protect wetlands and water quality. 2. Work with partners to integrate recommended water quality BMPs into the ongoing “Stormwise” vegetation management initiative and research program led by UConn and the CT Agricultural Experiment Station. The Stormwise program will identify management strategies to reduce the risk of tree-related power and transportation disruptions during storms while sustaining trees and forested areas. <p><i>Lead Agency: CT DEEP</i> <i>Partners: UConn, CT Agricultural Experiment Station UConn Cooperative Extension System, CLEAR, Utility Companies</i></p> |

4.2.4 Material Storage

Background

Aboveground and underground storage tanks and hazardous materials are potential sources of NPS impacts in Connecticut.

Storage Tanks

Underground storage tanks (USTs) and aboveground storage tanks (ASTs) are used to store petroleum products such as motor fuels and heating oils and other types of chemicals. Storage tanks pose a risk to surface and ground water. Storage container leaks or exposure to precipitation or runoff may lead to contamination of waters. When an underground storage tank leaks, the soil around the tank will become contaminated and the ground water may also be impacted posing environmental and health risks. The length of time the tank has been leaking and the type of soil the tank is placed in will play a factor in the extent of contamination. Leaking USTs have caused significant impacts, including the contamination of numerous private wells, temporary disruption in the use of public wells, explosions and fires at construction sites, explosion hazards within buildings, and the leaching of petroleum into surface waters. Proper siting, design, construction, operation, and maintenance of USTs and ASTs are critical to minimizing the opportunities for such releases to occur.

Approximately 45,000 commercial underground storage tanks (USTs) are registered in Connecticut, of which over 12,000 are still in use. Underground storage tank systems pose a pervasive environmental threat to Connecticut and Long Island Sound without the protection provided by continuous upgrading or replacement. The UST regulations and the Connecticut underground storage tank enforcement program have been in effect since November 1985. The regulations were adopted at both the State and federal levels for preventing pollution and to clean up petroleum or chemical leaks from USTs.

Since 1985, as a result of this regulatory program, over 33,000 USTs have been removed because their ages exceeded established average life expectancy criteria. Connecticut now boasts one of the nation's lowest ratios of releases to total number of commercial USTs in use. Federal and State rules require certain UST systems installed before December 22, 1988 to have pollution prevention modifications including protection from spills, overfills, and corrosion.

As of September 2012, EPA records show that there were 2,870 confirmed releases from USTs in Connecticut and 2,027 of those releases had completed cleanups. The majority of Connecticut facilities are in compliance with the applicable regulations including release prevention (86% compliance) and release detection (82%).

Hazardous Materials

The improper use, handling, storage, and disposal of hazardous materials can have a significant impact on surface and ground water quality. Hazardous materials is a broad category that generally includes toxic, corrosive, flammable, or explosive materials which, due to their quantity, concentration, or physical/chemical characteristics, may, upon release or exposure, cause or contribute to human health or environmental hazards. Concerns associated with hazardous materials generally involve their use in industrial or commercial operations; yet even small amounts

of household hazardous materials have the potential to impact water quality. Automobiles and automobile-related facilities are another source of NPS pollution.

Discharges and releases of toxic chemicals and other hazardous materials to the environment are regulated by a variety of federal and state laws and programs. The major federal laws include the Clean Water Act, the Resource Conservation and Recovery Act, the Clean Air Act, the Toxic Substances Control Act, the Comprehensive Environmental Response, Compensation and Liability Act (and the 1986 SARA Amendments for TRI Release Reporting), and the Federal Insecticide, Fungicide and Rodenticide Act.

On July 17, 1990, the Department adopted hazardous waste management regulations that incorporated the federal hazardous waste regulations (40 CFR 260-270 and 40 CFR 124). At that time, the Department modified several of the federal requirements, which made Connecticut's hazardous waste program more stringent or broader in scope than the federal program.

On October 31, 2001, June 27, 2002 and September 10, 2002, the Department updated the state's hazardous waste management regulations to incorporate the federal hazardous waste regulations (40 CFR 260-279 and 40 CFR 124). As it did with the state's 1990 regulations, the Department modified several of the federal rules which were incorporated through these updates. While many of the changes were made for clarification purposes, others continued to make the revised state regulations more stringent or broader in scope than the federal regulations. The changes were consistent with the Department's previous efforts to adequately protect public health and the environment in Connecticut.

Household hazardous wastes (HHW) also pose a danger to the environment; however, these wastes are not subject to the same rules as wastes generated by commercial, industrial, and institutional activities. Common HHW include oil-based paints, thinners, pool chemicals, pesticides, mercury fever thermometers, and gasoline. Since the first collection in 1984 in Ridgefield, HHW programs have grown dramatically in Connecticut. Collections are available for nearly every resident, and on average, over 30,000 state residents participate in HHW collections each year.

Control Measures

- CT DEEP Hazardous Waste Management (RCRA) Program:
<http://www.ct.gov/deep/rcrahelp>
- CT DEEP UST Program:
<http://www.ct.gov/deep/ust>
- CT DEEP Pit Stop Fact Sheets - Pollution Prevention for Vehicle Repair, Body Shops and Dismantlers:
<http://www.ct.gov/deep/pitstops>
- CT DEEP Household Hazardous Waste Program:
<http://www.ct.gov/deep/hhw>

Table 4-13. Material Storage – Five-Year Objectives, and Actions

| Objectives | Actions |
|---|---|
| <p>1. Continue regulatory programs for USTs and hazardous waste management</p> | <p>1. Continue to implement Connecticut’s UST and hazardous waste management regulatory programs.</p> <p><i>Lead Agency: CT DEEP, Bureau of Materials Management and Compliance Assurance</i></p> |
| <p>2. Expand Household Hazardous Waste Collection Opportunities</p> | <p>1. Evaluate the feasibility of creating a program financed by Extended Producer Responsibility to expand Household Hazardous Waste opportunities for citizens. An example of a program financed by Extended Producer Responsibility is the PaintCare stewardship program where citizens and small businesses in Connecticut can return unwanted paint to drop-off locations. The PaintCare program has been operated successfully in Connecticut since July 2013.</p> <p>2. Develop a strategy for implementing an expanded HHW program financed by Extended Producer Responsibility.</p> <p><i>Lead Agency: CT DEEP</i> <i>Partners: Industry Representatives, CBIA</i></p> |

4.2.5 Resource Extraction

Background

In Connecticut, sand and gravel mining and rock quarries are the most common resource extraction activities that contribute to NPS pollution. According to the U.S. Geological Survey (USGS), Connecticut produced approximately 18,417,000 metric tons of raw minerals in 2004. Crushed stone and construction sand and gravel are the state's leading mineral commodities by value – accounting for nearly all of the state's mineral production. Crushed stone quarried in Connecticut is used for riprap and jetty stone, as fine and coarse aggregate, and other uses. Sand and gravel are used in concrete aggregate (including concrete sand), concrete products (blocks, bricks, pipe and decorative uses), road construction, fill, and in snow and ice control. In 2004, there were 75 sand and gravel pits and 21 crushed stone quarries in the state (Frisman, 2007).

Potential NPS impacts from resource extraction activities in Connecticut include:

- Sand and gravel mining can lead to increased erosion and sediment load, which can have adverse affects on receiving waterbodies.
- Like other types of mining, sand and gravel mining involves the removal of overburden (layers of soil or rock overlying a valuable mineral deposit) which can play an important role in the protection of ground water.
- Stone and gravel washing at quarries and mining sites can lead to sedimentation if not properly controlled.
- Water quality impacts can result from fuel spills and other hazardous material discharges associated with vehicles and equipment at the mining site.
- Sand and gravel sites can attract illegal dumping if not properly managed.

Surface mining activities are subject to a variety of state and federal environmental regulatory programs, including water discharge permitting, solid and hazardous waste management, water and natural resources permitting, and air emissions permitting. Resource extraction activities are often regulated at the local level through zoning and inland wetland regulations.

Control Measures

- CT DEEP Industrial Stormwater General Permit (Sector B - Mines & Quarries and Stone Cutting):
<http://www.ct.gov/deep/stormwater>

Table 4-14. Resource Extraction – Five-Year Objectives and Actions

| Objectives | Actions |
|--|---|
| <p>1. Strengthen regulatory controls on resource extraction activities to protect water quality</p> | <ol style="list-style-type: none"> 1. Building on previous CT DEEP efforts to develop a general permit program for the mining industry, re-evaluate the compliance status and existing threat to water quality from mining activities in Connecticut. 2. Assess the effectiveness of municipal land use regulations for addressing potential water quality impacts of resource extraction activities. 3. Develop recommendations for modified state and/or local regulatory mechanisms for more effectively addressing water quality impacts of mining activities. <p><i>Lead Agency: CT DEEP</i> <i>Partners: Industry Representatives, CBIA</i></p> |

4.2.6 Atmospheric Deposition

Background

Nitrogen and sulfur compounds released into the atmosphere from combustion and chemical processes form acids that enter surface waters through fallout, precipitation, and indirect runoff from the land, resulting in acidic soil and water conditions. Nutrients, particularly nitrogenous compounds, may contribute to increased biological productivity and dissolved oxygen deficits as has been observed in Long Island Sound. Toxic substances, including heavy metals, hydrocarbons, and pesticides, are transported via the atmosphere and contribute to water and sediment degradation when deposited. Atmospheric deposition of nutrients and other NPS pollutants is most effectively controlled through aggressive implementation of the Clean Air Act through reductions in air emissions.

In the Northeast, over 10,000 lakes, ponds, and reservoirs, and over 46,000 river miles are listed as impaired for fish consumption primarily due to atmospheric deposition of mercury (NEIWPC, 2007). All freshwaters in Connecticut have a fish consumption advisory due to atmospheric deposition of mercury. The Northeast Regional Mercury TMDL (see Waters Impaired by Mercury) establishes the mercury reduction goal and management strategy for multiple waterbodies throughout New England, including Connecticut, that are impaired by the atmospheric deposition of mercury.

All of the New England states, including Connecticut, are implementing stringent mercury reduction programs. The Northeast region's ability to achieve the calculated TMDL allocations is dependent on the adoption and effective implementation of national and international programs to achieve necessary reductions in mercury emissions. Given the magnitude of the reductions required to implement the TMDL, the Northeast cannot reduce in-region sources further to compensate for insufficient reductions from out-of-region sources (NEIWPC, 2007).

Control Measures

- Northeast Regional Mercury Total Maximum Daily Load:
<http://www.epa.gov/region1/eco/tmdl/pdfs/ne/Northeast-Regional-Mercury-TMDL.pdf>
- The Impact of Atmospheric Nitrogen Deposition on Long Island Sound
<http://longislandsoundstudy.net/wp-content/uploads/2010/03/hypfsat.pdf>

Table 4-15. Atmospheric Deposition – Five-Year Objectives, Actions, and Milestones

| Objectives | Actions |
|---|---|
| <p>1. Continue regional mercury emissions reduction initiative</p> | <ol style="list-style-type: none"> 1. Continue to implement the Regional Mercury TMDL. The goal of the TMDL is to use adaptive implementation to achieve a target fish tissue mercury concentration of 0.1 ppm for Connecticut. 2. Re-evaluate progress made toward the fish tissue goal and determine if adjustments need to be made in the reduction goals or how they can be achieved in accordance with the timeline set forth in the TMDL implementation plan. 3. Continue to evaluate and reduce emissions limits on coal-fired utilities, sewage sludge incinerators, municipal waste combustors, area sources, and residential heating/commercial and industrial oil combustion. 4. Work with other Northeast states to recommend adaptive implementation of the TMDL to meet the national implementation requirements of the TMDL. |

5 NPS Program Funding and Evaluation

5.1 NPS Program Funding

The Connecticut NPS Program is supported by both federal and state funds and is administered by the Water Protection and Land Reuse Bureau. Like many states, Connecticut does not have sufficient resources to implement measures for all existing or potential NPS pollution problems. To maximize NPS pollution control efforts, technical and financial assistance from federal, state, and local sources are cooperatively targeted to NPS priority watersheds and statewide programs. This Plan identifies the use and allocation of Section 319 Clean Water Act funds as well as the use and coordination of other funding for NPS activities in Connecticut.

Funding for NPS activities in Connecticut comes primarily from Section 319 of the federal Clean Water Act, which establishes the national program to control nonpoint sources of water pollution. Under Section 319, the U.S. Environmental Protection Agency (EPA) awards a grant annually to CT DEEP. That grant is divided into “NPS program” and “Watershed project” funds by the type of work funded. “Watershed project” funding is for implementing water quality restoration activities while “NPS program” funding supports the full range of nonpoint source program activities. CT DEEP’s Section 319 funding allocation follows the FY 14 EPA guidelines. It allows the State to use up to 50% of the total state section 319 funding allocation for “NPS program” activities while the State must use at least 50% of the annual allocation for “watershed project” funds to implement watershed projects guided by WBPs (the Watershed Project funds).

CT DEEP allocates a portion of the 319 program funds through its EPA Performance Partnership Grant (PPG) to support regulatory and non-regulatory staff that supports water quality programs, watershed management, planning, technical assistance, and project oversight. The remaining Section 319 funding allocation not used as PPG program funds is called the categorical grant and is used for NPS implementation and planning projects. These funds typically go to grantees outside CT DEEP. “Watershed project” funding, to eligible projects that support the implementation of Connecticut’s NPS Management Program, is a major focus of the program and implements watershed-based plans (WBP) designed to correct NPS related impairments, particularly those listed as impaired on the “State of Connecticut Integrated Water Quality Report” (IWQR) and 303(d) list of impaired waters.

Additional funding from NPS Program partners and other grant sources may also be available to supplement or leverage Section 319 funds. These include State bond funds, Coastal Zone Management Act funds, awarded by the National Oceanic and Atmospheric Administration, EPA Long Island Sound Program, EPA 604b Water Quality Planning, and USDA NRCS. Other funding sources, from other federal and state agencies and private foundations, are utilized when available and a list and description of these funding sources is provided in Appendix E.

The primary Connecticut Nonpoint Source Program staffing consists of three Watershed Managers and a Lakes Management Analyst, and a supervisor position which serves as the CT NPS Coordinator. They work within CTDEEP and externally with other state agencies, the 169 municipalities in Connecticut and all of the program partners listed in Section 2.1. The Watershed

Managers have developed collaborative partnerships with Municipalities, Connecticut Conservation Districts, Watershed Organizations, Advocacy Groups, other NGOs and Citizens, and assist them with developing and implementing strategies to restore and protect waters to meet Water Quality Standards and support designated uses. More details and examples of the organizations we work with are presented in Connecticut's Nonpoint Source Program Annual Reports.

Connecticut's FY 2014 319 PPG program funds are used to support CT DEEP Water Quality Management Program staff including full funding of two full time Watershed Managers, partial funding two full time staff in the TMDL/WQS Program, and 80% support of one full time employee in the Agricultural and Subsurface Disposal Program. State grant funding match is provided by staff in the Monitoring and Assessment, Watershed Management, Aquifer Protection, and Lakes Management Programs. The State's Nonpoint Source Program is embedded within the Watershed Management Program and works seamlessly within the other CT DEEP Water Quality Management Programs in the Planning and Standard Division of the Bureau of Water Protection and Land Reuse.

Watershed management plans have been developed for watersheds throughout Connecticut since the mid-1990s. A number of EPA nine element watershed based plans have been completed in Connecticut since 2008, which serve as models for ongoing and future plan development and implementation in other watersheds. Implementation projects resulting from these watershed based plans, consisting of on-the-ground water quality restoration or protection projects, have been completed throughout the state with Section 319 and other sources of federal, state, local and private funding. Completed and ongoing watershed based plans and other watershed management plans are available on the CT DEEP website at www.ct.gov/deep/watershed.

An annual Request for Proposals is developed to solicit projects to meet DEEP's priorities, with the highest priority being restoration of impaired water bodies. As part of this 2014 program plan it is planned to allocate the watershed project funds as follows: 90% for restoration of impaired waters, 5% to protect threatened waters, and 5% to protect high quality waters. A small portion of the funding is allocated to planning to continue development of watershed-based plans. A selection committee made up of CT DEEP Bureau of Water Protection and Land Reuse Water Programs, Agricultural and Subsurface Disposal Program and Pollution Prevention Program reviews and ranks proposals according to RFP and grant criteria.

The Clean Water State Revolving Fund (CWSRF) continues to be evaluated for potential NPS funding opportunities to consider NPS related activities. However there are significant high priority point source wastewater projects related to treatment plant upgrades, collection systems, and combined sewer overflow (CSO) needs. The CWSRF currently includes set-asides or reserves categories for green infrastructure, river restoration and small communities wastewater (including decentralized). Currently the reserve for construction of green infrastructure includes up to \$20,000,000 for FY 14 and FY15 (50%grant/50% loan) to minimize the amount of combined sewage that discharges into the environment by improving the quality of the storm water using green infrastructure. This includes technologies to promote infiltration of stormwater into the ground including community demonstration projects in combined sewer overflow areas. The small community set-aside currently includes decentralized systems funding in Old Saybrook. More detailed information on the CT CWSRF can be found at

http://www.ct.gov/deep/cwp/view.asp?a=2719&q=325578&deepNav_GID=1654

5.2 NPS Program Evaluation

CT DEEP, working with its NPS Program partners, will evaluate the Connecticut NPS Program consistent with the FY14 NPS Guidelines to ensure the effective use of Section 319 funds and resources. The program evaluation will be documented as an update to the NPS Management Plan every five years. At a minimum, the update will ensure that the NPS Program goals, objectives, and annual milestones are current and relevant. Regular updates of the NPS Management Plan also provide an opportunity to reflect activities completed since the previous plan update as well as changes in strategic priorities.

The following measures are used to evaluate the performance and progress of the Connecticut NPS Program:

- **Water Quality Monitoring and Assessment:** Water quality monitoring data collected as part of the CT DEEP Ambient Monitoring and Assessment Program, and data from other state and federal agencies, local governments, drinking water utilities, volunteer organizations, and academic sources, are used to assess the quality of the State's waters relative to attainment of Connecticut Water Quality Standards. The monitoring and assessment process is used to determine whether impaired waterbodies have been restored and can be removed from the State's list of impaired waters. CT DEEP also uses these data to assess any incremental improvements to water quality, removal of individual impairments to waterbodies, and to the prevention of impairments to threatened waterbodies. These assessments of restoration, incremental water quality improvements, and pollution prevention are used to measure environmental and functional program progress and success, and to used evaluate adaptive management strategies for non-point source pollution. Connecticut updates its Impaired Waters List every two years for EPA review and approval.
- **Project Reports:** Annual or semi-annual project progress reports are completed for all Section 319 grant-funded projects, including those performed by the recipient, subgrantees, contractors, and through interagency agreements. The reports compare actual accomplishments to the outputs/outcomes established in the workplan for that period, including milestone progress, resulting restorations, decreases in pollutant loadings, and other water quality improvements.
- **Annual NPS Program Report:** CT DEEP prepares an annual report on the progress of the State's NPS Management Program. The report contains a summary of progress, including rationale/evidence, in meeting the schedule of milestones in the approved management program and reductions in NPS pollutant loading and restoration of water quality that has resulted from implementation of the NPS Management Program.
- **Grants Reporting and Tracking System:** Section 319 grant recipients are required to submit semi-annual and annual reports in the "Grants Reporting & Tracking System" (GRTS). GRTS is the primary tool for management and oversight of the grants portion of EPA's Nonpoint Source Pollution Control Program. GRTS pulls grant information from EPA's centralized

grants and financial databases and allows grant recipients to enter detailed information on individual projects or activities funded under each grant. GRTS enables EPA and States to document the accomplishments achieved with the use of Section 319 grant funds.

- **Annual CCMP Tracking and Monitoring:** The Long Island Sound Study produces an annual Comprehensive Conservation and Management Plan (CCMP) Tracking and Monitoring Report, which describes progress in implementing the CCMP action plans for hypoxia management, toxic contamination, pathogen contamination, living marine resources, floatable debris, and public education and outreach. The NOAA Office of Coastal Resource Management requires OLISP to provide semi-annual progress reports, which includes development and implementation of the Coastal Nonpoint Pollution Control Plan.
- **Success Stories:** CT DEEP periodically prepares and submits to EPA NPS Program “success stories,” which highlight primarily NPS-impaired waterbodies that have been partially or fully restored as a result of restoration efforts. To date, CT DEEP has submitted four success stories to EPA for compilation and publication (Edgewood Park Pond, North Running Brook and two segments of the Norwalk River), with another expected to be submitted to EPA in FY 2015. CT DEEP also publishes numerous fact sheets and brochures describing its successful projects for general distribution, through which feedback is sought from its NPS Program partners and the public.

6 Climate Change

Background

Climate change can have a variety of impacts on surface water, drinking water, and ground water quality. Higher water temperatures and changes in the timing, intensity, and duration of precipitation can affect water quality. Increased precipitation and more frequent extreme precipitation events will likely create infrastructure operation and maintenance challenges and will degrade water quality, as increased runoff strains antiquated, undersized storm sewer pipes and culverts and delivers greater pollutant loads to receiving waters. The frequency and intensity of floods could also increase. In addition, sea level rise may affect freshwater quality by increasing the salinity of coastal rivers and bays and causing saltwater intrusion.

Connecticut is at the forefront of U.S. states responding to the challenges posed by global climate change. After nearly two decades in which greenhouse gas emissions (GHG) rose significantly, Connecticut succeeded in returning GHG emissions to 1990 levels by 2010, a goal set by the New England Governors and Eastern Canadian Premiers in 2001 as part of the first multi-national, multi-jurisdictional framework for climate change action. In the next few years, the state is likely to achieve the first GHG emissions reduction mandate of the Global Warming Solutions Act of 2008, reducing emissions to 10 percent below 1990 emissions levels well ahead of the 2020 deadline established by the Act. Driven, in part by significant emissions reductions from the electric power sector, Connecticut has achieved just over half the reductions necessary to meet its 2020 mandate. Connecticut has made significant progress in implementing critical GHG reduction strategies identified in the 2005 Climate Change Action Plan and the 2013 Comprehensive Energy Strategy.

Connecticut is a member of the Regional Greenhouse Gas Initiative (RGGI), which is the first market-based regulatory program in the United States to reduce greenhouse gas emissions. RGGI is a cooperative effort among many of the Northeast U.S. states to cap and reduce carbon dioxide (CO₂) emissions from the power sector. The RGGI states implemented a new 2014 CO₂ cap of 91 million short tons, which then declines 2.5 percent each year from 2015 to 2020. States sell nearly all emission allowances through auctions and invest proceeds in energy efficiency, renewable energy, and other consumer benefit programs. These programs are spurring innovation in the clean energy economy and creating green jobs in the RGGI states.

The Connecticut Climate Preparedness Plan, released in 2013, significantly advances legally mandated efforts to prepare the state to weather the impacts of climate change resulting from historical emissions of greenhouse gases. The strategies outlined in the Climate Preparedness Plan center around five basic themes (CT DEEP, 2014):

- Intensify efforts to ensure preparedness planning
- Integrate climate change adaptation into existing plans
- Update existing standards to accommodate change expected during infrastructure design life
- Plan for flexibility and monitor change
- Protect natural areas and landscape features that buffer potential impacts from climate change.

2013 also marked the passage of two important adaptation bills: Public Act 13-179 An Act Concerning the Permitting of Certain Coastal Structures by the Department, and Special Act 13-9, An Act Concerning Climate Change Adaptation and Data Collection. Act 13-179 contains updated sea level rise considerations and planning procedures, including the projected impacts on coastal development and permitting. Special Act 13-9 calls for a plan to establish a Connecticut Center for Coasts as well as for significant data collection, monitoring requirements, and reporting guidelines (CT DEEP, 2014).

CT DEEP will continue implementing strategies outlined in the state's Climate Change Action Plan and Comprehensive Energy Strategy to maintain and advance progress toward the goal of reducing statewide climate-disrupting emissions by 80 percent from 2001 levels by mid-century.

CT DEEP partnered with the University of Connecticut and launched the Connecticut Institute for Resilience and Climate Adaptation (CIRCA). CIRCA, located at the University's Avery Point campus in Groton, will be a multi-disciplinary, regional center of excellence, bringing together experts in the natural sciences, engineering, economics, political science, finance, and law to provide practical solutions to a changing climate. These solutions will help coastal and inland floodplain communities in Connecticut and throughout the Northeast better adapt to the changing climate and to improve the future resilience and sustainability of the state's highly developed – yet habitat and natural resource-rich – coastline and inland watersheds (CT DEEP, 2014).

CT DEEP offers trainings and events to support and inform local adaptation efforts, as well as to help coordinate and oversee funding opportunities for municipal adaptation work in the region through various regional and federal collaborations. The Department has provided and continues to provide multiple channels of assistance for city and town planners incorporating adaptation measures into their local activities and hosts a Coastal Hazards and Management Planning (CHAMP) tool on its website (CT DEEP, 2014). CT DEEP, in conjunction with partners at CT DOT, CT DCS, and UConn, will also address climate change issues by updating State stormwater design manuals to reflect observed increases in frequency and intensity of large storms.

In addition to its work with UConn at CIRCA, the Department is working to incorporate climate change adaptation and resiliency strategies by working with partners in other state agencies to update statewide planning documents. CT DEEP will also support and provide technical assistance and outreach to municipalities interested in developing local adaptation plans to address coastal and inland flooding, coastline resilience, and erosion hazards. CT DEEP will also promote the integration of flood resiliency planning approaches into existing watershed-based plans in Connecticut.

Control Measures

- CT DEEP Climate Change Website:
<http://www.ct.gov/deep/climatechange>
- Connecticut Climate Preparedness Plan:
<http://www.ct.gov/deep/climatechange>
- Connecticut Adaptation Resource Toolkit (CART):

- <http://www.ct.gov/deep/climatechange>
- Regional Greenhouse Gas Initiative (RGGI):
<http://www.rggi.org/>
- EPA Climate Change and Water Quality Website:
<http://water.epa.gov/scitech/climatechange/Water-Quality.cfm>

Table 4-16. Climate Change – Five-Year Objectives and Actions

| Objectives | Actions |
|--|--|
| 1. Continue to implement Connecticut's Climate Change Action Plan and Comprehensive Energy Strategy. | <ol style="list-style-type: none"> 1. Continue to implement the strategies outlined in the state's Climate Change Action Plan and Comprehensive Energy Strategy to maintain and advance progress toward the goal of reducing statewide climate-disrupting emissions by 80 percent from 2001 levels by mid-century. 2. Ongoing implementation of statewide and regional climate change initiatives. <p><i>Lead Agency: CT DEEP</i> <i>Partners: CT DOT, RGGI, Regional and National Partners</i></p> |
| 2. Update State stormwater design manuals to reflect observed increases in frequency and intensity of large storms. | <ol style="list-style-type: none"> 1. Update design rainfall amounts to account for observed climate change-related increases in the frequency and intensity of large storms. 2. Work with partner agencies to adopt and implement revised design standards to account for observed increases in extreme precipitation. <p><i>Lead Agency: CT DEEP</i> <i>Partners: CT DOT, CT DCS, UConn</i></p> |
| 3. Continue to develop and implement climate change adaptation and resilience strategies. | <ol style="list-style-type: none"> 1. Develop solutions to help coastal and inland floodplain communities in Connecticut better adapt to the changing climate and to improve the future resilience and sustainability of the state's coastline and inland watersheds. 2. Potential strategies include: <ol style="list-style-type: none"> a. Modification of municipal and regional land use plans to include a flood resilience element and encourage flood resilient communities b. Fluvial Erosion Hazard zoning overlay districts and associated regulations c. Riparian corridor/buffer regulations d. Flood resiliency design standards e. Procedures for expedited permitting of repairs and reconstruction after emergency flood events for work which meets new resiliency standards f. Requirements or incentives for the use of green infrastructure/low impact development for new development and redevelopment g. Active and passive restoration projects along the coastline and inland waterbodies |

Table 4-16. Climate Change – Five-Year Objectives and Actions

| Objectives | Actions |
|---|--|
| | <p>h. Ongoing collaboration through the Connecticut Institute for Community Resilience and Climate Adaptation (CIRCA).</p> <p>3. Build upon ongoing community coastal resilience planning efforts in Guilford, Groton, and Greenwich as well as resilience planning for state infrastructure by agencies such as CT DOT.</p> <p><i>Lead Agency: CT DEEP</i> <i>Partners: UConn/CIRCA, Municipalities, CT DOT</i></p> |
| <p>4. Incorporate climate change and flood resiliency into watershed planning.</p> | <p>1. Promote the integration of flood resiliency planning approaches into watershed based plans in Connecticut following the EPA nine element watershed based plan format or other alternative plan formats. Build upon the model flood resiliency planning effort beginning in the Wood-Pawcatuck River watershed in southeastern CT and RI.</p> <p><i>Lead Agency: CT DEEP</i> <i>Partners: Watershed Groups, Municipalities</i></p> |
| <p>5. Develop municipal DPW outreach to strengthen local flood resiliency and adaptation strategies.</p> | <p>1. Develop outreach programs, guidance, and training/technical assistance to municipalities on the following topics:</p> <ul style="list-style-type: none"> a. General awareness and understanding of river processes, aquatic habitat and how land use and infrastructure affects and is affected by river stability b. How to design, construct and maintain roads and bridges to create greater river stability and more flood resilient transportation infrastructure c. The role of green infrastructure techniques and approaches to provide community resiliency and multiple ecosystem benefits d. Post-flood emergency stream intervention that protects and enhances natural ecosystems, including water quality. <p><i>Lead Agency: CT DEEP</i> <i>Partners: Municipalities, CT DOT</i></p> |

7 References

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Appendix A

Legal Authority for Connecticut's Nonpoint Source Management Program

Legal Authority for Connecticut's Nonpoint Source Management Program

In 1987, the federal Clean Water Act (CWA) was amended in a number of ways, one being the addition of Section 319, titled "Nonpoint Source Management Programs." This new section established the first national program to authorize federal funding for the control of NPS pollution. To be eligible for federal funding under Section 319, each state was required to prepare two documents: a state assessment report describing the state's NPS problems and a state management program explaining statewide planning. Section 319 requires states to regularly update their NPS management plans.

In 1990, Congress passed a second NPS statutory mandate—Section 6217 of the Coastal Zone Act Reauthorization Amendments (CZARA). CZARA requires states with federally-approved coastal zone management programs to develop coastal nonpoint pollution control programs to be approved by the EPA and the National Oceanic and Atmospheric Administration (NOAA). These programs strengthen the link between federal and state coastal zone management and water quality programs with the intent of enhancing state and local efforts to manage land and water use activities that degrade coastal waters and coastal habitats.

Although Connecticut General Statutes contain no specific requirement to develop a NPS management program or plan, statewide NPS planning complements and helps to integrate Connecticut's state water quality initiatives.

Connecticut's Water Pollution Control Statutes (Section 22a-416 through 22a-484 of the Connecticut General Statutes, hereinafter referred to as Chapter 446k), as well as inland water resources statutes (Chapter 446i and others), provide the Commissioner of DEEP with regulatory authority and nonregulatory tools to abate, prevent, or minimize sources of water pollution, including nonpoint sources. The programs include:

- Education
- Technical guidance
- Establishment of site-specific water quality goals and criteria
- Best management practices
- Product bans
- Discharge permitting authorities
- Multiple enforcement tools to abate and prevent pollution
- Financial assistance for sewerage infrastructure, cove and embayment projects, and Long Island Sound water quality research and management.

Connecticut General Statutes, Sections 22a-90 through 22a-112, in effect since January 1, 1980, serve as the basis for the state's coastal management program. The Connecticut Coastal Management Act (CCMA) contains specific goals, policies, and standards that, when applied to development proposals, ensure that the development or use of the land and water resources proceeds in a manner consistent with the capability of the land and water resources to support the development and that adverse impacts to coastal resources and water-dependent uses are avoided, minimized, or mitigated. Section 22a-93(15)(A) of the CCMA specifically defines "Adverse Impacts on Coastal Resources" to include degrading water quality through the significant

introduction into either coastal waters or ground water supplies of suspended solids, nutrients, toxics, heavy metals or pathogens, or through the significant alteration of temperature, pH, dissolved oxygen or salinity.” Thus, the CCMA specifically protects against adverse NPS pollution impacts to coastal water quality. Further, any permit issued pursuant to the State’s coastal regulatory authority must be made with due regard for indigenous aquatic life, fish and wildlife, and the interests of the state, including pollution control, water quality, recreational use of public water and management of coastal resources, with proper regard for the rights and interests of all persons concerned (CGS Section 22a-359).

Appendix B

Minimum Elements of a Watershed-Based Plan

Minimum Elements of a Watershed-Based Plan

Although many different elements may be included in a watershed plan, EPA has identified nine minimum elements that are critical for achieving restoration of water quality. In general, EPA requires that nine-element watershed-based plans (WBPs) be developed prior to implementing project(s) funded with § 319 watershed project funding. In many cases, state and local groups have already developed watershed plans and strategies for their rivers, lakes, streams, wetlands, estuaries, and coastal waters that address some or all of the nine elements. EPA encourages states to use these plans and strategies, where appropriate, as building blocks for developing and implementing WBPs. If these existing plans contain all nine elements listed below, they can be used to fulfill the WBP requirement for watershed projects. If the existing plans do not address all nine elements or do not include the entire watershed planning area, they can still provide valuable components to inform, develop, and update WBPs.

The nine elements, as well as short explanations of how each element fits in the context of the broader WBP, are provided below. Although they are listed as *a* through *i*, they do not necessarily take place sequentially. For example, element *d* asks for a description of the technical and financial assistance that will be needed to implement the WBP, but this can be done only after you have addressed elements *e* and *i*.

Element A. Identification of causes of impairment and pollutant sources or groups of similar sources that need to be controlled to achieve needed load reductions, and any other goals identified in the watershed plan. Sources that need to be controlled should be identified at the significant subcategory level along with estimates of the extent to which they are present in the watershed (e.g., X number of dairy cattle feedlots needing upgrading, including a rough estimate of the number of cattle per facility; Y acres of row crops needing improved nutrient management or sediment control; or Z linear miles of eroded streambank needing remediation).

Your WBP source assessment should encompass the watershed of the impaired waterbody(ies) throughout the watershed, and include map(s) of the watershed that locates the major cause(s) and source(s) of impairment in the planning area. To address these impairments, you will set goals to meet (or exceed) the appropriate water quality standards for pollutant(s) that threaten or impair the physical, chemical, or biological integrity of the watershed covered in the plan.

This element will usually include an accounting of the significant point and nonpoint sources in addition to the natural background levels that make up the pollutant loads causing problems in the watershed. If a TMDL or TMDLs exist for the waters under consideration, this element may be adequately addressed in those documents. If not, you will need to conduct a similar analysis (which may involve mapping, modeling, monitoring, and field assessments) to make the link between the sources of pollution and the extent to which they cause the water to exceed relevant water quality standards.

Element B. An estimate of the load reductions expected from management measures.

On the basis of the existing source loads estimated for element *a*, you will similarly determine the reductions needed to meet water quality standards. After identifying the various management measures that will help to reduce the pollutant loads (see element *c* below), you will estimate the load reductions expected as a result of implementing these management measures, recognizing the difficulty in precisely predicting the performance of management measures over time.

Estimates should be provided at the same level as that required in the scale and scope described in element *a* (e.g., the total load reduction expected for dairy cattle feedlots, row crops, eroded streambanks, or implementation of a specific stormwater management practice). For waters for which TMDLs have been approved or are being developed, the plan should identify and incorporate the TMDLs; the plan needs to be designed to achieve the applicable load reductions in the TMDLs. Applicable loads for downstream waters should be included so that water delivered to a downstream or adjacent segment does not exceed the water quality standards for the pollutant of concern at the water segment boundary. The estimate should account for reductions in pollutant loads from point and nonpoint sources identified in the TMDL as necessary to attain the applicable water quality standards.

Element C. A description of the nonpoint source management measures that will need to be implemented to achieve load reductions in element b, and a description of the critical areas in which those measures will be needed to implement this plan.

The plan should describe the management measures that need to be implemented to achieve the load reductions estimated under element *b*, as well as to achieve any additional pollution prevention goals outlined in the watershed plan (e.g., habitat conservation and protection). Pollutant loads will vary even within land use types, so the plan should also identify the critical areas¹⁷ in which those measures will be needed to implement the plan. This description should be detailed enough to guide needed implementation activities throughout the watershed and can be greatly enhanced by developing an accompanying map with priority areas and practices. Thought should also be given to the possible use of measures that protect important habitats (e.g. wetlands, vegetated buffers, and forest corridors) and other non-polluting areas of the watershed. In this way, waterbodies would not continue to degrade in some areas of the watershed while other parts are being restored.

Element D. Estimate of the amounts of technical and financial assistance needed, associated costs, and/or the sources and authorities that will be relied upon to implement this plan.

You should estimate the financial and technical assistance needed to implement the entire plan. This includes implementation and long-term operation and maintenance of management measures, information/education (I/E) activities, monitoring, and evaluation activities. You should also document which relevant authorities might play a role in implementing the plan. Plan sponsors should consider the use of federal, state, local, and private funds or resources that might be available to assist in implementing the plan. Shortfalls between needs and available resources should be identified and addressed in the plan.

Element E. An information and education component used to enhance public understanding of the plan and encourage their early and continued participation in selecting, designing, and implementing the nonpoint source management measures that will be implemented.

The plan should include an I/E component that identifies the education and outreach activities or actions that will be used to implement the plan. These I/E activities may support the adoption and long-term operation and maintenance of management practices and support stakeholder involvement efforts.

Element F. Schedule for implementing the nonpoint source management measures identified in this plan that is reasonably expeditious.

You should include a schedule for implementing the management measures outlined in your watershed plan. The schedule should reflect the milestones you develop in *g* and you should begin implementation as soon as possible. Conducting baseline monitoring and outreach for implementing water quality projects are examples of activities that can start right away. It is important that schedules not be “shelved” for lack of funds or program authorities; instead they should identify steps towards obtaining needed funds as feasible.

Element G. A description of interim measurable milestones for determining whether nonpoint source management measures or other control actions are being implemented.

The WBP should include interim, measurable implementation milestones to measure progress in implementing the management measures. These milestones will be used to track implementation of the management measures, such as whether they are being implemented according to the schedule outlined in element *f*, whereas element *h* (see below) will develop criteria to measure the effectiveness of the management measures by, for example, documenting improvements in water quality. For example, a watershed plan may include milestones for a problem pesticide found at high levels in a stream. An initial milestone may be a 30% reduction in measured stream concentrations of that pesticide after 5 years and 50 percent of the users in the watershed have implemented Integrated Pest Management (IPM). The next milestone could be a 40% reduction after 7 years, when 80% of pesticide users are using IPM. The final goal, which achieves the water quality standard for that stream, may require a 50% reduction in 10 years. Having these waypoints lets the watershed managers know if they are on track to meet their goals, or if they need to re-evaluate treatment levels or timelines.

Element H. A set of criteria that can be used to determine whether loading reductions are being achieved over time and substantial progress is being made toward attaining water quality standards.

As projects are implemented in the watershed, you will need water quality benchmarks to track progress towards attaining water quality standards. The *criteria* in element *h* (not to be confused with *water quality criteria* in state regulations) are the benchmarks or waypoints to measure against through monitoring. These interim targets can be direct measurements (e.g., fecal coliform concentrations, nutrient loads) or indirect indicators of load reduction (e.g., number of beach closings). These criteria should reflect the time it takes to implement pollution control measures, as

well as the time needed for water quality indicators to respond, including lag times (e.g., water quality response as it is influenced by ground water sources that move slowly or the extra time it takes for sediment bound pollutants to break down, degrade or otherwise be isolated from the water column). Appendix B of these guidelines, "Measures and Indicators of Progress and Success," although intended as measures for program success, may provide some examples that may be useful. You should also indicate how you will determine whether the WBP needs to be revised if interim targets are not met. These revisions could involve changing management practices, updating the loading analyses, and reassessing the time it takes for pollution concentrations to respond to treatment.

Element I. A monitoring component to evaluate the effectiveness of the implementation efforts over time, measured against the criteria established under element h.

The WBP should include a monitoring component to determine whether progress is being made toward attaining or maintaining the applicable water quality standards for the waterbody(ies) addressed in the plan. The monitoring program should be fully integrated with the established schedule and interim milestone criteria identified above. The monitoring component should be designed to assess progress in achieving loading reductions and meeting water quality standards. Watershed-scale monitoring can be used to measure the effects of multiple programs, projects, and trends over time. Instream monitoring does not have to be conducted for individual BMPs unless that type of monitoring is particularly relevant to the project.

For more detailed information on developing watershed-based plans, please see *A Handbook for Developing Watershed Plans to Restore and Protect Our Waters*, U.S. EPA, EPA 841-B-08-002 March 2008, (water.epa.gov/polwaste/nps/handbook_index.cfm). Other resources for watershed planning are available on the Watershed Central website - including the Watershed Central Wiki and Plan Builder tool at: water.epa.gov/type/watersheds/datait/watershedcentral/index.cfm.

Appendix C

Connecticut Interim NPS Priority Watersheds List

Interim NPS Priority Waters List

An interim list of NPS priority waters was developed for three major categories of waters – lakes, rivers and streams, and marine/estuaries. The starting point for this list was current water quality information collected under the Connecticut Consolidated Assessment and Listing Methodology (CT CALM) and the assessment and reporting in the CT Integrated Water Quality Report (IQWR) on the quality of surface waters related to nonpoint source pollution. This interim list includes those impaired waters prioritized for restoration, as well as those waters threatened or prioritized for protection. This list is a step in effective nonpoint source management and will assist in the allocation of limited resources. A combination of ecological, stressor, and social characteristics was considered and the process included consideration of the water quality status, public support and prior agency commitment to the watershed, and alignment with other resource planning priorities and was reviewed by CT DEEP water resources professional staff knowledgeable in lake, stream and marine water quality assessment and management. Factors included: Watershed Based Plans or other watershed management plan; Total Maximum Daily Load (TMDL) in draft or final form; initiatives to assess nonpoint source pollution in the watershed; priority watersheds for a partner agency; presence of an active watershed group; and overall social water use benefits. This Interim Priority List represents DEEP priorities at this time, and may be revised annually. Additional waterbodies that may be eligible for project funding and/or Watershed Based Plan development are listed at: http://www.ct.gov/deep/lib/deep/water/nps/planupdate/nps_priority_impaired.pdf

| Interim Priority List - Impaired Water Quality Lakes In Need of Restoration | | | |
|--|-------------------------|--|-------------|
| Waterbody Name | Drainage Basin # | Reasoning | Rank |
| Amos Lake | 3002-02 | TBD; Watershed Based Plan (WBP)/Diagnostic Feasibility (DF) study is ongoing | High |
| Lower Bolton Lake | 3108-02 | Basin and internal loading; WBP/DF study is ongoing | High |
| Silver Lake | 4601-00 | Basin loading and internal nutrient loading; Assess latest dredging project phase work | High |
| Beseck Lake | 4607-10 | Basin loading and internal nutrient loading; WBP/DF study needed | High |
| Pocotopaug Lake | 4709-04 | Basin nutrient loading; Urban runoff BMPs needed | High |
| Hatch Pond | 6016-00 | Basin loading and internal nutrient loading; WBP/DF study is ongoing | High |
| Lillinonah Lake | 6700-00 | Basin loading and hydrologic modification; WBP needed | High |
| West Thompson Lake | 3700-00 | Nutrient loading and hydrologic modification; Review existing data needed | Medium |
| Aspinook Lake | 3700-40 | Nutrient loading and hydrologic modification; WBP needed | Medium |
| Roseland Lake | 3708-00 | Basin nutrient loading; WBP/Agricultural BMPs needed | Medium |
| Union Pond | 4500-00 | Basin nutrient loading; WBP needed | Medium |
| Branford Supply Pond | 5111-09 | Basin loading; WBP needed | Medium |

Connecticut protects oligotrophic lakes by emphasizing ongoing water quality monitoring, watershed planning, and land preservation. To help achieve these objectives, watershed based plans are recommended. Below is a list of Connecticut lakes that are recommended for consideration of CWA Section 319(h) and/or Section 604(b) NPS funding for watershed based plans.

| Interim Priority List - High Water Quality Lakes In Need of Protection | | |
|---|---------------------|---------------------------------------|
| Waterbody Name and Drainage Basin # | Municipality | Rank – Threatened Concern/Need |
| Mashapaug Lake 3203-00 | Union | Land Preservation |
| Beach Pond 3600-00 | Voluntown/RI | Watershed Based Plan |
| Alexander Lake 3700-23 | Killingly | Ground water withdrawals |
| Wauregan Reservoir 3700-28 | Killingly | Watershed Based Plan |
| Doolittle Lake 4304-03 | Norfolk | Septic Systems |
| West Hill Lake 4305-00 | New Hartford | Watershed Based Plan |
| East Twin Lake 6002-00 | Salisbury | Watershed Based Plan |
| West Twin Lake 6002-00 | Salisbury | Watershed Based Plan |
| Wononscopomuc Lake 6005-00 | Salisbury | Watershed Based Plan |
| Lake Winchester 6905-00 | Winchester | Land Preservation |
| Bashan Lake 4710-00 | East Haddam | Watershed Based Plan |

| Interim Priority List – Impaired Rivers and Streams In Need of Restoration | | |
|---|--|-------------|
| Waterbody Name and Drainage Basin # | Reasoning (NPS Impaired) | Rank |
| Pawcatuck River 1000 | Shellfish Direct Consumption, Recreation/Bacteria multi-state TMDL, pending federal Wild and Scenic River study area; watershed stakeholder capacity | High |
| Latimer Brook 2202 | Recreation/Bacteria; TMDL, delisted in 2012; WBP; Implementation projects ongoing; citizen science water quality monitoring program; watershed organization capacity | High |

| Interim Priority List – Impaired Rivers and Streams In Need of Restoration | | |
|---|---|-------------|
| Waterbody Name and Drainage Basin # | Reasoning (NPS Impaired) | Rank |
| Niantic River 2204-00 | Habitat for Fish, Other Aquatic Life and Wildlife, Cause unknown; Recreation/Bacteria; Shellfish Direct Consumption/Bacteria; WBP; Implementation projects ongoing; watershed organization capacity; nitrogen work group plan of study with reports in 2015; viable eelgrass beds | High |
| Birch Plain Creek 2000-27 | Shellfish Harvesting/Bacteria TMDL; WBP Implementation; some stakeholder capacity | High |
| Amos Lake 3002-02 | Recreation/Bacteria; WBP in process; lake stakeholder capacity | High |
| Eagleville Brook 3100 | Habitat for Fish, Other Aquatic Life and Wildlife, Cause unknown; IC TMDL; WBP Implementation; watershed team capacity; Recreation/Bacteria TMDL | High |
| Moosup River 3500 | Recreation/Bacteria; TMDL; Hydro modification with multiple dams/barriers to aquatic life movement; inter-agency habitat restoration projects underway | High |
| Muddy Brook 3708 | Recreation/Bacteria; TMDL; WBP; Habitat for Fish, Other Aquatic Life and Wildlife/Cause unknown; watershed stakeholder capacity | High |
| Peckham Brook 3708 | Recreation/Bacteria; TMDL; WBP Implementation; watershed stakeholder capacity | High |
| Little River 3708 | Recreation/Bacteria; TMDL; WBP Implementation; watershed stakeholder capacity; Source water Protection Plan | High |
| Roseland Lake 3708 | Recreation/Bacteria, Nuisance Vegetation; WBP Implementation; watershed stakeholder capacity | High |
| Mashamoquet Brook 3710 | Recreation/Bacteria; WBP, pending initial implementation projects | High |
| Pequabuck River 4315 | Habitat for Fish, Other Aquatic Life and Wildlife/Cause Unknown; Recreation/Bacteria; TMDL; Proposed WBP | High |
| Park River-North Branch 4404 | Aquatic Life TMDL/Cause Unknown; Recreation/Bacteria; watershed org capacity Recreation/Bacteria; WBP with initial implementation projects | High |
| Coginchaug River 4607 | Recreation/Bacteria TMDL; WBP Implementation; watershed stakeholder capacity | High |

| Interim Priority List – Impaired Rivers and Streams In Need of Restoration | | |
|---|--|-------------|
| Waterbody Name and Drainage Basin # | Reasoning (NPS Impaired) | Rank |
| Quinnipiac River 5200 | Habitat for Fish, Other Aquatic Life and Wildlife/Cause Unknown; WBP; watershed organization capacity | High |
| Wharton Brook 5207 | Habitat for Fish, Other Aquatic Life and Wildlife/Cause Unknown | High |
| West River 5305 | Habitat for Fish, Other Aquatic Life and Wildlife/Cause Unknown; Recreation/Bacteria; pending WBP; watershed stakeholder capacity | High |
| Housatonic River 6000 | Fish Consumption/PCBs (Cat 4 pollution control measures); federal consent decree – ongoing project; watershed organization capacity | High |
| Blackberry River 6100 | Recreation/Bacteria TMDL; ongoing agriculture projects | High |
| Still River 6600 | Recreation/Bacteria; Aquatic Habitat/Nutrients TMDLs; Proposed 319 project to create WBP | High |
| Pomperaug River 6800 | Recreation/Bacteria TMDL; existing watershed plan proposal to upgrade to 9 element WBP; watershed organization capacity | High |
| Weekeepeemee River 6804 | Recreation/Bacteria TMDL; existing watershed plan to upgrade to 9 element WBP; watershed organization capacity | High |
| Steele Brook 6912 | Aquatic Habitat/Iron; Recreation Bacteria TMDL; WBP; design completed for implementation plan; watershed stakeholder capacity | High |
| Pequonnock River 7105 | Aquatic Life TMDL/Cause Unknown; Recreation/Bacteria; watershed organization capacity | High |
| Sasco Brook 7109 | Aquatic Life TMDL/ Cause Unknown; Recreation/Bacteria; WBP Implementation; watershed stakeholder capacity | High |
| Saugatuck River 7200 | Lower segment Habitat for Fish, Other Aquatic Life and Wildlife/Insufficient Information; WBP Implementation pending; watershed stakeholder capacity | High |
| Norwalk River 7300 | Aquatic Life TMDL/Cause Unknown, Sedimentation/Siltation; Recreation/Bacteria; WBP Implementation; watershed organization capacity | High |
| Mill-Rippowam River 7405 | Habitat for Fish, Other Aquatic Life and Wildlife/Cause Unknown; WBP; watershed stakeholder capacity | High |

| Interim Priority List – Impaired Rivers and Streams In Need of Restoration | | |
|---|--|-------------|
| Waterbody Name and Drainage Basin # | Reasoning (NPS Impaired) | Rank |
| Shunock River 1004 | Recreation/Bacteria TMDL; riparian land protection | Medium |
| Flat Brook 3000-09 | Recreation/Bacteria, TMDL; WBP | Medium |
| Roaring Brook 3104 | Habitat for Fish, Other Aquatic Life and Wildlife/Insufficient Information; point source fuel spill now managed under permits; local high water quality basin currently threatened with three new/expanded development areas and impervious surfaces | Medium |
| Crandall Pond 3106 | Recreation/Bacteria, TMDL; WBP | Medium |
| Mount Hope River 3206 | Recreation/Bacteria TMDL, Track down Study and BMP priorities developed; top BMP being installed; stakeholder capacity | Medium |
| Natchaug River 3208 | Recreation/Bacteria TMDL; WBP; some watershed stakeholder capacity | Medium |
| French River 3300 | Recreation/Bacteria; TMDL; Delisted n 2012; pending Track down Survey, WBP, watershed stakeholder capacity | Medium |
| Long Branch Brook 3300 | Recreation/Bacteria; pending Track down Survey, WBP | Medium |
| Spaulding Pond 4302-00 | Recreation/Bacteria; WBP | Medium |
| Tankerhoosen River 4503 | Habitat for Fish, Other Aquatic Life and Wildlife, Cause unknown; WBP with implementation underway; some watershed stakeholder capacity | Medium |
| Mill Brook (Cornwall) 6008 | Habitat for Fish, Other Aquatic Life and Wildlife/Cause unknown; WBP Implementation | Medium |
| Long Meadow Pond Brook 6917 | Recreation/Bacteria Habitat for Fish, Other Aquatic Life and Wildlife/Cause unknown; TMDL | Medium |
| Nash Creek (Westport) 7000 | Not assessed in 2012; local stakeholders pursuing pollution prevention work outside of watershed planning framework | Medium |
| Sherwood Mill Pond (Westport) 7000 | Not assessed in 2012: stakeholder capacity and town clean water priority | Medium |
| Johnson’s Creek-Yellow Mill (Bridgeport) 7103 | Not assessed in 2012; watershed stakeholder capacity, strong city priority to address environmental justice watershed | Medium |

| Interim Priority List – Impaired Rivers and Streams In Need of Restoration | | |
|---|--|-------------|
| Waterbody Name and Drainage Basin # | Reasoning (NPS Impaired) | Rank |
| Rooster River 7106 | Recreation/Bacteria TMDL | Medium |
| Mill River (Fairfield) 7108 | Recreation/Bacteria TMDL | Medium |
| Five Mile (New Canaan-Norwalk) 7401 | Habitat for Fish, Other Aquatic Life and Wildlife/Cause unknown; Recreation/Bacteria; watershed stakeholder capacity | Medium |
| Goodwives River 7402 | Not assessed in 2012; watershed management plan; some stakeholder capacity | Medium |
| Byram River 7411 | Habitat for Fish, Other Aquatic Life and Wildlife, Cause unknown; Recreation/Bacteria | Medium |

The following streams and rivers are either assessed as unimpaired or not assessed through Connecticut’s integrated water quality assessment and accompanying CALM. These waters are determined to be threatened, subject to potential impacts from NPS pollution (From Chemical, and Biological Attributes of Moderately Developed Watersheds within Connecticut. Chris Bellucci, Mike Beauchene, and Mary Becker. Connecticut Department of Environmental Protection Bureau of Water Protection and Land Reuse Planning and Standards Division 54 pages with 20 Figures, 11 Tables, and 3 Appendices Last Revised November 24, 2008).

| Interim Priority List – Unimpaired or Unassessed Rivers and Streams Threatened by NPS Pollution | |
|--|-------------|
| Waterbody Name and Drainage Basin # | Town |
| Roaring Brook 4312 | Farmington |
| Copper Mine Brook 4314 | Bristol |
| Thompson Brook 4316 | Avon |
| Nod Brook 4317 | Avon |
| Belcher Brook 4601 | Berlin |
| Sawmill Brook 4606-00 | Middletown |
| Meadow Brook 4703 | Colchester |
| Farm River 5112-00 | East Haven |

| Interim Priority List – Unimpaired or Unassessed Rivers and Streams Threatened by NPS Pollution | |
|--|-------------|
| Waterbody Name and Drainage Basin # | Town |
| Ten Mile River 5202 | Southington |
| Misery Brook 5203 | Southington |
| Muddy River 5208-00 | North Haven |
| Willow Brook 5301 | Hamden |
| Deep Brook 6019 | Newtown |
| Means Brook 6024 | Shelton |
| Hop Brook 6900 | Naugatuck |
| WB Naugatuck River 6904 | Torrington |
| EB Naugatuck River 6905 | Torrington |
| Hancock Brook 6911 | Waterbury |
| Steele Brook 6912 | Waterbury |
| Long Meadow Brook 6917 | Naugatuck |
| Cricket Brook 7107 | Fairfield |
| Mill River 7108 | Fairfield |
| Sasco Brook 7109 | Fairfield |
| Comstock Brook 7301-00 | Wilton |

Streams for Protection

A study was conducted to define least disturbed watersheds in Connecticut based on stringent screening criteria. Land use characteristics (natural land cover > 80%, impervious land cover < 4%), water quantity stress (no known diversions), habitat fragmentation (no large dams and no dams of any type within 1.6 km of stream reach), and no fish stocking were used to select least disturbed streams. Details of the selection methodology are in Bellucci et al 2011.

A total of 30 least disturbed streams (Table 1) were identified and these streams can form the basis of an initial list of streams for protection under the NPS Plan. Ninety percent of the least disturbed streams sampled contained *Salvelinus fontinalis* (Brook Trout), which can be considered a sentinel fish species for small, least disturbed streams in Connecticut. These streams also contained many sensitive macroinvertebrate taxa, some of which are only known to occur in least disturbed small stream in Connecticut.

These should not be considered the only streams in the state designated for protection. There are efforts underway to use the Biological Condition Gradient (BCG) for tiered assessments that can have promising utility in identifying streams for protection. For example, streams with data showing BCG < 3 are considered fully functional healthy ecosystems. In addition, there are efforts to classify streams under the streamflow regulations that can be used to identify minimally altered streams. Once identified either using the BCG approach or stream flow classification approach, these streams can be added for future consideration under the “Stream for Protection” Category.

Bellucci, C. M. Becker, and M. Beauchene. 2011. *Characteristics of Macroinvertebrate and Fish Communities from 30 Least Disturbed Small Streams in Connecticut*. *Northeastern Naturalist* 18(4):411-444.

| Interim Priority List – High Quality Rivers and Streams In Need of Protection | |
|--|-------------|
| Waterbody Name and Drainage Basin # | Town |
| Pendleton Hill Brook 1001-02 | Stonington |
| Stickney Hill Brook 3104 | Union |
| Branch Brook 3203-10 | Ashford |
| Bebbington Brook 3206-10 | Ashford |
| Gardner Brook 3206-09 | Ashford |
| Knowlton Brook 3205-01 | Ashford |
| Stonehouse Brook 3204 | Chaplin |
| Mott Hill Brook 4008-03 | Glastonbury |
| Hemlock Valley Brook 4016-11 | East Haddam |
| Hungerford Brook 4016-10 | Lyme |
| Beaver Meadow Brook 4015-02 | Haddam |

| Interim Priority List – High Quality Rivers and Streams In Need of Protection | |
|--|--------------|
| Waterbody Name and Drainage Basin # | Town |
| Kettle Brook 4308-13 | Barkhamsted |
| Roaring Brook 4308-11 | Barkhamsted |
| Rugg Brook 4302-04 | Winchester |
| Powder Brook 4313 | Harwinton |
| Elbow Brook 4700-09 | East Hampton |
| Day Pond Brook 4700-02 | Colchester |
| Flat Brook Central 4700 | East Hampton |
| Muddy Brook 4800-06 | East Haddam |
| Early Brook 4800-01 | East Haddam |
| Burnham Brook 4800 | East Haddam |
| Beaver Brook 4803 | Lyme |
| Cedar Pond Brook 4803 | Lyme |
| Chatfield Hollow Brook 5105 | Madison |
| Carse Brook 6009 | Ashford |
| Whiting Brook 6200-06 | Canaan |
| Flat Brook North 6200-05 | Canaan |
| Brown Brook 6201 | Canaan |
| Jakes Brook 6902-02 | Torrington |
| Hall Meadow Brook 6901 | Torrington |

Connecticut prioritizes lake restoration efforts based on available funding, recreational access, water degradation from nonpoint source pollution and public interest. Connecticut recognizes that unlike other water resources, internal nutrient loading can be a significant source of nonpoint pollution. Lakes are assessed based on the natural trophic tendency. Lakes with a trophic state beyond the natural trophic tendency are prioritized for diagnostic feasibility studies and restoration projects. Most lake projects are accomplished by developing partnerships with municipalities and lake groups who have an interest in improving the water quality of their local lake.

| Interim Priority List - Impaired Marine/Estuarine Segments In Need of Restoration | | |
|---|---|-------------|
| Waterbody Name and Drainage Basin # | Reasoning | Rank |
| Estuary: Norwalk Western Long Island Sound Shoreline Segments: 11-14 Mid-Shore Segment: 8 | TMDL Complete: Impairment to Direct Shellfish Consumption | High |
| Estuary: Greenwich/Stamford Western Long Island Sound Shoreline Segments: 18-22, 24-25 Mid-Shore Segments: 12-13, 15 Bathing Beach: Byram Beach | TMDL Complete: Impairment to Direct Shellfish Consumption Impaired Bathing Beach | High |
| Estuary: Darien Western Long Island Sound Shoreline Segments: 15-17 Mid-Shore Segments: 9-10 | TMDL Complete: Impairment to Direct Shellfish Consumption | High |
| Estuary: Westport/Fairfield Western Long Island Sound Inner Segment: 5,8 Shoreline Segments: 6-7, 9-10 Mid-Shore Segments: 5-6 | TMDL Complete: Impairment to Direct Shellfish Consumption | High |
| Estuary: Milford Central Long Island Sound Shoreline Segments: 23 Mid-Shore Segments: 17, 19-20 | TMDL Complete: Impairment to Direct Shellfish Consumption | High |
| Estuary: Bridgeport Western Long Island Sound Shoreline Segments: 4 Mid-Shore Segment: 2-4 | TMDL Complete: Impairment to Direct Shellfish Consumption | High |
| Estuary: Branford / East Haven Central Long Island Sound Shoreline Segments: 11-13 Mid-Shore Segment: 9-11 | TMDL Complete: Impairment to Direct Shellfish Consumption | High |

| Interim Priority List - Impaired Marine/Estuarine Segments In Need of Restoration | | |
|--|---|-------------|
| Waterbody Name and Drainage Basin # | Reasoning | Rank |
| Estuary: Guilford/Madison Central Long Island Sound Inner Segments: 6-7 Shoreline Segments: 5-10 Mid-Shore Segment: 4, 6 | TMDL Complete: Impairment to Direct Shellfish Consumption | High |
| Estuary: Clinton Central Long Island Sound Inner Segment: 5 Shoreline Segments: 3-4 Mid-Shore Segments: 2-3 | TMDL Complete: Impairment to Direct Shellfish Consumption | High |
| Estuary: New London/Groton Eastern Long Island Sound Inner Segments: 9-13,17 Shoreline Segments: 6-8 Mid-Shore Segments: 3-4 | TMDL Complete: Impairment to Direct Shellfish Consumption | High |
| Estuary: Stonington Eastern Long Island Sound Inner Segments: 3, 5-6 Shoreline Segments: 2-5 | TMDL Complete: Impairment to Direct Shellfish Consumption | High |
| Estuary: East Lyme / Waterford Eastern Long Island Sound Inner Segments: 19-22 Shoreline Segments: 12-16 Mid-Shore Segments: 6-7 | TMDL Complete: Impairment to Direct Shellfish Consumption | High |
| Estuary: Old Saybrook / Old Lyme Eastern Long Island Sound Inner Segments: 23, 32 Shoreline Segments: 17-18, 20, 22 Mid-Shore Segments: 8, 10-11 | TMDL Complete: Impairment to Direct Shellfish Consumption | High |
| Estuary: North Stonington Eastern Long Island Sound Shoreline Segment: 1 Mid-Shore Segment: 1 | TMDL Complete: Impairment to Direct Shellfish Consumption | High |
| Estuary: Norwalk Western Long Island Sound Inner Segment: 13 | TMDL Complete Impairment to Commercial Shellfish | Medium |
| Estuary: Greenwich/Stamford Western Long Island Sound Inner Segment: 22 | TMDL Complete Impairment to Commercial Shellfish | Medium |

| Interim Priority List - Impaired Marine/Estuarine Segments In Need of Restoration | | |
|--|---|-------------|
| Waterbody Name and Drainage Basin # | Reasoning | Rank |
| Estuary: Westport/Fairfield Western Long Island Sound Inner Segment: 10 | TMDL Complete Impairment to Commercial Shellfish | Medium |
| Estuary: Milford Western Long Island Sound Inner Segments: 18-19 | TMDL Complete Impairment to Commercial Shellfish | Medium |
| Estuary: Bridgeport Western Long Island Sound Inner Segments: 1-2 | TMDL Complete Impairment to Commercial Shellfish | Medium |
| Estuary: Branford / East Haven Central Long Island Sound Inner Segment: 9 | TMDL Complete Impairment to Commercial Shellfish | Medium |
| Estuary: Clinton Central Long Island Sound Inner Segments: 3-4 | TMDL Complete Impairment to Commercial Shellfish | Medium |
| Estuary: New London/Groton Central Long Island Sound Inner Segment: 14 | TMDL Complete Impairment to Commercial Shellfish | Medium |
| Estuary: Old Saybrook / Old Lyme Eastern Long Island Sound Inner Segments: 24, 26 | TMDL Complete Impairment to Commercial Shellfish | Medium |
| Estuary: North Stonington Eastern Long Island Sound Inner Segments: 1-2 | TMDL Complete Impairment to Commercial Shellfish | Medium |

| Interim Priority List – Marine/Estuarine Segments Threatened by NPS Pollution | | |
|---|--|-------------|
| Waterbody Name and Drainage Basin # | Reasoning | Rank |
| Estuary: Norwalk Western Long Island Sound Inner Segment: 13 Mid-Shore Segment: 7 Beaches: Bell Island Beach, Calf Pasture Beach, Hickory bluff Beach, Marvin Beach, Rowayton Beach, Shady Beach | Waterbody is not impaired or is unassessed for recreational or shellfishing uses | Threatened |

| Interim Priority List – Marine/Estuarine Segments Threatened by NPS Pollution | | |
|---|--|-------------|
| Waterbody Name and Drainage Basin # | Reasoning | Rank |
| Estuary 2: Greenwich/Stamford Western Long Island Sound Inner Segments: 17-20 Mid-Shore Segment: 14 Beaches: Byram Beach, Great Captain’s Island Beach, Greenwich Point Beach, Island Beach, Cummings Beach, East (Cove Island) Beach, Quigley Beach, West Beach, | Waterbody is not impaired or is unassessed for recreational or shellfishing uses | Threatened |
| Estuary: Darien Western Long Island Sound Beaches: Pear Tree Point Beach, Weed Beach | Waterbody is not impaired or is unassessed for recreational or shellfishing uses | Threatened |
| Estuary: Westport/Fairfield Western Long Island Sound Inner Segment: 11 Beaches: Jennings Beach, Penfield Beach, Sasco Beach, South Pine Creek Beach, Southport Beach, Burying Hill Beach, Compo Beach, Sherwood Island State Park Beach | Waterbody is not impaired or is unassessed for recreational or shellfishing uses | Threatened |
| Estuary: Milford Central Long Island Sound Inner Segments: 20-21 Shoreline Segments: 20-22 Mid-Shore Segment: 18 Beaches: Walnut Beach, Gulf Beach, Anchor Beach (Merwin Point #1), Anchor Beach (Merwin Point #2), Woodmont Beach, Silver Sands State | Waterbody is not impaired or is unassessed for recreational or shellfishing uses | Threatened |

| Interim Priority List – Marine/Estuarine Segments Threatened by NPS Pollution | | |
|---|--|-------------|
| Waterbody Name and Drainage Basin # | Reasoning | Rank |
| Estuary: New Haven/West Haven Western Long Island Sound Shoreline Segments: 17, 19 Mid-Shore Segments: 14-15 Beaches: Fort Hale Beach, Lighthouse Point Beach, South Street Beach, Seaview Beach, Dawson Beach, Sea Bluff Beach, Rock Street Beach, Oak Street A Beach, Oak Street B Beach, Altschuler Beach, Morse Beach | Waterbody is not impaired or is unassessed for recreational or shellfishing uses | Threatened |
| Estuary: Bridgeport Western Long Island Sound | Waterbody is not impaired or is unassessed for recreational or shellfishing uses | Threatened |
| Estuary: Branford / East Haven Central Long Island Sound Shoreline Segments: 14-16 Mid-Shore Segments: 8, 12-13 Beaches: Branford Point Beach, Clark Avenue, Beach, Stony Creek Beach, East Haven Town Beach | Waterbody is not impaired or is unassessed for recreational or shellfishing uses | Threatened |
| Estuary: Guilford/Madison Central Long Island Sound Inner Segment: 8 Mid-Shore Segments: 5, 7 Beaches: Jacobs Beach (Town Beach), West Wharf Beach, East Wharf Beach, Pent Road Beach, Hammonasset Beach State Park Beach | Waterbody is not impaired or is unassessed for recreational or shellfishing uses | Threatened |
| Estuary: Clinton Central Long Island Sound Inner Segment: 2 Beaches: Town Beach | Waterbody is not impaired or is unassessed for recreational or shellfishing uses | Threatened |

| Interim Priority List – Marine/Estuarine Segments Threatened by NPS Pollution | | |
|---|--|-------------|
| Waterbody Name and Drainage Basin # | Reasoning | Rank |
| Estuary: New London/Groton Eastern Long Island Sound Inner Segment: 8 Shoreline Segments: 9-10 Beaches: Eastern Point Beach, Esker Point Beach, Noank Dock Beaches: Ocean Beach Park, Green Harbor Beach | Waterbody is not impaired or is unassessed for recreational or shellfishing uses | Threatened |
| Estuary: Stonington Eastern Long Island Sound Inner Segments: 4, 7 Mid-Shore Segment: 2 Beaches: Dubois Beach | Waterbody is not impaired or is unassessed for recreational or shellfishing uses | Threatened |
| Estuary: East Lyme / Waterford Central Long Island Sound Inner Segments: 13, 18 Shoreline Segments: 11 Mid-Shore Segment: 5 Beaches: Rocky Neck State Park Beach, McCook Point Beach, Hole-In-the-Wall Beach, Pleasure Beach, Waterford Town Beach | Waterbody is not impaired or is unassessed for recreational or shellfishing uses | Threatened |
| Estuary: Old Saybrook / Old Lyme Eastern Long Island Sound Inner Segments: 13, 25, 28-29 Shoreline Segments: 19 Mid-Shore Segment: 9 Beaches Harvey's Beach, Town Beach (Old Saybrook), White Sands Beach, Soundview Beach | Waterbody is not impaired or is unassessed for recreational or shellfishing uses | Threatened |
| Estuary: North Stonington Western Long Island Sound Inner Segment: 13 | Waterbody is not impaired or is unassessed for recreational or shellfishing uses | Threatened |
| Estuary: Stratford Beaches: Park Beach, Long Beach, Long Beach (Marnick's), Short Beach | Waterbody is not impaired or is unassessed for recreational or shellfishing uses | Threatened |

| Interim Priority List – Marine/Estuarine Segments Threatened by NPS Pollution | | |
|---|--|-------------|
| Waterbody Name and Drainage Basin # | Reasoning | Rank |
| Estuary: Westbrook Beaches: Westbrook Town Beach, West Beach, Middle Beach, Stannard Beach | Waterbody is not impaired or is unassessed for recreational or shellfishing uses | Threatened |

Appendix D

Developed Area Runoff BMP Selection Matrix

The Connecticut DEEP NPS Program is developing a Developed Area Runoff BMP Selection Matrix. The latest iteration can be found at:

http://www.ct.gov/deep/lib/deep/water/nps/planupdate/ct_nps_bmp_selection_matrix.pdf

Appendix D
Developed Area Runoff
BMP Selection Matrix

| BMP Category | BMP Description | Type of BMP | Nature of Structural BMP | | Pollutants Addressed | | | | | | O&M Needs | Cost of Implementation | Applicability | | | | Reference |
|-------------------------------|--|----------------|--------------------------|-----------|---|----------|------------|----------|--------|-----------|-----------|--|---------------|----------------------|-------------|-----------------------|-----------|
| | | | Permanent | Temporary | Sediment | Nitrogen | Phosphorus | Bacteria | Metals | Petroleum | | | Redevelopment | Groundwater Recharge | Small Sites | Requires Pretreatment | |
| Pretreatment | Vegetated Filter Strips | Structural | X | | X | | | | | | | \$50 - 100 per linear foot | X | | | | a |
| Pretreatment | Hydrodynamic Separators- Vortex | Structural | X | | X | | | | X | X | | \$8,000 to \$15,000 per device | X | | X | | a |
| Pretreatment | Enhanced Hydrodynamic Separator | Structural | X | | X | | | | X | X | | Varies | X | | X | | - |
| Pretreatment | Baffle Box | Structural | X | | X | | | | | | | \$20,000 to \$30,000 per device | X | | | | a |
| Pretreatment | Catch basin filter | Structural | | X | X | | | | | X | | \$35 to \$100 per device | | | | | Multiple |
| Pretreatment | Compost filter sock | Structural | | X | X | X | X | X | X | X | | \$1 to \$5 per linear foot | | | | | Multiple |
| Pretreatment | Sediment forebay | Structural | X | | X | | | | | | | \$2 to \$10 per square foot | | | | | Multiple |
| Treatment (with infiltration) | Bioretention cell/ Rain Garden | Structural | X | | X | X | X | X | X | X | | \$5 to \$30 per square foot | X | X | | X | a |
| Treatment (with infiltration) | Planter box | Structural | X | | X | X | X | X | X | X | | \$24- \$32 per square foot | X | | X | X | a |
| Treatment (with infiltration) | Tree box filter | Structural | X | | X | X | X | X | X | X | | \$10,000 - \$18,000 per device | X | | X | | a |
| Treatment (with infiltration) | Roadway median retrofit | Structural | X | | X | | | | X | X | | Varies | X | | X | | Multiple |
| Treatment (with infiltration) | Subsurface engineered infiltration system | Structural | X | | X | | | | | | | Varies | X | X | | X | a |
| Treatment (with infiltration) | Woodland buffer | Structural | X | | X | X | X | X | X | X | | \$108 per acre (\$2.16 to \$2.57 per pound total N removed) | | | | | c |
| Treatment (with infiltration) | Grass buffer | Structural | X | | X | X | X | X | X | X | | \$17 per acre (\$0.61 per pound total N removed) | | | | | c |
| Treatment (with infiltration) | Soil Amendments | Structural | X | | | | X | | | | | \$135,000 - \$400,000 capital plus \$6,500 to \$25,000 per year in O&M | X | | | | d |
| Treatment (with infiltration) | Constructed wetland | Structural | X | | X | X | X | X | X | X | | \$50,000 - \$250,000 | | | | X | a |
| Treatment (with infiltration) | Subsurface gravel wetland | Structural | X | | X | | X | | | | | \$4 to \$5 per square foot; \$22,300 per acre of impervious surface treated | X | | | X | e |
| Treatment (with infiltration) | Sand or multi-media filter | Structural | X | | X | X | X | X | X | X | | \$10,000 to \$50,000 per impervious acre | X | | | X | a |
| Treatment (with infiltration) | Vegetated roof | Structural | X | | | | | | | | | \$20 to \$30 per square foot | X | | | | a |
| Treatment (with infiltration) | Private Property Retrofits | Structural | X | | Retrofit varies by site - focus on private parcels in high-load areas | | | | | | Varies | Varies | | | Varies | Multiple | |
| Treatment (with infiltration) | Water Quality Swale | Structural | X | | X | X | X | | X | | | \$0.50 per square foot; \$10 per linear foot | X | X | X | X | Multiple |
| Treatment (with infiltration) | Tree planting program | Non-Structural | | | X | X | X | | | | | \$108 per acre (\$8 to \$11 per pound total N removed) | X | | | | c |
| Infiltration | Roofline drip edge | Structural | X | | X | | | | | | | \$5 per cubic foot of stormwater infiltrated; \$13.00 per linear foot | | X | | | Multiple |
| Infiltration | Permeable pavement | Structural | X | | X | X | X | X | X | X | | \$8 to \$15 per square foot | X | X | | | a |
| Infiltration | Roof downspout redirection/disconnection | Structural | X | | N/A | | | | | | L | Varies | | X | | Multiple | |
| Infiltration | Dry well/ infiltration basin | Structural | X | | X | X | X | X | X | X | | \$500 to \$1,000 each | X | X | X | | a, d |
| Infiltration | Gravel trench | Structural | X | | X | X | X | X | X | X | | \$50 to \$80 per linear foot | X | X | | X | a |
| Conveyance | Vegetated Conveyance Swale | Structural | X | | X | X | | | X | X | | \$4.90 to \$50 per linear foot | X | | | X | a |
| Runoff Reduction | Residential Rain Barrels | Non-Structural | | | N/A | | | | | | | \$1 to \$4 per gallon | X | | X | | a |
| Runoff Reduction | Retention (Wet) Basin | Structural | X | | X | X | X | | | | | \$2 to \$10 per square foot | | | | | Multiple |
| Runoff Reduction | Minimize new impervious surface | Non-Structural | | | X | X | X | | | | | None | X | | X | | - |
| Runoff Reduction | Redirect existing impervious surface | Structural | X | | X | X | X | | | | | Varies | X | | X | | a |
| Pollution Prevention | Septic System Inspection Program | Non-Structural | | | | X | X | X | | | | \$400 to \$1,500 per system | X | | | X | Multiple |
| Pollution Prevention | Detergent phosphate prohibition | Non-Structural | | | | | X | | | | | Varies | | | | X | Multiple |
| Pollution Prevention | Pet waste information/ outreach | Non-Structural | | | | X | X | X | | | | \$2,500 to \$10,000 per year | | | | X | Multiple |
| Pollution Prevention | Pet waste disposal stations | Non-Structural | | | | X | X | X | | | | \$100 to \$500 per station | X | | | X | Multiple |
| Pollution Prevention | Waterfowl congregation area management | Non-Structural | | | | X | X | X | | | | Varies | X | | X | | - |
| Pollution Prevention | Manure management program | Non-Structural | | | | X | X | X | | | | \$8,186 per acre or 145 animals (\$3.84 per pound of total N removed) | X | | | | c |
| Pollution Prevention | Livestock exclusion fencing | Non-Structural | | | X | X | X | X | | | | \$95 per pound of total P removed | X | | | | c |
| Pollution Prevention | Retirement of cropland or pasture | Non-Structural | | | X | X | X | | | | | \$17 per acre (\$1.80 per pound total N removed) | X | | | | c |
| Pollution Prevention | Wetland Restoration | Non-Structural | | | X | X | X | | | | | \$108 per acre (\$2.16 per pound total N removed) | X | X | | X | c |
| Pollution Prevention | Sealcoating alternatives | Non-Structural | | | | | | | X | X | | Cost increase over traditional materials: \$1 to 2 per square yard of surface treated. | X | | | X | |
| Pollution Prevention | Soil testing and fertilizer selection outreach | Non-Structural | | | | X | X | | | | | \$2,500 to \$10,000 per year | X | | X | | Multiple |

a- "Stormwater Best Management Practices: Guidance Document". Boston Water and Sewer Commission, 980 Harrison Avenue, Boston, MA 02119. January 2013

b- "2013 Clean Water Act Section 319 Nonpoint Source Pollution Management Program Annual Report and 2013 Progress Report on the 'Chesapeake Bay and Virginia Waters Cleanup Plan', July 1, 2012 – June 30, 2013, and "Supplement: TMDL Watershed Implementation Progress Summary", February 2014. Commonwealth of Virginia

c- "Pennsylvania Nonpoint Source BMP Effectiveness, Cost-Effectiveness and Potential for Reducing Loads". Jeff Sweeney, University of Maryland. PA Chesapeake Bay Advisory Committee Meeting. Harrisburg, PA. June 3, 2004

d- USEPA NPDES Stormwater "Menu of BMPs" Fact Sheets

e- "Low Impact Best Management Practice (BMP) Information Sheet: Constructed Stormwater Subsurface Gravel Wetland"; Charles River Watershed Association; January 2009

Appendix E

Connecticut Nonpoint Source Management Program Funding Sources

| Connecticut Nonpoint Source Management Program – Potential Funding Sources | | |
|--|--|---|
| Funding Source | Description | Reference |
| EPA Urban Waters Small Grants Program | Funds research, investigations, experiments, training, surveys, studies, and demonstrations that will advance the restoration of urban waters by improving water quality through activities that also support community revitalization and other local priorities. Projects proposed for funding must take place entirely within and focus on specific Eligible Geographic Areas. | http://www2.epa.gov/urbanwaters/urban-waters-small-grants |
| EPA Healthy Waters | | http://water.epa.gov/polwaste/nps/watershed/hwi_action.cfm |
| EPA Healthy Communities Grant Program | EPA New England's main competitive grant program to work directly with communities to reduce environmental risks to protect and improve human health and the quality of life. | http://www.epa.gov/region1/eco/uep/hcgp.html |
| EPA Environmental Education Grants | The Grants Program sponsored by EPA's Office of Environmental Education (OEE), Office of External Affairs and Environmental Education, supports environmental education projects that enhance the public's awareness, knowledge, and skills to help people make informed decisions that affect environmental quality. | http://www.epa.gov/enviroed/grants.html |
| EPA Five Star Restoration Grant Program | The Five Star Restoration Program brings together students, conservation corps, other youth groups, citizen groups, corporations, landowners and government agencies to provide environmental education and training through projects that restore wetlands and streams. The program provides challenge grants, technical support and opportunities for information exchange to enable community-based restoration projects. | http://www.epa.gov/owow/wetlands/restore/5star/ |
| United States Fish and Wildlife Service (USFWS) | The USFWS administers a variety of natural resource assistance grants to governmental, public and private organizations, groups and individuals. | http://www.fws.gov/grants/ |

| Connecticut Nonpoint Source Management Program – Potential Funding Sources | | |
|---|--|---|
| Funding Source | Description | Reference |
| USFWS North American Wetlands Conservation Act (NAWCA) | NAWCA provides matching grants to organizations and individuals who have developed partnerships to carry out wetlands conservation projects in the United States, Canada, and Mexico for the benefit of wetlands-associated migratory birds and other wildlife. | http://www.fws.gov/birdhabitat/Grants/NAWCA/index.shtm |
| USFWS Partners for Fish and Wildlife Program | The Partners Program provides technical and financial assistance to private landowners and Tribes who are willing to work with USFWS and other partners on a voluntary basis to help meet the habitat needs of Federal Trust Species. The Partners Program can assist with projects in all habitat types which conserve or restore native vegetation, hydrology, and soils associated with imperiled ecosystems such as longleaf pine, bottomland hardwoods, tropical forests, native prairies, marshes, rivers and streams, or otherwise provide an important habitat requisite for a rare, declining or protected species. | http://www.fws.gov/partners/ |
| USFWS National Coastal Wetlands Conservation Grant Program | The NCWCGP provides States with financial assistance to protect and restore these valuable resources. Projects can include (1) acquisition of a real property interest (e.g., conservation easement or fee title) in coastal lands or waters (coastal wetlands ecosystems) from willing sellers or partners for long-term conservation or (2) restoration, enhancement, or management of coastal wetlands ecosystems. All projects must ensure long-term conservation. | http://www.fws.gov/coastal/coastalgrants/ |
| USFS Watershed and Clean Water Action and Forestry Innovation Grants | This effort between USDA FS-Northeastern Area and State Foresters is to implement a challenge grant program to promote watershed health through support of state and local restoration and protection efforts. | http://www.na.fs.fed.us/watershed/gp_innovation.shtm |
| NRCS Conservation Stewardship Program | This program is available to producers to address resource concerns in a comprehensive manner by improving existing conservation activities and undertaking new conservation activities. | http://www.nrcs.usda.gov/programs/csp/ |

| Connecticut Nonpoint Source Management Program – Potential Funding Sources | | |
|--|--|---|
| Funding Source | Description | Reference |
| NRCS Conservation Reserve Program | This program is to provide technical and financial assistance to eligible farmers to address soil, water, and related natural resource concerns on their lands in an environmentally-beneficial and cost-effective manner. | http://www.nrcs.usda.gov/programs/crp/ |
| NRCS Floodplain Easement Program | NRCS is providing up to \$124.8 million in Emergency Watershed Protection Program-Floodplain Easement funding to help prevent damages from future storm events in Connecticut and other states affected by Hurricane Sandy. NRCS purchases the permanent easements on eligible lands and restores the area to natural conditions. The program complements traditional disaster recovery funding and allows NRCS to purchase a permanent easement on lands within floodplains that sustained damage from Sandy. | http://www.nrcs.usda.gov/wps/portal/nrcs/detail/ct/home/?cid=stelprdb1143958 |
| NRCS Wildlife Habitat Incentives Program (WHIP) | For creation, enhancement, maintenance of wildlife habitat; for privately owned lands. | http://www.nrcs.usda.gov/programs/whip/ |
| NRCS Environmental Quality Incentives Program (EQIP) | For implementation of conservation measures on agricultural lands. | http://www.ct.nrcs.usda.gov/programs/eqip/eqip.html |
| NRCS Healthy Forests Reserve Program | For restoring and enhancing forest ecosystems | http://www.nrcs.usda.gov/programs/hfrp/prgoinfo/index.html |
| NRCS Wetlands Reserve Program | For protection, restoration and enhancement of wetlands | http://www.nrcs.usda.gov/programs/wrp/ |
| EPA Section 319 Grant Program | CT DEEP administers a grant program with EPA Clean Water Act Section 319 funds to effectively and efficiently address nonpoint source pollution are available to municipalities, nonprofit environmental organizations, regional water authorities/planning agencies, and watershed associations. | http://www.ct.gov/deep/cwp/view.asp?a=2719&q=325594&deepNav_GID=1654 |

| Connecticut Nonpoint Source Management Program – Potential Funding Sources | | |
|--|---|---|
| Funding Source | Description | Reference |
| EPA Section 604(b) Program | Under the federal Clean Water Act, EPA Section 604(b) funds are awarded to CT DEEP to carry out water quality management planning including revising water quality standards; performing waste load allocation/total maximum daily loads, point and non-point source planning activities, water quality assessments and watershed restoration plans. | http://www.ct.gov/deep/cwp/view.asp?a=2688&Q=458026&depNav_GID=1511 |
| CT DEEP Connecticut Clean Water Fund | The Connecticut Clean Water Fund (CWF) is the state's environmental infrastructure assistance program. The fund was established in 1986 to provide financial assistance to municipalities for planning, design and construction of wastewater collection and treatment projects. This program was developed to replace state and federal grant programs that had existed since the 1950s. The 1987 amendments to the Federal Clean Water Act required that states establish a revolving loan program by 1989. The fund was modified in 1996 to include the Drinking Water State Revolving Fund (DWSRF) to assist water companies in complying with the Safe Drinking Water Act by providing low cost financing. | http://www.ct.gov/deep/cwp/view.asp?a=2719&q=325578&depnave_gid=1654 |
| Connecticut Lakes Grant Program | Provides matching grants for lake restoration projects to municipalities, lake authorities, and lake taxing districts at lakes that are available to the general public for recreation. Funds for the Lakes Grant Program are made available through authorizations of the State Legislature and allocated by the State Bond Commission. The Lakes Grant Program requires a 25% match for studies and a 50% match for implementation of control measures. When funding is available for the Lakes Grant Program, notification is provided to every municipality in Connecticut and to groups who have previously inquired about funding for lake management projects. | http://www.ct.gov/deep/cwp/view.asp?a=2719&q=332726&depnave_gid=1654 |

| Connecticut Nonpoint Source Management Program – Potential Funding Sources | | |
|--|--|---|
| Funding Source | Description | Reference |
| Long Island Sound Study - Long Island Sound Research Grant Program | To support research that will enhance scientific understanding of Long Island Sound, and provide information needed by managers to protect and effectively manage the Sound and its valuable resources. Available to Connecticut academic institutions. | http://longislandsoundstudy.net/research-monitoring/lis-research-grant-program/ |
| CT DEEP Hazard Mitigation Grant Program | Provides financial assistance to state and local governments for projects that reduce or eliminate the long-term risk to human life and property from the effects from natural hazards. | http://www.ct.gov/dep/cwp/view.asp?a=2720&q=325654&depNav_GID=1654 |
| CT DEEP Landowner Incentive Program | The Wildlife Division’s Landowner Incentive Program (LIP) provides technical advice and cost assistance to private landowners for habitat management that will result in the protection, restoration, reclamation, enhancement, and maintenance of habitats that support fish, wildlife, and plant species considered at-risk. This program has been made possible through grants from the U.S. Fish and Wildlife Service. | http://www.ct.gov/dep/cwp/view.asp?a=2723&q=325734&depNav_GID=1655 |
| CT DEEP Long Island Sound License Plate Program | Section 14-21e of the Connecticut General Statutes (CGS) authorizes the issuance of the Long Island Sound license plate by the Department of Motor Vehicles, while CGS Section 22a-27k establishes the Long Island Sound Fund to be administered by the Department of Energy and Environmental Protection into which proceeds from the sale of the plates are deposited. Funds are distributed to schools, municipalities, environmental groups, and other non-profit organizations which apply for grants for projects to benefit Long Island Sound | http://www.ct.gov/dep/cwp/view.asp?a=2705&q=323782&depNav_GID=1635 |
| CT DEEP Open Space and Watershed Land Acquisition | The Open Space and Watershed Land Acquisition (OSWA) Grant Program provides financial assistance to municipalities and nonprofit land conservation organizations to acquire land for open space and to water companies to acquire land to be classified as Class I or Class II water supply property. | http://www.ct.gov/dep/cwp/view.asp?a=2706&q=323834&depNav_GID=1641 |

| Connecticut Nonpoint Source Management Program – Potential Funding Sources | | |
|---|--|---|
| Funding Source | Description | Reference |
| CT DEEP Recreation and Natural Heritage Trust Program | The Recreation and Natural Heritage Trust program was created by the Legislature in 1986 in order to help preserve Connecticut’s natural heritage. It is the CT DEEP’s primary program for acquiring land to expand the state’s system of parks, forests, wildlife, and other natural open spaces. | http://www.ct.gov/dep/cwp/view.asp?a=2706&q=323840&depNav_GID=1641 |
| CT DEEP Urban Forestry Grant Programs | America the Beautiful Urban Forestry Grants: Grants of up to \$12,000 are available to assist municipalities and non-profits in local urban forestry efforts. Urban Forestry Outreach Grant: Grants for non-profit organizations in urbanized areas to foster outreach in these areas. | http://www.ct.gov/dep/cwp/view.asp?a=2697&q=322872&depNav_GID=1631&depNav= |
| American Rivers – NOAA Community-Based Restoration Program Partnership | These grants are designed to provide support for local communities that are utilizing dam removal or fish passage to restore and protect the ecological integrity of their rivers and improve freshwater habitats important to migratory fish. | http://www.americanrivers.org/initiative/grants/projects/american-rivers-and-noaa-community-based-restoration-program-river-grants-2/ |
| FishAmerica Foundation Conservation Grants | FishAmerica, in partnership with the NOAA Restoration Center, awards grants to local communities and government agencies to restore habitat for marine and anadromous fish species. Successful proposals have community-based restoration efforts with outreach to the local communities. | http://www.fishamerica.org/grants.html |

| Connecticut Nonpoint Source Management Program – Potential Funding Sources | | |
|--|---|---|
| Funding Source | Description | Reference |
| NFWF Five Star and Urban Waters Restoration Grant Program | The Five Star and Urban Waters Restoration Program seeks to develop nation-wide-community stewardship of local natural resources, preserving these resources for future generations and enhancing habitat for local wildlife. Projects seek to address water quality issues in priority watersheds, such as erosion due to unstable streambanks, pollution from stormwater runoff, and degraded shorelines caused by development. The program focuses on the stewardship and restoration of coastal, wetland and riparian ecosystems across the country. | http://www.nfwf.org/fivestar/Pages/home.aspx |
| NFWF Long Island Sound Futures Fund | The Long Island Sound Futures Fund supports projects in local communities that aim to protect and restore the Long Island Sound. It unites federal and state agencies, foundations and corporations to achieve high-priority conservation objectives. Funded activities demonstrate a real, on-the-ground commitment to securing a healthy future for the Long Island Sound. | http://longislandsoundstudy.net/about/grants/lis-futures-fund/ |
| Corporate Wetlands Restoration Partnership (CWRP) | Coastal America is an action-oriented, results-driven process aimed at restoring and preserving vital coastal ecosystems and addressing our most critical environmental issues. The Coastal America Partnership was launched in 1991 and formalized in 1992 with a Memorandum of Understanding signed by nine sub-cabinet level agency representatives. These representatives committed their agencies to work together and integrate their efforts with state, local and nongovernmental activities. The Coastal America Partnership utilizes a number of tools and programs to facilitate its mission. These include the Corporate Wetlands Restoration Partnership (CWRP) and the network of Coastal Ecosystem Learning Centers (CELCs), and the Coastal America Partnership Awards program. | http://www.ctcwrp.org/9/ |

| Connecticut Nonpoint Source Management Program – Potential Funding Sources | | |
|--|---|---|
| Funding Source | Description | Reference |
| Trout Unlimited Embrace A Stream | Embrace-A-Stream (EAS) is a matching grant program administered by TU that awards funds to TU chapters and councils for coldwater fisheries conservation. | http://www.tu.org/conservation/watershed-restoration-home-rivers-initiative/embrace-a-stream |

Grant Search Resources

Please also see the following grant search resources for assistance in finding additional state, federal, local, and private sources of funding related to nonpoint source pollution management:

- Grants.gov
<http://grants.gov/>
- Catalog of Federal Domestic Assistance
<https://www.cfda.gov/>
- CT DEEP Watershed and Stormwater Funding Website
http://www.ct.gov/dep/cwp/view.asp?a=2719&q=335494&depNav_GID=1654&pp=12&n=1
- EPA Catalog of Federal Funding Sources for Watershed Protection
www.epa.gov/watershedfunding
- EPA Watershed Funding
<http://water.epa.gov/aboutow/owow/funding.cfm>
- EPA Green Infrastructure Funding Website
<http://cfpub.epa.gov/npdes/greeninfrastructure/fundingopportunities.cfm>
- Foundation Center: Philanthropy News Digest
http://foundationcenter.org/pnd/rfp/cat_environment.jhtml
- USDA National Agriculture Library: Water Quality Information Center
http://wqic.nal.usda.gov/nal_display/index.php?info_center=7&tax_level=2&tax_subject=589&level3_id=0&level4_id=0&level5_id=0&topic_id=2342&&placement_default=0