Connecticut Nonpoint Source Management Program Plan

September 2019

Connecticut Department of
ENERGY &
ENVIRONMENTAL
PROTECTION

Connecticut Department of Energy and Environmental Protection

79 Elm Street
Hartford, CT 06106-5127

Table of Contents

Tables

Figures

Figures

Appendices

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 or failed subsurface sewage disposal systems (SSDS)
- 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 or failed subsurface sewage disposal 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 2015 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.

Between 1985 and 2015, 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 155 square miles, representing 3.1 percent of the State's land area (**Figures 1-1 and 1-2**). In contrast, approximately 177 square miles of forested land (representing 3.5 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. (See UConn CLEAR website for details and data).

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 (CT 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 and support for aquatic life.

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.

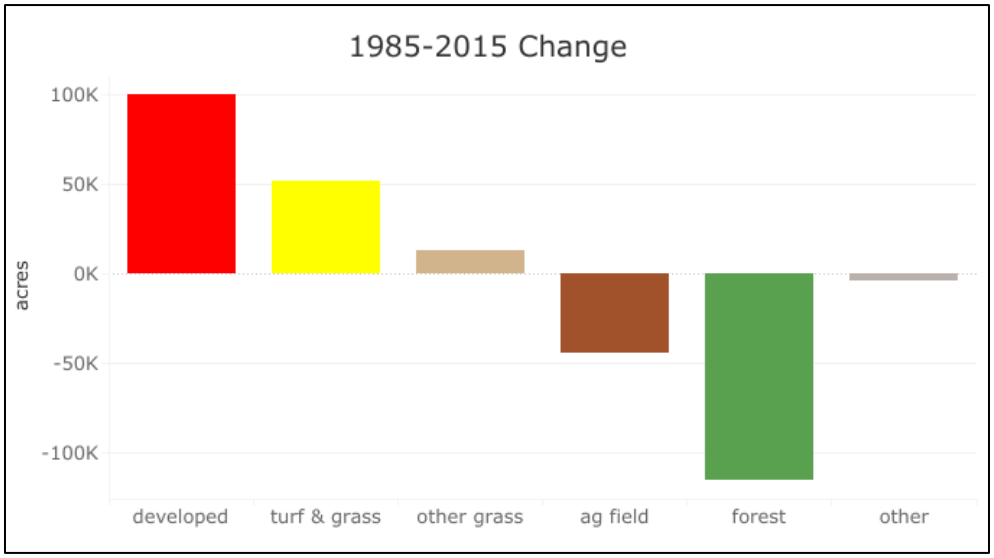


Figure 1-1. Statewide Change in Land Cover Between 1985 and 2015 (CLEAR, Connecticut's Changing Landscape, http://clear.uconn.edu/projects/landscape/index.htm).

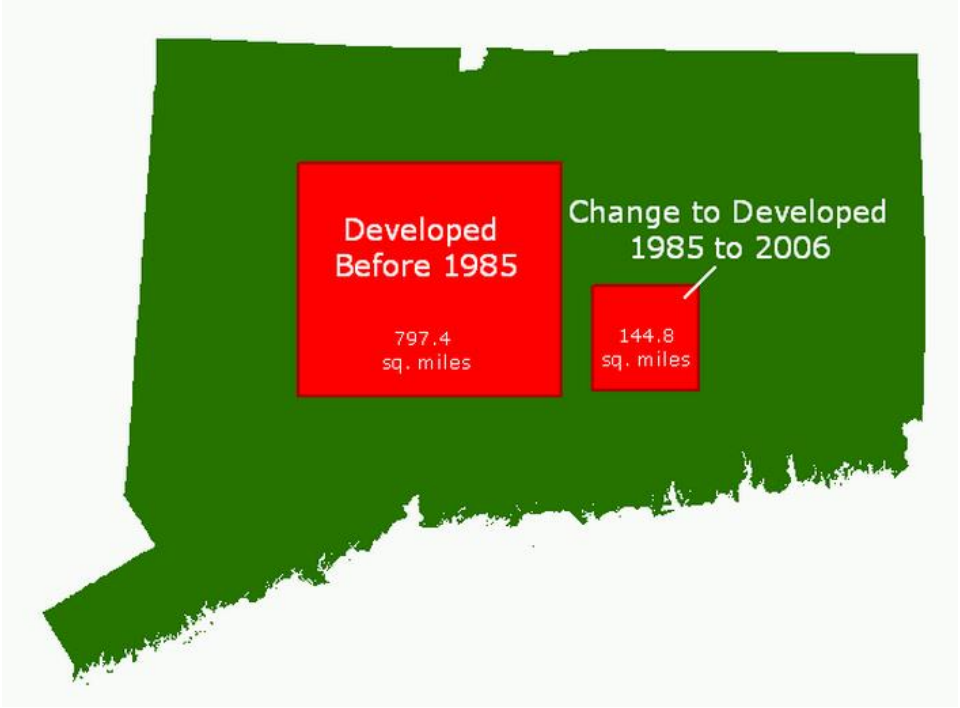


Figure 1-2. Statewide Change in Developed Land Cover Between 1985 and 2006.
If all of the developed land in Connecticut was clumped together in a square, it would cover the area shown. The smaller square represents all area that was changed to developed land cover between 1985 and 2006 (CLEAR, Connecticut's Changing Landscape, http://clear.uconn.edu/projects/landscape/index.htm). Note that another 10.5 square miles of land was converted to developed between 2008 and 2015.

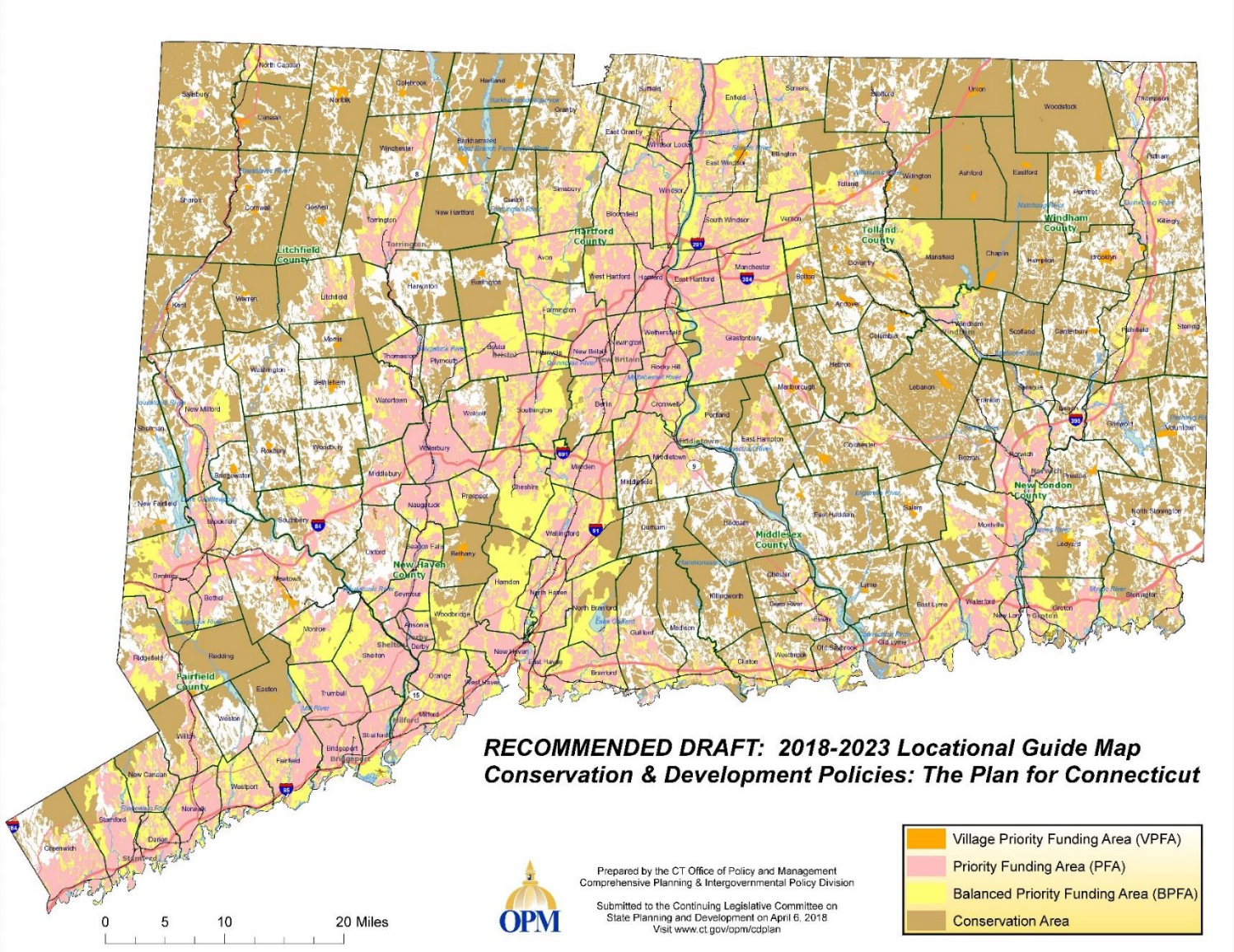


Figure 1-3. Conservation & Development Policies Plan for Connecticut Locational Guide Map
http://www.ct.gov/opm/lib/opm/igp/org/cdupdate/lgm_adopted.pdf

1.3 NPS Management Program Goals

CT 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 by restoring polluted waters and preserving healthy waters
- Inform the public and NPS partners about the causes and impacts of NPS pollution in Connecticut
- Implement long-term strategies for protecting and restoring water resources in Connecticut that are threatened or impaired by NPS pollution, to the extent possible.

The 2019 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 U.S. Environmental Protection Agency (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. The Plan was also updated in 2014.

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

The 2019 Connecticut Nonpoint Source Management Program Plan (Plan) updates the State's 2014 Plan and outlines Connecticut's approach to addressing NPS pollution for the next 5 years. The updated Plan is also consistent with EPA's recently revised guidelines for state NPS management programs which requires Plan updates every five years. (*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

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

This 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. This 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 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.

Table 1-1. How the Connecticut NPS Management 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

Table 1-1. How the Connecticut NPS Management Plan Addresses the EPA Key NPS Program Components	
EPA Key NPS Program Components	Connecticut NPS Management Program Plan
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

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.

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**). 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.

Figure 2-1. CT NPS Management Program

CT DEEP's Nonpoint Source and Watershed Section is part of the Water Planning and Management Division, within the Bureau of Water Protection and Land Reuse. The section interacts seamlessly with other Water Planning and Management sections: Water Quality, Monitoring, Water Quantity, Dam Safety, and Municipal Wastewater. 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 CT DEEP's Nonpoint Source program and Municipal Facilities assures efficient utilization and community involvement in application of Clean Water State Revolving Funds for Green Infrastructure projects in communities with Combined Sewer Overflows (CSOs). 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 Land and Water Resources, and Remediation. The Coastal Resources and Land and Water Planning Sections, within

the Land and Water Resources Division, interact 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. Land and 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 has 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 Compliance within the Office of Planning and Program Development. The P2 Section recently produced a video promoting Organic Land Care practices. The Agency's Green Team meets monthly to discuss collaborative Pollution Prevention activities for CT DEEP, other State agencies and statewide, and is working to streamline Agency public outreach activities.

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, Nonpoint Source Management, among other programs and activities.

CT DEEP's Water Quality Standards are comprised of three components:

1. Standards: The Water Quality Standards describe CT DEEP's general policies and goals necessary to protect or restore water quality. The Standards identify designated uses for surface and ground waters and set conditions necessary for their attainment. The Standards also describe acceptable types of discharges and activities consistent with CT DEEP's goals for each classification. The Standards also define the concept of a zone of influence for such discharges. Anti-degradation Standards include policies for protecting ground and surface water whose actual quality exceeds that quality associated with its classification.

2. Water Quality Criteria: The water quality criteria can be either narrative or numeric and describe conditions necessary to support designated uses.

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. In Connecticut, classifications are based on designated uses.

Water Quality Monitoring and Reporting

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 identification of waters for Action Plan development for water quality restoration or protection, 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, 2016) 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. The 2018 IWQR is expected to be finalized in early Fall 2019. As in the 2016 report, NPS pollution continues to significantly affect water quality in Connecticut.

In addition to updating the IWQR, CT DEEP allocates monitoring resources to directly measure the impacts of projects aimed at reducing NPS. For example, CT DEEP monitoring staff revisit impaired water bodies to determine if they can be removed from the impaired waters list following a restoration project. Decisions about which sites to revisit are made annually during the development of the monitoring workplan for the year. As part of the National Water Quality Initiative (NWQI) program (see Section 4.1.3), water quality monitoring is done to assess instream changes in pollution resulting from implementation of farm BMPs funded by the Natural Resource Conservation Service.

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	**Stormwater**, 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 between multiple pollutants, Low Dissolved Oxygen	Industrial discharges, municipal wastewater treatment discharges, hazardous waste sites, **oil and chemical spills, land use, Stormwater**
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, Stormwater**
Recreation	Bacteria, nutrients	**Stormwater**, illicit discharges, **agricultural runoff**
Shellfish Harvesting for Direct Consumption Where Authorized	Bacteria	**Stormwater**, illicit discharges, **agricultural runoff**
Commercial Shellfish Harvesting Where Authorized	Bacteria	**Stormwater**, illicit discharges, **agricultural runoff**

Source: CT DEEP, 2016

Total Maximum Daily Loads

A TMDL is a target pollutant level that must be met to restore or protect the quality of the water and meet designated uses. It is a "pollution budget" that identifies the amount of 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 or protect water quality. TMDLs therefore provide the framework for restoring impaired waters and protecting

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).

waters consistent with Antidegradation provisions in the Water Quality Standards. In Connecticut, TMDLs are implemented through various implementation programs such as National Pollutant Discharge Elimination System (NPDES) permits for point sources, Remedial Action Plans for remediation sites and watershed-based management plans for nonpoint sources.

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 outlined in a watershed based plan such as: reducing the use of fertilizers, herbicides, and pesticides; keeping SSDS's 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 elements 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 2019 319 Funds support two full time Environmental Analysts in the Watershed Unit, approximately one full time employee in the Water Quality 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 program, the Water Quality Program, and the Watershed Program.

Annual Request for Proposals

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. A selection committee made up of CT DEEP Water Planning and Management Division, Agricultural and Subsurface Disposal Program, and EPA reviews and ranks proposals according to RFP and grant criteria. 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 Planning and Management 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 staff consists of three Watershed Managers, and a program supervisor. 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

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.

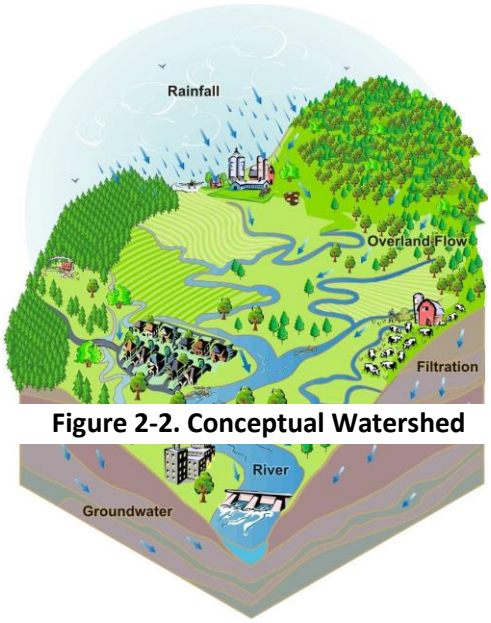


Figure 2-2. Conceptual Watershed

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.

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, 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 protect waters with good water quality or restore impaired waters with or without approved TMDLs or TMDL alternatives.

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, TMDLs or TMDL alternatives 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.

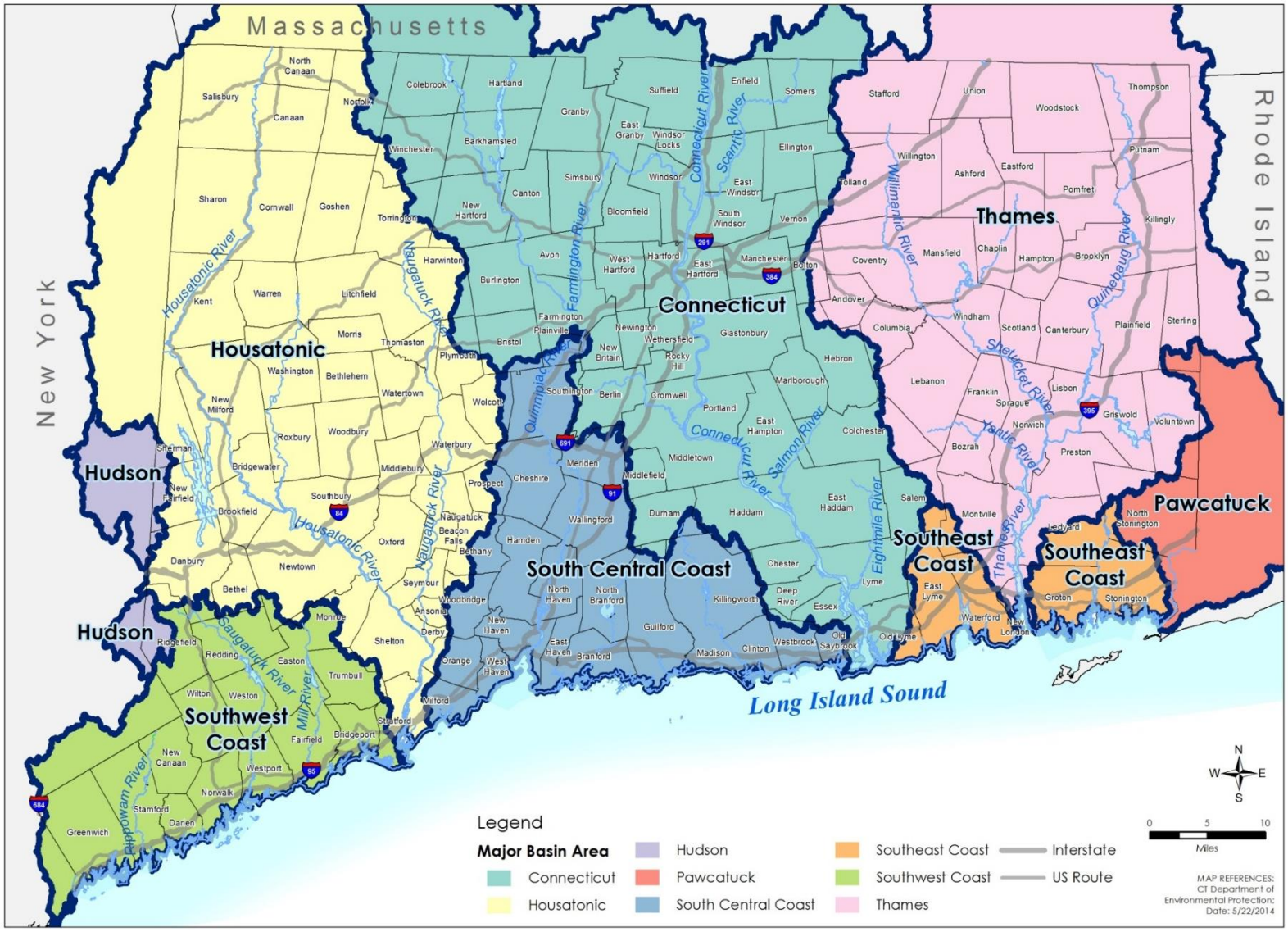


Figure 2-3. Connecticut's Major Watershed Basins

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.

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

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. Additionally, any nine-element watershed based plan that is designed to meet Water Quality Standards is also an acceptable TMDL alternative plan. 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. Further, a wastershed based plan can also be in conjunction with a TMDL or TMDL alternative plan for the restoration or protection of a waterbody.

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 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.

CT 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, 2016).

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, CT DEEP and municipalities that manage wastewater treatment plants throughout the state have been actively involved in the CT 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.

With the successes gained on overall Long Island Sound bottom water hypoxia trends, recent focus has been directed toward the most productive and fragile components of the LIS estuary, coastal embayments. Under Connecticut's "Second Generation Nitrogen Strategy", greater attention is being paid to nonpoint sources. The new strategy has three components: (1) continued nutrient reductions at wastewater treatment plants; (2) reducing in nitrogen loads from stormwater and other nonpoint sources statewide; and (3) reducing nitrogen loads to coastal embayments. One of the first steps to implement this strategy was an Onsite Wastewater Treatment System Study to determine the most efficient and effective means to reduce nitrogen inputs to embayments originating from onsite wastewater. The Long Island Sound Study provided funding for Phase 1 of this study. The second phase of the study, also funded by the Long Island Sound Study, will be completed in 2020 to further evaluate control measures recommended in Phase 1.

Some of the activities that CT DEEP staff involved with the Long Island Sound Study are involved with include: Technical coordination with EPA's Nitrogen Reduction Strategy, participation in an Interstate Nitrogen Coordination workgroup, Continue to work with EPA and Upstream states to reduce Nitrogen loads to CT (this is primarily point source), Nonpoint Source Tracking Tool development, and Offshore LIS Eutrophication Model project (this will include PS and NPS).

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.

Between 2012 and 2017, CT DEEP worked with EPA and stakeholders on a statewide phosphorus control strategy that included 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, were established to meet the PA 12-155 requirement that CT DEEP collaborate with municipalities to address the goals of the legislation. A final report with recommendations for a statewide strategy phosphorus strategy was produced in 2017. Some of the controls enacted under PA #12-154 include strict limits on phosphorus in fertilizers marketed for, and used, on lawns, and regulations limiting applications to minimize phosphorus runoff. CT DEEP has also provided significant state funding to municipalities to upgrade wastewater treatment plants to remove phosphorus. See: 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 are 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). In recent years, Connecticut has committed approximately $1.5 million dollars per year from its Clean Water State Revolving Funds for Green Infrastructure Project implementation in CSO communities. In coming years it's expected that up to $2 million dollars per year could be available for Green Infrastructure projects through Connecticut's Clean Water Fund Priority List. Projects will compete with other Clean Water Fund proposals.

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 SSDS's can cause localized water quality problems, releasing high levels of 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. The CNPCP does not have its own management plan, however, the programs that are part of it are listed at: https://www.ct.gov/deep/cwp/view.asp?a=2705&q=323554&deepNav_GID=1709.

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 Land & Water Resources Division (LWRD) (formerly known as Office of Long Island Sound Programs) is responsible for administering the CNPCP in conjunction with the Water Planning and Management Division in the Bureau of Water Protection and Land Reuse. LWRD 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 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 SSDS 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 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 was completed in 2015. More information can be found at http://longislandsoundstudy.net/.

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

The LISS has allocated funding to CT DEEP for several studies that will directly implement portions of this NPS Management Plan. For example, in 2021, projects will be completed to develop a NPS BMP Tracking Tool. The first phase of this project (a feasibility study) was completed in 2014. Similarly, funding will be provided to UConn to develop a decision support tool for municipalities to use to estimate nutrient load reductions that would result from land conservation and riparian buffer protection. LISS is also funding a multi-phase study of SSDS's and their potential impacts on water quality in coastal embayments (see previous section). Finally, $400,000 was allocated for a coastal dam removal in Merwin Meadows Park in Wilton CT.

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, industrial or CT DOT sites, is regulated by Stormwater General Permits, so it is 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 revised MS4 General Permit was issued by CT DEEP in July 2017 will expire in June 2022.

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

Approximately 40 percent of Connecticut's population – over 1 million people – relies on subsurface sewage disposal systems (SSDS) for wastewater treatment and disposal. These systems are primarily used in rural and suburban areas outside of areas served by sanitary sewers (see Figure 4-2), and generally serve individual homes, small residential communities, and commercial buildings. A typical septic system has the following main components: a pipe from the home, a septic tank, a septic tank effluent pipe and distribution box, a leaching system, and the receiving soil. Microbes in the soil form a bacterial layer underneath the leachfield known as a Biomat which digests or reduces most contaminants from wastewater before it intercepts ground water or other nearby sensitive receptors.

Common Causes of Septic System Malfunctions or Failures

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
- Unsuitable site conditions
- High loading rate or uneven effluent distribution
- Lack of a mature Biomat

Although SSDS's cause a disproportionately smaller percent of water quality impairments than their public sewer counterparts, inadequate or failed SSDS's represent a significant threat to human health, as well as 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 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 waterbodies through direct surface runoff or through seepage to ground water that discharges to surface water. Agriculture in Connecticut primarily consists of greenhouses, poultry and eggs, and dairy / milk production. Fruit farming, aquaculture, produce, tobacco, livestock, forestry and forest products, bees, Christmas trees, vineyards, maple syrup are also significant components. (Lopez et al., 2017).

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.

NPS Program Partners responsibilities for implementing actions of this plan as shown below:

Table 2-2 Connecticut Partners Leading Implementation

Program Element	Lead Implementing Organizations
NPS Program, Partnerships and Funding	CT DEEP, NRCS, LISS, and CSWC
Watershed Prioritization	CT DEEP
Runoff from Developed Areas and Roadways	UConn NEMO, CT DEEP, CT Department of Transportation (DOT), CSCW
Subsurface Sewage Disposal Systems	CT DEEP, CT Department of Public Health (DPH), Local Health Departments, Conservation Districts Agriculture: NRCS, CT DEEP, UConn Cooperative Extension, CSWC
Hydrologic and Habitat Modification	CT DEEP, LISS, National Oceanic and Atmospheric Administration (NOAA)
Boating and Marinas	CT Marine Trades Association, CT DEEP Boating Division
Other Sources	UConn Cooperative Extension, CT DEEP Materials Management and Compliance Assurance Bureau, CT DEEP Remediation Division, CT DEEP Forestry Division, CT DEEP Land Acquisition Program, CT DPH, CSWC

NPS Program Partners in Connecticut

Federal:
- U.S. Environmental Protection Agency
- U.S. Department of Agriculture
  - Natural Resources Conservation Service
- U.S. Army Corps of Engineers
- U.S. Department of Commerce
  - National Oceanic and Atmospheric Administration Fisheries,
  - Ocean and Coastal Resource Management
  - National Weather Service
- U.S. Department of Interior
  - U.S. Fish and Wildlife Service
  - U.S. Geological Survey
  - National Park Service
- Neighboring State and County Governments

State:
- CT Department of Energy & Environmental Protection
- CT Department of Public Health
- CT Department of Transportation
- CT Department of Agriculture/Aquaculture
- CT Office of Policy and Management
- CT Department of Economic and Community Development
- CT Department of Emergency Services and E Public Protection
- CT Department of Administrative Services
- University of Connecticut NEMO, CLEAR, CIRCA, Sea Grant
- CT Council on Soil and Water Conservation

Local/Regional:
- Municipalities
- Regional Councils of Governments
- Conservation Districts
- Water Utilities & Water Pollution Control Authorities
- Local Health Districts
- CT Conference of Municipalities
- CT Council of Small Towns

Other:
- Native American Tribes
- Private Colleges and Universities
- Watershed Organizations
- Advocacy Groups and other NGOs
- Land Trusts
- Industry Organizations
- News Media Organizations

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

The 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 2-3 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 2-3. NPS Program, Partnerships, and Funding – Five-Year Objectives, Actions, and Milestones							
Objectives	**Actions**	**Milestones**	**Schedule**				
			2020	**2021**	**2022**	**2023**	**2024**
1. <u>Program Administration</u>: Continue to manage and implement the NPS Program to meet program goals and work towards addressing priority NPS-related water quality issues.	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). 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. *Lead Agency: CT DEEP*	Satisfactory Progress Determination achieved for Connecticut's program annually (see Section 5 for a list of tasks associated with this determination)	X	X	X	X	X

Table 2-3. NPS Program, Partnerships, and Funding – Five-Year Objectives, Actions, and Milestones							
Objectives	**Actions**	**Milestones**	**Schedule**				
			2020	**2021**	**2022**	**2023**	**2024**
2. <u>Partnerships</u>: Build and strengthen partnerships of the lead agencies to coordinate efforts and effectively implement the CT NPS Management Program Plan.	1. Strengthen partnerships with other organizations that fund NPS work in CT, particularly NRCS, LISS, and the Council on Soil and Water Conservation, through: a. Attending meetings b. Combining funds to complete larger projects. CT *Lead Agency: CT DEEP, NRCS, LISS, CSWC* *Partners: Rivers Alliance of Connecticut, Conservation Districts, CLEAR, Watershed organizations, COGs, DPH, , etc.*	Number of NPS projects initiated with joint funding from multiple NPS programs within the state	1	1	1	1	1
3. <u>Pollutant Reduction Tracking</u>: Development of a statewide NPS management tracking system to quantify NPS pollution reductions and credits.	1. Participate in LISS project to develop 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. Participate in LISS project to develop a decision support tool to estimate nutrient load reductions due to land conservation and riparian buffers *Lead Agency: CT DEEP* *Partner Agency: NEIWPCC, LISS, NRCS, CT Conservation Districts, Municipalities, UConn Cooperative Extension,*	Statewide NPS Tracking Tool completed Statewide Decision Support Tool completed		X		X	

Table 2-3. NPS Program, Partnerships, and Funding – Five-Year Objectives, Actions, and Milestones							
Objectives	**Actions**	**Milestones**	**Schedule**				
			2020	**2021**	**2022**	**2023**	**2024**
4. <u>Funding</u>: Make some State Clean Water Funds available for eligible green infrastructure and onsite waste treatment system projects by municipalities	1. Maintain reserves within the Clean Water Fund for green infrastructure and onsite waste treatment systems *Lead Agency: CT DEEP*	Reserves for GI and onsite systems budgeted in the CWF (See Sections 4.1.1 and 4.1.2 for milestones regarding use of the funds)	X	X	X	X	X
5. <u>Plan Update</u>: Update NPS Management Program Plan	1. Consult partner agencies and solicit public input to update the Connecticut NPS Management Program Plan for the next cycle. 2. Review and update NPS Management Program Plan. *Lead Agency: CT DEEP* *Partner Agencies: NPS Partners and the public*	NPS Management Program Plan for the next cycle (including milestones for 2025-2029) approved by October 1, 2024					X

3 Watershed Prioritization in Connecticut

3.1 Priority Watersheds in Connecticut

Prioritization is an important step in effective nonpoint source planning because it aids in the efficient allocation of limited resources by identifying and ranking watersheds based on their potential for successful restoration and protection efforts. The first step in this process is CT DEEP's water quality assessment which identifies healthy and impaired waters throughout the state. The results of the assessments are summarized in a comprehensive report, the Integrated Water Quality Report (https:/www.ct.gov/deep/iwqr), which is submitted for EPA approval every two years.

The Integrated Water Quality Report, while comprehensive, does not establish priority waters for restoration and protection. Consequently, a systematic approach for comparing and evaluating waters for focusing restoration and protection is necessary. CT DEEP produced a watershed priority list (**Appendix C**) using the Integrated Water Resources Management strategy (https:/www.ct.gov/deep/iwrm) to develop the prioritization process for restoration and protection plans. In general, the majority of priorities identified are focused on watershed restorations, but there are several protections plans that have been identified as well. The priority watersheds are also spread across Connecticut which ensures a commitment to a statewide approach to improving and maintaining water quality. The prioritization process included a public review and comment process both to identify general water quality priorities as well as identify specific waterbodies and watersheds for plan development. Through this process focus areas for water quality protection and restoration were identified which include protection of designated uses such as swimming, shellfishing and aquatic life use support, as well as addressing water quality impacts from nutrients and stormwater and also addressing water quality within Connecticut's coastal embayments. These general priorities were then used to identify specific water bodies for plan development. While it is CT DEEP's ultimate goal to restore all impaired waters to their designated uses, a combination of ecological, stressor, and social characteristics influence the successfulness of restoration and protection efforts.

From this watershed priority list, CT DEEP is working to establish the priorities for developing Watershed Based Plans for restoration and protection. Resources are directed to the prioritized watersheds to establish plans, support implementation actions, and collaborate with stakeholders. Establishing priorities and focusing resources is more efficient to achieve the water quality goals of restoring waters and protecting waters from impairments.

The Integrated Water Resources Management strategy is a process that will be reviewed when needed to update priority watersheds in the future. In 2019, CT DEEP scheduled a public meeting in September to discuss with the public progress on addressing previous identified priorities and solicit public feedback on the priorities in general and the waterbodies identified for plan development. The following map displays CT DEEP's selected waterbodies for prioritization which will be updated as more information becomes available:

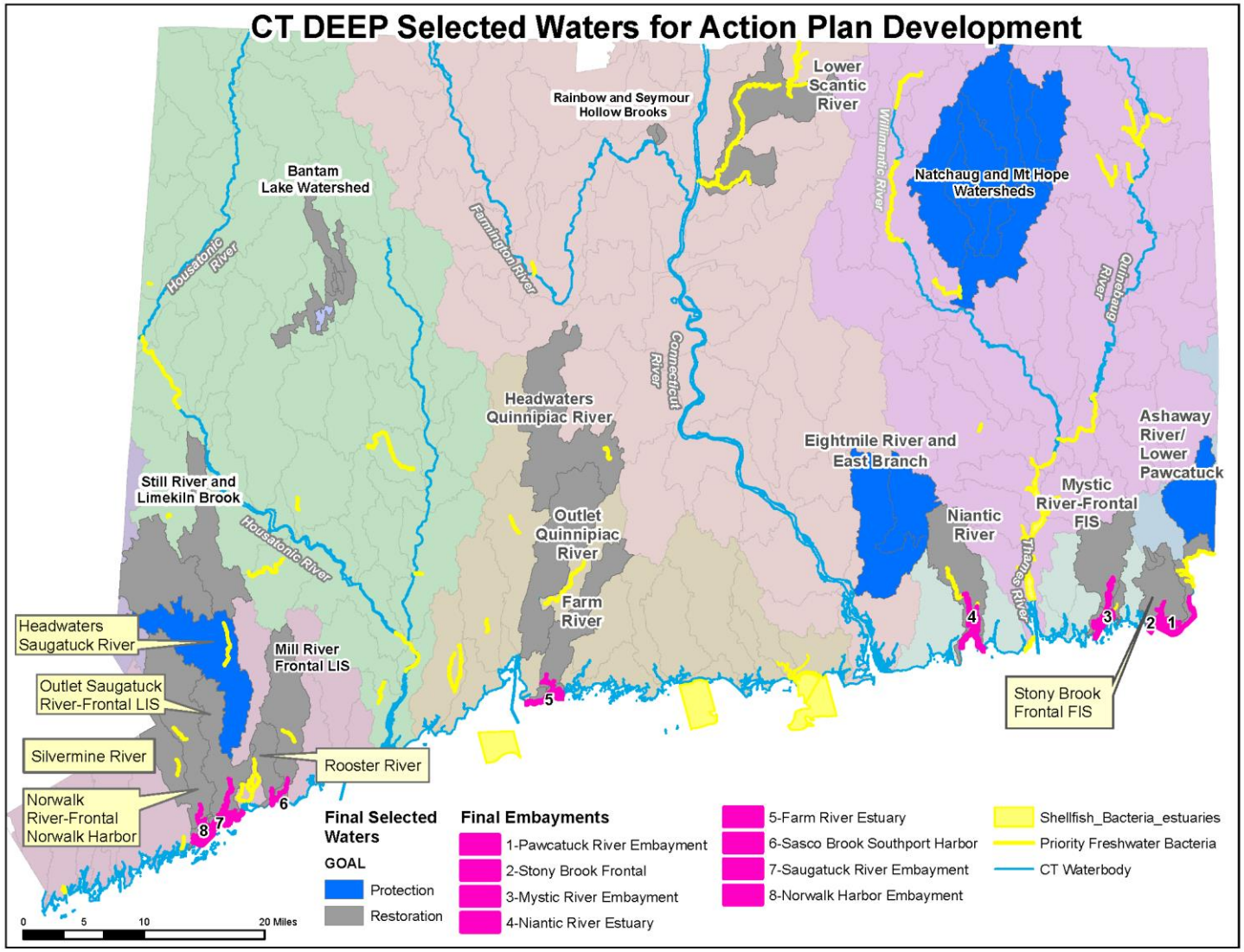


Figure 3-1: CT DEEP Priority Waters for Action Plan Development

3.2 Objectives, Actions, Milestones Related to Watershed Prioritization

Table 3-1 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 3-1 Watershed Approach Prioritization – Five-Year Objectives, Actions, and Milestones

Objectives	Actions	Milestones	Schedule				
			2020	2021	2022	2023	2024
1. <u>Prioritization:</u> Evaluate NPS priority lists as new information on individual watersheds becomes available.	1. Evaluate NPS priority watersheds lists and provide opportunity for public comment. 2. Update priority lists as needed - add or remove individual waterbodies to the priority lists as new information becomes available. *Lead Agency: CT DEEP*	NPS priority watershed list published in Integrated Water Quality Report List of priority hydromodification and migratory corridor enhancement projects updated	X X	 X	X X	 X	X X

Table 3-1 Watershed Approach Prioritization – Five-Year Objectives, Actions, and Milestones							
Objectives	**Actions**	**Milestones**	**Schedule**				
			2020	**2021**	**2022**	**2023**	**2024**
2. <u>Planning</u>: Approve 5 additional nine element watershed based plans (WBP) or significant updates for restoration of impaired waters.	1. Provide watershed organizations and managers with the information, technical support, guidance and, when available, funding for development of effective WBPs 2. Develop a Watershed-Based Plan Addendum that can be applied to lakes with nutrient TMDLs *Lead Agency: CT DEEP*	Number of new or updated nine element WBPs approved Watershed Based Plan Addendum for Bantam Lake completed	1	1 X	1	1	1

Table 3-1 Watershed Approach Prioritization – Five-Year Objectives, Actions, and Milestones							
Objectives	**Actions**	**Milestones**	**Schedule**				
			2020	**2021**	**2022**	**2023**	**2024**
3. <u>Restoration</u>: Fully or partially restore NPS impaired waterbodies; Prepare NPS Success Stories that document the restorations.	1. Provide support and funding through NPS Section 319 grant program to support implementation of WBPs for waters with high potential to be restored. 2. Work with local municipalities and interest groups to resolve pathogen contamination problems on bacteria impaired waterbodies. 3. 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. 4. 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. 5. Include information in NPS annual report. *Lead Agency: CT DEEP*	Four NPS success stories approved for partially or fully restored waterbodies. Two NPS success stories that show progress toward achieving water quality goals or ecological restoration	1	1 1	1	1 1	

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.

Table 4-1. Connecticut NPS Pollution Categories

Major Sources	Other Sources
• 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	• 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 2020 through 2024 are provided for each NPS pollution source category.

4.1 Major Sources

4.1.1 Runoff from Developed Areas and Roadways

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 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

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.

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 *2016 State of Connecticut Integrated Water Quality Report*, developed land uses (along with agricultural lands) have been identified by CT DEEP as contributing too 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, 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 and transportation infrastructure 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. These permits include conditions for minimum measures to be completed by the applicant such as street sweeping for municipalities, institutions and DOT infrastructure. Storm runoff that is not regulated by CT DEEP Stormwater General Permits (e.g., municipalities which do not have an urbanized area, or 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.*

The UConn 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. One specific tool is a searchable online version of CT Stormwater Quality Manual. See links at the end of this chapter for details.

LID (also referred to as "green infrastructure") is the preferred approach to stormwater management and land development in Connecticut. 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. CT Center for Land Use Education and Research (CLEAR) has developed a "State of LID" Story Map (http://s.uconn.edu/stateoflid) which evaluates the LID regulations of 81 towns for compliance with different LID-friendly provisions, and provides links to towns' LID regulations. CT CLEAR also conducts dozens of tours and presentations each year about LID.

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 Authorities to fund municipal stormwater management programs. Much like water and sewer authorities, 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 Authorities are seen as a fair way of collecting funds for stormwater management. In addition, stormwater collaboratives or partnerships between adjacent municipalities to manage stormwater can also reduce costs and increase effectiveness.

Several Connecticut communities have explored the feasibility of implementing a Stormwater Authority 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. Since the passage of Stormwater Authority enabling legislation and the completion of feasibility studies, New London has recently become Connecticut's first established Stormwater Authority, and there is a separate effort underway to develop a collaborative with member municipalities in eastern Connecticut with the Northeastern and Southeastern Councils of Government and the Eastern Connecticut Conservation District.

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.

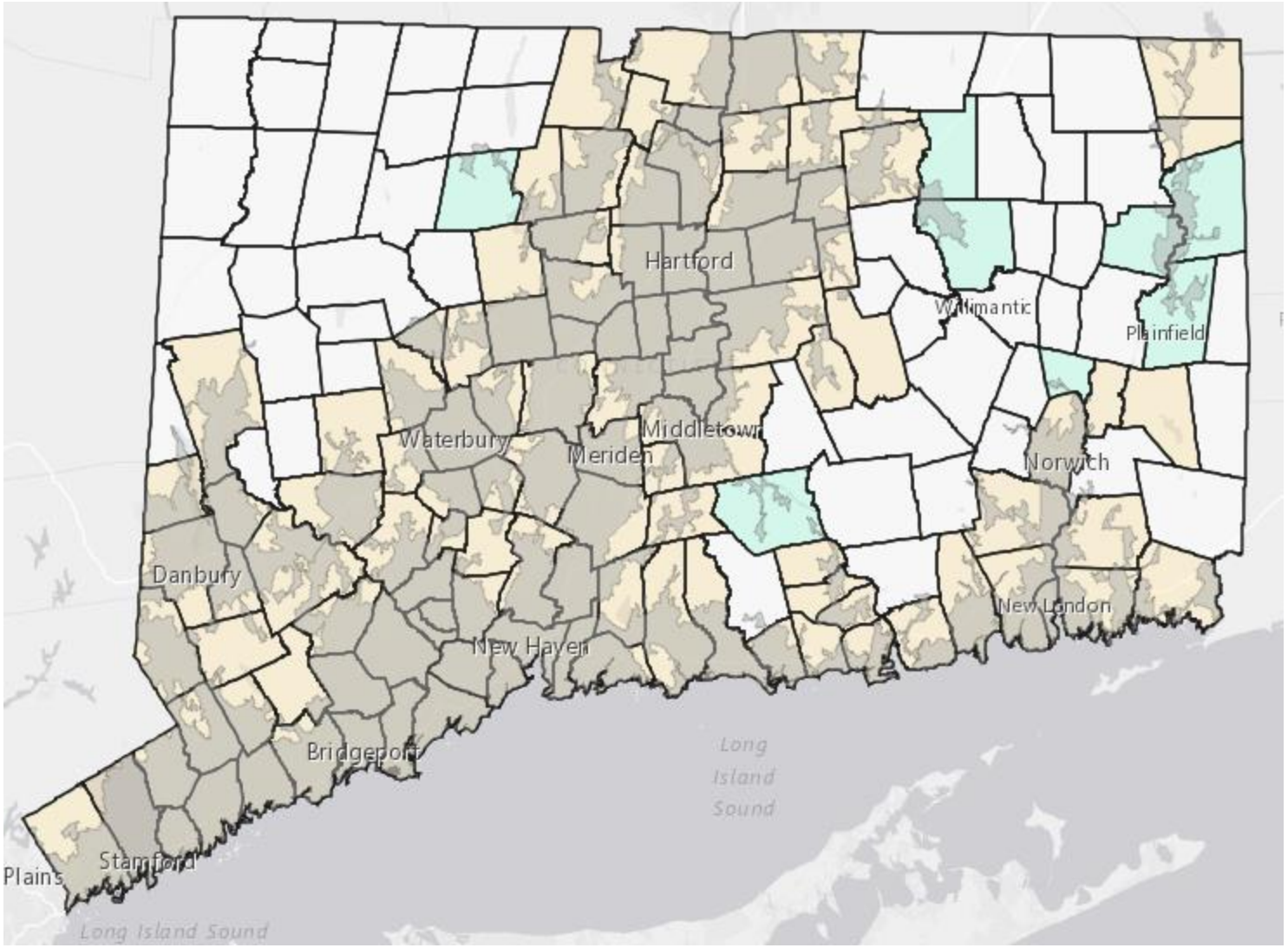


Figure 4-1. Urbanized Areas and MS4 Regulated Communities. Urbanized areas are shaded gray. MS4 municipalities are outlined in tan and light green (new in 2016).

Application of road salt for winter deicing has been standard practice since the 1940s on Connecticut' 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. CTDOT switched to anti-icing: 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.

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 for road salt storage and application, all salt piles at CTDOT facilities are now kept undercover or within structures to reduce exposure to precipitation. Most municipalities have also implemented similar best management practices 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 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. Another concern associated with runoff from airports is release of per- and polyfluoroalkyl substances (PFAS) in aqueous firefighting foams. These chemicals may be used both in wet and dry weather conditions. Some airports employ recycling systems to capture and treat runoff from runways as much as practicable. In places where this practice is not used, 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. PFAS compounds do not break down and can accumulate in the environment. They have been associated with adverse health effects for both humans and wildlife (https://www.epa.gov/pfas/basic-information-pfas).

Resources and References

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
  - Land and Water Resources Division
- 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

- CT Nonpoint Education for Municipal Officials Website regarding municipal stormwater https://nemo.uconn.edu/ms4/index.htm
- *2004 Connecticut Stormwater Quality Manual*: http://www.ct.gov/deep/cwp/view.asp?a=2721&q=325704&deepNav_GID=1654
- CT Nonpoint Education for Municipal Officials searchable online version of CT Stormwater Quality Manual. https://ctstormwatermanual.nemo.uconn.edu
- *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/ https://nemo.uconn.edu/tools/index.htm
- 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-%2012-01-10%20rev%20to%2007-07-11%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
- 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 4-2. Runoff from Developed Areas – Five-Year Objectives, Actions, and Milestones							
Objectives	**Actions**	**Milestones**	**Schedule**				
			2020	**2021**	**2022**	**2023**	**2024**
1. <u>Municipal GI/LID Outreach and Implementation</u>: Enhance municipal outreach for GI and LID.	1. Provide outreach to CT municipalities regarding urban runoff management under existing 5 year contract between CT DEEP and CT NEMO. 2. Obtain funding to extend contract for outreach services 3. Execute a contract extension for outreach services for through at least 2026. 4. Provide outreach to CT municipalities regarding urban runoff management under new contract between CT DEEP and CT NEMO. *Lead Agency: UConn NEMO/CLEAR* *Partners: CT DEEP*	Years of municipal outreach services provided by CT NEMO under contract to CT DEEP Additional funds to extend the CT DEEP-NEMO contract obtained Contract between CT DEEP and CT NEMO either extended or re-established Years of municipal outreach services provided by CT NEMO under contract to CT DEEP	1	1 1 1	1	1	1
2. <u>Municipal GI/LID Implementation</u>: Enhance municipal implementation of GI and LID.	1. Maintain a reserve of Clean Water Funds for municipal Green Infrastructure/LID projects in CSO communities. 2. Provide Section 319 and Clean Water Funds for eligible GI/LID projects in CSO communities to reduce stormwater infiltration into the combined sewer system. *Lead Agency: CT DEEP* *Partners: Municipalities, UConn NEMO/CLEAR*	Number of municipal LID projects completed in communities with CSOs					2

Table 4-2. Runoff from Developed Areas – Five-Year Objectives, Actions, and Milestones							
Objectives	**Actions**	**Milestones**	**Schedule**				
			2020	**2021**	**2022**	**2023**	**2024**
3. <u>BMP Manuals:</u> Update State stormwater design manuals to reflect observed increases in frequency and intensity of large storms.	1. Engage and work with partner agencies to develop a scope of revision to the guidance documents to account for observed increases in extreme precipitation. *Lead Agency: CT DEEP* *Partners: CT DOT, CT DCS, UConn, CT CSWC*	Memo documenting agreement on the scope of revisions to the State guidance documents (CT Stormwater Manual and Erosion and Sedimentation Guidelines) completed					1
4. <u>Regional Approaches</u>: Promote regionalization and municipal cooperation to address runoff-related water quality issues.	1. Continue to support the development of stormwater authorities and regional partnerships to increase efficiencies for stormwater management. 2. Support use of the USGS' Stochastic Empirical Load Dilution Model (SELDM) for a regional monitoring approach by CT DOT. *Lead Agency: CT DEEP* *Partners: Regional Councils of Government, Municipalities, CT DOT*	Institutional mechanisms (either authorities or collectives) for regional stormwater management established Additional local and regional stormwater authorities and collaboratives established Feasibility study or pilot study of SELDM for regional monitoring completed					3 1 1

Table 4-2. Runoff from Developed Areas – Five-Year Objectives, Actions, and Milestones							
Objectives	**Actions**	**Milestones**	**Schedule**				
			2020	**2021**	**2022**	**2023**	**2024**
5. <u>CT DOT Roadway Anti-icing and Deicing Program</u>: Continue to enhance state roadway deicing programs to address water quality.	1. Support the "Green Snow Pro" program which provides training to municipal staff and private snow clearing companies on best management practices. 2. Incorporate any new best practices into the state roadway deicing program to reduce impacts to surface and ground water quality. *Lead Agency: CT DOT, UConn NEMO/CLEAR and Technical Assistance Center* *Partners: CT DEEP*	Number of Green Snow Pro classes offered by UCONN-CLEAR to municipal staff and private snow clearing companies Passage of legislation regarding Green Snow Pro certification and liability relief	1	1	1	1	1 1

4.1.2 Subsurface Sewage Disposal Systems

Background

Approximately 40 percent of Connecticut's population – over 1 million people – relies on subsurface sewage disposal systems (SSDS) for wastewater treatment and disposal. These systems, which are typically conventional septic systems, are primarily used in rural and low-density suburban areas outside of areas served by sanitary sewers (see **Figure 4-2**), and generally serve individual homes, small residential communities, and commercial buildings. A typical SSDS has the following components: a pipe from the home/building, a septic tank, a septic tank effluent pipe and distribution box, a leaching system, and the receiving soil. Microbes in the soil form a bacterial layer underneath the leachfield known as a Biomat which digests or reduces most contaminants from wastewater before it intercepts ground water or other nearby sensitive receptors.

Common Causes of Septic System Malfunction or 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
- Unsuitable site conditions
- High loading rate or uneven effluent distribution
- Lack of a mature Biomat

Although SSDS's cause a disproportionately smaller percent of water quality impairments than their public sewer counterparts, inadequate or failed SSDS's represent a significant threat to human health as well as 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 or districts, 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 7,500 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. SSDS's with design flows of less than 2,000 gallons per day are regulated by the local Health Department or district. Conventional systems with design flows greater than 2,000 gallons per day but less than 7,500 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 7,500 gallons per day, including sites where multiple smaller systems on a single "lot" have a combined flow greater than 7,500 gallons per day

- Community sewerage systems (i.e., one subsurface sewage disposal system serving two or more residential buildings, regardless of system size)
- 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 having occurred in January 2018.

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 SSDS 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 SSDS 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 SSD, and (b) where nitrogen loadings from SSDS are delivered to ground water that is closely hydrologically connected to surface water.

Many Connecticut communities are faced with wastewater management challenges in existing high density developed areas with old, undersized, malfunctioning septic systems or that are located in areas that are vulnerable to flooding and sea level rise; and in newer developments that need high-performance treatment facilities to protect ground water and nearby sensitive receptors. CT DEEP and a number of Connecticut communities such as Old Lyme and Old Saybrook are evaluating and implementing comprehensive and holistic approaches to address wastewater management needs on a long term basis. Old Saybrook has been implementing a decentralized management program predicated upon the upgrade of individual SSDSs within a designated wastewater management district and through the implementation of SSDS upgrade standards. More recently, Old Saybrook started reevaluating the current approach to consider decentralized community options or a centralized solution for addressing remaining wastewater management needs within the most flood-prone and high density areas within the wastewater management district. Old Lyme has opted for implementing a centralized solution whereby wastewater will be collected via a sanitary sewer system and transported to an existing wastewater treatment plant for treatment and disposal.

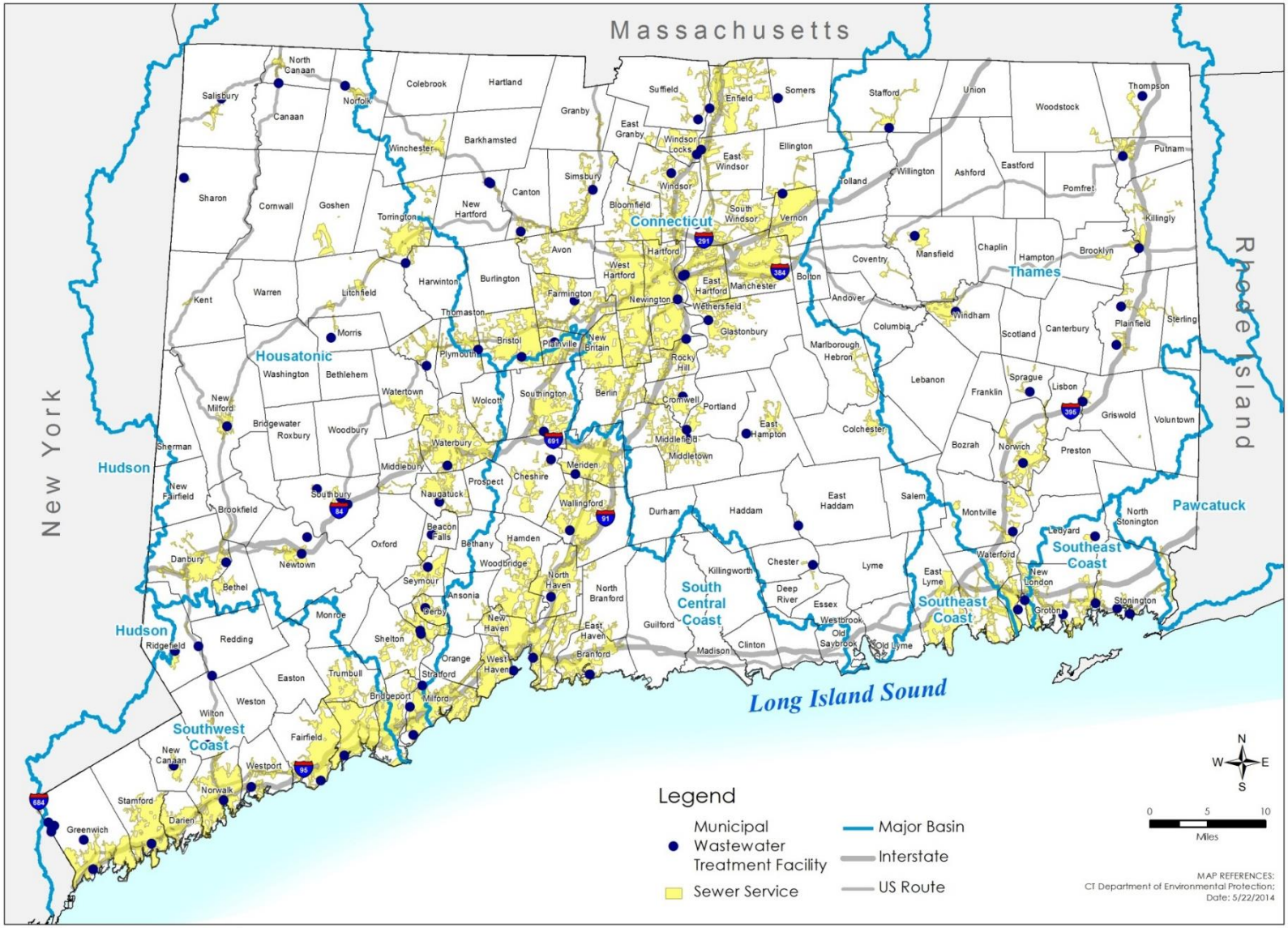


Figure 4-2. Sewer Service Areas in Connecticut. (Areas in white are served by subsurface sewage disposal systems.)

Resources and References

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's (DPH) Circular Letters dealing with nitrogen analysis:

- Density of Developments: http://www.ct.gov/dph/lib/dph/environmental_health/environmental_engineering/pdf/CIR_2000-01_Sewage_Updates.pdf
- Nitrogen Loading Design Considerations: http://www.ct.gov/dph/lib/dph/environmental_health/environmental_engineering/pdf/CIR_2002-03_Updates_On-Site_Sewage_Disposal.pdf

Table 4-3. Subsurface Sewage Disposal Systems – Five-Year Objectives, Actions, and Milestones							
Objectives	**Actions**	**Milestones**	**Schedule**				
			2020	**2021**	**2022**	**2023**	**2024**
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. Continue 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: a. Identify methods for tracking of onsite wastewater systems and common metadata elements b. Evaluate enhanced nitrogen and phosphorus treatment technologies. c. Evaluate and recommend adaptive and mitigative measures to address expected climate change (e.g., sea level rise) impacts on SSDS's in flood prone areas. *Lead Agencies: CT DEEP, CT DPH* *Partners: Local Health Departments, Municipal and industry representatives, NEIWPCC, UConn, WPCAs, OPM*	Workgroup with CT DEEP and CT DPH established List of priorities for process improvement generated Report with recommendations from the Workgroup completed	X X		 X		

Table 4-3. Subsurface Sewage Disposal Systems – Five-Year Objectives, Actions, and Milestones							
Objectives	**Actions**	**Milestones**	**Schedule**				
			2020	**2021**	**2022**	**2023**	**2024**
2. <u>Homeowner Education</u>: Educate homeowners and homebuyers about proper use and maintenance of SSDS's.	1. Discuss the need and opportunities for homeowner and homebuyer education with CT DPH. 2. Develop improved or expanded educational resources and materials for homeowners and homebuyers. 3. Implement an outreach campaign to homeowners and homebuyers. *Lead Agencies: CT DEEP, CT DPH, Local Health Departments, CT Conservation Districts* *Partners: Municipal and industry representatives, watershed associations*	Plan for outreach campaigns prepared Outreach campaigns completed			X		1
3. <u>Municipal Assistance</u>: Provide funding to municipalities to address water quality impairments due to SSDS's	1. Maintain a reserve of Clean Water Funds to evaluate wastewater treatment alternatives to individual SSDSs for small communities where there are water quality impairments. 2. Provide Clean Water Funds to municipalities or authorities for eligible decentralized wastewater treatment projects or sewer line extensions to solve water quality impairments associated with substandard or failed SSDS's. *Lead Agency: CT DEEP* *Partners: Municipalities*	Number of municipal planning, design, or construction projects completed with Clean Water Funds to address water quality impairments associated with substandard or failed SSDS's					2

Table 4-3. Subsurface Sewage Disposal Systems – Five-Year Objectives, Actions, and Milestones							
Objectives	**Actions**	**Milestones**	**Schedule**				
			2020	**2021**	**2022**	**2023**	**2024**
4. <u>Prioritization</u>: Assess the impact of SSDS's on water quality in coastal embayments	1. Use available information to estimate nitrogen loads to priority embayments from SSDS's. 2. Conduct a follow-up study to verify the estimated loads using field information. 3. Evaluate SSDS loads as a percentage of total nitrogen loads to embayments as part of TMDL or Alternative TMDL Action Plans. *Lead Agency: CT DEEP* *Partners: Long Island Sound Study, NYSDEC, RIDEM*	SSDS load estimation study completed SSDS load verification study completed TMDL or Alternative TMDL Action Plans for embayments completed (pending LISS funding)	X		X		8

4.1.3 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 4-3**). 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 69 acres, the state has the third smallest average in the U.S. According to the 2017 Census of Agriculture, more than half of the 5,500 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 will 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 4-44**).

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, Connecticut Agricultural Experiment Station, and UConn Cooperative Extension Service.

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 implementation of integrated pest management is recommended as a common sense approach to pest control in all environments from agricultural to residential, municipal, commercial, and campus settings.

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 two basins in Connecticut that were selected for NWQI designation are the Little River in Woodstock/Putnam/Thompson (011000010401, selected in 2013) and Broad Brook in Ellington/East Windsor (010802050202, selected in 2015). In 2018 NRCS announced a readiness pilot program under the NWQI for the Farm River watershed in the towns of North Branford, Branford, and East Haven (011000040206) which will provide assessment and planning for source water protection of public water supplies.

Several recent actions have occurred within these NWQI watersheds. Within the Little River basin, three dairy farms have partnered with CT DEEP and Eastern Connecticut Conservation District to incorporate custom-designed BMPs including precision planting equipment to plant valuable cover crop on 830 acres, construction of a dairy mortality composting facility, an integrated suite of agricultural waste management BMPs with CT DEEP 319 funds and EPA EQIP cost share assistance to address an increasing herd size and close proximity to the receiving Little River, and piloting a denitrifying bioreactor installation beneath a hay field to treat subsurface, nutrient-laden tile drain water before entering surface waters. These agricultural businesses are hosting site tours to share lessons learned with peer producers in support of technology and practice transfers across this watershed and beyond. In addition, a Roseland Lake nutrient monitoring and modeling project produced a Section 319-funded lake nutrient management plan (2018) with several recommendations for in-lake and tributary nutrient loading. The project is generating implementing project applications through an emerging Little River Source Water Collaborative. In the Broad Brook basin, the North Central Conservation District has conducted June nitrate sampling on silage corn field for several years to inform farmers of their effective nutrient management planning. Current implementation projects build on the Phase 2 Broad Brook watershed plan developed in 2018 using Section319 funds, which identified many site specific projects and primarily on private agricultural land. Multiple support agencies are leveraging available resources, including NRCS EQIP cost share assistance (with completion of new CNMP), CT Department of Agriculture Farmland Restoration Program funds, technical assistance from UCONN Cooperative Extension, along with a substantial dairy farmer in-kind match. In 2019, one Plan-recommended project at a large dairy involves removing 2 unlined manure pits (at least one of which had been intercepting groundwater), and regrading those areas and heavy use areas and putting them into stable, no-till crop production.

Part of the NWQI program is water quality monitoring to assess instream changes in pollution resulting from implementation of farm BMPs funded by NRCS's EQIP funds. This task will be completed through a combination of state-wide monitoring programs, pour point monitoring in the watersheds, and targeted monitoring near projects. Statewide monitoring programs have stations in the selected NWQI watersheds that are revisited periodically. Pour point monitoring can be used to assess overall pollutant load reductions from the watersheds before and after projects are implemented. Finally, project specific monitoring can be completed if such data are requested by NRCS and the participating farmer.

Figure 4-3. Agricultural Land Use and Selected Animal Farms in Connecticut

Resources and References

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
- Roseland Lake Nutrient Management Plan (2018) https://www.ct.gov/deep/lib/deep/water/watershed_management/wm_plans/roselandlake_wbp.pdf

Table 4-4. Agriculture – Five-Year Objectives, Actions, and Milestones							
Objectives	**Actions**	**Milestones**	**Schedule**				
			2020	**2021**	**2022**	**2023**	**2024**
1. <u>Assistance to Farmers</u>: Provide outreach and technical and financial assistance to farmers regarding agricultural NPS pollution and control measures.	1. Identify & prioritize the specific agricultural operations in need of technical assistance based on apparent risks to surface water and ground water quality. 2. Identify & inventory existing agriculture BMPs and resources that are targeted to specific types of agricultural operations in need of assistance 3. Allocate technical assistance resources, including Section 319 funds and outreach resources, to implement projects to improve water quality associated with agricultural practices. *Lead Agencies: NRCS* *Partners: CT DEEP, Connecticut Department of Agriculture, UConn Cooperative Extension, Connecticut Agricultural Experiment Station, Connecticut Conservation Districts*	Number of completed projects to improve water quality associated with agricultural practices	10	10	10	10	10

Table 4-4. Agriculture – Five-Year Objectives, Actions, and Milestones							
Objectives	**Actions**	**Milestones**	**Schedule**				
			2020	**2021**	**2022**	**2023**	**2024**
2. <u>NWQI</u>: Implement National Water Quality Initiative Program with NRCS (Water Quality Monitoring)	1. CT DEEP to coordinate with NRCS to address agricultural sources of pollution in NWQI watersheds. 2. CT DEEP to prioritize allocation of Section 319 funds to leverage NRCS funding for projects in NWQI watersheds. 3. CT DEEP to conduct monitoring in NWQI watersheds either as part of specific projects or as part of statewide monitoring. *Lead Agencies: CT DEEP, NRCS,* *Partners: CT Conservation Districts, Connecticut Department of Agriculture, UConn Cooperative Extension, Connecticut Agricultural Experiment Station*	Number of water quality projects in NWQI watersheds with Section 319 funds expended in the calendar year Number of monitoring projects to collect water quality data in NWQI watersheds	1 1	1 1	 1	 1	1 1

Table 4-4. Agriculture – Five-Year Objectives, Actions, and Milestones							
Objectives	**Actions**	**Milestones**	**Schedule**				
			2020	**2021**	**2022**	**2023**	**2024**
3. <u>Nutrient Management</u>: Promote and improve nutrient management practices at Connecticut farms.	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. Prepare Comprehensive Nutrient Management Plans (CNMPs) with farmers for prioritized areas. 3. Prepare Nutrient Management Plans (NMPs) for cropland and beginning farmers statewide and for prioritized areas. *Lead Agencies: NRCS* *Partners: CT DEEP, CT Conservation Districts, Connecticut Department of Agriculture, UConn Cooperative Extension, Connecticut Agricultural Experiment Station*	Number of CNMPs prepared for AFO/CAFO farms in CT Number of NMPs prepared for farms in CT	5 10	5 10	5 10	5 10	5 10

Table 4-4. Agriculture – Five-Year Objectives, Actions, and Milestones							
Objectives	**Actions**	**Milestones**	**Schedule**				
			2020	**2021**	**2022**	**2023**	**2024**
4. <u>Regional Nutrient Management and Processing</u>: Develop and expand regional nutrient management technologies and approaches.	1. Work with stakeholders to formulate a plan to identify & prioritize areas in CT where the livestock manure nutrient surplus is a priority because it can impact ground water and/or surface water quality. 2. Work with stakeholders to discuss need, opportunities and strategies to develop/expand capacity for technologies to address the excess manure: • Anaerobic digesters, which may serve multiple purposes (manure, food & other organic wastes). • Regional/cooperative composting. • Cooperative strategies to maximize use of manure nutrients generated from Connecticut Farms. *Lead Agencies: NRCS, UConn Cooperative Extension, CT DEEP* *Partners: Connecticut Department of Agriculture, Connecticut Agricultural Experiment Station, Connecticut Conservation Districts*	Number of anaerobic digesters or other practices to address excess nutrients installed on farms in CT					3

Table 4-4. Agriculture – Five-Year Objectives, Actions, and Milestones								
Objectives	**Actions**	**Milestones**	**Schedule**				
			2020	**2021**	**2022**	**2023**	**2024**
5. <u>Soil Health</u>: Promote "Soil Health" as an agricultural BMP.	1. Form a Subcommittee on Soil Health (as part of the Council on Soil and Water Conservation) to lead the coordination of soil health initiatives in the state, including the work on Healthy Soils legislation reporting to the Council. 2. Coordinate soil health initiatives in the state, facilitating the dialogue among stakeholders (institutions and the relevant public) and identifying gaps and needs. *Lead Agency: Council on Soil and Water Conservation* *Partner Agencies: NRCS, Connecticut Department of Agriculture, Connecticut Agricultural Experiment Station, Connecticut Conservation Districts CT DEEP*	Subcommittee on Soil Health (as part of the Council on Soil and Water Conservation) formed Soil health workshops and presentations to agricultural producer groups conducted Passage of legislation regarding a statewide program the promote soil health	X 1				1 X

4.1.4 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. Restoration and protection of migratory fish runs are considered to be a very high priority for CT DEEP and NOAA National Marine Fisheries Service to enhance the ecological productivity and integrity of Long Island Sound. Hydromodification 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, 2016).

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.

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 4-4** 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 Land and Water Resources Division 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, and the process of stream classification was completed and adopted in 2019. 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.

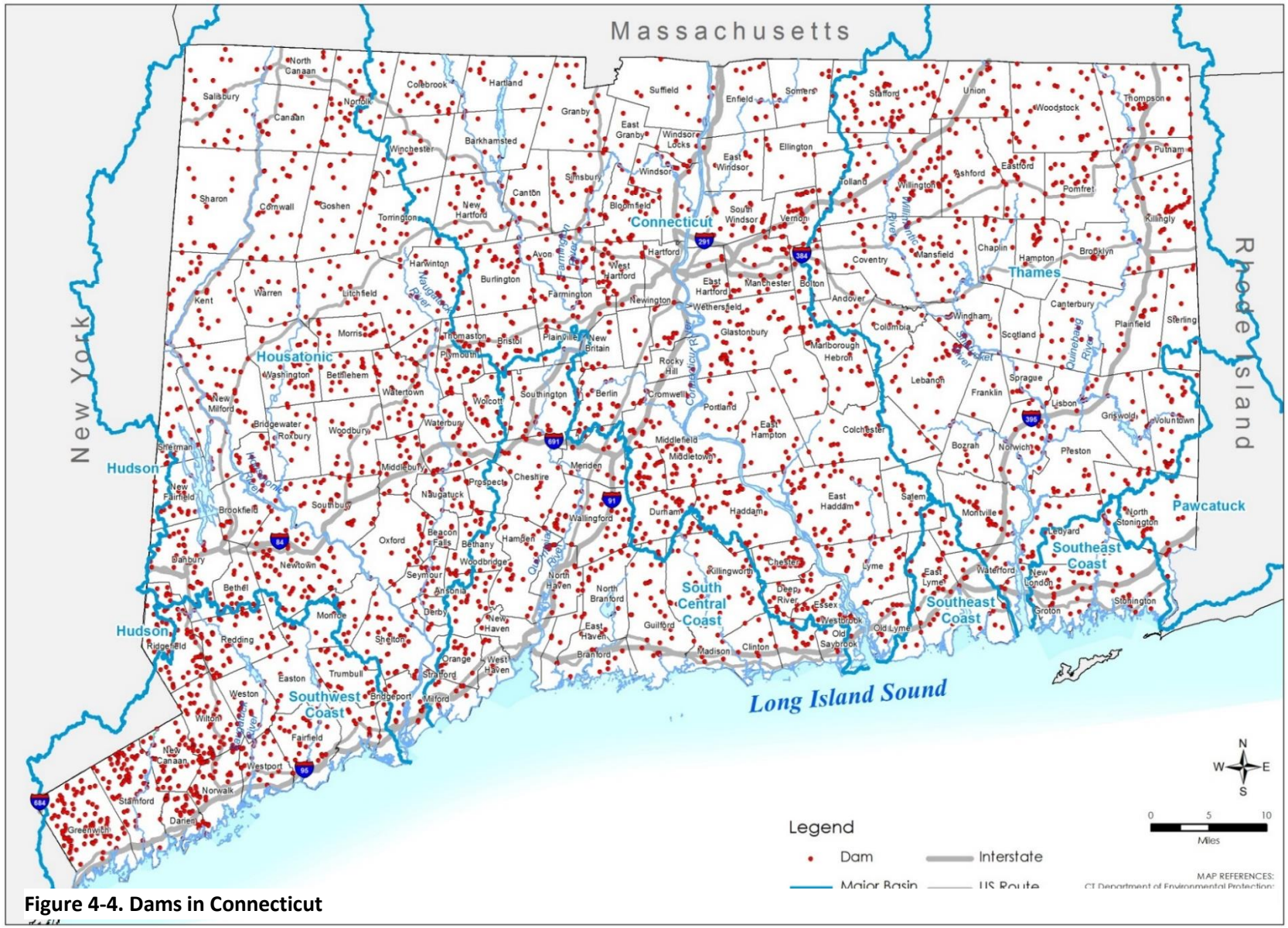


Figure 4-4. Dams in Connecticut

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. Each year CT DEEP convenes a meeting of partners working on this topic to update the list of priority dams for removal.

Resources and References

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 4-5. Hydrologic and Habitat Modification – Five-Year Objectives, Actions, and Milestones							
Objectives	**Actions**	**Milestones**	**Schedule**				
			2020	**2021**	**2022**	**2023**	**2024**
1. <u>Ecosystem-Based Restoration</u>: Protect and restore water quality using streamflow-based protection and restoration.	1. 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: a. Protection from coastal erosion through the use of living shorelines and coastal wetland restoration b. Restoration and creation of wetlands, eelgrass, and oyster beds c. Stream and riparian zone restoration d. Hydromodification such as dam removal e. Streamflow protections 2. Promote such approaches in new and updated watershed based plans and implementation projects, and in community coastal resilience plans. *Lead Agencies: CT DEEP, NOAA, LISS* *Partners: Municipalities, CT Conservation Districts, NGOs*	Number of projects implemented that utilize ecosystem-based approaches through cooperation with Migratory Corridor and Diadromous Fish Restoration Plan, and CT Green Plan.					5

4.1.5 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 and pathogens 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. . Nearly 50 off-leash dog parks have been established throughout Connecticut in recent years. Many are managed by municipalities and often run by 'Friends of" volunteer groups, which have broadened awareness and affected positive behavioral change in picking up pet waste, as a regular pet owner responsibility. 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. Currently 121 Connecticut municipalities and several state and federal institutions regulated under the General Permit for the Discharge of Stormwater from Small Municipal Separate Storm Sewer (MS4) are widely distributing domestic pet waste information through outreach events and public website posting of annual reporting, as well as installing pet waste stations to assist in meeting the Pollution Prevention and Good Housekeeping minimum control measure.

Most watershed-based plans developed within CT in recent years incorporate NPS source information about pet waste and generally acceptable management practices, with many plans identifying specific areas of likely or known concentrations of pet dogs to focus on pollutant loading reductions through structural stormwater retrofit practices, and non-structural education and outreach events, signage, and pet waste stations. Where State Parks and similar State facilities are located in such watersheds, proper pet waste outreach campaigns in interpretive programs, signage and pet waste stations are developed.

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 and modifying natural vegetated areas near waterbodies to managed turf 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. 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, non-turf 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.

The previous Baker Cove (Groton) watershed-based plan has provided water quality monitoring and stream walk assessment findings and recommendations that include addressing high visibility issues with non-migratory Canada geese populations. In 2019 the Eastern Connecticut Conservation District utilized a Section 319 grant to convene an active stakeholder group that advised on local goose population locations and documented management techniques, leading to development of a goose management measures matrix document for prioritizing effective control measures for site specific locations. Technical guidance and support was provided by CT DEEP Wildlife, local health department staff, regional airport grounds management, water company utility field personnel, municipal and institutional land groundskeepers and local shellfish commissions, reflecting the anticipated spectrum of stakeholders typically found in other urbanized watersheds. The matrix and development process is designed to be transferable for use at other locations with large non-migratory Canada goose populations in a regional (5 mile radius) context. The Baker Cove project has since evolved into a standing watershed advisory team to further implement prioritized actions from this management matrix, with the added objective to leverage increased public awareness and interest about goose issues to address other recommended NPS management actions from the Baker Cove watershed plan.

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.

Resources and References

- 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
- "Pollution Prevention for Ideas for Pet Care" fact sheet: https://www.ct.gov/deep/cwp/view.asp?a=2708&q=457360
- 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
- Managing Urban Deer in Connecticut:

https://www.ct.gov/deep/lib/deep/wildlife/pdf_files/game/urbandeer07.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
- Fairfield County Deer Management Alliance: http://www.deeralliance.com/
- DEEP Watershed Plans and Documents: https://www.ct.gov/deep/cwp/view.asp?a=2719&q=379296&deepNav_GID=1654#bakercove

Table 4-6. Domestic Animals and Wildlife – Five-Year Objectives, Actions, and Milestones							
Objectives	**Actions**	**Milestones**	**Schedule**				
			2020	**2021**	**2022**	**2023**	**2024**
1. Provide information to municipalities, state park staff, watershed organizations, and others on nuisance wildlife deterrent BMPs to enhance protection of water quality	1. Update current CT DEEP waterfowl and nuisance wildlife deterrent BMPs to reflect current research findings and successful approaches. 2. Promote habitat modification approaches and the use of vegetated buffers, which have additional water quality benefits. 3. Promote signage in public parks and other educational tools, in addition to enforcement of prohibitions on the feeding of waterfowl. 4. Assist with management strategies in areas of special concern: airports, water supply reservoirs, parks and athletic fields with documented public health and safety concerns. *Lead Agencies: CT DEEP, Local Health Departments* *Partners: CT DOT, airport authorities*	Nuisance wildlife deterrent BMPs updated Goose management measure matrix implemented in Baker Cove as a pilot study for other coastal communities Consultations completed with municipalities, state parks staff, watershed organizations, and others to transfer knowledge regarding beneficial domestic animal and nuisance wildlife control measures	X		X 1	1	1

4.1.6 Boating and Marinas

Background

Boating is a major recreational and commercial activity in Connecticut. There are 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.

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 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.

This program is currently managed by the Connecticut Marine Trades Association. 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.

Resources and References

- 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/lisdmmp.html
- Connecticut Marine Trades Association – Environmental Compliance: http://www.ctmarinetrades.org/environmental/index.html

Table 4-7. Boating and Marinas – Five-Year Objectives, Actions, and Milestones							
Objectives	**Actions**	**Milestones**	**Schedule**				
			2020	**2021**	**2022**	**2023**	**2024**
1. Seek continuation of and promote participation in the Clean Marina Program and the use of BMPs to protect water quality	1. Connecticut Marine Trades Association (CMTA) will work with partners to continue to provide BMPs and training opportunities for marinas and the recreational boating community through existing resources. 2. CMTA will continue to assess the level of adherence by marinas to the minimum standards of the Clean Marina certification program. *Lead Agency: CT Marine Trades Association* *Partners: CT DEEP, Municipalities, Stakeholders and User groups*	Number new Certified Clean Marinas per year Achieve 60% of all marinas to be certified Clean Marinas by 2024	10	10	10	10	10 60%
2. Continue to promote use of marina pumpout facilities	1. Continue to work with partners to provide and promote the use of pumpout facilities. Updated locations are listed at an online interactive pumpout facility map: www.ct.gov/deep/pumpoutdirectory 2. Evaluate the need for additional pumpout facilities for inland and coastal waterbodies. *Lead Agency: CT DEEP Boating Division*	Remove over 1 million (1M) gallons of wastewater from recreational vessels each year CT	1M	1M	1M	1M	1M

4.2 Other Sources

4.2.1 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.

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.

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. 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 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 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.

- UCONN developed a smartphone application to assist homeowners and turfgrass practitioners in calculating the amount of lawn fertilizer needed, drop and rotary spreader calibration, and reading a fertilizer label to properly apply fertilizer to turfgrass areas. Built in calculators help users determine how much fertilizer will be needed to properly fertilize turfgrass areas, streamline calibration calculations, and calculate the amount of nitrogen, phosphate and potash that will be applied to their area based on the fertilizer selected. Animations and videos guide turfgrass enthusiasts on how to take a soil sample, properly apply fertilizer using drop and rotary spreaders, calibrate a fertilizer spreader, and calculate lawn surface area. The application is available for Apple Store and Android Store. https://apps.apple.com/us/app/fertadvisor/id1454017899.

Resources and References

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 (NEIWPCC): http://www.neiwpcc.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 Connecticut FertAdvisor App (Apple Store link but also available for Android) https://apps.apple.com/us/app/fertadvisor/id1454017899
- 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 4-8. Landscaping and Turf Management – Five-Year Objectives and Actions	
Objectives	**Actions**
1. <u>Homeowner Outreach</u>: Reduce water quality impacts from residential lawn care and landscaping activities.	1. Using existing educational materials and programs (such as , such as UConn-CLEAR guidance, NEIWPCC's Regional Turf Fertilizer Initiative, NOFA's Organic Landcare Program, and UCONN FertAdvisor App) provide 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. *Lead Agency: UConn Extension* *Partners: CT DEEP, NOFA, NEIWPCC*
2. <u>Municipal Outreach</u>: Reduce water quality impacts from municipal lawn care and landscaping activities.	1. Conduct hands-on trainings with municipal staff to education them on using BMPs for turf management, calibrating turf equipment, and using of the FertAdvisor app. *Lead Agency: UConn Extension* *Partners: CT DEEP, NOFA*

4.2.2 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.

Approximately 40 percent of Connecticut's population disposes of their domestic sewage with onsite subsurface sewage disposal systems (SSDS's). 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.

Resources and References

- 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 4-9. Land Disposal – Five-Year Objectives and Actions	
Objectives	**Actions**
1. Continue to implement the CT DEEP Solid Waste Management Program and Connecticut Solid Waste Management Plan	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. *Lead Agency: CT DEEP-Bureau of Materials Management and Compliance Assurance* *Partners: Municipalities, Stakeholder Workgroups*

4.2.3 Brownfields and Contaminated Sites

Background

Contaminated sites, including brownfields[2], 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.

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.

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.

CT DEEP is 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, 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 – not years later by a new property owner or the State. The proposed regulatory reforms and

2 A brownfield is defined by Connecticut General Statutes §32-760(2) 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."

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).

Resources and References

- 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 4-10. Brownfields and Contaminated Sites – Five-Year Objectives and Actions	
Objectives	**Actions**
1. Promote brownfield restoration for public open space.	1. Work with NGOs and Municipalities to facilitate non-intensive development options for brownfields. 2. Work with stakeholders to identify available funding sources for open space land restoration and water protection. 3. Encourage brownfield redevelopment as an alternative to development of undeveloped lands. 4. Provide incentives to redevelop brownfields and take advantage of existing infrastructure. 5. Encourage utilization of incentives for brownfields redevelopment through CT DECD program grants such as: to municipalities for the costs of assessment and cleanup of brownfields, loans to private developers. 6. *Lead Agency: CT DEEP Remediation Division* *Partners: Municipalities, Stakeholder Workgroups*

4.2.4 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 Action Plan 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 is updating the Forest Action Plan in 2020. The Forest Action Plan is required by the U.S. Farm Bill and must be updated every 10 years and reviewed every five years. The next update will include an assessment of current conditions and strategies for the next 10 years.

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 has used several funding sources to increase forest preservation holdings including the Recreation and Natural Heritage Trust Program and the Open Space and Watershed Land Acquisition Grant Program.

CT DEEP's watershed and NPS staff coordinate with and provide comments to CT DEEP's Open Space and Watershed Land Grant Acquisition Program, and the Recreation and Natural Heritage Trust Program.

Resources and References

- 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
- CT DEEP Forest Action Plan https://www.ct.gov/deep/cwp/view.asp?a=2697&q=454164&deepNav_GID=1631
- CT DEEP Open Space and Watershed Land Grant Acquisition Program https://www.ct.gov/deep/cwp/view.asp?a=2706&q=323840&deepNav_GID=1641
- CT DEEP Recreation and Natural Heritage Trust Program https://www.ct.gov/deep/cwp/view.asp?a=2706&q=323834&deepNav_GID=1641

Table 4-11. Forestry – Five-Year Objectives and Actions	
Objectives	**Actions**
1. Review and update the CT Forest Action Plan	1. Assessment of current conditions and strategies for the next 10 years. 2. Solicit stakeholder input. 3. Produce updated Forest Action Plan. *Lead Agency: CT DEEP Division of Forestry* *Partners: Connecticut Forest & Park Association, UConn Cooperative Extension System, Connecticut Agricultural Experiment Station, Natural Resources Conservation Service*
2. Continue to provide education and outreach to private land owners and municipal officials	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. *Lead Agency: CT DEEP Division of Forestry* *Partners: Connecticut Forest & Park Association, UConn Cooperative Extension System, Connecticut Agricultural Experiment Station, Natural Resources Conservation Service*
3. Promote preservation of forests and open space through grants and direct purchase of lands	1. Continue to Fund Open Space Grants for municipalities to purchase open space, 2. Purchase and preserve lands to add to State Forests and Parks as a priority for NPS abatement. 3. Coordinate with and provide comments to CT DEEP's Open Space and Watershed Land Grant Acquisition Program, and the Recreation and Natural Heritage Trust Program. *Lead Agency: CT DEEP Land Acquisition* *Partners: Municipalities*
4. Promote urban forestry as a key component of effective municipal green infrastructure programs	1. Continue to promote urban forestry through grants and technical assistance to municipalities. *Lead Agency: CT DEEP Division of Forestry* *Partners: Municipalities, UConn Cooperative Extension System, Connecticut Fund for the Environment*

4.2.5 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 48,000 commercial underground storage tanks (USTs) are registered in Connecticut, of which just over 8,000 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, approximately 40,000 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.

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 but are now becoming less available overall. Collections are available, and on average, over 30,000 state residents participate in HHW collections each year. State funding for this program has been eliminated. Municipal participation is variable due to high costs and available funding for these programs. The result is a greater need for extended producer responsibility, but this has not been a high legislative priority. Another option is implementation of "fee for service" or other year-round options such as found at www.nedt.org in Westfield, MA. There are issues with permitting, liability, and insurance that provide barriers to establishing new facilities of this type. There is at least one public water supply utility that is paying for collections in their service area.

Resources and References

- 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 4-12. Material Storage – Five-Year Objectives, and Actions	
Objectives	**Actions**
1. Continue regulatory programs for USTs and hazardous waste management	1. Continue to implement Connecticut's UST and hazardous waste management regulatory programs. *Lead Agency: CT DEEP, Bureau of Materials Management and Compliance Assurance*
2. Expand Household Hazardous Waste Collection Opportunities	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. 2. Develop a strategy for implementing an expanded HHW program financed by Extended Producer Responsibility. *Lead Agency: CT DEEP* *Partners: Industry Representatives, CBIA*

4.2.6 Resource Extraction

Background

In Connecticut, sand and gravel mining and rock quarries are the most common resource extraction activities that contribute to NPS pollution. 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.

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.

Resources and References

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

Table 4-13. Resource Extraction – Five-Year Objectives and Actions	
Objectives	**Actions**
1. Strengthen regulatory controls on resource extraction activities to protect water quality	1. Support efforts to modify Comprehensive NPDES General Permit program to regulate the mining industry, and 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. These include CT Industrial Stormwater General Permit. *Lead Agency: CT DEEP* *Partners: Industry Representatives, CBIA*

4.2.7 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 (NEIWPCC, 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 (NEIWPCC, 2007).

Resources and References

- 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 4-14. Atmospheric Deposition – Five-Year Objectives and Actions	
Objectives	**Actions**
1. Continue regional mercury emissions reduction initiative.	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. Continue 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. The State of Connecticut has a consumption advisory to the public on fish captured in freshwaters due to mercury contamination, similar to the majority of states in the conterminous USA. The advisory was initiated shortly after the conclusion of the first statewide assessment in 1995-96, and was continued after a second assessment in 2005-06. The second assessment found lower levels generally, although levels remained above thresholds commonly advocated as leading to risk among consumers. A project was initiated in 2019 that will reevaluate the mercury concentration in fish tissue from these same 51 lakes, repeating the majority of sites used in the previous two statewide assessments. These data will be used to evaluate trends and make recommendations for fish consumption advisory in the state. *Lead Agencies: CT DEEP, CT DPH*

5 NPS Program Funding and Evaluation

5.1 NPS Program Funding

In Connecticut programs that address NPS pollution are supported with both federal and state funds. 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.

Section 319 of the federal Clean Water Act 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. The Section 319 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 projects while "NPS program" funding supports the full range of nonpoint source program and planning activities. Current EPA guidance allows states to use up to 50% of the annual Section 319 grant award for "NPS program" activities while states must use as least 50% of the annual grant award for "watershed projects" to implement watershed projects guided by EPA approved Watershed Based Plans (WBP) or an EPA approved equivalent plan.

CT DEEP uses a portion of the 319 program funds through its EPA Performance Partnership Grant (PPG) to support regulatory and non-regulatory staff in water quality, watershed management, planning, technical assistance, and project oversight programs. The remaining Section 319 funding that is not used as PPG program funds is called the categorical grant and is used for implementation projects in basins with approved WBPs or planning projects such as WBP development. These funds typically go to grantees outside CT DEEP. A major focus of Connecticut's NPS Program is to implement WBP plan recommendations related to impairments listed in the "State of Connecticut Integrated Water Quality Report" (IWQR) and 303(d) list of impaired waters.

EPA Section 319 funds support only a small portion of the overall nonpoint source activities in Connecticut. Other Federal funds include NRCS EQIP funds that go directly to producers, EPA's Long Island Sound Study grants, grants from the US Fish and Wildlife Service, Coastal Zone Management Act funds awarded by the National Oceanic and Atmospheric Administration, and EPA 604b Water Quality Planning grants. FEMA Pre-Disaster Mitigation Funds also support projects in Connecticut. Other funding sources from other federal, state agencies, and private foundations are used when available. A list and description of these funding sources is provided in **Appendix E**.

Additional funding for NPS control is embedded in various CT DEEP programs. For example CT DEEP, through the Clean Water Fund (CWF), extends sanitary sewers or establishes decentralized wastewater management systems in areas with failing septic systems. The CWF also provides grants and loans to municipalities with combine sewer overflows for green infrastructure projects. Green Infrastructure project proposals must compete with other proposals to be considered under

the Biennial Clean Water Fund Priority List. They must also demonstrate compliance to achieving the goals of the local Long Term Control Plan for CSO abatement, if they are to be considered for Clean Water Revolving Funds and Loans. Through state bond funds, Connecticut provides 95% of the funding for the CWF. CT DEEP provides grants to communities for open space acquisition or purchases properties directly to preserve undeveloped areas. Purchase of open space protects properties from development and protects water quality. Recently the Connecticut General Assembly passed legislation to establish the Passport to Parks program. The Passport to Parks Program uses a ten dollar charge on vehicle registrations to fund Connecticut Parks. Funding from the Passport to Parks also goes to Connecticut's five Conservation Districts and the Council on Soil and Water. Connecticut's five Conservation Districts are on the frontline in controlling NPS pollution throughout Connecticut.

Connecticut provides a 40% match to the Section 319 grant. Connecticut's match comes from contributions from partners for individual projects, salaries for CT DEEP staff who are funded by the Connecticut's General fund, and from NPS related CWF projects. Connecticut also contributes to Section 319 funded projects when project costs go beyond the amount usually funded by Section 319 grants. In 2018 CT DEEP contributed Supplemental Environmental Funds (SEP) to two projects, both of which cost over million dollars. With larger NPS projects, the Section 319 funds are the seed money needed to begin and develop the project and help to secure larger sources of funds.

The primary Connecticut Nonpoint Source Program staffing consists of three Watershed Coordinators and a NPS Coordinator Supervisor. They work within CT DEEP and externally with other state agencies, the 169 municipalities in Connecticut and all of the program partners listed in Section 2.1. The Watershed Coordinators 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 are presented in Connecticut's Nonpoint Source Program Annual Reports.

Connecticut's FY 2019 319 PPG program funds are used to support CT DEEP Water Planning and Management Program staff including full funding of two full time Watershed Coordinators, partial funding two full time staff in the Water Quality 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, Watershed, and Water Quantity Programs. The State's Nonpoint Source Program is embedded within the Watershed Program and works seamlessly within the other CT DEEP Water Planning and Management Division Programs of the Bureau of Water Protection and Land Reuse.

5.2 NPS Program Evaluation

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

National Guidelines: Use the Nonpoint Source Program and Grants Guidelines for States and Territories released on April 12, 2013, to identify eligible activities, program priorities, programmatic conditions, and reporting requirements. At least 50% of 319 funding will be used for implementing watershed-based plans (WBP) to protect or restore priority water bodies. One nine-element WBP per state will be submitted annually to the Region for review; all alternative watershed-based plans will be submitted to the Region for review and approval. Continue to work with USDA through participation on the State Technical Committee and to support the National Water Quality Initiative, including monitoring. Complete annual Grants Reporting and Tracking System (GRTS) reporting by February 28th, and enter all mandatory GRTS data elements within 90 days of a categorical grant or final PPG award. Submit an annual work plan and schedule that describes proposed 319-funded work, outputs, staffing, environmental outcomes, and budget, consistent with management plan milestones.
NPS meetings/training: A representative of the State's NPS program is expected to attend national and regional NPS and GRTs training workshops, conferences and meetings convened by EPA unless prevented by state-wide travel bans. Annual state work plans should include adequate 319 funds to cover travel expenses for NPS program staff to participate unless state funds are available for this purpose.
Success Stories: Submit success stories for impairments eliminated in previous years (Type 1 stories) and/or that show improvement in water quality (Type 2 stories) or demonstrate ecological restoration (Type 3 stories). To do this, identify impairments eliminated or waterbodies with demonstrated water quality or habitat improvements, and investigate whether local, state, federal or private NPS mitigation occurred that might make these waterbodies a candidate for a NPS Success Story. Using EPA's guidance (https://www.epa.gov/nps/success-stories-about-restoring-water-bodies-impaired-nonpoint-source-pollution), prepare and submit to EPA candidate success stories (via the Grants Reporting Tracking System portal) by July 15th. See http://water.epa.gov/polwaste/nps/success319/ for examples of success stories and other information.
Annual Report: In accordance with the CWA and following the current Nonpoint Source Program and Grants Guidelines, report annually on progress made in implementing the State's NPS Management Program, including a summary of major accomplishments and completed milestones, a description of 319-funded statewide programs and completed 319-funded watershed projects, a list of active 319 projects with expected completion dates, a brief summary of water quality improvements (e.g. restoration of impaired waters or other notable environmental results) and NPS pollutant load reductions (total phosphorus, nitrogen, and sediment reductions for the state, from the previous February's GRTS reporting). Where information is not yet available on load reductions and water quality improvement where implementation is underway, surrogate measures of environmental progress should be used.
Satisfactory Progress Review: EPA will use information provided by the state (annual report, workplan, GRTS entry, success stories) to determine whether the State has made satisfactory progress in implementing its NPS Management Program in accordance with CWA Section 319(h)(8). If appropriate, EPA will request additional information to assist with the determination. EPA will complete an annual checklist on Progress and Performance and document its findings.

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.

6.1 Stormwater Management Design Guidance

The most direct way that climate change affects nonpoint source pollution is through increased stormwater runoff due to increased storm intensity. State guidance manuals on stormwater management and erosion and sedimentation were developed nearly 20 years ago (2004 and 2002, respectively). Therefore, one way in which CT DEEP plans to prepare for the climate change challenge is by working with partners in other state agencies to update these statewide planning documents. The CT Council on Soil and Water Conservation has also prioritized the update to these documents as an objective in their Plan of Work.

6.2 Resiliency and Adaptation

In 2013, 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. 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 (see previous section).

In 2017, the Wood-Pawcatuck Flood Resiliency Management Plan was produced by Fuss & O'Neill for the Wood-Pawcatuck Watershed Association. This plan was developed "to help local decision-makers think more strategically about ways to utilize natural systems to provide more effective strategies to reduce flooding, while also benefitting the watershed ecosystem. The protection and restoration of natural resources in the watershed will reduce flood potential while protecting water quality and ecological health." (Fuss & O'Neill, 2017, p. 13). Many of the elements of this plan overlap with the nine-element watershed based plans for 319 projects. Therefore, the Wood-Pawcatuck plan can serve as a template for other watershed associations to use if they want to incorporate flood hazard mitigation into their watershed plans where there is overlap with fixing water quality impairments.

In 2018, the CT Legislature passed Public Act 18-82, An Act Concerning Climate Change Planning And Resiliency. The Act called for the University of Connecticut to publish a sea level change scenario every 10 years. The most recent prediction is for a 50 cm (20 inch) increase in sea level by 2050 (see https://circa.uconn.edu/sea-level-rise/). The predicted sea level rise must be considered in "flood proofing" evaluations for state projects or publically funded projects, plans for municipal evaluation and hazard mitigation plans, civil preparedness plans, and plans of conservation and development.

6.3 Greenhouse Gas Emissions

In addition to adapting to the changing climate, CT DEEP is taking action to reduce greenhouse gas emissions. The following paragraphs summarize CT DEEP's activities related to this topic. However, because emission reductions are outside the scope of CT DEEP's nonpoint source programs, Table 6-1 does not list any measurable milestones related to this topic.

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. With the passage of the 2008 Global Warming Solutions Act and the 2018 Act Concerning Climate Change Planning and Resiliency, the state is statutorily required to reduce emissions to 10 percent below 1990 levels by 2020 and 45 and 80 percent below 2001 levels by 2030 and 2050, respectively. Since 2004 the state has achieved a rapid decline in emissions, primarily a result of power sector emission reductions associated with improved energy efficiency, a shift from dirtier fossil fuels such as coal and oil to natural gas, and increased deployment of renewable energy sources. Connecticut is implementing a suite of complementary strategies to ensure that the state is on a course to achieve its mandatory GHG reductions. The range of GHG reduction actions include direct regulations, monetary and non-monetary incentives, market-based mechanisms, and recognition for voluntary actions.

The creation of the Governor's Council on Climate Change (GC3) in 2015 through Executive Order No. 46, required that the Council "examine the efficacy of existing policies and regulations designed to reduce greenhouse gas emissions and identify new strategies to meet the established emission reduction targets" and to "establish interim goals that, if met, will ensure that the state will achieve

the 2050 target." After a thorough review of a variety of mitigation scenarios that drive down GHG emissions in the electric, building, and transportation sectors, the GC3, through consensus, recommended an economy-wide reduction target of 45 percent below 2001 levels by 2030. As one of the most ambitious mid-term reduction targets in the nation, the selected target ensures Connecticut is on a downward trajectory from today's GHG emissions to its mandated 80 percent reduction by 2050 target. The GC3's mid-term reduction target recommendation was adopted by the General Assembly and signed into law in June 2018 (An Act Concerning Climate Change Planning and Resiliency (Public Act 18-82). In addition to setting a mid-term target, the GC3 released a set of recommendations to meet the mid-term target in the report *Building a Low Carbon Future for Connecticut, Achieving a 45% reduction by 2030.* The recommendations in the report build upon the successful policies and measures the state has implemented to date, propose strengthening existing programs, and put forth new strategies to help Connecticut reach its mid- and long-term GHG reduction targets. The recommendations underscore that there is no single solution; instead, they offer a balanced mix of strategies that allow for flexibility and mid-course adjustments as technologies and costs change over time. More specifically the recommendations in the report lay out a long-term vision for decarbonizing Connecticut's economy through three primary strategies:

- Zero-carbon electricity generation
- Clean transportation
- Clean, efficient, and resilient buildings

CT DEEP will continue implementing the strategies outlined in the GC3 report as well as its Comprehensive Energy Strategy in order to maintain and advance progress toward the goal of reducing statewide climate-disrupting emissions by 80 percent from 2001 levels by mid-century.

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. Upon completion of the 2017-18 program review process, the RGGI states committed to a regional emissions cap in 2021 equal to 75,147,784 tons with an annual decline of 2.275 million tons of CO2 per year, which is equivalent to a 30% reduction in the regional cap from 2020 to 2030. 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.

Resources and References

- CT DEEP Climate Change Website: http://www.ct.gov/deep/climatechange
- Connecticut Institute for Resilience & Climate Adaptation (CIRCA) https://circa.uconn.edu/
- Building a Low Carbon Future for Connecticut, Achieving a 45% reduction by 2030 https://www.ct.gov/deep/lib/deep/climatechange/publications/building_a_low_carbon_future_for_ct_gc3_recommendations.pdf

- Connecticut Comprehensive Energy Strategy
  https://www.ct.gov/deep/cwp/view.asp?a=4405&q=500752&deepNav_GID=2121
- 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 the Water Sector Website:
  https://www.epa.gov/climate-change-water-sector

6-1. Climate Change – Five-Year Objectives, Actions, and Milestones								
Objectives	**Actions**	**Milestones**	**Schedule**					
			2020	**2021**	**2022**	**2023**	**2024**
1. Update State stormwater design manuals to reflect observed increases in frequency and intensity of large storms.	1. Engage and work with partner agencies to develop a scope of revision to the guidance documents to account for observed increases in extreme precipitation. *Lead Agencies: CT DEEP, CT CSWC* *Partners: CT DOT, CT DCS, UConn*	Memo documenting agreement on the scope of revisions to the State guidance documents (CT Stormwater Manual and Erosion and Sedimentation Guidelines) completed					X
2. Incorporate climate change and flood resiliency into watershed planning.	1. Pilot study to incorporate flood resiliency assessments, following the example from the Wood-Pawcatuck Flood Resiliency Management Plan (2017), into one EPA 9-element watershed based plan where there is overlap with fixing water quality impairments. 2. If Action #1 is successful, incorporate flood resiliency assessments into additional watershed based plans. *Lead Agency: CT DEEP* *Partners: Watershed Groups, Municipalities*	Pilot study for watershed based plan with flood resiliency assessment completed. Additional watershed based plans with flood resiliency assessments completed.			1	1	1

7 References

Bellucci, C. (2007). *Stormwater and Aquatic Life: Making the Connection Between Impervious Cover and Aquatic Life Impairments for TMDL Development in Connecticut Streams*. TMDL 2007. Water Environment Federation.

CT DEEP (2012). *2012 State of Connecticut Integrated Water Quality Report*. December 17, 2012.

CT DEEP (2013). *Draft Proposal for a Transformed Cleanup Program*. February 7, 2013.

CT DEEP (2014). Active Landfill Sites in Connecticut. http://www.ct.gov/deep/cwp/view.asp?a=2718&q=325462&deepNav_GID=1646. Website accessed on June 13, 2014.

CT DEEP (2014). *Taking Action on Climate Change 2014 Progress Report*. Issued Pursuant to Connecticut General Statutes Section 22a-200a, Public Act 08-98: An Act Concerning Global Warming Solution. June 6, 2014.

CT DEEP (2016). 2016 State of Connecticut Integrated Water Quality Report. April 25, 2017

CTDOT (2011). *2011 Master Transportation Plan (2011-2015)*. State of Connecticut Department of Transportation. January 2011.

EPA (2014). National Water Quality Inventory Report to Congress – National Summary of State Information. http://ofmpub.epa.gov/waters10/attains_nation_cy.control. Website accessed on September 3, 2014.

Lopez, R.A., Boehm, R., Pineda, M., Gunther, P., and Carstensen, F. Economic Impacts of Connecticut's Agricultural Industry: Update 2015. (2017) Zwick Center for Food and Resource Policy Outreach Report No. 47, University of Connecticut, September 2017. Published online: http://www.zwickcenter.uconn.edu/news_59_1295854761.pdf.

New England Interstate Water Pollution Control Commission (NEIWPCC) (2007). Northeast Regional Mercury Total Maximum Daily Load. October 24, 2007.

USDA Forest Service (2005). *Urban Watershed Forestry Manual - Part 1: Methods for Increasing Forest Cover in a Watershed.* U. S. Department of Agriculture Forest Service, Northeastern Area, State and Private Forestry, NA-TP-04-05; July 2005. http://www.forestsforwatersheds.org/storage/completePart1ForestryManual.pdf. Website accessed on June 30, 2014.

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(s) 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(s) 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, (https://www.epa.gov/nps/handbook-developing-watershed-plans-restore-and-protect-our-waters).

Appendix C

Connecticut Interim NPS Priority Watersheds List

Connecticut DEEP, through its TMDL Visioning initiative, uses Integrated Water Resource Management and the Recovery Potential Tool to develop a list of priority watersheds for restoration efforts. More details on the Integrated Water Resource Management process are found at: https://www.ct.gov/deep/iwrm. The website provides an overview of the IWRM approach to prioritize restoring and protecting Connecticut's waters. It also includes web links to the published IWRM document, technical support documents, public comment documents as well as an interactive Story Map to guide the reader through the process.

CT DEEP published its Integrated Water Resource Management (IWRM) strategy in 2016 to prioritize waters for restoration and protection. The IWRM 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
Water Quality Status: What is the current and trending status of water quality in the watershed?	• Impaired water (for restoration) • High quality water (for protection) • Declining status of water quality • Nonpoint source of impairment (existing or threat of)
Streamflow Condition: What is the degree of alteration from natural hydrograph?	• Class 1 Waters (for protection) • Class 3 or 4 Waters (for restoration)

Table 3-1. Prioritization Framework Summary	
Criteria	**Rationale for Selection**
Agency Prior Commitment: Have agencies already committed resources to the watershed, providing a base for restoration/protection efforts?	• 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
Public Support: Are there active watershed partners that would improve the likelihood of action at the local level?	• Presence of an active watershed group • Identification as a drinking water supply • Active, managed recreational area
Restoration (or Preservation) Potential : What is the likelihood or potential that restoration (or protection) efforts will be successful in a particular watershed?	• 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: ○ 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
Alignment with Other Agency Priorities: Would restoration or protection efforts align with other priorities identified by CT DEEP or partner agencies?	• Identified as a resource in one of several planning efforts ○ 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 ○ 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**
• Watershed Size • Maintenance of % Natural Cover • Strahler Stream Order < 3	• Watershed Size • Watershed Aquatic Barriers • Corridor Road Crossing Density • Number of Impairment Causes Listed	• 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
Watershed Land Cover % • Within Connecticut • Unimpaired Miles (Stream) • Unimpaired Acres (Lake) • Natural Cover • Forest • Wetlands • Natural Services Network	**Watershed Land Cover %** • Impervious Area • Agriculture • Pasture • Developed • Increased in Developed Classes	**Watershed Land Cover %** • Miles Assessed (Stream) • Acres Assessed (Lakes) • Protected Land • Agriculture • Pasture
Active River Area % • Natural Cover • Forest • Wetlands	**Active River Area %** • 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**
• Aquatic Life • Recreation • Fish Consumption	• Aquatic Life • Recreation • Fish Consumption • Drinking Water	• 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
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

Table 2.1 summarizes impaired rivers lakes and estuaries on Page 35 of the 2018 Integrated Water Quality Report (https://www.ct.gov/deep/iwqr). It can lead to confusion and error to make generalizations about trends from that data.

The following is a list of the Priority watersheds which is current as of this plan (September 2019). This list is included as an Appendix in the CT Integrated Water Quality Report and may be updated periodically (for a revised list in the future, see this web link - https://www.ct.gov/deep/iwqr).

Watersheds Listed[1]	Description	Cause[2]	Designated Use
Statewide Bacteria TMDL: Additional Waterbodies			
CT-C1_001	LIS CB Inner - Patchogue And Menunketesuck Rivers	Fecal Coliform	Shellfish Harvesting for Direct Consumption where Authorized
CT-C2_001	LIS CB Shore - Westbrook Harbor (East), Westbrook	Fecal Coliform	Shellfish Harvesting for Direct Consumption where Authorized
CT-C2_002	LIS CB Shore - Westbrook Harbor (West), Westbrook	Fecal Coliform	Shellfish Harvesting for Direct Consumption where Authorized
CT-C3_001	LIS CB Midshore - Westbrook Harbor, Westbrook	Fecal Coliform	Shellfish Harvesting for Direct Consumption where Authorized
CT-E1_003	LIS EB Inner - Inner Wequetequock Cove, Stonington	Enterococcus	Recreation
CT-E3_012	LIS EB Midshore - Westbrook	Fecal Coliform	Shellfish Harvesting for Direct Consumption where Authorized
CT-W1_012-SB	LIS WB Inner - Norwalk Harbor, Norwalk	Fecal Coliform	Commercial Shellfish Harvesting Where Authorized
CT-W1_012-SB	LIS WB Inner - Norwalk Harbor, Norwalk	Enterococcus	Recreation
CT-W1_021-SB	LIS WB Inner - Greenwich Harbor, Greenwich	Fecal Coliform	Commercial Shellfish Harvesting Where Authorized
CT-W1_021-SB	LIS WB Inner - Greenwich Harbor, Greenwich	Enterococcus	Recreation
CT-W2_003	LIS WB Shore - Seaside Park Beach	Fecal Coliform	Shellfish Harvesting for Direct Consumption where Authorized
CT-C3_005	LIS CB Midshore - Madison	Fecal Coliform	Shellfish Harvesting for Direct Consumption where Authorized
CT-C3_016	LIS CB Midshore - West Haven	Fecal Coliform	Shellfish Harvesting for Direct Consumption where Authorized
CT-E1_007-SB	LIS EB Inner - Mystic River (Mouth), Stonington	Fecal Coliform	Commercial Shellfish Harvesting Where Authorized
CT-E1_015-SB	LIS EB Inner - Thames River (middle), Ledyard	Fecal Coliform	Commercial Shellfish Harvesting Where Authorized

Watersheds Listed[1]	Description	Cause[2]	Designated Use
CT-E1_015-SB	LIS EB Inner - Thames River (middle), Ledyard	Enterococcus	Recreation
CT-E1_016-SB	LIS EB Inner - Thames River (Upper), Norwich	Fecal Coliform	Shellfish Harvesting for Direct Consumption where Authorized
CT-E1_016-SB	LIS EB Inner - Thames River (Upper), Norwich	Enterococcus	Recreation
CT-E1_033	LIS EB Inner - Pequotsepos Cove, Stonington	Fecal Coliform	Shellfish Harvesting for Direct Consumption where Authorized
CT-E2_010-SB	LIS EB Shore - Thames River Mouth (West), New London	Fecal Coliform	Commercial Shellfish Harvesting Where Authorized
CT4013-05-1-L1_01	Crystal Lake (Middletown)	Escherichia coli	Recreation
CT4200-00_01	Scantic River-01	Escherichia coli	Recreation
CT4200-00_02	Scantic River-02	Escherichia coli	Recreation
CT4200-00_03	Scantic River-03	Escherichia coli	Recreation
CT4200-15_01	Thrasher Brook (Somers)-01	Escherichia coli	Recreation
CT4200-28_01	Dry Brook (South Windsor/East Windsor)-01	Escherichia coli	Recreation
CT4202-00_01	Gillettes Brook (Somers)-01	Escherichia coli	Recreation
CT4203-00_01	Gulf Stream (Somers)-01	Escherichia coli	Recreation
CT4204-00_01	Abbey Brook (Somers)-01	Escherichia coli	Recreation
CT4312-00_01	Roaring Brook (Farmington)-01	Escherichia coli	Recreation
CT5206-01_01	Spoon Shop Brook (Meriden)-01	Escherichia coli	Recreation
CT5208-00_02a	Muddy River (North Haven)-02a	Escherichia coli	Recreation
CT5301-00_01	Willow Brook (Hamden)-01	Escherichia coli	Recreation
CT5304-00_01	Wintergreen Brook (New Haven)-01	Escherichia coli	Recreation
CT5306-00_02	Indian River (Orange)-02	Escherichia coli	Recreation

Watersheds Listed[1]	Description	Cause[2]	Designated Use
CT5306-01_01	Silver Brook (Orange)-01	dEscherichia coli	Recreation
CT5306-01_02	Silver Brook (Orange)-02	Escherichia coli	Recreation
CT6000-00_01	Housatonic River (Orange/Shelton/Derby)-01	Escherichia coli	Recreation
CT6000-00_02	Housatonic River (Shelton/Derby)-02	Escherichia coli	Recreation
CT6000-00_04	Housatonic River-04	Escherichia coli	Recreation
CT6014-00_01	Bog Hollow Brook (Kent)-01	Escherichia coli	Recreation
CT6019-00_01	Deep Brook (Newtown)-01	Escherichia coli	Recreation
CT6026-03_01	Cemetery Pond Brook (Stratford/Shelton)-01	Escherichia coli	Recreation
CT6402-00_01	Ball Pond Brook (New Fairfield)-01	Escherichia coli	Recreation
CT6806-00_01	Transylvania Brook (Southbury)-01	Escherichia coli	Recreation
CT6916-00-3-L4_01	Hop Brook Lake (Waterbury/Middlebury)	Escherichia coli	Recreation
CT6919-00_01	Bladens River-01	Escherichia coli	Recreation
CT7000-16_01	Muddy Brook (Westport)-01	Escherichia coli	Recreation
CT7000-16-trib_01	Unnamed trib to Muddy Brook	Escherichia coli	Recreation
CT7000-17_01	Unnamed trib, Muddy Brook (Westport)-01	Escherichia coli	Recreation
CT7000-18_01	Unnamed trib, Sherwood Millpond LIS (Westport)-01	Escherichia coli	Recreation
CT7000-29_01	Unnamed trib to Farm Creek LIS (Norwalk)-01	Escherichia coli	Recreation
CT7107-00_01	Cricker Brook (Fairfield)-01	Escherichia coli	Recreation
CT7201-00_01	Little River (Redding)-01	Escherichia coli	Recreation
CT7301-00_01	Comstock Brook (Wilton)-01	Escherichia coli	Recreation

Watersheds Listed[1]	Description	Cause[2]	Designated Use
CT7302-13_01	Belden Hill Brook	Escherichia coli	Recreation
CT2202-00_01	Latimer Brook (East Lyme)-01	Escherichia coli	Recreation
CT2204-03_01	Stony Brook (Waterford)-01	Escherichia coli	Recreation
CT3100-00_03	Willimantic River (Willington/Tolland)-03	Escherichia coli	Recreation
CT3103-00_02	Furnace Brook (Stafford)-02	Escherichia coli	Recreation
CT3208-00_01	Sawmill Brook (Mansfield)-01	Escherichia coli	Recreation
CT3208-02_01	Conantville Brook (Mansfield)-01	Escherichia coli	Recreation
CT3300-10_01	Quinatissett Brook (Thompson)-01	Escherichia coli	Recreation
CT3700-00_01	Quinebaug River (Lisbon/Griswold)-01	Escherichia coli	Recreation
CT3700-00_05	Quinebaug River-05	Escherichia coli	Recreation
CT3700-17_01	Durkee Brook (Pomfret)-01	Escherichia coli	Recreation
CT3708-00_01	Bittle River (Putnam)-01	Escherichia coli	Recreation
CT3708-18_01	Wheatons Brook (Putnam/Thompson)-01	Escherichia coli	Recreation
CT3709-00_01	Wappaquoia Brook-01	Escherichia coli	Recreation
CT3709-02_01	Day Brook (Pomfret)-01	Escherichia coli	Recreation
CT3800-00_01	Shetucket River (Norwich)-01	Escherichia coli	Recreation
CT3800-00-6+l3_01	Spaulding Pond (Norwich)	Escherichia coli	Recreation
CT3900-07_01	Kahn Brook (Bozrah)-01	Escherichia coli	Recreation
Protection Watersheds			
Upper Pawcatuck Watershed			

Watersheds Listed[1]	Description	Cause[2]	Designated Use
CT1000	Pawcatuck River	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT1001	Wyassup Brook	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT1002	Green Fall River	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT1003	Ashaway River	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
Natchaug River and Mount Hope Watershed			
CT3200	Natchaug River	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT3201	Bungee Brook	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT3202	Still River	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT3203	Bigelow Brook	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT3204	Stonehouse Brook	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT3205	Squaw Hollow Brook	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT3206	Mount Hope River	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT3207	Fenton River	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
Eightmile River Watershed: Eightmile River and East Branch Eightmile River			
CT4800	Eightmile River	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT4801	Harris Brook	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT4802	East Branch Eightmile River	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT4803	Beaver Brook	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
Headwaters of the Saugatuck River			
CT7201	Little River	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife

Watersheds Listed[1]	Description	Cause[2]	Designated Use
CT7200	Saugatuck River	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
Freshwater Restoration Watersheds			
Scantic River Regional Basin			
CT4200	Scantic River	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT4201	Wachaug River	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT4202	Gillettes Brook	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT4203	Gulf Stream	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT4204	Abbey Brook	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT4205	Buckhorn Brook	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT4206	Broad Brook	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT4207	Ketch Brook	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
Rainbow Brook / Seymour Hollow Brook			
CT4300-50	Rainbow Brook	Ethylene Glycol, Propylene Glycol	Habitat for Fish, Other Aquatic Life and Wildlife
CT4300-51	Seymour Hollow Brook	Ethylene Glycol, Propylene Glycol	Habitat for Fish, Other Aquatic Life and Wildlife
Quinnipiac River Watershed			
CT5200	Quinnipiac River	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT5201	Eightmile River	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT5202	Tenmile River	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife

Watersheds Listed[1]	Description	Cause[2]	Designated Use
CT5203	Misery Brook	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT5204	Broad Brook	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT5205	Sodom Brook	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT5206	Harbor Brook	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT5207	Wharton Brook	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT5208	Muddy River	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
Bantam Lake Watershed			
CT6703-00	West Branch Bantam River	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT6705-00	Bantam River	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT6705-00-3-L3_01	Bantam Lake (Litchfield/Morris)	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT6705-06	Tannery Brook	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT6705-07	Unnamed Brook	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT6705-08	Moulthrop Brook	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
Still River Watershed: Headwaters Still River & Limekiln Brook Still River			
CT6600	Still River	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT6601	Miry Brook	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT6602	Kohanza Brook	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT6603	Padanaram Brook	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT6604	Sympaug Brook	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT6605	East Swamp Brook	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife

Watersheds Listed[1]	Description	Cause[2]	Designated Use
CT6606	Limekiln Brook	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
Embayments and Associated Upland Watersheds			
Stonington Harbor / Pawcatuck River Embayment			
CT1000	Pawcatuck River	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT1001	Wyassup Brook	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT1002	Green Fall River	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT1003	Ashaway River	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT2000-01	Barn Island Coastal Area	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT-E1_001-SB	LIS EB Inner - Pawcatuck River (01), Stonington	Nutrients	Habitat for Marine Fish, Other Aquatic Life and Wildlife
CT-E1_002-SB	LIS EB Inner - Pawcatuck River (02), Stonington	Nutrients	Habitat for Marine Fish, Other Aquatic Life and Wildlife
CT-E2_001	LIS EB Shore - Wequetequock Cove, Stonington	Nutrients	Habitat for Marine Fish, Other Aquatic Life and Wildlife
Stony Brook Frontal			
CT2000-12	Pequotsepos Brook Coastal Area	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT2000-13	Pequotsepos Brook Coastal Area	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT2000-14	Pequotsepos Brook	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT-E1_003	LIS EB Inner - Inner Wequetequock Cove, Stonington	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT-E2_002	LIS EB Shore Stonington Point	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT-E3_001	LIS EB Midshore-Stonington	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
Mystic River			
CT2000-15	Mystic Coastal Area	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife

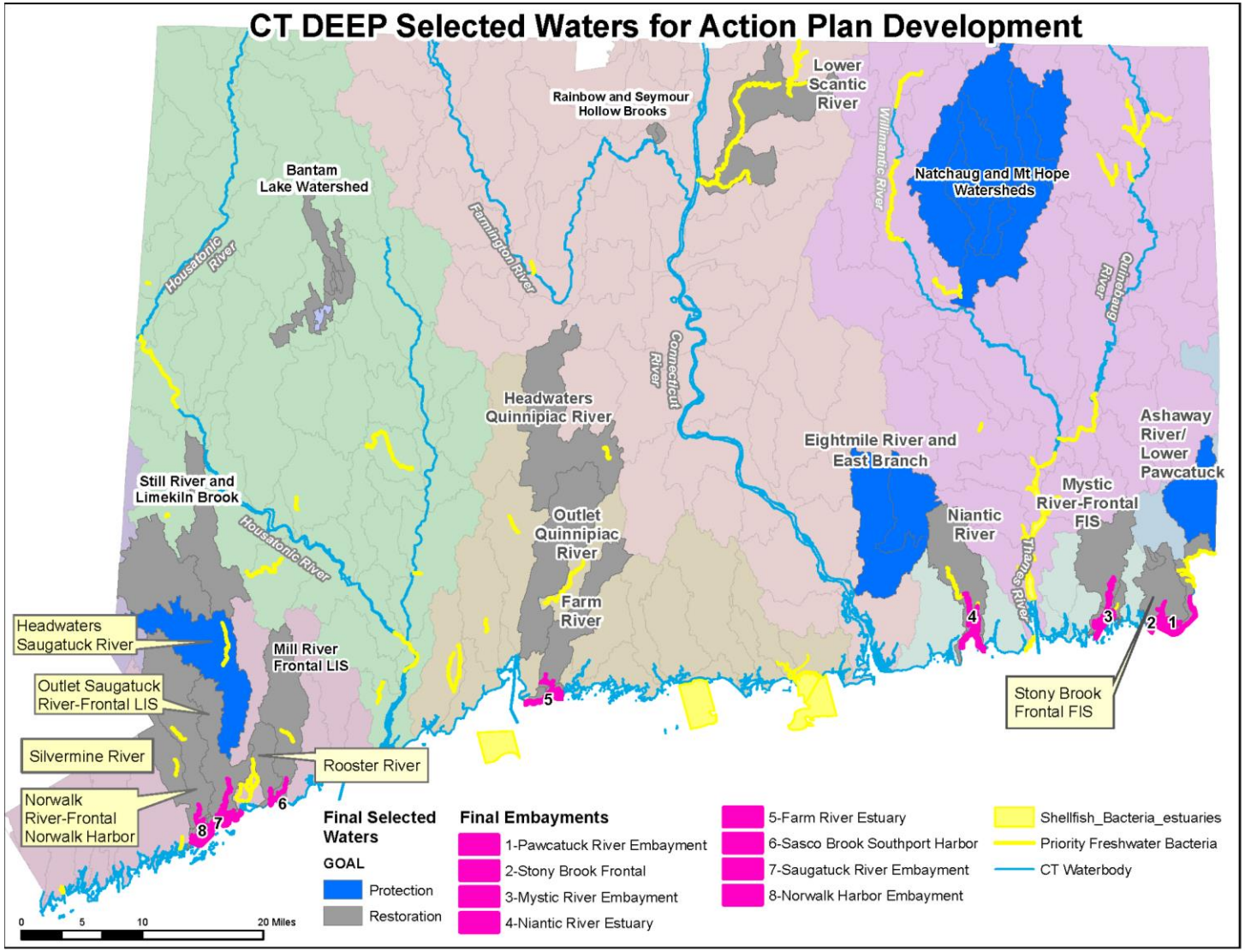
Watersheds Listed[1]	Description	Cause[2]	Designated Use
CT2000-16	Beebe Cove Coastal Area	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT2000-17	Noank Coastal Area	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT2101-01	Wheeler Brook	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT2101-02	Unnamed Brook	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT2103	Williams Brook	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT2104	Whitford Brook	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT2105	Haleys Brook	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT2106	Mystic Brook	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT-E1_007-SB	LIS EB Inner - Mystic River (Mouth), Stonington	Nutrients	Habitat for Marine Fish, Other Aquatic Life and Wildlife
CT-E1_008-SB	LIS EB Inner - Mystic Harbor, Groton/Stonington	Nutrients	Habitat for Marine Fish, Other Aquatic Life and Wildlife
CT-E1_009	LIS EB Inner - Beebe Cove (Mystic Harbor), Groton	Nutrients	Habitat for Marine Fish, Other Aquatic Life and Wildlife
Niantic River Estuary			
CT2000-38	Millstone Point Coastal Area	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT2000-39	Black Point Coastal Area	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT2202	Latimer Brook	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT2203	Oil Mill Brook	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT2204	Niantic River	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT-E1_020	LIS EB Inner - Niantic River (mouth), Niantic	Nutrients	Habitat for Marine Fish, Other Aquatic Life and Wildlife
CT-E2_013	LIS EB Shore - Niantic Bay (East), Waterford	Nutrients	Habitat for Marine Fish, Other Aquatic Life and Wildlife
CT-E2_014	LIS EB Shore - Niantic Bay (West), East Lyme	Nutrients	Habitat for Marine Fish, Other Aquatic Life and Wildlife

Watersheds Listed[1]	Description	Cause[2]	Designated Use
Farm River Embayment			
CT5000-42	Short Beach Coastal Area	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT5000-43	Momaugum Coastal Area	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT5000-44	Momaugum Coastal Area	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT5112	Farm River	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT-C1_011	LIS CB Inner – Farm River, East Haven	Nutrients	Habitat for Marine Fish, Other Aquatic Life and Wildlife
CT-C2_015-SB	LIS CB Shore - Pages Cove, Branford	Nutrients	Habitat for Marine Fish, Other Aquatic Life and Wildlife
CT-C2_016-SB	LIS CB Shore - New Haven Harbor (East), East Haven	Nutrients	Habitat for Marine Fish, Other Aquatic Life and Wildlife
Southport Harbor / Sasco Brook Embayment			
CT7000-10	Sasco Hill Beach Coastal Area	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT7000-11	Southport Coastal Area	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT7000-12	Frost Point Coastal Area	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT7107	Cricker Brook	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT7108	Mill River	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT7109	Sasco Brook	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT-W1_005	LIS WB Inner - Southport Harbor, Fairfield	Nutrients	Habitat for Marine Fish, Other Aquatic Life and Wildlife
CT-W1_006	LIS WB Inner - Mill River, Fairfield	Nutrients	Habitat for Marine Fish, Other Aquatic Life and Wildlife
CT-W1_007	LIS WB Inner - Sasco Brook, Westport	Nutrients	Habitat for Marine Fish, Other Aquatic Life and Wildlife
CT-W2_006	LIS WB Shore - Southport Harbor (East), Fairfield	Nutrients	Habitat for Marine Fish, Other Aquatic Life and Wildlife
CT-W2_007	LIS WB Shore - Southport Harbor (West), Fairfield	Nutrients	Habitat for Marine Fish, Other Aquatic Life and Wildlife

Watersheds Listed[1]	Description	Cause[2]	Designated Use
Saugatuck River Embayment			
CT7000-20	Compo Coastal Area	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT7000-21	Compo Coastal Area	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT7000-22	Indian River Coastal Area	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT7200	Saugatuck River	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT7201	Little River	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT7203	West Branch Saugatuck River	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT-W1_009	LIS WB Inner - Grays Creek, Westport	Nutrients	Habitat for Marine Fish, Other Aquatic Life and Wildlife
CT-W1_010-SB	LIS WB Inner - Saugatuck River (mouth), Westport	Nutrients	Habitat for Marine Fish, Other Aquatic Life and Wildlife
CT-W1_011	LIS WB Inner – Saugatuck River, Westport	Nutrients	Habitat for Marine Fish, Other Aquatic Life and Wildlife
CT-W2_010	LIS WB Shore - Compo Beach, Cedar Point, Westport	Nutrients	Habitat for Marine Fish, Other Aquatic Life and Wildlife
CT-W2_011	LIS WB Shore - Canfield Island, Westport	Nutrients	Habitat for Marine Fish, Other Aquatic Life and Wildlife
Norwalk Harbor Embayment			
CT7000-23	Davidge Brook	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT7000-24	Kettle Creek	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT7000-25	Unnamed Brook	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT7000-26	Poplar Blains Brook	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT7300	Norwalk River	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT7301	Comstock Brook	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife
CT7302	Silvermine River	Nutrients	Habitat for Fish, Other Aquatic Life and Wildlife

Watersheds Listed[1]	Description	Cause[2]	Designated Use
CT-W1_012-SB	LIS WB Inner - Norwalk Harbor, Norwalk	Nutrients	Habitat for Marine Fish, Other Aquatic Life and Wildlife
CT-W1_013-SB	LIS WB Inner - Norwalk Harbor (Marvin Beach), Norwalk	Nutrients	Habitat for Marine Fish, Other Aquatic Life and Wildlife
CT-W2_012	LIS WB Shore - Outer Norwalk Harbor(East), Norwalk	Nutrients	Habitat for Marine Fish, Other Aquatic Life and Wildlife
CT-W2_013	LIS WB Shore - Outer Norwalk Harbor(West), Norwalk	Nutrients	Habitat for Marine Fish, Other Aquatic Life and Wildlife

The following map displays Connecticut DEEP's selected waterbodies for prioritization which will be updated as more information becomes available:



Appendix D

Developed Area Runoff BMP Selection Guidance

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

DEEP also developed a list of Best Management Practices to mitigate nonpoint source phosphorus included as **Table 5.2.1 Removal Efficiency, Capital Costs, Maintenance Costs, Type, and Frequency, and Cost Effectiveness for Urban Stormwater Best Management Practices (BMPs)** in the Nonpoint Source Workgroup Report to P.A. 12-155 Coordinating Committee. The Report is online at https://www.ct.gov/deep/lib/deep/water/water_quality_standards/p/nps_p_workgroup_report.pdf

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	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.	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

Connecticut Nonpoint Source Management Program – Potential Funding Sources		
Funding Source	**Description**	**Reference**
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.	https://www.epa.gov/urbanwaterspartners/five-star-and-urban-waters-restoration-grant-program-2018
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/
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.	https://www.fws.gov/birds/grants/north-american-wetland-conservation-act.php
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/

Connecticut Nonpoint Source Management Program – Potential Funding Sources		
Funding Source	**Description**	**Reference**
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/
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.	https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial/csp
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 Environmental Quality Incentives Program (EQIP)	For implementation of conservation measures on agricultural lands.	http://www.ct.nrcs.usda.gov/programs/eqip/eqip.html

Connecticut Nonpoint Source Management Program – Potential Funding Sources		
Funding Source	**Description**	**Reference**
NRCS Healthy Forests Reserve Program	For restoring and enhancing forest ecosystems	http://www.nrcs.usda.gov/programs/hfrp/proginfo/index.html
EPA Section 319 Grant Program	Under the federal Clean Water Act, EPA Section 319 funds are awarded to CT DEEP to administer a grant program 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/nps
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.	Contact the CT DEEP Water Planning and Management Division at (860) 424-3000
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/cleanwaterfund

Connecticut Nonpoint Source Management Program – Potential Funding Sources		
Funding Source	**Description**	**Reference**
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&depnav_gid=1654
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 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=|
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
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

Connecticut Nonpoint Source Management Program – Potential Funding Sources		
Funding Source	**Description**	**Reference**
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.cwrp.org/
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://beta.sam.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
  https://www.epa.gov/waterdata/water-finance-clearinghouse

- EPA Watershed Funding
  http://water.epa.gov/aboutow/owow/funding.cfm

- EPA Green Infrastructure Funding Website
  https://www.epa.gov/green-infrastructure/green-infrastructure-funding-opportunities

- Foundation Center: Philanthropy News Digest
  http://foundationcenter.org/pnd/rfp/cat_environment.jhtml

- USDA National Agriculture Library: Water and Agriculture Information Center
  https://www.nal.usda.gov/waic