New Jersey 1988
State Water Quality Inventory Report

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION • DIVISION OF WATER RESOURCES

New Jersey 1988 State Water Quality Inventory Report

A Report on the Status of Water Quality in New Jersey Pursuant to the New Jersey Water Pollution Control Act and Section 305(b) of the Federal Clean Water Act

State of New Jersey
Department of Environmental Protection
Division of Water Resources
Bureau of Water Quality Planning
Trenton, New Jersey

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Cover Art

Misty Morning, an original watercolor painting by Keith R. Jones of Trenton, New Jersey is presented on the front cover. The Department appreciates Mr. Jone's willingness to allow the use of his painting for this report.

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"Rivers have what man most respects and longs for in his own life and thought - a capacity for renewal and replenishment, continual energy, creativity, cleaning."

John M. Kauffmann

Flow East

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Executive Summary

CHAPTER I.

Executive Summary

A. Purpose

The New Jersey 1988 State Water Quality Inventory Report is an assessment of current water quality conditions in the State's major rivers, lakes, estuaries, and ocean waters. In addition, the report describes which waters are attaining state designated water uses and national clean water goals; the pollution problems identified in surface waters; and the suspected and known sources of water pollution. Two statewide assessments required by the Water Quality Act of 1987 are also included, a determination of waters impacted by nonpoint sources of water pollution; and a listing of waters where toxics are suspected or known to be elevated because of wastewater discharges.

This report is prepared every two years pursuant to Section 305(b) of the federal Clean Water Act and is the eighth in a series of state water quality inventory reports since 1975. Five chapters are included in this report; they include:

I. *Executive Summary*
II. *Introduction and Background*
III. *Surface Water Quality in New Jersey*
IV. *Ground Water Quality in New Jersey*
V. *New Jersey's Water Quality Management Programs*

B. Principal Findings

The following major conclusions and findings from the 1988 State Water Quality Inventory Report are grouped by chapter.

Chapter II - *Introduction and Background*

- New Jersey has 6,450 miles of rivers, 24,000 acres of public lakes, 900,000 acres of freshwater and tidal wetlands, 120 miles of ocean coast line and 420 square miles of open estuarine waters. New Jersey had 7.4 million residents in 1980.

- Freshwaters of the State should be able to support primary contact recreation, and the maintenance and propagation of natural and established biota (clean water goals). Most estuarine and ocean waters should also meet these uses, as well as for shellfish harvesting. However, certain inter-state waters between New Jersey and New York, and New Jersey and Pennsylvania do not have to have sufficient water quality for these uses.

Chapter III - *Surface Water Quality in New Jersey*

- The report uses two assessment methodologies to evaluate water quality and pollution sources: monitored assessments (based on actual in-stream monitoring) and evaluated assessments (based on professional judgement, land uses, known pollution sources, and other non-water quality information).

- Water quality has been assessed in nearly 1900 freshwater stream miles (only 740 estimated miles are monitored); public lakes (all public lakes are evaluated but not monitored); 620 square miles of estuarine waters (almost all monitored); and 430 ocean square miles (mostly monitored).

- Approximately 31 percent of New Jersey monitored freshwater rivers and streams meet both the swimmable and fish propagation/ maintenance clean water goals. Of these 227 miles which meet both goals, 136 (or 60 percent) are the Delaware River alone. The fishable goal is supported in 78 percent of the assessed waters, while 17 percent partially support the goal and 5 percent do not support it. Sixty three percent of monitored freshwaters are not swimmable.

- All of New Jersey's public lakes are classified to be threatened for attainment of

Chapter II

Introduction and Background

CHAPTER II

Introduction and Background

A. Introduction

The New Jersey 1988 State Water Quality Inventory Report is the eighth in a series of State Water Quality Inventory Reports that have been prepared by the New Jersey Department of Environmental Protection (NJDEP) since 1975. The State Water Quality Inventory Report is due every two years, and is prepared pursuant to Section 305(b) of the federal Clean Water Act (P.L. 95-217). The Report, commonly referred to as the 305(b) report, addresses the following issues:

- *The quality of the State's surface waters.*

- *An analysis of the extent to which surface waters will attain the fish propagation and maintenance and swimmable goals of the Clean Water Act, and the designated uses outlined by the State.*

- *A description of water pollution sources that are adversely affecting water quality.*

- *The actions that are necessary to improve water quality in the State's waters so that clean water goals are achieved, and the estimated costs of such actions.*

The State Water Quality Inventory Report serves two major functions. First, it is the main public reporting document produced by the NJDEP that describes water quality conditions, trends or changes, and whether progress is being achieved in meeting designated uses and clean water goals. Second, the report notifies Congress on what is necessary to clean our waters. New Jersey's report is incorporated into a National Water Quality Inventory Report by the United States Environmental Protection Agency (USEPA), and is then submitted to Congress. The report, therefore, is instrumental in shaping national policy regarding water pollution control mandates and priorities. This report also has much value to the State's citizens and interested public as an information source on water quality conditions and water pollution sources.

The 1988 State Water Quality Inventory Report serves as the initial submittal of certain information required by the Federal Water Quality Act of 1987. This includes an assessment of the severity and extent of nonpoint source pollution in the State, including a listing of waters suspected of being impacted by nonpoint sources; and a preliminary identification of waters affected by toxic pollutants originating from point sources. Both of these assessments will be used as a basis for further investigation on the subject, and in the development of water quality management programs. This year's 305(b) report also contains an expanded fisheries analysis based on waterbody characterizations performed by the NJ Division of Fish, Game and Wildlife. Finally, the report summarizes water quality data from the period 1983 to 1987 with the water quality index introduced in the 1986 report.

The 1988 State Water Quality Inventory Report contains five chapters. Besides Chapter I - Executive Summary, and Chapter II - Introduction and Background, they are: Chapter III - Surface Water Quality in New Jersey, Chapter IV - Ground Water Conditions in New Jersey, and Chapter V - New Jersey's Water Quality Management Programs. The information provided in this report, as well as its general layout, has been designed to follow USEPA's <u>Guidelines for the Preparation of the 1988 State Water Quality Assessment.</u> Much of the narrative in this report was originally prepared for the 1986 report, and has been updated accordingly.

Chapter III - Surface Water Quality in New Jersey presents major conclusions regarding the quality of the State's waterways, and summarizes water quality conditions in the State's major rivers and streams between 1983 and 1987. The quality of the

State's lakes, estuaries and ocean waters are assessed in this chapter, including the percentage of each type of waterbody that will meet the fish propagation/maintenance and swimmable clean water goals and State designated uses. Causes of nonsupport of designated uses are reviewed along with a preliminary listing of waters suspected of being degraded by nonpoint sources. The results of the preliminary determination of waters impacted by toxics, as required by the new Water Quality Act of 1987, is also included in this chapter. In addition, Chapter III contains detailed waterbody specific information in the Water Quality Inventory, which is an assessment of the water quality, pollution sources, and use support determination for approximately 50 streams throughout the State and interstate waters. Finally, a section discussing the States concern over ocean water quality is presented in this chapter.

Chapter IV - Ground Water Conditions in New Jersey is a discussion of groundwater quality and quantity conditions in the State and current management efforts for the resource. This chapter is designed to update information on ground waters provided in previous 305(b) reports.

The State's water quality management activities for the control of both point and nonpoint sources are presented in Chapter V - New Jersey's Water Quality Management Programs. Successes and highlights from these management programs are described, as are our needs (projected to the year 2000) for improving municipal wastewater treatment. This chapter also contains a description of monitoring activities and results of the updated Surface Water Rating System which was discussed in the 1986 305(b) report. The rating system has been used to prioritize certain pollution control activities in the State. Recommendations for further achievement of the Clean Water goals and designated use are also presented in this chapter.

This report has been prepared by the Bureau of Water Quality Planning of the Planning and Standards Element, Division of Water Resources, NJDEP. In addition, numerous offices throughout the Division, Department and local government contributed information utilized in the report's preparation. The information collected has been designed to supplement the water quality data presented so that designated use and goal assessments, in-stream conditions, and pollution sources can be better understood and identified.

The New Jersey 1988 State Water Quality Inventory Report incorporates much information from other state agencies and local agencies in order to describe the potential extent and severity of nonpoint source pollution, and the quality of in-stream conditions. This will serve as the basis for further study and should provide a better understanding of stream conditions in the State. Maintaining a relationship with these agencies is necessary for future nonpoint source and water quality management work.

B. Background

New Jersey, despite being the fourth smallest state in the nation, contains a wide variety of land use types, water resources, geologic characteristics and natural biota and fauna. Within the State's 8,204 square miles are sections of the Appalachian Mountains, 120 miles of coastline, large cities and industrial centers, rich crop-producing lands and a largely undeveloped Pinelands region. New Jersey has approximately 6,450 miles of rivers and streams, and 24,000 acres of lakes and ponds. In addition, there are 1400 square miles of fresh and saline marshes and wetlands, and 420 square miles of open estuarine waters.

There are five major drainage basins in the State. The largest is the Delaware River Basin (3000 sq. miles), followed by the Atlantic Coastal Basin (approximately 2000 sq. miles), the Passaic/Hackensack Basin (1200 sq. miles), the Raritan River Basin (1100 sq. miles) and the Wallkill River (210 sq. miles), which drains to the Hudson River in New York State. Figure II-1 shows these basins and the many smaller watersheds within

TABLE II-1 NEW JERSEY GEOGRAPHIC ATLAS

State Surface Area	7,486 sq. miles
State Population (1980)	7.365 million
Major River Basins	Delaware, Passaic/Hackensack, Atlantic, Raritan and Wallkill
River Miles	6,450*
Border River Miles	310*
Number of Public Lakes/Reservoirs/Ponds	380*
Acres of Public Lakes/Reservoirs/Ponds	24,000*
Square Miles of Estuaries/Bays	420 (open waters)
Ocean Coastal Miles	120
Acres of Freshwater Wetlands	661,000*
Acres of Coastal/Tidal Wetlands	243,000*

* Approximate Figure

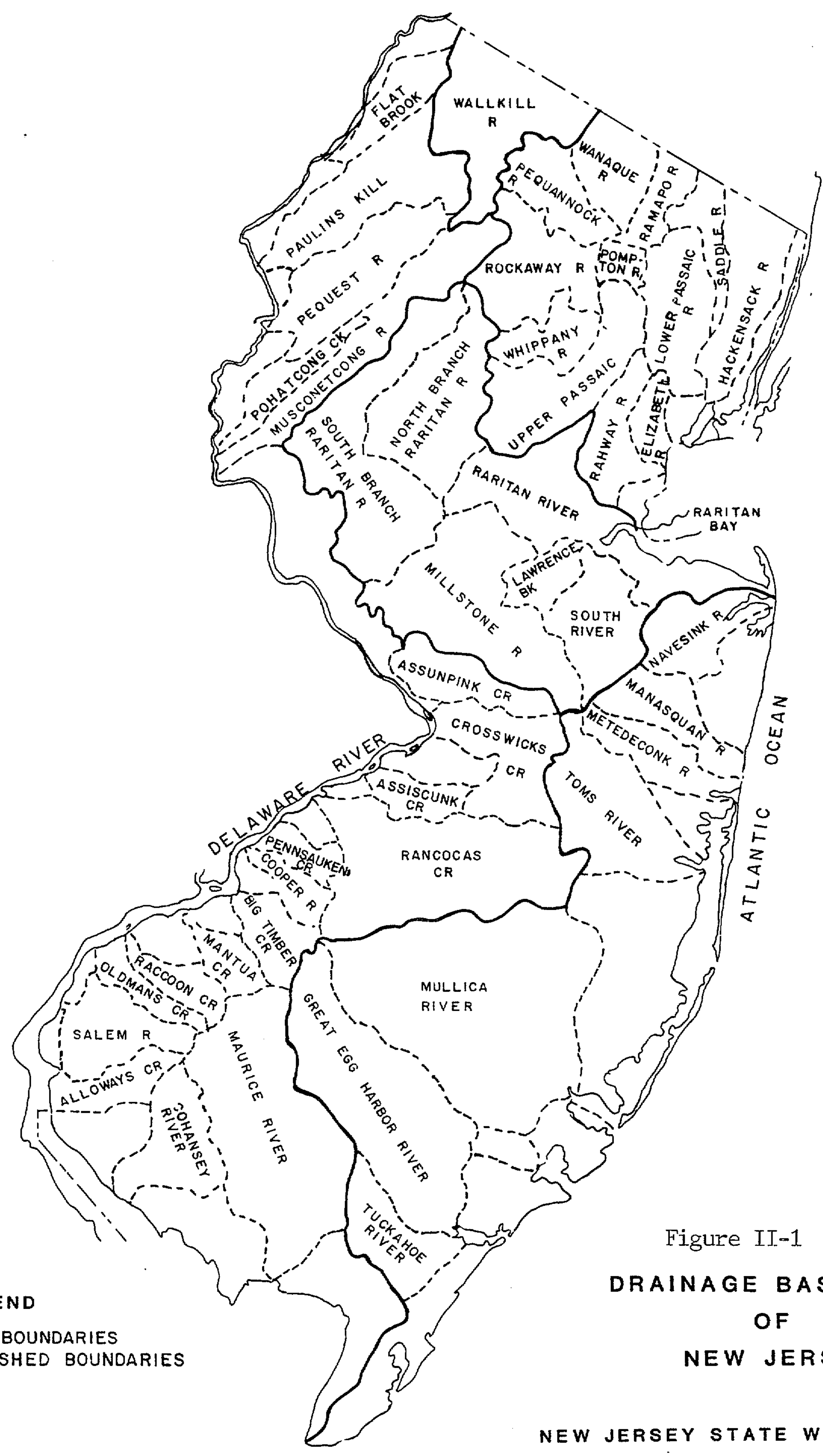

Figure II-1

DRAINAGE BASIN MAP OF NEW JERSEY

NEW JERSEY STATE WATER QUALITY INVENTORY REPORT

LEGEND

——— BASIN BOUNDARIES
------- WATERSHED BOUNDARIES

of the State: Delaware Bay as the southern border, Delaware River as the western border and the Atlantic Ocean, Raritan Bay, Arthur Kill, Kill Van Kull and Hudson River as the eastern boundary.

The waters of New Jersey are heavily influenced by the land uses and population centers in the State. In 1980, New Jersey had a population of slightly over 7.3 million people. By the year 2000, the NJ Department of Environmental Protection estimates that the State's population will climb to over 8.5 million. Although New Jersey is the most densely populated state in the nation, the State's population is not equally distributed. Densities are greatest in the regions surrounding New York City and Philadelphia, and along the northern Atlantic Coast. Many scattered towns and cities are found throughout the remainder of the State. Most watersheds in the State flow through a variety of land uses, usually within short distances. Generally, streams and rivers originate in rural, undeveloped and agricultural lands before entering suburban/urbanized areas.

Accurate figures on the percentage of the various land uses that currently exists in New Jersey are not available. Undeveloped forests and other vacant lands are still the predominant land uses in the State. The remainder is divided fairly equally between agricultural, suburban and urban (including industrial) uses. Many areas of New Jersey have been undergoing extensive and rapid growth during the past five years. This growth consists of light industry/corporate centers, commercial facilities and suburban development. The development, encouraged by a favorable economy and improved transportation corridors, is encroaching upon prime agricultural and vacant lands in most of northern and central portions of the State, in the northern coastal counties, and in the southern Delaware River drainage area near Philadelphia.

Waterfront development and redevelopment is also occurring in an intense manner in New Jersey. Along the Lower Hudson River and the Delaware River, former piers and docks are being converted to commercial and residential centers. In older urban cities, redevelopment along available waterways is serving as the basis for entire urban renewal projects. Vacant buildable space along the State's coast and estuaries/bays is rapidly diminishing. Inland, lakefront property or land near lakes is in prime demand.

New Jersey's surface waters are utilized for a variety of purposes. Water diversions are so great that the State's three largest rivers, the Delaware, Passaic and Raritan Rivers, all have passing flow requirements. Diversion of stream flow for potable water supply, industrial process and cooling purposes, agricultural irrigation, and maintenance of reservoir/impoundment water levels is common throughout the State. NJDEP's Bureau of Water Allocation, as mandated in the State Water Supply Management Act (N.J.S.A. 58A:1 et. seq.), requires water diversion permits for all withdrawals of more than 100,000 gallons per day. As of April 1988, allocations have been issued in amounts of approximately 2,700 million gallons per day (mgd) for potable supply, 1,100 mgd for agricultural use, and nearly 6,000 mgd for industrial purposes.

Surface waters also serve as an important foundation for recreation in the State. NJDEP (1984) estimates that combined peak day demand for swimming, motor boating and fishing in New Jersey in 1980 was 2,959,986 activity days. Freshwater swimming composed 40 percent of the total, saltwater swimming 47 percent, freshwater boating and fishing 3 percent, and saltwater boating and fishing 10 percent. By the year 2000, the combined peak day demand for these activities is expected to be over 3,550, 000 activity days (NJDEP, 1984). Overall, swimming is the second most popular outdoor recreation activity in the State; fishing is seventh and motor boating is seventeenth. Maintenance and improvement of water quality in the State is critical from a recreational standpoint. As recreational demand increases, so will our demand for clean water.

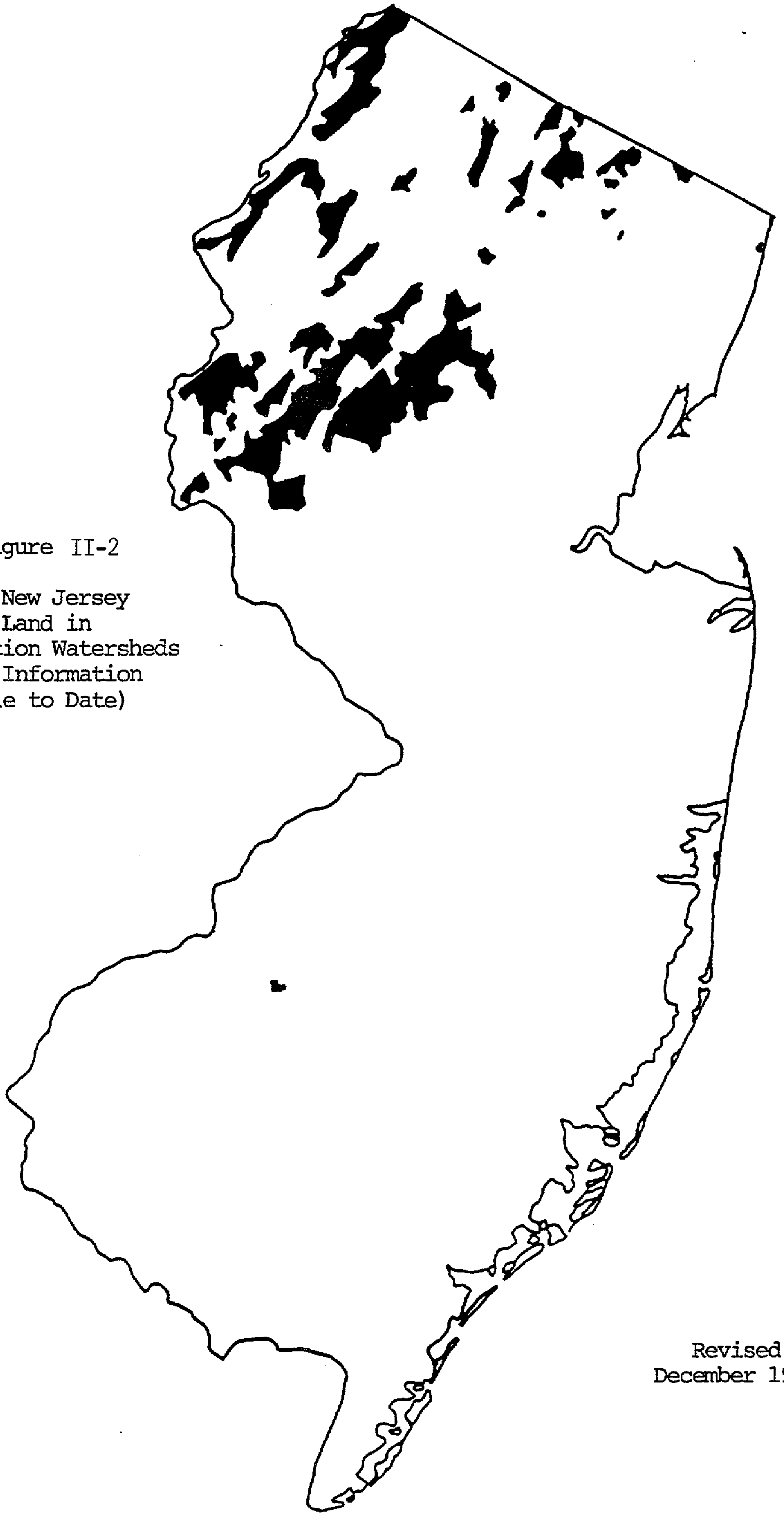

Figure II-2

Areas of New Jersey
With Land in
Trout Production Watersheds
(Based on Information
Available to Date)

Revised
December 1987

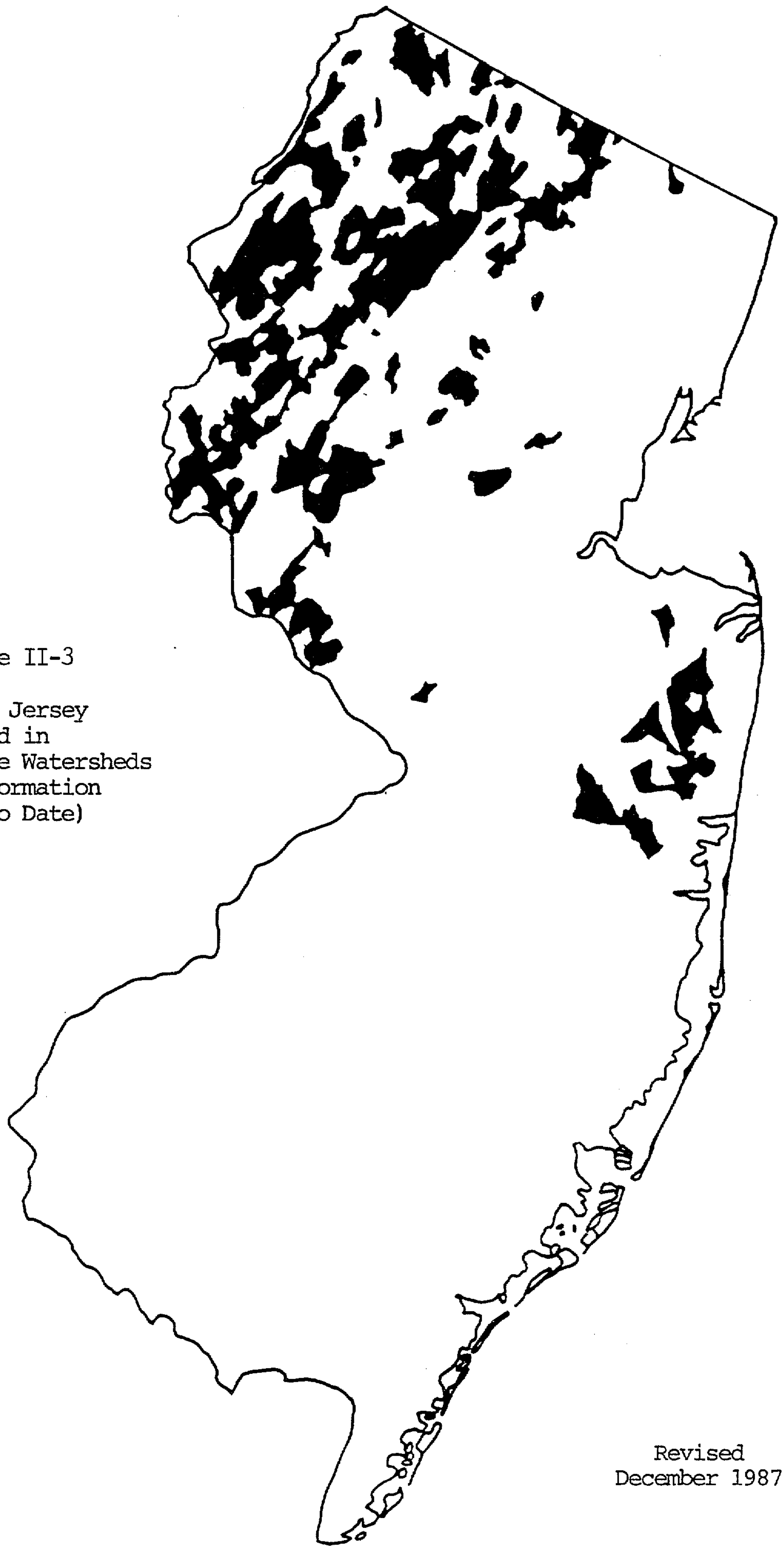

Figure II-3

Areas of New Jersey
With Land in
Trout Maintenance Watersheds
(Based on Information
Available to Date)

Revised
December 1987

A variety of aquatic habitats are found throughout New Jersey. Freshwaters vary from cool trout waters in northern New Jersey, to acidic Pinelands streams in southern areas of the State. Tidal streams and rivers, along with coastal bays and estuaries, are used by anadromous fish, and various ocean fishes migrate past and through the State's coastal waters. Figures II-2 and II-3 show the extent of Trout Production and Trout Maintenance waters in the State as outlined in New Jersey's Surface Water Quality Standards (N.J.A.C. 7:9-4.1 et. seq.) (NJDEP, 1983 and 1985). The remaining freshwaters of the State are classified as Nontrout, meaning that warm water fish predominate. The NJ Division of Fish, Game and Wildlife also stocks sport fishes in many streams and lakes. Both trout species and warm water lake fishes are stocked annually.

New Jersey's estuarine and coastal waters also contain viable commercial shellfisheries. The health of this resource is especially dependent upon clean waters. Disruption of shellfish beds by dredging and siltation combined with bacterial pollution has threatened the ability of the shellfish to reproduce and grow. This has hindered or prevented harvesting. New Jersey's environmental protection efforts have made maintenance of this resource a statewide priority.

C. Water Classifications and Designated Uses in New Jersey

In New Jersey, all surface waters have been assigned a set of "designated uses" that the waters should be able to support throughout the year. These designated uses are defined in the State's Surface Water Quality Standards regulations and are generally based on a set of numeric and narrative water quality criteria (NJDEP, 1985). In most areas of the State, the designated uses correspond to the swimmable and fish propagation and maintenance goals of national clean water legislation. The swimmable goal is intended to have all possible surface waters be of sufficient quality to allow for primary contact recreation. The fish propagation and maintenance (fishable) goal is designed to have all possible waters supporting healthy and reproducing aquatic biota (usually both indigenous and introduced).

All freshwaters of New Jersey are assigned designated uses that reflect the national clean water goals (except for freshwater tidal portions of the Delaware River tributaries from Rancocas Creek to Big Timber Creek inclusive). Certain tidal and estuarine saline waters of the State are classified for less than these goals. SE-2 (Saline estuarine) waters only have to meet water quality criteria for secondary contact recreation, while SE-3 waters only have to allow for secondary contact recreation and the maintenance/migration of fish (not propagation). Waters in New Jersey assigned SE-2 and SE-3 classifications are found in the urbanized northeast and the Philadelphia/Camden region. They include the tidal Passaic, Hackensack, Elizabeth and Rahway Rivers, and specific tidal tributaries to the Delaware River from Big Timber Creek to Oldman Creek. All interstate waters between New Jersey and New York do not have to meet clean water goals, as defined by the Interstate Sanitation Commission. This is also true for the Delaware River from mile point 118 downstream to mile point 60, based on criteria established by the Delaware River Basin Commission.

Anti-degradation policies apply to all surface waters of the State. Existing uses must be either maintained or protected, and no irreversible changes to water quality are allowed that would impair or preclude attainment of designated uses. Waters classified as nondegradation waters must be maintained in their natural state, and are not to be subject to any manmade wastewater discharges.

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Ibid. 1984. Outdoor Recreation Plan of New Jersey. Green Acres Program; Trenton, New Jersey.

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Chapter III

Surface Water Quality in New Jersey

CHAPTER III.

Surface Water Quality in New Jersey

A. Introduction

This chapter presents a review of current water quality conditions in New Jersey's streams, rivers, lakes, estuaries and ocean waters. The types of pollutants found in the State's surface waters, and known and potential cources of these pollutants are also discussed. A determination of waters that are achieving State designated uses and the national clean water goals is presented.

Chapter III is divided into nine sections.. Besides this introduction, sections include: B. River and Stream Quality, C. Lake Quality, D. Estuarine and Ocean Water Quality, E. New Jersey's Nonpoint Source Assessment, F. New Jersey Waters Impacted by Toxic Substances Originating From Point Sources, G. The Condition of New Jersey's Ocean Waters - A Special State Concern, H. Recommendations and I. Water Quality Inventory. Sections B-E are designed as Statewide summaries, utilizing the more detailed information provided in section I. Water Quality Inventory.

Assessment Methodologies

This State Water Quality Inventory Report uses two main assessment methodologies, monitored and evaluated, to determine the quality of surface waters and sources impacting them. The US Environmental Protection Agency (USEPA) defines these terms as follows:

Evaluated waters are those waterbodies for which the assessment is based on information other than current site-specific ambient data, such as data on land use, location of known or potential sources, predictive modeling using estimated input variables, surveys of fisheries personnel, citizen complaints, and best professional judgement.

Monitored waters are those waterbodies for which the assessment is based on current site-specific ambient water quality data (USEPA, 1987).

Prior NJ State Water Quality Inventory Reports were based primarily on monitoring information with limited use of best professional judgement and other non-water quality data assessments. However, the USEPA is encouraging the states to report on as many waters as possible and to use all available sources of water quality-related information. As a result, expanded utilization of fisheries surveys and questionnaires has taken place for this report. These new evaluations serve as the basis for the nonpoint source assessments and determination of waters achieving the fish propagation and maintenance use. A more detailed description of assessment methodologies is presented in the introduction to Section I. Water Quality Inventory.

This State Water Quality Inventory Report assesses water quality, fish communities, and pollution sources in over 60 major rivers and streams, plus numerous smaller tributaries. The State's larger estuarine waterways and ocean waters are also reviewed. Limited information on lake quality is available because minimal monitoring and evaluation has been conducted recently. The primary source of monitoring data used for assessing freshwater river and stream quality are the State and federal ambient stream water quality monitoring networks. This includes approximately 115 monitoring locations across the State, all located in freshwaters.

A host of water quality and pollution indicators are analyzed at each site. Indicators used in this report to characterize water quality conditions include: stream temperature, dissolved oxygen (concentration and percent saturation), biochemical oxygen demand, pH, fecal coliform, total phosphorus, nitrogen-containing compounds (ammonia, nitrite-nitrate and total Kjeldahl nitrogen), total dissolved solids, and metals (lead, mercury, cadmium and copper). Combined these indicators can present a picture of a stream's condition at the particular time of sample collection. However, the stream environment is dynamic; what is found in a stream one day, may or may not be found the next day, or in much different levels.

The results of monitoring activities were also utilized in characterizing estuarine and ocean water quality. These activities consist of shellfish harvesting water classification monitoring, summer-time bay and ocean beach sampling, bay and ocean phytoplankton monitoring, and EPA's summer ocean monitoring program. The interstate agencies also perform monitoring of their respective waters. Other monitoring activities used to assess surface waters were intensive surveys (usually for wasteload allocation and enforcement purposes), and special studies.

As mentioned above, evaluated assessments were also used to determine general water quality conditions and potential pollution sources. Evaluations of the fish communities and their health were performed by biologists in the NJ Division of Fish, Game and Wildlife. These evaluations served as the prime determinant of which waters support fish propagation/maintenance uses and goals. Information from county planning agencies, local soil conservation districts, and fisheries biologists was the basis of the nonpoint source assessment and which waters are impacted by these sources. This "evaluated" assessment was necessary because little or no monitoring of nonpoint sources has been conducted in the State. Evaluations were also based on the presence of point sources or hazardous waste sites, land uses, stream disturbance activities, and the lack of certain water uses occurring in a stream.

Determination of designated use support and achievement of clean water goals was based on both monitored and evaluated data. Swimmable status was determined where monitoring for fecal coliform took place; or in the absence of data, where gross pollution levels occur.

The fish propagation and maintenance (fishable) use and clean water goal was based primarily on the fisheries surveys provided by State biologists. Water quality data was also factored into the decision-making process where no fisheries survey was completed, or when the water quality data identified specific problems. A more thorough description of how designated uses were determined is presented in the introduction to Section I of this chapter.

B. River and Stream Quality

This section summarizes the quality of the freshwater rivers and streams in New Jersey. This summary is based on the detailed watershed assessments in Section I Water Quality Inventory. Described below are the amount of fresh waters in New Jersey meeting the State's designated uses, the amount achieving the clean water goals set forth in national legislation, the pollutants found, and the source categories causing water degradation.

1. Water Quality Conditions

The amount of freshwater river and stream mileage in the State which is achieving the swimmable and fish propagation and maintenance designated uses/clean water goals is presented in Table III-1. This report has evaluated 740 monitored freshwater miles, and nearly 1600 evaluated freshwater miles. Of the 740 monitored miles, 148 are the Delaware River. Table III-2 shows the quality of the major rivers and streams in the State and their current use attainment.

Approximately 31 percent of New Jersey's freshwater streams (as measured in miles) can be considered to be meeting both the swimmable and fish propagation and maintenance clean water goals. Generally, streams classified as swimmable are also of sufficient quality for supporting healthy fishlife. Of the total 740 monitored stream miles, 227 miles or 31 percent are swimmable. However, 136 of these 227 miles occur in the Delaware River; therefore, when excluding the Delaware River only 91 monitored miles (15 percent) are judged

TABLE III-1 DESIGNATED USE SUPPORT AND CLEAN WATER ACT GOAL ATTAINMENT - NEW JERSEY'S FRESHWATER RIVERS AND STREAMS[1]

Swimmable

Use/Goal Support	Miles Evaluated	Miles Monitored	Total	Assessed
Fully Supports	0	227	227	
Threatened[3]	0	46		
Partially Supports	0	48	48	
Does Not Support	0	465	465	
Total	0	740		740

Fish Propagation and Maintenance

Use/Goal Support	Miles Evaluated	Miles Monitored	Total	Assessed[2]
Fully Supports	1207	598		1463
Threatened[3]	340	16		
Partially Supports	297	112		307
Does Not Support	72	30		97
Total	1576	740		1867

1 Designated uses for New Jersey's freshwaters are equivalent to the swimmable and fish propagation/maintenance Clean Water Act goals.

2 The total miles for assessing fishable use is less than the total evaluated and monitored miles because double-counting is eliminated.

3 Threatened waters are considered a subset of fully supports.

TABLE III-2 PAST AND CURRENT STATUS OF FRESHWATER STREAMS MEETING THE SWIMMABLE AND FISHABLE DESIGNATED USES/CLEAN WATER GOALS

	Swimmable Status		Fishable Status		
Waterway	1977	1988	1977	1988	Current Quality
Wallkill River	No	No	Yes	Yes*	Good
Flat Brook	Yes	Yes	Yes	Yes	Good
Paulins Kill	No	No	Yes	Yes	Good/Fair
Pequest River	No	No	Yes	Yes	Good
Musconetcong River	Yes*	Yes*	Yes	Yes	Good/Fair
Pohatcong Creek	No	No	Yes	Yes	Fair
Wickecheoke Creek	No	No	Yes	Yes*	Fair
Assunpink Creek	No	Yes*	Yes*	Yes*	Good/Fair
Crosswicks Creek	No	No	Yes	Yes*	Good/Fair
Rancocas Creek	No	Yes*	No	Yes	Good/Fair
Pennsauken Creek	No	No	No	Yes*	Fair/Poor
Cooper River	No	Yes*	No	Yes*	Good/Very Poor
Big Timber Creek	No	No	No	Yes	Fair
Raccoon Creek	No	No	Yes	Yes*	Good
Oldmans Creek	No	No	Yes	Yes	Good
Salem River	No	Yes	No	Yes	Good/Fair
Cohansey River	No	No	Yes	Yes	Fair
Maurice River	No	Yes*	Yes	Yes	Excellent/Good
Great Egg Harbor R.	Yes*	Yes*	Yes	Yes*	Fair/Poor
Mullica River	Yes	Yes*	Yes	Yes	Excellent
Toms River	Yes*	No	Yes	Yes	Good
Manasquan River	No	No	Yes	Yes	Fair
Shark River	-	Yes*	-	Yes	Good
So. Branch Raritan R.	No	Yes*	Yes	Yes	Good/Fair
Lamington River	-	No	-	Yes	Good/Fair
No. Branch Raritan R.	No	No	Yes	Yes	Good/Fair
Millstone River	No	No	Yes	Yes*	Good/Fair
So. River Tributaries	No	No	Yes	Yes	Good/Fair

* Portions Only

TABLE III-2 (Continued) PAST AND CURRENT STATUS OF FRESHWATER STREAMS MEETING THE SWIMMABLE AND FISHABLE DESIGNATED USES/CLEAN WATER GOALS

Waterway	Swimmable Status 1977	Swimmable Status 1988	Fishable Status 1977	Fishable Status 1988	Current Quality
Raritan River	No	No	No	Yes*	Good/Fair
Rahway River	No	No	Yes	Yes*	Fair
Elizabeth River	No	No	Yes*	No	Fair
Upper Passaic River	No	No	Yes	Yes*	Fair/Poor
Whippany River	No	No	Yes	Yes*	Fair/Poor
Rockaway River	Yes*	No	Yes	Yes*	Good/Fair
Pequannock River	-	Yes	-	Yes*	Good
Wanaque River	-	Yes	-	Yes*	Excellent
Ramapo River	Yes*	No	Yes	Yes	Fair
Pompton River	Yes*	No	Yes	Yes*	Good
Lower Passaic River	No	No	No	Yes*	Fair
Hackensack River	No	No	No	Yes*	Good
Delaware River (freshwater)					
Zone 1	Yes*	Yes*	Yes	Yes	Excellent/Good
Zone 2	Yes*	Yes	Yes	Yes	Good/Fair

* Portions Only

swimmable. Forty-six of the 91 swimmable miles are further thought to be threatened by the presence of potential pollution sources. The 1986 305(b) report stated that 29 percent of the monitored freshwaters are swimmable. The 31 percent figure given for 1988 represents a modest 6 percent increase over the two year period, and a 32 percent increase since 1972. Waters classified as swimmable are those primarily in protected watersheds or directly downstream of an impoundment where the settling action of the impoundment likely reduces the instream bacteria levels. High fecal coliform concentration is the principal reason why so many waterways are not of swimmable quality.

The proportion of New Jersey's freshwaters supporting healthy and reproducing fish populations is considerably better. Of over 1850 stream miles evaluated and monitored, 1463 or 78 percent are believed to be fully supporting the fish propagation and maintenance designated use and clean water goal. Twenty-four percent of waters meeting this use may be threatened, however, because of the existence of known or potential pollution sources. Waters which have moderately degraded fish communities are considered to be partially meeting the fish propagation and maintenance use. Seventeen percent of the assessed waters fall into this category. Only five percent are classified as not meeting the use, or to have severely degraded communities.

In comparison with prior assessments of the proportion of waters meeting the fish propagation and maintenance use, 13 percent more waters are now meeting the use than in 1972. But such direct comparisons are not encouraged because different assessment methodologies are now employed to determine attainment of the fishable goal. Actual fisheries surveys are currently utilized to determine "fishable" status. Earlier editions of this report relied principally on water quality data.

2.. Causes of Water Quality Degradation

The great majority of New Jersey's monitored freshwater streams contain elevated nutrients (phosphorus and nitrogen compounds) and bacteria (fecal coliforms) levels. Table III-3 summarizes which pollutants are found in the State and their relative impact. The table shows that nutrients and pathogens/bacteria are excessive in 81 percent of the monitored freshwaters (excluding the Delaware River). Other pollutants which are suspected of having statewide and significant impacts on water quality include organic enrichment/dissolved oxygen levels, salinity from road salts, and oil and grease.

A number of other pollutant types are either known or suspected problems in the State. Known pollutants/water quality problems occurring in moderate to low levels statewide (or are locally significant) are certain pesticides, priority organics and metals, ammonia, pH deviations, and temperature or thermal modifications. These problems have been detected in monitoring activities, and their extent range from being elevated in one percent of the monitored waters for metals to 14 percent for ammonia. Most other categories of pollutants, as defined by EPA and presented Table III-3, are suspected of being present in New Jersey's surface waters in small quantities. They include unknown toxic substances, nonpriority organics, and chlorine. Habitat modifications and flow alterations also have impacts locally.

The actual cause of these water quality problems is less clear. Table III-4 shows those pollutant source categories which are adversely affecting the State's freshwaters. No accurate quantification of the extent of these sources is currently available. This is because both point and nonpoint sources are present to some degree in practically every watershed in the State, and unless monitoring or predictive modelling is performed specifically for the purpose of defining pollutant inputs and stream response, such a determination can not be correctly made. Even when modelling activities are conducted in New Jersey they are usually for wasteload allocations, and analyze low flow conditions.

Generally, the 1100 industrial and municipal wastewater discharges have significant impacts to water quality statewide. Nonpoint sources coming from urban runoff, construction activities, agricultural practices, and land disposal practices (including septic systems), are also extensive. In many instances pollutants from these sources are released via stormwater outfalls. Other types of nonpoint sources found in New Jersey in limited scope include silvicultural activities, resource extraction, and hydrologic/habitat modification. Combined sewer outfalls, surcharging sewage conveyence lines/pump stations, illegal discharges, and facilities in permit non-compliance are all fairly common sources of water pollution in New Jersey. The wet and dry deposition of air pollutants, including acid rain, is a pollution source whose significance is as yet unclear because of a lack of data. Additional discussion of the State's point source control programs can be found in Chapter V. Section E of this chapter reviews the nonpoint source assessment performed pursuant to the Water Quality Act of 1987.

TABLE III-3 SUMMARY OF POLLUTANTS FOUND IN NEW JERSEY'S FRESHWATERS

Pollutant Categories	Major/Statewide Impacts	Moderate/Localized/Minor Impacts
Unknown Toxicity		?
Pesticides		3
Priority Organics		3
Nonpriority Organics		?
Metals		1
Ammonia		14
Chlorine		?
Nutrients	81	
pH		8
Siltation	?	
Organic Enrichment/Dissolved Oxygen	11	
Salinity/Road Salts	?	
Thermal Modification		13
Flow Alteration		?
Habitat Alterations		?
Pathogens	81	
Radiation		?
Oil and Grease	?	

Key:
? = Impact is suspected; a lack of monitoring data exists to substantiate the conclusion and its extent.

= The percentage of monitored freshwaters containing the pollutant in elevated amounts. Based on a total of 590 monitored miles; does not include Delaware River Basin Commission interstate waters.

TABLE III-4 SUMMARY OF THE SEVERITY OF POLLUTANT SOURCES IMPACTING NEW JERSEY'S FRESHWATERS

Source Category	Major/Statewide Impacts	Moderate/Local/Minor Impacts
Point Sources		
Industrial	X	
Municipal	X	
Combined sewer outfalls		X
Stormwater outfalls	X	
Nonpoint Source		
Agriculture	X	
Silviculture		X
Construction	X	
Urban Runoff	X	
Resource Extraction		X
Land Disposal	X	
Hydrologic/Habitat Modifications		X

Note: Insufficient information exists to quantify the extent of these pollutant source categories.

C. Lake Quality

1. Water Quality Conditions

New Jersey has approximately 51,000 lake acres with approximately 24,000 of these acres in public ownership. While lakes play an important role in providing recreation, aesthetic value and wildlife habitat throughout the State, only limited monitoring and assessment of lakes has occurred during the past 5 to 8 years. Current water quality information is available only for a limited number of lakes. The most recent comprehensive data collection programs were conducted as a result of State or Federally funded Phase I Diagnostic-Feasibility Studies. These projects have all taken place at lakes where water quality has deteriorated. For the remainder of the lakes in the State, there is little conclusive data.

However, the NJDEP estimates lake quality throughout the State has generally deteriorated or is threatened by accelerated eutrophication. In the absence of hard water quality data all public lakes are being classified as "Designated Water Quality Uses Threatened, Pending Further Information." Public lakes in the State are listed in Table III-5.

The 1985 Nonpoint Source Assessment prepared for the Association of State and Interstate Water Pollution Control Administrators (ASIWPCA) gave a rough picture of designated use attainment in the State's lakes (ASWPCA, 1985). This report assessed almost 19,000 acres of the State's lakes for use impairments. Over 5,000 acres were known to have partial or full use impairment, with over 11,000 acres listed as threatened with impairment.

Another indicator of possible water quality conditions in New Jersey's lakes is aquatic herbicide application permits. In 1987, the NJDEP's Division of Environmental Quality, Bureau of Pesticide Control, issued 314 permits for herbicide application for the control of aquatic weeds and algae. This represents approximately one-quarter of the State's lakes. While herbicides are usually adequate to control unwanted weed and algae growth, it must be remembered that this type of activity is only treating the symptoms of eutrophication, and is not addressing any of the causes of the problems.

The primary factors to consider are the healthy economy and the associated building boom which has been taking place. Associated with this is the loss of forests and grassland which would curb allochthonous nutrient inflow into lakes. While no figures are available, there have most likely been increasing loadings of nonpoint pollutants to many lakes throughout the State. In many cases, there is no regulatory oversight prior to these activities taking place and the problem is not noticed until a use is prohibited or excessive plant growth reaches problematic levels. The following lakes are known to have some degree of use impairment and require implementation of control programs. This list is not complete and only represents lakes for which there is some specific information:

Deal Lake	Franklin Lake
Allamuchy Pond	Mac's Pond
Branchbrook Park	Sylvan Lake
Waterloo Lake	Wesley Lake
Speedwell Lake	Pocahontas Lake
Imlaystown Lake	Bethel Lake
Kirkwood Lake	Clove Lake
Lily Lake	Davidson's Mill Pond
Lincoln Park Lake	Devoe Lake
Manahawkin Lake	Echo Lake
Manalapan Lake	Hammonton Lake
Mary Elmer Lake	Overpeck Lake
Memorial Lake	Spring Lake
New Brooklyn Lake	Strawbridge Lake
Lake Takanassee	Sunset Lake
Woolman Lake	Lake Topanemus
Giampietro Lake	Verona Park Lake
Tuckerton Lake	Woodbury Lake

In addition, 41 lakes have been identified by local officials and fisheries biologists to suffer possible impacts from nonpoint sources. These lake are listed in Section E of this chapter under the Nonpoint Source Assessment.

2. Causes of Water Quality Degradation

A summary of pollutant categories affecting lakes in New Jersey is presented in Table III-6. Pollutants are indicated as either a known or `suspected problem. There is insufficient monitoring of lakes in the State to be able to quantify the amount of lake acres being impacted by each pollutant category. The monitoring information available is, for the most part, greater than five years old and may not reflect current conditions. The results of the 1985 lake nonpoint source assessment, the ASIWPCA nationwide study, is still considered the most recent and accurate account of lake acres impaired by pollutant categories and sources (ASIWPCA, 1985). The most frequent pollution problems impacting lakes are nutrients (most lakes analyzed in the State are at some stage of eutrophication), pH fluctuations, siltation, depressed dissolved oxygen and organic enrichment and pathogens (fecal coliform). The possible results of water diversions (flow alterations), and oil and grease from runoff are suspected of adversely impairing many lakes.

Nonpoint source pollution is the primary cause of water quality degradation in New Jersey's lakes and impoundments. These sources include urban, agricultural, construction, and land disposal runoff; much of this is transferred via stormwater outfalls. These nonpoint sources, with the exception of agricultural runoff, is generally thought to be increasing in most areas of the State. Effluent from municipal sewage treatment plants is also considered a major source of pollutants, although the extent of treatment plants discharging to lakes/impoundments is less than that of nonpoint sources.

Contamination of lake fish and aquatic life with chlordane has been detected in three southern New Jersey lakes. Strawbridge, Cooper and Steward Lakes have been closed to fishing because of elevated chlordane in fish tissue.

TABLE III - 5 NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

NEW JERSEY PUBLIC LAKES

ATLANTIC COUNTY

BARGAINTOWN POND
BIRCH GROVE PARK PD
EGG HARBOR LAKE
HAMMONTON LAKE
HUNTERS MILL POND
STOCKTON STATE COLLEGE-FRED LAKE
STOCKTON STATE COLLEGE-PAM LAKE
TUCKAHOE IMP-LOWER
TUCKAHOE IMP-MIDDLE
TUCKAHOE IMP-UPPER

BERGEN COUNTY

BEAR SWAMP LAKE
BERGEN CO. WILDLIFE-CTR. (2 PONDS)
BERGEN CO. WILDLIFE-MAPLE LAKE
BERGEN CO. WILDLIFE-RAMPOUT
CANNONBALL LAKE
COLE POND
CRESTWOOD LAKE
CRYSTAL LAKE (B.S.)
CRYSTAL LAKE PARK
DAHNERTS LAKE
DARLINGTON PARK (3 PONDS)
GLEN ROCK
INDIAN LAKE
MACMILLAN RES.
MILL LAKE
OLD MILL POND
ORADELL RES.
OVERPECK PARK-LOWER LAKE
OVERPECK PARK-UPPER LAKE
PINE LAKE
SADDLEBROOK CO. PARK
SILVER LAKE
TAPPON LAKE RES.
VAN SAUN CO. PARK
VREELAND LAKE
WILD DUCK POND
WILLOW LAKE
WOODALE CO. PARK POND
WOODCLIFF LAKE RES.

BURLINGTON COUNTY

ABSEGAMI POND
ATISON LAKE
BATSTO LAKE
CRYSTAL LAKE
GOSHEN POND
HARRISVILLE POND
INDIAN MILLS LAKE
KENNEDY PK. LAKE
KIRBY MILLS LAKE
LEBANON LAKES
MIRROR LAKE-WILD FOWL LAKE
MIRROR LAKES-BAYBERRY
MIRROR LAKES-BIG PINE
MIRROR LAKES-LITTLE PINE LAKE
MIRROR LAKES-MIRROR LAKE
NEW LISBON COL.
NEW LISBON LAKE
OAKFORD LAKE
OSWEGO LAKE
PAKIM POND
PRESIDENTIAL LAKES-ADAMS
PRESIDENTIAL LAKES-GRANT
PRESIDENTIAL LAKES-JEFFERSON (LOWER)
PRESIDENTIAL LAKES-JEFFERSON (UPPER)
PRESIDENTIAL LAKES-MADISON
PRESIDENTIAL LAKES-MONROE
SHADOW LAKE
SHERWOOD LAKES (2)
SMITHVILLE LAKE
STRAWBRIDGE LAKE
SWEDES LAKE
SYLVAN LAKE-LOWER
SYLVAN LAKE-UPPER
VINCENTOWN MILL

TABLE III-5 continued

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

NEW JERSEY PUBLIC LAKES

CAMDEN COUNTY	CAPE MAY COUNTY	CUMBERLAND COUNTY
AUDUBON LAKE	CAPE MAY COUNTY PARK	ALBERT GIAMPIETRO LAKE
BLACKWOOD LAKE	CLINT MILL POND	BURNT MILL POND
BLUE ANCHOR-WEST LAKE	DAVEYS LAKE	CLARKS POND-UPPER
COOPER RIVER LAKE	DENNISVILLE LAKE	CLARKS PONDS-LOWER
CRYSTAL LAKE	EAST CREEK POND	CLARKS PONDS-MAIN
DRAMISI LAKE	LILLY LAKE	HANKINS POND
EVANS POND	NUMI LAKE	MARY ELMER LAKE
HADDON LAKE	PARKWAY POND	MENANTICO POND
HIDDEN LAKE	TUCHAHOE IMP.-MIDDLE	SHAWS MILL POND
HIRSHES LAKE	TUCKAHOE IMP.-LOWER	SUNSET LAKE
HOPKINS POND	TUCKAHOE IMP.-UPPER	
IRON MILL	TUCKAHOE LAKE	
JAGGERS LAKE		
LAKELAND LAKE		
LAKEVIEW DEV. LAKE		
LAUREL LAKE		
NEW BROOKLYN LAKE		
NEWTON LAKE		
ROWAND LAKE		
TROUT RUN POND		
WALWORTH POND		
WINSLOW WILDLIFE		

TABLE III-5 continued

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

NEW JERSEY PUBLIC LAKES

ESSEX COUNTY	GLOUCESTER COUNTY	HUDSON COUNTY
BRANCH BROOK PARK LAKES-LOWER	ALCYON LAKE	HACKENSACK RESERVOIR #1
BRANCH BROOK PARK LAKES-MIDDLE	BELL LAKE PARK	HACKENSACK RESERVOIR #2
BRANCH BROOK PARK LAKES-UPPER	FRANKLINVILLE LAKE	JERSEY CITY RESERVOIR #2
BROOKDALE PARK	GLEN LAKE	JERSEY CITY RESERVOIR #3
BUTLER POND	GREEN LAKE	LINCOLN LAKE PARK (3)
CAMPBELLS POND	GRENWICH LAKE	NORTH HUDSON PARK
CANOE BROOK RES #1	HARRISONVILLE LAKE	
CANOE BROOK RES #2	IDLE ACRES LAKE	
CEDAR GROVE RES.	IONA LAKE	
COMMONWEALTH RES #3	IRVIN LAKE	
DIAMOND MILL POND	LOGAN POND	
GROVER CLEVELAND	MALAGA LAKE	
IRVINGTON PARK	NARRATICON LAKE	
KINGSLAND PARK	TYLER LAKE	
ORANGE PARK	WASHINGTON TWP. LAKES-CEDAR	
ORANGE RESERVOIR	WASHINGTON TWP. LAKES-SPRING	
TAYLOR LAKE	WOODBURY LAKE	
VERONA PARK		
WEEQUAHIC LAKE		

TABLE III-5 continued

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

NEW JERSEY PUBLIC LAKES

HUNTERDON COUNTY	MERCER COUNTY	MIDDLESEX COUNTY
AMWELL LAKE	BALDWIN	BRAINARD LAKE
	CARNEGIE LAKE	DALLENBACH POND
	COLONIAL LAKE	DAVIDSONS MILL
	GROVERS MILL	DEVOE LAKE
	HAMILTON PARK	FARRINGTON LAKE
	KATZENBACH SCHOOL	HOOKS CREEK LAKE
	MERCER CO. PARK	JOHNSON PARK LAKE
	PEDDIE LAKE	MANALAPAN LAKE
	ROSEDALE LAKE	NEW MARKET POND
	ROWAN LAKE	PLAINSBORO POND
	SPRING LAKE	ROOSEVELT PARK
	TRENTON STATE COLLEGE-CEVA LAKE	SILVER LAKE
	TRENTON STATE COLLEGE-SYLVIA LAKE	WESTON MILL POND
	WHITEHEAD MILL	

TABLE III-5 continued

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

NEW JERSEY PUBLIC LAKES

MONMOUTH COUNTY	MORRIS COUNTY	OCEAN COUNTY
ALBERTA	AMES LAKE	BAMBER LAKE
ALDRICH LAKE	BAKER MILL POND	BARNEGAT LAKE
ALLAIRE ST. PARK	BEE MEADOWS	BAUER POND
ALLENTOWN LAKE	BIRCHWOOD LAKE	BAY AVE. LAKE
ASSUNPINK LAKE	BOWLBY POND	BENNETTS POND
COMO LAKE	BROWNWOOD LAKE	BRINDLE LAKE
DEAL LAKE	BURNHAM PARK POND-LOWER	BUTTERFLY BOGS
ECHO LAKE	BURNHAM PARK POND-UPPER	CARASALJO LAKE
FLETCHER LAKE	CHARLOTTEBURG RES.	CEDAR LAKE
FRANKLIN LAKE	CRYSTAL LAKE	COLLIERS MILLS
IMLAYSTOWN LAKE	DALRYMPLES POND	DEER HEAD LAKE
LEFFERTS LAKE	DENMARK LAKE	DOUBLE TROUBLE PARK
MATAWAN LAKE	HARDBARGAIN POND	FORGE POND
MILL POND-WEAMACONK	HOPATCONG LAKE	HARRY WRIGHT
MOHAWK LAKE	HORSESHOE LAKE	HOLIDAY LAKE
MONMOUTH CO. HORSE	KIKEOUT RES.	HORICON LAKE
NATCO LAKE	LEDDELS POND	LAKE OF THE LILLIES
PORICY POND	LILLIAN LAKE	LAKEHURST NAS-BASS LAKE
RISING SUN POND	LOANTOKA BROOK POND	LAKEHURST NAS-CLUB LAKE PD.
SHARK RIVER LAKE	LONGWOOD LAKE	LAKEHURST NAS-ISLAND LAKE
SHARON LAKE	MACOPIN RES.	LAKEHURST NAS-PICKERAL POND
SILVER LAKE	MIDLAND LAKE	LAKEHUT NAS-RAINBOW POND
SPRING LAKE	MINE HILL LAKE	LITTLE SILVER
STONE TAVERN LAKE	MORRISTOWN RES.	MANAHAWKIN LAKE
SUNSET LAKE	MOUNTAIN LAKE	MANETTA LAKE
SUNSET MANOR LAKE	MUSCCONETCONG LK.	OCEAN COUNTY PARK
SWIMMING RIVER RESERVOIR	PICATINNY LAKE	PINE LAKE
SYLVAN LAKE	POCAHONTAS LAKE	PROSPERTOWN LAKE
TAKANA LAKE	RANDOLPH LAKE	SHENANDOAH LAKE
TAKANASSEE LAKE	SAXTON LAKE	STAFFORD FORGE
TOPANEMUS LAKE	SPEEDWELL LAKE	SUCCESS LAKE
TURKEY SWAMP LAKE	SPRING GARDEN LAKE	SUCCESS LAKE-CENTER LAKE
WAMPUM LAKE	SPRING LAKE	SUCCESS LAKE-LOWER LAKE
WESLEY LAKE	SUNSET LAKE	SUCCESS LAKE-UPPER LAKE
WRECK POND	WATERLOO LAKE	TURN MILL POND
	WILDWOOD LAKE	
	WOODLAND LAKE- PV LAKE	

TABLE III-5 continued

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

NEW JERSEY PUBLIC LAKES

PASSAIC COUNTY	SALEM COUNTY	SOMERSET COUNTY
BARBOUR POND	BOSTWICK	BEST POND
CEDAR POND	FOX MILL	METTLARS POND
ECHO LAKE	LAUREL LAKE	METTLERS DUCKPOND
GREENWOOD LAKE	MASKELLS MILL POND	METTLERS POWDER MILL POND
HANKS POND	MICKEL'S MILL POND	METTLERS SPOOKY BROOK POND
MT. LAUREL LAKE	PARVIN LAKE	SYLVAN LAKE
NORTH COVE POND	THUNDERGUST POND	WASHINGTON LAKE
RAINBOW VALLEY		WATCHUNG LAKE
RAMAPO LAKE		
RINGWOOD STATE PARK-SALLY'S POND		
SHEPPARD LAKE		
SURPRISE LAKE		
TALLMANS POND		
TOM'S LAKE		
UPPER MT. LAUREL LAKE		
WALLACE POND		
WANAQUE RESERVOIR		
WEST MILFORD LAKE		
WEST POND		
WOODLAND LAKE		
YOHN'S POND		

TABLE III-5 continued

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

NEW JERSEY PUBLIC LAKES

SUSSEX COUNTY	UNION COUNTY	WARREN COUNTY
ASHROE LAKE	BLACKBROOK POND	ALLAMUCHY POND
BLUE MTN. LAKES (2)	BRIANT PARK POND	DEER PARK POND
CANISTEAR RES.	BRIGHTWOOD POND	GHOST
CLEARWATER	GREEN BROOK LAKE	MOUNTAIN LAKE
CLOVE ACRES LAKE	JACKSON POND	MOUNTAIN LAKE- #2
CRANBERRY LAKE	KENILWORTH LAKE	SUNFISH POND
CRATER LAKE	LENAPE LAKE	
CULVERS LAKE	MCGILROYS POND;	
DRY POND RES.	MILTON LAKE	
DUCK POND	MINDOWASKIN LAKE	
FRANKIN POND	NOMAHIGAN PARK	
HEATERS POND	RAHWAY PARK LAKE	
HERZENBERG LAKE	SEELEY'S POND	
KOHOUT LAKE	SURPRISE LAKE	
LAUREL LAKE	WARINANCO PARK	
LIVINGSTON PONDS (3)		
LONG PINE PONDR		
MARCIA LAKE		
MORRIS LAKE (NEWTON RES.)		
MOUNTAIN RIDGE		
ROUND HOLLOW POND		
RUTHERFORD RES.		
SAW MILL LAKE		
SPRING LAKE		
STEENYKILL LAKE		
STONY LAKE		
SUCCESS LAKE		
SWARTSWOOD LAKE- BIG		
TIBB MEADOW IMP.		
WAWAYANDA LAKE		

TABLE III-6a SUMMARY OF THE SEVERITY OF POLLUTANT SOURCES IMPACTING NEW JERSEY'S LAKES

Source Categories	Major/Statewide Impacts	Moderate/Localized/Minor Impacts
Point Sources		
Industrial		X
Municipal	X	
Combined sewer outfalls		X
Stormwater outfalls	X	
Nonpoint Sources		
Agriculture	X	
Silviculture		X
Construction	X	
Urban runoff	X	
Resource extraction		X
Land Disposal	X	
Hydrologic/Habitat modification		X

Note: Insufficient recent information exists to quantify the extent of these pollutant source categories.

TABLE III-6b SUMMARY OF POLLUTANTS FOUND IN NEW JERSEY'S LAKES

Pollutant Categories	Major/Statewide Impacts	Moderate/Localized/Minor Impacts
Unknown toxicity		?
Pesticides		X
Priority Pollutants		X
Nonpriority organics		?
Metals		X
Ammonia		?
Chlorine		?
Nutrients	X	
pH	X	
Siltation	X	
Organic enrichment/DO	X	
Salinity/Road salts		?
Thermal modification		?
Flow alteration	?	
Habitat alteration		?
Pathogens	X	
Radiation		?
Oil and Grease	?	

Key:
X = Known water quality problems due to these pollutants have been identified.
? = Suspected problems may exist because of the pollutant, but no or very limited data exists.

Note:
Insufficient recent monitoring data exists to quantify the extent of these pollutant categories.

D. Estuarine and Ocean Water Quality

1. Water Quality Conditions

Ocean Waters

Support of designated use and attainment of national clean water goals for New Jersey ocean waters are summarized on Tables III-7 (State designated use and clean water goals for ocean waters in New Jersey are the same). Coastal Cooperative Monitoring Program (CCMP) monitoring results from the early 1980's up to 1987 indicate that the New Jersey coastal beaches from Sandy Hook south to Cape May are fully swimmable; however, some beaches are threatened by occasional short-term elevations of bacterial levels which have resulted in beach closures for brief periods (NJDEP, 1986b, 1987a, 1988a). Most of the New Jersey ocean waters are fishable but are threatened by toxics and by pathogens. For purposes of assessing coastal waters the fishable goal is defined as the following: waters should be of sufficient quality to allow open shellfish harvesting in accordance with States regulations, to allow for safe consumption of fish free from toxic or chemical tissue contamination, and to support healthy and propagating indigenous and introduced fish populations. Of the 439 square miles of coastal waters under the jurisdiction of the State's shellfish water sanitation program; approximately 28 percent are condemned to shellfishing due to excessive levels of indicator bacteria in the water or the presence of point pollution sources. In addition, the NJDEP has found high levels of PCB's and certain pesticides (primarily chlordane) in finfish from New York-New Jersey interstate waters. As a result, recreational fishing advisories have been issued by the State for striped bass and bluefish taken in offshore waters from Barnegat Inlet northward (NJDEP 1986b). Hence, this portion of the New Jersey ocean waters out to 3 miles are regarded as partially fishable. Ocean waters tabled in this report as partially fishable are waters condemned to shellfish harvesting by the NJDEP and, or have fishing advisories in effect. These waters, however, are still regarded as supporting the propagation and maintenance of healthy marine communities and do contain finfish available for commercial and recreational use.

A sag in bottom dissolved oxygen levels is recorded offshore each year through the monitoring efforts of USEPA. These oxygen levels reach their minimum values along the coast during late August and early September, and are brought about by sediment oxygen demand and reduced reaeration within the water column. The most critical area is usually a contained cell off of northern Ocean County. This hypoxia was less severe in 1986 than in 1985 due to more frequent on-shore-winds and storm events facilitating reaeration (USEPA 1987b). Nevertheless, dissolved oxygen values as low as 2.3 ppm were recorded off Monmouth County in 1986. (USEPA 1987b).

Problems of additional concern in the ocean are the incidences of phytoplankton blooms in coastal waters and wash-ups of floating garbage along bathing beaches. Phytoplankton productivity is considered high in the State's coastal waters, especially in the northern areas. It appears, however, that phytoplankton blooms may be on the increase in southern New Jersey as well. In 1986, the NJDEP, USEPA, and the National Oceanic and Atmospheric Administration's National Marine Fisheries Service convened an interagency committee to investigate the casual factors related to the occurrence of these blooms along the coast. Although a "green tide event" did not occur during the year of the investegation (1986), significant progress was made in understanding the conditions that led to near-shore algal blooms (USEPA, 1987a).

New Jersey ocean beaches are also aesthetically threatened with the occasional wash-up of floating garbage which was highly publicized in the summer of 1987, and resulted in discretionary beach closing from Point Pleasant through Long Beach Island in Ocean County (NJDEP 1988a). See section G of this chapter, *The Condition of New Jersey's Ocean Waters - A Special State Concern*, for more discussion on this issue.

Estuarine Waters

Support of designated uses and the attainment of Clean Water Act goals for New Jersey's bays and estuaries are summarized in Table III-7. Of the approximate 600 square miles assessed by monitoring agencies, 477 square miles are judged to be fully supporting designated use (most of this mileage is in Delaware Bay), 72 square miles are judged to be partially supporting, while 18 square miles are regarded as not supporting designated uses (all in New York-New Jersey interstate waters).

With respect to Clean Water Act goals; more than half the area assessed meet the goals, 54 square miles fail to meet goals, and some 18 square miles are judged to be areas where goals are not attainable. The areas of non-attainment are limited to the New Jersey-New York interstate waters. Some 18 square miles of New Jersey estuary were assessed to be partially fishable because, although they are condemned for shellfish harvesting, these waters do support the taking of finfish for commercial and recreational purposes and are assessed as supporting the propagation and maintenance of relatively healthy estuarine fish communities.

As stated above, a large portion of the total waters meeting clean water goals and designated uses are in Delaware Bay. The Delaware River Basin Commission (DRBC) (1988) reports the 360 square miles of the Delaware Bay under New Jersey jurisdiction to be of good water quality based upon monitored data of 1986 and 1987. The Commission states that fecal coliform readings indicate excellent sanitary quality in the bay. The New Jersey Coastal Cooperative Monitoring Program survey of 1987, however, did indicate that some New Jersey bathing beaches along the Bay were threatened from occasional elevated bacterial levels which resulted in short term beach closures (NJDEP, 1988a). Although minimum dissolved oxygen levels were violated occasonally during the 1986 and 1987 summer seasons, the average dissolved oxygen level for the Bay remained consistently above 6.0 mg/l (DRBC, 1988).

The New Jersey New York interstate waters including the Arthur Kill, Kill Van Kull, Hudson River, Newark Bay and tidal Hackensack River failed to meet designated uses or attain clean water goals due to extremely high levels of fecal coliform bacteria and severely depressed summertime dissolved oxygen concentrations. Additionally, the NJDEP has found high levels of PCBs and certain pesticides (primarily chlordane) in finfish from these interstate waters. As a result, commercial fishing bans and recreational fishing advisories have been issued by the State for these waters. Extensive sampling has turned up wide spread dioxin contamination in certain fish and shellfishing species in both the tidal Passaic River and New York Bight Apex waters. Because tissue concentrations of dioxin above the US Food and Drug Administration's "level of concern" were identified (NJDEP, 1985c), the State of New Jersey has ordered a prohibition on the sale and consumption of all fish and shellfish taken from the tidal Passaic River. The ban has been extended to include striped bass and blue crabs from Newark Bay, tidal Hackensack River, Arthur Kill, and Kill Van Kull. Fish species and waters included in these bans and advisories are shown in Figures III-1, and III-2.

Phytoplankton blooms are a conspicuous feature in Raritan and Sandy Hook Bays and also in Barnegat Bay (in 1985 and 1986). In a region remote from routine phytoplankton monitoring, a bloom was observed in July of 1986 along the shore of Delaware Bay (NJDEP, 1987b). In 1987, phytoflagellate and chlorophyte blooms were minimal. However, diatoms did produce heavy blooms both early and late in the summer season resulting in brown water discoloration in Sandy Hook Bay and the Monmouth County coastal waters (NJDEP, 1988c).

2. Causes of Water Quality Degradation

Ocean Waters

Because of the complexity of the coastal ocean system, the great variety of factors that appear to influence ocean water quality, and the limited ocean monitoring; cause and effect relationships between water quality and pollution source are difficult to identify. In addition, determination of trends are generally limited to coliform data from shellfish harvesting areas and from bathing beaches. The principal source for elevated bacterial levels affecting coastal bathing beach closures is stormwater discharge along the coast as suggested by CCMP data (NJDEP, 1988a). This conclusion is based upon comparison of bacterial levels recorded during both dry periods and after rain events. The regionalization of sewage treatment along the New Jersey coast has improved bay and estuary water quality, yet is also responsible for greater and greater amounts of nutrients and oxygen-demanding materials being discharged to open ocean waters. There is concern that these sources, in concert with tributary inputs, the disposal of dredged materials, and the outflow from the Hudson/Raritan estuary, are all contributing to the gradual enrichment of our coastal waters, leading perhaps to more extensive benthic anoxia in the summer, and to phytoplankton blooms of ever increasing intensity and frequency.

The sources of floating garbage washing up on New Jersey beaches in 1987 is, at present, still largely unresolved. During one event in the summer of 1987 when a mixture of medical wastes, wood, and glass washed up on New Jersey beaches, an investigation determined that the principal cause of the release of the material into the ocean was due to flaws in the procedures followed by New York City in its handling and transfer of solid waste in the harbor area (NJDEP, 1988a).

Tables III-8 and III-9 indicate which pollutants and pollution source categories impact ocean waters.

Estuarine Waters

The severely degraded water quality occurring in the New Jersey-New York interstate waters as well as in the tidal Delaware River near Philadelphia is due to the large amount of untreated and primary treated wastewaters still being discharged to these waters. In New York City alone, over two billion gallons per day is discharged, with ten percent being raw sewage (NJDEP, 1985b). Twice this amount may be discharged during storm events by combined sewage outfalls. In a use attainability study, NJDEP, (1985b) determined that even with the projected improvements in sewage treatment from New York and New Jersey facilities, pollution from nonpoint sources and combined sewer outflows, together with high benthic oxygen demands will continue to severely stress these waters.

Bacterial contamination in estuarine waters monitored by the CCMP, specifically the Atlantic Coastal Basin and some Delaware Bay estuaries, are closely tied with stormwater discharges (NJDEP, 1988a). In bay areas with low flushing rates, the stormwater effect can be severe and of longer duration than in areas where current circulation would support the dispersion of stormwater and its bacterial loading. This stormwater effect on the fecal coliform concentrations in the bays is often confounded by the bacterial loading from the illegal discharge of marine sanitation devices on boats, the presence of large wildlife populations, and the resuspension of sediments by boat-created turbulence (NJDEP, 1988a). Hence for bay CCMP stations which exceeded sanitary standards, the specific cause of the increased fecal coliform concentrations could not be determined. The Bureau of Marine Water Classification and Analysis concurs that stormwater serves as a significant source of bacterial contamination, and that natural sources such as waterfowl populations often are significant additional contributors to the overall problem. The Bureau, as well as other agencies, add that additional bacterial contamination is suspected to be coming from tributary inputs to the bays. These tributary inputs carry additional runoff and septic tank leachate from sources upstream.

Tables III-10 and III-11 show which pollutants and pollution source categories have an impact on estuarine water quality in the State.

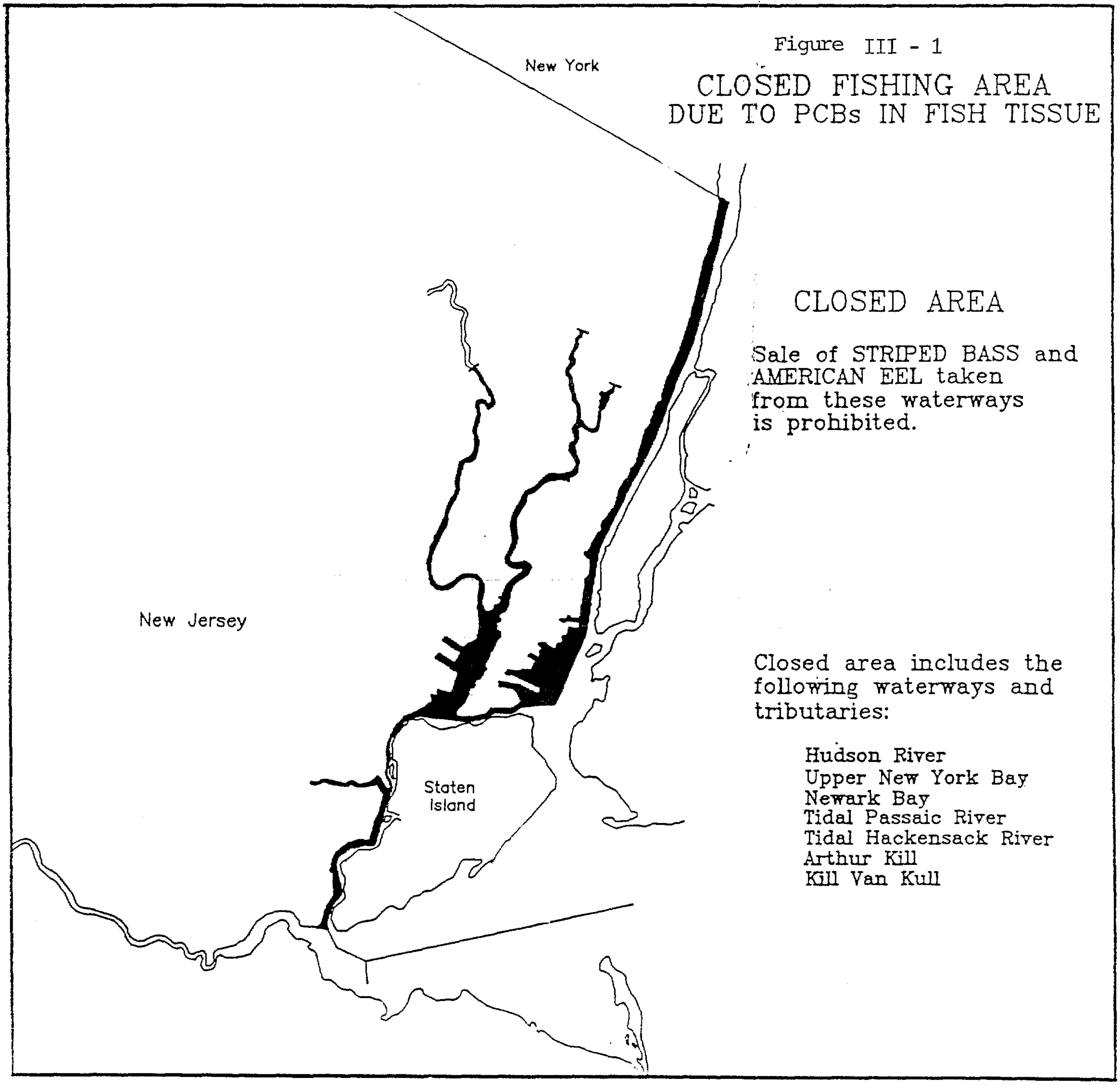
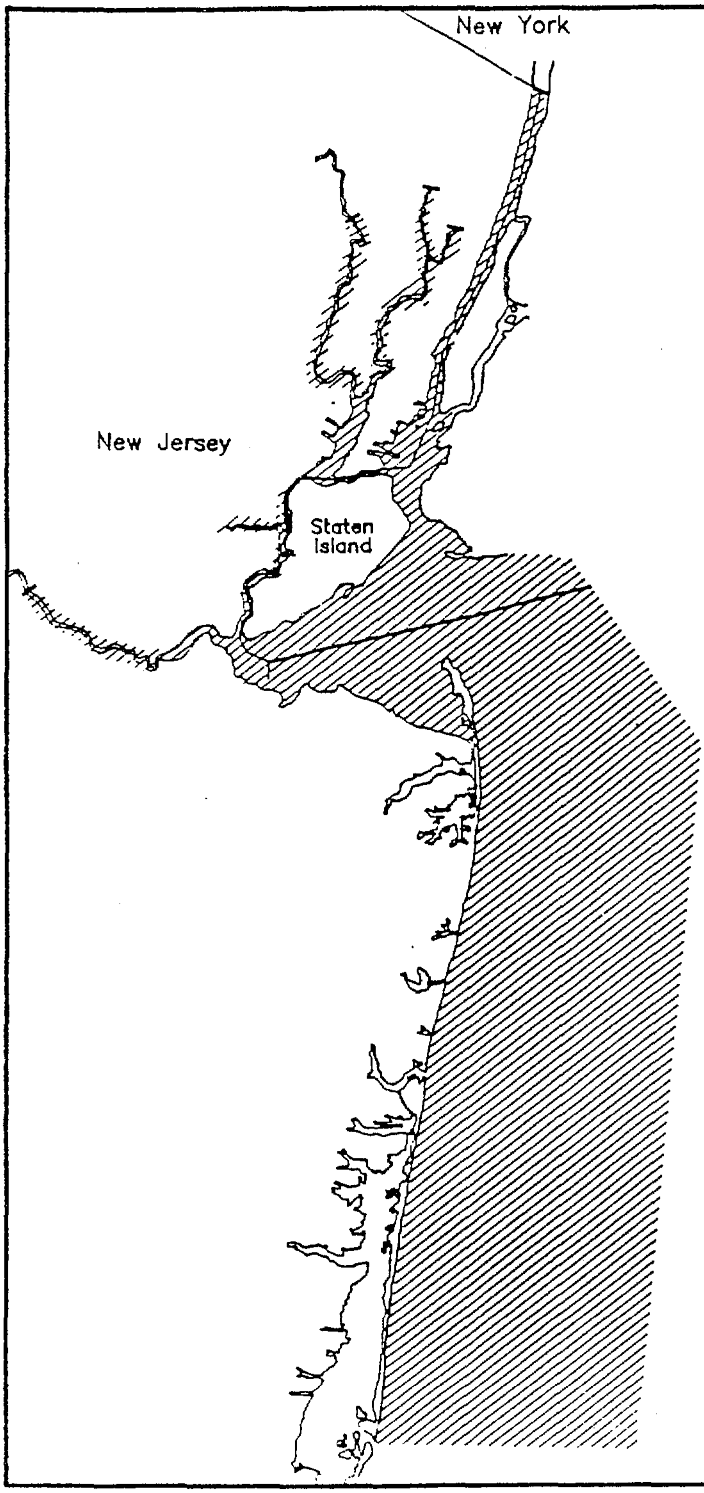


Figure III - 1
CLOSED FISHING AREA DUE TO PCBs IN FISH TISSUE

Taken from: NJDEP, 1985 c.

Figure III - 2

FISHING ADVISORY AREA DUE TO PCBs IN FISH TISSUE



ADVISORY AREA

Advisory in effect to limit consumption of STRIPED BASS, BLUEFISH, WHITE PERCH, WHITE CATFISH, and AMERICAN EEL.

Advisory area includes the following waterways and tributaries:

- Hudson River
- Upper New York Bay
- Newark Bay
- Tidal Passaic River
- Tidal Hackensack River
- Arthur Kill
- Kill Van Kull
- Tidal Raritan River
- Raritan Bay
- Sandy Hook Bay
- Lower New York Bay

STRIPED BASS and BLUEFISH advisory includes Offshore Waters for Northern Coastal Area.

AMERICAN EEL advisory includes all waterways statewide.

Taken from: NJDEP, 1985 c.

TABLE III-7 DESIGNATED USE SUPPORT AND DEGREE OF ATTAINMENT OF CLEAN WATER ACT GOALS IN STATE ESTUARINE AND OCEAN WATERS AS MEASURED IN SQUARE MILES.

ESTUARY: Designated Use Support

	Miles Evaluated	Miles Monitored	Miles Total
FULLY		117	117
THREATENED	360		360
PARTIALLY SUPPORTING		72	72
NOT SUPPORTING		18	18

ESTUARY: Clean Water Act (CWA) Goals

GOAL ATTAINMENT	FISHABLE	SWIMMABLE
Miles Meeting	477	360
Miles Not Meeting	54	54
Miles Not Attainable	18	18
Miles Partially Meeting	18	

OCEAN: Designated Use Support

	Miles Evaluated	Miles Monitored	Miles Total
FULLY		318	318
THREATENED			
PARTIALLY SUPPORTING		121	121
NOT SUPPORTING			

OCEAN: Clean Water Act (CWA) Goals

GOAL ATTAINMENT	FISHABLE	SWIMMABLE
Miles Meeting	318	122 (linear miles of coastline)
Miles Not Meeting		
Miles Not Attainable		
Miles Partially Meeting	121	

NOTE: Figures represent square miles.

TABLE III-8 SUMMARY OF POLLUTANTS FOUND IN NEW JERSEY'S OCEAN WATERS[1] (SQUARE MILES)

Pollutant Categories	Major/Statewide Impacts		Moderate/Localized/Minor Impacts	
	Monitored	Suspected	Monitored	Suspected
Unknown toxicity				?
Pesticides				?
Priority Organics	150			
Nonpriority Organics				
Metals		?		
Ammonia				
Chlorine				
Nutrients				270
pH				
Siltation				
Organics Enrichment/DO				270
Salinity/Road salts				
Thermal modification				
Flow alteration				
Habitat alterations				
Pathogens			?	
Radiation				
Oil and Grease				

Key: ? = Impact is suspected; a lack of monitoring data exists to substantiate the conclusion.

Footnote: 1 = Covers waters out to 3 miles.

TABLE III-9 SUMMARY OF THE SEVERITY OF POLLUTANT SOURCES IMPACTING NEW JERSEY'S OCEAN WATERS[1] (SQUARE MILES)

Source Categories	Major/Statewide Impacts (Suspected)	Moderate/Localized/Minor Impact (Suspected)
Point Sources		
Industrial	?	
Municipal		270
Combined sewer outfalls		120
Stormwater outfalls		
Nonpoint Sources		
Agriculture		120
Silviculture		
Construction		
Urban Runoff		120
Resource Extraction		
Land disposal		
Hydrologic/habitat modifications		

Key: ? = Impact is suspected; a lack of monitoring data exists to substantiate the conclusion.
Footnote: 1 = Covers waters out to the 3 mile limit.

TABLE III-10 SUMMARY OF POLLUTANTS FOUND IN NEW JERSEY'S ESTUARIES (SQUARE MILES)

Pollutant Categories	Major/Statewide Impacts		Moderate/Localized/Minor Impacts	
	Monitored	Suspected	Monitored	Suspected
Unknown toxicity				?
Pesticides	70			
Priority Organics	70			
Nonpriority Organics				?
Metals				?
Ammonia				
Chlorine				
Nutrients	70	?		
pH				
Siltation		140		
Organic Enrichment/DO		?		
Salinity/Road salts				
Thermal modification				
Flow alteration				
Habitat alterations				
Pathogens	142			
Radiation				
Oil and Grease				?

Key: ? = Impact is suspected; a lack of monitoring data exists to substantitae the conclusion

TABLE III-11 SUMMARY OF THE SEVERITY OF POLLUTANT SOURCES IMPACTING NEW JERSEY'S ESTUARIES (SQUARE MILES)

Source Categories	Major/Statewide Impacts (Suspected)	Moderate/Localized/Minor Impact (Suspected)
Point Sources		
Industrial	?	
Municipal	140	
Combined sewer outfalls		
Stormwater outfalls	140	
Nonpoint Sources		
Agriculture	70	
Silviculture		
Construction	140	
Urban Runoff	140	
Resource Extraction		
Land disposal		?
Hydrologic/habitat modifications		

<u>Key:</u> ? = Insufficient information exists to quantify the extent of these suspected pollutant source categories.

E. Nonpoint Source Assessment

This statewide nonpoint source evaluation was performed in cooperation with county planning departments, the State's soil conservation districts, the N.J. Division of Fish, Game and Wildlife, and the N.J. Division of Water Resources' Bureau of Marine Water Classification and Analysis. Nonpoint source questionnaires were completed by these agencies and their results compiled by the DWR's Bureau of Water Quality Planning. These evaluations reflect the best professional judgment of the assessor and are not thought to be based upon actual monitored data. Detailed watershed by watershed assessments are presented in Chapter III, Section I: Water Quality Conditions In New Jersey, within this report. In reporting, these agencies focused upon pollution sources; and as a result, pollution cause categories (types of pollutants) were not reported in perhaps forty percent of the questionnaires. If cause categories were not provided in the evaluations, pollution categories based upon what would have been suspected from the pollution sources listed in the evaluations would be added to the table. For example, if a stream has construction activity reported to us by a local planning department as a local nonpoint pollution source, siltation would be the suspected category based upon our experience, and we would report it as such. All pollution source and cause categories are regarded as suspected and preliminary because they are not derived from monitored data.

Summary of Nonpoint Source Pollution in New Jersey

Nonpoint source pollution is a ubiquitous problem throughout much of the State. Runoff from agriculture, roads, and urban/suburban surfaces is the most commonly reported nonpoint pollution source. The severity of the problem both in terms of the quantity of the pollutants as well as their degree of impact upon the receiving waters appears to be directly proportional to the regional population density and/or the intensity of local agricultural activity. Regions where sources and impacts are either absent or minimal are limited to the northwest corner of Sussex County in the Flatbrook watershed, and to the Pinelands region surrounding and including State forestlands. Other common nonpoint pollution sources reported were septic systems (land disposal) and construction sites; contributing bacteria/nutrients and sediment loads respectively to receiving waters. The most common pollutant categories encountered in the evaluations were sediment loading, nutrient loading, and bacterial contamination. Table III-12 represents a preliminary listing of waterways in New Jersey that are *suspected* of being impacted by nonpoint sources. There is insufficient information at this time to determine the actual effects of these sources on designated stream uses, and the relative contribution the sources make to total pollutant loadings. If a pollution source is listed, then the DEP suspects that additional actions are needed to control the source. The pollutants (pollution cause categories) are also suspected.

The deposition of air pollutants through rain has been reported to us by the Department's Division of Environmental Quality as averging 16.2 pounds of nitrate (from nitrogen oxides) per acre per year as determined through the Division's acid rain monitoring network (personal communication). The over all significance of this pollution source is as yet unclear because of a lack of data and is presently under study.

Nonpoint contributions to lake tributaries will ultimately impact the downstream lakes. Because lakes behave as sinks trapping sediments, nutrients, as well as waterborne chemicals; incoming sediments, toxins, etc. gradually build up in lake bottoms. At the same time excessive nutrient inputs accelerate primary productivity, which in turn increases biomass and therefore, the process of lake eutrophication (aging). As with rivers and streams, the degree of impact upon a lake is directly proportional to the degree of urban/suburban development or the intensity of agricultural activity within the watershed. However, our nonpoint source evaluations have shown that even lakes lying in undeveloped watersheds can be impacted by pollution associated with recreation. For example, lakes located in the relatively pristine watersheds in the extreme northwest corner of New Jersey are suffering degradation from septic system leachate associated with local summer homes.

Evaluations of the State's estuaries and nearshore ocean waters indicate that high population densities impact coastal waters in much the same way as they impact freshwater streams and lakes. The growing population along the State's coastal regions are adding ever increasing nonpoint source pollution to these waters. Shellfish harvesting and coastal recreation (swimming, etc.), both important resources in this State, are severely threatened by this pollution. Stormwater runoff has been sited often as a principal source of pollution threatening bathing beaches and some shellfish beds. Additional threats to shellfishing come from the bacterial loads which many coastal watersheds receive from agriculture, septic systems, urban/suburban runoff, as well as from the vast waterfowl populations which inhabit coastal waters.

The State of New Jersey recognizes the need for an effective nonpoint source control strategy, and is working toward the Water Quality Act of 1987 mandate concerning the development of a Statewide nonpoint source management program. For a detailed discussion of the State control program see Chapter V.B. Nonpoint Source Control Program.

TABLE III-12a. PRELIMINARY LIST OF WATERWAYS SUSPECTED OF BEING IMPACTED BY NONPOINT SOURCE POLLUTION

Rivers and streams that without additional action to control nonpoint sources of pollution, cannot be expected to attain or maintain standards. Categories of nonpoint sources which add significant pollution to the listed waterbodies are provided. Pollution sources are limited to those reported to us as having a moderate to severe impact upon the receiving waterway. Pollution categories listed are most often suspected and preliminary and are not based upon monitored data.

Rivers underlined denote names of major watersheds (listed alphabetically). Rivers not underlined are tributaries within the major watershed listed immediately above.

STREAM/RIVER	POLLUTION CAUSE CATEGORIES (POLLUTANTS)	POLLUTION SOURCE
Assicunk Creek	Sedimentation, Nutrients	Agricultural Runoff, Construction, Urban Runoff
Assunpink Creek	Sedimentation, Nutrients	Construction, Urban Runoff
Big Timber Creek Woodbury Creek	Sedimentation, Nutrients, Pathogens, Toxics(?), Oils and Grease	Agriculture, Construction, Urban Runoff, Surface Mining, Landfills, Septic Systems, Waste Storage Tanks, Road Runoff
Cooper River	Sedimentation, Nutrients, Pathogens, Oils and Grease	Agricultural Runoff, Construction, Urban Runoff, Mining Activities, Landfills
Crosswicks Creek	Nutrients, Sedimentation, Amonia, Pathogens, Pesticides, Herbicides, Chlorides	Agricultural Runoff, Construction, Septic Systems, Urban Runoff
North Run	Nutrients, Oil and Grease	Agricultural Runoff, Road Runoff

TABLE III-12a. PRELIMINARY LIST OF WATERWAYS SUSPECTED OF BEING IMPACTED BY NONPOINT SOURCE POLLUTION (Continued)

STREAM/RIVER	POLLUTION CAUSE CATEGORIES (POLLUTANTS)	POLLUTION SOURCE
Crosswicks Creek (Continued)		
Doctors Creek	Nutrients, Herbicides, Pesticides, Siltation	Agricultural Runoff, Construction, Urban Runoff
Elizabeth River	Nutrients, Pathogens, Oils and Grease, Flooding, Loss of Habitat, Organics, Chlorides	Urban Runoff, Channelization
Great Egg Harbor River (Lower)	Pathogens, Nutrients	Storm Sewers, Septic Systems
Maple Run	Siltation, Habitat Loss	Surface Runoff, Construction, Channelization
Hackensack River	Siltation, Nutrients, Toxics (?), Flooding, Habitat Destruction, Pathogens	Construction, Urban Runoff, Landfills, Spills, Inplace Contaminants, Flow Regulation
Manasquan River	Nutrients, Pathogens, Siltation, Volatile Organics, Chlorides	Agriculture (pastureland, animal holdings), Hazardous Waste Site, Road Runoff
	Erosion, Siltation, Loss of Habitat	Dam Construction, Flow Regulation, Streambank Modification
Marsh Bog Brook	Siltation, Nutrients, Pathogens (?)	Agricultural Runoff, Landfills

TABLE III-12a. PRELIMINARY LIST OF WATERWAYS SUSPECTED OF BEING IMPACTED BY NONPOINT SOURCE POLLUTION (Continued)

STREAM/RIVER	POLLUTION CAUSE CATEGORIES (POLLUTANTS)	POLLUTION SOURCE
Mantua Creek	Sedimentation, Nutrients, Pathogens, Oils and Grease	Road Runoff, Agricultural Runoff, Septic Systems, Urban Storm Sewers, Surface Mining
Maurice River	Sedimentation, Nutrients, Pathogens, Oils and Grease	Agricultural Runoff, Construction, Road Runoff, Landfills, Urban Runoff via storm sewers,
Nacote Creek Matrix Run	Sedimentation, Oils and Grease	Road Runoff, Construction
Metedeconk River	Pathogens, Turbidity	Septic Systems, Urban Surface Runoff
Muddy Ford Brook	Volatile Organics, Oils/Grease	Landfill
Millstone River	Nutrients, Sedimentation, Pesticides, Pathogens, Toxics	Agricultural Runoff, Urban Runoff, Septic Systems, Landfills, Spills, Construction
Mullica River	Sedimentation, Nutrients	Agricultural Runoff, Landfills, Construction, Surface Mining
Wading River		Hazardous Waste Site
Musconetcong River	Siltation, Nutrients, Pathogens, Oils and Grease	Construction, Agriculture, Road Runoff, Urban Runoff, Septic Systems
Mine Brook	Sedimentation, Chlorides, Habitate Destruction	Construction, Road Runoff, Channelization

TABLE III-12a. PRELIMINARY LIST OF WATERWAYS SUSPECTED OF BEING IMPACTED BY NONPOINT SOURCE POLLUTION (Continued)

STREAM/RIVER	POLLUTION CAUSE CATEGORIES (POLLUTANTS)	POLLUTION SOURCE
Navesink River	Nutrients, Pathogens, Pesticides, Sedimentation	Agricultural Runoff, Urban Runoff, Septic Systems
Swimming River	Siltation, Nutrients, Pathogens, Oils and Grease	Agriculture, Construction, Urban Runoff
North Branch Raritan River	Sediment, Nutrients, Pathogens	Agricultural Runoff, Construction, Urban Runoff
Lamington River	Sediment, Nutrients, Pathogens	Agricultural Runoff, Construction, Urban Runoff, Septic Systems
Rockaway Creek	Sedimentation	Surface Mining
Oldmans Creek	Sedimentation, Nutrients, Pathogens, Oils and Grease	Agricultural Runoff, Construction, Urban Surface Runoff, Septic Systems
Oyster Creek	Pathogens, Oils/Grease	Urban Surface Runoff
Passaic River	Siltation, Nutrients, Habitat Destruction, Elevated Stream Temperatures, Toxics, Pathogens	Construction, Urban Runoff, Flow Regulation, Spills, Inplace Contaminants, Waste Storage Leaks, Septic Systems
Green Brook Toney's Brook	Siltation, Habitat Destruction, Stream Bank Modification	Silviculture, Channelization

TABLE III-12a. PRELIMINARY LIST OF WATERWAYS SUSPECTED OF BEING IMPACTED BY NONPOINT SOURCE POLLUTION (Continued)

STREAM/RIVER	POLLUTION CAUSE CATEGORIES (POLLUTANTS)	POLLUTION SOURCE
Passaic River (Continued)		
Second River	Nutrients, Toxics, Oils/Grease, Pathogens	Urban Runoff
Mill Creek	Oils and Grease	Urban Runoff
Notch Brook	Siltation, Pathogens, Nutrients, Chlorides, Oils and Grease	Construction, Urban Runoff
Peckman River	Siltation, Nutrients, Pathogens, Oils/Grease, Chlorides, Habitat Destruction, Pathogens	Construction, Urban Runoff, Silviculture, Road Runoff, Stream Bank Modification
Foulertons Brook Canoe Brook	Siltation, Nutrients, Pathogens, Oils/Grease, Chloride	Urban Runoff, Channelization
Primrose Brook	Siltation, Habitat Destruction	Construction, Road Runoff, Flow Regulation
Paulins Kill	Chlorides	Landfill, Road Runoff

TABLE III-12a. PRELIMINARY LIST OF WATERWAYS SUSPECTED OF BEING IMPACTED BY NONPOINT SOURCE POLLUTION (Continued)

STREAM/RIVER	POLLUTION CAUSE CATEGORIES (POLLUTANTS)	POLLUTION SOURCE
Pequannock River	Siltation, Nutrients, Organics, Habitat Destruction, Oils/Grease, Pathogens	Construction, Urban Runoff, Surface Mining, Road Runoff, Channelization, Stream Bank Modification
Kikeout Brook	Habitat Destruction, Siltation	Construction
Pequest River	Chlorides, Flooding, Habitat Destruction (within Channelized reach)	Road Runoff, Construction, Channelization
Pohatcong Creek	Oils and Grease	Urban Runoff
Pompton River	Siltation, Nutrients, Warming of Stream Temperatures, Flooding	Construction, Urban Runoff, Surface Mining, Flow Regulation, Dredging
Sheffield Brook	Erosion, Turbidity, Destabilization of Stream Channel	Hazardous Waste Site, Channelization
Masonicus Brook	Siltation, Toxics (?)	Urban Runoff, Construction
Raccoon Creek	Sedimentation, Nutrients, Pathogens, Oils and Grease	Road Runoff, Agricultural Runoff, Septic Systems

TABLE III-12a. PRELIMINARY LIST OF WATERWAYS SUSPECTED OF BEING IMPACTED BY NONPOINT SOURCE POLLUTION (Continued)

STREAM/RIVER	POLLUTION CAUSE CATEGORIES (POLLUTANTS)	POLLUTION SOURCE
Rahway River	Sediment, Nutrients, Pathogens, Oil and Grease, Elevated Stream Temperature, Flooding, Loss of Habitat, Chlorides	Construction, Urban Runoff, Landfills, Channelization
Ramapo River	Siltation, Warming of Stream Temperatures Loss of Habitat for Biota	Construction, Urban Storm Sewers Channelization, Dredging
Rancocas Creek	Sedimentation, Nutrients, Pathogens, Habitat Destruction	Landfill, Construction, Agricultural Runoff, Urban Runoff, Septic Systems
Raritan River	Sedimentation, Nutrients	Urban Runoff, Construction, Landfills
Rockaway River	Siltation, Nutrients, Pathogens, Warming of Stream Temperature, Habitat Destruction	Construction, Urban Runoff, Flow Regulation, Streambank Modification
Jackson Brook Beaver Brook	Siltation, Pathogens, Nutrients	Construction, Urban Runoff, Spills
Den Brook	Siltation, Nutrients, Habitat Destruction	Construction

TABLE III-12a. PRELIMINARY LIST OF WATERWAYS SUSPECTED OF BEING IMPACTED BY NONPOINT SOURCE POLLUTION (Continued)

STREAM/RIVER	POLLUTION CAUSE CATEGORIES (POLLUTANTS)	POLLUTION SOURCE
Salem River	Sedimentation, Nutrients, Pathogens, Oils and Grease	Agricultural Runoff, Construction, Road Runoff, Septic Systems
Swedes Run	Oils and Grease	Road Runoff
Shark River	Siltation, Nutrients, pH Depression, Chlorides	Urban Runoff, Landfill, Construction, Waste Storage leaks
Shrewsbury River	Pathogens, Sedimentation, Nutrients, Oils and Grease, Elevated Stream Temperatures	Horse Race Track (agricultural), Construction, Urban Runoff, Agricultural Runoff, Septic Systems, Hazardous Waste Site
South Branch Raritan	Sedimentation, Nutrients, Pathogens	Spills, Agriculture, Septic Systems
Mulhockaway Creek	Siltation	Construction
Neshanic River	Pathogens, Nutrients, Siltation	Pasturelands Feedlots, Septic Systems, Construction, Storm Sewers, Sludge disposal
South River	Nutrients, Sedimentation	Construction, Urban Runoff, Streambank Destabilization
Manalapan Brook Matchaponix Brook	Siltation, pH Depression, Nutrients, Pathogens	Agricultural, Runoff, Construction, Urban Runoff, Septic Systems

TABLE III-12a. PRELIMINARY LIST OF WATERWAYS SUSPECTED OF BEING IMPACTED BY NONPOINT SOURCE POLLUTION (Continued)

STREAM/RIVER	POLLUTION CAUSE CATEGORIES (POLLUTANTS)	POLLUTION SOURCE
<u>Toms River</u>	Siltation, Pathogens, Nutrients, Siltation, pH Depression	Agriculture (crop production), Septic Systems, Urban Surface Runoff, Construction
Manapaqua Brook	High Ammonia, Nutrients, Turbidity, Pathogens	Urban Surface Runoff, Septic Systems
<u>Wallkill River</u>	Sedimentation, Nutrients, Pathogens	Construction, Urban Runoff, Agricultural Runoff
Clove Brook Papakating Creek	Nutrients, Pathogens	Agricultural Runoff
<u>Wanaque River</u>	Siltation, Warming of Stream Temperatures	Urban Runoff, Road Runoff
Belcher Creek	Siltation, Oils and Grease	Construction, Urban Runoff
<u>Whippany River</u>	Siltation, Nutrients, Pathogens, Oils and Grease	Construction, Urban Runoff, Spills, Inplace Contaminants

TABLE III-12b. Lakes, listed by watershed, which are evaluated as being significantly impacted by nonpoint and point source pollution. Specific pollution problems, categories, and their sources are listed. Question marks following pollution categories denote suspected categories based upon pollution sources supplied to us. Lake evaluations are based upon the best professional judgement of the agencies reporting and are not based upon monitoried data. Watersheds are listed alphabetically.

WATERSHED	LAKE	POLLUTION PROBLEM OR CATEGORIES (SUSPECTED)	POLLUTION SOURCES
Assunpink	Lake Assunpink Stone Tavern Lake Rising Sun Lake Mercer Lake	Nutrients	Agriculture, Suburban Runoff
Doctors Creek	Imlaystown Lake Allentown Lake	Siltation (severe)	Agriculture (crop production)
Flatbrook	Kittatinny Lake	Eutrophication	Construction, Suburban Surface Runoff, Septic System (Summer homes being converted to year-round homes)
Great Egg Harbor River	Collings Lake	Eutrophication (?)	Septic Sys., Road Runoff
	Lake Lenape	Eutrophication (?) Siltation (?)	Agriculture (crop production), Road Runoff
	Patcong Lake	Siltation	Construction, Suburban Runoff
	Atlantic City Reservoir	Possible Contamination of Drinking Supply	Hazardous Waste

TABLE III-12b (Continued).

WATERSHED	LAKE	POLLUTION PROBLEM OR CATEGORIES (SUSPECTED)	POLLUTION SOURCES
Manasquan River	Mac's Pond	Eutrophication, Elevated Bacterial Levels	Natural (birds), Road Runoff, Inplace Contaminants
	Stockton Pond	Eutrophication	Urban Runoff, Inplace Contaminants, Natural (birds)
Maurice River	Palatine Lake Union Lake	Eutrophication (?)	Septic Sys.
	Clartis Mill Pond Mill Pond	Siltation (?)	Point Sources: Industrial and Municipal STP. Nonpoint Sources: Urban Runoff, Landfills, Hazardous Waste Sites, Dam Construction
Mid-Atlantic Coastal Region	Tuckerton Lake	Beach Closings	Urban Runoff, Natural (birds, severe)
Millstone River	Etra Lake Peddie Lake	Siltation	Agriculture (severe crop production runoff)
Mullica River	Hammington Lake	Eutrophication	Urban/Suburban Runoff, Severe STP Input.

TABLE III-12b (Continued).

WATERSHED	LAKE	POLLUTION PROBLEM OR CATEGORIES (SUSPECTED)	POLLUTION SOURCES
Musconetcong	Lake Shawnee	Siltation, Eutrophication (?)	Construction
	Lake Hopatcong	Eutrophication	Construction, Storm Sewers, Septic Sys., Fuel Spills and Leaks
Navesink River	Swimming River Reservoir Shadow Lake Poricy Pond	Siltation, Elevated Bacteria, Organics	Construction, Urban Storm Sewers
Passaic River	Verona Lake	Sediment Bars, Fishery Impairment	Construction, Urban Runoff, Dredging, Flow Regulation, Removal of Riparian Vegetation
Paulins Kill	Paulinskill Lake Culvers Lake Lake Owassa	Some Eutrophication Eutrophication	Construction, Suburban Surface Runoff, Septic System (Summer homes being converted to year-round homes)
Pennsauken River	Strawbridge Lake	Fish and Duck Kills	Urban Runoff (Waterway passes through highly developed residential office complexes and regions of light industry)
	Memorial Lake	Siltation	Urban Runoff
Rockaway River	Dixons Pond Kohlers Pond	Fishery Impairment	Urban Runoff (storm sewers)

TABLE III-12b (Continued).

WATERSHED	LAKE	POLLUTION PROBLEM OR CATEGORIES (SUSPECTED)	POLLUTION SOURCES
Toms River	Bennets Pond	Oil and Grease, Siltation	Urban Runoff, Construction
	Twilight Lake	Siltation, Beach Closings	Urban Runoff, Natural (birds)
	Pine Lake	Beach Closings	Point Sources: Municipal STP Nonpoint Sources: Urban Runoff (severe)
	Manahawkin Lake Ocean Acres Lake	Beach Closings	Urban Runoff, Natural (severe problem with birds)
Whippany River	Speedwell Lake Black Meadows Troy Meadows	Siltation (?)	Construction (severe), Urban Runoff (storm sewers)

TABLE III-12c. PRELIMINARY LIST OF WATERWAYS SUSPECTED OF BEING IMPACTED BY NONPOINT SOURCE POLLUTION: Estuaries, Bays, Coastal Waters.

Bays, estuaries, and coastal waters suspected of being degraded or threatened by nonpoint source pollution. Pollution source categories and cause categories are as described in Table III-12a.

WATER BODY (Bay, Estuary, Coast)	POLLUTION PROBLEM OR CATEGORIES (Suspected)	POLLUTION SOURCE
Raritan Bay	Pathogens, Eutrophication, pH Depression, Landfill Leachate, Petroleum Contamination, Benzene and Other Volatiles, PCB's	Suburban Runoff, Natural: Acid Runoff, Landfill Leachate, Inplace Contaminants, Hazardous Waste Site Leachate.
Sandy Hook Bay	Pathogens, Nutrients, Toxic Leachate, Siltation, Oil and Grease	Construction, Suburban Runoff, Septic Tanks, Landfills.
Navesink River Shrewsbury River	Pathogens, Nutrients, Siltation, Oils and Grease	Agricultural Runoff: Crop and Animal (stored horse manure), Construction, Suburban Runoff, Septic Tanks, Natural (Waterfowl).
Shark River	Pathogens, Siltation, Nutrients	Agricultural (crop and animal holding), Construction, Suburban Runoff, Landfill, Natural (Waterfowl).
Manasquan River Metedeconk River	Pathogens, Siltation, Nutrients	Agricultural Runoff (cropland and animal holding), Suburban Runoff, Natural (Waterfowl).
Barnegat Bay: including Kettle Creek Toms River, South to Tuckerton Creek	Pathogens, Siltation, Nutrients, Oils and Grease	Construction, Septic Systems, Suburban Runoff, Landfill Leachate, Natural (Waterfowl). (Forked River and Oyster Creek: Channelization, Spills, Inplace Contaminants).

TABLE III-12c (continued). PRELIMINARY LIST OF WATERWAYS SUSPECTED OF BEING IMPACTED BY NONPOINT SOURCE POLLUTION: Estuaries, Bays, Coastal Waters.

WATER BODY (Bay, Estuary, Coast)	POLLUTION PROBLEM OR CATEGORIES (Suspected)	POLLUTION SOURCE
Great Bay	Pathogens, Oil and Grease, Nutrients, Siltation	Construction, Suburban Runoff, Natural (Waterfowl).
Brigantine Reeds Bay Absecon Bay	Pathogens, Oils and Grease, Nutrients	Suburban Surface Runoff, Septic Systems, Boat Docking Facilities, Natural (Waterfowl).
Lakes Bay	Pathogens, Nutrients	Suburban Runoff, Marinas
Great Egg Harbor	Pathogens, Nutrients	Septic Systems, Natural (Waterfowl)
Cape May: Atlantic Estuaries	Pathogens	Suburban Surface Runoff, Marinas
Cape May: Delaware Bay Estuaries	Pathogens, Nutrients	Septic Systems, Natural (Waterfowl)
Delaware Bay Estuaries: (West Creek, Maurice River, Dividing Creek to Cohansey River)	Pathogens	Septic Systems, Natural (Waterfowl).
Atlantic Ocean: Chelsea Beach (near Shark River)	Pathogens	Natural (Birds on Pier).
Atlantic Ocean: All other beaches	Pathogens	Storm Sewers fed by Suburban Runoff.

F. Waters Impacted by Toxics From Point Sources

The Clean Water Act (CWA) provides broad statutory authority which mandates that programs be implemented to control the discharge of pollutants to surface waters. Under sections of the Act, the States and USEPA are required to develop and implement both technology-based and water quality-based controls of toxic pollutants (specifically EPA's list of 126 priority pollutants), as well as conventional (and what USEPA has designated as nonconventional) pollutants.

Section 304(l) of the CWA of 1987 requires states to develop lists of impaired waters, to identify point sources and amounts of pollutants they discharge that cause toxic impacts, and to develop individual control strategies for each such point source. These individual control strategies are designed to ensure that applicable water quality standards are achieved by no later than June 1992. The result of this effort is to focus national surface water quality protection programs immediately on addressing known water quality problems caused either entirely or substantially by point source discharges of toxic "priority pollutants".

Pursuant to Section 304(l), the NJDEP's Division Of Water Resources has generated a list of impaired waters (the Long List), and has developed two additional lists (the "Short List" and the "Mini List") which are subsets of the Long list.

1. Comprehensive (Long) List

The impaired waters of the State are identified in Table III-A, which is designed to meet the requirements under Section 304(l)(A)(ii) of the Clean Water Act Amendments of 1987. This is the comprehensive "Long List" of all known waters impacted or potentially impacted by toxic, conventional, and nonconventional pollutants from point and nonpoint sources.

The table specifies those waters which are believed to be "Swimmable Impaired", "Fishable Impaired" (finfish or shellfish), meeting the use goals, or which have not yet been evaluated in this regard. The table also indicates whether the waters are impacted by point or nonpoint sources of pollution. Streams, lakes and impoundments, estuaries, interstate waters, as well as some specific wetlands are included in the table. The determinations of point source and nonpoint source impacts are predominantly based on 1) the presence of point sources and 2) the results of questionnaires which were completed by local government bodies and agencies which participated in the Division's survey (see Section III.E "Nonpoint Source Assessment").

The basis and methodology for determining whether a designated use is being met is presented in Section I of this chapter, in the Introduction to the Water Quality Inventory. Waterbodies presented on the Short List and Mini-List were also included in the Long List.

TABLE III-A IMPAIRED WATERBODIES IN NEW JERSEY

This table identifies those waters of New Jersey which are believed to be impaired. The waterbodies may or may not be impaired throughout their entire length; in many instances, insufficient information presently exists to quantify the full extent of their impairment. The table also identifies those waterbodies receiving point sources and/or nonpoint sources of pollution. Waterbodies are grouped by watershed. The notes at the end of the table explain the codes used in the table.

The New Jersey Division of Fish, Game and Wildlife performed the fishery evaluations which were used in determining whether "fishable" (finfish) goals are being met. For estuarine waters, shellfish harvesting classifications were also used. In determining whether "swimmable" goals are being met, the Division of Water Resources examined bacteria levels in monitoring samples.

Key: 1. Lakes, reservoirs, and wetlands are indicated by an asterisk (*).

2. An "X" in the "Fishable" (finfish) or "Swimmable" column means that the goal is not being fully met. For certain waters, a use may be met at specific locations, but the waterway is not meeting the use throughout its length or at all times. Waters with shellfish constraints are indicated by a double asterisk (**).

3. A dash (-) in the Fishable or Swimmable column means that there has been no assessment of whether the goal is being met. An "M" in the Fishable or Swimmable column means that the goal is being met.

4. An "X" in the "Point" or "Nonpoint" column means that it is believed that that source is impacting the specified waterbody.

Waterbody	Fishable Impaired	Swimmable Impaired	Pollution Source Point	Nonpoint
1. Wallkill River	X	X	X	X
-Papakating Creek	X	X	X	X
-Clove Brook	X	-	-	X
-Black Creek	-	X	X	X
-Clove Lake*	-	X	-	X
2. Flat Brook	M	M	-	X
-Little Flat Brook	-	-	-	X
3. Paulins Kill	M	X	X	X
-Clovers Lake*	-	-	-	X
-Paulins Kill Lake*	X	-	X	X
-Kittatiny Lake*	-	-	-	X
-Lake Owasa*	-	-	-	X
4. Pequest River	M	X	X	X
5. Pohatcong Creek	M	X	X	X
-Merrill Creek	M	-	-	X
-Lopatcong Creek	M	-	X	X
6. Musconetcong River	M	X	X	X
-Lake Hopatcong*	M	M	-	X
-Lake Musconetcong*	M	M	-	X

Waterbody	Fishable Impaired	Swimmable Impaired	Pollution Source Point	Nonpoint
-Wills Brook	X	-	X	X
-Mine Brook	-	-	-	X
-Trout Brook	M	-	-	X
-Lake Shawnee*	M	M	-	X
7. Delaware River Tribs.				
(Hunterdon County)				
-Wickecheoke Creek	X	X	X	X
-Alexauken Creek	M	X	X	X
-Lockatong Creek	M	X	-	X
8. Assunpink Creek	X	X	X	X
-Lake Assunpink*	-	-	-	X
-Stone Tavern Lake*	-	-	-	X
-Rising Sun Lake*	-	-	-	X
-Mercer Lake*	-	-	-	X
9. Crosswicks Creek	-	X	X	X
-Doctors Creek	-	-	-	X
-Duck Creek	X	-	-	X
-North Run	X	-	-	X
-Back Creek	-	-	-	X
-Imlaystown Lake*	-	-	-	X
-Allentown Lake*	-	-	-	X
-Assiscunk Creek	-	-	-	X
10. Rancocas Creek	M	X	X	X
-North Branch	-	-	X	X
-South Branch	-	-	X	X
-Cranberry Branch	M	-	-	X
-Powell Run	-	-	-	X
-Friendship Creek	M	-	-	X
-Mason Creek	M	-	-	X
-Mill Creek	X	-	-	X
11. Pennsauken Creek	-	X	X	X
-North Branch	M	X	-	X
-South Branch	X	X	X	X
-Strawbridge Lake*	-	X	X	X
-Memorial Lake*	-	-	-	X
12. Cooper River	X	X	X	X
13. Big Timber Creek	-	X	X	X
-North Branch	M	X	X	X
-South Branch	M	X	X	X
-Woodbury Creek	-	-	X	X
-Newton Creek	-	-	-	X
-Holly Run	-	-	-	X

Waterbody	Fishable Impaired	Swimmable Impaired	Pollution Source Point	Nonpoint
14. Raccoon Creek	M	X	X	X
-South Branch	X	-	-	X
-Mantua Creek	-	-	-	X
-Chestnut Branch	-	-	-	X
-Edwards Run	-	-	-	X
15. Oldmans Creek	M	X	-	X
16. Salem River	M	X	X	X
-Swedes Run	X	-	X	X
17. Cohansey River	M**	X	X	X
18. Maurice River	M**	M	X	X
-Mill Creek	X	-	-	X
-Hudsons Branch	-	-	X	X
-Still Run	-	-	-	X
-Muddy Run	-	-	-	X
-Blackwater Branch	-	-	X	X
-Clartis Mill Pond*	-	-	-	X
-Mill Pond*	-	-	-	X
19. Great Egg Harbor River	X**	X	X	X
-Squankum Branch	-	-	-	X
-Four Mile Branch	-	-	-	X
-Hospitality Branch	-	-	-	X
-Atlantic City Reservoir*	-	-	-	X
-Babcock Creek	-	-	X	X
-Gravelly Run	-	-	-	X
-Miry Run	-	-	-	X
-Mill Branch	-	-	-	X
-Maple Run	-	-	-	X
-Patcong River	-	-	-	X
-Colling Lake*	-	-	-	X
-Lake Lenape*	-	-	-	X
-Patcong Lake*	-	-	-	X
20. Mullica River	M**	M	-	X
-Hammonton Creek	X	X	X	X
-Sleeper Branch	M	M	-	X
-Gum Branch	M	M	-	X
-Albertsons Branch	M	M	-	X
-Landing Creek	M	M	-	X
-Indian Cabin Creek	M	M	-	X
-Union Creek	M	M	-	X
-Wading River	M	M	-	X
-Morses Mill Creek	M	M	-	X
-Matix Run	M	M	-	X
-Hammonton Lake*	-	-	-	X
-Nacote Creek	-	-	-	X

Waterbody	Fishable Impaired	Swimmable Impaired	Pollution Source Point	Nonpoint
21. Toms River	M**	X	X	X
-Union Branch	-	-	-	X
-Wrangle Brook	-	-	-	X
-Pine Lake*	-	-	X	X
-Manapaqua Brook	-	-	-	X
-Oyster Creek	-	-	-	X
-Metedeconk River	-	-	-	X
-Muddy Ford Brook	-	-	-	X
-Bennets Pond*	-	-	-	X
-Twilight Lake*	-	-	-	X
22. Manasquan River	M**	X	X	X
-Marsh Bog Brook	M	X	X	X
-North Branch Squankum Bk.	-	-	X	X
-DeBois Creek	-	-	X	X
-Mac's Pond*	-	-	-	X
-Stockton Pond*	-	-	-	X
23. Navesink River	M**	-	-	X
Shark River (Monmouth County Coastal Drainage)	M**	X	-	X
-Willow Brook	-	-	X	-
-Shrewsbury River	X**	-	-	X
-Waackaack Brook	-	-	X	-
-Lake Lefferts*	-	-	X	-
-Birch Swamp Brook	-	-	X	X
-Swimming River	-	-	-	X
-Swimming River Reservoir*	-	-	-	X
-Poricy Pond*	-	-	-	X
-Shadow Lake*	-	-	-	X
24. South Branch Raritan River	M	X	X	X
-Neshanic River	M	X	-	X
-Bushkill Brook	M	-	X	X
-Spruce Run Creek	M	X	-	X
-Mulhockaway Creek	M	X	-	X
-Pleasant Run	M	-	-	X
-Capoolong Creek	-	-	X	X
25. North Branch Raritan River	M	X	X	X
-Lamington River	M	X	-	X
-Rockaway Creek	M	X	-	X
-Mill Brook	-	-	X	X
-Mine Brook	-	-	X	-

Waterbody	Fishable Impaired	Swimmable Impaired	Pollution Source Point	Nonpoint
26. Millstone River	X	X	X	X
-Stony Brook	-	X	X	X
-Bedens Brook	-	X	-	X
-Etra Lake*	-	-	-	X
-Cranbury Brook	-	-	-	X
-Peddie Lake*	-	-	-	X
-Rocky Brook	-	-	X	-
27. South River	M	X	X	X
-Matchaponix Brook	M	X	X	X
-Manalapan Brook	M	X	X	X
-Edmunds Creek	-	-	-	X
28. Raritan River	X	X	X	X
-Peters Brook	-	-	-	X
-Lawrence Brook	-	-	X	-
29. Rahway River	X	X	X	X
Elizabeth River	X	X	X	X
-Morses Creek	X	-	X	X
30. Upper Passaic River (headwaters to Pompton River)	X	X	X	X
-Dead River	-	-	X	X
-Foulertons Brook	X	-	-	X
-Green Brook	-	-	-	X
-Toney's Brook	-	-	-	X
31. Whippany River	X	X	X	X
-Speedwell Lake*	-	-	-	X
-Black Meadows*	-	-	-	X
-Troy Meadows*	-	-	-	X
32. Rockaway River	X	X	X	X
-Beaver Brook	X	-	-	X
-Den Brook	X	-	-	X
-Dixons Pond*	-	-	-	X
-Jackson Brook	-	-	-	X
-Kohlers Pond*	-	-	-	X
33. Pequannock River	X	M	-	X
-Kikeout Brook	X	-	-	X
34. Wanaque River	X	M	-	X
-Belcher Creek	X	-	X	X
-High Mountain Brook	-	-	X	-
35. Ramapo River	M	X	X	X
Pompton River	X	X	X	X
-Sheffield Brook	-	-	-	X
-Masonicus Brook	X	-	-	X

Waterbody	Fishable Impaired	Swimmable Impaired	Pollution Source Point	Nonpoint
36. Lower Passaic River (Pompton River to Newark Bay)	X	X	X	X
-Saddle River	X	X	X	X
-Second River	X	-	X	X
-Deepavaal Brook	X	-	X	X
-Verona Lake*	X	-	-	X
-Peckman River	-	-	X	X
-Singac River	-	-	X	-
-Hohokus Brook	-	-	X	-
-Ackermans Creek	-	-	X	X
-Notch Brook	X	-	-	X
-Canoe Brook	-	-	-	X
-Primrose Brook	-	-	-	X
37. Hackensack River	X	X	X	X
-Overpeck Creek	X	X	X	X
-Berry's Creek	-	X	X	X
-Oradell Reservoir*	-	-	X	X
-Cresskill River	X	-	-	-
38. Tidal Estuarine Waters				
-Monmouth County	-**	-	X	X
-Ocean County	-**	-	-	X
-Atlantic County	-**	-	-	X
-Cape May County	-**	-	X	X
-Cumberland County	-**	-	-	X
-Atlantic Ocean	-**	-	X	X
39. Delaware River				
-Zone 1	M	X	-	X
-Zone 2	M	M	X	X
-Zone 3	X	X	X	X
-Zone 4	X	X	X	X
-Zone 5	X	M	-	-
40. New York-New Jersey Interstate Sanitation Commission Waters (includes: Newark Bay, Hudson River, Arthur Kill, Kill Van Kull, Raritan Bay, and Upper New York Bay)	X	X	X	X

2. "Short List"

The "Short List" is a list of waters for which a state does not expect applicable water quality standards (numeric or narrative) to be achieved after technology-based requirements have been met due entirely or substantially to point source discharges of what USEPA has defined as the 126 "priority pollutants". The following table is a list of reaches where impairment is suspected. These are not waters necessarily with known problems.

TABLE III-B NJDEP PRELIMINARY SHORT LIST REACHES

REACH NUMBER	REACH LENGTH (mi.)	REACH NAME
02030103001	21.1	Hackensack River
02030104001	20.1	Upper New York Bay
02030104002	12.7	Newark Bay / Arthur Kill
02030104003	9.3	Arthur Kill
02030105005	17.0	Raritan Bay
02030105031	18.1	Upper Millstone River
02030105032	13.4	Cranbury Brook
02030105013	18.0	Lower Pequest River
02040201004	11.3	Delaware River - Z2
02040202036	5.4	Delaware River - Z3
02040301054	5.4	Hammonton Creek
02040302010	17.5	Great Egg Harbor River

3. Mini List

The "Mini-List" is comprised of waterbodies not expected to achieve State water quality standards, revised pursuant to Section 303 (c) (2)(B) for priority pollutants, due to point or nonpoint sources after technology-based requirements have been met.

TABLE III-C CANDIDATE MIMI LIST

KEY: PS = Point Source, NPS = Nonpoint Source, UKS = Unknown Source

Reach	Waterbody Name	PS	NPS	UKS
02020007028	Wallkill River	*		*
02030101005	Hudson River	*	*	*
02030101009	Hudson River	*	*	*
02030103	Deepaval Brook	*		
02030103	Peckman River	*		
02030103	Singac River	*		
02030103	Hohokus Brook	*		
02030103	Ackermans Creek		*	
02030103001	Hackensack River	*	*	
02030103002	Hackensack River (Oradell Reservoir)	*		
02030103005	Hackensack River	*		*
02030103010	Passaic River	*	*	
02030103011	Saddle River	*		
02030103012	Passaic River	*		
02030103013	Pompton River	*		
02030103014	Ramapo River	*		
02030103021	Passaic River	*		
02030103022	Whippany River	*	*	
02030103023	Rockaway River	*	*	
02030103024	Whippany River	*		
02030103025	Passaic River	*	*	
02030103034	Berrys Creek		*	
02030104	Kill Van Kull		*	
02030104	Elizabeth River	*		
0203104	Birch Swamp Brook		*	
02030104001	Upper New York Bay	*	*	
02030104002	Newark Bay	*	*	*
02030104003	Arthur Kill	*	*	*
02030104006	Sandy Hook Bay	*		*
02030105	Capoolony Creek		*	
02030105	East Trout Brook		*	
02030105	Rocky Brook	*		
02030105	Edmunds Creek		*	
02030105	Lawrence Brook			*
02030105001	Raritan Bay	*	*	*
02030105002	Raritan River	*	*	
02030105015	Raritan River South Branch	*		
02030105026	Millstone River	*		*

Reach	Waterbody Name	PS	NPS	UKS
02030105028	Millstone River	*		
02030105029	Stony Brook	*		
02030105031	Millstone River, Upper	*		
02030105033	South River	*	*	
02030105059	Mill Brook		*	
02030105060	Mine Brook	*		
02040105003	Assunpink Creek, Upper	*		
02040105008	Musconetcong River	*		
02040105011	Delaware River	*	*	
02040105021	Paulins Kill			*
02040105032	Assunpink Creek, Lower	*		*
02040201003	Assiscunk Creek		*	*
02040201004	Delaware River (Zone 2)	*	*	*
02040202	Woodbury Creek (Stewart Lake)		*	*
02040202	Newton Creek		*	*
02040202	Holly Run/Briar Lake		*	
02040202	Edwards Run		*	
02040202	Chestnut Brook/ Alcyow Lake		*	
02040202030	Delaware River (Zone 3/4)		*	*
02040202034	Cooper River	*	*	*
02040202035	Delaware River (Zone 3/4)		*	*
02040202039	Pennsauken Creek	*	*	*
02040202040	Delaware River (Zone 3/4)		*	*
02040202043	Delaware River (Zone 3/4)		*	*
02040202046	Delaware River (Zone 3/4)		*	*
02040202050	Rancocas Creek			*
02040202053	Delaware River (Zone 3/4)		*	*
02040206	Hudson Brook of Maurice River		*	
02040206030	Blackwater Brook		*	
02040301	Squankum Brook, North Branch		*	
02040301002	Manasquan River	*	*	
02040301014	Toms River	*	*	
02040301017	Toms River	*	*	
02040301018	Toms River	*		

G. The Condition of New Jersey's Ocean Water: A Special State Concern

Potential water quality problems associated with the condition of New Jersey's Coastal water quality and beaches received a great deal of publicity in the summer of 1987. The major complaints by beach-goers and local residents included health risk concerns, garbage floating in the water, and litter on the beaches. From unexplained dolphin dealths to hospital wastes washing onshore, it appeared to the public that the complaints were not unfounded (NJDEP, 1986b).

At the same time, the New Jersey Department of Envionmental Protection (DEP) and the United States Environmental Protection Agency (EPA) reported that their routine monitoring programs indicated excellent ocean water quality. The state and federal scientists were looking at high dissolved oxygen levels, good water clarity and low bacterial counts (NJDEP, 1986b).

The apparent ability of the Atlantic Ocean to dilute and assimilate a large quantity of solid and liquid waste has designated it as a major disposal site for modern society. The New Jersey Shore is also highly valued as a base for recreational and residential activities., and numerous living resources. This is evident by the publicity created by the summer of 1985 beach closings and visible pollution problems. The ocean does have a remarkable ability to process waste naturally without harm to living marine resources or its recreational value. The pollution problems visible to all this summer indicate that this ability has its limits. These limits cannot be abused without detrimental effects.

The necessity to close beaches in the summer of 1987 indicated areas and times when the ocean environment was stressed beyond its limit for supporting primary contact recreation. The Coastal Cooperative Monitoring Program identified showed 12 short term and 3 extended ocean beach closings in 1987 (see section D of this chapter for a more detailed description of estuarine and ocean water quality). The causes of the periodic short term beach closings in the ocean were land-based and usually associated with rainfall. The three extended closings were in Atlantic City, Monmouth County, and Seaside Heights. The mechanism for bacterial transport to beaches during an August 17-22 closing in Atlantic City was considered to be contamitated flow from the stormwater pipes discharging to the ocean. A damaged valve in a sewage line at the Ocean Township Sewerage Authority Facility was the cause of an August 17-19 closing in Monmouth County. In Seaside Heights, the beach was closed on August 3 on either side of the Casino Pier as fecal coliform concentrations were elevated above the standard. The bacterial contamination was attributed to the presence of the bird populations roosting under the pier (NJDEP, 1988a).

The Jersey Shore suffered beach closings in the summer of 1987 due to other causes than high bacterial levels. Discretionary beach closings from Point Pleasant through Long Beach Island in Ocean County from May 27 through May 29 were invoked during the extensive washup of floatables which included plastics (condoms and tampon applicators), grease-coated organic particles of varying size and the decomposing remnants of an major algal bloom which had extented from Sandy Hook to Long Beach Island. From August 13 through August 16, a period preceeded by extreme tides, heavy rains and northeast winds, another major floatables washup caused beach closings from southern Monmouth County through Long Beach Island. The presence of medical waste (syringes, needles, intravenous tubing), wood and glass required major cleanup efforts prior to the reopening of the beaches (NJDEP, 1988a).

Steps were taked to address the pollution problems of the summer of 1987. Governor Kean of New Jersey introduced a 14 point plan to address ocean and beach problems. This plan includes a reorganization of state coastal authority through a coastal commission. Legislation has recently been introduced to address most of the pollution problems identified in the Governor's 14 point plan. The 14 points and the Coastal Commission are outlined later in this section.

The NJDEP, New Jersey Department Of Health and the USEPA initiated and continued a number of programs and studies addressing ocean and beach pollution. These include: a floatable study to identify sources and determine the distribution of solid wastes that float or remain suspended in the water column was continued by NJDEP and EPA (NJDEP, 1987d). The concern over gastrointestinal, respiratory and skin infections reported by visitors and residences of the shore during the summer of 1987 initiated a health study by the NJDOH (NJDOH, 1988). DEP and EPA are analying phytoplankton and chlorophyll "a" concentrations in the New York Bight area. NJDEP and the coastal county health departments have a program to monitor ocean water quality as related to fecal coliform concentrations at bathing beaches (NJDEP, 1988a). The Commissioner of NJDEP initiated a study by scientific, governmental, and environmental professions to review the events of this past summer in the context of the larger issues of coastal development, water quality and marine resources. A written report to be presented to the Commissioner in May, 1988 which will address the events of last summer and include recommmendations of actions to take to avoid similar occurences in the future.

The New York-New Jersey Harbor and the Delaware Bay have been declared estuaries of national significance and have been nominated for the National Estuary Program. The NJDEP will be working with EPA Region I and II, Delaware, Pennsulvania, and New York to develop comprehensive management plans which include recommendations for pollution control in both the New York-New Jersey Harbor and the Delaware Bay.

Controls over ocean pollution are regulated by the state and federal governments. Highlighted below are the major potential pollution sources and present regulations or programs to control the pollution. It is a combination of these pollution sources that causes the ocean environment to be stressed by bacterial and floatable pollutants.

Municipal Sewage Sludge

Sewage sludge is the solid portion of human waste remaining of municipally operated plants the solids settle to the bottom of tanks during the wastewater treatment process.

Three New York and six New Jersey sewerage agencies dispose of a great deal of sludge into ocean. Over 150 smaller New Jersey communities have stopped ocean disposal of sewage sludge since 1976 (NJDEP, 1988b).

EPA has set 1991 as the date for cessation of all dumping in the ocean. In 1984 EPA denied petitions from the ocean dumpers to continue to use an EPA designated site located 12 miles off shore in shallow water. At present all sludge dumping is to be done at a 106 mile site in deep water off the continental shelf (NJDEP, 1988b).

Two alternative disposal options for sludge are incineration and composting with land application. While these options would stop ocean disposal they could cause serious air or ground water pollution problems.

Dredged Material

Sand, silt, and mud must be removed from navigational channels and docking areas throughout the port of New York and New Jersey. Some of these sediments come from industrial and sewer outfall areas which contain pollutants such as heavy metals, and PCBs, oil and grease. The Army Corp of Engineers is responsible for the transportation and dumping of the dredged material at a site (Mud Dumping Site) six miles east of Sea Bright. The Corp is responsible for determining the suitability of dredge material for dumping by running bioassay and bioaccumulation tests. In 1986 a law was enacted by Congress which requires the EPA and the Corps to find a new site at least 20 miles offshore and relocate the dredge material disposal from the Mud Dump Site.

The dredged material remains in place on the ocean floor so it does not pose a threat to beaches or swimmers. The dreged material causes stress to marine organisms by covering the ocean floor at and near the site. Promising alternatives to dumping the dredged material include the creation of a containment island in Lower New York Bay or in Raritan Bay, filling-in existing holes in the harbor area and using clean sand to re-establish eroded beaches (NJDEP, 1988b).

Industrial Waste Disposal

Only two companies continue to dispose of a portion of their wastes in the ocean under permit authority of the USEPA. EPA's regulations state that ocean disposal can only be considered if land-based alternatives do not exist. Allied Corporation disposes of dilute hydrochloric acid at a site approximately 20 miles east of Asbury Park. Dupont in Delaware disposes of dilute iron-acid waste at the 106 mile site. All ocean disposal of industrial waste is expected to curtailed as soon as these companies begin to utilize land based disposal aterantives (NJDEP, 1988b).

Wood Burning

A New Jersey/New York Harbor clean-up program exists in cooperation with the Corps of Engineers. This program is designed to remove old piers, pilings, bulkheads, and abandoned vessels. Wooden debris and charred timbers which drift in the harbor and are found on beaches are collected. The wood is collected to minimize harzards to boat navigtation. The collected material is burned in special steel barges at a site approximately 20 miles east of Point Pleasant, New Jersey.

Public concerns center around the poor record of operations by certain burn barge contractors. Timbers have fallen overbard in transit to the burn site and washed onto beaches or caused hazards to fishing and recreational boats. The NJDEP has been authorized by EPA to monitor all burn operations involving New Jersey originated material. In 1986 and 1987 EPA imposed conditions on burning including fewer burns, no overloading of barges, trailing vessels to pickup fallen material and increased monitoring. Air pollution and water pollution by soot and ash are also concerns which need to be addressed (NJDEP, 1988b).

Boat litter

There are laws which prohibit the discharge of oil or oily substances in the ocean. The Coast Guard is responsible for ensuring that the merchant marine laws are enforced.

At the present time, commercial vessels can legally dispose of garbage generated aboard ship in the ocean beyond three miles from shore. This practice has become a major issue nationally. A recent DEP study concluded that there is a significant potential for wash up of garbage plastics and floatables from offshore vessels including recreational craft, fishing boats, and merchant marine vessels.

The problem of plastics and marine garbage is being addressed by an international agreement known as MARPOL, Annex V. The United States will soon become a party to that agreement. When it becomes operational, ships will no longer be able to dispose of plastic wastes overboard and other types of solid waste disposal will be strictly regulated (NJDEP, 1988b).

Wastewater Discharges

The developed areas of New Jersey and New York process human wastes at sewage treatment plants. Each day the coastal ocean receives approximately three billion gallons of wastewater from New York City and New Jersey. This volume currently includes primary treated wastewater, secondary treated wastewater, industrially treated wastewater and varing amounts of raw sewage and combined sewer overflows. Sewage treatment generally removes 85-90% of the pollutants. The cummulative impact of the wastewater discharges likely has a major impact on pollutant loading in the coastal ocean.

The states of New Jersey and New York together with the federal government require at least secondary level of sewage treatment. New Jersey and the EPA have invested several billion dollars in upgrading sewage treatment plants throughout the State. Almost all of the older primary level plants along the coast have been improved or replaced with new secondary plants over the past ten years. The upgrading will be completed within a year or so when new plants serving Asbury Park and the Wildwoods come on line (NJDEP, 1988b).

Ciba-Geigy Corporation operates a chemical manufacturing plant in Toms River and discharges its treated industrial wastewater to the ocean one-half mile offshore through an outfall pipeline. It is New Jersey's only industrial discharge directly into the ocean. The discharge is regulated through a permit issued by the DEP.

The Ciba-Geigy ocean discharge has been very controversial and the subject of severe criticism. One of the criticisms is that the ocean discharge poses a public health hazard to bathers in the vicinity of the outfall. The Department's Division of Science and Research provided direction and oversight on a number of required research studies. Dye studies were conducted to trace pollutants both offshore and nearshore. The conclusion reached by DEP in May of 1987 was that the ocean discharge does not, at this time, pose a meaningful health hazard to bathers (NJDEP, 1988b).

Nonpoint Sources of Pollution

Nonpoint source pollution is any pollution beside that which comes out the end of an outfall pipe from a regulated treatment plant. The pollutants can enter the waterway directly from stormwater runoff through storm sewer systems. Urban runoff contains oil, grease, heavy metals, pathogens, nutrients, chemicals, and litter. Agricultural runoff contains excessive nutrients, pesticides, and soil particles. Suburban areas contain conbinations of both urban and agricultural pollutants.

Eighty to ninety percent of the coastal beach closings are attributable to localized sources of elevated bacterial pollution from stormwater runoff. During the past two summers there have been no pollution incidents resulting form sewage treatment plants along the coast. The bacteria comes from leaky sanitary sewer lines, cross connections of sanitary lines into storm sewers, bird populations, and pet droppings. Excess fertilizers from agricultural lands and suburban lawns likely contribute the nutrients that sometimes trigger blooms of algeal in the ocean. The majority of floating litter and debris that has plagued the beaches of New Jersey comes from stormwater runoff and flushing of storm water pipes after heavy rainfalls (NJDEP, 1988b).

In his State of the State Address in 1987, Governor Kean announced the proposal of a 14-point Action Plan to preserve the quality of New Jersey's ocean and beaches. The establishment of a New Jersey Coastal Commission is an essential element of the Governors proposal. The proposal is the Governor's response to the intense publicity recently recieved by pollution problems along the New Jersey Shore.

The Coastal Commission to be created by the Governors proposal will have jurisdiction over the entire coastal region as defined in New Jersey Coastal Area Facility Review Act. The appropriate Division of Coastaol Resources personnel and functions will be transfered to the commmission. The commission will develop a comprehensive shore Master Plan which will streamline the regulatory and planning framework for the coast, address water quality and shore protection, and delegate permitting athority to localities. The commission will be responsible for the funding needed to support necessary programs (NJCC, 1987).

The fourteen measures the Governor has outlined that municipalities, the state, and congress must do to stop the degradation of the ocean and beaches of New Jersey are outlined Below:

A. Municipal Measures

- Control beach litter.
- Sweep streets and clean stormsewers.

B. State Action

- Increase funding for marine police.
- Control stormwater pollution.
- Improve operation and maintenance of sewage treatment plants.
- Extend Monmouth County sewage outfalls.
- Fix combined sewer overflows.
- Accelerate Industrial Pretreatment Program.

C. Congressional Action

- End Ocean Dumping of Sludge in Five Years.
- Immediately close six-mile dredge spoil site.
- Deny approval of commercial woodburning site.
- Increase Coast Guard funding.
- Implement MARPOL.
- Require manifest system for hospital waste.

According to the Governor the effectiveness of these 14 measures will be compromised without comprehensive coastal management. The New Jersey Coastal Commission will provide the framework for the long-term protection of our beaches and water (NJCC, 1987).

H. RECOMMENDATIONS FOR IMPROVING WATER QUALITY IN NEW JERSEY

Water quality in New Jersey has improved in some streams and declined in others, but has generally held steady in most areas and waterways. How then, can greater improvements in water quality take place across the State?

Listed below are a series of recommendations based on the conclusions in this report. Improving water quality conditions, in the face of extensive residential and commercial development, will be a major challenge for all of the State's citizens, industries and the various levels of government. It depends on the level of commitment we are willing to make.

1. Increased Water Quality Monitoring Activities.

Much of the current water quality monitoring conducted in New Jersey is in the form of ambient networks. These networks, such as the Primary and Basic Water Quality Monitoring Networks, utilize the collection of bimonthly or quarterly samples from a fixed number of monitoring stations located on the larger streams in the State. The major purpose of these networks are to determine long-term water quality trends and general water quality conditions for use in the 305(b) report. However, these programs do not identify specific sources of water pollution, the effects of these sources on stream quality and biota, the assimilation or removal of pollution by the stream environment, and the effectiveness of specific water pollution control activities. If public resources are to be used in the most efficient manner then specific sources of pollution, which can be controlled, must be properly identified and analyzed for impacts on the receiving waters and the aquatic ecosystem.

To accomplish these objectives, it is recommended that a long-term intensive survey monitoring program be implemented in the State. This program would supplement the existing ambient monitoring networks being conducted by NJDEP and other agencies under contract. Watersheds or segments of a watershed would be intensively sampled on a periodic basis, (including lakes) with the number of monitoring sites in the watershed dependent upon water quality, land uses, known and potential pollution sources, and the amount of historical data.

An intensive survey program would have as its specific objectives the following: Determination of water quality trends; diurnal stream quality; identification of pollution sources; quantification of pollution impacts on receiving waters (both point and nonpoint sources); comparison of water quality data to flow conditions; modelling for wasteload allocation purposes; determination of assimilative capacity of the waterbody; and statistical analysis of the data gathered.

2. Increased Identification of Nonpoint Sources of Water Pollution

Nonpoint source pollution has been identified in this report as a significant impediment to achieving designated water uses and the water quality objectives of the Clean Water Act. In addition, very little in-stream monitoring for nonpoint sources has been performed. In order to implement nonpoint source control measures nonpoint sources must be identified. The first step must be to segregate nonpoint source (nps) from point source pollution. This would require a substantial upgrade of monitoring efforts throughout the State for this purpose. In addition, monitoring should be directed to locate specific nps, as best possible in order to allow an effective focus for the implementation of effective control measures.

3. Ambient Monitoring for Estuarine Waters

New Jersey's estuarine waters play a significant role in the vitality of many activities in the State; they range from supporting wildlife habitat to tourism and aesthetics. Despite their value, very little ambient monitoring is performed in these waters.

With the exception of sampling for bacteria in shellfish growing waters and bathing waters and monitoring by interstate agencies of their respective regions, most estuarine waters are not routinely evaluated. It is recommended that a routine ambient monitoring program be developed for tidal waters of major rivers and the larger bays of the State. The purpose of this program would be to determine long-term trends in estuarine water quality, evaluate year-round conditions, analyze potential tributary impacts, and the critical water quality constituents.

4. Greater Emphasis in Nonpoint Source Management

Nonpoint sources are a statewide and significant pollution problem. As such a greater commitment for their control is needed. This report recommends that a nonpoint source (nps) control policy be divided into two overall efforts: education and source control.

Education would be directed to specific audiences: from the general public to local officials to special user groups. Public education could high-light such issues as proper septic tank maintenance, disposal of household chemicals, motor oils, pet wastes, the proper use of chemicals employed in lawn and garden care, and local and state ordinances or laws. The general public needs to be aware of the contribution they make to nps pollutants.

Nps controls should be established as part of routine road and stormwater infrastructure systems. The incorporation of municipal stormwater management laws (that include water quality control features) into local and county planning ordinances is necessary in the State for both new construction activities and existing infrastructure (retrofitting). Routine maintenance and inspections of such structures are also necessary.

5. Coordinated Watershed Management Activities

All activities in a watershed dealing with water pollution control and water resource management should be coordinated so that duplication of effort is eliminated and maximum efficiency results. This coordination should involve local, county, regional, state, and federal agencies; with special consideration given to local and county health offices or departments, in light of responsibilities designated to those agencies under the New Jersey County Environmental Health Act of 1977 (P.L. 1977, c 443).

Specific activities that would benefit from a coordinated approach include water quality monitoring, water use identification, location and recognition of pollution sources, and generation of public support for water quality management activities.

It is recommended that the NJDEP continue to pursue initiatives developed by the U.S. Environmental Protection Agency's Clean Water Strategy. This strategy encourages watershed-by-watershed pollution control actions.

6. Achieving Necessary Effluent Quality from Point Sources

Due to the large number of point sources in many of New Jersey's watersheds, wastewater can often have profound impacts on stream water quality. In addition, streams in the State which consistently suffer from poor water quality, have on the average, the greatest number of wastewater treatment plants that are not meeting their effluent requirements. If clean water goals are to be met in New Jersey, it is imperative that all point sources be in compliance with their discharge permit limitations. Poor discharge quality is often due to inadequate, antiquated or underdesigned treatment systems and the poor or delinquent operation of facilities. Although most primary treatment plants are now eliminated, many secondary treatment plants are discharging unsatisfactory treated wastewaters because of system overload or improper operation. These deficiencies need to be corrected at all municipal/domestic, industrial and other wastewater facilities.

I. Water Quality Inventory

Introduction

This section of Chapter III contains waterbody specific information on water quality conditions, pollution problems and designated use attainment in New Jersey's larger rivers and streams. An evaluation of whether Clean Water Act goals (swimmable and fish propagation/maintenance) are being achieved is also presented. Thirty-seven watershed assessments have been made for this report, as well as a summary of shellfish growing waters classifications in the State's coastal bays, estuaries and ocean waters. Summaries of the Delaware River Basin Commission 305(b) report submittal on the Delaware River, and the Interstate Sanitation Commission's assessment of their jurisdictional waters are included in this chapter. The detailed assessments in this chapter are the basis for the summaries presented earlier in the Chapter.

The primary waterways assessed in this section are listed in Table III-13. As with the 1986 305(b) report watersheds are reviewed separately and not in groups. A few streams that were assessed in prior 305(b) reports are not included in this assessment because of a general reduction in ambient monitoring in the State during the past five to eight years. However, the evaluated information collected for the nonpoint service assessment provides a new understanding of many smaller streams.

Each watershed assessment contains the following narrative sections: Watershed Description, Water Quality Assessment, and Problem and Goal Assessment. Also included is a watershed map (certain watersheds are mapped together), a 'Water Quality Index Profile 1983-1987' table, and a wastewater discharge inventory.

The Watershed Description is a brief characterization of stream geography, land uses, population centers, and stream classifications according to the State Surface Water Quality Standards (N.J.A.C. 7:9-4.1 *et seq.*) (NJDEP, 1985a). Much of the information contained in this section is taken from prior 305(b) reports and the Areawide Water Quality Management Plans. The land use statistics are, for the most part, based on information collected in the mid-1970s, and as such should be used to obtain a general sketch of the watershed. Sub-watersheds are also mentioned in the Watershed Description. These sub-watersheds are portions of the larger, full watershed, and will likely serve as the basis for the Waterbody System segmentation which the US Environmental Protection Agency (USEPA) is asking the States to provide. The Waterbody System is an automated data management system developed by USEPA for the information contained in this report.

The Water Quality Assessment contains a description of water quality conditions from 1983 to 1987 for the State's major rivers and streams. The assessment also includes summaries of biomonitoring performed at selected locations and a fishery community description provided by the NJ Division of Fish, Game and Wildlife. The primary source of data for the Water Quality Assessment is that collected at approximately 110 ambient monitoring stations around the State. The results of special or intensive surveys are also utilized when available.

This report utilizes the water quality indexing procedure presented in the New Jersey 1986 305(b) report. The Water Quality Index (WQI) was developed by the USEPA Region X for assessing water quality conditions and trends for regional and national environmental profiles. The WQI is a modified version of a WQI first developed and described by the National Sanitation Foundation in 1970 (Brown, *et. al.*, 1970).

Water quality data is transformed to a value between 0 (best) and 100 (worst) through the use of severity curves. The severity curve is a plot of the water quality constituent concentration (i.e. dissolved oxygen, phosphorus, etc.) versus pollution assessment (the 0 to 100 scale or index). The indices for each data value are then averaged and aggregated with the indices for the other indicators assessed to get a single WQI value for a location over time. The WQI

TABLE III - 13 WATERSHEDS EVALUATED IN THE WATER QUALITY INVENTORY

Wallkill River

Delaware River Basin

- Flat Brook
- Paulins Kills
- Pequest River
- Pohatcong Creek
- Musconetcong River
- Hunterdon County
  - Delaware River Tributaries-
- Assunpink Creek
- Crosswicks Creek
- Rancocas Creek
- Pennsauken Creek
- Cooper River
- Big Timber Creek
- Raccoon Creek
- Oldmans Creek
- Salem River
- Cohansey River
- Maurice River

Atlantic Coastal Basin

- Monmouth Coastal Drainage-
  - Navesink and Shark Rivers
- Manasquan River
- Toms River
- Mullica River
- Great Egg Harbor River

Raritan River Basin

- South Branch Raritan River
- North Branch Raritan River
- Millstone River
- South River
- Raritan River

Northeastern New Jersey Waters

- Rahway and Elizabeth Rivers
- Upper Passaic River
- Whippany River
- Rockaway River
- Pequannock River
- Wanaque River
- Ramapo and Pompton Rivers
- Lower Passaic River
- Hackensack River

Shellfish Resources and Harvesting Area Classifications, 1984-1987, and Estuarine Water Quality

Delaware River - Status Report by the Delaware River Basin Commission

New York-New Jersey Interstate Waters - Status Report by the Interstate Sanitation Commision procedure aggregates indices by Pollution Category, and within each Category, by Component Parameters. Table III-14 presents the Pollution Categories and Components used to prepare the WQI for New Jersey's waters.

The WQI is based on a scale from 0 to 100, where 0 represents no pollution or best conditions, and 100 equals gross pollution or worst case conditions. Between these extremes the WQI scale is divided into excellent, good, fair, poor and very poor conditions. Table III-15 shows the WQI value and associated classifications.

WQI values are calculated for all data of each component in a category. The water quality indicator (component) with the highest WQI values in a category is then aggregated to determine the final station WQI value. Station total WQI values are given for the entire period of review and for each month in the years assessed. Two aggregation methods are available: an "additive", and a "synergistic" aggregation. The synergistic procedure is used for this report as it tends to better represent actual conditions. The synergistic aggregation procedure takes the average of each category and then adds more index "points" based on how much the data exceeds respective criterion. A total station WQI value is also determined for the worst three month period to establish what are the critical periods in the stream.

The WQI procedure is performed through STORET: USEPA's national computerized water quality data base. WQI values are calculated for approximately 150 ambient water quality monitoring stations in New Jersey and interstate waters; the Delaware River Basin Commission utilizes the WQI as a supplemental assessment methodology in their 1988 305(b) report submittal. The WQI serves as the basis for the water quality component of the Surface Water Rating System presented in Chapter V and assists in performing the water quality assessments in this chapter. The WQI along with a summary statement of the raw data (number of values, mean, geometric mean and percent exceeding criterion) are the primary information used to prepare the water quality assessments. WQI results for each monitoring station are summarized in a WQI Profile table located in each watershed assessment.

Fixed-station ambient biomonitoring is also utilized in the water quality assessment when it is available. Fourteen stations have had the periphyton community assessed, while 18 stations review the macroinvertebrate community. The stations where biomonitoring is conducted are listed in Table III-16. More information on macroinvertebrate monitoring can be found in the report by the NJ Department of Environmental Protection (NJDEP) (1986), while NJDEP (1984) presents a discussion of periphyton monitoring.

Water quality data used for this report originates from three ambient monitoring networks in the State. Two networks are affiliated with the US Geological Survey (USGS) - the National Stream Quality Accounting Network (NASQUAN) and the NJDEP/USGS Joint Primary Network. Six NASQUAN stations are present in the State; sampling is conducted at various intervals, ranging from hourly for temperature and specific conductance to four times yearly for trace metals. Most indicators are sampled either monthly or every two months. Sampling for the NJDEP/USGS Joint Network is generally performed six times yearly for the 82 stations in this network. Certain supplemental sampling is conducted once to twice yearly.

The third ambient monitoring program is USEPA's Basic Water Monitoring Network. There are 26 stations in this network in New Jersey and sampling is performed four times yearly (seasonally). Supplemental samples are collected yearly for metals, macroinvertebrates, and dissolved minerals.

Toxics monitoring results for each watershed are described in the 1982 305(b) report. Toxics assessment is not present in this year's report because statewide toxics monitoring is not being performed. The NJDEP used to conduct statewide ambient monitoring for toxics in the late 1970s. The monitoring program for toxics, coordinated through the NJDEP's Division of Science and

TABLE III - 14 WATER QUALITY INDEX CATEGORIES, COMPONENTS, AND CRITERIA FOR ASSESSING NEW JERSEY'S RIVERS AND STREAMS

Criteria Category	Component	(Index Value of 20)
Temperature	Temp. Cold-water fishery	19°C
	Temp. Warm-water fishery	28°C
Oxygen	Dissolved Oxygen-Trout Production	7 mg/l
	Dissolved Oxygen-Trout Maintenance	5 mg/l
	Dissolved Oxygen-Nontrout	4 mg/l
	D.O. Saturation	80, 120 %
pH	pH-Non-acidic waters	6.5 - 8.5 SU
	pH-Pinelands naturally acidic	3.5 - 5.5 SU
	pH-Non-Pinelands naturally acidic	4.5 - 7.5 SU
Bacteria	Fecal Coliform	200 MPN/100ml
	Total Coliform	2400 MPN/100ml
Nutrients	Total Phosporus-Free flowing waters	10 mg/l
	Total Phosphorus-Above impoundment	0.05 mg/1
	Total Kjeldahl Nitrogen	2.5 mg/l
	Total Inorganic Nitrogen	2.0 mg/l
Solids	Total Dissolved Solids	500 mg/l
	Conductivity	750 micromhos
Ammonia	Un-ionized-Warm waters	0.05 mg/l
	Un-ionized-Trout waters	0.02 mg/l
Metals	Total Lead	50 ug/l
	Total Copper	50 ug/l
	Total Mercury	0.50 ug/l
	Total Cadmium	4.0 ug/l
	Total Chromium	50 ug/l

TABLE III - 15 WATER QUALITY INDEX (WQI) CLASSIFICATIONS

WQI	Classification/Condition	Description
0-10	Excellent	No or minimal pollution; water uses met throughout year.
11-25	Good	Generally low amounts of pollution; water uses periodically not met.
26-60	Fair	Pollution amounts vary from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution in high amounts; water uses not met.
81-100	Very Poor	Pollution occurs at extremely high levels causing severe stress to streamlife, water uses not met.

An index of 20 is equivalent to the level of water quality criteria.

TABLE III - 16 AMBIENT BIOMONITORING STATIONS

Station	Macroinvertebrate Sampling	Periphyton Sampling
Pequannock River at Macopin Intake	X	X
Rockaway River at Boonton	X	X
Millstone River at Blackwells Mills	X	X
North Branch Raritan River at North Branch	X	X
South Branch Raritan River at Stanton Station	X	X
Flat Brook at Flatbrookville	X	X
Musconetcong River at Bloomsbury	X	X
Pequest River at Pequest	X	X
Wallkill River at Unionville	X	X
Assunpink Creek at Trenton	X	X
Cooper River at Haddonfield	X	
Maurice River at Millville	X	X
NB Rancocas Creek at Mounty Holly	X	
SB Rancocas Creek at Hainesport	X	
Salem River at Courses Landing	X	X
Great Egg Harbor at Folsom	X	X
Manasquan River at Squankum	X	
Mullica River at Green Bank	X	X

Sources: NJDEP, 1984; NJDEP, 1986a.

Research, now performs site-specific studies. Monitoring is performed for specific problem areas as deemed necessary. The results of these studies are included in the Water Quality Assessment or Problem Assessment sections, when available.

In the report for the first time is a description of the type of fish community present in the State's waterways and the healthiness of the community. This information is part of the Water Quality Assessment and is designed to supplement the results of chemical and biological monitoring. The fish community assessments are provided by regional biologists of the NJDEP's Division of Fish, Game and Wildlife. The assessment includes a determination of the primary types of fish found (warm or cold water species) and the healthiness of the fish community (healthy, moderately degraded or degraded). The three health classifications are defined as follows:

Healthy: Adequate game fish reproduction and/or adequate species diversity in relation to the natural characteristics of the water. If present, carp or goldfish compose only a minor segment of the population.

Moderately Degraded: Minimal to no game fish reproduction and/or less than adequate species diversity and/or carp or goldfish a major segment of the population.

Degraded: Population dominated by carp, goldfish, or killfish. Or fish population absent or virtually absent.

The Problem and Goal Assessment section presents known and suspected water pollution problems in a watershed, and concludes which monitored surface waters are meeting State designated uses and national swimmable and fishable clean water goals. The section is divided into Point Source Assessment, Nonpoint Source Assessment, and Designated Use and Goal Assessment.

The information used to describe pollution problems comes from a variety of sources. The point source inventory identifies the relative contribution of point source loadings to the stream. The Department's Division of Water Resources (DWR) Enforcement Element has prepared a description of surface water dischargers currently under enforcement action which are causing deleterious impacts on surface waters, and the pollutants being discharged. This listing of enforcement cases is used to help determine pollution sources. The State's hazardous waste sites which are contaminating local surface waters, as determined by the NJDEP Division of Hazardous Site Mitigation, are also included in the point source part of the Problem and Goal Assessment. More detailed information on the sites can be found in Site Status Reports on Hazardous Waste Remediation (NJDEP, 1987a). Other sources of information used in this section are prior 305(b) reports, Construction Grants projects which have been completed, are under construction or are being planned, and other site-specific studies.

An important component of this year's report is a nonpoint source pollution assessment. The national Water Quality Act of 1987 requires each state to prepare a State Assessment Report and Management Program for nonpoint sources by August, 1988. The USEPA is requesting that the assessment report be presented in the 305(b) report so that there is some consolidation in reporting. The nonpoint source assessment segment of the Problem and Goal Assessment section is designed to fulfill this requirement by providing nonpoint source assessments on a waterbody by waterbody basis. The Water Quality Act states that the assessment report must describe the nature, extent and effect of nonpoint sources of water pollution, the causes of such pollution, and the waterways impacted.

USEPA has asked the states to use all available information in preparing their nonpoint source assessments. Two levels of assessment are available: monitored and evaluated. Monitored assessments are those based on actual waterway sampling collected within the past five years. Evaluated waters are those assessed with best professional judgement, the presence of known or potential sources, fishery surveys, citizen complaints or older monitoring data. In

New Jersey there has been very little monitoring specifically for nonpoint sources. In addition most of the State's larger rivers, streams and estuaries/ocean waters have one or more wastewater discharges. Therefore, it becomes very difficult to determine the source of pollutants and the contribution they make to stream degradation once identified. Even when modelling studies of streams are performed, they are usually designed for low flow analysis and/or for the purpose of point source waste load allocations.

In an attempt to gather the best available information on nonpoint sources, the DWR decided to ask a variety of state and local agencies to perform watershed-by-watershed assessments. A questionnaire was prepared by the DWR which asked these agencies to report on: what waterways are affected by nonpoint sources, what nonpoint source pollution category or subcategory (as defined by USEPA in 305(b) guidance) is present, what type of knowledge was used in the assessment (suspected or known), how severe is the nonpoint pollution source (low, moderate or severe), is the source increasing or decreasing, and what impacts are observable to the receiving waters. This questionnaire was sent to all the State's county planning agencies, local soil conservation districts, regional fisheries biologists in the NJ Division of Fish, Game and Wildlife, and the staff of the DWR Bureau of Marine Water Classification and Analysis. There was a 100 percent response rate from every group except the county planning agencies (of which approximately 80 percent responded).

The results of these questionnaires are the primary data source for the nonpoint source assessment. This information is considered to be of the "evaluated" type, since it generally consists of best professional judgement. This information can be regarded as the most thorough nonpoint source assessment compiled in New Jersey since the mid-1970s when the Areawide Water Quality Management (208) Plans were prepared. Respondents were asked to provide a breakdown of waterway assessments by subwatersheds as delineated by DWR. As a result, a particular nonpoint category or subcategory was usually assigned to an entire waterbody rather than specific sections. For instance, a county planning agency may have noted that the North River was impacted by suburban runoff. But the portion of the river actually being impacted is not defined. Therefore, the entire river is listed as being impacted, when in actuality only 40 percent of the watershed is developed. This reporting method may result in an over-estimation of the problem.

The nonpoint source assessment provides a good, general inventory of the waterways impacted by nonpoint source pollution, their extent on a state-wide basis, and their estimated severity. This assessment will be used as the basis for further in-depth study, especially in areas of the state where designated uses are precluded because of nonpoint pollution. The Division greatly appreciates the assistance of those agencies which contributed to the nonpoint source assessment.

The determination of whether or not a waterbody is meeting the State's designated uses and clean water goals is based on a variety of criteria. In New Jersey all freshwaters are assigned designated uses which reflect State and National clean water goals (swimmable and fish propagation/maintenance). Most estuaries and all ocean waters (those classified SE-1 and SC-1) also have designated uses consistent with the clean water goals. Tidal waters in the New York Harbor area and the Delaware River around Phildelphia (SE-2 and SE-3 waters) are not required to meet clean water goals; their designated uses are less stringent than the goals. Table III - 17 presents the designated uses assigned to the various surface water classifications. More information on the State's water quality standards and classifications can be found in NJDEP (1985a). Conclusions regarding attainment of the swimmable designated use/goal is based primarily on ambient monitoring results. Swimmable status is determined by the presence of fecal coliform bacteria, as identified in ambient monitoring. If monitoring finds no fecal

TABLE III - 17
SELECTED DESIGNATED USES AND THEIR ASSOCIATED WATER CLASSIFICATIONS

Designated Use		Water Classification
1.	Primary and secondary contact recreation	FW-1, FW-2, SE-1, SC and PL
2.	Secondary contact recreation	SE-2, SE-3
3.	Maintenance, migration and propagation of the natural and established biota (PL) (biota indigenous to the unique ecological region)	FW-1, FW-2, SE-1, SE-2, SC,
4.	Maintenance and migration of fish populations	SE-3
5.	Shellfish harvesting in accordance with State regulations.	SE-1, SC
6.	Public potable water supply, after such treatment as required by law or regulation	PL, FW-2

Source: NJDEP, 1985a

coliform levels above the State criterion of 200 MPN/100ml, then the waters are deemed swimmable. If up to 25 percent of the fecal coliform values exceed the criterion, then waters are classified as marginally swimmable. Greater than 25 percent indicates that waters are not swimmable. It should be noted that regardless of the swimmable classification assigned to a stream, swimming is recommended only in those waters routinely monitored for bathing. Each monitoring station is thought to assess five stream miles (2.5 miles upstream and downstream).

Achievement of the fish propagation and maintenance (fishable) goal is based primarily on resource information, but water quality analysis are utilized. In this year's report, fisheries resource information is the main assessment tool for determining if the fish propagation/maintenance use is being met. The fisheries assessment presented in the Water Quality Assessment section describes the quality of the fisheries; this in turn is the basis for determining if the stream supports a fish community which is healthy and reproducing. Table III - 18 shows the different designated use definitions concerning the fish propagation/maintenance use. Because of this new methodology for determining attainment of the fish propagation and maintenance use goal, certain waters that were formally considered as meeting the use goal are now noted as threatened or partially degraded, and vice versa.

Dissolved oxygen, pH, un-ionized ammonia and the presence of elevated toxic substances in aquatic life are evaluated to determine if stressful conditions to fishlife are present. Biomonitoring data is also utilized along with the water quality data. It should be noted that many factors affect the suitability of a waterway to support a healthy fish community. Not all factors are reviewed during ambient monitoring, and therefore, actual community conditions may vary from what is described in this report.

TABLE III - 18 DEFINITION OF THE FISH PROPAGATION AND MAINTENANCE DESIGNATED USE CLASSIFICATIONS

Classification	Definition
Fully Meeting Fish Propagation/ Maintenance Use	Fish community is healthy. Water quality conditions are excellent to fair.
Fully Meeting Use, but Threatened	Fish community is healthy, but man-related pollution sources have observable impacts on the fisheries. Pollution problems may be worsening.
Partially meeting the fish propagation/maintenance use	Fish community is classified as moderately degraded. Water quality ranges from fair to very poor.
Not meeting the fish propagation/ maintenance use	Fish community is classified as degraded or severely degraded. Water quality ranges from fair to very poor.

1. WALLKILL RIVER

Watershed Description

The Wallkill River drains from New Jersey into New York and has a 203 square mile watershed in New Jersey. The 27 mile length of this river in New Jersey is located in Sussex County. This area is predominately rural, the largest towns being Vernon, Sparta, Franklin, and Sussex. Major tributaries flowing into the Wallkill include the Papakating (15 miles long) and Pochuck (8 miles long) Creeks. Lakes and impoundments in this watershed include Lake Mohawk (at the headwaters), Newton Reservoir, Lake Grinnell, Wawayanda Lake, and many others. Four sub-watersheds have been delineated for the Wallkill watershed: Upper and Lower Wallkill, Papakating Creek and Black Creek.

The land use in this watershed is primarily forested and agricultural, although the amount of developed lands is increasing. There are 23 New Jersey Pollution Discharge Elimination System (NJDPES) permits here, of which 15 are municipal and 8 are industrial/commercial. Most of the Wallkill River is classified FW-2 Nontrout, except for the stretch from Sparta Glen Brook to the Rt. 23 bridge, which is classified as FW-2 Trout Maintenance. Papakating Creek and Clove Brook contain both FW-2 Trout Maintenance and Nontrout waters.

Water Quality Assessment

Five monitoring stations are present in the Wallkill River watershed: Wallkill River at Franklin, Sussex and near Unionville, New York, Papakating Creek at Sussex, and Black Creek near Vernon. They represent approximately 30 stream miles. Water quality of the Wallkill River is generally good at all three stations, although conditions degrade somewhat during summer months to fair quality. Total phosphorus and fecal coliform are often found at problematic levels. Black and Papakating Creeks have somewhat poorer water quality than the Wallkill because of higher bacterial and nutrient levels.

The Wallkill at Franklin is impounded to form Franklin Pond. Below the Franklin Pond outlet the Wallkill can experience severely reduced flow during the summer months, resulting in high stream temperatures that may cause stress to cold water fish. Nutrients, notably total phosphorus, increase in the Wallkill as one travels downstream. This is also true of fecal coliform, with geometric means going from 84 MPN/100ml at Franklin to 236 MPN/100ml at Sussex and 283 MPN/100ml at Unionville. Papakating Creek contain levels of phosphorus and fecal coliform that exceed state criteria in 61 and 77 percent, respectively, of all samples collected. Water quality in Papakating Creek is fair to poor in late summer/early fall. Black Creek has conditions similar to Papakating Creek, but pollutant levels are not quite as high. Metals were generally within acceptable levels throughout the watershed, but one elevated cadmium concentration was detected in the Wallkill River at Franklin.

Biomonitoring conducted in the Wallkill River at Unionville confirms the results of the chemical data. Macroinvertebrate and periphyton collection indicates generally healthy and favorable conditions, although some organic enrichment is suggested. Macroinvertebrate sampling since 1977 has found no appreciable changes.

The Upper Wallkill is described by the New Jersey Division of Fish, Game and Wildlife as supporting a healthy cold water fishery. The lower 18 miles in contrast, is characterized as partially degraded, stretches of which have had histories of fish kills. Fish species present in the Lower Wallkill are principally warm water forms. Franklin Pond and Black Creek support healthy cold water fish communities. Wawayanda and Pochuck Creeks, tributaries to Black Creek, also contain healthy fisheries; the former contains both cold and warm water species, the latter is limited to cold water forms. Clove Brook is characterized as partially degraded and contains both cold and warm water fish. Papakating Creek, having a cold water fishery, is also found to be partially degraded.

Problem and Goal Assessment

Point Source Assessment

The water quality problems identified in the Wallkill Watershed are due to a variety of point and nonpoint sources. The Wallkill River, Papakating Creek and Black Creek all appear to have poorer water quality in the warm weather months, indicating that point or continuous sources may be the main cause for stream degradation. Two wastewater discharges currently under enforcement action are suspected of causing water pollution problems. The Sussex Boro Treatment Plant (Clove Brook) has raw sewage overflows during wet weather and excessive chlorine loads. Ames Rubber Corporation is discharging industrial wastes (volatile organic compounds) in violation into the Wallkill River; this discharge is to be eliminated by June, 1988. A former pollution source to the Wallkill, Accurate Forming, was eliminated in 1986. Sussex County MUA now operates a new advanced treatment facility in the Upper Wallkill. One hazardous waste site, Metaltec, is suspected of discharging volatile organics and metals to Wildcat Brook, a Wallkill tributary.

Nonpoint Source Assessment

Evaluated nonpoint pollution in the Wallkill Watershed, in general, shows a shift from agricultural sources to those created by increasing urbanization. In the Upper Wallkill River, deleterious effects of both urbanization and agricultural activities are on the rise. Increasing construction and urban surface runoff have resulted in sediment loading and stormwater contamination, respectively. Local officials have stressed the need for stormwater management such as the use of large dentention ponds in the region. In addition, agricultural runoff from crop production, pasture lands, and animal holdings are believed to have contributed to widespread eutrophic conditions in the Upper Wallkill. The Lower Wallkill River is also experiencing the effects of increased urbanization, largely in the form of construction site runoff. Crop production, pasturelands, and a zinc mine at Franklin are all suspected of affecting water quality in the lower segment of the Wallkill.

Clove Brook suffers from excessive nutrient loading which causes low dissolved oxygen levels and algal growth. The known sources are agricultural; including feedlot, pasture land and crop runoff. Feedlot runoff has been identified to be the reason for the closure of bathing beaches in Clove Lake. Increasing agricultural runoff (crop production, pasture land, animal holding) along Papakating Creek is suspected as having contributed to severe eutrophic conditions in this stream and in turn, a degradation of the stream's fishery potential. Black Creek receives some agricultural runoff; however, its principal nonpoint source problem is believed to be suburban/urban in nature. Construction activities coupled with surface runoff are suspected in sediment loading and stormwater contamination. Some tributaries in the Black Creek sub-watershed are so severely impacted that they are described as being devoid of aquatic life. This sub-watershed has been sited by local officials as needing storm water management.

The control of animal waste (bacteria and nutrients) is currently the purpose of a Soil Conservation Service project in the Clove Brook watershed. Sheet and rill erosion in the Wallkill watershed averaged 3.6 tons/acre, less than the statewide average.

Designated Use and Goal Assessment

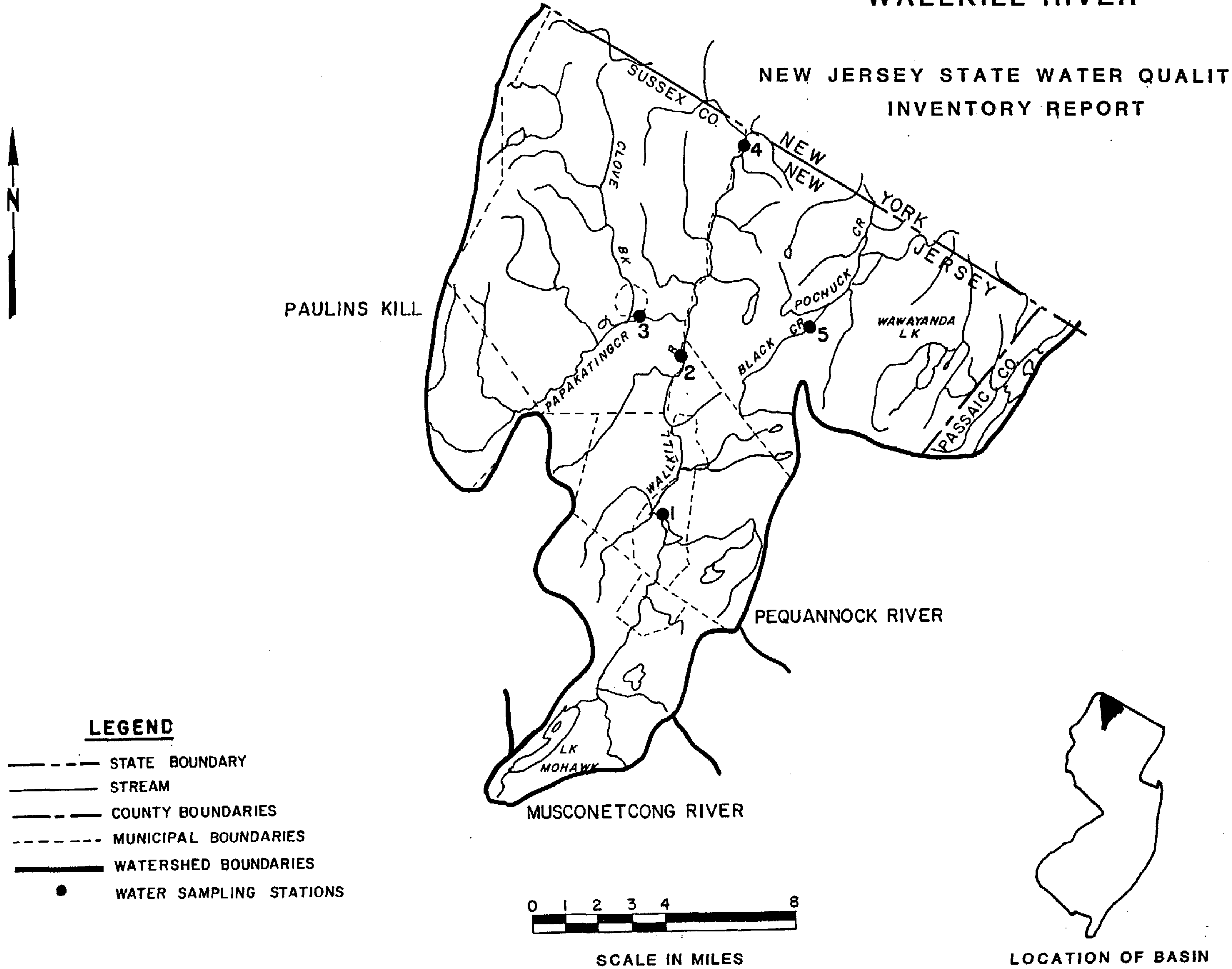
Attainment of the fish propagation and maintenance designated use and goal is occuring in portions of the watershed. The Upper Wallkill (9 miles), Wawayanda Creek and Pochuck Creek are supporting the goal, while Black Creek (7 miles) is currently supporting but threatened by wastewater discharges. The Lower Wallkill (18 miles), Clove Brook (5 miles), Papakating Creek (15 miles) can be classified as partially meeting the fish propagation and maintenance use because of moderately degraded fisheries. All 20 monitored stream miles contain excessive fecal coliform and as a result will not meet the swimmable use and goal. However, this use attainment is occurring throughout many headwater lakes.

Monitoring Station List

Map Number	Station Name and Classification
1	Wallkill River at Franklin, NJ, FW-2 Trout Maintanance,
2	Wallkill River near Sussex, NJ, FW-2 Nontrout,
3	Papakating Creek at Sussex, NJ, FW-2 Nontrout
4	Wallkill River near Unionville, NY, FW-2 Nontrout
5	Black Creek near Vernon, NJ, FW-2 Nontrout

WALLKILL RIVER

NEW JERSEY STATE WATER QUALITY INVENTORY REPORT



WATER QUALITY INDEX PROFILE 1983-1987

Wallkill River

WATER QUALITY INDICATORS

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVERAGE AND CONDITION
Wallkill River at Franklin	AVG WQI	14	6	15	20	13	10	8	18	24 Good
	WORST3 MONTHS	June-Aug	May-July	Sept-Nov	June-Aug	April-June	Sept-Nov	July-Sept	June-Aug	42 Fair Jun-Aug
Wallkill River near Sussex	AVG WQI	1	9	7	26	13	12	5	8	16 Good
	WORST3 MONTHS	June-August	June-August	March-May	June-August	June-August	August-Oct	July-Sept	March-May	26Good/Fair June-August
Wallkill River near Unionville	AVG WQI	1	19	5	28	17	10	3	ID	23 Good
	WORST3 MONTHS	June-August	July-Sept	August-Oct	May-Nov	Nov-January	Sept-Nov	June-August		35 Fair June-August
Papakating Creek At Sussex	AVG WQI	2	25	3	39	21	7	4	8	35 Fair
	WORST3 MONTHS	June-August	August-Oct	April-June	August-Oct	Sept-Nov	Sept-Nov	August-Oct	Sept-Nov	60Fair/Poor August-Oct
Black Creek near Vernon	AVG WQI	1	37	5	25	16	15	6	7	32 Fair
	WORST3 MONTHS	July-Sept	Sept-Nov	April-June	July-Sept	June-August	August-Oct	August-Oct	April-June	51 Fair July-Sept

LEGEND - Water Quality Index Description

WQI	Condition	Description
0-10	Excellent	No or minimal pollution; water uses met throughout the year.
11-25	Good	Generally low amounts of pollution; water uses periodically not met.
26-60	Fair	Pollution amounts vary from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution in high amounts; water uses not met.
81-100	Very Poor	Pollution occurs at extremely high levels; severe stress to stream life; water uses not met.
ID	Insufficient Data	

An index of 20 is equivalent to the level of water quality criteria.

N.J.P.D.E.S. DISCHARGE INVENTORY WATERSHED: WALLKILL RIVER

DISCHARGE NAME	# NJPDES	RECEIVING WATERS	MUNICIPALITY/COUNTY	TYPE
High Pt. Rg. H.S. Wantage	0031585	Papakating Creek	Wantage/Sussex	Municipal
Accurate Forming Corp	0002275	Wallkill River	Hamburg/Sussex	Ind/Comm
Plastoid Corp	0006661	Wallkill River	Hardyston/Sussex	Ind/Comm
Sparta-Plaza STP	0027057	Trib to Wallkill	Sparta/Sussex	Municipal
Sparta-Alpine STP	0027065	Trib to Wallkill	Sparta/Sussex	Municipal
Franklin Boro - Hemlock STP	0022055	Wallkill River	Franklin Boro/Sussex	Municipal
Franklin DPW	0029220	Wallkill River	Franklin Boro/Sussex	Municipal
NJ Zinc Co., Inc	0004596	Wallkill River	Ogdensburg/Sussex	Ind/Comm
Franklin Board of Public Work	0031038	Wallkill River	Franklin/Sussex	Municipal
Regional Oil Com	0026115	Swampy Area To D	Franklin/Sussex	Ind/Storm
Ames Rubber Corp	0000141	Wallkill River	Hamburg/Sussex	Mun/Ind/Thm
Vernon Valley Recreational	0021814	Trib to Black Creek	McAfee/Sussex	Municipal
Great Gorges Mountain View	0023949	Black Creek	McAfee/Sussex	Ind
Pope John XXIV HS	0027049	Trib to Wallkill	Sparta/Sussex	Municipal
Sparta BD of ED HS	0027073	Trib to Wallkill	Sparta/Sussex	Municipal
Tri-Cty Water Condition Co	0033472	Wallkill	Sparta/Sussex	Ind
Sussex Borough	0021857	Wallkill	Sussex/Sussex	Municipal
Regency Apartments	0029041	Trib to Wallkill	Wantage/Sussex	Municipal
Stonehill Corp	0032841	Black Creek	Vernon/Sussex	Municipal
Vernon Twp School Board	0023841	Black Creek	Vernon/Sussex	Municipal
Newton Subaru	0063819	Wallkill River	Hampton/Sussex	Ind
Sussex County MUA	0053350	Wallkill River	Sussex	Municipal

2. *FLAT BROOK*

Watershed Description

The area drained by the Little Flat Brook, the Big Flat Brook (15 miles long) and the Flat Brook (10 miles long) is 65 square miles. This brook runs along the western boundary of Sussex County into the Delaware River 1.5 miles downstream of Flatbrookville. Sub-watersheds include Little Flat Brook, Big Flat Brook and Flat Brook. There are no major population centers, as most of this area is undeveloped mountainous forests within state parks, state forests, and the Delaware Water Gap National Recreation Area.

There are many lakes and ponds to accomodate bathing beaches and recreational fishery resources. There are no point sources in the watershed. The Flat Brook and its tributaries are classified, for the most part, FW-1 and FW-2 Trout Maintenance. There are also FW-2 Trout Production and Nontrout waters.

Water Quality Assessment

The Flat Brook and tributaries contain among the highest quality surface waters in the state. Much of the Flat Brook watershed lies within state park and forest boundaries, thereby affording the streams protection from development. Monitoring is conducted on the Flat Brook near Flatbrookville, which generally represents the 10 mile stretch of the Flat Brook. Data collected from this station between 1983 and 1987 indicates water quality is good. Periodic summertime problems exist because of elevated stream temperature for the protection of cold water fisheries. Dissolved oxygen, fecal coliform and nutrients were all within appropriate State criteria throughout the period of review.

An overall improvement in Flat Brook water quality has been identified between 1977 and 1987. This improvement is the result of increasing dissolved oxygen, and decreasing nitrogen-containing compounds and total mercury concentrations. pH values have also shown significant increases. The 1986 305(b) report stated that water quality degraded to fair conditions in the summer months. No such seasonal degradation is now detected. The improvement can possibly be tied to the Annandale Correctional Institution sewage treatment plant discharge which was under enforcement action in the early 1980s. This surface water discharge has been eliminated and a return to more natural stream conditions has resulted.

Biomonitoring has also indicated water quality improvements. The benthic macroinvertebrate community was indicative of a healthy stream with improved community structure and diversity since 1977. The slightly elevated presence of periphyton feeders and chlorophyll a levels may show some nutrient enrichment. Periphlyton levels are also reduced over the 1977 to 1985 period.

The New Jersey Fish, Game, and Wildlife describe Little Flat Brook, Bears Creek, Flatbrook, Mill Brook, Shimers Brook, Big Flat Brook, Parker Brook, Tuttles Brook and Stony Brook as all supporting healthy cold water fish communities (Flat Brook supports both cold and warm water species). Flat, Parker, Tuttles and Stony Brooks are noted as maintaining natural trout reproduction throughout the year.

Problem and Goal Assessment

Point Source Assessment

No point sources are present in the Flat Brook watershed Nonpoint Source Assessment. The waters of the Flat Brook watershed are among the least polluted in the state. The conversion of summers homes to year-round dwellings has resulted in some local nonpoint source contamination from home and road construction, suburban runoff and septic system leachate. Only Little Flat Brook was noted as receiving some minor agricultural runoff.

Goal Assessment

Approximately 30 stream miles of this watershed is categorized as fully meeting fish propagation and maintenance goals. Monitoring indicates that the Flat Brook appears to meet the swimmable designated use.

Monitoring Station List

Map Number	Station Name and Classification
1	Flat Brook near Flatbrookville, FW-2 Trout Maintenance

See page III-88 for a map of the Flat Brook watershed.

WATER QUALITY INDEX PROFILE 1983-1987

Flat Brook

WATER QUALITY INDICATORS

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVERAGE AND CONDITION
Big Flat Brook at Flatbrook-ville	AVG WQI	10	3	10	10	7	5	6	21	12 Good
	WORST3 MONTHS	June-August	July-Sept	July-Sept	July-Sept	June-August	Sept-Nov	August-Oct	Nov-Jan	19 Good July-Sept.

LEGEND - Water Quality Index Description

WQI	Condition	Description
0-10	Excellent	No or minimal pollution; water uses met throughout the year.
11-25	Good	Generally low amounts of pollution; water uses periodically not met.
26-60	Fair	Pollution amounts vary from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution in high amounts; water uses not met.
81-100	Very Poor	Pollution occurs at extremely high levels; severe stress to stream life; water uses not met.
ID	Insufficient Data	

An index of 20 is equivalent to the level of water quality criteria.

3. PAULINS KILL

Watershed Description

The Paulins Kill drains an area of 172 square miles, of which 110 square miles are in Sussex County and 62 square miles are in Warren County. This 39 mile long river runs through western Sussex and northern Warren Counties to the Delaware River at Columbia. Newton and Blairstown are the most developed centers of this rural area, but there is development along Route 15. Major tributaries to the Paulins Kill include Yards Creek, Trout Brook, Blair Creek, Morses Brook, and Culver Brook. Swartswood Lake, and the Upper and Lower Paulins Kill are delineated sub-watersheds. Impoundments include Paulins Kill Lake (3 miles long, 0.4 square mile surface area), Swartswood Lake, Little Swartswood Lake, Culvers Lake, and Lake Owassa.

The land use in this watershed is primarily agricultural and forested, but there are increasing amounts of developed suburban and commerical lands. There are 11 NJPDES permitted discharges, of which 6 are municipal and 5 are industrial/commercial. The stream classifications for the Paulins Kill and tributaries have been identified as FW-2 Trout Production, FW-2 Trout Maintenance, and FW-2 Nontrout.

Water Quality Assessment

Water quality of the Paulins Kill improves in a downstream direction, going from fair quality in the upper watershed to good conditions in the lower portions. This is based on ambient monitoring conducted at Balesville (upper watershed) and Blairstown (lower watershed) representing 10 stream miles. The Paulins Kill at Balesville experiences water quality problems due to excessive fecal coliform and phosphorus concentrations. Fecal coliform counts averaged 430 MPN/100 ml over the period of assessment, with 69 percent of all values exceeding the primary contact recreation criterion. Ninety-five percent of all phosphorus values exceeded the .05 mg/l criterion and averaged .14 mg/l. This suggests that the stream is moderately enriched at this location. The Paulins Kill at Balesville experiences deteriorated water quality during warm weather months, approaching poor conditions. Stream temperatures at this time may cause periodic stress to the coldwater fishlife present.

Reduced levels of phosphorus and fecal coliform bacteria in the Paulins Kill at Blairstown indicate better water quality. Fecal coliform violated state criterion 31 percent of all values from 1983 to 1987. This signifies that primary contact recreation in the stream is doubtful, although other chemical parameters show generally good conditions with little nutrient enrichment and oxygen demands. Elevated stream temperature during warm weather is common, possibly causing stress to cold water fisheries.

In the upper most reaches of the Paulins Kill, the East Branch has been evaluated by the New Jersey Fish, Game, and Wildlife as supporting a healthy cold water fish community. The West Branch in contrast, has a moderately degraded warm water fishery. The main stem of the Paulins Kill contains healthy fish communities of both warm and cold water species. Melden Brook and Yards Creek both contain healthy cold water fish populations; while Culvers Creek support healthy cold and warm water fish communities. Of the assessed lakes in the watershed; Swartswood, Little Swartswood, and Paulins Kill Lake, all support warm and cold water fisheries. Swartswood Lake and Little Swartswood Lake are judged to support healthy fish communities; Paulins Kill Lake contains moderately degraded fish populations due to eutrophication.

Problem and Goal Assessment

Point Source Assessment

The Upper Paulins Kill, from Newton to Paulins Kill Lake, is significantly impacted by the Newton sewage treatment facility which is discharging inadequately treated secondary effluent. Modelling analyses estimations are that up to 95 percent of the nutrient loading in the Upper Paulins Kill is from this facility. A number of swampy areas from which the Paulins Kill flows and the contribution of suburban/agricultural runoff act to overload the assimilative capacity of the stream. This results in fair water quality at Balesville and the eutrophication of Paulins Kill Lake below Balesville. In the Lower Paulins Kill reduced point source loadings and increased re-aeration and dilution tend to improve water quality.

Enforcement actions in the watershed include: Blair Academy's discharge (excessive phosphorus) to Blair Brook, the Newton STP, Kittatiny Regional Board of Education STP discharge (elevated phosphorus and residual chlorine) to the Paulins Kill, and the Sussex Co. Service Center STP (elevated phosphorus) to the Paulins Kill. Some improvement to the Paulins Kill in the vicinity of the Rhone Poulenc facility is expected now that the discharge has been discontinued.

Nonpoint Source Assessment

The Paulins Kill watershed is assessed to be experiencing an increase in runoff associated with rapid suburban land development. Housing construction site runoff, suburban surface runoff, as well as heavy winter road salting, are all suspected to be on the increase. This is coupled with a decline in agricultural runoff from crop production activities. Additional water quality degradation has resulted from leachate coming from Hamms landfill, a problem which although is described as severe at times, is believed to be on the decline. Nonpoint sources have caused eutrophication in many of the lakes in this watershed, including Swartswood Lake.

Designated Use and Goal Assessment

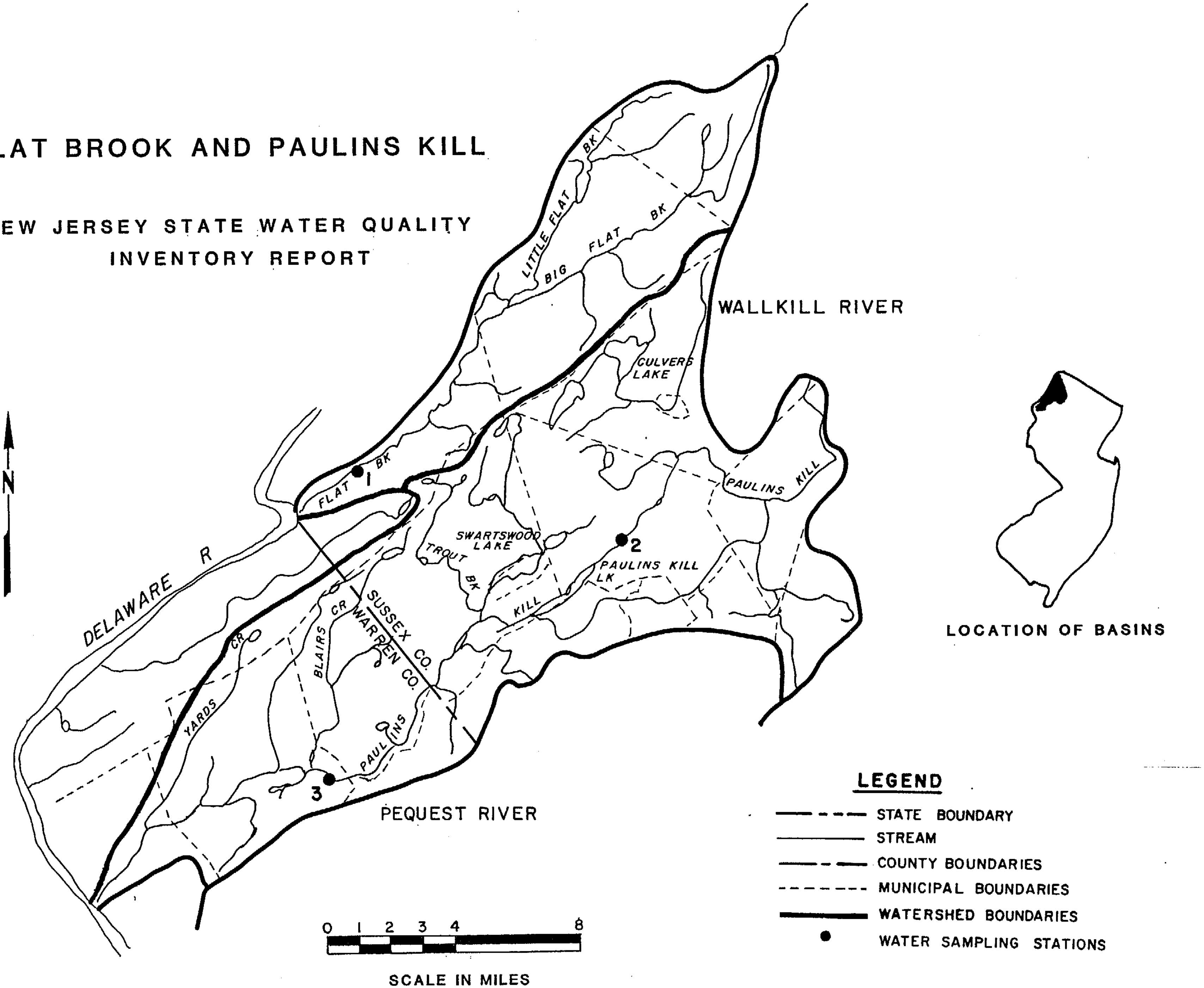
The Paulins Kill is not considered swimmable where monitoring takes place. However, all waters appear to be meeting the fish propagation and maintenance designated use/goal. However, some stress to cold water fishlife (trout and smallmouth bass populations) from high water temperature in summer months may be occurring. Increased residential and commercial development forecasted for the watershed will undoubtably impact water quality.

Monitoring Station List

Map Number	Station Name and Classification
2	Paulins Kill at Balesville, FW-2 Trout Maintenance
3	Paulins Kill at Blairstown, FW-2 Trout Maintenance

FLAT BROOK AND PAULINS KILL

NEW JERSEY STATE WATER QUALITY INVENTORY REPORT



Paulins Kill

WATER QUALITY INDEX PROFILE 1983-1987

WATER QUALITY INDICATORS

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVERAGE AND CONDITION
Paulins Kill at Balesville	AVG WQI	10	7	8	30	42	12	9	17	39 Fair
	WORST3 MONTHS	July-Sept	June-August	August-Oct	July-Sept	August-Oct	August-Oct	Nov-Jan	August-Oct	58 Fair July-Sept
Paulins Kill at Blairstown	AVG WQI	14	6	11	16	13	10	6	17	17 Good
	WORST3 MONTHS	July-Sept	August-Oct	August-Oct	May-July	June-August	August-Oct	August-Oct	Sept-Nov	32 Fair July-Sept

LEGEND - Water Quality Index Description

WQI	Condition	Description
0-10	Excellent	No or minimal pollution; water uses met throughout the year.
11-25	Good	Generally low amounts of pollution; water uses periodically not met.
26-60	Fair	Pollution amounts vary from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution in high amounts; water uses not met.
81-100	Very Poor	Pollution occurs at extremely high levels; severe stress to stream life; water uses not met.
ID	Insufficient Data	

An index of 20 is equivalent to the level of water quality criteria.

N.J.P.D.E.S. DISCHARGE INVENTORY WATERSHED: Paulins Kill

DISCHARGE NAME	# NJPDES	RECEIVING WATERS	MUNICIPALITY/COUNTY	TYPE
Sussex Co. MUA-Sussex Serv. CT.	0022063	Paulins Kill	Frankford Twp./Suss	Municipal
Kittatinny Reg. Bd. of Ed.	0028894	Paulins Kill	Newton Town/Sussex	Municipal
Schering Corp.-Safety Eval. CT.	0005711	Paulins Kill	Lafayette Twp./Suss	Ind./Comm.
Newton STP	0020184	Moore's Brook	Newton Town/Sussex	Municipal
Hart+Illif Fuel Oil Co., Inc.	0028819	Hyper Humus Swan	Newton Town/Sussex	Ind./Comm.
Limestone Products of America	0004791	Paulins Kill Trib.	Lafayette Twp./Suss	Ind./Comm.
N. Warren Reg. H.S. STP	0031046	Paulins Kill	Blairstwn. Twp/Warr	Municipal
Blair Academy	0022101	Blair Creek	Blairstwn. Twp/Warr	Municipal
Sussex Co. BRD Freeholders	0026701	Paulinskill Trib.	Frankford Twp./Suss	Municipal
Kennedy Construction Co.	0024163	Paulins Kill	Newton/Sussex	Industrial
Sussex Co MUA	0050580	Paulins Kill	Hamton/Sussex	Mun
Rhone-Poulenc	0052272	Paulins Kill	Sussex	Ind

4. PEQUEST RIVER

Watershed Description

The Pequest River drainage basin is 158 square miles. The river itself is 32 miles long and flows from southern Sussex County southwest through Warren County to the Delaware River, downstream of Belvidere. The major tributaries to the Pequest include Trout Brook, Beaver Brook, Furnace Brook, and Bear Creek. Sub-watersheds consist of the Upper and Lower Pequest and Bear Creek. While there are many small lakes and ponds in the watershed, there are no major impoundments on the Pequest River.

The Pequest River watershed contains many recreational areas, with land use being heavily forested and agricultural. As with the other watersheds in the northwestern section of the state, residential and commerical development is intensifying. There are 9 NJPDES permitted discharges here, of which 3 are municipal and 6 are commercial/industrial. The water quality classifications are FW-2 Trout Maintenance and FW-2 Nontrout, except for the waterways within the Whittingham Tract, which are classified FW-2 Trout Production.

Water Quality Assessment

The Pequest River is monitored at the town of Pequest, located in the lower watershed. Overall water quality of the Pequest at this location from 1983 through 1987 can be characterized as good, although conditions degrade to fair quality during warm-weather months. The Pequest River in the lower watershed is a cool, fast moving stream with numerous riffles. Therefore, oxygen reaeration results in sufficient instream dissolved oxygen levels during critical periods. Fecal coliform contamination, elevated phosphorus and inorganic nitrogen, and summer water temperatures are the significant water quality problems for the Pequest River at Pequest. Forty-one percent of all fecal coliform values exceeded 200 MPN/100ml, and all values resulted in a geometric mean of 110 MPN/100ml during the period of review. Total phosphorus was above the state water quality criterion for 33 percent of all values, indicating moderate nutrient enrichment. Inorganic nitrogen exceeded 2.5 mg/l in 25 percent of the samples collected, and periodic high warm-weather un-ionized ammonia levels were detected. Stream temperatures averaged above the 19 degrees celsius criterion for trout maintenance waters during July and August; further indicating some stress to cold water fisheries.

Biological monitoring of the Pequest River at Pequest from 1977 to 1984 for macroinvertebrates has shown some improvements in species diversity and the percentage of pollution intolerant individuals; however, the stream community is indicative of somewhat enriched conditions. Macroinvertebrate and periphyton data show moderately healthy aquatic life.

Almost all 32 miles of the Pequest are evaluated as supporting a healthy cold water fish community. An exception is a channelized stream in the Vienna-Great Meadows area. Other streams in the watershed assessed include: Kymers's Brook, Barkers Mill Brook, Andover Junction Brook, Bear Creek, Jacksburg Creek, Beaver Brook, Furnace Brook, and Harney Run. They were found to support healthy fisheries, comprised largely of cold water species.

Bear Creek is further described by the N.J. Division of Fish, Game, and Wildlife as one of the best streams in the state for native brown trout.

Problem and Goal Assessment

Point Source Assessment

Point source impacts to the Pequest River are thought to be limited. Two new regional sewerage facilities, at Belvidere and Oxford, have eliminated a number of septic system problem areas. Enforcement action is underway with the Pequest Sewer Co. because of excessive chlorine amounts in their discharge to the river. One hazardous waste site is suspected of contributing volatile organics to the Pequest. This is the Southland Corporation site at Great Meadows.

Nonpoint Source Assessment

The Pequest is impacted by the increasing suburban development occuring throughout the watershed. The Soil Conservation Service has identified the Pequest system as having serious sheet and soil erosion rates. In the upper half, pollution from agricultural activities such as runoff from crop lands and animal holdings is believed to be on the decline. In its stead are the increasing effects of housing construction, suburban runoff, and heavy winter road salting. The overall result has been a combination of nutrient enrichment, pesticide and sediment loading, flooding, and elevated chloride levels in the stream. Nonpoint source pollution in the lower half of the Pequest is known to arise principally from housing construction activities. Flooding has been documented as a problem in Belvidere (Warren Co.). The most degraded section of the Pequest is in the Vienna-Great Meadows area where channelization has resulted in complete habitat destruction. Many tributaries in the watershed which support healthy fisheries do receive some minor agricultural runoff; two such streams are Andover Junction Brook and Beaver Brook.

Designated Use and Goal Assessment

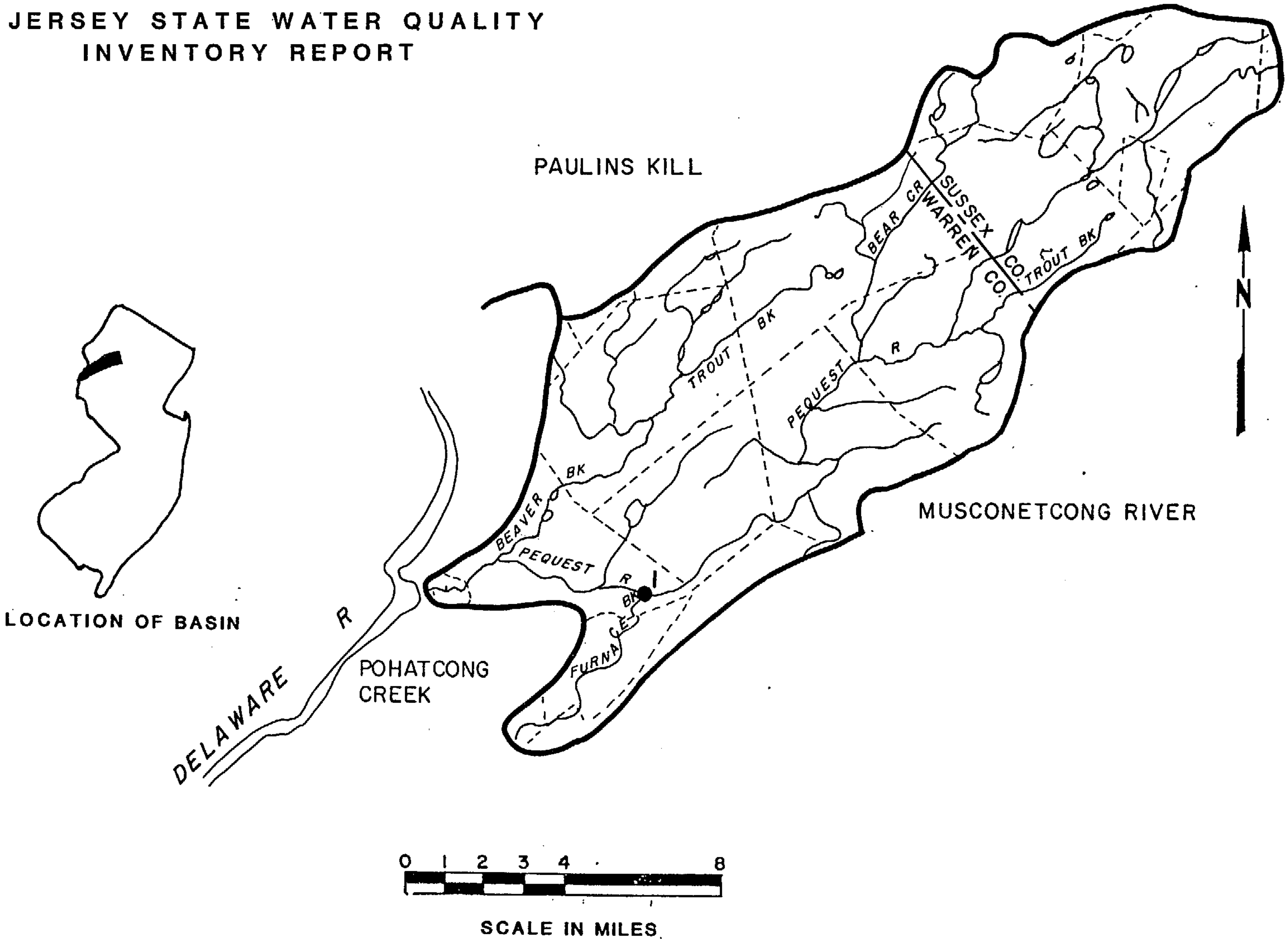
Because of bacterial contamination, the Lower Pequest cannot be considered swimmable. The Pequest River contains both Trout Maintenance and Nontrout waters. Where natural trout populations exist, summer water quality conditions may cause periodic stress to the fishlife because of high stream temperature and nutrient enrichment. Overall, fish communities of approximately 80 stream miles are assessed as healthy and therefore will meet fish propagation and maintenance goal/designated use. Furnace Brook (approximately 10 miles) currently has a healthy fish community, but it is considered threatened.

Monitoring Station List

Map Number	Station Name and Classification
1	Pequest River at Pequest, FW-2 Trout Maintenance

PEQUEST RIVER

NEW JERSEY STATE WATER QUALITY INVENTORY REPORT



WATER QUALITY INDEX PROFILE 1983-1987

Pequest River

WATER QUALITY INDICATORS

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVERAGE AND CONDITION
Pequest River at Pequest	AVG WQI	9	4	12	21	18	12	10	I.D.	19 Good
	WORST3 MONTHS	June-August	Jan-March	Jan-March	July-Sept	Nov-Jan	Oct-Dec	July-Sept		34 Fair July-Sept.

LEGEND - Water Quality Index Description

WQI	Condition	Description
0-10	Excellent	No or minimal pollution; water uses met throughout the year.
11-25	Good	Generally low amounts of pollution; water uses periodically not met.
26-60	Fair	Pollution amounts vary from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution in high amounts; water uses not met.
81-100	Very Poor	Pollution occurs at extremely high levels; severe stress to stream life; water uses not met.
ID	Insufficient Data	

An index of 20 is equivalent to the level of water quality criteria.

N.J.P.D.E.S. DISCHARGE INVENTORY

WATERSHED: PEQUEST RIVER

DISCHARGE NAME	# NJPDES	RECEIVING WATERS	MUNICIPALITY/COUNTY	TYPE
Southland Corp.-Fine Chems.	0005291	Pequest River	Independence Twp/Wrn	Ind./Comm.
Pequest Water Co.	0029033	Pequest River	Allamuchy Twp/Warren	Municipal
Pequest Sewer Co.	0020605	Pequest River	Allamuchy Twp/Warren	Municipal
Brockway IMCO, Inc.	0005665	Pophandusing Creek	Belvidere Town/Wrn.	Ind./Comm.
Oxford Tex. Finishing Co.	0004901	Furnace Brook	Oxford Twp./Warren	Ind./Comm.
Oxford Area Wastewater-TF	0035483	Pequest River	Oxford Twp./Warren	Municipal
A Gross Candle Co.	0031631	Delaware River	Hope Twp./Warren	Thermal
Pequest Fish Hatchery	0033189	Pequest River	Liberty Twp./Warren	Industrial
Newton T&M Corp.	0050954	Pequest River	Fredon Twp./Sussex	Thermal

5. POHATCONG CREEK

Watershed Description

The 28 mile long Pohatcong Creek stretches from Independence Township to the Delaware River south of Phillipsburg. It drains a 57 square mile area of southwestern Warren County. The population in this area is centered in the Boroughs of Alpha and Washington. Major tributaries include Brass Castle Creek, Shabbecong Creek, and Merrill Creek. The only notable impoundment in the watershed is the Roaring Rock Brook Reservoir, although a reservoir for low-flow augmentation in the Delaware River is being constructed on Merrill Creek.

The land use in this watershed is predominantly agricultural. There are 6 NJPDES permitted discharges here, 3 of which are municipal and 3 are commercial/industrial. Pohatcong Creek and its tributaries are classified as FW-2 Trout Production and FW-2 Trout Maintenance.

Water Quality Assessment

Pohatcong Creek is monitored at New Village for determination of ambient water quality conditions. Monitoring at this location is thought to represent approximately five stream miles. This station is located midway along the stream's length and has found water quality to be marginal, with high concentrations of fecal coliform, especially during the warmer seasons, moderate levels of total phosphorus and elevated stream temperatures from June through August. Because of these problems, overall water quality approaches poor conditions during the summer.

Fecal coliform concentrations averaged nearly 670 MPN/100ml with 71 percent exceeding the 200 MPN/100ml criterion. Summer and early fall values for fecal coliform often exceeded 2000 MPN/100ml. Total phosphorous amounts averaged two times the .1 mg/l state criterion and were above this level in 80 percent of all samples collected. Other water quality indicators that show periodic problems are elevated readings of stream temperatures, inorganic nitrogen and un-ionizied ammonia. Stream temperatures above the 19 degrees Celcius criteria for trout maintenance streams were frequent throughout the June to August period. Fourteen percent of the un-ionized ammonia values were also greater that the state criterion for protection of coldwater fisheries. These high temperatures and un-ionized ammonia levels indicate possible adverse conditions for the native and stocked trout populations.

Pohatcong Creek, Merrill Creek, Brass Castle Brook, Buckhorn Creek, and Pohandusing Creek are all assessed as supporting healthy cold water fish populations. Lopatcong Creek, adjacent to Pohatcong Creek, contains a healthy warm water fishery. An intensive survey of Pohatcong Creek conducted in 1984 found elevated lead, manganese and nickel in fish tissue. The potential source of the metals was not identified. A decrease in macroinvertebrate populations as one travels downstream was due to habitat changes, not to water quality changes.

Problem and Goal Assessment

Point Source Assessment

Pohatcong Creek and tributaries drain a predominantly agricultural area with one population center, Washington Borough, Warren County. The creek is fairly small and it appears from the water quality data that it cannot assimilate the pollution loads that drain into the stream. The municipal wastewater discharges in the watershed may likely have significant impact on water quality. The High Point Landfill in Washington Twp., Warren County, is suspected of contaminating Pohatcong Creek with landfill leachate.

Nonpoint Source Assessment

Pohatcong Creek is believed to be impacted by agricultural runoff from croplands and chicken farms. The Pohatcong Creek watershed is known to have among the highest soil erosion rates in the state. Coupled with this is intensive suburban development fueled by one-acre zoning. Housing construction, urban surface runoff, plus runoff from storm sewers is suspected to be contributing to local flooding and the decline in water quality. Merrill Creek was reported by local officials to have had nonpoint source pollution problems in the recent past during the construction of a reservoir.

Lopatcong Creek is reported to have had severe water quality problems in the past below Harmony which had led to fish kills. The suspected cause was industrial pollution. As in the Pohatcong Creek, Lopatcong Creek is impacted by the increasing degree of suburban development within the watershed, receiving ever increasing quantities of urban surface runoff and storm sewer outflow. These are suspected to cause some water quality degradation as well as flooding. New residential and commercial development in many areas of the watershed will contribute additional runoff problems.

Designated Use and Goal Assessment

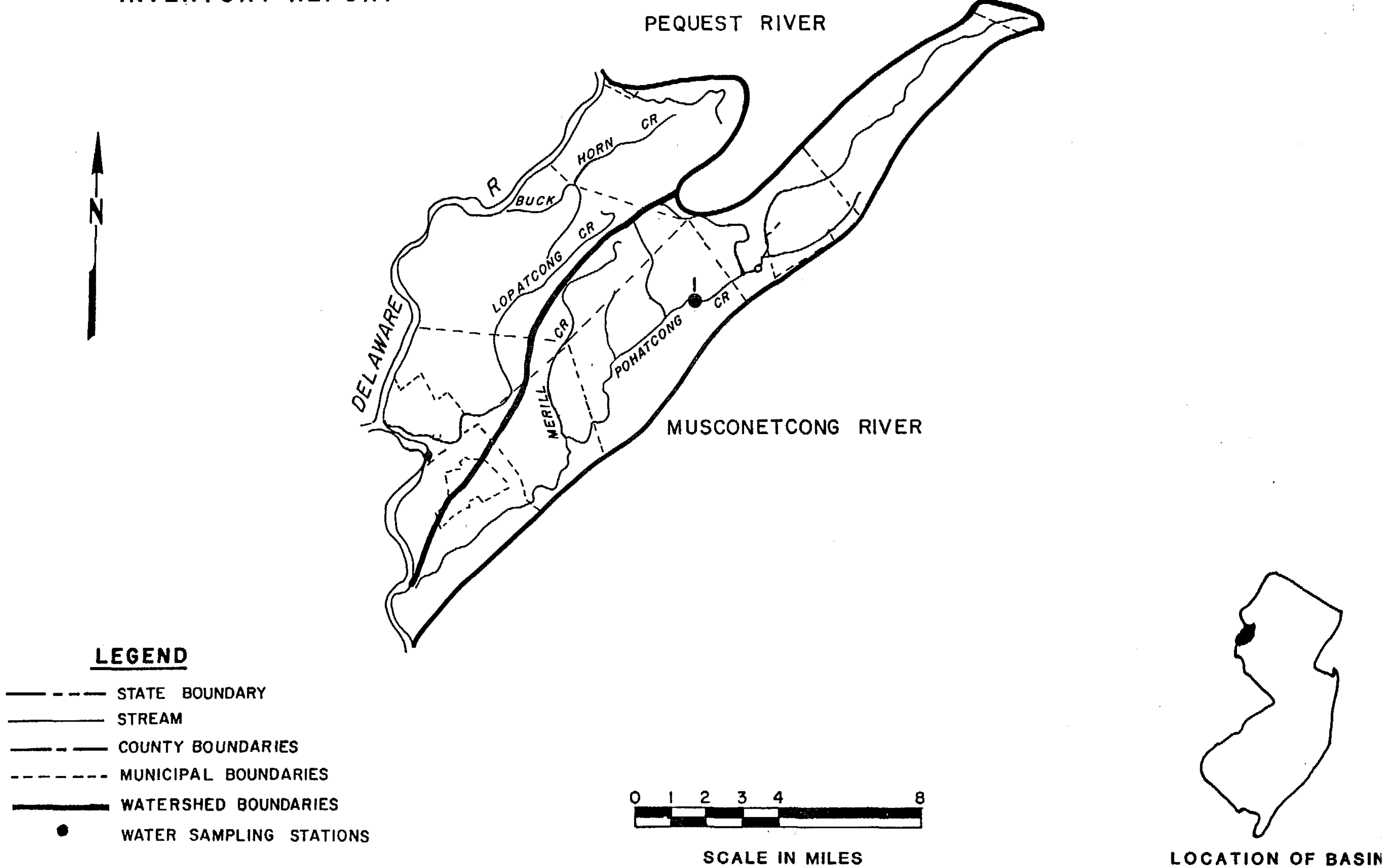
The monitored waters of Pohatcong Creek will not meet the swimmable designated use/goal because of high fecal coliform levels. All streams will meet the fish propagation/maintanence goal, but some waters appear to be threatened. In the area of Washington, Pohatcong Creek's fisheries are threatened because of wastewater discharges, while Merrill Creek's fish community is threatened during the construction of the reservoir.

Monitoring Station List

Map Number	Station Name and Classification
1	Pohatcong Creek at New Village, FW-2 Trout Maintenance

POHATCONG CREEK

NEW JERSEY STATE WATER QUALITY INVENTORY REPORT



Pohatcong Creek

WATER QUALITY INDEX PROFILE 1983-1987

WATER QUALITY INDICATORS

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVERAGE AND CONDITION
Pohatcong Creek at New Village	AVG WQI	10	11	10	37	26	6	11	18	37 Fair
	WORST3 MONTHS	July-Sept	March-May	March-May	June-August	Nov-Jan	August-Oct	March-May	April-June	55 Fair July-Sept.

LEGEND - Water Quality Index Description

WQI	Condition	Description
0-10	Excellent	No or minimal pollution; water uses met throughout the year.
11-25	Good	Generally low amounts of pollution; water uses periodically not met.
26-60	Fair	Pollution amounts vary from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution in high amounts; water uses not met.
81-100	Very Poor	Pollution occurs at extremely high levels; severe stress to stream life; water uses not met.
ID	Insufficient Data	

An index of 20 is equivalent to the level of water quality criteria.

N.J.P.D.E.S. DISCHARGE INVENTORY

WATERSHED: POHATCONG CREEK

DISCHARGE NAME	# NJPDES	RECEIVING WATERS	MUNICIPALITY/COUNTY	TYPE
Pearsall Corp.	0008460	Pohatcong Creek	Phillipsburg Tn./Wrn	Ind./Comm.
Windtrust Apts.	0030007	Pohatcong Creek	Mt. Laurel/Warren	Ind./Comm.
Washington Borough STP	0021113	Shebbecong Crk. Trib	Washington Boro/Wrn.	Municipal
Warren Co. Tech School	0020711	Pohatcong Creek	Franklin Twp./Warren	Municipal
Belford Seafood Cooperative	0004049	Lopatcong Creek	Phillipsburg/Warren	Ind-Thermal
Phillipsburg, Town of	0024716	Lopatcong Creek	Phillipsburg/Warren	Municipal

6. MUSCONETCONG RIVER

Watershed Description

The Musconetcong River drains an area of about 156 square miles. It is 42 miles long, stretching from its headwaters at Lake Hopatcong to the Delaware River at Riegelsville. Parts of Sussex, Warren, Hunterdon, and Morris Counties are in the Musconetcong drainage basin. The Upper and Lower Musconetcong sub-watersheds comprise the entire watershed. The population centers in this watershed are the towns of Hackettstown, Mt. Olive, and Stanhope. There is also significant development along the shores of Lakes Hopatcong and Musconetcong. The two major tributaries to the Musconetcong River are Lubbers Run and Beaver Brook. Major impoundments include Lake Hopatcong (the largest lake in New Jersey), Lake Shawnee, Lake Musconetcong, and Cranberry Reservoir.

Aside from the aforementioned developed areas, the rest of the watershed is mostly forests or used for agriculture, although significant development pressures are occurring. There are 22 NJPDES permitted discharges here, 10 municipal and 12 commerical/industrial. The water quality of the Musconetcong and tributaries are classified, at various locations as FW-1, FW-2 Trout Production, FW-2 Trout Maintenance, and FW-2 Nontrout.

Water Quality Assessment

Ambient water quality monitoring of the Musconetcong River is performed at five locations. This monitoring represents most of the river's length. They are, in downstream order, at the outlet of Lake Hopatcong, at Lockwood, Beattystown, near Bloomsbury and at Riegelsville. Results from these stations show that the Musconetcong River degrades in the downstream direction, going from good overall quality to fair quality in the lower watershed. The Musconetcong originates at the outlet of eutrophic Lake Hopatcong before flowing into Lake Musconetcong. While these two lakes have excessive nutrients and aquatic weed growth, they act to remove nutrients from the river. The only water quality problems in the Musconetcong River at the outlet of Lake Hopatcong are elevated stream temperatures during the summer months that pose a threat to the cold-water fish populations, and periodic phosphorus concentrations that exceed state criterion.

The Musconetcong River at Lockwood, although having good overall quality, experiences greater water pollution problems with higher phosphorus and fecal coliform concentrations. Fecal bacteria levels are highest during periods of warm weather. At this location stream temperatures exceed trout maintenance criterion during summer months. The moderately enriched conditions at Lockwood cause summer water quality to be classified as fair. The quality of the Musconetcong at Beattystown is similar to that at Lockwood, but higher concentrations of fecal coliform and total phosphorus exceeded water quality criteria in 39 and 73 percent, respectively, of all samples collected from 1983 through 1987. There are occassionally high un-ionized ammonia levels at this location. Elevated warm weather stream temperatures are also found at Beattystown.

The two monitoring stations in the lower watershed, near Bloomsbury and at Riegelsville, contain fair quality waters, having excessive amounts of fecal coliform and total phosphorus. Other water quality indicators are not at problematic levels, although stream temperatures in warm weather and supersaturated oxygen conditions occassionally exceed their respective criterion. In addition, one high copper reading was identified at Riegelsville during the period of review. Biomonitoring in the Musconetcong near Bloomsbury confirms the presence of enriched stream conditions. A high percentage of filter feeders (64 percent) suggest this enrichment, while typical clean water organisms accounted for 59 percent of the total sample. Periphyton collection found extremely high chlorophyll a levels in 1984, but overall, this measurement has shown a lot of variability over the years.

All 42 miles of the Musconetcong is evaluated as supporting a healthy fish community. The area below Bloomsbury however, has had fish kills in the past caused by industrial pollution. The upper approximately 18 miles of the Musconetcong are categorized as a cold water fishery; the lower 36 or so miles are classified as containing both warm and cold water forms. Other streams in the watershed including Hances Brook, Stephensburg Brook, Bingalor Brook, Trout Brook, and Lubbers Run were all assessed to be healthy cold water fisheries. Willis Brook in Morris County, also a cold water fishery, is evaluated as moderately degraded. Cranberry Lake, Lake Musconetcong, and Lake Hopatcong were regarded as supporting healthy fish communities. All three support warm water species, while Cranberry Lake also contains populations of cold water fish.

Problem and Goal Assessment

Point Source Assessment

The Upper Musconetcong is impacted by industrial point sources in the Hackettstown region. The fish population of Wills Brook in Warren County is degraded by low dissolved oxygen brought about by STP effluent with inadequate phosphate removal. New Jersey Fish, Game and Wildlife personnel have noted that industrial point sources are suspected in past fish kills in this subwatershed.

Nonpoint Source Assessment

The upper reaches of the Musconetcong are believed to be receiving increasing amounts of pollution as a result of areawide suburban development. Moderate to severe urban runoff and runoff from construction activities are suspected as causing a decline in stream water quality and an increase in lake eutrophication. Heavy winter road salting is also an areawide problem. Increasing runoff from urban surfaces and from storm sewers has been singled out as a problem in the Hackettstown area. In the lower reaches of the Musconetcong, chemical and bacterial contamination from agricutural crop production and pasture land are on the decline. In contrast, siltation and erosion from construction activities, nutrients and bacteria from septic systems, as well as road salt, and oil and grease from highway runoff are all on the increase.

Wills Brook, in addition to point sources, also suffers from the impacts of construction, urban runoff, road runoff, and channelization. They are all assessed to be at severe and ever growing levels. These have brought about flooding as well as a decline in water quality. Mine Brook likewise suffers from water quality and flooding problems brought about by growing levels of construction, highway maintenance runoff, and channelization. Mine Brook additionally receives agricultural runoff from animal holdings, crop land, and pasture land, all of which apprear to be on the decline. The runoff arising from the increasing amounts of housing construction activity in the areas around Trout Brook is believed to be a significant threat to the Hackettstown fish hatchery, as pointed out by local officials. In addition, this brook has experienced fish kills in the past caused by industrial pollution.

Among the lakes evaluated, Lake Musconetcong suffers from advanced eutrophication linked to suburban runoff. Lake Shawnee in Morris County is impacted by increasing housing construction. Lake Hopatcong receives a wide range of nonpoint source pollution; known sources include runoff from housing and road construction, and runoff from road and suburban surfaces. A severe problem with septic system leachate has been singled out by local authorities. Well maintained retention basins is a suggested solution made by local authorities. Lake Hopatcong is also reported to receive local fuel spills and leaks which have been suspected in fish kills.

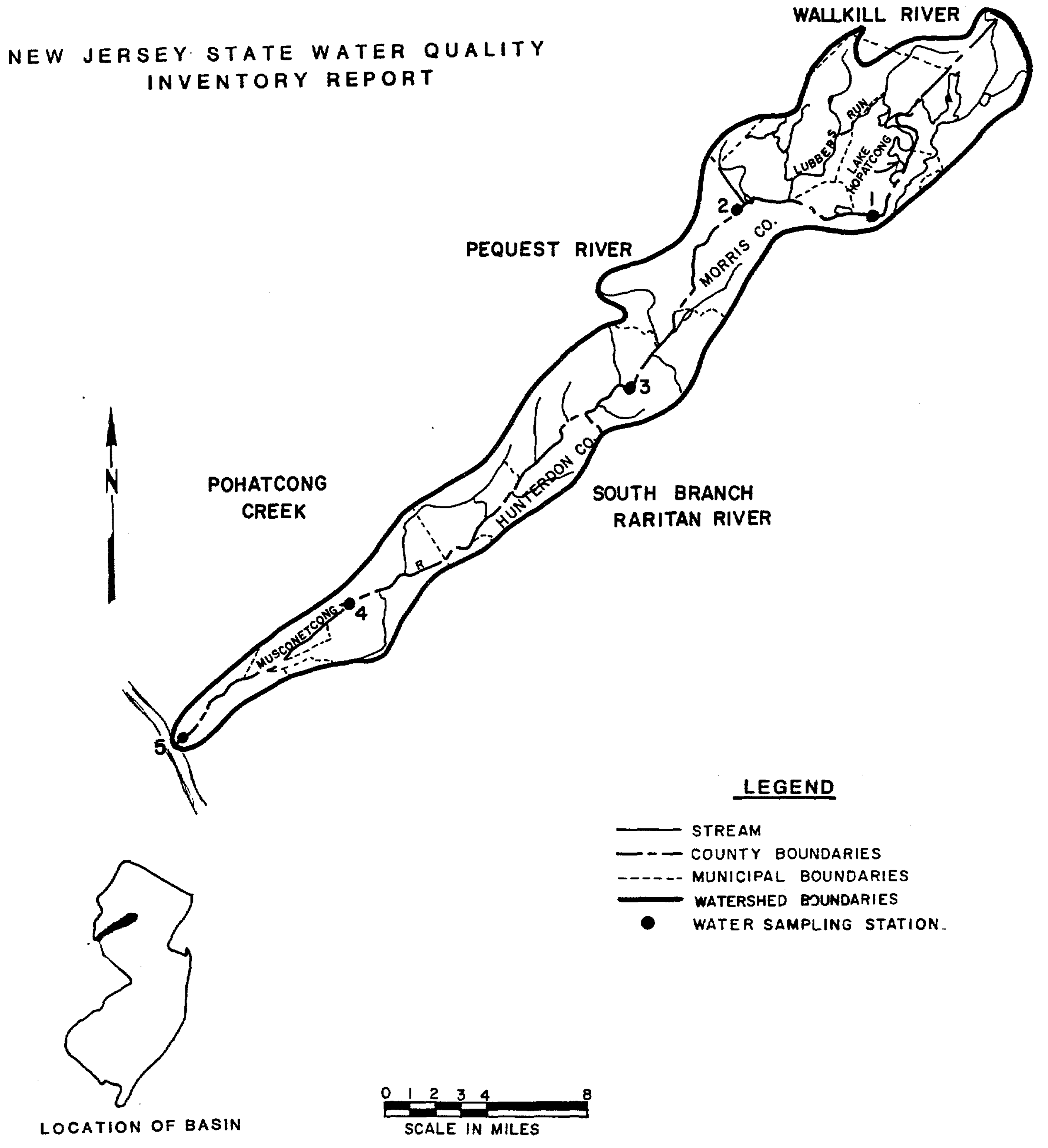
Designated Use and Goal Assessment

Approximately 30 of the 35 monitored miles of the Musconetcong River is considered not swimmable, only the section immediately below Lake Hopatcong will meet this designated use. The Musconetcong River contains generally healthy trout and smallmouth bass fisheries and is heavy stocked and utilized by fishermen. As such, the river will meet the fish maintenance and propagation use and goal. A section of the river in the Bloomsbury area, however, is threatened by industrial pollution. Wills Brook contains a moderately degraded fisheries resource because of wastewater discharges. Hances and Trout Brooks have healthy fisheries, but they are threatened. Lakes in the watershed generally support both the swimmable and fish propagation/maintenance designated uses.

Monitoring Station List

Map Number	Station Name and Classification
1	Musconetcong River at the outle of Lake Hopatcong, FW-2 Trout Maintenance
2	Musconetcong River at Lockwood, FW-2 Trout Maintenance
3	Musconetcong River at Beattystown, FW-2 Trout Maintenance
4	Musconetcong River near Bloomsbury, FW-2 Trout Maintenance
5	Musconetcong River at Riegelsville, FW-2 Trout Maintenance

MUSCONETCONG RIVER



WATER QUALITY INDEX PROFILE 1983-1987

Musconetcong River

WATER QUALITY INDICATORS

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVERAGE AND CONDITION
Musconetcong River at outlet of Lake Hopatcong	AVG WQI	17	4	6	9	13	6	3	14	14 Good
	WORST3 MONTHS	June-August	July-Sept	June-August	Sept-Nov	July-Sept	Jan-March	Jan-March	March-May	30 Fair June-August
Musconetcong River at Lockwood	AVG WQI	15	7	6	17	17	8	11	17	19 Good
	WORST3 MONTHS	June-August	Sept-Nov	June-August	June-August	July-Sept	Nov-Jan	July-Sept	Aug-Oct	39 Fair July-Sept
Musconetcong River at Beattystown	AVG WQI	14	5	11	18	23	8	10	ID	21 Good
	WORST3 MONTHS	June-August	May-July	Feb-April	July-Sept	July-Sept	July-Sept	July-Sept		40 Fair June-August
Musconetcong River near Bloomsbury	AVG WQI	11	17	16	31	17	8	9	ID	30 Fair
	WORST3 MONTHS	June-August	Feb-April	Jan-March	August-Oct	Nov-Jan	Nov-Jan	June-August		43 Fair July-Sept
Musconetcong River at Riegelsville	AVG WQI	11	6	12	30	18	8	8	29	34 Fair
	WORST3 MONTHS	June-August	March-May	March-May	July-Sept	May-July	Dec-Feb	July-Sept	April-June	56 Fair June-August

LEGEND - Water Quality Index Description

WQI	Condition	Description
0-10	Excellent	No or minimal pollution; water uses met throughout the year.
11-25	Good	Generally low amounts of pollution; water uses periodically not met.
26-60	Fair	Pollution amounts vary from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution in high amounts; water uses not met.
81-100	Very Poor	Pollution occurs at extremely high levels; severe stress to stream life; water uses not met.
ID	Insufficient Data	

An index of 20 is equivalent to the level of water quality criteria.

N.J.P.D.E.S. DISCHARGE INVENTORY

WATERSHED: MUSCONETCONG RIVER

DISCHARGER NAME	# NJPDES	RECEIVING WATERS	MUNICIPALITY/COUNTY	TYPE
Byram Twp. Bd. of Ed.	0022632	East Brook	Byram/Sussex	Municipal
US Mineral Products	0004600	Musconetcong River	Stanhope/Sussex	Ind/Comm
Our Lady of the LK Rectory	0026239	Musconetcong River	Mt. Arlington/Morris	Municipal
Reichold Chem-Cooke Div	0028657	Musconetcong River	Mansfield/Warren	Ind/Comm
M&M Mars	0004928	Musconetcong River	Hackettstown/Warren	Ind/Comm
Hackettstown MUA	0021369	Musconetcong River	Hackettstown/Warren	Municipal
Amerace-ESNA Corp.	0004812	Schooleys MTN. Brook	Washington/Morris	Ind/Comm
Diamond Hill Estates SP	0028592	Hansen Creek	Mansfield/Warren	Municipal
Garden St. Truck Plaza	0023094	Musconetcong River	Bloomsbury/Hunterdon	Ind/Comm
Bloomsbury WD	0025569	Musconetcong River	Bloomsbury/Hunterdon	Municipal
Asbury Graphite Mills	0031208	Musconetcong River	Franklin/Warren	Ind/Comm
Reigel Paper Corp-Hughesville	0004421	Musconetcong River	Lopatcong/Warren	Ind/Comm
Musconetcong SA		Wills Brook	Byram/Sussex	Municipal
Regional West	0035033	Hatchery Brook	Hackettstown/Warren	Ind/Oil-H2O sept/SW
Musconetcong SA	0027821	Musconetcong River	Mount Olive/Morris	Municipal
Jefferson TWP	0021105	Lake Hopatcong	Jefferson/Morris	Municipal
Jefferson TWP Rock	0026867	Mitts Pond	Jefferson/Morris	Municipal
Consolidated School	0021156	Lakes Hopatcong	Lake Hopatcong/Morr	Municipal
Advanced Environmental Tech	0034975	Willis Brook	Mount Olive/Morris	Ind/Storm
Warren Glen Mill	0004448	Musconetcong River	Holland/Hunterdon	Ind
USR of Tonix	0032247	Musconetcong River	Washington/Morris	Ind

7. DELAWARE RIVER TRIBUTARIES - HUNTERDON COUNTY

Watershed Description

The tributaries to this 45 mile length of the Delaware River include Hakihokake, Harihokake, Nishisakowick, Lockatong, Wickecheoke, Alexauken, and Swan Creeks in Hunterdon County; and Moores, Fiddlers, and Jacobs Creeks in Mercer County. They are jointly divided into three sub-watersheds: Harihohake Creek to Warford Creek, Lopcatong Creek to Wickechecheoke Creek, and Alexauken Creek to Gold Run. This is a total drainage area of 200 square miles, with approximately 75 total stream miles. The Delaware and Raritan Canal originates in this area. There are no large population centers here, but towns evident are Milford Borough, Frenchtown, Sergeantsville, Lambertville, and Stockton. Two impoundments are the Swan Creek Reserviors, East and West.

The land use in this area is primarily agricultural and forested with residential and commercial development scattered throughout. Residential development is increasing in these small watersheds. There are 11 NJPDES permitted discharges to these Delaware tributaries. Six are municipal and five arecommercial/ industrial. The waterways in this section have been classified FW-1 at Washington's Crossing State Park, FW-2 Trout Production, FW-2 Trout Maintenance, and FW-2 Nontrout.

Water Quality Assessment

Wickecheoke Creek at Stockton is the only ambient monitoring station on the Delaware River tributaries between the Musconetcong River and Assunpink Creek. The streams in this section are small with summer flows generally below 20 cfs. Wickecheoke Creek has overall fair water quality, with conditions degrading in late summer to early fall. Water quality problems in this creek include elevated stream temperatures in warm weather periods, periodic high fecal coliform counts, and excessive nutrients with regard to total nitrogen. Unionized ammonia exceeded state water quality criterion for trout maintenance waters in 13 percent of all samples, usually in the period from July through September. pH values indicate highly alkaline conditions due to the nature of the region's bedrock material. One cadmium value was above the recommended level during the period 1983 to 1987.

Ambient monitoring has been discontinued on a number of streams in this area. Streams with sampling data to 1982 include Lockatong Creek, Hakihokake Creek, Harihokake Creek, Alexauken Creek and Swan Creek. Lockatong, Alexauken and Swan Creeks had generally good water quality, while Hakihokake and Harihokake Creeks were of fair quality. All the streams had excessive fecal coliform, and experienced elevated stream temperatures during the summer months.

Among the Delaware River tributaries evaluated by the Division of Fish, Game and Wildlife, Locatong Creek (13 miles) and Alexauken Creek (6 miles) have both been assessed as supporting healthy cold water fisheries. Wickechoeke Creek (approx. 14 miles), also a cold water fishery, is evaluated as moderately degraded. An intensive survey on this latter stream's macroinvertebrate community has found a shift from forms normally present in cold water streams to species tolerant of extremely saline conditions.

Problem and Goal Assessment

Point Source Assessment

Any introduction of pollutants into these streams can have a deleterious impact, especially during low flow periods. The Delaware Township STP discharge to Wickecheoke Creek is under enforcement action for exceeding its permit limitations for nitrogen, phosphorus, chlorine residual and BOD removal. An industrial facility located at the headwaters of Wickecheoke Creek is discharging chloride and solids into the stream and may be degrading the fishery by causing a saline shift in the resident macroinvertebrate population. The Texas Eastern facility in West Amwell, Hunterdon Co., is a hazardous waste site and is suspected to be polluting Alexauken Creek with PCBs, PHC and dioxin.

Nonpoint Assessment

Locatcong and Wichecheoke Creeks are assessed to be impacted by runoff from crop land and from pasture land. These agricultural sources are believed to be on the decline and are being replaced by increasing quantities of runoff from road construction/maintenance. These streams also receive occasional septic tank leachate which is suspected to have contributed to nutrient enrichment and fecal coliform contamination.

Alexauken Creek is known to be impacted by a wide range of nonpoint pollution sources. Agriculture, specifically crop and pasture land, contributes fertilizers, soil, and manure runoff. Suburban runoff from storm sewers contribute oils, salts, and fecal coliform contamination. Alexauken Creek receives nutrients and fecal bacteria from local septic systems.

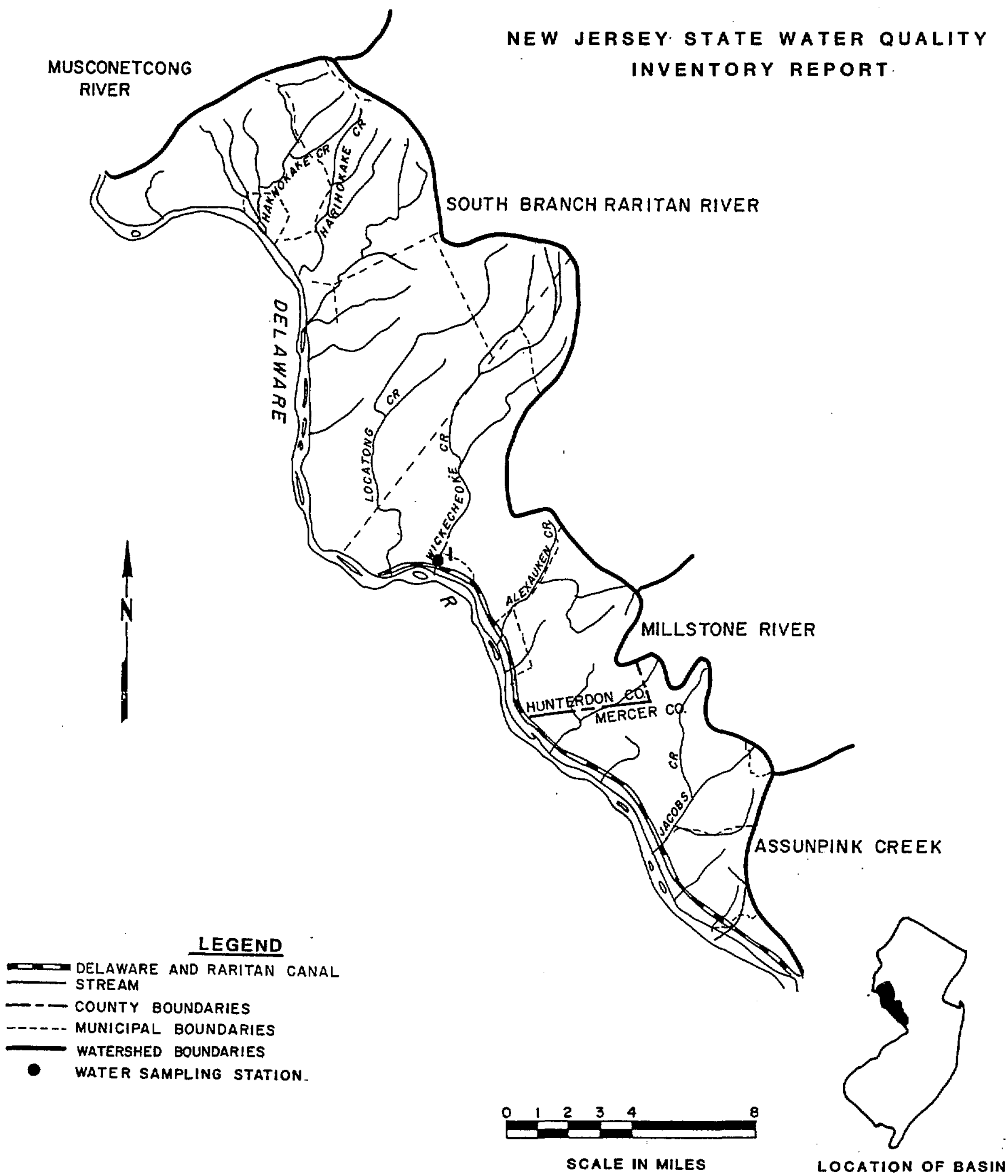
Designated Use and Goal Assessment

The Delaware River tributaries discussed in this segment are generally not considered suitable for primary contact recreation because of excessive fecal coliform concentrations. Lockatong and Alexauken Creeks meet the fish propagation and maintenance use/goal (approximately 20 miles), while Wickecheoke Creek (14 stream miles) is considered to have a moderately degraded fisheries, (i.e. partially meeting this designated use), because of wastewater discharges.

Monitoring Station List

Map Number	Station Name and Classification
1	Wickecheoke Creek at Stockton, FW-2 Trout Maintenance

DELAWARE RIVER TRIBUTARIES
(HUNTERDON/MERCER COUNTIES)



WATER QUALITY INDEX PROFILE 1983-1987

Delaware River Tributaries
Hunterdon County

WATER QUALITY INDICATORS

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVERAGE AND CONDITION
Wickecheoke Creek at Stockton	AVG WQI	16	8	12	19	22	9	8	21	29 Fair
	WORST3 MONTHS	June-August	July-Sept	August-Oct	Sept-Nov	Sept-Nov	Jan-March	July-Sept	Sept-Nov	51 Fair Aug- Oct

LEGEND - Water Quality Index Description

WQI	Condition	Description
0-10	Excellent	No or minimal pollution; water uses met throughout the year.
11-25	Good	Generally low amounts of pollution; water uses periodically not met.
26-60	Fair	Pollution amounts vary from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution in high amounts; water uses not met.
81-100	Very Poor	Pollution occurs at extremely high levels; severe stress to stream life; water uses not met.
ID	Insufficient Data	

An index of 20 is equivalent to the level of water quality criteria.

N.J.P.D.E.S. DISCHARGE INVENTORY

WATERSHED: DELAWARE TRIBUTARIES

DISCHARGE NAME	# NJPDES	RECIEVING WATERS	MUNICIPALITY/COUNTY	TYPE
Salvation Army-Camp Techmuseh	0023001	Nishisakawick Creek	Alexandria Twp./Hunt	Ind./Comm.
Alexandria Bd. of Ed.	0027553	Trib to Nishisa-kawick Creek	Alexandria Twp./Hunt	Municipal
Kingwood Twp. Bd. of Ed.	0023311	Krial Pond	Kingwood Twp./Hunter	Municipal
Delaware Twp. MUA	0027561	Tributary to Wick-echeoke Creek	Delaware Twp./Hunter	Municipal
Magnesium Elecktron Inc.	0027537	Wickecheoke Creek	Kingwood Twp./Hunter	Ind./Comm.
Lehigh Fluid Power, Inc.	0036005	Alexauken Creek	Lambertville/Hunter	Industrial
Homasote Company	0004031	Gold Run	Ewing Township	Industrial
Mercer County Airport STP	0023779	Jacob Creek	Ewing Township	Municipal
General Sullivan Group Inc.	0034321	Gold Run	Ewing Township	Industrial
Hopewell Valley Reg. Bd of Ed	0021776	Trib of Delaware R.	Titusville/Mercer	Municipal
County of Mercer Co. Pine	0027715	Fidler Creek	Hopewell/Mercer	Municipal

8. ASSUNPINK CREEK

Watershed Description

The Assunpink Creek drains an area of 91 square miles. It is about 25 miles long, flowing from Millstone Township in Monmouth County through central Mercer County to the Delaware River at Trenton. The Upper and Lower Assunpink sub-watersheds comprise the entire Assunpink watershed. Shabbecunk Creek and Miry Run are the major tributaries to the Assunpink. A number of impoundments exist along Assunpink Creek and tributaries for the purpose of flood control.

Land uses in this watershed are both agricultural/undeveloped and urban/suburban. Population is centered in Trenton and surrounding areas. There are 17 NJPDES permitted discharges here, 2 municipal and 15 commercial/industrial. The waters of the Assunpink Creek watershed are classified primarily FW-2 Nontrout with a two mile stretch determined to be FW-2 Trout Maintenance.

Water Quality Assessment

Assunpink Creek experiences severe degradation in water quality when it flows into the Trenton area, based on monitoring near Clarksville and at Trenton. The creek is of overall good quality at Clarksville, upstream of Trenton. However, below Clarksville Assunpink Creek is impounded, channelized, and subject to significant municipal and industrial discharges. As a result, water quality is fair to poor in this area.

The Assunpink near Clarksville drains suburban development, and crop and vacant lands. Water quality problems are limited to excessive phosphorus and periodic high fecal coliform concentrations. Fecal coliform levels averaged 52 MPN/100ml during the 1983 to 1987 period with 13 percent exceeding the 200 MPN/100ml criterion. Total phosphorus was above its criterion in 63 percent of all samples collected. Stream quality shows little change throughout the year.

Assunpink Creek at Trenton contains water quality conditions that are typical of highly developed urban areas of the state. Fecal and total coliform averaged 622 and 2770 MPN/100ml, respectively. Total phosphorus was above the .1 mg/l recommended limit in all samples collected (average levels were seven times the .1 mg/l criterion). Total inorganic nitrogen levels also indicate high nutrient enrichment of the creek. During 1983 to 1987, the late spring and early summer months found poor water quality conditions in the Assunpink.

Overall conditions have not changed significantly since a major regional municipal wastewater facility, which discharges to the creek, initiated advanced treatment. Biomonitoring of Assunpink Creek at Trenton shows the stream to be highly degraded with unfavorable conditions. Macroinvertebrate sampling has indicated some improvement in community structure with a significant decrease in pollution tolerant species and, for the first time, the presence of pollution intolerant species.

The upper 16 miles of Assunpink Creek were evaluated as supporting a healthy warm water fish community. The lower 6 miles begins to degrade becoming moderately degraded due to low species diversity and a lack of game species. This lower portion of the Assunpink supports both warm and cold water fish forms. New Sharon Branch, a small tributary also assessed by the Division of Fish, Game and Wildlife, contains a healthy warm water fishery.

Problem and Goal Assessment

Point Source Assessment

Point source discharges influence water quality conditions in the lower sections of Assunpink Creek, especially from Whitehead Mill Pond downstream. Impacts from point sources above the pond are localized.

Nonpoint Source Assessment

In the Upper Assunpink watershed an increase in suburban and commercial development is currently underway, but water quality does not appear to have been adversely impacted. Pollution problems may be masked by the retention effects of a number of impoundments on the creek which are used for flood control purposes. What problems are conveyed in the monitoring data for the Upper Assunpink are likely nonpoint source related. Crop production in the upstream sections of the Assunpink is known to have led to soil erosion and increasing stream siltation. Further downstream, agriculture gives way to urban runoff as the principal source of nonpoint source contamination, specifically land development and urban runoff. In Trenton, however, water quality degradation is evident from the large municipal and industrial wastewater contributions to the creek. These wastewaters, combined with the effects of stream channelization and nonpoint sources, result in a water body that cannot assimilate organic and nutrient loads. The high bacterial levels are due to urban runoff.

Evaluated lakes in the Assunpink watershed; Lake Assunpink, Stone Tavern Lake, Rising Sun Lake, and Mercer Lake are all believed to receive some nutrient loading from agricultural and residential runoff.

Designated Use and Goal Assessment

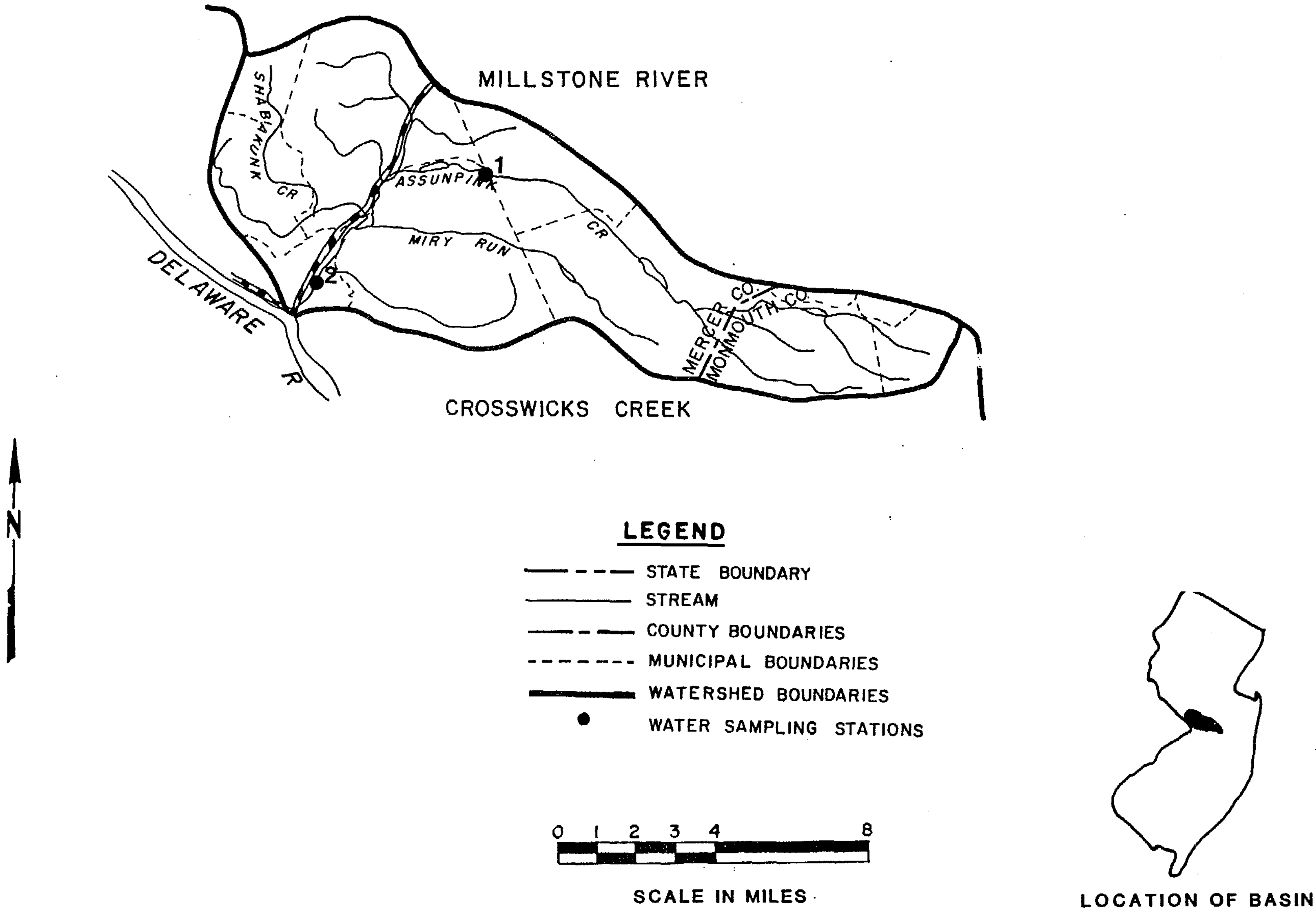
The fishable goal will be met in the Upper Assunpink Creek watershed, and partially met in the Trenton area, (the lower 5 miles). The highly enriched conditions in the Lower Assunpink and degraded biological community indicates that stress occurs to the warm water fisheries present. The swimmable goal is partially met at the Clarksville monitoring location, and not achieved in the lower reaches.

Monitoring Station List

Map Number	Station Name and Classification
1	Assunpink Creek near Clarksville, FW-2 Nontrout
2	Assunpink Creek at Trenton, FW-2 Nontrout

ASSUNPINK CREEK

NEW JERSEY STATE WATER QUALITY INVENTORY REPORT



WATER QUALITY INDEX PROFILE 1983-1987

Assunpink Creek

WATER QUALITY INDICATORS

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVERAGE AND CONDITION
Assunpink Creek near Clarksville	AVG WQI	4	7	8	11	30	3	0	5	16 Good
	WORST3 MONTHS	July-Sept	July-Sept	Sept-Nov	July-Sept	Dec-Feb	Nov-Jan	Aug-Oct	April-June	20 Good Dec-Feb
Assunpink Creek at Trenton	AVG WQI	5	12	11	44	53	10	3	16	54 Fair
	WORST3 MONTHS	June-August	May-July	May-July	March-May	August-Oct	March-May	May-July	Nov-Jan	72 Poor April-June

LEGEND - Water Quality Index Description

WQI	Condition	Description
0-10	Excellent	No or minimal pollution; water uses met throughout the year.
11-25	Good	Generally low amounts of pollution; water uses periodically not met.
26-60	Fair	Pollution amounts vary from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution in high amounts; water uses not met.
81-100	Very Poor	Pollution occurs at extremely high levels; severe stress to stream life; water uses not met.
ID	Insufficient Data	

An index of 20 is equivalent to the level of water quality criteria.

N.J.P.D.E.S. DISCHARGE INVENTORY WATERSHED: ASSUNPINK CREEK

DISCHARGE NAME	# NJPDES	RECEIVING WATERS	MUNICIPALITY/COUNTY	TYPE
Carter-Wallace Inc.	0031429	Assunpink Creek	Trenton City/Mercer	Ind./Comm.
Fermenta Animal Heat	0004502	Sand Run Creek	Lawrence Twp./Mercer	Ind./Comm.
Hydrocarbon Research: R+D Ctr	0032913	Assunpink Creek	Lawrence Twp./Mercer	Ind./Comm.
Trane, DPG	0032832	Assunpink Creek	Hamilton Twp./Mercer	Ind./Comm.
Goodall Rubber Co.	0004626	Assunpink Creek	Hamilton Twp./Mercer	Ind./Comm.
Federated Metals Corp.	0020664	Assunpink Creek	Trenton City/Mercer	Ind./Comm.
National Sponge Cushion Co.	0032999	Assunpink Creek	Trenton City/Mercer	Ind./Comm.
Transamerica De Laval-Turbine	0004677	Assunpink Creek	Hamilton Twp./Mercer	Ind./Comm.
Boro of Roosevelt	0022918	Assunpink Creek	Roosevelt Boro/Momth	Municipal
Ewing-Lawrence SA	0024759	Assunpink Creek	Lawrence Twp./Mercer	Municipal
Trenton Internat. Warehouse	0034274	Shabakunk Creek	Ewing Twp/Mercer	Ind.
American Biltrite Inc.	0031895	Assunpink Creek	Hamilton Sq./Mercer	Thermal
Wenkzel Tile Corp.	0033278	Assunpink Creek	Trenton/Mercer	Ind./Comm.
NJ Transit Corp	0061077	Assunpink Creek	Trenton/Mercer	Ind.
Delorenzo Transfer Station	0064106	Assunpink Creek	Trenton/Mercer	Ind.
Polychrome Corp	0099066	Assunpink Creek	Hamilton Squ./Mercer	Ind.
Exxon Station 0139	0064297	Pond Run	Hamilton Twp./Mercer	Comm.
ER Squibb & Sons	0027618	Shiptauken Creek	Princeton/Mercer	Ind
Sterling Drug	0032255	Wallkill River	Trenton/Mercer	Ind.

9. CROSSWICKS CREEK

Watershed Description

Crosswicks Creek is 25 miles long drains an area of 146 square miles to the Delaware River at Bordentown. It drains sections of Ocean, Burlington, Monmouth, and Mercer Counties. The two main population centers here are Yardville in Mercer County and Bordentown in Burlington County. Major tributaries include Jumping Brook, Lahaway Creek, North Run, and Doctors Creek (17 miles long). Sub-watersheds includes Upper and Lower Crosswicks Creeks and Doctors Creek. Tides affect this stream up to the Crosswicks Mill Dam. Allentown Lake, Oxford Lake, Prospertown Lake, and Imlaystown Lake are the major impoundments in the Crosswicks Creek watershed.

Important land uses in this watershed include agricultural, forested, residential/commercial and military installations. There are 14 NJPDES permitted discharges, of which 9 are municipal, 3 are commercial/industrial, and 2 are from the military installations of McGuire Air Force Base and Fort Dix. Crosswicks Creek and tributaries have been classified as FW-1 from the headwaters of Lahaway Creek in the Colliers Mill Wildlife Management Area and FW-2 Nontrout for the rest of the Crosswicks Creek system.

Water Quality Assessment

Routine ambient monitoring of Crosswicks Creek and tributaries, representing approximately 15 stream miles, is performed at the following locations: Crosswicks Creek at Extonville and Doctors Creek at Allentown. The Ocean County Health Department samples Crosswicks Creek and selected tributaries once yearly. The results of an ambient monitoring station, Crosswicks Creek at Groveville, which was discontinued in 1983, is also briefly presented.

The Upper Crosswicks Creek watershed appears to be moderately to severely degraded. Intensive survey results from 1984 shows nutrient enrichment, with generally high bacteria counts and low dissolved oxygen saturation. Nutrient concentrations were usually higher during low flow periods. In addition, elevated total residual chlorine levels, noticable chlorine odors and chloroform were found in Upper Crosswicks Creek. Macroinvertebrate sampling of the Upper Crosswicks Creek watershed also indicate generally poor water quality, with pollution tolerant organism prevalent throughout.

Downstream at Extonville water quality improves so that good (overall) to fair (summer period) conditions are present. Crosswicks Creek, as measured at Extonville, contains elevated fecal coliform and phosphorus levels, and reduced dissolved oxygen recorded as percent saturation. Although biochemical oxygen demand is periodically high (over 5.00 mg/l), dissolved oxygen concentrations were within State criterion. The low dissolved oxygen saturation levels may be due to the ground water contribution to base stream flows. Fecal coliform geometric averages at Extonville from 1983 to 1987 was 223 MPN/100ml; total phosphorus averaged .25 mg/l with 95 percent of the values greater than the State criterion. Inorganic nitrogen is also occasionally high. pH readings in the creek fluctuated around the neutral level. The results of the discontinued monitoring at Groveville found conditions similar to those at Extonville.

Doctors Creek, a major tributary to the Lower Crosswicks Creek, contains fair water quality as monitored at Allentown. Like Crosswicks Creek, Doctors Creek has water quality problems due to high fecal coliform, inorganic nitrogen and total phosphorus concentrations. Total phosphorus exceeded the .1 mg/l State criterion in all of samples taken, while fecal coliform was excessive in 75 percent of all samples. Doctors Creek experiences reduced water quality conditions during the May to July period.

Direct assessments of the fish populations of Crosswicks and Doctors Creeks are not available. Neighboring and tributary streams in the watershed however, have been evaluated by the New Jersey Division of Fish, Game, and Wildlife. Of these, two adjacent streams Black Creek (13 miles), and Crafts Creek (15 miles) were assessed as supporting healthy warm water fish communities. Black Creek (4 miles) a tributary to Crosswicks Creek, was likewise assessed to be in the same condition. Duck Creek's warm water fishery was evaluated to be moderately degraded, as was North Run (9 miles), a tributary to Crosswicks, because of poor bass reproduction. An unnamed tributary to Doctors Creek was described as supporting a healthy warm water fish population.

Problem and Goal Assessment

Point Source Assessment

Sewage treatment plant effluent, together with runoff and other nonpoint sources, is suspected of causing nutrient enrichment and poor water quality in the headwaters of Crosswicks Creek. The Wrightstown MUA discharge to Crosswicks Creek is under enforcement action for not meeting permit limitations. The Hamilton Township STP is also currently under NJDEP enforcement action because of excessive BOD and suspended solids in its discharge. The facility discharges to Crosswicks Creek just above its confluence with the Delaware River. A number of hazardous waste sites are present in the upper watershed that may be contaminating local surface waters. They include: McGuire Air Force Base (aromatic hydrocarbons to South Run), Hopkins Farm site (volatile organics and unknown substances to unnamed tributary), Wilson Farm site (volatile organics and unknown substances to Bordens Run), and Goose Farm (volatile organics to unnamed tributary).

Nonpoint Source Assessment

The upper 15 miles of Crosswicks Creek receives pollution from both agriculture and suburban development. The Soil Conservation Service has found agricultural sheet and rill erosion to be high in the Crosswicks Creek basin. Severe runoff from cropland and housing construction is known to be responsible for turbidity, high total dissolved solids, and excessive phosphorus levels in the creek. Rising rates of suburban development in New Egypt has brought about severe problems with septic tank leachate and surface runoff. These have resulted in reports of elevated ammonia and coliform bacteria, as well as depressed dissolved oxygen levels. The lower reaches of Crosswicks Creek, some 7 miles, is known to receive fertilizer, herbicides, pesticides, and silt loads from ever increasing amounts of crop land runoff. In addition, stream bank erosion is suspected in Crosswicks Creek along stretches of pasture land. Severe runoff from suburban construction sites, storm sewers, as well as road maintenance are noted to be increasing problems. Local septic systems are suspected to be causing rising levels of coliform contamination. The only declining source of nonpoint source pollution here was reported to be that produced by road and bridge construction.

The 17 mile long Doctors Creek is believed to receive severe levels of crop land runoff carrying fertilizer, herbicides, pesticides, and silt. Housing and road construction in the upstream reaches are suspected to be contributing additional silt loads to this stream. North Run is evaluated as receiving agricultural and road runoff which are believed to be causing water quality degradation from the effects of nutrient enrichment and oil and grease. Duck Creek is believed to receive increasing amounts of storm sewer effluent. Back Creek is assessed as possibly receiving large quantities of runoff from road and housing construction in addition to runoff from suburban surfaces.

Imlaystown and Allentown Lakes were also evaluated and noted to be receiving high levels of siltation from local plant nursery stock operations.

Designated Use and Goal Assessment

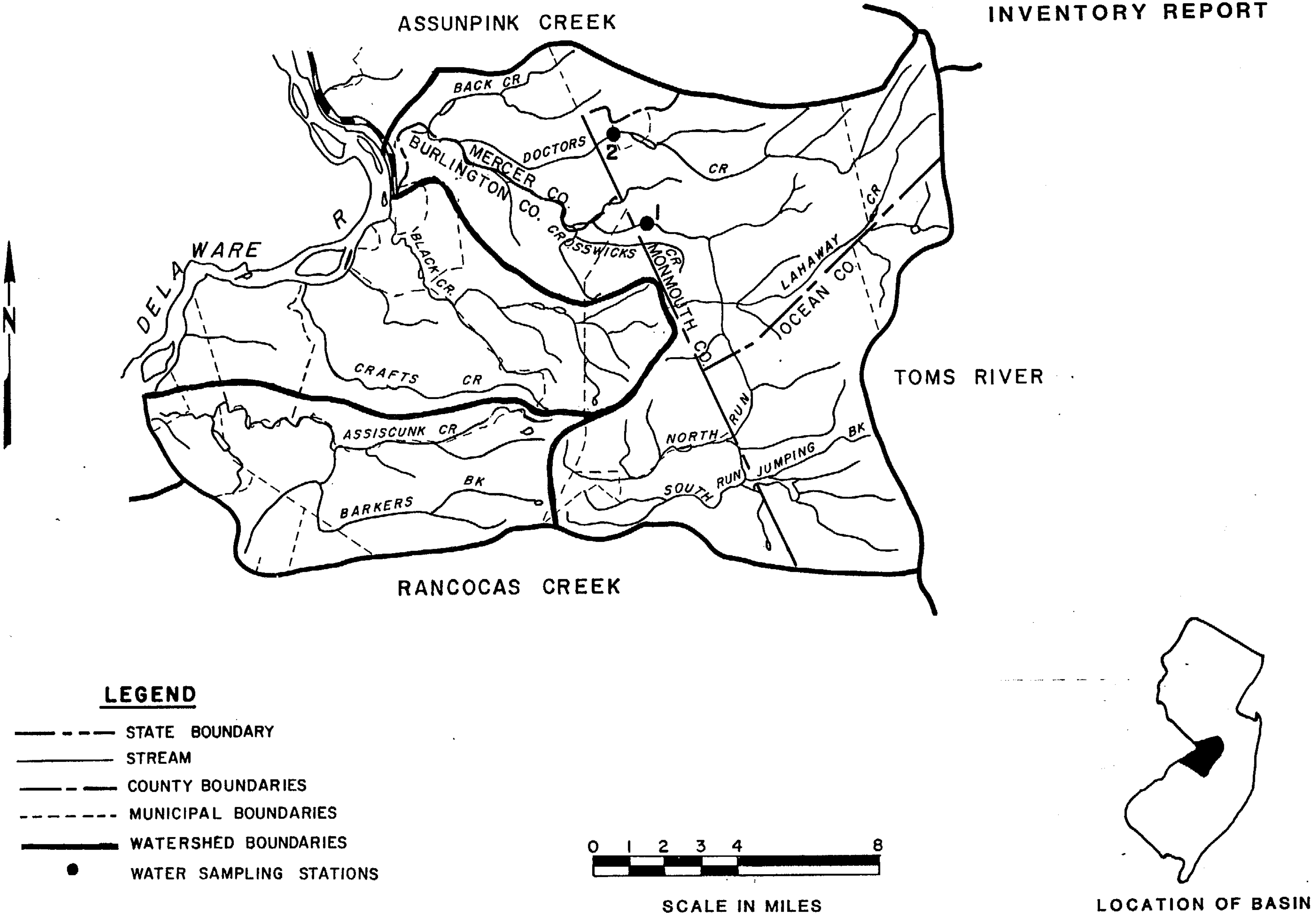
Portions of Crosswicks Creek and tributaries will meet the fish propagation/maintenance goal, but swimmable status can not be assigned to the watershed. The macroinvertebrate survey of 1984 indicates that fishlife may be stressed in the upper watershed, as such this section is considered to be partially meeting the fish propagation/maintenance use. In the Lower Crosswicks Creek this use is met. Fecal coliform counts in streams frequently exceed the standard for swimming.

Monitoring Station List

Map Number	Station Name and Classification
1	Crosswicks Creek at Extonville, FW-2 Nontrout
2	Doctors Creek at Allentown, FW-2 Nontrout

CROSSWICKS CREEK

NEW JERSEY STATE WATER QUALITY INVENTORY REPORT



Crosswicks Creek

WATER QUALITY INDEX PROFILE 1983-1987

WATER QUALITY INDICATORS

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVERAGE AND CONDITION
Crosswicks Creek at Extonville	AVG WQI	2	21	10	20	27	5	2	10	24 Good
	WORST3 MONTHS	June-August	May-July	April-June	June-August	Dec-Feb	July-Sept	May-July	April-June	37 Fair June-August
Doctors Creek at Allentown	AVG WQI	3	16	13	34	28	4	4	6	32 Fair
	WORST3 MONTHS	June-August	July-Sept	March-May	Sept-Nov	May-July	Nov-Jan	July-Sept	Oct-Dec	45 Fair May-July

LEGEND - Water Quality Index Description

WQI	Condition	Description
0-10	Excellent	No or minimal pollution; water uses met throughout the year.
11-25	Good	Generally low amounts of pollution; water uses periodically not met.
26-60	Fair	Pollution amounts vary from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution in high amounts; water uses not met.
81-100	Very Poor	Pollution occurs at extremely high levels; severe stress to stream life; water uses not met.
ID	Insufficient Data	

An index of 20 is equivalent to the level of water quality criteria.

N.J.P.D.E.S. DISCHARGE INVENTORY

WATERSHED: CROSSWICKS AND ASSISCUNK CREEK

DISCHARGE NAME	# NJPDES	RECEIVING WATERS	MUNICIPALITY/COUNTY	TYPE
Bordentown Cty Disposal Plant	0024678	Blacks Creek	Bordentown City/Bur.	Municipal
Yates Indust., Inc.	0004332	Mile Hollow Brook	Bordentwon City/Bur.	Ind./Comm.
Hamilton Twp/Independence Ave	0026301	Crosswicks Creek	Hamilton Twp./Mercer	Municipal
Ocean Spray Cranberries, Inc.	0004294	Thornton Creek	Bordentown City/Bur.	Ind./Comm.
Garden St. Water Co.	0001198	Culvert Pond Run	Hamilton Twp./Mercer	Municipal
N.J. Tpk. Auth.-Area 6N + 6S	0020737	Crosswicks Creek	Hamilton Twp./Mercer	Municipal
Bordentwn Twp Mile Hollow STP	0024121	Crosswicks Creek	Bordentown Twp./Bur.	Municipal
Yth. Correct. Inst.-Bordentwn	0026719	Crosswicks Creek	Bordentown Twp./Bur.	Municipal
Allentown Borough Water Plant	0030848	Doctors Creek	Allentown Boro Monm	Municipal
Allentown Borough STP	0020206	Doctors Creek	Allentown Boro Monm	Municipal
Burlington Twp.- Gorce SQ.SA	0021695	Assiscunk Creek	Burlington Twp./Bur.	Municipal
Burlington Twp.- Central Ave STP	0021709	Tawners Run	Burlington Twp./Bur.	Municipal
N. Burlington C. Reg. School District	0022381	Bacon Run	Mansfield Twp./Bur.	Municipal
Springfield Twp. School STP	0021571	Barkers Creek	Springfield Twp./Bur	Municipal
Calif. Villa Mobile Home Pk.	0027511	Crosswicks Creek	N. Hanover Twp./Bur.	Ind./Comm.
Wrightstown MUA	0022985	Crosswicks Creek	Wrightstown Boro/Bur	Municipal
McGuire A.F.B.	0022578	South Run	Wrightstown Boro/Bur	Municipal
US Army-Ft. Dix+Training Ctr.	0004855	Crosswicks Creek	New Hanover Twp/Bur.	Municipal
Hanover Mobile Home Pk.	0027464	Crosswicks Creek	N. Hanover Twp./Bur.	Ind./Comm.
Plumstead Twp. School Dist.	0021407	Crosswicks Creek	New Egypt/Ocean	Municipal
Hub Servall Record Mfg. Corp.	0031950	Highland Brook	Cranbury/Middlesex	Thermal
Linpro Company	0059838	Assiscunk	Plainsboro/Middlesex	Ind./Comm.
IBM Corp.-Card Mfg. Plant	0000426	Assiscunk	Dayton/Middlesex	Industrial
McCleon Eng. Labs Inc.	0003794	Little Bear Creek	Princeton Jct./Mercr	Industrial
Bordentown Water Department	0028649	Crosswicks Creek	Bordentown/Burlingtn	Industrial
Interstate Storage & Pipeline	0033677	Ditch to Assiscunk	Burlington/Burlingtn	Industrial
Kauffman & Minteer Inc.	0032310	Assiscunk Creek	Jobstown/Burlington	Industrial

10. RANCOCAS CREEK

Watershed Description

The Rancocas Creek watershed is 360 square miles and the largest in south-central New Jersey. Of this area, 167 square miles is drained by the North Branch and 144 square miles is drained by the South Branch. The North Branch is 31 miles long and is fed by the Greenwood Branch, McDonalds Branch, and Mount Misery Brook. The major tributaries to the South Branch (27 miles long) include the Southwest Branch Rancocas Creek, Stop the Jade Run, Haynes Creek, and Friendship Creek. The mainstem flows about eight miles and drains an area of approximately 49 square miles before emptying into the Delaware River at Delanco and Riverside. Tidal influence occurs for about 15 stream miles, extending the entire length of the mainstream to the dam at Mt. Holly on the North Branch, Vincentown on the South Branch, and Kirby Mills on the Southwest Branch. The Rancocas Creek watershed has been divided into six sub-watersheds: Upper North Branch, Cranberry Branch, Lower North Branch, Upper South Branch, Southwest Branch, Lower South Branch and Rancocas Creek mainstem. Population centers are Pemberton Township, Medford Township, Medford Lakes Borough, Evesham Township, Mount Holly, and Willingboro. Major impoundments include Medford Lake, Pine Lake, Browns Mills Lake, and Crystal Lake.

About half this drainage basin is forested, with the remaining area divided between agricultural use and urban/suburban. Significant development is taking place in many former agricultural areas. The eastern part of this watershed drains the Pinelands Protection Area. There are 24 NJPDES permitted discharges here, of which 20 are municipal and four are industrial/commercial. This watershed has been classified FW-Central Pine Barrens, FW-1 for the waters within the state parks, state forests, and wildlife management areas, and FW-2 Nontrout.

Water Quality Assessment

Ambient water quality monitoring of the North and South Branches of Rancocas Creek indicates good to fair conditions, with water quality degradation occurring in the downstream direction. No ambient monitoring is performed on the tidal mainstem Rancocas Creek. The North and South Branches have background water quality which is indicative of the Pinelands area - low pH in the range of 3.5-5.5 SU, and reduced dissolved oxygen saturation and nutrient levels. McDonalds Branch, a tributary of the North Branch, is sampled as part of the National Hydrologic Benchmark Program for determining natural or background conditions. This location is in the heart of the Pinelands area, and has dissolved oxygen saturation averaging 41 percent and a pH of 4.07 SU from 1983 to 1987.

The North Branch of Rancocas Creek is routinely sampled (in downstream order) at Browns Mills, Pemberton, and Mt. Holly. Overall water quality at these three locations can be characterized as good, with fair conditions during warm weather months at Browns Mills. Conditions improve at Pemberton before some degradation at Mt. Holly. Dissolved oxygen concentrations are adequate for warm-water fisheries in the North Branch, but percent saturation often falls below 80 percent. Moderate nutrient enrichment is found at both Browns Mills and Mt. Holly, as evident in the total phosphorus levels and above normal pH values. Total phosphorus exceeded State criterion in 30 and 83 percent, respectively, at Browns Mills and Mt. Holly. Fecal coliform counts are comparatively low at Browns Mills and Pemberton with geometric means under 30 MPN/100ml, but amounts significantly increase at Mt. Holly (averages 123 MPN/100ml with 50 percent greater than State criterion). One elevated value of each lead and copper was found at Pemberton between 1983 and 1987.

The South Branch of Rancocas Creek is of good to fair quality as sampled at Vincentown and Hainesport. During the late spring period water quality at Hainesport degrades to near poor conditions. Both stations show the effects of man's pollution - generally high nutrient and fecal bacteria concentrations. As in the North Branch, water quality worsens in a downstream direction. Total phosphorus averages .16 mg/l at Vincentown and .28 mg/l at Hainesport. Fecal coliform increased from a geometric mean of 73 MPN/100ml at Hainesport to 618 MPN/100ml at Vincentown during the period of review. The low dissolved oxygen saturation values during the summer may indicate ground water discharges to base stream flows.

The upper and lower sub-watersheds of the North Branch of the Rancocas, as well as Cranberry Branch, an 8 mile long tributary to this creek, have been evaluated by the New Jersey Division of Fish, Game, and Wildlife as supporting a healthy warm water fish community. Assessments for the South Branch of the Rancocas were unavailable. However, numerous tributaries to this stream were evaluated. Of these, Friendship Creek (4 miles), Mason Creek (9 miles), and Haynes Creek (5 miles) were all assessed to be containing healthy warm water fisheries. Mill Creek, 8 miles long, was judged to be supporting a moderately degraded warm water fish community.

Problem and Goal Assessment

Point Source Assessment

The North and South Branches of Rancocas Creek suffer from low to moderate amounts of water pollution. Pollution inputs come from both point and nonpoint sources. Surface water quality problems in the Rancocas Creek occur because of the following dischargers which are now under Department enforcement action: Delran STP, Mt. Laurel MUA, Hartford Road and Rancocas STPs, and the Riverside STP. The Pemberton Boro STP has been eliminated with flows now going to the Pemberton Township facility. The BEMS Landfill is a hazardous waste site suspected of contaminating Centribury Lake in Southampton Township.

In the tidal Rancocas Creek mainstem a water quality modeling study found excessive nutrients, elevated algae production and highly fluctuating diurnal dissolved oxygen concentrations. The study also concluded that Delaware River boundary affects were limited to the western end of the mainstem, and that stream sources (sediments) of oxygen demand were greater than those from point source inputs.

Nonpoint Source Assessment

Agricultural and suburban runoff is responsible for the pH, bacteria, and nutrient concentrations that are higher than natural background levels. It is expected that the significant development pressures will further stress the streams in the Rancocas watershed. The Upper North Branch of the Rancocas receives nonpoint runoff from a wide assortment of sources; among these are dairy farms, croplands, road and housing construction, road salting, urban surfaces, and storm sewers. Most of these are believed to be increasing over time. Local fishkills are suspected to be the result of pollution coming from the spreading of sludge on local farms lands, the L&D Landfill, and a hazardous waste site (Syron Chemical Co.). The fisheries resource in the lower reaches of the North Branch are evaluated as being threatened by runoff from housing construction, road maintenance, croplands, and the subsurface infiltration of septic wastes. The landfill in Pemberton has been described by local authorities as an extreme and increasing threat to local water quality.

The fish population of Cranberry Branch, a tributary to the North Branch is threatened by subsurface infiltration of septic wastes. In addition, this stream is also believed to receive nonpoint source pollution from cropland runoff and from local housing construction activities. The fishery in Powell Run is suspected to be impaired by local land disposal of sludge. The Upper South Branch Rancocas is suspected to suffer water quality degradation from sod farm runoff, road and housing construction, urban surface runoff, and septic tank leachate. Furthermore, a landfill in Lumberton is suspected of being a growing problem, affecting water quality there.

The Lower South Branch receives much of the same nonpoint source pollution as the upper reaches including increasing levels of runoff from housing construction, urban surfaces, croplands, septic systems, and surface mining activities. These are all believed to be associated with past fish kills which have occurred in this waterway.

Friendship Creek, Mason Creek, Mill Creek, all tributaries to the Rancocas, are suspected to be impacted by road and highway runoff. Friendship Creek is believed to be further impacted by a local sanitary landfill, while Mill Creek is suspected of being affected by urban runoff.

Designated Use and Goal Assessment

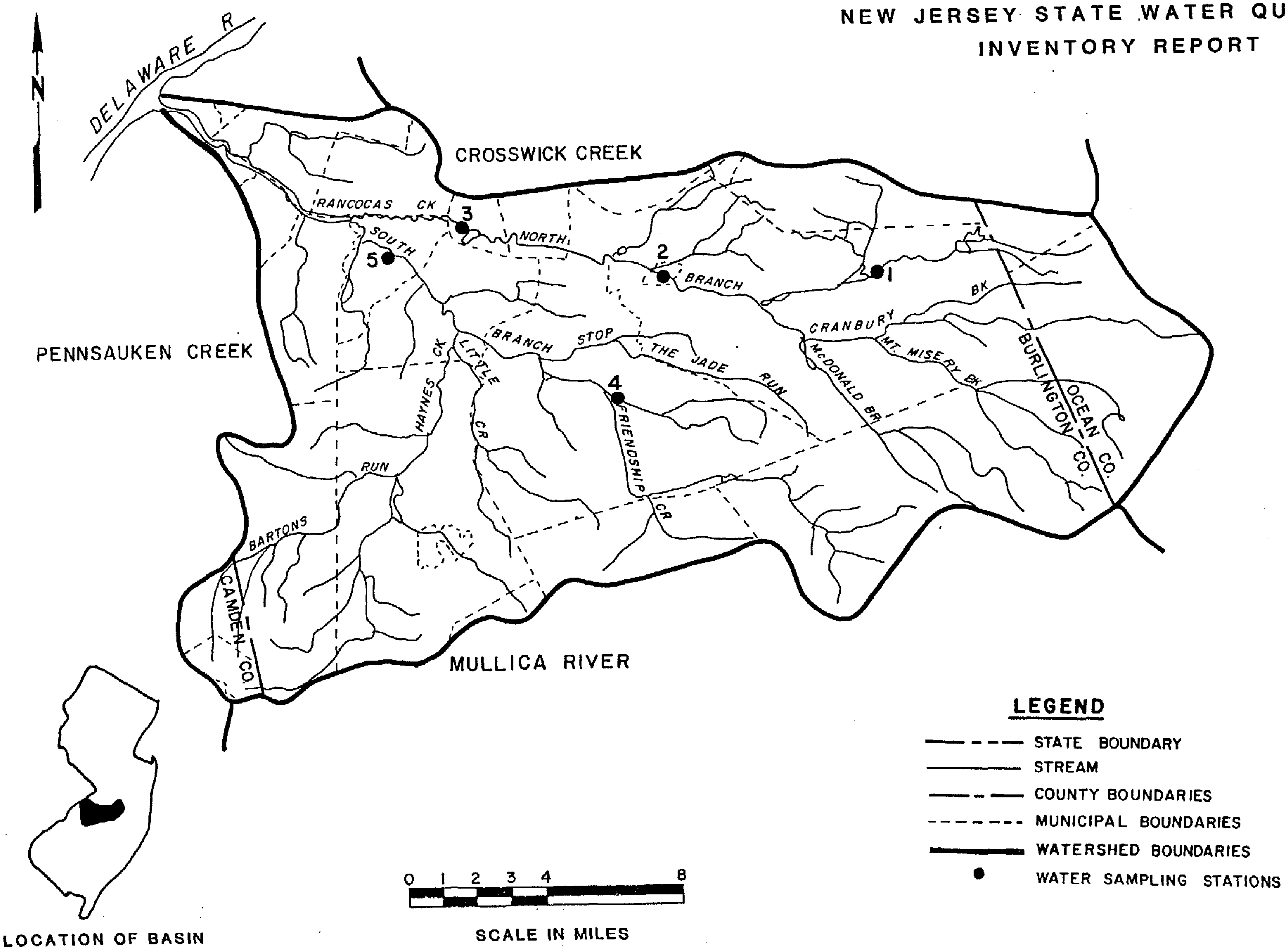
Monitoring indicates that of the 25 miles assessed, 15 are marginally swimmable. This is because of periodic high fecal coliform counts in the upper portions of both North and South Branches. The remaining section appear to be not swimmable. Most of the evaluated fisheries (55 stream miles) are healthy and therefore, the streams are meeting the fish propagation/maintenance designated use. However, of these 55 miles, over 30 are considered threatened because of various pollution problems. Mill Creek contains a moderately degraded fisheries and is thought to be partially meeting the designated use.

Monitoring Station List

Map Number	Station Name and Classification
1	North Branch Rancocas Creek at Browns Mills, FW-2 Nontrout
2	North Branch Rancocas Creek at Pemberton, FW-2 Nontrout
3	North Branch Rancocas Creek at Mt. Holly, FW-2 Nontrout
4	South Branch Rancocas Creek at Vincentown, FW-2 Nontrout
5	South Branch Rancocas Creek at Hainesport, FW-2 Nontrout

RANCOCAS CREEK

NEW JERSEY STATE WATER QUALIT
INVENTORY REPORT



WATER QUALITY INDEX PROFILE 1983-1987

Rancocas Creek

WATER QUALITY INDICATORS

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVERAGE AND CONDITION
NB Rancocas Creek at Browns Mills	AVG WQI	3	8	20	6	17	1	0	8	14 Good
	WORST3 MONTHS	July-Sept	June-August	July-Sept	July-Sept	July-Sept	Dec-Feb		July-Sept	31 Fair July-Sept
NB Rancocas Creek at Pemberton	AVG WQI	2	15	5	10	11	2	0	19	11 Good
	WORST3 MONTHS	June-August	June-August	July-Sept	May-July	June-August	Oct-Dec		Oct-Dec	16 Good Aug-Oct
NB Rancocas Creek at Mt. Holly	AVG WQI	3	10	5	23	25	3	0	14	20 Good
	WORST3 MONTHS	July-Sept	Sept-Nov	Feb-April	Dec-Feb	June-August	Sept-Nov		July-Sept	25 Good July-Sept
SB Rancocas Creek at Vincentown	AVG WQI	3	20	7	14	21	2	0	16	20 Good
	WORST3 MONTHS	June-August	June-August	Oct-Dec	Aug-Oct	June-August	June-August		Oct-Dec	29 Fair June-August
SB Rancocas Creek at Hainesport	AVG WQI	3	31	4	38	29	4	0	19	44 Fair
	WORST3 MONTHS	July-Sept	June-August	Feb-April	March-May	July-Sept	Sept-Nov		Jan-March	58 Fair April-June

LEGEND - Water Quality Index Description

WQI	Condition	Description
0-10	Excellent	No or minimal pollution; water uses met throughout the year.
11-25	Good	Generally low amounts of pollution; water uses periodically not met.
26-60	Fair	Pollution amounts vary from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution in high amounts; water uses not met.
81-100	Very Poor	Pollution occurs at extremely high levels; severe stress to stream life; water uses not met.
ID	Insufficient Data	

An index of 20 is equivalent to the level of water quality criteria.

N.J.P.D.E.S. DISCHARGE INVENTORY WATERSHED: RANCOCAS CREEK

DISCHARGE NAME	# NJPDES	RECEIVING WATERS	MUNICIPALITY/COUNTY	TYPE
Riverside Sewage Plant	0022519	Rancocas Creek	Riverside Twp./Bur.	Municipal
Delran Sewage Treat. Auth.	0023507	Rancocas Creek	Delran Twp./Bur.	Municipal
Willingboro Filtration Plant	0030741	Mill Creek	Willingboro Twp./Bur	Municipal
Willingboro M.U.A.	0023361	Rancocas Creek	Willingboro Twp./Bur	Municipal
Mt. Laurel-Interim STP	0025178	Rancocas Creek	Mt. Laurel Twp./Bur	Municipal
Moorestown Twp.	0029548	Kendalls Run-Ranc.	Moorestown Twp./Bur	Municipal
NJ Tpk. Auth.-4N Serv. Area	0020745	Parkers Creek	Mt. Laurel Twp./Bur	Municipal
Evesham MUA	0024031	Rancocas Creek	Evesham Twp./Bur.	Municipal
Mt. Holly S.A.	0024015	Rancocas Creek	Mt. Holly Twp./Bur.	Municipal
Mt. Laurel Twp.-Rancocas STP	0023990	Rancocas Creek	Mt. Laurel Twp./Bur.	Municipal
Elizabethtown Water Co.	0004731	Rancocas Creek	Mt. Holly Twp./Bur.	Ind./Comm.
Landfill + Development Co.	0033502	Rancocas Creek	Mt. Holly Twp./Bur.	Ind./Comm.
Southampton Sew. Treat. Plant	0023736	S. Br. Rancocas Crk.	Southampton Twp/Bur.	Municipal
Medford WPC Plant	0026832	S.W. Br. Rancocas Cr	Medford Twp./Burling	Municipal
Sybron Chem. Div. WWTP	0005509	Rancocas Creek	Pemberton Twp./Bur.	Ind./Comm.
Pemberton Twp. MUA	0024821	Rancocas Creek	Pemberton Twp./Bur.	Municipal
Pemberton Twp. H.S. #1 STP	0022438	N. Br. Rancocas Cr.	Pemberton Twp./Bur.	Municipal
Sunbury Village S. Co.	0027383	N. Br. Rancocas Crk.	Pemberton Twp./Bur.	Municipal
New Lisbon St. School	0021768	Rancocas Creek	Woodland Twp./Bur.	Municipal
Medford Lks. Boro. STP	0021326	Atna Run	Mdfrd. Lks. Boro/Bur	Municipal
Pemberton Township Bd. of Ed.	0031011	N. Br.Rancocas Crk.	Pemberton/Burlington	Municipal
Moble Homes of Southampton	0028665	Rancocas Creek	Southampton/Bur.	Municipal
Stokes of Vincetown Inc.	0033367	Rancocas Creek	Vincetown/Burlington	Industrial
Flanangan Auto Maintenance Facility	0063380	Mason's Creek (Trib to Rancocas)	Lumberton/Burlington	Oil/Wtr Sep

11. PENNSAUKEN CREEK

Watershed Description

The Pennsauken Creek drains 33 square miles of southwestern Burlington County and northern Camden County. This creek flows into the Delaware River near Palmyra, New Jersey. The North Branch of the Pennsauken Creek, 10 miles long, is in Burlington County; while the South Branch, 11 miles long, is the boundary between Burlington and Camden Counties. The tide affects the three mile mainstem and the first few miles up the branches. Population is centered around Mt. Laurel, Maple Shade, Cherry Hill and downstream of Maple Shade. Industry is concentrated at the mouth of the Pennsauken Creek. Much of this watershed is developed urban/suburban area with the remainder divided between farmland and forested land. There are 15 NJPDES permitted discharges here, 13 of which are municipal and two are industrial. Waters have been classified FW-2 Nontrout.

Water Quality Assessment

Pennsauken Creek water quality is representative of a small urban stream receiving significant amounts of point and nonpoint source pollution. Routine monitoring performed on the North Branch Pennsauken Creek near Moorestown and on the South Branch Pennsauken Creek at Cherry Hill supports this conclusion. Streams in the Pennsauken Creek watershed contain extremely high levels of fecal bacteria, nutrients, and biochemical oxygen demand. In addition, elevated concentrations of PCBs and pesticides have been found in the Creek's sediment and fishlife.

The North Branch Pennsauken Creek has fair overall water quality with poor conditions during low-flow periods (September through November). Ninety-five percent of the samples collected from 1983 to 1987 contained total phosphorus in excess of the State criterion. Forty-two percent of the samples had fecal coliform counts greater than the 200 MPN/100ml criterion for freshwater streams. The South Branch Pennsauken Creek has among the worst water quality in the State. Poor water quality conditions are found in the stream throughout the year, with very poor stream quality during the summer months. The South Branch experiences total phosphorus concentrations that average eleven times the State criterion, and fecal coliform counts with geometric means over 5100 MPN/100ml. Un-ionized ammonia levels exceed State criterion for protection of warmwater fisheries during summer months. Total inorganic and Kjeldahl nitrogen was also elevated in almost all samples collected. Five-day biochemical oxygen demand is periodically greater than 10 mg/l indicating significant organic loadings in the stream. Despite this, dissolved oxygen concentrations appear to be adequate, but extreme diurnal fluctuations can be expected in this enriched water system. Dissolved oxygen saturation was usually less than 80 percent, and averaged 69 percent during the period of review.

High levels of chlordane and PCBs in fish taken from the Pennsauken Creek mainstem and the South Branch from Strawbridge Lake downstream pose a potential health hazard. As a result, recreational fishing has been banned in these waterways. The North Branch Pennsauken Creek was assessed by the NJ Division of Fish, Game and Wildlife as supporting a healthy warm water fish community.

Problem and Goal Assessment

Point Source Assessment

The severe water quality problems found in Pennsauken Creek are due to the large amount of treated wastewaters and stormwaters discharged to the stream, combined with a limited assimilative capacity of the creek to decompose wastes. Plans for the elimination of a number of the municipal treatment discharges and construction of a regional facility discharging to the Delaware River, should result in better water quality. Dischargers currently under enforcement action that are suspected of having water quality impacts include the Moorestown and Mt. Laurel MUA - Ramblewood STPs that effect the North Branch Pennsauken Creek, and three Cherry Hill STPs to the South Branch.

Nonpoint Source Assessment

The North Branch of the Pennsauken (10 stream miles) is evaluated as receiving pollution from several nonpoint sources including runoff from urban surfaces, roadways, bridge and highway construction sites; and leachate from landfills. These sources were assessed as being severe and are presently believed to be increasing. Additional suspected sources, but of less severity, include construction activities (declining), storm sewers, an industrial tract in Palmyra (oil runoff), septic systems, mining and agricultural sources. Many of these sources are evaluated by the New Jersey Division of Fish, Game, and Wildlife as threatening the health of the fishery resources of the North Branch. Fish kills have occurred in Pennsauken Creek over the years.

Two lakes were assessed within the Pennsauken watershed. Strawbridge Lake receives urban runoff from a dense development of homes, offices, and light industry. This pollution is suspected as having contributed to fish and duck kills. The other lake, Memorial, also receives urban surface runoff causing siltation.

Designated Use and Goal Assessment

Limited attainment of clean water goals will occur in this watershed. Primary contact recreation is precluded in the waterways, and the maintenance and propagation of aquatic life goal is occurring in the North Branch, but it is threatened. The South Branch is considered to have a degraded fish community because of pollution sources and habitat destruction. Chlordane contamination of fish tissue also threatens the viability of the fisheries.

Monitoring Station List

Map Number	Station Name and Classification
1	South Branch Pennsauken Creek at Cherry Hill, FW-2 Nontrout
2	North Branch Pennsauken Creek near Moorestown, FW-2 Nontrout

See page III-135 for a map of the Pennsauken Creek watershed.

WATER QUALITY INDEX PROFILE 1983-1987

Pennsauken Creek

WATER QUALITY INDICATORS

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVERAGE AND CONDITION
NB Pennsauken Creek at Moorestown	AVG WQI	4	25	6	30	50	9	4	18	50 Fair
	WORST3 MONTHS	June-August	Sept-Nov	April-June	Oct-Dec	May-July	Dec-Feb	July-Sept	Sept-Nov	72 Poor Sept- Nov
SB Pennsauken Creek at Cherry Hill	AVG WQI	2	31	13	66	66	11	13	4	80 Poor\ Very Poor
	WORST3 MONTHS	June-August	July-Sept	July-Sept	Sept-Nov	June-August	Dec-Feb	July-Sept	Aug-Oct	100VeryPoor July-Sept

LEGEND - Water Quality Index Description

WQI	Condition	Description
0-10	Excellent	No or minimal pollution; water uses met throughout the year.
11-25	Good	Generally low amounts of pollution; water uses periodically not met.
26-60	Fair	Pollution amounts vary from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution in high amounts; water uses not met.
81-100	Very Poor	Pollution occurs at extremely high levels; severe stress to stream life; water uses not met.
ID	Insufficient Data	

An index of 20 is equivalent to the level of water quality criteria.

N.J.P.D.E.S. DISCHARGE INVENTORY

WATERSHED: PENNSAUKEN CREEK

DISCHARGE NAME	# NJPDES	RECIEVING WATERS	MUNICIPALITY/COUNTY	TYPE
Mt Ephraim STP	0023817	Little Timber Creek	Mt Ephraim/Camden	Municipal
Cadillac Pet Foods Inc	0031216	Pennsauken Creek	Pennsauken/Camden	Ind/Comm
Camden City: Morris-DelairWTP	0031984	Pennsauken Creek	Pennsauken/Camden	Municipal
Merchantville-Pennsauken Park	0032093	Pennsauken Creek	Pennsauken/Camden	Municipal
Maple Shade-Linwood Ave STP	0028738	Pennsauken Creek	Maple Shade/Bur	Municipal
Cherry Hill-Colwick Crk	0025127	Pennsauken Creek	Cherry Hill/Camden	Municipal
Cherry Hill-Pennsauken Crk	0025089	Pennsauken Creek	Cherry Hill/Camden	Municipal
Moorestown STP	0024996	Pennsauken Creek	Moorestown/Bur	Municipal
Armack	0004588	Pennsauken Creek	Maple Shade/Bur	Ind/Comm
Maple Shade WD	0025577	Pennsauken Creek	Maple Shade/Bur	Municipal
Maple Shade-Main St STP	0028746	S Br Pennsauken Ck	Maple Shade/Bur	Municipal
Maple Shade-WP #2	0031879	Pennsauken Creek	Maple Shade/Bur	Municipal
Mt Laurel-Ramblewood STP	0023981	Pennsauken Creek	Mt Laurel/Bur	Municipal
Cherry Hill- Kingston STP	0025071	Pennsauken Creek	Cherry Hill/Camden	Municipal
Evesham -Woodstream STP	0024040	Landing Creek	Evesham/Bur	Municipal

12. COOPER RIVER

Watershed Description

The Cooper River is 16 miles long and its watershed encompasses an area of 40 square miles. The river flows from northwest Camden County to the Delaware River at Camden. The most significant tributary is Tindale Run, on the South Branch of the Cooper River. There is intense development along the mainstem and the areas adjacent to the North and South Branches, with the population centers being Camden, Cherry Hill, Haddonfield, and Haddon. Major impoundments include Cooper River Lake, Linden Lake, Hopkins Lake, and Square Circle Lake.

Land use in this watershed is primarily urban/suburban. There are 8 NJPDES permitted discharges here, of which 6 are municipal and two are industrial. The streams in the watershed have been classified FW-2 Nontrout.

Water Quality Assessment

Cooper River, like Pennsauken Creek, is a highly degraded urban stream receiving significant amounts of sewage treatment effluent and stormwater runoff. Monitoring performed on the Cooper River at Lindenwold, Lawnside and Haddonfield shows that water quality is generally good in the upper stretches of the stream, but rapidly worsens to some of the poorest quality surface waters in the State as it flows through Camden and adjoining towns. In addition, pesticide contamination in stream sediments and fishlife has resulted in a recreational fishing ban on the Lower Cooper River.

The Cooper River is sampled at Lindenwold directly below Linden Lake. Partially because of settling and detention in the lake, the Cooper River emerges as a generally good quality stream with moderate amounts of nutrients and reduced summertime dissolved oxygen concentrations. Fecal coliform counts are low, with a geometric mean of 21 MPN/100 ml from 1983 to 1987. However, in just a few miles where the Cooper River reaches Lawnside it has received wastewaters from a number of municipal treatment facilities. Water quality is now very poor with extremely high amounts of nutrients and fecal coliform, and severely depressed dissolved oxygen. Total phosphorus exceeded State criterion in all samples collected between 1983 and 1987, and averaged 1.7 mg/l. Total Kjeldahl nitrogen and inorganic nitrogen averaged 8.8 mg/l and 8.4 mg/l, respectively; two to three times the recommended limits. Fecal coliform was above the 200 MPN/100ml criterion in 61 percent of all samples. Because of high biochemical oxygen demand in the stream, dissolved oxygen is frequently below 4.0 mg/l during low-flow and warm weather periods. Un-ionized ammonia concentrations are, for the most part, above the criterion (.05 mg/l) for protection of warmwater fisheries during summer months.

Downstream at Haddonfield the Cooper River is still grossly polluted and in very poor condition. Phosphorus averages 1.1 mg/l and nitrogen-containing compounds continue to be excessive, with levels similar to those found at Lawnside. Fecal coliform had a geometric mean of 1162 MPN/100ml between 1983 and 1987. Dissolved oxygen concentrations were adequate, all above the criterion for nontrout waters. This may be due, however, to high primary productivity in the stream. Biomonitoring at Haddonfield confirms the presence of a very unhealthy stream environment. Ninety-six percent of macroinvertebrates collected were detritivores, with the majority of these *Nais* spp. worms.

The Cooper River from Cooper River Lake downstream to the confluence with the Delaware River is closed to recreational fishing because of chlordane contamination of fish tissues. Elevated chlordane and PCB concentrations have also been identified in stream sediments.

Fishery evaluations as performed by the New Jersey Division of Fish, Game, and Wildlife in the Cooper River watershed was limited to Tindale Run, a 5 mile long tributary to the Cooper River, which was found to be supporting a healthy warm water fish population.

Problem and Goal Assessment

Point Source Assessment

The water quality problems of the Cooper River are a result of excessive municipal and industrial wastewater discharges, combined with the effects of urban stormwater runoff and a limited assimilative ability of the stream. The Camden County UA regional sewerage system will eventually eliminate most of the discharges to the Cooper River, but water quality will continue to suffer from runoff and benthic oxygen demands for a number of years. By the end of 1987 16 local sewage treatment plants had been abandoned for the regional facility. Dischargers in the watershed that are under enforcement action for poor quality wastewaters include the Cherry Hill Barclay Farm STP, the Cherry Hill Old Orchard STP, Gardlock Plastics, the New Jersey Turnpike Authority and Sherwin Williams (illegal discharge).

Nonpoint Source Assessment

The 16 mile long Cooper River is known to receive nonpoint source pollution from roadways and housing construction as well as from croplands, storm sewers, suburban surfaces, highway maintenance activities, various spills, mining activities, and landfills. These, combined with point sources, are cited as contributing to declining water quality and occassional fish kills in this river. The fisheries of Tindale Run are believed to be threatened by urban surface and road runoff and by local sewage treatment plant effluent.

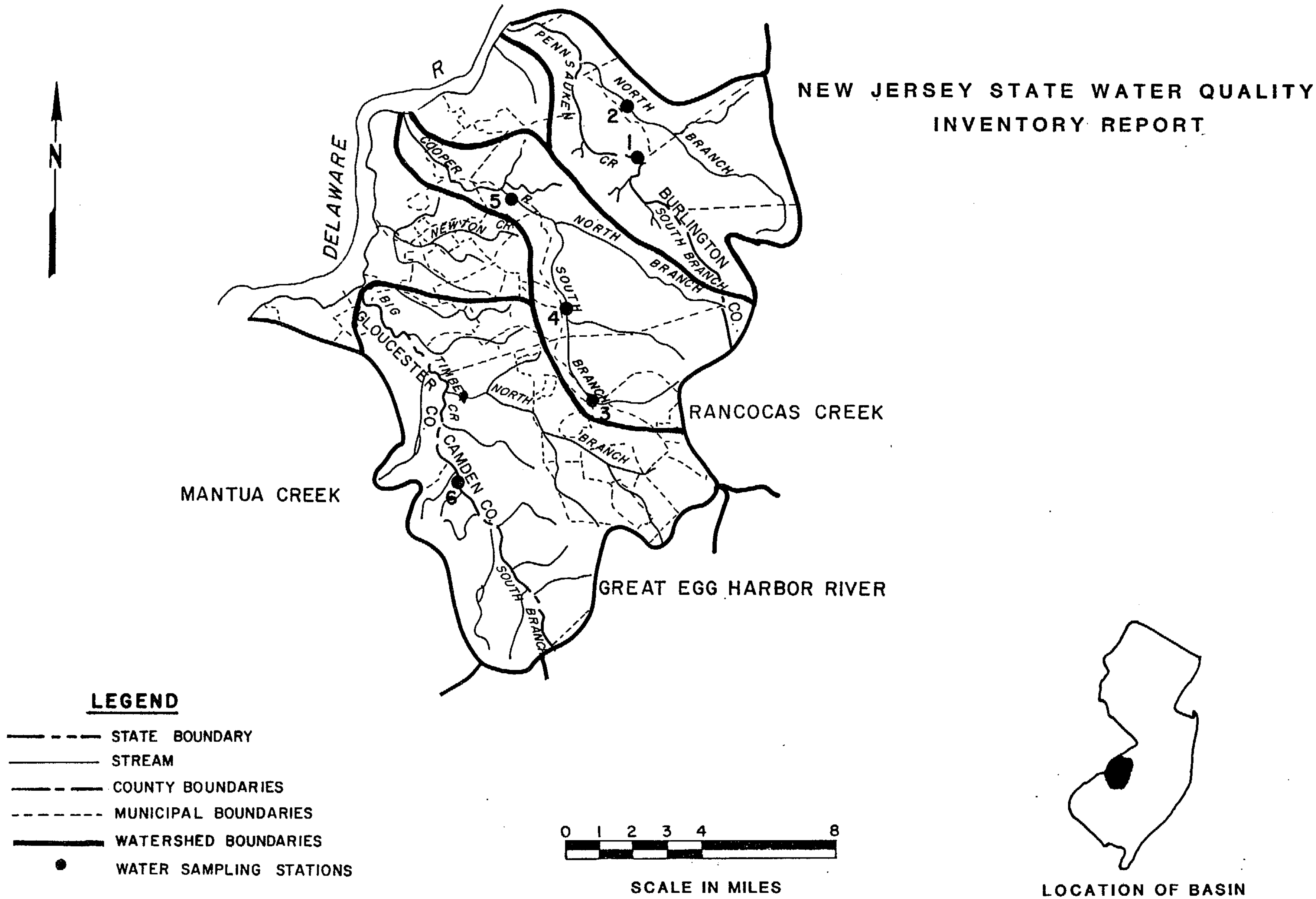
Designated Use and Goal Assessment

The Cooper River and tributaries partially meet the swimmable and fish propagation/maintenance designated uses only in the headwater reaches. At Lindenwold the Cooper River is considered marginally swimmable, but downstream of this location it is not. In addition, below Lindenwold, excessive pollution prohibits the maintenance and propogation of natural biota. Tindale Run is currently meeting the fish propagation/maintenance goal, but it is threatened from the various pollution sources.

Monitoring Station List

Map Number	Station Name and Classification
3	Cooper River at Lindenwold, FW-2 Nontrout
4	Cooper River at Lawnside, FW-2 Nontrout
5	Cooper River at Haddonfield, FW-2 Nontrout

PENNSAUKEN CREEK, BIG TIMBER CREEK AND COOPER RIVER



WATER QUALITY INDEX PROFILE 1983-1987

Cooper River

WATER QUALITY INDICATORS

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVERAGE AND CONDITION
Cooper River at Lindenwold	AVG WQI	3	26	5	12	22	2	0	5	20 Good
	WORST3 MONTHS	June-August	Oct-Dec	April-June	Oct-Dec	June-August	Dec-Feb		April-June	28 Fair August-Oct
Cooper River at Lawnside	AVG WQI	3	56	13	48	98	9	21	9	95Very Poor
	WORST3 MONTHS	July-Sept	June-August	July-Sept	July-Sept	Oct-Dec	Nov-Jan	Sept-Nov	Sept-Nov	100VeryPoor June-August
Cooper River at Haddonfield	AVG WQI	4	23	10	46	98	11	15	16	90 VeryPoor
	WORST3 MONTHS	July-Sept	Oct-Dec	July-Sept	June-August	July-Sept	Feb-April	July-Sept	July-Sept	100VeryPoor July-Sept

LEGEND - Water Quality Index Description

WQI	Condition	Description
0-10	Excellent	No or minimal pollution; water uses met throughout the year.
11-25	Good	Generally low amounts of pollution; water uses periodically not met.
26-60	Fair	Pollution amounts vary from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution in high amounts; water uses not met.
81-100	Very Poor	Pollution occurs at extremely high levels; severe stress to stream life; water uses not met.
ID	Insufficient Data	

An index of 20 is equivalent to the level of water quality criteria.

N.J.P.D.E.S. DISCHARGE INVENTORY WATERSHED: COOPER RIVER

DISCHARGE NAME	# NJPDES	RECEIVING WATERS	MUNICIPALITY/COUNTY	TYPE
Campbell Soup Co	0005053	Cooper River	Camden/Camden	Ind/Comm
Merchantville-Pennsauken-Brow	0032085	Chandlers Run	Pennsauken/Camden	Municipal
Collingswood Boro WP	0029564	Cooper River	Collingswood/Camden	Municipal
NJ Tpk Auth Area 3S	0020753	Tindale's Run	Cherry Hill/Camden	Municipal
Cherry Hill- Stafford STP	0025097	Cooper River	Cherry Hill/Camden	Municipal
Cherry Hill- Cooper River	0025062	Cooper River	Cherry Hill/Camden	Municipal
Cherry Hill-Woodcrest	0025101	Cooper River	Cherry Hill/Camden	Municipal
Cherry Hill- Ashland	0025119	Cooper River Trib	Cherry Hill/Camden	Municipal
Hussman Refrigerator Co	0003999	Cooper River	Cherry Hill/Camden	Municipal
Lawnside Sew Util Dept	0020621	Cooper River	Lawnside/Camden	Ind/Comm
Somerdale STP	0021652	Cooper River	Somerdale/Camden	Municipal
Voorhees- Osage	0022403	Cooper River	Voorhees/Camden	Municipal
Gibbsboro Sew Corp	0026361	Hilliards Creek	Gibbsboro/Camden	Municipal
Lindenwold Util Auth	0026409	Cooper River	Lindenwold/Camden	Municipal
Haddonfield WWTP	0024503	Cooper River	Haddonfield/Camden	Municipal
Haddon Twp- Coles Mill Rd STP	0024830	Cooper River	Haddon/Camden	Municipal
Cherry Hill-Barclay STP	0025046	Cooper River	Cherry Hill/Camden	Municipal
Cherry Hill-Old Orchard	0025054	Cooper River	Cherry Hill/Camden	Municipal

13. BIG TIMBER CREEK

Watershed Description

Big Timber Creek drains an area of 63 square miles. The mainstem and most of the South Branch divide Gloucester and Camden Counties before flowing into the Delaware River near Brooklawn, south of Camden. Aside from the North and South Branches, (which are 10 and 11 miles long, respectively), major tributaries include Otter Creek, Beaver Brook, and Almohesson Creek. The mainstem is less than four miles long. The major impoundments are Blackwood Lake, Grenlock Lake, Hirsch Pond, and Nashs Lake.

This watershed is primarily urban/suburban with forests at the headwaters and cities at the mouth of Big Timber Creek. There are 18 NJPDES permitted discharges here, 15 of which are municipal and 3 are industrial. The waters in the watershed are FW-2 Nontrout, with the exception of a small area in a headwater stream (Mason Run) classified as FW-2 Trout Production.

Water Quality Assessment

The South Branch of Big Timber Creek is currently monitored at Blackwood Terrace, (this location is thought to represent around 5 stream miles). The North Branch at Glendora monitoring station was discontinued in 1983. The South Branch is of fair water quality throughout the year, while past monitoring shows the North Branch to contain poor water quality. The North Branch Big Timber Creek experienced depressed summer dissolved oxygen levels and excessive concentrations of nutrients and fecal bacteria. Both total inorganic nitrogen and total phosphorus averaged above recommended criteria. Eighty percent of the fecal coliform samples from 1981 to 1983 exceeded the 200 MPN/100ml criterion. Water quality was found to decline to very poor conditions during late spring and early summer. Current conditions are thought to be similar to what was identified earlier in the decade.

Water quality is appreciably better in the South Branch Big Timber Creek at Blackwood Terrace. However, total phosphorus and fecal coliform still generally exceed the State criteria. The concentrations of total phosphorus average .15 mg/l during the current period of review, with 73 percent of the values greater than the State criterion. Fecal coliform exceeded 200 MPN/100ml in 52 percent of the samples collected. The South Branch has adequate dissolved oxygen readings, despite the presence of occasionally high biochemical oxygen demand.

The South Branch of Big Timber Creek (11 miles long) was evaluated by the New Jersey Division of Fish, Game, and Wildlife as supporting a healthy warm water fish community.

Problem and Goal Assessment

Point Source Assessment

Big Timber Creek is subject to a variety of pollution sources. Numerous municipal wastewater discharges contribute to the poor conditions in the North Branch, and to the fair quality of the South Branch. Thirteen municipal treatment plants in this watershed are under DEP enforcement action for discharging wastewaters in violation of permit limitations. The regionalization of municipal treatment systems in Camden County will, in the long-run, eliminate these plants that will result in improved water quality conditions. Gems Landfill, a national Superfund hazardous waste site, is thought to be contaminating Holly Run and Briar Lake with a variety of organic substances. Clean-up activities are currently underway at this site. Fazzio Landfill is also suspected of contaminating Big Timber Creek with organic chemicals.

Nonpoint Source Assessment

Urban/suburban runoff are suspected of being important contributors to the elevated nutrients and bacteria in these streams. Big Timber Creek (25 total stream miles) and Woodbury Creek were evaluated by local authorities as receiving a wide range of pollutants from nonpoint sources including runoff from cropland and feed lots, road and housing construction, urban surfaces, surface mining, road maintenance, eight landfills, septic systems, waste storage tank leaks, and local spills.

Designated Use and Goal Assessment

Attainment of clean water goals is limited in the Big Timber Creek watershed. The South Branch Big Timber Creek generally contains healthy warmwater fisheries, but they are threatened from a variety of pollution sources. Although the fish propagation/maintenance goal is assigned to the remaining streams in the watershed, stressful conditions likely occur in the urbanized and tidal areas during warm weather. High fecal coliform levels preclude the use of these waters for swimming.

Monitoring Station List

Map Number	Station Name and Classification
6	South Branch Big Timber Creek at Blackwood Terrace, FW-2 Nontrout

See page III-135 for a map of the Big Timber Creek watershed.

WATER QUALITY INDEX PROFILE 1983-1987

Big Timber Creek

WATER QUALITY INDICATORS

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVERAGE AND CONDITION
SB Big Timber Creek at Blackwood Terrace	AVG WQI	3	13	12	33	22	4	0	7	27 Fair
	WORST3 MONTHS	June-August	June-August	April-June	Sept-Nov	Sept-Nov	Dec-Feb	April-June	Oct-Dec	43 Fair Sept-Nov

LEGEND - Water Quality Index Description

WQI	Condition	Description
0-10	Excellent	No or minimal pollution; water uses met throughout the year.
11-25	Good	Generally low amounts of pollution; water uses periodically not met.
26-60	Fair	Pollution amounts vary from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution in high amounts; water uses not met.
81-100	Very Poor	Pollution occurs at extremely high levels; severe stress to stream life; water uses not met.
ID	Insufficient Data	

An index of 20 is equivalent to the level of water quality criteria.

N.J.P.D.E.S. DISCHARGE INVENTORY

WATERSHED: NEWTON CREEK
BIG TIMBER CREEK

DISCHARGE NAME	# NJPDES	RECEIVING WATERS	MUNICIPALITY/COUNTY	TYPE
Gloucester City STP	0026620	Big Timber Creek	Gloucester/Camden	Municipal
Sohio Pipeline Co	0028801	Unnamed Ditch	West Deptford/Glou	Ind/Comm
Bellmawr SA	0026743	Big Timber Creek	Bellmawr/Camden	Municipal
Runnemede SA	0026859	Beaver Brook	Runnemede/Camden	Municipal
Gloucester Twp Chws Lndg	0026468	Big Timber Creek	Gloucester/Camden	Municipal
Gloucester Blackwood STP	0026476	Big Timber Creek	Gloucester/Camden	Municipal
Owens-Corning Fiberglass	0004316	Otter Br. Creek	Barrington/Camden	Ind/Comm
Barrington SU	0026875	Beaver Brook	Barrington/Camden	Municipal
Gloucester Mardale Manor	0026484	Signey Run	Gloucester/Camden	Municipal
Stratford SA	0022624	N Br of Big Timber C	Stratford/Camden	Municipal
Camden City Hosp Lakeland	0029840	S BR of Big Timber C	Gloucester/Camden	Municipal
Clementon STP	0020320	Big Timber Creek	Clementon/Camden	Municipal
Alhyde Co	0032336	Big Timber Creek	Trenton/Mercer	Thermal
Booklawn STP	0022748	Big Timber Creek	Brooklawn/Camden	Municipal
Gloucester MUA	0026492	N Br Big Timber	Gloucester/Camden	Municipal
Gloucester MUA	0028959	S Br Big Timber	Gloucester/Camden	Municipal
Audubon	0022446	Newton Creek	Audubon/Camden	Municipal
Collingswood	0025526	Newton Creek	Collingswood/Camden	Municipal
Haddon	0021440	Newton Creek	Audubon/Camden	Municipal
Haddon Heights	0021229	Kings Run	Haddon Heights/Camd	Municipal
Magnolia SA	0021431	Otter Br Cr	Magnolia/Camden	Municipal
Mt. Ephriam	0023817	Little Timber Cr	Mt Ephriam/Camden	Municipal
Woodlynne	0022012	N Br of Newton	Woodlynne/Camden	Municipal
National Park	0025844	Woodbury Cr	National Park/Glous	Ind
Dun-rite Sand & Gravel	0035891	Slab Bridge Bran	Turnersville/Glous	Ind
Durkee Food Divi of SCM	0033260	Wilkens Ditch	West Deptford/Glous	Ind
Gulf Oil/Cumberland Farm	0026026	Woodbury R	Woodbury/Gloust	Ind
Polyrez Comp Inc	0004871	Matthews	Woodbury/Gloust	Thermal

14. RACCOON CREEK

Watershed Description

The Raccoon Creek watershed contains approximately 40 square miles and drains central Gloucester County. The creek itself is 19 miles long and flows from Elk Township to the Delaware River, across from Marcus Hook, Pennsylvania. While there are several minor tributaries, the only significant one is the South Branch Raccoon Creek. Population centers of this rural area are Swedesboro and Mullica Hill. At the mouth of Raccoon Creek are tidal marshes and much of the lower half of the creek is tidal. Ewan Lake, Mullica Hill Pond, and Swedesboro Lake are among the many small lakes and ponds of this area.

The land use in this watershed is primarily agricultural/rural with industries located along the creek's tidal section. However, there has been recent suburban residential and commerical development in much of the watershed. There are 5 NJPDES permitted discharges in the Raccoon Creek watershed: 2 municipal and 3 industrial. Waters are classified as FW-2 Nontrout and SE-2.

Water Quality Assessment

Raccoon Creek is routinely sampled east of Swedesboro for ambient water quality. This monitoring represents approximately five stream miles. Results indicate that the creek is of good quality with conditions worsening to fair quality in the summer. (The 1986 305(b) report identified fair conditions in the stream throughout the year.) Elevated total phosphorous concentrations along with moderately excessive fecal coliform counts and inorganic nitrogen levels are the water quality problems found in the creek. Dissolved oxygen appears to be adequate in Raccoon Creek for the maintenance of warm water fisheries, although dissolved oxygen saturation periodically drops below 80 percent. Biochemical oxygen demand is usually below 2.5 mg/l and, as a result, should not have a significant effect on dissolved oxygen levels. pH of the stream is slightly to moderately acidic.

Fecal coliform counts exceeded State criterion in 33 percent of the samples collected since 1983. The geometric mean for this period was 161 MPN/100 ml, with the highest counts occurring during the warm weather months. Total phosphorus was above the State criterion of .1 mg/l in 71 percent of all samples since 1983 and averaged .24 mg/l. Total inorganic nitrogen was highest during the winter season with levels periodically over 2.0 mg/l.

The approximate 8 miles of the South Branch Raccoon Creek maintains a fish community evaluated as moderately degraded. This is the only stream in the watershed evaluated. The approximately 4 mile long Repaupo Creek, a nearby Delaware River tributary, was assessed as supporting a healthy warm water fish community.

Problem and Goal Assessment

Point Source Assessment

Raccoon Creek is a moderately enriched waterway, based on the nutrient levels present. Agricultural runoff and a municipal point source are the likely sources of the nutrients. The Mullica Hill STP is proposed for upgrading (with nitrification) and enlargement as part of the Gloucester County UA. A regional Gloucester County UA sewerage system is also planned for the western sections of the watershed that will eliminate the Swedesboro STP. Chemical Leaman Tank Lines (Logan Township) waste site is contaminating tidal waters in the western portion of the watershed with pesticides and organics.

Nonpoint Source Assessment

Raccoon Creek is evaluated as receiving nonpoint source pollution from agricultural sources as well as that created by suburban development. The agricultural sources include runoff from crop production, pasture lands, feed lots, and animal holding areas.

Suburban, urban, and industrial development has led to impacts from housing construction, urban surface runoff, mining, septic systems, runoff from road maintenance, and occasional chemical spills. All these impacts as well as the impact of various point sources within the watershed are judged to be gradually increasing and acting to degrade local water quality.

Designated Use and Goal Assessment

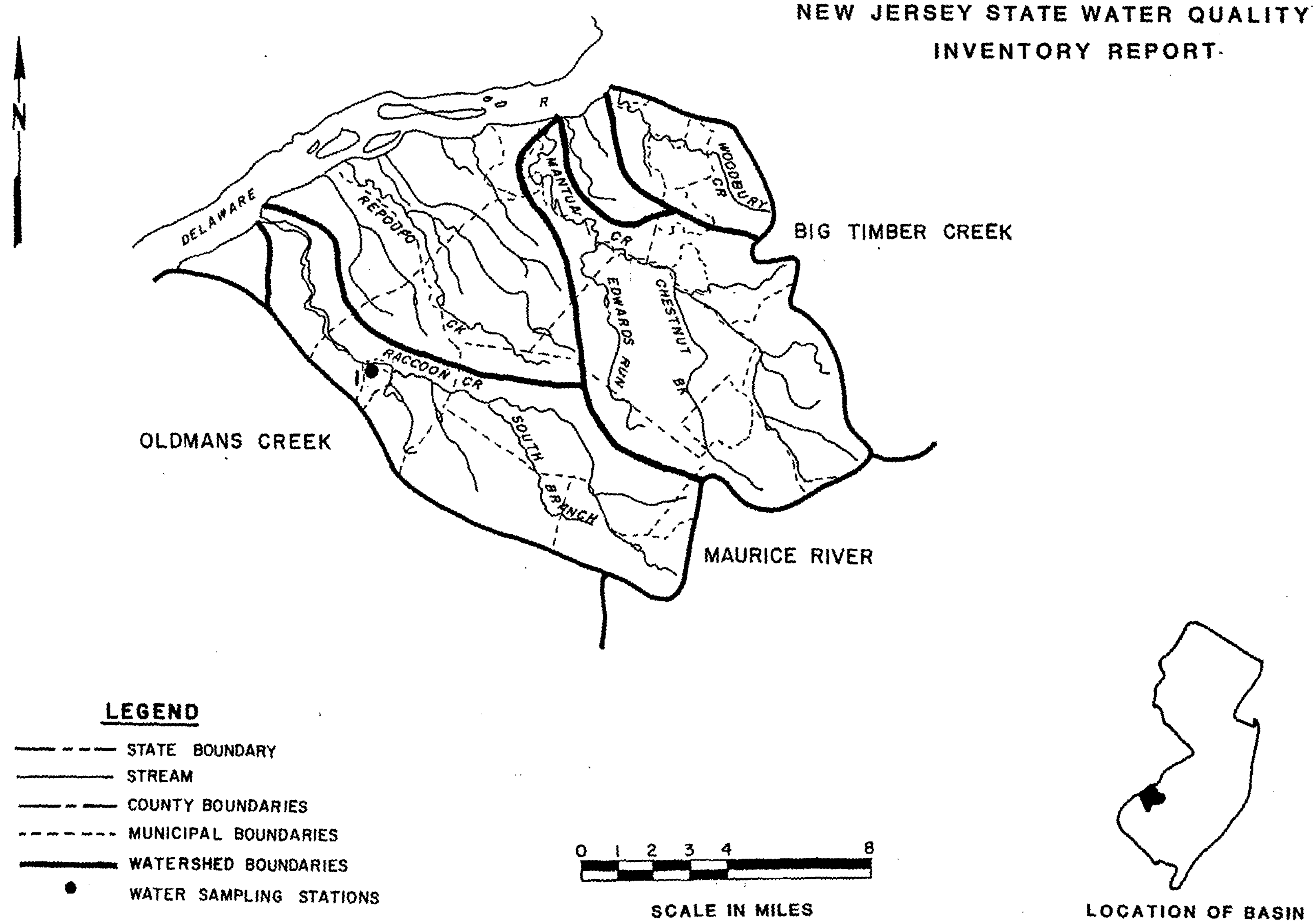
Raccoon Creek will generally meet the fish propagation/maintenance goal of the Clean Water Act, but the South Branch is classified as partially meeting this goal because of some fisheries degradation. The creek is not achieving swimmable status. Elevated fecal coliform concentrations occur primarily during warm weather months rendering the waters unfit for primary contact recreation.

Monitoring Station List

Map Number	Station Name and Classification
1	Raccoon Creek near Swedesboro, FW-2 Nontrout

MANTUA AND RACCOON CREEKS

NEW JERSEY STATE WATER QUALITY INVENTORY REPORT



WATER QUALITY INDEX PROFILE 1983-1987

Raccoon Creek

WATER QUALITY INDICATORS

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVERAGE AND CONDITION
Raccoon Creek near Swedesboro	AVG WQI	2	8	9	20	24	4	0	6	16 Good
	WORST3 MONTHS	June-August	Nov-Jan	August-Oct	May-July	July-Sept	August-Oct	April-June	July-Sept	30 Fair July-Sept

LEGEND - Water Quality Index Description

WQI	Condition	Description
0-10	Excellent	No or minimal pollution; water uses met throughout the year.
11-25	Good	Generally low amounts of pollution; water uses periodically not met.
26-60	Fair	Pollution amounts vary from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution in high amounts; water uses not met.
81-100	Very Poor	Pollution occurs at extremely high levels; severe stress to stream life; water uses not met.
ID	Insufficient Data	

An index of 20 is equivalent to the level of water quality criteria.

N.J.P.D.E.S. DISCHARGE INVENTORY WATERSHED: RACCOON CREEK

DISCHARGE NAME	# NJPDES	RECIEVING WATERS	MUNICIPALITY/COUNTY	TYPE
Rollins Env Ser	0005240	Raccoon Creek	Logans/Gloucester	Ind/Comm
Air Prod & Chem Inc	0004278	Clonmell Creek	Paulsboro/Gloucester	Ind/Comm
Swedesboro Borough STP	0022021	Raccoon Creek	Swedesboro/Glouc	Municipal
Atlantic Richfield Co	0023230	Little Mantua Creek	West Deptford/Glouc	Ind/Comm
Paulsboro Bourough	0026191	Mantua Creek	Paulsboro/Glouc	Municipal
ICI Americas Inc	0033588	Mantua Creek	Woodbury/Glouc	Ind/Comm
East Greenwich Sew Corp	0030368	Nehonsey Creek	East Greenwich/Glouc	Municipal
Harrison- Mullica Hill STP	0020532	Raccoon Creek	Harrison/Glouc	Municipal
CBS Records	0004413	Chestnut Br Trib	Pitman/Glouc	Ind/Comm
Owens- Illinois Divis Glass C	0005312	Still Run	Glassboro/Glouc	Ind/Comm/Th
Ron & Son Mushroom Prod., Inc	0032361	Still Run	Glassboro/Glouc	Ind/Comm
Delware River Port Authority	0026379	Raccoom Creek	Camden/Camden	Ind
Shell Chemical Corp	0035831	Mantua Creek	Woodbury/Glouc	Ind/SW
Nalco Chem Co	0036153	Little Mantua Creek	Paulsboro/Glouc	Ind
Pureland Water Comp	0023299	Trib to Raccoon Cr	Logan/Glouc	Ind

15. OLDMANS CREEK

Watershed Description

Oldmans Creek drains an area of 44 square miles and flows on the Coastal Plain to the Delaware River. This creek, 20 miles long, marks the boundary between Gloucester and Salem Counties. Tidal marshes exist at the mouth of this creek, while the western third of the creek is tidal. Major tributaries include Kettle Run and Beaver Creek.

For the most part, this watershed is agricultural and forested, with some residential and industrial development. The two NJDPES permitted discharges are industrial. Oldmans Creek and tributaries have been classified FW-2 Nontrout, except the tidal portions, which are rated SE-1.

Water Quality Assessment

Oldmans Creek is routinely monitored at Porches Mill, it is thought to represent about one-half of the stream's length. Although overall quality is considered good, during late spring and early summer conditions degrade to fair quality. Principal water quality problems are high fecal coliform and nutrient concentrations. Fecal coliform exceeded State criteria in 52 percent of the samples collected between 1983 and 1987, with a geometric mean of 235 MPN/100ml. Bacteria counts are highest in the months May through July.

Nutrient levels are generally elevated throughout the year. Total phosphorus and total inorganic nitrogen averaged .18 and 2.1 mg/l, respectively. Sixty-five percent of the phosphorus values exceeded the .1 mg/l criteria. Dissolved oxygen concentrations are adequate in Oldmans Creek with all values above 4.0 mg/l. Biochemical oxygen demand was usually less than 3.0 mg/l. Oldmans Creek is moderately acidic.

Oldmans Creek has been evaluated by the New Jersey Division of Fish, Game and Wildlife as supporting a healthy warm water fish community.

Problem and Goal Assessment

Point Source Assessment

Point source effects in this watershed are thought to be limited to the tidal portions of Oldmans Creek. No enforcement activities or hazardous waste sites were identified as impacting the watershed.

Nonpoint Source Assessment

Nonpoint sources are the sole contributors to the water quality problems identified in Oldmans Creek. Agricultural sheet and rill erosion is considered a high priority in this region by the Soil Conservation Service. Oldmans Creek is believed to be receiving nonpoint source pollution from agricultural runoff and suburban development activities. Sources of agricultural runoff include crop production, pasture land, and animal holdings. Suburban sources of pollution include runoff from road and housing construction, urban surfaces, mining activities and leachate from septic systems. All these sources are believed by local officials to be responsible for a decline in water quality, some minor habitat destruction, and are suspected to be threatening the health of the instream fishery.

Designated Use and Goal Assessment

Monitored waters of Oldmans Creek will not meet the swimmable designated use/goal because of excessive bacteria levels. The creek will achieve the fish propagation goal, although the warm-water fisheries present is considered threatened from nonpoint sources.

Monitoring Station List

Map Number	Station Name and Classifcation
1	Oldmans Creek at Porches Mill, FW-2 Nontrout

See page III-152 for a map of the Oldmans Creek watershed.

WATER QUALITY INDEX PROFILE 1983-1987

Oldmans Creek

WATER QUALITY INDICATORS

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVERAGE AND CONDITION
Oldsman Creek at Porches Mill	AVG WQI	2	10	10	27	21	5	0	7	20 Good
	WORST3 MONTHS	June-August	Nov-Jan	April-June	May-July	June-August	August-Oct	Feb-April	August-Oct	28 Fair May-July

LEGEND - Water Quality Index Description

WQI	Condition	Description
0-10	Excellent	No or minimal pollution; water uses met throughout the year.
11-25	Good	Generally low amounts of pollution; water uses periodically not met.
26-60	Fair	Pollution amounts vary from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution in high amounts; water uses not met.
81-100	Very Poor	Pollution occurs at extremely high levels; severe stress to stream life; water uses not met.
ID	Insufficient Data	

An index of 20 is equivalent to the level of water quality criteria.

N.J.P.D.E.S. DISCHARGE INVENTORY

WATERSHED:Oldmans Creek

DISCHARGE NAME	# NJPDES	RECEIVING WATERS	MUNICIPALITY/COUNTY	TYPE
B.F. Goodrich-Chem. Grp.	0004286	Ditch to Oldmans Trb	Oldmans Twp./Salem	Ind./Comm.
Airco Ind. Gases	0004553		Oldmans Twp./Salem	Ind./Comm.

16. SALEM RIVER

Watershed Descriptions

The Salem River drains an area of 114 square miles and flows 32 miles from Upper Pittsgrove Township west to Deepwater, then south to the Delaware River. This area lies within Salem County. Much of the lower section of the river is tidal. The Upper and Lower Salem River sub-watersheds comprise the entire watershed. The major population center of this area is Salem City. Major tributaries to the Salem River include Mannington Creek, Game Creek, Majors Run, and Fenwick Creek. There are some ponds on this creek, with a major impoundment being East Lake.

Land use in this watershed is about 40 percent cropland, with the rest being woodland, tidal/freshwater marshes, urban, and pasture. Of the 11 NJPDES permitted discharges here, 5 are municipal and 6 are industrial. Surface water has been classified FW-2 Nontrout, except for the tidal portions, which are SE-1.

Water Quality Assessment

Ambient water quality monitoring occurs at two locations in the Salem River watershed; on the Salem River at Woodstown and at Courses Landing. This monitoring represents less than 10 stream miles. Based on sampling from these two locations overall water quality conditions are assessed as good to fair at Woodstown and fair at Courses Landing. In the short distance between the two stations (approximately 4 miles) conditions degrade from Woodstown to Courses Landing. Both locations contain elevated fecal coliform and nutrient concentrations.

The Salem River at Woodstown is monitored at the outlet of Memorial Lake; as such conditions are not indicative of true stream quality. Even with the effects of retention in the lake, nutrients and fecal coliform bacteria are excessive at the outlet. Total phosphorus averaged .27 mg/l during 1983 to 1987, over three times the State criterion for flowing waterways. Total inorganic nitrogen was also elevated with 54 percent of the samples collected greater than 2.0 mg/l. Fecal coliform counts appear to be highest during spring. Overall, the geometric mean of fecal coliform was 202 MPN/100ml between 1983 and 1987. Fifty percent were above the 200 MPN/100ml level. Dissolved oxygen, measured as concentration and percent saturation, is adequate throughout the year. Stream temperature appears to periodically exceed 28 degrees Celcius during the summer months indicating that some stress to warm-water fisheries may occur.

At Courses Landing the Salem River contains the same problems as at Woodstown, but levels of pollutants are higher. In spring the quality of the river approaches poor conditions. Total phosphorus averaged .42 mg/l with all values above the State criterion of .1 mg/l. Total inorganic nitrogen concentrations are similar to those identified at Woodstown. The geometric mean of fecal coliform was 207 MPN/100ml. Although dissolved oxygen concentrations were always above 4.0 mg/l, percent saturation averaged only 78 percent between 1983 and 1987. Biochemical demand is generally high in the river with numerous levels over 4.0 mg/l. One elevated concentration of lead was found in the river at this location during the period of review.

Biomonitoring is conducted at Courses Landing for periphyton and macro-invertebrates. Herbivores and filter feeders dominated the macroinvertebrate sampling indicating some nutrient enrichment. The presence of a saprophilic diatom together with moderate levels of chlorophyll a also confirms mild enrichment at this location.

Fishery evaluations for the Salem River were not available; rather, assessments were performed on two Salem River tributaries. Game Creek, a 5 mile long tributary to the Upper Salem was categorized as supporting a healthy community of warm water fish species. Swedes Run (4 miles) a tributary to the lower Salem River was evaluated as containing a moderately degraded warm water fish community.

Among the neighboring streams adjacent to the Salem River watershed, Alloway Creek and Horse Run were both evaluated as supporting healthy warm water fisheries. In contrast, Harby Creek (3 mile) and Black Ditch (4 miles) are both assessed as containing severely degraded warm water fish communities.

Problem and Goal Assessment

Point Source Assessment

The upper watershed of the Salem River contains water quality problems resulting from the combined effects of point and nonpoint sources. Although municipal discharges in this area meet permit limitations advanced treatment is necessary to improve water quality conditions. Conditions are thought to be generally poor in tidal sections of the Salem River. Limited assimilative capacity together with numerous point sources in the lower watershed are considered to be reasons for these conditions. The Salem City STP, which discharges to the lower section of the Salem River, is only a primary treatment facility and is under enforcement action for poor quality effluent. The plant is scheduled for upgrading in the next few years. The Woodstown STP is also under enforcement order.

Nonpoint Source Assessment

The Upper Salem River is believed to be receiving occasional, yet increasing, amounts of nonpoint runoff from agricultural and urban sources. Agricultural sources include cropland, feedlots, and animal holdings. Urban contributors include surface and road runoff, septic tank leachate, building construction runoff, and mining runoff. The agricultural runoff is believed to be threatening the fishery of Game Creek, a tributary to the Salem River. The Lower Salem watershed receives nonpoint source pollution from croplands, pastures, feedlots, animal holdings, road and housing construction sites, septic systems, suburban surfaces, and road runoff. These sources are estimated to be at moderate to severe levels but have shown little increase over time. The fishery resource of Swedes Run, a tributary to the Lower Salem is believed to be degraded by the combined inputs of industrial point sources and nonpoint road runoff. In addition, local authorities have noted that housing developments, storm sewers, and pasturelands all present moderate to severe problems to water quality in Swedes Run.

Local officials have pointed out that the Salem River Watershed contains some 13 landfills, which although at present do not produce any "known" impact, do represent a potential problem and hence should be monitored.

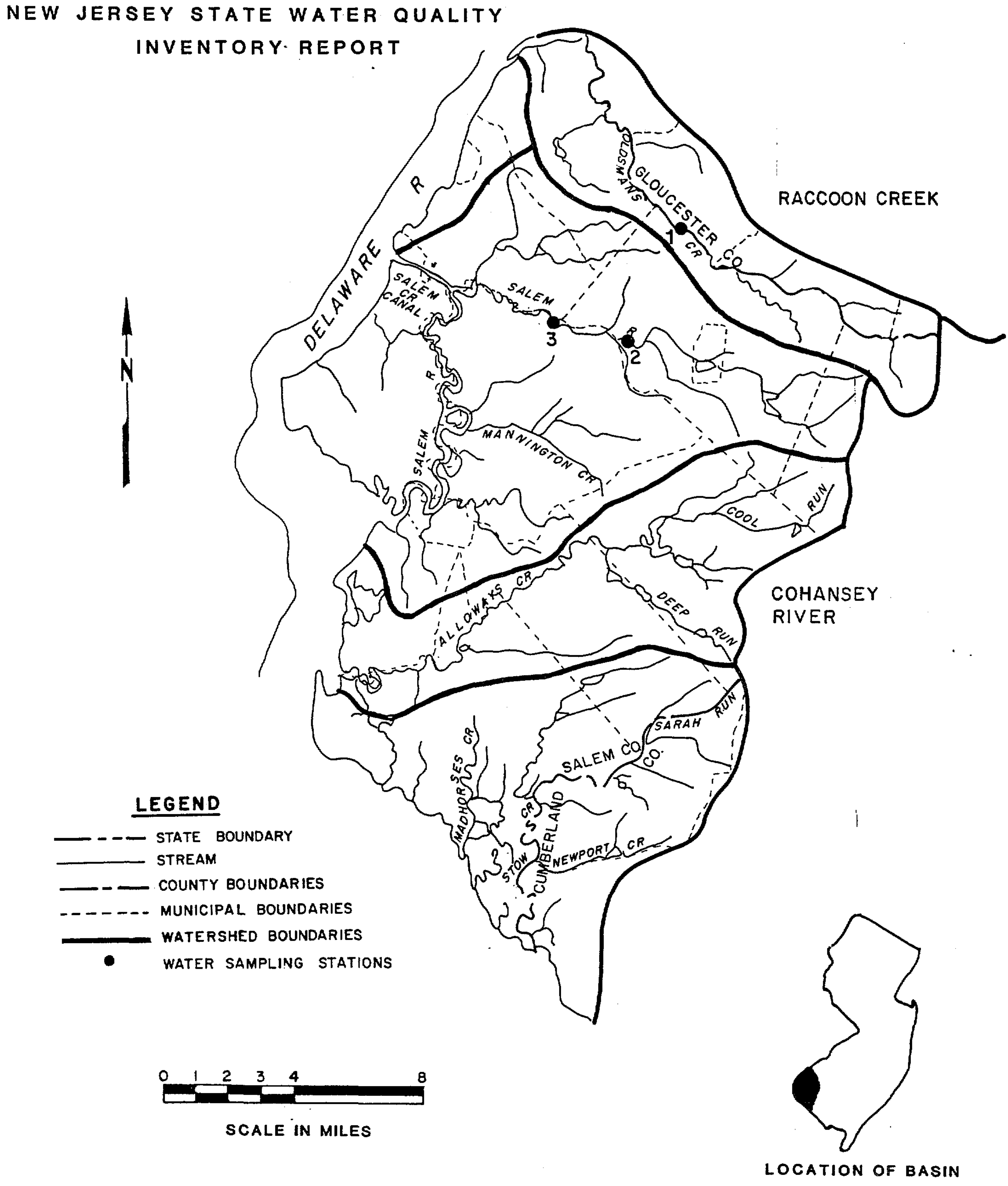
Designated Use and Goal Assessment

The Salem River, despite its water quality problems, will meet the fish propagation/maintenance use, but the fisheries may be threatened. This is also the case for Game Run; Swedes Run is considered to be partially meeting this use. The swimmable goal is not met at Woodstown and Courses Landing because of excessive fecal coliform counts in the river.

Monitoring Station List

Map Number	Station Name and Classification
2	Salem River at Woodstown, FW-2 Nontrout
3	Salem River at Courses Landing, FW-2 Nontrout

OLDSMANS CREEK AND SALEM RIVER



WATER QUALITY INDEX PROFILE 1983-1987

Salem River

WATER QUALITY INDICATORS

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVERAGE AND CONDITION
Salem River at Woodstown	AVG WQI	5	5	14	27	27	5	2	6	25Good/Fair
	WORST3 MONTHS	June-August	May-July	July-Sept	May-July	Feb-April	Sept-Nov	May-July	March-May	35 Fair May-July
Salem River at Courses Landing	AVG WQI	3	33	8	31	36	7	1	18	45 Fair
	WORST3 MONTHS	June-August	April-June	August-Oct	Jan-March	Feb-April	Oct-Dec	August-Oct	July-Sept	56 Fair Feb-April

LEGEND - Water Quality Index Description

WQI	Condition	Description
0-10	Excellent	No or minimal pollution; water uses met throughout the year.
11-25	Good	Generally low amounts of pollution; water uses periodically not met.
26-60	Fair	Pollution amounts vary from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution in high amounts; water uses not met.
81-100	Very Poor	Pollution occurs at extremely high levels; severe stress to stream life; water uses not met.
ID	Insufficient Data	

An index of 20 is equivalent to the level of water quality criteria.

N.J.P.D.E.S. DISCHARGE INVENTORY   WATERSHED: Salem River

DISCHARGE NAME	# NJPDES	RECIEVING WATERS	MUNICIPALITY/COUNTY	TYPE
Budd Chem Co	0033570	Delarware R. Trib	Carney's Pt/Salem	Ind/Comm
N.J. Tph Auth Area 1s and 1n	0020761	Playton Lake	Oldmans/Salem	Municipal
Richman Ice Cream	0004308	Salem River	Wooktown/Salem	Ind/Comm
Woodstowm SA	0022250	Rock Brook	Woodstown/Salem	Municipal
Salem Co Vo Tech Sch	0028797	Mavor Run Creek	Mannington/Salem	Ind/Comm
Mannington Mills, Inc	0005614	Pledger Creek	Manninton/Salem	Ind/Comm
Salem STP	0024856	Salem River	Salem/Salem	Municipal
Anchor Glass Containers Corp	0005151	Salem River	Salem/Salem	Therm
ALU Chem Inc	0052400	Lower Salem River	Salem/Salem	Thermal
Salem WTP, City of	0035742	Keasbey Creek	Salem	Mun
Lower Alloways Tep Hancock	0050423	Alloways Creek	Lower Alloway/Salem	Ind

17. COHANSEY RIVER

Watershed Description

The Cohansey River is nearly 30 miles long, draining 105 square miles of eastern Salem County to the Delaware Bay. This is an area of very low relief which results in numerous small tributaries. Sunset Lake and Mary Elmer Lake are among 10 major impoundments in this drainage basin. The largest population center is Bridgeton. The river is tidal from Bridgeton. The Cohansey contains two sub-watersheds: the Upper and Lower sections of the watershed.

The main land use of this watershed is agriculture, but much of this area is forested. There are four NJPDES permitted discharges here, two are industrial and two are municipal. Waterways are classified FW-2 Nontrout, except those portions that are SE-1 (downstream of Sunset Lake) and FW-1 (within State parks and wildlife management areas).

Water Quality Assessment

Ambient monitoring is conducted on the Cohansey River at Seeley as part of the USGS/DEP Primary Network. Results from this monitoring shows that about 5 miles of the Upper Cohansey River is of fair quality with conditions worsening somewhat during the early summer months. The reasons for the moderate water quality are generally high fecal coliform and nutrient levels. Inorganic nitrogen and phosphorus occur in elevated concentrations. Total phosphorus has averaged .1 mg/l since 1983 with 77 percent above the .05 mg/l criterion for waters flowing into lakes and impoundments. Total inorganic nitrogen averaged 4.2 mg/l during this period, with all readings greater than 2.0 mg/l..

Fifty-nine percent of the fecal coliform samples between 1983 and 1987 were greater than the 200 MPN/100ml level. Dissolved oxygen concentrations are above the 4.0 mg/l warm-water criterion throughout the year, but percent saturation periodically drops below 80 percent. Biochemical oxygen demand is low to moderate in this watershed. Within the two subwatersheds of the Cohansey River, fishery evaluations were available on Clarks Run, a four mile tributary to the Upper Cohansey, and Mill Creek, a five mile long tributary to the Lower Cohansey. Both streams are assessed by the New Jersey Division of Fish, Game and Wildlife as supporting healthy warm water fish communities.

Problem and Goal Assessment

Point Source Assessment

The Cohansey River watershed has some impacts from point sources, but they are not clearly defined. The presence of municipal and industrial point sources likely influences local water quality conditions. There are no enforcement actions or hazardous waste sites in the watershed that are suspected of impacting surface water quality.

Nonpoint Source Assessment

Nonpoint source pollution, most likely from agriculture, is the probable cause of the moderately degraded water quality in the Cohansey River at Seeley. Numerous nonpoint pollution sources are known to impact the Upper Cohansey River and have resulted in siltation and the impairment of the local fisheries. Pollution sources include both agricultural and suburban development activities; specific sources include runoff from croplands (increasing), pasture lands, feedlots, housing developments, roads and urban surfaces. In addition, septic systems have been described by local authorities in this region as creating a severe water quality problem. Landfills too are noted as a potential problem, yet their actual impact on local waterways at the present time is not known.

Impacts in the Lower Cohansey watershed are much the same. Suspected sources, both agricultural and urban, include runoff from crop production, pasture lands, feedlots, animal holdings, tree harvesting, urban surfaces, expanding housing construction, road maintenance runoff, surface mining, as well as leachate from septic systems. Of these sources: cropland runoff, an increasing problem in the sub-watershed, is known to have brought about the degradation of local fishing and shellfish harvesting waters. Here as in the Upper Cohansey, landfills are noted as an increasing potential problem.

Designated Use and Goal Assessment

The Cohansey River will not meet the swimmable goal of the Clean Water Act based on monitoring at Seeley. The river and tributaries will meet the fish propagation and maintenance goal. In the tidal sections it will not achieve the shellfish harvesting designated use because of excessive bacteria levels.

Monitoring Station List

Map Number	Station Name and Classification
3	Cohansey River at Seeley, FW-2 Nontrout

See page III-162 for a map of the Cohansey watershed.

WATER QUALITY INDEX PROFILE 1983-1987

Cohansey River

WATER QUALITY INDICATORS

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVERAGE AND CONDITION
Cohansey River at Seeley	AVG WQI	2	9	4	29	48	5	0	7	38 Fair
	WCRST3 MONTHS	June-August	July-Sept	Nov-Jan	May-July	Nov-Jan	Nov-Jan		March-May	54 Fair May-July

LEGEND - Water Quality Index Description

WQI	Condition	Description
0-10	Excellent	No or minimal pollution; water uses met throughout the year.
11-25	Good	Generally low amounts of pollution; water uses periodically not met.
26-60	Fair	Pollution amounts vary from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution in high amounts; water uses not met.
81-100	Very Poor	Pollution occurs at extremely high levels; severe stress to stream life; water uses not met.
ID	Insufficient Data	

An index of 20 is equivalent to the level of water quality criteria.

N.J.P.D.E.S. DISCHARGE INVENTORY

WATERSHED: Cohansey River

DISCHARGE NAME	# NJPDES	RECEIVING WATERS	MUNICIPALITY/COUNTY	TYPE
CCUA: Cohansey R. Basin Plant	0024651	Cohansey River	Bridgeton Cty/Cumlnd	Municipal
Petrunis Realty Co.	0025992	Cohansey River	Bridgeton Cty/Cumlnd	Mun/Strmwtr
Seabrook Brothers & Sons	0033066	South Branch Fos	Seabrook/Cumblnd.	Thermal
Seabrook Plant	0062731		Upper DeerField Twp	Industrial

18. MAURICE RIVER

Watershed Description

The Maurice River has a drainage area of 386 square miles and meanders south for 50 miles through Cumberland County to the Delaware Bay. The population centers are Vineland and Millville. The major tributaries of this river are Scotland Run, Manantico Creek, Muskie Creek, Muddy Run, and the Manumuskin River. There are about 20 major lakes in this area, with Union Lake being the largest. The river is tidal below Union Lake. The Maurice River drainage has been segmented into nine sub-watersheds: Still Run, Scotland Run, Upper Maurice River, Muddy Run, Union Lake, Maurice River below Union Lake, Manantico Creek, Manumuskin Creek and Lower Maurice River.

Principal land use in this watershed is agriculture, with much of the area forested. Of the 17 NJPDES permitted discharges in the watershed 1 is municipal while 16 are industrial/commercial. The Maurice watershed is primarily classified FW-2 Nontrout, with some SE-1 and FW-1.

Water Quality Assessment

The Maurice River is monitored at Norma and near Millville for ambient water quality, representing approximately 10 stream miles. Both locations have good to excellent water quality, although at Millville conditions degrade to fair quality during late winter. However, stream degradation is thought to occur in the Maurice River below Union Lake, but no monitoring is performed to substantiate this conclusion. In the lower tidal sections of the Maurice River, bacterial contamination of shellfish growing areas has resulted in the condemned status of these waters.

The Upper Maurice River, as monitored at Norma and near Millville, contains very low fecal coliform levels and moderate amounts of nutrients. Total phosphorus was above appropriate State criteria in 19 and 36 percent of the samples at Norma and Millville, respectively. While at Norma contains occassionally high inorganic nitrogen, this indicator was elevated in nearly three-quarters of the samples collected between 1983 and 1987. The only other water quality problem measured at these stations is occassional dissolved oxygen saturation measurements below 80 percent. Biochemical oxygen demand is usually under 2.0 mg/l.

Intensive surveys were performed on two tributaries in 1984 to determine the impacts of industrial discharges that were under enforceemnt action. In Scotland Run levels of lead, zinc and copper were higher in the stream below the metal plating industry being investigated. Concentrations of chromium in fish tissue were also unnaturally high. In the Hudson Branch, a metal refining operation caused excessive total and hexavalent chromium in the water column and sediments. Severe degradation of the macroinvertebrate community was also detected.

Biomonitoring performed at Millville has found generally favorable conditions for streamlife. Periphyton productivity is low with a diverse community representative of a mildly acidic environment. Macroinvertebrate community structure also indicates generally healthy conditions.

Fishery evaluations were performed on several tributaries to the Maurice River. Of those entering the Maurice above Union Lake, Reeds Branch, and Thundergust Brook were judged to be supporting healthy warm water fisheries. Scotland Run, 12 miles long, and Blackwater Branch, 8 miles long, were assessed as supporting healthy populations of both warm and cold water fish species. The Mill Creek warm water fishery, 5 miles long, was evaluated as moderately degraded due to the impact of agricultural and highway runoff. Of the tributaries below Union Lake, Buckshuten Creek, (7 miles long) Manantico Creek (10 miles) and Bowkers Run were all assessed as supporting healthy warm water fish communities. Big Neal Branch, a 3 mile long tributary to the Manumuskin River, was also evaluated as supporting a healthy warm water fishery.

Problem and Goal Assessment

Point Source Assessment

The good water quality conditions of the Upper Maurice River indicate few pollution problems. However, enforcement activities are underway in this watershed. Facilities under enforcement that are impacting surface waters include Landis SA discharge (actually a ground discharge) to Parvins Branch and the Millville STP discharge to the Maurice River. The NJ Division of Fish, Game and Wildlife believes the Maurice River above Union Lake is suspected to be impacted by increasing quantities of industrial and municipal point source waste waters, both of which are believed to be contributing to declining water quality and causing local fish kills. Additionally, a municipal treatment plant is suspected of being the cause of bathing beach closures in the Upper Maurice. In the Lower Maurice River point source effluents are believed to have led to the impairments of shellfish harvesting waters.

Hazardous waste sites contaminating surface waters include the Vineland Chemical Corporation site and Shield Alloy. The Vineland Chemical Corporation has caused widespread arsenic contamination of sediments in Union Lake, while Shield Alloy is contaminating Hudsons Branch with chromium.

Nonpoint Source Assessment

In the northern most assessed areas of the Maurice River watershed are the sub-watersheds of Still Run and Scotland Run. Tributaries to Still Run, Little Ease Run, and Reeds Branch are believed to be receiving storm water runoff. Still Run is suspected of suffering fish kills and overall water quality degradation from moderate to large quantities of both agricultural and urban nonpoint source pollution. Suspected sources impacting this waterway, as well as to Scotland Run, are septic tank leachate, runoff from crop and pasture lands, urban surfaces, road and home construction, and road maintenance. The Upper Maurice River itself receives both agricultural and suburban nonpoint source pollution; sources include runoff from crop production, tree harvesting, road and home construction, road maintenance and runoff. Additional pollution sources include sludge disposal activities and local landfills. This runoff is suspected to be contributing to a general decline in water quality and to fish kills in the Upper Maurice River.

Farther downstream in the area surrounding Union Lake, runoff is believed to be coming from urban storm sewers, urban surfaces, sludge disposal sites, landfills, hazardous waste sites, and dam construction activities, all of which are estimated to be on the rise. Additional sources reported are surface mining, road maintenance, and housing construction. Below Union Lake, pollution from storm sewers and urban surfaces, while estimated to be on the decline, is believed to have contributed to the impairment of shellfish harvesting areas further downstream. In this region also, landfills are viewed as a possible source of pollution whose actual impact upon local waters is not yet known. Other suspected sources of nonpoint pollution are tree harvesting activities, home construction, urban and road surfaces, dredging and septic systems. Of the two large tributaries to the Lower Maurice, Manantico Creek receives occasional runoff from croplands, construction sites, urban surfaces, storm sewers, tree harvesting, as well as from what is estimated to be increasing levels of road construction and maintenance. Manamuskin River is believed to receive pollution in its headwaters from croplands (estimated to be in decline), and is impacted in its mainstem by road construction, road runoff, suburban surface runoff, landfills, and dredging. To the west a third tributary, Muddy Run, is suspected of experiencing water quality degradation from what is believed to be moderate to severe levels of cropland and pastureland runoff, as well as pollution from road and housing construction sites, surface mining, and sludge disposal.

Designated Use and Goal Assessment

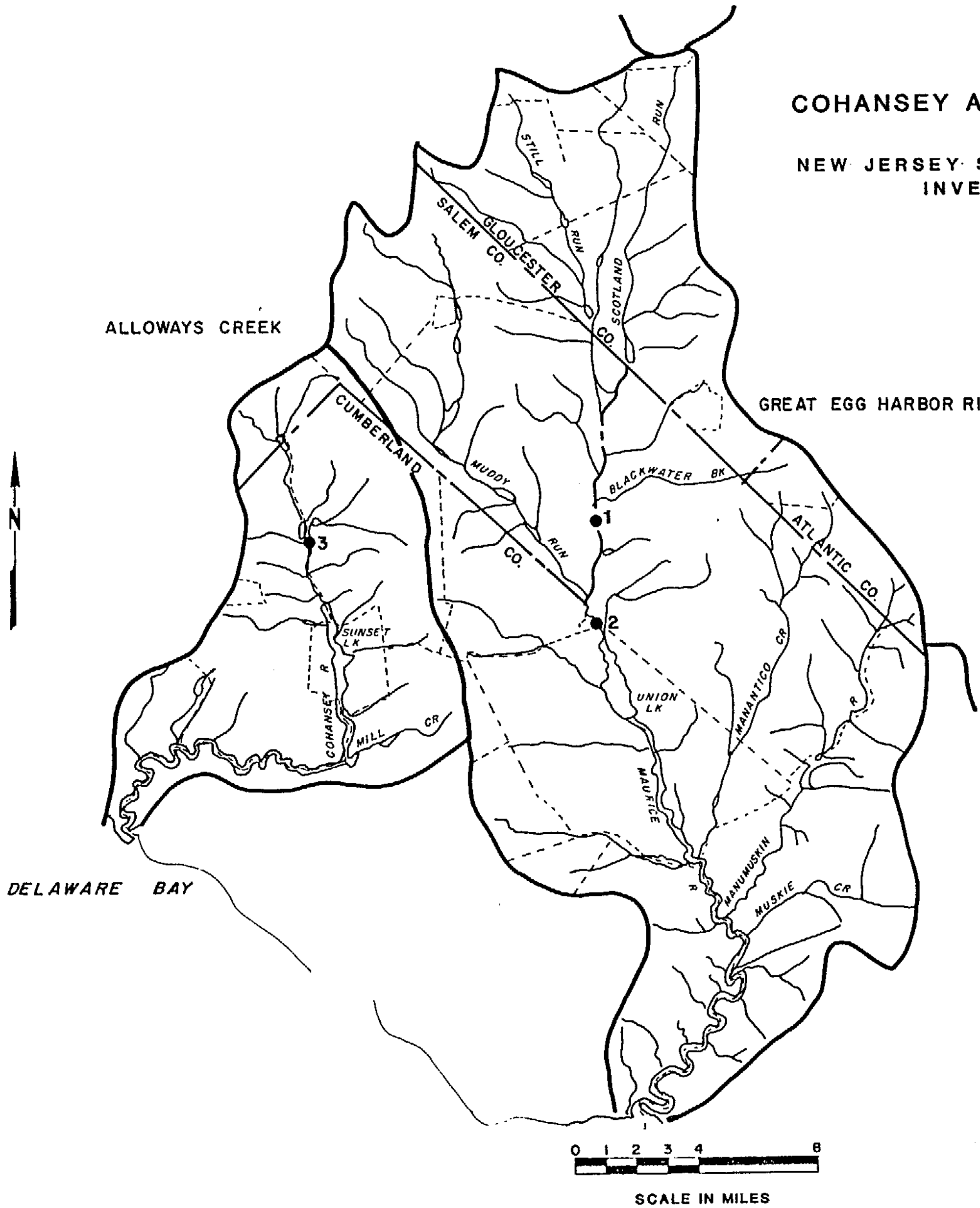
The Maurice River at Norma and near Millville is considered to be meeting the swimmable designated use, based on monitoring information. The river is also considered to be achieving the fish propagation/maintenance use, but some sections may be threatened from various pollution sources. The tributaries are classified as either fully meeting this use (30 miles), fully meeting but threatened (30 miles) or partially meeting the use (15 miles). The tidal sections of the Maurice River are condemned for shellfish harvesting.

Monitoring Station List

Map Number	Station Name and Classification
1	Maurice River at Norma, FW-2 Nontrout
2	Maurice River near Millville, FW-2 Nontrout

COHANSEY AND MAURICE RIVERS

NEW JERSEY STATE WATER QUALITY INVENTORY REPORT



LOCATION OF BASIN

WATER QUALITY INDEX PROFILE 1983-1987

Maurice River

WATER QUALITY INDICATORS

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVERAGE AND CONDITION
Maurice River at Norma	AVG WQI	2	14	3	7	14	2	0	7	7 Excellent
	WORST3 MONTHS	June-August	May-July	Feb-April	July-Sept	Nov-Jan	Sept-Nov		April-June	11Good/Exc May-July
Maurice River near Millville	AVG WQI	2	20	3	11	24	3	0	11	18 Good
	WORST3 MONTHS	June-August	March-May	June-August	Oct-Dec	Dec-Feb	August-Oct	June-August	Oct-Dec	34 Fair Jan-March

LEGEND - Water Quality Index Description

WQI	Condition	Description
0-10	Excellent	No or minimal pollution; water uses met throughout the year.
11-25	Good	Generally low amounts of pollution; water uses periodically not met.
26-60	Fair	Pollution amounts vary from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution in high amounts; water uses not met.
81-100	Very Poor	Pollution occurs at extremely high levels; severe stress to stream life; water uses not met.
ID	Insufficient Data	

An index of 20 is equivalent to the level of water quality criteria.

N.J.P.D.E.S. DISCHARGE INVENTORY

WATERSHED: MAURICE RIVER

DISCHARGE NAME	# NJPDES	RECEIVING WATERS	MUNICIPALITY/COUNTY	TYPE
Pioneer Metal Finishing, Inc.	0025658	Scotland Run	Franklin Twp/Glcstr.	Ind./Comm.
Shield Alloy Corp.	0004103	Maurice River	Newfield Boro/Glcstr	Ind./Comm.
Owens-Illinois Inc.	0004499	Ditch to Maurice R.	Vineland City/Cumlnd	Ind./Comm.
Vinelnd Cty. Elec-Howard Down	0032182	Maurice River	Vineland Cty./Cumlnd	Ind./Comm.
Owens-Ill.-Schott Process Sys Inc.	0005304	Parvins Brook	Vineland Cty./Cumlnd	Ind./Comm
Progresso Quality Foods	0004880	Trib to Maurice R.	Millville Cty/Cumlnd	Ind./Comm.
West Co.	0023744	Wheaton Prop. Pond	Millville Cty/Cumlnd	Ind./Comm.
Wheaton Glass Co.	0004171	Petticoat Stream	Millville Cty/Cumlnd	Ind./Comm.
Kerr Glass Mfg. Corp.	0005398	Maurice River	Millville Cty/Cumlnd	Ind./Comm.
Unimin Corp.	0004405	Dividing Creek	Millville Cty/Cumlnd	Ind./Comm.
NJ Silica Sand Co.	0004618	Manamuskin River	Maurice R Twp/Cumlnd	Ind./Comm.
Owens-Ill. Corp.-Millville	0005339	Muskie River	Comm. Twp./Cumlnd.	Ind./Comm.
Port Norris Oyster Co., Inc.	0026051	Maurice River	Comm. Twp./Cumlnd.	Ind./Comm.
Geo. O. McConnell Co.	0029581	Maurice River	Comm. Twp./Cumlnd.	Ind./Comm.
Delaware Bay Oyster Co.	0029530		Comm. Twp./Cumlnd.	Ind./comm.
Leesburg St. Prison	0021989	Riggins Ditch	Maurice Twp./Cumb.	Municipal
Millville SA, City of	0029467	Maurice River	Millville/Cumberland	Municipal
Capt. Sig's Seafood Inc.	0004766	Maurice River	Port Norris/Cumblnd.	Ind.
Marshall Service Inc.	0036129	Maurice River	Newfield/Glcstr.	Ind.

19. GREAT EGG HARBOR RIVER

Watershed Description

The Great Egg Harbor River is 49 miles long and drains an area of 304 square miles. It originates in eastern Gloucester and Camden Counties, an agricultural and suburban area, before flowing through the Pinelands region. The river drains into Great Egg Harbor Bay before emptying into the Atlantic Ocean. The river is tidal downstream of the dam at Mays Landing. Upper, Mid and Lower Great Egg Harbor River sub-watersheds have been delineated.

The watershed's dominate land use is forests with the remainder agricultural and developed. Population centers include Berlin, Winslow, Monroe, Mays Landing, and Egg Harbor City. The major tributaries are Hospitality Branch, Watering Race, Babcock Creek, Deep Run, South River, and Stephens Creek. There are many lakes and ponds in this area, but the largest is Lake Lenape, near Mays Landing. Of the 12 NJPDES permitted discharges here, 6 are municipal and 6 are industrial/commercial. Waters in the Great Egg Harbor watershed are classified FW-2 Nontrout, Pineland Waters, FW-1, and SE-1.

Water Quality Assessment

Four ambient water quality monitoring stations are present on the Great Egg Harbor River: near Sicklerville and Blue Anchor, at Folsom and at Weymouth. This monitoring represents most of the freshwater reaches of the river and shows that water quality is severely degraded in the headwaters near Sicklerville, but that conditions improve to fair quality as one travels downstream. Although the Great Egg Harbor is a Pinelands stream, pH in the river has been significantly altered because of water pollution.

Near Sicklerville the Great Egg Harbor River has poor to very poor water quality because of high nutrient concentrations, reduced dissolved oxygen, and pH readings which are frequently near neutral levels. Stream conditions are most severe during summer months. Total phosphorus averaged .57 mg/l during the 1983 to 1987 period with all of the values greater than appropriate State criterion. Total inorganic nitrogen also appeared excessive in nearly 50 percent of the samples collected. Dissolved oxygen concentrations drop below 4.0 mg/l during summer months and percent saturation averaged only 60 percent during the period of review. Biochemical oxygen demand frequently exceeds 3.0 mg/l. Stream pH averages 6.3 SU, significantly greater than the recommended 3.5 to 5.5 range for Pineland surface waters.

Downstream near Blue Anchor and at Folsom the Great Egg Harbor River recovers somewhat from the problems at Sicklerville. Total phosphorus is still high with 94 and 100 percent above State criterion near Blue Anchor and at Folsom, respectively. But total inorganic nitrogen is lower and dissolved oxygen concentrations appear to be adequate (dissolved oxygen saturation is still commonly below 80 percent). In addition, pH values show reductions, although they continue to average above what is considered natural background for Pineland streams. Fecal coliform counts are low with only 26 and 0 percent above recommended levels near Blue Anchor and at Folsom, respectively. Two elevated copper values occurred in samples collected at Folsom. The source of this copper should be investigated further since this problem was identified in the 1986 305(b) report.

Water quality in the river at Weymouth shows continued improvement. Total phosphorus remains elevated but concentrations are lower. The average pH value is just above the 5.5 level, showing a return to more natural conditions. Dissolved oxygen concentrations are sufficient for the protection and maintenance of warm-water fisheries.

The Tuckahoe River is reported to have continuously failed to meet public health fecal coliform standards for primary contact recreation during the spring and summer periods. Intensive sampling has revealed that the primary source of this fecal contamination is from animals, with additional contributions coming from local septic tank overflows which occur along the mainstem of the river.

Biomonitoring has been performed at Folsom. The pollution intolerant caddisfly comprised 72 percent of the macroinvertebrate substrate sample indicating favorable clean water habitats. Periphyton productivity is very low with blue green algae the dominant periphyte. The low number of diatoms is indicative of acid waters.

No fisheries evaluations were made by the NJ Division of Fish, Game and Wildlife of streams in the Great Egg Harbor River watershed.

Problem and Goal Assessment

Point Source Assessment

The water quality problems present in the Great Egg Harbor River appear to be related to point source discharges in the upper watershed. The Berlin STP, which will be eliminated in the near future, is currently under enforcement action for inadequate treatment of wastewaters. A number of other enforcement cases concerning ground water discharges are underway in the watershed. In the Lower Great Egg Harbor River watershed the Hamilton Twp. STP discharge to Babcock Creek and the Federal Aviation Administration discharge to Gravelly Run are both discharging inadequately treated wastewaters. Local officials have noted that various nonpermitted discharges have been entering Hospitality Branch, a tributary to the Lower Great Egg Harbor.

Nonpoint Source Assessment

Runoff from croplands is suspected to be impacting the entire length of the Great Egg Harbor River above Mays Landing. Additional pollution sources in this sub-watershed are believed to be from surface mining, which impact the uppermost reaches of the river, and sediment loads which result from ditch bank erosion occurring in the small tributary streams which flow into the Great Egg in the region around Lake Lenape. Below Mays Landing, nonpoint source pollution is believed to shift from agricultural sources to suburban development: storm sewers, road surfaces, and septic systems.

In the assessed tributaries feeding into the Upper Great Egg Harbor River, stormwater runoff and suburban development appear to be the major contributors to nonpoint source pollution. Squankum Branch (7 miles long) and Four Mile Branch both are suspected of being impacted by stormwater runoff. Water quality in the 13 mile long Hospitality Branch is believed to be affected by stormwater/road runoff; in addition, surface mining is reported to be a known yet declining source of sedimentation in the Hospitality Branch. Babcock Creek (10 miles long) is undergoing excessive sedimentation; the suspected sources are runoff from animal holding areas, construction sites, surface mines, and outfalls from combined sewers. Local authorities have reported however, that these problems in Babcock Creek are presently on the decline. Gravelly Run and Miry Run, 6 miles and 5 miles long respectively, are receiving what are believed to be diminishing quantities of sedimentation. Mill Branch is believed to be impacted by housing construction and combined sewers. Maple Run is reported to be affected by rising amounts of siltation, known sources of which are the rising levels of construction and stream channelization occurring in the sub-watershed. Patcong River receives ever increasing quantities of sediment, which is suspected to be coming from local storm sewers.

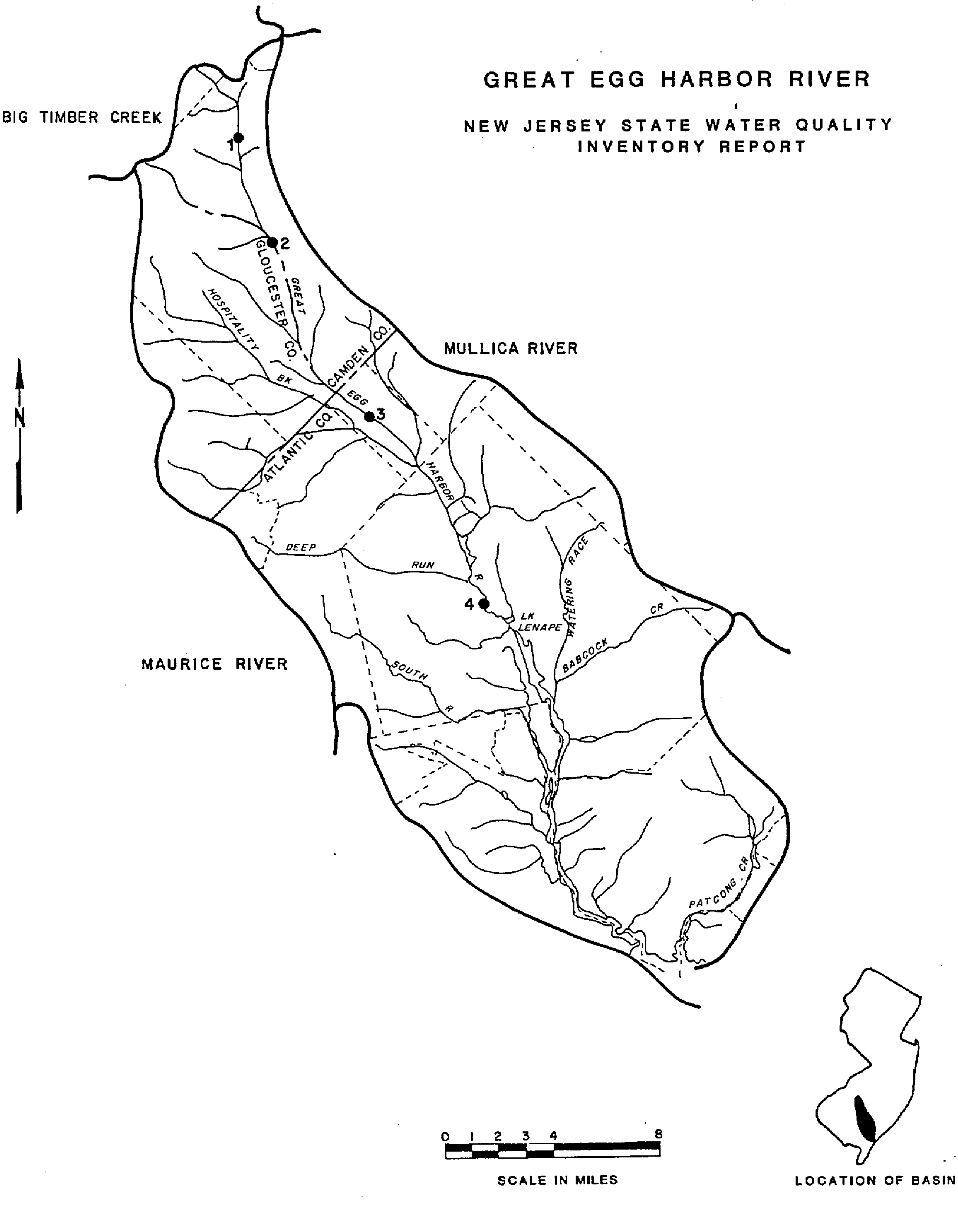
Of the lakes assessed in the Great Egg Harbor River Watershed, Colling Lake is reported to be receiving septic system leachate and road runoff. Lake Lenape is believed to be impacted by road and cropland runoff, and Patcong Lake is said to be becoming a shallow "silted in" lake from what is suspected to be runoff from housing construction sites and suburban surfaces.

Designated Use and Goal Assessment

Fecal coliform counts are low enough to classify the Great Egg Harbor River as meeting the swimmable use/goal in the region around Folsom and Weymouth (approximately 10 miles); however the remaining freshwater sections of the river are considered either not swimmable (5 miles) or marginally swimmable (10 miles). The river can also be considered as meeting the fish propagation/maintenance use with the exception of the river's headwaters in Camden County which are classified as partially degraded. Elevated pH levels have seriously affected the acid tolerant aquatic community in this area. The majority of the tidal sections of the river are classified as condemned for the direct harvesting of shellfish.

Monitoring Station List

Map Number	Station Name and Classification
1	Great Egg Harbor River near Sicklerville, FW-2 Nontrout
2	Great Egg Harbor River near Blue Anchor, Pineland Waters
3	Great Egg Harbor River at Folsom, Pineland Waters
4	Great Egg Harbor River at Weymouth, Pineland Waters


GREAT EGG HARBOR RIVER
NEW JERSEY STATE WATER QUALITY
INVENTORY REPORT
BIG TIMBER CREEK
MULLICA RIVER
MAURICE RIVER
GLOUCESTER CO.
CAMDEN CO.
ATLANTIC CO.
GREAT
EGG
HARBOR
R
HOSPITALITY
BK
DEEP
RUN
SOUTH
R
LK
LENAPE
WATERING
RACE
BABCOCK
CR
PATCONG CR
1
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0 1 2 3 4 8
SCALE IN MILES
LOCATION OF BASIN

WATER QUALITY INDEX PROFILE 1983-1987

Great Egg Harbor River — WATER QUALITY INDICATORS

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVERAGE AND CONDITION
Great Egg Harbor River near Sicklerville	AVG WQI	1	42	45	17	72	3	0	7	78 Poor
	WORST3 MONTHS	June-August	June-August	June-August	Oct-Dec	June-August	June-August		June-August	100 Very Poor June-August
Great Egg Harbor River near Blue Anchor	AVG WQI	1	29	37	18	27	3	0	6	43 Fair
	WORST3 MONTHS	June-August	Oct-Dec	June-August	May-July	May-July	Oct-Dec		Sept-Nov	62 Poor June-August
Great Egg Harbor River at Weymouth	AVG WQI	1	12	28	6	32	2	0	13	27 Fair
	WORST3 MONTHS	June-August	March-May	July-Sept	August-Oct	May-July	Dec-Feb		March-May	47 Fair June-August
Great Egg Harbor River at Folsom	AVG WQI	1	16	43	8	39	2	0	23	49 Fair
	WORST3 MONTHS	June-August	April-June	July-Sept	June-August	Jan-March	Oct-Dec		Oct-Dec	54 Fair August-Oct

LEGEND - Water Quality Index Description

WQI	Condition	Description
0-10	Excellent	No or minimal pollution; water uses met throughout the year.
11-25	Good	Generally low amounts of pollution; water uses periodically not met.
26-60	Fair	Pollution amounts vary from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution in high amounts; water uses not met.
81-100	Very Poor	Pollution occurs at extremely high levels; severe stress to stream life; water uses not met.
ID	Insufficient Data	

An index of 20 is equivalent to the level of water quality criteria.

N.J.P.D.E.S. DISCHARGE INVENTORY

WATERSHED: GREAT EGG HARBOR RIVER

DISCHARGE NAME	# NJPDES	RECEIVING WATERS	MUNICIPALITY/COUNTY	TYPE
Berlin Boro STP	0026972	Great Egg Harbor R	Berlin Twp./Camden	Municipal
Scott Paper Co.	0004324	Deep Run	Buena Boro/Atlantic	Ind./Comm.
Buena Boro MUA	0021717	Trib. to Deep Run	Buena Boro/Atlantic	Municipal
NJ Expressway Auth.	0026522	Makepeace Stream	Hammonton Town/Atl.	Municipal
Scholler Bros. Inc.	0021393	Babcock Stream	Hamilton Twp./Atl.	Ind./Comm.
Hamilton Twp. MUA	0002193	Babcock Stream	Hamilton Twp./Atl.	Municipal
Lenox China Inc.	0005177	Jack Pudding Brook	Galloway Twp./Atl.	Ind./Comm.
NJ Hwy. Auth.-Atlantic City	0027189	Mattily Run	Galloway Twp./Atl.	Municipal
Stockton State College	0027588	Bonita Tideway	Brigantine Cty./Atl.	Industrial
FAA Technical Center	0020800	Gravelly Run Branch of Great Egg	Egg Harbor City/Atl	Municipal
Atlantic Electric	0005444	Great Egg Harbor	Marmora/Cape May	Ind/Thermal

20. MULLICA RIVER

Watershed Description

The total drainage basin for the Mullica River and tributaries is 561 square miles. The Mullica River itself is about 45 miles long. This watershed is considered the major Pinelands drainage system. Major tributaries include the Wading River (30 miles long), Nochescatauxin Brook, Atsion Creek, the Bass River (8 miles long), Batsto River (18 miles), Nescochaque Creek, Landing Creek, Hammonton Creek (9 miles) and the Oswego River (21 miles). The Mullica River empties into Great Bay, a large estuarine system. The population centers are Winslow, Galloway, and Hammonton. Subwatersheds include the Batsto River, Upper Mullica River, Mid-Mullica River, Oswego River, West Branch Wading River, Lower Mullica River and Great Bay.

About 80 percent of this watershed is undeveloped state parks and forests, with the remainder being agricultural and developed areas. Of the 7 NJPDES permitted discharges here, 4 are municipal/institutional and 3 are industrial/commercial. The streams are classified FW-Pineland Waters, FW-1, FW-2 Nontrout, and SE-1. Much of these waterways are incorporated in the New Jersey Wild and Scenic River System.

Water Quality Assessment

The Mullica River watershed is the largest in southern New Jersey. As such, seven ambient monitoring stations are present on the Mullica and tributaries. The Mullica is sampled at the outlet of Atsion Lake and at Green Bank. Hammonton Creek, Batsto River, West Branch of the Wading River, Oswego River and the East Branch of the Bass River are all sampled. The Mullica watershed is for the most part undeveloped forests within State parks and forests. Water quality is among the best in the State, especially on the tributaries mentioned above (with the exception of Hammonton Creek). Surface waters of the Pinelands are naturally highly acidic with low nutrient content.

The Mullica River contains excellent water quality at Atsion, but degrades to generally good quality downstream at Green Bank. No pollution indicators contravened State criteria in samples collected at Atsion. The Mullica River at Green Bank, however, contains moderately excessive bacteria and nutrient concentrations, as well as pH which often is greater than natural background. Dissolved oxygen levels are adequate when measured as milligrams per liter. The geometric mean of fecal coliform counts between 1983 and 1987 was 41 MPN/100ml with 16 percent greater than 200 MPN/100ml. Total phosphorus was considered high in 66 percent of the samples from this period. High conductivity values, especially during summer months, indicates that some brackish tidal water occurs at Green Bank.

The Batsto River at Batsto, West Branch Wading River at Maxwell, Oswego River at Harrisville and East Branch Bass River at New Gretna all contain excellent water quality. In all streams, fecal coliform and nutrient concentrations are low and conditions are generally indicative of natural background. One elevated mercury and cadmium concentration were detected in the Batsto and West Branch Wading Rivers, respectively.

Hammonton Creek is the only waterway with significant pollution problems. The creek is subjected to a significant municipal point source discharge which has severely degraded water quality. The creek at Westcoatville is in very poor condition with severely reduced dissolved oxygen, elevated nutrients and pH not reflective of Pineland's water. During summer months water quality worsens to very poor conditions. Dissolved oxygen is often recorded less than 2.0 mg/l in summer months with biochemical oxygen demand frequently above 4.0 mg/l. Dissolved oxygen saturation averaged only 47 percent from 1983 to 1987 and forty-five percent of the dissolved oxygen values were less than 4.0 mg/l. Total phosphorus averaged .82 mg/l with all values contravening State criterion. Total inorganic nitrogen was excessive in the majority of the samples collected.

Biomonitoring has been performed on the Mullica River at Green Bank. Macroinvertebrate sampling found the site to be favorable, but there has recently been a decrease in clean water organisms along with an increase in pollution tolerant forms. Periphyton sampling suggests some organic enrichment although species representative of acidic conditions were abundant.

All rivers and streams in the Mullica River watershed which were evaluated by the New Jersey Division of Fish, Game and Wildlife were found to be supporting healthy warm water fish populations. The assessed waters were the Muskingun Brook, a 5 mile long tributary to the Batsto River; Sleeper Branch, a tributary to the Nochescatauxin Brook; Hammonton Creek, a 9 mile long tributary to the Mullica; the 21 mile long Oswego River; the 20 mile long West Branch of the Wading River; and lastly, the lower 16 miles of the Mullica itself.

Problem and Goal Assessment

Point Source Assessment

The Mullica watershed contains surface waters that are generally of natural quality. With the exception of Hammonton Creek, all monitored waters are of either excellent or good water quality. These waters are extremely sensitive to the effects of man's activities. Both point and nonpoint sources can seriously alter the acid-tolerant stream environments of the watershed.
Hammonton Creek is severely impacted by the Hammonton MUA wastewater discharge which adds wastewater discharge with high amounts of nutrients and oxygen-demanding substances. The Egg Harbor City STP is having deleterious impacts on Union Creek. Both facilities are currently under enforcement action by the DEP. One hazardous waste site has been identified in the Mullica watershed to be contaminating local surface waters. This is Woodland Chemical Dumps 1 and 2 near Chatsworth. The dumps are suspecting of releasing volatile organics, pesticides and metals to nearby cranbury bogs.

Nonpoint Source Assessment

Agricultural and suburban runoff can have significant impacts on water quality by adding nutrients and raising stream pH. This appears to be occurring throughout the Pinelands region in various waterways including those within the Mullica River watershed.

The Upper Mullica sub-watershed is known to suffer water quality problems caused by what are reported to be moderate amounts of nonpoint source contamination from construction activities, surface mining and landfills. Also reported is a problem with ditch bank erosion in drainage ditches associated with cropland areas. The Upper Mullica, Sleeper Branch, Gum Branch, and Albertsons Branch are all believed to be impacted by increasing amounts of road and highway runoff.

In the Mid-Mullica sub-watershed, runoff from croplands is suspected to be an occasional water quality problem, although it is assessed to be on the decline. As in the Upper Mullica, there are problems with ditch bank erosion. Hammonton Creek is suspected of being impacted on occasion by leachate from land disposal sites, urban runoff, as well as runoff from construction sites. Landing Creek, Indian Cabin Creek, and Union Creek are all believed to be impacted by moderate yet increasing amounts of urban stormwater runoff. Landing Creek is also suspected to be impacted by occassional leachate from local landfills.

In the Lower Mullica/Great Bay sub-watersheds, the Wading River is suspected to be severely impacted by hazardous waste sites. The problem is assessed as increasing and impairing the local fisheries. Surface mining, although evaluated as being in decline, is known to be causing occasional turbidity in Morses Mill Creek, a tributary to Great Bay. Matix Run, also a Great Bay tributary, is suspected of being impacted by rising levels of runoff from housing construction sites and stormwater. To the northeast, the Oswego River is assessed by local authorities to have no reportable non-point source pollution problems.

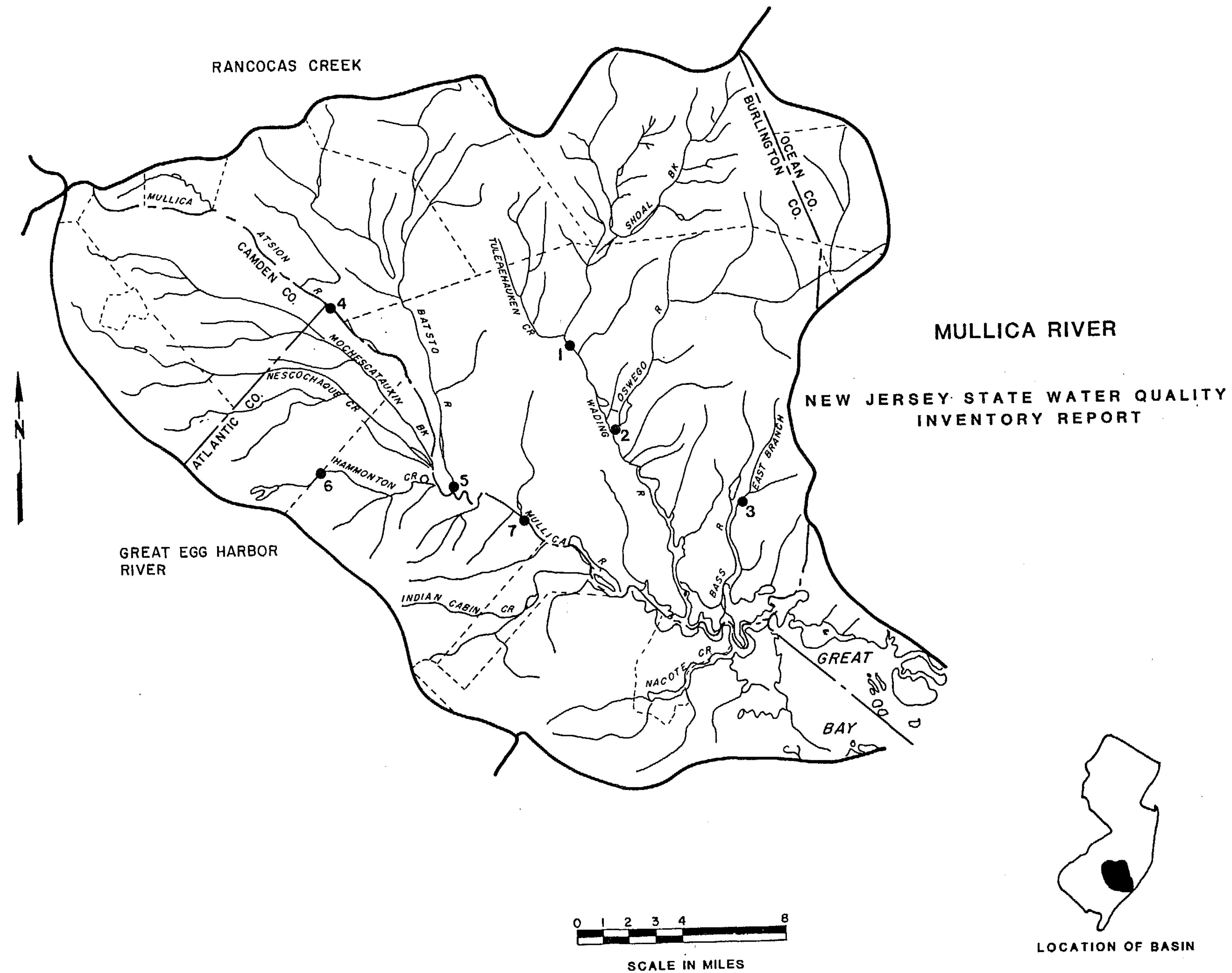
The only lake evaluated in the Mullica watershed was Hammonton Lake. Here increasing amount of runoff from urban surfaces, roads, and storm sewers were believed to be impacting the lake's water quality.

Designated Use and Goal Assessment

All waters in the Mullica River system, with the exception of Hammonton Creek, will meet the swimmable and fish propagation/maintenance goals of the Clean Water Act. The Lower Mullica around Green Bank can be considered to be marginally swimmable while Hammonton Creek is not swimmable. While all streams are thought to contain generally healthy fish communities, Hammonton Creek is considered to be partially meeting the fish propagation and maintenance goal because of very poor water quality conditions. Tidal sections of the Mullica River and tributaries are classified condemned, seasonal, or open with regard to shellfish harvesting, depending on location.

Monitoring Station List

Map Number	Station Name and Classification
1	West Branch Wading River at Maxwell, Pinelands Waters
2	Oswego River at Harrisville, Pinelands Waters
3	East Branch Bass River at New Gretna, Pinelands Waters
4	Mullica River at outlet of Atsion Lake, Pinelands Waters
5	Batsto River at Batsto, Pinelands Waters
6	Hammonton Creek at Westcoatville, Pinelands Waters
7	Mullica River at Green Bank, Pinelands Waters



RANCOCAS CREEK
MULLICA RIVER
NEW JERSEY STATE WATER QUALITY INVENTORY REPORT
GREAT EGG HARBOR RIVER
MULLICA
ATSION
R
CAMDEN CO.
BURLINGTON CO.
OCEAN CO.
ATLANTIC CO.
SHOAL BK
TULPEHAUKEN CR
BATSTO
R
MOCHESCATAUXIN
BK
NESCOCHAQUE CR
HAMMONTON CR
OSWEGO
R
WADING
R
EAST BRANCH
BASS
R
MULLICA
R
INDIAN CABIN CR
NACOTE CR
GREAT
BAY
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0 1 2 3 4 8
SCALE IN MILES
LOCATION OF BASIN

WATER QUALITY INDEX PROFILE 1983-1987

Mullica River

WATER QUALITY INDICATORS

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVERAGE AND CONDITION
West Branch Wading River at Maxwell	AVG WQI	1	13	3	3	6	1	0	6	4 Excellent
	WORST3 MONTHS	June-August	May-July	Oct-Dec	April-June	Dec-Feb	Nov-Jan		Aug-Oct	5 Excellent July-Sept
Oswego River at Harrisville	AVG WQI	3	5	4	9	7	1	0	9	5 Excellent
	WORST3 MONTHS	July-Sept	March-May	August-Oct	March-May	June-August	May-July		April-June	9 Excellent May-July
East Branch Bass River New Gretna	AVG WQI	1	21	5	8	7	1	0	ID	10Excellent
	WORST3 MONTHS	July-Sept	August-Oct	March-May	May-July	June-August	May-July			5 Good August-Oct
Mullica River at Atsion	AVG WQI	3	4	7	8	7	1	0	5	5 Excellent
	WORST3 MONTHS	July-Sept	May-July	Sept-Nov	May-July	July-Sept	Dec-Feb		April-June	5 Ecellent Aug-Oct
Hammonton Creek at Westcoat-ville	AVG WQI	2	62	47	13	59	3	1	11	84Very Poor
	WORST3 MONTHS	July-Sept	August-Oct	Jan-March	May-July	August-Oct	August-Oct	Jan-March	March-May	100verypoor July-Sept

LEGEND - Water Quality Index Description

WQI	Condition	Description
0-10	Excellent	No or minimal pollution; water uses met throughout the year.
11-25	Good	Generally low amounts of pollution; water uses periodically not met.
26-60	Fair	Pollution amounts vary from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution in high amounts; water uses not met.
81-100	Very Poor	Pollution occurs at extremely high levels; severe stress to stream life; water uses not met.
ID	Insufficient Data	

An index of 20 is equivalent to the level of water quality criteria.

WATER QUALITY INDEX PROFILE 1983-1987

Mullicia River Continued

WATER QUALITY INDICATORS

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVERAGE AND CONDITION
Batsto River	AVG WQI	3	8	6	8	8	1	0	13	6 Excellent
	WORST3 MONTHS	June-August	Oct-Dec	June-August	May-July	Dec-Feb	Oct-Dec		April-June	8 Excellent Dec-Feb
Mullica River at Batsto	AVG WQI	5	11	23	17	18	17	0	ID	18 Good
	WORST3 MONTHS	June-August	May-July	Sept-Nov	March-May	June-August	August-Oct			25Good/Fair March-May

LEGEND - Water Quality Index Description

WQI	Condition	Description
0-10	Excellent	No or minimal pollution; water uses met throughout the year.
11-25	Good	Generally low amounts of pollution; water uses periodically not met.
26-60	Fair	Pollution amounts vary from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution in high amounts; water uses not met.
81-100	Very Poor	Pollution occurs at extremely high levels; severe stress to stream life; water uses not met.
ID	Insufficient Data	

An index of 20 is equivalent to the level of water quality criteria.

N.J.P.D.E.S. DISCHARGE INVENTORY WATERSHED: Mullica River

DISCHARGE NAME	# NJPDES	RECEIVING WATERS	MUNICIPALITY/COUNTY	TYPE
Eastern Brewing Corp.	0028223	Cedar Branch Stream	Hammonton Twn/Atlntic	Ind./Comm.
Hammonton Waste Trmt. Plant	0025160	Hammonton Creek	Hammonton Twn/Atlntic	Municipal
NJ Exp. Auth. Elwood-Weymouth	0026531	Makepeace Stream	Hamilton Twp/Atlntic	Municipal
Whitehall Laboratories	0024210	Pond Lk. to Mullica River	Hammontom Twn/Atlntic	Ind./Comm.
Egg Harbor City WTP	0024589	Union Creek	Egg Harbor/Atlantic	Municipal
Carpenter Realty Inc.	0005428	Mullica River	Washington/Burlingtn	Mun/Ind/Thr
Presswell Records Mfg. Co.	0031275	Neschoaque Creek	Camden County SA	Thermal

21. TOMS RIVER

Watershed Description

Toms River is 31 miles long and drains an area of 124 square miles. It flows from western Ocean and Monmouth Counties southeast to Barnegat Bay at Toms River, 11 miles north of Barnegat Inlet. This is an area of low relief containing many small tributaries to the Toms River. The larger tributaries include Davenports Branch, Union Branch, and Wrangle Brook. Subwatersheds include Upper Toms River, Union Branch and Lower Toms River. The watershed also drains a large area of the Pinelands. Major impoundments include Success Lake and Horicon Lake. Population centers include Toms River, Lakehurst, Dover, and Manchester.

This watershed lies in the Coastal Plain and is about one-half forested, with the remainder being residential developments, a military installation and agricultural. There has been a substantial amount of new residential and commercial development throughout the watershed in the past five years. Of the 9 NJPDES permitted discharges within the watershed, 5 are industrial/commercial, and 4 are municipal/institutional. Waters have been classified as Pinelands (some of the Pinelands water are also designated trout maintenance), FW-l, FW-2 Nontrout and SE-1.

Water Quality Assessment

An evaluation of water quality data collected from the Toms River near the City of Toms River was utilized in this assessment. This station is part of the NASQUAN national monitoring network operated by the US Geological Survey. Additional monitoring is also performed by the Ocean County Health Department on the Toms River and other streams in the county. However, sample collection is limited to once or twice yearly.

The Toms River near Toms River contains generally good water quality with conditions reduced somewhat during the summer months. There appears to be some degradation since the previous report, as the river was considered to have excellent water quality in the first half of this decade. Indicators which appear at problematic levels are fecal coliform and pH. Fecal coliform exceeded the State criterion of 200 MPN/100 ml in 38 percent of the samples collected. Surface and ground waters are naturally acidic in this region. While pH averaged 5.07 SU between 1983 and 1987, 28 percent of the values were greater than the 5.5 SU upper criterion for Pinelands waters. Nutrients were within respective criteria for over 90 percent of the values. Dissolved oxygen concentrations are sufficient throughout the year and biochemical oxygen demand is usually less than 2.5 mg/l.

Ocean County Health Department monitoring of the Upper Toms River in the first half of this decade found good to fair quality waters. Low dissolved oxygen saturation is found in the upper watershed, probably due to ground water inflow to the river.

The fish communities of five streams which drain portions of the central coastal area other than the Toms River were assessed by the New Jersey Division of Fish, Game and Wildlife. These were the Metedeconk River (the North Branch and mainstem), Cedar Creek, Union Branch of the Toms River, Oyster Creek, and Westecunk Creek. All were judged to support healthy warm water fish communities. Some cold water fish species are also successfully supported in the upper stretches of the Toms River.

Problem and Goal Assessment

Point Source Assessment

The Toms River does not suffer from any severe pollution problems based on the ambient monitoring conducted. A few minor point sources are present in the watershed, but they do not appear to have significant effects on stream quality. The Ocean County UA regional sewerage system has eliminated a number of municipal facilities in the lower watershed. However, local officials feel that this is an increasing problem in the upper Toms River.

Two hazardous waste sites are suspected of impacting surface waters in the Toms River watershed. They are the Lakehurst Naval Air Engineering Center adjacent to the Ridgeway Branch (aromatics, volatile organics, and metals), and Ciba-Geigy which is potenially affecting the Toms River with volatile organics and metals.

Nonpoint Source Assessment

Nonpoint runoff from man's activities in the watershed have affected water quality from the standpoint of increases in nutrients and stream pH. The streams of the Pinelands region are very susceptible to increases in pH because of the low buffering capacity of the waters. Man's activities tend to cause increases in stream pH. The predominent nonpoint sources in the Toms River and surrounding watersheds are those associated with suburban development. It is the urban surface runoff and septic systems which are suspected to be primarily responsible for the loss of shellfish harvesting areas in Barnegat Bay. Agricultural inputs appear to be limited largely to the Upper Toms River sub-watershed. Another prominant source of nonpoint pollution in this central New Jersey region are the acid-producing mineral deposits located in the soil. When these soils are exposed to air and water as during construction, they produce sulfuric acid, which when carried away in runoff, acts to depress the pH of the receiving waters.

The upper reaches of the Toms River watershed receives agricultural runoff largely from croplands. It appears that the irrigated fields produce larger runoff problems in contrast to nonirrigated fields. Here the principal complaint is that runoff is acting to silt in private ponds. Suburban development is known to create a wide range of severely deleterious impacts to the Toms River including elevations in fecal coliform levels, turbidity, phosphorus, and dissolved solids; as well as declining dissolved oxygen levels, and a decline in the river's suitability for recreational use. These problems are reported to be brought about as a result of the combined impacts of rising levels of septic tank leachate and urban surface runoff. Housing construction in this watershed has caused increased turbidity and siltation as well as the release of increasing amounts of sulfuric acid from acid producing soils.

In the Lower Toms River sub-watershed, suburban development is the primary reported source of nonpoint pollution. Increasing amounts of urban surface runoff, storm sewer drainage, and natural pollution are known to have brought about high levels of phosphorus and coliform bacteria, increases in dissolved solids, and a decrease in dissolved oxygen levels. A decline in the recreational use of the waterway has resulted from periodic beach closures which have occurred in the downstream stretches. The lower Toms River, as well as the Union Branch, have received impacts from stream encroachment and housing construction. Wrangle Brook, a tributary to Toms River in Berkeley Township, is reported to be undergoing a decline in urban surface runoff and septic tank leachate; excessive levels of which have caused high ammonia levels in the stream and have correspondingly threatened the stream's recreational use.

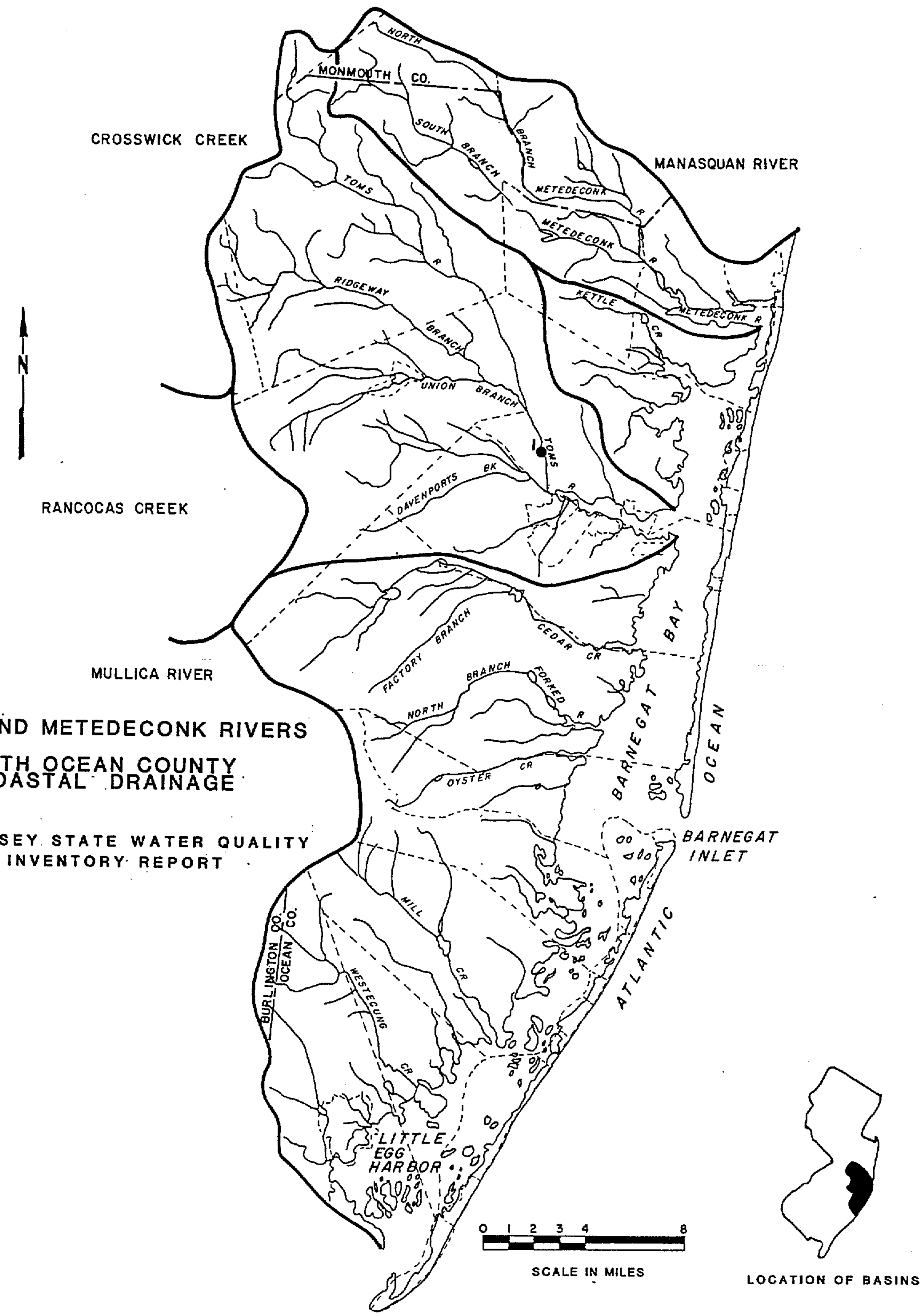
Pine Lake in Manchester Township is reported to have had beach closures because of pollution brought about by urban surface runoff combined with municipal sewage treatment plant effluent.

Designated Use and Goal Assessment

The Toms River will meet the fish propagation/maintenance goal of the Clean Water Act. In the future, however, increasing amounts of runoff may threaten some of the acid tolerent fish populations. Because of high summertime fecal coliform concentrations the river is considered not swimmable in the freshwater sections. In the tidal reaches the Toms River is classified marginally swimmable due to occasionally elevated bacterial levels. The tidal Toms River is also classified as condemned for the harvesting of shellfish.

Monitoring Station List

Map Number	Station Name and Classification
1	Toms River near Toms River, FW-2 Nontrout



TOMS AND METEDECONK RIVERS
WITH OCEAN COUNTY
COASTAL DRAINAGE

NEW JERSEY STATE WATER QUALITY
INVENTORY REPORT

WATER QUALITY INDEX PROFILE 1983-1987

Toms River

WATER QUALITY INDICATORS

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVERAGE AND CONDITION
Toms River near Toms River	AVG WQI	2	10	14	19	9	2	0	8	14 Good
	WORST3 MONTHS	July-Sept	June-August	Sept-Nov	Sept-Nov	June-August	Nov-Jan		May-July	28 Fair June-August

LEGEND - Water Quality Index Description

WQI	Condition	Description
0-10	Excellent	No or minimal pollution; water uses met throughout the year.
11-25	Good	Generally low amounts of pollution; water uses periodically not met.
26-60	Fair	Pollution amounts vary from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution in high amounts; water uses not met.
81-100	Very Poor	Pollution occurs at extremely high levels; severe stress to stream life; water uses not met.
ID	Insufficient Data	

An index of 20 is equivalent to the level of water quality criteria.

N.J.P.D.E.S. DISCHARGE INVENTORY

WATERSHED: TOMS RIVER

DISCHARGE NAME	# NJPDES	RECEIVING WATERS	MUNICIPALITY/COUNTY	TYPE
Naval Air Eng Ctr STP	0004642	Toms River Branch	Manchester/Ocean	Ind/Comm
Jackson Twp MUA Jr and Sr HS	0029513	North Branch Toms R	Jackson/Ocean	Municipal
Toms River Water Co	0005649	Toms River	Dover/Ocean	Municipal
Toms River Water Co	0005657	Bay Leaf Brook	Dover/Ocean	Municipal
Ciba-Giegy Corp Toms River	0004120	Atlantic Oc.,Toms R	Dover/Ocean	Ind/Comm
Oak Tree Mobile Home Park	0031267	Toms River	Jackson/Ocean	Ind

22. MANASQUAN RIVER

Watershed Description

The Manasquan River drains an area of 81 square miles and flows for 23 miles southeasterly from Freehold Township in Central Monmouth County to the Manasquan Inlet on the Ocean/Monmouth County line. Here, it empties into the Atlantic Ocean at Manasquan Inlet. The headwaters flow from a rural/agricultural area to the densely populated shore. The Manasquan River is connected in its lower reach to Barnegat Bay through the Point Pleasant Canal. The Manasquan River is fed by the major tributaries of Debois Creek, Mingamahone Creek, and Marsh Bog Brook (7 miles long). Population centers include Point Pleasant, Howell Township, Freehold Township, Freehold Borough, and Wall Township. The tides affect the Manasquan River up to a point two miles east of the Garden State Parkway.

About half of the land use in this watershed is crop/pastureland, although, like other watersheds in this region large-scale development is taking place in many areas. There are a number of small lakes and ponds, most of which are used for local recreational purposes. Of the 9 NJPDES permitted discharges in the watershed, one is municipal and 8 are industrial/commercial. The waters are classified FW-1, FW-2 Trout Maintenance, FW-2 Non-trout, and SE-1.

Water Quality Assessment

The Manasquan River has been assessed on the basis of sampling at Squankum. A tributary, Marsh Bog Brook is also routinely monitored and assessed at Squankum. Results indicate that both the Manasquan River and Marsh Bog Brook are of fair water quality. Water quality appears to have improved in the Manasquan during the past few years, while declining in Marsh Bog Brook. This is based on comparing present water quality indices with those from 1986. Sampling of the Upper Manasquan River near Georgia was performed until 1983. This monitoring also found fair conditions.

At Squankum the Manasquan contains excessive levels of nutrients and fecal coliform. Dissolved oxygen is periodically below criterion for trout maintenance waters and stream temperature is at times higher than that recommended for cold-water fisheries. Fecal coliform averaged 625 MPN/100ml between 1983 and 1987, with all of the values greater than 200 MPN/100ml. Dissolved oxygen is lower in summer months and DO saturation frequently falls below 80 percent. Stream temperatures during warm weather months also indicate some stress to cold-water fisheries may occur. Overall water quality conditions are reduced during the summer months.

Fair water quality is present in Marsh Bog Brook, a major tributary to the Manasquan. As with the Manasquan, high nutrients and bacteria are present in this stream. Fecal coliform was excessive in 65 percent of samples since 1983, and averaged 536 MPN/100ml during this period. Total phosphorus was also high in 75 percent of the samples taken, while total inorganic nitrogen was above 2.0 mg/l in 30 percent of the samples. Levels of organic nitrogen were periodically excessive. Dissolved oxygen concentrations were sufficient throughout the period of review, although DO saturation averaged only 81 percent.

Biomonitoring conducted on the Manasquan River at Squankum found less than favorable community structure. *Nais* spp. worms comprised 60 percent of the sample population and only 2 percent of the community were individuals representative of clean water habitats.

The Manasquan River is assessed by the New Jersey Division of Fish, Game and Wildlife as supporting a healthy fish community of both warm and cold water species.

Problem and Goal Assessment

Point Source Assessment

The Manasquan River and Marsh Bog Brook experience significant point source loadings. These have contributed to excessive nutrients and as a result, low levels of dissolved oxygen in some sections of the stream. In the Freehold Boro area, a number of industrial facilities discharge to tributaries of the Upper Manasquan. In the headwaters of the river, Lone Pine landfill, a Superfund hazardous waste site exists and contributes pollutants (volatile organics and metals) to the river. In addition, the Bog Creek Farm site is contaminating the North Branch Squankum Brook with volatile organics. A number of municipal wastewater facilities within the Manasquan watershed have been eliminated and their wastewater flows transferred to the Ocean County UA Northern facility for treatment and discharge to the Atlantic Ocean. Long-term improvements are expected in the Manasquan River from this action. No facilities currently under enforcement action by the Department are thought to be impacting water quality.

Nonpoint Source Assessment

The Manasquan River watershed receives a wide range of nonpoint source pollutants. Sources include agriculture, waste disposal, and suburban development. Here as in other eastern coastal watersheds, bacterial contaminations of waterways is a widespread and significant problem.

In the Manasquan River itself, agricultural nonpoint impacts are reported to be largely centered in the region just east of Route 9. Here croplands, pastureland, feed lots and animal holding areas have combined to cause nutrient loading, siltation, and high bacterial levels in the river. Bacterial levels after rain events are known to be on the decline from pastureland but are believed to be on the rise from local sheep and horse farms. Non-agricultural problems include dam and reservoir construction (Manasquan Reservoir) which has led to local stream bank modification and the loss of riparian vegetation. This has caused severe and increasing degrees of erosion, siltation, and turbidity in the stream; posing a threat to the local freshwater fishery. Increasing amounts of housing construction are also contributing to siltation and turbidity problems, while moderate to severe levels of runoff from urban surfaces and road salting have led to increases in salinity and nutrient loading.

Tributaries to the Manasquan received much the same types of nonpoint pollution as does the Manasquan itself. Squankum Brook is suspected of receiving increasing amounts of runoff from cropland, pastures, and animal holding areas, (and from the Bog Creek Farm site mentioned above). Marsh Bog Brook is suspected of being impacted by agricultural runoff from cropland and animal holding areas, a problem which is believed to be on the rise. Local landfills and septic systems are also suspected and known sources of pollution respectively. DeBois Creek is known to be impacted by siltation from both road and home construction. Here tree cutting during road construction has led to the destablization of streambanks. DeBois Creek is also degraded by increasing amounts of urban runoff.

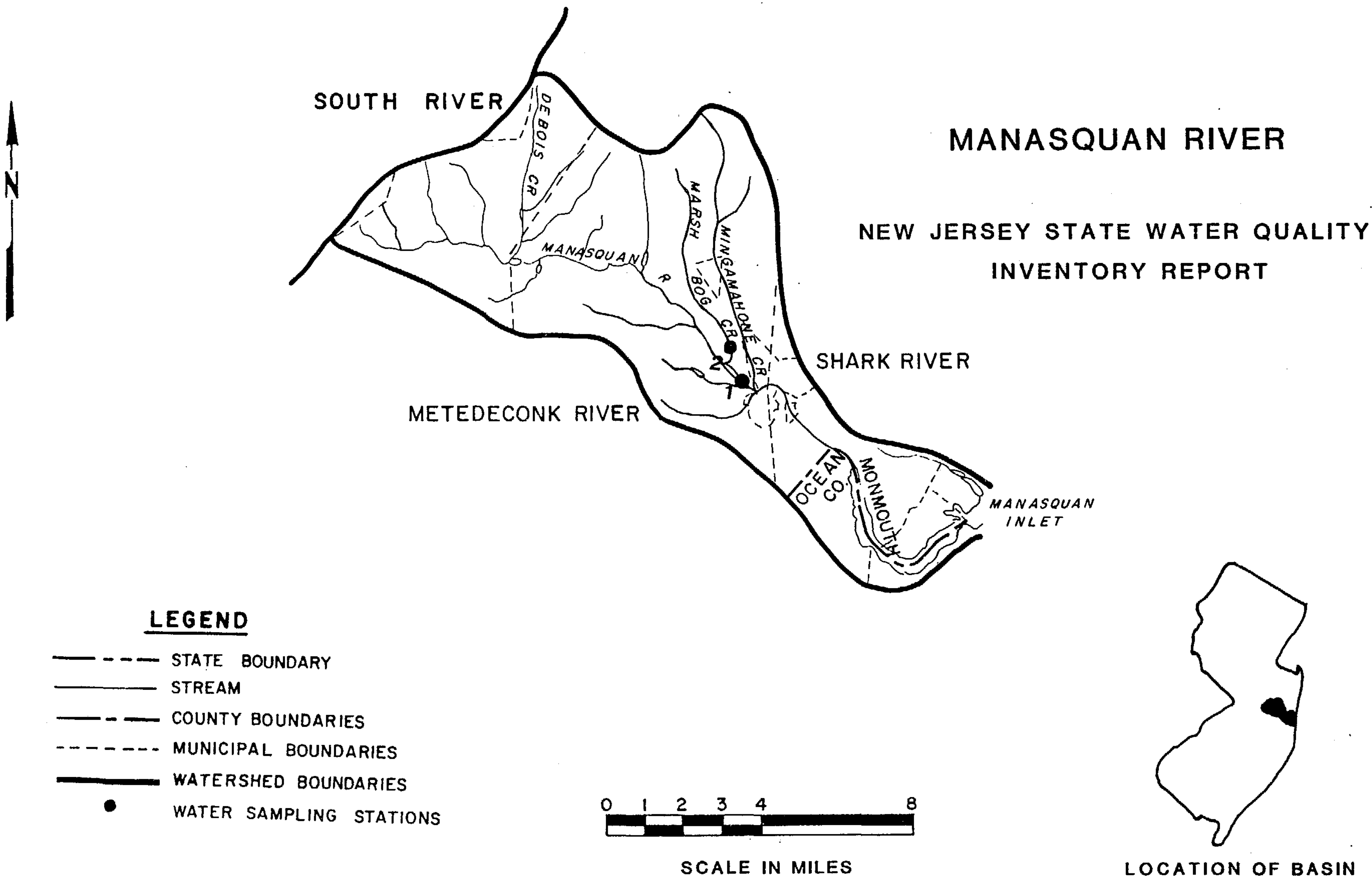
Lakes assessed in the watershed are experiencing high bacterial levels and eutrophication as a result of inputs from waterfowl and road runoff.

Designated Use and Goal Assessment

The Manasquan River and Marsh Bog Brook will not meet the swimmable goal of the Clean Water Act and New Jersey's designated use because of elevated fecal coliform levels. The tidal Manasquan River is also condemned for the harvesting of shellfish. These streams will meet the fish propagation and maintenance use and goal, but the fish communities are threatened in sections due to the water's highly enriched condition and occasional reduced dissolved oxygen.

Monitoring Station List

Map Number	Station Name and Classification
1	Manasquan River at quankum, FW-2 Trout Maintenance
2	Marsh Bog Brook at Squankum, FW-2 Nontrout


MANASQUAN RIVER
NEW JERSEY STATE WATER QUALITY
INVENTORY REPORT
N
SOUTH RIVER
DE BOIS CR
MARSH BOG CR
MINGAMAHONE CR
MANASQUAN R
SHARK RIVER
METEDECONK RIVER
2
1
OCEAN CO
MONMOUTH
MANASQUAN INLET
LEGEND
STATE BOUNDARY
STREAM
COUNTY BOUNDARIES
MUNICIPAL BOUNDARIES
WATERSHED BOUNDARIES
WATER SAMPLING STATIONS
0 1 2 3 4 8
SCALE IN MILES
LOCATION OF BASIN

WATER QUALITY INDEX PROFILE 1983-1987

Manasquan River

WATER QUALITY INDICATORS

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVERAGE AND CONDITION
Marsh Bog Brook at Squankum	AVG WQI	1	19	6	34	23	4	2	7	28 Fair
	WORST3 MONTHS	June-August	June-August	March-May	May-July	April-June	August-Oct	June-August	Oct-Dec	52 Fair June-August
Manasquan River at Squankum	AVG WQI	9	16	15	36	23	6	2	20	33 Fair
	WORST3 MONTHS	June-August	July-Sept	Oct-Dec	July-Sept	May-July	July-Sept	July-Sept	July-Sept	48 Fair July-Sept

LEGEND - Water Quality Index Description

WQI	Condition	Description
0-10	Excellent	No or minimal pollution; water uses met throughout the year.
11-25	Good	Generally low amounts of pollution; water uses periodically not met.
26-60	Fair	Pollution amounts vary from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution in high amounts; water uses not met.
81-100	Very Poor	Pollution occurs at extremely high levels; severe stress to stream life; water uses not met.
ID	Insufficient Data	

An index of 20 is equivalent to the level of water quality criteria.

N.J.P.D.E.S. DISCHARGE INVENTORY

WATERSHED: MANASQUAN RIVER

DISCHARGE NAME	# NJPDES	RECEIVING WATERS	MUNICIPALITY/COUNTY	TYPE
Peerless Tube Co	0004910	Manasquan River	Freehold/Monmouth	Ind/Comm
Harwood Co	0032956	Manasquan River	Farmingdale/Monmouth	Ind/Comm
Frequency Eng. Labs	0028622	Mingamahone Creek	Farmingdale/Monmouth	Ind/Comm
Arthur Brisbane Trmnt Ctr	0022977	Branch of Manasquan	Wall/Monmouth	Municipal
Brockway Glass Co	0002933	Debois Creek	Freehold/Monmouth	Ind/Comm
Nestles Co, Inc	0005606	Debois Creek	Freehold/Monmouth	Ind/Comm
Capscan Cable Co	0031917	Manasquan River	Freehold/Monmouth	Thermal
Howell-Freehold Car Wash	0050270	Long Brook	Howell/Monmouth	Ind
Minnesota Mining & Mtg. Co	0004359	Passaquanaqu Creek	Fairton/Cumberland	Ind/Thm/Sto
First Brands Corp	0029661	Burke's creek	Freehold/Monmouth	Ind/Comm

23. COASTAL MONMOUTH COUNTY DRAINAGE - NAVESINK AND SHARK RIVERS

Watershed Description

The Navesink River is the largest watershed in this segment, draining an area of 95 square miles, while the Shrewsbury River drains an area of 27 square miles, and the Shark River an area of 23 square miles. Tributaries to these rivers include: the Swimming River - Yellow Brook, Big Brook, Mine Brook, and Willow Brook; Parkers Creek, Oceanport Creek, and Little Silver Creek to the Shrewsbury River; and Jumping Brook (7 miles long) to the Shark River (10 miles). Small tidal streams drain northern Monmouth County to Raritan Bay and Sandy Hook Bay. These creeks include: Cheesequake Creek, Matawan Creek, and Waackaack Creek. Sub-watersheds include the Navesink, Shrewsbury and Shark Rivers, and tributaries to Raritan Bay. Population centers in this area include Asbury Park, Long Branch, Red Bank, Keyport, and Eatontown. There are many small ponds in this area, but major impoundments used for potable water are the Swimming River Reservoir and the Glendola Reservoir.

Land use in this watershed is about one third forested, with a smaller percentage agricultural. An appreciable amount of land is used for residential/commercial/industrial uses with about 15 percent being wetlands and water. Of the 36 NJPDES permitted discharges here 9 are municipal, and 27 are industrial/commercial. The waters in this region have been classified FW-2 Trout Maintenance, FW-2 Nontrout, and SE-1.

Water Quality Assessment

Jumping Brook and the Shark River near Neptune City are the only ambient water quality monitoring locations in these watersheds. Monitoring was discontinued on both Willow and Yellow Brooks in 1983, and the results of this monitoring is briefly described.

Yellow and Willow Brooks are tributaries to the Swimming River Reservoir, a potable water supply. Water quality was considered fair in these streams between 1981 and 1983 with fecal coliform and total phosphorus occurring in excessive levels.

Water quality is considered excellent and good based on sampling in Jumping Brook and the Shark River, respectively. The only water quality indicator found in problematic levels in Jumping Brook are occasional fecal coliform counts greater than 200 MPN/100ml (less than 20 percent). Nutrient and fecal coliform levels are higher in the Shark River, but still less than statewide averages. Fecal coliform had a geometric mean of 125 MPN/100ml in the Shark River with 30 percent greater than the State criterion. Total phosphorus was above the .1 mg/l criterion in 26 precent of the samples collected between 19893 and 1987. Dissolved oxygen is sufficient throughout the year in the two streams. Both streams are moderately acidic.

The warm-water fishery of the Navesink River was evaluated by the New Jersey Division of Fish, Game and Wildlife as healthy. The Shark River which supports both warm and cold water fish species was also assessed to support healthy communities. The Shrewsbury River in contrast, which supports warm water forms, was judged to be moderately degraded.

Problem and Goal Assessment

Point Source Assessment

Point sources contribute to water quality problems in many of the coastal streams of Monmouth County. Willow Brook suffers from the contribution of both point and nonpoint sources. A number of industrial point sources combined with suburban and agricultural runoff and septic systems are the likely causes of the elevated nutrients and bacteria in the brook. Engineered Precision Casting Co. is polluting Waackaack Brook with excessive metals and dissolved solids, and is currently under DEP enforcement orders. Imperial Oil Co. contains a hazardous waste site that is affecting Lake Lefferts and Birch Swamp Brook with organics, metals and PCBs. The Seaview Square Mall is built on an old dump site and is suspected of contaminating Deal Lake with metals and polyaromatic hydrocarbons.

Nonpoint Source Assessment

Horse farms, construction activities, and urban runoff are believed to be the principal nonpoint sources of pollution in this region. These have brought about siltation, nutrient loading, and excess bacterial contamination in the local rivers. Bacteria from horse farms and urban runoff has contaminated many of the shellfish harvesting beds in the downstream reaches of these rivers. In the tidal Navesink River a NJDEP nonpoint source control project is underway to alleviate the bacterial contamination of shellfish growing waters by suburban and agricultural runoff. The US Soil Conservation Service is also sponsoring a soil erosion and animal waste control project in the watershed.

In the Navesink watershed both agricultural and suburban construction activities have created severe pollution problems. Crop production and horse farming, especially the stockpiling of manure, are described by local authorities as a severe problem which has resulted in excessive nutrients and bacterial loadings. In addition, depressed dissolved oxygen levels now threaten the local fresh water fishery in the Navesink. Urban development impacts the Navesink largely by contributing stormwater runoff and septic tank leachate, both of which are believed to contribute to siltation, nutrient loading, and oil and grease contamination.

The Shark River watershed appears to be impacted more by suburban pollution sources and less by agricultural sources than the Navesink River watershed. Agricultural activity is suspected of contributing some runoff from pasturelands resulting in nutrient and silt loads entering the waterway. In this watershed road and housing construction, as well as urban runoff and landfills predominate as the suspected principal nonpoint pollution sources. Local construction on roadways and housing are suspected of contributing to severe siltation and turbidity, especially in the headwaters. In addition, construction activities expose acid-producing soils which in turn can cause a pH depression in local streams. Wide spread suburban runoff from both suburban surfaces have sent excess silt, road salts, and bacteria into the Shark River, its tributaries and lakes. Landfills and other forms of waste storage are also suspected sources of pollution in the Shark River. In the head waters in Tinton Falls, volatile organics are reported to be leaking into the local waters during rain. In Neptune City, underground waste storage tanks are known to be leaking petroleum products.

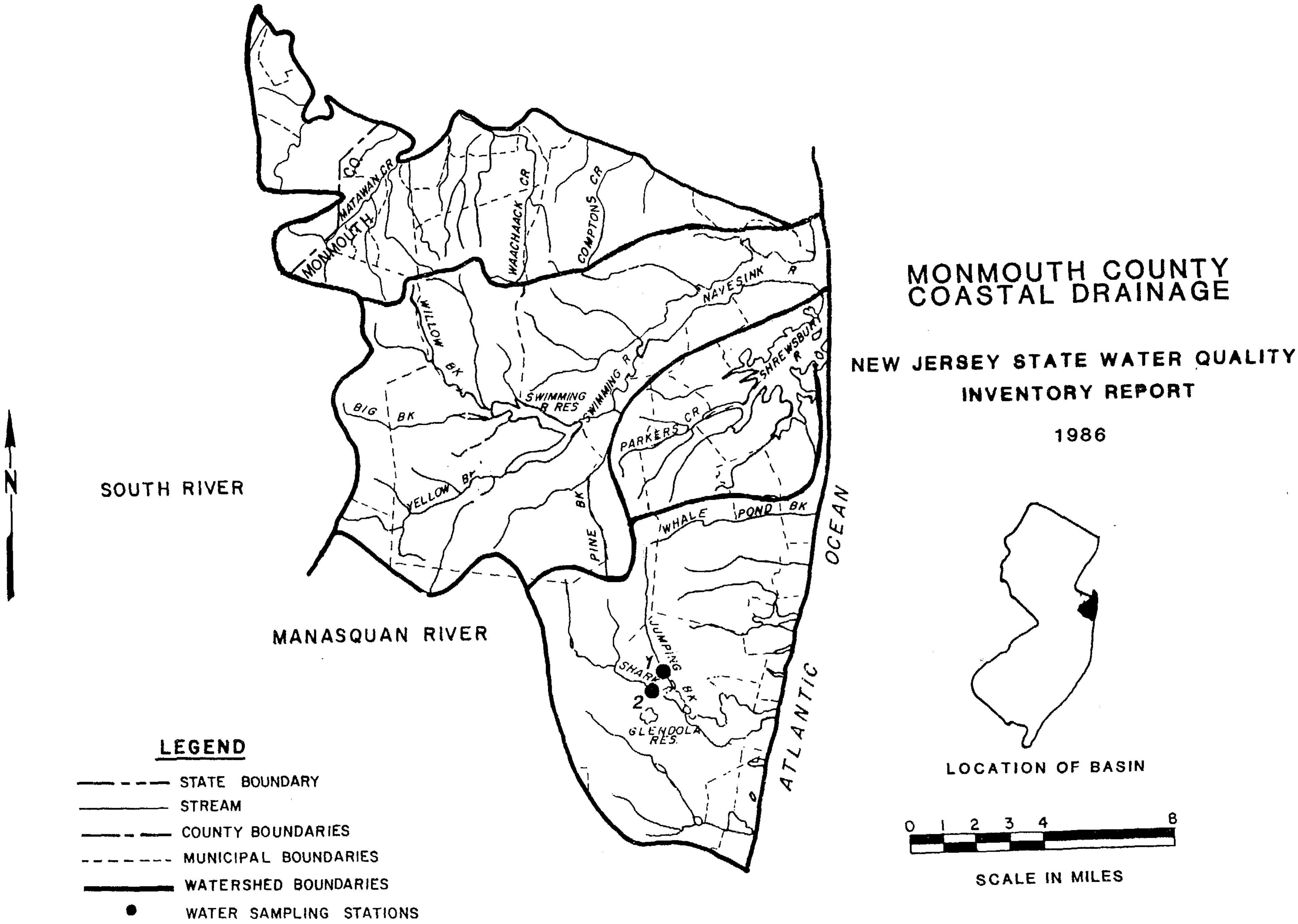
The Shrewsbury River is impacted by much of the same problems that impact the other local waters. Severe agricultural runoff from croplands, pastures, and animal holding areas are believed to be contributing excess nutrients, silt, bacteria, and nutrients to surface water. Horse manure at Monmouth Race Track is known to contribute high levels of bacteria to the river. Increases in suburban and commercial construction in the watershed have combined with runoff from storm sewers and suburban surfaces to send what are believed to be excess amounts of silt, salts, nutrients, and oil and grease into the waterway. This has caused high water temperatures, low dissolved oxygen levels, and restrictions in shellfish harvesting. Some nonpoint pollution in the Shrewsbury watershed is also suspected from septic systems, and from waste disposal sites.

Designated Use and Goal Assessment

The fish propagation/maintenance designated use will be met in the Shark and Navesink watersheds, but the fisheries of portions of the Navesink River and tributaries are considered threatened from poor water quality. The fisheries of the Shrewsbury River are partially degraded, and therefore, the river is considered to be partially meeting the fish propagation/maintenance use. Shellfish growing waters in this region are classified both condemned and restricted (further treatment required) for harvesting. Jumping Brook will partially meet the swimmable use, while the Shark River is not swimmable.

Monitoring Station List

Map Number	Station Name and Classification
1	Jumping Brook near Neptune City, FW-2 Nontrout
2	Shark River near Neptune, FW-2 Nontrout


MONMOUTH COUNTY
COASTAL DRAINAGE
NEW JERSEY STATE WATER QUALITY
INVENTORY REPORT
1986
N
SOUTH RIVER
MANASQUAN RIVER
ATLANTIC
OCEAN
MONMOUTH CO
MATAWAN CR
WAACHAACK CR
COMPTONS CR
NAVESINK R
SHREWSBURY R
WILLOW BK
BIG BK
SWIMMING R RES
SWIMMING R
PARKERS CR
YELLOW BK
PINE BK
WHALE POND BK
JUMPING BK
SHARK R
GLENDOLA RES
1
2
LOCATION OF BASIN
0 1 2 3 4 8
SCALE IN MILES
LEGEND
STATE BOUNDARY
STREAM
COUNTY BOUNDARIES
MUNICIPAL BOUNDARIES
WATERSHED BOUNDARIES
WATER SAMPLING STATIONS

WATER QUALITY INDEX PROFILE 1983-1987

Coastal Monmouth County

WATER QUALITY INDICATORS

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVERAGE AND CONDITION
Jumping Brook near Neptune City	AVG WQI	2	6	10	12	9	4	0	7	7 Excellent
	WORST3 MONTHS	June-August	Nov-Jan	Jan-March	July-Sept	July-Sept	Jan-March		August-Oct	11Excellent July-Sept
Shark River near Neptune	AVG WQI	1	8	2	20	15	4	0	7	11 Good
	WORST3 MONTHS	June-August	May-July	July-Sept	July-Sept	July-Sept	Dec-Feb		March-May	20 Good July-Sept

LEGEND - Water Quality Index Description

WQI	Condition	Description
0-10	Excellent	No or minimal pollution; water uses met throughout the year.
11-25	Good	Generally low amounts of pollution; water uses periodically not met.
26-60	Fair	Pollution amounts vary from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution in high amounts; water uses not met.
81-100	Very Poor	Pollution occurs at extremely high levels; severe stress to stream life; water uses not met.
ID	Insufficient Data	

An index of 20 is equivalent to the level of water quality criteria.

N.J.P.D.E.S. DISCHARGE INVENTORY

WATERSHED: Navesink River Sandy Hook Bay

DISCHARGE NAME	# NJPDES	RECEIVING WATERS	MUNICIPALITY/COUNTY	TYPE
South Amboy STP	0020541	Raritan Bay	South Amboy City/Mds	Municipal
South Amboy WTP	0003913	Raritan Bay	South Amboy City/Mds	Municipal
Sayreville Boro -Morgan STP	0023825	Raritan Bay	Sayreville Boro/Mds	Municipal
Old Bridge - Lawrence Hrbr.	0022471	Raritan Bay	East Brunswick/Mds	Municipal
Aberdeen Twp. MUA Strathmore	0022543	Mohingson Creek	Aberdeen/Monmouth	Municipal
Aberdeen Twp. MUA River Gard.	0022829	Matawan Creek	Aberdeen/Monmouth	Municipal
Biddle Sawyer Inc.	0030872	Lupatacong Creek	Keyport/Monmouth	Ind/Comm
Union Bch. Boro W.D.	0025437	Little Creek	Union Bch./Monmouth	Municipal
Shorelands Water Plant 1	0025453	East Creek	Hazlet Twp./Monmouth	Industrial
Comdata Systems Incorporated	0001775	Ditch to Mahora	Holmdel Twp/Monmouth	Ind/Comm
Bell Labs - Crawford Hill	0000485	Ramanessin Brook	Holmdel Twp/Monmouth	Ind/Comm
USEPA Office R&M	0005762	Sandy Hook Bay	Middletown/Monmouth	Ind/Comm
Seacoast Products	0000779	Sandy Hook Bay	Middletown/Monmouth	Ind/Comm
Middletown TWP SA	0025356	Atlantic Oc	Middletown/Monmouth	Municipal
McConnell Fuel Oil Co	0000868	Sandy Hook Bay	Atlantic Highlands/M	Ind/Comm
Holmdel Nursing + Conval	0027529	Branch Willow Brook	Holmdel/Monmouth	Ind/Comm
Pleasant Valley Pub Inc	0031674	Navesink River	Holmdel/Monmouth	Ind/Comm
Marlboro St Psych. Hosp.	0022586	Big Brook	Matawan Boro/Monmout	Municipal
Bell Laboratories	0000477	Ramanenssin Brook	Holmdel/Monmouth	Ind/Comm
Holmdell Twp. B. of Ed.	0027031	Ramanenssin Brook	Holmdel/Monmouth	Municipal
Pennwalt - SS White Div. Holm	0001481	Willow Brook	Holmdel Twp/Monmouth	Ind/Comm
Colts Neck Inn	0031771	Mine Brook	Colts Neck/Monmouth	Ind/Comm
US Naval Weapons Sta Earle	0023540	Trib to Yellow Brook	Colts Neck/Monmouth	Mun/Comm/In
Bendix Corp. Electric Power	0002623	Husky Brook	Eatontown Boro/Monm	Ind/Comm
Electronic Ass Inc	0002135	Turtle Mill Brook	West Long Branch/Mon	Ind/Comm
Shore Gas Oil Co.	0021849	Takannassee Lake	Ocean /Monmouth	Ind/Comm
NJHighway Auth. G.S.Pkwy	0021148	Trib to Shark River	Wall/Monmouth	Municipal
Molecular Wire Corp	0034258	Shark River	Wall/Monmouth	Thermal
Farmingdale WTP	0055581	Shark River	Farmingdale/Mon	Ind
Electronic Concepts Inc	0067075	Shrewsbury River	Eatontown/Monmouth	Ind
Allanhurst Water Dept T	0098647	Shark River	Allenhurst Boro/Mon	Ind
Prudential Property and Casua	0035718	Willow Brook	Holmdel/Monmouth	Municipal
Water Treatment Pl#2	0067156	Big Brook	Marlboro/Monm	Ind
Water Treatment Pl#3	0067164	Big Brook	Marlboro/Monm	Ind
Four Ponds Center Assoc.	0035441	Jumping Brook	Middletown/Monm	Thermal

N.J.P.D.E.S. DISCHARGE INVENTORY

NAVESINK RIVER
WATERSHED: SANDY HOOK BAY

DISCHARGE NAME	# NJPDES	RECEIVING WATERS	MUNICIPALITY/COUNTY	TYPE
East Coast Ice	0063134	Shark River	Neptune /Monmouth	Ind
Laird and Company	0035823	Yellow Brook	Scobeyville/Mon	Municipal
New Jersey Gravel and Sand Co	0032239	Wreck Pond Brook	Wall/Monmouth	Ind
Bel Ray Company Inc	0034177	Shark River	Wall Twp/Mon	Ind
Atlantic Highlands Borough	0034924	Many Mind Creek	Atlantic High/Mon	Municipal
Shorelands Water	0025461	East Creek	Holmdel Twp/Mon	Municipal

24. SOUTH BRANCH RARITAN RIVER

Watershed Description

The South Branch of the Raritan River drains an area of 279 square miles and flows from western Morris County through central Hunterdon County and into western Somerset County before joining the North Branch. The South Branch is 51 miles long. Population centers include Flemington, Washington Township, Mt. Olive, Clinton, and High Bridge. Major tributaries to the South Branch are the Neshanic River (11 miles long), Spruce Run Creek (6 miles) Mulhockaway Creek (8 miles), and Cakepoulin Creek. The major impoundments located in the watershed are Spruce Run Reservoir and Round Valley Reservoir. The watershed has been divided into the following sub-watersheds: Upper and Lower South Branches, Neshanic River and Pleasant Run.

The land use in this watershed is mostly agricultural, but suburban/industrial development is increasing at a rapid rate. Of the 23 NJPDES permitted discharges here, 12 are municipal, and 11 are industrial/commercial. The streams in this watershed are classified as FW-2 Trout Production, FW-2 Trout Maintenance, and FW-2 Nontrout.

Water Quality Assessment

The South Raritan River and tributaries are monitored at eight locations: the South Branch at Middle Valley, High Bridge, Stanton Station, and Three Bridges; Spruce Run near Glen Gardner and at Clinton; Mulhockaway Creek at Van Syckel; and the Neshanic River at Reaville. Bushkill Brook at Rockefellows Mill was sampled until mid-1983 when it was discontinued. Results from this monitoring indicates that the South Branch watershed contains generally good quality waters.

The Upper South Branch Raritan River has good water quality as measured at Middle Valley and High Bridge. Both stations degrade during summer months to fair quality because of elevated stream temperature, nutrients and fecal coliform. The river, trout maintenance at these two locations, frequently has summer stream temperatures above recommended criterion for the protection of cold-water fisheries. Fecal coliform exceeded the State criterion in 42 and 20 percent of the samples collected from 1983-1987 at Middle Valley and High Bridge, respectively. Total phosphorus was excessive in about one-half of the samples at both stations.

In the Lower South Branch as measured at Stanton Station and Three Bridges, water quality degrades somewhat to fair conditions. At Stanton Station stream temperatures are often high during warm-weather months for trout maintenance waters, while fecal coliform and total phosphorus were elevated in 38 percent of their samples. Unionized ammonia was periodically elevated in the early 1980s, but now appears to be at acceptable levels. Downstream at Three Bridges the South Branch is classified as nontrout waters. Water quality indicators found at problematic levels are fecal coliform and total phosphorus. The geometric mean of fecal coliform counts during the period of review (1983-1987) was 659 MPN/100ml with 66 percent above 200 MPN/100ml. Total phosphorus was elevated in 77 percent of the samples and averaged .15 mg/l. At both locations all dissolved oxygen readings were above respective criterion throughout the period. Biochemical oxygen demand is usually under 3.0 mg/l in the Lower South Branch as measured at Three Bridges and Stanton Station.

Monitoring of tributaries has found good water quality in Spruce Run and Mulhockaway Creek, and fair quality in the Neshanic River and Bushkill Brook. Spruce Run above Spruce Run Reservoir and Mulhockaway Creek are trout production waters with high summertime stream temperatures and moderately excessive fecal coliform and total phosphorus concentrations. Below the reservoir Spruce Run at Clinton is of excellent quality. Bushkill Brook is a small tributary draining Flemington and adjacent developed lands. The brook has a history of water pollution problems because of point sources. Sampling from 1981 to mid-1983 found the brook to be of fair quality with conditions becoming poor during the summer. Most severe are nutrients (total phosphorus and inorganic nitrogen), total dissolved solids and reduced dissolved oxygen saturation.

The remaining tributary monitored is the Neshanic River. The Neshanic River is of fair quality, but worsens to very poor quality in the summer. The river appears to be enriched and experiences supersaturated dissolved oxygen during this critical period as a result of elevated primary productivity. Both total phosphorus and total inorganic nitrogen appear in generally high amounts. Fecal coliform was above the 200 MPN/100ml criterion in 75 percent of samples collected, with a geometric mean of 511 MPN/100ml. Also occurring as a periodic problem are excessive total dissolved solids and un-ionized ammonia concentrations.

Biological monitoring of the South Branch at Stanton Station has found generally healthy conditions. Macroinvertebrate sampling indicates some nutrient enrichment. Forty-nine percent of the sample was clean water forms, with 42 percent periphyton feeders. Chlorophyll a levels were low in 1984 indicating low productivity.

The South Branch of the Raritan River was evaluated by the New Jersey Division of Fish, Game, and Wildlife as supporting a healthy fish community. The Neshanic River and Pleasant Run, tributaries to the South Branch, are both judged to contain healthy warm water fisheries.

Problem and Goal Assessment

Point Source Assessment

The South Branch Raritan River watershed contains a variety of pollution problems. Point and nonpoint sources both contribute to the water quality conditions found in the river. NJDEP enforcement actions are currently underway against the Clinton Township STP discharge to the South Branch, the Union Twp. Board of Education STP discharge to Mulhockaway Creek, the Clover Hill STP in Mt. Olive discharge to Drakes Brook and the Schooley Mountain STP discharge to the South Branch. These facilities are releasing excessive pollutants commonly associated with municipal treatment systems.

Nonpoint Source Assessment

The South Branch Raritan River exhibits a pattern which appears common throughout the State: a gradual decline in agricultural nonpoint source pollution paralleled by a rapid increase in suburban nonpoint sources. Both housing and road construction are reported to be in the rise in the Upper South Branch watershed and these are known to be sources of excessive sediment loads going to the South Branch. Coupled with these activities are the increasing problems with runoff from suburban sources and storm drains which are known to be contributing additional nutrients and sediments to the river. Septic tanks are reported to be a severe problem in this watershed, especially the increasing number of older systems which are failing in the High Bridge and Califon areas. Agriculture also is suspected in contributing nutrient and sediment loads to the South Branch. Local authorities suggest that while runoff from pasture lands maybe on the rise, the gradual loss of farmland in this watershed has caused a decline in the severity of cropland runoff. Agricultural sheet and rill erosion is considered severe in the South Branch watershed by the Soil Conservation Service. Local timber harvesting is noted to have contributed to siltation but this problem is also believed to be on the decline. Other pollution sources suspected of impacting the South Branch are surface mining activities and general road runoff.

Five large tributary streams were also evaluated in this watershed: Bushkill Creek, Spruce Run Creek, Mulhockaway Creek, the Neshanic River, and Pleasant Run. Bushkill Creek is believed to have been impacted by chemical spills and by urban runoff from combined sewers. Spruce Run Creek is known to be impacted by runoff from road maintenance, construction activities, feedlots, surface mines, and leaks from waste storage facilities. These in turn have sent excess silt as well as oil and grease into the stream, and are reported to have contributed to a general decline in the creek's fishery habitat. Mulhockaway Creek is said to be experiencing significant amounts of housing developments, which are causing severe silt problems. The Neshanic River receives what are believed to be excess levels of nutrient and sediment loads from agricultural sources. Of these suspected sources, runoff from local croplands is judged to be on the rise while feedlot and pasture land runoff is believed to be on the decline. Suburban development in the Neshanic watershed has brought about a rise in pollution problems. This includes construction activities, septic systems, suburban surface runoff, and road runoff. Additional problems in this sub-watershed have been reported from the improper land disposal of sludge. Pleasant Run is suspected of receiving excessive amounts of nutrient and sediment from croplands, suburban construction sites, storm sewers, and roads.

Designated Use and Goal Assessment

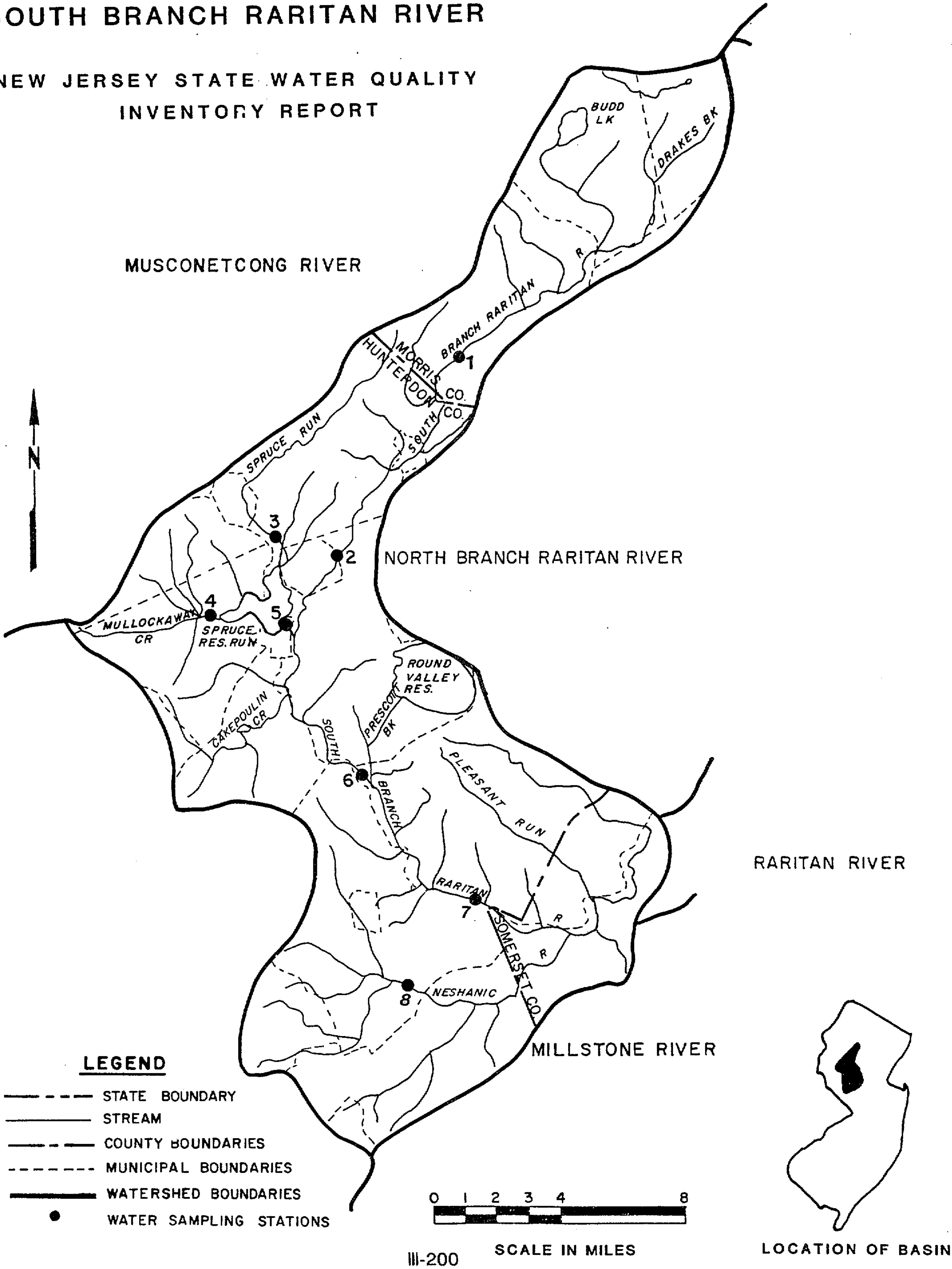
The Neshanic River, Mulhockaway Creek, most of the South Branch and the upper portions of Spruce Run all will not meet the swimmable use. Below Spruce Run Reservoir, Spruce Run appears to have sufficiently low fecal coliform counts to meet the swimmable designated use, while the South Branch in the High Bridge area is considered marginally swimmable. All waters will achieve the fish propagation and maintenance use and are recognized as having healthy cold and warm-water fisheries. The healthiness of the fisheries of most streams, however, are threatened in sections because of increasing pollution loads.

Monitoring Station List

Map Number	Station Name and Classification
1	South Branch Raritan River at Middle Valley, FW-2 Trout Maintenance
	South Branch Raritan River at High Bridge, FW-2 Trout Maintenance
3	Spruce Run near Glen Gardner, FW-2 Trout Production
4	Mulhockaway Creek at Van Syckel, FW-2 Trout Production
5	Spruce Run at Clinton, FW-2 Trout Maintenance
6	South Branch Raritan River at Stanton Station, FW-2 Trout Maintenance
7	South Branch Raritan River at Three Bridges, FW-2 Nontrout
8	Neshanic River at Reaville, FW-2 Nontrout

SOUTH BRANCH RARITAN RIVER

NEW JERSEY STATE WATER QUALITY INVENTORY REPORT



WATER QUALITY INDEX PROFILE 1983-1987

South Branch Raritan River

WATER QUALITY INDICATORS

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVERAGE AND CONDITION
SB Raritan River at Middle Valley	AVG WQI	9	7	7	23	20	6	6	17	19 Good
	WOPST3 MONTHS	July-Sept	May-July	August-OCt	July-Sept	July-Sept	Dec-Feb	July-Sept	Sept-Nov	35 Fair July-Sept
SB Raritan River at High Bridge	AVG WQI	13	5	10	20	18	6	6	20	20 Good
	WORST3 MONTHS	June-August	May-July	August-Oct	May-July	July-Sept	Nov-Jan	July-Sept	April-June	35 Fair June-August
Spruce Run near Glen Gardner	AVG WQI	9	7	9	18	23	4	1	17	17 Good
	WORST3 MONTHS	June-August	August-Oct	August-Oct	May-July	July-Sept	Sept-Nov	June-August	March-May	31 Fair July-Sept
Mulhockaway Creek at Van Syckel	AVG WQI	8	5	7	19	19	5	1	17	14 Good
	WORST3 MONTHS	June-August	June-August	Sept-Nov	June-August	Feb-April	Sept-Nov	May-July	March-May	33 Fair June-August
Spruce Run at Clinton	AVG WQI	16	6	6	9	10	4	1	17	12 Good
	WOR3T3 MONTHS	June-August	Sept-Nov	March-May	Oct-Dec	July-Sept	Dec-Feb	June-August	August-Oct	24 Good June-August

LEGEND - Water Quality Index Description

WQI	Condition	Description
0-10	Excellent	No or minimal pollution; water uses met throughout the year.
11-25	Good	Generally low amounts of pollution; water uses periodically not met.
26-60	Fair	Pollution amounts vary from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution in high amounts; water uses not met.
81-100	Very Poor	Pollution occurs at extremely high levels; severe stress to stream life; water uses not met.
ID	Insufficient Data	

An index of 20 is equivalent to the level of water quality criteria.

WATER QUALITY INDEX PROFILE 1983-1987

South Branch Raritan River Continued

WATER QUALITY INDICATORS

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVERAGE AND CONDITION
SB Raritan River at Stanton Station	AVG WQI	15	6	10	27	20	5	6	20	26Good/Fair
	WORST3 MONTHS	June-August	Jan-March	Feb-April	Oct-Dec	April-June	Oct-Dec	June-August	July-Sept	41 Fair June-August
SB Raritan River at Three Bridges	AVG WQI	3	7	7	40	22	7	6	6	28 Fair
	WORST3 MONTHS	June-August	Nov-Jan	August-Oct	Sept-Nov	Oct-Dec	Dec-Feb	July-Sept	Sept-Nov	42 Fair Sept-Nov
Neshanic River at Reaville	AVG WQI	5	45	23	37	20	11	8	5	54 Fair
	WORST3 MONTHS	July-Sept	July-Sept	July-Sept	Sept-Nov	Dec-Feb	Sept-Nov	July-Sept	Oct-Dec	85 VeryPoor July-Sept

LEGEND - Water Quality Index Description

WQI	Condition	Description
0-10	Excellent	No or minimal pollution; water uses met throughout the year.
11-25	Good	Generally low amounts of pollution; water uses periodically not met.
26-60	Fair	Pollution amounts vary from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution in high amounts; water uses not met.
81-100	Very Poor	Pollution occurs at extremely high levels; severe stress to stream life; water uses not met.
ID	Insufficient Data	

An index of 20 is equivalent to the level of water quality criteria.

N.J.P.D.E.S. DISCHARGE INVENTORY WATERSHED: S. BRANCH RARITAN RIVER

DISCHARGE NAME	# NJPDES	RECIEVING WATERS	MUNICIPALITY/COUNTY	TYPE
Washington Twp. Schooleys Mtn	0023493	S. Branch Raritan R	Washington Twp/Morr	Municipal
Welsh Farms Inc.	0001236	Electric Brook	Washington Twp/Morr	Ind./Comm.
Roxbury Twp. Skyview STP	0022683	Trib. to Jakes Brook	Roxbury Twp./Morris	Municipal
Clinton Twp. Bd. of Ed.	0023175	S. Br. Raritan River	Clinton Twp./Hunter	Municipal
Town of Clinton	0020389	S. Br. Raritan River	Clinton Twp./Hunter	Municipal
N. Hunterdon H.S.	0028363	Cramer Creek	Clinton Twp./Hunter	Municipal
Flemington Boro STP	0028436	Bushkill Creek	Flemington Boro/Hunt	Municipal
Ethyl Corp.	0003298	S. Br. Raritan River	Raritan Twp./Hunter	Ind./Comm.
Branchburg Twp. Neshanic Sta.	0020354	S. Br. Raritan River	Branchburg Twp/Somer	Municipal
Wilson Fiberfil International	0003051	Raritan River	Branchburg Twp/Somer	Ind./Comm.
Merck + Co. - 3 Bridges Farm	0003905	Erie Basin	Hillsborough Twp/Som	Ind./Comm.
Exxon Co. USA Flemington Term	0000892	Second Neshanic R.	Raritan Twp./Hunter	Ind./Comm.
Raritan Twp. MUA	0022047	S. Br. Raritan R.	Flemington Boro/Hunt	Municipal
Youth Corr. Inst. Annandale	0028487	S. Br. Raritan River	Annandale /Hunterdon	Municipal
Youth Correc. Inst.	0029874	S. Br. Raritan River	Sussex	Municipal
Dart Ind.	0032662	S. Br. Raritan River	Neshanic St./Somer	Thermal
U.S. Bronze Powders Corp.	0003336	Bushkill Creek	Raritan Twp./Hunter	Thermal
Meenam Oil Co. Inc.	0028754	Raritan River	Clinton Twp./Hunter	Industrial
Tenneco Polymers, Inc.	0001660	Bushkill Creek	Raritan Twp./Hunter	Ind./Comm.
Lentine Aggregates	0026450	Spruce Run Creek	Glen Gardner/Hunter	Industrial
Roxbury Motel Assoc.	0028304	Drakes Brook	Roxbury Twp/Morris	Municipal
Hercules Inc.	0000876	Black River	Roxbury Twp/Morris	Ind/Comm
Mt. Olive Twp.	0021954	Drakes Brook	Flanders/Morris	Municipal

25. NORTH BRANCH RARITAN RIVER

Watershed Description

The North Branch of the Raritan River, 23 miles long, drains an area of 190 square miles and flows from northwestern Morris County through Somerset County to the confluence with the South Branch between the towns of Branchburg and Raritan. Population centers include Bernardsville, Peapack-Gladstone, Chester, Bedminister, Mendham, and Far Hills. Major tributaries to the North Branch are Peapack Brook, Rockaway Creek (16 miles), and the Lamington River (27 miles). The only major impoundment in this drainage area is Ravine Lake. Sub-watersheds include the Upper and Lower North Branches and the Lamington River.

The land use in this watershed is primarily rural, woodland, agricultural and scattered commercial/residential, but there is intense development along the major road corridors (Rts. 24, 206, and highways 22, 287, and 78). Of the 22 NJPDES permitted discharges here, 10 are municipal, and 12 are industrial/commercial. The streams in this watershed have been classified, along various stretches, FW-2 Trout Production, FW-2 Trout Maintenance, and FW-2 Nontrout.

Water Quality Assessment

The North Branch Raritan River and tributaries contains generally good water quality, although conditions are marginal or fair in the headwaters and during warm weather. Ambient monitoring is performed on the North Branch near Chester, at Burnt Mills, and at North Branch. Sampling of tributaries includes the Lamington River near Ironia, near Pottersville, at Burnt Mills, and on the Rockaway Creek at Whitehorse.

The Lamington River, the major tributary of the North Branch, contains good water quality with the exception of the headwaters. The Upper Lamington River, as sampled near Ironia, is generally of fair quality, but conditions approach poor quality in the early summer period. The river at this location contains elevated nutrients and fecal coliform, and during low flow, reduced dissolved oxygen that may pose a threat to in-stream fisheries. Both total phosphorus and total inorganic nitrogen appeared at high concentrations. Downstream near Pottersville and at Burnt Mills water quality improves as dissolved oxygen is for the most part above respective criteria in samples collected since 1983. Total phosphorus and inorganic nitrogen is significantly lower, although it still exceeds recommended levels in 60 percent of all samples at the Pottersville station. Fecal coliform counts, lower at Pottersville, increase again at Burnt Mills. Geometric means of fecal coliform measurements near Pottersville and at Burnt Mills were 82 and 220 MPN/100ml, respectively. The Lamington River near Pottersville is a trout production stream. Summertime stream temperature frequently exceeds recommended temperature for these waters.

Rockaway Creek, a tributary to the Lower Lamington River is sampled at Whitehorse. Results indicate the stream is of good quality, but that during the early summer conditions degrade to fair quality. The creek has generally low nutrients, (approximately one-third of the total phosphorus values were greater than State criterion), but experiences high fecal coliform counts. Fecal coliform exceeded 200 MPN/100ml in 60 percent of the samples collected between 1983 and 1987, and had a geometric mean of 232 MPN/100ml. Dissolved oxygen is sufficient for this warm-water stream. The Lamington River and Rockaway Creek are both mildly alkaline.

The North Branch Raritan River measured near Chester has fair quality waters containing elevated nutrients and fecal coliform concentrations. In addition, stream temperatures are periodically above recommended levels during the summer for trout production waters. Total phosphorus was greater than the State criterion in all of samples collected and averaged .44 mg/l. Total inorganic nitrogen concentration were also high averaging 2.6 mg/l between

1983 and 1987. The geometric mean of fecal coliform during this period was 119 MPN/100ml with 26 percent above 200 MPN/100ml. Dissolved oxygen appears to drop below the 7.0 mg/l criterion for trout waters at times during warm-weather months. One elevated cadmium level was recorded on the North Branch at this location during the period of review.

In the Lower North Branch water quality is generally good although fecal coliform is frequently high. Geometric means were 178 and 138 MPN/100 ml at Burnt Mills and North Branch, respectively. Total phosphorus is moderately high at Burnt Mills, averaging .13 mg/l, but concentrations lower at North Branch, averaging only .08 mg/l. Dissolved oxygen levels are adequate with no measured concentrations below 4.0 mg/l.

Biomonitoring of the North Branch at North Branch found generally healthy conditions with balanced populations. Macroinvertebrate sampling found both a low percentage of clean water species and no pollution tolerant species. Primary productivity was high in 1984 based on chlorophyll a concentrations. Turbidity and siltation is thought to suppress primary productivity in the stream.

The Lamington River, Trout Brook and the North Branch Raritan River are all assessed to be supporting healthy fish communities. The Lamington and the upper reaches of the North Branch Raritan both support cold water fish species, while in the lower portion of the North Branch the fish community shifts to one of warm water forms.

Problem and Goal Assessment

Point Source Assessment

The North Branch Raritan River and tributaries experience water quality degradation in the vicinity of a number of point sources. The Upper Lamington River, while naturally having large diurnal dissolved oxygen fluctuations, contains elevated total phosphorus primarily from the Roxbury Township-Ajax Terrace STP. This facility is to be upgraded for phosphorus removal. Other enforcement actions involving facilities impacting stream quality include: Valley Road Sewerage Co. discharge to the Lamington River (BOD, total chlorine residual and dissolved oxygen), Chester Shopping Center for discharging excessive suspended solids, ammonia, and chlorine to the Lamington, Westinghouse Elevator Co. for discharging cooling (this water contains a variety of pollutants) and storm waters to the Lamington without appropriate permits, Bernardsville Quarry for excessive suspended solids to Mine Brook, and the Mendham Boro STP for excessive ammonia discharges to India Brook. The Combe Fill South waste site is contaminating tributaries of the Lamington with volatile organics.

Nonpoint Source Assessment

Active suburban development appears to be the primary nonpoint pollution source in the North Branch Raritan River watershed. The Lamington River is impacted by increasing amounts of housing construction along its entire length, many of these developments being on former farmlands. These developments are suspected of contributing nutrients and sediments to the river. Other reported problems arising from suburban development are increasing urban runoff from storm sewers, leachate from septic tanks, and runoff from land clearing. Agriculture is a suspected nonpoint source problem largely from crop production, and from one poorly managed pasture. Rockaway Creek, a tributary to the lower Lamington is reported to have a severe pollution problem from surface mines. The Rockaway is also suspected to be impacted by horse pasture and septic systems in its north branch, and road runoff in its south branch.

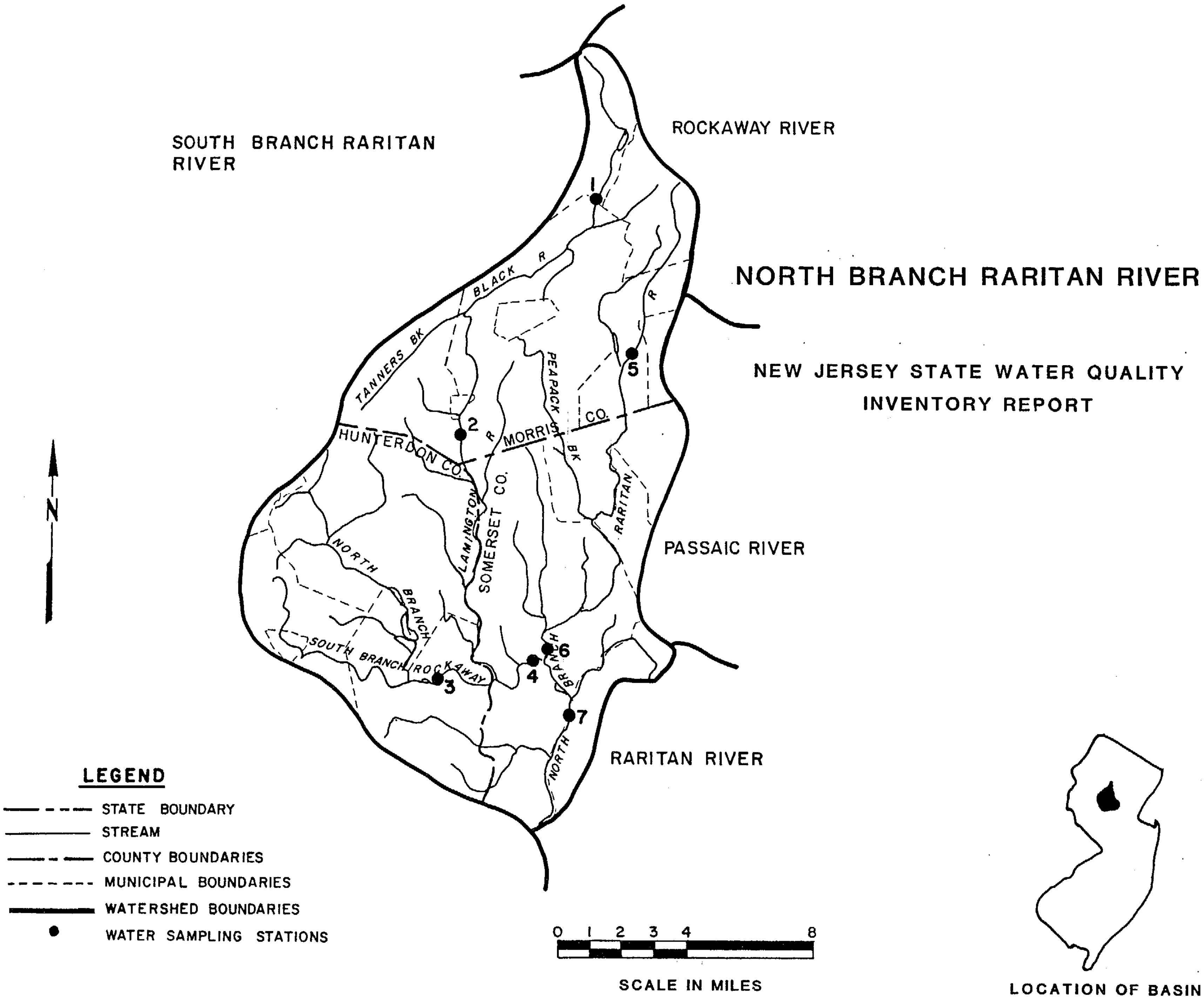
The North Branch Raritan River is impacted much the same way as is the Lamington. Active suburban development along much of its length, especially in the Pluckemin and Mendham areas, is known to contribute to the excessive loading of nutrients and sediments. Another suspected suburban pollution source is urban surface runoff, which appears to be a declining problem now due to better stormwater control. Agricultural activities also have an impact in this river, primarily through poorly managed pasture lands and feedlots. Pasture lands are estimated by local authorities to be an increasing nonpoint problem while the feedlots are assessed to be in decline due to an overall decrease in farm activity in the area.

Designated Use and Goal Assessment

Monitored waters of the North Branch and tributaries are not of swimmable quality because of fecal coliform concentrations. However, they do contain generally healthy fish communities. Recreational fishing for trout and smallmouth bass is heavy in many streams of the watershed. Water quality problems threaten the fisheries in sections of the Lamington and North Branch.

Monitoring Station List

Map Number	Station Name and Classification
1	Lamington River near Ironia, FW-2 Nontrout
2	Lamington River near Pottersville, FW-2 Trout Production
3	Rockaway Creek at Whitehorse, FW-2 Nontrout
4	Lamington River at Burnt Mills, FW-2 Nontrout
5	North Branch Raritan near Chester, FW-2 Trout Production
6	North Branch Raritan River at Burnt Mills, FW-2 Nontrout
7	North Branch Raritan River at North Branch, FW-2 Nontrout


NORTH BRANCH RARITAN RIVER
NEW JERSEY STATE WATER QUALITY INVENTORY REPORT
SOUTH BRANCH RARITAN RIVER
ROCKAWAY RIVER
PASSAIC RIVER
RARITAN RIVER
BLACK R
TANNERS BK
PEAPACK BK
HUNTERDON CO.
MORRIS CO.
SOMERSET CO.
LAMINGTON R
NORTH BRANCH
SOUTH BRANCH
ROCKAWAY
RARITAN
1
2
3
4
5
6
7
N
LEGEND
STATE BOUNDARY
STREAM
COUNTY BOUNDARIES
MUNICIPAL BOUNDARIES
WATERSHED BOUNDARIES
WATER SAMPLING STATIONS
0 1 2 3 4 8
SCALE IN MILES
LOCATION OF BASIN

WATER QUALITY INDEX PROFILE 1983-1987

North Branch Raritan River

WATER QUALITY INDICATORS

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVERAGE AND CONDITION
Lamington R near Ironia	AVG WQI	2	38	7	18	38	10	2	7	41 Fair
	WORST3 MONTHS	June-August	May-July	Jan-March	July-Sept	May-July	Dec-Feb	March-May	April-June	58 Fair May-July
Lamington R near Pottersville	AVG WQI	15	6	5	18	18	6	2	18	18 Good
	WORST3 MONTHS	June-August	June-August	Jan-March	Nov-Jan	June-August	Nov-Jan	March-May	Sept-Nov	30 Fair June-August
Lamington R at Burnt Mills Brook	AVG WQI	2	7	8	25	16	6	2	8	15 Good
	WORST3 MONTHS	July-Sept	August-Oct	August-Oct	Nov-Jan	May-July	Aug-Oct	August-Oct	April-June	22 Good July-Sept
Rockaway Creek at Whitehouse	AVG WQI	2	6	10	25	18	5	4	6	16 Good
	WORST3 MONTHS	July-Sept	March-May	March-May	May-July	June-August	August-Oct	July-Sept	June-August	30 Fair May-July
NB Raritan River near Chester	AVG WQI	10	8	7	17	37	6	5	ID	27 Fair
	WORST3 MONTHS	June-August	June-August	Dec-Feb	June-August	July-Sept	Sept-Nov	March-May		48 Fair July-Sept

LEGEND - Water Quality Index Description

WQI	Condition	Description
0-10	Excellent	No or minimal pollution; water uses met throughout the year.
11-25	Good	Generally low amounts of pollution; water uses periodically not met.
26-60	Fair	Pollution amounts vary from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution in high amounts; water uses not met.
81-100	Very Poor	Pollution occurs at extremely high levels; severe stress to stream life; water uses not met.
ID	Insufficient Data	

An index of 20 is equivalent to the level of water quality criteria.

WATER QUALITY INDEX PROFILE 1983-1987

North Branch Raritan River

WATER QUALITY INDICATORS

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVERAGE AND CONDITION
NB Raritan River AT Burnt Mills	AVG WQI	1	11	15	21	19	6	4	8	16 Good
	WORST3 MONTHS	June-August	Sept-Nov	August-Oct	July-Sept	June-August	Sept-Nov	August-Oct	April-June	32 Fair July-Sept
NB Raritan River at NB	AVG WQI	2	8	8	20	15	6	2	11	15 Good
	WORST3 MONTHS	June-August	June-August	Aug-Oct	May-July	Dec-Feb	August-Oct	August-Oct	August-Oct	31 Fair June-August

LEGEND - Water Quality Index Description

WQI	Condition	Description
0-10	Excellent	No or minimal pollution; water uses met throughout the year.
11-25	Good	Generally low amounts of pollution; water uses periodically not met.
26-60	Fair	Pollution amounts vary from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution in high amounts; water uses not met.
81-100	Very Poor	Pollution occurs at extremely high levels; severe stress to stream life; water uses not met.
ID	Insufficient Data	

An index of 20 is equivalent to the level of water quality criteria.

N.J.P.D.E.S. DISCHARGE INVENTORY

WATERSHED: N. BRANCH RARITAN R.

DISCHARGE NAME	# NJPDES	RECEIVING WATERS	MUNICIPALITY/COUNTY	TYPE
Branchburg Twp Fox Hollow STP	0020338	Trib. to N. Branch Raritan River	Somerville Boro/Som	Municipal
Vianini. Pipe Inc.	0032328	Chambers Brook	Somerville Boro/Som	Ind./Comm.
Readington Twp. Bd. of Ed.	0026677	Holland Brook	Readington Twp./Hunt	Municipal
Taylor Forge Stainless	0003638	N. Branch Raritan R.	Branchburg Twp/Somer	Ind./Comm.
Print Products Division	0003158	Trib to Chambers Brk	Branchburg Twp/Somer	Ind./Comm.
RCA Corp. Solid State Plant	0002569	Raritan River	Bridgewtr. Twp/Somer	Ind./Comm.
Chester Shopping Mall	0026824	N. Branch Raritan R.	Chester Boro/Morris	Ind./Comm.
County Concrete Corp.	0002861	Black River	Roxbury Twp./Morris	Ind./Comm.
Oldwick Materials Inc.	0002197	Rockaway Creek	Tewksbury Twp/Hunter	Ind./Comm.
A.M. Best Co.	0028452	N. Br. Rockaway Crk.	Tewskbury Twp/Hunter	Ind./Comm.
John Z. Delorean	0027227	Lamington River	Bedminster Twp/Somer	Ind./Comm
Bedminster Twp. STP	0028495	N. Br. Raritan River	Bedminster Twp/Somer	Municipal
Environmental Disposal Corp.	0033995	Raritan River	Bedminster Twp/Somer	Ind./Comm.
Peapack-Gladstone STP	0021881	Peapack Brook	Peapack-Gladstone/ Somerset	Municipal
Bernardsville Boro STP	0026387	Mine Brook	Bernardsville Boro/ Somerville	Municipal
Bernardsville Quarry Inc.	0029637	Mine Brook	Bernardsville Boro/ Somerville	Ind./Comm.
Branchburg Township of	0020362	Tri to Chambers Brk	Branchburg Twp/Somer	Municipal
During Farms Inc.	0031488	Rockaway Creek	Whitehouse Station/ Hunterdon	Thermal/Ind
Readington-Lebanon S.A.	0098922	Rockaway Creek	Readington Twp./Hunt	Municipal
Valley Road Sewerage Co.	0022781	Lamington R.	Tewksbury/Hunterdon	Municipal
Roxbury Twp - Ajax STP	0022675	Lamington R.	Roxbury/Morris	Municipal
Mendham Boro STP	0021334	India Brook	Mendham/Somerset	Municipal

26. MILLSTONE RIVER

Watershed Description

The Millstone River drains an area of 271 square miles that include parts of Hunterdon, Somerset, Middlesex, Mercer, and Monmouth Counties. This river is 38 miles long and flows from Millstone Township in Monmouth County to the Raritan River near Manville and Bound Brook. For most of the lower half of the river it flows adjacent to the Delaware and Raritan Canal. The population centers in this drainage basin are Princeton Township and Borough, Manville, South Brunswick, East and West Windsors Township, Hightstown, and Pennington. Major tributaries include Stony Brook (21 miles), Cranbury Brook, Bear Brook, Ten Mile River, Six Mile River, and Bedens Brook (10 miles). The largest impoundment in this area is Carnegie Lake in Princeton, but there are a large number of smaller lakes in the watershed. Sub-watersheds include Stony Brook and the Upper and Lower Millstone.

The land use in the Millstone watershed is primarily suburban development with scattered agricultural areas. Extensive and recent development is present in the Upper Millstone watershed. Of the 43 NJPDES permitted discharges here, 23 are municipal and 20 are industrial/commercial. All surface waters in the Millstone basin are classified FW-2 Nontrout.

Water Quality Assessment

Seven ambient monitoring stations currently exist in the Millstone watershed. They are: the Millstone River near Manalapan, at Grovers Mill, at Kingston, at Blackwells Mills and at Weston; Stony Brook at Princeton; and Bedens Brook near Rocky Hill. Results of this monitoring from 1983 through 1987 shows generally good to fair quality waters exist in the watershed.

The Upper Millstone River (above Carnegie Lake) is sampled near Manalapan and Grovers Mill. The Manalapan location has good overall water quality, but contains fair conditions during summer months. Both fecal coliform and total phosphorus are moderately excessive, averaging 130 MPN/100ml and .19 mg/l, respectively. Dissolved oxygen concentrations were above 4.0 mg/l at all times, but percent saturation periodically falls below 80 percent. At Grovers Mill the Millstone River attains its worst water quality. Here the river contains fair to poor water quality with conditions degrading further during late late spring/early summer. Both total phosphorus and total inorganic nitrogen are highly elevated, averaging .32 mg/l and 3.4 mg/l, respectively. Fecal coliform exceeded State criterion in 57 percent of all samples collected and had a geometric mean 226 MPN/100 ml. Although dissolved oxygen concentrations were only occasionally measured below 4.0 mg/l, when analyzed as percent saturation, it was below 80 percent in 65 percent of the values and averaged only 70 percent. Biochemical oxygen demand often is greater than 4.0 mg/l. One elevated concentration of lead and copper was also found in the period reviewed.

Stony Brook, a tributary of Carnegie Lake, is sampled at Princeton. Water quality here is fair with conditions slightly worse during winter months. Nutrients (primarily phosphorus) and fecal coliform appear to be the main problem indicators in the brook. Total phosphorus averaged .08 mg/l with 83 percent of the values greater than the .05 mg/l State criterion. Fecal coliform exceeded its recommended level in 41 percent of the samples analyzed and had a geometric mean of 248 MPN/100ml. Dissolved oxygen saturation is frequently above 120 percent indicating supersaturated conditions.

At the outlet of Carnegie Lake the Millstone River emerges with good quality waters except during summer months when good-fair conditions are present. Total phosphorus and total inorganic nitrogen were above recommended levels in 72 and 22 percent of the samples collected, respectively. The geometric mean of fecal coliform was 132 MPN/100ml with 29 percent greater than 200 MPN/100ml. Downstream at Blackwells Mills water quality degrades to fair quality.

Nutrients and bacterial levels are higher, and dissolved oxygen saturation is lower. The Millstone at Blackwells Mills seems to be highly enriched. Total phosphorus averaged .34 mg/l, while inorganic nitrogen had a mean value of 2.5 mg/l. Fecal coliform exceeded recommended criterion in 66 percent of the samples and had a geometric mean of 268 MPN/100ml. Dissolved oxygen saturation averaged only 85 percent from 1983 through 1987 with nearly one-quarter of the values below the 80 percent level.

The final monitoring station on the Millstone River before it joins the Raritan River is located at Weston. Water quality is similar to what is found at Blackwells Mills, with fair conditions existing. Total phosphorus and total inorganic nitrogen concentrations remain elevated, but fecal coliform and dissolved oxygen saturation readings are somewhat better. Late spring and early summer months brings reduced water quality at this location.

Bedens Brook, a tributary to the Lower Millstone, has generally fair water quality. This stream, however, also experiences elevated fecal coliform and total phosphorus concentrations. Total inorganic nitrogen also periodically is elevated. High dissolved oxygen saturation levels indicate supersaturated conditions in the brook during summer months.

In 1987 a modeling study of the Upper Millstone (Rocky Brook to Carnegie Lake) was completed by the Department for determining appropriate point source wasteload allocations. This study found nitrogenous biochemical oxygen demand was the major dissolved oxygen sink in the river, and that the lower sections of the study area is enriched with ammonia from treatment plant discharges. Phosphorus appears to be the limiting nutrient.

Biomonitoring of the Millstone River at Blackwells Mills has found a favorable but enriched stream environment. Filter feeders comprised a majority of the macroinvertebrates collected. Periphyton sampling over time has found highly variable primary productivity, possibly influenced by siltation in the river.

The Millstone River is assessed by the New Jersey Division of Fish, Game and Wildlife as supporting a moderately degraded warm water fish community along its entire length.

Problem and Goal Assessment

Point Source Assessment

The Millstone River's most severe problem is elevated nutrient concentrations. Sources of the nutrients are suspected of being primarily from point sources. The wasteload allocation study identified treatment plant effluent from Hightstown and East Windsor as the major cause for dissolved oxygen and nutrient problems in the river. Because of the need for additional sewage flows in the upper watershed level 4+ treatment will be required during critical low flow periods. In the Lower Millstone River, the Stony Brook Regional SA upgraded their discharge to include nitrification, but the facility will have to enlarge in the near future to accommodate new development in the region.

Department enforcement actions involving facilities having an impact on surface water quality in the Millstone watershed include: the Valley Road Sewerage Co. River Road discharge to the Millstone, Carrier Foundation discharging to the Millstone River high amounts of suspended solids and phosphorus, the Hightstown STP discharge to Rocky Brook, the Hopewell Twp. discharge to Honey Branch, and the East Windsor MUA discharge to the Millstone River.

Nonpoint Source Assessment

The predominant nonpoint pollution sources in the Millstone watershed are those associated with suburban development which is on the increase throughout the watershed. Runoff from construction sites, suburban surfaces, storm sewers and roads are contributing to excessive sediment loading. Septic systems are also believed to be a potential pollution problem throughout the watershed. In the upper reaches of the Millstone River, this source may also be a threat to the ground water.

Nonpoint pollution associated with agriculture is limited in this watershed to the regions drained by Etra and Peddie lakes, Cranbury Brook, and the lower reaches of the Millstone near its confluence with the Raritan River. Sediments, nutrients, and pesticides are suspected of coming from croplands, and are believed to be severe in the East Windsor area where chronic fish kills have occurred. It is a combination of agricultural and urban runoff along with local sewage treatment plant effluent which is suspected of degrading the fish communities in the upper Millstone River.

Other nonpoint pollution sources have been reported in the Millstone watershed. Fuel oil spills have occurred in the Upper Millstone, causing fish kills. Landfills are assessed as problems, both in the upper watershed where recreational usage and ground water are impacted, and in South Brunswick where leachate from a municipal landfill has been noted by local authorities as a problem.

Designated Use and Goal Assessment

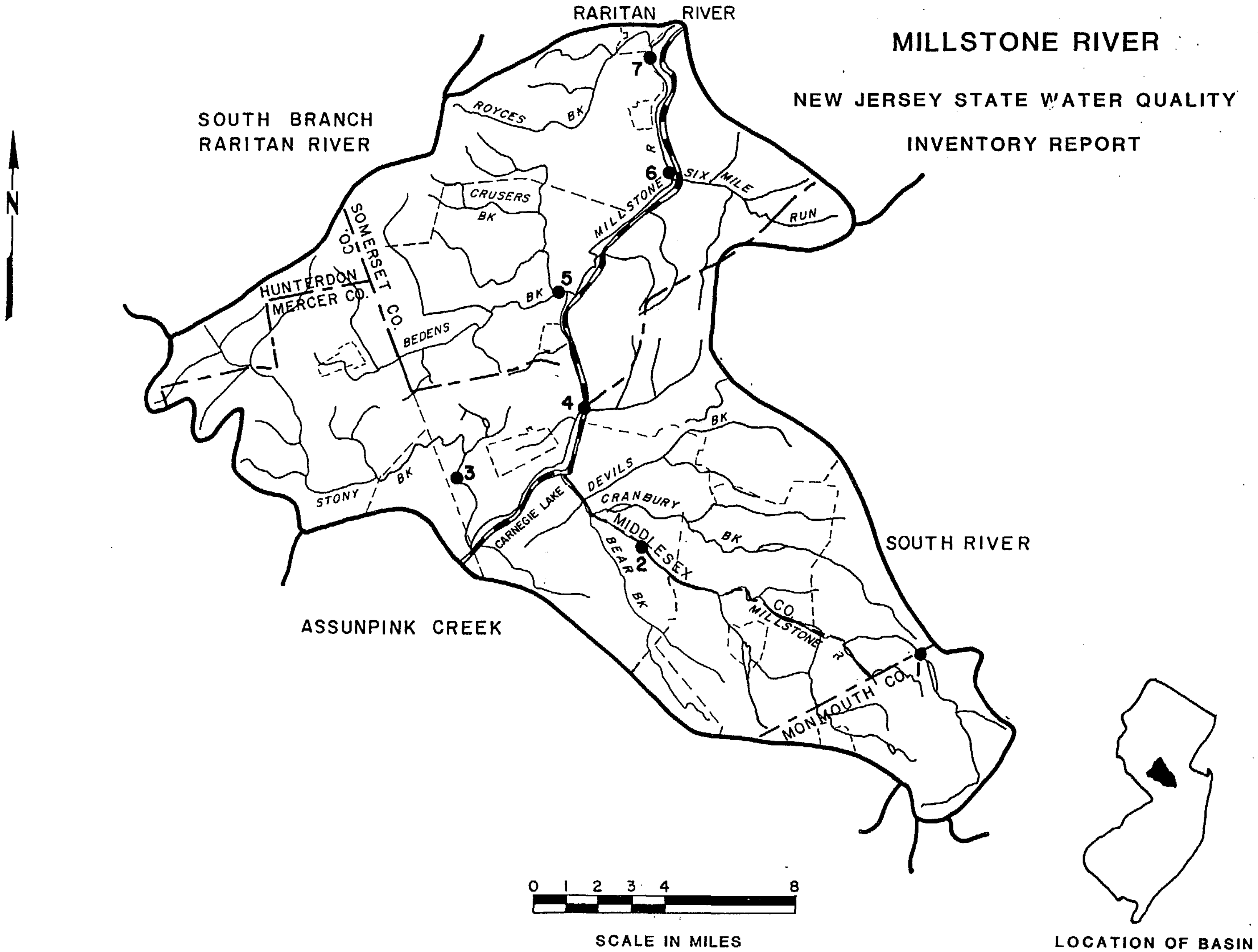
The Millstone River and tributaries contain moderately degraded fisheries, and as such, it is considered to be partially meeting the fish propagation/maintenance use. The monitored waters of the Millstone River and tributaries are classified as not swimmable because of excessive fecal bacteria concentrations.

Monitoring Station List

Map Number	Station name and Classification
1	Millstone River near Manalapan, FW-2 Nontrout
2	Millstone River at Grovers Mill, FW-2 Nontrout
3	Stony Brook at Princeton, FW-2 Nontrout
4	Millstone River at Kingston, FW-2 Nontrout
5	Bedens Brook near Rocky Hill, FW-2 Nontrout
6	Millstone River at Blackwells Mills, FW-2 Nontrout
7	Millstone River at Weston, FW-2 Nontrout

MILLSTONE RIVER

NEW JERSEY STATE WATER QUALITY INVENTORY REPORT



WATER QUALITY INDEX PROFILE 1983-1987

Millstone River

WATER QUALITY INDICATORS

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVERAGE AND CONDITION
Millstone R near Manalapan	AVG WQI	2	12	4	27	23	3	0	8	22 Good
	WORST3 MONTHS	June-August	May-July	June-August	July-Sept	May-July	Sept-Nov		Sept-Nov	32 Fair July-Sept
Millsone R at Grovers Mill	AVG WQI	4	36	5	29	61	5	2	14	60Fair/Poor
	WORST3 MONTHS	June-August	August-Oct	March-May	May-July	Nov-Jan	Dec-Feb	April-June	Sept-Nov	73 Poor May-July
Stony Brook at Princeton	AVG WQI	2	15	8	28	32	6	5	6	31 Fair
	WORST3 MONTHS	June-August	July-Sept	March-May	Dec-Feb	Oct-Dec	July-Sept	March-May	August-Oct	40 Fair Jan-March
Bedens Brook near Rocky Hill	AVG WQI	3	13	7	33	22	6	4	5	27 Fair
	WORST3 MONTHS	June-August	June-August	June-August	Sept-Nov	July-Sept	July-Sept	June-August	March-May	42 Fair Sept-Nov
Millstone River at Kingston	AVG WQI	6	5	18	22	21	5	8	9	22 Good
	WORST3 MONTHS	July-Sept	August-Oct	Sept-Nov	April-June	April-June	Dec-Feb	July-Sept	June-August	25 Good Sept-Nov

LEGEND - Water Quality Index Description

WQI	Condition	Description
0-10	Excellent	No or minimal pollution; water uses met throughout the year.
11-25	Good	Generally low amounts of pollution; water uses periodically not met.
26-60	Fair	Pollution amounts vary from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution in high amounts; water uses not met.
81-100	Very Poor	Pollution occurs at extremely high levels; severe stress to stream life; water uses not met.
ID	Insufficient Data	

An index of 20 is equivalent to the level of water quality criteria.

WATER QUALITY INDEX PROFILE 1983-1987

Millstone River Continued

WATER QUALITY INDICATORS

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVERAGE AND CONDITION
Millstone River at Blackwells Mills	AVG WQI	3	14	8	28	34	6	1	13	31 Fair
	WORST3 MONTHS	June-August	April-June	April-June	May-July	May-July	Oct-Dec	Jan-March	July-Sept	43 Fair May-July
Millstone River at Weston	AVG WQI	3	12	4	28	33	5	3	6	28 Fair
	WORST3 MONTHS	July-Sept	April-June	Feb-April	May-July	Nov-Jan	July-Sept	June-August	Oct-Dec	50 Fair May-July

LEGEND - Water Quality Index Description

WQI	Condition	Description
0-10	Excellent	No or minimal pollution; water uses met throughout the year.
11-25	Good	Generally low amounts of pollution; water uses periodically not met.
26-60	Fair	Pollution amounts vary from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution in high amounts; water uses not met.
81-100	Very Poor	Pollution occurs at extremely high levels; severe stress to stream life; water uses not met.
ID	Insufficient Data	

An index of 20 is equivalent to the level of water quality criteria.

N.J.P.D.E.S. DISCHARGE INVENTORY

WATERSHED: MILLSTONE RIVER

DISCHARGE NAME	# NJPDES	RECEIVING WATERS	MUNICIPALITY/COUNTY	TYPE
Johnson + Johnson Baby Prod.	0026140	Back Brk.	Montgmy.Twp/Somerset	Ind./Comm.
Carrier Foundation	0023663	Cruisers Brk.	Montgmy.Twp/Somerset	Municipal
Bedens Brook Club	0032417	Bedens Brook	Montgmy.Twp/Somerset	Ind./Comm.
Gen. Serv. Admn.-Public Bldg. Service	0020656	Br. of Cruisers Brk.	Hillsboro Twp./Somer	Municipal
Montgomery Twp. STP #1-Burnt Hill	0026891	Back Brook	Montgmy.Twp/Somerset	Municipal
Montgomery Twp. STP #2	0026905	Millstone R.	Montgmy.Twp/Somerset	Municipal
Montgomery STP #3-Sleepy Hollow	0026913	Pike Brk.	Montgmy.Twp/Somerset	Municipal
Montgomery Bd. of Ed.-Burnt Hill	0023124	Kings Crk.	Montgmy.Twp/Somerset	Municipal
Princeton Sewer Operating Comm.	0020796	Millstone R.	Princeton Boro/Mercr	Municipal
Valley Rd. Sewer Co.-River Rd	0022764	Royce Bk.	Hillsboro Twp./Somer	Municipal
Stony Brook Reg. S.A.	0031119	Millstone R.	Princeton Twp./Mercr	Municipal
Ingersoll-Rand Res. Inc.	0032565	Millstone R.	Montgmy. Twp/Somer.	Ind./Comm.
RCA Corp.	0002534	Millstone R.	S. Brunswk. Twp/Mids	Ind./Comm.
Lincoln Prop. Co. Util.	0024104	Cranbury Brook	Plansboro Twp/Midsex	Municipal
East Windsor MUA	0023787	Millstone River	E. Windsor Twp/Mercr	Municipal
Faloona Robert Chemical E.	0033821	Hightstown Sewer	Hightstown Boro/Mrcr	Ind./Comm.
Jefferson Pk. Trmt. Plant	0022551	Bridgroom Run	W. Windsor Twp/Mercr	Municipal
Hightstown Boro. Plant	0029475	Rocky Brk.-Millstone	Hightstwn Boro/Mercr	Municipal
Hightstown Boro. STP	0003832	Rocky Br.	Hightstwn Boro/Mercr	Municipal
Coca-Cola Co. Foods Div.	0004561	Big Bear Brook	Hightstwn Boro/Mercr	Ind./Comm.
Standard Pkg./National Metal	0032611	Shallow Brk.	Cranbury Twp./Midsex	Ind./Comm.
Carter-Wallace: 2 Plants	0002666	Cranbury Brook	Cranbury Twp./Midsex	Ind./Comm.
Minnesota	0003255	Roaring Brook	Belle Mead/Somerset	Industrial
Aethna Gas Products	0036021	Royce´s Brook	Belle Mead/Somerset	Thermal
Riverside Farms Sewage	0050130	Millstone River	Montgomery	Municipal
North Princeton Dev SLF	0022390	Rocky Brook	Skillman	Municipal
Princeton Plasma Physics Lab	0023922	Millstone River	Plainsboro	Industrial

N.J.P.D.E.S. DISCHARGE INVENTORY WATERSHED: MILLSTONE RIVER

DISCHARGE NAME	# NJPDES	RECIEVING WATERS	MUNICIPALITY/COUNTY	TYPE
Columbian Chemical Com	0000191	Heathcote Brook	Monmouth Junct/Midd	Ind
Pennington Quarry	0032263	Baldwins Creek	Kingston/Midd	Ind
NL Chemicals	0004243	Millstone River	Hightstown/Mercer	Ind/Thermal
David Sarnoff Research Center	0000272	Millstone River	Ocean Gate Boro/Mer	Ind/Thermal
FMC Corp	0027731	Millstone River	Princeton/Mercer	Ind/Thermal
Stony Brook Reg. SA	0035301	Stony Brook	Princeton/Mercer	Municipal
Mobil Research & Dev Co	0000795	Stony Brook	Hopewell/Mercer	Industrial
Hopewell Township MUA	0022560	Honey Brook Trib	Hopewell/Mercer	Municipal
Stony Brook Reg SA	0035319	Stony Brook	Princeton/Mercer	Municipal
Princeton SOC	0020770	Stony Brook	Princeton/Mercer	Municipal
Ed. Testing Service	0022110	Stony Brook	Princeton/Mercer	Municipal
Princeton Theological Sem.	0023205	Stony Brook	Princeton/Mercer	Municipal
Benton Fibre Drum Co	0060992	Millstone River	Lower Millstone/Mon	Industrial
NJE Corp	0057339	Lower Millstone	South Brunswick/Midd	Industrial
AT&T	0000809	Stony Brook	Mercer	Industrial
Hopewell Regional School	0032905	Stony Brook	Pennington/Mercer	Municipal

27. SOUTH RIVER

Watershed Description

The South River drains an area of 133 square miles. It begins at Duhernal Lake in Spotswood, Middlesex County and flows through the County to the Raritan River at Sayreville. Tides affect this 10 mile waterway from Duhernal Lake to the outfall into the Raritan River. The South River is formed by the confluence of Manalapan (20 miles long) and Matchaponix (15 miles) Brooks. Other tributaries include Deep River and Tennants Brook. The major impoundments are Duhernal Lake and Lake Manalapan. The population of this drainage area is concentrated in Spotswood, Old Bridge, East Brunswick, and Sayreville. Sub-watersheds include Manalapan Brook, Matchaponix Brook, and South River.

Agriculture and forests probably still account for the major portion of land uses in the upper watershed (Manalapan and Matchaponix Brooks), but there is much new industrial and residential development in these watersheds with older existing development along the South River. There are 17 NJPDES permitted discharges in the watershed, 8 are municipal and 9 are industrial/ commercial. Waters have been classified FW-2 Nontrout and SE-1.

Water Quality Assessment

Three ambient monitoring stations exists in the South River watershed. They are Manalapan Brook near Manalapan and at Spotswood, and Matchaponix Brook at Spotswood. A fourth station, the South River at Old Bridge, was discontinued in 1983. The three existing stations are analyzed below. Manalapan Brook has good quality surface waters, while Matchaponix Brook is of fair quality. The South River had good water quality based on past monitoring earlier in the decade.

Manalapan Brook experiences a moderate improvement in water quality as one travels downstream. Both monitoring stations have good overall water quality, but the Manalapan location experiences only fair conditions during the summer months. Both total phosphorus and fecal coliform are higher at Manalapan, exceeding State criteria in 90 and 31 percent, respectively, of the samples collected between 1983 and 1987. At Spotswood, Manalapan Brook contained total phosphorus and fecal coliform concentrations above criteria in 55 and 31 percent of the samples, respectively. Dissolved oxygen measured as concentration and percent saturation appears adequate for the protection of warm-water fisheries. Manalapan and Matchaponix Brooks are both moderately acidic waterways, but pH in Manalapan Brook at Spotswood often falls below 4.5 SU. This may be due to highly acidic soils being disturbed from development activities.

Matchaponix Brook contains much higher nutrient concentrations than Manalapan Brook. Total phosphorus has averaged .16 mg/l with 85 percent above the criterion of .05 mg/l for waters flowing into a impoundment. Total inorganic nitrogen is also elevated, exceeding 2.0 mg/l in 75 percent of the samples and averaging 3.0 mg/l. Total Kjeldahl nitrogen is also periodically excessive. Dissolved oxygen concentrations occasionally drops below 4.0 mg/l during summer months, and saturation averages only 77 percent. Fecal coliform concentrations are similar to those found in Manalapan Brook, having a geometric mean from 1983 to 1987 of 116 MPN/100ml. Conditions in Matchaponix Brook degrade significantly during low-flow months.

Below Duhernal Lake monitoring of the South River between 1981 and 1983 found generally good conditions. In summer months, the river has marginal water quality. During summer months reduced flows over Duhernal Lake dam allows brackish tidal waters to reach this station.

Manalapan Brook, Matchaponix Brook, South River, and Deep Run were all assessed by the New Jersey Division of Fish, Game and Wildlife as supporting healthy warm water fish communities.

Problem and Goal Assessment

Point Source Assessment

Water quality in Manalapan and Matchaponix Brooks is influenced by both point and nonpoint sources. Manalapan Brook contains a few small wastewater discharges that may have localized impacts on water quality. Matchaponix Brook, however, receives wastewaters from a regional sewage treatment system in the headwaters area. This facility may be responsible for the high nutrient concentrations found in the brook. The treatment system has been upgraded to perform advanced nitrogen removal.

A number of hazardous waste sites are found in the South River watershed, many of which are on the National Priority (Superfund) List. Two sites are suspected of contaminating local surface waters: the Sayreville Landfill which is adjacent to the South River (releasing pesticides and volatile organics) and the Viking Terminal also adjacent to the South River (containing mirex).

Nonpoint Source Assessment

Land uses in this watershed are primary agricultural and suburban/commerical, with significant amounts of residential and commercial development continuing to take place. Agricultural soil erosion in the watershed is considered to be moderate by the Soil Conservation Service. Manalapan and Matchaponix Brooks appear to receive nonpoint source pollution primarily from areas of suburban development. A major threat to the fisheries of both streams is the runoff coming from acid-producing soils of the region. When exposed to air and water, as during construction, these soils produce sulfuric acid which when washed in to rivers in runoff, can cause a sudden and sometimes long lasting pH depression. This in turn can have a deleterious effect on the aquatic biota of the receiving stream. In addition, increasing amounts of construction activity coupled with urban surface and road runoff have all contributed to silt loadings, flooding, and a reduction in the quality of fish habitat. This is especially severe in the Manalapan Township region of Monmouth County. Runoff from construction sites is reported to be a severe and increasing problem along Matchaponix Brook. Also judged to be impacting these two brooks is septic tank leachate, and stream bank destabilization. Agricultural impacts to both brooks are evaluated to be largely sediment loads coming from increasing local cropland runoff.

The South River receives nonpoint source pollution largely from developed lands. Construction activities and severe stream bank modification are known to have contributed to silt loads and local flooding. Increasing amounts of runoff from urban surfaces, roads and storm sewers are suspected of contributing to nutrient and sediment loading. In addition, this stream is believed to be possibly threatened with toxic contamination from the Burnt Fly Bog waste disposal site located near Deep Run, a tributary to the South River.

Designated Use and Goal Assessment

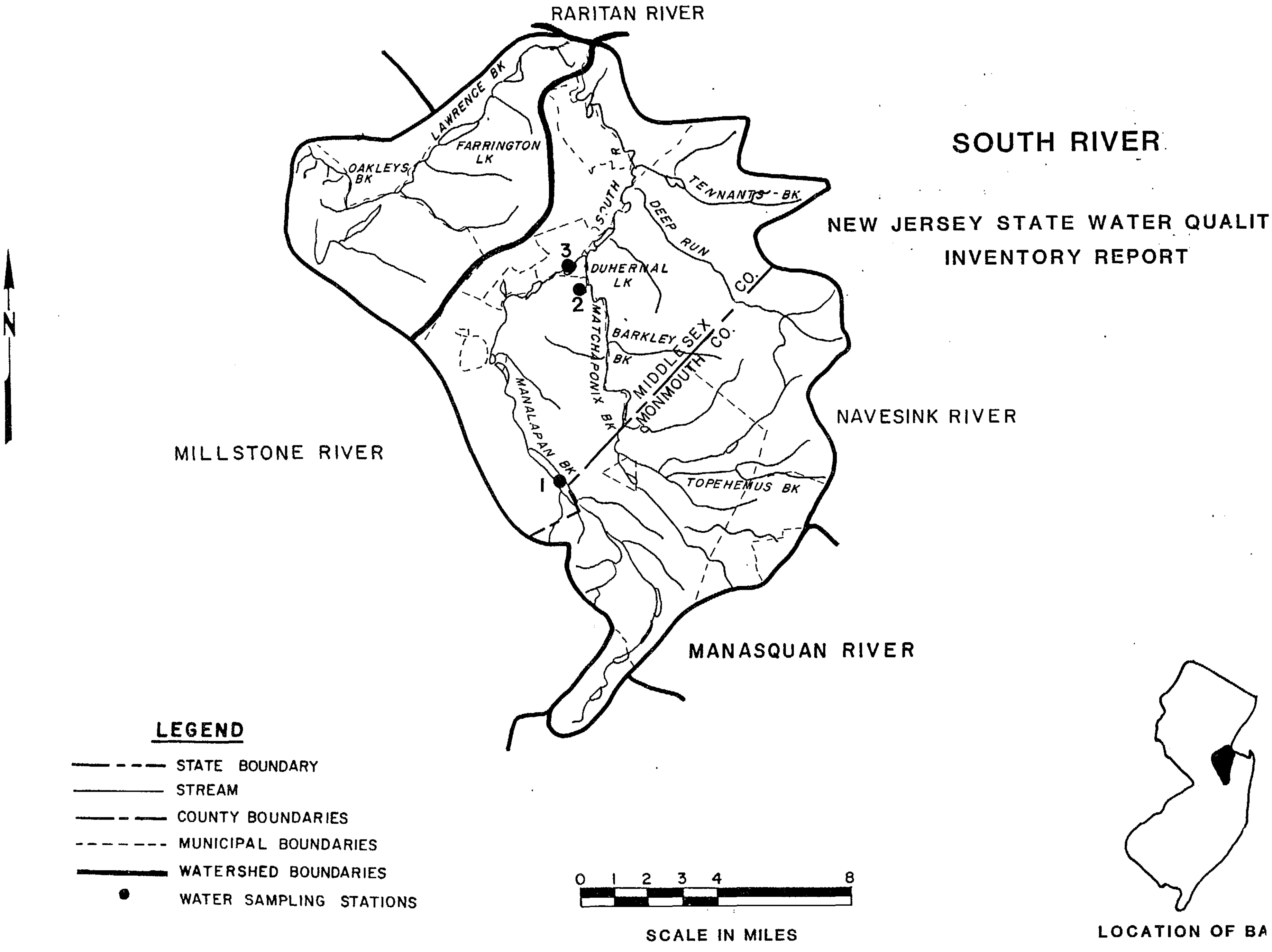
Waters of the South River and tributaries will meet the fish propagation/maintenance designated use and goal, but state fisheries biologists feel that these fish communities are threatened with various point and nonpoint sources. The monitored sections of Manalapan and Matchaponix Brooks are not considered swimmable because of high fecal coliform levels.

Monitoring Station List

Map Number	Station Name and Classification
1	Manalapan Brook near Manalapan, FW-2 Nontrout
2	Matchaponix Brook at Spotswood, FW-2 Nontrout
3	Manalapan Brook at Spotswood, FW-2 Nontrout

SOUTH RIVER

NEW JERSEY STATE WATER QUALIT
INVENTORY REPORT



WATER QUALITY INDEX PROFILE 1983-1987

South River

WATER QUALITY INDICATORS

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVERAGE AND CONDITION
Manalapan Brook near Manalapan	AVG WQI	2	6	7	20	37	3	0	5	24 Good
	WORST3 MONTHS	June-August	Oct-Dec	Sept-Nov	August-Oct	June-August	Nov-Jan		June-August	31 Fair August-Oct
Manalapan Brook at Spotswood	AVG WQI	2	8	21	15	22	4	0	7	18 Good
	WORST3 MONTHS	June-Aug	July-Sept	Oct-Dec	July-Sept	Nov-Jan	Dec-Feb		Sept-Nov	22 Good August-Oct
Matchaponix Brook at Spotswood	AVG WQI	2	21	9	17	36	6	1	12	30 Fair
	WORST3 MONTHS	July-Sept	July-Sept	Jan-March	July-Sept	Jan-March	Nov-JAn	July-Sept	April-June	50 Fair July-Sept

LEGEND - Water Quality Index Description

WQI	Condition	Description
0-10	Excellent	No or minimal pollution; water uses met throughout the year.
11-25	Good	Generally low amounts of pollution; water uses periodically not met.
26-60	Fair	Pollution amounts vary from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution in high amounts; water uses not met.
81-100	Very Poor	Pollution occurs at extremely high levels; severe stress to stream life; water uses not met.
ID	Insufficient Data	

An index of 20 is equivalent to the level of water quality criteria.

N.J.P.D.E.S. DISCHARGE INVENTORY

WATERSHED: SOUTH RIVER

DISCHARGE NAME	# NJPDES	RECIEVING WATERS	MUNICIPALITY/COUNTY	TYPE
Hercules Inc	0001023	South River	Sayreville/Middsex	Ind/Comm
E.I. Dupont-F&F Dept	0000159	Pond Creek	Sayreville/Middsex	Ind/Comm
E.I. Dupont-Photo Prod	0000167	Selover Creek	Sayreville/Middsex	Ind/Comm
Quigley Co., Inc	0028771	Deep Run & South R	E. Brunswick/Midsex	Ind/Comm
Busch Ind Pro Corp	0002470	South River	E. Brunswick/Midsex	Ind/Comm
Old Bridge Bd of Ed	0022306	Tennetts Brook	Old Bridge/Middsex	Municipal
Western Monmouth Utilities	0023728	Matchaponix Brook	Manalapan/Monmouth	Municipal
Englishtown Boro WT	0003921	Matchaponix Brook	Englishtown/Monmouth	Municipal
Freehold Boro WTP	0029190	McGallairds Brook	Freehold/Monmouth	Municipal
Wickatunk Village	0026816	Deep Run	Morganville/Monmouth	Ind/Mun
Marlboro MUA	0031887	Deep Run	Wickatunk/Monmouth	Ind/Mun
Edgeboro MUA	0031071	South River	E. Brunswick/Midd	Ind/Mun
Jamesburg School For Boys	0028479	Matchaponix Brook	Monroe/Midd	Municipal
B&J Warren And Sons, Inc	0053473	Manalapan Brook	Monroe/Midd	Industrial
Water Treatment Plant 1	0063851	Millford Br.	Manalapan/Mon	Municipal
Water Treatment Plant 5	0067181	Tepehemus Br.	Manalapan/Mon	Municipal
BFI Monroe Twp SLF	0099988	Matchaponix Br.	Jamesburg/Mon	Municipal

28. RARITAN RIVER

Watershed Description

The Raritan River, its tributaries, and branches drain an area totalling over 1100 square miles. The Raritan River basin is the largest river basin located entirely within New Jersey. The mainstem, 31 miles long, drains parts of Somerset, Union, Middlesex, and Monmouth Counties before emptying into the Raritan Bay. Tides affect this waterway to the Fieldsville Dam upstream of New Brunswick. The Delaware and Raritan Canal flows alongside the Raritan River from the confluence of the Millstone River to New Brunswick. Major tributaries to the Raritan are the North and South Branches, Millstone River, South River, Green Brook, and Lawrence Brook. The section of the Raritan basin reviewed here is the mainstem of the Raritan River from the confluence of the North and South Branches to Raritan Bay, and small tributaries. For the most part, this drainage area is densely populated, with the centers of population being Plainfield, New Brunswick, Perth Amboy, Edison, South Amboy, Sayreville, Bound Brook, Somerville, Manville, Piscataway, Metuchen, and Bridgewater. There are two low dams in the river, Fieldsville Dam and Calco Dam. Among the many small recreational lakes and ponds in this area are Watchung Lake, Suprise Lake, Spring Lake, and Green Brook Pond (all manmade).

The land use in this watershed is primarily urban/suburban, with industrial and commercial centers throughout. There are 73 NJPDES permitted discharges here, 12 of which are municipal and the remainder industrial/commercial. Fifteen discharges go to Raritan Bay and tributaries. Classifications of waters in the Lower Raritan River watershed are FW-2 Trout Maintenance, FW-2 Nontrout, and SE-1.

Water Quality Assessment

The Raritan River is currently monitored at three locations in the river. These locations are at Raritan, Manville, and from the Queens Bridge at South Bound Bridge.

The Raritan River at Raritan and Manville contains generally good water quality. At Manville conditions worsen to fair quality during the late spring-early summer period. The similar conditions at the two locations is exemplified in the water quality data collected between 1983 and 1987. Total phosphorus and fecal coliform often appear in elevated levels. Total phosphorus averaged .1 mg/l at both Raritan and Manville. Approximately 50 percent of all phosphorus values from the two stations were in excess of the recommended State criterion. Total inorganic nitrogen was greater than 2.0 mg/l in 15 percent of the samples from Raritan and 10 percent from Manville. Fecal coliform had geometric means of 132 and 158 MPN/100ml at Raritan and Manville, respectively. Fecal coliform violated State criterion in less than one-half of all samples collected at the two stations. Dissolved oxygen was above 4.0 mg/l in all samples from 1983 to 1987, while biochemical oxygen demand was generally under 3.0 mg/l.

Downstream at South Bound Brook ambient monitoring has detected fair water quality with conditions worsening in the summer period. The river here has experienced major changes in water quality within the past decade. In 1981 the Raritan River experienced very poor conditions during low flow periods. Extremely high nutrient concentrations and low dissolved oxygen saturation indicated a severely stressed stream. However, between 1981 to 1985 conditions improved in the river. While nutrients (phosphorus and nitrogen containing compounds) are still elevated, concentrations are one-third to one-half of those recorded in 1981. Total phosphorus values averaged .22 mg/l from 1983 to 1987, compared to .64 mg/l in 1981. Fecal coliform continues to be found at problematic levels, having a geometric mean of 752 MPN/100ml from 1983 to

1987. Dissolved oxygen appears to be adequate in this section of the river, but large diurnal fluctuations during warm weather are still expected. The significant improvements in the Raritan River at South Bound Brook can be attributed to the gradual reduction in discharge flows from the American Cyanamid facility. In 1985 the company's discharge was eliminated with flows transferred to the Somerset Raritan Valley SA treatment plant.

The NJDEP's Division of Science and Research has performed extensive work in the Raritan River to study the fate and transport of toxic substances in 1982 and 1983. The results of this study was throughly described in the 1982 and 1986 305(b) reports, but are summarized here. Water samples were analyzed for priority pollutants. Sediments were analyzed for priority pollutants as well as grain size. The water analyses showed that the volatile organics were the most frequently occurring organic compounds. Chloroform, toluene, ethylbenzene, and 1, 1, 2, 2-tetrachloroethylene were found at levels up to 50 ug/l in almost every sample. Copper, zinc, arsenic, and silver were the most frequently occurring metals.

The sediment analyses detected organic compounds rather infrequently. Metals were detected in every sample. Copper and zinc were detected at the highest levels, most likely due to their geologic abundance. Lead was also detected at elevated levels. Fine grain sediments were positively correlated to the metal concentrations; metals were also strongly intercorrelated meaning that when one was high others were also elevated.

The Raritan River, from the confluence of the North and South Branches downstream to the confluence with the Millstone River, is assessed as supporting a healthy warm water fish community. Below the confluence with the Millstone down to the Landing Lane Bridge in New Brunswick, the river's fishery is judged to be moderately degraded.

Problem and Goal Assessment

Point Source Assessment

The Raritan River appears to be heavily influenced by both point and nonpoint sources. The elimination of the American Cyanamid discharge, as noted above, has resulted in improvements in river water quality. However, a number of DWR enforcement actions are now underway. Facilities that are under such action which are having known impacts on surface water quality include: Somerset Raritan Valley Sewerage Authority's discharge to Cuckels Brook, the Manville STP discharge to the Raritan River, the Stavola Construction Materials discharge to Middle Brook, the Conrail Tile Drain discharge to the Raritan River, the Raritan River Steel discharge to the Raritan River, and a Middlesex County UA discharge to the Raritan River. A number of hazardous waste sites are located in the Raritan River watershed, many of which are on the National Priority List. Sites that are impacting surface waters include: Blue Spruce International (Raritan River), Chemical Insecticide Corporation (Mill Creek), Horseshoe Road Dump (Raritan River), Kin-Buc Inc. (Edmonds Creek and Raritan River), Renora Inc. (Mill Creek), and Rhone-Poulene/Reagent Chemical (Raritan River).

Nonpoint Source Assessment

The Raritan River is impacted by nonpoint source pollution from urban/suburban development throughout its length. Additional nonpoint source pollution from landfill leachate is suspected in the lower portions of the river. Runoff from urban surfaces, storm sewers and roadways are all believed to be an increasing problem in the watershed. Additional contamination sources are suspected from the land disposal of wastewater and from local chemical spills.

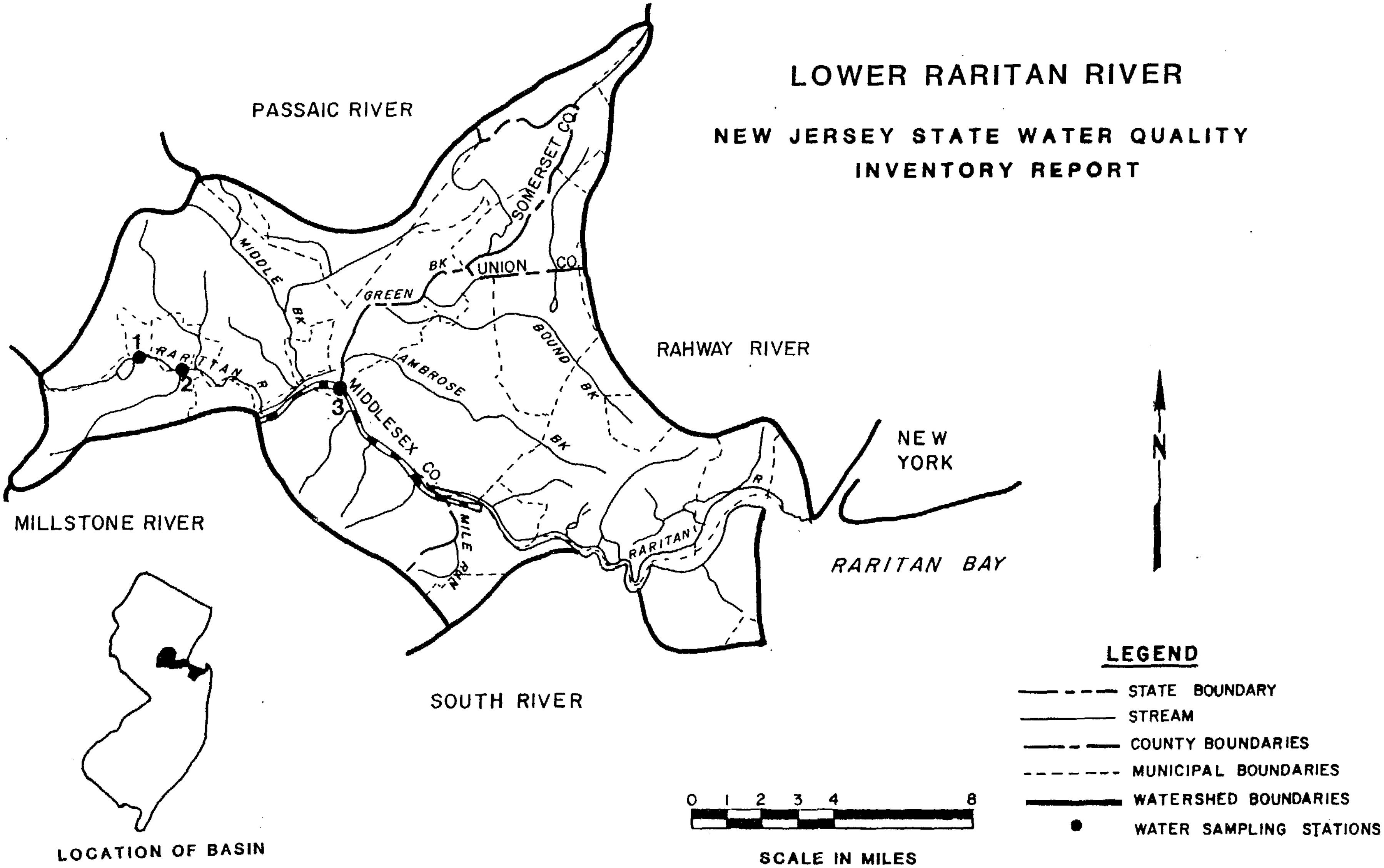
Construction activities are noted to be active in the Peters Brook area of the Upper Raritan sub-watershed, and in Franklin and Warren Townships in the Lower Raritan sub-watershed. The result of this urbanization is an increase in the nutrient and sediment loads which the river must absorb, as well as an increase in local flooding.

Designated Use and Goal Assessment

The Raritan River will only partially meet clean water goals and State designated uses. The entire river is not swimmable, and only the freshwater portions can be considered to be meeting the fish propagation and maintenance use/goal. The fisheries in this part of the river are thought to be threatened by the pollution sources present. In the tidal section of the river a moderately degraded fisheries is present and there is a fishing advisory because of PCBs contamination in certain fishes. The presence of elevated PCBs may indicate possible long-term health effects for fish. As a result the tidal Raritan River is only partially meeting the fish propagation/maintenance use.

Monitoring Station List

Map Number	Station Name and Classifiction
1	Raritan River at Raritan, FW-2 Nontrout
2	Raritan River at Manville, FW-2 Nontrout
3	Raritan River at Queens Bridge, FW-2. Nontrout


LOWER RARITAN RIVER
NEW JERSEY STATE WATER QUALITY INVENTORY REPORT
PASSAIC RIVER
SOMERSET CO
UNION CO
MIDDLE BK
GREEN BK
BOUND BK
AMBROSE BK
RARITAN R
MIDDLESEX CO
MILE RUN
RARITAN
R
RAHWAY RIVER
NEW YORK
RARITAN BAY
MILLSTONE RIVER
SOUTH RIVER
1
2
3
N
LEGEND
STATE BOUNDARY
STREAM
COUNTY BOUNDARIES
MUNICIPAL BOUNDARIES
WATERSHED BOUNDARIES
WATER SAMPLING STATIONS
0 1 2 3 4 8
SCALE IN MILES
LOCATION OF BASIN

WATER QUALITY INDEX PROFILE 1983-1987

Raritan River

WATER QUALITY INDICATORS

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVERAGE AND CONDITION
Raritan River at Raritan	AVG WQI	3	6	10	24	18	6	5	ID	16 Good
	WORST3 MONTHS	July-Sept	August-Oct	August-Oct	April-June	July-Sept	Nov-Jan	July-Sept		23 Good April-June
Raritan River at Manville	AVG WQI	4	11	11	22	18	6	6	7	17 Good
	WORST3 MONTHS	July-Sept	March-May	August-Oct	May-July	May-July	Sept-Nov	August-Oct	April-June	30 Fair May-July
Raritan River at Queens Bridge	AVG WQI	3	7	4	39	28	7	5	10	31 Fair
	WORST3 MONTHS	June-August	August-Oct	March-May	July-Sept	August-Oct	August-Oct	May-July	Feb-April	50 Fair July-Sept

LEGEND - Water Quality Index Description

WQI	Condition	Description
0-10	Excellent	No or minimal pollution; water uses met throughout the year.
11-25	Good	Generally low amounts of pollution; water uses periodically not met.
26-60	Fair	Pollution amounts vary from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution in high amounts; water uses not met.
81-100	Very Poor	Pollution occurs at extremely high levels; severe stress to stream life; water uses not met.
ID	Insufficient Data	

An index of 20 is equivalent to the level of water quality criteria.

N.J.P.D.E.S. DISCHARGE INVENTORY WATERSHED: Raritan River

DISCHARGE NAME	# NJPDES	RECIEVING WATERS	MUNICIPALITY/COUNTY	TYPE
St. Bernards Sch. STP	0020991	Lochiel Creek	Brdgwtr. Twp/Somerst	Municipal
Ethicon Inc.	0001139	Peters Brook	Brdgwtr. Twp/Somerst	Ind./Comm.
Crestline Div. of N. Am. Prod	0029921	Gaston Ave. Brook	Raritan Boro/Somerst	Ind./Comm.
Indust. Tube Corp.	0023019	Raritan River Trib.	Smrvil. Boro/Somerst	Ind./Comm.
Valley Rd. Sew. Co. - Fieldhedge	0022772	Royce Brook	Hilsboro Twp/Somerst	Municipal
Chemicals Corp.	0021806	Middle Brook	Brdgwtr. Twp/Somerst	Ind./Comm.
Somerset-Raritan Valley S.A.	0024864	Cuckel's Brook	Brdgwtr. Twp/Somerst	Municipal
American Cynamid-Bound Brook	0002313	Raritan River	Brdgwtr. Twp/Somerst	Ind./Comm.
Taylor Oil Co.	0029271	Raritan River	Smrvil. Boro/Somerst	Ind./Comm.
Devro Inc.	0001961	Peters Brook	Smrvil. Boro/Somerst	Ind./Comm.
Warren Twp. SA-Stage 3 STP	0023752	Middle Brook	Warren Twp./Somerset	Municipal
Johns-Manville Sales Corp.	0001678	Raritan River	Manvile Boro/Somerst	Ind./Comm.
Manville Boro STP	0028762	Confluence of Raritan/Millst.	Manvile Boro/Somerst	Municipal
Veterans Admin. Supply Depot	0020036	Roycefield Brook	Smrvil. Boro/Somerst	Municipal
RBH Dispersions	0033545	Ambrose Brook	Midsex Boro/Middlesex	Ind./Comm.
Reagent Chem. + Research In.	0033251	Trib to Raritan Riv.	Midsex Boro/Middlesex	Ind./Comm.
National Starch & Chem. Corp.	0032506	Raritan River	Brdgwtr. Twp/Somerst	Thermal
Gibson Tube, Inc.	0064700	Trib. to Cuckels Brk	Brdgwtr. Twp/Somerst	Ind/Thermal
Zappa Res. & Molding Corp.	0030309	Green Brook River	Green Brook/Somerset	Thermal
Colorguard Corp.	0033111	Woodmere Brook	Raritan/Somerset	Thermal
Tingley Rubber Corp	0020672	Dismal Swamp	South Plainfield	Ind/Thermal
Scott Environmental Tech	0033707	Bound Brook	South Plainfield	Industrial
Metz Metallurgical Corp.	0034835	Middlesex County	South Plainfield	Industrial
Ronnie Packing Co.	0034886	Rain Water Ditch	South Plainfield	Thermal
United Steel Container Corp.	0032034	Mile Run	N. Brusnwick	Thermal
Clayton Block Corp.	0026069	Mill Brook	Metuchen/Midd.	Ind/Strmwtr
Troy Chen-Corp.	0031453	Pierson's Creek	Middlesex Boro/Midd.	Thermal
Webcraft	0052655	Dismal Swamp	Metuchen/Midd.	Thermal
Gulton Industries, Inc.	0028720	Storm Creek Flow	Metuchen/Midd	Industrial
Sayeville Borough of	0050245	Cheesequake Creek		Industrial

DISCHARGE NAME	# NJPDES	RECIEVING WATERS	MUNICIPALITY/COUNTY	TYPE
National Cam	0036102	Bound Brook	Edison/Midd	Thermal
Academy Die Casting & Plating	0034495	Ambrose Brook	Edison/Mid	Industrial
Union Steel Corp.	0001015	Trib. to Raritan R.	Piscataway Twp/Midsx	Ind./Comm.
Sun Oil Co. of Pennsylvania	0025798	Raritan River	Piscataway Twp/Midsx	Ind./Comm.
Kentile Floors	0030023	Bound Brook	S. Plnfld. Boro/Mid.	Ind./Comm.
LA Dreyfus Co.	0001210	Drainage Ditch to Bound Brook	S. Plnfld. Boro/Mid.	Ind./Comm.
Mobile Chem. Co.	0026255	Bound Brook	Edison Twp./Middlesex	Ind./Comm.
PSE&G - Edison	0003603	Raritan River	Edison Twp./Middlesex	Ind./Comm
Raritan Arsenal	0028835	Raritan River	Edison Twp./Middlesex	Municipal
Ford Motor Co. - Metuchen	0002691	Mill Brook	Edison Twp./Middlesex	Ind./Comm.
Oxford Div. - Hartford	0032557	Mile Run Brook	New Brnswk/Mdsx	Ind./Comm.
Delco Remy Div. of GMC Plant 12	003092	Mile Run Brook	New Brnswk/Mdsx	Ind./Comm.
Nuodex Inc.	0001791	Raritan River	Edison Twp./Middlesex	Ind./Comm.
NJP + Light	0002747	Raritan River	Sayreville Boro/Mdsx	Ind./Comm.
Amerada Hess Corp.	0001376	Raritan River	Perth Amboy Cty/Mdsx	Ind./Comm.
Chese Borough Ponds Corp.	0002381	Raritan River	Perth Amboy Cty/Mdsx	Ind.Comm.
Saytech Inc.	0031470	Trib. To Burt Ditch	New Brnswk. Cty/Mdsx	Ind./Comm.
Middlesex Co. M.U.	0020141	Raritan Bay	Sayreville Boro/Mdsx	Municipal
Sayreville Boro-Melrose STP	0023833	Raritan Bay	Sayreville Boro/Mdsx	Municipal
Bell Labs-Murray Hill	0000442	Trib. to Green Brook	Brkly Hts. Twp/Union	Ind./Comm.
Anchor Glass Container Corp.	0033651	Long Neck Creek	Cliffwood/Monmouth	Industrial
Buhler and Bitter	0062669	Raritan Bay	Hazlet/Monmouth	Industrial
Comdata Systems Incorp	0001775	Ditch to Mahora	Holmdel/Mon	Industrial
Biddle Sawyer Corp	0030872	Lupatcong Creek	Keyport/Mon	Thermal
Aberdeen Twonship MUA	0022535	Whale Creek	Matawan/Mon	Municipal
Engineered Precision Castings	0033294	Wrackaack Creek	Middletown Twp./S.A.	Thermal
Aberdeen Township WTP	0034142	Wilkson Creek	Monmouth County	Ind
Imperial Oil Comp Inc	0035874	Lake Lefferts	Morganwille/Mon	Ind
Stavola Constructions Mat	0002895	Middle Brook	Red Bank/Mon	Ind/Storm
National Starch & Chemical	0001333	Coreen Brook	Plainfield/Union	Ther/Storm
Olivetti Corp of America	0032581	Raritan River	Somerville/Union	Ind

N.J.P.D.E.S. DISCHARGE INVENTORY

WATERSHED: Raritan River

DISCHARGE NAME	# NJPDES	RECIEVING WATERS	MUNICIPALITY/COUNTY	TYPE
Septembers On The Hill	0026727	Raritan River	Watchung/Union	Mun
Valvoline Oil Comp	0030503	Raritan River	Edison/Middlesex	Ind
Nuodex Inc	0000116	Raritan River	Fords/Midd	Therm/Ind
Weldon Concrete	0000345	Raritan River	Keasbey/Midd	Ind
Sohio-Carborundum	0002950	Raritan River	Keasbey/Midd	Ind
Woodbridge, Twp	0020401	Raritan River	Keasbey/Midd	Mun
New Brunswick	0033219	Raritan River	N. Brunswick/Midd	Mun
Old Bridge, Twp	0022471	Raritan Bay	Old Bridge/Midd	Mun
Old Bridge MUA Browntown	0033065	Raritan Bay	Old Bridge/Midd	Mun
Reserve Terminal Corp	0001392	Raritan Bay	Perth Amboy/Midd	Ind
Perth Amboy	0023213	Raritan Bay	Perth Amboy/Midd	Mun
Raritan River Steel Comp	0031178	Storm Sewer to Rar	Perth Amboy/Midd	Ind
Union Carbide	0000256	Raritan River	Piscataway/Midd	Ind/Therm
Beecham Laboratories Inc	0035491	Raritan River	Piscataway/Midd	Ind
EH Werner Generating Station	0002755	Raritan River	South Amboy/Midd	Ind/Therm
Silvatrim Corp of American	0030881	Raritan River	South Plainfield/Mid	Ind
Design & Molding Services	0029629	Bound Brook	Piscataway/Midd	Ind
Captive Plastics	0030571	Ambrose Brook	Piscataway/Midd	Ind
Parkway Plastics	0032042	Bound Brook	Piscataway/Midd	Thermal
Evans Partnership	0033723	Ambrose Brook	Piscataway/Midd	Ind
Eastern Steel Barrel Corp	0034797	Bound Brook	Piscataway/Midd	Ind
Bound Brook Operation	0061794	Bound Brook	Piscataway/Midd	Ind
Exxon Service Station	0063967	Raritan River	Matawan/Mon	Ind
North American Philips Lgt.	0064939	Ambrose Brook	South Plainfield/Mid	Ind

29. *RAHWAY RIVER (INCLUDING THE ELIZABETH RIVER)*

Watershed Description

Measured from the headwaters to the City of Rahway, the Rahway River drains an area of 41 square miles, which includes parts of Middlesex, Union, and Essex Counties. The mainstem, 24 miles long, flows from Union into the Arthur Kill near Linden and is tidal from the Pennsylvania Railroad bridge at Rahway down to the mouth. This is a densely populated area, with the centers of population being Rahway, Woodbridge, Clark, Springfield, Cranford, Westfield, and Kenilworth. Major tributaries to the Rahway River include the East Branch Rahway River, Woodbridge River, and Robinsons Branch. The major impoundments are the Middlesex Reservoir, Orange Reservoir, Lower and Upper Echo Lakes, and Diamond Mill Pond. The Elizabeth River is 11 miles long, much of it being channelized for flood control purposes.

Land uses in these watersheds are residential, commercial, industrial and other uses. There are 53 NJPDES permitted discharges identified in the Rahway and Elizabeth watersheds, all except 5 are industrial/commerical. The waters of the Rahway and Elizabeth Rivers and tributaries have been classified FW-2 Nontrout, SE-2, and SE-3.

Water Quality Assessment

Routine water quality monitoring is performed at three locations on the Rahway River: the West Branch at West Orange, near Springfield and at Rahway. The Elizabeth River is monitored at Ursino Lake in Elizabeth. The Rahway River has fair water quality along its length with generally improving conditions in the downstream direction. The Elizabeth River is severely degraded, especially during the early summer period.

The West Branch Rahway River has fair overall quality with conditions approaching poor quality in late summer. Fecal coliform, total phosphorus, and total dissolved solids are found at problematic levels. Fecal coliform counts had a geometric mean of 1445 MPN/100ml from 1983 to 1987 with 85 percent greater than 200 MPN/100ml. Total phosphorus has averaged .11 mg/l from 1983 to 1987, during which the majority of samples exceeded State criterion. Total dissolved solids have averaged 364 mg/l, among the highest of all monitoring stations in the State. While dissolved oxygen concentrations appear adequate, saturation occasionally falls below 80 percent in the fall.

Near Springfield the Rahway River has its worst monitored water quality. Although overall quality is considered fair, it is poor during late spring/early summer. Excessive fecal coliform and total phosphorus concentrations are found at this location. Periodically, low dissolved oxygen along with high total dissolved solids measurements also occur. Fecal coliform counts had a geometric mean of 1352 MPN/100ml near Springfield, while total phosphorus concentrations averaged around the .1 mg/l criterion for flowing waterways. Occasionally high inorganic nitrogen was also detected. Dissolved oxygen saturation averaged only 74 percent near Springfield, with low dissolved oxygen concentrations often below 4.0 mg/l during early summer. At Rahway conditions are improved over what is found near Springfield. Fecal coliform and total phosphorus are still excessive, but levels are, for the most part, lower. Fecal coliform had a geometric mean of 538 MPN/100ml with 70 percent above State criterion. Solids continue to be present at high concentrations on a periodic basis.

The Elizabeth River drains highly developed urban lands adjacent to the Rahway watershed. Water quality in the Elizabeth River is fair to poor with very poor conditions in May to July. The river, channelized in sections, has fecal coliform concentrations which averaged 13154 MPN/100ml from 1983 to 1987 and excessive phosphorus and nitrogen. Total phosphorus was above State criterion in 61 percent of the samples, while inorganic nitrogen was excessive in one-third of the measurements taken. Dissolved oxygen saturation often exceeds 120 percent during summer months indicating elevated primary productivity. Total dissolved solids have also occurred at elevated levels, averaging 435 mg/l during the period of review.

The warm water fish community of the Rahway River has been evaluated by the New Jersey Division of Fish, Game, and Wildlife as moderately degraded. Morses Creek and the Elizabeth River are judged to be containing degraded fish communities; few fish are reported to be able to survive in either waterway.

Problem and Goal Assessment

Point Source Assessment

Water quality of the Rahway and Elizabeth Rivers are reflective of urbanized streams. The presence of high nutrients, fecal coliform and biochemical oxygen demand is thought to be from nonpoint sources and municipal/industrial point sources. Both the Lower Elizabeth and Rahway Rivers have combined sewer overflows discharging during storm events, however the impacts are most severe in the Elizabeth River. There are 16 Department enforcement actions against discharges that are impacting water quality in these two watersheds. They range from facilities not meeting permit limitations to raw sewage discharges. Hazardous wastes sites are present in these watersheds, but none have been identified to be contaminating surface waters. In the lower tidal sections of the Elizabeth and Rahway Rivers water quality is reduced because of boundary conditions (i.e., Arthur Kill water quality).

Nonpoint Source Assessment

The Rahway River watershed is highly urbanized and its waterways are severely degraded both by nonpoint source pollution and by the physical alterations which extensive urbanization has brought about. In addition to pollution and habitat destruction, flood control has been a major problem in this watershed. Known sources of nonpoint pollution in the Rahway River include construction activities, storm sewers, urban surfaces, roads, and combined sewer overflows; all of which have contributed to high stream temperatures, sediment and nutrient loadings, periodic low dissolved oxygen levels, and fishkills. Another problem in this watershed is landfill leachate which is believed to have contributed to the degradation of the tidal Rahway River, as well as to the adjacent Arthur Kill, Marshes Creek, and Kings Creek.

Morses Creek and the Elizabeth River, draining almost totally developed watersheds, have been extensively channelized. Both are judged to support minimal fish life due to the combined effects of habitat loss and severe water pollution levels coming from numerous nonpoint and point sources. The Elizabeth River has been described as chronically polluted over its entire length.

Designated Use and Goal Assessment

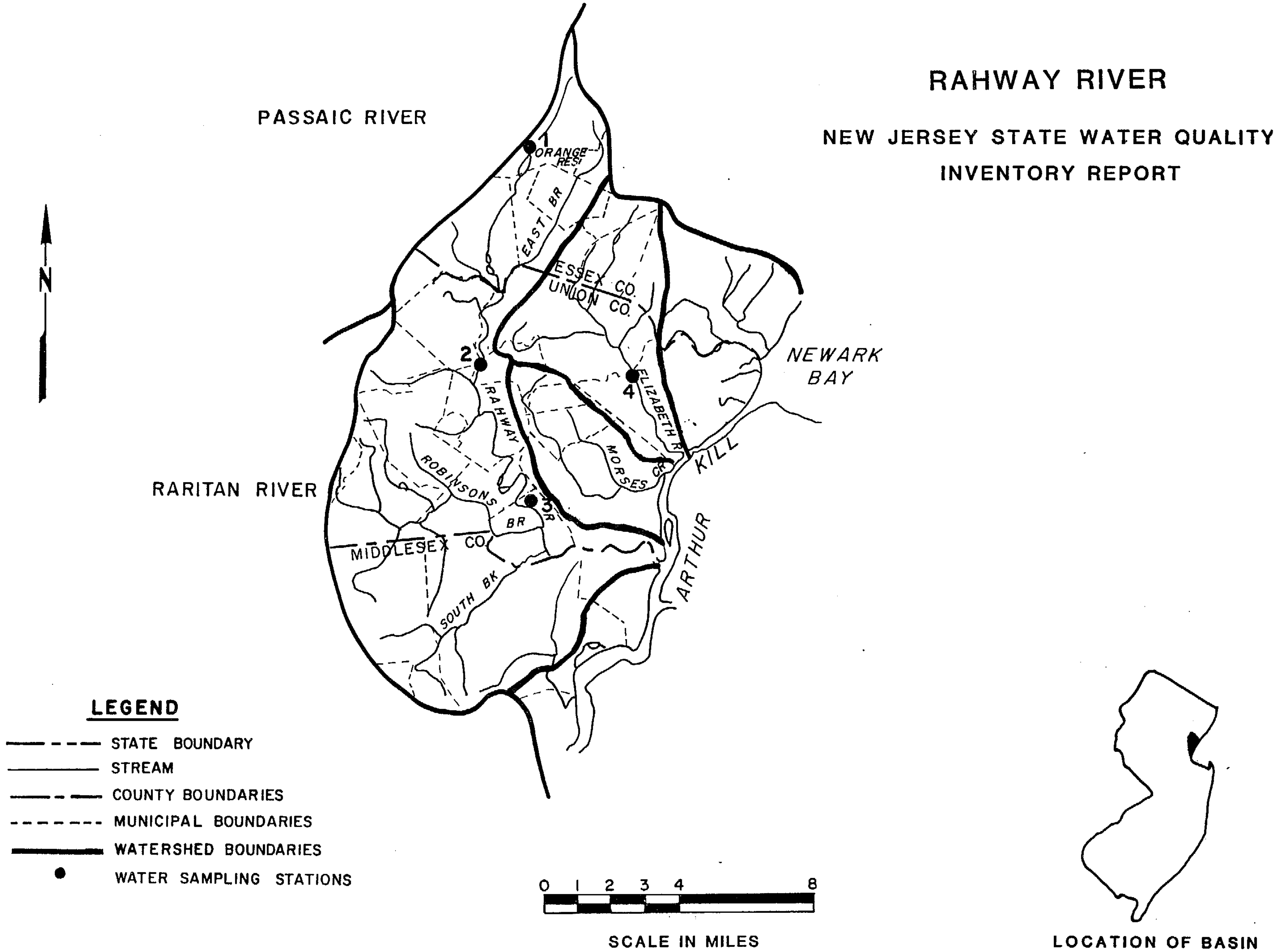
The Rahway and Elizabeth Rivers are not of swimmable quality. Severe pollution of the Elizabeth River along with channelization combine to cause a degraded fish community in the river. Therefore, the freshwater Elizabeth River is classified as not achieving the fish propagation/maintenance use and goal. The freshwater Rahway River is considered to be partially meeting the fish propagation/maintenance use because of a moderately degraded fish community. Designated use attainment (which is generally less than the swimmable/fish propagation goal) in the tidal portions of both rivers is not known because of a lack of water quality information.

Monitoring Station List

Map Number	Station Name and Classification
1	West Branch Raritan River at West Orange, FW-2 Nontrout
2	Rahway River near Springfield, FW-2 Nontrout
3	Rahway River at Rahway, FW-2 Nontrout
4	Elizabeth River at Ursino Lake, FW-2 Nontrout

RAHWAY RIVER

NEW JERSEY STATE WATER QUALITY INVENTORY REPORT



WATER QUALITY INDEX PROFILE 1983-1987

Rahway River

WATER QUALITY INDICATORS

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVERAGE AND CONDITION
West Branch Rahway River at W. Orange	AVG WQI	2	15	2	47	27	20	2	9	41 Fair
	WORST3 MONTHS	June-August	Sept-Nov	Feb-April	August-Oct	June-Aug	Dec-Feb	July-Sept	Sept-Nov	58 Fair Aug-Oct
Rahway River near Springfield	AVG WQI	2	32	3	48	18	14	2	9	43 Fair
	WORST3 MONTHS	June-August	May-July	Feb-April	June-August	May-July	Dec-Feb	April-June	June-August	72 Poor May-July
Rahway River at Rahway	AVG WQI	3	15	5	40	18	11	3	15	29 Fair
	WORST3 MONTHS	June-August	July-Sept	Feb-April	Sept-Nov	August-Oct	Feb-April	April-June	Sept-Nov	39 Fair June-August
Elizabeth River at Ursino Lake	AVG WQI	3	17	6	74	24	20	5	14	59Fair/Poor
	WORST3 MONTHS	June-August	June-August	Feb-April	May-July	May-July	Nov-Jan	July-Sept	April-June	82FeryPoor May-July

LEGEND - Water Quality Index Description

WQI	Condition	Description
0-10	Excellent	No or minimal pollution; water uses met throughout the year.
11-25	Good	Generally low amounts of pollution; water uses periodically not met.
26-60	Fair	Pollution amounts vary from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution in high amounts; water uses not met.
81-100	Very Poor	Pollution occurs at extremely high levels; severe stress to stream life; water uses not met.
ID	Insufficient Data	

An index of 20 is equivalent to the level of water quality criteria.

RAHWAY RIVER

N.J.P.D.E.S. DISCHARGE INVENTORY

WATERSHED: ELIZABETH RIVER

DISCHARGE NAME	# NJPDES	RECEIVING WATERS	MUNICIPALITY/COUNTY	TYPE
Investment Casting Corp	0034525	Rahway River	Springfield Twp./Uni	Ind/Comm
Koppers Co., Inc.	0032751	Rahway River	Westfield Town/Unio	Ind/Comm
Durex	0031127	Rahway River	Union City/Hudson	Ind/Comm
Monsanto Co.	0001554	Rahway River	Kenilworth Boro/Uni	Ind/Comm
Schering Corp.	0002305	Rahway River	Kenilworth Boro/Uni	Ind/Comm
Schering Corp.	0002291	Elizabeth River	Union/ Union	Ind/Comm
McMillan Bloedel Cont. Inc.	0029611	Elizabeth River	Union/ Union	Ind/Comm
Rotary Pen Corp.	0034568	Kenilworth Brook	Kenilworth/Union	Ind/Comm
Springfield Die Casting Co.	0034070	West Brook	Kenilworth/Union	Ind/Comm
New Departure Hyatt Bearing	0001066	Rahway River	Clark /Union	Ind/Comm
Solar Compounds Corp.	0003395	Rahway River	Linden/Union	Ind/Comm
Huffman & Koos Co. Inc.	0003883	Rahway River	Rahway/Union	Ind/Comm
Merck & Co. Inc.	0002348	Kings Creek	Linden/Union	Ind/Comm
Turtle & Hughs Co. Inc	0025429	Kings Creek	Linden/Union	Ind/Comm
Rahway City DPN	0025585	Rahway River	Rahway/Union	Ind/Comm
Exxon Co. USA	0026671	Rahway River	Linden/Union	Ind/Comm
American Cyanamid-Warners	0001058	Rahway River	Linden/Union	Ind/Comm
Township of S. Orange Village	0052426	Rahway River	South Orange/Essex	Ind
Amerada Hess-Port Reading	0028878	Port Reading Rea.	Woodbridge/Middlesex	Ind/Comm
Gulf Oil Co.-Linden	0000311	Bk. Rahway River	Linden/Union	Ind/Comm
B.P. Oil Inc.	0000515	Rahway River	Linden/Union	Ind/Comm
Orange City Water Filtration	0034592	Rahway River	Orange/Essex	Municipal
Coastal Oil Corp.	0027880	Trib to Clark Res.	Clark/Union	Ind/Storm
Witco Chemical Corp.	0031411	Stream SWR to Robi	Clark/Union	Therm/Storm
Elizabeth, City of	0020648	Elizabeth River	Elizabeth/Union	Municipal
Joint Mtg. Essex & Union	0024741	Elizabeth River	Elizabeth/ Union	Municipal
Watchung Die Casting Co	0055271	Garwood Brook	Garwood/Union	Thermal
ECD Inc.	0031186	Elizabeth River	Hillside Twp/Union	Thermal
Atlas Tod Company	0035980	Elizabeth River	Hillside Twp/Union	Thermal
EMCO Graphics, Inc.	0061867	Elizabeth River	Hillside Twp/Union	Thermal
Supermarket Services	0022225	King's Creek	Linden/Union	Municipal
Citgo Petroleum Corp	0024554	Rahway River	Linden/Union	Industrial

RAHWAY RIVER

N.J.P.D.E.S. DISCHARGE INVENTORY

WATERSHED: ELIZABETH RIVER

DISCHARGE NAME	# NJPDES	RECEIVING WATERS	MUNICIPALITY/COUNTY	TYPE
Carpenter Tech.- Tube Div.	0052931	Rahway River		Ind/Ther/SW
Exxon Bayway Refinery	0026662	Rahway River	Linden/Union	Ind.
AI Manufacturing Corp.	0035203	Kings Creek	Linden/Union	Ind.
Palnut Division of TRW In	0035530	Echo Brook	Mountainside/Union	Ind/Thermal
Rahway DPW, City of	0025585	Rahway River	Rahway/Union	Municipal
Dri-Print Foils, Inc	0062138	Rahway River	Rahway/Union	Thermal/SW
Custom Molders Corporation	0052531	Cedar Brook	Scotch Plains/Union	Industrial
County of Union	0002887	Briant Brook	Springfield Twp/Unio	Ind.
Schiable Oil Corp.	0056219	Rahway River	Springfield Twp/Unio	Ind.
Engelhard Corp	0001180	Rahway River	Union Twp/Union	SW
Elastic Stop Nut	0003433	Storm Sewer to L	Union Twp/Union	Ind./Therm
Teledyne Adams	0029416	Rahway River	Union Twp/Union	Thermal
Tuscan Dairy Farm	0034266	Elizabeth River	Union Twp/Union	Thermal
Tuff Lite Corp	0032883	Rahway River	Edison/Middlesex	Ind/Therm
Continental Fibre Drum	0001121	Drainage Ditch T	Carteret/Middlesex	Thermal
American Alum. Cast Co	0060194	Elizabeth	Irvington/Essex	Ind
Mitchell-Supreme Fuel	0061921	Rahway River	Orange/Essex	Ind
Mobil Oil - Linden Term	0062103		Linden/Union	Ind
Polychrome Corp	0062821	Robinson´s Creek	Clark/Union	Ind
Browning-Ferris Ind	0062057	Newark Bay	Elizabeth/Union	Ind
Stephens-Miller Co	0061573	Briant´s Pond	Summit/Union	Ind

30. UPPER PASSAIC RIVER

Watershed Description

The Upper Passaic River, from the source to the confluence of the Pompton River, is nearly 50 miles long and drains approximately 200 square miles of eastern Somerset, southern Morris, and western Essex Counties. Major tributaries include the Dead River, Rockaway River, Whippany River, and the Black Brook. There are no large impoundments, but smaller ones include the Canoe Brook Reservoir, Osborn Pond and Van Dorens Mills Pond. The areas adjacent to the Passaic River are subject to frequent flooding. The population centers are Madison-Chatham, Florham Park, Bernards, Berkeley Heights and New Providence. Two sub-watersheds are delineatd: the Upper Passaic River from headwaters to the New River, and the Mid-Passaic River from the New River to the Pompton River.

Approximately one-half of the land use in this watershed is undeveloped or vacant with the remainder being primarily residential and commercial. This watershed is facing significant development in the vacant areas. There are 29 NJPDES permitted discharges identified in this watershed, of which 17 are municipal and 12 are industrial/commercial. The streams of the Upper Passaic River watershed have been classified primarily FW-2 Nontrout, but some FW-2 Trout Maintenance waters are present.

Water Quality Assessment

The Upper Passaic River is monitored at three locations - near Millington and Chatham and at Two Bridges. Results from this monitoring indicates that the Passaic River has fair water quality near Millington and Chatham, but conditions degrade at Two Bridges to poor quality. As such, water quality worsens in a downstream direction.

Near Millington and Chatham the Passaic River is nutrient enriched as evidenced by total phosphorus and total inorganic nitrogen concentrations. Phosphorus averaged .16 and .38 mg/l near Millington and Chatham, respectively. Seventy-two percent of the values were greater than .1 mg/l near Millington, while 94 percent exceeded this level near Chatham. The Passaic River near Chatham also contains generally high inorganic nitrogen with concentrations averaging 1.8 mg/l from 1983 to 1987. Fecal coliform counts were above the 200 MPN/100ml level in 62 and 77 percent of the samples taken from near Millington and Chatham, respectively. Both locations also experience reduced dissolved oxygen concentrations during summer months when levels are thought to be frequently below 4.0 mg/l (15 percent of the dissolved oxygen values were less than 4.0 mg/l). Saturation averaged only 61 percent near Millington and 78 percent near Chatham. Biochemical oxygen demand is often greater than 4.0 mg/l near Chatham. Water quality conditions degrade somewhat in the Passaic near Millington during the late spring-early summer indicating nonpoint sources may be a contributing factor. Near Chatham conditions worsen to poor quality during summer months, likely a result of point sources.

At Two Bridges the Passaic River has been subjected to numerous municipal wastewater discharges. These discharges, combined with a limited assimilative capacity of the river as it flows through a swampy area, creates poor overall water quality and very poor conditions during low flow periods. Nutrients and ammonia are highly excessive and dissolved oxygen is severely depressed during this critical period. Total phosphorus has averaged .62 mg/l at this location from 1983 to 1987, while total inorganic nitrogen concentrations averaged 3.9 mg/l. Un-ionized ammonia is present in problematic amounts during low flow and exceeded State criterion in 25 percent of all samples collected between 1983 and 1987. Dissolved oxygen concentrations average below the 4.0 mg/l criteria during the months of June to October, while dissolved oxygen saturation was below 80 percent in practically every sample. Total dissolved solids in the Passaic River periodically exceeds 500 mg/l at Two Bridges in the fall months. Fecal coliform is also excessive in the river at this location.

The NJDEP completed a modeling study in 1987 of the Passaic River from Little Falls (Lower Passaic River) upstream. The study examined the possible effects of a Raritan-Passaic inter-basin water transfer for low flow augmentation, and to determine appropriate discharge limitations for wastewater discharges. Water quality analyses for this study found severely depressed oxygen throughout the river along with ammonia toxicity problems. The river itself is considered to be eutrophic based on nutrient and algal concentrations. Phosphate is the limiting nutrient in the river.

The Passaic River is evaluated as supporting a healthy fish community from its headwaters downstream to Chatham. From Chatham to Livingston the fishery is judged to be moderately degraded. Downstream of this point to Little Falls the fish community is assessed to be degraded. Species composition in the Passaic is described as cold water types in its headwaters, shifting to both warm and cold water species north of Millington. From Chatham downstream to its mouth the fish community is limited to warm water forms.

The four mile long Foulertons Brook, a tributary to the Passaic River in Roseland, is evaluated as having a severely degraded fishery, with no aquatic life being evident.

Problem and Goal Assessment

Point Source Assessment

The Passaic River has a very limited capacity to assimilate wastewaters discharged to it and additional pollutants which may enter it as runoff. Modeling performed on the river finds that background conditions alone meet the river's assimilative capacity. In addition, major tributaries such as the Whippany River, Rockaway River and Dead River contribute severely degraded waters to the Upper Passaic. However, protection and restoration of water quality in the river is imperative because it is a significant source of drinking water for a large portion of northeastern New Jersey. Sediment oxygen demand and hydrologic characteristics of the Passaic River may result in municipal discharges having to meet levels 4 or 5 advanced treatment for denitrification. Even such extreme treatment requirements may not significantly improve water quality because of nonpoint impacts.

Department enforcement actions currently underway against facilities that are impacting surface water quality include these Passaic River discharges: Passaic Township STP, Florham Park SA, Montville MUA Forest Park STP, Berkeley Heights STP, Boro of Caldwell, Boro of West Caldwell, and Reheis Chemical in Berkeley Heights; and Welsh Farms in West Caldwell discharging to Green Brook. Hazardous waste sites known to be contaminating surface waters in this watershed are the Chevron site in Berkeley Heights releasing PCBs and volatiles to the Passaic River, and the Millington Asbestos site releasing asbestos to the Passaic River.

Nonpoint Source Assessment

The Passaic River is impacted by the extensive urban/suburban development which has occurred throughout much of its watershed. In the uppermost stretches, the Great Swamp region, local housing construction and the construction of a gas pipeline are suspected of contributing to localized stream habitat destruction. As the river flows from the Great Swamp region to Chatham the degree of development within the watershed becomes greater. Septic seepage, road and building construction, and urban surface and road runoff are all known to impact the Upper Passaic River. Florham Park and Chatham are reported to have a highly developed stormwater infrastructure, suggesting that stormwater outfalls may be a significant source of pollution to the river in this area.

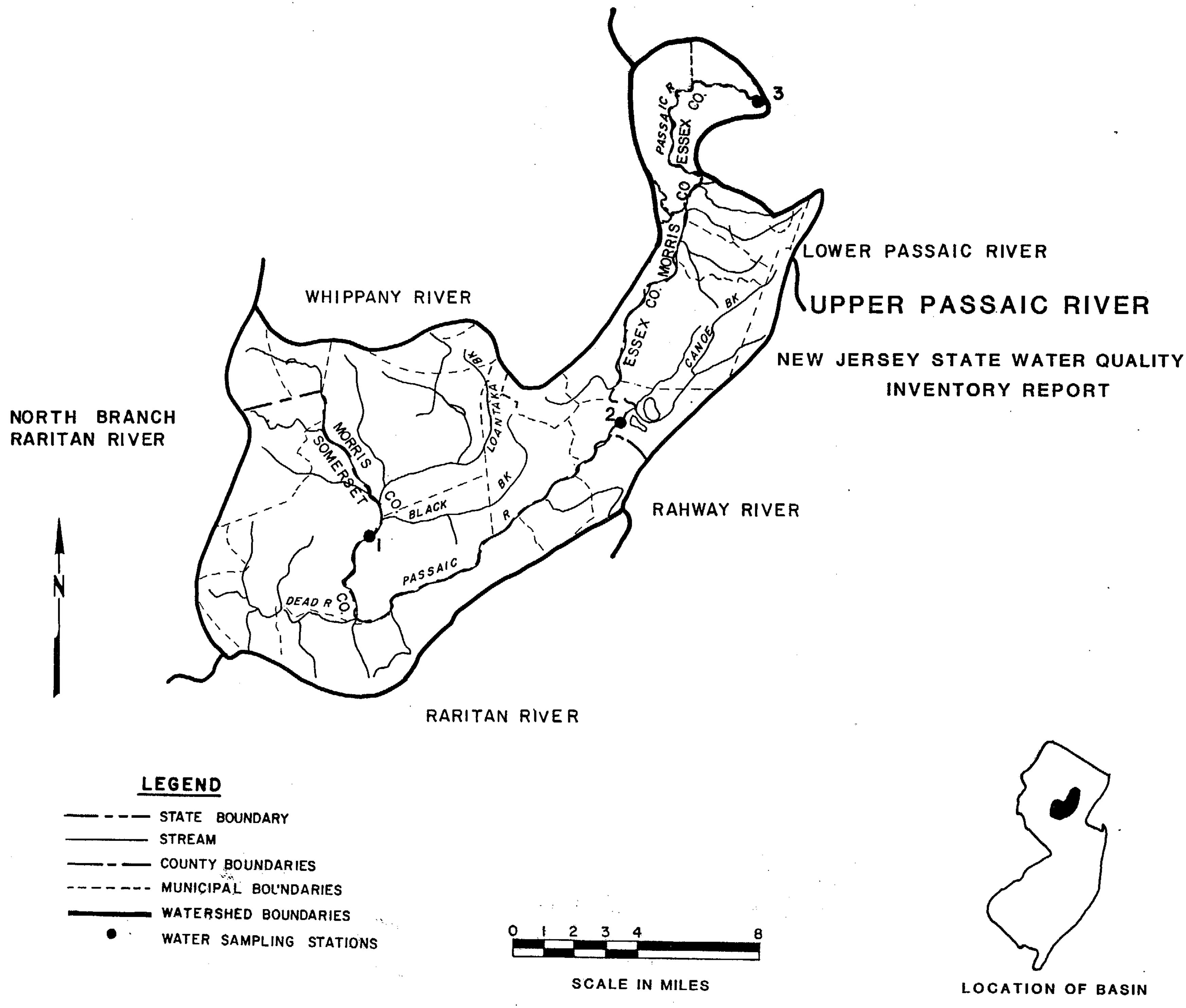
The impacts to the river from urbanization increase in severity along the stretch from Chatham to Livingston. Siltation is suspected of being the principal agent of habitat destruction in this portion of the river. It is here that the fishery begins to noticeably degrade, so that few game species are present. Those species which do survise are largely limited to pollution-tolerant forms such as carp and goldfish. Between Livingston and the Pompton River confluence habitat destruction continues to rise in severity, brought about largely by dredging, channelization, the removal of riparian vegetation, as well as ever increasing silt loads. Stream bank erosion and urban runoff appear to be common problems along the Passaic and many of its tributaries.

Designated Use and Goal Assessment

The Upper Passaic River will meet only the fish propagation and maintenance designated use/goal in portions of the river. This is the section from the river's headwaters to Chatham. From Chatham to Livingston the Passaic is partially meeting this use because of a moderately degraded fishery. From Livingston the river is considered not to be meeting the designated use. Water quality monitoring supports these conclusions. All waters will not meet the swimmable goal.

Monitoring Station List

Map Number	Station Name and Classification
1	Passaic River near Millington, FW-2 Nontrout
2	Passaic River near Chatham, FW-2 Nontrout
3	Passaic River at Two Bridges, FW-2 Nontrout


UPPER PASSAIC RIVER
NEW JERSEY STATE WATER QUALITY INVENTORY REPORT
LOWER PASSAIC RIVER
WHIPPANY RIVER
NORTH BRANCH RARITAN RIVER
RAHWAY RIVER
RARITAN RIVER
PASSAIC R
ESSEX CO.
MORRIS CO
ESSEX CO.
CANOE BK
LOANTAKA BK
BLACK BK
MORRIS
SOMERSET
CO.
PASSAIC R
DEAD R
CO.
1
2
3
N
LEGEND
STATE BOUNDARY
STREAM
COUNTY BOUNDARIES
MUNICIPAL BOUNDARIES
WATERSHED BOUNDARIES
WATER SAMPLING STATIONS
0 1 2 3 4 8
SCALE IN MILES
LOCATION OF BASIN

WATER QUALITY INDEX PROFILE 1983-1987

Upper Passaic River

WATER QUALITY INDICATORS

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVERAGE AND CONDITION
Passaic River near Millington	AVG WQI	2	45	3	22	22	6	0	6	35 Fair
	WORST3 MONTHS	June-August	May-July	May-July	July-Sept	May-July	Oct-Dec	May-July	April-June	57 Fair May-July
Passaic River near Chatham	AVG WQI	3	28	2	36	36	12	7	7	44 Fair
	WORST3 MONTHS	June-August	August-Oct	April-June	May-July	Sept-Nov	Sept-Nov	August-Oct	April-June	60Fair/Poor July-Sept
Passaic River at Two Bridges	AVG WQI	3	58	2	29	53	12	14	ID	70 Poor
	WORST3 MONTHS	June-August	August-Oct	June-August	Sept-Nov	Sept-Nov	Sept-Nov	July-Sept		100VeryPoor Sept-Nov

LEGEND - Water Quality Index Description

WQI	Condition	Description
0-10	Excellent	No or minimal pollution; water uses met throughout the year.
11-25	Good	Generally low amounts of pollution; water uses periodically not met.
26-60	Fair	Pollution amounts vary from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution in high amounts; water uses not met.
81-100	Very Poor	Pollution occurs at extremely high levels; severe stress to stream life; water uses not met.
ID	Insufficient Data	

An index of 20 is equivalent to the level of water quality criteria.

N.J.P.D.E.S. DISCHARGE INVENTORY WATERSHED: UPPER PASSAIC RIVER

DISCHARGE NAME	# NJPDES	RECIEVING WATERS	MUNICIPALITY/COUNTY	TYPE
Vet. Admin. Hosp-Lyons	0021083	Passaic River	Bernrdsvile Boro/Som	Municipal
Bernards Twp. SA	0022845	Dead River Trib.	Bernards Twp./Somer	Municipal
Warren Twp. SA Stage IV STP	0022497	Dead River	Warren Twp./Somerset	Municipal
Warren Twp. SA-Stage 2 STP	0022489	Passaic River	Warren Twp./Somerset	Municipal
Passaic Twp. STP	0024465	Passaic River	Passaic Twp./Morris	Municipal
National Mfg. Co.	0032573	Passaic River	Chatham Twp./Morris	Ind./Comm.
Chatham Twp.-Main Plant	0020290	Black Brook	Chatham Twp./Morris	Municipal
New Providence WW Disp. Plant	0021636	Passaic River	New Providence Boro/ Union	Municipal
Park Central Ass.-Chatham Twp	0020281	Passaic River	Chatham Twp./Morris	Municipal
Reheis Chem. Co.	0002551	Trib. to Passaic R.	Brkly. Hts Twp/Union	Ind./Comm.
Madison-Chatham Joint Meeting	0024937	Passaic River	Chatham Boro/Morris	Municipal
Ciba-Giegy Pharmaceutical Div	0000540	Passaic River	Summit city/Union	Ind./Comm.
Celanese Research Co.	0033197	Briant Pond	Summit City/Union	Ind./Comm.
NJDOT Springfield	0002887	Briant Brook	Sprngfld. Twp./Union	Ind./Comm.
Montville Bd of Ed-Cedar Hill	0021181	Passaic River	Montville Twp/Morris	Municipal
Montville MUA-Forest park	0024431	Passaic River	Montville Twp/Morris	Municipal
Morris Twp. Woodland STP	0024929	Loantaka Brook	Morris Twp./Morris	Municipal
Taylor Rental Center	0064181			Oil/Wtr/Sep
Warren SA Township of	0022489	Passaic River	Warren	Municipal
Orange Products Inc.	0001490	Passaic River	Chatham/Morris	Thermal
Chatham Twp-Chatham Glen STP	0052256	Passaic River	Chatham/Morris	Municipal
US Army Nike E. Hanover	0021938	Passaic River	E. Hanover Twp/Morrs	Municipal
Chem Service Inc.	0035637	Passaic River	E. Hanover Twp/Morrs	Thermal
Allied Corp.	0031305	Passaic River	Morristown/Morris	Industrial
Groene Aluminum Kasting	0063461	Upper Passaic River	Chatham/Morris	Industrial
Richards Industries	0063886	Upper Passaic River	West Caldwell/Morris	Industrial
West Caldwell Twp	0061158	Upper Passaic River	West Caldwell/Morris	Municipal
Welsh Farms	0000850	Passaic River	West Caldwell/Morris	Industrial
Berkeley Heights Twp STP	0027961	Passaic River	Berkeley Hgt/Union	Municipal

31. WHIPPANY RIVER

Watershed Description

The Whippany River drains 72 square miles of Morris County and flows 18 miles to the New River near East Hanover, directly upstream of the Passaic River. Two of the larger tributaries are Black Brook and Troy Brook. Major impoundments include Clyde Potts Reservoir, Speedwell Lake and Pocahantas Lake. The population is centered in Morristown, Parsippany-Troy Hills, Hanover Township, and East Hanover Township.

The land use in this watershed is about one-half agriculture, parkland, and vacant land; with most of the remainder being residential or commercial development. Of the 30 NJPDES permitted discharges, 17 are industrial/ commercial and 13 are municipal. Streams in this watershed have been classified FW-2 Trout Production and FW-2 Non-trout.

Water Quality Assessment

The Whippany River is routinely monitored at two locations, Morristown and Pine Brook. These two stations have fair to poor overall water quality. At Morristown the Whippany River was impacted until 1986 by a large raw sewage overflow. This may be why conditions are very poor in the river at certain periods of the year. As a result of the bypass, fecal coliform counts at Morristown have been extremely high in the river. Between 1983 and 1987 the fecal coliform geometric mean was 4798 MPN/100 ml with all of the values above State criterion. Nutrients, most notably total phosphorus, was also highly elevated in the Whippany at Morristown. Average values of total phosphorus and inorganic nitrogen were .36 mg/l and 1.9 mg/l, respectively. The State criterion for total phosphorus was exceeded in 100 percent of the samples collected during the period of review. Un-ionized ammonia also appears to be periodically excessive during summer months. While dissolved oxygen concentrations seem to be adequate, wide diurnal fluctuations may be occurring. Dissolved oxygen concentrations of 15 mg/l and over, as well as saturation values over 130 percent, indicate high primary productivity in the river.

Downstream at Pine Brook the Whippany River has significantly lower fecal coliform counts than those found at Morristown, but nutrients are higher and dissolved oxygen is generally lower. Fecal coliform counts were above State criterion in 66 percent of the samples; the geometric mean over the 1983-1987 period being 349 MPN/100ml. On the average, total phosphorus was about 50 percent higher at Pine Brook than at Morristown. In addition, total inorganic nitrogen was elevated in 61 percent of all samples, averaging 2.8 mg/l. Un-ionized ammonia has also been found to be above State criteria in warm weather periods. Dissolved oxygen may routinely drop below 4.0 mg/l during summer months and saturation is also severly reduced during this time.

The upper reaches of the Whippany River from its headwaters to Speedwell Lake were classified by the NJ Division of Fish, Game, and Wildlife as supporting a healthy cold water fish community; the fishery the river's lower reach, downstream of Speedwell Lake, is judged to be degraded. Troy Brook, a tributary, is evaluated as supporting a healthy warm water fishery.

Problem and Goal Assessment

Point Source Assessment

The Whippany River has a number of municipal and industrial wastewater discharges in its watershed. These point sources combined with urban/suburban runoff create the fair and poor conditions in the river. The Morristown STP is currently under NJDEP enforcement action for violating the BOD, suspended solids and fecal coliform limitations of its permit. The Morristown sewerage system, as noted above, had experienced raw sewage overflows. The raw sewage overflows have been eliminated, but a sewer extension ban remains in effect. Another enforcement case is underway concerning the Parsippany-Troy

Hills STP discharge to the Whippany River because of excess chlorine residual levels. The Sharkey Landfill in Parsippany-Troy Hills is impacting both the Whippany and Rockaway Rivers with metals and volatile organics.

Nonpoint Source Assessment

Urban/suburban development is suspected of degrading the water quality of the Whippany River in its upper reaches and is known to have a severe impact in the river's lower section. Upstream of Speedwell Lake, runoff from construction activity, stormwater discharges, urban surfaces, and the loss of riparian vegetation are all suspected of contributing to increasing levels of siltation in the river. This in turn has led to a reduction in the trout holding capacity of the waterway. In the lower end below Speedwell Lake, urban runoff and chemical spills have resulted in severe siltation and an overall degradation of the river's water quality. The lower Whippany River is reported to have had a long history of fishkills caused by industrial and municipal pollution. Few game fish are said to inhabit this portion of the river, in their stead are pollution tolerant forms such as carp and pan fish. Speedwell Lake and the wetland areas of the Whippany River watershed, Black and Troy Meadows, are known to be receiving severe and increasing runoff from construction activity and from local storm sewers.

Designated Use and Goal Assessment

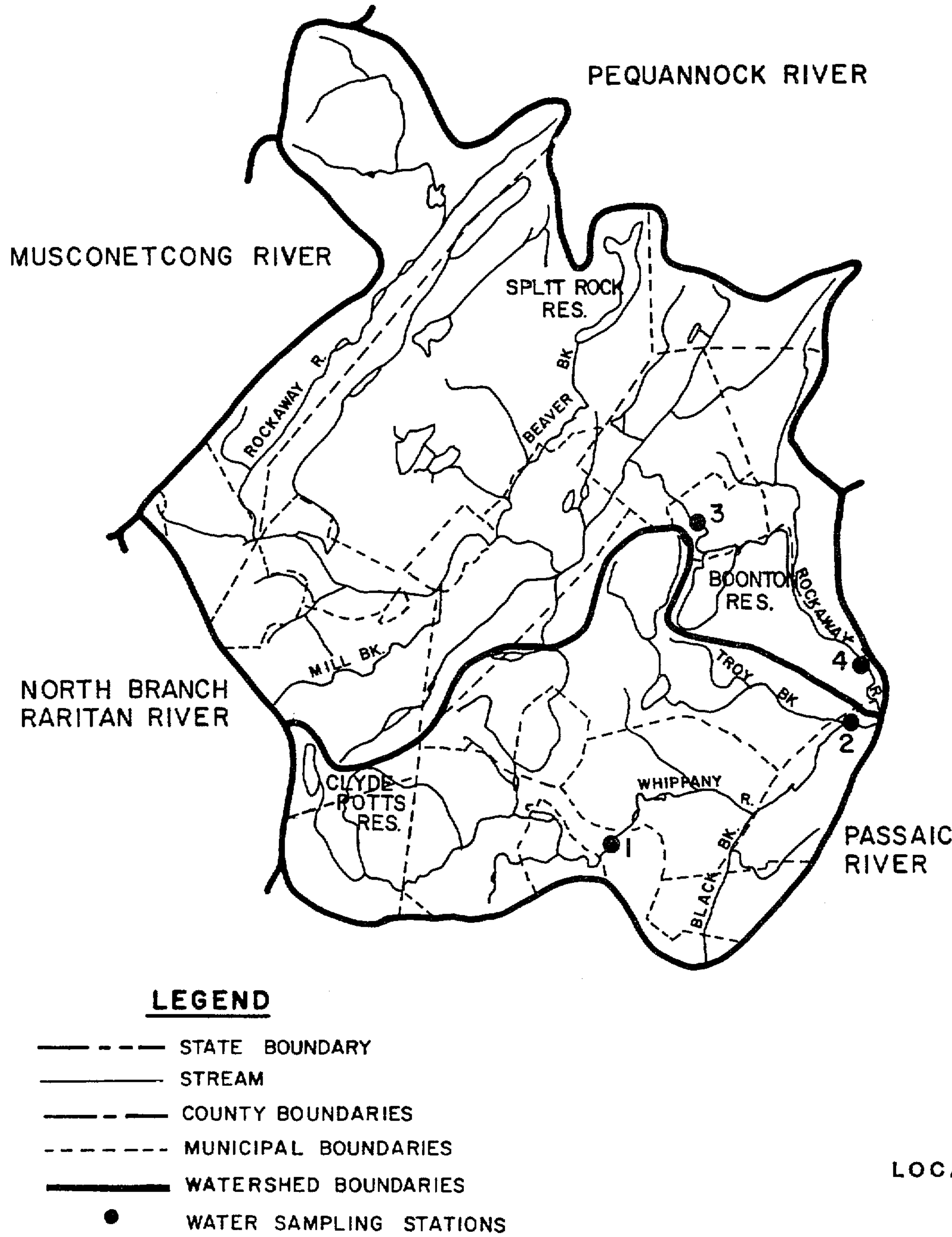
The Whippany River will meet the fish propagation/maintenance designated use in the upper two-thirds of the watershed; but the lower reach of the river is considered as containing degraded fisheries, and as such, is not meeting the fish propagation/maintenance use and clean water goal. The river will not achieve swimmable status because of fecal coliform concentrations.

Monitoring Station List

Map Number	Station Name and Classification
1	Whippany River at Morristown, FW-2 Nontrout
2	Whippany River at Pine Brook, FW-2 Nontrout

WHIPPANY AND ROCKWAY RIVERS

NEW JERSEY STATE WATER QUALITY INVENTORY REPORT



LOCATION OF BASINS

WATER QUALITY INDEX PROFILE 1983-1987

Whippany River

WATER QUALITY INDICATORS

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVERAGE AND CONDITION
Whippany R at Morristown	AVG WQI	2	37	8	66	35	8	10	8	69 Poor
	WORST3 MONTHS	June-August	Nov-Jan	August-Oct	May-July	Oct-Dec	Sept-Nov	August-Oct	June-August	94very Poor Nov-Jan
Whippany R at Pine Brook	AVG WQI	2	37	3	30	46	10	10	10	52 Fair
	WORST3 MONTHS	June-August	May-July	Dec-Feb	Feb-April	Sept-Nov	Sept-Nov	July-Sept	April-June	77 Poor June-August

LEGEND - Water Quality Index Description

WQI	Condition	Description
0-10	Excellent	No or minimal pollution; water uses met throughout the year.
11-25	Good	Generally low amounts of pollution; water uses periodically not met.
26-60	Fair	Pollution amounts vary from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution in high amounts; water uses not met.
81-100	Very Poor	Pollution occurs at extremely high levels; severe stress to stream life; water uses not met.
ID	Insufficient Data	

An index of 20 is equivalent to the level of water quality criteria.

N.J.P.D.E.S. DISCHARGE INVENTORY WATERSHED: WHIPPANY RIVER

DISCHARGE NAME	# NJPDES	RECIEVING WATERS	MUNICIPALITY/COUNTY	TYPE
Contract Packaging Corp.	0021334	India Brook	Mendham Boro/Morris	Municipal
St. Marys Abby-Delbarton Sch.	0026751	Whippany River	Morris Twp./Morris	Municipal
DOT I80 Harding Twp. Reststop	0029912	Great Brook	Harding Twp./Morris	Municipal
Parke Davis/Warner Lambert	0002542	Watnong Brook	Morris Plains/Morris	Ind./Comm.
Greystone Pk. Psych. Hospital	0026689	Vaqui Pond to Whipp.	Morris Twp./Morris	Municipal
Airtron Div. Litton Ind.	0025739	Whippany River	Morris Plains/Morris	Ind./Comm.
Colloid Chem. Labs	0003697	Whippany River	Hanover Twp./Morris	Ind./Comm.
Fabricated Plastics	0029734	Whippany River	Morristown Twn./Morr	Ind./Comm.
Champion-Dairypak Div.	0033685	Whippany River	Morristown Twn./Morr	Ind./Comm.
Morristown STP	0025496	Whippany River	Morristown Twn./Morr	Municipal
Morris Twp. Butterworth STP	0024911	Whippany River	Morris Twp./Morris	Municipal
Asco Elec. Prod. Co.	0032166	Eastmans Brook	Parsip.-Troyhills/ Morris	Ind./Comm.
Leeming Pacquin Corp.	0003450	Eastmans Brook	Parsip.-Troyhills/	Ind./Comm.
Rowe International Inc.	0001708	Passaic Basin	Hanover Twp./Morris	Ind./Comm.
Hanover Twp. STP	0024902	Whippany River	Hanover Twp./Morris	Municipal
Campbell-Pratt Oil Co.	0028339	Whippany River	Hanover Twp./Morris	Ind./Comm.
Amax Specialty Metals Inc.	0001881	Black Brook	Florham Pk Boro/Morr	Ind./Comm.
Sis. of Charity of St. Eliz.	0026654	Black Brook	Florham Pk Boro/Morr	Municipal
Exxon Research + Eng.	0003476	Drain to Black Brook	Florham Pk Boro/Morr	Ind./Comm.
Parsippany-Troyhills	0024970	Whippany River	Parsip. Troyhills/ Morris	Municipal
NORDA, Inc.	0003514	Whippany River	E. Hanover Twp./Morr	Ind./Comm.
East Hanover Twp. Well No2	0036081	Whippany River	E. Hanover Twp./Morr	Industrial
Township of Morris	0024911	Whippany River	Morris Twp./Morris	Municipal
Mennen Company	0035238	Whippany River	Morristown Twp./Morr	Industrial
Campbell-Pratt Oil Co.	0028339	Whippany River	Whippany R./Morris	Stormwater
Chatham Township Main Sewage	0020290	Black Brook	Chatham/Morris	Municipal
Leslie Co.	0032221	Eastman's Brook	Parsippany/Morris	Industrial
Anchor Swim Club	0050024	Malapardis Brook	Hanover Twp/Morris	Industrial
Magullian Fuel Corp	0026093	Whippany River	Hanover Twp/Morris	Industrial
AT&T Bell Labs- Whippany	0063835	Whippany River	Hanover Twp/Morris	Industrial

32. ROCKAWAY RIVER

Watershed Description

The Rockaway River has a drainage area of 133 square miles that is mostly within Morris County with a small portion in Sussex County. It flows east to a confluence with the Whippany River at Pine Brook. Major tributaries to this 37 mile long river include Stone Brook, Mill Brook, Beaver Brook and Den Brook. There are many lakes and ponds in this area, but the major impoundments are Mountain Lakes Reservoir, Upper Longwood Lake, Boonton Reservoir, Taylortown Reservoir, Splitrock Reservoir, White Meadow Lake, and Lake Denmark. The population centers include Boonton, Randolph, Montville, Kinnelon and Dover.

Much of the land use in this area is wooded, vacant, and park lands. The remaining land is residential, but there is also some industrial and commercial land use. Development is occurring in much of the vacant areas. There are 32 NJPDES permitted dischargers here, of which 25 are industrial/commercial and 7 are municipal. Waters in this drainage basin have been rated FW-2 Trout Production, FW-2 Trout Maintenance, FW-2 Nontrout and FW-1.

Water Quality Assessment

The Rockaway River is routinely monitored at Boonton above the Boonton Reservoir and at Pine Brook. This monitoring indicates that the river is of normally good quality above the reservoir, but has fair quality below it. Conditions in the Lower Rockaway River degrade significantly during summer months to very poor quality.

Above the Boonton Reservoir the Rockaway River contains low to moderate amounts of fecal coliform and total phosphorus. The geometric mean of fecal coliform counts from 1983 to 1987 was 114 MPN/100ml with 41 percent exceeding the State criterion. Total phosphorus was elevated in 25 percent of the samples and averaged .04 mg/l, just below the .05 mg/l criterion for prevention of impoundment/lake eutrophication. Dissolved oxygen concentrations appear to be above the 4.0 mg/l standard for warm-water fisheries in the river, although very high DO levels (over 14 mg/l) may indicate excessive primary productivity in the river.

Below the Boonton Reservoir the Rockaway River is monitored at Pine Brook. Water quality conditions at this location are significantly poorer than those at Boonton. Elevated nutrients, BOD and fecal coliform, along with reduced dissolved oxygen, result in fair overall quality, with very poor conditions during the late summer period. Total phosphorus has averaged above .50 mg/l during the period 1983 to 1987. Seventy-three percent of the samples were greater than the .1 mg/l criterion. Total inorganic nitrogen and total Kjeldahl nitrogen are also high; inorganic nitrogen samples averaged 3.7 mg/l, and Kjeldahl nitrogen averaged 3.1 mg/l. As a result, un-ionized ammonia is frequently above the criterion for protection of aquatic life. Thirty-one percent of all un-ionized ammonia samples were greater than .05 mg/l with the majority of the high values occurring during late summer-early fall. Fecal coliform was above 200 MPN/100ml in 44 percent of all values and had a geometric mean of 169 MPN/100ml during the period of review.

Dissolved oxygen concentrations in the Rockaway River at Pine Brook drops below 4.0 mg/l during the summer, while DO saturation often falls well below 80 percent. DO saturation has averaged only 72 percent from 1983 to 1987.

Biological monitoring of the Rockaway River at Boonton has found the waterway to contain a healthy environment for macroinvertebrates. The percentage of pollutant-tolerant organisms was low, and no single species dominated the community. Historically, the macroinvertebrate community appears to have improved over the past decade. Periphyton densities have been variable, but this sampling also indicates the waters to be relatively free of organic enrichment.

The Rockaway River supports cold water fish species in its upstream sections and warm water forms in its downstream reaches. The fish community in the river above Dover is assessed by the New Jersey Division of Fish, Game, and Wildlife to be healthy. Between Dover and the Boonton Reservoir, the fish population is judged to be moderately degraded; below the reservoir the fishery is regarded as degraded.

Four additional streams were assessed in the watershed. Hibernia and Mill Brooks are judged to contain healthy cold water fisheries. The fish community of Beaver Brook is reported to be healthy except in its lower reaches where it is evaluated as moderately degraded. Den Brook is assessed to be degraded.

Problem and Goal Assessment

Point Source Assessment

The Rockaway River appears to be impacted by a combination of point and nonpoint sources. In the Upper Rockaway watershed, a number of small treatment plants discharge to the river. Of these, the Picatinny Arsenal discharge to Green Pond Brook, the Berkshire Sand and Stone discharge to the Rockaway, Jefferson Township's Middle and High School discharge to Edison Brook and the Stanlick School discharge to Lake Shawnee are all under enforcement actions because of poor quality wastewaters. Septic systems are also thought to be contributing to pollution loads in the river. The Boonton Reservoir likely acts as a pollutant sink because of detention in the reservoir.

In the Lower Rockaway River the Rockaway Valley Regional SA has been the dominant discharger to the river. This discharge was recently upgraded to level 4 treatment with denitrification, and expanded to a 12 mgd design capacity. But the discharge is suspected of being the prime source of nutrients, ammonia and depressed DO in the Lower Rockaway. The impacts of the discharge are magnified by limited drawdown from Boonton Reservoir during low-flow. The Rockaway Valley SA discharge may contribute up to 50 percent of the Rockaway's stream flow during extreme low-flow periods. Dischargers under enforcement actions in the Lower Rockaway watershed include the two Montville MUA discharges to Valhalla Brook (the Brook Valley and Norrland Estates STPs).

Two known hazardous waste sites are located in the Rockaway watershed which are suspecting of contaminating surface waters. They are the Sharkey Landfill in Parsippany-Troy Hills and L.E. Carpenter in Wharton Boro.

Nonpoint Source Assessment

The Rockaway River from Dover down to the Passaic River is impacted to varying degrees by urban/suburban development; this impact increases in severity as one travels downstream. Construction activities and urban runoff from storm sewers and urban surfaces have resulted in siltation, high stream temperatures, and losses of riparian vegetation, all of which contribute to a general decline in stream water quality. In the stretch between Dover and the Boonton Reservoir this degradation has led to a reduction in the stream's trout holding capacity. Farther downstream of the reservoir the impacts from these sources become more severe, and together with the effects of point sources the fish population degrades to one limited to species such as carp, which are tolerant of pollution.

Many other streams in this watershed are also impacted by urbanization. Construction and urban runoff (sewers, urban surfaces) have degraded Jackson Brook where fishkills have been documented. Beaver Brook is reported to have a severely impaired fishery due to intensive and increasing road and housing construction. Development is so severe around Den Brook that it has led to complete habitat destruction within the stream.

Designated Use and Goal Assessment

The Rockaway River will only meet the fish propagation and maintenance designated uses and Clean Water Act goal in certain areas. This is the river above Dover. From Dover to the Boonton Reservoir the river partially achieves the use, while below the Boonton Reservoir it does not meet the use. Various tributaries meet, meet but are threatened, partially meet, or do not meet the fish propagation/maintenance use. The river will not achieve swimmable status.

Monitoring Station List

Map Number	Station Name and Classification
3	Rockaway River at Boonton FW-2, Nontrout
4	Rockaway River at Pine Brook, FW-2 Nontrout

See page III-246 for a map of the Rockaway watershed.

WATER QUALITY INDEX PROFILE 1983-1987

Rockaway River

WATER QUALITY INDICATORS

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVERAGE AND CONDITION
Rockaway R at Boonton	AVG WQI	2	4	7	23	17	6	2	ID	14 Good
	WORST3 MONTHS	June-August	Nov-Jan	June-August	Nov-Jan	Nov-Jan	Feb-April	July-Sept		25Good/Fair Nov-Jan
Rockaway R at Pine Brook	AVG WQI	2	28	2	21	43	9	10	7	41 Fair
	WORST3 MONTHS	June-August	July-Sept	July-Sept	June-August	July-Sept	August-Oct	July-Sept	May-July	86very poor July-Sept

LEGEND - Water Quality Index Description

WQI	Condition	Description
0-10	Excellent	No or minimal pollution; water uses met throughout the year.
11-25	Good	Generally low amounts of pollution; water uses periodically not met.
26-60	Fair	Pollution amounts vary from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution in high amounts; water uses not met.
81-100	Very Poor	Pollution occurs at extremely high levels; severe stress to stream life; water uses not met.
ID	Insufficient Data	

An index of 20 is equivalent to the level of water quality criteria.

N.J.P.D.E.S. DISCHARGE INVENTORY WATERSHED: Rockaway River

DISCHARGE NAME	# NJPDES	RECIEVING WATERS	MUNICIPALITY/COUNTY	TYPE
Jefferson Twp. Sr. High and Middle School	0021091	Rockaway River	Jefferson Twp/Morris	Municipal
Roxbury Motel Assoc.	0028304	Drakes Brook	Roxbury Twp./Morris	Municipal
Hercules Inc.	0000876	Black River	Roxbury Twp./Morris	Ind./Comm.
Picatinny Arsenal	0002500	Green Pond Brook	Rockaway Twp./Morris	Ind./Comm.
Air Prod. + Chem. Corp.	0000523	Rockaway River	Wharton Boro/Morris	Ind./Comm.
L>E> Carpenter + Co.	0003611	Rockaway River	Wharton Boro/Morris	Ind./Comm.
GHA Lock Joint	0002593	Rockaway River	Wharton Boro/Morris	Ind./comm.
Thatcher Glass Mfg. Co.	0034681	Ground Water	Wharton Boro/Morris	Ind./Comm.
Mt. Hope Rock Prod., Inc.	0003409	White Meadow Brook	Rockaway Twp./Morris	Ind./Comm.
Rockaway Townsquare Mall	0032808	Rockaway River	Rockaway Twp./Morris	Ind./Comm.
McWilliams Forge Co., Inc.	0002496	Rockawayy River	Rockaway Twp./Morris	Ind./Comm.
Howmet Turbine Co. Corp.	0001635	Rockaway River	Rockaway Twp./Morris	Ind./Comm.
Hewlett-Packard Co. NJ Div.	0003077	Hibernia Brook	Rockaway Twp./Morris	Ind./Comm.
Ivex Corp.	0034720	Rockaway River	Rockaway Twp./Morris	Ind./Comm.
Kueffel + Esser Co. Redon Plt	0001261	Burnt Meadow Brook	Rockaway Twp./Morris	Ind./Comm.
WP Realty Co.	0035050	Beaver Brook	Denville Twp./Morris	Ind./Comm.
Our Lady of the Magnificat School	0024457	Butler Reservoir	Kinnelon Boro/Morris	Municipal
Montville Twp. BP MVA - Norland	0030317	Valhalla Brook	Montville Twp/Morris	Municipal
Montville Twp. MUA-Brook Valley STP	0030317	Valhalla Brook	Montville Twp/Morris	Municipal
Scerbo Bros., Inc.	0030911	Crooked Brook	Boonton Twp./Morris	Ind./Comm.
Rockaway Valley Reg. S.A.	0022349	Rockaway River	Prsipny.-Tryhls./Mor	Municipal
Jim Salerno Pontiac Inc.	0031755	Rockaway River	Randolph Twp./Morris	Ind./Comm.
Randolph High School	0026603	Mill Brook	Randolph Twp./Morris	Municipal
Advance Pressure Casting Corp	0034649	Rockaway River	Denville Twp./Morris	Thermal
Green Hammer Metal Products Company	0034134	Rockaway River	Dover/Morris	Thermal
Jefferson Middle & High School	0021091	Rockaway River	Jefferson Twp/Morris	Municipal
Mt. Olive Township	0021954	Drakes Br.	Flanders/Morris	Municipal
Howmet Turbine Comporets Corp	0001635	Rockaway River	Rockaway/Morris	Thermal/Ind
White Meadow Lake Prop Onm	0022802	White Meadow Brook	Rockaway Twp./Morris	Municipal

N.J.P.D.E.S. DISCHARGE INVENTORY WATERSHED: Rockaway River Cont.

DISCHARGE NAME	# NJPDES	RECIEVING WATERS	MUNICIPALITY/COUNTY	TYPE
Action Technology Company	0027564	Burnt Meadow Brook	Rockaway/Morris	Industrial
Rockaway Township WTP	0035785	Beaver Brook	Rockaway Twp/Morris	Industrial
Pneu Hydro Products Inc.	0052396	Green Pond Brook	Wharton Boro/Morris	Industrial
Thermal American Fused	0032026	Beaver Brook	Montville/Morris	Thermal
Dover, Town of	0055727	Rockaway River	Dover/Morris	Industrial
Adron	0003506	Lake Intervale	Parsippany/Morris	Industrial
Berkshire Sand & Stone	0029394	Rockaway River	Jefferson Twp./Morr	Industrial

33. PEQUANNOCK RIVER

Watershed Description

The Pequannock River is 30 miles long and drains an area of 90 square miles. Its headwaters are in Sussex County and it flows east, delineating the Morris/Passaic County line. It continues flowing east and joins the Wanaque River and flows to the Pompton River in Wayne Township. There are many lakes, ponds and reservoirs in this area, but the major impoundments are the Kikeout Reservoir, Lake Kinnelon, Clinton Reservoir, Canistear Reservoir, Charlottsburg Reservoir, Oak Ridge Reservoir, and Echo Lake Reservoir. The major tributary is Stonehouse Brook. Population in this watershed is centered in Butler and Bloomingdale Townships.

The great majority of the land use in this watershed is forested and protected for water supply purposes and parklands. The remaining is residential and industrial/commercial. There are 18 NJPDES permitted discharges; 6 municipal and 12 industrial. Waters are classified FW-1 in the Newark water supply area, FW-2 Trout Production, FW-2 Trout Maintenance, and FW-2 Nontrout.

Water Quality Assessment

The Pequannock River is routinely sampled at the Macopin Intake. Based on this monitoring the Pequannock River has good overall water quality, with conditions approaching fair quality during summer months. The river is classified trout maintenance at this location. The only significant water quality problem identified in ambient monitoring is stream temperature, which is often above recommended trout maintenance criterion from June to August. Dissolved oxygen is sufficient at all times and biochemical oxygen demand is usually less than 3.0 mg/l. Fecal coliform counts did not exceed the 200 MPN/100ml criterion from 1983 to 1987, and had a geometric mean of 25. Nutrients are also low, as total phosphorus averaged .05 mg/l and exceeded recommended criterion in only one sample during the period of review.

Biological monitoring is also performed at the Macopin Intake. Both macroinvertebrate and periphyton sampling found good healthy communities, but some nutrient enrichment or the presence of detritus is indicated.

The Pequannock River upstream of Butler is assessed as supporting a healthy cold water fish community. Below Butler, the fishery is judged to be moderately degraded. Two additional streams in the watershed were assessed: Pacack Brook is evaluated to be containing a healthy warm water fishery; Kikeout Brook is believed to carry a degraded cold water fish community.

Problem and Goal Assessment

Point Source Assessment

The Pequannock River watershed is primarily forested and in protected water supply lands. As a result, development and pollution sources are, for the most part, limited. The major pollution problem in the watershed was the Butler-Bloomingdale STP which discharges to the lower portion of the river. The plant had a history of poor quality effluent. In December 1987, the plant discontinued operation with flows tranferred to the Pequannock River Basin Regional STP. Improvements to river water quality should result from this action. Enforcement activities are underway against two facilities having deleterious impacts on stream water quality: the West Milford MUA Crescent Park STP discharge to Belchers Creek and the Petracca Landfill adjacent to a small tribuatary to the Pequannock River.

Nonpoint Source Assessment

The principal source of nonpoint pollution in the Pequannock River watershed from Stockholm to the Pompton River is evaluated to be urban/suburban development. In general, water quality declines as one travels downstream, especially as one passes through the Butler-Bloomingdale area. Reported pollution sources include rising levels of runoff from roads, building construction, urban surfaces, storm sewers and surface mines. Additiion problems below Bloomingdale include channelization, streambank modification, and the removal of riparian vegetation. All this has contributed to high water temperatures, silt loads, and organic pollution.

Designated Use and Goal Assessment

The Pequannock River will achieve the fish propagation/maintenance designated use in most parts of the river. The lower five miles, evaluated to contain a moderately degraded fisheries, is classified as partially meeting the designated use. Monitoring at the Macopin Intake finds that the river will meet the swimmable use and clean water goal at this location.

Monitoring Station List

Map Number	Station and Classification
1	Pequannock River at Macopin Intake, FW-2 Trout Maintenance

See page III-265 for a map of the Pequannock River watershed.

WATER QUALITY INDEX PROFILE 1983-1987

Pequannock River

WATER QUALITY INDICATORS

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVERAGE AND CONDITION
Pequannock River at Macopin Intake	AVG WQI	15	8	8	9	9	4	2	ID	12 Good
	WORST3 MONTHS	June-August	March-May	Nov-Jan	June-August	May-July	Jan-March	July-Sept		26 Good June-August

LEGEND - Water Quality Index Description

WQI	Condition	Description
0-10	Excellent	No or minimal pollution; water uses met throughout the year.
11-25	Good	Generally low amounts of pollution; water uses periodically not met.
26-60	Fair	Pollution amounts vary from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution in high amounts; water uses not met.
81-100	Very Poor	Pollution occurs at extremely high levels; severe stress to stream life; water uses not met.
ID	Insufficient Data	

An index of 20 is equivalent to the level of water quality criteria.

N.J.P.D.E.S. DISCHARGE INVENTORY

WATERSHED: PEQUANNOCK RIVER

DISCHARGE NAME	# NJPDES	RECIEVING WATERS	MUNICIPALITY/COUNTY	TYPE
W Milford MUA-Crescent Pk STP	0026174	Belchers Creek	W. Milford Twp/Pass	Municipal
Camp Vacamas Ass. of NJ	0030201	Pequannock R. Trib.	W. Milford Twp/Pass	Mun/Ind/Com
W. Milford MUA-Olde Milford	0027677	Belchers Creek Trib.	W. Milford Twp/Pass	Municipal
W. Milford High View	0027685	Vreeland Pond	W. Milford Twp/Pass	Municipal
Milford Manr Nursing Home-STP	0026981	Trib. to Nosengo	W. Milford Twp/Pass	Ind./Comm.
Kinnelon H.S.	0022284	Trib to Pequanock R.	Kinnelon Boro/Morris	Municipal
Kinnelon Twp.-Stony Brk. Sch.	0022276	Pequannock River	Kinnelon Boro/Morris	Municipal
Pass. Crushed Stone Co., Inc.	0025500	Pequannock River	Pompton Lks Boro/Pas	Ind./Comm.
Riverdale Quarry	0001601	Pequannock River	Riverdale Boro/Morri	Ind./Comm.
W. Milford Shopping Ctr.	0024414	Belcher's Creek	W. Milford/Passaic	Industrial
Passaic Rubber Co.	0030457	Pequannock River	Wayne Twp/Passaic	Ind/Thermal
Mack-Wayne Plastics Com	0030775	Pequannock River	Wayne Twp/Passaic	Ind/Thermal
Pilot Metal Fabricators Inc.	0033642	Pequannock River	Wayne Twp/Passaic	Thermal
NJ Department of Defense	0050717	Pequannock River	Riverdale Boro/Morr.	Industrial
Raia Industries	0062243	Pequannock River	Riverdale Boro/Morr	Ind./Storm
Vibration Mounting & Control	0025712	Pequannock River	Butler/Morris	Industrial
Butler Water Department	0025721	Kakeout Brook	Butler/Morris	Industrial
Franks Sanitation Service	0065862	Pequannock	Riverdale/Burl	Ind

34. *WANAQUE RIVER*

Watershed Description

The Wanaque River, with its headwaters in New York State, has a total drainage area of 108 square miles. That part which is in New Jersey is in Passaic County. Its headwaters begin as minor tributaries to Greenwood Lake (which is half in New York and half in New Jersey) before flowing southwesterly to the Wanaque Reservoir, then south to Lake Inez. It flows from Lake Inez to its confluence with the Pequannock River at Riverdale. The river's total length is 27 miles. Major tributaries include West Brook and Jennings Creek. There are many lakes, reservoirs, and ponds with the larger ones being the Wanaque Reservoir, Greenwood Lake, Arcadia Lake and Lake Inez. There are no large population centers, but most of the people can be found living in Ringwood and Wanaque Townships.

Most of the land in this watershed is undeveloped, consisting of vacant lands, reservoirs, parks, and farms. For the most part, the remainder is residential with some land being used for industry and commerce. Of the 11 NJPDES permitted discharges here, 4 are commercial/industrial, and 7 are municipal. The waters of this drainage area have been classified FW-1, FW-2 Trout Production, FW-2 Trout Maintenance, and FW-2 Nontrout.

Water Quality Assessment

The Wanaque River has one ambient water quality monitoring station which is located at Wanaque. This is just downstream of the dam at Wanaque Reservoir, a major water supply source. As such, water quality conditions in the Wanaque River at Wanaque are highly influenced by the impoundment. Routine monitoring finds the Wanaque River to be of excellent quality with very little pollution. During 1983 to 1987 there was very little seasonal change in water quality

Few water quality problems have been documented by ambient monitoring of the Wanaque River at Wanaque. Fecal coliform counts had a geometric mean of 9 MPN/100 ml from 1983 to 1987, with all counts less than 200 MPN/100 ml. Total phosphorus was similarily low, averaging .03 mg/l. Dissolved oxygen, as measured as concentration and percent saturation, is adequate for warm water fisheries throughout the year.

The Wanaque River upstream of the Wanaque Reservoir is assessed by the New Jersey Division of Fish, Game and Wildlife as containing a healthy cold water fish community. Below the reservoir the fishery shifts to warm water species and is judged to be moderately degraded. Belcher Creek is evaluated as supporting a moderately degraded warm water fish community.

Problem and Goal Assessment

Point Source Assessment

The water quality of the Wanaque River at Wanaque, although excellent, is probably not indicative of the entire river. Conditions are thought to degrade somewhat in a downstream direction. Below this monitoring station point sources and increased development likely influence the river's quality.

Two municipal sewage treatment facilities, (the Haskell and Meadowbrook STPs, both in Wanaque Boro), were under enforcement action in prior years and were impacting water quality of the Wanaque River. They have been eliminated recently with the completion of the new Wanaque Valley Regional SA facility. An industrial discharge to Belcher Creek is suspected of degrading the fishery of the creek. The Lakeland High School hazardous waste site in Wanaque Township is contaminating High Mountain Brook with chemicals.

Nonpoint Source Assessment

Nonpoint source assessments on the Wanaque River were restricted to the river reaches below the Wanaque Reservoir. In this region the primary nonpoint pollution sources are those associated with urban/suburban development; they have degraded the fishery habitat by contributing to excessive siltation and elevated stream temperatures. Other nonpoint pollution sources known to be a problem here include runoff from urban surfaces and roads. In addition, the removal of riparian vegetation along the river is reported to have further contributed to stream degradation.

Designated Use and Goal Assessment

The Wanaque River is swimmable as it emerges from the Wanaque River. It is not known if the river maintains good bacterial quality downstream. The Wanaque River will meet the fish propagation and maintenance use above the reservoir, but is thought to partially meet it below the impoundment.

Monitoring Station List

Map Number	Station Name and Classification
2	Wanaque River at Wanaque, FW-2 Nontrout

See page V-265 for a map of the Wanaque Watershed.

WATER QUALITY INDEX PROFILE 1983-1987

Wanaque River

WATER QUALITY INDICATORS

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVERAGE AND CONDITION
Wanaque River at Wanaque	AVG WQI	1	3	4	4	6	3	0	6	3 Excellent
	WORST3 MONTHS	July-Sept	May-July	Jan-March	Sept-Nov	April-June	Feb-April	July-Sept	Sept-Nov	4 Excellent Sept-Nov

LEGEND - Water Quality Index Description

WQI	Condition	Description
0-10	Excellent	No or minimal pollution; water uses met throughout the year.
11-25	Good	Generally low amounts of pollution; water uses periodically not met.
26-60	Fair	Pollution amounts vary from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution in high amounts; water uses not met.
81-100	Very Poor	Pollution occurs at extremely high levels; severe stress to stream life; water uses not met.
ID	Insufficient Data	

An index of 20 is equivalent to the level of water quality criteria.

N.J.P.D.E.S. DISCHARGE INVENTORY

WATERSHED: WANAQUE RIVER

DISCHARGE NAME	# NJPDES	RECIEVING WATERS	MUNICIPALITY/COUNTY	TYPE
American Candle Co. Inc.	0029769	Passaic Trib.	Wanaque Boro/Passaic	Ind./Comm.
Arrow Group Ind., Inc.	0001317	Post Brook	Wanaque Boro/Passaic	Ind./comm.
Solar Prod.	0029947	Wanaque River	Pomton Lks Boro/Pass	Ind./Comm
National Beryllia Pecision	0025470	Post Brook	Wanaque Boro/Passaic	Thermal
West Milford Twp. MUA	0027669	Wanaque River	West Milford/Passaic	Municipal
Wanaque Valley RSA/WTP	0053759	Wanaque River	Ringwood Boro/Pass.	Municipal
Ringwood Plaza STP	0032395	Wanaque River	Ringwood Boro/Pass.	Municipal
Ringwood Acres Treatment	0027006	High Mt. Brook	Ringwood Boro/Pass.	Municipal
Robert Erskine Schol	0029432	Erskine Brook	Ringwood Boro/Pass.	Municipal
Peter Cooper School	0034169	High Mt. Brook	Ringwood Boro/Pass.	Municipal
Marshall Hill School	0033308	Greenwood Lake	West Milford/Passaic	Municipal

35. *RAMAPO AND POMPTON RIVERS*

Watershed Description

The Ramapo River has a drainage area of about 160 square miles, 110 of which are in New York State. It flows from New York into Bergen County and enters the Pequannock River to form the Pompton River in Wayne Township. The Ramapo River is 15 miles long in New Jersey. The Pompton River is a tributary to the Passaic River and is 7 miles long. Major impoundments include Point View Reservoir #1, Pompton Lake and Pines Lake. The population centers are Mahwah, Pompton Lakes, Pompton Plains, Oakland, and Franklin Lakes.

Over one-half of this watershed is undeveloped, with the remainder being primarily suburban/commericial/industrial. New development is extensive in many areas of the watershed. There are 24 NJPDES permitted discharges present in the two watersheds, 17 of which are municipal and 7 are industrial. Waters have been rated FW-2 Trout Production and FW-2 Nontrout.

Water Quality Assessment

The Ramapo and Pompton Rivers both have one ambient monitoring station each. The Ramapo River is sampled at Mahwah and the Pompton River is monitored at Packanack Lake. Results of this monitoring finds that the Pompton River has good conditions while the Ramapo River contains fair quality waters.

The Ramapo River is afflicted with moderately excessive fecal coliform and nutrient concentrations. Fecal coliform exceeded State criterion in 70 percent of all samples, and had a geometric mean of 586 MPN/100ml. High concentrations of total phosphorus are also found. Total phosphorus averaged .20 mg/l from 1983 to 1987 with 78 percent above the recommended criterion of .1 mg/l. Total inorganic nitrogen was found to be high in 10 percent of the samples collected. Although dissolved oxygen concentrations were above criterion in all measurements, when analyzed as percent saturation it was occasionally below 80 percent. Biochemical oxygen demand appears to periodically be greater than 4.0 mg/l. Conditions in the Ramapo River degrade somewhat during late summer/early fall.

In the Pompton River conditions are better. Good quality waters from the Pequannock and Wanaque Rivers appear to be maintained in the Pompton River. Although lower than the Ramapo River, the Pompton River contains moderate bacterial and nutrient concentrations. Total phosphorus was elevated in 66 percent of the samples, and averaged .19 mg/l. Total inorganic nitrogen is occasionally high, averaging 1.3 mg/l. Fecal coliform had a geometric mean of 143 MPN/100ml during the period of review, with 44 percent greater than the 200 MPN/100ml criterion. The Pompton River also suffers from low dissolved oxygen saturation during summer months. During this period saturation is usually less than 80 percent. BOD concentrations are somewhat elevated in low flow periods. One elevated cadmium concentration was found in the Pompton River during the period of review.

The Ramapo River is evaluated by the New Jersey Division of Fish, Game and Wildlife as supporting a healthy warm water fish community. The Masonicus Brook, a Ramapo River tributary, is judged to be containing a moderately degraded warm water fishery. The Pompton River supports both cold and warm water fish forms, yet these populations are believed to be moderately degraded.

Problem and Goal Assessment

Point Source Assessment

The Ramapo and Pompton Rivers have water quality problems that are due to both point and nonpoint sources. The Ramapo has a significant discharge to it in New York State before it flows into New Jersey. Fish kills are thought to have resulted at times because of the discharge. Downstream, Oakland Boro requires centralized treatment to correct on-site system problems. Along the Pompton River a number of municipal dischargers have been either upgraded or eliminated. One facility, the Pompton Lakes MUA discharge to the Pompton River, is under Department enforcement action for violating permit limitations for residual chlorine and BOD. Good quality waters from its tributaries help to maintain the good status of the Pompton River.

Nonpoint Source Assessment

Moderate, yet increasing levels of suburban/urban development along the length of the Ramapo River have resulted in both a loss of habitat for biota and an apparent decline in water quality from siltation and elevated stream temperatures. Runoff from housing and road construction sites, especially the construction of Interstate 287, combined with runoff from urban surfaces and storm sewers, have contributed significantly to pollution in the waterways. Habitat loss in this river has been expanded and intensified by local dredging and channelization.

Urban development has resulted in water quality degradation in the Pompton River. Increasing levels of runoff from construction activity, urban surfaces, storm sewers, and surface mining, together with dredging and the removal of riparian vegetation have contributed to silt and nutrient loading, elevated stream temperatures, and flooding. The fish community in the Pompton has been reduced to species tolerant of degraded conditions; few game fish are present and species diversity is low in many areas of the river.

Designated Use and Goal Assessment

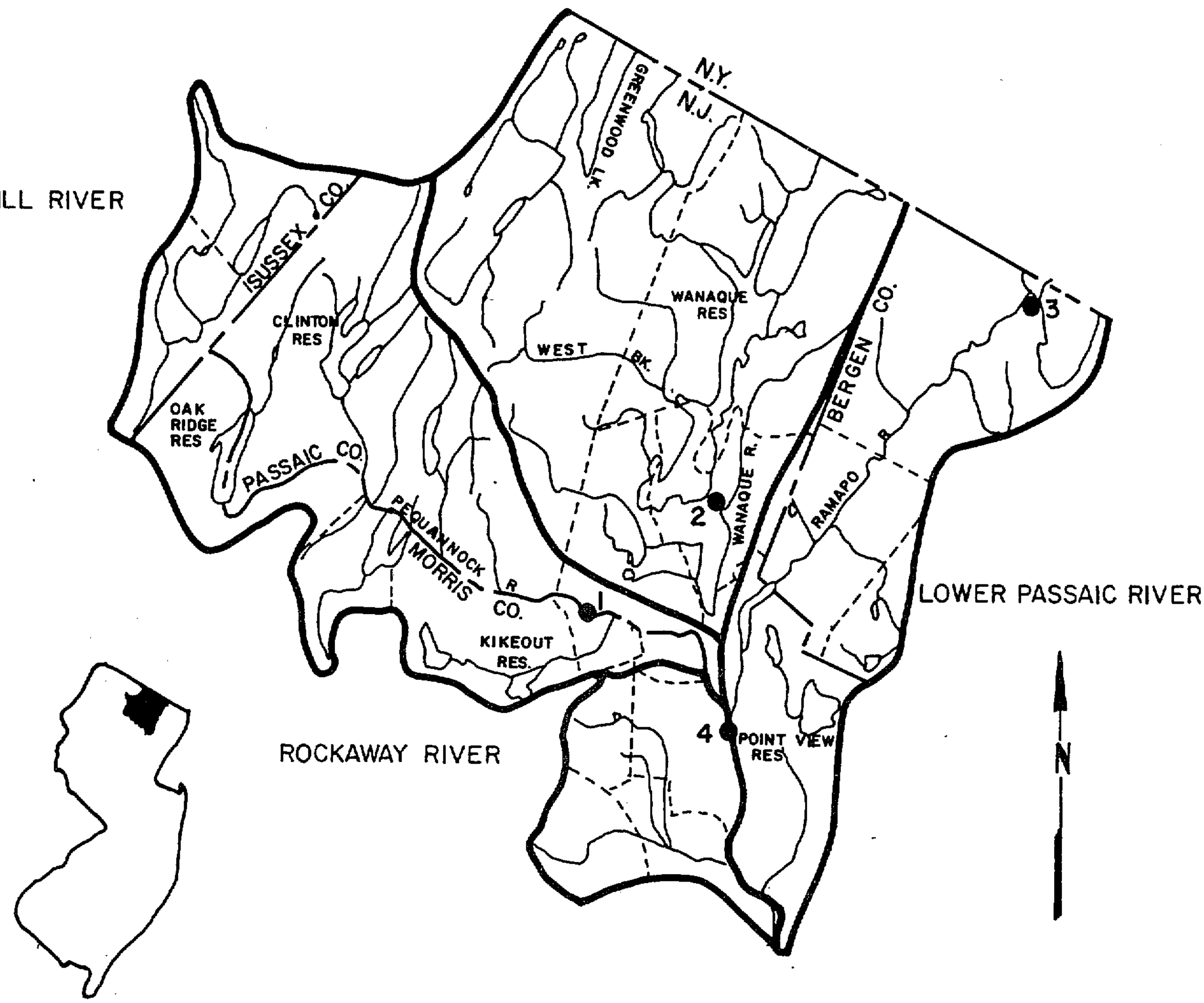
The Ramapo River will meet the fish propagation and maintenance designated use, but the waterway's fisheries are considered threatened by agricultural pollution. The Pompton River will partially meet this designated use because of moderately degraded fisheries. Both rivers are not of swimmable quality due to elevated fecal coliform levels.

Monitoring Station List

Map Number	Station Name and Classification
3	Ramapo River near Mahwah, FW-2 Nontrout
4	Pompton River at Packanack Lake, FW-2 Nontrout

POMPTON, PEQUANNOCK, RAMAPO AND WANAQUE RIVERS

NEW JERSEY STATE WATER QUALITY INVENTORY REPORT



LEGEND

- STATE BOUNDARY
- STREAM
- COUNTY BOUNDARIES
- MUNICIPAL BOUNDARIES
- WATERSHED BOUNDARIES
- WATER SAMPLING STATIONS

0 1 2 3 4 8

SCALE IN MILES

WATER QUALITY INDEX PROFILE 1983-1987

Ramapo And Pompton Rivers

WATER QUALITY INDICATORS

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVERAGE AND CONDITION
Ramapo R Near Mahwah	AVG WQI	2	10	5	42	24	9	8	6	32 Fair
	WORST3 MONTHS	July-Sept	August-Oct	Jan-March	July-Sept	August-Oct	Dec-Feb	Jan-March	May-July	42 Fair Aug-Oct
Pompton R Packanack Lake	AVG WQI	2	12	2	24	22	7	6	9	20 Good
	WORST3 MONTHS	June-August	July-Sept	Sept-Nov	Sept-Nov	August-Oct	August-Oct	August-Oct	Sept-Nov	32 Fair Aug-Oct

LEGEND - Water Quality Index Description

WQI	Condition	Description
0-10	Excellent	No or minimal pollution; water uses met throughout the year.
11-25	Good	Generally low amounts of pollution; water uses periodically not met.
26-60	Fair	Pollution amounts vary from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution in high amounts; water uses not met.
81-100	Very Poor	Pollution occurs at extremely high levels; severe stress to stream life; water uses not met.
ID	Insufficient Data	

An index of 20 is equivalent to the level of water quality criteria.

N.J.P.D.E.S. DISCHARGE INVENTORY WATERSHED: POMPTON AND RAMAPO R.

DISCHARGE NAME	# NJPDES	RECIEVING WATERS	MUNICIPALITY/COUNTY	TYPE
Oak Knolls-Oakland Boro	0027774	Unnamed Trib. to Ramapo River	Oakland Boro/Bergen	Municipal
E.I. DuPont De Nemours	0001350	Pompton Lake	Pmptn. Lk. Boro/Pass	Ind./Comm.
Franklin Lakes STP	0021946	Ramapo River	Mahwah Twp./Bergen	Municipal
Mahwah Twp.-Blue Hills Dev.	0023906	Ramapo River	Mahwah Twp./Bergen	Municipal
Gem Car Wash	0030139	Ramapo River	Wayne Twp./Passaic	Ind./Comm.
Manito Sch. Bd. of Ed.	0030384	Ramapo River	Oakland Boro/Bergen	Municipal
Ramapo-Indian Hills Reg. H.S.	0021253	Crystal Brook	Franklin Lks. Boro/ Bergen	Municipal
Ramapo St. College STP	0024082	Ramapo River	Mahwah Twp./Bergen	Municipal
Riverdale Plastics Inc.	0030074	Passaic River Trib.	Riverdale Boro/Morrs	Ind./Comm.
Pompton Lakes Borough MUA	0023698	Pompton River	Pompton Lks Boro/Pas	Municipal
Sheffield Hills Plt.	0026841	Pompton River	Wayne Twp./Passaic	Municipal
Pequannock Twp.-Plains Plaza	0026514	Pompton River	Pequannock Twp/Morrs	Ind./Comm.
Pequannock Twp.-Laurel Homes	0022926	Pompton River	Pequannock Twp/Morrs	Municipal
Tri Corner Reality Corp.	0021245	Ramapo River	Franklin Lakes/Berg	Municipal
Urban Farms Shopping CTR	0026441	Pond Brook	Franklin Lakes/Berg	Municipal
Ramapo Hills Bd of Ed	0021253	Crystal Creek	Oakland/Bergen	Municipal
Oakland Care Center	0029858	Ramapo River	Oakland/Bergen	Municipal
Oakland, Borough of	0021342	Ramapo River	Oakland/Bergen	Municipal
Dewey Electronic Corp	0052299	Ramapo River	Oakland/Bergen	Thermal
Oakland Boro-Chapel Hill Est.	0053112	Trib of Ramapo	Oakland/Bergen	Municipal
Oakland Town Houses	0061981	Trib of Ramapo	Oakland/Bergen	Municipal
Wayne, Township of	0026841	Pompton River	Wayne/Passaic	Municipal
MBA Printed Circuits Inc	0029653	Pompton River	Wayne/Passaic	Municipal
Clifton Adhesive Inc	0029971	Burgess Place	Wayne/Passaic	Ind
American Cyanamid Co	0032778	Point View Res	Wayne/Passaic	Ind
Pequannock LP & Fair FLDS		Pompton River	Lincoln Park/Morris	Mun/Ind

36. LOWER PASSAIC RIVER

Watershed Description

The Lower Passaic River is considered in this report to be that section from the Pompton River confluence downstream to Newark Bay. This 33 mile section includes parts of Bergen, Hudson, Passaic and Essex Counties. Major tributaries include the Saddle River, Preakness Brook, Second River, and the Third River. The Lower Passaic River contains a number of falls, culminating with the Great Falls at Paterson. There is one small dam on the river near Newark named Dundee Dam. This is a densely populated area including the major cities of Newark, Paterson, Clifton, and East Orange. Sub-watersheds include the Mid-Passaic River from the confluence of the Pompton River to the confluence of the Saddle River, Saddle River, and the Lower Passaic River.

The predominate land use in this watershed is extensive development with many older cities and industries present. There is little open space except in the Upper Saddle River Watershed. Of the 119 NJPDES permitted discharges identified, 100 are industrial/commercial and 19 are municipal. The waters of the Lower Passaic River and its tributaries are classified FW-2 Trout Production, FW-2 Trout Maintenance (in the Saddle River watershed), FW-2 Nontrout, SE-2 and SE-3.

Water Quality Assessment

The Lower Passaic River, including the Saddle River, flows through a densely populated, urbanized and industrialized region. As a result, water qualty conditions in the region's surface waters are reflective of numerous point sources, significant non-point source contributions and high sediment oxygen demands. Ambient monitoring of the Lower Passaic is performed at Little Falls, Singac and Elmwood Park. The Saddle River is monitored at Fair Lawn and Lodi.

Water quality in the Lower Passaic River from 1983 to 1987 varied from fair quality at Singac to good quality at Little Falls and poor quality at Elmwood Park. The improvements in river quality at Little Falls is likely due to in-stream reaeration caused by a number of small falls in the river. Problems in the river include excessive fecal coliform, in-stream oxygen demand and nutrient concentrations. All three Passaic River monitoring stations had total phosphorus averaging from .36 to .44 mg/l, with nearly all samples containing excessive amounts. Total inorganic nitrogen was also high; averaging around 2.5 mg/l at the three locations. At Singac the Passaic also contained occasionally high total Kjeldahl nitrogen, as 26 percent of the values were greater than 2.5 mg/l. Un-ionized ammonia is elevated in the Passaic River at Little Falls during low-flow periods.

Fecal coliform concentrations varied widely at the Lower Passaic stations. Geometric means ranged from 40 MPN/100ml at Little Falls to 2710 MPN/100 ml at Elmwood Park. Exceedence of the 200 MPN/100ml criterion occurred in 61, 40 and 92 percent of the samples collected at Singac, Little Falls, and Elmwood Park, respectively. Dissolved oxygen concentrations were above the 4.0 mg/l standard in all measurements from the Lower Passaic. Dissolved oxygen saturation periodically falls below 80 percent at all three locations. Biochemical oxygen demand occasionally approaches 10 mg/l in the Lower Passaic. Conditions are poorest in the river during low-flow periods.

Water quality of the Saddle River is degraded because of extremely high nutrients, and moderately elevated fecal coliform and biochemical oxygen demand. Total phosphorus averaged 1.3 and .87 mg/l at Fair Lawn and Lodi, respectively, from 1983 to 1987. Practically all samples contained total phosphorus in excess of State criterion. Total inorganic nitrogen and total Kjeldahl nitrogen are found at very high concentrations. Total inorganic nitrogen averaged 6.6 mg/l at Fair Lawn and 5.4 mg/l at Lodi. Total Kjeldahl nitrogen had a mean of 4.6 mg/l at Fair Lawn and 3.4 mg/l at Lodi. Un-ionized ammonia appears high in the Saddle River during late spring, often exceeding

State criterion for the protection of a warm water fishery.

Fecal coliform are found in moderate amounts in the Saddle River, although concentrations are higher at Lodi. Geometric means of 640 and 955 MPN/100 ml have been recorded at Fair Lawn and Lodi, respectively. These counts are significantly higher than those recorded earlier this decade. Dissolved oxygen occasionally falls below 4.0 mg/l at Lodi, but appears sufficient at Fair Lawn. Conditions in the Saddle River are poor at Fair Lawn overall and very poor during late spring-early summer. At Lodi conditions are similar, but poorest quality occurs from August to October during the low flow period.

The warm water fish community of the Passaic River between Little Falls and Garfield has been evaluated by the New Jersey Division of Fish, Game and Wildlife as being moderately degraded, an improvement compared to the more degraded conditions upstream between Livingston and Little Falls. The Passaic River below Garfield is judged to be in a degraded condition, supporting a fish community dominated by carp and goldfish. Occasional fish kills are also reported here. Second River and Deepvaal Brook, tributaries to the Passaic River, and Verona Lake in Verona are all evaluated as supporting a degraded warm water fishery. Notch Brook in Little Falls is assessed as severely degraded with no aquatic life evident.

Problem and Goal Assessment

Point Source Assessment

The Lower Passaic River from the Pompton River to the Dundee Dam is severely affected by point sources which overload the assimilative capacity of the river. The Passaic River is highly enriched and suffers from excessive nutrients and oxygen demand. Below Dundee Dam the Passaic River is tidal and impacted by point and nonpoint sources, and boundary conditions. The large number of point sources discharging to the river reflects the complexity of water quality management for the Passaic River. A number of enforcement actions are directed by the Department at discharges in the Lower Passaic, 21 of which are having impacts on surface water quality (15 to the Passaic River and tributaries, and 6 to the Saddle River and tributaries). A number of municipal treatment facilites have been eliminated or upgraded recently. Included is the upgraded and enlarged Wayne Township STP, and a number of North Haledon Boro plants that were discontinued. Combined sewer overflows are present in the Newark and Bayonne areas, affecting both the Passaic River and Newark Bay.

The Saddle River is suspected of being primarily impacted by urban/suburban runoff, although point sources do exist in the watershed. Six enforcement actions are underway against discharges to the Saddle River that are affecting surface water quality. The very high nutrients, especially nitrogen-compounds, is cause for concern and should be studied further.

A number of hazardous waste sites and contamination problems are found in the Lower Passaic and Saddle River watersheds, including Newark Bay. Those sites that are affecting water quality are chromium disposal sites in Jersey City (to Newark Bay), the Wayne Township Landfill (volatile organics and metals to a small pond), the Ottilio Landfill in Newark (base neutrals, volatile organics and metals) and the Diamond Alkali/Shamrock Corporation site along the Passaic River in Newark. This site is suspected of contributing dioxin and other chemicals to the waterway, sediments and aquatic life.

Nonpoint Source Assessment

The Lower Passaic River suffers water quality degradation and habitat destruction from the consequences of extensive urban/suburban runoff, road and building construction activities, waste storage leaks, riparian vegatation removal, and stream channel modifications. It is suspected by local authorities that a proposed flood control project planned for the Lower Passaic will have additional adverse impacts on the already stressed aquatic life in the river.

In the Passaic River, downstream of Garfield, the degrading impacts of urbanization increase to severe levels. In addition to those urban sources listed in the preceding paragraph, the lower reaches also receive chemical spills and leachate from contaminated soils. Severe degradation from urban runoff, construction, and streambank modification is also evident in many of the tributaries to the Passaic in the lower watershed. Many of these streams are so severely degraded that they are reported to be unable to support any form of aquatic life.

Designated Use and Goal Assessment

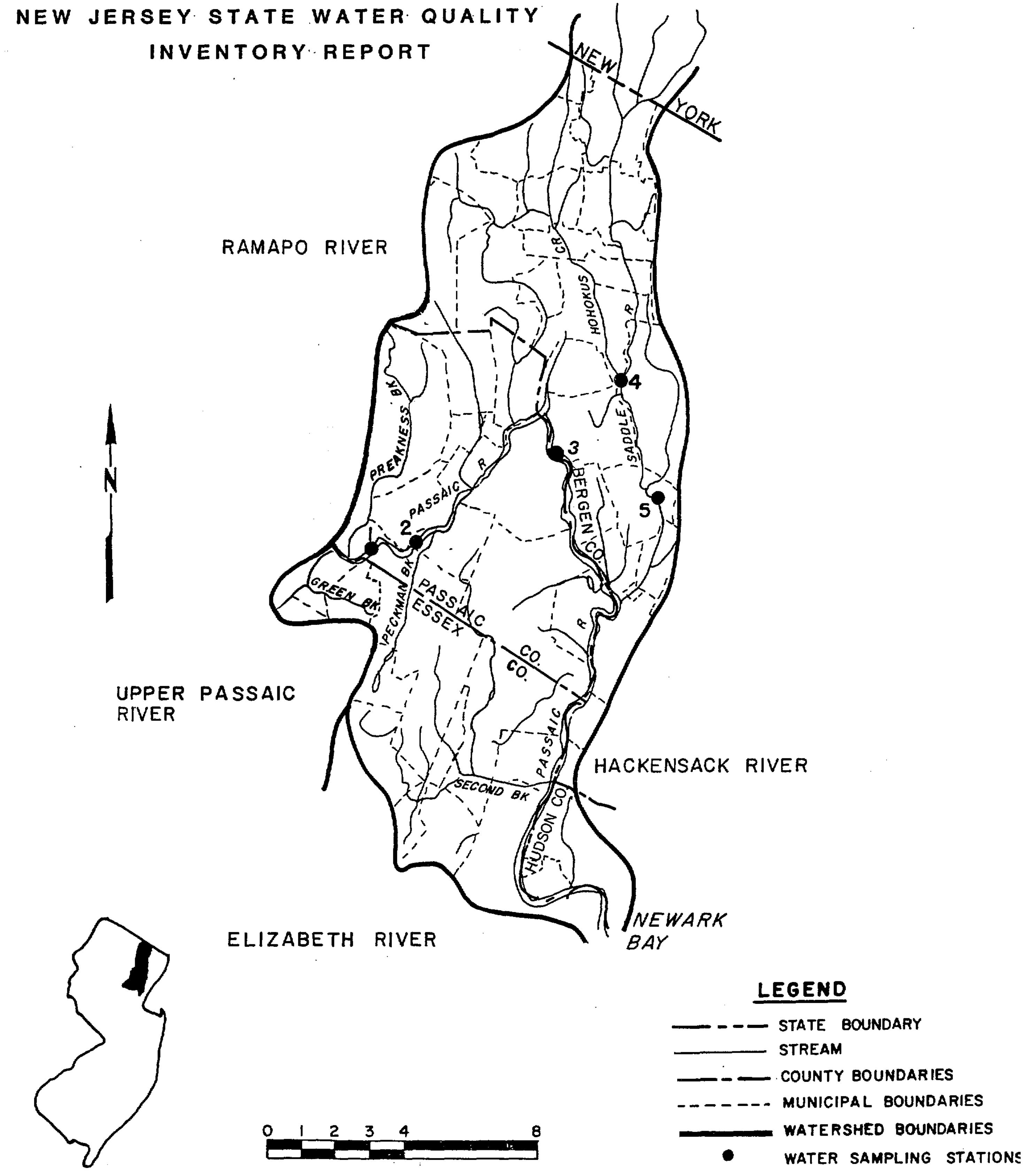
The waters of the Lower Passaic River and Saddle River will not achieve the swimmable designated use and goal. The tidal Passaic River will not meet water quality criteria for the designated uses assigned to SE-2 and 3 waters. The Passaic River from the Pompton River to Little Falls will not meet the fish propagation/maintenance use and goal because of degraded fisheries. The river from Little Falls to Garfield will partially meet this use and goal. The waters of the tidal Passaic River and Newark Bay are closed to commercial and recreational fishing and shellfishing (crabbing) because of aquatic life contamination with chlordane, PCBs and dioxin. As such, the tidal Passaic River will not meet the fish propagation and maintenance goal. Lack of water quality data in the tidal Passaic River prevents determination of designated use attainment for fish maintenance in SE-3 waters. The Saddle River is partially meeting the fish propagation/ maintenance use because of the presence of elevated un-ionized ammonia. Other, smaller tributaries to the Passaic River (Deepvaal Brook, Second River and Notch Brook) have been assessed as not achieving this use because of degraded fisheries.

Monitoring Station List

Map Number	Station Name and Classification
1	Passaic River at Singac, FW-2 Nontrout
2	Passaic River at Little Falls, FW-2 Nontrout
3	Passaic River at Elmwood Park, FW-2 Nontrout
4	Saddle River at Fair Lawn, FW-2 Nontrout
5	Saddle River at Lodi, FW-2 Nontrout

LOWER PASSAIC RIVER

NEW JERSEY STATE WATER QUALITY INVENTORY REPORT



WATER QUALITY INDEX PROFILE 1983-1987

Lower Passaic River

WATER QUALITY INDICATORS

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVERAGE AND CONDITION
Passaic R at Singac	AVG WQI	3	8	5	29	35	9	8	14	31 Fair
	WORST3 MONTHS	June-August	Oct-Dec	Nov-Jan	Oct-Dec	May-July	May-July	May-July	August-Oct	44 Fair Oct-Dec
Passaic R Little Falls	AVG WQI	3	10	4	12	34	9	13	9	23 Good
	WORST3 MONTHS	June-August	Nov-Jan	July-Sept	April-June	June-August	August-October	July-Sept	August-Oct	38 Fair July-Sept
Passaic R at Elmwood Park	AVG WQI	4	15	8	61	39	9	5	21	59 Fair
	WORST3 MONTHS	June-August	May-July	May-July	Sept-Nov	Oct-Dec	Nov-Jan	Nov-Jan	Nov-Jan	72 Poor Oct- Dec
Saddle River At Fair Lawn	AVG WQI	3	18	3	39	76	15	21	8	68 Poor
	WORST3 MONTHS	June-August	May-July	Nov-Jan	May-July	Nov-Jan	Dec-Feb	May-July	August-Oct	83Very Poor May-July
Saddle River at Lodi	AVG WQI	3	36	2	44	64	15	17	10	70 Poor
	WORST3 MONTHS	June-August	May-July	Nov-Jan	August-Oct	July-Sept	Dec-Feb	May-July	April-June	98Very Poor Aug-Oct

LEGEND - Water Quality Index Description

WQI	Condition	Description
0-10	Excellent	No or minimal pollution; water uses met throughout the year.
11-25	Good	Generally low amounts of pollution; water uses periodically not met.
26-60	Fair	Pollution amounts vary from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution in high amounts; water uses not met.
81-100	Very Poor	Pollution occurs at extremely high levels; severe stress to stream life; water uses not met.
ID	Insufficient Data	

An index of 20 is equivalent to the level of water quality criteria.

N.J.P.D.E.S. DISCHARGE INVENTORY WATERSHED: LOWER PASSAIC RIVER

DISCHARGE NAME	# NJPDES	RECEIVING WATERS	MUNICIPALITY/COUNTY	TYPE
Patterson, City of	0021971	Passaic River	Newark/Essex	Municipal
Macarthur Petrol. & Solvent	0027898	Passaic River	Newark/Essex	Municipal
Kuzmik Mfg Co	0030121	Peckman River	Newark/Essex	Ind/Thm/SW
Universal Foods	0001201	Second River	Belleville/Essex	Thermal
Peerless Tube Co Inc	0029327	Wigwam Brook	Bloomfield/Essex	Thermal
Peerless Tube Co Inc	0029335	Wigwam Brook	Bloomfield/Essex	Thm/SW
The Lummus Co Eng Develop	0052078	Third River	Bloomfield/Essex	Ind
Dresser Pump Division	0036048	Second River	Essex County	Thermal
Orange DPW, City of	0025925	Wigwam Brook	Orange/Essex	Municipal
ITT	0020435	Passaic River	Nutley/Essex	Ind/Comm
Eastern Molding Co Inc	0029319	Passaic River	Belleville/Essex	Ind/Comm
General Plastics Corp	0029173	Passaic River	Bloomfield/Essex	Ind/Comm
Q Petroleum, Inc	0028185	Passaic River	Newark/Essex	Ind/Comm
Franklin Plastics Corp	0002194	Passaic River	Kearny/Hudson	Ind/Comm
Pantasote Co of NY	0020478	Weasel Brook	Passic/Passaic	Ind/Comm
Garden St. Paper Corp	0000370	Passaic River	Garfield/Bergen	Ind/Comm
Kalama Cem Inc	0000124	Saddle Brook	Wallington/Bergen	Ind/Comm
Farmland Daries	0033511	Saddle Brook	Wallington/Bergen	Ind/Comm
Garfield Mfg. Co	0027146	Saddle Brook	Wallington/Bergen	Ind/Comm
Hearthstone at Mahwah	0023931	Saddle Brook	Mahwah/Bergen	Municipal
Apple Ridge C.C.	0028827	Saddle Brook	Mahwah/Bergen	Ind/Comm
CM & Son Trucking Inc	0029726	Smokisvoll Brook	Allendale/Bergen	Ind/Comm
Ridgewood Village STP	0024791	Hohokus Brook	Ridgewood/Bergen	Municipal
IBM Corp	0033987	Sprout Brook	Paramus/Bergen	Ind/Comm
Thermo Electric	0029441	Passaic River	Saddle Bk/Bergen	Ind/Comm
PSE&G Essex Station	0000639	Passaic River	Newark/Essex	Ind/Comm
Haledon Borough WD	0003964	Molly Ann Brook	North Haledon/Pass	Municipal
JL Prescott Co	0002232	Passaic River	Passaic/Passaic	Ind/Comm
River Oil Term., jInc	0027901	Passaic River	Passaic/Passaic	Ind/Comm
Custom Chem Corp	0033146	Fleischers Brook	Paterson/Passaic	Ind/Comm
West Patterson Boro STP	0022098	Passaic River	W. Paterson/Passaic	Ind/Comm
Singer Co Kearfott Div	0021288	Passaic River	W. Paterson/Passaic	Ind/Comm
Singer Co Kearfott Div	0021270	Passaic River	W. Paterson/Passaic	Ind/Comm
Totowa-Riverview STP	0022071	Passaic River	Totowa/Passaic	Municipal
ATI Chem Spray Div	0029571	Passaic River	Totowa/Passaic	Ind/Comm

N.J.P.D.E.S. DISCHARGE INVENTORY WATERSHED: LOWER PASSAIC RIVER

DISCHARGE NAME	# NJPDES	RECIEVING WATERS	MUNICIPALITY/COUNTY	TYPE
PSE&G Harrison Gas	0005066	Passaic River	Harrison/Hudson	Ind/Comm
Passaic Valley Water Comm	0025607	Passaic River	Totowa/Passaic	Municipal
Inmount Corp	0002453	Passaic River	Hawthorne/Passaic	Ind/Comm
Pan Chem Co	0030031	Passaic River	Hawthorne/Passaic	Ind/Comm
Pope Chem Co	0027219	Passaic River	Paterson/Passaic	Ind/Comm
Singer Co Kearfott Div	0030902	Passaic River	Fairfield/Essex	Ind/Comm
Fairmount Chem Co Inc	0033430	Passaic River	Newark/Essex	Ind/Comm
Sandoz, Inc	0001147	Passaic River	Fairlawn/Bergen	Ind/Comm
Curtis-Wright Corp	0002976	Deepavaal Brook	Fairfield/Essex	Ind/Comm
Rexon Corp-Air Spec Div	0030112	Passaic River	Fairfield/Essex	Ind/Comm
Unimatic Mfg Corp	0031003	Trib to Passaic	Fairfield/Essex	Ind/Comm
No W Bergen Co SA	0024813	Hohocus Brook	Waldwick/Bergen	Municipal
GAF Corp- Adm. & Res. Ctr	0028291	Passaic RIver	Wayne/Passaic	Ind/Comm
IBM OPD Trmt Plt Fac	0020109	W. Br. Hohocus Brk.	Franklin Lks/Bergen	Ind/Comm
Getty Term Corp	0026034	Passaic River	Newark/Essex	Ind/Comm
Sun Oil Co Newark	0002771	Passaic RIver	Newark/Essex	Ind/Comm
Essex Chem	0002283	Passaic RIver	Newark/Essex	Ind/Comm
Shulton Inc	0001287	Weasel Brook	Clifton/Passaic	Thermal
Miles Lab Inc	0022608	Passaic River	Clifton/Passaic	Thermal
Heller Heat Treating Comp	0027430	Passaic River	Clifton/Passaic	Thermal
Hawthorne, Borough of	0024767	Passaic River	Hawthorne/Passaic	Municipal
PF Laboratories Inc	0035572	Passaic River	Passaic/Passaic	Thermal
Tilcon Quarry	0020486	Passaic River	Paterson/Passaic	Thm/Ind
Mona Industries	0035009	Passaic River	Paterson/Passaic	Industrial
American Car Wash Systems	0036099	Passaic River	West Paterson/Pass	Industrial
US Tempering Glass Comp Inc	0052949	Saddle River		Thermal
Marcel Paper Mills Inc	0002674	Passaic River	East Paterson/Passa	Industrial
Ken Manufacturing Co Inc	0000906	Passaic River	Fairlawn/Passaic	Thermal
Nabisco Inc	0002577	Henderson Brook	Fairlawn/Passaic	Ind/Therm
Unified Data Products	0034738	Passaic River	Fairlawn/Passaic	Ther/Ind/SW
FCM Inc	0035459	Passaic River	Garfield/Passaic	Thermal
Home Fuel Oil Comp	0027910	Diamond Brook	Glen Rock Boro	Ind/Storm
Bergen Cable Techn	0035262	Lodi Brook	Lodi	Thermal
Phillips Electronic Instruct	0033235	Masonicus Creek	Mahwah	Industrial
Interstate Motor Plaza	0098485	Masonicus Creek	Mahwah	Thermal

N.J.P.D.E.S. DISCHARGE INVENTORY WATERSHED: LOWER PASSAIC RIVER

DISCHARGE NAME	# NJPDES	RECIEVING WATERS	MUNICIPALITY/COUNTY	TYPE
Union Camp Corp	0031801	Passaic River	Wayne Twp/Passaic	Ind/Comm
Caldwell Borough	0020427	Passaic River	Caldwell/Essex	Municipal
Fritzsche Dodge & Olcott	0001651	Passaic River	East Hanover/Morris	Ind/Comm
T-Fal	0030694	Deepavaal Brook	Fairfield/Essex	Ind/Comm
Precise Rubber Mfg	0030210	Trib to Passaic R	Fairfield/Essex	Ind/Comm
Pollution Ctrl Ind Inc	0028096	Trib to Passaic R	W. Caldwell/Essex	Ind/Comm
Resistoflex Corp	0029955	Passaic River	Roseland/Essex	Ind/Comm
M. Polander & Son, Inc	0003743	Fullertons Brook	Roseland/Ess	Ind/Comm
Servometer Corp	0027847	Peckman River	Cedar Grove/Essex	Ind/Comm
Cedar Grove Twp STP	0025330	Peckman River	Cedar Grove/Essex	Municipal
Essex Co Hosp Center	0021687	Peckman River	Cedar Grove/Essex	Municipal
Verona Boro STP	0024490	Peckman River	Verona/Essex	Municipal
National Starch & Chemical	0003760	Yantacaw River	Bloomfield/Essex	Ind/Comm
National Standard Corp	0000035	Weasel Brook	Clifton/Passaic	Ind/Comm
Clifton Ent. WC	0034932	Weasel Brook	Clifton/Passaic	Ind/Comm
Stone Ind	0001589	Molly Ann Brook	Haledon/Passaic	Ind/Comm
Mycalex	0029114	Passaic River	Passaic/Passaic	Ind/Comm
Duro Test Corp	0029815	McDonalds Brook	Clifton/Passaic	Ind/Comm
Hoffman LaRoche Inc	0034185	St. Pauls Brook	Nutley/Essex	Ind/Comm
ITT-Avionics	0020214	Passaic River	Nutley/Essex	Ind/Comm
Henkel Process Cem	0002801	Passaic River	Harrison/Hudson	Thermal
Tenneco Oil Corp	0031348	Passaic River	Harrison/Hudson	Ind/Oil/WS
BASF Corp Chem Div	0001112	Passaic River	Kearny/Hudson	Industrial
Western Electric Works	0020443	Passaic River	Kearny/Hudson	Ind/Thermal
Clara Maass Memorial Hospit	0032280	Passaic River	Belleville/Essex	Mun/Ind
Mansol Ceramics Corp	0034193	Passaic River	Belleville/Essex	Industrial
Mansol Ceramics Comp	0034223	Passaic River	Belleville/Essex	Industrial
Esgraph Incorporated	0034428	Deepavaal Brook	Fairfield/Essex	Industrial
Borough of Totowa	0022080	Tributary to Passaic	Totowa/Passaic	Municipal
Newark, City of	0024724	Passaic River	Newark/Essex	Municipal
Broe WN Bovert-Recoma Inc	0035424	Passaic River	Fairfield/Essex	Industrial

N.J.P.D.E.S. DISCHARGE INVENTORY

WATERSHED: LOWER PASSAIC RIVER

DISCHARGE NAME	# NJPDES	RECEIVING WATERS	MUNICIPALITY/COUNTY	TYPE
Stepan Chemical Co	0003182	Lodi Brook	Maywood/Passaic	Thermal
Ramsey Auto Imports	0033634	Ramsey Brook	Ramsey/Passaic	Industrial
Millbrook Farms Inc	0025682	Saddle River	Upper Saddle River	Municipal
International Wire	0098469	Hohokus Brook	Wyckoff/Passaic	Industrial
H & N Chemical Co	0031623	Passaic River	Totowa/Passaic	Thermal
Ungerer & Co	0034444	Passaic River	Totowa/Passaic	Thermal
GAF Corp	0028291	Passaic River	Wayne/Passaic	Industrial
Rexon Techn	0030104	Passaic River	Wayne/Passaic	Thermal
Carsow Corp	0034053	Passaic River	Wayne/Passaic	Thermal
Okonite Comp	0002615	Weasal Brook	Passaic/Passaic	Industrial
Hoffman-LaRoche	0052337	Singac Brook		Thermal
Little Falls, Township of	0024732	Peckman River	Little Falls/Passaic	Municipal
Schmid Products Co	0034941	Peckman River	Passaic/Passaic	Industrial
Hercules Inc	0033600	Passaic River	Passaic/Passaic	Ind/Storm
North Jersey Dev Center	0021261	Natchunk	Totowa/Passaic	Municipal
Wayne,Township of	0028002	Singac Brook	Wayne/Passaic	Municipal
Jersey Specialty Co Inc	0031739	Storm Sewer To Pass	Wayne/Passaic	Industrial
Sandoz Parmaceutiacals Corp	0001155	Black Brook	Glen Gardner/Hunt	Ind/Thm/SW
Interstate Route 280	0034959	Franks Creek	Kearny/Hudson	Ind/Thm/SW
Mobay Chemical Corp	0003174	Mollyann Brook	Haledon/Passaic	Industrial

37. HACKENSACK RIVER

Watershed Description

The Hackensack River drains an area of 202 square miles, which includes parts of Hudson and Bergen Counties. The Hackensack originates in New York State and flows south to Newark Bay. The river is 31 miles long in New Jersey. Major tributaries include the Pascack Creek, Berry's Creek, Overpeck Creek, and Wolf Creek. The major impoundments on this river are Oradell Reservoir, Lake Tappan, and Woodcliff Reservoir. This region of the State is very populated; major cities being Paramus, Bergenfield, Secaucus, Hackensack, Fort Lee, Jersey City and Englewood. Much of the Lower Hackensack watershed is tidal marshes known as the Hackensack Meadowlands.

About 50 percent of the land use in this watershed is undeveloped, with more than 30 percent being residential. The remainder is commercial/industrial. Of the approximately 78 NJPDES permitted discharges here, 67 are industrial/commercial and 9 are municipal. Waters in the Hackensack River and its tributaries have been classified as FW-2 Nontrout, FW-2 Trout Production (Creskill Brook), SE-1, SE-2 and SE-3.

Water Quality Assessment

The Hackensack River is routinely monitored at two locations: at River Vale and at New Milford. The New Milford station is directly downstream of the Oradell Reservoir dam. The Hackensack River has overall good quality waters at River Vale, and at New Milford.

Elevated total phosphorus and fecal coliform concentrations are present in the Hackensack River at River Vale. Fecal coliform had a geometric mean of 148 MPN/100ml from 1983 to 1987, with 37 percent of the values above State criterion. Total phosphorus averaged .21 mg/l during the period of review. Seventy-eight percent of the phosphorus readings were greater than the .05 mg/l criterion for prevention of eutrophication in impoundments. Dissolved oxygen concentrations are adequate throughout the year, although saturation often falls below 80 percent during the summer. Biochemical oxygen demand is for the most part under 4.0 mg/l. Conditions in the Hackensack at River Vale worsen significantly during the late summer months.

Monitoring of the Hackensack River at New Milford reflects the condition of the Oradell Reservoir discharge, rather than true stream conditions. Pollutant concentrations tend to be reduced because of settling in the reservoir. This is why the Hackensack River can be considered good at this location. Both fecal coliform and nutrients are low, occurring at problematic levels in 30 and 38 percent respectively, of the samples collected. Dissolved oxygen concentrations were above 4.0 mg/l in all samples from 1983 to 1987. One elevated mercury concentration has been found in the Hackensack River during the period of review.

The Hackensack Meadowlands Development Commission has conducted an annual summer monitoring program of the tidal Hackensack River and tributaries since 1971. Cheng and Konsevick (In press) have summarized the results of monitoring from 1978 to 1987 for the mainstem tidal Hackensack River. Monitoring results show very low dissolved oxygen (less than 1.0 mg/l) in the river during summer months, along with high levels of biochemical oxygen demand, oil and grease, and fecal coliform. The 10 mile stretch of the river analyzed had no significant changes in water quality for selected indicators over the period reviewed. The river shows important differences between monitoring sites indicating that impacts do occur locally.

Fishery assements by the NJ Division of Fish, Game and Wildlife were limited to the Cresskill River in the Upper Hackensack watershed and to Overpeck Creek, a tributary to the Lower Hackensack. Both are evaluated as supporting moderately degraded fish communities. The Cresskill contains cold water fish species while the Overpeck supports warm water forms.

Problem and Goal Assessment

Point Source Assessment

The Upper Hackensack River as monitored at River Vale and New Milford does not show severe water quality problems. However, in the lower tidal sections of the river, extremely high bacterial and nutrient levels are present, as well as reduced dissolved oxygen, and thermal pollution. A large number of industrial and municipal wastewater discharges are present in the lower watershed. Twenty-six dischargers in the watershed which are under enforcement action are having deleterious impacts on stream water quality. Problems range from raw sewage by-passes, to illegal discharges and not meeting permit limitations. In addition, nonpoint pollution contributions from urbanized and industrial areas, landfills and sediment oxygen demand are also considered to be significant.

Seven hazardous waste or Superfund sites are found in the Hackensack watershed which are known or suspected to be contaminating local surface waters. In addition, extensive mercury contamination of Berry's Creek has occurred. Certain fish from the Lower Hackensack River have been identified to contain high PCBs and chlordane concentrations. As a result, the sale and consumption of striped bass and blue crabs is prohibited. Large thermal discharges in this area also have water quality impacts on the tidal Hackensack River by reducing the water's ability to hold dissolved oxygen.

Nonpoint Source Assessment

Water quality in the Hackensack River above the Oradell River appears to primarily be affected by nonpoint sources. Oradell Reservoir is highly eutrophic and the Hackensack Water Company occasionally treats the reservoir to kill aquatic weed growth. Nonpoint source pollutants include those brought about by extensive urban/suburban development, and by the land disposal of waste materials. The Upper Hackensack is reported to be impacted by runoff from construction activities, urban surfaces, storm and combined sewers, roads, and by landfill leachate. These sources have resulted in flooding, habitat destruction for biota, fish community degradation, reduced dissolved oxygen levels, excessive nutrients, and accelerated eutrophication. In the Lower Hackensack River the presence of these sources continues and their impacts become even more severe. Habitat destruction becomes more intense in the lower river due to riparian vegetation removal and flow regulation efforts. There are also severe impacts from chemical spills, local landfills, hazardous waste disposal sites, and inplace contaminants.

Designated Use and Goal Assessment

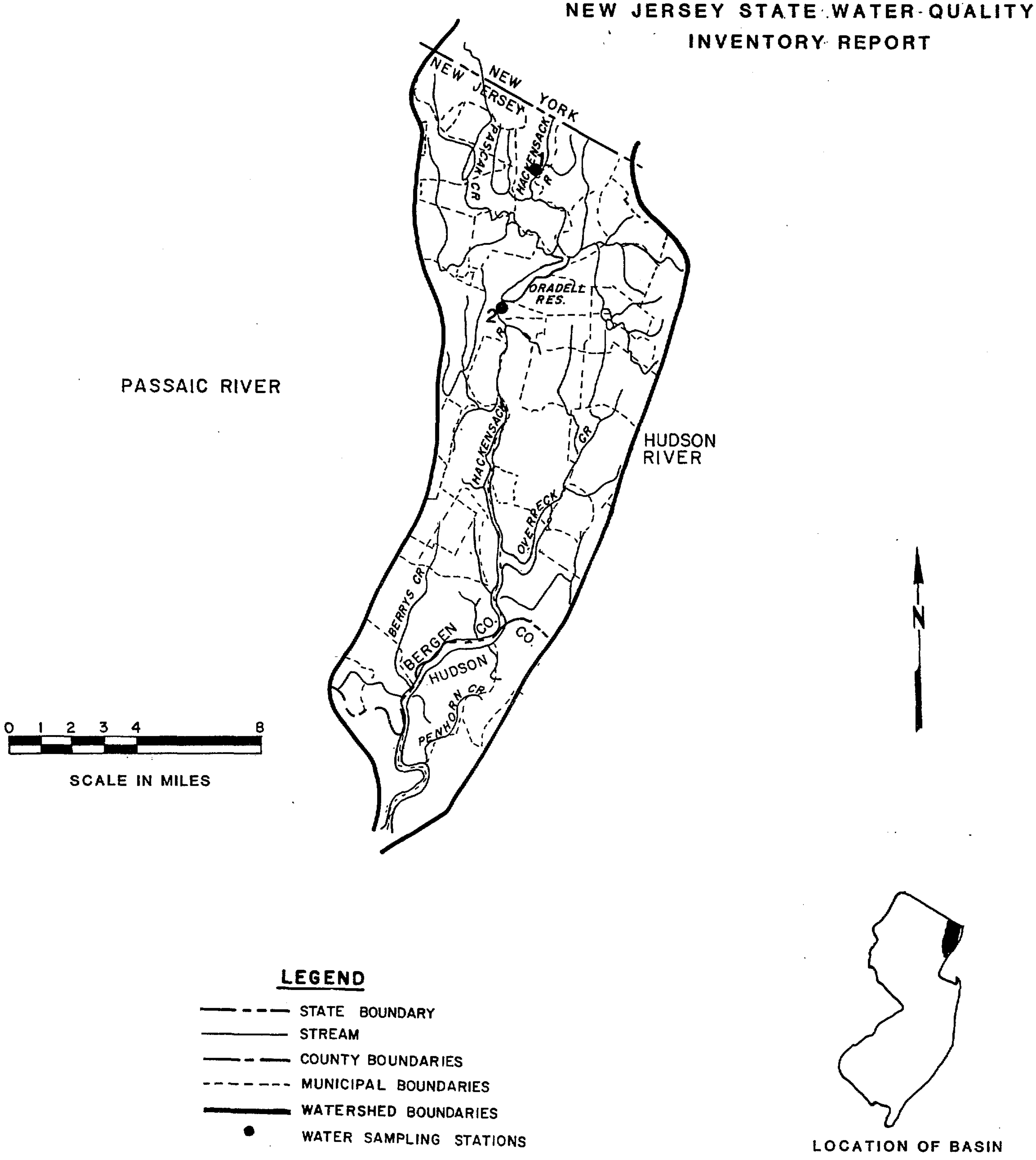
The Upper Hackensack River (above the Oradell Reservoir) will achieve the fish propagation and maintenance goal of the Clean Water Act and the State's designated use, but it is not of swimmable quality. In the tidal Hackensack, both the fishable and swimmable goals cannot be met. Based on the Hackensack Meadowland Development Commission's sampling of the tidal Hackensack and tributaries this region is not considered to be meeting the designated uses for SE-2 and SE-3 waters.

Monitoring Station List

Map Number	Station Name and Classification
1	Hackensack River at River Vale, FW-2 Nontrout
2	Hackensack River at New Milford, FW-2 Nontrout

HACKENSACK RIVER

NEW JERSEY STATE WATER-QUALITY INVENTORY REPORT



WATER QUALITY INDEX PROFILE 1983-1987

Hackensack River

WATER QUALITY INDICATORS

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVERAGE AND CONDITION
Hackensack River At River Vale	AVG WQI	2	13	4	20	32	9	6	6	23 Good
	WORST3 MONTHS	July-Sept	August-Oct	March-May	August-Oct	July-Sept	Jan-March	July-Sept	Sept-Nov	40 Fair Aug-Oct
Hackensack River at New Milford	AVG WQI	4	9	8	17	17	9	1	17	15 Good
	WORST3 MONTHS	June-August	Nov-Jan	May-July	May-July	May-July	Jan-March	Nov-January	August-Oct	22 Good May-July

LEGEND - Water Quality Index Description

WQI	Condition	Description
0-10	Excellent	No or minimal pollution; water uses met throughout the year.
11-25	Good	Generally low amounts of pollution; water uses periodically not met.
26-60	Fair	Pollution amounts vary from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution in high amounts; water uses not met.
81-100	Very Poor	Pollution occurs at extremely high levels; severe stress to stream life; water uses not met.
ID	Insufficient Data	

An index of 20 is equivalent to the level of water quality criteria.

N.J.P.D.E.S. DISCHARGE INVENTORY WATERSHED: HACKENSACK RIVER

DISCHARGE NAME	# NJPDES	RECEIVING WATERS	MUNICIPALITY/COUNTY	TYPE
Hackensack Water-New Milford	0003310	Hackensack River	Ordell Boro/Bergen	Ind/Comm
Amerada Hess Corp.	0001414	Hackensack River	Bogota Boro/Bergen	Ind/Comm
Hoke, Inc.	0003786	Tenakill River	Cresskill Boro/Berge	Ind/Comm
Texaco, Inc. (IASD)	0031194	Hackensack River	S. Hackensack/Bergen	Ind/Comm
Wood-Ridge SA	0021586	Berrys Creek	Wood-Ridge Boro/Ber	Mun.
Diamond Shamrock Corp.	0002798	Berrys Creek	Carlstadt/Bergen	Ind/Comm
Randolph Prod. Co.	0028991	Berrys Creek	Carlstadt/Bergen	Ind/Comm
Tech. Oil Prod.,Inc	0005754	Berrys Creek	Carlstadt/Bergen	Ind/Comm
Arsynco. Inc	0030970	Berrys Creek	Carlstadt/Bergen	Ind/Comm
Becton-Dickinson	0001074	Berrys Creek	E.Rutherford/Bergen	Ind/Comm
Matheson Gas Prod., Inc. Co	0002721	Ackermans Creek	E.Rutherford/Bergen	Ind/Comm
US Printing Ink Co	0003646	Berrys Creek	E.Rutherford/Bergen	Ind/Comm
Joint Mfg.	0022756	Berrys Creek	E.Rutherford/Bergen	Mun
NJ Sports & Expo Auth	0023345	Berrys Creek	E.Rutherford/Bergen	Mun/Storm
Howmedica, Inc.	0003468	Berrys Creek	Rutherford/Bergen	Ind/Comm
Penreco	0031607	Kingsland Creek	LyndhurstTwp/Bergen	Ind/Comm
Sika Chem. Corp.	0002011	Berrys Creek	Lyndhurst/Bergen	Ind/Comm
Benedict-Miller, Inc	0001031	Hackensack River	Lyndhurst/Bergen	Ind/Comm
Secaucus Town STP	0025038	Miller Creek	Secaucus/Hudson	Mun
N. Arlington-Lyndhurst Jt. Mg	0025291	D.to Hackensack R.	N.Arlington/Bergen	Mun
Amerada Hess-Little Ferry	0001406	Hackensack River	Little Ferry/Bergen	Ind/Comm
Teterboro Airport	0028941	Berrys Creek	Teterboro/Bergen	Ind/Comm
PSE&G-Bergen Generating	0000621	Hackensack River	Ridgefield Boro/Berg	Ind/Comm
Bergen Co. Ut. Auth	0020028	Hackensack River	Little Ferry/Bergen	Ind/Comm
Metro Oil & Chem Corp	0031500	Wolfs Creek	Ridgefield/Bergen	Ind/Comm
Yoo-Hoo Bev. Co.	0003344	Berrys Creek	Carlstadt/Bergen	Ind/Comm
Tec Cast	0033405	Drainage Ditch	Carlstadt/Bergen	Ind/Comm
Grobet File Co of America	0029378	Hackensack River	Carlstadt/Bergen	Thermal/Sto
Colorite Plastics Co.	0000132	Sweetkill Creek	Carlstadt/Bergen	Ind/Comm
Transcontinental Gas Pipeline	0002101	Hackensack River	Carlstadt/Bergen	Ind/Comm
Metal Improvement Com	0003719	Drainage Ditch	Jersey City/Hudson	Ind/Comm
Howard Johnson Co	0028410	Penhorn Creek	Secaucus/Hudson	Ind/Comm
Sears Roebuck & Co	0020508	Penhorn Creek	N.Bergen/Hudson	Ind/Comm
Diamond Shamrock Corp.	0002402	Hackensack River	Jersey City/Hudson	Ind/Comm
US Postal Ser Kearny	0027758	Dead Horse Creek	Kearny/Hudson	Mun

N.J.P.D.E.S. DISCHARGE INVENTORY

WATERSHED: HACKENSACK RIVER

DISCHARGE NAME	# NJPDES	RECIEVING WATERS	MUNICIPALITY/COUNTY	TYPE
PSE&G Kearny Generating	0000655	Hackensack River	Kearny/Hudson	Ind/Comm
Marzahl Chem Co	0000451	Hackensack River	Kearny/Hudson	Ind/Comm
Eastern of NJ, Inc	0031747	Hackensack River	Jersey City/Hudson	Ind/Comm
Kearny Town STP	0022161	Hackensack River	Kearny/Hudson	Ind/Comm
Degen Oil & Chem Co.	0030791	Hackensack River	Jersey City/Hudson	Mun
Secaucus MUA Harts MT.	0032921	Hackensack River	Secaucus/Hudson	Ind/Comm
Gilbert Ind Pk	0028584	Hackensack River	Secaucus/Hudson	Ind/Comm
Clipper Express Co.WWTP	0027251	Penhorn Creek	Jersey City/Hudson	Ind/Comm
PSE&G Hudson Generating Sta	0000647	Hackensack River	Jersey City/Hudson	Ind
Standard Chlorine Chem. Co.	0001856	Hackensack River	Kearny Town/Hudson	Ind/Comm
Spinnerin Yarn Co., Inc.	0002038	East Riser Ditch	S. Hackensack/Bergen	Ind/Comm
Bendix Corp.	0002097	West Ditch	Teterboro/Bergen	Ind/Comm
General Auto. Spec. Co.	0030996	Hackensack River	Carlstadt Boro/Bergn	Thermal
PSE&G	0000574	Hackensack River	Jersey City/Hudson	Ind/Comm
Kleer Kast Inc.	0031313	Hackensack River	Kearny Town/Hudson	Ind/Comm
Owens-Corning Fiberglass	0035025	Hackensack River	Hudson County	Thermal
Amerada Hess Corp.	0001368	Hackensack River	Secaucus/Hudson	Industrial
Columbia Terminal Inc.	0025631	Hackensack River	South Kearny	Industrial
Meadowview Hospital	0023566	Hackensack River	Secaucus/Hudson	Municipal
Carlee Corporation	0050113	Sparkill Brook		Thermal
Inversand Company Sewell	0004146	Berrys Creek	Carlstadt/Bergen	Thermal
Cosan Chemical Corp	0032522	Berrys Creek	Carlstadt/Bergen	Industrial
Spear Packing Corp	0032590	Hackensack River	Carlstadt/Bergen	Thermal
Alfa Inc & Chemical Corp	0050300	Moonachie Creek	Carlstadt/Bergen	Thermal
Weyerhauser Company	0032620	Oradell Res	Closter/Bergen	Industrial
Chemed Corp- Dubois Div	0035769	Hackensack River	East Rutherford/Ber	Industrial
Hackensack City	0030805	Hackensack River	Hackensack/Bergen	Municipal
Classified Inc	0032603	Hackensack River	Hackensack/Bergen	Ind/Oil/Wse
Polycast Technology	0034819	West Rider	Hackensack/Bergen	Thermal
Atlas Plastics	0052736	Hackensack River	Little Ferry/Bergen	Thermal
Standard Tool & Mfg Co	0035131	Hackensack River	Lyndhurst/Bergen	Municipal
Hackensack Meadowlands	0053082	Hackensack River	Lyndhurst/Bergen	Municipal

N.J.P.D.E.S. DISCHARGE INVENTORY WATERSHED: HACKENSACK RIVER

DISCHARGE NAME	# NJPDES	RECIEVING WATERS	MUNICIPALITY/COUNTY	TYPE
Haward Corp	0023868	Saw Mill Creek	North Arlington/Ber	Ind/Thermal
Golding Mfg Inc	0028355	Hackensack River	North Arlington/Ber	Ind
Hackensack Meadowlands	0033448	Sawmill Creek	North Arlington/Ber	Ind/Munic
Rose Holand Ouse Inc	0003808	Skeet Hill Creek	Ridgefield Park/Ber	Thermal
Stranahan Foil	0033375	Berrys Creek	South Hackensack/Ber	Thermal
Takasago Corp USA	0033669	Hackensack River	Teterboro/Bergen	SW/Thermal
Exxon Company USA	0055719	Lower Hackensack	Teterboro/Bergen	Ind
Teledyne Isotopes	0061808	Lower Hackensack	Westwood/Bergen	Ind
Rail Equipment Maintenance	0031992	Hackensack River	Kearney/Bergen	Ind

38. Shellfish Resources and Harvesting Area Classifications, 1984 - 1987, and Estuarine Water Quality

Introduction

New Jersey's shellfish resources support an important commercial and recreational fishery. The 1984 commercial landings of shellfish (hard clams, soft clams, surf clams, ocean quahogs, oysters, mussels and sea scallops) in New Jersey had a dockside value in excess of $46.1 million. The recreational fishery in New Jersey concentrates primarily on the harvest of hard clams. Although annual data on recreational landings is not available, a survey conducted by the Division of Fish, Game & Wildlife in 1980 indicates that the recreational landings of hard clams comprise approximately one-third of the total hard clam harvest.

The Bureau of Marine Water Classification and Analysis (BMWC&A), Division of Water Resources, NJ DEP, monitors the sanitary quality of estuarine and ocean waters for the suitability of shellfish harvesting. Their criteria for determining shellfish growing water status is based on the presence of real or potential sources of contamination from both point and non point discharges. The above are determined through actual measurements of coliform concentrations in the water column, hydrographic (tracing), and shoreline surveys.

The Bureau of Shellfisheries (Division of Fish, Game & Wildlife) is responsible for issuance of licenses for the various shellfish harvested. In 1987 approximately 15,000 clamming (hard and soft clams) licenses were issued of which 2,000 were commercial. An additional 1,000 permanent recreational senior citizen licenses were also issued. Also during 1987, because of the substantial reduction in the state's oyster populations due to MSX disease, the Bureau issued only 50 oyster tonger licenses.

The State's shellfish resources are spread throughout its coastal and estuarine waters. The distribution of the shellfish resources can best be described by dividing the State into three basic regions consisting of the Atlantic Coast estuaries, Delaware Bay, and the Atlantic Ocean.

Atlantic Coast Estuaries

The hard clam, *Mercenaria mercenaria*, is the most widely distributed species being present in abundant quantities in virtually every estuary from Raritan Bay to Cape May. The expansive distribution and high consumptive appeal of this species provides excellent commercial and recreational opportunities.

The soft clam, *Mya arenaria*, is also found throughout the Atlantic Coast estuaries but the distribution of commercially important beds is limited. Although commercial populations of soft clams may occur occasionally in any estuary, areas supporting a regular fishery are confined to the Navesink and Shrewsbury Rivers and sections of Sandy Hook Bay.

Oyster beds within the Atlantic Coast estuaries have been significantly reduced from historic levels and are now only present in commercial densities in the Mullica and Great Egg Harbor River systems. Commercial harvest from these areas represent at most, five percent of the total oyster landings for New Jersey.

The mussel, *Mytilus edulis*, is found in the estuaries as well as offshore. Although they may be extremely abundant at certain times they represent a relatively low percentage of the shellfish landed in New Jersey.

Delaware Bay

Today the oyster, *Crassotrea virginica*, is most abundant in Delaware Bay which accounts for at least 95 percent of New Jersey's annual oyster landings. The oyster fishery in Delaware Bay is almost exclusively a commercial operation. Although hard and soft clams occur in Delaware Bay there are no known areas of abundance and no commercial fishery for either of these species currently exists.

Atlantic Ocean

The surf clam, *Spisula solidissima*, ocean quahog, *Arctica islandica*, and the sea scallop, *Placopecten magellanicus*, are all oceanic species and are harvested off New Jersey's coast. Harvesting of all species is predominantly a commercial enterprise although some bait amd recreational harvesting of surf clams along the beaches does occur.

Ocean quahogs and sea scallops do not occur within New Jersey's territorial sea (within three miles of the beach) but considerable quantities are landed by both New Jersey and other vessels at New Jersey ports. Surf clams are found both in New Jersey and federal waters and support a significant fishery. Currently the bulk of the New Jersey inshore (within three miles) resource is located between the Shark River Inlet and the Great Egg Harbor Inlet.

The BMWC&A annually assigns harvest classifications to the State's shellfish growing waters. From January 1971 through January 1979, 18,660 estuarine acres were reclassified from approved to a more restrictive classification. Approximately 25 percent of these areas were reclassified Condemned. The general decline in classification was attributed to increased recreational and development pressure in coastal areas and the declining effectiveness of older municipal wastewater treatment plants. In 1980 a net gain of over 5,000 acres upgraded was recorded. During 1981 an additional net gain of approximately 2,500 acreas was established. The 1982 reclassifications resulted in a net loss of slightly over 200 acres. The net gain for 1983 was approximately 6,700. A net loss of approximately 8,484 acres in 1984 was a direct result of the seasonal disinfection policy in the Raritan Bay complex and its effect on water quality during the winter. A net increase of 255 acres was shown for 1985. The 1986 regulations were changed to expand the availability of 13,000 acres in Raritan Bay for depuration for an additional two months. The most noteable changes for 1987 were the downgrading of 3,740 acres of the Atlantic Ocean in the North Coastal Basin from approval to prohibited, and the upgrading of roughly the same acreage in the South Coastal Basin Ocean area from prohibited to approved.

Classification totals for the ocean waters have fluctuated in recent years. Large numbers of acres are initially closed when each regional ocean discharge goes on line. After assessment of observed water quality, operational efficiency and reporting reliability some refinement (reduction) of the Condemned classifications may occur.

The BMWC&A has classified coastal waters into five categories of shellfish harvesting areas. These categories are as follows:

1) **Approved** - Waters meeting the sanitary standards for approved shellfish harvesting as recommended by the National Shellfish Sanitation Program. Waters not classified as Condemned, Special Restricted, or Seasonal shall be considered Approved for the harvest of shellfish.

2) **Seasonal** - Waters which are Condemned and opened for the harvest of oysters, clams and mussels each year but open by operation of regulations according to the schedule of 7:12-1.4: seasonal areas Approved November 1 through April 30, Condemned May 1 through October 31; and 1.5: Seasonal areas Approved January 1 through April 30, Condemned May 1 through December 31 yearly.

3) **Seasonal Special Restricted** - Waters Condemned for the harvest of oysters, clams and mussels. However, harvesting for further processing may be done under special permit from the State Department of Environmental Protection between May 1 and September 30th yearly.

4) **Special Restricted Area** - Waters Condemned for the harvest of oysters, clams and mussels. However, harvesting for further processing may be done under special

permit from the State Department of Environmental Protection.

5) **Condemned** -Water not meeting the established sanitary standards as recommended by the National Shellfish Sanitation Program of the Federal Food and Drug Administration. Applications for removal of shellfish to be used for human consumption from areas classified as Condemned will be considered for resource recovery programs promulgated by the Department of Environmental Protection.

The Department is responsible for delineating the distribution of the shellfish resources and implementing various management programs to provide for the best utilization of these resources. Some of the management programs that exist today such as relay and depuration are jointly managed by the Bureau of Shellfisheries and Bureau of Marine Law Enforcement (Division of Fish, Game and Wildlife), BMWC&A and Department of Health.

Relay Program

The ability of shellfish to purify themselves of bacterial contamination when relayed to clean water was discovered early in the 1900's. New Jersey's Department of Environmental Protection presently operates a program which relays shellfish from its Special Restricted Seasonal, Special Restricted and Condemned growing areas into Approved growing areas for a minimum of thirty days. This enables shellfish to cleanse themselves of contaminating bacteria and/or viruses. Following the purification period, a sample of clams are analyzed for bacterial quality prior to being released for harvesting and marketing. The cleansed shellfish now become a part of the economy and by reducing the resource in condemned/restricted waters help to deprive illegal clammers operations of a source of shellfish, thus protecting consumer health.

The Relay Program was initially begun during the early 1970's in the vicinity of Atlantic City. This area includes Lakes Bay, Absecon Bay and Scull Bay plus the vast complex of interwinding waterways. The program has been subsequently expanded to include portions of Raritan and Sandy Hook Bays, the Navesink, Shrewsbury, Manasquan and Shark Rivers and certain areas in Cape May County. The waters in these localities are classified as Special Restricted or Condemned. Hard clams taken from these waters are relayed to beds in Great Bay or, in some instances, to lots in Little Egg Harbor and Barnegat Bay.

An individual must comply with two requirements in order to participate in the relay program: (1) A harvester must possess a valid commercial clamming license and, (2) a valid Relay Permit.

The program is under the supervision of the New Jersey BMWC&A and Bureau of Shellfisheries. Day to day patrol is provided by the Division of Fish, Game and Wildlife, Bureau of Law Enforcement. All clams harvested on any one day by clammers involved in the program are bagged, tagged and transported under secured conditions to the Approved growing areas. Transportation of clams by secured means insures the public that none of the clams will be marketed before being relayed. After arriving at the Approved growing waters, the clams are deposited on the privately leased plots by the clammers. The Bureau of Law Enforcement patrols the area until the clammers are notified that the clams are safe to harvest and market. The BMWC&A and the Division of Fish, Game and Wildlife monitor the relay waters to insure proper water conditions are being met and thus verify the physiological requirements of the clams are such to permit pumping/purging to occur. Clams relayed during the winter are required to stay in the relay beds until early spring because it is known that lower water temperatures (minimum 50 degrees F) inhibits the rate of cleansing action (purging) by the shellfish.

The relay program is now centered in Monmouth County. The Navesink and Shrewsbury Rivers have been the mainstay of the clammers for several years now. Portions of Raritan and Sandy Hook Bays and the Manasquan and Shark Rivers are also being used.

Depuration Program

The State of New Jersey has licensed three plants for the depuration of soft shelled clams. This program, like the relay program, relys on the natural ability of shellfish to purge themselves of bacterial contamination when placed in a clean environment. The program involves harvesting soft shelled clams, under provision of a special permit issued by the BMWC&A, from areas classified as Special Restricted and requires a 48 hour depuration period. At the depuration plant, the shellfish are placed in a water environment closely controlled to provide optimal conditions for efficient purification. Salinity and water temperatures are controlled to maintain maximum pumping/purging rates in the shellfish. The recirculated water in the depuration tanks is also disinfected with ultraviolet light to maintain high bacterial quality. Following the depuration process, laboratory analyses are performed to verify that the shellfish meet market standards. The depurated shellfish are then released for marketing.

New Jersey's three depuration plants are located in Highlands, Monmouth County, the center of the soft clam resource. Primary harvest sites are the Navesink and Shrewsbury Rivers. Specially designated boats are used for harvesting under the direction of the Division of Fish, Game and Wildlife (Bureau of Law Enforcement). At the end of the daily harvest activities, shellfish are loaded aboard a "mother craft" for transportation to the depuration plant. All aspects of harvesting and transportation of these shellfish are closely monitored by the Division of Fish, Game and Wildlife (Bureau of Law Enforcement) to insure complete compliance with program procedures.

A hard clam depuration plant began a pilot operation in July 1984. This operation is for all intents and purposes, almost identical to the soft clam depuration program. However, updated regulations at this time to meet the ever changing needs of both the state (from the enforcement standpoint) and the industry (from the harvesting aspect) are necessary. New regulations (1986) are designed to address these concerns.

Status of New Jersey's Shellfish Growing Waters

New Jersey has been divided into four major basins which are subject to shellfish growing water classification regulations. These include the Raritan River Basin, the New Jersey North Coastal Basin, the New Jersey South Coastal Basin and the Delaware River Basin Commission Zones 5 and 6. The classification of shellfish growing waters are found in NJDEP (1987c)

Raritan River Basin

Only a small portion of the Raritan River itself need be examined, as most of the upper basin consists of freshwater habitats. Prime consideration here is given to Raritan Bay, Lower New York Bay, Sandy Hook Bay, Navesink River, Shrewsbury River and their tributaries. There are no waters in this basin classified Approved. Thirty-five percent of the available acreage is classified Special Restricted or Seasonal Special Restricted. Based on data collected during the period of disinfection and non-disinfection a new classification (Seasonal Special Restricted) was developed that allows the harvest of shellfish for depuration during certain periods of the year. The eastern portion of Raritan Bay, Sandy Hook Bay and the Navesink and Shrewsbury Rivers are the only areas in this basin that are utilized in the Special Permit Programs (Relay and Depuration).

Reclassifications in the Raritan River Basin since 1982 include:

June 1984

Raritan Bay: Approximately 13,000 acres downgraded from Special Restricted to Seasonal Special Restricted.

Shrewsbury River: Approximately 680 acres downgraded from Special Restricted to Condemned.

June 1985
Shrewsbury River: Approximately 80 acres downgraded from Special Restricted to Condemned.

May 1986
Atlantic Highlands Marina: 92 acres Special Restricted to Condemned.

Raritan Bay: 13,000 acres, Seasonal Special Restricted expanded dates available for depuration harvest.

Raritan River Basin - Nonpoint Source Assessment

This region has been severely impacted principally from non-point source pollution produced as a consequence of agricultural activities, urban/suburban development, local industry, waste storage, and land based waste disposal. Point sources also impact waters in the region. These combined sources have contributed to silt and nutrient loads, high bacterial levels, and chemical pollution in the bays. Agricultural nonpoint pollution largely comes from run-off from cropland, feedlots, and animal holding areas. The stockpiling of horse manure both on farms and at race tracks is a significant source of bacterial pollution in this region. Active suburban development within the watersheds draining into the Raritan River basin have brought about increasing levels of run-off from construction sites, urban surfaces, roads, and septic tanks; and it is the urban surface run-off and septic tanks which are suspected of being one of the important contributors to excess levels of bacteria in the shellfish beds. Several landfills and hazardous waste sites, as well as petroleum processing sites, are all known to be sources of chemical pollution in Raritan and Sandy Hook Bays. Aside from human activity, natural sources such as waterfowl are cited as having a significant contribution to high bacterial levels here and throughout the State's bays and estuaries.

Designated Use And Goal Assessment

All of the Raritan River Basin fails to meet the shellfish harvesting goal and designated use for SE-1 waters based upon criteria established by the BMWC&A, Division of Water Resources, NJDEP.

New Jersey North Coastal Basin

This basin consists of a large portion of the Atlantic Ocean coastal environment in New Jersey. Most of the acreage classified in this basin is in Barnegat Bay. Barnegat Bay comprises the largest percentage of the total acreage available for shellfish harvesting in this basin. The remainder of the basin is made of a number of somewhat smaller bays, rivers, creeks and their tributaries. These include Shark River, Manasquan River, Metedeconk River, Toms River, Forked River, Oyster Creek, Manahawkin Bay, Little Egg Harbor, Cedar Run, Westecunk Creek, Tuckerton Creek, Big Thorofare and Big Creek.

Fully open shellfish harvesting acreage constitutes 70-75 percent as of 1988 of the total available acreage in this basin. These areas are generally located in Barnegat Bay and Little Egg Harbor. This leaves 10-15 percent (1988) of the total available acreage Condemned, and 10-15 percent (1988) classified as Seasonally Approved. Under the Shellfish Relay Program, clams are removed from Condemned waters in the Manasquan and Shark Rivers and deposited in specified Approved waters in Barnegat Bay, Little Egg Harbor Bay in Tuckerton Cove, or Great Bay for purification.

Reclassification on the North Coastal Basin since 1985 include:

June 1985
Barnegat Bay (Applegate Cove): approximately 100 acres downgraded from Approved to Condemned

May 1986
Barnegat Bay (Potter Creek to Laurel Harbor) approximately 140 acres Seasonal to Approved and and 33 acres Condemned to Approved.

Manahawkin Bay: 180 acres Approved to Seasonal.

Little Egg Harbor: 160 acres Approved to Seasonal.

July 1987
Shark River: Prohibited to Special Restricted :1180 acres

Barnegat Bay: north (off Swan Point) Seasonal to Special Restricted: 290 acres

Barnegat Bay(Barnegat Inlet Area): Approved to Special Restricted: 200 acres

North Coastal Basin - Nonpoint Source Assessment

The bays north of Barnegat Bay, specifically those fed by the Shark, Manasquan, and Metedeconk Rivers are believed to be impacted by both urban/suburban and agricultural non-point source pollution. It is urban run-off from stormsewers (urban surfaces) coupled with natural pollution from waterfowl which have been singled out as important contributors to high coliform levels in bay waters. This in turn has led to losses of shellfish harvesting waters, as well as beach closings. Siltation is reported to be coming from construction activities occuring within the watersheds. Agricultural sources of pollution include run-off from crop production, pasture lands, feedlots and animal holding areas.

Throughout Barnegat Bay septic tanks, waterfowl, and urban surfaces feeding into stormsewers are assessed as the principal contributors to the excess bacterial levels which are found in many regions of the bay. In Barnegat Bay and Little Egg Harbor, impacts from agriculture appear to be limited to tree harvesting activities. Siltation is suspected to be elevated by construction activities and by stream bank destablization. In the areas of Forked River and Oyster Creek, local habitat destruction has been reported caused by channelization, dam construction, and efforts to regulate river flow. Also in Barnegat Bay are reports of pollution from landfills in Kettle Creek, as well as inplace contaminants and industrial point sources located near Forked River and Oyster Creek.

Designated Use And Goal Assessment

Based upon criteria established by the BMWC&A, Division of Water Resources, NJDEP; 63 percent of the shellfish waters in the North Coastal Basin fully meet fishable goals and designated use for shellfish harvesting, 13 percent meet partial use, and 24 percent fail to meet desingated use and clean water goal for shellfish harvesting.

New Jersey South Coastal Basin

The New Jersey South Coastal Basin, combined with the New Jersey North Coastal Basin, make up more than 90 percent of the Atlantic Ocean coastal zone drainage basin in New Jersey. In comparison with the three other basins (Raritan River, New Jersey North Coastal Basin and Delaware River Zones 5 and 6)) which support shellfish harvesting, this basin is the most productive as far as hard clams are concerned.

The New Jersey South Coastal Basin includes Great Bay, Mullica River, Reed Bay, Absecon Bay, Lakes Bay, Great Egg Harbor, Great Egg Harbor River, Ludlam Bay, Great Sound, Jenkins Sound, Grassey Sound, Richardson Sound and Cape May Harbor. Reclassifications which have taken place in this basin since 1984 include:

1984
Reed Bay: 119 acres Condemned to Approved

Ocean City-Somers Point: 3,033 acres Seasonal to Approved

Sea Isle-Avalon Area: 658 acres Approved to Condemned

1985
Reed Bay: 119 acres Condemned to Approved

1986
Brigantine: 107 acres Condemned to Seasonal

Great Egg Harbor River:92 acres Condemned to Seasonal

Townsend and Stites Sound 442 acres Condemned to Approved

1987
Great Bay (Cape Horn Area): Approved to Special Restriced 23 acres

Atlantic City (Black Hole Area): Prohibited to Seasonal 10 acres

Atlantic Ocean (Avalon Area): Approved to Prohibited 3740 acres

Townsend Sound and Mill Thorofare: Prohibited to Seasonal 245 acres

South Coastal Basin - Nonpoint Source Assessment

Bays and estuaries in the South Coastal Basin are suspected of receiving excess silt and coliform bacteria primarily from urban sources such as construction activities, urban surface run-off and septic tanks. Additional bacterial imputs are believed to be from the extensive waterfowl population present through out the bays in this Basin. Additional pollution is suspected from boat docking facilities which are present along the shorelines of Brigantine, Great Egg Harbor, Lakes Bay, and the Cape May Atlantic tributanies. One point sources in this region, a municipal waste water treatment plant located in Mays Landing, is reported to be impacting Great Egg Harbor.

Designated Use And Goal Assessment

Based upon criteria established by the BMWC&A, Division of Water Resources, NJDEP; 61 percent of the shellfish waters in the South Coastal Basin fully meet designated use and fishable goals for shellfish harvesting, 12 percent meet partial use, and 27 percent fail to meet this designated use.

Delaware River Basin - Zones 5 and 6

Delaware Bay contains 97 percent of the total classified acreage in the basin and is the only area in the basin that contains waters classified as Approved for shellfish harvesting. The remaining areas are classified either Condemned or Seasonally Approved. In the past, problem areas have included the Maurice River and Cove area, the Cohansey River area, the Back Creek area, the Cedar Creek area and the Nantuxent Creek area. Of the total acreage available for shellfish harvesting, 80 percent is classified Approved, and roughly 20 percent is either Condened or Seasonally approved in 1987.

Delaware Bay is the major oyster producing area of the State. Although the bay and its tributaries still produce approximately 98 percent of the oysters harvested, their numbers have been severely reduced due to MSX *(Minchinia nelsoni* disease and the presence of the oyster drill *Urosalpinx cinerea* and *Euplaura candata*). Most oysters which are harvested in New Jersey originate in Delaware Bay seed beds and are transplanted to the leased grounds for growing and harvesting. Roughly 28,000 acres in the Bay are leased for planting oyster seeds.

Delaware River Basin - Nonpoint Source Assessment

Non-point pollution comes largely from septic systems and waterfowl populations. Waterfowl are suspected of being a major pollution source contributing to shellfish contamination. However, this source is believe restricted to the shellfish beds located within small bay tributarys and along the New Jersey shoreline. The Delaware River Basin is receiving pollution from municipal sewage treatment plants, many of which are being or soon will be put out of service, hence their impact to shellfish waters are assessed as being transient.

Designated Use And Goal Assessment

Based upon criteria established by the NJDEP; 78 percent of the shellfish waters in the Delaware River Basin fully meet designated use and clean water goals for shellfish harvesting while some 22 percent fail to meet this use and goal.

Atlantic Ocean

None of the basins previously discussed included figures on the Atlantic Ocean. There are 280,708 acres of marine waters which are regulated by the BMWC&A. Of this total area 72 percent of the waters are classified as Approved while the remainder is classified as Condemned (1986 data). The reclassifications in the Atlantic Ocean since 1984 are as follows:

1984
Atlantic City area: 3,170 acres Condemned to Approved

1985
Atlantic City area: 700 acres Condemned to Approved and 130 acres Approved to Condemned

Wildwoods 670 acres: Condemned to Approved and 315 acres Approved to Condemned

1986
Wildwoods 62: acres Condemned to Approved and 1,190 acres Approved to Condemned

1987

July 1987
Atlantic Ocean (Bay Head Area): Prohibited to Approved 460 acres

Atlantic Ocean: Prohibited to Approved 3350 acres

Summary of Shellfish Waters and Resources

It is important to be cautious when examining shellfish harvesting data for the past 14 years as seen in Table III-19: Yearly N.J. Shellfish Catches. These figures represent the total amount of shellfish (clams, oysters, mussels and scallops) produced/processed in New Jersey and not necessarily the total amount harvested from New Jersey's territorial waters. Three major factors that cannot be evaluated, but nevertheless affect these statistics must be considered: 1) catches from non-state harvest areas are included in these figures; 2) out-of-state fishermen use New Jersey's harvest areas and take their catches to other states for processing; and 3) hellfish harvested by sports fishermen. When these three factors are considered, one can readily see the difficulty involved when attempting to discuss past and future harvest trends. The overall general trend has been an increase in total pounds harvested.

While the BMWC&A is encouraged by recent gains in classification, there is concern for the immediate future. The change in the economy has created extensive building pressure for commerial, residential and industrial facilities in coastal communities. The major concern regarding this construction is degraded stormwater runoff associated with developed areas. Water quality gains realized through regionalization of wastewater treatment could be negated through extensive new construction and its associated runoff. It is noted that the estuarine waters of the coastal areas which are jeopardized by this development, are among the most productive in the State. Stormwater controls are being required in many of the developments now under construction through the issuance of Coastal Area Facilities Review Act (CAFRA) permits. In addition, the largest projects are also implementing water quality sampling programs to determine whether water quality degradation is resulting from their development.

A coordinated management approach is a requirement if New Jersey's shellfish resource is to be maintained as a national industry. Besides overall water quality improvements in New Jersey's coastal waters, there is a need for protection of shellfish habitats (bay and estuary bottoms), continued protection of significant clam and oyster seed beds, monitoring of annual harvest amounts and shellfish growing rates, and sampling of shellfish tissue for chemical and metals contamination. Depuration and relay programs will also undoubtedly play a greater role in the harvesting of New Jersey's shellfish resource in the future.

TABLE III-19 YEARLY NEW JERSEY SHELLFISH CATCHES

YEAR	CATCH (IN POUNDS)
1972	25,303,811
1973	24,896,494
1974	25,501,852
1975	38,325,940
1976	31,519,713
1977	39,302,494
1978	34,925,000
1979	45,281,000
1980	37,616,000
1981	44,961,664
1982	50,377,267
1983	50,510,727
1984	65,662,700
1987	65,274,800

TABLE III-20. COMPARISON OF 1979 AND 1984 CATCHES AND MONETARY VALUES.

SPECIES	CATCH LBS.	VALUE DOLLARS	CATCH LBS.	VALUE
	1984		**1987**	
Hard clam	1,601,200	4,865,798	1,539,800	5,862,558
Soft clam	186,900	266,451	5,200,700	116,009
Oyster	788,800	2,098,984	14,700	62,064
Surf clam	39,191,300	19,428,949	35,821,200	16,564,955
Quahog (Ocean)	21,469,300	6,438,737	24,394,900	6,929,495
Scallops (Ocean)	2,419,200	12,991,176	3,451,500	13,484,683
TOTALS	**65,662,700**	**46,090,095**	**65,274,800**	**43,019,764**

39.

DELAWARE RIVER
WATER QUALITY ASSESSMENT

1986-87 305(b) Report

Delaware River Basin Commission
West Trenton, New Jersey

March 1988

EXECUTIVE SUMMARY

Delaware River Water Quality Assessment
1986-87 305(b) Report

Delaware River and Bay comprise part of the boundary of four states: Delaware, New Jersey, New York and Pennsylvania. From Hancock, New York to the mouth of the Delaware Bay the Delaware River flows 330 miles, draining 0.4 percent of the U.S. land area. Almost 10 percent of the nation's population rely on the waters of the Delaware River Basin for potable and industrial water.

The non-tidal Delaware extending from Hancock, New York to Trenton, New Jersey is one of the Nation's premier recreational rivers. Thirty-nine percent of the non-tidal Delaware has been included in the National Wild and Scenic Rivers System and over one-half million visitors use the non-tidal river for fishing, boating, canoeing and swimming each year.

The Delaware Estuary extending from Trenton, New Jersey to Liston Point, Delaware flows through the Nation's fifth largest urban area: the Philadelphia-Camden metropolitan area. Including Trenton, New Jersey and Wilmington, Delaware, this area is one of the world's greatest concentrations of heavy industry, the second largest U.S. oil refining-petrochemical center and the world's largest freshwater port. Historically this section of the Delaware has also been one of the nation's most grossly polluted rivers. Water quality in 1986-87, however, reflects substantial water quality improvements as the result of water pollution control efforts extending back 40 years.

The 782 square mile Delaware Bay is 48 miles long and from 4 to 20 miles wide. The Bay is biologically productive and the home of commercially important fin and shell fish. Recreation and navigation are important as well.

Summary of Conditions

The water quality of the Delaware River, the Delaware Bay and the interstate portion of the West Branch Delaware River was assessed for the 1986-87 period. From the total river miles assessed (339 miles), it appears that:

- 49% had <u>excellent</u> water quality
- 32% had <u>good</u> water quality
- 7% had <u>good to fair</u> water quality
- 3% had <u>fair</u> water quality
- 5% had <u>fair to poor</u> water quality
- 4% had <u>poor</u> water quality
- 88% met the federal <u>fishable</u> goal
- 89% met the federal <u>swimmable</u> goal
- 11% did not support <u>designated uses</u>
- 9% were severely impaired by <u>point sources</u>
- 9% were severely impaired by <u>non-point sources</u>
- 13% had known or potential problem <u>toxics</u>

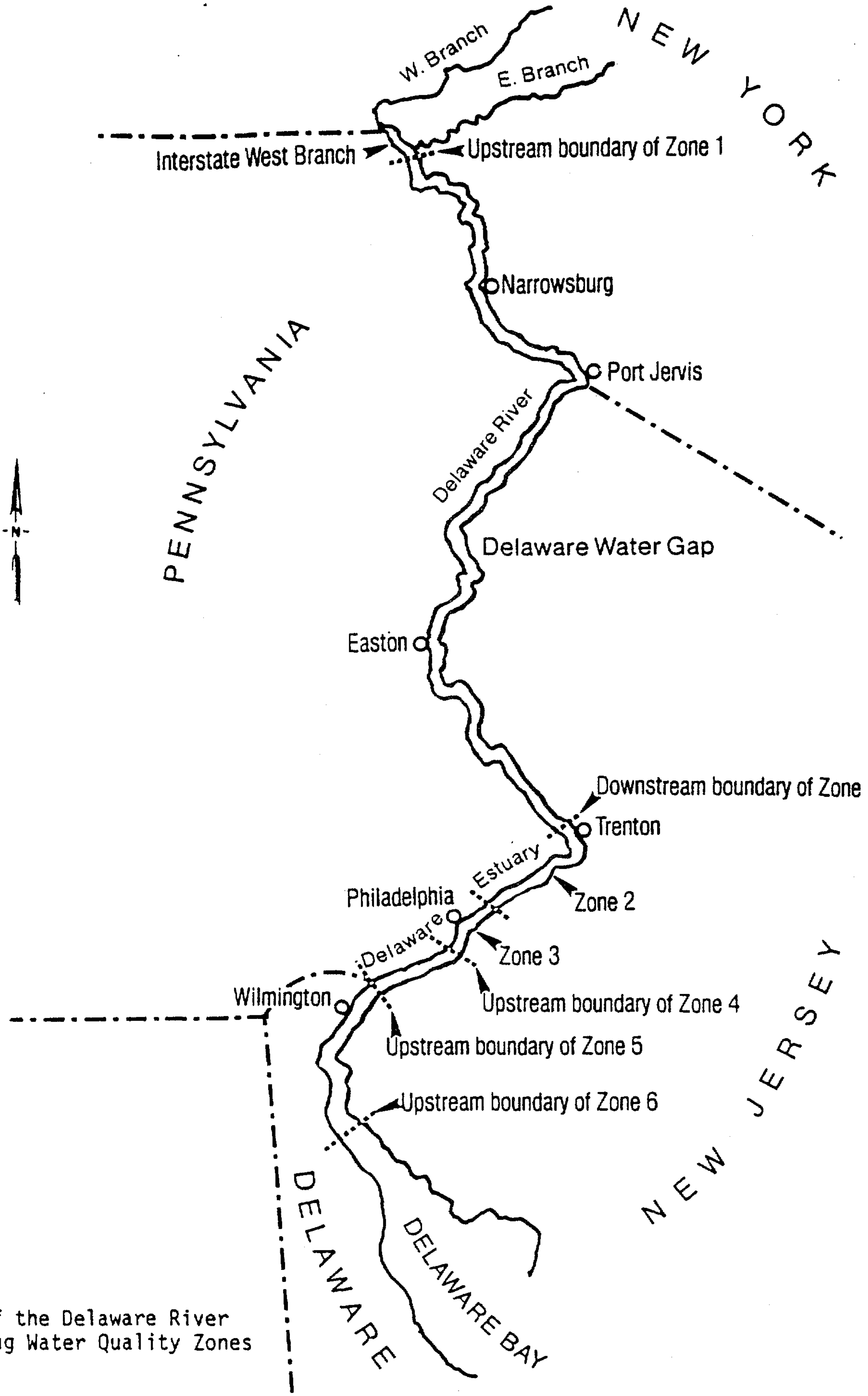
The following table presents a reach by reach assessment of water quality. The terms excellent, good, fair and poor refer to the degree of standards violation (areal extent and frequency) plus the amount of effluent disposed in the zone.

Reach by Reach Assessment

River Reach	States	No. of Miles	General Water Quality	Meets Swimmable Goal	Meets Fishable Goal	Supports Designated Uses
West Branch Delaware	NY,PA	9	Good	yes	yes	yes
Zone 1: Hancock to Port Jervis	NY,PA	74	Excellent	yes	yes	yes
Zone 1: Port Jervis to Delaware Water Gap	PA,NJ	46	Excellent	yes	yes	yes
Zone 1: Delaware Water Gap to Trenton	PA,NJ	77	Good	yes(65 mi) no(12 mi)	yes	yes(65 mi) no(12 mi)
Zone 2: Trenton to Northeast Philadelphia	PA,NJ	25	Good to Fair	yes	yes	yes
Zone 3: Philadelphia-Camden Area	PA, NJ	13	Poor	no	no	no
Zone 4: Schuylkill R. to Marcus Hook, PA	PA, NJ	16	Poor to Fair	yes(5 mi) no(11 mi)	no	yes(5 mi) no(11 mi)
Upper Zone 5: Marcus Hook to New Castle, DE	NJ,DE	11	Fair	yes	no	yes
Lower Zone 5: New Castle to Delaware Bay	NJ,DE	20	Good	yes	yes	yes
Zone 6: Delaware Bay	NJ,DE	48	Good	yes	yes	yes

Water pollution control in the Delaware River is the joint responsibility of the federal government, the four Delaware River Basin states and the Delaware River Basin Commission. The Commission conducts monitoring, regulatory and other water quality management programs as part of its basinwide responsibilities.

During 1986 and 1987, the DRBC conducted a use attainability study of the Delaware Estuary which included special studies of sediment oxygen demand, toxics, fish health, combined sewers, bacterial quality and others. Final recommendations, directed at the attainment of the federal fishable and swimmable water quality goals in the Delaware Estuary are expected in Spring, 1988. The 1986-87 305(b) report reflects the data gathered as part of the use attainability study. Conducted in 1987 as well were special studies in the non-tidal river including sediment toxics. New efforts of the commission include seasonal disinfection studies, a scenic rivers water quality planning effort, an interstate toxics program and others.



Map of the Delaware River
Showing Water Quality Zones

40. STATUS REPORT ON NEW YORK-NEW JERSEY INTERSTATE WATERS

EXECUTIVE SUMMARY

Interstate Sanitation District waters have generally showed some improvement during the past several years with regard to dissolved oxygen and coliform levels. District waters meet dissolved oxygen requirements during the winter; however, in some locations, dissolved oxygen values in the summer drop below standards. Some waters are high in heavy metals and oil and grease.

In 1986, the ISC and the States of New York and New Jersey upgraded a portion of the Hudson River (from the confluence with the Harlem River north to the New York/New Jersey border) to swimmable/fishable.

The Interstate Sanitation District encompasses 797 square miles of water in the Greater New Jersey Metropolitan Area and includes portions of the States of New Jersey, New York, and Connecticut. New Jersey surface waters located within the New Jersey-New York Metropolitan Area form part of the jurisdiction of the Interstate Sanitation Commission.

The Commission's programs for the improvement of these waters, in cooperation with the states, include the following:

(1) to open waters for swimming;
(2) to open waters for shellfishing;
(3) to ensure Compliance with ISC Water Quality Regulations by an active enforcement program;
(4) to establish and attain minimum dissolved oxygen requirements for all surface waters;
(5) to establish necessary pollutant levels for discharges into District waters;
(6) to monitor surface waters by analysis for samples obtained from regularly scheduled and intensive surveys;
(7) to do sampling and analysis of municipal and industrial dischargers to determine whether Compact requirements are being met;
(8) to perform effluent sampling to assist the states and the U.S. EPA in determining permittee compliance with NPDES/SPDES permit limitation;
(9) to supply water quality data to STORET, the U.S. EPA data storage and retrieval system, and to the state and federal agencies;
(10) to assist the states in conducting Use Attainability Analyses.

Summary of Classified Uses

New Jersey Portion of the Interstate Sanitation District

Classified Use	Total Size Classified For Use Estuaries (1) (sq. mi)
ISC Class A Waters (2)	54
ISC Class B-1 Waters (3)	9
ISC Class B-2 Waters (4)	9

(1) All waters in the Interstate Sanitation District are considered estuarine.
(2) Denotes primary contact recreation, shellfish culture and development of fish life.
(3) Denotes secondary contact recreation and fishing.
(4) Denotes fish passage and maintenance.

Water Quality Summary

DESIGNATED USE SUPPORT

Type of Waterbody: ESTUARINE (1)

Degree of Use Support	Assessment Basis: Evaluated (Sq. Mi.)	Assessment Basis: Monitored (Sq. Mi.)	Total Assessed (Sq. Mi.)
Size fully supporting		0	
Size partially supporting		54	54
Size not supporting		18	18
TOTAL		72	72

ATTAINMENT OF CWA GOALS

Type of Waterbody: ESTUARINE (1)

Goal Attainment	Fishable Goal (Sq. Mi.)	Swimmable Goal (Sq. Mi.)
Size meeting	0	0
Size not meeting	54	54
Size not attainable	18	18

1. All waters in the Interstate Sanitation District are considered estuarine.

Nonpoint source information

The following list is comprised of waterbodies within the New Jersey portion of the Interstate Sanitation District that without additional action to control nonpoint sources of pollution, cannot reasonably be expected to attain or maintain standards:

Waterway	Nonpoint Source Category	Subcategory
All Waterways	Silviculture	Road Construction/ Maintenance
	Construction	Highway/road/bridge Land development
	Urban Runoff	Surface runoff
Lower Bay	Resource Extraction	Subsurface mining
Kills Raritan Bay	Land Disposal	Wastewater Landfills Industrial land treatment/On-site wastewater systems
Hudson River Kills Lower N.Y. Bay Raritan Bay	Hydrologic/Habitat Modification	Dredging
All Waterways	Other	Atmospheric deposition Spills

Public Health/Aquatic Life Concerns
Toxics - Related Concerns

Fishing Advisories and Bans Currently in Effect

Waterbody Name	Pollutants of Concern	Type of Restriction	Area (Sq. Mi)	Date Established	Source of Pollution	Species (1) Affected
Hudson River	PCB	A	8.6	Dec. 1982	Ft. Edward, Washington County, NY	Striped Bass(2) Large Bluefish White Perch White Catfish American Eel(2) Blue Crab
Raritan Bay/Sandy Hook Bay	PCB	A	48	Dec. 1982		
Raritan River - Tidal Portion	PCB	A	(3)	Dec. 1982		
KVK/AK	PCB	A	4.63	Aug. 1984	Diamond-Alkali Newark, NJ	
Newark Bay	PCB	A	5	Aug. 1984		
Passaic River - Tidal Portion	DIOXIN	B	(3)	Aug. 1984		
Hackensack River - Tidal Portion	PCB	A	(3)	Aug. 1984		
Upper NY Bay	PCB	A	6	Aug. 1984		

A - Health advisory: Limited consumption.
B - Ban on consumption and/or sale of all organisms.
1 - These species can be found in all waterbodies.
2 - Commercial sale prohibited from waters of the Newark Bay Complex.
3 - Beyond yet adjacent to the Interstate Sanitation District.

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Chapter IV

Ground Water Quality in New Jersey

CHAPTER IV:

Ground Water Quality in New Jersey

A. Introduction

The value of New Jersey's ground water to its citizens and industries can be considered equal to that of its surface waters. Fortunately, New Jersey has an abundance of ground water resources which are of generally good quality. But the resource is not without its share of problems and threats. This chapter will summarize information on the State's ground water with regard to its importance for various uses, the quality of the resource, and problems it currently faces. In addition, a review of existing state programs to protect and enhance our ground water is presented.

B. Importance of Ground Water in New Jersey

Currently about one-half of the State's population, about four million people, rely on ground water for their drinking water. Of the 622 community public water systems in the State, 558 obtain all or part of their supplies from ground-water sources (US Environmental Protection Agency, 1985). There are also approximately 16,000 non-community wells and 400,000 private potable wells in the State. In addition, industrial and agricultural (including irrigation) uses of ground water occur throughout the State.

Ground water is important for providing base flows to most of the rivers and streams in the State. In the predominantly sandy Coastal Plain physiographic province, it has been estimated that 67 to 89 percent of the base flow is due to ground water discharge to streams (Havens et al., 1980). The ground water contribution to stream base flows in the Piedmont and Highlands provinces is also considered to be significant.

C. Ground Water Quality and Quanity Concerns

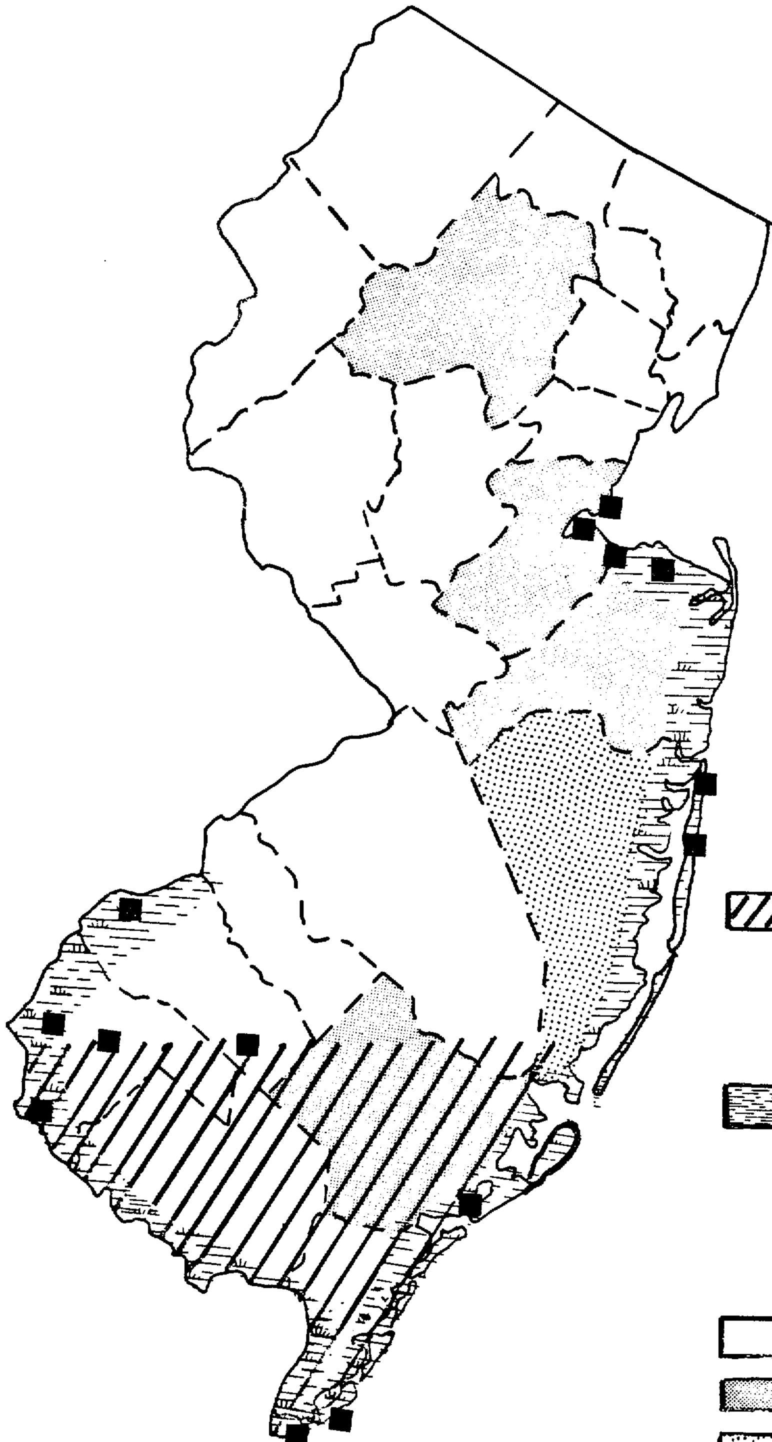
Ambient ground water quality is considered to be good in the State although in many areas, iron removal is necessary for potability. There are ground water problems, however, as evidenced by the fact that during the past three years, 218 wells were sealed due to ground water pollution problems. Of that number, some were due to sediment entering holes in well screens and not to pollution plumes (NJDEP, 1988). During the period from 1985 to 1987, the NJDEP responded to 960 ground water pollution cases. Figure IV-1 is a generalized map which summarizes ground water quality in New Jersey. Table IV-1 summarizes the common sources and causes of ground water pollution in the State.

Beginning in late 1984, drinking water supplies throughout the State were analyzed semi-annually for volatile organic chemicals. This sampling was done as part of the State's effort to satisfy requirements of the New Jersey Safe Drinking Water Act amendments (P.L. 1983, c. 443), commonly known as A-280. Sampling results from the period of May 24, 1985 to December 1, 1987, indicated that seventy-six public wells had unacceptable levels of volatile organic chemicals. The sampling did not include private wells; however, one hundred and thirty-nine private wells with unacceptable contamination were brought to the NJDEP's attention. Figures IV-2 and IV-3 show the general locations of wells with unacceptable concentrations of volatile organic chemicals based on this sampling. Subsequently, some of these wells closed down while others employed treatment to correct the volatile organic chemical problem.

Discharges of hazardous substances to the environment pose a potential threat to the ground water. The universe of sites managed by the NJDEP's Division of Hazardous Site Mitigation and the Division of Hazardous Waste Management is comprised of over 1,200 sites with known or suspected hazardous waste contamination (including

Figure: IV-1

Ground Water Quality in New Jersey



Area of Water-Quality Concern

■ **Known saltwater intrusion (from Schaefer, 1983)**

Chloride concentration greater than 250 milligrams per liter near the top of the Potomac-Raritan-Magothy aquifer system (from Luzier, 1980)

Potential salt water intrusion

Wells That Yield Contaminated water, by county

0 - 25

26 - 75

More than 300

(Modified from: U.S. Geological Survey Open-File Report 87-0740)

TABLE IV-1 COMMON GROUND WATER POLLUTION SOURCES

The main ground water pollution sources in New Jersey are listed below. Following each source is a number that corresponds to the key at the end of the table which describes the significance of the pollution threat. The numbers do not represent a relative ranking of the pollution source.

I. Wastes and Waste-Generating Activities

Source

-Septic systems (1)
-Infiltration/percolation lagoons (1)
-Waste injection wells (1)
-Landfills (unlined) (1)
-Junkyards (2)
-Leaky sewer lines (3)
-Waste piles (3)
-Unauthorized dumping by individuals (4)
-Infiltration basins (4)
-Animal feedlots (4)
-Agricultural use of sewage and industrial sludges
and compost derived from wastes (5)
-Landfills (lined) (5)
-Upland disposal of dredge spoils (5)
-Lined lagoons (5)

II. Other Sources of Pollution

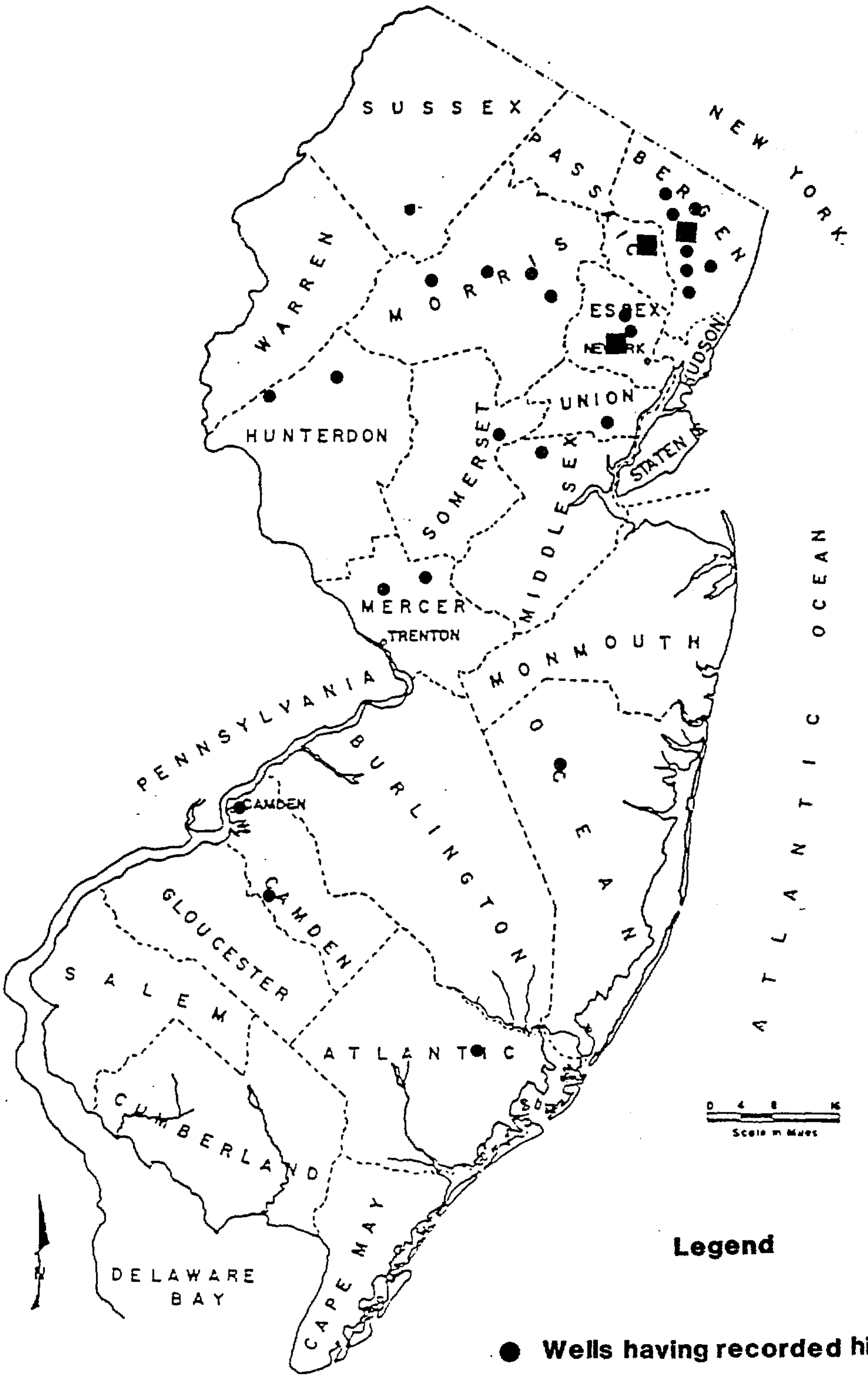
Source

-Underground storage tanks (1)
-Salt stockpiles and highway deicing (1)
-Above-ground storage tanks (2)
-Agricultural application of fertilizers, pesticides,
and herbicides (2)
-Accidental spills at industrial facilities and
poor housekeeping (2)
-Saltwater intrusion (3)
-Transportation accidents causing spills (4)
-Petroleum transmission pipelines (4)
-Abandoned wells (5)
-Mining (e.g., acid mine drainage) (5)

Key:
1 Major source of ground water pollution
2 Significant source of ground water pollution
3 Potential major source of ground water pollution
4 Potential significant source of ground water pollution
5 Minor or negligible source of ground water pollution

Figure IV-2

Approximate Locations of Public - SupplyWells Having Recorded High Concentrations of Volatile Organic Chemicals (VOC'S)



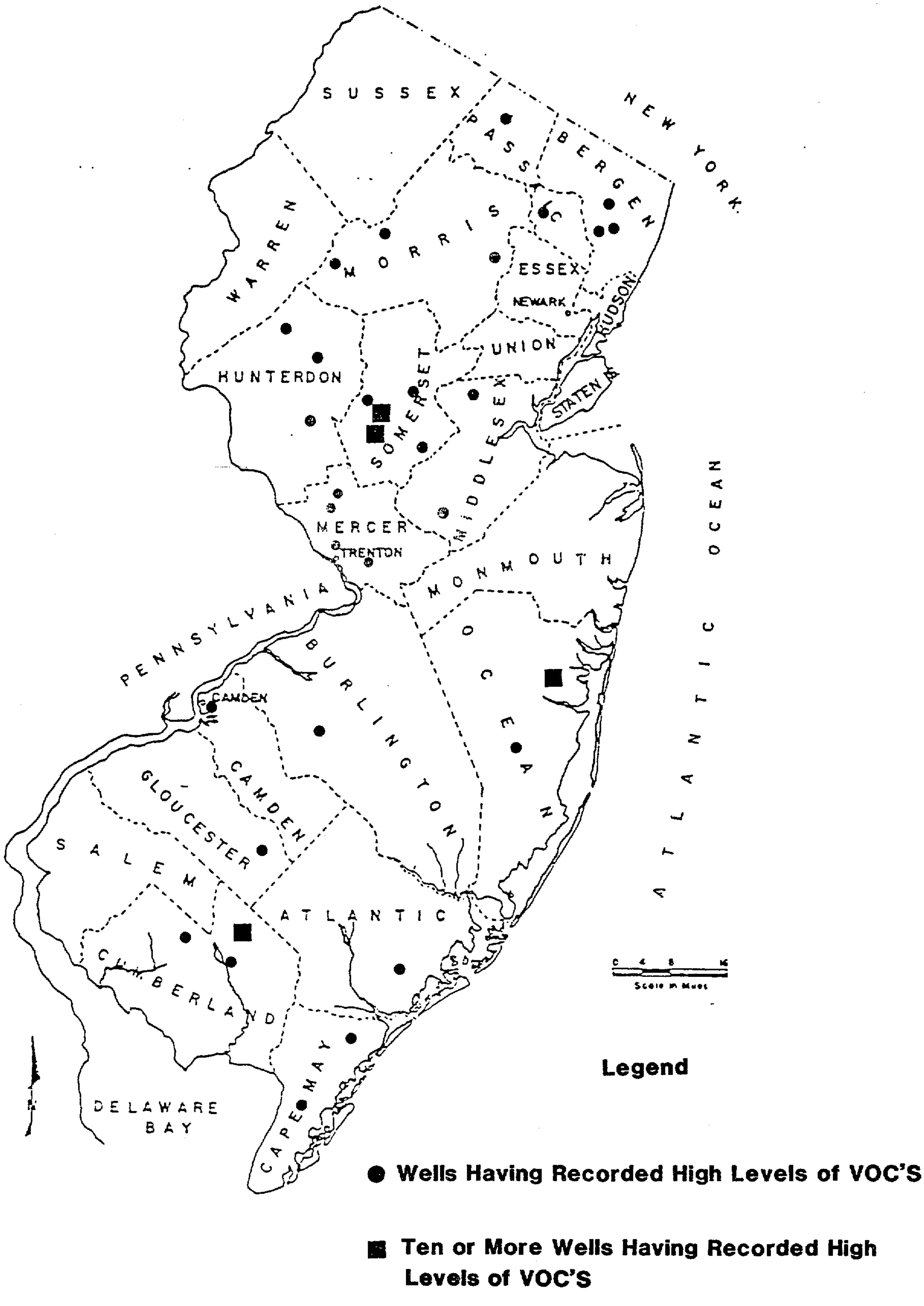
Legend

● **Wells having recorded high levels of VOC'S**

■ **Five or more wells having recorded high levels of VOC'S**

Figure IV-3

Approximate Locations of Private Wells Having Recorded High Concentrations of Volatile Organic Chemicals



100 National Priorities List sites); over 4,000 industries generating hazardous waste; over 400 facilities treating, storing, or disposing of waste; 640 facilities which may require corrective action; and 15,000 industrial establishments which may potentially be subject to the Environmental Cleanup Responsibility Act.

In addition, there are 685 known and potential Resource Conservation & Recovery Act facilities; 800 NJPDES cases, of which 175 may require long-term remediation; 200 major responsible party cases in the NJDEP's Bureau of Case Management; 422 cases in the NJDEP's Bureau of Field Operations; and 155 publicly-funded remediation sites (80 actual and 75 projected) (NJDEP, 1987a).

In addition to point sources of ground water pollution, there is also thought to exist a large number of unpermitted nonpoint sources of pollution which have yet to be identified. The primary nonpoint sources suspected of causing ground water pollution include underground storage tanks, surface runoff, land application of pesticides, and other unknown sources. Pollution of surface waters can also contribute to ground water contamination.

Among the municipalities believed to have private wells affected by nonpoint sources of pollution are: Edgewater Park, Delanco, Dennis, Winslow, Howell, and Monroe (Gloucester County). In these areas, it is believed that the contamination may be from agricultural fertilizers, septic tanks, or a combination of both, resulting in high nitrate levels in the ground water (Robert Oberthaler, NJDEP, personal communication). Ground water sampling which was done in conjunction with the "Contaminated Wellfield Bond Program," in which the NJDEP makes available low interest loans for the provision of alternate potable water sources, was the source of the data. It is probable that such nonpoint source pollution as this also occurs in other areas of the State.

Another problem related to ground water is the presence of high concentrations of radon. Radon in ground water is a problem because it can contribute to higher levels of radon in indoor air. The USEPA suggests that every 10,000 picocuries per liter of radon in water will contribute 1 picocurie per liter to in-home air. Therefore, for example, a waterborne radon level of 40,000 picocuries per liter can result in an indoor air level of about 4 picocuries per liter. Four picocuries per liter is the indoor air level at which the USEPA recommends that remedies be considered (U.S. Environmental Protection Agency, 1987).

The NJDEP's Bureau of Environmental Radiation is conducting a program ("Confirmatory Monitoring Program") for sampling and analysis of radon in indoor air concentrations. As part of this program, 1,000 samples of well water were also taken. Results from the sampling, primarily from the Piedmont and Highlands Physiographic Provinces, indicated that approximately 13% of the water samples contained at least 10,000 picocuries per liter of radon.

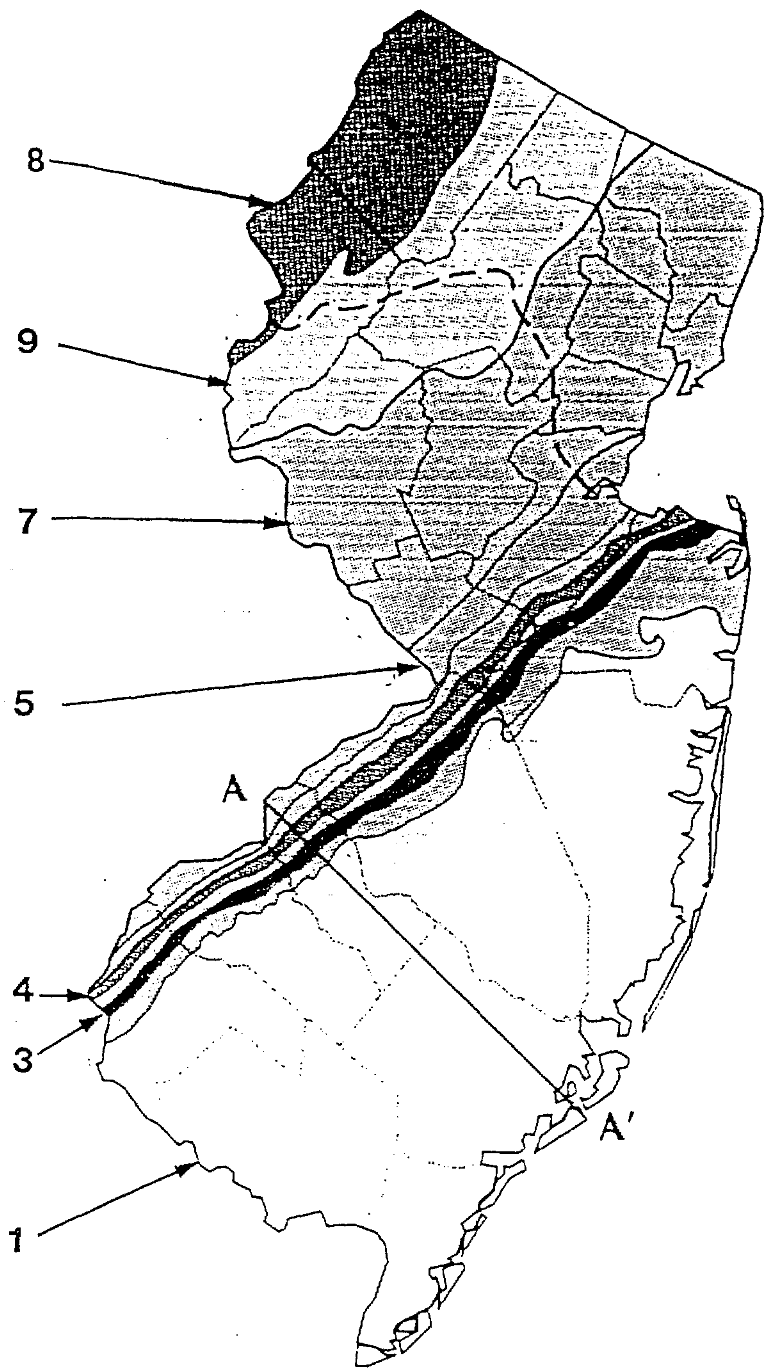
New Jersey's ground water is also being stressed from overpumpage. Overpumpage has caused lowered ground water levels which has resulted in salt water intrusion in areas directly adjacent to ocean waters and estuaries. Several water supply wells in these areas have been closed due to high chloride and sodium concentrations.

D. Ground Water in the State's Physiographic Provinces

This section will describe the ground waters found in New Jersey's major physiographic provinces: the Coastal Plain, the Piedmont, the Highlands, and the Valley and Ridge. In the narrative, the Highlands and the Valley and Ridge provinces are discussed together. Also presented is a description of the value which ground water has in each of the physiographic provinces, as well as the magnitude of quality/quantity problems currently impacting the resource. Figure IV-4 shows both the aquifers of the State and the major physiographic provinces.

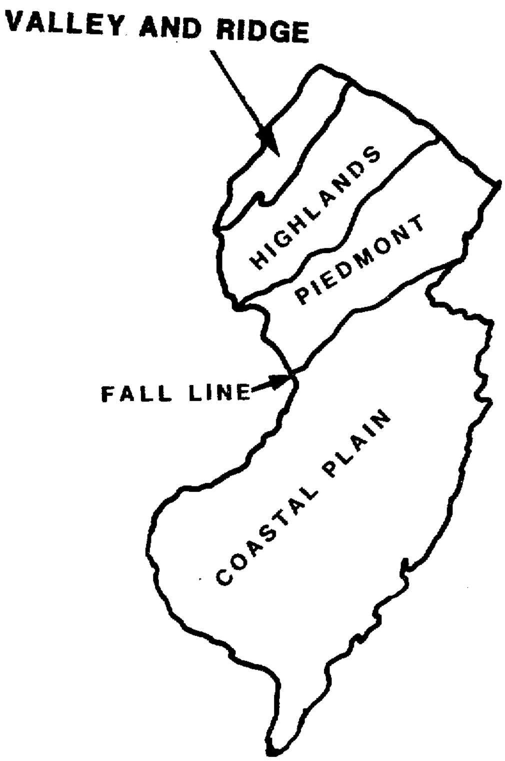
Figure IV-4

Principal Aquifers in New Jersey



(Figure IV-4 cont'd.)

(Modified from: U.S. Geological Survey Open-File Report 87-0740)



PRINCIPAL AQUIFER Numeral is aquifer **number in figure on previous page and section below.**

COASTAL PLAIN AQUIFERS

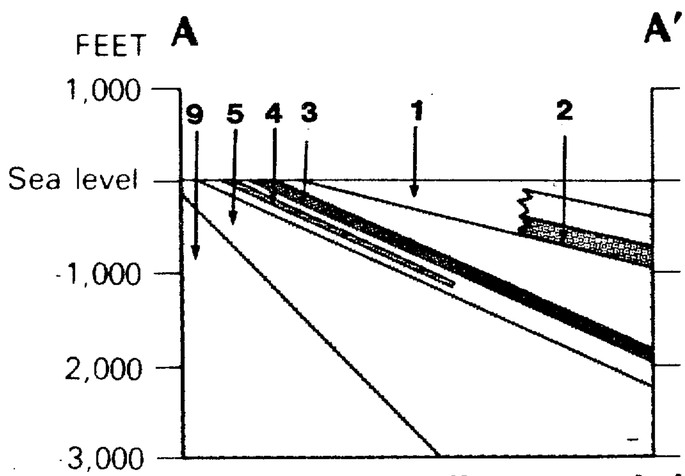
- Kirkwood-Cohansey aquifer system **(1)**
- Atlantic City 800-foot sand **(2)**
- Wenonah-Mount Laurel **(3)**
- Englishtown **(4)**
- Potomac-Raritan-Magothy aquifer system **(5)**
- Confining beds and minor aquifers

NON-COASTAL PLAIN AQUIFERS

- Glacial valley-fill deposits **(6)** Not shown on map
- Aquifers in the Newark Group **(7)**
- Valley and Ridge sedimentary units **(8)**
- Highlands crystalline units **(9)**

— — **Southern limit of Wisconsin glacial terminal moraine**

A—A' Trace of hydrogeologic section



Vertical scale greatly exaggerated

1. The Coastal Plain Physiographic Province

The Coastal Plain is the largest of the physiographic provinces in New Jersey, covering an area of nearly 4,500 square miles. The geology of the province is composed of a series of overlying and overlapping southeasterly dipping and thickening sediments. Sands, gravels, silts and clays are the dominant materials composing the unconsolidated Coastal Plain sediments.

The Coastal Plain contains both confined and unconfined aquifers. The four major confined aquifers are the Potomac-Raritan-Magothy, Englishtown, Mt. Laurel-Wenonah, and Kirkwood formations. The Potomac-Raritan-Magothy aquifer is the oldest, thickest and most developed aquifer in the Coastal Plain. The Cohansey Sand Formation is the major unconfined aquifer (except in Cape May County where it is confined) and outcrops over much of the southern Coastal Plain.

In the areas of the Coastal Plain where the confined aquifers predominate, significant hydraulic connections have been identified between the aquifers. As such, even these confined aquifers tend to act as an interrelated system. Vertical leakage of ground water through confining layers is especially pronounced when aquifers are heavily pumped. The Potomac-Raritan-Magothy aquifer between Trenton and Salem receives an estimated 47 percent of its recharge from the Delaware River (over an outcrop area), 31 percent from vertical leakage through overlying formations, 17 percent from direct precipitation on the outcrop areas, and 5 percent from underflow (Havens et al., 1980). The Raritan-Magothy formation can adequately deliver one million gallons per day (mgd) from properly constructed wells (Havens et al., 1980).

Ground water supplies most of the potable water to the inhabitants of the Coastal Plain. Seventy-one percent of the total water purveyor-supplied water in the province consists of ground water and seventy-five percent of the Coastal Plain inhabitants rely on municipal or domestic ground water supplies. Population growth in the Coastal Plain to the year 2000 is estimated to average nearly 20 percent, which will undoubtedly put further demands on the ground waters in the province (NJDEP, 1985b).

The overuse of Coastal Plain ground water has resulted in the development of five regional zones of water level declines. These "cones of depression" are in three general areas and correspond to where ground water usage is greatest in the Coastal Plain - along the Delaware River, the Atlantic Coast and Raritan Bay. Because of the interrelationship between Coastal Plain aquifers, water level declines can adversely affect several aquifers in an area. Areas of salt water intrusion are due to heavy regional water use coupled with close proximity to saline waterways or interfaces with connate water downdip.

Despite the problems currently confronting ground water in the Coastal Plain, an immense and relatively pure resource still exists. An estimated 5 billion gallons per day are recharged to the Coastal Plain aquifers, much of this in the still primarily undeveloped Pinelands area (Havens et al., 1980). The effective management of this resource will be one of the most important and significant challenges currently facing environmental protection in the State.

2. The Piedmont Physiographic Province

The Piedmont physiographic province, the second largest in the State, encompasses over 1500 square miles. The Piedmont is a northeasterly to southwesterly trending group of rock formations. Mudstone, sandstone and conglomerate rock with interlayered igneous rock characterize this area. The dominant formation in the province is the red-colored Brunswick Shale.

Ground water in this province is found primarily in weathered rock fractures and joints. Consequently, ground-water flow is considered to be very complex, highly erratic, and difficult to predict. The glacial stratified drift deposits overlying the consolidated rock are the most productive water bearing formations in this region. As a result, they are heavily relied upon as water supply sources.

It is estimated that approximately fifty-nine percent of the purveyor-supplied water in the province is ground water. In addition, more than 71,000 domestic wells supply approximately nine percent of the Piedmont's inhabitants with water (NJDEP, 1985b).

Ground water level declines have not occurred in the Piedmont on the scale found within the Coastal Plain. However, localized declines have taken place primarily in the highly developed Buried Valley Aquifer in the Morris-Essex Counties area of the Piedmont. Where overuse has occurred adjacent to saline water bodies in the Newark area there has been some salt water intrusion into the bedrock aquifers.

The Piedmont, like the Coastal Plain, faces significant new development pressures in many areas. Despite the availability of surface water to fill much of the water supply needs of the region, significant ground water threats imperil the resource. The introduction of contaminants, the construction of regional sewer systems that transfer waters outside basins, and the paving of aquifer recharge areas all threaten to reduce ground water availability in the Piedmont.

3. Highlands and Valley and Ridge Provinces

The area comprised of the Highlands and Valley and Ridge Physiographic Provinces includes the remaining 1480 square miles of the State. For the purposes of this discussion, both provinces are discussed together in the narrative under the category "Highlands."

The Highlands province contains Precambrian crystalline rock formations and Paleozoic sedimentary rock. The region is generally characterized by a series of northeasterly to southwesterly trending ridges and valleys. The upland areas contain thin soils, while the valleys may be filled with up to 350 feet of sand, gravel, silt and clay materials deposited during glacial periods. Sandstone, shale, siltstone, limestone, and conglomerate comprise the Paleozoic sedimentary rock.

The ability of the Highlands geologic formations to supply ground water is variable and, in many areas, less than most other regions of the State. As in the Piedmont, joints and fractures act in the Precambrian gneisses to store waters. Yet unlike the Piedmont, water movement is considered restricted in the gneisses to localized areas, and no regional ground-water flow systems are thought to exist (NJDEP, 1985b). With the exception of certain limestones, the Paleozoic sedimentary rocks are also considered to be poor water-bearing formations. Cavities formed in the limestone permit open channel flows that are important sources locally for municipal, industrial and agricultural supplies in portions of Warren, Sussex and Hunterdon Counties.

The pollution of ground water in this region is difficult to predict because of the movement of water from one fracture zone to another. In addition, ground-water movement within the limestone formations is very rapid.

Residential, commercial and industrial development pressures in northern New Jersey may be affected to a certain extent by the availability of ground water supplies. The resource, already considered very limited in many areas of the Highlands, will require appropriate management measures to avoid overuse and contamination. Studies regarding the mapping and exploration of the region's ground water are also necessary.

E. Ground Water Management in New Jersey

New Jersey has taken an active and progressive approach to the management of the State's ground water. A number of fed-

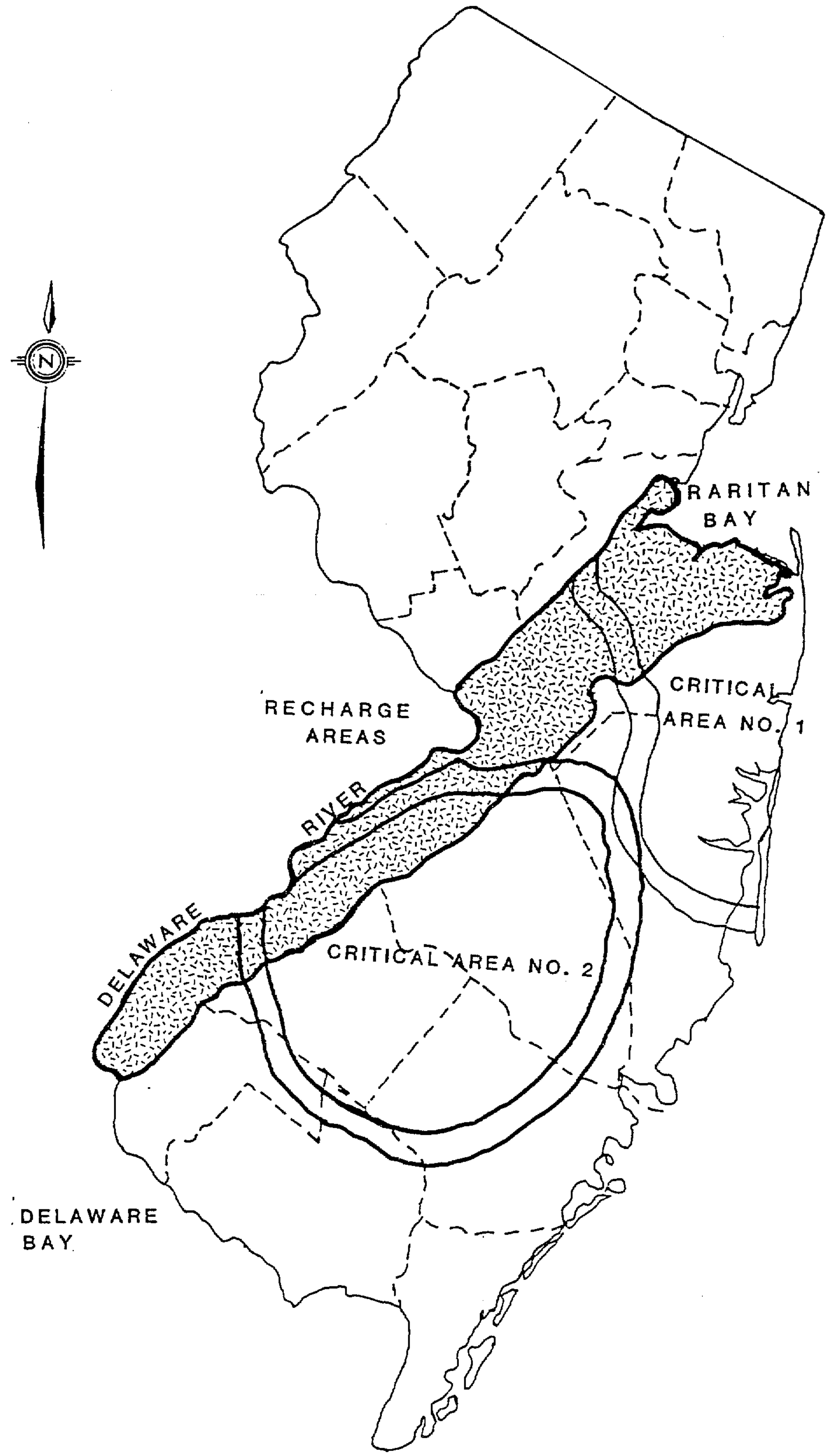
TABLE IV-2 SUMMARY OF GROUND-WATER RESOURCE EVALUATION AND ASSESSMENT ACTIVITIES IN NEW JERSEY

Agency	Functions
1. U.S. Geological Survey	Conducts long-term data gathering and special short-term ground water quality and quantity research projects, most performed in cooperation with the NJDEP. These efforts include:
	a. Saltwater Encroachment Network consisting in 1988 of approximately 240 wells. Samples are tested for pH, temperature, specific conductance, chlorides, and sometimes sodium
	b. Synoptic Well Network to determine potentiometric water levels in the Coastal Plain. The Synoptic Network Wells are examined every five years and are scheduled to next be checked in 1988. It is planned that the potentiometric water levels of between 1,250 and 1,350 wells will be measured in 1988.
	c. Observation Well Network consisting of 124 wells Statewide in which water level data is observed.
	d. Ambient Ground Water Quality Network in which 25-30 wells will be sampled, during 1988, in the aquifers of the northern portion of the State and intensive study of an additional 40-45 wells.
2. NJDEP, Division of Water Resources	
A. N.J. Geological Survey	Performs resource assessments on aquifer water quality and quantity characteristics, develops data bases, performs computer modelling, and is conducting a Statewide aquifer mapping project for completion in 1991. Provides overall technical support on ground water issues.
B. Bureau of Monitoring Management	Conducts ground-water monitoring in conjunction with the USGS Ambient Network. Assists substate agencies in development of their own ground-water monitoring program.
C. Bureau of Water Quality Standards and Analysis	Revising State Ground Water Quality Standards using a new aquifer classification system. Developing aquifer classification system based on the evaluation of natural potability, hydraulics, and susceptability to pollution.

TABLE IV-2 (Continued) SUMMARY OF GROUND-WATER RESOURCE EVALUATION AND ASSESSMENT ACTIVITIES IN NEW JERSEY

Agency	Functions
D. Bureau of Safe Drinking Water	Requires periodic sampling of public water supplies (finished water) for 16 hazardous contaminants. Performs periodic sampling from public supply wells when contamination is detected or requires public supply to furnish monitoring data.
E. Bureau of Water Supply	Conduct safe yield studies of areas requiring the development of new ground water supplies. Collects related information.
F. Bureau of Ground Water Discharge Control	Evaluates localized ground water quality and hydraulics for the purpose of issuing appropriate permit limitations on discharges to ground waters.
3. NJDEP, Division of Discharge Control	
	Analyzes ground water for the presence of potentially hazardous and toxic chemicals, metals, and organic substances. Projects are developed for specific study areas.
4. County Cooperative Ground Water Monitoring Program	
	One County is presently conducting its own ground water quality monitoring network (Ocean County).

Figure IV-5
Location of Water Supply Critical Areas 1 and 2



eral, State and sub-state offices are involved in ground water management activities ranging from resource evaluation to the cleanup and restoration of contaminated wells. New Jersey considers its efforts in ground water protection and pollution control to be a priority and has made major commitments to managing the ground water.

The NJDEP, the agency with primary responsibility for ground water management in New Jersey, is taking an overall resource approach to ground water protection. Instead of concentrating on controlling only specific pollution sources, the NJDEP is prepared to deal with all known and potential pollution sources. Presented below is a brief description of the various ground water management programs in the State. The programs are listed by subject: Resource Evaluation, Quantity Protection, and Quality Protection (pollution control).

1. Resource Evaluation

Assessment and evaluation of the State's ground water resources is critical if management is to be effective. The State, alone and in conjunction with outside agencies, has been conducting ground water resource investigations for a number of decades. With the identification of significant ground water problems over the past ten years or so, the scope of the resource investigations have been expanded. Table IV-2 presents a summary of the ground water resource assessment and evaluation programs currently underway in New Jersey.

Resource evaluations range from descriptions of surface and subsurface geology to analyzing aquifer water quality and recharge rates. As such, resource assessments usually review either the ground water quantity or quality issues. Groundwater resource management strategies generally are developed by the Division of Water Resources. Both the US and NJ Geological Surveys provide support for preparing management strategies through the development of necessary ground water data bases.

Increased importance is being placed on the gathering of ground water quality data. The NJDEP (1985a) has outlined a strategy for collecting ground water quality data which emphasizes greater data coordination between data collecting agencies. Other monitoring priorities are to assist counties in the development of their own monitoring programs and to maintain a statewide ambient ground-water monitoring network. Other significant ground water evaluation projects underway within the NJDEP include a statewide aquifer mapping and assessment project to be completed by 1991, and the preparation of revised ground water quality standards during 1988.

The revised ground water quality standards will include broad policies for protecting ground water quality; a classification system based upon hydrogeologic properties, natural quality, and human patterns of use of ground waters; numeric criteria; and policies for applying the ground water quality standards through the NJDEP's regulatory programs. The ground water classification system has been developed in consultation with a Departmental Ground Water Working Group. Ground water quality standards will be based on the potability of the water in an aquifer, the hydraulic properties of the aquifer, and on the use of the aquifer system.

2. Quantity Protection

The management of New Jersey's ground water originated at the turn of the century when the Water Supply Commission was created in 1907 to control all public supplies. Today, under the auspices of the Water Supply Management Act, (N.J.S.A. 58.1A-1-17), the NJDEP's Bureau of Water Allocation requires water diversion permits for all withdrawals of 100,000 gpd or more (or 10,000 gpd or more from critical water supply aquifers) and well permits for all new public or domestic wells.

The permit process is designed to ensure adequate water supplies now and in the future. All holders of a diversion permit must submit quarterly water usage reports, and if a well is used, static water levels. New allocations will not be granted if there is evidence that a diversion can not be sustained with use or that it will adversely affect adjacent uses. The Bureau of Water Allocation has issued approximately 1,000 diversion permits. On a yearly basis, 25,000 applications for well permits are handled by the staff of the Bureau of Water Allocation.

The State Water Supply Management Act of 1981 also serves as the basis for the General Water Supply Management Regulations (N.J.A.C. 7:19) which provide for the establishment of water supply critical areas. In these critical areas, severe water supply problems exist. To alleviate these problems, the State is empowered to exercise regional water management controls not applicable in other areas of the State.

Responding to severe water level declines and increased development in the northern Coastal Plain, New Jersey established Water Supply Critical Area Number 1 in 1985. Four aquifers are included in Water Supply Critical Area Number 1, including the: Englishtown, Mount Laurel-Wenonah, Upper Potomac-Raritan-Magothy, and Lower Potomac-Raritan-Magothy formations. There is also a Water Supply Critical Area Number 2. This area includes portions of Camden, Burlington, Gloucester, Salem, Cumberland, Atlantic, Monmouth, and Ocean Counties. The affected aquifer is the Potomac-Raritan-Magothy. The regulations for the establishment of critical areas allows for the reduction of existing diversion allocations when alternative supplies become available, promotes water conservation and the development of alternative supplies. Figure IV-5 shows the locations of Water Supply Critical Areas 1 and 2.

To emphasize the importance of New Jersey's ground water to its citizens and industries, in 1985 the NJDEP petitioned the USEPA, under the Safe Drinking Water Act, to declare practically the entire State as a sole source aquifer (NJDEP, 1985b). This petition recognized the vulnerability of the State's ground water to the many known and potential pollution sources present in the State. In addition, the lack of alternative supplies is a problem once contamination is identified and the water supply closed. The added protection of sole source aquifer designation goes hand in hand with the many ground-water management programs already in place in the State.

Presently, there are six sole source aquifers in the State which have been approved by the USEPA. These include the Buried Valley Aquifer in southeastern Morris and western Essex Counties, consisting of unconsolidated and bedrock geologic materials; the Ridgewood Brunswick Shale and Sandstone Aquifer in the municipalities of Ridgewood, Midland Park, Glen Rock, and Wyckoff; the Upper Rockaway River Basin Unconsolidated Quaternary Aquifer in the municipalities of Boonton Town, Boonton Township, Denville, Dover, Jefferson, Mine Hill, Mountain Lakes, Randolf, Rockaway Borough, Rockaway Township, Roxbury, Victory Gardens, and Wharton; and the Highlands Aquifer System lying in West Milford, Jefferson, Rockaway, Vernon, Hardyston, Pompton Lakes, Bloomingdale, Ringwood, Wanaque, Butler, and Riverdale.

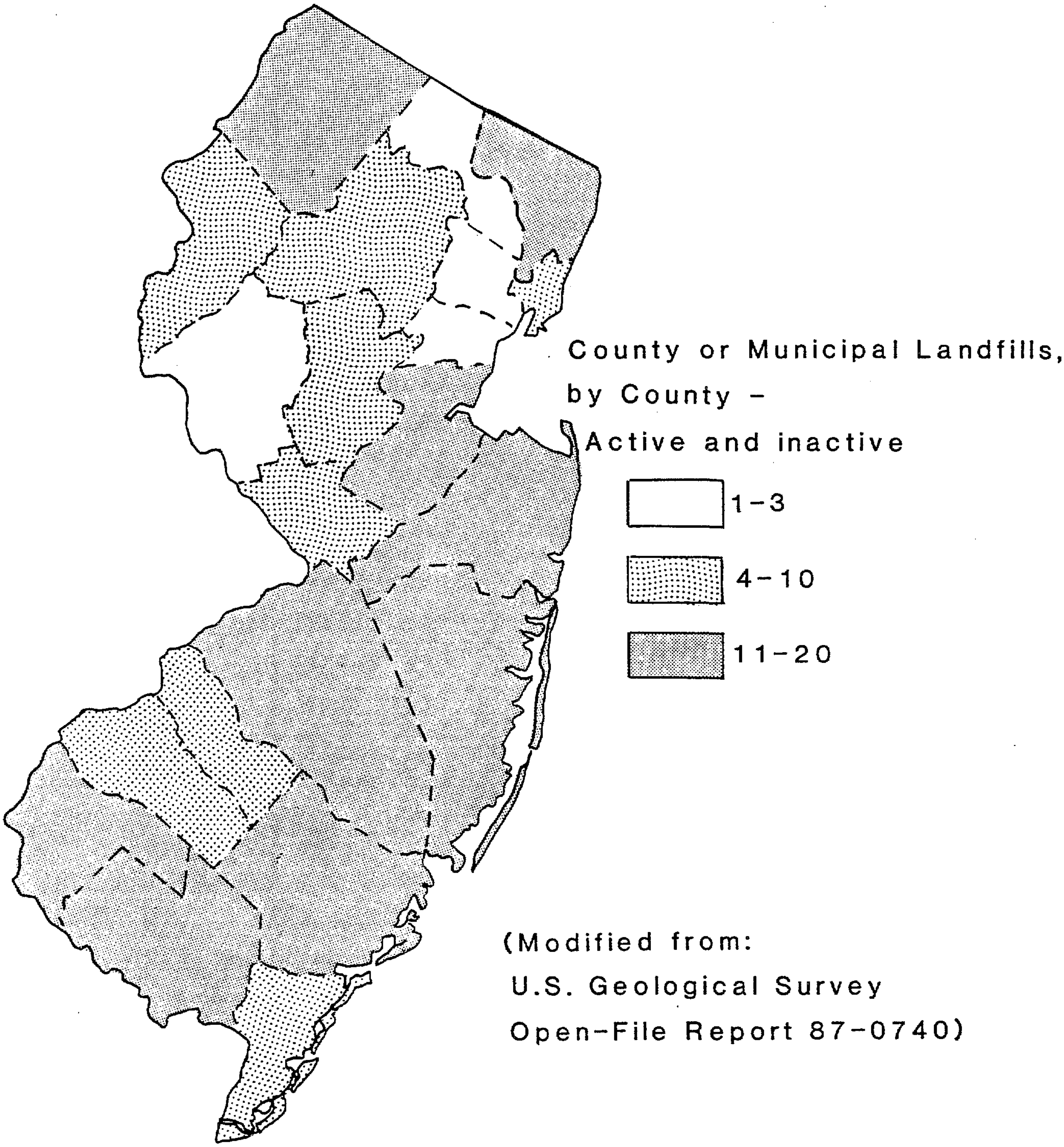
In June 1988, the two most recent sole source aquifer designations were approved by the USEPA. These are the Coastal Plain and Northwestern New Jersey designations. The Coastal Plain designation consists of those municipalities in the Coastal Plain physiographic province, while the Northwestern New Jersey designation includes fifteen separate aquifer systems within all or portions of the following counties: Warren, Sussex, Passaic, Somerset, Morris, Hunterdon, Middlesex, and Mercer.

3. Quality Protection

A major part of the NJDEP's ground water protection effort consists of the New Jersey Pollutant Discharge Elimination System program. Permits are issued for both ground water and surface water discharges. Ground water discharges that have been or can be issued a permit include surface impoundments, infiltration/percolation lagoons, landfills, injection wells, spray irri-

Figure IV-6

Distribution of Landfill Sites in New Jersey



gation, overland flow, and land application of residuals for hazardous and nonhazardous wastes. Figure IV-6 shows the distribution of landfill sites in New Jersey. Figure IV-7 shows the locations of hazardous waste site active remediation activities.

For these activities, which were already existing when the program was developing, the NJDEP issued an initial interim permit for one to three years with an assessed fee. Information on each facility was gathered based on a file review or field inspection. New discharges are subject to a full NJPDES review and are also assessed a fee. Work involved in permit issuance ranges from pre-application conferences and application reviews to public notices and hearings. All permitted facilities must perform routine discharge and aquifer (upgradient and downgradient) monitoring. Final permits are issued for five years.

The NJDEP Bureau of Ground Water Discharge Control, which issues NJPDES permits, also conducts a review of other permit requirements for potential ground water discharges. This includes industrial waste management facilities, the statewide sludge management program and best management practices for stormwater and emergency cleanup from major industrial facilities.

Another part of New Jersey's ground-water protection effort addresses the management of on-site septic tanks. In this effort, the NJDEP is revising the (P.L. 1954, Chapter 199) "Standards for Individual Subsurface Sewage Disposal Systems." The new standards will reflect current scientific knowledge and engineering practices to protect ground water quality and to reduce the frequency of septic system malfunctions.

Another source of ground water pollution consists of underground storage tanks. The magnitude of underground storage tanks in the State is staggering. There are currently about 15,000 registered facilities, each with an average of four storage tanks. Many, if not most, industrial sites have underground fuel or chemical storage tanks. To address this issue, the NJDEP's Bureau of Underground Storage Tanks is taking an active role in the registration and identification of underground storage tanks which are governed under the provisions of the New Jersey Underground Storage of Hazardous Substances Act. All owners of regulated underground storage tanks (UST) containing hazardous substances or petroleum products must register by February 19, 1988.

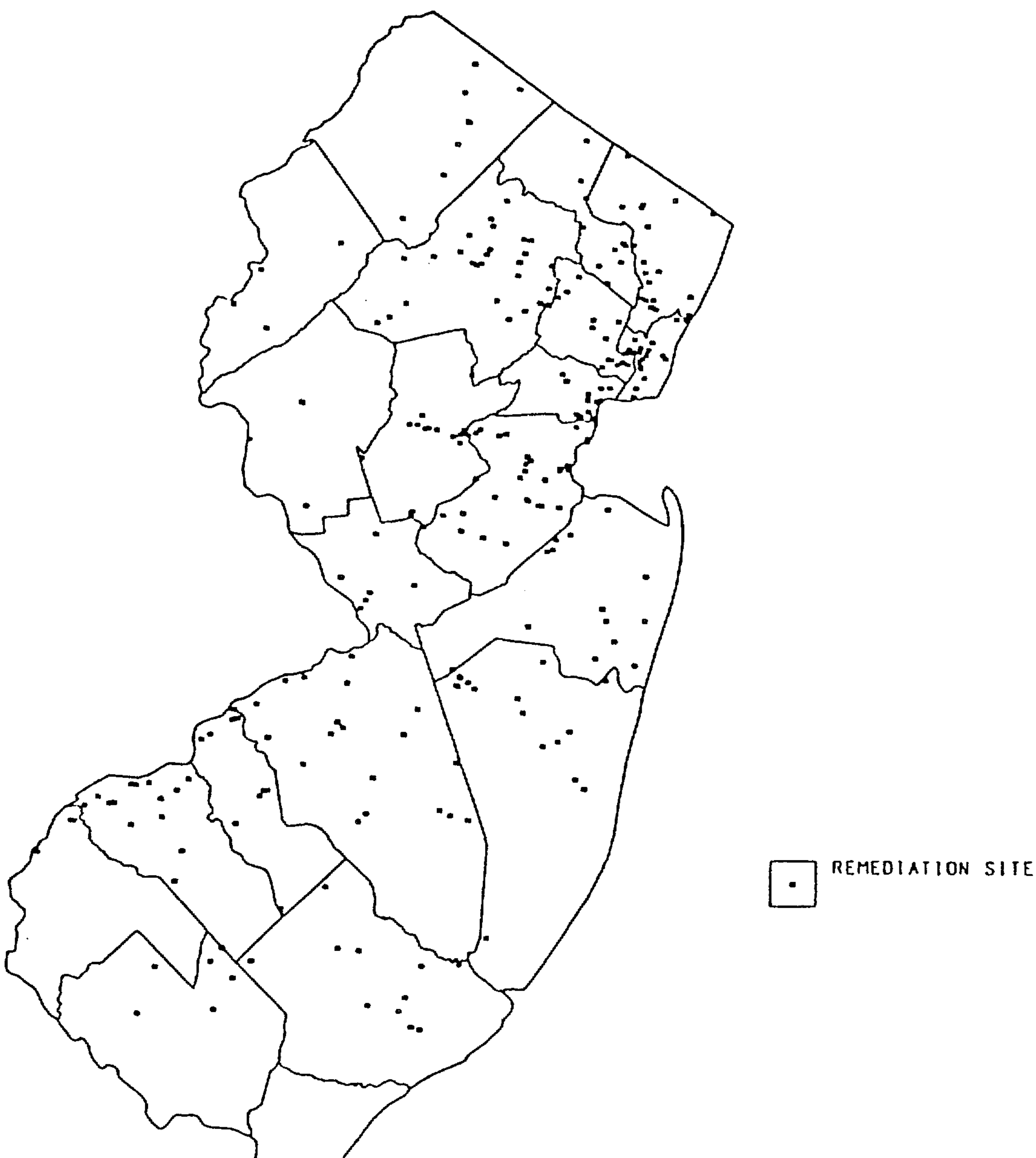
The Bureau is undertaking other activities as mandated by the Act. A regulatory program which will incorporate new tank construction standards, mandatory upgrade requirements for existing tanks, and closure standards including a site assessment for decommissioned tanks. Monitoring systems must be installed at every facility. Each tank owner must show a level of financial responsibility to pay for cleanup of a release and third-party liabilities. A loan program will be available for tank owners who indicate a financial hardship in complying with the rules. Finally, the Bureau will administer the UST Trust Fund, a federal grant program to be used for cleanup of sites where an owner can not be found.

Another NJDEP ground-water protection effort is the well restriction area program. In such an area, ground water contains, or is likely to contain in the near future, contaminant concentrations above NJDEP standards or guidelines for potable water. In well restriction areas, it is required that alternate sources of water supply be found. There are also restrictions which prevent drilling into the affected aquifer. There are presently approximately fifty well restriction areas in the State.

The Enforcement Element of the NJDEP Division of Water Resources has been heavily involved in the process of ground water pollution investigation and control. Major activities include the identification and mitigation of sources of ground water contamination, discharge permit compliance monitoring inspections and other permit related compliance activities, and regulatory actions. Currently, much of the Enforcement Element's case load is devoted to the problem of ground water pollution.

Figure IV-7

ACTIVE REMEDIATION ACTIVITIES
FOR FY 1986 - 1987



Source: N.J. Department of Environmental Protection
Site Status Reports on Hazardous Waste
Remediation, October 1987

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Chapter V

New Jersey Water Quality Management Program

CHAPTER V

New Jersey's Water Quality Management Programs

Introduction

New Jersey has an active and progressive approach for the protection of water quality. New Jersey's programs to provide this protection are briefly described in this chapter. For the purposes of the discussion, the programs are grouped in the following categories: point source control, nonpoint source control, wetlands protection, and monitoring efforts.

The direction and activities of New Jersey's water quality management programs are outlined in the Statewide Water Quality Management Program Plan, produced by the Division of Water Resources in 1985. That document presents more than 25 Departmental policies, procedures, and strategies for a number of water quality and wastewater management issues. The Statewide Water Quality Management Program Plan satisfies State and federal continuing planning requirements. The document will be updated periodically to reflect new or revised water quality needs and priorities.

As discussed in Chapter III, total phosphorus and fecal coliform concentrations are the most severe water quality problems in New Jersey's rivers and streams. Other common pollutants or pollution indicators often found at problematic levels include nitrogen-containing compounds (including ammonia), biochemical oxygen demand, reduced dissolved oxygen, and locally, various toxic substances. These pollutants originate from both point and nonpoint sources.

Despite these current problems, progress has been made in improving the quality of our waters. These improvements are due to such measures as greater pollutant rate removals at wastewater treatment plants, and the elimination of many older and antiquated wastewater treatment facilities.

A. Point Source Control

The protection of water quality through the provision of proper wastewater treatment has long been a program priority in New Jersey. Since 1972, more than $ 2.2 billion in federal funds have been obligated in the State for the construction of wastewater treatment works. The 1986 National Needs Survey, however, reports that approximately $3.3 billion of new investment in wastewater treatment projects is required to meet current needs in the State. Table V-1 presents the costs for the various categories assessed in the 1986 Needs Survey.

New Jersey's point source-related programs are described in the narrative below. The program discussions are divided into the following major subject areas: the New Jersey Municipal Wastewater Treatment Construction Assistance Program, the New Jersey Pollutant Discharge Elimination System program, the sewer extension permit program (including sewer extension ban restrictions), the industrial pretreatment program, and enforcement-related activities.

1. New Jersey Municipal Wastewater Treatment Construction Assistance Program: The NJDEP, through its Construction Grants Administration Element, administers various funding sources for the construction of wastewater treatment facilities throughout New Jersey. These are collectively referred to as the New Jersey Municipal Wastewater Treatment Construction Assistance Program. That program consists of the traditional federal Construction Grants Program administered by the State on behalf of the USEPA and the State Wastewater Treatment Financing Program. The State Wastewater Treatment Financing Program consists of the combined Wastewater Treatment Fund and the New Jersey Wastewater Treatment Trust Program.

The Wastewater Treatment Trust derives its monies from revenue bonds and it operates under the jurisdiction of an "independent financing authority." The Wastewater Treatment Fund is a State program administered by the NJDEP and is capitalized with federal funds. Together, these programs provide for loans at approximately 50% of the market interest rate. Terms of the loans are from 20-23 years. In State Fiscal Year 1988, the State Wastewater Treatment Financing Program issued $235 million in low interest loans.

In applying for funding, applicants must meet deadlines for each of the following steps: commitment, planning, design, and formal application. To date, the design deadline has been reached with 25 applicants having met it.

2. New Jersey Pollutant Discharge Elimination System: New Jersey was delegated the federal discharge permit program in 1982, and subsequently the program became known as the New Jersey Pollutant Discharge Elimination System or NJPDES. The NJPDES program regulates facilities and activities discharging or releasing pollutants into the surface waters or ground waters of the State.

Of the permitted municipal wastewater facilities, 328 discharge to surface water, 22 to ground water, and 24 to both the ground water and surface water. Of the industrial facilities, 650 discharge to surface water, 179 to ground water, and 135 to both surface water and ground water. In addition, there are also approximately 375 landfills with NJPDES permits.

In 1985, a revised schedule for the NJPDES was adopted. It utilizes a more comprehensive assessment of potential environmental damage resulting from discharges and imposes a fee based on the extent of projected water quality damage. In Fiscal Year 1987, the NJDEP collected $6.6 million in NJPDES permit fees.

As part of New Jersey's NJPDES program to control the effects of point source discharges on water quality, toxics-related effluent limits are being applied. One of the major mechanisms to control toxic point source discharges is the "whole effluent (or toxicity testing) approach." This approach establishes permit limits on the toxicity of an effluent as a whole, utilizing bioassay toxicity tests with fish or aquatic invertebrates.

Whole effluent limits are being incorporated into industrial wastewater permits for all process water discharges and other selected wastewaters. There are presently such limits in permits for approximately 130 industrial wastewater dischargers, including 45 permits which contain water quality based acute toxicity limits. Currently, there are also approximately 200 municipal dischargers which have whole effluent limits.

3. Sewer Extension Permit Program: The NJDEP issues sewer extension permits for discharges to wastewater treatment facilities. Permits may only be issued for projects in compliance with the provisions and requirements of applicable Water Quality Management Plans and Wastewater Facilities Plans. A component of the sewer extension permit activity is the sewer extension ban program.

The imposing of sewer bans prevents overloading of sewage treatment plants and resultant discharges of improperly treated sewage. The sewer connection regulations (N.J.A.C. 7:14A-12.1 et seq.) require that municipalities place a moratorium on sewer extensions once the treatment plant has reached capacity or exceeded its permit limits. The moratorium can only be lifted when capacity has been increased or treatment upgraded. As of February 1988, there were 114 sewer moratoriums in effect in the State, affecting a total of 99 municipalities. Aggressive use of the program, and resulting pressure from local communities and developers, has resulted in numerous solutions to long standing non-compliance problems.

4. Industrial Pretreatment Program: New Jersey has in effect an industrial pretreatment program to help control the following problems which may result from untreated industrial wastewater discharged into municipal wastewater treatment plants:

- toxic industrial pollutants may pass through the treatment plant, polluting a receiving water body and posing a threat to aquatic life, and, through the food chain, to human health,

- toxic industrial wastes may interfere with the operation of the treatment plant, rendering the treatment of other wastes less effective,

- industrial wastes containing high levels of toxic metal or organic compounds can contaminate sludge, making disposal options more expensive and more limited (NJDEP, 1987b)

In 1981, New Jersey was delegated authority from the USEPA for a pretreatment program. In implementing this program, the NJDEP is responsible for approving the pretreatment programs developed by publicly operated treatment facilities and for developing pretreatment programs for the remaining wastewater treatment facilities in the State. Presently, there are NJDEP-approved pretreatment programs for 22 facilities. It is estimated that 80 to 90 percent of the State's industrial indirect dischargers are located within the service districts of those facilities.

Information from Department audits of publicly owned treatment works (POTWs) may be used in gauging the effectiveness of the pretreatment program. Those findings indicate that of the six POTWs disposing of their sludge by ocean dumping, only one received a rating of "unacceptable" on the most recent audit of their program implementation. All six had reductions in most of their heavy metals ranging from 32 to 91 percent (NJDEP, 1987b).

5. Enforcement-Related Activities: New Jersey has an active enforcement program that ensures NJPDES permit compliance, correction of the problem of nonpermitted discharges, and assists in the cleanup of hazardous waste disposal areas. Table V-2 summarizes the numbers of inspections conducted by the Division of Water Resources' Enforcement Element, the percentage of dischargers found to be out of compliance (i.e., not meeting permit limitations), and the penalties assessed.

One of the responsibilities of the Enforcement Element is to maintain a "Municipal Management Strategy List" of facilities which have not achieved compliance with effluent limits and have no compliance schedule to do so. As of January 1988, 85 of those facilities achieved compliance with effluent limits or are on a compliance schedule through a Construction Grants project, NJPDES permit or an enforcement action.

On July 1, 1988 (pursuant to Section 301 of the federal Clean Water Act), publicly operated treatment works will be required to meet secondary or water quality based effluent limitations, whichever is more stringent. Certain facilities will be unable to meet this deadline and it will be necessary for the NJDEP to issue Administrative Consent Orders (ACO's) to bring the facilities into compliance. The ACO's will establish schedules to ensure that delinquent facilities come into compliance with treatment standards set forth in their NJPDES permits at the earliest possible date. These ACO's will also contain interim effluent limitations as well as provide for stipulated penalties should they not meet their schedules or limits.

During 1987, approximately $44 million was spent on hazardous waste cleanups by responsible parties (NJDEP, 1987a). This program is entirely separate from the State Spill Fund and federal Superfund programs in that the hazardous waste cleanups are funded by those responsible for the pollution, at no additional expense to the taxpayers. The privately funded cleanup program provides for an equivalent type of remedial action as the Spill Fund and Superfund. Thus, the State has the flexibility of providing for cleanup at hazardous waste sites using a variety of funding methods, all capable of achieving the same goal. With the privately funded cleanup program there is the added benefit that taxpayers do not have to bear the cost for remediating the consequences of private parties' actions.

TABLE V-1 NEW JERSEY 1986 NEEDS SURVEY RESULTS FOR SEWERAGE SYSTEMS.

CATEGORY - CURRENT 1986 PUBLICLY OWNED WASTEWATER TREATMENT NEEDS ELIGIBLE FOR FEDERAL FINANCIAL ASSISTANCE

Secondary Treatment	1,339
Advanced Treatment	142
Infiltration/Inflow	225
Replacement/Rehabilitation	104
New Collector Sewers	252
New Interceptor Sewers	461
Combined Sewer Overflows	767
Total	**3,290**

(All figures are in thousands of dollars)

* As Reported By: US Environmental Protection Agency. February 1987. 1986 Needs Survey Report to Congress. EPA 430/9-87-001.

TABLE V-2 SUMMARY OF NJPDES PERMIT COMPLIANCE INSPECTIONS

	Fiscal Year 86	Fiscal Year 87	Fiscal Year 88
Penalties Assessed*	$844,445	$2,503,586	$713,279 (through Feb. 1988)
Surface Water Discharger Inspections	1,487 (42% out of compliance)	2,104 (35% out of compliance)	1,157 (50% out of compliance as of Dec.1987)
Ground Water Discharger Inspections	334 (55% out of compliance)	362 (39% out of compliance)	241 (56% out of compliance as of Dec.1987)

**On dischargers failing to meet NJPDES permit conditions*

B. Nonpoint Source Pollution Control

Currently, nonpoint source (NPS) pollution is variably managed in New Jersey through a broad range of both regulatory and voluntary programs. These programs exist at all levels of government. In many instances nonpoint source control has been authorized through existing regulatory programs which were originally created to primarily control point sources of pollution. As a result, given the sources that have been made available and the emphasis that has been placed on point source control both nationally and statewide, these programs have not fully exercised their regulatory authority to control nonpoint source pollution.

To a great extent, NPS control programs which currently exist in the State are voluntary. However, regulatory programs do exist. These programs focus primarily on soil erosion control during new construction activities, coastal water protection and stormwater management in developing areas. Local and county stormwater management ordinances are required under State law only when there is State funding for development of such ordinances. Because of this approach these regulatory programs do not contain provisions for identifying specific pollutants to control and waterways to be improved, but are implemented with technology-based standards. In addition, there has been very little evaluation of their effectiveness to control specific pollutant sources (i.e. bacteria, BOD, nutrients, etc.). Without the benefits of results from such evaluations, coupled with the lack of programs aimed at specific water quality improvements through NPS control, and very limited in-stream monitoring of NPSs, it is not possible at this time for the State to make recommendations and identify appropriate remedial actions, or best management practices, necessary to control NPS pollution in the individual waterbodies identified in Chapter III as suspected of being impacted by NPS.

The State of New Jersey recognizes that if clean water goals are to be met more emphasis must be placed on NPS and stormwater quality management. To accomplish this goal the State is currently in the process of developing a Statewide Nonpoint Source Pollution Control Management Program. This program will be developed in four phases: NPS assessment as part of the N.J. Water Quality Inventory Report; a Nonpoint Source Pollution Control Strategy; Regulatory and Management Program Development; and an Implementation Program. Such a program is also required by the federal Water Quality Act of 1987. It is proposed that as each of these phases are developed they will be incorporated as elements of the existing Statewide Water Quality Management Plan. Ultimately, the New Jersey Department of Environmental Protection (NJDEP) anticipates municipal and county governments will take an active role in the development of local water pollution control plans which would address and coordinate both NPS and point source pollution management within their respective jurisdictions. The NJDEP will also take an active role in developing educational programs and materials aimed at bringing NPS control to public awareness. Continuing public participation efforts will provide assistance to private, commercial and governmental communities for creating and implementing programs for managing NPS pollution. Determining how to implement the proposed Statewide Nonpoint Source Pollution Control Program will require an inventory of existing nonpoint source control programs both at the State and local levels. Preparation of such an inventory will assist in identifying where strong nonpoint source control currently exists within the State and where control is weak which may require the development of new programs or expansion of existing programs. The following list identifies many existing programs at both the State and local levels that currently control or could be used to control nonpoint source pollution. Each of these programs will be evaluated further to determine their legal authority, funding abilities and effectiveness to control nonpoint source pollution. Once this evaluation is complete a more detailed description of the possible NPS programs will be developed and presented in the Statewide Nonpoint Source Pollution Control Management Program.

1. State NPS Program

a. *Regulatory Programs*

Department of Environmental Protection

- Stormwater Management Program (NJAC 7:8-1.1)
Regulates the management of storm water from new development and provides grants to local governments for the development of local storm water management ordinances and plans.

- Water Quality Management Planning Program (NJSA 58:11A-1 et seq.)

Provides regulatory authority for a consistent statewide approach for maintaining, improving, and protecting water quality.

- New Jersey Pollutant Discharge Elimination System (NJPDES) Permit Programs (NJAC 7:14A-1.1 et seq.)

Restricts and controls the discharge of pollutants including toxic and hazardous pollutants, and municipal and industrial waste, to both surface and groundwater.

- Coastal Area Facilities Review (CAFRA) Program (NJSA 13:19-1 et seq.)

Involved in coastal area planning as well as reviewing the siting of certain facilities in the designated Coastal Zone of the State.

- Waterfront Development Permit Program (NJSA 12:5-3)

Regulates construction activities in and adjacent to water bodies located within the Coastal Zone of the State.

Department of Agriculture

- Soil Erosion and Sediment Control Act (NJSA 4:24-39 et seq.)

Requires the installation of "best management practices" to control soil erosion and sedimentation during construction and quarrying activities.

Other Regulatory Programs

- Pinelands Commission (NJSA 13:18A-5)

Protects, preserves and enhances the significant values of the resources of the Pinelands area of New Jersey.

- Beach Erosion Commission (NJSA 52:91-2)

Protects and preserves the State's beaches and shorefront.

- Tidelands Resource Council (NJSA 13:1B-10)

Formulates comprehensive policies for the development and use of the natural and economic resources.

- Delaware River Basin Commission (NJSA 32:11D-7)

Develops and effectuates plans, policies and projects relating to the water resources of the Basin.

- Interstate Sanitation Commission (NJSA 32:19-1)

Formed to abate existing and control future pollution in the harbor of New York.

b. *Voluntary Programs*

Department
of Environmental Protection

- Navesink River Shellfish Pollution Control Project

An inter-governmental cooperative effort aimed at restoring water quality and the shellfish resources in the Navesink River through the implementation of best management practices designed to control bacteria caused by NPS pollution.

- N.J. Wastewater Treatment Financing Program

Provides low interest loans for constructing and upgrading municipal wastewater treatment systems.

Department of Agriculture

- Statewide Soil and Water Conservation Program

Provides technical and financial assistance to landowners for nonpoint source control

- Agricultural Retention and Development Program (NJSA 4:1c-11 et seq.)

Cost sharing program developed for farmers to implement "best management practices" to reduce nonpoint source pollution.

c. *Technical Assistance/ Advisory Agencies*

- Commission on Intergovernmental Relations (NJSA 52:9B-4)

Formulates proposals of cooperation between New Jersey, other states and the federal government.

- Clean Water Council (NJSA 58:25-11)

Acts to preserve and improve water quality in the State.

- Pesticide Control Council (NJSA 26:2c-1 et seq.)

Increases public awareness on safe pesticide use by providing educational programs.

- New Jersey Geological Survey

Provides data and expertise regarding groundwater supplies and geology to the Department of Environmental Protection.

- New Jersey Sea Grant Extension

Provides educational and technical advice on coastal resource issues.

- Rutgers Cooperative Extension

Provides educational and technical support for various environmental concerns.

- Soil Conservation Act (NJSA 4:24-1 et seq.)

Provides technical assistance for Best Management Practices that control soil erosion and sedimentation.

2. Local NPS Programs

a. *Regulatory Programs (County/Municipal)*

- Statewide Stormwater Management Program (where in existence)

Through the assistance of the Department of Environmental Protection develops regional stormwater management planning programs and local stormwater management ordinances.

- Water Quality Management Planning Program (where designated)

Designated county or regional planning agencies develop comprehensive Water Quality Management Plans which describe their long term needs and strategies for improving water quality within their planning areas.

- County Environmental Health Act (NJSA 26:3A2-21 et seq.)

Authorizes county boards of health to pass ordinances to control pollution in the county.

- Soil Erosion and Sediment Control Act (NJSA 4:24-39 et seq.)

Administered by the 16 Soil Conservation Districts located in the State to control soil erosion and sedimentation from construction activities occurring within the districts.

b. *Voluntary Programs (County/Municipal)*

- Statewide Soil and Water Conservation Program

Provides funding through a cost share mechanism to implement soil and water best management practices.

- Farmland Preservation Program

Acts to preserve farmland in the State and requires implementation of best management practices to reduce sedimentation/erosion and improve water quality.

- Conservation Operations Program

Provides technical assistance to landowners through local soil conservation districts

- Municipal Land Use Laws

Through local code enforcement officers ensures compliance of various activities with applicable ordinances and zoning requirements.

C. Wetlands Protection

Over the past two decades, the public perception of wetlands has changed significantly. Once commonly regarded as waste areas with little or no value, wetlands are now recognized by many as a vital link in our ecological system. In New Jersey, wetlands are considered to be "waters of the State" under the New Jersey Water Quality Planning Act (N.J.S.A. 58:11A-1) and the New Jersey Water Pollution Control Act (N.J.S.A. 58:10A-1). The protection of the chemical, physical, and biological integrity of such waters is a key objective of these laws. Wetlands can provide many important benefits including: flood control, pollution filtration, aquatic and wildlife habitat, soil erosion and sedimentation control, ground water recharge, water supply, recreation, aesthetics, and research.

Wetlands have become increasingly threatened by development, as suitable land for building is rapidly diminishing. Since wetlands are scattered throughout the State, this impact is widespread. Table V-3 shows the spatial distribution of wetlands by county. As indicated, while the central and southern counties contain much of the wetlands in the State, there is significant acreage in all of New Jersey's counties. It is estimated that New Jersey may have lost at least 20 percent of its wetlands since the mid-1900's (Tiner, 1985). While some of the early losses were due to agriculture; for the last 30-40 years, filling of wetlands for residential, commercial, and industrial development has predominated.

Wetlands in New Jersey have in recent years been regulated under the authority of seven different State laws:

1. Wetlands Act of 1970 *(N.J.S.A. 13:9A-1 et seq.)*,
2. Pinelands Protection Act of 1979 *(N.J.S.A. 13:18-1 et seq.)*,
3. Hackensack Meadowlands Reclamation and Development Act *(N.J.S.A. 13:17-1 et seq.)*,
4. New Jersey Flood Hazard Control Act *(N.J.S.A. 58:16A)*,
5. Coastal Area Facility Review Act *(N.J.S.A. 13:19-1 et seq.)*,
6. Waterfront Development Law *(N.J.S.A. 12:5-3)*,
7. New Jersey Water Quality Planning Act.

In addition, the U.S. Army Corps of Engineers, in coordination with the U.S. Environmental Protection Agency, administers provisions of the federal Clean Water Act and the federal River and Harbor Act, which address regulation of wetlands and waters of the State (NJDEP, 1988). On July 1, 1987, the strategy for the protection of freshwater wetlands in the State changed significantly as a new law was enacted: the Freshwater Wetlands Protection Act of 1987 (N.J.S.A. 13:9B-1 et seq.). The Freshwater Wetlands Protection Act (FWPA) defines a freshwater wetland as an area that is inundated or saturated by surface water or ground water at a frequency and duration sufficient to support, and that under normal circumstances does support, a prevalence of vegetation typically adapted for life in saturated soil conditions, commonly known as hydrophytic vegetation. Further, the hydrology, soils, and vegetation are considered in determining whether an area is wetland.

The FWPA authorizes, beginning in July 1988, the issuance of permits by the NJDEP for regulated activities. These activities include: (1) removal, excavation, disturbance, or dredging of soil, sand, gravel, or aggregate material; (2) drainage or disturbance of the water level or water table; (3) dumping, discharging, or filling; (4) driving of pilings; (5) placing of obstructions; and (6) destruction of vegetation which would alter the character of a wetland.

The permit program will not affect tidal wetlands regulated under the Wetlands Act of 1970. In addition, in the Pinelands Area and the Hackensack Meadowlands District, the NJDEP shall issue permits only for the discharge of dredged or fill material as part of a State-administered "404 Program." Other than these activities, areas under the jurisdiction of the Hackensack Meadowlands Development Commission or the Pinelands Commission will not require a freshwater

TABLE V-3 WETLANDS ACREAGE IN NEW JERSEY

County	Land Area (sq. mile)	Wetland Area (acres)	% of County Represented by Wetlands
Atlantic	569	148,149	40.7
Bergen	234	10,084	6.7
Burlington	819	136,297	26.0
Camden	221	20,922	14.8
Cape May	267	89,581	52.4
Cumberland	500	98,950	30.9
Essex	130	6,833	8.2
Gloucester	329	36,844	17.5
Hudson	47	3,897	13.0
Hunterdon	423	5,450	2.0
Mercer	228	11,819	8.1
Middlesex	312	24,022	12.0
Monmouth	476	32,700	10.7
Morris	468	40,264	13.4
Ocean	642	128,531	31.3
Passaic	192	5,042	4.1
Salem	365	58,987	25.3
Somerset	307	11,127	5.7
Sussex	527	30,771	9.1
Union	103	3,053	4.6
Warren	362	12,637	5.5
State Total	7,521	915,960	19.0

Source: Tiner, 1985

wetlands permit or be subject to transition area requirements.

The FWPA contains several other provisions relating to wetland mitigation requirements, the establishment of a Wetlands Mitigation Council, and other subjects. The Act also indicates that the State will take appropriate action to assume the (404) permit program, presently the responsibility of the U.S. Army Corps of Engineers.

Presently, freshwater wetlands protection regulations are being finalized. Public hearings were held on the draft regulations in January, 1988. At such time as the regulations are adopted (scheduled for July, 1988), there will be a clearer and more consolidated procedure for the protection of freshwater wetlands in New Jersey.

D. Surface Water Monitoring Programs

Introduction

This section discusses the water quality monitoring activities which are being conducted in the State. Monitoring data is used to establish baseline conditions, determine trends, and identify solutions to or further study water quality problems. The NJDEP's primary water quality monitoring unit is the Division of Water Resources' Bureau of Monitoring Management, although monitoring functions are also performed by other units.

Since approximately 1981, there has been a gradual shift in the emphasis of the Bureau of Monitoring Management's monitoring activities. One such trend has been a deemphasizing of fixed station ambient monitoring with emphasis, instead, being placed on intensive surveys. Another trend is the broadening in scope of the ambient monitoring program to include both surface water and ground water monitoring.

While these changes have taken place there has been no appreciable increase in staff; and, as a result, less long-term trend data have been obtained. In addition, areas studied are necessarily smaller as intensive surveys increased at the expense of routine ambient monitoring. The information for a given area, however, over a short temporal span, has increased. Another trend, in the Bureau's monitoring activities, has been an emphasis on the coastal area with a corresponding decrease in inland surface water monitoring.

To make up for the lessened emphasis on ambient monitoring, the Division has been delegating certain monitoring responsibilities to the counties. To date, six agencies have been delegated monitoring responsibilities (Ocean County, Cape May County, Atlantic County, Monmouth County, Burlington County, and Passaic County).

To date, the emphasis in the State's monitoring activities has been on point sources and as a result, little nonpoint source-related monitoring data is available.

The present and anticipated water quality monitoring activities in New Jersey are summarized in the following paragraphs. For the purposes of the discussion, the activities are divided into the following categories: routine monitoring, toxics-related monitoring, biological monitoring, and intensive surveys/special studies. It should be understood that although an activity falls within a particular category within the discussion, there may be aspects of the project which overlap with other categories. The intensive surveys/special studies will be discussed within general geographical areas: northern, southern (below the "Fall Line" as shown on Figure IV-4), coastal, and Statewide.

All of the monitoring activities discussed below are conducted by the Bureau of Monitoring Management unless otherwise indicated.

1. Routine Monitoring

Basic Water Monitoring Network: This is a component of EPA's national 1,000 station network, of which 26 monitoring sites occur in New Jersey. This program is designed to establish baseline water quality; characterize and define trends in physical, chemical, and biological conditions; identify new and existing water quality problems; and measure progress towards meeting national water quality goals. The program has been active since 1976. The sampling frequency is four times per year for "routine" parameters and once per year for "supplemental" parameters.

Routine parameters and observations include: gage readings, weather conditions, water temperature, dissolved oxygen, pH, specific conductance, fecal strep, total coliforms, BOD, nitrite, nitrite + nitrate, ammonia, TKN, color, turbidity, and suspended solids. Supplemental parameters include: COD, chloride, sulfate, petroleum hydrocarbons, dissolved minerals (Ca, Mg, Na), and metals (As, Cd, Cr, Cu, Hg, Pb).

Primary Monitoring Network: The purpose of this program, which has been active since 1975, is to establish baseline water quality; to define trends in physical, chemical, and biological conditions; and to identify existing water quality problems. A total of eighty-two sites are monitored in New Jersey, of which 46 are monitored by the Bureau of Monitoring Management. The USGS monitors the remainder. The sampling frequency is six times per year for routine water column parameters, two times per year for supplemental water column parameters, and one time per year for supplemental sediment parameters.

Routine water column parameters and observations include: water temperature, gage readings, weather conditions, dissolved oxygen, pH, specific conductivity, BOD, nitrite, nitrate, nitrite + nitrate, TKN, total P, fecal coliforms, fecal strep, TOC, and dissolved minerals (chloride, fluoride, calcium, magnesium, potassium, sodium, silica, sulfate). Supplemental water column parameters include: sulfide, total hardness, arsenic, beryllium, boron, cadmium, chromium, copper, iron, lead, manganese, nickel, zinc, aluminum, selenium, mercury, phenol). Supplemental sediment parameters include: metals, organic pesticides, herbicides, and PCBs.

Estuarine and Ocean Water Monitoring: Routine water quality monitoring in New Jersey bays, estuaries, and coastal reaches is performed by various governmental agencies. The interstate estuary and bay waters shared by New Jersey and New York which include the Arthur Kill, the Kill Van Kull, the Hudson River, Newark Bay, and the tidal Hackensack River as well as the Raritan and Sandy Hook Bays are monitored by the Interstate Sanitation Commission. The Delaware River and Bay are overseen by the Delaware River Basin Commission. Both of these agencies monitor sanitary conditions (bacteria), dissolved oxygen, nutrients, and toxic substances.

The waters of the Atlantic Coastal Plain, both estuarine and coastal, as well as parts of Delaware Bay, are monitored by two networks overseen by the NJDEP: the Cooperative Coastal Monitoring Program (CCMP), and the New Jersey Bureau of Marine Water Classification and Analysis (BMWC&A). The CCMP is an NJDEP-coordinated network involving the New Jersey Division of Water Resources in concert with the health departments of four coastal counties and five coastal municipalities, and is organized to monitor bathing beaches from May to September. The Bureau of Marine Classification and Analysis under the Division of Water Resources is concerned with the fitness of waters for the purposes of shellfish harvesting. This agency monitors waters, both bay and coastal, from Raritan Bay down to Delaware Bay. CCMP and BMWC&A sampling is limited to coliform bacteria measurements in bathing beaches and shellfish harvesting waters respectively.

The USEPA annually conducts monitoring of chemical and biological conditions in the New York Bight region from early April to late September. This sampling network performs bacteria, phytoplankton, and chemical monitoring along the coast out to nine miles.

National Stream Quality Accounting Network (NASQUAN), and National Hyrologic Benchmark Network: These are USGS water quality monitoring programs. The purpose of the NASQUAN network is to determine the quality of the Nation's waters. There are six NASQUAN network stations in New Jersey. Samples are analyzed for several conventional parameters, although at one station (Delaware River at Trenton) samples receive radiochemical tests.

The National Hydrologic Benchmark Network includes one monitoring station (McDonalds Branch in Lebanon State Forest). National Hydrologic Benchmark Network monitoring stations are selected based on their remoteness from the activities and influence of man. Parameters and observations include: specific conductance, water temperature, streamflow, pH, DO, fecal coliforms, fecal strep, BOD, suspended sediment, sand-silt fraction, common ions, nutrients, dissolved solids, TOC, trace metals, and radiochemicals.

2. Toxics-Related Monitoring

Imperial Oil Company/Birch Swamp Brook: The purpose of this study is to determine the sources of toxicity in bioassay water collected upstream of the Imperial Oil wastewater discharge. Samples for nutrients, solids, heavy metals, base neutral/acid extractable organics, phenols, and petroleum hydrocarbons in the water column and sediment will be collected from points upstream and downstream of the Imperial Oil outfall.

USEPA Freshwater Chronic Toxicity Testing Project: The USEPA has let a contract to a NJ certified laboratory for the performance of chronic toxicity tests. Each of six sites is being 24-hour composite sampled (unchlorinated final effluent) three separate times. Bioassays will be performed to determine the toxicity of the effluent.

Chlorinated Hydrocarbons and Sedimentation in Newark Bay and the Passaic and Hackensack Rivers: This project, being conducted by the NJDEP's Division of Science and Research, involves the tracing of contamination offsite from a Superfund site. Both sediment cores and biota (lobsters and blue crabs) are being studied.

New Jersey Fisheries Toxic Monitoring Program: This project is a coordinated effort between the Division of Water Resources; the Division of Fish, Game and Wildlife; and the Division of Science and Research. The project involves the monitoring of levels of polychlorinated biphenyls and organochlorine pesticide residues in select finfish collected from New Jersey waterways. Other goals of the project are: to develop the necessary human health risk assessments associated with consumption of these species and identified levels, and to evaluate the levels of these contaminants in finfish over time in order to make any necessary changes to the existing advisories, bans, and prohibitions to protect the fish-consuming public.

3. Biological Monitoring

USEPA New York Bight Water Quality Survey: This project involves phytoplankton and chlorophyll "a" analysis on twelve stations for sixteen weeks.

NJDEP Coastal Eutrophication Study: This project involves supplemental data collection collection on "brown/red" tide in cooperation with the New Jersey Shellfish Program, NOAA, and the USEPA. Analysis is for phytoplankton, chlorophyll "a", and related parameters on 14 stations, once per month.

USGS/NJDEP Hopewell-Pennington Basin Study: This study is to characterize present ambient water quality conditions of Stony Brook, Bedens Brook, and Jacobs Creek using biological data. A report will be written based on data from 135 macroinvertebrate samples and 48 periphyton samples.

Pinelands Biomonitoring Intensive Survey: This project involves the sampling and analysis of periphyton and macroinvertebrates. Samples are to be taken at 20 stations, two times per year.

Toxic Database Biomonitoring Data Collection: This project involves sampling and analysis for macroinvertebrates and fish at 10 stations, 2 times per year.

USEPA Basic Water Biomonitoring Program: This study includes sample collection, analysis, and reporting of periphyton and macroinvertebrate data for 30 stations, 2 times per year.

USEPA Bioaccumulation Project: This study is follow-up to the National Dioxin Study and seeks to determine the prevalence and concentration of selected pollutants in fish. Three to five game fish and bottom feeders will be collected from ten ambient, undisturbed or industrial discharge areas, identified as to species, sized, weighed and analyzed for seventy parameters. The parameters include priority pollutants, non-conventional pollutant pesticides in effluents, the Carcinogen Assessment Group's List of carcinogens, semi-volatile organic compounds identified in human adipose tissue, and additional chemicals evaluated by the International Agency for Research on Cancer.

Barnegat Bay Study: This project involves the study of Barnegat Bay, one of the largest back barrier estuaries in New Jersey. The study, which is to be conducted by the Division of Science and Research, includes various components as follows:

- an investigation of the fate and effects of marina-associated pollutants on commercially important fish and shellfish in Barnegat Bay,

- eutrophication and nutrient loading in Barnegat Bay

- development of a critical pathways analysis for the Oyster Creek Nuclear Generating Station using the hard clam *Mercenaria mercenaria*.

4. Intensive Surveys/Special Studies

i. Northern

Upper Delaware River Bacterial Study: This is a cooperative project between the DRBC and the State of Pennsylvania to try to determine the sources of high levels of fecal coliform discovered on the upper portion of the Delaware River during sampling conducted by the Delaware River Basin Commission in 1987.

Hances Brook: This study is to determine whether State Surface Water Quality Standards are being met upstream and downstream of the Diamond Hill Estates sewage treatment plant. Four stations will be sampled five times within a thirty day period for: temperature, DO, pH, NH3+NH4-N, total P, fecal coliform, fecal strep, TSS, TDS, turbidity, BOD5, chloride, TRC, and sulfate.

ii. Southern

Mullica River Basin: This study is to determine water quality in the Pinelands Regional Growth Area of Winslow Township, Waterford Township, and Chesilhurst in Camden County. The data will be used to assess impacts associated with several wastewater disposal strategies designed to serve future development of the Pinelands. Nineteen sites along eleven streams will be monitored for streamflow, specific conductance, pH, DO, total alkalinity, NO2-N, NO2+NO3-N, NH3+NH4-N, TKN, ortho P, total P, TSS, TDS, and TOC.

Four Mile Branch: This study is to determine whether the Surface Water Quality Standards are being met upstream and downstream of the Winslow Township sewage treatment plant. Four stations will be sampled five times within a thirty day period for: temperature, DO, pH, NH3+NH4-N, total P, fecal coliform, fecal strep, TSS, TDS, turbidity, BOD5, chloride, TRC, and sulfate. The data is needed to determine the condition of the stream prior to facility upgrade.

Tidal Tuckahoe River: This project involves coordination and assistance to the Atlantic and Cape May County Health Departments in studying high bacteria levels in the Tuckahoe River. Twenty-nine stations will be sampled four times per month between June and September for: temperature, pH, fecal coliform, and fecal strep. Dye testing will be conducted in areas with high bacteria concentrations to determine the sources.

Navesink River Stormwater Survey: The purpose of this study is to measure fecal coliform concentrations over time in stormwater outfalls to the Navesink River. Selected stormwater outfalls will be sampled when storm events begin and at short intervals thereafter to establish concentration versus time curves. The data will be used to evaluate stormwater impacts to the Navesink River.

iii. Coastal

Coastal Bloom (Green Tide) Study: This program seeks to monitor near shore coastal waters from Atlantic City to Ocean City to determine the physiochemical conditions required for the development of *Gyrodinium aureolum* blooms. Eighteen stations will be sampled weekly for: temperature, DO, salinity, NO2-N, NO2+NO3-N, NH3+NH4-N, ortho P, total P, phytoplankton count, and chlorophyll "a".

Floatables Study: The phased analysis of the floatables in the coastal waters was initiated to determine the character and quality of floatables. Sixteen representative beaches will be sampled after the highest predicted tide in April, after a significant rainfall, and during a dry period of normal tidal ranges. From the sampling and subsequent indexing, priority beaches will be selected for focused drogue tracking for potential and verified sources of the floatables.

Chlorination Study of the Ocean Health Study: The Departments of Environmental Protection and Health are conducting the Ocean Health Survey. A substudy will evaluate the efficacy of current wastewater treatment and ocean discharge of the wastewater. The effects of chlorination on sewage microbes and ocean dispersion of the effluent plume are the focal point.

Toms River Study: Survey of the Toms River estuary to determine the extent and causes of the bacteria contamination of the public bathing area.

iv. Statewide

Lakes Management Program: This is a sample collection program from twenty public lakes throughout the State. The lakes studied are primarily those having high recreational usage. Samples are analyzed for nutrients, turbidity, algae, and possibly coliforms.

NJPDES Compliance Sampling: This is a continuing program of 24 hour compliance sampling at selected NJPDES permittees throughout the State to determine their compliance with permit conditions.

DRBC Compliance Sampling: This is a cooperative 24 hour sampling program carried out under a contract with the Delaware River basin Commission on facilities located in the Delaware River drainage system.

Industrial Pretreatment 24 Hour Sampling Program: This program involves the sampling of certain municipal sewage treatment plants to determine what impact industrial effluents are having on municipal treatment systems.

E. Surface Water Rating System

The 1982 New Jersey 305(b) Report contained a Surface Water Rating System which was designed to give a comparative assessment of water quality and water uses in 29 individual or grouped watersheds. Results from this rating system have been utilized in the State's Construction Grants Project Priority System and List and the NJDEP's Municipal Management Strategy. However, the rating system had a number of limitations, as was discussed in the State's 1984 305(b) Report. These limitations included: 1) the potential for water quality/uses to be restored was not included; 2) ratings were generated for only 29 segments statewide and therefore reflected generalized areas; and, 3) much of the previous water use information failed to accurately reflect true water use.

The 1984 305(b) Report described plans for updating and refining the Surface Water Rating System so as to alleviate the weaknesses outlined. Among the changes made were breaking the State into nearly 150 small watersheds which were evaluated separately, employing a new methodology for determining the Water Quality Index, and gathering additional information on the suitability of waters for recreation in and on the water, and the healthiness of a stream's fish community.

The Surface Water Rating System presented in the 1986 report reflected the changes outlined above, as well as updated data. This system is also used in this report. Table V-4 presents the results of the Surface Water Rating System with updated water quality indices through 1987. Each segment contains a Water Quality Index and a Water Use Index, both having a scale from 0 to 100. The Water Quality Index is based on the same Water Quality Index described in Chapter III.I - Water Quality Inventory, and used to assess ambient water quality conditions in monitored waterways. The Water Use Index incorporates information on potable water supplies, freshwater fisheries, shellfisheries, and bathing beaches. Although in theory the index does go up to 100 as stated previously, values calculated up till now have not exceeded fifty. The index results from the 1986 report were utilized in the fee formula for all NJPDES permits.

Potable water supply points are based on the amount of surface waters diverted for this purpose during the period 1983 to the fall of 1985. Fisheries points are assigned on the basis of fishes (both cold and warm-water types) stocked in the segment from 1982 to 1984 by the Division of Fish, Game and Wildlife. The percentage of open, special restricted, and seasonally classified shellfish harvesting areas in a coastal/estuarine segment serves as the basis for shellfisheries points. The number of bathing beaches in a segment is utilized for assigning swimming points to a segment.

Each of the four components in the Water Use Index receives 0 to 25 points and is based on the percentage of a given water use in a segment compared to the segment with the greatest use. For instance, the Middle South Branch Raritan River has received from 1982 to 1984 the greatest amount of stocked fish of all waters of the State, and therefore, is assigned 25 fisheries points. The Lamington River has stocked in it approximately one-fifth as many fish as the Middle South Branch, and gets a fisheries rating of 5.

Additional or supplemental information was collected for the rating system which is not used in the quantitative ratings. As was discussed in the 1984 305(b) Report qualitative information such as the potential for use restoration or the condition of an aquatic system, is also necessary to fully assess a waterway and prioritize water quality management activities. The Division of Fish, Game and Wildlife completed a questionnaire regarding the quality of fish communities in the State's streams. The questionnaire also reviews where water quality has degraded existing fisheries. This information was utilized in the individual watershed assessments in Chapter III. The Green Acres Program also provided information on where park facilities have been constructed or are planned, and those that contain water-based recreational activities.

A detailed analysis of water quality and resources for the State's shellfish producing waters is currently being performed. This study is determining the potential for water quality restoration where conditions are degraded, and where the shellfish resource is commercially and recreationally valuable. Results of the study will be used in assessing coastal development permits and prioritizing restoration activities.

The Surface Water Rating System will continue to be applied to certain water quality management activities, as needed. In addition, the system will undergo futher refinement and updating as better information becomes available. When developing a system for rating surface waters, many factors that are both quantitative and qualitative, appear to be necessary for a good, workable system. However, meshing these factors together into a single "rating" or measure is difficult. As such, the Water Quality Index and Water Use Index can only be considered as an initial evaluation. Further and more detailed analysis is then necessary.

TABLE V-4 RESULTS OF THE SURFACE WATER RATING SYSTEM

SEGMENT	WATER QUALITY INDEX	WATER USE INDEX
- Wallkill River Basin		
Upper Wallkill River	20	12
Papakating Creek	35	4
Black Creek	32	6
Lower Wallkill River	23	1
- Upper Delaware Basin		
Mill Brook	N.A.	3
Delaware Tribs. (Sussex Cnty)	N.A.	0
Little Flat Brook	N.A.	2
Big Flat Brook	7*	5
Flat Brook	12	15
Van Campens Brook/Dunfield Creek	N.A.	0
Swartswood Lake	N.A.	6
Upper Paulins Kill	39	11
Lower Paulins Kill	17	12
Delawanna Creek	N.A.	1
Upper Pequest River	29	5
Bear Creek	N.A.	1
Lower Pequest River	19	14
Upper Musconetcong River	17	25
Lower Musconetcong River	28	20
Beaver Brook	21*	2
Delaware Tribs. (Warren Cnty)	21	2
Lopatcong Creek	51*	1
Pohatcong Creek	37	8
Delaware Tribs. (Hakihokake Creek to Warford Creek)	30*	1
Delaware Tribs. (Lockatong Creek to Wickecheoke Creek)	29	1
Delaware Tribs. (Alexauken Creek to Gold Run)	24*	2
Upper Assunpink Creek	16	1
Lower Assunpink Creek	54	2
Delaware River Zone 1A	6	2
Delaware River Zone 1B	13	2
Delaware River Zone 1C	15	9
- Lower Delaware Basin		
Upper Crosswicks Creek	80*	0
Mid-Crosswicks Creek	24	2
Doctors Creek	32	0
Lower Crosswicks Creek (w/ Duck Creek)	25	2
Blacks Creek	48*	0
Crafts Creek and nearby Delaware Tribs.	38*	2
Assiscunk Creek	36*	0
Upper North Branch Rancocas Creek	14	0
Cranbury/Mt. Misery Brooks	44	1
Lower North Branch Rancocas Creek	16	1
Upper South Branch Rancocas Creek	20	1
South West Branch Rancocas Creek	30	7

N.A. = No ambient water quality data available
* = Water Quality data from before 1985

TABLE V-4 Continued

SEGMENT	WATER QUALITY INDEX	WATER USE INDEX
Lower South Branch Rancocas Creek	44	0
Rancocas Creek - Mainstem	36	1
Swedes Run and Pompeston Creek	N.A.	1
Pennsauken Creek	65	1
Cooper River	68	1
Big Timber Creek and Woodbury Creek	27	4
Mantua Creek	26*	1
Repaupo Creek	30	1
Raccoon Creek	16	3
Oldmans Creek	20	2
Delaware Tribs. (Upper Salem County)	29	2
Upper Salem River	35	1
Lower Salem River	35	1
Delaware Tribs. (Central Salem County)	N.A.	0
Alloways Creek	N.A.	1
Stow Creek	N.A.	0
Upper Cohansey River	38	2
Lower Cohansey River	47*	1
Back, Cedar, and Natuxent Creeks	12	12
Dividing Creek	14	8
Still Run	9	2
Scotland Run	9	1
Upper Maurice Run	7	3
Muddy Run	N.A.	1
Maurice River/Union Lake	18	4
Mid-Maurice River	24	1
Manantico Creek	N.A.	0
Manumuskin Creek	24	1
Lower Maurice River	34	0
East and West Creeks	14	1
Dennis Creek	13	2
Delaware Bay Tribs. (Cape May County)	11	1
Delaware River Zone 2	23	41
Delaware River Zones 3 & 4	72	0
Delaware River Zone 5	38	0
Delaware Bay Zone 6	27	24
- Passaic River and Hackensack River Basins		
Elizabeth River (incl. Morses Creek)	59	1
Rahway River	38	9
Arthur Kill, Kill Van Kull, Newark Bay, Upper N.Y. Harbor, Bound Creek	56	0
Upper Passaic River	40	6
Mid-Passaic River-New River to Pompton River	70	0
Whippany River	61	3
Rockaway River	28	33
Pequannock River	12	19

N.A. = No ambient water quality data available
* = Water Quality data from before 1985

TABLE V-4 Continued

SEGMENT	WATER QUALITY INDEX	WATER USE INDEX
Wanaque River	3	4
Ramapo River	32	30
Pompton River	20	8
Mid-Passaic River-Pompton River to Garfield	38	4
Lower Passaic River	69	1
Saddle River	69	4
Upper Hackensack River	19	4
Lower Hackensack River	49	21
Hudson River and Minor Tribs.	47	1
- Raritan River Basin		
Lamington River	23	6
Upper North Branch Raritan River	22	6
Lower North Branch Raritan River	15	4
Upper South Branch Raritan River	20	14
Middle South Branch Raritan River	19	28
Neshanic River	54	1
Lower South Branch Raritan River	18	2
Upper Millstone River	41	0
Stony Brook	31	5
Lower Millstone River	27	3
Lawrence Brook	23*	5
Manalapan Brook	21	1
Matchaponix Brook	30	1
South River	17*	3
Upper Raritan River	17	26
Raritan River	31	2
Raritan Bay and Tribs.	23	12
- Atlantic Ocean Basin		
Navesink River	32*	20
Shrewsbury River	23	12
Shark River	9	27
Manasquan River	31	13
North Branch Metedeconk River	27*	3
South Branch Metedeconk River	22*	3
Metedeconk River	N.A.	5
Kettle Creek and North Barnegat Bay	21*	25
Upper Toms River	25*	2
Ridgeway Branch	29*	1
Lower Toms River	14	3
Cedar Creek	15*	1
Central Barnegat Bay and Tribs.	10	29
Forked River	18*	1
Oyster Creek and Central Barnegat Bay	20*	33
Mill Creek, Cedar Run, Westecunk Creek and Lower Barnegat Bay	21*	29
Tuckerton Creek and Little Egg Harbor	16*	25
Batsto River	6	1

N.A. = No ambient water quality data available
* = Water Quality data from before 1985

TABLE V-4 Continued

SEGMENT	WATER QUALITY INDEX	WATER USE INDEX
Upper Mullica River	5	2
Mid-Mullica River	51	2
Oswego River	5	1
West Branch Wading River	4	0
Lower Mullica River	10	19
Great Bay	N.A.	25
Upper Great Egg Harbor River	57	0
Mid-Great Egg Harbor River	27	2
Lower Great Egg Harbor River	44	3
Patcong Creek and Lakes Bay	N.A.	15
Cape May/Atlantic Tribs.	13	30
Tuckahoe River	11*	1
Doughty Creek, Reeds Bay, Absecon Bay	7	11
Absecon Bay	N.A.	1

N.A. = No ambient water quality data available
* = Water Quality data from before 1985

F. Lakes Management

The Lakes Management Program has been limited to specific restoration projects in the last two years. These projects have been funded by a combination of Federal, State, and local monies. In FY87, EPA Region II provided $265,000 for lakes restoration projects in New Jersey, while state funding of restoration projects was $1.1 million dollars.

In 1987 the funding formula for State funded lake restoration projects was revised to provide a 75% State share for Phase II Restoration projects. The formula for Federally-funded Phase II projects remains 50% Federal, 40% State, and 10% local.

Community response to deteriorating lake water quality varies widely. For publicly owned water bodies, the possibility exists for financial assistance, whether it is from Federal, State, or County agencies. However, a major factor in awarding State grants (and Federal, when available) is a strong local involvement in the process. This is necessitated by the mechanism of the grant award process. A grant is made directly to the responsible local agency, which subcontracts work as necessary.

For privately-owned lakes, there is no Federal or State financial assistance programs available. Assistance is limited to dissemination of available technical information. Many lake communities have developed their own programs in response to symptoms of deteriorating water quality, with most activities being limited to the application of aquatic herbicides.

Future program activities are dependent upon the funding provided. It appears that Federal financial assistance is very uncertain, leaving only the annual line item budget allocation in the NJDEP budget, and special appropriations as approved by the State Legislature. The anticipated budget should be adequate for a modest program of restoration activities.

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