

INTRODUCTION

The Importance of Long Island Sound

Long Island Sound is an estuary where salt water from the ocean mixes with fresh water from inland streams and rivers. Bounded by Connecticut and Westchester County to the north and Long Island to the south, it is approximately 110 miles long and up to 21 miles wide.

Like other estuaries, Long Island Sound had been blessed with an abundance of fish, shellfish and waterfowl. It provides feeding, breeding, nesting and nursery areas for a variety of fish and wildlife. Unlike other estuaries, though, Long Island Sound does not have only one connection to the sea. It has two. Many other estuaries have a major source of freshwater at their heads and a wide mouth that empties into the ocean. Long Island Sound, however, is open at both ends: through “The Race” at the eastern tip of Long Island and at the confluence of the East River and New York Harbor. Most of its freshwater comes from streams and rivers flowing into it from the north, such as the Connecticut and Housatonic rivers in Connecticut, and a series of much smaller streams and rivers that, cumulatively, contribute substantial amounts of freshwater to the Sound. These smaller watercourses include Stephenson, Pine, Blind and Beaver Swamp brooks, and Mamaroneck, Hutchinson, Mianus and Mill rivers in Westchester County. The Bronx River is a tributary of the Sound but first flows into the East River, which drains into the Sound.

The Sound is unique in the degree to which it provides recreational and commercial value to the region. It is in the midst of one of the most densely populated regions of the United States. More than eight million people live in the Long Island Sound watershed and millions more flock yearly to the Sound for recreation. Research commissioned by the joint state and federal Long Island Sound Study estimated that about \$5 billion is generated annually in the regional economy from boating, commercial and sport fishing, swimming and beach-going. The ability of the Sound to support these uses is dependent on its quality, living resources and habitats. Westchester’s economy also benefits from the Sound’s many other valuable uses, such as cargo shipping and boat excursions. With the uses it serves and the recreational opportunities it provides, Long Island Sound is among the most important estuaries in the nation.

While Long Island Sound is a demonstrable economic resource, there are other values that are less quantifiable. Natural habitats and good water quality contribute to residential property values. On another level, the Sound’s many attributes, aesthetic and otherwise, can inspire a special bond between people and the water.

The current value and quality of the Sound are partly the result of investments in water pollution control programs over the past 25 years since the passage of the Clean Water Act. These programs have led to measurable improvements in pollution control and water quality, despite ever-increasing numbers of people and activities on the Sound and within its watershed.

The Problem

Large areas of Long Island Sound are or have been impaired as habitat for fish, shellfish and other animals partly because of low dissolved oxygen levels called hypoxia. This condition is

largely the result of excessive amounts of nitrogen in the water, which produces excessive amounts of algae. The decay of this algae consumes oxygen.

The productivity of many freshwater and tidal wetlands, intertidal areas, and other habitats has been diminished by development and pollution. Streams that empty into the Sound often carry high amounts of nutrients and pollutants because of inland and coastal development. The degradation of habitat has had direct and indirect impacts on the regional economy and quality of life. Health advisories warn against eating too much Long Island Sound fish and shellfish, and the size of commercial and recreational fish catches has diminished over the past several years due to the need for better fisheries management, pollution, and loss of habitat. Beaches suffer periodic closures due to pathogen contamination and other pollutants.

Since 1985, New York and Connecticut governmental agencies, in conjunction with the U.S. Environmental Protection Agency and several non-profit organizations, have been cooperating to restore the Sound's health. Other agencies, such as the USDA-Natural Resources Conservation Service and a partnership called Coastal America, have since become involved in restoring the Sound.

The Long Island Sound Study (LISS) is a result of this cooperative effort and identified numerous threats to the Sound's future productivity and recreational viability. The study noted that a primary inhibitor to the Sound's health is excessive nitrogen and resulting low oxygen conditions.

The LISS is implementing a phased approach to reducing nitrogen loadings to the Sound. Phase I, announced in December 1990, called for a freeze on point and nonpoint sources of nitrogen loadings in critical areas of the Sound at 1990 levels. Phase II, approved in 1994, committed to low cost actions to begin to reduce the load of nitrogen below the 1990 freeze levels. Phases I and II were based on LIS 2.0, a two-dimensional water quality model, while work was completed on LIS 3.0, a more advanced model. LIS 3.0, a three-dimensional water quality model that better defines the area and duration of low dissolved oxygen conditions, has been used to guide the next phase of hypoxia management. Phase III, established in 1997, calls for nitrogen reduction targets to be set for each of 11 watershed management zones established around the Sound. Westchester County is in management zone 7.

As new regulations call for improved treatment of sewage effluent to curb point sources of nitrogen pollution, many communities, including Westchester County, are finding that treatment improvements can be difficult and costly. Due to these difficulties, alternative ways of reducing nitrogen levels must be sought. A more cost effective means of protecting water quality may be achieved through a combined pollution control strategy. Such a strategy addresses both "point" and "nonpoint" sources of nitrogen and other contaminants that threaten water quality. This type of approach addresses as many pollution sources as possible and will help protect the long-term health and recreational value of Long Island Sound.

Westchester County's Nonpoint Source Pollution Control Program

In response to the significant concerns raised by the Long Island Sound Study, in 1992 Westchester County formed the Citizen's Committee on Nonpoint Source Pollution in Long Island Sound. The Citizen's Committee consisted of elected officials and staff members of municipalities, representatives of the construction industry and building trades, members of the environmental community, and Westchester County staff. The Citizen's Committee was charged with making recommendations and proposing a combined pollution control strategy to reduce Westchester County's contribution of nonpoint source pollutants to the 16,000 square mile Long Island Sound watershed. The Citizen's Committee produced detailed findings and a plan in its "Report and Recommendations" in 1993 to reduce pollution and improve water quality in Long Island Sound. This report addresses point source pollution controls, biological and structural nonpoint source pollution controls, institutional and land use controls, education, and financing. Overall, the Citizen's Committee made 33 recommendations to address point and nonpoint source pollution, which were accepted and approved by the County Executive and Board of Legislators with the understanding that, if implemented, these recommendations would result in improved water quality in Westchester's streams, rivers, ponds, lakes, groundwater, wetlands, and ultimately, Long Island Sound.

To implement the recommendations made by the Citizen's Committee, a Committee on Nonpoint Source Pollution in Long Island Sound was formed. In 1993, the Westchester County Department of Planning, in conjunction with this committee, began implementing the 33 Citizen's Committee recommendations for Long Island Sound. In 2000, the committee became the Committee on Nonpoint Source Pollution, and began examining nonpoint source pollution issues throughout Westchester County. Westchester County Executive Andrew Spano also formally pledged his support to improving water quality in the county. He formed a Water Quality Council administered by the county Department of Planning, which will coordinate and continue the county's water quality protection efforts.

The Committee on Nonpoint Source Pollution and county Department of Planning, and participating municipalities, have embraced the ongoing cooperative municipal-county venture to develop and implement cost-effective local programs that emphasize the following categories: natural resources protection and restoration, stormwater management, land use planning and regulations, and education and outreach.

As a result of this venture, efforts are being planned and executed to improve water quality in the Sound. For example, management plans have been completed for the joint municipal-county Watershed Advisory Committees (WACs) 3 and 5. A host of recommendations made by these plans have been implemented; others are being strongly considered. Stream and wetland restoration projects aimed at improving water quality and habitat have been completed, and others are being designed or planned. Several municipalities have changed or added ordinances to better protect water quality. The county is upgrading its sewage treatment plants in the Long Island Sound watershed, and education and outreach programs, such as volunteer monitoring and the publication of informational products, are helping to educate the public about water quality issues.

Watershed Planning

Westchester County and many municipalities have recognized the need to identify threats to Long Island Sound and address these threats by implementing strategies to reduce nonpoint source pollution. An intermunicipal watershed planning approach was identified by the Committee on Nonpoint Source Pollution as the best method to address these threats. Watershed planning is a comprehensive planning process that, in part, assesses the balance between resource protection and economic development based on natural drainage patterns rather than municipal boundaries. This requires an examination of development patterns or other land use changes having a direct influence over water quality and other natural features. In Westchester County, individual municipalities govern land use changes and development patterns. However, the nature of water is such that water quality problems do not follow municipal boundaries. Pollutants enter streams and rivers and then travel along these systems to their final destinations, most likely a water body such as Long Island Sound. Along the way, the pollutants may flow through several villages, towns and cities. Therefore, it is important to establish geographic boundaries based on hydrology rather than traditional municipal bounds. A hydrologic boundary requires cooperation and coordination among local governments, especially since municipalities may have different land use goals and strategies, to govern land use changes and development patterns within the entire watershed area.

The Watershed Management Approach

The watershed management process includes a series of steps: planning, assessment, evaluation, and implementation. The planning phase focuses on managing objectives and deciding what needs to be accomplished. This phase is largely dedicated to selecting actions that will tackle the most critical and feasible objectives. When the planning phase is complete, a general list of critical resources and possible management techniques will result. Each of these resources and techniques will be assessed to quantify and document a watershed's current conditions. Watershed assessment also involves careful analysis of water and other natural resources and potential stresses, such as land development. The evaluation phase identifies which management strategies will be effective in protecting and/or restoring a watershed's health. The implementation of these management techniques provides an opportunity to change land use and development patterns, as well as environmental protection efforts, and to determine whether or not the implemented strategies are working. Specific management practices can be implemented to correct pollution problems and specific regulatory controls can be introduced or revised to ensure pollution reduction. Watershed planning provides a solid framework to reduce both point and nonpoint sources of pollution and ensure the long-term health and recreational viability of the Long Island Sound watershed in Westchester County.

The Nature of Westchester's Long Island Sound Watershed

The Long Island Sound watershed in Westchester County covers nearly 70,000 acres and supports about half of the county's population. This area and population does not include the Bronx River watershed, which indirectly flows into the Sound. Between the northern and southern portions of the Long Island Sound watershed in Westchester County, there are drastic demographic and land use differences. The northern portion is less developed and less populated than the urbanized southern portion. The table below provides a comparative analysis of the land use differences between the northern and southern portions of the watershed. The largest

difference between the two is in the amount of undeveloped land (approximately 6,889 acres in the north and 847 acres in the south) and in the total amount of commercial, retail, office and mixed use land coverage (approximately 412 acres in the north and 3,002 acres in the south).

**LONG ISLAND SOUND WATERSHED LAND USE SUMMARY
(SELECT CATEGORIES)**

LAND USE TYPE	NORHTERN WATERSHED AREA (ACRES)	SOUTHERN WATERSHED AREA (ACRES)	TOTAL WATERSHED AREA (ACRES)
Undeveloped Land	6,889	847	7,736
Open Space (Public and Private)	2,893	7,502	10,395
Commercial/Retail/Office/Mixed Use	412	3,002	3,414
Residential	14,890	23,628	38,518

Nineteen Westchester County municipalities in 10 subwatersheds of the county’s larger Long Island Sound watershed contribute drainage to the Sound. To effectively plan for and manage this watershed, the Long Island Sound drainage basin in Westchester County was divided into six subwatershed study areas as noted in the table below. A nonpoint source pollution control plan will be developed for each of these study areas to: 1) prevent an increase in nitrogen and related nonpoint source pollution to the Sound; and 2) implement strategies to reduce existing pollution within the Sound’s watershed.

SUBWATERSHEDS OF LONG ISLAND SOUND

WAC #	SUBWATERSHEDS	MUNICIPALITIES
1	Silvermine, Mill and Mianus Rivers	Bedford, Lewisboro, North Castle, Pound Ridge
2	Byram River	Bedford, New Castle, North Castle, Port Chester
3	Blind, Beaver Swamp, and Brentwood Brooks, and Milton and Port Chester Harbors	Harrison, Mamaroneck (Village), Port Chester, Rye Brook, Rye City
4	Mamaroneck and Sheldrake Rivers, and Mamaroneck Harbor	Harrison, Mamaroneck (Town and Village), New Rochelle, Scarsdale, White Plains
5	Pine, Stephenson, and Burling Brooks, and Larchmont Harbor	Mamaroneck (Town and Village), Larchmont, New Rochelle, Pelham, Pelham Manor
6	Hutchinson River	Eastchester, Mount Vernon, New Rochelle, Pelham, Pelham Manor, Scarsdale

Watershed Advisory Committees

Six intermunicipal Watershed Advisory Committees (WACs) have been formed in the county's Long Island Sound watershed; each representing a specific study area of the watershed in Westchester County. Municipalities in these study areas were asked to designate a qualified representative or representatives to their respective WAC(s). These representatives, with administrative and technical support from the County Department of Planning, are working together to develop local implementation programs that will reduce nonpoint source of pollution.

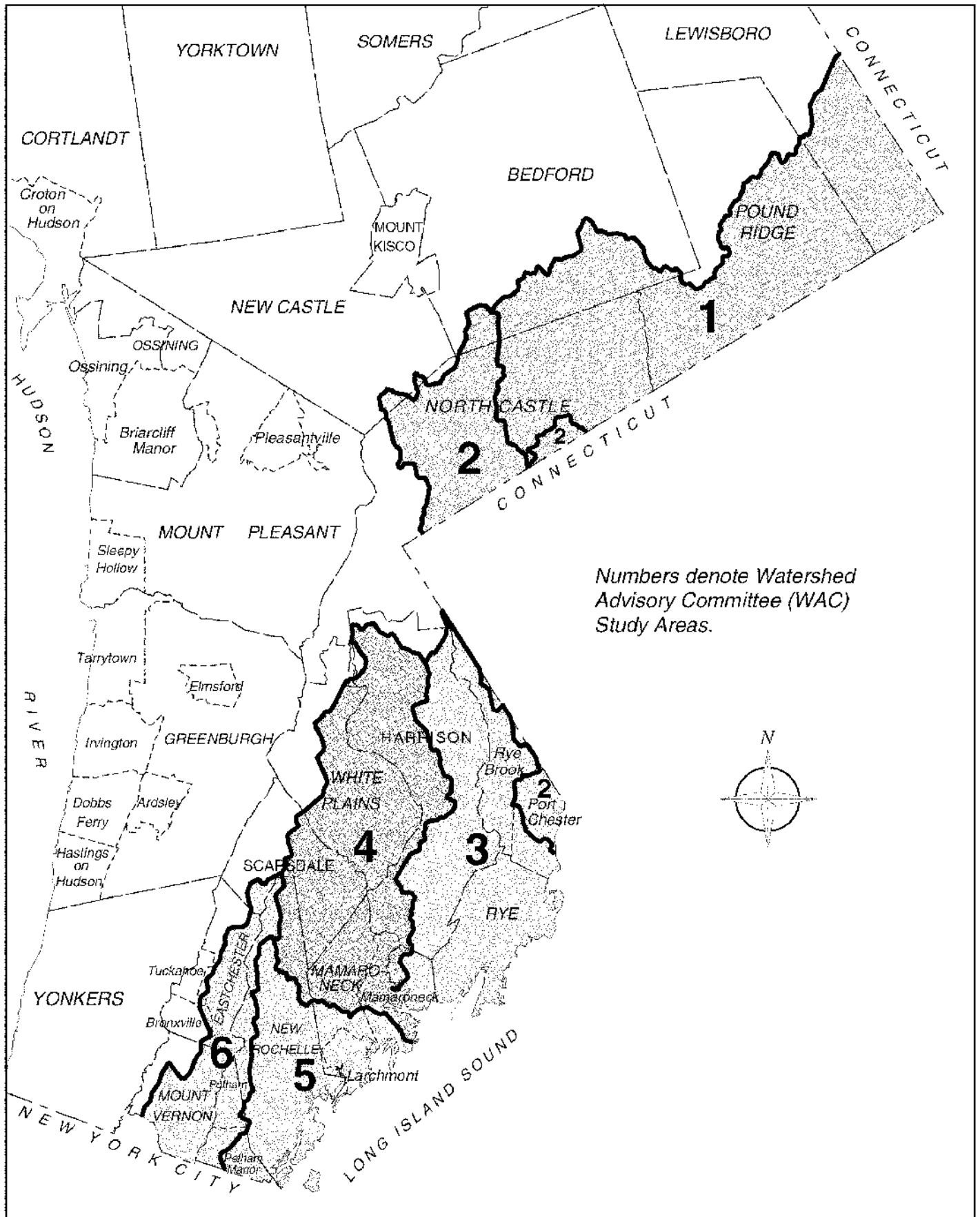
Watershed Advisory Committees are essential to Westchester County's watershed planning approach. The WACs were created to foster a cooperative relationship between all municipalities in each of their study areas and to recognize the importance of developing locally acceptable nonpoint source pollution control plans. Targeted land use measures, local ordinances, structural and vegetative best management practices, and education are most effective when implemented at the local level.

Elements of the Long Island Sound Watershed Process

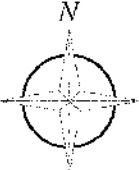
The first phase in the development of plans to control nonpoint source pollution, or polluted stormwater, in Long Island Sound, consists of a natural resource and land use inventory of the study area. An objective of this inventory is to map and identify: (1) zoning and land uses; (2) open space; (3) wetlands and hydrography; (4) flood plain, wetland and watercourse buffers; (5) existing stormwater facilities; and (6) golf courses. Another goal is to identify potential resource protection and restoration measures and potential best management practices. These inventories will be the base line for developing each nonpoint source pollution plan.

The second phase consists of assessing the natural features and existing water pollution control measures in the study area and assessing existing local ordinances related to water quality protection. The natural features assessment primarily focuses on streams and wetlands and identifies protection and restoration opportunities. Stormwater management practices, such as stormwater wetlands, are assessed and prioritized for potential water quality retrofit activities. A survey of local ordinances provides a comparison of water quality protection measures with minimum standards to ensure consistency throughout the watershed study area. Particular attention is paid to wetland, stormwater, and erosion and sediment control ordinances. Recommendations pertaining to new and/or amended regulations for each municipality are then drafted.

The final phase of the watershed planning process is to prioritize and make recommendations to protect and restore natural features and, where needed, to change and/or strengthen local comprehensive plans and ordinances. Also included are potential outreach and education strategies, as well as a list of potential funding opportunities to assist municipalities in implementing projects and programs to benefit water quality. It is important to recognize that continuous outreach and education plays a large part in controlling nonpoint source pollution. Public outreach and education should happen throughout the various stages of any watershed plan and long after its recommendations have been set forth and implemented. Planning and assessing a watershed can only be effective if the people who live, work and play in the watershed understand water quality issues, problems and their related causes.



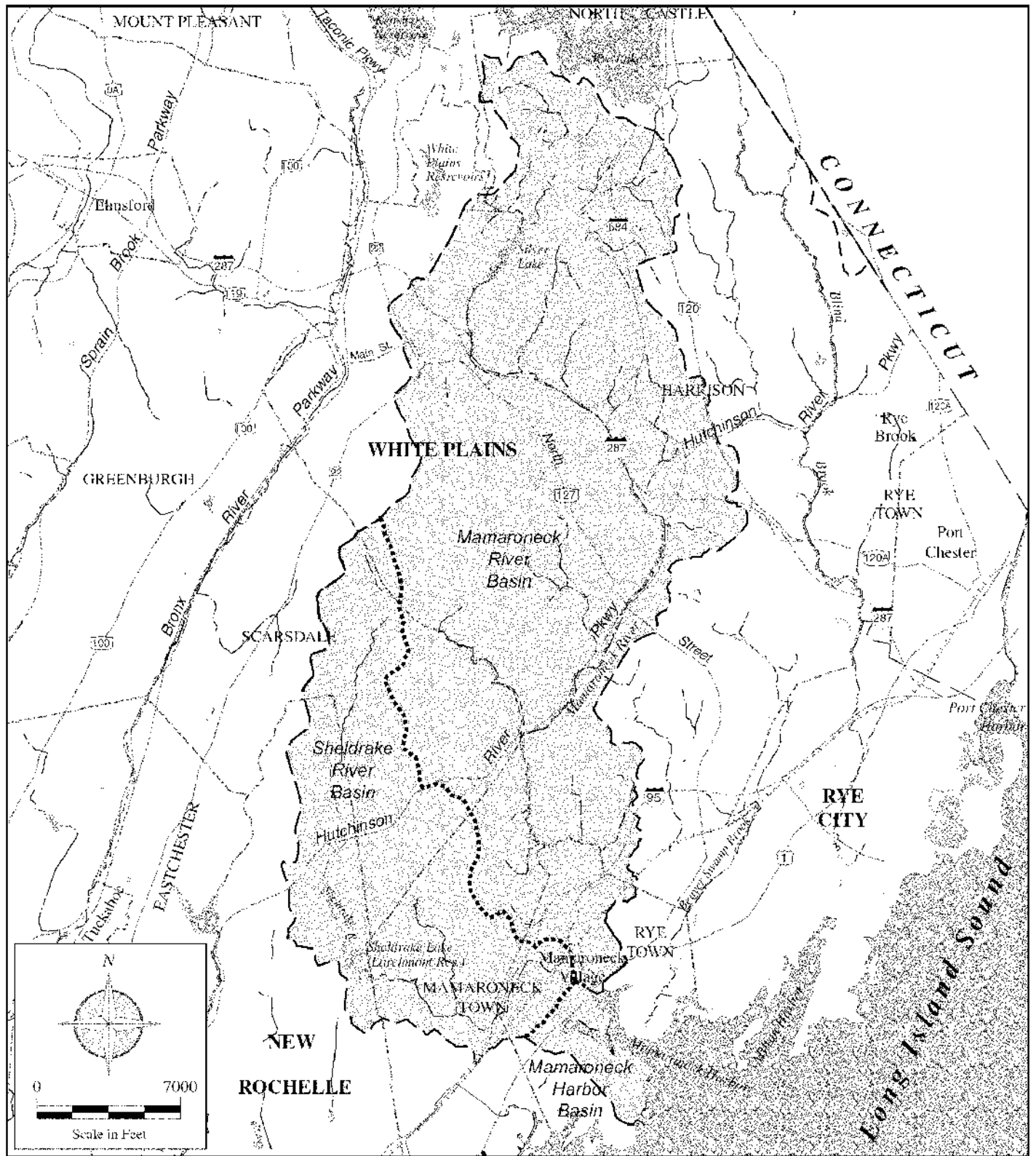
Numbers denote Watershed Advisory Committee (WAC) Study Areas.



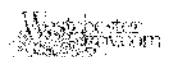
MAP 1
**Long Island Sound
 Watershed Advisory Committees**

Westchester County
 Andrew J. Spano
 County Executive

Department of Planning
 Joyce M. Lannert
 Commissioner



MAP 2
Study Area
Watershed Advisory Committee 4
 Sheldrake River, Mamaroneck Harbor & Mamaroneck River Watersheds


 Andrew J. Spano
 County Executive

Department of Planning
 Joyce M. Lannert
 Commissioner

As part of Westchester County's Nonpoint Source Pollution Control Program, the County and Manhattan College have completed a water quality monitoring study, funded by a federal grant administered through the New York State Department of Environmental Conservation. The monitoring determined nutrient loads (nitrogen and suspended solids) delivered to Long Island Sound from two watersheds in Westchester County via the Mamaroneck River and Blind Brook. Using the LISS's LIS 3.0 Model, this monitoring data can be extrapolated to the entire Long Island Sound watershed in Westchester County to determine base line conditions for nonpoint sources of pollution entering the Sound from the county.