

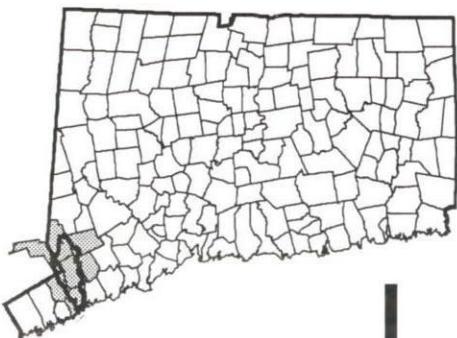
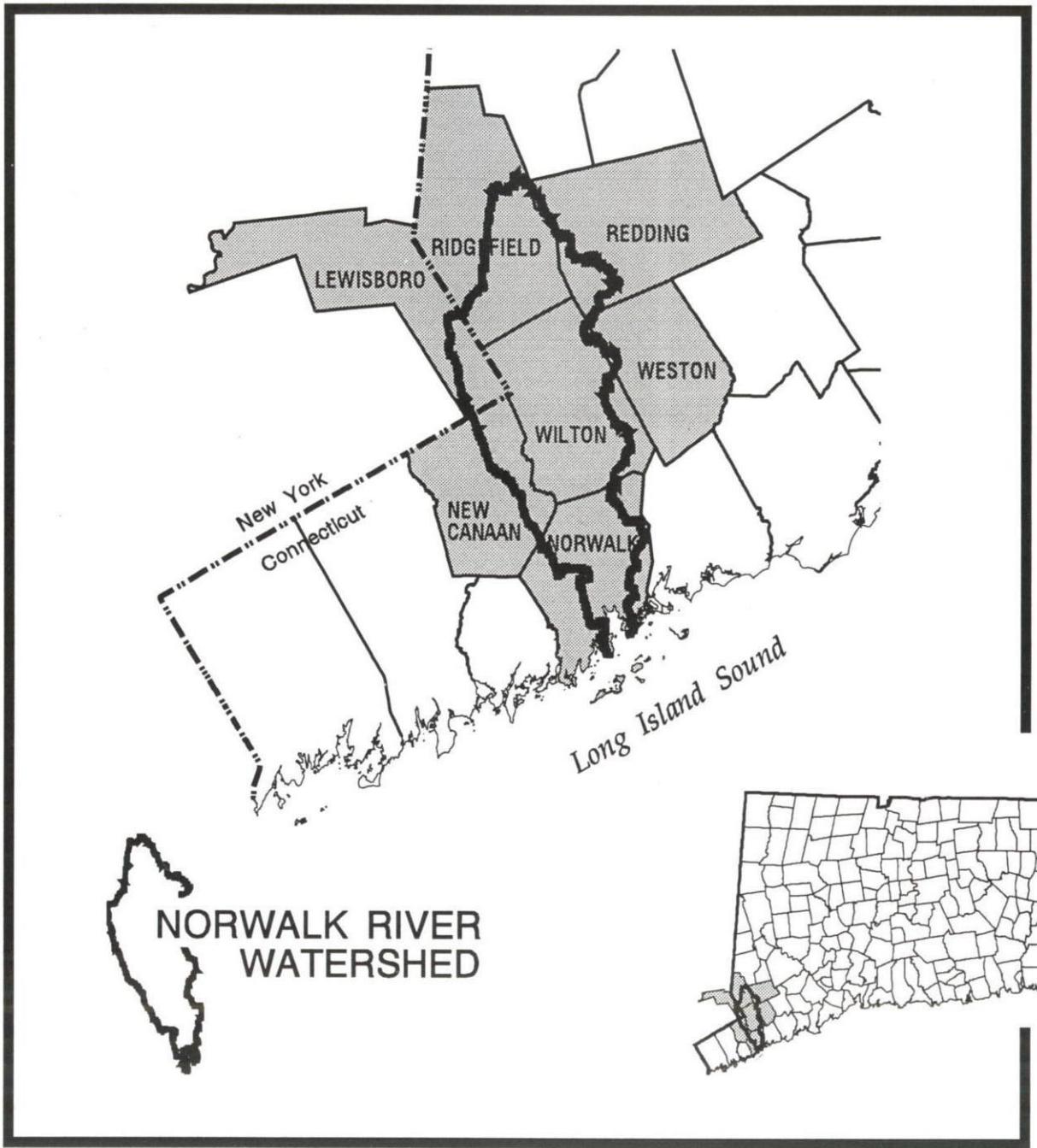
The Norwalk River Watershed Action Plan

It's Our Watershed—Let's Take Care of It



October 1998

Prepared by: The Norwalk River Watershed Initiative Committee



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Vision Statement

"We envision a restored Norwalk River Watershed system: one that is healthy, dynamic and will remain so for generations to come; one that offers clean water and functioning wetlands; one in which a diversity of freshwater and anadromous fish as well as other wildlife and plants are once again sustained; one in which the river system is an attractive community resource that enhances quality of life, education, tourism and recreation; and above all, one in which growth respects this vision and all people participate in the stewardship of the watershed."

Norwalk River Watershed Initiative Committee, 1998

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City of Norwalk, Connecticut
CT Department of Agriculture /Bureau of Aquaculture
CT Department of Environmental Protection
CT Department of Public Health
CT Department of Transportation
Earth Alliance
Fairfield County Soil & Water Conservation District
Harbor Watch/River Watch
Housatonic Valley Council of Elected Officials
Long Island Sound Advisory Council
Norwalk Chamber of Commerce
Norwalk League of Women Voters
Norwalk River Watershed Association
Norwalk First District Water Company
Norwalk Second District Water Company
Save The Sound
Sierra Club of Fairfield County*

*South Western Regional Planning Agency
The Maritime Aquarium
The Nature Center for Environmental Activities
Town of Lewisboro, New York
Town of New Canaan, Connecticut
Town of Redding, Connecticut
Town of Ridgefield, Connecticut
Town of Weston, Connecticut
Town of Wilton, Connecticut
Trout Unlimited
UCONN Cooperative Extension System
US Army Corps of Engineers
USDA Natural Resources Conservation Service
US Environmental Protection Agency
US Fish and Wildlife Service
US Geological Survey
Watershed Schools
Westchester County Department of Planning
Wilton League of Women Voters
6-Town River Board*

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Organization Acronyms

CTDEP - Connecticut Department of Environmental Protection

CTDOA/AQ - Connecticut Department of Agriculture/Bureau of Aquaculture

CONNDOT - Connecticut Department of Transportation

EPA-LISO - Environmental Protection Agency - Long Island Sound Office

FCSWCD - Fairfield County Soil and Water Conservation District

FEMA - Federal Emergency Management Agency

HW/RW - Harbor Watch/River Watch

NEMO - Nonpoint Education for Municipal Officials

NRWA - Norwalk River Watershed Association

NRWI - Norwalk River Watershed Initiative

NRWIC - Norwalk River Watershed Initiative Committee

NYDEC - New York Department of Environmental Conservation

OPM - Office of Policy and Management, State of Connecticut

STS - Save The Sound

UCONN-CES - University of Connecticut Cooperative Extension System

USACOE - US Army Corps of Engineers

USDA-NRCS - US Department of Agriculture-Natural Resources Conservation Service

USEPA - US Environmental Protection Agency

USGS - US Geological Survey

Foreword

Water quality management in the United States is at an important crossroad. Most of the obvious sources of water pollution -- municipal sanitary and industrial wastewater -- are strictly regulated and required to provide advanced levels of treatment. Despite great progress in controlling these point sources, water quality problems remain. The remaining water quality impairments are primarily the result of polluted runoff. These diffuse sources include runoff from roads, parking lots, and lawns, leachate from septic systems, farms, and atmospheric deposition of pollutants. The significance of these sources is that they are largely the result of the way we have developed the landscape, and the way we go about our daily lives. We are all part of the problem.

The traditional top-down, "command-and-control" approach that has been so successful in reducing, and in some cases, eliminating point sources of pollution, will probably not work for most nonpoint sources. Inspection and maintenance ordinances for septic systems can reduce failure rates and associated pollution, and improved storm water treatment systems can remove some of the pollutants carried in urban runoff. However, reducing nonpoint source pollution at the source will require fundamental changes in land management practices and lifestyle. Land use decisions are largely the domain of municipal government agencies and their various boards and commissions, and influencing lifestyle changes requires extensive education and outreach.

The current solution, of which this Norwalk River Watershed Action Plan is representative, is community-based, locally-led, comprehensive watershed planning and management. This approach assumes that the watershed is a logical, geographically defined unit in which a wide range of environmental issues can be analyzed and assessed in a comprehensive fashion, taking into account the interaction of various pollution sources and resource impairments and their cumulative impacts. Those who live and work in the watershed are most likely to understand the problems affecting it, have the greatest stake in its health, and have the greatest incentive to affect the changes necessary to restore and protect the resource. The *Norwalk River Watershed Action Plan* represents a watershed community with a common interest in restoring and protecting their watershed resources. It is a model for voluntary, community-based watershed planning and management that can be emulated throughout the Long Island Sound Watershed and elsewhere in New England and the rest of the country.

Executive Summary

The Norwalk River Watershed Initiative (NRWI) is a partnership effort among federal and state agencies, local authorities, local groups and individuals within the Norwalk River Watershed. Begun in 1996, the NRWI is a voluntary, cooperative, locally-based watershed planning effort. The purposes of the Initiative are: 1) to build local capacity to protect and restore the Norwalk River Watershed; and 2) assist communities in integrating the resource management objectives of the Long Island Sound *Comprehensive Conservation and Management Plan* into local land use planning and regulatory programs. To do this, participants in the Initiative have developed a watershed Action Plan. The plan represents a coordinated effort to address local water quality and resource protection problems and opportunities.

The Norwalk River Watershed encompasses portions of seven communities whose political boundaries fall within the states of Connecticut and New York. The six Connecticut towns, all located in Fairfield County, are New Canaan, Norwalk, Redding, Ridgefield, Weston and Wilton. The seventh town is Lewisboro, New York, which falls within Westchester County. A watershed can be defined as all of the land and water area from which precipitation runs off and drains into a particular watercourse or waterbody. The watershed is approximately 40,000 acres or 64.1 square miles, and is populated by approximately 66,000 people (1990 census). The watershed is defined by three main drainages: the Norwalk River, Comstock Brook and the Silvermine River. For this plan, the watershed boundary covers the inner harbor area in Norwalk and includes that portion of the harbor extending to the mouth of the Norwalk River between Manresa Island and Calf Pasture Point.

The authors of this plan are members of the NRWI Committee. The Committee was formally established in February 1997. By March 1997, the Committee formed the following four subcommittees in order to better focus on the issues affecting the watershed: habitat restoration, land use/flood protection/open space, water quality, and stewardship and education. Each of the subcommittees developed goals and objectives which were, in turn, presented to the public for review and comment in June 1997. The NRWI Committee refined its goals and objectives based on public comment and proceeded to identify those tasks which would be needed to achieve the goals of the plan.

The goals adopted by the Committee are listed below:

- *To preserve and conserve habitat features to protect and increase the diversity of floral and faunal species. We will seek to improve wildlife habitat, to foster cold water fisheries, and to restore anadromous fish passage.*
- *To promote balanced growth which preserves property values and protects and enhances the watershed's resources for future generations. This will be done by (1) providing that new development is within the carrying capacity of the environment, (2) promoting economic development without adversely impacting the watershed, and (3) creating performance standards by which all development and renovations can be evaluated.*
- *To restore and protect surface and ground water resources to meet state water quality standards throughout the watershed such that it supports its designated uses (e.g., fishing, swimming, drinking water).*
- *To educate citizens about the boundaries and functions of the Norwalk River Watershed, the specific needs for protection of and improvement to the river system, the benefits of a healthy watershed to individuals and communities, and the opportunity for the public to speak out on issues, and to participate in the stewardship of the watershed.*

This Norwalk River Watershed Action Plan provides a background of the Initiative; summarizes the socioeconomic, cultural, and environmental conditions of the watershed; recommends implementation items to protect and restore the resources of the watershed; and highlights the need for continued watershed stewardship by individual and collaborative actions. This plan presents action items for restoring habitat for fish and wildlife, for protecting citizens and property in flood prone areas, and for maintaining and restoring water quality. This plan also provides tools for better land use management and endeavors to educate citizens on the concept of watershed based decision making and resulting impacts. The plan's goals rely heavily on the coordination of efforts by all interested parties to address local water quality and resource protection problems. To coordinate these implementation efforts, the plan recommends the formation of a Watershed Advisory Committee and the establishment of a Watershed Action Plan Coordinator(s).

Chapter 1

The Norwalk River Watershed Initiative: Purpose and Process

The Norwalk River Watershed reflects the typical impacts associated with urbanization and mirrors other coastal watersheds in the Long Island Sound Basin. Like most coastal watersheds in Connecticut and New York, it is most heavily urbanized at the outlet—the harbor. The upper reaches of the watershed, by degree, exhibit the typical shift from agricultural and forest land to suburban landscapes that characterizes land use over time in growing communities.

The Norwalk River Watershed discharges directly into Long Island Sound at Norwalk Harbor. It is characterized as urban, with sectors devoted to commercial and industrial land uses, and a high degree of residential settlement. The watershed comprises approximately 40,000 acres, covers six municipalities in Connecticut (New Canaan, Norwalk, Redding, Ridgefield, Weston, and Wilton) and one in New York (Lewisboro). It is defined by three main drainages: the Norwalk River, Comstock Brook, and the Silvermine River. For this report, the watershed's boundary encompasses the Inner Harbor in Norwalk, including that portion of the harbor that extends to the mouth of the Norwalk River between Manresa Island and Calf Pasture Point.

The Norwalk River Watershed Initiative (Initiative or NRWI) is a voluntary, community-based, watershed planning effort. The NRWI provides a framework in which to focus on the resource needs of the watershed by prioritizing community interests, taking stock of available resources, and enhancing the feasibility of success by community-based decision-making. The purpose of the Initiative is to develop and implement an advisory watershed management plan to protect and restore the natural resources of the Norwalk River Watershed. The process is one of partnership among federal, state, regional and local agencies, and the local organizations and citizens.

Two agencies — the USDA-Natural Resources Conservation Service (NRCS) and the Environmental Protection Agency through its Long Island Sound Office (EPA-LISO) — first proposed a pilot project to test watershed management approaches that might be applicable to the Long Island Sound's watershed communities. These two agencies next met with the Connecticut Department of Environmental Protection (CTDEP). CTDEP also recognized the importance of a watershed management approach in continuing to protect and restore the State's surface and ground waters and Long Island Sound.

NRCS, EPA, and CTDEP then held discussions with locally-based environmental groups, other governmental agencies, local municipalities, and individuals with an interest in the protection of the Norwalk River Watershed. Many of these groups had been working in the watershed on land use, water quality, and environmental projects and welcomed participating in this project. The final decision to form a partnership to work in this watershed was based on four factors:

- Size of the watershed
- Its proximity to the western end of Long Island Sound
- Number and complexity of environmental issues within the watershed
- Most importantly, the willingness of the communities to participate in the process.

As a result of these discussions, agreement was also reached that this Norwalk River Watershed Initiative should emphasize building local capacity to improve the management of water quality in general in the watershed, with a focus on addressing polluted runoff, as well as other water pollution concerns. In addition, all parties agreed that it was important to ensure that an institutional structure be developed to enable municipalities to continue implementation after the Initiative had completed the development of a watershed action plan.

Initiative Development and Process

Managing and protecting environmental resources is an increasingly complex task that should be accomplished with participation and support from the public. There is also a need for improved coordination between the public and private sectors to achieve community resource protection on a watershed scale. This is especially true when limited resources are available.

In March 1996, CTDEP, EPA-LISO, and NRCS mutually identified the Norwalk River Watershed as an important resource in which water resource improvements may benefit Long Island Sound and the water resources of its communities. There was agreement among these agencies that a model watershed “initiative” should demonstrate the following:

- A holistic watershed approach with a goal to improve, protect and restore the water quality, habitat and other resources conditions of the watersheds that drain into Long Island Sound
- An understanding that the cumulative impacts of local decision-making affect a watershed’s “health”

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- A voluntary, collaborative partnership effort among federal, state, regional and local authorities
 - A high degree of public involvement
 - A comprehensive method to approach watershed management focusing on the resource needs of the watershed
 - An emphasis on implementing solutions to priority issues.

In April 1996, after agreement was reached that a watershed management approach could be taken in the Norwalk River Watershed, the three sponsors began a series of meetings with other federal, state, regional agencies and local municipalities, and citizens and groups with an interest in the watershed. Beginning with the chief elected officers of each municipality, three questions were asked:

- Would you be interested in working in a partnership effort to model collaborative, community-based watershed planning?
- Would you commit resources to the effort?
- What are your issues and interests relating to the watershed?

Results from these meetings indicated a willingness from each of the seven communities to commit to this model watershed initiative and to designate a town representative; also, a preliminary list of over 50 issues and interests relating to this watershed was also developed.

By October 1996, a Technical Advisory Group consisting of the designated municipal leads and staff from EPA, NRCS, and CTDEP, was formed to oversee the next phase. The focus of this group was to coordinate the creation of a watershed planning committee known ultimately as the Norwalk River Watershed Initiative Committee (NRWIC or Committee), and to begin a process in which a watershed action plan could be developed.

Important to the Initiative's early planning stages was the "Streamwalk Assessment" conducted from August to November 1996. The Streamwalk was largely the effort of volunteers who walked the perennial streams of the watershed and recorded information about the physical condition of the watershed's streams and streambanks. This Streamwalk added considerably to the existing knowledge regarding the physical condition of the watershed's stream corridors (see Appendix 1 which summarizes the streamwalk's findings).

The formal planning process began in February 1997 with the establishment of the Norwalk River Watershed Initiative Committee, comprised of watershed residents, local officials, interested organizations, and state and federal representatives (see list of participants on page ii). An 18-month planning process was proposed to the Committee and this time frame was accepted. The Committee subsequently established subcommittees to develop goals, objectives, and tasks for four priority areas: water quality, habitat restoration, land use/flood protection/open space, and education/stewardship. These subcommittees were established as a way to prioritize watershed issues and interests that the Committee had initially developed. The subcommittees then proceeded to develop objectives and tasks to address the prioritized issues and interests. The subcommittees' work was periodically reviewed by the full Committee until consensus was reached.

Leadership roles in the full Committee and each subcommittee were established. Formally designated co-chairs of the Committee leads were Patricia Sesto, Director of Environmental Affairs for the Town of Wilton, CT, and Ray Morse, Chairman of the Conservation Advisory Council of Lewisboro, NY. Patricia Sesto was also designated chair of the habitat restoration subcommittee; Dick Carpenter, Southwestern Regional Planning Agency, was designated chair of the land use/flood protection/open space subcommittee; Dave Dunavan, Norwalk Harbor Management Commission, was designated chair of the water quality subcommittee; and Dan Porter, a resident of Ridgefield, was designated chair of the stewardship and education subcommittee.

A draft plan was prepared and released to the public in April 1998 for review and comment. Based on public input, the Committee reevaluated and revised the plan now known as the Norwalk River Watershed Action Plan. This report is then the result of the Committee's work.

In addition to developing a plan, the Committee was active on other fronts over the 18-month planning time. Of special note are implementation of a Riparian Area Demonstration Project in Wilton and the approval of a Flood ALERT System for the watershed communities, the publication and distribution of watershed newsletters, and the establishment of an Initiative-specific local water quality monitoring effort. Appendix 2 contains a selected list of actions taken by the Committee from February 1997 to October 1998.

Vision and Goals

The vision statement and goals adopted by the Committee for the future of the watershed are as follows:

Vision Statement for the Norwalk River Watershed

We envision a restored Norwalk River Watershed system: one that is healthy, dynamic and will remain so for generations to come; one that offers clean water and functioning wetlands; one in which a diversity of freshwater and anadromous fish as well as other wildlife and plants are once again sustained; one in which the river system is an attractive community resource that enhances quality of life, education, tourism and recreation; and above all, one in which growth respects this vision and all people participate in the stewardship of the watershed.

Goal Statements

Habitat Restoration:

To preserve and conserve habitat features to protect and increase the diversity of floral and faunal species. We will seek to improve wildlife habitat, to foster cold water fisheries, and to restore anadromous fish passage.

Land Use/Flood Protection/Open Space

To promote balanced growth which preserves property values and protects and enhances the watershed's resources for future generations. This will be done by (1) providing that new development is within the carrying capacity of the environment, (2) promoting economic development without adversely impacting the watershed, and (3) creating performance standards by which all development and renovations can be evaluated.

Water Quality:

To restore and protect surface and ground water resources to meet state water quality standards throughout the watershed such that it supports its designated uses (e.g., fishing, swimming, drinking water).

Stewardship and Education:

To educate citizens about the boundaries and functions of the Norwalk River Watershed; the specific needs for protection of and improvement to the river system, the benefits of a healthy watershed to individuals and communities, and the opportunity for the public to speak out on issues, and to participate in the stewardship of the watershed.

With this vision statement and the four goals in place, the Committee believes that the plan, when implemented, will protect and restore the resource conditions of the watershed for future generations. The Committee also recognizes that all watershed residents, as well as federal, state, regional, and local entities, play ongoing critical roles as stewards of the watershed.

Chapter 2

Overview of the Norwalk River Watershed

The following overview of the Norwalk River Watershed offers a snapshot of the basin in 1998, summarizes the sociological profile of the watershed, and provides an overview of the history of the watershed and the people who settled it.

Snapshot of the Watershed

The Norwalk River Watershed encompasses portions of seven communities whose political boundaries fall within the states of Connecticut and New York. The six Connecticut towns, all located in *Fairfield County*, are New Canaan, Norwalk, Redding, Ridgefield, Weston and Wilton. The seventh town is Lewisboro, New York, which falls within Westchester County.

The climate in the watershed is modified slightly by its proximity to the Sound. Breezes from the ocean tend to moderate the climate somewhat, producing cooler summers and warmer winters than are found further inland. The prevailing winds are from the southwest, at an average 12 miles per hour, but during the winter months, the predominant wind direction shifts to the northwest, bringing in cold Canadian air. The average yearly temperature is 51 degrees Fahrenheit, with an average precipitation of 47 inches. A portion of this precipitation occurs as snow, falling primarily from December through March, with an average yearly accumulation of 25 inches (NOAA, 1981).

The watershed is approximately 40,000 acres or 64.1 square miles, and is populated by 65,687 people (1990 census). About 64 percent of the watershed has been developed with commercial and light industry uses, residential neighborhoods, and roads. Woodland, open lands, water, and wetlands make up the remaining 36 percent of the watershed.

The watershed is defined by three main drainage basins or subwatersheds: the Norwalk River, the Silvermine River, and Comstock Brook. The main stem of the Norwalk River is approximately 20 miles in length. With the highest elevation at 860 feet above sea level, the Norwalk River flows along the valley floor at a grade of one half of one percent; the tributaries that drain to the River have a higher gradient, averaging between two to four percent. From a bird's eye view, the Norwalk River begins in the Great Swamp in Ridgefield and runs north approximately a mile to Taylors Pond, before turning south towards its terminus in Norwalk Harbor. The last three miles are a tidal estuary. The river discharges into a major oyster producing area and an important

wildlife habitat area. From the air, the Norwalk River is easily identified by Route 7 and the Metro-North, Danbury/Norwalk commuter train line, both of which run parallel to the river.

The main stem of the Silvermine River is approximately eight miles in length from its confluence with the Norwalk River to John D. Milne Lake in New Canaan and Lewisboro. Tributaries of the Silvermine add an additional 21 miles of stream. The main stem of Comstock Brook measures approximately three miles in length from the junction of the stream with the Norwalk River in Wilton north to the headwaters of East Branch Comstock Brook. Tributaries of the Comstock measure approximately 16 miles of stream.

Sociological Profile¹

The sociological profile of an area can provide insight to the ways land has been used in the past, and will be used in the future. Humankind's dependence on particular resources, such as an adequate water supply for irrigation or drinking or to support various types of development, often guides societal goals in preserving or exploiting the land. Likewise, social background can indicate where the priorities of a community lie and where opportunities for positive environmental changes may exist.

Table 2-1 shows the population density of towns in the Norwalk River Watershed. Norwalk is the most densely populated with a population density of 2,827 people per square mile. In comparison, Redding has the fewest people per square mile, with a population density of only 246 people per square mile. The difference in density clearly illustrates the variability of land use within the watershed, with a direct correlation between increased density and increased impervious coverage. As population increases, so does the level of impervious surfaces, such as roofs and roadways. As the amount of impervious coverage climbs, the level of pollutants in surface water increases, surface water temperatures rise, and erosion caused by storm flows increases.

Table 2-2 shows population and income statistics within the watershed. Median family incomes for the six Connecticut communities range from \$55,000 in Norwalk to \$115,779 in Weston. This is higher than the state median family income of \$49,199. Higher levels of income have been correlated with a greater ability to manipulate the land through such activities as residential and commercial development, clearing of second growth forests, instream alterations, and lawn development with its associated lawn care services.

¹Data sources consulted for this profile include town meetings, surveys, and interviews with various residents. U.S. Census Bureau "Town USA: statistical information was used, as well as 1996-1997 information from the Connecticut Department of Economic and Community Development.

Table 2-1. Population density of municipalities in the Norwalk River Watershed

Town	Land Area in Square Miles	Population	Density of People Per Square Mile
New Canaan	23.3	17,840	766
Norwalk	27.7	78,331	2,827
Redding	32.2	7,920	246
Ridgefield	34.8	20,944	602
Weston	20.8	8,637	415
Wilton	26.8	15,993	597
Lewisboro	29.3	11,313	386

Table 2-2. Population and income statistics of municipalities in the Norwalk River Watershed

Town	Population	Median Family Income	Per Capita Income
New Canaan	17,840	109,512	52,692
Norwalk	78,331	55,269	23,075
Redding	7,920	83,479	37,193
Ridgefield	20,944	83,859	34,103
Weston	8,637	115,779	48,498
Wilton	15,993	87,686	41,249
Lewisboro	11,313	85,839	35,557

The majority of towns in the watershed serve as bedroom communities for New York City and for businesses in Westchester County, New York, and Fairfield, Connecticut. In 1994, *Money* magazine identified the Stamford/Norwalk area (that includes the majority of the watershed communities) as the sixth best metropolitan area in the United States, and the best in the Northeast, in which to live. People live in the watershed because of the "country" landscape, Long Island Sound, other natural and cultural resources, and proximity to urban centers and their associated job opportunities. The majority of the residents have paid considerable sums to have access to these amenities, with median house prices per town ranging from \$181,216 to \$475,000. The desirability of the area is reinforced by the presence of several Fortune 500 corporate headquarters in the watershed.

Geological Perspective

Prior to the present-day political boundaries being established, the watershed was defined solely by the geologic processes which molded it. Millions of years ago, this area was a vast open sea called Lapetus (Cappel, 1992). Sediments accumulating from the

bordering highlands gradually changed into hardened sedimentary rocks, which were later transformed by heat and pressure from the intense movements of the earth's crust that occurred some 350-575 million years ago. Different degrees of folding, warping, uplift, and crystallization yielded metamorphic rock, creating the rock formations which are visible in roadcuts and outcroppings in the region. Movement of a glacier south 12,000 years ago modified the landscape, forming hills and valleys, and brought pieces of bedrock from as far away as Canada. Soils were altered, leaving glacial till as the predominant soil composition; surficially, the glacial scour created shallow soil cover over bedrock and ground water, and left the landscape strewn with boulders. Retreating ice also left behind its terminal moraine, forming Long Island and subsequently, Long Island Sound. Today's river valley shows the scars of its formation, with the river flowing through the resulting valley before discharging to the Sound.

The Norwalk River Valley and Settlement

This orientation of the Norwalk River and hills dictated the pattern of settlement by people. Native American tribes who lived in the area found fertile soils in the valley, plenty of wood, and a bounty of fish and shellfish from the River and the Sound. Their trade routes ran along the coast and to the north following the path of the river. As one historian points out, the current Route 7 is probably one of the oldest continuous trade corridors in North America, running from Norwalk to the Province of Quebec, Canada, over 500 miles away (Bloom, 1998).

The Native Americans first inhabiting this fertile valley were known as "people of the shell," and later referred to as the Wappinger Confederacy, a subdivision of the Algonquin group that stretched from Canada to the Carolinas. Colonial settlement of the river basin began in 1640, when Roger Ludlow purchased the land from the Saugatuck River west to the Five Mile River as "as far inland as a man could walk from sunrise to sunset" from the Algonquin Indians (Gould, 1998). In 1650, Ludlow sold this land to a group of settlers from the Hartford area. The settlers, led by Nathaniel Eli and Richard Olmstead, had to meet basic criteria established by Ludlow; there had to be at least 30 good families, "none of whom could be obnoxious to the public good of the commonwealth." In addition, settlers had to agree to apportion the land fairly, pay taxes, and obey "other wholesome orders of the colony" (Gould, 1998).

A year later, Norwalk was recognized by Hartford legislature as a township. Life centered around the village green and church (this was facilitated by a law which forbade one to live more than a mile from the meeting house). Common grazing land was established a distance outside the village (Hubbard, 1971). This original Norwalk township gave rise to all or portions of the seven communities of the Norwalk River Watershed, as well as several other towns to the east and west.

Colonial settlers in the watershed grew grain and maize, and raised cows, sheep, and pigs. Oysters, scallops, lobsters, and finfish provided sustenance, as well. Virgin forests of birchwood, buttonwood, hickory, pepperidge, sycamore, and whitewood pro-

vided fuel and building materials, and later pulp for production of paper. Commerce in the watershed was dominated by farming well into the 20th century, with the mouth of the River always serving as a port of trade and landing. Many of those who settled in the area actually entered through ports of New Haven and Norwalk, with others entering from New York City to the west.

The Norwalk River Watershed did more than provide fertile soil for early colonists, it dictated the type of manufacturing that developed in the valley. To harness the water's energy, dams were created, forming ponds that supplied the water wheels providing power. Grist mills, iron processing mills, lumber mills, and others lined the Norwalk River. The River was not, however, the ideal power source as indicated in one historical account of Norwalk. "...[T]he terrain rose so gently that in the winter when the river was frozen, children were able to skate from a dam near today's Belden Avenue and Forest Street upriver for almost a mile, and in a dry summer, the river fell too low to attract great new textile factories" (Ray & Steward, 1992).

Despite this, the watershed was home to some notable entrepreneurs who freely availed themselves of the many resources at hand. Among these were the Lockwoods of Norwalk, who counted among their many holdings the Danbury and Norwalk Turnpike, a fleet of ships (12 sloops and 18 schooners) that plied the coastal and West Indian trade routes, a sawmill and one of the only rolling and slitting mills in the country. Another well known industry in the watershed, the Gilbert and Bennett Manufacturing Company, was located in the Georgetown section of Redding, from 1828 until 1989 (when the manufacturing arm of the company moved to Georgia). This factory produced the first wire mesh in the world. Other notable industry included hatteries, potteries, and shoemakers. The business which has outlasted all others, however, is that of oystering, which still depends on the brackish waters of the harbor.

Today, watershed lands host residential uses to a far greater extent than the industrial uses of days past. This shift can, in part, be attributed to the construction of two highways, Interstate 95 and the Merritt Parkway, and the New York/New Haven rail line, all three traverse the lower third of the watershed. These transportation options allow people a relatively easy commute from New York to the country landscape of the watershed communities.

The Watershed as a Transportation Corridor

Before these large east-west travel corridors were established, several early north-south transportation routes, which followed the course of the river and the adjacent ridgelines, served as the major transportation routes. In the early 1700's as settlements grew and trade with the watershed towns and Danbury to the north increased, the need for better transportation routes grew. To meet this need, the Danbury-Norwalk Road along the Norwalk River, now Route 7, was expanded; Ridgefield Road was upgraded as well, leading from today's Wilton Center (Wilton did not separate from Norwalk until 1800), northwest to Ridgefield and beyond (Annals of Wilton, 1958). Present day Routes 35

and 123 are also old trading roads, which served to transport goods and people from the countryside to Norwalk's harbor. One of Connecticut's earliest turnpikes, present day Route 57, was constructed in 1795 between Norwalk and Danbury, running through the towns of Weston and Redding.

In 1852, the spur rail line to Danbury off the New York/New Haven line was completed, solidifying the importance of depots like Branchville, Wilton, and Cannondale in the Norwalk River valley.

With the advent of the car and the completion of the Merritt Parkway in the late 1940's, the attractiveness of area towns to those who wished to work in New York City, but live in the country, was sealed. And with the completion of Interstate 95, the final transportation corridor linking the watershed to surrounding communities was completed.

The Great Flood of 1955

On October 15, 1955, the coexistence between the Norwalk River and the people was sorely tested. Thirteen inches of rain fell in a 36 hour period and overwhelmed the Norwalk River and its tributaries, all saturated by previous storms (Wilton Historical Society, 1987). Within a few hours, dams were breaking from the surge of debris that rushed them, and homes and businesses were washed downstream to lodge under bridges, most of which also fell. In a history of the Gilbert and Bennett corporation, the author describes the disruption of the 137-year relationship that the company had with the river as a 9-foot wall of water raced through Main Street in Georgetown:

As the water gathered in the valley, it formed a tremendous force—that washed out bridges, roads and dams and rushed through the plant—knocked out windows and doors, tossed freight cars around and covered machinery ... to a depth of 9-10 feet (Knowles and Miller, 1968).

The cost of the clean-up to watershed industry and towns was in the millions of dollars. The flood also changed the river, depositing tons of sediments into the harbor. Swimming holes that once graced the river were filled in with sediment, as was the case with Myers swimming hole just below the Wolfpit Road Bridge in Wilton. To restore the flow of traffic, the US Army Corps of Engineers erected temporary steel bridges across the river. The only bridge left standing was the original 1850 bridge at Wall Street in Norwalk, although the building that was constructed on top of the bridge was destroyed by the debris carried by the river. Despite the mass destruction and loss of life (four people died in the seven watershed towns), the communities rebuilt along the river. In one instance, the wetlands that ran along the Norwalk River at the base of Redding Ridge and Route 7 were filled with the debris from the flood and new buildings were built between the river and Route 7, despite the vulnerability of the location (Carey, 1998).

By 1965, the State of Connecticut and local towns, with the assistance of the then Soil Conservation Service, had developed a flood control plan for the watershed. To date, completed modifications include two dams, one at Great Swamp and the other on Spectacle Brook, both built by NRCS, and the channelization of a section of the mainstem in Norwalk by the US Army Corps of Engineers. A recent study indicates that the watershed would sustain considerable damages (\$21,780,000) in the event of a 100-year storm. A ten-year storm event would cause damages in the range of \$2.6 million (USDA-NRCS, 1997).

Historical Signs of Stress

The relationship between the natural world of the watershed and the people who have settled it has not always been beneficial. With settlement came the issue of waste disposal. Norwalk's early residents simply dumped waste in the tidal marshes just south of Washington Street that fringed the harbor. In 1929, Captain Frederick Lovejoy, a prominent Oysterman, sued the city for negligence, claiming that the dump was polluting the harbor so seriously that it had affected the shellfish harvest. While Lovejoy lost his suit, the City did turn its attention to the harbor and constructed the City's wastewater treatment facility (Ray, et al, 1992). Other treatment plants were developed up the river, including one of Connecticut's first industrial liquid waste disposal systems constructed in 1930 by Gilbert and Bennett. By 1965, the plant was discharging 400,000 gallons of water treated with lime into the river a day (Knowles, et al, 1968).

Beyond the exploitation of the harbor, commercial business density grew along the river valley to the detriment of the river. The industrial revolution altered the communities' needs for the Norwalk River, as well as their views of its value. Colonial citizens used the river's power in mills, fish was harvested, and passive recreation was sought. Later, residents and developers used the river as a waste receptacle and treated it as an impediment in need of straightening and controlling. Construction of buildings and associated parking, retaining walls, and drainage reduced the riparian corridor, increased the amount of polluted runoff discharged to the river, and confined the river within a limited portion of its valley. With this development, recreational uses diminished as access became difficult and the water was polluted, and eventually, the river faded into the background of the Route 7 travel corridor.

Holding to the pattern of the initial industrial development, development today continues to take place along the tightly packed Route 7 corridor. The construction of the Merritt 7 commercial complex in Norwalk, and what is known locally as Super 7, caused the river to be moved west from its original course. In addition, many of the small streams and wetlands that made up the fabric of the watershed have been diverted, piped, or filled to accommodate new roads and development.

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Chapter 3

State of the Watershed

This chapter examines the Norwalk River Watershed in terms of four environmental conditions -- water resources, land use, habitat, and open space. As growth and development continue in the watershed, the Norwalk River continues to fulfill its traditional roles of allowing for waste assimilation from treated wastewater discharges, sustaining fish and aquatic life, and providing aesthetic appeal for citizens. The Norwalk River Watershed's surface and ground waters also serve as important water supplies to residents of the watershed. Recreation plays a limited yet important role in the Norwalk River Watershed; recreational boating takes place at the mouth of the river and in the inner harbor, while fishing occurs along the river's entire length. While more than a dozen established public access sites are available in the harbor area, open space in the watershed is otherwise limited and direct public access to the Norwalk River is confined to relatively few sites.

While the watershed exhibits generally good water quality, there remain portions of the watershed which are stressed. The watershed faces continuous threats and impacts to water quality from potential nonpoint sources of pollution, such as storm water runoff, failing septic systems, and atmospheric deposition of pollutants. The watershed is characterized by mixed land use, with urban and more commercialized and industrialized sectors in the southern portion of the watershed and a high degree of residential settlement elsewhere. Habitat conditions in the watershed vary from extremely good to severely disturbed. Impaired sites are found along the adjacent developed lands of watercourses, excessive algae growth occurs behind impoundments and dams during the summer months, water flow is restricted in certain stream segments, and streambank manipulation is common in both commercial and residential settings. These conditions, plus many others, affect the viability of fish species and populations.

Water Resources

This section describes the water resources and conditions found within the Norwalk River Watershed. Water quality and quantity, monitoring, wetlands and watercourses, dams and impoundments, coastal non-point source impacts, wastewater treatment, flood management, and ongoing significant pollution clean-up activities are discussed.

Connecticut's Water Quality Standards (WQS)

Water quality standards direct overall State policies to improve and manage Connecticut's water resources. Required by Section 303 of the federal Clean Water Act and Section 22a-426 of the Connecticut General Statutes, Connecticut's WQS address:

- Restoration of the quality of the State's surface and ground water resources to support a healthy aquatic environment, enable recreation uses, be suitable for industrial purposes, and provide high quality drinking water for the citizens of the State
- Protection of existing high quality surface and ground waters from degradation
- Segregation of drinking water supplies from waters used for waste assimilation
- Adoption of standards that promote the State's economy while protecting the environment

The water quality standards are made up of three elements: the standards, criteria, and classification maps. The standards are comprised of policy statements that discuss quality classifications (goals) for individual water resources, anti-degradation, allowable discharges, principles of waste assimilation, and a variety of other subjects. Water quality criteria set numerical or narrative limits on a particular pollutant or on a condition of a waterbody, which are designed to protect and support the classification. The classification maps identify and indicate assigned classifications to water resources throughout the State; these maps also show the goals for the water resources. Connecticut's classification system is as follows:

- Inland surface water classifications: AA, A, B, C, and D. Surface water classes with a slash (B/A) indicate the present condition (e.g., B) and the goal (e.g., A).
- Coastal and marine surface waters: SA, SB, SC, or SD.
- Ground water classifications: GAA, GA, GB, and GC.

Surface waters with the classification of AA, A and SA, and ground waters classified as GAA and GA are afforded the highest water quality protections.

Class B waters mean that designated recreational uses (fishable and/or swimmable) are being met, as well as providing for suitable fish and wildlife habitat, and allowing for agricultural and industrial supply and other legitimate uses (i.e. navigation). The minimum acceptable classification goal is Class B unless a CTDEP and EPA approved use attainability analysis demonstrates that one or more uses are not attainable. Surface and ground waters not meeting these goals indicate that present water quality conditions preclude the full attainment of one or more designated uses. This could result from non-point sources of pollution, community-wide septic system failures, sediment contamination, and historic industrial spills.

In April 1997, CTDEP adopted the "Water Quality Classifications Map for the Housatonic River, Hudson River, and Southwest Coastal Basins." These surface water classifications require EPA approval. In Spring 1998, CTDEP was notified by EPA that certain coastal classifications should be reevaluated to consider longer term goals. CTDEP subsequently revised the Southwest Coastal Classifications for saline waters in several areas. CTDEP will be holding a hearing in the Fall of 1998 for this limited portion of the basin. CTDEP expects final adoption approval by EPA by early 1999. Map 3-1 presents the water quality classifications for the Norwalk River Watershed. For the majority of its length, from its head waters in Ridgefield to the Wall Street Bridge in Norwalk, the Norwalk River meets its Class B goal. However, below the Wall Street Bridge into the inner harbor area, the river has been classified as SC/SB. The lower portion of the Silvermine River where it meets Belden Hill Brook to above Deering Pond in Norwalk has a classification of B/A. Comstock Brook is classified of AA and A. Belden Hill Brook, Mayapple Brook and Bryant Brook, which are all in Wilton, are classified as B/A.

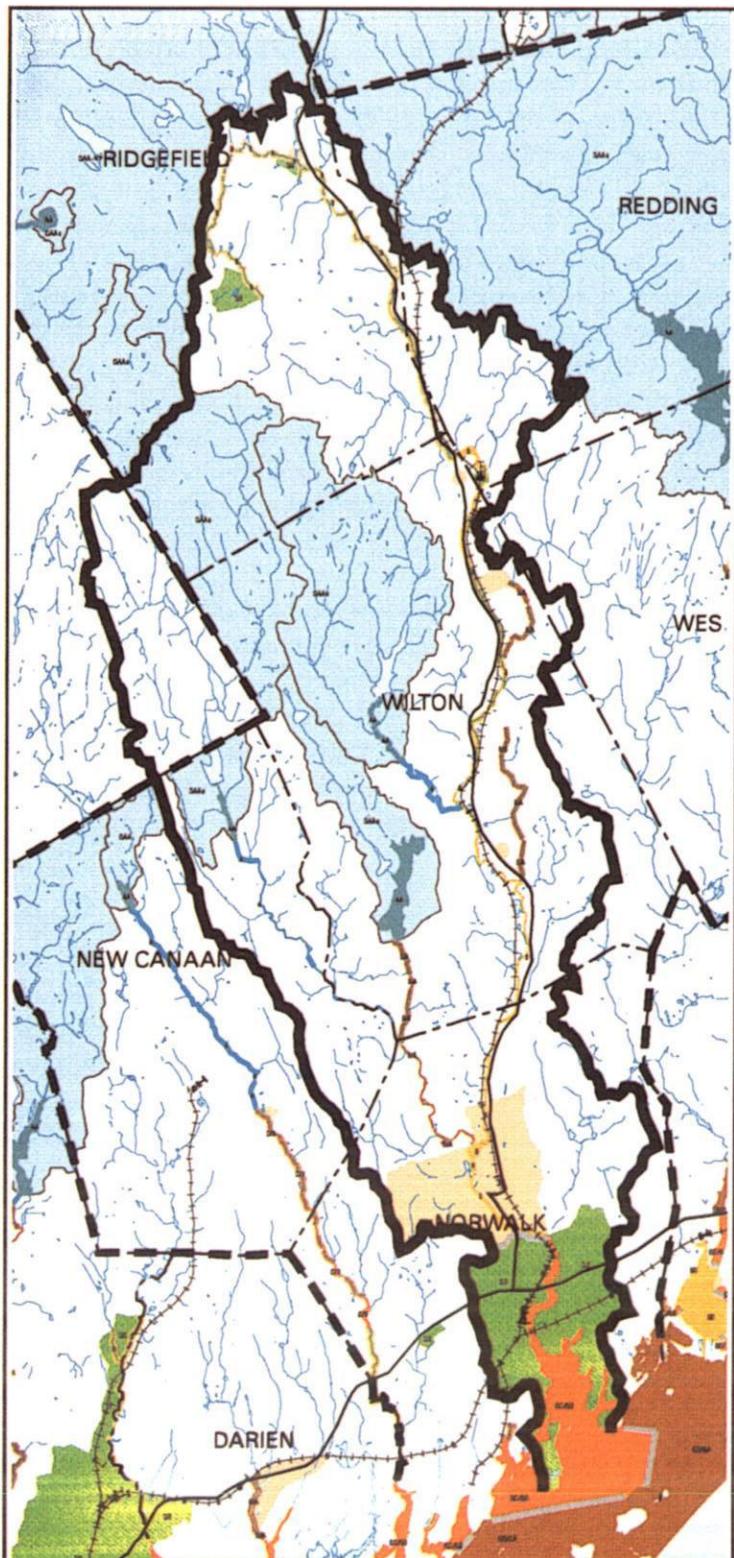
The federal Clean Water Act (CWA) requires each state to develop a prioritized list of waterbodies where existing controls on point and non-point sources of pollutants are inadequate to meet WQS and support designated uses. The CWA also mandates that States develop and adopt Total Maximum Daily Loads (TMDLs) for those waters affected by pollutants. The TMDL establishes the maximum amount of a pollutant that may be introduced into a waterbody that still allows for the attainment and maintenance of water quality standards, after the application of technology-based or other required pollution controls.

In August 1998, CTDEP's report *Connecticut Waterbodies Not Meeting Water Quality Standards* was formally approved by EPA. The "303(d) List," as it is called, identifies surface waters throughout the State that do not meet, or are not expected to meet (even with required pollution controls), state water quality standards. Table 3-1 identifies waterbodies found within the Norwalk River Watershed that have been included in the 303(d) List. The table provides information on the probable reasons why the waterbody is not currently meeting criteria and supporting designated uses and also indicates the status of developing a TMDL for that waterbody.

Monitoring

Available ambient water quality monitoring data indicate generally good water quality in the Norwalk River, with respect to its ability to support aquatic life. However, there are continuous threats and impacts to water quality from the following:

- Nonpoint sources, such as runoff from commercial and industrial areas that contains high concentrations of sediments, hydrocarbons, and metals, and direct precipitation (i.e., atmospheric deposition of nitrogen).
- High levels of indicator bacteria which can be attributed to wildlife and domestic animal sources and occasional sewer overflows.



NORWALK RIVER WATERSHED

Water Quality
Classifications
1997

WATER QUALITY SURFACE WATER INLAND

	A
	A/A/AA, AA
	B, B*, Bc, Bbc
	B/A, B/AA, B/A/AA, C/A
	C/B, C/Bc, D/B

COASTAL

	SA
	SB
	SB/SA, SC/SA, SD/SA
	SC/SB, SD/SB

GROUND WATER

GA (white background)	
GAA, GAA _s	
GA, GAA May not meet current standards	
GB	
GC	

Map 3-1 - Norwalk River Watershed - Water Quality Classifications, April 1997

- Storm water discharges (storm water runoff and permitted discharges) throughout the watershed.

Table 3-1. Adopted 303(d) List, August 1998

Waterbody	Problem or Impairment	Suspected Cause	Probability of TMDL Development
Norwalk River	Aquatic life support	Unknown. An intensive survey of ambient benthic community structure was conducted by DEP in the Fall of 1997. Initial results indicate no impairment at all sites from Ridgefield at Route 35 downstream through Wilton at Schenck's Island Park. Some impairment was seen in Norwalk at Perry Avenue and at Route 123. This is fully consistent with results of long-term ambient biological monitoring.	High
	Contact recreation	Bacteria from waterfowl, nonpoint sources, and onsite septic systems.	High
at Norwalk Mill Pond (Norwalk)	Inadequate fish passage	Fishway needed at Flock Process Dam	not applicable
	Mercury and lead	Mercury and lead	High
Norwalk Harbor Norwalk	Aquatic life support	Sediment contamination resulting from Combined Sewer Overflows (CSO), urban runoff and historic point source discharges.	Low
Belden Hill Brook Wilton	Contact recreation	Bacteria from CSO's and urban runoff, small private sewage treatment plant.	High

Water quality monitoring of the Norwalk River is conducted regularly. Since 1980, the United States Geological Survey (USGS) and CTDEP have cooperatively maintained a fixed chemical/physical monitoring network site on the Norwalk River main stem at Perry Avenue in Norwalk where monitored parameters include nutrients, metals, and bacteria. Sampling is performed eight times per year. USGS recently completed a trend assessment that indicated total nitrogen, ammonia-nitrogen, nitrate-nitrogen, and total phosphorus decreased at this site between 1980 and 1992. However, runoff through the urbanized areas and the rural unsewered areas of the watershed is a major source of fecal coliform loading in the river. At this sampling site, from 1993 to 1996, monitoring results indicated fecal coliform bacteria exceeded criteria 100 percent of the time during the summer monitoring period. These excessive levels of bacteria probably result from many of the several hundred pipes that empty into the river which extend for many miles and collect pollutants from streets, failing septic systems, broken sewer lines, sump pumps, illegal drain connections, and parking areas. The steep topography along the river also results in immediate runoff.

In addition to the fixed network site, CTDEP has periodically conducted intensive water quality surveys since 1978. These surveys typically monitor physical/chemical

parameters over a twenty-four hour time period. The most recent survey of this type was conducted in the upper mainstem of the Norwalk River in August 1995 and showed continuing problems related to low dissolved oxygen levels. The causes for this have not yet been identified.

CTDEP also maintains two biological monitoring sites on the Norwalk River main stem, one located in Ridgefield at Branchville and the other in Norwalk at Perry Avenue (USGS/CTDEP fixed monitoring site). At these sites, benthic invertebrate organisms are used as indicators of water quality. For monitoring conducted from 1978 to 1989, results indicated good water quality in Ridgefield. However, over the same period, slight to moderate impairment was found at Norwalk although improved conditions were seen in 1988-1989. In 1997 and 1998, CTDEP resampled at 8 sites on the mainstem and sample analysis and reporting are currently underway.



Photo: The Norwalk River is monitored for a number of water quality parameters.

During 1990 and 1991, the Department of Agriculture/Bureau of Aquaculture (DOA/BA) surveyed properties along the Norwalk River from the harbor northward. Sources of pollution found during this survey included failing septic systems, stormdrains, and nonpoint source runoff. Several locations along the river were sampled for fecal coliform bacteria. These sampling events discovered pollution sources and follow-up work was determined to be necessary. These pollution sources included illegal wastewater discharges, failing septic systems, raw sewage discharges, pavement runoff, and raw sewage discharge from marinas. In 1996, the DOA/BA conducted a Comprehensive Shoreline Survey of all properties immediately along the shoreline in Norwalk. Approximately 8 miles of shoreline and 209 individual properties were inspected. A total of 52 locations that required follow-up inspections were further investigated.

In addition, water quality monitoring for physical/chemical parameters is currently being conducted at 20 sites from Georgetown to Norwalk Harbor by a local organization, Harbor Watch/River Watch. Previous surveys conducted by Harbor Watch/River Watch in 1995 and 1996 indicated high concentrations of bacteria throughout the Norwalk River; in June 1998, this monitoring effort was resumed. Monitoring consists of benthic macroinvertebrate and fecal coliform bacteria sampling at selected locations along the Norwalk River and its major tributaries (the Silvermine River, Comstock Brook, and Cooper Pond Brook). Harbor Watch/River Watch will collect and analyze water samples for fecal coliform bacteria using the following frequency: monthly during October through April; weekly from May through September. Benthic macroinvertebrate will be sampled only once in the fall at two sites. Storm event observations will also be made and recorded on the weekly sampling. Harbor Watch/River Watch plans to submit an interim report in November 1998 to CTDEP. A final written report will be issued in June 1999.

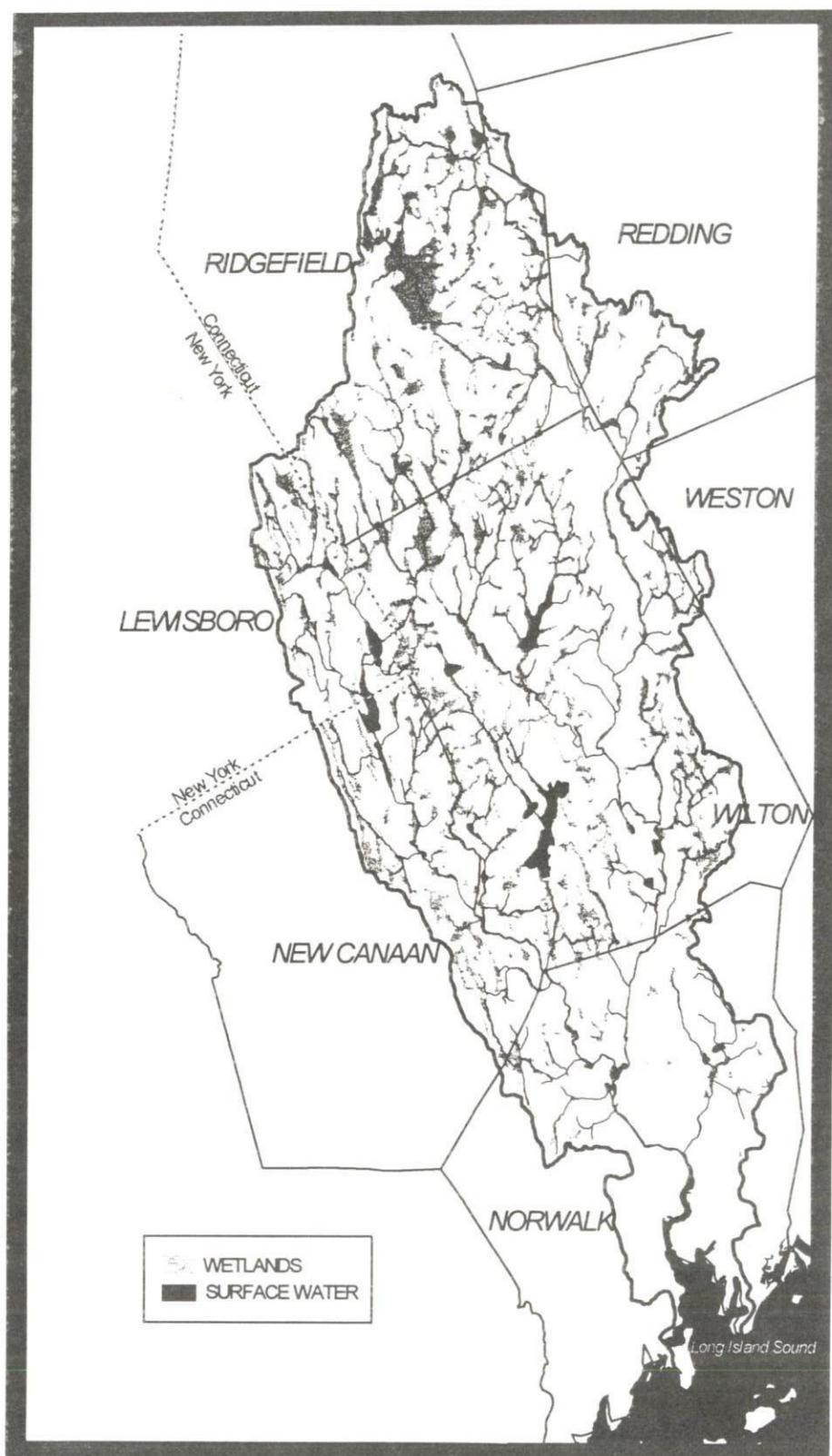
Water Supply

Sixty-six percent of the households in the watershed obtain their water from three local public water supply systems: Norwalk First District Water Company, Norwalk Second District Water Company, and Bridgeport Hydraulic Company. Public surface supplies are in the form of reservoirs in Wilton (Second District) and Lewisboro (First District). Public subsurface supplies are large municipal wellfields (such as the Kellogg-Deering wellfield in Norwalk) and several smaller community systems located within the watershed. Thirty-four percent of all households get their water from wells.

Inland and Tidal Wetlands

Inland wetlands and watercourses are important for many reasons. They are essential in providing an adequate supply of surface and ground water; they promote hydrological stability and control flooding and erosion; they purify ground and surface waters; and they enable animals and plant life to exist. The role of wetlands in sediment and pollutant renovation, especially in attenuating the effects of nutrients, is an important function that protects water quality in all surface waterbodies, including the Long Island Sound. Many inland wetlands and watercourses have been destroyed or are in danger of destruction because of unregulated use. The deposition, filling or removal of material, the diversion or obstruction of water flow, and the erection of structures and other uses have despoiled, polluted, and eliminated wetlands and watercourses throughout the watershed. Such unregulated activity has had, and will continue to have, a significant, adverse impact on the environment and ecology of this watershed.

Two types of inland wetlands predominant within the Norwalk River Watershed: one is the alluvial and floodplain wetlands which are located primarily along the Norwalk River and its tributaries; and the other is the poorly drained and very poorly drained soils which are located adjacent to alluvial soils and throughout the watershed. Map 3-2 shows that more wetlands can be found in the northern portion of the watershed with



Map 3-2 - "Wetlands" as depicted by hydric soils

fewer wetlands in the southern portion, reflecting a more intensive use of the land over time in the southern portion. Based on this map, approximately 15% of the watershed contains wetlands.

In 1972, Connecticut enacted the Inland Wetland and Watercourse Act. This act is currently being implemented through municipal inland wetland agencies statewide. The act enables CTDEP and municipal authorities to adopt programs regulating construction and other activities affecting inland wetlands and watercourses. Local wetland agencies have adopted regulations governing construction activities located in upland areas surrounding wetlands and watercourses. These regulations are known as upland review area, buffer, or setback regulations depending on the town. Both the width of the upland review area and the type of upland construction activities which require a permit vary widely from town to town. Within the Norwalk River Watershed, the upland review areas from wetlands and watercourses range from 15 feet to 200 feet. (See Appendix 3 on the review of existing municipal regulations).

New York State's freshwater wetlands are regulated by Article 24 of the Environmental Conservation Law, also known as the Freshwater Wetlands Act. Many municipal governments in New York State also have ordinances or provisions in ordinances regulating freshwater wetlands. As of 1975, the New York State Freshwater Wetlands Act allowed municipal governments to regulate wetlands wholly or partially within their boundaries. Municipal wetland protection ordinances may co-regulate state-regulated wetlands, assume all jurisdiction over state-regulated wetlands, or may be stronger than the state Act (for example, by regulating smaller wetlands). However, no municipal ordinance can be adopted that is less protective than the Freshwater Wetlands Act. The Westchester County Soil and Water Conservation District has prepared *A Model Ordinance for Wetland Protection*, which was extensively revised in 1997. This model has been used in whole or in part by many Westchester municipalities, including Lewisboro.

Tidal wetlands are generally flat, vegetated areas occurring at the land/ocean interface where daily tidal action moves water in and out of the system. Tidal wetlands are one of the most rich and biologically productive resources in the world and serve as nursery grounds for many coastal fishes. Waterfowl and many aquatic animals use tidal wetlands for homes and resting areas. They also play a role in cleansing water and in helping to protect shore areas from flooding. The most familiar form of tidal wetland is the coastal salt marsh characterized by such plants as salt marsh cordgrass, salt meadow cordgrass, and spike grass. In the Norwalk River, tidal wetlands are located south of Wall Street and create a fringe along the harbor with larger expanses in various inlets down to the river's mouth.

On another level, CTDEP implements the structure, dredging, and fill statutes, Connecticut Tidal Wetlands Act of 1969, and the Connecticut Coastal Management Act of 1980. State permits are required for work in tidal wetlands or below the high tide line in coastal, tidal, or navigable waters. Norwalk has adopted a "municipal coastal pro-

program” planning document and coastal management performance standards into local zoning regulations in an effort to protect coastal resources, such as tidal wetlands and intertidal flats through the Coastal Management Act. Along with the Connecticut Coastal Management Act, the Norwalk Municipal Coastal Program protects and promotes water-dependent uses, such as marinas or oyster processing plants along Norwalk Harbor and has enabled Norwalk to secure numerous public access walkways along its waterfront.

Coastal Nonpoint Source Pollution

Section 6217 of the Coastal Zone Reauthorization Amendments of 1990 requires that states with federally approved coastal zone management programs develop Coastal Nonpoint Source Pollution Control Programs to protect their coastal waters from non-point source pollution. The development of this program closely coordinates with the objectives of this plan to address the problem of coastal nonpoint source pollution in the Norwalk River Watershed (see Section III, Water Quality Action Items, in Chapter 4). Nonpoint source pollution, or “polluted runoff,” is one of the most critical problems facing the nation’s coastal areas and watersheds. All seven of the watershed towns will be affected by the requirements of Section 6217 and will be required to implement specific management measures, where not already in effect, to control nonpoint source pollution in coastal waters. Currently, Connecticut has obtained conditional approval for the 6217 program and is working towards final approval. The Norwalk River Watershed Action Plan is an important tool of utilizing existing authorities and combined resources to control coastal nonpoint source pollution as required in the Section 6217 program.

Dams

According to the Dam Safety Inventory of Connecticut, 48 dams have been constructed on the Norwalk River and its tributaries in the Wilton area. This inventory also identified 10 dams in New Canaan, 21 in Ridgefield, 6 in Redding, 14 in Norwalk, and 3 in Lewisboro, New York. However, only about seven of these dams are on the main stem of the Norwalk. According to the inventory, there are eight dams on the Silvermine River’s main stem. These dams on the Norwalk and Silvermine rivers are considered “run of river,” which means that the inflow into the impoundment is equal to the outflow; the dams hold back very little water. In times of low flow, evaporation is minimal in these impoundments. These dams provide little in the way of flood water storage or attenuation of flood peaks. All seven of the dams on the Norwalk River’s main stem impede fish migration.

The Norwalk River Watershed Initiative’s Streamwalk counted 13 dams on the Norwalk River (a difference of six from the State’s inventory) and 26 on the Silvermine (a difference of 18). This difference may be attributable to the fact that the CTDEP inventory does not record small dams (less than six inches in height) which are irregularly constructed out of boards and rocks.

Two flood control dams are present in the watershed: one at the "Great Swamp" in Ridgefield and the other, Spectacle Brook, in Wilton. Both dams affect peak flows of the Norwalk River during flooding conditions. Each contains a wildlife pool regulated by flash boards which allows minimal storage of water for release during dry summer months.

There are eight water supply dams in the Norwalk River Watershed. These dams can provide some flood control protection during periods of heavy rainfall in the summer when they are partially empty. When full, these dams provide about 325 acres of impounded water in this watershed. This type of flood control is not generally accepted because of the uncertainties of summer storms and reservoir drawdowns.

The rest of the dams in the watershed are privately owned by homeowners and businesses. Many of these dams were constructed as impoundments for recreational or aesthetic purposes.

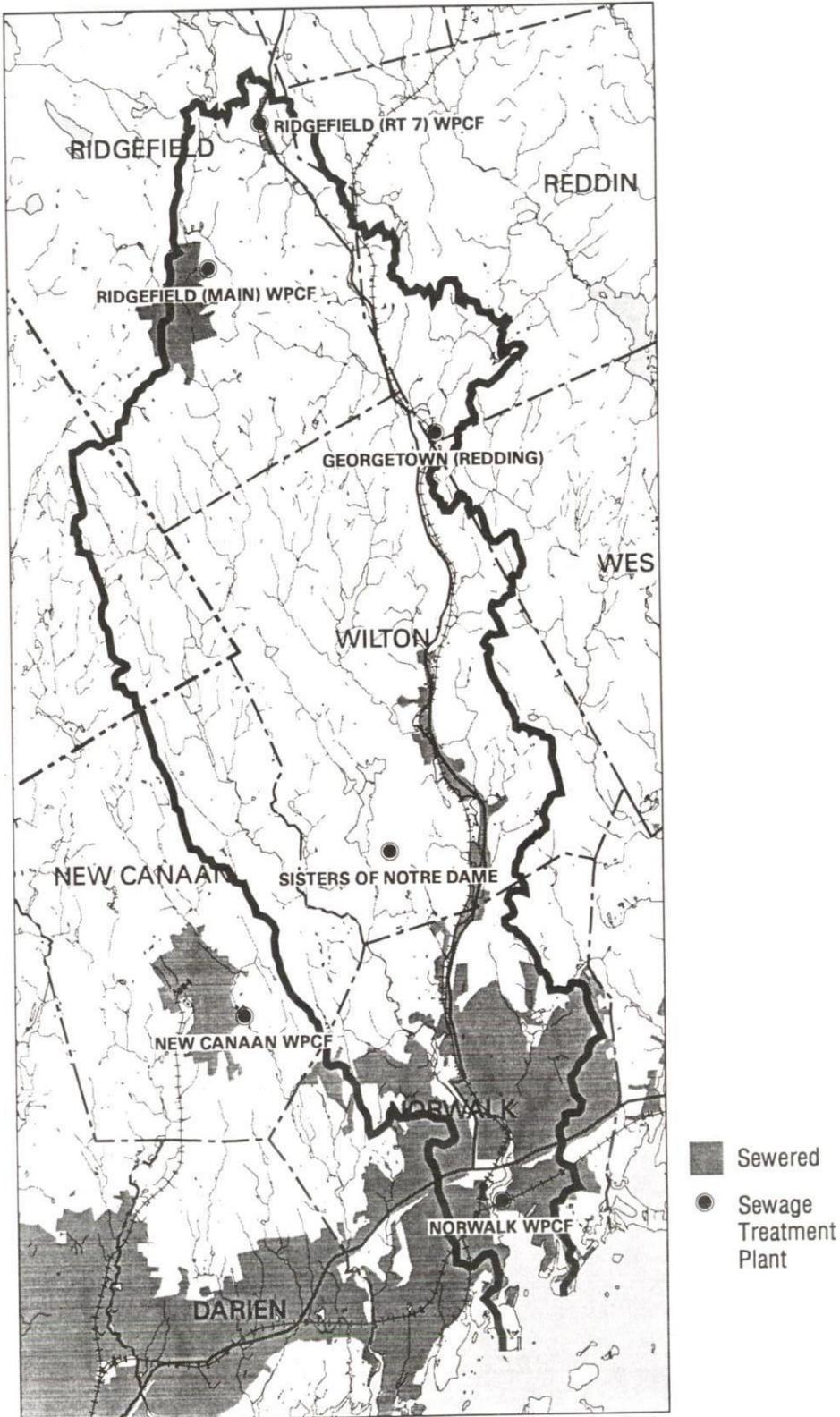
The presence of these dams in the watershed causes many problems. As mentioned above, a number of these dams on the Norwalk and Silvermine Rivers pose a barrier to fish migration. In addition, the numerous dams located throughout the watershed also provide detention time for the uptake of nutrients. This, in turn, promotes the growth of plants and algae, resulting in eutrophication.

Municipal Wastewater Treatment Facilities

Fifty-six percent of the households in the Norwalk River Watershed dispose of their wastes in public sewage disposal systems. The remaining households dispose of their sewage through on-site septic systems. There are four municipal wastewater treatment plants providing wastewater treatment service in the Norwalk River Watershed: one in Norwalk (15 million gallons per day), one in Georgetown servicing Redding (17,000 gallons per day), and two in Ridgefield (840,000 gallons per day). Wastewater from the areas in Wilton that are sewered is piped to the Norwalk plant. There is also one small private sewage treatment plant in the watershed, the Sisters of Notre Dame in Wilton, which is permitted to discharge 20,000 gallons per day. This permit is currently being considered for reissuance with a schedule to study how the discharge to Belden Hill Brook could be eliminated. Map 3-3 shows the location of each facility and sewered areas in the watershed.

Within this watershed, each of the four wastewater treatment facilities are designed and/or operated to provide an advanced level of treatment. When expansion is completed at the Norwalk and Georgetown facilities, high quality effluent will be the result; most important will be the significant reduction of nitrogen loadings to the Long Island Sound from these sources. In 1995, Ridgefield completed a retrofit at the main facility; nitrogen levels are now less than 6 milligrams per liter (mg/l). The Norwalk plant was also retrofitted in 1995 to reduce nitrogen in the discharge to less than six milligrams per liter. The following summarizes operations at each of the municipal facilities:

- Norwalk: In 1997, Norwalk began construction of an Advanced Waste Treatment (AWT) facility. The new plant will replace aging equipment at the existing secondary treatment facility (which dates from 1971), increase capacity to incorporate future demand flows, and meet state requirements to reduce nitrogen by 70 percent. The new facility will increase treatment capacity from 15 to 18 million gallons per day (mgd). Currently, the City is listed as one of the 13 Combined Sewer Overflow (CSO) communities in Connecticut. In Norwalk, all combined sewage is conveyed to the wastewater treatment plant. There are no collection system overflows. At the plant, flows in excess of the capacity of the facility are treated in a supplemental plant that provides the equivalent of primary treatment and disinfection. The combined sewer overflow at the plant is active only when flow exceeds 30 mgd. On average, the plant experiences approximately 15 CSO events per year. Over the past eight years, Norwalk has completed several inflow and infiltration (I & I) removal projects in order to reduce the frequency and volume of CSOs during storm events. The I&I projects presently underway and further ones planned, upon completion, should reduce the frequency and volume of CSO discharges even further. As a requirement of its National Pollutant Discharge Elimination System (NPDES) permit, the City must conduct a further study to verify that it is in compliance with national and state CSO strategies. The study needs to demonstrate that water quality standards are achieved even during wet weather events. If not, the City will be required to undertake additional work to solve its CSO problem.
- Georgetown: Georgetown's small treatment plant came on-line in 1996 (Phase I), resulting in improved water quality conditions in the area. This facility currently meets total nitrogen limits of 8 mg/l. Recent proposed development activity in Georgetown has focused on upgrading the wastewater treatment facility to provide for treatment capacity of 75,000 gpd and achieve a nitrogen limit of 6 mg/l. The upgraded plant could be on line by Fall 1999.
- Ridgefield: In 1994, CTDEP notified the Town that in order to comply with permit limits for its main facility (when this permit has to be reissued) reductions in the concentrations of heavy metals in the effluent would likely be necessary. Because of the small size of the stream into which this facility discharges, simple dilution of the effluent was not sufficient to meet the statewide water quality standards in effect at that time. In view of this situation, CTDEP entered into a Consent Order with Ridgefield, which extended the term of the existing permit for three years and required the Town to identify the sources of metals being discharged to the facility. The Town was also required to investigate ways to reduce metals and concentrations by means of either source controls or modifications to the treatment process and implement those which were economically and technically feasible. To assist in this effort, CTDEP hired a consultant to work with the Town and agreed to investigate whether site-specific conditions in Ridgefield Brook could provide a basis for adjusting future effluent limits for metals. The "metals mass balance treatability" study



Map 3-3 - Sewered/Unsewered Areas in the Norwalk River Watershed

showed that the facility was operating at or near the limit of available technology. Few feasible options were available to reduce metals discharged to the facility. CTDEP's investigation into the effect of metals on aquatic organisms, however, revealed that slightly higher concentrations of metals could be present in organically enriched streams without causing impairment to resident aquatic organisms. The state's investigation found that chemical reactions between the metals and organic material present in the stream rendered the metals less toxic. (Similar results were obtained by CTDEP for organically enriched streams in other Connecticut towns. Studies conducted by EPA at locations scattered across the country were consistent with the results seen in Connecticut.) This research led to adoption by the State, and approval by EPA, of slightly higher criteria for certain streams, such as Ridgefield Brook, which are organically enriched. CTDEP is now drafting a permit which includes limits based on the new criteria.

Flood Management

The Norwalk River Watershed has a long flood history. Major floods have occurred in September 1938, March 1953, and August and October 1955. The flood of October 1955 (described in Chapter 2), the largest on record within this watershed, was of hurricane origin.

CTDEP recently conducted a review of rainfall data for the Norwalk River Watershed for 1948 through 1996. An analysis of the 10 largest storms to affect the watershed showed that most of these storms had limited rainfall/flooding impact. In fact, since the 1955 flood, there has not been a flood above the 10-year frequency in this watershed.

As a result of the 1955 flood, Congress approved, in 1965, the Norwalk River Watershed Project (commonly referred to as a PL-566 project). The project, which was envisioned to encompass over 20,000 acres, included measures for watershed protection, flood prevention, and wetland wildlife habitat improvement. It recommended the creation of five detention dams and the construction of channels in Wilton. This project was to be carried out by CTDEP as the sponsoring organization, in cooperation with Ridgefield, Wilton, Redding, Norwalk, and the Fairfield County Soil and Water Conservation District. NRCS was to provide federal assistance.

To date, not all of the measures proposed in this project have been implemented. Two multi-purpose flood prevention and wildlife structures have been installed, one at Great Swamp in Ridgefield and the other at Spectacle Swamp on a tributary of Comstock Brook near the Wilton-Ridgefield town line. Both structures have a flash board weir structure at the low stage outlet to regulate the fish and wildlife pool water elevation. However, three structures remain to be completed, all of which face some construction obstacles. The largest remaining structure is Miller's Pond Dam in Ridgefield and Redding; at this site, Route 7 would have to be relocated before the dam could be built. Most of the land rights have been acquired to construct this dam. The second structure