

CONNECTICUT DEPARTMENT OF ENVIRONMENTAL PROTECTION

NONPOINT SOURCE MANAGEMENT PROGRAM 2006 & 2007 ANNUAL REPORT



Lieutenant River, Old Lyme, CT
Photo Courtesy of Mark Parker, CT
DEP

Nonpoint Source (NPS) pollution is usually caused by rainwater from cities, impervious paved areas, construction sites, and farms. NPS pollution occurs when rainfall, snowmelt, or irrigation, runs over land or through the ground, picks up pollutants, and deposits them into rivers, lakes, and groundwater. NPS pollutants also includes adverse changes to the vegetation, shape, and flow of streams and other aquatic systems.

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I. INTRODUCTION

The Connecticut Department of Environmental Protection (CT DEP) Nonpoint Source (NPS) Program works to abate known water quality impairments and prevent significant threats to water quality from nonpoint source pollution. A significant strength of the program is its networked approach to nonpoint source management. CT DEP has formed partnerships with a wide range of public agencies, industry organizations, and private (citizens) groups to implement nonpoint source management. Connecticut's NPS Program is well-balanced, with an appropriate mix of statewide programs and geographically targeted watershed projects. The state NPS Program includes all the components required under the federal Clean Water Act (CWA) Section 319(h) (Nonpoint Source Management Programs).

Resources

The CT DEP NPS Program is supported by both federal and state funds. The CT DEP Bureau of Water Protection and Land Reuse (BWPLR) administers grants funded under the Clean Water Act (CWA) Section 319(h). From FY90-07, Section 319 grants totaling almost \$21 million have supported 411 projects and CT DEP NPS Program staff salaries. Of these 411 projects, 175 projects were active between beginning January 2006 and December 2007. CT DEP closed out 52 projects in during this period. Since FY97, 25-30 percent of the total Section 319 allocation to Connecticut has been awarded as part of the state's Performance Partnership Grant (PPG), primarily to support NPS Program-related staff positions. The remaining allocation funded projects that are generally targeted to watersheds identified by the state as impaired (i.e., not meeting state water quality standards), and/or for which the development of total maximum daily load (TMDL) analyses are required.

CT DEP State funds support staff in other units that are involved in various aspects of NPS management. State bond and other special legislative acts provide funds for special projects and grant programs targeting specific resources. Coastal Zone Management Act (CZMA) funds, awarded by the National Oceanic and Atmospheric Administration (NOAA), support CT DEP Office of Long Island Sound Programs (OLISP) nonpoint source management efforts in the coastal area. Numerous other funding sources, from other federal and state agencies, and private foundations, are utilized when available.

II. CT DEP NPS MANAGEMENT STRUCTURE

The NPS Program is responsible for coordinating the NPS management activities of various units throughout the CT DEP, as well as those being conducted by other state, county, and municipal organizations within the state. Numerous NPS Program activities are implemented by the BWPLR, which is organized into three divisions with the following responsibilities:

Planning and Standards Division (PSD): Adopts water quality standards and classifications for the state's surface and groundwater resources; monitors and assesses the quality of water resources; administers the TMDL program, watershed, and lakes management programs; conducts NPS Program planning and coordination; manages the planning, design, construction and permitting of municipal sewage treatment facilities; administers the state's revolving fund,

the Clean Water Fund (CWF); and provides support functions for the other bureau divisions for necessary planning, program development, and technical and administrative assistance.

Inland Water Resources Division (IWRD): Regulates activities in the state's inland wetlands, watercourses, and flood plains, including oversight of municipal Inland Wetland Agencies; enforces the state's inland wetland and floodplain protection statutes; manages allocation of water resources through diversion permitting; and prevents or mitigates natural disasters through flood warning, emergency recovery efforts from flooding, and dam safety programs.

Office of Long Island Sound Program (OLISP): The CT DEP Office of Long Island Sound Programs (OLISP) also has NPS management responsibilities. OLISP administers the state's Coastal Zone Management Program, and is responsible for developing and administering in conjunction with the BWPLR, the state Coastal Nonpoint Pollution Control Program (CNPCP) pursuant to Section 6217 of the Coastal Zone Act Reauthorization Amendments (CZARA). OLISP also is responsible for administering statutes related to coastal NPS problems, including the state's Tidal Wetlands Act and Structures, Dredging, and Fill Act.

Remediation/Sites Clean-up: The Remediation Division oversees the investigation and remediation of environmental contamination and the redevelopment of contaminated properties. The Division's goal is to clean up contaminated sites to meet Connecticut's Remediation Standards Regulations, which ensure that human health and the environment are protected. The Remediation Division staff, with the help of Licensed Environmental Professionals (LEPs), oversees the clean-up of hundreds of contaminated sites across Connecticut.

There are also several other CT DEP units that perform NPS Program support activities. The CT DEP Office of Communication and Publications supports outreach and education on NPS issues to municipal agencies, the general public, and teachers. The Office of Information Management (OIM) houses the department's Geographic Information System (GIS) staff, whose members are responsible for collecting and digitizing all manner of data relevant to water resource management in the state. The GIS Office is responsible for coordinating GIS activities that involve CT DEP and other federal, state, and local government agencies. Over the past couple of years, the GIS Office has expanded its program to include GIS activities and issues that relate specifically to NPS management.

Program Coordination

The CT DEP NPS Program Coordinator is responsible for the overall management of the program, and for coordination of state, regional, and local NPS management activities. This involves working closely with EPA, the USDA Natural Resources Conservation Service (NRCS), the University of Connecticut Cooperative Extension System (UConn/CES), the soil and water conservation districts, and other NPS Program partners. The coordinator is also responsible for the technical review, ranking, and implementation of all Section 319 NPS grant-supported projects, including reporting on progress to EPA, coordinating NPS meetings, and organizing issue-based groups involved in NPS management.

One of the major tasks of the NPS Coordinator is working with CT DEP Watershed Managers to identify, prioritize, and oversee watershed projects being conducted by local organizations, including the Connecticut soil and water conservation districts (SWCDs) and their partners. The NPS Program Coordinator continues to ensure that Connecticut's program meets the requirements of CWA Section 319 and associated state statutes and regulations.

In 2006 & 2007, Section 319 funds in the PPG were used to support the following staff: NPS program coordinator, Water Bureau administrative assistant, two watershed managers, two subsurface staff, one full time cartographer and one position for data management (305[b]). These staff help integrate NPS Program goals and objectives into their own programmatic areas.

CT DEP is an active participant in the New England Interstate Water Pollution Control Commission's (NEIWPCC) NPS Work Group. The purpose of the work group is to promote technical transfer among NPS managers at the federal, state, regional, and local levels in the New England states, and New York.

Monitoring and Data Management

Section 319 funds supports two staff positions in the water quality monitoring and data management unit: the Volunteer Monitoring Coordinator and the 305(b) Coordinator. The Volunteer Monitoring Coordinator assists in evaluating and assessing water quality data, and provides assistance to volunteer monitoring organizations to improve data quality. This includes working closely with monitoring programs funded under section 319, like the Connecticut River Watch Program, and the Earthwatch (formerly Harborwatch/Riverwatch) program in the Norwalk River watershed. One of the major program responsibilities is to review and assist with the development of Quality Assurance Project Plans (QAPP), which assure the scientific reliability of data collected for these federally funded projects. DEP and EPA must approve these plans. This program has fostered the development of a volunteer monitoring database linked to a Geographic Information System, and improved evaluation of volunteer data.

The 2007 summary report for the Rapid Bioassessment in Wadeable Streams and Rivers by Volunteer Monitors can be seen on the DEP web page under the Bureau of Water Protection and Land Reuse, volunteer monitoring heading (http://www.ct.gov/dep/cwp/view.asp?a=2719&q=325606&depNav_GID=1654). This program enables citizen groups to collect useful data for DEP by combining the utility of invertebrate indicators with a non-technical methodology. Prior to sampling, a three-hour training session was held where over 200 individuals participated in this water quality-monitoring program. Participants have included watershed associations, college ecology classes, town conservation commissions, and sporting clubs.

Number of monitoring locations	92
Number of waterbodies monitored	66
Number of individual participants	325
Number of groups	26
Number of groups participating for the first time	6
Number of returning groups	20

Data collected according to the RBV protocol can be used as a screening tool to identify stream sections with either very high or very low water quality. The documentation of key indicator organisms in a section of a stream provides a record of the benthic community present for a collection date and time. **Since the program inception in 1999 just over 323 river miles of fully supporting river miles have been used in the 305(b) water quality report to Congress.**

The primary responsibility of the 319-funded 305(b) Coordinator is to assemble available information and prepare a biennial "Water Quality Report to Congress" or 305(b) Report, as required under Section 305(b) of the federal Clean Water Act (CWA). To make water quality assessments, the CT DEP relies primarily on its own monitoring data, and data generated by the U.S. Geological Survey. Volunteer, municipal, academic, and Project SEARCH monitoring data are also incorporated into water quality assessments if the data meet certain quality standards. The 305(b) coordinator also worked closely with TMDL staff to prepare the 2006 Connecticut Impaired Waters List, which is required by Section 303(d) of the CWA and was generated as a subset of 305(b) assessed waters.

Outreach and Education

Project SEARCH is a collaborative program of the CT DEP and The Children's Museum, and provides equipment, training, and technical support to high school and select middle school teachers who have incorporated a water quality monitoring program as part of their science curriculum. Funding for this program, which was initiated through a National Science Foundation grant, is now provided by CT DEP General Funds and section 319.

In 2006 and 2007, Project SEARCH continued to work with teachers and students from over 145 public and private high schools and middle schools across Connecticut to collect water quality data on rivers and streams within their communities. Schools collected water chemistry data, assessed habitat quality (including potential NPS pollution), and surveyed benthic macroinvertebrate communities in the fall and spring at their monitoring sites. SEARCH staff conducted 215 school site visits including 156 field sampling trips to provide technical support to teachers and collect replicate data for the project QAPP, 24 classroom training sessions with students on SEARCH methods, and 13 planning and introductory sessions with teachers establishing new SEARCH programs in their curricula.

In both years, SEARCH staff conducted 3-day workshops in August to train new teachers entering the program. A total of 27 teachers participated in these SEARCH workshops. A field-intensive program has been developed and is used to build teacher confidence with implementing the monitoring techniques with their students. The involved teachers participate in all components of the SEARCH program and determine the water quality of the training site at the completion of the workshop. An estimated 175-195 teachers and 4,000-4,500 students in grades 9-12 participated in SEARCH activities throughout both calendar years.

Water quality data was collected from 173 sites on 133 rivers and streams. SEARCH staff collected 186 replicate samples for the project's Quality Assurance/Quality Control (QA/QC) analysis, and prepared annual reports, *Project SEARCH: Water Quality Data Summary Report 2006* and *2007*, that summarized the results of the stream surveys. SEARCH staff successfully integrated NPS issues into new data collection sheets the schools use during their trips. Several schools have started to collect the NPS data in addition to their other data. New teachers receive training on the use of the sheet and discuss NPS issues and sources with their students during the summer workshop. Several schools have continued their use of the GIS land use/cover mapping component to the program to facilitate understanding of NPS issues with their students. At the conclusion of the GIS lessons, the students will be able to generate watershed maps of their stream with land use types highlighted and connected to their water quality samples.

Geographic Information

The NPS Program receives GIS support services from trained Bureau of Water Protection and Land Reuse (BWPLR) staff and from the Office of Information Management (OIM). GIS services relevant to NPS management include maintaining the NPS Online Viewer and the DEP GIS Data Download websites, assisting NPS Program staff both with the use of desk top GIS and with materials and guidance for GIS projects, producing updated data layers and maps of Aquifer Protection Areas and Ground Water Quality Classifications.

III. PROGRAM HIGHLIGHTS

In 2006 and 2007, grantees completed fifty-two nonpoint source projects. Below are a few of the completed projects and their accomplishments.

- Connecticut River Coastal Conservation District's (CRCCD) River Watch Program continued assessment and restoration programs within the Connecticut River basin (Mattabesset, Hockanum, Eightmile, Salmon and Farmington River Regional Basins).
- The CRCCD conducted several assessment activities in the Mattabesset/Coginchaug Regional Basin as part of ongoing efforts to identify and address the causes and sources of water quality impairments. Twenty-seven community volunteers participated in the Coginchaug Stream Walk Survey to gather information about physical characteristics of the river corridor and potential areas of concern. Potential concerns and threats to the health of the river and aquatic life identified in the survey include adjacent agricultural and industrial uses, lawns kept to the edge of the river, non-native invasive plant species, inadequate stream buffers, road runoff, and five large dams.
- CRCCD developed a citizen-based, periodic visual inspection program (VIP) as a tool to identify and address active water quality concerns in a timely manner, and piloted the program in the summer/fall 2006. Five volunteers each "adopted" a site on a nearby stream, conducted baseline inspections, and then monitored them on a regular basis for changes and potential problems. District staff conducted track down survey stream corridor assessments of two Mattabesset River watershed streams with documented NPS problems to search for sources of impairments and identify restoration opportunities. The track down surveys were a critical first step in developing abbreviated EPA nine element watershed-based plans. NPS sources, as well as potential sources of riparian and in-

stream habitat impairments were identified in the two watersheds assessed. Likely sources of NPS include onsite wastewater treatment systems, collection system failure, agriculture, stream bank erosion, storm sewers, domestic animals and wildlife. Other potential sources include backyard lawns, landscape and yard waste, and recreational use. Possible riparian and in-stream habitat impairment sources include non-native invasive species, stream channelization and bank hardening, and dams and culverts impeding fish passage.

- Connecticut's Conservation Districts continued to provide NPS technical assistance on a watershed basis to municipalities and agricultural producers. They provide site plan reviews, recommendations for BMPs, management of NPS pollution and erosion and sedimentation control issues, assistance with watershed management planning, technical services on a watershed basis, and helped those affected by new regulations understand their new obligations.
- The Farmington River Watershed Association (FRWA) conducted a streamwalk on the Pequabuck. Using volunteers, the association assessed land-use and identified potential impairments. FRWA trained 24 streamwalkers and collectively identified 24 buffer issues, 30 infrastructure issues, 7 discolored water issues, 11 invasive plant or algae issues, and 15 excess sedimentation issues.
- The Housatonic Valley Association (HVA) collected water quality data using over 55 volunteer monitors in the Housatonic Watershed. Tributaries were sampled to determine the overall water quality that was entering the Housatonic River. Tributaries reporting low water quality were further investigated to identify sources of pollution. They used the CT DEP's Ambient Monitoring Program titled *Rapid Bioassessment in Wadeable Streams and Rivers by Volunteer Monitors program* (RBV). The data collected assist CT DEP with their Water Quality Report to Congress summarizing the condition of waterbodies across the state as required by the Clean Water Act.
- The Town of Brooklyn implemented innovative structural and non-structural BMPs for stormwater management in a 200-acre watershed that drains to the Quinebaug River.
- CT DEP Fisheries/USDA NRCS conducted a riparian and stream restoration project along a 1,000 linear feet section of the Mount Hope River, in Ashford, Connecticut. Cattle had trampled portions of streambanks causing bank instability, erosion and sedimentation, and degradation of the riparian zone and instream habitats for the resident fish community. Cattle were excluded from the restored areas, instream habitats for fish and aquatic macroinvertebrates were created, and streambank areas were stabilized.
- The Interstate Environmental Commission (IEC) performed upstream field investigations of the storm sewers that lead into the Byram River to locate potential sources of contamination. These investigations were performed jointly with the City of West Chester Department of Health (DOH). The investigations involved visually inspecting the interceptors to locate sources of contamination, which included dye-testing private homes or businesses that were believed to be sources of contamination. IEC performed 38 non-sampling inspections. The Commission has performed numerous types of water quality sampling: end-of-pipe of several outfalls, and ambient water in the vicinity of storm sewer outfalls and upstream in the storm sewers that lead to the river. All of these samples were analyzed for fecal coliforms, total coliforms and enterococcus. During the samplings a total of 12, 13 and 10 samples were taken, respectively. These results show that despite some progress achieved by Port Chester in eliminating individual illegal

connections and/or cross-connections between sanitary and storm sewers, there is still a significant bacterial contamination in the storm sewer system that needs to be addressed further. Since this project began, several violations have been identified and addressed by IEC, West Chester DOH and the local municipality (Village of Port Chester).

- University of Connecticut provided 22 farms/businesses/others with technical outreach on 2,023.5 acres for Integrated Pest Management (IPM), Integrated Crop Management (ICM) and nutrient management. The following commodity areas were included: vegetable crops, nursery crops, greenhouse crops, fruit crops (orchards and small fruit), and field corn. The nutrient management portion of the grant was conducted on six farms, with a total of 545.7 acres, during the 2006 growing season. Five growers with 437.7 acres were involved with the Presidedress Soil Nitrate Test (PSNT) and one additional grower with 108 acres was involved with End-of-Season Cornstalk Tests. Three of the growers involved with the nutrient management project were also involved with IPM programs; therefore a total of 25 people and 23 farms were involved in both projects.
- A total of 207 in-field IPM training sessions were conducted by UConn IPM Specialists in the Thames River Basin. As a result of this training, the cooperators reduced pesticide applications by 16% (979.8 pounds of active ingredient (A.I.)). The project succeeded in reducing the use of 25 of the 62 pesticides reported by the cooperators and eliminated the use of nine products entirely. The growers in the program reported a net reduction in use of 294.4 pounds A.I (38%) of insecticides and 700.3 pounds (21%) of herbicides. However, fungicide use increased slightly by 14.9 pounds A.I. (0.8%) because of rainy conditions that were conducive to plant diseases. Another success of the project was to reduce the use of pesticides with moderate to severe leaching potentials by 58% (1,872.4 pounds A.I.). The project also produced a 58% reduction (1729.6 pounds A.I.) in use of pesticides previously found in Connecticut ground water (Keeney, 1991). Non-chemical alternatives and pesticides with less detrimental characteristics were substituted wherever possible.
- Soil sampling for the Presidedress Soil Nitrate Test (PSNT) was conducted by staff of the Eastern Connecticut Conservation District (ECCD) on 5 farms with a total of 437.7 acres of field corn and/or sweet corn. As a result of the testing, nitrogen applications were reduced by a total of 8,488 pounds (19.4 pounds per acre) despite one of the wettest seasons on record. The End-of-Season Cornstalk Test conducted on one farm with 108 acres indicated that 33% of the acreage had excess nitrogen. Therefore, this grower was advised to reduce nitrogen applications in 2007.
- IPM education for homeowners and the general public was accomplished in many ways. Collaboration was established with the UConn Cooperative Extension Residential Water Quality Project to address residential water quality and sustainable landscapes, including turfgrass management. The UConn IPM website also provided IPM educational materials and on-line courses directed to homeowners. IPM information was also presented to Master Gardeners, civic groups, school groups, and at statewide public events. A total of 4,540 people attended 62 presentations conducted throughout the state by the University of Connecticut staff involved in this project. In addition, five display presentations were viewed by over 43,000 people.
- CT DEP Parks and the Connecticut River Coastal Conservation District (CRCCD) conducted a pet waste best management practices program at Schreeder Pond in Chatfield

Hollow State Park in Killingworth, Connecticut. A TMDL analysis for the pond noted that uncollected dog waste is a primary potential source of bacteria to the swimming area. During wet weather events dog waste deposited on paved roadways, road shoulders, and trails can be carried with surface runoff into the pond. Education outreach was provided to dog owners visiting the park on the need to collect and properly dispose their pet's waste. Five dog waste stations were installed and educational materials were distributed to dog walkers to encourage behavioral changes.

- USDA Natural Resources Conservation Service (NRCS) implemented a retrofit of an older stormwater detention system that once controlled only stormwater runoff peak flows. A water quality remediation was incorporated at Willow which eventually empties into Hanover Pond (Quinnipiac River) in Meriden. Invasive plants were replaced with native plants. This retrofit has allowed for renovation of NPS pollutants.
- US Geological Survey (USGS) conducted an analysis of data from the network sites located on the Housatonic, Still, and Shepaug Rivers for the purpose of estimating the mass loading of nutrients to Lake Lillinonah. This investigation provided data for subsequent analysis by DEP and to support development of a management plan for nutrients in the watershed. The analysis identified the Still River as contributing a higher percentage of the phosphorus load relative to watershed size and confirmed that a significant proportion of the error associated with estimating the annual load is associated with high flow events.
- University of Connecticut in conjunction with USDA NRCS provided Animal Feed Operations/Confined Animal Feed Operations (AFO/CAFO) nutrient management assistance. NRCS and UConn/CES assessed about 130 farms from FY96 through FY06 and wrote or revised about 60 agricultural waste management system plans (AWMPs) that CT DEP has approved. In 2006, nutrient management plans were implemented on 26 farms and about 11,658 acres. Training for collection of soil samples for the June Nitrate Test and for collection of cornstalks for the cornstalk nitrate test has been given to farmers who are implementing nutrient management plans (NMP). All farmers on NMPs received training to collect and interpret the results of these tests.
- CT DEP mapped and analyzed forest areas in Connecticut that are sensitive to current levels of acidic deposition inputs. These results will be used in the policy context for determining the need for further emissions reductions, and in the forest resource management context for identifying potentially sensitive forest areas. Identification of sensitive forest areas facilitates selection of sites where the consequences of future (elevated or reduced) deposition levels can most effectively be monitored. Comparisons between ecological indicators of forest health and productivity and critical loads suggest that forest health is poorer and growth rates lower where critical loads are exceeded. A relatively small increase in deposition levels will increase sensitive forest area substantially, while reduction in deposition levels will reduce sensitive forest area.
- The Quinebaug-Shetucket Heritage Corridor (QSHC) purchased water quality monitoring equipment and conducted outreach Stream Walks Rapid Bioassessment for Volunteers (RBV).
- The North Central Conservation District (NCCD) established approximately 9,300 square feet of streamside vegetative buffer along Hatchery Brook in the town of Berlin. The area previously contained only lawn and invasive plants.

- USGS monitored nutrient loads and groundwater residence times in the Broad Brook basin. The 15.8-square mile basin is predominately agricultural in nature. Nitrogen loads from groundwater discharge were studied. Loads were calculated, along with the travel times of groundwater from recharge to discharge areas, to estimate the time required for the effects of best management practices (BMPs) to be observed. Nitrogen loads from Broad Brook basin ranged from 117,000 to 270,000 pounds/year, and yields were about 10 times larger than from forested basins in Connecticut. Nitrate in base flow averaged 71 percent of the annual load of total nitrogen discharged from the basin, indicating that the largest source of nitrogen was likely from groundwater discharge. The CT DEP and the NRCS will be using the results of this study to develop TMDLs, and to initiate a watershed based plan.

IV. WATERSHED MANAGEMENT PROGRAM

Watershed Management

The CT DEP has been in a comprehensive, multi-media “watershed approach” for over a decade now. CT DEP has developed a watershed management strategy that establishes the framework within which the CT DEP will work 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 nonpoint source pollution. The CT DEP has organized and focused base program staff, establishing five “major basin” coordinators, and continues to target grant funds based on watershed priorities.

Consistent with this approach, CT DEP offers competitive annual Section 319 grants to watershed initiatives for the priority watersheds, and to statewide NPS initiatives for transfer to local watershed management efforts. Basins that CT DEP has targeted in the past include the Norwalk, Quinnipiac, Hockanum, Mattabesset, Pequabuck, Scantic, Sasco, and Fenger River watersheds. New focused watershed management initiatives are underway for the Little, Quinebaug and Shetucket rivers in the Thames River basin, the Pomperaug River and Steel Brook in the Housatonic River basin, the Niantic in the Southeast coastal basin, the Saugatuck in the Southwest coastal basin, the Coginchaug in the Connecticut basin, and other priority watersheds. The watershed approach is also being used to restore lake water quality, building upon studies and plans developed with funds provided by the state Lake Water Quality Grant Program, the federal Clean Lakes Program (pursuant to section 314 of the C.W.A), and Section 319 grants.

The NPS Coordinator works closely with Watershed Management and Coordination (WMC) staff and other NPS Program partners to select and manage watershed projects for Section 319 funding. Generally, the goals and objectives for watershed programs include the protection, restoration and improvement of water quality, habitat for fisheries and other wildlife, and recreational opportunities. As described in the state’s *Enhanced State Nonpoint Source Management Program*, watershed management priorities are determined by a variety of mechanisms, including watershed and stream corridor assessments, the Consolidated Assessment and Listing Methodology (CALM) reporting and targeted NPS assessments. The primary purposes of the CALM data analyses are to determine the extent that all waters are attaining

water quality standards, to identify waters that are impaired and need to be added to the 303(d) list, and to identify waters that can be removed from the list because they are attaining standards. The CT DEP WMC Section administers river and lake watershed management programs in cooperation with other CT DEP programs, other state and federal agencies, and nongovernmental organizations. The WMC Section includes coordinator positions for the five major river basins, to oversee and coordinate watershed management activities there: Thames, Connecticut, Housatonic, Central Coastal, and Southwest Coastal Basins. The watershed program addresses NPS-related water quality problems on a comprehensive basis throughout an entire watershed. The role of the WMC basin coordinators include:

- Coordinating CT DEP base program activities in priority watersheds
- Serving as liaison between CT DEP and other state and federal agencies, municipalities, citizen groups, watershed associations, and other partners
- Assisting in the development of basin reports, watershed assessments, TMDLs, and watershed management plans
- Providing education and outreach on watershed issues, including the CT DEP web site, fact sheets, meetings, workshops, and conference
- Helping to manage NPS control projects financed in part with funds from the federal Clean Water Act Sections 319, 604(b), 104(b)(3), and state River Restoration Grants; and NPS education and outreach, and capacity building for nongovernmental organizations

CT DEP continues to encourage the growth of new and existing non-governmental watershed organizations, partnerships and initiatives in priority watersheds, by directing funds to the Rivers Alliance of Connecticut to administer the Watershed Assistance Small Grants Program (WASGP). The WASGP was established in 2002 through the Section 319 (FY '01) program to provide small grants to start up and growing organizations, and those who have not had ready access to some of the more traditional sources of funding. In this program, 27 watershed groups have been active in watershed management activities related to NPS pollution education and controls, water monitoring, and water resource and land-use management and education. The program is well received and effective at improving watershed protection and reducing NPS pollution. During 2006 and 2007, CT DEP emphasis continued on completing progress on previously provided assistance grants, and preparing for a new round of grants in 2008. The Rivers Alliance is also assisting CT DEP in developing and promoting model municipal tools and regulatory options to reduce and control NPS pollution. CT DEP and Rivers Alliance are focusing on an in-depth study of towns' needs, useful tools, model regulatory language and non-regulatory efforts that will be suitable for towns to adopt or modify as they see necessary.

Other watershed management initiatives during 2006 and 2007 include:

- Continuing to evaluate and implement CT DEP watershed management strategies to improve watershed management and strengthen the state's ability to control NPS pollution including coordination of DEP programs that influence land use development, creating stronger municipal relationships, offering assistance to municipalities making land use decisions, and promoting low impact development tools;

- Examining a long-term approach to solving complicated water quality impairments in the main stem tributaries in Thames basin;
- Working with the NPS Program to focus on 303(d)-listed impaired waters, causes and sources of impairments, and implementation projects to fix impairment;
- Developing a watershed management plan model in the Niantic River basin, which covers all 9 elements of an EPA watershed-based plan, build out conditions, and other CT DEP NPS and watershed management assessment, planning and implementation needs.

Connecticut's soil and water conservation districts ("Conservation Districts") have an integral role in nonpoint source (NPS) pollution by delivering technical assistance and to municipalities and landowners. Technical and educational services provided include erosion and sedimentation control, management and controls of NPS pollution, management of storm water runoff, and promotion of watershed management with recommendations for best management practices. Districts work within communities by partnering with various public and private stakeholders to formulate and implement watershed management plans and local initiatives to preserve the health of watersheds. Partners include among others, CT DEP, NRCS, municipalities, regional planning entities, as well as natural resource and land preservation groups. Throughout 2006 and 2007, Conservation Districts used their base section 319 funds to provide assistance to municipal leaders, commissions, staff, residential, commercial, and agricultural land users by:

- Providing technical information and assistance on natural resource problems by preparing site plan reviews and on-site inspections, and providing recommendations for management of NPS pollution, erosion, sedimentation controls, conducting pollution source trackdowns, and storm water management including stormwater retrofit opportunities;
- Planning and presenting technical assistance, natural resource training workshops and hands-on assistance to land use decision makers and landowners on, for example, channel restoration and restoration of stream banks; management of erosion and sediment control, nutrient management, stormwater management; best management for forestry practices, and integrated pest management;
- Providing on-call detailed information and recommendations to ensure protection of wetlands, streams, rivers, groundwater, watersheds and land from storm water run-off, and to address problems resulting from the lack of erosion and sedimentation controls.

Rivers Alliance of Connecticut received Section 319 Nonpoint Source (NPS) grant funds to conduct a broad survey of towns and local environmental organizations on their practices and policies for water quality protection. The survey results rendered valuable information on current issues of concern, which will help Rivers Alliance develop future educational and resource opportunities. They also compiled and posted on their web site several ordinances and regulations from Connecticut towns which serve as examples of new and effective or innovative ways to address nonpoint source pollution

(see: <http://www.riversalliance.org/ModelOrdinances/modelordinances.cfm>).

Southwestern Coastal Basin

Western Coastal Basin

The Western Coastal Basin consists of a series of mostly north to south flowing streams that discharge to Long Island Sound between Stratford, CT and Port Chester, NY. The Western Coastal Basin encompasses approximately 448 square miles, 57 of which are in New York State, and is home to approximately 650,000 people. The basin can be further subdivided into five regional basins: Southwest Shoreline, Southwest Eastern Complex, Saugatuck, Norwalk, and Southwest Western Complex. The northern half of the basin watershed is relatively rural, characterized by small towns, farmland and forest, much of which surrounds public water supply reservoirs. The southern half of the watershed tends to be more urbanized and commercial, dominated by the major transportation corridor surrounding I-95 and US 1.

Byram River

The Byram watershed is in the towns of Greenwich Connecticut and Port Chester/Bedford New York. The major issues in this watershed are: flooding, especially in the Pemberwick area, water quality, storm sewer overflows (SSOs), illicit discharges, combined sewer overflows (CSOs) from Port Chester, NY, into the estuary, sediment quality due to its industrial legacy, contaminated sediments, and the plan to develop a Watershed-Based Management Plan.

The Byram River Workgroup has met regularly under the direction of the Town of Greenwich Conservation Director. The major focus of that group has been flooding and erosion in response to three storms which have caused overbank flooding in the last two years. The Pemberwick area in Greenwich is particularly hard hit. Government agencies have met approximately quarterly with NY DEC to discuss pathogen issues discovered by monitoring performed by Greenwich, IEC, Westchester County Health, and Port Chester. A number of illicit discharges and cross connections have been eliminated in the Port Chester area, but ambient monitoring still indicates significant dry-weather sewage discharges coming from the Port Chester stormwater systems. The Byram River Watershed Coalition has been organized with the following three focuses: Water Quality, Watershed Based Plan Development, Public Access

Watershed stakeholders include, but are not limited to the Town of Greenwich, IEC, Byram River Watershed Coalition, Westchester County Health, Port Chester, Southwest Conservation District, Westchester County Planning/Conservation District, Bedford, Save our Shores, Save the Sound/CFE, and SoundKeeper.

Mianus River

The Mianus River watershed is in the towns of Greenwich and Stamford Connecticut. The major issues in this watershed are land preservation, riparian restoration, heavy use of parks, NPS pollution, and goose management.

Significant gains continue to be achieved with land acquisition and management. The Mianus River Watershed Council has met to discuss watershed preservation and other conservation goals. The City of Stamford has actively worked with local park users to enhance the trail

system to lessen impacts to the river at Mianus River Park. Volunteer labor has been managed very successfully to implement trail and river corridor management projects. Plans are underway to provide some hardened access points to alleviate conflicts between heavy traffic and riparian restoration. In some areas, temporary fencing has been an effective tool in restoring vegetation by limiting human and animal traffic. River herring runs continue to improve dramatically in response to improved fish passage over existing dams.

Watershed stakeholders include, but are not limited to the Mianus River Watershed Council, Greenwich, Stamford, Mianus River Greenway Alliance, Aquarion, and Mianus River Gorge Preserve.

Mill/Rippowam River

The Mill/Rippowam watershed is located in Stamford Connecticut. The major issues in this watershed include the Mill River Restoration Project, which includes two dam breaches and significant bulkhead removals with resultant riparian restoration and flood mitigation, as well as an effort to develop a watershed-based management plan.

The City of Stamford has undertaken a major project to restore a more natural riparian condition and mitigate flooding in the lower end of the Mill River, in cooperation with the US Army Corps of Engineers. Bulkheads are being removed, two dams are being breached, and streambank slopes are being restored and managed for multiple uses. Engineering design and permitting is nearly complete. The City has also allocated funding for a Watershed Based Plan to address water quality and stormwater.

Watershed stakeholders include, but are not limited to Stamford, the Mill River Collaborative, and the US Army Corps of Engineers.

Noroton River/ Holly Pond/Goodwives/Stoney/Tokeneke Rivers/Gorham's Pond

The Norton River/Holly Pond watersheds are located in Stamford Connecticut. Goodwives/Stoney/Tokeneke Rivers/Gorham's Pond watersheds are located in Darien Connecticut. Major issues in these watersheds include sedimentation, NPS pollution, and flooding.

The City of Stamford has published a Request for Qualifications for a Holly Pond Sedimentation Study and Improvement Design Project. The Town of Darien is planning significant work to mitigate flooding in the town's watercourses, beginning with Stony Brook.

Watershed stakeholders include, but are not limited to Stamford, Darien, SoundWaters, and the Darien Land Trust.

Five Mile River

The Five Mile River watershed is located in New Canaan, Norwalk and Darien Connecticut. Major issues in the watersheds include flooding, erosion and sedimentation, water quality issues from point and nonpoint source pollution, treated effluent dominated in late summer, and development of a watershed-based management plan.

Concerns have been voiced regarding frequent flooding, erosion and sedimentation, and degradation of water quality and riparian habitat. Funding is being sought for a watershed-scale Hydraulic and Hydrologic study, as well as creation of a Watershed Based Plan for water quality.

Watershed stakeholders include, but are not limited to Norwalk, New Canaan, Darien, Friends of the Five Mile River, and the West Norwalk Association.

Norwalk / Silvermine / Comstock Rivers

The Norwalk/Silvermine/Comstock River watersheds are located in the towns of Norwalk, Wilton, New Canaan, Weston, Ridgefield, Redding Connecticut and Lewisboro New York. Major issues in the watersheds include flooding, erosion and sedimentation, and water quality issues including nutrients from POTWs and pathogens from nonpoint source pollution.

The river's flow can be strongly influenced by treated wastewater effluent in late summer. There is an industrial legacy and high zinc concentrations in sediments may have some effect upon aquatic life use support. Volunteer water quality monitoring has been active and has led to correction of many pollution sources. A bacteria TMDL has been written and is being implemented with the assistance of the municipalities and the Norwalk River Watershed Initiative. A stressor ID study is also being conducted to determine needs for further analyses/TMDLs. An ongoing project to manage nuisance populations of non-migratory Canada Geese has commenced. New high density development proposals in Redding and Ridgefield will result in greater wastewater and nonpoint source discharges to the river. Development and increased discharges at Publicly Owned Treatment Works (POTWs) are a concern for local watershed groups. CT DEP has undertaken a stressor analysis study focusing on nutrients and dissolved oxygen, and the role of wastewater discharges and impoundments on water quality and aquatic life use support. Riparian restoration projects have been completed at Cannondale Dam (fish passage) and Silvermine School. The April 15, 2007 storm resulted in bank erosion and point bar deposition at the previously restored Silvermine School site. Citizen's water quality monitoring and a part time NRWI Watershed Coordinator continue despite the loss of State funding. Management of excess non-migratory Canada Geese has been identified as a priority project and funded by CT 319 funding. The goals are threefold: egg oiling, harassment with dogs, and educating people to not feed geese. Two dam removal projects are being planned on the Norwalk River. Engineering design and permitting will be completed by NRCS, under contract to CT DEP, at Merwin Meadows Dam in Wilton. A similar design project at Flock Process Dam in Norwalk has been delayed due to funding problems.

Watershed stakeholders include, but are not limited to the Norwalk River Watershed Initiative, Norwalk River Watershed Association, Harbor Watch/River Watch, Trout Unlimited, Norwalk Maritime Museum, Norwalk, Wilton, New Canaan, Ridgefield, Redding, Weston, Lewisboro, Southwest Conservation District, South Norwalk Water and Electric, and SoundKeeper.

Saugatuck / Aspetuck Rivers

The Saugatuck and Aspetuck River Watersheds are located in Westport, Weston Easton, Redding, Newtown, Wilton, Fairfield, and Danbury Connecticut. Major issues in the watersheds include land preservation, water quality, NPS, shellfish, water diversions and low flow, citizens monitoring, goose management, The Nature Conservancy-Aquarion Low Flow Reservoir Management Model, Westport YMCA, alternative wastewater system, State Plan of Conservation and Development, Eureka/Bennett's Pond 830g Affordable Housing, burden of proof on local planning and zoning, and high density development.

The Saugatuck River Watershed Partnership has had success with municipal support for its Conservation Compact. Several watershed workshops have been held focusing on stormwater and nonpoint source pollution. Citizen's water quality monitoring has been successfully implemented in both the Saugatuck and Aspetuck River watershed. A proposal to construct a new YMCA has drawn strong opposition resulting in public scrutiny of alternative wastewater system permitting.

Watershed stakeholders include, but are not limited to the Saugatuck River Watershed Partnership, The Nature Conservancy, Harbor Watch/River Watch, Aquarion, Westport, Fairfield, Weston, Newtown, Wilton, Fairfield, Ridgefield, Danbury, Easton, Trout Unlimited, Land Trust, USGS, Highstead Arboretum, SouthWest Conservation District, and Soundkeeper.

Sherwood Mill Pond

Sherwood Mill Pond is located in the town of Westport Connecticut. The Town of Westport and Harbor Watch River Watch have been actively seeking out bacteria sources through Citizen's Water Quality Monitoring efforts to supplement efforts by the Westport-Weston Health District.

Watershed stakeholders include, but are not limited to Westport, Harbor Watch/River Watch, and the Westport-Weston Health District.

Sasco Brook

Sasco Brook watershed is located in the town of Westport Connecticut. Major issues in the watersheds include water quality, citizens monitoring, NPS pollution, goose management, hobby farms/animals, watershed based management plan, and the bacteria TMDL.

Nonpoint source management continues to be a primary concern. Education of horse owners to use best management practices for manure management has been successful. Trackdown of outfalls that serve areas where septic systems may fail continues. Revisions are being planned to a draft watershed based plan.

Watershed stakeholders include, but are not limited to Westport, Sasco Brook Water Pollution Abatement Committee, HarborWatch/Riverwatch, SouthWest Conservation District, Natural Resources Conservation District, and the CT Department of Agriculture Aquaculture Division.

Mill River

The Mill River watershed is located in the towns of Fairfield, Easton, Trumbull and Monroe Connecticut. Major issues in the watersheds include water quality, water quantity, lead and bacteria TMDLs, and riparian restoration.

The Mill River Wetland Committee continues to work on educational programs in schools. Other organizations such as the League of Women Voters and the Fairfield garden clubs have taken an active role in public education and outreach, as well as riparian restoration and invasive species control at local parks and dedicated open spaces.

Watershed stakeholders include, but are not limited to Fairfield, RiverLab / Mill River Wetland Committee, Fairfield Garden Clubs, and the League of Women Voters.

Ash Creek / Rooster River

Ash Creek and Rooster River watersheds are located in the towns of Bridgeport and Fairfield Connecticut. Major issues in the watersheds include water quality, CSOs, riparian restoration and preservation, and the bacteria TMDL.

Conservation efforts in the watershed coalesced around opposition to several large dock proposals and spread to other areas such as habitat restoration.

Watershed stakeholders include, but are not limited to the Ash Creek Conservation Association and Connecticut Conservation Association.

Pequonnock River

The Pequonnock River watershed is located in the towns of Bridgeport, Trumbull and Monroe Connecticut. Major issues in the watersheds include water quality, riparian and habitat restoration, flooding, watershed based plan.

Interest in organizing a Pequonnock River Watershed Partnership has been strong. Several well-attended meetings and workshops have been held at the Beardsley Zoo, and river cleanups and invasive species control have been undertaken. A landuse and land allocation (LULA) training was also held in the watershed. CT 319 grants have been allocated for developing a watershed based plan as well as Citizen's Water Quality Monitoring program.

Watershed stakeholders include, but are not limited to Beardsley Zoo, Save the Sound, Bridgeport, Trout Unlimited, Harbor Watch/River Watch, and USDA/NRCS.

Housatonic Major Basin

Originating near Pittsfield, MA, the Housatonic River flows south for approximately 150 miles through western Massachusetts and Connecticut before entering Long Island Sound at Stratford

and Milford, CT. Altogether, the Housatonic watershed encompasses almost 2000 square miles in Connecticut, Massachusetts and New York. In Connecticut, the approximately 1200 square mile “Housatonic Major Drainage Basin” can be further subdivided into the following 10 “Regional Drainage Basins”: Housatonic Main Stem, Aspetuck, Blackberry, Candlewood, Hollenbeck, Naugatuck, Pomperaug, Shepaug, Still and Tenmile. The northern half of the Housatonic watershed is relatively rural, characterized by small towns, farmland and forest. The southern half of the Housatonic watershed tends to be more urbanized and industrial.

Housatonic Mainstem Regional Basin

The Housatonic River has been extensively harnessed for hydroelectric power generation. In Connecticut, FirstLight Power Resources operates five hydroelectric facilities on the Housatonic River: Falls Village, Bulls Bridge, Rocky River (associated with Candlewood Lake), Shepaug (dam forms Lake Lillinonah) and Stevenson (dam forms Lake Zoar). A new license covering all of these facilities was issued by the Federal Energy Regulatory Commission (FERC) in June 2004. The license includes a Water Quality Certificate issued by CT DEP. In addition to these five plants, McCallum Enterprises operates a hydropower facility at Derby Dam (dam forms Lake Housatonic).

To date, the major issues affecting water quality of the Housatonic River in Connecticut have revolved around eutrophication, dissolved oxygen levels and PCBs. The first two issues are primarily associated with the three lower impoundments on the river – Lake Lillinonah, Lake Zoar and Lake Housatonic. It has been found that excessive amounts of phosphorus from upstream sources are causing serious algal blooms in these lakes. Reduction in phosphorus levels at upstream wastewater treatment plants, as well as the disappearance of some point sources, has helped to lower nutrient levels and improve water quality. However, eutrophication problems persist, particularly in Lake Lillinonah.

The Housatonic PCB issue was first identified in the late 1970’s and is primarily associated with releases from the General Electric Company (GE) facility in Pittsfield, MA. As a result of a Consent Decree, approved by the U.S. District Court in October 2000, involving GE, U.S. EPA (EPA) and other federal entities, the State of Connecticut, Commonwealth of Massachusetts and City of Pittsfield, clean-up of PCBs in the most heavily contaminated portions of the river (close to the GE facility) is underway. In-river remediation activities are being addressed in three distinct phases known as: the ½ mile (on the East Branch of the Housatonic, immediately adjacent to and downstream of the GE facility); the 1 ½ mile (on the East Branch of the Housatonic, commencing immediately below the ½ mile and ending at the confluence of the East and West Branches); and Rest of River (from the confluence of the East and West Branches which form the mainstem of the Housatonic, down through MA and CT to Long Island Sound).

The Housatonic River and the lands within its watershed constitute an important recreational resource. There are hundreds of acres of public recreation land within the watershed, including the Appalachian Trail, which runs along the river for five miles between Kent and Cornwall. In Connecticut, the northern portion of the river offers catch-and-release Trout Management Areas, Smallmouth Bass Management Areas and seasonal Class I-IV whitewater boating opportunities. Meanwhile, the four lakes in the watershed - Lillinonah, Zoar, Housatonic and Candlewood - are

popular areas for boating, fishing and swimming. In 2001, the Housatonic Main Stem was officially designated by the State as the “Housatonic Riverbelt Greenway”. It is hoped that this planning designation will encourage towns and other groups to work together and create a contiguous greenway along the river corridor.

During 2006:

With regard to the Housatonic GE-PCB remediation project:

- EPA completed remediation of the 1½ mile section of the East Branch of the Housatonic in Pittsfield, MA. More than 91,600 cubic yards of river bank and sediment materials were excavated during this removal action.
- EPA finalized the “modeling study” for Rest of River which is an important component for determining remediation options;
- EPA approved revised Interim Media Protection Goals (IMPGs) submitted by GE. The IMPGs pertain to human and ecological receptors found to be at risk in Rest of River. Development of IMPGs is another step forward in the process of determining whether additional PCB clean-up actions will be undertaken in the Rest of River area.
- GE voluntarily agreed to continue PCB monitoring in fish and aquatic invertebrates in the Housatonic River in Connecticut for the 2006 season, although there is no longer a formal CT DEP – GE Cooperative Agreement in effect.
- The Federal Energy Regulatory Commission (FERC) approved Northeast Generation Services Company design drawings for the Dissolved Oxygen Diffuser System for the Shepaug Dam/Lake Lillinonah hydropower facility on the Housatonic River. Development of the DO system is a requirement of the CT DEP 401 water quality certification attached to the 2004 FERC license issued for this facility. In conjunction with the design drawings, CT DEP required the development of a water quality monitoring plan to determine the effectiveness of the system. With approval of the design drawings and monitoring plan, the DO system can now be constructed, the purpose of which is to raise DO levels in the Shepaug Dam/Lake Lillinonah outflow to Lake Zoar to meet CT water quality standards and allow for delisting of the current water quality impairment.
- Through a CWA 604(b) grant, the Housatonic River Commission (HRC) completed an update of their Housatonic River Management Plan. HRC represents seven municipalities along the upper Housatonic and advises its member towns on environmental activities and issues within the river corridor.
- Under a CWA 604(b) grant, the Housatonic Valley Association (HVA) produced two “Ace Your River Report Card” brochures – one for municipal land use decision makers

and one for developers – to encourage use of low impact development stormwater practices.

- The Pootatuck Watershed Association was formed to protect the Pootatuck River watershed and its underlying aquifer. The Pootatuck River is located in Newtown and a tributary to the mainstem of the Housatonic River.

During 2007:

- With regard to the Housatonic GE-PCB remediation project:
 - GE submitted and EPA approved a Corrective Measures Study Proposal (CMS-P). The CMS-P is the work plan for creating the Corrective Measures Study (CMS) which will propose clean-up alternatives for Rest of River. This represents another step forward in the process of determining whether additional PCB clean-up actions will be undertaken in the Rest of River area.
- GE submitted a report to CT DEP regarding the 2006 PCB monitoring of fish and aquatic invertebrates in the Housatonic River in Connecticut. PCB levels stayed relatively the same as compared to the most recent monitoring rounds.

Hollenbeck Regional Basin

The 43 square mile watershed of the Hollenbeck River encompasses most of the Town of Canaan (Falls Village) but also includes parts of North Canaan, Norfolk, Cornwall and Goshen. The river flows south to north and passes through Robbins Swamp, an ecologically significant calcareous wetland, before entering the Housatonic River about a mile north of Northeast Generation Services' Falls Village hydropower facility. The watershed area is primarily rural and includes active agricultural lands as well as a considerable amount of State Forest and privately-preserved open space.

The Northwest Conservation District (NCD) has been working with the USDA Natural Resources Conservation Service (NRCS) on a CWA Sec. 319 funded project to address severe gullyng, erosion, and flooding problems in a Falls Village neighborhood caused by agricultural drainage diversions in fields at the top of Beebe Hill, and highly erodible soils on its slopes.

During 2006:

- Under a 319 grant to the Northwest Conservation District, the USDA Natural Resources Conservation Service completed construction specifications for the alternative selected to address the gullyng, erosion and flooding problems in the Beebe Hill neighborhood. It will be up to the Town of Canaan (Falls Village) to pursue implementation of this plan.

Naugatuck Regional Basin

The Naugatuck River is the largest tributary of the Housatonic River, with a watershed of approximately 311 square miles in parts of 27 municipalities. The mainstem of the Naugatuck River forms in Torrington and flows south for 40 miles to Derby, where it enters the Housatonic River only 11 miles from Long Island Sound. The Naugatuck River watershed has the potential for excellent cold-water fish habitat and has historically supported anadromous fish runs. The existence of these runs ceased during the industrial revolution due to the construction of numerous dams and poor water quality. Although the river has a long history and reputation as one of the most polluted in the state and country, it has been recovering as a result of restoration efforts by CT DEP and other stakeholders initiated in the late 1960s. The primary objectives of the restoration efforts are to restore water quality and anadromous fish passage. Secondary goals include providing passage for recreational boating, reducing sediment deposition in impoundments, removing safety hazards, reducing flood levels, and establishing greenways. While initial efforts focused on eliminating or reducing gross point source pollution, more recent efforts have involved advanced wastewater treatment, NPS management, and fish habitat restoration. These efforts have been led by the CT DEP, watershed municipalities, Naugatuck Valley Chapter of Trout Unlimited, Naugatuck River Watershed Association, the U.S. Army Corps of Engineers, and the SWCDs.

Based on a wasteload allocation (WLA) analysis completed by CT DEP in 1988, five of the six major municipal wastewater treatment facilities were upgraded to advanced treatment between 1992 and 2001, and the sixth was linked to the new Waterbury facility. In conjunction with the upgrade of the Waterbury wastewater treatment plant (WWTP), by far the largest of the six plants, a mitigation plan was developed that included: dam removals or construction of fish passage facilities at seven dams in the watershed, tributary habitat enhancements, river corridor revegetation, water quality monitoring, and assignment of a full-time CT DEP field inspector to the watershed. In 1999, four dams on the Naugatuck were removed or breached (Freight Street, Platts Mill, Union City, and Anaconda). In 2004, the Chase Brass Dam on the Waterbury/Watertown section of the river was removed by the City of Waterbury Plans is underway to construct fish and canoe/kayak passage around Tingue Dam in Seymour. In 1998-99, a fish ladder was constructed at the Kinneytown Dam, the southern-most dam on the river, as a condition to issuance of a federal hydropower license. Once all of this work is complete, over 30 miles of the lower Naugatuck River up to the Thomaston Flood Control Dam will be opened for anadromous fish passage. As water quality in the river has improved over the years, CT DEP Fisheries has expanded its fish-stocking program of trout and broodstock salmon on certain sections of the river, and has designated the Naugatuck Mainstem - from the confluence of the East and West Branches in Torrington to the Kinneytown Dam in Seymour - as a Trophy Trout Stream. In 2001, the portion of the Naugatuck River between Thomaston and Derby was officially designated by the State as a “greenway” area.

During 2006:

- Under a CWA 604(b) grant, the Litchfield Hills Council of Elected Officials completed the “Naugatuck River Greenway Assessment – Phase II (Rte 118 to Thomaston Dam)” report for the Litchfield/Harwinton section of the Naugatuck River. Complementing a similar report that was done for the adjacent Torrington section of the river, this report assesses the potential for creating a greenway in the upper Naugatuck. In addition to

providing a conceptual plan for improving public access, enjoyment and passive recreational use of the river, the report identifies problem erosion and stormwater outlets locations, and provides suggestions for stabilizing these areas.

- The Connecticut Greenway Council officially designated the Torrington section of the Naugatuck River as a greenway area. This designation complements the Litchfield Hills Council of Elected Officials 2004 greenways assessment report for this area as well as City of Torrington downtown redevelopment plans to showcase the river.
- Working with the UCONN CES Nonpoint Education for Municipal Officials (NEMO) “Municipal Initiative” Program, the City of Torrington celebrated some major accomplishments in revising local engineering standards as well as zoning and subdivision regulations. Revisions included incorporating principles of the “2004 Connecticut Stormwater Quality Manual”. The NEMO “Municipal Initiative” Program is funded by CWA Sec. 319 to help communities to address nonpoint source issues.

During 2007:

- The Natural Resource Conservation Service (NRCS) entered into an agreement with CT DEP to develop a Sec. 319-funded watershed-based plan for Steele Brook in Watertown. The project will focus primarily on two water quality issues: an iron precipitate impairment below Heminway Pond Dam; and an indicator bacteria impairment on the lower section of Steele Brook.
- The Connecticut Greenway Council officially designated the Litchfield/Harwinton section of the Naugatuck River as a greenway area. This designation complements the Litchfield Hills Council of Elected Officials 2006 greenways assessment report for this area.

Pomperaug Regional Basin

The Pomperaug River drains a 90 square mile area, most of which is located within the towns of Bethlehem, Woodbury and Southbury, and enters the Housatonic River at the northern end of Lake Zoar in Southbury. The northern part of the watershed remains relatively rural in character, with a significant amount of active agricultural land. Over the last 30-40 years, the southern part of the watershed, which includes a section of I-84, has become increasingly developed in terms of residential and commercial growth. The Pomperaug River valley also contains a sizeable stratified drift aquifer, portions of which are used for public water supply. Some of this water is transferred out of the Pomperaug basin to satisfy increasing water demands in neighboring communities. Internal and external pressures on the water supply have caused watershed residents to become concerned about over-allocation of water resources and river flow issues. Contamination of the aquifer is also a matter of concern, especially in Woodbury, which has had incidents involving TCE and MTBE. NPS nutrient loads originating from the Pomperaug River watershed contribute to eutrophication problems in Lake Zoar, and residents near the mouth of the river are concerned about sedimentation. Transylvania Brook, a tributary to the Pomperaug, is impaired by contamination caused by discharges from the state-operated Southbury Training

School wastewater treatment plant. In 2001, CT DEP established and EPA approved a TMDL for phosphorous, ammonia, chlorine, copper, and zinc, and CT DEP reissued a discharge permit with more stringent limits for these pollutants to help meet water quality standards in Transylvania brook. Meanwhile, a final report is being completed for CT DEP which evaluates the different options for addressing this issue, including upgrading the wastewater treatment facility, redirecting the discharge or eliminating the discharge.

In 1999, increasing interest in these issues led to the formation of the Pomperaug River Watershed Coalition (PRWC), a broad cross-section of watershed stakeholders dedicated to protecting and restoring the watershed. Since its formation, PRWC has completed a “state of the watershed” report, and is sponsoring an on-going series of streamwalks to assess the Pomperaug mainstem and tributaries using GIS mapping to examine watershed land use patterns and issues, pursuing a major watershed study, and developing a watershed management plan for the Pomperaug basin. Working with the U.S. Geological Survey and University of Massachusetts, PRWC is characterizing surface and groundwater flows throughout the basin and identifying instream habitat requirements. Information from these and other studies is being incorporated into the “Pomperaug River Water Resources Management Plan” with the purpose of assisting watershed municipalities in making scientifically based land uses decisions.

During 2006:

- The Pomperaug River Watershed Coalition (PRWC) developed a draft Watershed Management Plan for the Pomperaug watershed and aquifer. This plan pulls together existing information and recent studies pertinent to the watershed and is meant to be a “living” document that will be periodically updated. Using this scientifically-based plan, it is PRWC’s intention to assist municipalities, water companies and other watershed stakeholders with management strategies which allow for appropriate water use needs but are also protective of the resource. The Plan includes pieces such as the USGS watershed modeling project and University of Massachusetts instream habitat modeling project which are being funded in part by a grant from the State of Connecticut which is being by CT DEP. These projects are still “in process”.
- As part of a CT DEP River Restoration grant, the Abbey of Regina Laudis in Bethlehem installed exclusionary cattle and sheep fencing, and had two engineered cattle crossings constructed on their farm. These accomplishments are elements of a comprehensive project to install best management practices to protect wetland and watercourse areas impacted by the Abbey’s agricultural operations.

During 2007:

- The Natural Resources Conservation Service (NRCS) completed an Emergency Watershed Protection (EWP) project on the Pomperaug River, just below the Judson Avenue bridge in Woodbury, to stabilize a steep and severely eroded riverbank threatening a home and septic system. The Northwest Conservation District had originally received a 319 grant in 2002 to develop a plan to address problems at this site. However, a series of severe rain events and subsequent high river flows between the fall of 2005 and spring of 2007 aggravated conditions at the site and caused major bank slumping which escalated the situation to a point

which called for immediate action. Although these developments caused original plans to morph into an emergency action project, groundwork laid by the 319 project assisted with execution of the NRCS EWP. In addition, 319 funding was used to revegetate and stabilize the site with native plantings.

- With funding through the Sec. 319 Watershed Assistance Small Grants Program administered by Rivers Alliance of Connecticut, the Pomperaug River Watershed Coalition (PRWC) worked with the Southbury Land Trust to develop “A Manual for Assessing Hydrologic Value of Land Parcels Based on Physical Attributes”. PRWC combined information from the USGS watershed modeling project and GIS maps prepared by the Council of Governments Central Naugatuck Valley to develop a method for identifying parcels that are significant to protect from a hydrological perspective.
- As part of their CT DEP River Restoration grant, the Abbey of Regina Laudis in Bethlehem installed additional exclusionary cattle fencing in two areas of their farm. As described above, these are elements of a comprehensive project to install best management practices to protect wetland and watercourse areas impacted by the Abbey’s agricultural operations.

Connecticut River Major Basin

Scantic Regional Basin

The Scantic Regional Watershed covers an area of almost 114 square miles, of which 83 are in Connecticut. It flows in a southwesterly direction from Massachusetts before entering the Connecticut River north of Hartford. The watershed encompasses parts of six towns - Somers, East Windsor, Enfield, Stafford, South Windsor, and Ellington. Land use in the watershed includes agriculture, mixed residential, light industry, and forest. Water quality problems include turbidity and sedimentation resulting from agricultural runoff and urban development, nutrient enrichment, and, to a lesser degree, bacterial contamination.

The Scantic River Watershed continues to hold public outreach and recreational events, including stream water quality monitoring using CT DEP’s Rapid Bioassessment in Wadeable Streams & Rivers by Volunteer Monitors (RBV) methodology.

Broad Brook Subregional Basin

The Broad Brook Watershed covers nearly 16 square miles, mostly in Ellington and about one fourth in East Windsor. Predominantly undeveloped or pastureland, this area has been impaired by nutrients, organic enrichment/low dissolved oxygen and pathogens, likely caused by agricultural sources.

The USDA Natural Resources Conservation Service (NRCS) received a Section 319 NPS grant to develop a Watershed-Based Plan for the Broad Brook Watershed in Ellington and East Windsor. USGS recently reported on the high levels of nitrogen in the basin and ground water; additionally, CT DEP has data regarding bacteria load.

The WBP will provide federal, state and local entities and the public with a comprehensive water quality improvement plan by employing a watershed wide assessment and management planning approach. The WBP will strengthen the likelihood that practices addressing systemic issues (i.e. root causes of the water quality impairments) will be considered, evaluated and implemented, not only to meet individual pollutant standards and criteria, but to satisfy related physical and biological management needs to the extent possible. The WBP will also satisfy Section 319 NPS guidance to become eligible for future Section 319 NPS implementation funding. Equally important, this project will exemplify how cooperative partnerships between local, state and federal governments and other organizations can enhance local capacity to implement the WBP.

Additional assistance is being provided by the North Central Conservation District (NCCD) who also received a Section 319 NPS grant to assist in community outreach and municipal regulation review associated with preparation of Broad Brook Watershed Based Plan. The NCCD recently conducted a study with Section 319 NPS funds to identify significant nonpoint sources of pollution, proposing BMP solutions to the municipalities within the Broad Brook Watershed.

Farmington Regional Basin

The Farmington Regional Watershed covers 607 square miles in two states, including sixteen Connecticut towns (Avon, Barkhamsted, Bloomfield, Bristol, Burlington, Canton, Colebrook, East Granby, Farmington, Granby, Hartland, New Hartford, Simsbury, West Hartford, Windsor, and Windsor Locks). Beginning in the rural Berkshire Mountains in Massachusetts, flowing through the Connecticut highland region and Farmington Valley, then out to the Connecticut River in Windsor; it provides 100% of the drinking water for over 600,000 people living in the Greater Hartford area and the Farmington Valley. The main stem of the Farmington River and the West Branch flows for 81 miles, and overall receives over 35 million gallons per day of treated wastewater from 9 publicly owned sewage treatment plants. The watershed is 2/3 forested, with equal amounts of agriculture and development, and supports abundant recreational opportunities; unique fish, wildlife, and plant habitats; hydropower generation; and is the first River in Connecticut to have a section federally designated as Wild & Scenic - one of only six in New England.

The US Forest Service (USFS) is in the process of conducting a two-phase study for the Highlands, a geographic region which cuts through the upper portion of northwest Connecticut which received federal funding for assessment. The Highlands Study covers a designated area within four states: PA, NJ, NY and CT and identifies significant natural resources and threats from a landscape perspective. This study is currently being conducted in CT and PA so that these states can formally become part of the Highlands Region. (NJ and NY have already received formal designation.) Designation will allow CT to qualify to receive Highlands funding approved by Congress. Funding can be used for purchase of lands that fall with priority natural resource areas identified through the USFS Highlands Study.

The Farmington River Coordinating Committee (FRCC), the stakeholder group (consisting of the National Park Service, CTDEP, Metropolitan District Commission (MDC), Farmington River Watershed Association (FRWA), the towns of Hartland, Barkhamsted, New Hartford, Canton

and Colebrook, and the Farmington River Anglers Association) oversees the implementation of the Upper Farmington River Management Plan for the Wild & Scenic section (non-regulatory, advisory only). The FRCC, in cooperation and coordination with the MDC, FRWA, CTDEP State Parks, completed a project with Section 319 NPS grant funds to re-grade and stabilize a roadway embankment within Nepaug State Forest that was a source of erosion and sediment to the Farmington River.

Farmington River Subregional Basin

The Lower Farmington River and Salmon Brook Wild & Scenic Study Committee was approved by Congress in late 2006 to determine the eligibility of these waterbodies for possible federal Wild & Scenic designation by the National Park Service (this study area is a continuation from the existing federally designated 14-mile segment of the Farmington River, downstream to the Rainbow Dam and includes both branches of Salmon Brook). Wild & Scenic designation will provide the ten communities (Avon, Bloomfield, Burlington, Canton, East Granby, Farmington, Granby, Hartland, Simsbury, and Windsor) with the knowledge, tools and resources to ensure that growth is approached in a way that is compatible with preserving the region's outstanding resource values. The valuable attributes currently being considered are geology, water quality, biological diversity, cultural landscape, and recreation. Also serving on the Study Committee is CT DEP, the Farmington River Watershed Association, and Stanley Works.

As part of the Wild & Scenic designation process, a locally supported management plan must be developed to provide for the long-term protection of these valuable attributes. This will provide an invaluable opportunity for the lower Farmington River and Salmon Brook watershed towns to come together, mobilize public participation, and fulfill a locally-shaped vision for their communities to protect and preserve these highly valuable water resources. The management plan would guide the actions of a locally led coordinating committee who would oversee the plan's implementation (non-regulatory, advisory only), similar to the FRCC above.

Salmon Brook Subregional Basin

See above.

West Branch Salmon Brook Subregional Basin

See above.

Pequabuck River Subregional Basin

The Pequabuck River watershed lies in the Central Connecticut Valley and collects drainage from both the Poland River and Coppermine Brook Subregional Basins, eventually discharging to the Farmington River. The Pequabuck River watershed alone is 29 square miles, but combined with the Poland and Coppermine watersheds totals nearly 58 square miles. This larger area covers six towns (Bristol, Burlington, Farmington, Harwinton, Plainville and Plymouth) and has three Water Pollution Control Facilities (WPCF) discharging their effluent into the Pequabuck River. Although there has been a drastic reduction in bacteria and nutrients since the late 1980s, much work still needs to be done to improve the water quality of the river. E-coli

bacteria levels still exceed the permissible limit for non-contact recreation and nitrogen is present in a significant amount. The Pequabuck River serves as a water source for various industrial and recreational purposes, as well.

The Central Connecticut Regional Planning Agency and the Pequabuck River Watershed Association rolled out to the general public the Pequabuck River Watershed Management Plan (including the Poland River and Coppermine Brook) which was written with a Section 319 NPS grant.

Poland River Subregional Basin

See above.

Coppermine Brook Subregional Basin

See above.

Park Regional Basin

The Park River's 77 square mile watershed covers the Greater Hartford Area (major towns include Bloomfield, East Hartford, Hartford, Newington, Rocky Hill, West Hartford, Wethersfield and Windsor; also portions of East Granby, Farmington, Glastonbury, Manchester, South Windsor and Windsor Locks). This highly urbanized, largely impoverished and minority community is plagued by Combined Sewer Overflows, Sanitary Sewer Overflows, as well as having its river and stream systems channelized and otherwise altered to convey stormwater, sewer overflows, and flood waters.

The Metropolitan District Commission (MDC) has developed a Long-Term Control Plan to reduce the impact of Combined Sewer Overflow discharges into the Connecticut River from the Park River and Wethersfield Cove. The fundamental purpose of the LTCP is to improve water quality by updating aged sewer infrastructure. Proposed activities include system-wide sewer cleaning assessment, capacity improvements and repairs; 80 miles of sewer separation, new drains and larger sewers; a 2 mile storage tunnel; a 2.5 mile microtunnel; treatment plant improvements to increase capacity and remove nitrogen; and relining and building new pipes to eliminate local overflows.

CT DEP's Municipal Facilities section is using Supplemental Environmental Project funds (SEP) to address public education and outreach related to combined sewer overflows. These are exacerbated by illicit connections which violate local sewer ordinances; however, in some communities the municipal officials may condone the connections in areas where separate storm sewers do not exist or are not accessible. Educational efforts are needed to find ways to communicate with the public and other officials that these connections are harmful to public health and the environment and to identify the means or enticements to eliminate the illicit connections and prevent future connections from being made. The targeted audience for education may include, but is not limited to, homeowners, building officials, and plumbers.

The Eastern Connecticut Resource Conservation and Development Program (RC&D) has partnered with the USDA Natural Resources Conservation Service, the City of Hartford, Hartford Housing Authority, and Capitol Region Council of Governments (CROG) to design and construct the Park River Greenway, a 1.8 mile multi-use trail, along the South Branch Park River. This is a component of a \$500,000 grant from CT DEP.

The City of Hartford is sponsoring a bike committee to assess potential bike paths that would connect the Park River Greenway, the East Coast Greenway, and other city routes. The East Coast Greenway is the nation's first long-distance urban trail system; a city-to-city transportation corridor for cyclists, hikers, and other non-motorized users. By connecting existing and planned trails, a continuous, safe, green route 3,000 miles long is being formed linking Calais, Maine at the Canadian border with Key West, Florida. It incorporates waterfront esplanades, park paths, abandoned railroad corridors, canal towpaths, and highway corridors, and in many areas it temporarily follows streets and roads to link these completed trail sections together.

North Branch Park River Subregional Basin

The MDC recently initiated its Clean Water Project to address Combined Sewer Overflows, Sanitary Sewer Overflows, and nitrogen removal. A Supplemental Environmental Project (SEP) in the amount of \$140,000 from a civil penalty of \$425,000 from a Consent Order between EPA and the MDC, has been reserved for the development of a Watershed-Based Plan (WBP) for the North Branch Park River Watershed for MDC's failure to correct CSOs. The proposed project will primarily take place in the towns of Bloomfield, Hartford and West Hartford. A sum of \$72,500 is being held in reserve for yet-to-be-identified project implementation upon completion of the WBP.

The WBP will complement this effort to control point sources of pollution by addressing, at a watershed scale, nonpoint source pollution, land use policies and practices, stormwater and river restoration and protection, education and outreach, and implementation to further advance water quality improvements and quality of life. It will also serve as a potential model for other urban watershed plans and to address the unique challenges and needs of urban rivers and waterways, their value as a natural resource, and their role in improving livability in an urban environment.

The WBP will assess current conditions, identify threats and opportunities for improvements, foster stewardship by the community, and serve as a model for other urbanized watersheds. The plan will characterize water and land resource conditions and nonpoint source pollution sources within the watershed. Based on this assessment, the plan will estimate the pollution load reductions and improved conditions that can be expected once the plan's management measures are implemented to achieve water quality standards. Besides the measurable water quality improvements, the plan will revitalize an urban river by maintaining and restoring natural systems within an urban environment, and improve public recreation and use. The plan will also provide for public education and outreach to inform businesses and residents about nonpoint source pollution, thereby promoting a constituency for sustainable development and demonstrating the value of collaboratively and cooperatively working on ways to better manage land and water resources.

The Farmington River Watershed Association (FRWA) has "adopted" under its stewardship the contiguous North Branch Park River Watershed and, together with the Park River Watershed Revitalization Initiative, will assist in the development of the WBP.

Hockanum Regional Basin

The Hockanum Regional Watershed encompasses 77 square miles in north central Connecticut and is a major tributary of the Connecticut River. It originates in the hills near Shenipsit Lake in Ellington and flows southwesterly into the Connecticut River Valley to its confluence with the Connecticut River in East Hartford. The Hockanum River is approximately 25 miles long, draining large portions of Manchester, Vernon, Ellington, and Tolland, and smaller portions of East Hartford, South Windsor, Bolton, Stafford, Glastonbury, and Somers. The major water quality issues include high turbidity and floatables, organic enrichment and algal growth, and elevated bacteria in various reaches of the Hockanum River and its impoundments. It gets progressively worse as it flows through the increasingly urbanized landscapes of the major population centers of Vernon, Manchester, and East Hartford. Potential sources include municipal point sources (landfills and wastewater treatment plants), urban runoff and storm sewers, agriculture, channelization and habitat modification, and erosion and sedimentation.

Hockanum River Subregional Basin

The North Central Conservation District (NCCD) received Section 319 NPS and River Restoration grants to construct improvements of stormwater outfalls, bank stabilization, fish habitat enhancement, and river access on the Hockanum River in the Rockville section of Vernon. The project was completed.

The Friends of the Hockanum River Linear Park of Vernon, the Hockanum River Watershed Association, and other watershed groups, together with the North Central Conservation District and the Connecticut River Watch Program, are actively involved in protection and restoration efforts throughout the watershed. The CT DEP provided a Section 319 NPS Watershed Assistance Small Grant to the North Central Conservation District and the Hockanum River Watershed Association to help disseminate the State of the Watershed Report on the Hockanum River, previously funded by 604(b) grant funds.

Tankerhoosen River Subregional Basin

The Friends of the Hockanum River Linear Park of Vernon also received a Section 319 NPS Watershed Assistance Small Grant to review local planning & zoning regulations for reducing imperviousness, as well as a previously receiving a Long Island Sound Futures Fund grant with the Hockanum River Watershed Association to collect and evaluate chemical and biological water quality monitoring data in the Tankerhoosen River Watershed. They additionally received a LISFF grant to develop a watershed management plan for the Tankerhoosen.

Mattabeset Regional Basin

The Mattabeset Regional Watershed has a drainage area of almost 109 square miles over more than ten towns (Berlin, Cromwell, Durham, Guilford, Middlefield, Middletown, Newington, New Britain, Rocky Hill, and Southington) and the Mattabeset River itself is a major tributary to the Connecticut River. The Mattabeset River flows for 18 miles in a southeasterly direction before entering the Connecticut River just north of Middletown. Land use in the watershed is nearly 50% forest cover and high-density urban development, with commercial development right up to the riverbank in many cases. Water quality and biological monitoring have documented significant degraded biological activity due to sedimentation, mostly as a result of urban development.

The Mattabeset River Regional Basin has a Total Maximum Daily Load (TMDL) analysis based on indicator bacteria. Achievement of the TMDL is directly linked to incorporation of the provisions of the General Permit for the Discharge of Stormwater from Small Municipal Separate Storm Sewer Systems (MS4) by municipalities, as well as the implementation of other BMPs to address nonpoint sources. Nonpoint sources of *E. coli* bacteria in the basin include failed collection systems, urban runoff and storm sewers, waterfowl, agriculture, and failed or inadequate septic systems. BMPs for the management of NPS sources include nuisance wildlife control plans, pet waste ordinances, septic system testing and maintenance, and farm animal waste management systems.

The Connecticut River Coastal Conservation District (CRCCD) has been systematically gathering and compiling water quality monitoring data, conducting education and outreach efforts, evaluating watersheds with Streamwalks and Track Down Surveys, designing and implementing stormwater retrofits, providing technical NPS assistance to municipalities, and preparing watershed management plans throughout the Mattabeset Watershed. Besides numerous Section 319 NPS grants, they received a Long Island Sound Futures Grant to conduct a Comparative Subwatershed Analysis of the Mattabeset Watershed as the first step towards developing small watershed restoration plans to address known water quality impairments.

Willow Brook Subregional Basin

The Connecticut River Coastal Conservation District (CRCCD) received a Section 319 NPS grant to develop and implement a site-specific recommendations to address elevated turbidity and bacteria levels in Willow Brook, including stormwater retrofits and streambank stabilization. The CRCCD is working with the Town of New Britain Public Works Department to improve stormwater issues at the town's park located in Cromwell.

Willow Brook local basin

Not to be confused with the Willow Brook noted above, this stream is also located in Cromwell. The CRCCD conducted a track-down survey with Section 319 NPS grant funds to identify several potential sources of pollution, suggested NPS management solutions, and prioritized the sites which were presented in a report to the municipality. The report also addresses EPA's 9 criteria for a watershed based plan, albeit at the local basin scale.

Coginchaug River Subregional Basin

The Coginchaug River watershed has a drainage area of 28 square miles (predominantly in Middlefield, Durham, Middletown, and Guilford) which is about half undeveloped and the rest equally divided between agriculture and development. The Coginchaug River is the major tributary to the Mattabesset River, and flows northerly where its confluence is just west of the Connecticut River. Indicator bacteria is the major impairment with suspected sources being agriculture, crop-related sources, intensive animal feeding operations, natural sources, waterfowl, and other unknowns.

The USDA Natural Resources Conservation Service (NRCS) received a Section 319 NPS grant to develop a watershed-based plan (WBP) to address the Mattabesset TMDL for bacteria and the Long Island Sound TMDL for nitrogen. The WBP will provide guidance on how to manage, at a watershed scale, nonpoint source pollution, land use policies and practices, stormwater and river protection, education and outreach, and implementation efforts to further advance water quality improvements. The NRCS has assessed current conditions; identifying threats and opportunities for improvements while fostering stewardship by the community.

The WBP characterizes water and land resource conditions and nonpoint source pollution sources within the watershed. Landscape features and characteristics were examined using GIS-based maps to assess the spatial relationships between impairments and land use/land cover types. This analysis then determined the potential for pollutant load reductions related to the impairment, load reduction goals, and other features and benefits essential to sound watershed management and healthy biological conditions in the stream network. The plan describes both “place-based” (site specific) and regional BMPs that will be needed to achieve the load reductions, as well as provide an estimate of the technical and financial assistance funds needed to implement the plan. This evaluation approach and recommendations will serve as a model for other watersheds.

The Connecticut River Coastal Conservation District (CRCCD) also received a Section 319 NPS grant to assist in the collection and compilation of data, and education and outreach efforts. The plan will also provide for public education and outreach to inform businesses and residents about nonpoint source pollution, thereby promoting a constituency for sustainable development and demonstrating the value of collaboratively and cooperatively working on ways to better manage land and water resources. The plan satisfies Section 319 NPS guidance while providing broader benefits to federal and state watershed management efforts in Connecticut and the NRCS Watershed Planning Process.

Salmon Regional Basin

The Salmon Regional Watershed is located near the mouth of the Connecticut River, where it drains nearly 150 square miles of largely undeveloped forested complex. It covers ten towns (Bolton, Colchester, Columbia, East Haddam, East Hampton, Glastonbury, Haddam, Hebron, Lebanon, and Marlborough) and supports a diverse population of species, especially fishes; and serves as CTDEP’s water quality reference for the Connecticut River basin. It is also part of the Silvio Conte Refuge managed by the U.S. Fish & Wildlife Service, who has identified the lower Salmon River as an area of focus for federal land acquisition.

The Nature Conservancy has spearheaded an effort to create a watershed partnership for the Salmon River and to develop a conservation action plan to conserve and restore the watershed and to support the long-term social and economic health and vitality of its communities. The Salmon River Steering Committee will consist of local, regional and municipal stakeholders, including CTDEP, that have a direct interest in the future of the watershed, and will manage implementation of the plan. Technical assistance will be provided by an advisory group comprised of technical specialists.

Blackledge River Subregional Basin

The Connecticut River Coastal Conservation District received a Section 319 NPS grant to develop and implement a pet waste education and clean-up campaign at Gay City State Park to reduce excessive bacteria. Signage and distribution of various educational materials on pet waste management were specifically designed for this purpose.

Eightmile Regional Basin

The Eightmile Regional watershed is located to the east of the Connecticut River near the state's coastline. Its name originated from being eight miles from the mouth of the Connecticut River. The watershed contains over 62 square miles of rolling forested landscape with over 150 miles of undegraded rivers and streams, large areas of unfragmented habitat, high water quality, and unimpeded stream flow, making it a unique example of an intact and functioning watershed ecosystem in Southern New England. The watershed is almost entirely located within three towns (East Haddam, Salem, and Lyme), which together support the adoption of the Watershed Management Plan that was generated from a Study Committee comprised of the National Park Service, CTDEP, The Nature Conservancy, municipal representatives and local land trusts in pursuit of federal designation as a component of the National Wild & Scenic Rivers System. Designation is being pursued for the entire watershed area.

The Eightmile River Watershed Management Plan makes specific recommendations on how to protect water quality: short term actions (Tier 1) to be adopted within 6-12 months; and longer term actions (Tier 2) that may take 2-5 years to implement.

Tier 1:

- Adopt a River Protection Overlay Zone for all perennial streams and rivers in the Eightmile River Watershed that provides a 50-foot protection area along small headwater streams, and a 100-foot protection area along larger streams;
- Set a maximum impervious surface goal of 10% for any sub-basin within local the watershed and 4% for the entire Eightmile River Watershed as a whole. In addition, each community supports working with the Eightmile River Committee to: 1) refine modeling of current and future impervious levels, 2) use the modeling to predict future increases in imperviousness in each town, and 3) adopt appropriate tools to address limiting impervious surface increases to meet impervious surface goals.

Tier 2:

- Require the design, implementation and maintenance of all new stormwater systems to be consistent with the 2004 CT DEP Stormwater Quality Manual;
- Complete a Stormwater Management Plan for each municipality's stormwater system as described in the State's General Permit for Stormwater from Small Municipal Separate Stormwater Systems (MS4);
- Adopt the University of Massachusetts guidance for watercourse crossings (an approach that is promoted by the Army Corps of Engineers' New England District).

The towns of East Haddam and Salem have already adopted zoning regulations to provide for riparian buffers; Lyme is soon to follow. Regardless of obtaining Wild & Scenic designation, this is a concerted collaborative and cooperative effort by the three towns to control NPS pollution through public education and outreach to minimize imperviousness, provide riparian buffer protection, and adoption of stormwater BMPs.

South Central Coast Major Basin

Quinnipiac Regional Basin

The Quinnipiac Regional Watershed covers an area of 165 square miles, located in 12 towns (Bristol, Cheshire, East Haven, Farmington, Hamden, Meriden, New Britain, New Haven, North Haven, Plainville, Southington, and Wallingford). The Quinnipiac River itself flows 38 miles southward from the Plainville - New Britain border and enters Long Island Sound from New Haven Harbor. The watershed is heavily urbanized and faces several problems including stormwater discharges, contaminated sediments, habitat degradation, low flows during summer months, and flooding. A Draft Total Maximum Daily Load Analysis is being developed for the entire basin to address excessive levels of indicator bacteria.

The Quinnipiac River Watershed Association (QRWA) has received several Section 319 NPS grants for outreach projects aimed at engaging the public and identifying NPS pollution through numerous streamwalks throughout the basin. As a result of their multi-year efforts, they have compiled a database of volunteers' observations and have provided recommendations to the towns for stream restoration. Section 319 NPS funding supported the analysis of this data and identification of areas of concern in need of restoration.

QRWA has additionally developed education and outreach materials for both the public (targeting riparian property owners), and municipal officials utilizing both Section 319 NPS and 604b Planning grant funds, creating a stream buffer landowners guide and pamphlet for riparian homeowners that extensively describes the various tools available for landowners to preserve their backyards and the Quinnipiac Greenway, including Best Management Practices and land conservation tools. QRWA also trained volunteers and municipal officials on the results of their previous funded trash and litter survey, and methods to abate pollution and illegal dumping. Their most recent grant award expands the streamwalk education and outreach program to include installation of storm drain markers, identification of impaired stream buffers, coordination of streambank restoration replanting efforts, and conducting Rapid Bioassessment water quality monitoring at targeted stream restoration sites. QRWA is also developing a

business recognition award program to encourage best management practices along the Quinnipiac River.

In Wallingford, the USDA Natural Resources Conservation Service (NRCS) used Section 319 NPS funds to design and construct a stormwater detention basin retrofit demonstration project for the U.S. Postal Service distribution center on Research Parkway. The existing two-series basin was originally designed to detain stormwater prior to discharging to Willow Brook which flows into Harbor Brook, a tributary of the Quinnipiac River, but had since become overgrown with invasives and offering little water quality renovation. The demonstration project involved USPS employees to remove the invasives, install wetland plantings, and assist in the maintenance of the structurally modified basins to better treat stormwater. A large, informational kiosk describes the project and its benefits.

Quinnipiac River Subregional Basin

The QRWA received Section 319 NPS grant funds to contract an engineering firm to develop plans for a fish ladder at Wallace Dam on the Quinnipiac River in Wallingford - the first barrier to fish passage. (A fish ladder was just recently installed upstream at Hanover Pond in Meriden.) With guidance from CT DEP Fisheries, construction drawings and project costs for a number of design variations were developed. CT DEP Fisheries also coordinated with Save The Sound to provide additional financial assistance and proposed oversight of the actual fish ladder construction, projected for Summer 2008.

The City of Meriden received a Section 319 NPS grant to reduce sedimentation from excessive and improper trail use (e.g. off-road vehicles) by stabilizing the streambank of the Quinnipiac River in the Gorge area, which also incorporated fish habitat enhancement features. Technical assistance on how to remediate the erosion sites was provided by the USDA Natural Resources Conservation Service (NRCS) and CT DEP Fisheries, which dovetailed with the City's efforts to reconstruct the open space trail through the Quinnipiac River Gorge. The City additionally posted educational kiosks on the project.

Wharton Brook Subregional Basin

The Wharton Brook watershed covers 7.65 square miles, the majority of which lies within the Town of Wallingford. Its confluence with the Quinnipiac River is just to the west in North Haven. The area is highly developed with a high percentage of imperviousness. As typical for most urbanized watersheds, sources of NPS pollution are construction, erosion and sedimentation, land development, urban runoff and storm sewers, and other unknown sources. Allen Brook, a tributary, is especially affected by golf course runoff and wildlife, specifically geese.

CT DEP State Parks Division, CT DEP Inland Fisheries, and the USDA Natural Resources Conservation Service (NRCS) worked cooperatively to develop and implement plans to stabilize a large, steep eroding bend along Wharton Brook in Wallingford at Wharton Brook State Park. Using Section 319 NPS grant funds, NRCS hired a contractor to demonstrate bank stabilization using cut and fallen trees cabled together and through the stream bank to stabilize the deep bend

along Wharton Brook, as well as install measures to minimize scouring at the confluence with Allen Brook; conducting vegetative plantings and partial retaining wall replacement just upstream along Allen Brook; and constructing a stormwater quality renovation basin below the outlet discharging stormwater from Route 5 to Wharton Brook.

A Total Maximum Daily Load Analysis was approved for Allen Brook and Allen Brook Pond located at Wharton Brook State Park in Wallingford for indicator bacteria, which denotes stormwater as being the major contributor.

CT DEP State Parks Division also obtained a Section 319 NPS grant to design the installation of a proposed sediment forebay and dredging project for Allen Brook Pond located at Wharton Brook State Park in Wallingford.

South Central Eastern Regional Complex

Chatfield Hollow Brook Subregional Basin

The Connecticut River Coastal Conservation District received a Section 319 NPS grant to develop and implement a pet waste education and clean-up campaign at Chatfield Hollow State Park to reduce excessive bacteria. Five pet waste stations were installed, along with signage and distribution of various educational materials specifically designed for this purpose.

South Central Western Regional Complex

West River Subregional Basin

Yale School of Forestry and Environmental Studies are facilitating local stakeholder interests in improving the water quality of the urbanized sections of the West River in New Haven/West Haven. A long list of experienced and notable individuals/entities have participated, leading to the creation of a West River list serve for future communications.

Thames River Major Basin

The Thames Major Drainage Basin comprises nine regional drainage basins: Thames Main Stem, French, Five Mile, Moosup, Pachaug, Quinebaug, Shetucket, Natchaug, Willimantic and Yantic. The upper reaches of the Quinebaug River and the French River are located in south-central Massachusetts, and smaller percentages of the French, Fivemile, Moosup and Pachaug basins originate in neighboring Rhode Island. The northern half of the basin is relatively rural, characterized by small towns, farmland and forest, although a variety of pressures have caused the disappearance of many farms and privately-owned forest lands. The southern half of the basin trends to more urbanized and industrial land uses where urban redevelopment and suburban expansion has occurred. Recent development and multiple expansion phases of two Tribal Nations casino resorts have created a national tourism destination area. The basin's proximity to urban areas of Hartford, Springfield and Providence has increased development pressures. A large-scale redevelopment proposal for the Norwich State Hospital property in Preston/Norwich and associated transportation improvement proposals are recent additions to regional development pressures.

Significant accomplishments in 2006 and 2007 included the following:

French River Basin

The Town of Thompson Together coalition, along with the Massachusetts-based French River Connection and other watershed stakeholders, continue action strategy development for water quality and watershed issues along the French River, and across State boundaries. Existing State and Federal agency water monitoring data are being shared. CT DEP provided some Section 319 NPS funds to the Quinebaug-Shetucket Heritage Corridor Water Subcommittee Coordinator to fund necessary water quality equipment for a citizen monitoring project in Thompson, CT, while the Coordinator also obtained funding support for the Commonwealth of Massachusetts to obtain water quality monitoring equipment for citizen monitoring work in the Dudley, Oxford and Webster, MA communities within the French River watershed. Data collected within Thompson was provided to CTDEP Water Monitoring program for integration in the upcoming Connecticut 2008 Integrated Water Quality Assessment report. A CT DEP Section 319 grant agreement with USDA-NRCS was executed to design and develop community support and participation in a riparian buffer project on a highly visible municipal parcel along the French River, with the project slated for completion in late 2007. Initial project deliverables and community participation were successfully completed, town volunteers and community leaders raised necessary funds and obtained local permits, and town volunteers were scheduled to begin riparian plantings in the spring of 2008.

The Town of Thompson:

This tri-watershed community (French/Quinebaug/Fivemile) completed a town wide trail inventory; the Conservation and Open Space Committee developed a quality Open Space Inventory and Plan; and an active town committee coordinated annual large-scale river cleanups along the French and Quinebaug Rivers. The Town Planner is engaging in regional planning and coordination planning efforts for regional trails, public water access and greenway designation proposals, and requested 2 ERT reviews – one for a residential subdivision with frontage on the Five Mile River and one for a pond-river-wetland complex resource inventory (Long Pond).

Quinebaug River Basin

Town of Brooklyn:

The implementation phase of the Day Street-Westview Drive stormwater quality management project was completed in 2006. This included acquisition of a conservation and drainage easement within a privately owned parcel to provide for a significant portion of the designed stormwater treatment train in the upper watershed. Installations included a sediment forebay and water quality swale in one area, a large serpentine water quality swale in a second area, several deep sump catch basins along two residential streets, and a downstream detention basin. Targeted local outreach was completed and is maintained by the Conservation Commission and First Selectman's office. CTDEP and the Town will be monitoring the approved commercial development of the private land

and its consistency with the installation of stormwater quality improvements made elsewhere on the property. The Town leveraged this project to attract an additional State (STEAP) grant award to design a downstream Town Park that receives this treated stormwater and improved access along the Quinebaug River. The Town has chosen a final park design and seeks other funding assistance. A portion of this Park is subject to a USDA-NRCS Wildlife Habitat Improvement Project award to the Town of Brooklyn to control invasive plant species within the riparian and upland habits of this Quinebaug River segment.

Eastern Connecticut Conservation District (ECCD):

- The Section 319-funded Standardized Farm Field Mapping Project was completed with targeted education brochures developed and distributed to eligible farmers in the Quinebaug River Basin, focusing on land applications of dairy manure and evaluating manure management options. Two farmers were selected to participate in the detailed mapping and record keeping training. The project deliverables included producing standardized maps of field locations, acreages, and soil test results and application data that will help reduce nutrient loading from farm fields that may impact downstream waterbodies in these river basins. The Conservation District developed additional capacity to access and utilize the USDA-Farm Services Agency digital soils and farm field maps, providing for additional District services options in the future.
- A *Phragmites* (reed grass) control project was completed at Roseland Lake, in the Muddy Brook/Little River sub-regional watershed of Woodstock that reduced the invasive non-native wetland plant by nearly 95%. The project was conducted by the CTDEP Wetland Habitat Management Program. The Roseland Park Trust, the Roseland Lake Homeowner's Association, the Town of Putnam Water Authority and other lake stakeholders continue to provide financial support for the project, towards working on reclaiming swimming and other water recreation opportunities along the Roseland Lake frontage. Continued outreach will continue to engage local stakeholders in ongoing monitoring and management. CT DEP incorporated the project outcomes within its 2006 CALM document assessment of this impaired waterbody segment to reflect this successful invasive species management work.
- The District initiated a Section 319-funded Farm Nutrient Reduction Project within the Little River sub regional basin of the Quinebaug River, primarily in Woodstock. Developed as an implementation action of the 2006 Little River Sourcewater Protection Plan for the Town of Putnam, the District began research and communication with area dairy farmers holding surplus animal manure. Options were developed for acquisition of specific farming equipment that can incorporate liquid manure into selected fields of 3-6 farmers, following a plan amongst farmers to share, transport and maintain the equipment, while the District is to subcontract with the University of Connecticut water resources program to establish a water monitoring study on the effectiveness of the equipment use to incorporate manure and reduce polluted runoff into the receiving waterbodies listed as impaired for Recreation by CTDEP. The chosen equipment and acquisition process should be completed prior to the spring 2008 growing season.

- The District initiated a Section 319-funded Watershed Management planning exercise for the upper Quinebaug River watershed contributing to the West Thompson Lake. The District is evaluating this section of the river and its tributaries, documenting possible contributing sources of pollutants and providing recommendations to reduce pollutant loading to the river. A number of federal and state agencies active in the area will be consulted. Initial work identifies a big obstacle of lack of local water quality monitoring data. The resulting plan will likely be expanded to include a Watershed-based Plan formula following US EPA's nine elements. The plan is designed to provide guidance to improving the water quality in this impaired section of the Quinebaug River. The management plan is expected to be completed by mid 2008, and be transferable in process, lessons learned, and some content focus on the adjacent Little River/Muddy River watershed in a Phase 2 Section 319-funded agreement with the District and CT DEP.

Quinebaug River Team (QRT):

QRT is an active sub-committee of the Natural Resource and Agriculture Committee in The Last Green Valley. QRT was formed to protect, improve and bring attention to the natural, historic and recreational resources of the Quinebaug River. The Phase II Visual Resource inventory in the lower Quinebaug River towns of *Canterbury, Plainfield, Sterling, Griswold, Lisbon, Preston, and Norwich* was completed in 2006. Information that includes possible NPS sources has since been shared at local land use commission and land trust meetings. Some information is being further developed for inclusion in the proposed 2009 Source to Sea Expedition by the Last Green Valley, Inc. This subcommittee is providing regional communication and umbrella coordination potential as the local watershed advocate for the Quinebaug River main stem, and could be a contributor to an upcoming Quinebaug River watershed based plan.

Quinebaug/Shetucket River Watershed Integrated Pest Management (IPM) and Nutrient Loading Demonstration Project:

- Partially supported with a Section 319 NPS grant, University of Connecticut Department of Plant Sciences and Cooperative Extension Service continued to recruit IPM project cooperators in several agricultural commodity areas. The primary goal of this project was to reduce the use of pesticides and nutrients within the Quinebaug and Shetucket River watersheds that may pose a critical threat to aquifers and surface waters. This was accomplished by in-depth educational training programs for agricultural producers and green industry professionals. Training was implemented in the Quinebaug and Shetucket River watersheds in the following commodity areas: vegetable crops, fruit crops, nursery crops, greenhouse crops, field corn and turf grass. Depending on the commodity or clientele group, IPM education consisted of on-site demonstration projects, individual and group training sessions, twilight meetings, season-long consultations and meeting presentations. The programs provided recommendations for best management practices, particularly to reduce high environmental risk pesticides (e.g. those with high leaching potential) and excess nitrogen applications. The Nutrient Management component

included the use of the Presidedress Soil Nitrate Test (PSNT). The soil testing was conducted by staff of the Eastern Connecticut Conservation District. Nitrate analysis and nutrient recommendations were provided by Dr. Tom Morris (University of Connecticut Extension Soil Specialist), and the University of Connecticut Soil Testing Laboratory. Post-season surveys of program participants were used to determine changes in pesticide and nutrient practices as a result of the program.

- A second goal of the project was to conduct educational programs for home gardeners, particularly for turf grass management. Collaboration was established with the UConn Cooperative Extension Residential Water Quality Project to achieve this goal. Additional education was provided via on-line Internet courses, through the University of Connecticut Home and Garden newsletter, as well as training of Cooperative Extension Master Gardeners. IPM presentations were also made at public events. Geographic and watershed-based impairment focus in this reporting cycle was transitioning to the lower Thames River basin during this reporting period.

Little River Sourcewater Protection Plan

The Plan was completed by a local team coordinated by the Atlantic States Rural Water and Wastewater Association. This Plan was developed during a year-long process to protect the Little River watershed which supplies drinking water for much of the Town of Putnam and public water supply wells in Woodstock. The management plan was developed to address the lack of hard data and mitigate known potential contamination sources. Major plan elements included: a comprehensive evaluation of the watershed, agricultural best practices, protection of key watershed lands, education and outreach, and a focus on both Roseland Lake and Muddy Pond waterbodies. A Standing Committee was established in 2007 to evaluate plan implementation progress and modifications over time. Some Plan elements are being addressed with a Section 319 NPS grant award for innovative manure injection application on sensitive agricultural lands (see above). Baseline watershed water monitoring was conducted over four quarters by the regional health district and data was provided to CTDEP Water Monitoring program for consideration in the upcoming CT 2008 Integrated Water Quality Assessment. A research project by the University of Massachusetts chose a willing dairy farmer property in Woodstock to study a technique to reduce nitrogen loading from agricultural operations to receiving waterbodies, in this case the Little River. An outreach presentation for river science and management stakeholders is slated for early 2008. Additional targeted outreach and education talks, interpretive signage and events have since led to a successful application to the Connecticut Greenways Council for State Greenway designation for the Little River corridor. Collaborative land protection efforts amongst the towns of Putnam and Woodstock, local land trusts, State agencies, and the Putnam Water Department were bolstered by the greenway designation and continue to support Plan recommendations. See:

<http://www.asrwwa.org/Images/1884/Little%20River%20SWPP.pdf>

Woodstock Nutrient Management Study

The CT DEP and Eastern Connecticut Resource Conservation and Development Area, Inc. (ECRCD) coordinated and used Section 319 NNPS funding for a feasibility study to evaluate composting or anaerobically digesting dairy manure at a regional facility in the Woodstock area, tributary to the Quinebaug River. This area was identified as having surplus dairy manure in excess of what is needed for crop production on the farms that generate the manure. Conceptual designs and associated costs were developed for four alternatives. The revenue generating ability of the proposed facilities was evaluated through market analysis of composting products and energy costs. A food waste survey was conducted to identify local food waste producers who could benefit from alternative disposal options. A project website, www.ctnm.org was developed to disseminate information about the project and the statewide nutrient management study of 2005, and a fact sheet was developed for the project. The project will continue with development of a business plan and marketing study to determine the direction future efforts will take in the Woodstock area. Funding from the CT DEP Section 319 NPS program and other State funding will be used in 2008 to start construction of a manure composting facility in North Canaan Connecticut.

Moosup River Basin

- The Borderlands Project, initiated by the Nature Conservancy (TNC) in 2001, focuses on the Pawcatuck Borderlands forests and has since expanded by the Rhode Island Economic Policy Council and basin communities to include 20 towns on the Rhode Island and Connecticut border, and includes the Moosup River basin in Connecticut and Rhode Island. A research project to identify priorities for ecologically-based land conservation was completed in 2005 with support from a new landscape target initiative of TNC. High priority parcel mapping in this watershed revealed that aquatic habitat ranks strongly in several alternative conservation strategies. The greatest threats to overall health of the area include future development, interruption of free-flowing streams, sewer discharges, roads and associated road runoff. Several headwaters and aquatic buffer areas most valuable to protect given these threats were identified and acquisition methods and agencies were provided. Formation of a bi-state watershed council is encouraged to address these watershed-scale conservation planning priorities. TNC continued their planning focus in 2007 with a Conservation Area Planning (CAP) exercise for the Thames River basin, highlighting conservation strategies for priority aquatic targets that include the Moosup River. One CAP outcome was the proposal by TNC staff to access settlement funds from the US Fish and Wildlife Service to initiate the removal of the first fish passage barrier on the Moosup at Water Street. USFWS plans to announce a Yaworski Lagoon/Canterbury needs assessment and restoration plan in 2008 with predicted alternative preference for this barrier removal, which would open 5 miles of upstream watershed habitat for migratory fish species and other aquatic organisms.
- A series of fish passage barriers have been identified along the mid Moosup River in Plainfield that effectively limit some anadromous fish species migration, as well as resident fish movement to varied river corridor habitats. The river corridor is identified

by CTDEP as one of the highest quality cold water fisheries of the Quinebaug River watershed. A preliminary assessment began in 2001-03 as part of a Supplemental Environmental Project proposal by Kaman Aerospace in Moosup. That proposal was revisited in 2006 and 2007 by CT DEP Watershed Management and Inland Fisheries Division staffs in preparation for a competitive application to the Millennium Power/Quinebaug River Mitigation Management Team Phase 2 program. Seven barriers, including an abandoned water/steam distribution main pipe and several dams of varying construction styles used for water impoundment and/or hydropower generation needs, have been visited, photographed and reviewed for initial design and construction cost estimates to breach or remove the barriers. Tours of this river corridor segment were provided to several other agencies and potential stakeholders, in anticipation of a CT DEP formal project proposal in 2008-9.

Natchaug River Basin

- The Naubesatuck Watershed Council completed a Section 319-funded project to develop a river Plan of Conservation (phase 1 data collection). Preliminary data was collected and augmented with late summer streamwalk assessments. A part time coordinator reviewed action plan options including town-by-town resource plans to address more watershed-based planning and management opportunities. Several multi-town conversations were held to determine priority directions to take and likely partners to include. That process has led to a proposal coordinated by the Nature Conservancy-CT Chapter staff, Naubesatuck Watershed Council, Windham Region Council of Governments and CT DEP to initiate a Natchaug Conservation Area Planning (CAP) in late 2008. This process will be based on a successful application within the Salmon River watershed and other locations in Connecticut. This process will develop a set of focal conservation targets that represent the Natchaug Basin biodiversity, key ecological attributes and measureable indicators, and determination of current and desired status. The process will first acquire the support from each of the watershed town's governing bodies. Nonpoint source pollution topical areas will include review of CT DOT and local highway department road operations and management of infrastructure with real and potential degrading impacts to generally high quality water resources in this watershed. The Green Valley Institute has started development of a watershed-wide Natural Resources Inventory, linked to a co-occurring resource analysis tool to identify key parcels in this watershed from the perspective of water quality protection and connectivity on the landscape.
- CT DEP's Inland Fisheries Division, Habitat Conservation and Enhancement Program, completed a Section 319 NPS-funded project to enhance riparian and stream habitat along a 1,000 foot section of the Mount Hope River in Ashford. Agricultural (mostly livestock) practices had resulted in the alteration of a forested riparian zone, causing streambank instability, erosion/sedimentation and degraded of the riparian area and instream habitats for the resident fish community. Project engineering and design was completed by USDA-NRCS staff, applying principles of natural channel processes with river engineering techniques to design stable, naturally functioning channels. Streambanks were stabilized with a combination of bank placed boulders, logs, erosion

control fabric and vegetation. Restoration involved filling much of the channel to create a restored and stable stream width, along with creation of a gentle sloped bankfull bench along the streambank. Over 3,200 feet of electric fencing was installed by the landowner to control livestock access and protect riparian areas. A replanting of the riparian zone was completed with sand bar willow, banker willow, silky dogwood and high bush blueberry. The DEP's Wetland Habitat and Mosquito Management construction team was utilized for much of the construction work. Post construction rain events were monitored in 2006 and 2007 that showed bankfull flow conditions successfully tested the design and construction without channel erosion or instability. Ongoing monitoring will continue by the Inland Fisheries Division to assess success of this stream restoration project.

- The Nature Conservancy- CT Chapter applied for a North American Wetland Conservation Act (NAWCA) grant in 2007 towards large scale land protection (1,103 acres) in the upper Quinebaug and Natchaug River watersheds. This proposal seeks to permanently protect significant habitat through fee and conservation restriction acquisitions. This proposal will contribute to the achievement of the Atlantic Coast Joint Venture waterfowl goals in the Thames River Basin and the Long Island Sound. Much of the focus is on highly functional wetland systems that support baseflow and excellent water quality in the targeted watersheds. Public benefits of the permanently protected lands will provide for water resource conservation, as well as for recreational and ecosystem services. Existing and pending CT DEP land acquisition matches are an integral part of a protection oriented strategic approach in this regional watershed, and meets the protection-oriented watershed strategies for the Natchaug River basin as well as some headwaters of the Quinebaug River basin. The request is for \$1,000,000 to TNC, with matching partners TNC, CTDEP, private landowners, Norcross Wildlife Foundation, Wyndham Land Trust, and towns of Eastford and Woodstock contributing over \$3.2 million with a non-matching partner contributions totaling \$145,000. Field visits by grant reviewers and Connecticut project partners (including CTDEP) were made to potential acquisition parcels in late 2007 and a strong favorable review was provided. Grant announcements are expected in early 2008.

Shetucket River Basin

- The CTDEP Diadromous Fish Restoration program continued monitoring of newly installed or revamped fish passage facilities at hydroelectric power generating facilities in the Taftville section of Norwich, and for Norwich Department of Public Utilities hydropower generation facility at the upstream Occum Dam. Diadromous fish species were reported as passing both facilities in their upriver migration in 2006 and 2007. Migratory river herring can now travel up the Thames River watershed to the base of the Scotland Dam in Scotland, which will incorporate fish passage plans as part of a Federal Energy Regulatory Commission (FERC) hydropower license reissuance by 2012.

- CT DEP continued to stock Atlantic salmon surplus broodstock in the Shetucket River to expand a popular recreational fishery between the Occum and Scotland Dams along the main stem.
- The current Scotland Dam hydropower generation FERC license was subject by its owners to the beginning of a long relicensing process in 2006. By mid 2007 a rather unique scenario unwound in the integrated relicensing process, as two applicants submitted notices of intent and preliminary resource assessment documents for the same facility – FirstLight Power and Norwich Department of Public Utilities. Both applicants are announcing run-of-river flow conditions through this facility, which can have significant benefit potential for water quality and aquatic life habitat needs in the river. CT DEP submitted review comments in 2007 with respect to water quality and flow regimes in this segment of the Shetucket River, reminding applicants to review their plans in light of the current impaired waters listing for Recreation, due to bacterial exceedances.
- The Thames River Basin Partnership (TRBP) convened a successful workshop in 2007 along the Shetucket River from Norwich to Willimantic. Over 40 watershed stakeholders traveled by bus along the river route, attending short presentations about fish passage at Taftville/Pohemah Mills dam, Scotland Dam hydropower operations, ice and flood protection issues near the new River Park in Sprague, Willimantic Whitewater Partnership new land acquisition at the proposed Riverside Park, and a keynote presentation by American Rivers staff described the US history of dams and dam removal and related river restoration projects in the region. Follow up information was supplied on a thumb drive to all participants, and workshop images are posted on the TRBP website at www.trbp.org.

Willimantic River Basin

Willimantic River Alliance (WRA):

- A watershed assistance small grant was awarded to the Alliance by Rivers Alliance of Connecticut for the development of a watershed-wide website (www.willimanticriver.org), and development of incorporation paperwork to become a formalized nonprofit conservation organization. In 2005 WRA did officially incorporate as a 501(c)(3) nonprofit organization, elected a board of directors, initiated a Plan of Work, and completed a website complete with a revised River Greenway and Recreation Guide, posted at: www.willimanticriver.org. The WRA continued to research information and utilize opportunities to review and comment on larger development proposals and one state highway bridge replacement proposal; NPDES wastewater permitting reviews; University of Connecticut master water supply planning and management proposals, comment on and provide community outreach about the DEP-developed TMDL for the newly listed impaired Eagleville Brook tributary to the Willimantic River. WRA provided community network support and outreach to an updated streamwalk assessment developed by the Eastern Connecticut Conservation District. WRA has gained regional stature as a reputable watershed voice, represented in

2007 on a UConn-sponsored instream flow study and hydrogeologic study of their Willimantic well field.

Willimantic Whitewater Partnership (WWP):

WWP continued its stakeholder organization with focus on the downtown Willimantic section of the Willimantic River.

- WWP's vision is to connect the City to the river by creating a world-class whitewater recreational park and a riverside park connecting historic, art and enterprise zones, joining three rail-trail recreational corridors, and restoring ecological and fisheries features through the removal or breaching of dams.
- WWP utilized a Partnership grant from the Quinebaug-Shetucket Heritage Corridor, Inc. to study lower Willimantic River sediments behind 2 dams that may be proposed for breaching or removal in support of the Willimantic Whitewater Park. Technical assistance and guidance was provided by CTDEP, by a NOAA Habitat Restoration grant program, and by consulting firms and others offering in-kind services.
- The Partnership is a key supporter of the annual Willimantic RiverFest, which attracts over 500 people to celebrate and learn about the historic and natural resources of the lower Willimantic River, including 80-100 boaters who travel the Willimantic River for 8 miles).
- Active Partnership planning in this lowermost river segment continues to build local capacity amongst community interests with regards to better stormwater management practices and smart growth planning from the small but economically stressed urban center.

Thames River Main Stem/Basinwide

A FY2005 319 NPS grant was executed through the Eastern CT Conservation District (ECCD) for a part-time coordinator (20 hr/wk) to assist in implementing the Thames River Basin Partnership's Plan of Work and in expanding outreach capabilities. The TRBP Steering Committee also worked cooperatively with the Water Subcommittee of the Quinebaug-Shetucket Heritage Corridor, Inc to support an additional 5hours/week for this coordinator to establish and promote a volunteer water monitoring network in the Corridor. The Partnership Steering Committee developed a job posting and in late 2005, and hired a Coordinator in spring 2006. With this funding support, the TRBP Coordinator was able to expand participation in the Partnership and at TRBP quarterly meetings; initiated a quarterly e-newsletter, the *Partners in Action Report*, to report on Partner Plan of Work activities; and initiated a new TRBP Subcommittee, the Poquetanuck Cove Preservation Committee, that applied for and received funding support for a multi-partner, multi-phased implementation project at Poquetanuck Cove, located between Ledyard and Preston, CT.

- A FY2006 319 NPS grant was executed through the ECCD to continue a part-time coordinator (20 hr/wk) to assist in implementing the TRBP Plan of Works and in expanding outreach capabilities. The Coordinator developed educational materials to enhance the knowledge of the public about non-point pollution sources and impacts. This included the organization of a regional workshop on Low Impact Development for land use decision makers. In addition to outreach materials and events, the TRBP Coordinator successfully developed an outreach program specific to Total Maximum Daily Load (TMDL) information and expanded the website, www.trbp.org. Quarterly meeting attendance and participation was improved significantly by inviting guest presenters to speak on TRBP Plan of Work topics. An outreach program focused on stormwater impacts on water quality was introduced via a rain barrel promotion.

Thames River Basin Partnership (TRBP) Floating Workshop

TRBP conducted their 6th annual Partnership flagship annual event, a “Floating Workshop” for watershed stakeholders. In 2006, this event along the Thames River was held in two parts. The morning session was a special tour of Poquetanuck Cove in response to a request from local conservation advocates concerned about planned land use changes and their impact on the cove. The afternoon workshop focused on smart growth/smart conservation initiatives. It began with a keynote speaker provided by Trout Unlimited at the Norwich City Hall, transitioned to the city dock where harbor redevelopment plans were presented, and ended with a boat tour of the Thames River aboard Project Oceanology’s Envirolab II. The morning program led to the formation of a Poquetanuck Cove Preservation Committee and a multi-partner implementation project to control *Phragmites australis* in Poquetanuck Cove.

U.S. Geological Survey/CT District Office (USGS)–USGS continued conducting an analysis, the Quinebaug River Nutrient and Algal Dynamics Study, to 1.) calculate the loads of total phosphorus and total nitrogen that discharge from the Quinebaug River into the Shetucket and upper Thames Rivers, 2.) record and document changes in water quality as a result of primary productivity and regulation in the watershed, and 3.) document the occurrence, distribution and types of algae in the Quinebaug River. Load estimates for priority nutrients will be revised using the USGS Loadset software program. The project will compile and interpret yield estimates for subbasins and sequential downstream main stem drainage areas. This project began in 2005, with a draft report expected in late 2006 and a completion in 2007.

One focus in 2004 was the development of a Thames River Basin Plan of Work (Science Plan). Its objective is furthering the understanding of hydrologic and water quality processes that will support management within the basin. The Science Plan outlines water quality investigations that will provide information necessary for the CTDEP to develop water quality management and restoration strategies for nutrient-related problems in the Thames River Basin. The CT 319 program used the science plan to prioritize funding for important projects.

USGS trend analyses indicate that total phosphorus in the Quinebaug River has decreased substantially since the 1970s.

USGS continued several studies of water quality impairments at West Thompson Lake in Thompson on the Quinebaug River. Using 319 funds, the USGS continued its investigation to develop a conceptual phosphorus budget for this Army Corps of Engineers Flood Control Project river impoundment. The results of this investigation are anticipated to support TMDL calculations for West Thompson Lake, listed as an impaired water body segment for aquatic life support and primary contact recreation.

A parallel investigation also using 319 funds began in 2005 to determine daily and seasonal loads into West Thompson Lake. The objectives include determining variations in stream nutrient concentrations, determining how daily fluctuations in nutrient concentrations and discharge affect daily load estimates, and evaluate the effects of streamflow regulation on the accuracy of nutrient load estimates based on current sampling schedules. Recent increases in phosphorus concentrations in the late 1990s may be due to increased nonpoint source contributions from urbanizing landscapes within the Quinebaug River Basin. See <http://pubs.usgs.gov/sir/2004/5094/>.

- USGS completed a study that characterized the relation between nutrients and primary productivity in the Quinebaug River Basin (see: <http://pubs.usgs.gov/sir/2004/5227/>).

The Eastern Connecticut Resource Conservation and Development Council (RC&D):

The RC&D continued successful implementation of their Plan of Work. The Plan focuses on agriculture, livable communities, and greenways. NPS management projects included:

Working with CTDEP and the farming community to meet the concentrated animal feeding operations (CAFO) rules. See Woodstock Nutrient Management Study listing within the Quinebaug River basin section of this report.

The Nature Conservancy (TNC):

In 2007 TNC-CT Chapter consulted with U.S. Army Corps of Engineers, CT DEP, and other agencies towards submission of a proposal to Congress to authorize the U.S. Army Corps of Engineers to conduct a preliminary feasibility study for water quality investigation needs with direct interest to the Corps mission in the Thames River Basin and Long Island Sound. The requested funding totals \$100,000 and the Corps' New England District Planning Branch is supportive of the proposal. Congress should act on the authorization in early 2008; it is unclear whether funding will be attached to the authorization. This proposal is a direct outgrowth of the TNC-conducted Conservation Area Planning process for the Thames River Basin in 2006-07. DEP has submitted a letter of support for the proposal and interest to discuss a future cooperating agency status if and when the feasibility study is completed.

Southeast Coastal Major Basin

Jordan Cove Urban Watershed National Monitoring Program Project:

The project team moved beyond its investigative phase completion ceremony toward a targeted education and outreach phase of the project. The research monitoring station and key monitoring structures were closed out and removed across the now fully developed neighborhood project site. Lessons learned from the successful national monitoring project were shared with target audiences through talks, trade journal articles, peer-reviewed publications, conferences and a major website revision. A 30-minute PowerPoint presentation, an interactive multi-media CD, were all developed by UConn staff and program in consultation with the project advisory team, and distributed to all 169 Connecticut municipalities. Over a dozen presentations were given by team members at professional conferences across the region and country. Several updated brochures and fact sheets were developed and linked to the project website (www.jordancove.uconn.edu), those of project team agencies and distributed to all Connecticut communities and New England state environmental agencies. At least 6 peer-reviewed articles were accepted for publication. Town staff and project team members continued to provide site tours of the project development to interested community planners, public works programs, and others. A final 319 reporting document was developed to CT DEP in 2007. A total of \$980,000 of Section 319 NPS funds was expended, with a non-federal match contribution total of nearly \$653,333 through the University of Connecticut, land owners, and the Town of Waterford. A final project report will be widely distributed in late 2008 signifying the completion of this project nearly 15 years in the making.

Southeast Coastal Watershed - Western Complex

Niantic River Watershed Protection Plan (NRWPP):

In 2005 CTDEP awarded a NOAA-OCRM coastal NPS management grant to develop a watershed protection plan for NPS-impaired Niantic River and its watershed (within towns of East Lyme, Montville, Salem and Waterford). A twelve-month planning process was completed in September 2006 with the publication of the *Niantic River Watershed Protection Plan: Watershed-wide Strategies to Prevent Nonpoint Source Pollution*. The Plan includes an integration of nine key watershed plan elements required by DEP and U.S. EPA for support of implementation recommendations that are eligible for Section 319 NPS funds. Key findings in the areas of data assembly and results, zoning, environmental and monitoring include:

- 15+ stormwater outfalls discharge directly into the Niantic River.
- 5 local basin drainages are currently covered by over 10% impervious surfaces, and current local regulations can allow for 10 local basins to be covered by 10% or more impervious cover, with one basin projected to be over 30% impervious cover.

- Stormwater modeling showed increased loading to the Niantic River from existing development. Any areas considered developable pose a risk for direct discharge to the lower river by increasing pollutant loading through its tributaries.
- Undeveloped areas upstream of the lower, more developed portion of the bigger watershed pose a great risk to increasing loads to town water supply reservoirs.
- Tracked development in the watershed since 1985 resulted in over a thousand acres of forest conversion to either developed, barren or grassed lands.
- For zoning, a more effective approach to protect community water resources may be to match wetland protection requirements for a consistent watershed wide approach to protecting water quality.
- Eelgrass populations plummeted in 1999 but rebounded in 2003-04. The future of eelgrass in the coastal river is unclear and requires regular protection and monitoring.
- Measurement of water quality throughout the watershed is not currently a standard practice. To evaluate improvements through use of BMPs and planning changes, practical measurement techniques will be needed.
- Monitoring and inspection programs are already underway in Towns of East Lyme and Waterford, but the potential for future development is the greatest in the upper reaches of the watershed.

The DEP Watershed Management program posted the document on its website at http://www.ct.gov/dep/cwp/view.asp?a=2719&q=379296&depNav_GID=1654 . DEP programs continued to meet with local stakeholders in 2007 towards formation of a standing committee to gain local adoption of the Plan. A delay ensued with the local election results bringing in new town chief officials. DEP contracted with Eastern CT Conservation District, utilizing Section 319 funds, to fund a part time position with existing District staff to provide a local coordinating role. The early results are promising, with new energy displayed by town staff and land use/shellfish commissions, local conservation and watershed organizations. There is a preliminary plan for a town CEO forum in early 2008 to garner political support to move the Plan document towards a useable community plan and basis for development of action strategies. Additional Plan priority recommendations that include water quality monitoring and community education/outreach were being pursued by DEP and local watershed stakeholders in future DEP contract agreements. An additional Plan recommendation is being addressed through the Connecticut Clean Marina Certification program, where DEP is working with at least one Niantic basin marina toward possible certification in 2008.

Southeast Coastal Watershed- Eastern Complex

Groton Utilities Drinking Water Quality Management Plan

The CT Department of Public Health is currently working with Groton Utilities and local communities to develop a water quality management plan for Groton Utilities and also to be used as a potential model for the State of Connecticut to protect public water supplies and still allow balance for prudent economic development. The Drinking Water Quality Management Plan will address immediate concerns related to the protection of the purity of drinking water in Groton Utilities watershed. The CT DPH had received funding from the EPA to initiate this process. Stakeholders' involvement is key to the project success and viability. DEP is an active agency participant in the Advisory Committee meetings and is attempting to broaden the planning objectives to incorporate additional watershed-based needs and assessments, aligning with the nine key elements of a watershed-based plan. There currently are no listed impaired waterbodies within the Groton Utilities public watershed supply areas.

Pawcatuck River Major Basin

- In the summer of 2007, CT DEP Water Monitoring Program, along with the CT Department of Agriculture/Aquaculture Bureau, assisted staff at the Rhode Island Department of Environmental Management in a sanitary survey along the Connecticut shoreline of the Pawcatuck River, towards a bacteria TMDL for the Pawcatuck River. Staff identified some NPS sources associated with livestock entering the river and riparian areas, and information was shared with USDA-NRCS and other agencies involved with nutrient management programs.

The Nature Conservancy (TNC) and the Rhode Island Economic Policy Council began in 2005 to formalize a watershed-wide conversation framed in smart growth and regional cooperation for the enlarged area known as the Borderlands. They had formerly focused on the unfragmented 136,000-acre forest land and critical watershed landscape area known by TNC as the Pawcatuck Borderlands.

The project progressed in this reporting cycle with several workshops in support of existing village centers within this region – including topics of transfer of development rights, alternative wastewater treatment technologies, economic development and affordable housing. The project is chronicled and communication amongst participants is enhanced with a project website posted at: <http://www.borderlandsproject.org/>. A Village Innovation Pilot program began in 2007 through a competitive application process. This is a strategic planning initiative to work with two Borderland towns to conserve critical lands by focusing appropriate growth into existing or planned village centers. The chosen towns are Exeter, Rhode Island within the Pawcatuck Major Basin, and the community of Killingly, CT, within the Thames Major Basin (Quinebaug/Fivemile). The pilot will also give organizers a stronger sense of the level of technical assistance needed by the communities future programs are crafted. This intensive community visioning and planning initiative should develop strong potential for transferability to other Borderland towns in the Pawcatuck Basins (and Thames), and develop local capacity to address nonpoint source pollution restoration and protection strategies and actions. The town of Killingly has already expressed interest to tie their new-found community village center visions to include integration of a stormwater retrofit project (within a streetscape improvement project) coordinated by the Thames River Basin Partnership Coordinator, under a Section 319 NPS grant.

V. STATEWIDE MANAGEMENT PROGRAMS

Inland Wetlands and Watercourses

Inland Wetlands Management

The Wetlands Management Section provides day-to-day support to all 170 municipal Inland Wetlands Agencies in the state. As the majority of land use decisions are made at the local level, one of the most important functions of the Wetlands Management Section is conducting the Municipal Inland Wetland Commissioners Training Program. The training program helps commission members and staff to understand their roles and responsibilities under the Inland Wetlands and Watercourses Act (IWWA). It also provides skills in the identification of wetlands, wetland functions, site plan review, impact analysis, permitting, and enforcement as related to the IWWA. The CT DEP wetlands program staff utilized numerous training materials in presenting the training program, including documents funded under Section 319.

In 2006 there were:

- 507 total participants, representing
- 101 municipal Inland Wetlands Agencies, of which
- 261 individuals attended at least one of the three program segments, with
- 78 of these individuals attending all three segments and therefore received a 2006 certificate of program completion.

In 2007 there were:

- 448 total participants, representing
- 114 municipal Inland Wetlands Agencies, of which
- 267 individuals attended at least one of the three program segments, with
- 74 of these individuals attending all three segments and therefore received a 2007 certificate of program completion.

Erosion and Sediment Control

In 2004, CT DEP completed the training program for the 2002 Connecticut Guidelines for Soil Erosion and Sediment Control (Guidelines), which was funded in part by a 319 grant. The Guidelines are out of print and a contract was awarded at the end of 2006 to provide replacement pages for errata found since its publication, to produce them on compact disk and to make them available on the Internet.

The 2002 Connecticut Guidelines for Soil Erosion and Sediment Control (Guidelines), which was funded in part by a 319 grant, are out of print. At the end of 2006 a contract was awarded to provide replacement pages for errata found since its publication, to produce them on compact disk and to make them available on the Internet. Prior to the expiration of the contract, an electronic version was developed with errata corrected and subsequently posted on DEP's webpage http://www.ct.gov/dep/cwp/view.asp?a=2720&q=325660&depNav_GID=1654 under Publications, Guidance Documents. A new contract is being developed to complete the work under the original contract to produce a fully bookmarked / linked version on compact disk and publication of the errata pages.

Water Allocation

The Water Planning Council (WPC) was established by Public Act 01-177 to study eleven issues which fall into two distinct areas of investigation: water company management and natural resource management. The WPC consists of Commissioners, or their designees, from 4 state agencies, the Department of Environmental Protection, Department of Public Health, Department of Public Utility, and the Office of Policy and Management. The Water Planning Council established three Committees to investigate issues identified in PA 01-177. The Council meets the first Monday of every month at the Department of Public Utility Control. Contact: Sharon Mann, Administrator for the Council at (860) 827-2675.

All Annual Reports, minutes of WPC meetings, the Water Allocation Policy Planning Model, and several other important committee reports related to WPC activities are available on the Department of Public Utility Control website:
<http://www.dpuc.state.ct.us/DPUCINFO.nsf/ByWaterPlanning?OpenView&Start=1&ExpandView>

Flood and Erosion Control Projects

The CT DEP Flood and Erosion Control program implements studies and capital repair projects to reduce or eliminate damage caused by flooding and erosion. CT DEP is allocated funding from the Connecticut General Assembly, and then awards grants on a cost-sharing basis with municipalities and special taxing districts. The CT DEP also provides technical assistance in cooperation with private consultants or government agencies like the NRCS and Army Corps of Engineers (ACOE).

CT DEP continued to administer a project with the ACOE, the Salmon River Ice Control Project.

CT DEP continued to be involved in the repair of the Hanover Pond dam using the "Flood & Erosion Control" program. The project was under construction during the 2006 construction season.

During 2006, IWRD assisted the ACOE in their construction of the ice control structure and adjacent sediment control structure on the Salmon River in Haddam and East Haddam. The project was completed just before the cold weather shut down the operation at the end of the

2006 construction season. The potential flood control project in downtown Westport has been placed on hold.

The DEP has completed a dam design for the dam on Upper Lake Phipps in West Haven. The dam reconstruction was bid in the fall of 2006. DEP did not receive bonding in a timely manner and a contract was not awarded based on this bid. The project will be funded through a cost sharing arrangement with the city and the incorporated homeowners association around the lake.

The Flood events of 2005, 2006 have led to 8 Emergency Watershed Projects (EWP) being worked on in 2006. The Natural Resource Conservation Service (NRCS) funds 75% of the project costs and DEP funds the non-federal share of 25%. All of these projects protect infrastructure, but most of these projects protect the infrastructure by controlling the erosion that has created the threat.

The CT DEP Flood and Erosion Control program implements studies and capital repair projects to reduce or eliminate damage caused by flooding and erosion. CT DEP is allocated funding from the Connecticut General Assembly, and then awards grants on a cost-sharing basis with municipalities and special taxing districts. The CT DEP also provides technical assistance in cooperation with private consultants or government agencies like the NRCS and Army Corps of Engineers (ACOE).

CT DEP worked with the ACOE as they completed the Salmon River Ice Control Project. A heavy rain caused the ice to flow in the winter of 2007, a small channel carved out naturally during a recent flood operated as a emergency spillway and a great deal of ice by-passed the ice control structure. Several additional improvements were made to the ice control system in the summer of 2007. A camera is planned to be installed in late 2007 or early 2008 which will give the ACOE and DEP the ability to monitor the operability of the ice control system. The potential flood control project in downtown Westport has been placed on hold.

CT DEP and Meriden completed the repair of the Hanover Pond dam using the "Flood & Erosion Control" program. The ribbon cutting was held in the summer of 2007.

The DEP has completed a dam design for the dam on Upper Lake Phipps in West Haven. After some minor changes to reduce the costs of the project, the dam reconstruction project was bid again in the fall of 2007. DEP is ready to start construction in the spring of 2008. The project will be funded through a cost sharing arrangement with the city and the incorporated homeowners association around the lake.

The Flood events of 2005, 2006 and 2007 have led to 10 Emergency Watershed Projects (EWP) being worked on in 2007. A delay in obtaining the federal funds led to the delay in getting these project areas stabilized. The Natural Resource Conservation Service (NRCS) funds 75% of the project costs and DEP funds the non-federal share of 25%. All of these projects protect infrastructure, but most of these projects protect the infrastructure by controlling the erosion that has created the threat.

Lakes

Lakes Management Program

The goal of the Lakes Management Program is to protect and restore the ecological and recreational integrity of Connecticut's lakes and ponds through pollution prevention, pollution source abatement, and implementation of lake restoration technologies. The primary water quality concerns for Connecticut lakes are infestations of non native aquatic plants and eutrophication. Eutrophication is a form of water pollution caused by excessive enrichment with plant nutrients, organic matter, and sediments. Symptoms of eutrophication include dense algal blooms, nuisance weed beds, and depletion of oxygen in bottom waters. These conditions limit recreational opportunities and diminish ecological values.

The technical components of a lake water quality improvement project are developed through baseline monitoring, diagnostic/feasibility studies, and engineering studies. Implementation includes watershed management to address land use issues and control active sources of pollution. In-lake management is used to remediate undesirable lake conditions that cannot be addressed by watershed management alone. The development of a successful lake management program is dependent on active community participation. CT DEP is very active in meeting and communicating with property owners, lake associations, and town officials to promote and assist in lake and pond management projects.

Lake and pond projects are funded through a variety of federal, state, and local funding sources. Federal and state funding sources generally place priority on lakes with public access for recreation. At the federal level, CWA Section 314 provided funding for statewide baseline water quality assessments, and matching grants for diagnostic/feasibility studies and lake restoration projects. Since the phasing out of Section 314 funding, Section 319 funds have supported nonpoint source pollution control projects in lake watersheds.

Lakes Grant Program

Connecticut DEP Lakes Grant Program funds lake restoration activities such as diagnostic water quality studies, land use planning, engineering feasibility studies, construction bid specifications development, storm water infrastructure improvements, dredging projects, and development of public education documents. The last year funding was available for the Lakes Grant Program was 2001. Due to the absence of funds for several years, the Lakes Grant Program initiated only one new project in 2007. A project was completed at Crystal Lake in Ellington in 2007.

Lake restoration projects are also conducted using bond funds authorized by the CT General Assembly and allocated by the State Bond Commission. In 2006 and 2007 projects using state bond funds continued or began at Lake Pocotopaug, Silver Lake, and Quaddick Lake.

CWA Section 319 Lake Projects

In 2006 and 2007 CWA Section 319 funds were used to develop the small grants program through the Connecticut Federation of Lakes. This program helps small and new lake groups become established and funds initial watershed assessments for lakes. CWA Section 319 also funded a lakes probabilistic

monitoring program. In 2007 Connecticut College, under contract with CT, DEP, completed monitoring sixty-lakes. This probabilistic monitoring project was designed to assist Connecticut with developing nutrient criteria for lakes. In 2006 and 2007 CWA Section 319 funds were used to award a grant to the Lake Lillinonah Authority who hired a consulting limnologist to implement a comprehensive water quality-monitoring program. This monitoring effort is helping CT, DEP develop a nutrient management strategy for Lake Lillinonah. In 2006 and 2007 CWA Section 319 funds supported development of a restoration program for Fulton Park Pond in Waterbury. This urban park pond is impacted by nutrients and sediment. Due to the location and of Fulton Park in a low-income urban area, this project is considered an environmental equity project.

Technical Assistance

The Lakes Management Program also provides technical assistance, as needed to municipalities, lakes groups, and DEP programs. In 2006 and 2007 several state Diversion Permits were reviewed that had potential impacts to lake water quality. Additionally, numerous FERC license articles for hydroelectric facilities were reviewed.

Invasive Aquatic Plants

The Bureau of Water Protection and Land Reuse, in cooperation with the Division of Inland Fisheries, Wildlife Division, and the Pesticides Group of the Materials Management and Compliance Assurance Bureau continued a pilot program to control infestations of non native aquatic plants species that are new to Connecticut. This program was funded with SEP funds and allows DEP to dispatch a private contractor to respond immediately to new infestations. With Connecticut receiving approval of its Aquatic Nuisance Species (ANS) Plan from NOAA and EPA, this pilot program began growing into a full program in 2007. Approval of the ANS plan makes Connecticut eligible to receive Federal funds for ANS. In 2007 the CT General Assembly also appropriated \$500,000 for invasive plant control. These funds will be used to address invasive aquatic plants as well as invasive terrestrial plants. Using the state and Federal funds, plans were initiated in 2007 to hire an invasive plant coordinator and an ANS coordinator.

Groundwater

The CT DEP develops and implements ground water protection strategies for all ground water resources, including public water supply wells. This includes ground water quality standards and classifications, ground water resource mapping, water supply planning, discharge permitting, water diversion permitting, site remediation, land use regulation in certain aquifer areas, technical assistance, pollution prevention, and a host of NPS control programs. One of the key components of this program is the Aquifer Protection Area (APA) Program, which provides comprehensive protection for major drinking water well fields in stratified drift aquifers. The APA Program requires mapping of the "areas of contribution" and "recharge areas" to major well fields and regulating land use in those areas to minimize the potential for contamination of the water supply.

Preliminary APA mapping has been completed for all the state's major well fields (126) and provides a rough estimate of the contributing areas. Inventories of potentially regulated facilities and agricultural activities have also been conducted. Final mapping is a further refinement and will define the APA, the area subject to land use regulation. To date, plans for data collection and analysis have been submitted for 99 well fields, of which 94 have been approved. Final Level A mapping has been submitted for 74 well fields and 45 have been approved. GIS mapping of the APAs has been partially supported with FY93 and FY95-98 section 319 funds.

The APA Land Use Regulations were adopted in February, 2004, and a Model Municipal Ordinance, along with guidance documents and forms necessary for implementation of the APA program were published in June, 2005. CT DEP continues to develop guidance on materials management plans, stormwater management plans, site plan review, planning and zoning coordination, water utility assistance, and other local guidance.

Municipalities are beginning program implementation, and the first step is to appoint a municipal aquifer protection agency (through adoption of a local ordinance). Thus far, 73 of the 78 towns have passed the required ordinance, and CT DEP continues to work with the remaining municipalities to implement this first step. Additionally, 21 have approved land use regulations in place, and 17 towns have adopted APAs.

In 2006 and 2007, CT DEP:

- Continued to work with the municipalities in the program to begin implementation of the program, providing extensive outreach and meeting with individual municipalities to assist with delineation of APAs and establishing local regulations;
- Began annual municipal training program, holding a two-day workshop for Municipal Aquifer Protection Agencies, in October, 2007. Another workshop is planned for May, 2008. The workshop was well attended and well received;
- Continued to keep the APA web site updated with new mapping as it becomes available, new guidance, examples and tracking tables;
- Provided technical assistance to numerous towns in response to inquiries and requests for assistance with aquifer protection issues;
- Completed work with the water utilities to develop a Municipal Assistance Program;
- Continued to collect and review data, including point and nonpoint pollution sources, land use/land cover, and water quality data;
- Continued to update the Water Quality Classifications and Leachate & Wastewater Discharge coverage for the Thames River major basin, as well as evaluated and approved (if appropriate) requests for reclassification of groundwater; and

- Completed work on a mapping project with the Connecticut Geological Survey to derive an “Aquifer Potential Map” for the state that is available in GIS format (the project utilizes federal section 319 funding) and will shortly be available on the DEP website.

Long Island Sound

Long Island Sound (LIS) is one of Connecticut’s most important natural and economic resources, serving as habitat to numerous fish and wildlife populations, a commercial and recreational resource to the citizens of CT and NY, and contributing an estimated \$5.5 billion annually to the regional economy. Improving water quality in LIS is a major goal to ensure healthy habitats and safe productive use by people living around LIS. Studies in the late 1980s identified hypoxia (low dissolved oxygen) occurring in the bottom waters of the western Sound as a result of excess nitrogen enrichment to LIS waters. CT and NY have implemented management actions including upgrading of sewage treatment plants (STPs) to remove more nitrogen from STP discharges entering LIS, thus alleviating the spread and intensity of hypoxia. Another challenge facing LIS are pressures for increased recreation and public access of the Sound, and commercial interests for energy and commerce. Habitat restoration projects are being carried out through a number of programs with the goal of preserving 2000 acres of coastal and near shore habitat and 200 river miles of migratory fish passage in CT and NY by 2020. In addition, citizens, their elected officials, and agencies are working to implement the Long Island Sound Stewardship Initiative preserving 33 areas of ecological and recreational value and identifying additional areas to preserve and protect for future generations.

CT DEP's Long Island Sound management efforts revolve around two major programs: the Long Island Sound Study (LISS), which is administered by the Bureau of Water Protection and Land Reuse Planning and Standards Division (BWPLR PSD) in cooperation with DEP's Office of Long Island Sound Programs (OLISP), and the Coastal Management Program, which is administered by the OLISP.

Long Island Sound Study

The Comprehensive Conservation and Management Plan (CCMP) for Long Island Sound, completed and approved by EPA and the states in 1994, identified low dissolved oxygen (hypoxia) as the primary water quality problem for the Sound and excess nitrogen loads as the primary cause of the problem. The CCMP also cites additional problems, including toxic contamination, pathogens, floatable debris, loss of fish and wildlife habitat, and land use and development pressures. Management efforts over the past several years have focused on reducing nitrogen loads to improve dissolved oxygen conditions and restoring degraded coastal habitats.

Nitrogen management efforts include installing advanced wastewater treatment equipment in new and existing municipal sewage treatment plants, eliminating raw sewage discharges through combined sewer overflows (CSOs), and controlling NPS pollution. In 2001, EPA approved the CT DEP and the New York State Department of Environmental Conservation (NYS DEC) TMDL for nitrogen loads to Long Island Sound. The TMDL calls for an approximately 64

percent reduction in nitrogen loads from point sources and a 10 percent reduction in nitrogen loads from nonpoint sources from urban and agricultural land.

In 2002, the nitrogen credit trading program and a statewide general permit with nitrogen limits for 79 sewage treatment plans were initiated. Six annual credit exchange cycles have now been completed with oversight by CT DEP and a nitrogen credit advisory board. It is anticipated that the trading program and general permit will continue to enable the state to meet the nitrogen load reduction required by the TMDL more cost-effectively.

The LISS contracted with Manhattan College and HydroQual Inc. in developing a nonpoint source nutrient watershed modeling tool. A nitrogen-tracking program is being developed and the LISS Nonpoint Source Workgroup has begun fine-tuning and implementation of the approach. The program will allow managers to determine progress towards the 10% load allocation reduction in CT and NY specified in the TMDL. Work was completed on a Long Island Sound Riparian Buffer Toolbox that is posted on the LISS web site providing resources for local officials in drafting and implementing regulations to protect riparian areas. Riparian buffers can be a very effective means of reducing nonpoint source pollution to receiving waters in developed watersheds, similar to that of the Long Island Sound.

The LISS and CTDEP have also been investing time and funding in habitat restoration activities that are relevant to NPS pollution abatement. In 2006, the LISS adopted 33 Inaugural Coastal Stewardship Areas and in September 2006 Congress passed the Long Island Sound Stewardship Act of 2006, which was signed into law by President Bush (Public Law 109-359) in October. The bill authorizes up to \$25 million per year for stewardship projects, including acquisitions of environmentally-sensitive lands for LIS that will help protect sensitive habitats but also ensure protection of land conditions that are amenable to pollutant removal. LISS is also involved in CTDEP eelgrass protection evaluations, with a goal of establishing appropriate nitrogen loading criteria to protect eelgrass beds in eastern CT that have been in decline in recent years.

Connecticut and New York have made commitments to have 50% of their respective sub-watershed areas in the LIS watershed developing or implementing watershed management initiatives in collaboration with locally based public and private entities by 2014.

With funding from the Long Island Sound Study (LISS), CT DEP has also conducted extensive monitoring of Long Island Sound. The program is used to track changes in low dissolved oxygen levels as well as nutrient and other parameters relevant to an extensive hypoxia impairment that affects the western half of Long Island Sound's bottom waters. In combination with upland monitoring described above, CT DEP and the LISS use these data to chart management progress, particularly for control of nitrogen, the primary pollutant leading to hypoxia.

Coastal Zone Management

In 2006 the coastal nonpoint source program coordinator also continued to work with other DEP staff on several initiatives:

During this reporting period, the CNP coordinator participated with UConn's Nonpoint Education for Municipal Officials staff in the remaining workshop to introduce the Connecticut 2004 Stormwater Quality Manual to municipal officials. The workshop was conducted in Norwich in conjunction with the Southeastern Connecticut Council of Governments.

The CNP coordinator continues to work with DEP staff in overseeing development of the Niantic River Watershed Management Plan. Office of Long Island Sound Programs and DEP Water Planning and Standards staff continue the coordination of the development of a watershed plan for the Niantic River watershed, a small coastal watershed in southeastern Connecticut, to guide efforts to improve water quality in the basin and set a foundation for future watershed protection. During this reporting period the project advisory committee, consisting of staff from DEP and representatives from each of the four watershed towns, met several times to discuss project planning needs and the overall timetable for the project. The consultant also convened two successful workshops: the first was a "Science Workshop" to review current research affecting the Niantic River and estuary, and discuss how these research efforts will be represented in the watershed management plan; the second was a low impact development workshop for construction industry professionals, including developers and contractors, to provide hands-on experience in installing best management practices (BMPs) and identifying problems to ensure that BMPs are properly functioning and maintained. A one-time extension for the project was also granted by OCRM during this reporting period, until September 30, 2006.

The CNP coordinator continued to work with Section 319 staff, the District Manager of the North Central Conservation District, and representatives from the City of Hartford to develop a project to re-vegetate the southern edge of Bushnell Park, just across the street from the entrance to the DEP building. This portion of the park has experienced erosion due to high foot traffic from patrons of food vendor trucks parked along the southern edge of the park—many of those patrons are DEP employees. The project will be funded through reprogrammed Section 319 funds from another project that the conservation district was unable to implement.

The CNP coordinator continues to participate on the DEP's Stormwater Work Group, which meets quarterly to discuss relevant stormwater issues facing the agency.

During this reporting period, the CNP coordinator was scheduled to assist other OLISP staff in a coastal management and coastal nonpoint source pollution control program workshop for the Town of Madison's land use planning and zoning commissioners, but inclement weather resulted in postponement of that workshop to the next reporting period.

During this reporting period, outreach to appropriate state agencies regarding the coastal nonpoint source program has taken the form of coordination on the proposed legislation to expand the coastal area. The proposed expansion of the coastal area to include the Town of Derby and each town adjacent to the Connecticut River will complement the state's coastal nonpoint source management program by further strengthening the watershed connection between the towns and Long Island Sound and the role those towns play in the overall health and protection of the Sound and its resources. State agencies including DOT and the Department of Public Works had expressed concern that an expanded coastal area would result in additional regulatory review burdens for their projects. OLISP diminished these fears by coordinating with

state agency representatives to explain that projects located in the upper reaches of the coastal area will likely only trigger coastal water quality concerns, and those issues are already addressed by state agencies through the CNP program.

The CNP coordinator continues to work with Town of Westbrook staff as they work on finalizing the Town's comprehensive Onsite Wastewater Management Plan. During this reporting period, the CNP coordinator attended a database tracking presentation conducted by the Town's contractor, Carmody Data Systems. The tracking system will be fully automated and entirely web-based, and will provide timely notification and tracking for system maintenance, inspection, and service.

During this reporting period, the CNP coordinator finalized the comprehensive CNP webpage that describes the coastal nonpoint source program and its various components, with links to networked agencies and documents that were developed in accordance with program development requirements. The webpage can be accessed at http://www.ct.gov/dep/cwp/view.asp?a=2705&q=323554&depNav_GID=1709&depNav=. In addition, the CNP coordinator continues to work with DEP staff to finalize the first in a series of brochures on the different components of the coastal nonpoint source pollution control program, similar to the brochures already developed by OLISP on the coastal management, coastal permitting, and habitat restoration programs. Edits suggested by other DEP staff have been made, and it is anticipated that brochure will be finalized within upcoming reporting periods.

The CNP coordinator continues to participate on the Long Island Sound Study (LISS) Nonpoint Source Pollution and Watersheds Work Group. The purpose of the work group is to assist the LISS Management Conference in effectively meeting the nonpoint source mitigation goals outlined in the LISS CCMP and the 2003 Long Island Sound Agreement. During this reporting period, the work group met with the consultant, the Columbia University Earth Engineering Center, to provide guidance on the "Buffers Tool Box" that will be developed for use by municipal officials to facilitate decision-making for riparian area protection, enhancement, and restoration. The task is proceeding according to schedule, and a website has been established to track progress: <http://www.hydroqual.com/projects/riparian/> .

The CNP coordinator has also worked with the Clean Marina program coordinator to conduct Clean Marina workshops to describe the Clean Marina certification program and the certification process, and to solicit participation in the program. Two workshops were conducted during this reporting period, one at DEP Marine Headquarters in Old Lyme, and the other at the Bridgeport Regional Vocational Aquaculture School. In addition, OLISP continues to participate in a regional Clean Marina Work Group sponsored by the Northeast Waste Management Officials Association (NEWMOA) and the EPA, which held one meeting in Chelmsford, Massachusetts during this reporting period to discuss several issues, including Clean Marina program progress and the proper handling of pressure wash wastewater. OLISP staff have participated in several meetings with other DEP staff, EPA, and NEWMOA regarding the pressure wash wastewater issues, and we anticipate that the Clean Marina guidebook and supporting documents will be revised during upcoming reporting periods to more accurately address this and other issues. Finally, OLISP staff continued to meet with staff from DEP's Bureau of Waste Management regarding options for the recycling of boat shrink wrap. The program will continue for the 2006

boating season. Information about Connecticut's Clean Marina Program, including lists of pledged and certified facilities, can be accessed at http://www.ct.gov/dep/cwp/view.asp?a=2705&q=323530&depNav_GID=1635.

In 2007, OLISP continued to implement Connecticut's fully approved coastal nonpoint source pollution control program. Because Connecticut's program is a networked program based on existing authorities, several implementation activities have been undertaken by OLISP staff in the administration of their current programs, often in consultation with the coastal nonpoint source program (CNP) coordinator to ensure consistent application of coastal nonpoint source management measures.

The coastal nonpoint source program coordinator also continued to work with other DEP staff on several initiatives:

The CNP coordinator continued to work with DEP staff and the project steering committee in planning for implementation of the Niantic River Watershed Management Plan. Office of Long Island Sound Programs and Planning and Standards staff in the Bureau of Water Protection and Land Reuse continued participation in the coordinating implementation of a watershed plan for the Niantic River watershed, a small coastal watershed in southeastern Connecticut, to guide efforts to improve water quality in the basin and set a foundation for future watershed protection. Although the watershed plan has been completed, the CNP coordinator will continue to participate in planning for the implementation of the plan as a part of her overall duties in implementing the state's coastal nonpoint source pollution control program. During this reporting period the project advisory committee transitioned into a plan implementation planning committee and met several times to discuss next steps for implementation of the plan. A draft PowerPoint presentation on the plan has been developed for each watershed town's Board of Selectmen to assure local buy-in of the plan. The presentation will describe the need for the Niantic River watershed plan, the process of watershed planning, and will highlight several key recommendations of the plan. During this reporting period, the CNP coordinator and the Thames River watershed coordinator from the Planning and Standards Division of the Bureau of Water Protection and Land Reuse gave a presentation to DEP staff on the Niantic River watershed plan as part of the Inland Water Resources Division's ongoing speaker forum. The CNP coordinator is also working with the Thames River watershed coordinator and other DEP staff to schedule a PowerPoint presentation on the plan for each watershed town's Board of Selectmen to assure local buy-in of the plan. The presentation will describe the need for the Niantic River watershed plan, the process of watershed planning, and will highlight several key recommendations of the plan. It is anticipated that the presentations will be conducted during the upcoming reporting period, at which time each town's Board of Selectmen will also be asked to appoint members to a plan implementation steering committee to oversee implementation of plan recommendations and to track progress.

The CNP coordinator continued to work with Section 319 staff, the District Manager of the North Central Conservation District, and representatives from the City of Hartford to develop a project to re-vegetate the southern edge of Bushnell Park, just across the street from the entrance to the DEP building. This portion of the park has experienced erosion due to high foot traffic from patrons of food vendor trucks parked along the southern edge of the park—many of those patrons are DEP employees. The project will be funded through reprogrammed Section 319 funds from another project that the conservation district was unable to implement. During this

reporting period, the City of Hartford selected a contractor for the project, and the contractor broke ground on the project. We anticipate that the project should be completed early in the upcoming reporting period.

The CNP coordinator and other OLISP staff continue to participate on the DEP's Stormwater Work Group, which meets quarterly to discuss relevant stormwater issues facing the agency. During this reporting period, the work group conducted a site visit to view a green roof that had been installed on a water treatment plant in Hamden.

The CNP coordinator also participated in the Northeast Regional Coastal Management meeting held during this reporting period in Hampton, NH.

The CNP coordinator has also worked with the Clean Marina program coordinator as warranted to advance the Clean Marina program. OLISP staff continue to meet with representatives of the Connecticut Marine Trades Association and the marina industry to address pressure wash wastewater issues, and we continue to work together to revise the Clean Marina guidebook and supporting documents to more accurately address this and other issues. Information about Connecticut's Clean Marina Program, including lists of pledged and certified facilities, can be accessed at http://www.ct.gov/dep/cwp/view.asp?a=2705&q=323530&depNav_GID=1635.

Staff of the DEP's Bureau of Materials Management and Compliance Assurance, Subsurface and Agriculture Division continue to work with the agricultural community located within the coastal nonpoint source management area to develop agriculture waste management plans. During this reporting period, Terra Firma Farm located in Stonington developed a nutrient management plan for their facility.

The CNP coordinator attended several regional workshops and conferences during this reporting period, including a Low Impact Development conference in Massachusetts, an urban rivers stormwater conference in Connecticut, and the 18th Annual Nonpoint Source Pollution Conference in Rhode Island. The 19th annual Nonpoint Source Pollution conference will be held in Groton, Connecticut in May 2008, and the CNP coordinator is participating on the conference planning committee.

The coastal nonpoint source program coordinator also continues to participate on the Long Island Sound Study's Nonpoint Source and Watershed Work Group. The purpose of the work group is to assist the LISS Management Conference in effectively meeting the nonpoint source mitigation goals outlined in the LISS CCMP and the 2003 Long Island Sound Agreement. During this reporting period, the work group did not meet due, in part, to the retirement of one of the work group's co-chairmen. Further, the one-day riparian buffers conference that was scheduled for this reporting period was cancelled due to low enrollment. However, some of the buffers information developed for the work group that would have been presented at the workshop can be found online at <http://www.crerpa.org/RiparianBuffers.html> and <http://www.seas.columbia.edu/earth/EECRiparian.html>. We anticipate that the work group will reconvene and a new co-chairman will be named during future reporting periods.

Clean Marina Program

OLISP continues to implement the Clean Marina Program. By the end of 2007, 29 marinas had taken a Clean Marina Pledge, and 10 marinas had been certified as "Clean Marinas." The Clean Marina Program also closed out the Clean Marina Cost-Share Assistance Grants funded by a Clean Water Act Section 319 grant. The final project was the purchase of 20 dustless sanders with distribution to 13 facilities that were either certified or pledged. The Clean Marina Cost-Share Assistance Grants are funded by a Clean Water Act Section 319 grant.

The Clean Marina Program is a voluntary, incentive-based education and outreach campaign to encourage environmental compliance and the use of BMPs at the state's 275 coastal and inland boating facilities. The program also includes an outreach campaign to educate the state's boaters about environmentally sensitive boating practices. OLISP, in cooperation with the CT DEP Boating Division, developed the program to address the potential threats to water quality from both inland and coastal marinas, particularly in the form of NPS pollution. In 2006:

- OLISP staff organized four workshops for marina owners/operators, in January, February, and March of 2007. The workshops introduced participants to the Clean Marina certification process and answered questions about the recently revised requirement on handling of pressure washing wastewater.
- Clean Marina staff conducted Outreach at the following events:
 - The Norwalk Boat Show
 - The Hartford Boat Show
 - The CT Marine Trades Association's Annual Marine Exposition
 - The CT Harbor Management Association's Annual Environmental Meeting
- All Certified CT Clean Marinas were re-certified.
- Clean Marina staff conducted informal informational site visits to several CT marinas.

Information on the Department's Clean Marina Program can be found at:
www.ct.gov/dep/cleanmarina.

Vessel Sewage Management

Sewage from recreational and commercial boating on Long Island Sound continues to be a potential source of pathogen contamination to shellfish beds and swimming areas. In poorly flushed areas with high boat concentrations this potential waste discharge may also contribute to nutrient enrichment. The CT DEP OLISP has primary responsibility for regulating marinas and related boating activities, including vessel sewage management.

Funding from the U.S. Fish and Wildlife Service through the Clean Vessel Act (CVA) grant program has allowed DEP OLISP to fund the construction, operation, and maintenance of a total of over 90 total pumpout facilities, including sixteen (16) pumpout boats, and 22 dump stations available to boaters at 89 boating facilities along Connecticut's coastal waters.

EPA approved the application for designation of all Connecticut coastal waters in Long Island Sound and its navigable tributaries from the New York state boundary in the Byram River to Guilford as a No Discharge Area on June 2007. All Connecticut coastal waters are now a designated NDA. The current website is:

http://www.ct.gov/dep/cwp/view.asp?a=2705&q=323816&depNav_GID=1635.

A directory of pumpout stations and boats can be found on the CTDEP website at: <http://dep.state.ct.us/olisp/cva/cva.htm>, along with a variety of information about Connecticut's Clean Vessel Act program.

Habitat Restoration

Like many northeastern coastal states, Connecticut has lost much of its historic, natural tidal wetlands and other habitats to development and hydromodification (e.g., ditching, diking, draining, and filling). In reversing this trend, Connecticut has become nationally recognized for its leadership role in tidal wetland restoration, and has been an active participant on the LISS Habitat Restoration Team. In 1997, CT DEP established the Wetlands Habitat and Mosquito Management (WHAMM) Program, one of the first dedicated wetland habitat restoration programs in the country, with dedicated staff and specialized low ground pressure equipment. Connecticut also was the first state in the country to use funding from the federal Intermodal Surface Transportation Efficiency Act (ISTEA) for tidal wetland restoration where undersized culverts or tide gates associated with transportation routes have impacted the coastline. Since the early 1970s, CT DEP has used these programs and resources to restore over 1800 acres of tidal wetlands. In addition to restoring degraded habitat, OLISP also is involved in preventing degradation through improved management of exotic and nuisance species. In 1998, the LISS adopted a "Habitat Restoration Strategy" that sets a goal of restoring 2000 additional acres of coastal habitats such as tidal wetlands and coastal grasslands by 2008. In September 2006, the LISS set a new goal to restore or protect an additional 300 acres of coastal habitat and open up an additional 50 miles of riverine migratory corridor to diadromous fish from January 1, 2006 to December 31, 2011, and ultimately restore 2,000 acres by 2020.

In 2006:

Restoration occurred at Great Meadows marsh in Stratford, parcels 1 & 4 – 15.15 acres; and Hammonasset Beach State Park, Madison – 4.1 acres, for a grand total of 19.25 acres of tidal wetlands.

In addition, WHAMM program performed Phragmites control at 15 sites in Connecticut totaling over 75 acres. These acres do not count toward DEP's restoration goal of 2000 acres.

Open marsh water management (OMWM) is a technique used on the salt and brackish marshes along the coast. OMWM can consist of creating ponds, new channels, or ponds with sill channels, and plugging old grid ditches. The idea behind OMWM is to provide habitat to sustain fish, which will eat mosquito larvae. In marsh restoration DEP uses this technique to increase flooding of phragmites and to restore fish and wildlife habitat through creation of surface water features that were eliminated by grid ditching, while at the same time not creating mosquito breeding areas.

A particularly important coastal habitat type is submerged aquatic vegetation dominated by eelgrass (*Zostera marina*). Historically, eelgrass grew in shallow water throughout the Sound, providing important habitat for fish and shellfish. In the 1930s, there was a major decline of eelgrass throughout its range on the Atlantic coastline. By the 1950s, eelgrass had returned to eastern Long Island Sound, but not to central and western coastal areas. CT DEP suspects that the excessive nitrogen loads associated with developed areas promoted greater phytoplankton production, which reduced light penetration necessary to support plant growth. Remaining eelgrass beds occur east of the Connecticut River, and the total acreage measured in 1993-94 was less than 700 acres. In 2002, the acreage of eelgrass had increased to over 1380 acres in CT (1598.5 overall). While some of this increase is likely due to differences in survey methodology (boat survey versus aerial photo analysis), much of this increase is due to natural 'recovery'. Most of the increase are associated with beds that in Long and Fishers Island Sounds. There is little change in the acreage of beds within coves, embayments and tidal rivers. Little Narragansett Bay continues to support no eelgrass beds and the beds in Clinton Harbor have disappeared. The only success story is the restoration of nearly 50 acres of eelgrass in Mumford Cove, the result of removing a sewage treatment plant discharge in 1987. Another aerial survey of eastern LIS was completed during summer 2006, and it was done using the same techniques as the 2002 survey. Preliminary results indicate that nearly 1900 acres of eelgrass were mapped, but the CT total was not yet available.

In 2007:

Restoration continued at Hammonasset Beach State Park, Madison – artificial fill was removed from 1.14 acres, restoring tidal flow to this area.

Atmospheric Deposition

The CT DEP, through the New England Governors and Eastern Canadian Premiers (NEG/ECP) Environment Committee, has been actively participating in a regional effort to promote additional reductions in nitrogen oxide (NO_x) emissions, which are believed to contribute significantly to nitrogen loading to the Sound through atmospheric deposition. CT DEP is a member of a New England Governors/Eastern Canadian Premiers committee charged with developing a northeastern Acid Rain Action Plan (ARAP). In the last few years, the Acid Rain Steering Committee has refocused and become the Acid Rain and Air Quality Steering Committee (ARAQSC) to take a more comprehensive look at issues related to both Acid Deposition and Ambient Air Quality. While the focus is on lake acidification and human health effects, attention is also being directed towards atmospheric nitrogen loads and their effect on estuaries as a logical extension of the problem. Over the last five years, the ARAQSC work groups have identified monitoring protocols and a network to track effects of atmospheric deposition that would lead to management recommendations for additional control of acid deposition. The final product defining acid deposition effects is forest sensitivity mapping throughout the region to determine critical loads that affect forest productivity. A section 319-funded project on critical loads mapping for forests in the State of Connecticut has been completed.

CTDEP will be participating in a new committee on Critical Loads for both land and water. The short-term goals of the Committee will be to gather scientific data and information to fill gaps in critical load development in the US. Eventually, the findings will help define management goals that could benefit both terrestrial and aquatic environments.

Air quality regulations set by CT DEP in December 2000 establishing a 20-30% reduction in NO_x emissions by 2003 and a 50% reduction in SO₂ emissions by 2002, beyond current commitments have been implemented on schedule. The actions reduced NO_x emissions by nearly 3,500 tons per year, a 26% reduction and SO₂ emissions by 8,900 tons per year, a 67% reduction, in concurrence with NEG/ECP goals. As required in the LIS TMDL for nitrogen, EPA's Clean Air Interstate Rule (CAIR) is being used to predict benefits of nitrogen emission control programs under federal law. Statewide efforts relevant to Connecticut include:

- New regulations and emphasis on state use of, and tax breaks for clean air vehicles.
- Adoption of a Connecticut climate action plan.

Review five years of progress under the Action Rain Action Plan, and assessment of future actions.

Fish Habitat Restoration

The CT DEP Inland Fisheries Division has an active fish habitat restoration program, involving removal of barriers to fish passage, construction of fish passage facilities, and physical restoration of in-stream and riparian habitat features. CT DEP coordinates its restoration activities with many other federal, state, and town agencies and non-government organizations, including the U.S. Fish and Wildlife Service, NOAA, NRCS, EPA, State Water Conservation Districts, American Rivers, Trout Unlimited, the Connecticut River Watershed Council, and various other watershed groups and land trusts. Although Section 319 funds have only been used on a limited basis in the past, several fishway projects currently in the planning stage have received 319 funding and these types of projects will receive high priority in the future. Providing fish passage at the Wallace Dam (first barrier on the Quinnipiac River) in Wallingford has been a top priority for many years. Progress was achieved in 2007 when final designs for a Denil fishway at the Town-owned dam were completed. The project is now undergoing permitting and it is hoped that construction could begin in 2009 using 319 funding.

Restoring habitat for native *diadromous* fish is a high priority in Connecticut. Diadromous species include *anadromous* and *catadromous* species. *Anadromous* species, which spend most of their lives in salt water and migrate up rivers to spawn in fresh water, include Atlantic salmon, blueback herring, alewife, and American shad. *Catadromous* species, which spend most of their lives in fresh water and migrate down rivers to spawn in salt water, include only the American eel, which is under consideration for listing under the federal Endangered Species Act.

Stormwater Management

Stormwater permitting and compliance is conducted by the CT DEP Water Permitting and Enforcement Division (WPED) under the authority of the CWA National Pollutant Discharge Elimination System (NPDES) storm water provisions and supporting state statutes and regulations.

CT DEP regulates stormwater discharges from the following sources:

- Construction sites (sites 1-5 acres in size are not required to register with DEP if municipal approval have been obtained; sites 5 acres or more must register with CT DEP),
- Industrial activities (activities defined as “light” industries with no stormwater exposure submit a No Exposure Certification in lieu of a permit registration),
- Commercial sites with more than 5 acres of impervious area, and
- Municipal separate storm sewer system discharges.

Approximately 3600 facilities, towns or activities were registered under the various stormwater discharge general permits as of June, 2008, most of which have annual monitoring requirements. There were 1,487 industrial operations, 1647 construction sites, 230 commercial sites, and 114 MS4 activities. Additionally, 126 No Exposure Certifications were submitted as of June, 2008. DEP stormwater staff conducted 145 and 94 inspections, respectively, in 2006 and 2007 and issued 100 and 48 Notices of Violations, respectively, in 2006 and 2007 for stormwater related violations.

Accomplishments in 2006 and 2007 include:

- The program developed a draft DOT MS4 permit with cooperation from DOT after several workgroup meetings. DOT prepared their Stormwater Management Plan for this permit in 2005 and they are following the Plan in advance of the permit being issued.
- CT DEP developed the first draft of the Institutional (formerly "non-traditional") MS4 permit.
- CT DEP conducted compliance initiatives of sites with poor stormwater quality such as auto salvage yards and marinas.
- On October 1, 2007, CT DEP reissued the construction and industrial general permit for a period of one year.
- In October, 2006, CT DEP issued 28 Notices of Violation to municipalities regulated by the MS4 permit for permit violations.
- In June, 2007, the state legislature enacted Public Act 07-154. This created a pilot program for as many as 4 municipalities to develop a stormwater utility authority and

provided \$1,000,000 to fund this. The Cities of Norwalk, New Haven and New London were authorized to go ahead and develop their programs. They have applied for the funding and have consultants working on the development of a utility. A report will be made on January 5, 2009 to determine what, if any, additional legislation may be necessary to fully implement a municipal stormwater utility.

Agricultural Nonpoint Source Management

Agricultural nonpoint source pollution remains a problem in several areas of Connecticut, notably in Litchfield, Windham, and portions of Hartford, Tolland, and New London counties. Farmland runoff contaminated with sediments, organic matter, nutrients, pesticides, pathogens and other substances, and groundwater contaminated with nutrients, pesticides and other soluble substances remains a priority problem for CT DEP and its NPS Program partners, including the NRCS, Department of Agriculture, UConn/CES, and SWCDs.

The Connecticut Council on Soil and Water Conservation (CCSWC) has received Section 319 funding periodically to support some aspects of the program. The Connecticut Association of Conservation Districts (CACD) serves as the umbrella organization for the soil and water conservation districts (SWCDs), providing coordination between the districts and CCSWC, and overall guidance on statewide district programs. EPA and CT DEP annually award 319 funds to NRCS, UConn/CES, and the SWCDs to match other funding sources (e.g., EQIP) to provide technical assistance to agricultural producers on nutrient management, and integrated crop and pest management.

The NRCS also administers two new programs established under the 1996 and 2001 Farm Bills, the Environmental Quality Incentives Program (EQIP), which provides cost-share funds to farmers to implement a wide range of conservation practices, and the Wildlife Habitat Improvement Program (WHIP), which funds restoration of riparian buffers and other natural wildlife habitat.

Confined animal feeding operations (CAFOs), an important source of agricultural pollution, are now defined by EPA as point sources. CT DEP, which is authorized by EPA to administer its NPDES permitting program, will implement the CAFO permitting program with a statewide general permit. CT DEP has determined that there are approximately 10 CAFOs and at least 35 animal feeding operations (AFOs) statewide. The DEP Commissioner has the discretion to decide that certain AFOs be regulated as CAFOs.

Under the general permit, each farm will be required to develop a Comprehensive Nutrient Management Plan (CNMP). Connecticut is using phosphorous-based manure application criteria for CNMPs. Recommendations for nutrient application rates will be based on the agronomic critical ranges required for crop production as established by the UConn Soil Test Lab, or UConn-recognized industry practice. Recommended rates are based on soil and post-mortem tissue tests, documented yield information, and management capabilities.

In addition, NRCS and UConn/CES evaluate the adequacy of a farm's land base with potential for fertilizer application for its capacity to utilize manure nutrients. NRCS will use the technical

guidance for developing CNMP's along with Field Office Technical Guide Practice Standards to develop CNMP's. CT DEP is working on the General Permit criteria.

Agricultural NPS program accomplishments during calendar years 2006 - 2007 include:

- NRCS and UConn/CES assessed about 160 farms from FY96 through FY07 and wrote or revised about 75 agricultural waste management system plans (AWMPs) that CT DEP has approved.
- Through FY07, nutrient management plans are being implemented on 18 farms and about 11,660 acres (although the acreage changes each crop year as farmers add and or lose fields, which is a little less than the projections made in December 1998 in the 319 proposal for nutrient management -- 25 farms and 12,500 acres).

NRCS and UConn/CES continued to work with agricultural producers to develop a user-friendly computerized record-keeping system to help them track nutrient use on their fields. The record-keeping program is being tested and developed for uploading to UConn's Soil Testing Laboratory's web site for ease of access for farmers. A new recommendation system for nitrogen management that relies on the field-by-field records of nutrient applications is being developed. UConn/CES has continued a 319-funded IPM/ICM program targeting coastal watersheds in Fairfield and New Haven counties, with a focus on outreach and education.

Technical Assistance/Demonstration Projects

CT DEP also has used its section 319 funds to provide technical assistance to local land-use decision makers, to develop numerous guidance documents, and to conduct demonstration projects in support of its watershed management and other base programs.

A number of targeted technical assistance programs are described in previous sections on watershed initiatives, erosion and sediment control, stormwater management, and agricultural NPS management. In addition to these targeted efforts, the CT DEP and EPA have utilized section 319 funds to support a statewide University of Connecticut Cooperative Extension System (UConn/CES) Nonpoint Education for Municipal Officials (NEMO) Project.

The goal of the NEMO Project is to provide local land use decision-makers with the tools necessary to understand the impacts of nonpoint source pollution and guide development in such a way as to minimize these impacts. Recognizing that NEMO's educational programs help achieve many of the goals of the CT DEP's NPS Program, the two state agencies have formed a partnership to deliver technical training to Connecticut municipalities over an extended period. Annual planning meetings between the NEMO Project team and CT DEP are held to ensure coordination between the Office of Long Island Sound Programs coastal zone management program, the BWPLR Watershed Management section, Aquifer Protection Program, stormwater permitting program (more intensely as the Phase 2 permitting program develops), and the TMDL program.

CT DEP and EPA have awarded FY99-07 section 319 funds to the NEMO Project to expand its program by adding research, watershed programming, Internet tools, and a targeted intensive municipal initiative to its educational effort. After fifteen years of the NEMO Project, there is concrete evidence that Connecticut municipalities are giving greater consideration to water quality in their land use planning and regulatory programs. In 2006 -2007, the NEMO program focused on bringing low impact development techniques to the fore through the use of town and regional workshops, web tools, and specific training for contractors and homeowner educators. Some of the results of these activities are outlined below:

1. A Statewide Conference on LID: Low Impact Development-Are we convinced yet?

A statewide conference on LID was held on August 17, 2007. The conference went beyond the basics of LID, delving into the research and application of LID techniques in New England, and addressing key barriers to these techniques in Connecticut communities. Speakers from Connecticut and New England talked about their research and specific projects and a panel of engineers, planners and developers addressed the issues surrounding implementation of LID. The conference drew over 120 participants from the land use professions of planning, engineering and landscape architecture, as well as many state agencies. Over 90% of the participants rated the conference as good to excellent in post-conference surveys.

2. Regional Workshops

During the report period up to 10 regional workshops have been held related to low impact development and alternative stormwater management. They are briefly listed below:

Planning for Stormwater, North East CT Council of Governments, Killingly, CT
1/28/2008

Implementing LID, New England Interstate Water Pollution Control Commission,
Groton, CT. 5/19/08

Planning for Stormwater, CT Assoc. of Conservation and Inland Wetlands
Commissions Conference, Wallingford, CT. 11/10/2007

Development Mother Nature Would Love, Community Builders Institute, 10/30/07

Green Zoning: LID in CT Regulations, Southern NE APA Conference, Hyannis,
MA. 10/11/2007

Minimizing our Footprint: Low Impact Development in Urban Environments,
Connecticut Regional Brownfields Workgroup Annual Meeting, Derby, CT. June
14, 2007

Reducing Runoff, organized by the Thames River Basin Partnership and the Town
of Woodstock. 6/14/2007.

Principles of Low Impact Development, The Nature Conservancy, Norwalk River Watershed Initiative, New Canaan, CT. March 22, 2007.

Low Impact Development for Contractors, Council of Governments for the Central Naugatuck Valley, Middlebury, CT. March 21, 2007.

Linking Land Use to Water Quality, Land Use Leadership Alliance, Guilford, CT. October 27, 2006.

Linking Land Use to Water Quality, Capitol Region Council of Governments, West Hartford, CT. October 19, 2006.

3. Conduct the Municipal Initiative in Three CT towns

The “Municipal Initiative “is a unique program developed in collaboration with the CT Department of Environmental Protection, that allows the NEMO Team to focus more resources on a few municipalities, establishing relationships between the program and these towns from the initial educational workshop through implementation of on-the-ground changes. Because of the time commitment required for this program, the NEMO Team can only focus on a few towns per year, however, the chosen towns then serve as case studies and examples to other towns in Connecticut. Selected towns must designate a contact person for the initiative who will be responsible for facilitating communication both between the program and the town, and among various commissions within the town. In addition, a NEMO Task Force must be established whose membership includes, at a minimum, members of the following commissions or boards: planning, zoning, inland wetlands, conservation and the office of the chief elected official (town council; board of selectmen, mayor’s office). Other groups, such as town departments, land trusts and economic development commissions are also encouraged to participate.

In 2006-2007, NEMO worked with three communities under the Municipal Initiative. Below is the progress each town made under the initiative:

Town of North Stonington

North Stonington is a community that is still quite rural, but faces considerable development challenges coming from the I-95 corridor that slices through its southern borders and the casino in an adjacent northern town. North Stonington typifies the small Connecticut town run primarily by volunteers and part time staff. NEMO met with members of several of the community’s commissions who wish to take some proactive planning measures to address their development challenges. NEMO followed a traditional approach working with the local task force of town commissioners and elected officials and designed a series of workshops.

Workshops Completed:

1. Linking Land Use to Water Quality
2. Approaches to Watershed Planning
3. Community Resource Inventory

4. Open Space Planning
5. Reducing Runoff: Principles of better site design
6. Economic Development

Although the town is still working through the planning process for their community, two substantive actions were taken during the reporting period. First, they adopted a stormwater management regulation that mandated the use of the approaches outlined in the CT Stormwater Quality Manual, and required applicants to submit a detailed stormwater management plan for development that disturbed greater than 1-acre of land. In addition, the town organized a watershed planning team for a Shunock watershed in order to come up with planning and regulatory recommendations to protect this public water supply watershed.

Town of Waterford

Waterford is an urban coastal town with a proximity to Interstate 95 and Long Island Sound. The easy accessibility of the town has made Waterford a regional commercial destination and several new shopping centers and retail areas have developed over that past few decades. Recent studies show that the town is over 20% developed, an increase in developed land of over 21% from 1985 to 2002. The town's economic resources also include the Sound, which is a potent draw for recreational fishing and boating. How to balance these two resources, so the success of one will not impair the other, is a challenge the town faces.

Waterford has full-time, professional staff, who understand the key planning and stormwater issues. The educational approach taken, therefore, needed to be different to reflect their deeper understanding of the issues. Therefore, we used a new approach that we based upon the Center for Watershed Protection's roundtables. The goal of this approach was to find areas of agreement between key town department's and map out an implementation strategy to codify these agreements. As of the writing of this report, Waterford is moving to approval of updates to both zoning and subdivision to incorporate a mandated approach to LID stormwater management. NEMO will continue to assist the town on an "as needed" basis to both review regulation updates and help educate the town's commissions on the need for these changes.

4. Other Municipal Education

NEMO's stock-in-trade has been the delivery of educational programs on a variety of land use planning topics at town hall. This method of taking education to the target audience is key to the success of any outreach program. Outside of the Municipal Initiative towns, NEMO team members delivered nearly 100 municipal workshops during the reporting period on topics such as stormwater management, land use planning, open space preservation and conducting a resource inventory.

5. Development of Web-based Tools

The NEMO program has increasingly been using internet technologies to further the reach and depth of its municipal education. During the 2006-2007 reporting period, two significant web tools were developed.

Planning for Stormwater: Reducing Runoff through Better Site Design

<http://nemo.uconn.edu/tools/stormwater/>

The Planning for Stormwater website provides general information on alternative stormwater management, offering information, details and case studies for implementing low impact development in Connecticut. From this site the user can learn what the elements of stormwater management and low impact development are—from green roofs to permeable pavement. The details include commercial and residential site design consideration, local examples and direct links to the 2004 Connecticut Stormwater Quality Manual. This site is designed to be accessible to land use officials who evaluate and implement these stormwater management practices in their local communities.



Connecticut LID Inventory

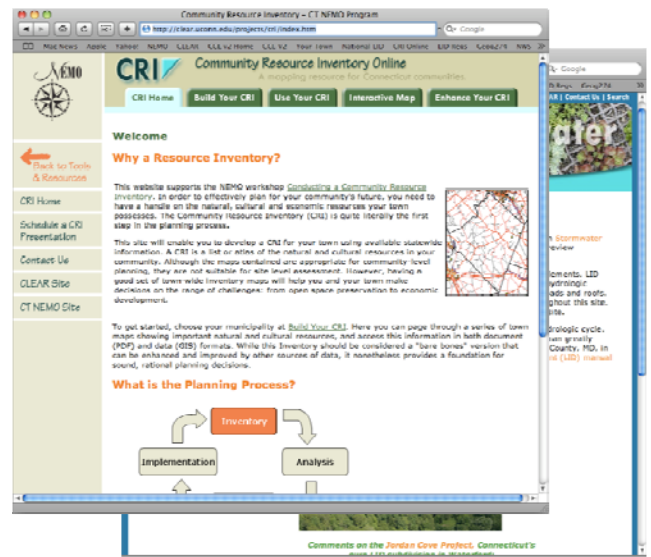
<http://nemo.uconn.edu/tools/lid/>

The CT LID Inventory website supplements and builds on the Planning for Stormwater website by providing searchable local examples of low impact development projects throughout Connecticut. The site allows the user to search projects by town, LID practice type or project name. To illustrate the examples fully, project profiles include maintenance considerations, contact information for the installers, engineers, owners and photos. The user can also search specifically for engineering and construction companies familiar with low impact development. In a partnership with the University of New Hampshire Stormwater Center, NEMO's CT LID Inventory website was expanded to be a part of the Northeast LID Inventory, a similar website that includes low impact development examples throughout the Northeast. This site is also accessible through NEMO's CT LID Inventory website.

Community Resource Inventory Online

<http://clear.uconn.edu/projects/crri/index.htm>

Natural resource-based planning is a mantra that runs through most NEMO workshops. Simply put, this approach to land use planning starts with an inventory of your town's natural and cultural resources, prioritizes those resources through the development of open space plans or plans of conservation and development, and implements those plans through regulations or town policies. Although the concept is simple,



we've found that getting started on that first step – the resource inventory – is often a stumbling block for communities that lack staff resources with geographic information system (GIS) technology.

No longer. Thanks to funding from the CT DEP, the NEMO program has created a dedicated website to help bridge the GIS technology gap. Called the Community Resource Inventory (CRI) Online, the website provides mapping resources, tutorials, examples and other resources that will assist you in getting started with natural resource-based planning. By working through the website, you will be able to develop a basic inventory of your towns natural and cultural resources, upon which you can build.

VI. National Monitoring Program

The Jordan Cove Urban Watershed National Monitoring Program Project was funded, in part, through the Connecticut Department of Environmental Protection (CT DEP) by the U.S. Environmental Protection Agency's (EPA) Section 319 National Monitoring Program (NMP). The Jordan Cove project is the only one of the 24 NMP project's nationwide that studied the effects of residential subdivision development on runoff quality and quantity, and of BMPs (or low impact development practices) designed to mitigate those impacts. The Section 319 NMP was established pursuant to section 319(l) of the federal Clean Water Act (Nonpoint Source Management Programs - Collection of Information). Section 319(l) states that EPA shall collect information and make available: (1) Information concerning the costs and relative efficiencies of best management practices for reducing nonpoint source pollution, and (2) Data concerning the relationship between water quality and implementation of various management practices to control nonpoint sources of pollution. The objectives of the Section 319 NMP are twofold: (1) To scientifically evaluate the effectiveness of watershed technologies designed to control nonpoint source pollution, and (2) To improve our understanding of nonpoint source pollution. To achieve these objectives, the NMP has selected watersheds across the country to be monitored over a 6- to 10-year period to evaluate how improved land management and the application of BMPs reduce water pollution. The results from these projects are being used to assist land use and natural resource managers by providing information on the relative effectiveness of BMPs to control nonpoint source pollution.

The Jordan Cove Urban Watershed Section 319 National Monitoring Program Project was a ten year study designed to determine the water quantity and quality benefits through the development of an urban subdivision using pollution prevention BMPs. Stormwater runoff from three watersheds - control, traditional and best management practice (BMP) - was monitored as part of the study. The traditional watershed has been developed using 'traditional' subdivision requirements. The BMP watershed has been developed using a best management practice approach and was studied before, during, and after construction. The runoff from these two watersheds was compared to an existing control watershed. Ultimately, the goal was to show that, by using a BMP approach, pre-development hydrologic conditions can be maintained during and after residential development.

Conclusions

Residential development has significant adverse impacts on runoff quality and quantity. Typical hydrologic alterations due to construction activities, such as increased runoff volume, were not found in the BMP watershed. On the contrary, a reduction of stormwater runoff was observed. This reduction can be attributed to both excavation of all basements in a relatively short time and proper location of earthen berms to retain and infiltrate stormwater onsite. Decreases in runoff continued in the BMP watershed during the post-construction period. Thus, this project was successful in maintaining predevelopment discharge rates. During the construction phase in the traditional watershed, runoff volume increased dramatically. That increase in flow continued during the post-construction period.

Concentrations of TSS, NO₃-N, NH₃-N, TKN and TP significantly increased in stormwater runoff from the BMP watershed during construction and remained higher following construction. The continued TSS and P exports from the BMP watershed could be related to transport from the swales and fertilizer applications in the swales. In contrast, TSS, NO₃-N, and NH₃-N concentrations did not change, and TKN and TP concentrations experienced a significant reduction, during construction in the traditional watershed. Single activities contributed to concentration spikes, and are important. These events included TSS increases during unstabilized soil conditions in the swales and N and P increases following fertilization. During the post-construction period in the traditional watershed, concentrations of TSS, TP, and TKN remained significantly lower than expected.

The mass export of nitrogen species, Cu and Pb did not change in stormwater runoff from the BMP watershed during construction. TSS and TP exports generally increased both during and after construction. Zn export declined in both periods. In contrast, the mass export of sediment, nutrients and metals all increased in stormwater runoff from the traditional watershed during and after construction. These increases were associated with higher discharge from the traditional watershed during and after construction.

The behavior of BMP watershed residents, as determined from annual surveys generally was not different from the residents in the other two traditional watersheds, perhaps indicating that education methods used were not as effective as expected.

The following treatment goals were established for the BMP watershed. Each goal is assessed as to whether the goal has been achieved.

1. To implement BMPs on 100% of the lots in the BMP portion of the subdivision. – **goal met.**
2. To maintain post-development peak runoff rate and volume at levels equal to predevelopment rates. – **volume and peak rate goal met**
3. To maintain post-development loading of TSS at levels equal to predevelopment rates – **goal not met.**
4. To retain sediment onsite during construction. – **goal not met.**

5. To reduce nitrogen export by 65% - **goal met.**
6. To reduce bacterial export by 85%. – **goal not met.**
7. To reduce phosphorus export by 40%. – **goal met.**

NPS Program Contact List

CT DEP Nonpoint Source Coordinator	(860) 424-3730
US EPA Nonpoint Source Coordinator	(617) 918-1687

Other Nonpoint Source related programs:

Aquifer Protection	(860) 424-3020
Council on Soil & Water Conservation	(860) 767-9594
Inland Water Resource Wetland Comm. Training	(860) 424-3706
Water Quality Monitoring	(860) 424-3020
Lakes Management	(860) 424-3020
Watershed Management & Coordination	(860) 424-3020
Stormwater Management	(860) 424-3018
Stormwater Data	(860) 424-3020
Permitting and Enforcement	(860) 424-3018
NRCS Water Quality Coordination	(860) 977-1543
Inland Fisheries Division	(860) 424-3474
Marine Fisheries Division	(860) 434-6043
Office of Long Island Sound Programs	(860) 424-3034