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Bureau of Water Management
Planning & Standards Division
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CONNECTICUT NONPOINT SOURCE MANAGEMENT PROGRAM 2003 ANNUAL REPORT



Nonpoint Source (NPS) 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 pollutions also includes adverse changes to the vegetation, shape, and flow of streams and other aquatic systems.

2003 CT DEP Nonpoint Source Annual Report

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Preface: The following document was prepared by Stan Zaremba, Senior Environmental Analyst and 319 Nonpoint Source Coordinator with the Connecticut Department of Environmental Protection (DEP), Bureau of Water Management Planning and Standards Division (PSD).

I. INTRODUCTION

The Connecticut Department of Environmental Protection (CT DEP) Nonpoint Source (NPS) Program works to abate known water quality impairments and prevent of 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 Management (BWM) administers grants funded under the Clean Water Act (CWA) Section 319(h). From FY90-03, Section 319 grants totaling just over \$13 million have supported 312 projects and CT DEP NPS Program staff salaries. Of the 312 projects, 104 are still active, and CT DEP closed out 15 projects in 2003. 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. In FY01, Congress increased the national Section 319 appropriation from \$200 million to \$238 million to improve states' capacity to address waters impaired by NPS pollution. In FY03, \$800,000 was awarded under the PPG, and \$1,585,568 was awarded under a separate "categorical" grant to support 35 projects. The categorical grant funds include \$717,377 for base or statewide programs, and \$768,191 for watershed projects. The project funds are generally targeted to watersheds identified by the state as impaired (i.e., not meeting state water quality standards), and for which the development of total maximum daily load (TMDL) analyses are required, and as "Category 1" by the state's Unified Watershed Assessment (UWA). The FY03 grant also included \$100,000 for the eighth year of the Jordan Cove Urban Watershed National Monitoring Project. This 10-year long-term monitoring project is part of the U.S. Environmental Protection Agency's (EPA) Section 319 National Monitoring Program, and is the only such project focusing on runoff from residential development.

CT DEP General 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 with the state. Numerous NPS Program activities are implemented by the BWM, 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, watershed, and lakes management programs; conducts NPS Program planning and coordination; manages the planning, design, and construction of municipal sewage treatment facilities; administers the state Clean Water Fund (SRF); and

provides support functions for the other bureau divisions for necessary planning, program development, and technical and administrative assistance.

Permits and Enforcement Division (PED): Regulates, inspects, and monitors municipal and industrial wastewater discharge facilities; regulates storm water; and requires the abatement of point and nonpoint source pollution.

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.

The CT DEP Office of Long Island Sound Programs also has NPS management responsibilities. The OLISP administers the state's Coastal Zone Management Program, and is responsible for developing and administering in conjunction with the BWM, 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.

There are also several other CT DEP units that perform NPS Program support activities. The CT DEP Office of Communication and Environmental Education (CEE) supports outreach and education on NPS issues to municipal agencies, the general public and teachers. The Environmental Geographic Information Center (EGIC) 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.

III. PROGRAM HIGHLIGHTS

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 Management and Coordination (WMC) Program staff 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 2003, Section 319 funds in the PPG were used to support the following staff: NPS program coordinator, fiscal administrative officer, two watershed coordinators, two subsurface staff, one full time employee for NPS/stormwater inspections and one position in each of the following programs: water quality monitoring, stormwater permitting, and 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, New York, and New Jersey.

Monitoring and Data Management

Section 319 funds support 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.

In 2003, CT DEP completed two years of monitoring at Wadeable stream sites chosen by a probabilistic design. Resulting data will be used to make statistically valid statements regarding the water quality of all Wadeable streams in Connecticut. However, because all results are not yet available from probabilistic monitoring, a full statistical analysis will not be fully addressed until the 2006 report. CT is currently preparing the 2004 305(b) Report and associated 303(d) List of Waters Not Meeting Water Quality Standards, both due to US EPA in 2004. Water quality assessments for both documents follow methodologies outlined in the 2004 CT Consolidated Assessment and Listing Methodology (CALM). The 2004 305(b) Report will comprise an update to the comprehensive 2002 report, including the most recent available assessment information. Even though a full statistical analysis of probabilistic data will not be included in the 2004 report, data from all the probabilistic sites will be incorporated into assessments for individual stream reaches. For all waterbodies (rivers, lakes and estuaries), where no new information was available, waterbody assessments remain as stated in the 2002 reporting cycle.

The 2003 summary report for the Rapid Bioassessment by Volunteer Monitors in Wadeable Streams and Rivers has recently been added to the DEP web page under the Bureau of Water Management, volunteer monitoring heading (<http://www.dep.state.ct.us/wtr/volunmon/volmonindex.htm>). This program enables citizen groups to collect useful data for DEP by combining the utility of invertebrate indicators with a non-technical methodology. Participants have included watershed associations, college ecology classes, town conservation commissions, and sporting clubs. For additional information regarding this program, please contact Mike Beauchene (860) 424-4185.

- During the fourth official sampling season (fall 2003) 14 volunteer groups collected 31 macroinvertebrate samples on 26 different waterbodies across Connecticut. The number of "most wanted" aquatic insects ranged from a high of 6 at Gages Brook, Tolland, to a low of 0 at Hemingway Creek, New Haven. In addition to Gages Brook, samples from 3 other river segments indicated full support of aquatic life use. Fourteen of 31 samples indicated excellent water quality, 10 very good water quality, and 6 fair/good water quality, and only 1 poor water quality.
- Prior to sampling, a three-hour training session was held. In 2003 over 110 individuals participated. For more information on the RBV, see <http://dep.state.ct.us/wtr/volunmon/volopp.htm>.

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. In 2002, pursuant to US EPA guidance, the 305(b) coordinator prepared a Consolidated Assessment and Listing Methodology (CT CALM) for water quality assessments for both Section 305(b) and Section 303(d) reporting. This

CT CALM clearly articulates the methods by which DEP staff determines if waters are meeting water quality standards, and allows the 303(d) List of Impaired Waters to be generated as a subset of all assessed waters.

Due to implementation of the rotating basin plan and an increased effort to include volunteer and academic information, the number of assessed river miles increased from 15% to 26%. Seventy-seven percent of assessed stream miles supported aquatic life use; 66% of assessed stream miles supported contact recreation. Runoff was identified as a potential cause of impairment in more than half of impaired river miles.

- In 2002, the Connecticut Impaired Waters List, required by Section 303(d) of the CWA was generated as a subset of 305(b) assessed waters. The 305(b) coordinator worked closely with TMDL staff to prepare a detailed 303(d) List. The full 2002 305(b) Report, a summary fact-sheet of the 2002 305(b) Report and the 2002 303(d) List are available on the CT DEP website see www.dep.state.ct.us/wtr/index.htm scroll to Water Quality Management Program.

CT DEP has provided assistance to the eight groups in Connecticut that are listed in the National Directory of Volunteer Environmental Monitoring Programs, and several others. In 1999, the CT DEP Volunteer Monitoring Coordinator developed a “Rapid Bioassessment in Wadeable Streams and Rivers for Volunteer Monitors” (RBV) protocol for macroinvertebrate collection. The data collected by volunteer monitors using the RBV protocol can be used to screen for either very high or very poor water quality. In the past, CT DEP collected water quality data from various water bodies on a rotating basis. Beginning this year, CT DEP is collecting water quality data on a probabilistic basis, in which collection sites (approximately 60 in all, 30 of which will be monitored in any one year) are chosen randomly. Data will be collected quarterly from these sites for the following parameters: water chemistry, and the health of the fish, macroinvertebrate, and periphyton communities. The rotating basin plan may resume in 2004.

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. CT DEP has conducted this monitoring since 1991 and currently samples at 17 stations on a monthly basis year round and at least 25 stations during summertime hypoxia surveys, conducted on a bi-weekly basis from June through September. Monthly samples include all nutrient analyses, dissolved oxygen, chlorophyll-a, and physical conditions including temperature and salinity. In combination with upland monitoring described above, CT DEP and the LISS use these data to chart management progress, particularly for nitrogen control, the primary pollutant leading to hypoxia. NPS nitrogen is a contributor to hypoxia and a reduction target has been established in the TMDL for Long Island Sound, which is tracked through these monitoring efforts. The general trend of hypoxia’s areal extent and duration appears to be downward. Additional monitoring conducted as part of EPA’s National Coastal Assessment has been in effect since 2000 and provides status and trend information on many parameters, including toxicity and tissue contamination, in both offshore and nearshore environments.

Outreach and Education

The CT DEP Office of Communication and Environmental Education (CEE) administers several environmental education programs, including Project WET (Water Education for Teachers) and Project SEARCH. Project WET assists teachers in integrating water quality lessons into their standard curricula. The first four years of Project WET were supported by section 319 funds. In 2000, funding support for this highly successful program was shifted from section 319 to the State.

In 2003, Kellogg Environment Center staff and trained WET facilitators and volunteers conducted 6 workshops, 7 festivals, 2 field days, classrooms, and 2 training programs. Kellogg staff, WET facilitators and volunteers worked with 786 students and trained 79 educators to use Project WET materials. Project WET was selected as the principal curriculum for an EPA funded program called Project CLEAR (Candlewood Lake Environmental Awareness and Responsibility). CLEAR is designed to integrate the social, biological, environmental and historical information about Candlewood Lake into the high school curriculum of the five school districts within the watershed.

Project SEARCH is a joint program of the CT DEP and Science Center of Connecticut, which provides equipment, training, and technical support to high school teachers who have adopted 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 2003, Project SEARCH continued to work with teachers and students from more than 70 public and private high schools across Connecticut to collect water quality data on rivers and streams within their communities. Schools sampled water chemistry and macroinvertebrate communities and assessed habitat quality, including potential NPS pollution sites, in the fall and spring at their monitoring sites. SEARCH staff conducted 105 site visits to provide technical assistance, working with an estimated 90-100 teachers and 1,800-2,100 students in grades 9-12. Water quality data was collected from 69 sites on 58 rivers and streams. SEARCH staff collected replicate samples for the projects Quality Assurance/Quality Control (QA/QC) analysis, and prepared an annual report, *Project SEARCH: Water Quality Data Summary Report 2003*, that summarized the results of the stream surveys. SEARCH staff presented a three-day training workshop on June for 23 new teachers starting up monitoring programs at their schools. SEARCH staff also completed a new chapter on NPS for the SEARCH Teachers curriculum manual and began planning for integration of a GIS land use/cover mapping component to the program to facilitate understanding of NPS issues with the schools.

In recognition of the need to improve documentation of environmental results from NPS Program implementation, NPS Program staff initiated the development of a series of NPS Program "Success Story" Fact Sheets. These fact sheets highlight successful NPS management programs and projects that utilized section 319 funds, and the associated environmental results. (see: www.dep.state.ct.us/wtr/index.htm and scroll to Nonpoint Source Management Program and Information).

The Envirothon is an environmental education program for high school students in the U.S. and Canada that promotes stewardship of natural resources by developing critical thinking skills, cooperative problem-solving skills, and decision-making skills to balance the quality of life and the quality of the environment. The Connecticut Envirothon was founded and is still led by the State's soil and water conservation districts, with active participation by CT DEP, NRCS and many other groups. Academic teams compete in the areas of Forestry, Aquatics, Soils, Wildlife and a current topic. This year's current topic is Farmland Preservation. Teams are provided with extensive resource materials, a series of workshops, and prepare throughout the year with guidance from a faculty advisor.

A total of 37 teams participated in the 2003 Connecticut Envirothon. The winner, a team from Norwich Free Academy, went on to the International Envirothon competition at Mount St. Mary's College in Maryland. To learn more visit: <http://www.connecticutenvirothon.org>

Geographic Information

The NPS Program receives GIS support services from trained BWM staff and from EGIC. During the past several years, CT DEP has used Section 319 funds to supplement state funding for GIS staff to support the NPS Program. During the past few years, additional funding support has come from the Safe Drinking Water Act "Source Water Assessment Program" (SWAP). GIS services relevant to NPS management include: making new land use/land cover data from the University of Connecticut widely available; assisting NPS Program staff with on-going use of desk top GIS capabilities; and producing updated maps of Aquifer Protection Areas and statewide watersheds.

In 2000, EGIC began the "Environmental Data and Geographic Exchange" (EDGE) initiative, the purpose of which is to develop a comprehensive environmental information management system to improve CT DEP staff efficiency and public access to environmental information. In 2001, the EDGE initiative launched Environmental Conditions Online (ECO), a Web-based GIS tool that provides the entire agency with direct access to environmental and natural resource information. Agency staff uses ECO to determine basic environmental conditions anywhere in Connecticut. For example, ECO reports back the water quality classification, aquifer protection area, flood zone, soil type, geology, basin designation, and map coordinates for a street address. ECO provides easy access to geographic information maintained by CT DEP and other state and federal agencies, including the Department of Public Health Services, UCONN, FEMA, NRCS, and USGS. ECO currently includes a diverse collection of 65 data layers and a

wide range of interactive tools for panning and zooming, querying map data, measuring distances, drawing features and text, and preparing customized maps for printing. In FY 2003, DEP decided not to pursue posting ECO on the Internet due to the costs and overhead associated with either replicating the database and server environments at DOIT or transferring the existing system to DOIT.

To more accurately designate surface water quality classifications in coastal waters, a new Shellfish Area Classification data layer was established by transforming information from paper maps to GIS data format. Shellfish area classification is under the jurisdiction of the Connecticut Department of Agriculture (DOA) so DEP trained DOA staff in the use of ArcView GIS software to maintain and use this information in digital format. As a result, DOA is able to update the GIS information and print shellfish area classification maps for the public and DEP is now able to reference a digital version of the shellfish area classification when updating the water quality classifications. The Shellfish Area Classification data layer is also targeted to be included in ECO. Additionally, during FY 2003, EGIC assisted DOA and the DEP Office of Long Island Sound Program (OLISP) in developing detailed mapping of shellfish lots (beds) along the Connecticut coast. This work represents the first comprehensive mapping of both shellfish area classification and shellfish beds for the Connecticut portion of Long Island Sound.

EGIC also provided technical support to the BWM relative to integrating field collected facility locations into a revised leachate and wastewater discharge inventory. This is a key GIS datalayer used in updating the agency's water quality classifications. The EGIC previously provided BWM with all the GIS-based maps for the Unified Watershed Report and the map graphics for the Web version of the Unified Watershed Report. During FY 2002, EGIC did the revisions for the Web version's map graphics. EGIC also developed a site on DEP's Intranet for BWM staff to access breakdowns of land use for individual major basins, regional basins, subregional basins, towns, counties, and regional planning agencies in Connecticut.

Additionally, updates to the Aquifer Protection Areas and revisions to the Water Quality Classifications were performed by EGIC as needed, ensuring that accurate and up-to-date information is available to agency staff and for distribution to the public. Updates were also made to DEP's 1:24,000 scale hydrography data layer in preparation for its use by the USGS as the basis for generating a National Hydrography Network (NHD) data layer for Connecticut. Corrections were made to shorelines and stream reaches to match their appearance on the most recently published USGS topographic quadrangle maps.

EGIC revised and fully documented the Web-based application software environment that supports the ECO application in order to make the software easier to maintain, enhance, or use for other purposes. For example, EGIC will use this software to develop NPS Management Online for DEP staff. EGIC carried out the necessary research and planning to develop a web-based GIS application tailored for NPS program needs. NPS Online is intended to be similar to ECO but will provide a more regional perspective, the ability to query information about entire towns or watersheds, and present information in a form suitable for NPS work.

Environmental GIS Data for Connecticut is an information product developed by EGIC and completely sold out through the DEP Store during FY 2003. This product is comprised of seven CDs of natural resource and environmental GIS data for Connecticut plus Arc Explorer mapping software for viewing the information on a PC. These CDs are the means by which local officials, environmental consultants, teachers, and student's access GIS information from DEP, including BWM. Using the data and software on the CDs, the general public is able to create digital maps of Connecticut that include a combination of environmental information from DEP and other cooperating State and Federal agencies. Features include lakes, rivers, streams, roads, political boundaries, dams, aquifer protection areas, water quality classifications, drainage basin divides, DEP property, municipal open space, detailed soil types, wetland soils, bedrock geology, glacial geology, USGS topographic quadrangle maps, and aerial photos taken in 1990.

As a follow up to *Environmental GIS Data for Connecticut*, EGIC is preparing a 2004 edition of the CDs with a companion Web site (<http://www.dep.state.ct.us/gis/>), where the general public can download updated aquifer protection area GIS data, for example.

IV. WATERSHED MANAGEMENT PROGRAM

Watershed Management

During the past several years, the CT DEP has been in transition from a traditional, program-driven approach to water resources management to a comprehensive, multi-media “watershed approach.” CT DEP has developed a watershed management strategy that describes the framework within which the CT DEP will work through a networked approach with federal, state, and municipal government and non-government agencies and organizations to conduct watershed management and strengthen the state’s ability to control nonpoint source pollution. The CT DEP also has reorganized and refocused base program staff, hired five “major basin” coordinators (one currently vacant), and continued to target grant funds based on watershed priorities. Consistent with this approach, CT DEP has dedicated 50-60 percent of the annual Section 319 grants to watershed initiatives for the Norwalk, Quinnipiac, Hockanum, Mattabeset, Pequabuck, and Scantic Rivers, and Sasco and Fenger brooks. New watershed management initiatives are underway for the Quinebaug and Shetucket rivers in the Thames River basin, the Pomperaug River in the Housatonic River 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. In a continuing effort to encourage the growth of new and existing non-governmental watershed organizations and initiatives in priority watersheds, CT DEP also directed \$50,000 of Section 319 (FY ‘02) funds to Rivers Alliance of Connecticut to administer a second round of 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. The second round of WASGP awards was made in 2003 for 13 projects throughout the state.

The Rivers Alliance is also assisting CT DEP in developing, and promoting to CT municipalities, model ordinances that pertain to activities which may affect rivers. It was proposed that the model ordinance would describe potential threats, provide examples of ordinances and/or regulations, and then explain how they would address the issues. In 2002, a format for providing samples of models ordinances was adopted but in 2003 it was decided that this format was conflicting with commissioner’s authorities. Subsequently, DEP and Rivers Alliance will focus on doing a more in-depth study of towns’ needs and will develop a model ordinance that will be generic enough for many towns to adopt or modify as they see necessary.

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 improvements in 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 assessments, the biennial 303(d) list of impaired waters, and targeted NPS assessments.

For the purpose of this report, the term watershed program will only be used to describe those projects that are addressing NPS-related water quality problems on a comprehensive basis throughout an entire watershed. The following is a brief summary of these projects.

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 includes five major basin coordinator positions to oversee and coordinate watershed management activities in each of the state’s five major river basins: Thames, Connecticut, Housatonic, Central Coastal, and Southwest Coastal. The role of the basin coordinators includes:

- Coordinate CT DEP base program activities in priority watersheds;
- serve as liaison between CT DEP and other state and federal agencies, municipalities, and citizen groups;

- assist in the development of comprehensive basin overview reports and assessments, TMDLs, and watershed management plans;
- provide education and outreach on watershed issues, the CT DEP web site, and numerous meetings, workshops, and conferences;
- help 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.

Connecticut's soil and water conservation districts (SWCD) are key partners in the NPS Program, delivering a variety of technical services to private property owners and municipalities across the state in a coordinated statewide approach. Over the past several years, CT DEP has been working with the Council on Soil and Water Conservation (Council) and the Connecticut Association of Conservation Districts (CACD) to reorganize the eight county-based Conservation Districts into five watershed-based Conservation Districts.

The intent in reorganizing Connecticut's Conservation Districts was to streamline more effective delivery of technical and educational services in areas including erosion and sedimentation control, management of nonpoint source (NPS) pollution, management of storm water runoff, promotion of watershed management, and to align the Conservation Districts more closely with the state's watershed management goals.

All Conservation Districts were reorganized in the late winter of 2002/early spring of 2003, with all reorganizations complete by April 1, 2003. The new offices are: Connecticut River Coastal Conservation District (Former Middlesex County SWCD); North Central Conservation District (Former Hartford County SWCD and Tolland County SWCD); Eastern Connecticut Conservation District (Former New London SWCD and Windham County SWCD); Southwest Conservation District (Former New Haven County SWCD and Fairfield County SWCD); and the Northwest Conservation District (Former Litchfield County SWCD). Following reorganization, and throughout 2003, the Conservation Districts used their base section 319 funds to provide assistance to municipal leaders, commissions, and staff, and residential, commercial, and agricultural land users:

- (1) 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, and storm water management;
- (2) planning and presenting technical assistance and natural resource training workshops to land use decision makers on, for example, erosion and sediment control, nutrient management, stormwater management, forestry practices, and integrated pest management. Each Conservation District hosted the workshop, "Training on Connecticut's 2002 Erosion and Sediment Guidelines for Municipal Staff." It was held across the state at several locations and was well attended by municipal staff and officials;
- (3) providing on-call detailed information and recommendations a.) to ensure protection of wetlands, streams, rivers, groundwater, watersheds and land from storm water run-off, and b.) for problems resulting from the lack of erosion and sedimentation controls;
- (4) supporting watershed management activities in cooperation with CT DEP and other NPS program partners.

Western Coastal Basin

Norwalk River

The Norwalk River Watershed Initiative (NRWI) was formed in late 1995 as a partnership between CT DEP, EPA (Region 1 and Long Island Sound Office), and NRCS. Other NRWI partners include Norwalk River Watershed Association, UConn/CES, South West Conservation District, Save the Sound, Mianus Chapter of Trout Unlimited, the Second Taxing District Norwalk Water Company, EarthWatch, the Maritime Aquarium at Norwalk, and the

seven watershed municipalities. The goals for this Initiative include: conducting detailed assessments of both water quality and quantity, habitat, recreational opportunities, land use/cover, and existing management efforts; and development and implementation of comprehensive, community-based management strategies and programs.

NRWI developed the *Norwalk River Watershed Action Plan* as part of the initiative, which municipalities have been using as a guide in their local land-use decision-making. In response to the action plan, municipalities have altered some development proposals to increase buffer widths between new construction and the river, and reduce the amount of new impervious surface.

Section 319 funds were instrumental in getting the Norwalk River Watershed Coordinator hired in 1999. This position continued to provide technical and administrative support to the committee, and direct public outreach efforts to inform residents and municipal officials about NRWI activities and opportunities to participate. This position is now self-supporting and funded with by a local private foundation and six of seven municipalities in the watershed.

Section 319 funds have supported implementation of high priority action plan recommendations. NRWI accomplishments in 2003 include:

- EarthWatch's Harbor Watch / River Watch program has completed six years of citizen water quality monitoring, developed a database, and delivered regular reports to CT DEP. Citizen monitoring has focused on determining the origin of elevated bacteria levels to help direct management activities, including establishment of a Total Maximum Daily Load (TMDL). Volunteer monitors have done intensive follow-up and identified pollution sources including apparent failed septic systems and previously undocumented overflows at a local wastewater plant, as well as identifying several areas where high waterfowl populations have led to high coliform bacteria counts in the river.
- NRCS and the City of Norwalk with assistance from CT DEP, have developed plans to restore a section of eroded streambank on the Silvermine River, near Silvermine School in Norwalk. The project incorporates structures to restore and enhance fish habitat as well as provide hydraulic stability to this section of stream, which has been downcutting and moving laterally.
- CT DEP, NRCS, and the South West Conservation District planned a riparian buffer planting project on the Silvermine River in New Canaan. This project replaced manicured turfgrass with naturalized buffers and serves as a demonstration project for other private property owners showing that naturalized landscaping can be aesthetically pleasing while providing water quality renovation and wildlife functions.
- CT DEP and the City of Norwalk are conducting a paired-basin sediment study in South Norwalk to evaluate measures to reduce the need for costly dredging in Norwalk Harbor. The study will compare the effectiveness of structural and non-structural stormwater controls in two adjacent and otherwise comparable basins that have stormwater outfalls near marinas that require frequent dredging.
- NRCS, CT DEP, and the Mianus Chapter of Trout Unlimited have led efforts to restore over 7,000 linear feet of stream channel and riparian buffers to protect water quality and improve coldwater fish habitat. Projects this year include ongoing restoration at Merwin Meadows Park and Schenck's Island, as well as finalizing design and permitting for a fisheries bypass channel around the dam at Cannondale.
- The Maritime Museum at Norwalk displayed a permanent exhibit focusing on the problem of nonpoint source pollution in the Norwalk River watershed. The exhibit includes a sixteen-minute video detailing the problem and suggesting what watershed residents can do to help reduce NPS pollution.
- The Fairfield County Soil and Water Conservation District has submitted a final report on road sand/salt use in the watershed and examined the potential environmental impacts and alternatives to conventional means of keeping roads clear during snow and ice storms.

- Plans have advanced toward removal of the Strong Pond dam at Merwin Meadows Park. Sediment sampling and analysis has been completed. A second phase of sediment studies, including a detailed analysis of dewatering and disposal options and costs is currently underway. Final design will be prepared in the coming year.
- DEP has begun preliminary design work with several partners toward initiating engineering design for removal of the Flock Process Dam in Norwalk. A detailed topographic survey and hydraulic analysis have been completed by CT DOT as part of their Route 7 and 15-interchange reconstruction. CT DOT will fully fund a project, to be completed by NRCS, which will provide an engineering design, easements, and permits.
- The Wilton Conservation Land Trust, with support from CT DEP and the Town of Wilton, has converted a manicured lawn area to a naturalized wildflower meadow. This project serves a demonstration project, that there are less environmentally damaging alternatives to manicured turfgrass that provide aesthetic beauty as well as wildlife and water quality functions.

Information about the watershed and the initiative is available at the following web site:

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

Sasco Brook

Sasco Brook is located in the Southwest Eastern Regional drainage complex and flows south directly into Long Island Sound. The watershed lies in Fairfield County almost entirely within the towns of Easton, Westport, and Fairfield. Land use in the lower watershed is dominated by high-density commercial and light industrial development (particularly along the U.S. Route 1 and I-95 corridor) and in the upper watershed by low-density residential development and open space. There also are a significant number of horse farms within the watershed. Despite being densely developed, there are currently no permitted point source discharges in the watershed. The primary NPS pollutants of concern are nitrogen and bacteria, resulting from urban stormwater, animal waste runoff, septic systems and residential lawn care products. Based on water quality data collected by CT DEP, USGS, and EarthPlace Harbor Watch/River Watch program, and on increased community awareness developed through the "Sasco Brook Watershed NPS Program," in 1999 the CT DEP developed a TMDL for nonpoint source bacteria and an implementation plan. Utilizing section 319 and other federal and state funding sources, the CT DEP is currently working to implement the plan with the municipalities of Westport and Fairfield (through the Sasco Brook Pollution Abatement Committee), NRCS, Harbor Watch River Watch and the South West Conservation District. Harbor Watch River Watch has been conducting detailed water quality monitoring in support of the TMDL and has expanded their scope to include sites on the Aspetuck River, another 303(d) listed stream affected by nonpoint sources.

The Town of Fairfield is committed to improving water quality in Sasco Brook. They have installed two more swirl concentrator devices, and retrofitted and maintained numerous catch basins in drainage systems discharging to Sasco Brook. They completed a riparian buffer planting project and also continue with active education and outreach to local citizens.

Byram River

The Byram River is located in the Southwest Western Regional drainage complex and flows south directly into Long Island Sound. The watershed lies within the towns of Greenwich and Stamford, and also in Westchester County, New York in the towns of Port Chester, Rye Brook, and Armonk. Land use in the lower watershed is dominated by high-density residential and commercial development and in the upper watershed by lower density residential development. The primary NPS pollutants of concern are bacteria and nitrogen, resulting from possible illicit wastewater connections, urban stormwater, animal waste runoff, septic systems and residential lawn care products. Historically, problems in this River have been difficult to address due to jurisdictional issues between two states, two EPA regions, two Army Corps Districts, and municipal and county governments on both sides. At the request of, and with funding from CT DEP, the Interstate Environmental Commission has initiated an

intergovernmental project to investigate and resolve sources of high fecal coliform bacteria in the river. They have identified two major drainage outflows in Port Chester New York, serving Westchester Avenue and Purdy Avenue, where illegal connections and sanitary sewage overflows and leaks appear to be significant problems. The Westchester County Health Department is working on more detailed analyses of the problem.

Darien Coastal Watersheds (Goodwives, Noroton, and Tokeneke Rivers)

These small coastal watersheds are unique because they are very densely developed and are connected directly to the Darien River and Holly Pond. The chief concern of the local residents is the high volume of sediment that has been deposited in these coastal ponds in the last 30 years. These streams are located in the Southwest Western Regional drainage complex. The watershed lies almost entirely within the towns of Darien and New Canaan. Land use in the watershed is mostly high-density residential development with a commercial strip along the Route 1/I-95 corridor. These watersheds are small in area and subject to very low mid-summer flows. The primary NPS pollutants of concern are sediments, nitrogen, and bacteria, resulting from urban stormwater, animal waste runoff, septic systems and residential lawn care products. Several local environmental organizations have hired a consulting firm to conduct a watershed study focusing on addressing the sedimentation problem and improving stormwater quality. These groups are seeking a cooperative approach that will involve CT DEP, ConnDOT, grassroots groups, and corporate funding.

Mianus River Watershed

DEP Watershed program staff members have attended meetings of the Mianus River Watershed Council. The Council plans to produce a Watershed Management Plan in the coming year. Several issues that will be likely to be addressed include water diversions, impact by the growth of intensive lawncare including irrigation as well as runoff of fertilizers and lawn chemicals, septic systems, unchecked growth in the watershed, and issues involved with interstate watersheds spanning two EPA districts. This organization has an impressive record with implementing major land preservation projects.

Housatonic River Basin

Housatonic Mainstem

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. Although a variety of pressures have caused the disappearance of many farms, an active agricultural community persists in this region. The southern half of the Housatonic watershed tends to be more urbanized and industrial. Because of its proximity to New York City, the entire Housatonic watershed is under increasing development pressures as more people choose to live outside urban areas in more suburban and rural settings.

The Housatonic River and the lands within its watershed also 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 two catch-and-release Trout Management Areas, two smallmouth Bass Management Areas and seasonal Class I-IV whitewater boating opportunities. On the southern portion of the river, Lake Lillinonah, Lake Zoar and Lake Housatonic - major impoundments created by three hydropower dams – are popular areas for boating, fishing and swimming. Candlewood Lake, a hydroelectric pump storage reservoir associated with the Housatonic, is also a popular recreational area. 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.

Meanwhile, Upper Housatonic Valley Heritage Area, Inc., a recently established non-profit organization, has been working with the National Park Service to explore the possibility of creating an Upper Housatonic National Heritage Area, which would stretch from Hancock, MA to Kent, CT. Although the Heritage Area would primarily have a cultural and historic emphasis, it would also have a natural resource component. This being the case, there is the potential for the Heritage Area organization to become a partner in addressing nonpoint source issues, especially with regard to land protection and land use.

As indicated above, the Housatonic has been extensively harnessed for hydroelectric power generation. In Connecticut, Northeast Generation Services (formed after the deregulation of Northeast Utilities) 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). With the exception of Rocky River, each of these developments involves dams across the Housatonic Main Stem. All of these facilities are currently being reviewed for relicensing by the Federal Energy Regulatory Commission (FERC). In addition, a sixth, privately operated hydropower facility is associated with Derby Dam, which 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. Starting in the 1970's, a series of studies determined that excessive amounts of phosphorus from upstream sources were 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, have helped to lower nutrient levels and improve water quality. However, eutrophication problems persist, particularly in Lake Lillinonah. Much work remains to be done with regard to reassessing point sources, and identifying and addressing nonpoint sources of phosphorus.

The Housatonic PCB issue was first identified in the late 1970's and is primarily associated with releases from the General Electric (GE) manufacturing facility in Pittsfield, MA. As a result of a 1999 Consent Decree, involving GE, the State of Connecticut, Commonwealth of Massachusetts, U.S. EPA and other federal entities, clean-up of PCBs in the most heavily contaminated portions of the river is underway. Under EPA's direction, GE completed clean-up of the first ½ mile section of the East Branch of the Housatonic River adjacent to the GE facility in Pittsfield, MA in September 2002. Following completion of the ½ mile remediation, EPA and U.S. Army Corps of Engineers began clean-up of the next 1 ½ mile section of the river. The work in the 1 ½ Mile section has been divided into three phases and completion is expected by 2007.

Down at the mouth of the Housatonic River, the Connecticut Audubon Coastal Center continues to explore the possibility of creating a Housatonic Estuary research station. If established, this research station would provide researchers from Connecticut colleges, universities and other institutions with facilities to conduct studies in the estuary and Long Island Sound. Connecticut Audubon has been offered a potential site and buildings on the recently remediated Remington gun club property at Stratford Point. Although researchers would be studying a variety of topics, it is possible that some of these subjects may relate to nonpoint source concerns associated with the Housatonic watershed.

During 2003:

- Approximately 31,000 cubic yards of bank and sediment material have been excavated from the 1 ½ Mile section of the East Branch of the Housatonic in Pittsfield, MA below the GE facility, since this phase of the PCB remediation efforts began in Fall 2002 under the supervision of U.S. EPA and the Army Corp of Engineers. As of December 2003, clean-up of the 1 ½ Mile section was approximately 30 per cent complete.
- U.S. EPA completed the Human Health and Ecological Risk Assessments for the "Rest of River" section of the Housatonic. These risk assessments will be used to determine the need for and extent of additional PCB remediation beyond the first 2 miles of river currently undergoing clean-up. An independent Peer Review Panel was convened in November 2003 to review and comment on the Human Health Risk Assessment.

- GE submitted a report to CT DEP in June 2003 on the 2002 monitoring results for PCB concentrations in fish and benthic invertebrates for selected sections of the Housatonic River in Connecticut as per the CT DEP-GE Cooperative Agreement. Overall, PCB concentrations in fish were similar to the previous monitoring study done in 2000. PCB concentrations in benthic invertebrates were similar to or lower than what was found in 2000. This information is reassuring in that it shows that PCB levels in Connecticut have not risen as a result of the remediation efforts in Pittsfield.
- FERC released the Draft Environmental Impact Statement (DEIS) for the relicensing of the five hydropower facilities which comprise the Housatonic River Hydroelectric Project and are operated by Northeast Generation Services Company. CT DEP submitted comments refuting FERC's contradiction of CT DEP's 401 Water Quality Certification which requires run-of-river operation of the Falls Village and Bulls Bridge facilities to improve water quality. The DEIS also discusses the proposed oxygen diffuser system which has been recommended to address the low dissolved oxygen discharge from Lake Lillinonah to Lake Zoar.
- The CT DEP Lake Management Program is funding Diagnostic Feasibility Studies for both Lake Lillinonah and Lake Zoar to look at water quality and contributing point and nonpoint sources of nutrients from the surrounding and upstream watershed areas. Results of these studies are expected in 2004.
- The Northwestern Connecticut Council of Governments and Litchfield Hills Council of Elected Officials submitted the final "Model Zoning Regulations for Parking for Northwestern Connecticut" in September 2003 as per the Northwest Connecticut Parking Study – Phase II funded through the US EPA CWA 604(b) program. (Much of Northwestern Connecticut falls within the Housatonic Basin.) Among other things, these model regulations promote use of shared parking facilities, permeable parking lot materials to help reduce impervious cover, and better stormwater management practices.
- The Housatonic River Commission (HRC) was selected to receive FY '03 604(b) funding to revise its twenty-year-old "Housatonic River Management Plan". HRC comprises the seven towns along the Housatonic River corridor and includes Canaan, Cornwall, Kent, New Milford, North Canaan, Salisbury and Sharon. The revised plan would continue to promote a cooperative regional approach at the local level to address environmental issues impacting the river corridor.
- The National Park Service completed a draft "Upper Housatonic Valley National Heritage Area – Feasibility Study". Approval of the Heritage Area designation is currently being considered by the U.S. Congress.
- The CT Audubon Coastal Center worked with UCONN to set up a "My Sound" station in the Housatonic Estuary, which began operating in August 2003. This station transmits "real time" water quality information to the UCONN "My Sound" website. At present, the Housatonic station is tracking temperature, conductivity (salinity) and dissolved oxygen.
- The Housatonic Valley Association (HVA) was selected to receive funding through the CWA Sec. 319 supported Watershed Assistance Small Grants Program for "Volunteer Stream Team" activities in the lower Housatonic Valley between Monroe/Oxford and Stratford/Milford. This project will organize volunteers to visually survey shoreline conditions in the river corridor and identify potential water quality concerns. Meanwhile, HVA completed a "Shoreline Survey Report and Action Plan" for the Lake Lillinonah and Lake Zoar section of the Housatonic River based on information collected by another Volunteer Stream Team in 2002.

Hollenbeck River

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) – formerly the Litchfield County Soil and Water Conservation District has been working on a CWA Sec. 319 funded project to address severe gullying, 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

In 2003, the USDA Natural Resource Conservation Service (NRCS), working with NCD, completed a draft of the “Beebe Hill Conceptual Plan” which identifies four alternatives to address the erosion problem. NCD, NRCS and CT DEP met to review and discuss the plan, and NCD has also had preliminary discussions with the Town of Falls Village. However, unforeseen circumstances have recently emerged which involve the potential sale of the farm property at the top of Beebe Hill where the erosion problems originate. NCD is following the situation and trying to determine the best way to proceed.

Naugatuck River

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 recently completed Waterbury facility. In conjunction with the upgrade of the Waterbury 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). Plans are underway to remove at least one more dam-and construct fish and canoe/kayak passage around another. 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.

In 2003:

- As part of its CWA 604(b) funded project to assess the need and potential for creating a greenway on the upper Naugatuck, the Litchfield Hills Council of Elected Officials (LHCEO) produced GIS maps of the river corridor and completed a draft inventory, assessment and preliminary plan for stabilizing erosion

locations and stormwater outlets. LHCEO was also selected to receive additional 604(b) funding for Phase 2 of the greenway study.

- The Naugatuck River Watershed Association and Naugatuck Chapter of Trout Unlimited received additional funding for their Naugatuck River Steward position from the second round of the CWA Sec. 319 supported Watershed Assistance Small Grants Program. Among other things, the Naugatuck River Steward has been organizing clean-ups, developing a website, and working with American Rivers and a dam owner on a tributary to the Naugatuck to look into possible funding for dam removal.

Pomperaug River

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 that should help meet water quality standards in the Transylvania brook. Plans are underway to upgrade the Southbury Training wastewater treatment facility or eliminate 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, sponsored an on-going series of streamwalks to assess the Pomperaug mainstem and tributaries, initiated a special project with CT DEP to help bring community septic systems into compliance, and actively participated in the State Water Planning Council subcommittees on Water Allocation and Instream Flow. Working with the U.S. Geological Survey, Cornell University and other entities including DEP, PRWC has also undertaken a major project to characterize surface and groundwater flows throughout the basin and identify instream habitat requirements. The ultimate goal of this project is to develop a "Water Resources Management Plan" for the Pomperaug Basin that will ultimately assist watershed municipalities in making scientifically based land uses decisions. In support of this effort, PRWC received funding from the first round of the CWA Sec. 319 supported Watershed Assistance Small Grants Program and has been targeted to receive \$40,000 in Supplemental Environmental Project funds (as a result of CT DEP enforcement action).

During 2003:

The PRWC Land Use Committee, working with the Central Naugatuck Valley Council of Governments, was selected to participate in the NEMO "Municipal Initiative" program to develop an open space plan for the Pomperaug Watershed.

PRWC was selected to receive FY '03 604(b) funding for its "Pomperaug Water Resources Management Plan".

The Connecticut Bond Commission approved a \$330,000 grant to the Town of Woodbury to develop a "Water Resources Management Plan for the Pomperaug River Watershed". The Town of Woodbury has designated PRWC as its agent to facilitate this undertaking and CT DEP will be administering the grant. The Connecticut Water Planning Council hopes to use the work produced by this watershed project as a model for the rest of the state.

In addition to the activities of PRWC:

- A draft conceptual plan to stabilize a severely eroded site on the Pomperaug River in Woodbury was produced through a project being overseen by the Northwest Conservation District. The initial planning phase of this project is being funded by a grant to the Town of Woodbury from the Connecticut Office of Policy and Management, while the initial construction phase will be funded by a CWA Sec. 319 grant.
- The Abbey of Regina Laudis in Bethlehem completed a River Restoration grant application detailing plans for livestock bridge crossings and exclusionary fencing to protect wetland and watercourse areas impacted by its agricultural operations. The Abbey will begin implementation of the project in 2004.

Shepaug River

The Shepaug River basin drains a 155+ square mile area that encompasses portions of 12 towns. From top to bottom, the watershed stretches approximately 29 miles from Cornwall, Goshen and Litchfield in the north to Roxbury, Bridgewater and Southbury in the south. The Shepaug River flows into the Housatonic River just 2 miles upstream of the Shepaug Dam, which stretches across the Housatonic to form Lake Lillinonah. In fact, the last 3 miles of the Shepaug are impounded as a result of dam. Hence this lower reach of the Shepaug is considered part of the lake and is known as the “Shepaug Arm” of Lake Lillinonah. In the northern half of the Shepaug watershed there are two water supply reservoirs and several large lakes including Bantam Lake, the largest natural lake in Connecticut.

The Shepaug watershed is relatively rural, characterized by forest, small towns and a diminished but persisting agricultural community. The scenic landscape makes this region a popular location for secondary as well as primary homes. As a result, residential and associated commercial development are exerting a steady and growing pressure on the land and water resources of the watershed. There are several active land trusts and other conservation entities in the region, which, among other things, have protected considerable stretches of land along the Shepaug and Bantam Rivers and around Bantam Lake. In addition, in 2001 the “Shepaug Greenway” received official State designation.

Almost the entire Shepaug basin has been identified as an existing or potential public water supply area as a result of long-range State public water supply planning efforts in the 1970’s. While active public water supply lands do comprise a portion of the basin, most of the watershed is not officially proposed as a future water supply source by a water supplier in an individual or regional water supply plan. In any case, before the areas designated for potential public water supply could be used as such, further improvements in water quality would need to be made given that the State policies do not allow waste-receiving streams to be used for drinking water purposes.

Stream flow levels in the section of the Shepaug River that passes through the towns of Washington and Roxbury have been an on-going source of controversy for many years. This issue stems from an historic contract which allows the City of Waterbury to divert water out-of-basin from reservoirs in the upper watershed for public water supply. This controversy eventually resulted in a lawsuit that ultimately made it all the way to the Connecticut Supreme Court. The court decision, issued in 2002, generally favors Waterbury’s diversion rights but several complex issues have yet to be resolved.

Bantam Lake, a valued fishery and popular water-based recreational resource, has also been a long-standing focus of attention in the Shepaug basin due to problems with algal blooms and nuisance weeds. Naturally eutrophic by virtue of its physiography and evolution, Bantam Lake has experienced increased eutrophication due to human activities in the watershed contributing excess nutrients to the lake. As a result, from the mid-1970’s through the early 1990’s, a major planning and management effort was undertaken to improve lake conditions. During this time, CT DEP worked to eliminate point source discharges of treated sewage effluent from the upstream watercourses, which feed the lake. Extensive dredging was also done in selected portions of the lake. These measures greatly improved lake water quality and checked the spread of aquatic weeds. However, management of this naturally eutrophic lake is an on-going process. For example, water chestnut, an invasive aquatic plant, was recently identified as an emerging issue that could affect habitat and recreation.

In 2002, the Bantam River Watershed Association (BRWA) received funding from the CWA Sec. 319 supported Watershed Assistance Small Grants Program to form a non-profit organization, raise citizen awareness and work on water resource issues within the watershed.

In 2003, the Goshen Land Trust received funding from the CWA Sec. 319-supported Watershed Assistance Small Grants Program to establish an office. The Land Trust was selected for this award because one of its primary goals is to acquire and protect land along headwater tributaries of the Bantam River.

South Central Coastal Basin

Quinnipiac River Watershed

The Quinnipiac River is located in south central Connecticut, flowing southward from the border of New Britain and entering Long Island Sound in New Haven. The watershed is heavily urbanized and faces several problems including stormwater discharges, contaminated sediments, habitat degradation, low flows during summer months, and flooding. In response to these problems, the CT DEP, in 1995 began the “Quinnipiac River Initiative.” One of the first steps was assigning a BWM staff person as a dedicated watershed inspector. In 1996, Section 319 funds were appropriated to initiate the “Quinnipiac River Watershed NPS Program,” now entering its eighth year. In 1997, EPA joined with CT DEP and other stakeholders to form the “Quinnipiac River Watershed Partnership” (QRWP), a comprehensive, community-based watershed planning and implementation project.

The QRWP established six issue-oriented work groups to address water quality, water allocation/low flow, land use, habitat, tidal marsh, and education and outreach. The work groups each developed a work plan for their specific issues, which have been integrated into a single strategic watershed action plan.

In 2000, the South Central Connecticut Regional Water Authority (RWA) hired the QRWP Coordinator with Section 319 funds to provide administrative support to the Partnership, and facilitate cooperation and better communication between the partners, as well as hold meetings and facilitate education and outreach to the watershed towns. A second year of funding was provided in 2001. In 2003, the QRWP changed its governing structure to more resemble a not-for-profit 501(c)(3) organization, and subsequently abbreviated its name to the Quinnipiac Watershed Partnership (QWP).

The role of the Coordinator has transformed into the Executive Director of the QWP, and continues to provide administrative support to the Partnership in addition to conducting education and outreach to the watershed towns on the Stormwater Phase II General Permit for Small MS4s, as well as working with the Quinnipiac River Watershed Association (QRWA) to get a watershed compact signed by the main stem towns and receive Greenway designation from the CT Greenways Council. The QWP, QRWA, and the Quinnipiac River Linear Trail Advisory Committee are endeavoring to help establish a bike and walking trail along the main stem of the river to improve access and build the constituency for the river.

In 2003, the QWP Executive Director received funding from the RWA through a Section 319 grant to continue to coordinate the activities of the Quinnipiac Watershed Partnership with special emphasis on education and outreach to watershed municipalities and the public on BMPs for the watershed. The Executive Director is also helping to educate small business owners located along the Quinnipiac River and its tributaries, and conduct outreach for the General Permit for the Discharge of Stormwater Associated with Commercial Activity (Business Outreach Program). The Executive Director continues to work closely with and assist the Quinnipiac River Watershed Association (QRWA) in establishing a Quinnipiac River Greenway and promoting the Quinnipiac River Watershed Compact, as well as continue as a facilitator for the watershed towns to work together on addressing the requirements for the Stormwater Phase II General Permit. The Executive Director will also facilitate implementation of the Quinnipiac River Watershed Action Plan.

Partnership members include: Quinnipiac River Watershed Association (QRWA), Yale University’s School of Forestry and Environmental Studies Center for Coastal and Watershed Systems and Peabody Museum of Natural

History, University of New Haven, South Central Connecticut Regional Water Authority (RWA), Southwest Conservation District, Council of Governments of the Central Naugatuck Valley, Central Connecticut Regional Planning Agency, South Central Regional Council of Governments, Regional Growth Partnership, land trusts, Trout Unlimited, Quinnipiac Valley Audubon Society, watershed municipalities, area businesses, and local residents. Advisors include: CT DEP, EPA, USGS, and USDA Natural Resources Conservation Service.

Major accomplishments in 2003 include:

- The Quinnipiac Watershed Action Plan is finished and is in the draft stage of layout for printing.
- The QWP assisted the town of Cheshire in adopting the most stringent drinking water aquifer protection in the state.
- The QWP obtained a local grant to study riverbank erosion on the Quinnipiac River. The study was facilitated by NRCS who also made recommendations for clearing logjams that had formed in the river.
- The QWP established a tax deductible Quinnipiac Watershed Partnership Fund at the Community Foundation of Greater New Haven so donations to the Partnership would be tax deductible.
- The QWP Executive Director serves on the advisory council for the Regional Growth Partnership's (a non-profit economic development corporation) Quinnipiac River Conservation and Development Corridor program which is funded by EPA's Brownfields Program through a revolving loan fund grant, and encouraged their joining the Partnership.
- The QWP Executive Director also serves on the State of Connecticut's Water Planning Council as co-chair of the Water Allocation Committee, and is active on the Connecticut Watershed Conservation Network Steering Committee.
- The QWP Executive Director coordinated meetings with watershed municipalities on stormwater phase-2 registration and is actively engaged with municipalities in this matter.

The QWP and the QRWA jointly pursued numerous facilitated meetings to reach a merger, however, the QRWA board membership voted to disapprove the proposition. The QRWA continues to work cooperatively with the QWP.

The QRWA received a Section 319 grant to continue ongoing biological control in cooperation with UCONN Plant Science Department for the control of purple loosestrife (*sp. Lythrum salicaria L.*) using Galerucella beetles to help control the spread of this invasive, exotic plant within the Quinnipiac Watershed. Beetles have been released and monitoring conducted following the UCONN protocol and using their forms, and volunteers were trained on beetle propagation.

The QRWA also has received Section 319 grants for Streamwalks and Source to Sound Cleanups.

Connecticut River Basin

The Connecticut River basin is the largest watershed in New England, comprising approximately 16,000 square miles and 8 million residents in parts of four states and Canada. The river flows south from near the U.S.-Canada border to Long Island Sound. The Connecticut River basin accounts for approximately 28 percent of Connecticut's land area and about 70 percent of the freshwater flowing into the Sound each year. In 1998, the Connecticut River was selected as one of 14 "American Heritage Rivers" by the President of the United States. The entire river is also designated as the Silvio Conte National Fish and Wildlife Refuge, and the estuarine portion on Connecticut is designated as a "wetland of international significance" by the RAMSAR Convention on Wetlands of International Importance. Because it is the largest source of freshwater (and along with it, many pollutants) to Long Island Sound, the Connecticut River basin remains one of the state's highest priorities for NPS management.

Mattabeset River

The Mattabeset River is a major tributary of the Connecticut River that flows for 18 miles in a southeasterly direction before entering the Connecticut River just north of Middletown. The 45,000-acre watershed encompasses

parts of seven towns - New Britain, Berlin, Cromwell, Southington, Newington, Rocky Hill, and Middletown - and two counties - Hartford and Middlesex. Land use in the watershed is predominately 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.

In 1992, the Middlesex County Soil and Water Conservation (MCSWCD—*now the Connecticut River Coastal Conservation District, CRCCD*) applied for and received Section 319 funding to conduct the first comprehensive watershed NPS management program in Connecticut. The "Mattabesset River Watershed NPS Program" included: implementation of best management practices to mitigate the effects of stormwater runoff; restoration of degraded areas; education of town staff, land use commissioners, developers and contractors on the methods needed to prevent and control polluted runoff; assessing water quality conditions and stream health; and public education and outreach.

As part of the watershed initiative, MCSWCD established the Connecticut River Watch Program (CRWP), a volunteer river monitoring, protection and improvement program for the Connecticut River designed to build awareness about river resources and water quality, and to collect scientifically credible data that can be used to identify and address water quality problems. While the initial focus was on the Mattabesset and Coginchaug Rivers and the lower Connecticut River, in 1999 CRWP was expanded to include the entire Connecticut River basin in Connecticut. Since expanding, CRWP has provided technical assistance to monitoring efforts in other Connecticut River basin tributaries, including the Hockanum, Eightmile, Salmon and Farmington (Pequabuck) Rivers. In 2000, the CRWP completed a report, *The Mattabesset River: A Study of Water Quality and Stream Health*, summarizing seven years of CRWP water quality information on the Mattabesset and Coginchaug rivers.

CRWP accomplishments in the Mattabesset in 2003 include:

- Continued its ongoing study in the Mattabesset River watershed with the help of community volunteers. Activities included collecting and analyzing water samples at 18 long-term monitoring sites (14 Mattabesset and 4 Coginchaug River sites) and collecting benthic macroinvertebrate samples at two long-term and two new tributary sites in the Mattabesset River watershed. Results indicate continued exceedances of state water quality standards for *E. coli* bacteria, as well as exceedances of state water standards for turbidity, mostly all related to runoff. Benthic macroinvertebrate samples collected in the fall of 2002 were analyzed in early 2003. Results indicated that the benthic macroinvertebrate community was lacking in diversity and pollution sensitive organisms, and did not meet the narrative criterion in the state's water quality standards.
- Conducted septic survey studies of streams in Berlin and Cromwell to identify failing septic systems and other sources of bacteria in selected tributary streams as a follow-up to CRWP results.
- Completed a report on intensive water quality surveys conducted in Webster Brook in Newington and Berlin, Sawmill Brook in Middletown, and Willow Brook in Cromwell in 2002, which included a discussion of results and recommendations for follow-up actions developed in cooperation with municipal staff.

Based on water quality data collected by CT DEP and CRWP, and increased community awareness developed through the "Mattabesset River Watershed NPS Program," in July 1999 MCSWCD convened a group of Mattabesset watershed stakeholders to develop a comprehensive watershed management plan. The group later became the "Mattabesset Stakeholders Group" (MSG). MSG, coordinated by MCSWCD with Section 319 funding support, included representatives from the seven watershed municipalities, CT DEP, EPA, NRCS, USGS, UConn/CES, and the Mattabesset River Watershed Association. The *Management Plan for the Mattabesset River Watershed*, completed in September 2000, includes a "state of the watershed" report, and goals and objectives for water quality, land use, education and outreach, and funding and partnerships.

Watershed management accomplishments in the watershed during 2003 include:

- Mattabeset River Stakeholder Group (MSG) steering committee continued to meet to encourage cooperative efforts, develop implementation strategies, raise funds, and share successes. In 2003, MSG reevaluated its direction and decided to focus efforts on encouraging municipal action through local committees in towns where none existed.
- The town of Cromwell established a municipal committee charged with implementing elements of the Management Plan. With support from CRCCD staff, the Cromwell Watersheds Conservation Committee has made progress in developing an educational display, planning for road signs at stream crossings and storm drain labeling.
- The town of Rocky Hill established a municipal committee charged with implementing elements of the Management Plan with support from CRCCD staff.
- With funding from Section 319, the town of Berlin continued working on the stormwater management and erosion control project on a riverbank section near Chestnut Lane, Berlin, begun by the District in 2002.
- The MSG Berlin Pilot Projects Subcommittee continued several pilot projects initiated in 2002. They include restoration of a streamside vegetative buffer in a residential neighborhood; a school-based storm drain marking and community education project pairing high school and elementary school students; and production of educational displays for the library and other town venues.
- Connecticut River Coastal Conservation District (CRCCD) staff secured grant funds to conduct a stream restoration project in the watershed and hold a stream restoration workshop to build knowledge and capacity of municipal staff in the watershed in the techniques of stream restoration.
- CRCCD staff continued work on two pilot projects in the town of Berlin, one to prioritize street sweeping and catch basin cleanout and the other to identify and prioritize stormwater retrofits, and completed a draft Final Assessment Report for the two projects.
- CRCCD staff coordinated mailing of *The Backyard Stream Guide: A Guide for Streamside Landowners in the Mattabeset Watershed* to streamside landowners in Rocky Hill, Cromwell and Middletown, and provided copies for distribution by municipalities and other watershed stakeholders. The guide, produced by the District in 2002, promotes best management practices that protect local streams.
- The Mattabeset River Watershed Association, Inc. (MRWA) sponsored numerous events to build awareness of the river and promote community stewardship, including cleanups, a hike, a stream assessment demonstration, and a successful series of weekly paddling trips on the Mattabeset River trail in the summer, and continued volunteer stewardship activities such as maintenance of wood duck nest boxes.
- MRWA staff, supported with funds from a 319 grant by Rivers Alliance awarded in 2002, created a new website with background information, pictures and upcoming events <http://www.mrwa-ct.org/index.html>; continued to encourage installation of signs at all Mattabeset stream crossings; and initiated membership building efforts.
- CT DEP is funding a project with Project Upbeat, a community services group of Berlin High School. Twenty students are participating in organizing a multimedia presentation on watersheds and storm water, to be presented at elementary schools, community groups, etc.

Scantic River

The Scantic River is a tributary of the Connecticut River that flows in a southwesterly direction from Massachusetts before entering the Connecticut River north of Hartford. The watershed encompasses parts of five towns - Somers, Ellington, Enfield, East Windsor, and South Windsor - and two counties - Hartford and Tolland. 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 USGS National Ambient Water Quality Assessment (NAWQA) for the Connecticut River identified Broad Brook, one of the main tributary streams, as one of the most nutrient-enriched streams in the Connecticut River basin. However, the results of a four-year voluntary benthic monitoring program, completed in 1996, indicated that aquatic habitat is only slightly impaired.

The "Scantic River Watershed NPS Program," initiated in 1993, was the second watershed management effort to receive section 319 funding support. The program was administered jointly by the Tolland and Hartford County SWCDs, which is now combined as the North Central Conservation District, with technical and financial assistance from CT DEP, EPA, NRCS, and UConn/CES.

The North Central Conservation District (NCCD) continues to provide technical assistance to all of the municipalities within the watershed and provides staff to the town of Somers to perform as the town's Wetland Agent. The District reviewed a number of land use applications during the year as part of its normal duties. The District's typical review encompasses erosion control, wetlands, and stormwater management. A number of land use projects were significantly altered as a result of the District's input, including projects in Ellington and East Windsor.

CT DEP, NRCS, NCCD, and municipalities previously formed the "Scantic River Watershed Terrace Escarpment Work Group". In 2002 the group completed a DEP-funded geological mapping project to identify and define soil and surficial conditions and natural resources impacts associated with 75 erosion sites previously inventoried by NRCS. The NCCD continues this effort by administering a 319 grant to continue the mapping project on a statewide basis.

Through a section 604(b) funded project during 2003, the NCCD also took the results of the mapping project and worked with the Towns of East Windsor, Enfield, and South Windsor to develop a draft brochure for homeowners explaining the value and limitations of owning land abutting terrace escarpments. The towns will eventually distribute the brochure to homeowners. The District is developing alternative projects for the remaining 604(b) funds. One possible project under discussion with DEP involves development an overall power point presentation on the threats of eroding escarpments in Connecticut.

Hockanum River

The Hockanum River is the third major Connecticut River tributary to be targeted for NPS management. Most of the watershed lies within the following seven towns -- East Hartford, Manchester, Vernon, South Windsor, Bolton, Tolland, and Ellington -- with the river originating in Ellington and flowing westward to its confluence with the Connecticut River in East Hartford. The river is heavily impacted by urban development, with urban nonpoint runoff, stormwater, and habitat degradation the primary causes of water quality impairment. In addition to addressing these water quality problems, another goal of the watershed stakeholders is to link existing riverside parks into a contiguous urban green way and trail.

The North Central Conservation District Inc. (formerly the Tolland and Hartford County Soil and Water Conservation Districts) has been receiving section 319 funding since 1996 to administer the "Hockanum River Watershed NPS Program." The watershed project is coordinated by the NCCD, with assistance from CT DEP, NRCS, the Hockanum River Watershed Association (HRWA), and the watershed communities, and is focused on the issues of stormwater management, fish habitat restoration, and public access. Accomplishments during the past year included:

- NCCD was approved for a 604(b) funding for a "state-of-the-watershed report".
- The NCCD Business Outreach Coordinator continued the "Hockanum River Watershed Pollution Prevention Program for Businesses," to promote voluntary adoption of stormwater BMPs. In the third year of the program, outreach efforts continued in Manchester and Vernon and were initiated in the town of East Hartford. Over 50 businesses are currently active members of the program and utilize BMP's as a normal part of business.

- CRWP coordinated with the DEP, NCCD, the Vernon Hockanum River Linear Park Committee, and HRWA to conduct a macroinvertebrate assessment of the Tankerhoosen and Hockanum Rivers following the DEP Rapid Bioassessment for Volunteers (RBV) protocol. The CT DEP Volunteer Monitoring Coordinator provided training to volunteers, assisted teams with fieldwork, completed the quality assurance check on the volunteer data, and compiled a list of organisms found. CRWP compiled and summarized the RBV data into a written report.
- The NCCD worked with the Town of Vernon to complete plans for a combined River Restoration/319 implementation project in the City of Vernon along the river. The project is scheduled for 2004 and involves streambank stabilization, stormwater improvements, river access, and fish habitat improvement.

Farmington River

The Farmington River Watershed is a 607 square mile (388,00 acres) watershed, beginning in the rural Berkshire mountains in Massachusetts, flowing through the Connecticut highland region and Farmington Valley, and out to the Connecticut River in Windsor, CT. The watershed is approximately 70% forested, 15% agricultural and 15% developed. Thirty-three towns lie within the watershed and the main stem of the Farmington River (including the West Branch) flows for 81 miles. The impact of the river reaches far beyond its watershed boundaries as the river system serves drinking water to over 500,000 people outside the watershed.

CT DEP awarded a FY01 supplemental 319 grant to the Farmington River Watershed Association (FRWA) for streambank restoration and fisheries habitat improvements along the West Branch of the Farmington River, which was completed in 2002. The project was developed by the Farmington River Coordinating Committee (FRCC), a partnership of the National Park Service, CT DEP, local municipalities, and the Metropolitan District Commission (MDC), established by Congress to promote long-term protection of the Wild and Scenic designated-section of the upper Farmington River. The project costs came in well-under budget, enabling the FRWA to further evaluate potential riverine improvement projects.

Planning is currently underway for watershed management efforts in the Pequabuck River watershed. In 2002, the Central Connecticut Regional Planning Agency was awarded a Section 604(b) grant to prepare a state of the watershed report in partnership with the Pequabuck River Watershed Association and Farmington River Watershed Association. Revisions submitted in 2003 are under final review by the CT DEP.

Eightmile River Watershed

Accomplishments in the Eightmile River in 2003 include:

The CT DEP watershed coordinator was assigned as representative to the Eightmile River Wild & Scenic Study Committee (ERWSSC) formed by the National Park Service in 2002. The Study Committee is represented by the towns of Salem, East Haddam and Lyme; Salem Land Trust; East Haddam Land Trust; Lyme Land Conservation Trust; The Nature Conservancy; National Park Service; USDA Natural Resources Conservation Service; CT River Estuary Planning Agency; and CT DEP. Four subcommittees were established to help assess the watershed's outstanding resource values and to conduct public education and outreach in support of the watershed's national scenic designation: Natural Resources, Cultural/Historical, Outreach & Education, and Management. With funds appropriated by the National Park Service, the ERWSSC has contracted studies to identify potential vernal pools; GIS build-out analysis; botanical surveys for endangered, threatened, CT species of special concern or other rare flora, and significant natural communities; a biodiversity assessment; and developed an instream flow study. The Study Committee's suitability report for Wild & Scenic designation is expected in 2005.

Thames River 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 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. The southern half of the basin tends to be more urbanized and industrial where recent urban redevelopment and suburban expansion has occurred. Recent development and expansion of two Tribal Nations casino resorts has created a national tourism destination area and proximity to urban areas of Hartford, Springfield and Providence has increased development pressures.

Major accomplishments in 2003 included the following:

French River Basin

The US Geological Survey- MA/RI District, in cooperation with the MA Executive Office of Environmental Affairs' River Restore Program, began an assessment of sediment quality and quantity at potential dam-removal sites. Perryville Pond, located ½ mile from the Connecticut state line, was one of three pilot sites. Most of the organic compounds and metals detected in Perryville Pond sediments exceeded safe concentrations for benthic organisms, but only rarely for human contact. The results identified possible "hot spots" in the Pond.

The Town of Thompson:

This tri-watershed community (French/Quinebaug/Fivemile) was actively involved in water quality and related land use inventory and planning projects (www.thompsonct.org):

- Second annual roadside litter cleanup with over 450 citizens collected over 10 tons of trash, 130 tires, and mapped roadside dumping "hot spots".
- The Thompson Together Environment Committee (30 volunteers) formed as a permanent group and cleared trash and debris from the French River in September and is establishing new trails and linking existing trails. The first river trail is along the Quinebaug River on Army Corps property.

Quinebaug River Basin

The Quinebaug River Millennium Study issued two reports in 2003:

- The Quinebaug River Ecohydrology study in Massachusetts and Connecticut assessed the river's biophysical conditions, identified habitat deficits, and determined potential improvement measures.
- The second study will investigate ways for the Millennium Power Partners (MPP) generating project to respond to MA DEP's water withdrawal permit, to address CT DEP's water quality standard concerns, and to explore ways to enhance or restore river habitats.

Town of Killingly:

- The Town acquired funding and associated permits for the Quinebaug River Multiple Use River Trail Extension Project.
- The Quinebaug Rivers Stream Team was established and began a two-town Quinebaug River mapping and survey project.

Town of Brooklyn:

- The Brooklyn Conservation Commission ordinance was expanded in 2003 to review subdivision proposals and make recommendations on conservation easements and related smart growth-clean water development principles.

Eastern Connecticut Conservation District (ECCD):

- A workshop on the new Connecticut Guidelines for Erosion and Sediment Control was held for municipal land use commissioners and staff. .
- A Section 319 Intensive Rotational Grazing Project to reduce nutrient runoff was implemented at two farms.
- A Section 319 Standardized Farm Field Mapping Project was implemented to produce standardized maps of field locations, acreages, and soil test results and application data that will help reduce nutrient loading from farm fields.
- A *Phragmites* (reed grass) control project was initiated at Roseland Lake, in the Muddy Brook/Little River sub-regional watershed of Woodstock that reduced *Phragmites* by nearly 90%.

Connecticut Audubon Center in Pomfret:

- The center established the Green Valley Citizen Science Monitoring Project that conducted a streamwalk survey, a rapid bioassessment project, and a vernal pool inventory and survey project.

The Green Valley Institute (GVI):

A partnership of the Quinebaug-Shetucket Heritage Corridor, Inc. and the University of Connecticut Cooperative Extension Service, the GVI was created to document, plan for and protect the resources of The Last Green Valley. Its goals are to improve the knowledge base and to build local capacity to protect and manage natural resources as this region grows. The programs target land use decision makers: private and municipal landowners, municipal leaders and contractors, and realtors.

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

Through a Section 319 grant, UConn's Department of Plant Sciences and Cooperative Extension Service recruited IPM project cooperators in several agricultural commodity areas in 2002-03.

- 14 cooperators from 12 businesses participated in the training programs for five commodities (vegetables, greenhouse crops, nursery crops, field corn and turfgrass). As a result, pesticide applications were reduced by 42% (249.1 pounds) on 21.6 acres and nitrogen by 25% (4,900 pounds) on 140 acres in the watershed.
- The use of 10 of the 27 pesticides reported by the cooperators was reduced and the use of two products was entirely eliminated. Growers reported a net reduction of 7.2 pounds of 18 insecticides (42%), 18.61 pounds (34%) of 3 fungicides, and 228.3 pounds (42%) for 6 herbicides.
- In addition, the use of pesticides with moderate to severe leaching potential was reduced by 25% (93.4 pounds). Non-chemical alternatives and pesticides with less detrimental characteristics were substituted where possible.

Shetucket River Basin

- The CTDEP Diadromous Fish Restoration program received approval for fish passage plans at Northeast Generation Company's (NGC) hydroelectric dam in the Taftville section of Norwich and at the upstream Occum Dam. The two fish ladders are expected to be operational in early 2005.
- The Eastern Connecticut Conservation District (ECCD) coordinated a Rapid Bioassessment For Volunteers training workshop. Data collected by trainees indicated good water quality.

Natchaug River Basin

- CTDEP's Inland Fisheries Division Habitat Conservation and Enhancement Program completed the engineering and design phase of the Mount Hope River Streambank Stabilization and Habitat Restoration Project.
- The University of Connecticut – Storrs campus initiated a study to determine the effects of water withdrawals from the University's Fenton River water supply wells on the aquatic habitat of the river.

Willimantic River Basin

Willimantic River Alliance (WRA):

- WRA sponsored the “Celebrate the River” Forum for stakeholders to promote improved conditions in the river.
- WRA completed the Willimantic River GIS/GPS Mapping Project, funded through a Rivers Alliance of Connecticut Watershed Assistance Small Grant Program award. Large GIS plots were provided to each river community and stakeholders to aid local and regional plan adoption and implementation.
- WRA completed the application for the Willimantic River State Greenway, which was official designated by CTDEP in May.

Willimantic Whitewater Partnership (WWP): A new stakeholder organization with a focus on the downtown Willimantic section.

- The WWP 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.
- A website was created at: <http://www.willimanticwhitewater.org>.

Thames River Main Stem/Basinwide

Thames River Basin Partnership (TRBP):

- The TRBP Steering Committee implemented several tasks associated with the 2003-2004 Plan of Work (available online at: www.thamesriverbasinpartnership.org).
- The Thames River Floating Workshop on Navigation Issues was held in June. Forty-five participants were advised by several resource experts about navigation, security, clean vessel and clean marina certification issues.
- The DEP hosted a Thames River Water Quality Symposium in April 2002 and distributed symposium proceedings in 2003. A wide range of stakeholders interested in improving the water quality discussed the role of the DEP Water Management Bureau’s TMDL program.

U.S. Geological Survey/CT District Office (USGS) began a study of water quality impairments, focusing on the development of a Thames River Basin Plan of Work (Science Plan). The objective is furthering understanding of hydrologic and water-quality that will support management within the basin.

- Phosphorus trends were analyzed and sampling designs reviewed for trend detection. Trend-analysis results indicate that total phosphorus in the Quinebaug River has varied over time, but has decreased substantially since the 1970s and 80s.
- West Thompson Lake Phosphorus Budget Development: A hydrologic study was initiated in 2003 to determine the phosphorus budget for the lake. Data indicate that concentrations of total phosphorus increase with depth.
- A study of nutrients and primary productivity in the Quinebaug River has been completed. A scientific publication (late 2004) will be titled, *Nutrient Enrichment, Phytoplankton Algal Growth, and Estimated Rates of Stream Metabolism in the Quinebaug River System, Connecticut, 2000-2001*. Water quality sampling has substantiated a consistent and pervasive pattern of nutrient enrichment during 2000 and 2001.

The Eastern Connecticut Resource Conservation and Development Council (RC&D) began implementing their 2003-2004 Plan of Work. It focuses on agriculture, livable communities, and greenways. NPS management projects included:

- Supporting legislation for GIS open-space mapping to assist communities with smart growth initiatives;

- Partnering with the Ecological Landscaping Network to assist landowners in implementing ecological landscape practices;
- Leading the effort to identify and connect the many fragmented and local greenways;
- Fostering the development of inter-municipal greenway groups along river corridors;
- Continuing support for the Environmental Review Team that assists towns and developers site plan reviews for major land use proposals.

Thames River Watershed and Dynamic Models of Land Use Change:

The Yale Global Institute of Sustainable Forestry and the State University of New York College of Environmental Science and Forestry (SUNY-ESF), with U.S. Forest Service funding, began a project to assist community leaders, conservation organizations, and citizens understand and predict land use change dynamics, in particular fragmentation and loss of forests.

- The research will detect the patterns and trajectories of cumulative changes that cause forest fragmentation and permanent loss of forestland.
- One primary goal is to identify the best predictors of land use change in a region (geographic, economic and social data, for example).
- http://research.yale.edu/gisf/assets/images/ppf/thames_map.jpg Predictive modeling of the Quinebaug and Shetucket area to promote responsible land use and satisfy diverse needs and uses.

Project Oceanology – Citizen Water Quality Monitoring Resource Center: With CT DEP Long Island Sound Fund grant citizens’ groups were assisted with water quality monitoring programs. Information is available online at <http://www.oceanology.org/37WQMRC.html>.

- A series of free citizens workshops introduced water quality monitoring field and laboratory methods and data analysis and rapid bioassessment of streams for citizen monitoring programs.

Southeast Coastal Major Basin

EPA Federal Beach Act: The U.S. EPA - Region 1, CT Department of Public Health and CT DEP enhanced public swimming beach safety with grants that help offset the costs water testing.

- Nearly \$750,000 has been provided to Connecticut. New London’s Ocean Beach Park has been designated one of EPA’s “Flagship Beaches”, because of heavy public use and strong City and State commitment to monitoring and public notification programs. Ocean Beach had very few beach closures in 2002 and 2003.

Pawcatuck River Major Basin

Multi-Agency Pawcatuck Water Use Availability study: Rapidly changing land use from agriculture and rural lands to residential and recreational uses (including golf courses and trout fishing) and water use issues have been a concern for years. This group and study will create sustainable, collaborative solutions to water use issues in the watershed.

- A Conjunctive Use Optimization Model for the Pawcatuck River Basin is under development that examines groundwater availability and surface water flow.

Wood Pawcatuck Watershed Association (WPWA):

- A multi-year study (Shunock River System Environmental study) on Parke Pond was initiated to complement the Nature Conservancy Pawcatuck Borderlands Project to install fishway passage along the Shunock. .
- http://www.wpwa.org/Whats_New.htm. A transient monitoring program was launched using data loggers that record short-term changes in water quality. Habitat variables for native brook trout are being studied to

predict population changes. The final report will be issued in mid 2004. The WPWA website provides reports at: www.wpwa.org.

- A pilot study of macroinvertebrates in lower order streams of the Pawcatuck River was conducted during 2002 and reported in 2003.
- Recreational Programs – River Events included canoe trips, opening day of trout season and Rivers Day festivals. River clean-ups, including clearing blow-downs for navigation and litter removal, were conducted.

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 Wetland Agencies in the state. This support includes training and education, review of local regulations for conformity (with state and federal laws), site review and assistance in project evaluation, and enforcement. Because most 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.

The 2003 Municipal Inland Wetland Commissioners Training Program consisted of three segments: (1) An Introduction to Principles and Practices; (2) Legal Issues, Resource Management and Related Disciplines; and (3) Connecticut's Inland Wetlands and Watercourses: Invasive Plants. The training program was used to notify all municipal inland wetland agencies of necessary changes to their regulations due to 2002 statutory changes, as well as a review of pending court cases. Training program accomplishments during the past year include:

- Approximately 228 individuals attended at least one of the three program segments, with approximately 406 total participants; 58 of these individuals attended all three segments and therefore received a 2003 certificate of program completion.

Erosion and Sediment Control

Many municipal planning and zoning regulations and CT DEP permits associated with land development require compliance with the technical standards in the *Connecticut Guidelines on Soil Erosion and Sediment Control*.

In May 2002 the *2002 Connecticut Guidelines for Soil Erosion and Sediment Control (Guidelines)* became effective and replaced the outdated 1988 edition.

Significant changes in the 2002 edition include technical advances in erosion and sediment control techniques. Erosion and sediment control measures have been reorganized into functional groups to assist in measure selection. A number of new measures have been added and some of the old measures have been reorganized to create new measures. The format of the measures has been standardized to easily identify when the design services of a licensed professional engineer are needed. Another addition is a fold out wall chart of all the measures in their functional groups with each measures definition, purpose and applicability limitations.

Over 1000 copies of the Guidelines have been distributed free of charge to every municipality in the state and well as many state agencies, federal agencies, municipal and college libraries. The Guidelines have been made available for purchase from the DEP Store at a cost of \$90.

As part of its compliance assistance initiatives and with funds from an Supplemental Environmental Project (SEP) as well as an EPA 319 grant, IWRD held five training classes on the *Guidelines* for professionals and governmental employees from October through December 2003. This training entailed a detailed review of the *Guidelines* over the span of two-day per class.

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 convened its first meeting on October 22, 2001 and established three Committees to investigate issues identified in PA 01-177 and submitted an Issues Work Plan to the Legislature on January 28, 2002. The three committees were, the Water Resource Management Committee, Water Utility Committee, and the Technical Management Committee. The three Committees were co-chaired by staff members from the following state agencies, DPUC, DEP, and DPH. Each of the three Committees had two subcommittees co-chaired by stakeholders performing the research and analysis laid out in the WPC Issues Work Plan. The charge given to the subcommittees was to address the issues in accordance with the Issues Work Plan and draft a report offering an analysis and recommendations. The sub-committees submitted their reports to the respective Committee Co-Chairs during the first week of September 2002. The Committee Co-Chairs then put together a report that contained summaries of the subcommittee's efforts and recommendations to present to the WPC for its consideration at the September 20, 2002 meeting.

After consideration of the recommendations of the committees and sub-committees, the Water Planning Council submitted its annual report to the Legislature in January 2003, and proposed a set of initial action steps and policy changes for state agency implementation or legislative consideration. Each of the recommendations are premised upon three general and overarching findings that are necessary for full implementation of system changes as contemplated and researched by the Council and its subcommittees. These findings include the need for a revised water allocation procedure, the securing of adequate, stable resources for water allocation management, and a reframing of the current management structure governing water policy. The Water Planning Council endorsed concepts proposed in the Water Allocation Planning Model developed by the Water Allocation Subcommittee. This model identifies the critical components of a water allocation policy that integrates aspects of water resource planning and management necessary for a reasonable and well-balanced process for decision-making. The Water Planning Council established an Advisory Group in 2003 comprised of a broad array of stakeholders to assist the Water Planning Council in accomplishing action items set out in their report. The Water Planning Council submitted its second Annual Report and Work Plan for 2004 to the General Assembly on January 26, 2004. The Water Planning Council accomplished a number of significant action items in 2003 that included the submission of proposed Aquifer Protection Regulations to the Legislative Review Committee that were adopted in February 2004, the adoption of a State Drought Management Plan, and proposed legislation for the 2004 session to amend the Diversion Act and the Water Utility Coordinating Committee process. The Water Planning Council assigned 4 workgroups in 2003 to study a water conservation rebate program, stream gage monitoring network, small water systems, and land use inventory of public water supply lands. Reports were submitted by the workgroups to The Water Planning Council Report in the fall of 2003. The Water Planning Council Reports and workgroup reports can be downloaded from the following website: www.dpuc.state.ct.us/DPUCINFO.nsf/ByWaterPlanning

Flood and Erosion Control Projects

The CT DEP Flood and Erosion Control program implements studies and capital repair projects to reduce or eliminate damages caused by flooding or 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 Corp of Engineers (ACOE).

CT DEP continued to administer three projects with the ACOE, a flood study of the Farm River in North Haven for \$90,000, the elevation of 39 homes that suffer chronic shoreline flood damage, and the Salmon River Ice Jam Repair Project.

CT DEP, in cooperation with NRCS, administers the "Emergency Watershed Program."

CT DEP constructed repair work on Tarrywile and Wackawana dams in Danbury at an estimated cost of \$350,000 for the Tarrywile Dam and \$250,000 for the Wackawana Dam.

Two dams in Danbury were repaired with Flood Erosion Control Board funding in 2003. The state is working with the city of Meriden to cost share in the \$3,000,000 repair of Hanover Pond Dam in Wallingford. This should start in 2004.

IWRD is also working with the Fisheries Division to repair eroded banks on the Blackledge and Hop rivers. Construction work is underway on the Hop River while design work is still underway on the Blackledge river. The Blackledge River construction will start in 2004. The cost of both projects will exceed \$400,000.

During 2003, IWRD completed the elevation of 34 houses in Milford with the ACOE and the City of Milford. The ACOE is designing an ice control structure and an adjacent sediment control structure on the Salmon River in Haddam. The project is scheduled for construction in the fall of 2004.

Lakes

The goal of the Lakes Management Program is to protect and restore the ecological and recreational integrity of Connecticut's lakes and ponds. Program objectives are to achieve and maintain natural water quality conditions 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 diminish ecological values and limits recreational opportunities.

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. At the state level, individual lake projects can be funded by special acts of the General Assembly. Also, matching grants to towns and lake associations can be made in accordance with Section 22a-339 of the general statutes "Grants to Improve Water Quality of Lakes Used for Public Recreation." (Lakes Grant Program). At the local level, lake projects can be funded within town budgets and with private contributions.

Connecticut DEP Lakes Grant Program funds lake restoration activities such as diagnostic water quality studies, land use planning, engineering feasibility studies, development of construction bid specifications, construction of storm water infrastructure improvements, dredging, and development of public education documents. Local matches of 25% for studies and 50% for implementation projects are required under the Lakes Grant program.

Funds from the Lakes Grant Program were used to complete lake management studies in 2003 at Pattagansett Lake (East Lyme), Ball Pond (New Fairfield), Pachaug Pond (Griswold), Lake Mamasasco (Ridgefield), Beseck Lake (Middlefield), Moodus Reservoir (East Haddam), Rogers Lake (Plainfield), and Bashan Lake (East Haddam). Funds from the Lakes Grant Program helped complete stormwater infrastructure improvements at Highland Lake (Winchester) and Lake Quonnipaug Pond (Guilford). Ongoing studies under the Lakes Grant Program included Candlewood Lake (New Fairfield/Sharon/Danbury), Lake Zoar (Middletown), Lake Lillinonah (Brookfield), Pickerel Lake (Colchester), and Crystal Lake (Ellington).

Special act funds authorized by the Connecticut General Assembly were used to develop bid specs and begin dredging Birge Pond (Bristol) and develop bid specs and hire a contractor to dredge Pine Lake (Bristol). Special act funds were also used to support the ongoing dredging of Silver Lake in Meriden. In 2003, 158,000CY of material was dredged from Silver Lake, bringing the total dredged to date to approximately 450,000CY.

In addition to state funded projects, in 2003 CWA Section 319 funds were used to construct stormwater infrastructure improvements at Highland Lake (Winchester), and Lake Mamasasco (Ridgefield), and dredge Egdewood Pond (New Haven). Supplemental CWA Section 106 funds are being used to support ongoing TMDL development for Linsely Pond (North Branford), Cedar Pond (North Branford), Batterson Park Pond (Farmington), and Lake Kenosia (Danbury). Also, 604(b) funds were used to complete a land use assessment and local regulations review in the Candlewood Lake watershed (New Fairfield/ Saron/Danbury).

In order to address the most prominent threat to Connecticut lakes, in 2003 the Lakes Grant Program in cooperation with the Division of Inland Fisheries, the Environmental and Geographic Information Center, and the Pesticides Group of the Waste Bureau initiated a pilot program to control infestations of non-native aquatic plants that are new to Connecticut. This program was funded with \$10,000 from the Supplemental Environmental Project (SEP) program and allows DEP to respond immediately to new infestations of non-native aquatic plants by preselecting a contractor who is on call to provide services.

In addition to the federal and state-funded projects, CT DEP continues to be actively involved with providing technical assistance to communities. In 2003 the Bureau of Water Management advised communities and individual water body owners requesting technical assistance on lake restoration studies and projects. Additionally, the lakes management program reviewed permit applications for herbicide applications and lake restoration activities regulated by DEP.

Groundwater

The CT DEP develops and implements groundwater protection strategies for all groundwater resources, including public water supply wells. This includes water quality standards and classifications, water supply planning, discharge permitting, water diversion permitting, site remediation, land use regulation in certain areas, 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 well fields in stratified drift aquifers. The APA Program requires mapping of the "areas of contribution" and "recharge areas" to major well fields and will soon regulate land use in those areas to minimize the potential for contamination of the water supply.

Mapping of the APAs is being done in two phases. A preliminary, or Level B, mapping has been completed for all the state's major well fields (~130) and provides a rough estimate of the contributing areas. Agricultural inventories within the Level B areas were conducted by the Connecticut soil and water conservation districts. Level A mapping is a refinement of Level B and will define the APA, the area subject to land use regulation. Level A mapping is a two-step process: a "Plan for Data Collection and Analysis" must be submitted to CT DEP and approved before the field work, modeling, and final Level A mapping is conducted.

To date, plans for data collection and analysis have been submitted for 72 well fields, and 67 have been approved. Final Level A mapping has been submitted for 40 well fields and 20 have been approved. GIS mapping of the

APAs has been partially supported with FY93 and FY95-98 section 319 funds, and wellhead set-aside funds from the Federal State Drinking Water Revolving Loan Funds.

The APA Land Use Regulations were adopted after 10 years of effort involving participation and input from many interested parties including municipalities, businesses, water companies, and the public. The effective date of the regulations is February 2, 2004. CT DEP is now working on preparing guidance documents and forms necessary for implementation of the APA program, including the Model Municipal Ordinance, and guidance on materials management plans, stormwater management plans, site plan review, planning and zoning coordination, water utility assistance, and other local guidance.

Assessments of the susceptibility of every public water supply in the state to pollution have been completed by the CT Department of Public Health, with assistance from CT DEP. The assessments consist of delineation of an assessment area around the source of supply (both surface water and ground water sources), an inventory of significant potential sources of contamination within the delineated area, and an assessment of the susceptibility of the water supply to contamination. The SWAPs build on and expand the APA program, as well as Connecticut's other existing ground and surface water protection programs.

In 2003, CT DEP:

- Finalized the state Aquifer Protection Area Land Use Regulations (Effective date is 2/2/04.)
- Provided extensive outreach on the APA Land Use Regulations, including 10 workshop presentations to stakeholders.
- Re-initiated work on numerous guidance documents and forms for implementation of APA Program.
- Provided technical assistance to 5 towns in adopting interim AP measures.
- Continued to collect and review data, including point and non-point 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.
- Continued participation in the Bedrock Well Recharge Area study with USGS to refine bedrock wellhead area delineations – final drafts have been reviewed and final publication anticipated shortly.
- DPH staff completed assessments for all of the public water supplies in the state. DEP assisted with review and response to comments on the assessments from utilities.
- Participated in CT DPH conference in April 2003 to distribute SWAP assessments to municipalities.
- Participated in the state wellhead protection workshop for small water companies sponsored by Atlantic States Rural Water and Wastewater Association addressing local protection strategies and DEP source water protection related programs.

Long Island Sound

Long Island Sound is one of Connecticut's most important natural and economic resources, serving as habitat to numerous fish and wildlife populations and contributing an estimated \$5.5 billion annually to the regional economy. Two of the most important industries are oyster harvesting and lobstering. Long Island Sound produces some of the finest shellfish in the country. Connecticut's oyster farming industry once led the nation in terms of value of oysters produced and ranked among the top five states in production volume. However, in recent years, parasites have decimated the oyster industry. Still, nearly 68,000 acres of shellfish grounds are cultivated in Connecticut's coastal waters by the aquaculture industry with additional acres cultivated in New York. Long Island Sound, once the third largest lobster fishery in the country, has dropped to fifth due to mortality events in the lobster population that may be linked to unusually warm water temperatures. CT DEP Marine Fisheries estimated about 1 million lobsters died in 1999. The combined dockside value of lobsters in Connecticut and New York dropped from \$35 million in 1998 to about \$13 million in 2002.

CT DEP's Long Island Sound management efforts revolve around two major programs: the Long Island Sound Study (LISS) is administered by BWM PSD (in cooperation with OLISP), and the Coastal Management Program 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 bacteria and pathogens, toxic contamination, floatable debris, and loss of fish and wildlife habitat. 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 states submitted the final TMDL in January 2001, and EPA approved it on April 6, 2001. 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 statewide general permit with nitrogen limits for 79 sewage treatment plants were initiated. The first trade, with oversight by CT DEP and a nitrogen credit advisory board, was completed in 2003 based on 2002 monitoring data and far exceeded expectations for nitrogen removal. It is anticipated that the trading program and general permit will enable the state to meet the nitrogen load reduction required by the TMDL more cost-effectively.
- CT DEP received an EPA grant to evaluate the feasibility of including NPS nitrogen loads in the Nitrogen Credit Exchange. The analysis is scheduled for completion in the fall of 2004.
- Connecticut received final approval for its conditional Coastal NPS Pollution Control Program (Section 6217 of CZARA, the Coastal Zone Act Reauthorization Amendments) in 2003.

The Long Island Sound TMDL also calls for a 25 percent reduction in point source nitrogen loads and 10 percent reduction in NPS nitrogen loads from tributary sources north of Connecticut, but it does not establish specific wasteload and load allocations (WLA/LA) due to a lack of data. To address this issue, CT DEP is participating in a NEIWPC and EPA work group to develop WLA and LA for nitrogen sources in Massachusetts, New Hampshire, and Vermont. The work group has initiated supplemental monitoring efforts in the Connecticut River basin conducted by the USGS. A USGS model (SPARROW) has been calibrated to help predict the relative effectiveness of different nitrogen management scenarios and will be refined using the new monitoring data. Although the effort was aimed towards meeting a requirement of the TMDL to establish nitrogen reduction plans for tributary states by August 2003, technical evaluations leading to a defensible nitrogen reduction plan are not scheduled for completion until 2006.

The LISS has begun evaluating water quality tracking programs and models to help quantify loads of nitrogen, phosphorus and sediments to receiving waters throughout the state. While such a program or model will help track the TMDL commitment of reducing NPS nitrogen loads by 10%, it will also assist the Section 319 program with quantifying pollutant reductions for GRTS reporting. LISS and CT hope to adopt a suitable system in the 2004-2005 time frame. In 2004, the LISS awarded Manhattan College in New York City a grant to identify and evaluate potential NPS tracking systems that CT and NY could use to better track progress with meeting the NPS load allocation for nitrogen. The LISS has also rejuvenated a NPS Work Group that will lend expertise to this project and to NPS management activities around the Sound.

The LISS and CTDEP have also been investing time and funding in habitat restoration activities that are relevant to NPS pollution abatement. In 2003, the LISS approved a draft "Stewardship" strategy 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.

Coastal Zone Management

Pursuant to section 6217 of the Coastal Zone Act Reauthorization Amendments (CZARA) of 1990, the CT DEP has developed and administered the state's Coastal Nonpoint Pollution Control Program (CNPCP) under conditional approval from EPA and NOAA since 1998. EPA/NOAA granted the conditional approval to give Connecticut time to meet all the required "management measures" and demonstrate that it has the legal authority to enforce their implementation. Progress during the last year includes:

Connecticut received full approval of the Coastal NPS Pollution Control Program in November 2003.

A final report was submitted by the CT DEP's contractor to determine if the state's minimum separation distance between septic systems and groundwater is adequate to protect water quality in order to meet the "Operating Onsite Wastewater Management" management measure condition. While the report indicates that Connecticut's existing separating distance appears adequate to protect water resources from pollution, the report contains several items that the DEP and Department of Public Health will consider in an effort to strengthen the current Public Health Code and Technical Standards.

OLISP continues to provide technical assistance to coastal municipalities to help them meet the nonpoint source-related goals and objectives of the CCMP, TMDL, section 6217, and Connecticut Coastal Management Act, and in complying with PA 91-170 (which requires that zoning regulations in coastal municipalities consider impacts on Long Island Sound water quality and habitat). In 2002, OLISP continued with its comprehensive outreach program utilizing the *Connecticut Coastal Management Manual* to train municipal planning and zoning officials and their staffs.

OLISP conducted a regional workshop targeting non-coastal municipalities located in the section 6217 coastal nonpoint source pollution management area, specifically in the mid-section of the Connecticut River watershed. The workshop and guidance materials were based on materials pertaining to stormwater management, watershed planning, and vegetated buffers that were developed for the coastal management workshops. Additional regional and individual workshops for non-coastal municipalities will also be conducted on an on-going basis.

OLISP continues to coordinate with the University of Connecticut's Nonpoint Education for Municipal Officials (NEMO) program. OLISP, NEMO, CT Sea Grant, and the Nature Conservancy developed a workshop, *Focus on the Coast*, to help municipal land use officials in coastal towns protect priority coastal resources including migratory fish habitat, tidal wetlands, and submerged aquatic vegetation.

New fact sheets and an associated *Focus on the Coast* website have been developed for coastal resource managers. Funding was obtained from the NOAA Coastal Services Center to support this initiative and make it available to coastal resource managers nationally. Please visit http://nemo.uconn.edu/workshops_initiatives/focus_on_coast.htm for more details.

OLISP anticipates increased coordination with NEMO to augment outreach efforts for land use officials and staff in non-coastal municipalities within the section 6217 management area in addition to continuing outreach efforts in coastal towns and conducting *Focus on the Coast* workshops.

OLISP provided a grant to the Town of Westbrook to develop a comprehensive Onsite Wastewater Management Program (OWMP). The OWMP will essentially serve as the onsite wastewater management component of the town's integrated wastewater management program that may include onsite, community, and offsite wastewater management approaches. The completed OWMP will ultimately enable the Town of Westbrook to sustain an onsite wastewater management approach for the properties in the project planning area in an effort to protect surface and ground water and human health. An additional, equally important purpose of the project is to document the planning process undertaken in the development of an onsite wastewater management plan, which may serve as a model for other municipalities in developing OWMP's. The plan will include criteria for property inspections;

identification of management program components (e.g., regularly scheduled system inspections and tank pump-outs, phase-out of cesspools, phase-in of system upgrades, etc.); identification of methods for inspection data collection and analysis, including the use of GIS; development of an outreach and education program regarding the importance and methods of proper system use and maintenance; and identification.

Clean Marina Program

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 350 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. Connecticut's Clean Marina Program is based on similar programs developed by some of the Chesapeake Bay states and is intended to help meet the marina storm water management condition necessary to receive full approval of Connecticut's CNPCP. In 2003:

- OLISP staff planned six informational meetings for January and February 2003 throughout the state to introduce the Clean Marina Program to the state's marina industry, and to distribute Program materials. Although one of the sessions was cancelled due to inclement weather, over 50 people attended these meetings.
- OLISP awarded 5 Clean Marina Cost-Share Assistance Grants, through a FY02 319 Nonpoint Source Grant, for the purchase and installation of pollution prevention equipment at marinas pursuing Clean Marina certification. Through the grant program, the following pollution prevention equipment was purchased: 2 dustless vacuum sanders, 2 used oil furnaces, 1 high-volume, low-pressure spray gun for paint spraying, and one pressure wash water treatment system. Grant money continues to be available on a first-come, first-served basis for eligible projects.
- Starting in May, staff hired by the DEP's Boating Division distributed clean boating information to boaters at boat launch ramps and at marinas throughout Connecticut. The seasonal boating education assistants distributed "Clean Boater Packets" which include an oil absorbent spill pad to clean up small drips and spills of petroleum products, a Boaters' Waste Wheel which provides information about the proper disposal of certain wastes that may be generated when boating, a Clean Boater Tip card which provides basic information about clean boating practices, a pumpout map and other related materials. Boaters were also asked to take a pledge to be a Clean Boater. Approximately 900 boaters took a Clean Boater Pledge in the 2003 boating season.
- In July, DEP launched the Program website. The web address is: <http://www.dep.state.ct.us/olisp/cleanmarina/index.htm>
- In June and July, respectively, the first marina and first boatyard were awarded CT Clean Marina certification.
- By the end of 2003, 21 marinas had pledged to become certified Clean Marinas within one year.

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. In FY03, OLISP received \$874,000 from the U.S. Fish and Wildlife Service through the Clean Vessel Act (CVA) grant program to build, operate, and maintain boat sewage pumpout and dump station facilities.

By the end of 2003, there were 90 total pumpout facilities, including eleven (11) pumpout boats, and 16 dump stations (including one floating rest room) available to boaters in Connecticut waters.

A decision on FY2004 CVA funding for Connecticut is anticipated in April 2004. CT DEP has proposed to construct two additional stationary pumpout stations, one new pumpout boat and provide operation and maintenance

funding for existing facilities.

In August 2003 EPA approved the designation of the Pawcatuck River/Little Narragansett Bay complex and Stonington Harbor in eastern Connecticut as a No Discharge Zone (NDZ).

In December 2003 DEP OLISP submitted an application for EPA approval of a NDZ for all Connecticut coastal waters in Fishers Island Sound from the limits of the approved NDZ in Stonington to Eastern Point, Groton, including Mystic Harbor, West Cove, Noank, Mumford Cove, the Poquonnock River and Pine Island Bay. EPA action on this application is anticipated prior to the 2004 boating season.

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 1500 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 acres of coastal habitats such as tidal wetlands and coastal grasslands by 2008. In 2003:

- Restoration occurred at Morris Creek, East Haven 0.37 acres; Ocean Beach Park, New London 0.5 acres and Essex Great Meadows 30 acres. All three project areas totaling 30.87 acres.
- In addition, WHAMM program did 270 acres of *Phragmites* control (Great & Upper Islands, Lower CT River 78 acres; Lord Cove 45 acres; & Lieutenant River 25 acres). These acreages do not count toward our restoration goal of 2000 acres.
- The WHAMM Program received permission from property owners at Little River Marsh in New Haven and North Haven to initiate a wetland habitat restoration project on their property. An area of 150 acres of *Phragmites* was mulched and herbicide was applied to the site. The site was monitored and it was estimated that 80 percent control was achieved in 2002. The WHAMM program is now investigating Open Marsh Water Management (OMWM).

OMWM is a technique we use 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 we use 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, most likely the combined result of "wasting" disease and a major climatic phenomenon such as El Nino or La Nina. By the 1950s, eelgrass had returned to eastern Long Island Sound, but not to central and western coastal areas. CT DEP suspects that the lack of eelgrass recovery in this area was due to a combination of the higher tide range in the western Sound and nitrogen enrichment from point and nonpoint sources. 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. With a grant from the EPA LISS, the US Fish & Wildlife Service acquired low altitude aerial photography in June of 2002, photointerpreted eelgrass beds and conducted a field verification in the fall of 2002. These data were used to develop a 2002 GIS coverage. In 2002, the acreage of eelgrass had increased to over 1380 acres. 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. DEP speculates that the 1993/94 survey was at a time when eelgrass beds experienced a natural decline perhaps in response to climatic conditions, many such declines are described in the scientific literature. Coves and embayments that are suspected to be enriched with nitrogen from point and nonpoint sources, most notably Niantic River, Mystic Harbor, and Stonington Harbor continue to decline. 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.

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). While the focus is on lake acidification, attention is also being directed towards atmospheric nitrogen loads and their effect on estuaries as a logical extension of the problem. The ARAP work groups are identifying monitoring protocols and a network to track effects of atmospheric deposition that would lead to management recommendations for additional control of acid deposition. One ARAP work group has mapped forest sensitivity to acid deposition in Vermont, Massachusetts and New Foundland, a project that will be expanded into Connecticut in the next year.

The University of Connecticut's Environmental Research Institute's (ERI) nitrogen and mercury deposition monitoring program at eight locations throughout the state has been discontinued. Data collected through June 30, 2002 were being used to monitor the role of atmospheric nitrogen deposition on nitrogen loading to Long Island Sound and is being incorporated into a nitrogen deposition and transport model at UConn. ERI also conducted mercury monitoring from 1995-99 to calibrate a mercury transport model.

New 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. Though required in the LIS TMDL for nitrogen, EPA has made no progress towards developing a recommended atmospheric deposition control plan for nitrogen by 2003. Recent federal activity has been towards relaxing existing air pollutant emission standards and Clean Air Act requirements. Without a strong federal EPA hand in controlling nitrogen oxides emissions, prospects for meeting LIS TMDL goals and improving estuarine health nationally are not good. Connecticut and other northeastern states have joined in a lawsuit to try to reduce impacts that would result from relaxed emission standards in the region. In 2003 the Acid Rain Steering Committee (ARSC):

- completed pilot studies on the effects of acid deposition on forests in MA, NH and VT. These studies are very relevant to nitrogen transport to aquatic systems in our region. Funds are being sought to complete the analyses in the remaining New England states.
- endorsed a white paper on nitrogen deposition effects on estuaries published by the Hubbard Brook Research Foundation.
- begun to review five years of progress under the Acid Rain Action Plan, and will develop a revised plan in the next year.

Fish Habitat Restoration

The CT DEP Inland Fisheries Division has an active fish habitat restoration program, involving removal of barriers to migratory fish passage, construction of fish passage facilities, and physical restoration of in-stream and riparian habitat features. Barriers to fish migration have also been removed or modified for resident stream fish migration and riverine habitat restoration. CT DEP coordinates its restoration activities with many other federal and state agencies and non-government organizations, including the U.S. Fish and Wildlife Service, NRCS, EPA, SWCDs, Trout Unlimited, various watershed groups, and the Connecticut River Watershed Council. Program partners provide funding, technical assistance, and public outreach and education and coordination services. 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.

Restoring habitat for anadromous fish, which spend most of their lives in salt water and migrate up rivers to spawn in fresh water, is a high priority in Connecticut. Anadromous fish native to Connecticut include Atlantic salmon, blueback herring, alewife, and American shad. The Inland Fisheries Division has an anadromous fish passage restoration strategy, which establishes restoration goals and priorities for the state. The LISS Habitat Restoration Strategy, described above, set a goal of restoring 100 miles of riverine migratory corridors for anadromous fish passage in Connecticut and New York by 2008. Restoring migratory corridors also is important for catadromous fish, which spawn in salt water but spend most of their lives in fresh water (like the American eel), and other species which benefit from longer stream reaches, cooler temperatures, and more natural stream flows.

Stormwater Management

Stormwater permitting and compliance is conducted by the CT DEP Permitting and Enforcement Division (PED) under the authority of the CWA National Pollutant Discharge Elimination System (NPDES) storm water provisions and supporting state statutes and regulations. As part of the Water Bureau's reorientation to watersheds as management units, PED recently reorganized its NPDES permits and enforcement staff into three regional units: (1) Housatonic, Southwest Coastal, and Hudson major basins; (2) Thames, Southeast Coastal, Pawcatuck, and South Central Coastal major basins; and (3) Connecticut River Basin. At least one environmental inspector is assigned to conduct compliance inspections in each of these three regions, while a central, statewide enforcement program handles more significant violations. One of the four stormwater program staff is funded under Section 319 through the PPG.

CT DEP regulates stormwater discharges from many sources, including construction sites, industrial activities, large commercial sites and municipally owned facilities. During 2003, the CT DEP stormwater program staff continued to conduct compliance inspections in priority watersheds and issued the modified industrial stormwater general permit in preparation to meet the requirements of the NPDES Stormwater Phase II Rule. The new municipal "MS4" stormwater permit was completed and issued on January 9, 2004. Accomplishments include:

- Approximately 2,600 facilities are registered under one or more stormwater discharge general permits, most of which have annual monitoring requirements. There are 1,500 industrial operations, 917 construction sites, and 200+ commercial sites. CT DEP issued 76 Notices of Violations to Stormwater General Permit permittees for failure to submit data.
- In 2003, DEP developed a "no-exposure" certification for the industrial permit and will take the construction threshold down to 1 acre for the construction permit. But the biggest part of Phase II is the MS4 (municipal separate storm sewer systems) general permit covering municipal storm sewers. DEP initiated public notice and held a public hearing. The permit was issued January 9, 2004. There are 130 towns in the state covered by this permit. Some may qualify for an exemption. The covered towns will have to develop a storm water management plan that addresses "six minimum measures". These minimum measures are: public education and outreach, public participation, illicit discharge detection and

elimination, construction storm water management, post-construction stormwater management, and pollution prevention/good housekeeping. DEP conducted extensive outreach and workshops in 2003 and have worked a great deal with a consultant and towns to develop the MS4 permit. DEP will also issue separate MS4 permits for DOT and "non-traditional" government-operated MS4s.

To support implementation of the Phase II stormwater permitting program and improve its technical assistance capabilities, the CT DEP initiated the development of a new BMP technical guidance manual utilizing FY99 319 funds. In 1999, an interdepartmental work group led by IWRD staff was formed to develop the manual, which will be used to conduct outreach and education to municipal land use officials and public works personnel, as well as private developers and their design engineers.

In 2003, DEP continued to work with its consultant on the Stormwater Quality Manual. A very impressive first draft was completed and the final draft is expected by mid 2003. Publication of the manual is expected by the end of 2004.

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) provides coordination between CT DEP and the agricultural community in Connecticut, and 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, 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.

Concentrated animal feeding operations (CAFOs), an important source of agricultural pollution, are now defined by EPA as point sources and operations that exceed a certain size threshold are subject to the National Pollutant Discharge Elimination System (NPDES) program. 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; after further investigation, the DEP Commissioner may determine 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. When manure or organic by-products are used as sources of nutrients, the current soil phosphorous (P) test level collected on a field-by-field basis will be used to develop recommendations for manure applications in accordance with the following guidelines: Phosphorous-based manure application may be recommended on fields where the soil P test is optimum. Nitrogen-based manure application may be recommended on fields where the soil P test level is below optimum. No manure application is recommended on fields where the soil P test level is above optimum.

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. To date, no farms have had CNMPs developed that meet the guidance criteria. 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.

Overall agricultural NPS program accomplishments during 2004 include:

- The technical report on the Impact of General Permit on Concentrated Animal Feeding Operations was completed.
- The technical report was presented to the CAFO advisory committee and farm community representatives to review and provide feedback. As a result the Impact of New General Permit on Connecticut Farmers brochure was developed as an educational tool. The report and the brochure were distributed to federal and state partners and farmers.
- The CT DEP supported the Connecticut Department of Agriculture's proposed legislation to increase cost sharing up to 90% as part of their Environmental Assistance Program. CT DEP will delay public notice of the CAFO general permit while it investigates potential funding sources to assist farmers in complying with its requirements. If successful the public notice could be issued in 2004. The CT DEP is also developing a request for proposals for alternatives/utilization of manure to address the surplus of nutrients identified in the technical report.
- NRCS and UConn/CES assessed about 105 farms from FY96 through FY02 and wrote or revised about 50 agricultural waste management system plans (AWMPs) that CT DEP has approved.
- Through FY02, nutrient management plans are being implemented on 27 farms and about 11,325 acres (although the acreage changes each crop year as farmers add and or lose fields, which is close to the program projections made in December 1998 in the 319 proposal for nutrient management -- 25 farms and 12,500 acres).
- NRCS and UConn/CES completed the first year of a project to develop a user-friendly computerized record-keeping system to help farmers track nutrient use on their fields. UConn/CES initiated 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 utilized its section 319 funds to provide technical assistance to local land-use decision makers, develop numerous guidance documents, and 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 BWM 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 FY99-02 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 nine 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.

Old Saybrook was one of the first municipalities to work with the NEMO Project, beginning in 1991, but only began to make serious progress during the last four years with encouragement by its full-time planner and public works director and the creation of a NEMO Task Force (which includes representatives from all the land use boards and commission, the board of selectmen, and the local land trust,). For example:

- The conservation commission has completed a resource inventory and open space inventory for the town, which they used to develop their Open Space Plan.
- The NEMO Task Force is working with the town engineer to revise the town's road ordinance to allow alternative stormwater management practices that will help the town comply with the new NPDES Phase II Stormwater Rule's permit requirements.
- The board of selectman adopted a policy statement that incorporates NPS management strategies promoted by NEMO in addition to alternative design standards for site development.
- The planning commission updated the town's plan of conservation and development (POCD) to include goals and objectives on reducing NPS pollution in its Water Resources section.
- The Planning Commission approved a "green subdivision" incorporating engineered grass swales, narrow road widths, and clustered development to reduce NPS pollution. The intent of the town is to make this subdivision a model for future development.
- The Zoning Commission has also updated its regulations to incorporate impervious surface limits in their business districts in order to minimize impacts from NPS to their coastal resources and Long Island Sound.
- The Town Planner is partnering with the NEMO Team on a "smart growth" project that evaluates the town's business districts with respect to smart growth principles.

Waterford, located on Long Island Sound in southeastern Connecticut, was the first municipality to work with NEMO. In 1994, the town began requiring "state-of-the-art" BMPs for commercial /industrial development, which are monitored by the town for performance. The town has since incorporated concepts promoted by NEMO in its land use regulations and Conservation and Development Plan. In 1995, a site in Waterford was selected for the section 319 National Monitoring Program, and in 2000, the town completed a watershed management plan for the Jordan Cove watershed.

East Haddam was accepted as a municipal initiative town in 2002-2003. They completed an intensive education series in early 2003 and began a comprehensive revision of their town planning documents and regulations. These include:

- Formed an inter-commission committee to review and suggest changes to POCD
- Revised wetland regulations to increase upland review zone from 75' to 100'
- Revised wetland regulations to include review zones around identified vernal pools
- Revised subdivision regulations to include a "net buildable area" standard of lot development
- Revised zoning and subdivision regulation to encourage and in some cases require the use of conservation subdivision design.
- Revised road standards to reduce road widths, limit curbs, and encourage stormwater quality controls
- Require stormwater management plan for new developments referencing and incorporating NEMO principles, the new CT Stormwater Quality Manual and the most recent Sediment and Erosion Control Guidelines.

In January 2001, the town of Woodstock adopted a new Open Space Plan, utilizing lessons learned from a NEMO open space workshop in 1998. Under the new plan, the planning and zoning commission requires the conservation commission to review subdivision plans that have open space set-asides to ensure compliance with the plan. NEMO is currently working with the conservation commission to develop a methodology for their review. Developed an NPS "action plan" that defines roles, specific tasks, and coordinating among municipal boards, commissions, and departments. The town also installed a "rain garden" demonstration project (see details below).

Under the guidance of NEMO, the Naugatuck Valley Regional Planning Agency is updating its regional Plan of Conservation and Development (POCD) to incorporate NPS management strategies. The process involves updating the individual municipal POCDs first, and then the regional plan. The first town to complete its update is Beacon Falls, which has incorporated NPS management practice guidelines promoted by NEMO.

Watertown has required grass swales and narrow, curb-less roads in two new subdivisions (as an alternative to curbs and gutters). The town is in the process of updating its POCD to incorporate NPS management measures as promoted by NEMO educational programs.

The NEMO Team worked with the Candlewood Lake Authority to insure NPS management strategies were included in the watershed management plan for the lake. The Candlewood Lake Authority Project has successfully promoted the creation of a *Special Watershed Protection District* in Brookfield and New Milford, each with additional standards for the % impervious in a lot. Developers or homeowners proposing to exceed the limit must meet additional stringent on-site stormwater management standards.

The town of Greenwich adopted "Earth Moving and Excavation Standards" which were reviewed by NEMO for NPS management issues.

The Central Naugatuck Valley Council of Governments has incorporated an impervious surface build out and associated NPS management strategies in their regional plan update, and with the NEMO team has presented the finding of the build-out to a majority of the towns in the COG region.

The NEMO Team provided a workshop on conducting a Community Resource Inventory for the town of Canterbury in June of 2002. As a result, the town is participating in a three-town natural resource inventory initiative lead by the Quinebaug and Shetucket National Heritage Corridor, Inc.

As a result of a regional educational program sponsored by the CT DEP and conducted by the NEMO Team back in 1996, the Litchfield Hills Council of Elected Officials in collaboration with the Northwestern Council of Governments went on to hire a consultant and complete (December of 2002) a parking utilization study for its member towns. The study proved that parking is excessive and model regulations have been prepared that incorporate parking limits and alternative design that favors porous pavement and vegetative management practices for stormwater. The study and model regulations will be made available to all CT Municipalities and nationally via NEMO's website. The project was highlighted at the American Planning Associations-national conference in Denver, April 2003, and at the regional APA meeting in Hartford in the fall of 2003.

The town of Suffield's Town Planner sent a full set of land use regulations to the NEMO Team for review with respect to water resource protection. As a result, zoning regulations are currently being updated to incorporate NPS management strategies including a requirement for stormwater management planning. Part of this update includes a definition of imperviousness and a new lot coverage definition.

In addition to the direct technical assistance to town officials, the NEMO partnership between CTDEP and UConn involves applied research to create better planning tools to reduce NPS pollution. During 2003 the NEMO team completed the study *Refinement of Population-Calibrated Land-Cover-Specific Impervious Surface Coefficients for Connecticut*. This study used highly accurate local data to calibrate a model that relates population density, land cover and imperviousness. Land cover coefficients were generated that result in highly accurate impervious surface estimates for Connecticut towns.

Also, NEMO helped to create a major new web site on the *Connecticut's Changing Landscape* project, a major new research effort of NEMO parent organization, the UConn Center for Land use Education and Research (CLEAR). The project website makes available new updated land cover data for 2002, and, for the first time, land cover change data for the period 1985-2002. NEMO will be incorporating this information into many of its educational offerings in 2004 and beyond.

Visit NEMO's website at: <http://nemo.uconn.edu/> for more details on NEMO educational program and the CTDEP supported Municipal Initiative, as well as for information on how this CT DEP-supported project has launched a national network of NEMO projects all working to protect water resources across the country.

Using reprogrammed FY00 319 funding, UConn is monitoring a rain garden at the Extension Center in Haddam. Monitoring consists of measuring volume and sampling inlet water, percolated water, and overflow water. Weekly composite samples are being analyzed for nitrate-nitrogen, ammonia-nitrogen, total Kjeldahl nitrogen, total phosphorus, and chloride. Monthly composite samples are analyzed for copper, lead, and zinc. Grab samples are taken when flow is occurring at the site and analyzed for fecal coliform bacteria. A quality assurance project plan was approved by CT DEP and EPA. Water quality monitoring began in November 2002 and is ongoing. Nutrient and flow data has been collected for a total of 46 weeks. Preliminary results indicate that the rain gardens are not treating nitrate-N, total Kjeldahl-N, or organic-N. Ammonia-N and total-N concentrations are significantly lower in the outflow than in the inflow ($p=0.001$ and 0.05 , respectively). The rain gardens only overflowed three times during this monitoring period, indicating that the vast majority of runoff was treated by the gardens. Monitoring will continue into 2004 using section 319 funds gardens after making a modification to create a zone of saturation in one garden. The purpose of the modification is to encourage denitrification thereby reducing nitrate-N concentrations.

VI. National Monitoring Program

Jordan Cove Urban Watershed Monitoring Project

The Jordan Cove Urban Watershed Monitoring Project is one of 24 projects in the nationwide section 319 National Monitoring Program (NMP). The purpose of the NMP is to scientifically evaluate the effectiveness of watershed technologies designed to control nonpoint source pollution, and improve our understanding of nonpoint source pollution. The Jordan Cove project, located in southeastern Connecticut in the town of Waterford, is a ten-year study to document the difference in stormwater quality and quantity between traditional subdivision development and a subdivision with best management practices incorporated into the design and construction. The project is using a "paired-watershed" approach to demonstrate the water quality benefits of incorporating best management practices (BMPs) into subdivision development. The University of Connecticut (UConn) initiated baseline monitoring of the two subdivision sites, and a third "control" subdivision, in November 1995 and construction phase monitoring began in June 1997 when construction commenced in the "traditional" neighborhood. Construction phase monitoring of the "BMP" neighborhood began in March 1999 and was completed in September 2002. Construction monitoring is now focused on the traditional neighborhood, which is scheduled for completion by May 2003. Monitoring of the control subdivision will continue throughout the entire project period. An important component of this project is outreach and education to municipal commissions, developers, and the public. Lessons learned from this project are already being shared with these target audiences through a variety of means, including presentations at workshops and conferences; articles in journals, newsletters, and newspapers; and web sites. For additional information see: www.canr.uconn.edu/jordancove/. The Jordan Cove project is also used as a case study in the UConn/CES NEMO Project, and has its own web page in the NEMO web site: <http://www.nemo.uconn.edu>.

Project accomplishments in 2003 include:

- The private developer, Inside/Out LLC, completed construction of the final three homes in the traditional neighborhood.
- UConn continues educational efforts with the BMP neighborhood residents on "housekeeping" BMPs.
- Monitoring during the construction of the "traditional" neighborhood, where houses were built using generally accepted practices, has determined that:
 - erosion and sediment controls reduced sediment and associated pollutants in construction site runoff, but did not reduce the volume of runoff, and increased runoff volumes increase the mass export of pollutants.

- Weekly flow and peak discharge increased by almost 100 percent, with increased concentrations and loading of nitrate-nitrogen (NO₃-N).
 - Sediment export increased 90 percent and total phosphorus increased 89 percent, and loading of copper, lead and zinc also increased.
- Results from the construction period at the traditional site suggest that increased runoff, rather than erosion, was the cause of increased pollutant export from the site.
- Monitoring during the post-construction period in the BMP neighborhood indicated that the volume of stormwater runoff decreased. However, the concentrations of total suspended solids, total phosphorus, and total k Kjeldahl nitrogen remain greater than during calibration. Exports have declined during post-construction, except for total phosphorus, which did not change. Metals export declined following construction.
- The driveway study was completed. Stormwater runoff and mass export of solids, nutrients, and metals was greater from the asphalt than the pavers than the crushed stone driveways. Concentrations of solids, nutrients, and metals were lower in runoff from the paver driveways than the asphalt driveways.

Post-construction monitoring will continue for several years to assess the overall differences in how these two types of development impact water quality.

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, Enforcement and Remediation	(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