New Jersey 1992
State Water Quality Inventory Report

New Jersey Department of
Environmental Protection and Energy
Office of Land and Water Planning

ERRATA

Re. 92 305(b)

The Department of Environmental Protection and Energy wishes to correct the following errors in the New Jersey 1992 State Water Quality Inventory Report:

Chapter III, Page III-63.

- The Pequest River ambient monitoring station is correctly denoted on this map by number 2 and not by number 1 as stated on page III-62. Station 1 on the map (Beaver Brook) is no longer in service.

Chapter III, Page III-176.

- The Toms River ambient monitoring station is correctly noted on this map by number 7 and not by number 1 as stated on page III-175. Stations 5 and 6 delineated on the map are no longer in operation.

NEW JERSEY
1992 STATE WATER QUALITY
INVENTORY REPORT

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

State of New Jersey
Department of Environmental Protection and Energy
Environmental Regulation
Office of Land and Water Planning

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CHAPTER I

EXECUTIVE SUMMARY AND RECOMMENDATIONS FOR IMPROVING WATER QUALITY

EXECUTIVE SUMMARY

The New Jersey 1992 State Water Quality Inventory Report is an assessment of current water quality conditions in the State's major rivers, lakes, estuaries, ocean waters, and ground water. In addition, the report describes which waters are attaining state designated water uses, the pollution problems identified, and the suspected and known sources of water pollution. Waters assessed in this report are limited to New Jersey state waters; no interstate waters are assessed. An assessment of the Delaware River is reported to USEPA through the 305(b) submittal of the Delaware River Basin Commission. The interstate waters between New Jersey and New York are assessed through submittals to USEPA provided by the Interstate Sanitation Commission.

This report is prepared every two years pursuant to Section 305(b) of the Federal Clean Water Act and is the tenth in a series of state water quality inventory reports since 1975. Water quality data presented here is current through 1991; descriptions of programs are current through mid 1992. The following is an overview of the 1992 State Water Quality Inventory Report including major conclusions and findings.

CHAPTER II:

- 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 coastline, and 420 square miles of open estuarine waters. New Jersey had 7.5 million residents in 1990.

- It is the goal of the Federal Clean Water Act that freshwaters of the State should support primary contact recreation (swimming), and the maintenance and propagation of natural and introduced biota. Most estuarine and ocean waters should also meet these goals (and uses), as well as support the harvesting of uncontaminated shellfish. However; certain interstate waters between New Jersey and New York, and New Jersey and Pennsylvania, do not have to have sufficient water quality necessary to support these goals (uses).

CHAPTER III:

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

- Water quality, in fresh water rivers and streams, has been assessed for aquatic life use support in 1,515 linear miles. Primary contact use support is assessed in 525 linear miles. A few public lakes are monitored (37 since 1989), but most are evaluated. Over 600 miles of estuarine waters are monitored; and 440 ocean square miles are monitored.

- Of the total fresh water stream miles monitored for primary contact use, 15 percent fully support the primary contact use but are threatened. Another 8 percent of assessed waters partially support the use. Primary contact use is not supported in 77 percent of waters. High fecal coliform concentrations are the principal reason why so many waterways are not of swimmable quality.

- Waters classified as swimmable but threatened are often in protected watersheds or directly downstream of an impoundment where the settling action of the impoundment is likely to reduce the instream bacteria levels.

- Of the approximately 1,515 stream miles evaluated and monitored for aquatic biota, 68 percent of assessed waters are believed to be fully supporting the aquatic life use (fish propagation and maintenance designated use). These waters, however, are regarded as threatened. Waters which have moderately degraded fish communities are considered to be partially meeting the aquatic life use; 22 percent of the assessed waters fall into this category. Only 11 percent are classified as not meeting the use.

- Trends in water quality in New Jersey were assessed by the US Geological Survey for both an 11-year and 6-year period. Several trends were relatively consistent on a statewide basis. In general, dissolved oxygen improved throughout the state. Fecal streptococcus bacteria displayed increases while fecal coliform exhibited both increases and decreases state-wide, depending upon location. There were statewide increases in dissolved sodium, chloride, calcium, magnesium, as well as specific conductance. Trace metals declined generally, and nutrients displayed mixed trends.

- All of New Jersey's public lakes are classified as threatened for support of the primary contact recreational use. Current monitoring information on public lakes is limited to several dozen. Based upon lakes which have been assessed, it is determined that the most frequent pollution problems are nutrients, siltation, depressed dissolved oxygen levels, and excess primary productivity. Nonpoint source pollution is cited as the principal source of contaminants.

- Comparisons with prior assessments of the proportion of waters supporting the aquatic life use in freshwaters is not encouraged because different assessment methodologies are now employed to determine use attainment than were used in the past. Extensive macroinvertebrate assessments have replaced many of the older fisheries surveys previously utilized. Still earlier editions of this report relied principally on water chemistry data before moving to fisheries surveys. Slight changes in the assessment of the primary contact use have also made comparisons difficult. The Department has changed its criteria to conform to USEPA's "standardized" nationwide assessment procedure for primary contact recreation. Although these changes are not significant, they nonetheless make comparisons with previous assessments misleading.

- With regard to the support of primary contact use in New Jersey's estuaries, beach closures in bay regions occur in such a manner that make generalizations regarding use support difficult. It can be said that back-bay beach closures are a serious problem on a local basis. Many beaches are subjected to frequent short-term closures. Other locations have only occasional closures while some regions, not designated for swimming for obvious reasons, have chronically elevated bacterial levels and are not supporting the primary contact use at all. Bacterial contamination in estuarine waters is closely tied with stormwater discharges.

- With regard to shellfish consumption use, of the estuary waters monitored for sanitary quality necessary to support shellfish harvesting (614 square miles), 72 percent fully support shellfish harvesting but are regarded as threatened. Twenty percent are classified as partially supporting this use, and 9 percent do not support the use.

- These same monitored estuarine waters are regarded as fully supporting the aquatic life use; but again, are threatened (614 square miles).

- New Jersey's coastal beaches from Sandy Hook south to end of Cape May are fully swimmable, however, certain limited areas are threatened due to short-term bacterial contamination. These coastal waters fully support aquatic life use, yet are threatened from the continued inputs of treatment plant effluent, the deposition of dredge spoils, and the outflow from the Hudson/Raritan estuary, the sum total of which may be leading to the gradual enrichment of these waters.

- An undetermined number of square miles of coastal waters in the northern portion of the state, directly adjacent to the New Jersey/New York interstate waters, are classified as partially supporting the fish consumption use because of recreational fishing advisories being in effect. High levels of PCB's and certain pesticides have been found in finfish taken in these waters.

- Water quality problems commonly occurring in the State's fresh water rivers and streams include total and fecal coliform bacteria (in 81 percent of the freshwaters), nutrients (also in 81 percent), depressed dissolved oxygen levels, siltation, road salts, and oil and grease.

- Toxic substances in water, sediments, shellfish and fish tissue are generally found in acceptable levels in the State, although in certain regions they exceed recommended levels. Areas with higher than recommended concentrations of toxic substances include New Jersey/New York interstate waters, rivers in the urbanized northeast part of the State, and certain tributaries to the Delaware River in the Camden area.

- Other types of known or suspected water quality problems consist of thermal modification/elevated stream temperatures, habitat alterations, pH fluctuations, and excess chloride levels.

- Point sources of wastewater still have a significant effect on many of the State's waterways.

- Nonpoint sources of pollution are suspected to be a major cause of water quality degradation in the State. However, very little monitoring data exists to quantify their extent. Nonpoint sources include stormwater outfalls; construction, urban, and agricultural runoff; land disposal practices; hydrologic/habitat modification; and marinas located in lakes and coastal waters.

- Available evidence suggests that sensitivity to acid precipitation in New Jersey is restricted to undisturbed portions of the Pinelands area in the southern part of the state, and to portions of the Highlands and Ridge and Valley Physiographic Provinces of northern New Jersey. In northern New Jersey, some lakes are thought to be experiencing increased acidity through acid precipitation. In the Pinelands some small declines in pH are suspected; however, evidence is not conclusive. Studies suggest that acid rain may be shifting the principal acid producing constituents in the undisturbed portions of Pinelands from organic to mineral acids. The former chelate with toxic metallic ions reducing their toxicity; the latter facilitate the release of free metallic ions increasing their toxicity. This topic is discussed in detail in the 1990 edition of New Jersey's 305(b) Report.

- Several New Jersey statutes provide various levels of protection to wetlands. These include the New Jersey Water Quality Planning Act (N.J.S.A. 58:11A-1), the Flood Hazard Area Control Act (N.J.S.A. 58:16A-50 et seq.) and the New Jersey Water Pollution Control Act (N.J.S.A. 58:10A-1). Specific protection is provided for New Jersey tidal wetlands through the Wetlands Act of 1970. In addition, since July 1, 1988, the State has protected its "inland" wetlands through the Freshwater Wetlands Protection Act (FWPA) (N.J.S.A. 13:9B-1 et seq.). Prior to enactment of the FWPA, several different state laws afforded various levels of protection to "inland" wetlands. One of the goals of the Act was to consolidate the protection of wetlands into one program.

- The State is also involved in a comprehensive mapping project to identify and classify all wetlands statewide. Approximately 60 percent of the State has been completed to date. The addition of this information to the State's Geographic Information System, together with data on permit activity, will allow an evaluation of the cumulative impacts to wetlands resulting from the State permitting program on a county, regional, or watershed basis.

CHAPTER IV:

- Ground water quality is considered naturally good in the State; however, treatment for some undesirable constituents of natural origin is warranted in some areas due to the physical/chemical nature of the geologic materials constituting the aquifer. The most common of these naturally occurring contaminants include iron, dissolved solids, sulfate and hardness. Other less common, yet significant, contaminants are radium, lead, and barium.

- Anthropogenic (human sources) contaminant discharges to ground water have a significant undesirable impact on water quality in New Jersey as evidenced by the 3,086 ground water pollution investigations underway as of December, 1989. The most common pollutants found in these investigations are volatile organic compounds (VOCs), metals, base neutrals, acid extractables, and PCBs/pesticides. Other contaminants included miscellaneous landfill contaminants, undifferentiated petroleum hydrocarbons, gasoline, and fuel oil. Of the pollution sources determined, underground storage tanks account for the largest percentage of known sources. Landfills, surface spills, and industrial/commercial septic systems all make up the next most common source of contaminants.

- There appears to be a direct correlation between population density throughout the State and the distribution of ground water pollution investigations.

- Regarding ground water quantity, present data suggest that there is an ample supply of good quality ground water in the State. Local/regional quantity problems do exist and they are usually in areas where the greatest demands on ground water supplies occur. Demand can lead to overpumping which, in turn, can lead to aquifer recharge from undesirable sources such as seawater, polluted surface waters, or highly contaminated shallow ground water.

- New ground water quality standards were adopted early in 1993. The standards contain a new system for classifying ground waters of the state, numerical criteria for many pollutants, and a policy which protects good quality ground water from significant degradation due to future discharges. These standards are fundamental to the implementation of the New Jersey Water Pollution Control Act.

- In 1990, The Department had prepared a guidance for voluntary municipal use in mapping and protecting local aquifer recharge areas and is preparing maps of major aquifer recharge areas, as required by State law.

CHAPTER V:

- Since 1972 New Jersey has obligated more than $3.4 billion in federal and state funds for the construction of wastewater treatment works. But approximately $4.4 billion is still necessary to meet current State wastewater treatment needs.

- New Jersey has instituted a wastewater loan fund program. Low interest loans were issued in State Fiscal Years 1989, 1990, 1991 and 1992 for approximately, $190 million, $147 million, $170 and $131 million, respectively.

- New Jersey has issued permits for approximately 1,400 surface water wastewater discharges. Two-thirds of these are industrial. There are also about 330 permitted ground water discharges.

- The Department has embarked on numerous nonpoint source (NPS) control initiatives; current programs designed to control NPS pollution include the following:

New Jersey Sewage Infrastructure Improvement Act (SIIA): The State mandate for nonpoint source control in the coastal region is currently directed under the SIIA. The SIIA Program developed by NJDEPE is being implemented in a phased approach consisting of the following phases:

<u>Phase I - Preliminary Mapping and Inventory</u>: Under this phase, the Department has made available $1.45 million in State grant funds to 94 municipalities to prepare preliminary maps and inventories of their stormwater and sanitary sewer systems. Eighty-eight municipalities participated in this phase which is now complete.

<u>Phase II - Final Mapping and Monitoring</u>: Under Phase II of the program, each municipality will develop a final map of all stormwater and sanitary sewer lines within their geographical boundaries. The final maps shall also identify all crossconnections and inter-connections found within that municipality. Grant applications have been received by the Department from all 94 municipalities.

<u>Phase III - Nonpoint Source Pollution Abatement</u>: Based on the information being gathered in Phases I and II, the Department is currently developing nonpoint source

abatement regulations under Phase III. The regulations, once adopted, will require 94 coastal communities to develop municipal nonpoint source abatement plans and begin implementing abatement measures.

Additional aspects of the SIIA address planning and design grants for the abatement or elimination of interconnections and cross-connections and pollution abatement measures for combined sewer overflows

Best Management Practices (BMP) Manual: The Department has completed a BMP Manual that will serve as guide for nonpoint source and stormwater management. This manual shows how to integrate NPS and stormwater best management (control) practices into the planning of developments.

Watershed Prioritization: The NJDEPE plans to identify priority watersheds in order to provide a basis for the implementation of nonpoint source pollution control programs

Model Ordinance: The Department is developing a model nonpoint source abatement ordinance for use by local communities, particularly the 94 municipalities along the coast. This ordinance will stress the concept of pollution prevention and source control.

Barnegat Bay Management Plan (BBMP): The BBMP is a comprehensive land use and environmental management plan for the Barnegat Bay watershed. The planning process identifies general source categories of water quality impairment, and recommends management strategies designed to reduce impairment within the Bay.

Industrial Stormwater Permitting: This program issues permits to stormwater discharges associated with certain industrial activities. An important objective of the program is to utilize pollution prevention strategies and source controls that minimize or eliminate contact between rainfall and potential pollution sources, thus minimizing the need for stormwater treatment.

Public Education: Nonpoint source education is one of the most important aspects of NJDEPE's NPS Management Program. Programs for public education aimed at describing the NPS problems in the State and the resulting heightening of public awareness regarding NPS issues are regarded as essential to the success of the program and are currently being implemented. Teachers guides produced by the Department, such as "Beneath The Shell," help schools conduct programs that teach students the effects of nonpoint source pollution upon the environment.

RECOMMENDATIONS FOR IMPROVING WATER QUALITY IN NEW JERSEY

Introduction:

Water quality in New Jersey has improved in some streams and declined in others, but has generally held steady on a statewide basis. 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.

1. Increased Water Quality Monitoring Activities

Much of the current water quality monitoring conducted in New Jersey by this Department is in the form of fixed-station 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 is to determine long-term water quality trends and general water quality conditions for use in the 305(b) reporting process. 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 broad-based intensive survey monitoring program be implemented in the State. This program would supplement the existing ambient monitoring networks being conducted by NJDEPE and other agencies under contract. Watersheds or segments of watersheds would be intensively sampled on a periodic basis. The number of monitoring sites within a watershed would be dependent upon the existing water quality, land uses, known and potential pollution sources, and the amount of available historical data. The Basinwide Ambient Systematic (BASS) Survey pilot study, planned by the Department, is a good first step towards a renewal of this detailed watershed-wide assessment process.

An intensive survey program would have as its specific objectives the following: detailed profile of water quality over 24 hour periods, identification of pollution sources, quantification of pollution impacts on receiving waters (from both point and non-point 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. In addition, such assessments should provide detailed use-support profiles for such designated uses as primary contact recreation and aquatic life support.

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 uses and the water quality objectives of the Clean Water Act within both fresh and coastal waters. 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 nonpoint sources, to the extent possible, in order to provide the focus necessary for nonpoint source control measures to be effectively implemented.

3. Ambient Monitoring for Estuarine Waters

New Jersey's estuarine waters play a significant role in the vitality of many activities in the State. Their value includes the provision of wildlife habitat, public recreation, and aesthetics. Despite their value, very little ambient monitoring has been performed in these waters until recently. Historically, the bulk of the States monitoring efforts have focused upon the sanitary quality of shellfish-growing waters and bathing waters. Broader based monitoring by interstate agencies has been limited to their respective regions with most of our estuarine waters not being routinely evaluated for nonsanitary parameters. Since 1988, a marine/estuarine monitoring network has begun collecting data throughout the State's coastal waters and it is hoped that the Department will continue to support this current, and much needed, ambient monitoring effort.

4. Greater Emphasis On Nonpoint Source Management

Nonpoint sources are a statewide and significant pollution problem. As such, a continued commitment for their control is needed. This report recommends that the Department continue to strongly support its nonpoint source (NPS) control policy. To be effective, nonpoint source control should maintain its strong two-fold effort: education and source control. Education is directed to specific audiences: from the general public to local officials to special user groups. Public education will highlight such issues as proper septic tank maintenance; proper disposal of household chemicals, motor oils, pet wastes; and the proper use of chemicals employed in lawn and garden care. Education efforts will also work to make the public more aware of local and state ordinances or laws. The general public needs to be made aware of the contribution which they make to NPS pollutants. Source controls focus on programs and policies which prevent or minimize the contact between a pollutant and its principal transport vehicle: stormwater.

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

This report strongly recommends that a coordinated watershed-specific approach be used when dealing with water pollution control and water resource management activities. Such an approach would greatly increase overall efficiency and greatly increase the precision with which pollution control measures could be applied. 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).

Because water quality decisions ultimately affect water supplies, wastewater policies need to be developed that more appropriately reflect the need to conserve and protect our dwindling freshwater supplies. The extensive regionalization of municipal treatment plants and their subsequent discharge to the lower portions of watersheds or to the ocean, are suspected of reducing the recharge of critical water supply areas, especially ground water based supplies. Efforts should be made to integrate water supply management and planning with wastewater management planning in both Statewide and Areawide Water Quality Management Plans, so that water supply issues are correlated with wastewater planning. For example, proposals for new wastewater discharges should be made with an effort to aid in the recharge of water supplies within corresponding basins. Concurrently, planning for the discharge of potentially harmful substances should be made so as to avoid any potential contamination of drinking water supplies.

Additional 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 NJDEPE continue to pursue initiatives developed by the USEPA'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 are consistently suffering 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, or their poor or delinquent operation. Although most primary treatment plants are now eliminated, many secondary treatment plants are discharging unsatisfactorily treated wastewaters because of system overload or improper operation. These deficiencies need to be corrected at all appropriate wastewater treatment facilities.

In addition, most if not all industrial discharge limitations should be water quality based rather than technology based. Unfortunately, only a small proportion of the permits or renewals issued annually currently are water quality based. Efforts should be made to have effluent limitations based upon the assimilative capacity of the receiving waters.

CHAPTER II

INTRODUCTION AND BACKGROUND

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A. Introduction

The New Jersey 1992 State Water Quality Inventory Report is the tenth in a series of State Water Quality Inventory Reports that have been prepared by the New Jersey Department of Environmental Protection and Energy (NJDEPE) since 1975. The State Water Quality Inventory Report is prepared every two years, pursuant to Section 305(b) of the federal Clean Water Act (P.L. 95-217). This current Report covers issues and programs into early 1992.

The Report, commonly referred to as the 305(b) report, addresses the following issues:

- The quality of the State's surface and ground waters.

- An analysis of the extent to which surface waters will attain the aquatic life support 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 surface and ground 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 NJDEPE that describes water quality conditions, trends or changes, and whether progress is being achieved in meeting designated uses and clean water goals. As such this report has much value to the State's citizens and interested public as an information source on water quality conditions and water pollution sources.

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 serves as the initial submittal vehicle to USEPA of certain information required by the Federal Water Quality Act of 1987. This includes a continuation of efforts begun under section 304(l) of the Federal Clean Water Act as amended by the Water Quality Act of 1987 requiring states to identify waters adversely affected by toxic, conventional, and nonconventional pollutants. These assessments will be used as a basis for the development of water quality management programs. In addition, the Water Quality Act of 1987 requires states to submit assessments of their lake water quality as part of section 314(a)(2) of the Clean Water Act. In response, New Jersey has completed an intensive trophic assessment of sixteen public lakes and the results are presented in this report.

This Report contains five chapters. Besides Chapter I - Executive Summary and Recommendations for Improving Water Quality, 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 Surface Water Quality Management Programs. The information provided in this report has been requested in USEPA's Guidelines for the Preparation of the 1992 State Water Quality Assessment. Much of the narrative in this report was originally prepared for previous reports, and has been updated accordingly.

Chapter I - Executive Summary and Recommendations provides an executive summary of all the material contained within this Report. This chapter also contains a series of recommendations as to how to improve water quality within the State based upon the information gathered from this Report.

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 using physical/chemical data as well as instream biological monitoring. The quality of the State's lakes, estuaries and ocean waters are assessed in this chapter. Causes of nonsupport of designated uses are reviewed. The results of the State's ongoing 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.

Chapter IV - Ground Water Conditions in New Jersey is a detailed discussion of ground water quality and quantity conditions in the State, current management efforts, and management strategies for the future. Also included are ground water-bodies in New Jersey currently under investigation, and their most recent finding.

Chapter V - New Jersey's Surface Water Quality Management Programs. This chapter presents the State's surface water quality management activities for the control of both point and nonpoint sources of pollution.

B. Background

New Jersey is the fourth smallest state in the nation, yet despite this, the State contains a wide variety of land use types, water resources, geologic characteristics, and natural biota and fauna. Within the State's 7,486 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 1,400 square miles of fresh and saline marshes and wetlands, and 420 square miles of open estuarine waters. A summary of the State's pollution and water resources are presented in Table I-1 below:

Table I-1: **NEW JERSEY GEOGRAPHIC ATLAS**

State Surface Area	7,486 sq. miles
State Population (1990)	7,730,188
Major River Basins	Delaware, Passaic/Hackensack, Atlantic Coastal, 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

There are five major drainage basins in the State. The largest is the Delaware River Basin (3,000 sq. miles), followed by the Atlantic Coastal Basin (approximately 2,000 sq. miles), the Passaic/Hackensack Basin (1,200 sq. miles), the Raritan River Basin (1,100 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 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.

LEGEND

——— BASIN BOUNDARIES

- - - - - - WATERSHED BOUNDARIES

Figure II-1

DRAINAGE BASIN MAP OF NEW JERSEY

NEW JERSEY STATE WATER QUALITY INVENTORY REPORT

The waters of New Jersey are heavily influenced by the land uses and population centers in the State. In 1990, New Jersey had a population of slightly over 7.7 million people. By the year 2000, the NJ Department of Environmental Protection and Energy 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 exist 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 years. This growth consists of light industry/corporate centers, commercial facilities, and suburban development. The development, previously 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 has also been 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, lake-front 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. NJDEPE'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.

The importance of surface waters as a foundation for recreation in the State has been documented (NJDEPE, 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.

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 through the State's coastal waters. Figure II-2 indicates the extent of Trout Production waters, that is waters designated for trout spawning and nursery purposes within the State (NJDEP, 1983). Figure II-3 denotes Trout Maintenance waters: waters designated for the support of trout throughout the year. The remaining freshwaters of the State are classified as Nontrout, meaning that warm water fish predominate. Trout and nontrout classifications are outlined in New Jersey's Surface Water Quality Standards (N.J.A.C. 7:9-4.1 et seq.). The N.J. 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, or rendered them unfit for consumption. This, in turn, has hindered or prevented harvesting. New Jersey's environmental protection efforts have made maintenance of this resource a statewide priority.

Ground water is an extremely important resource in New Jersey. It provides approximately 50 percent of the State's potable water, with 39 percent coming from public-supply wells and 11 percent from domestic-supply wells. It also provides baseflow to streams, and is intimately associated with the ecology of the State's wetlands. New Jersey maintains regulations and programs aimed at protecting this resource. The available data suggest that at present there is an ample supply of good quality ground water in the State of New Jersey. However, ground-water quantity (and quality) problems are usually concentrated in areas where the greatest volumes of ground water are needed.

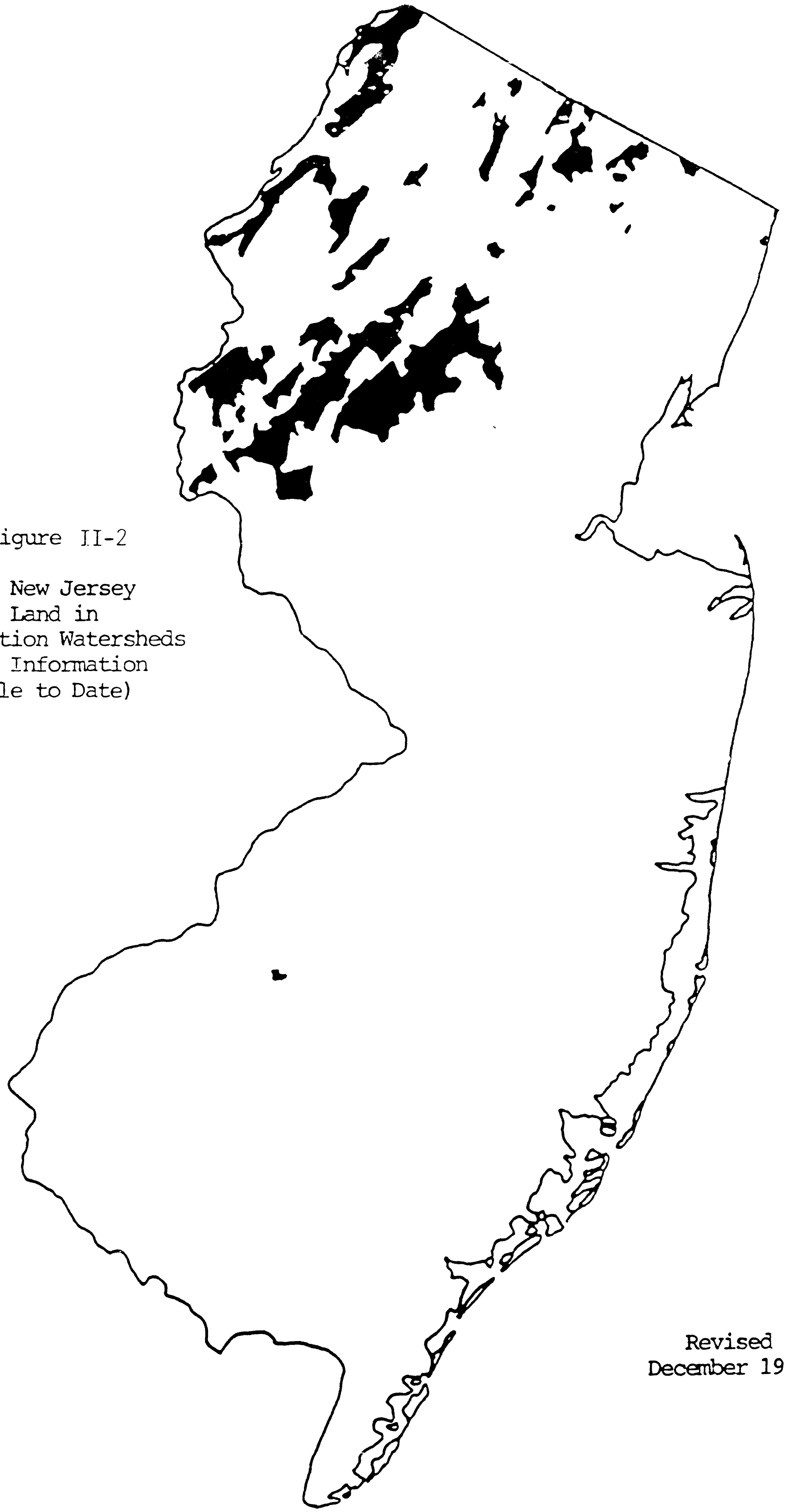


Figure II-2

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

Revised
December 1987

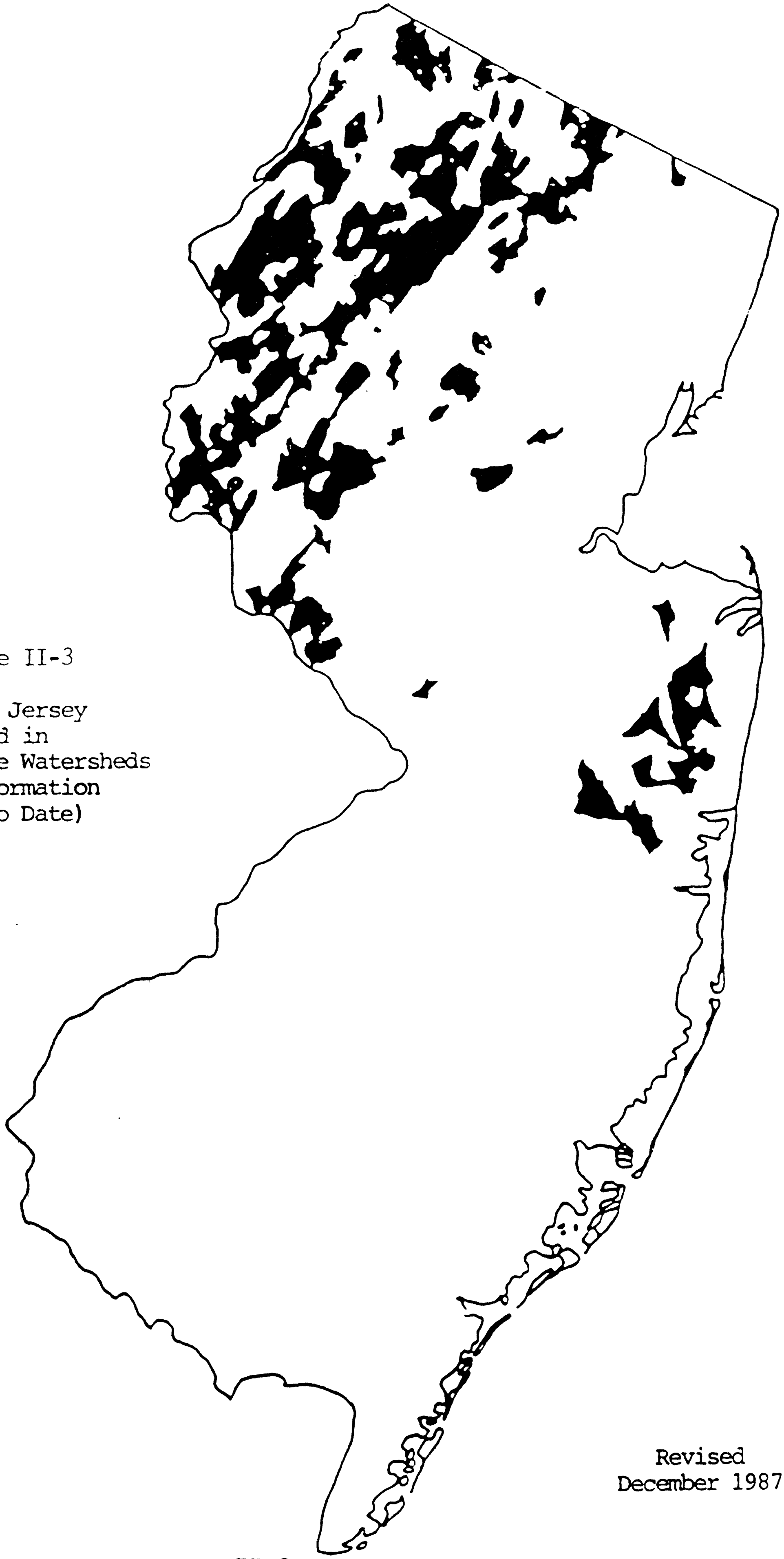


Figure II-3

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

Revised
December 1987

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 (Table II-2). These designated uses are defined in the State's Surface Water Quality Standards regulations (N.J.A.C. 7:9 et seq.) and are generally based on a set of numeric and narrative water quality criteria. 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 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 because the goals are regarded as not currently attainable. 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 Oldmans Creek. All interstate waters between New Jersey and New York do not have to meet The Clean Water Act's 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.

Table II-2 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

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. Also discussed are the types of pollutants found in the State's surface waters, known and potential sources of these pollutants, and long term water quality trends. A determination of waters that are achieving State designated uses is presented.

Water quality conditions within the interstate waters, specifically the Delaware River and Bay; Newark, Raritan, and New York Bays; the Hudson River; the Arthur Kill; and the Kill Van Kull are reported to USEPA under the section 305(b) requirements of the Delaware River Basin Commission (DRBC, 1992) and the Interstate Sanitation Commission (ISC, 1992). Summaries of these reports are presented at the end of the Water Quality Inventory within this Chapter, however, the reader is referred to these reports for more detailed information regarding these interstate waters.

Chapter III is divided into 8 sections. Besides this introduction, sections include:

B: River and Stream Quality, C: Lake Quality, D: Estuarine and Ocean Water Quality, E: Toxics, and F: Water Quality Inventory/Surface Water Rating System. A detailed discussion of acid precipitation upon state waters is presented in both the 1988 and the 1990 Inventory Reports. The reader is referred to these issues for such information.

Surface Water Quality Assessment: Methodologies

In New Jersey, all freshwaters are assigned designated uses which reflect Federal Clean Water Act clean water goals: swimmable (primary contact) and aquatic life use (fish propagation/maintenance) (see table below). 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 Philadelphia (SE-2 and SE-3 waters) however, are degraded to a degree that significant water quality improvements are not considered possible in the foreseeable future. Such waters are not required to meet clean water goals and their designated uses are less stringent than the goals. Refer to Chapter II; Water

Classifications and Designated uses in New Jersey, for further details regarding water quality standards.

Two levels of assessment are performed by the Department when appraising water quality as well as determining the causes and sources of water quality degradation. **Monitored assessments** are those based on actual waterway sampling conducted within the past five years. **Evaluated assessments** are those based upon best professional judgment, the presence of known or potential sources, fishery surveys, citizen complaints, or older monitoring data.

Instream chemistry data used for this report originates from three ambient monitoring networks in the State which combined comprise some 115 monitoring locations across the State, all located in freshwaters. Two networks are affiliated with the U.S. Geological Survey (USGS): the National Stream Quality Accounting Network (NASQUAN), and the NJDEPE/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 other indicators are sampled either monthly or every two months. Sampling for the NJDEPE/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 and dissolved minerals. Other monitoring activities used to assess surface waters were intensive surveys performed for wasteload allocation and enforcement purposes.

A host of water quality 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). In order to supply sufficient data points, the computations involving water chemistry data in this Report use data collected over a continuous five year period: specifically data collected between 1986 and 1990, inclusive.

Ambient chemical monitoring is supplemented by biological assessments of in-stream fish and macroinvertebrate communities. These biological assessments are useful in revealing the impact of toxic contaminants, as well as detecting chronic water quality conditions which may be overlooked by the short-term "snapshot" view provided by ambient chemical sampling discussed previously.

The results of monitoring were also utilized in characterizing estuarine and ocean water quality. These monitoring activities include a broad-based marine and estuarine water quality monitoring program (several parameters), shellfish harvesting water classification monitoring (bacteria), summertime bay and ocean beach sampling (also bacteria), bay and ocean phytoplankton monitoring. Also included is USEPA's summer ocean monitoring program. In addition, the interstate agencies perform monitoring of their respective waters which border on New Jersey. A more detailed discussion of New Jersey's coastal monitoring efforts is presented in Chapter V of this report.

Conclusions regarding attainment of the swimmable designated use (primary contact use) in freshwaters are based primarily on ambient monitoring results, specifically by the presence of fecal coliform bacteria. The criteria used to assign swimmable status were based upon USEPA's recommendations as published in its Guidelines for the Preparation of the 1992 State Water Quality Inventory Reports. If, over the 5-year period of monitoring (1986 to 1990, inclusive), fecal coliform levels exceed the State criterion of 200 MPN/100 ml in less than or equal to 10 percent of measurements, then the waters are deemed as **supporting swimmable use.** If fecal coliform values exceed the criterion in 11 to 25 percent of measurements, then waters are classified as **partially supporting swimmable use.** Exceedance of criterion that is greater than 25 percent of measurements indicates that waters are **not supporting swimmable use.** Waters that are regarded as **threatened** fully support use, however, present or future land uses have the potential to increase the bacterial loading to the point where the water may not support swimmable use in the future.

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). Primary contact use status in estuary and coastal waters was based upon the occurrence and frequency of bathing beach closures. Such closures are largely the result of violations of sanitary (fecal coliform) water quality (**see** NJDEPE, 1992).

Achievement of the aquatic life use is based primarily on information regarding the aquatic biota, but water chemistry analyses are utilized in some situations. As in the past two Inventory Reports, this year's report uses fisheries resource information as the principal assessment tool for determining if the aquatic life use is being met. These fisheries assessments are provided by regional biologists of the NJDEPE's Division of Fish, Game, and Wildlife and describe the type of fish communities present in the State's waterways and the health of these communities (healthy, moderately degraded, degraded, or threatened). These health classifications are defined as follows:

Healthy (fully supporting Aquatic Life Use): 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 (partially supporting Aquatic Life Use): 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 (no support of Aquatic Life Use): Population dominated by carp, goldfish, or killifish; or fish population absent or virtually absent.

Threatened: fully supporting Aquatic Life Use, however, present or future land uses have the potential to increase pollution loading to the point where the water may not support Aquatic Life Use in the future.

Beginning with this report, watershed-specific intensive macroinvertebrate monitoring surveys will be used whenever possible to assess the aquatic life designated use (fish propagation and maintenance use). Macroinvertebrate communities are examined using USEPA's Rapid Bioassessment Protocols (Protocols). From this, evaluations regarding the overall health of instream biota are estimated. In addition, careful recordings of the physical abnormalities observed in the individuals collected are made and used as indicators of possible toxic contamination. These rapid bioassessments are only available for five watersheds in this report. It is hoped that these assessments will continue and that they will suplement the fishery surveys as determinants of the aquatic life use.

Protocol ratings of "no impairment" and "slight impairment" are judged to be <u>fully supporting aquatic life use</u> in this Report. Locations rated as "moderately impaired" are judged to be <u>partially supporting use</u>. <u>No support of use</u> is often, but not always, based upon a Protocol determination of "severe impairment". Assigning <u>no support of use</u> to a river segment was always made under consultation with the biologist performing the macroinvertebrate analyses. This decision to not strictly follow the Protocol determinations for designated use assessments grew out of inconsistencies observed in the Protocol determinations obtained from the Millstone River/Cranbury Brook evaluation. Such inconsistencies observed in some applications of the Protocols are currently being addressed by the Bureau of Monitoring Management.

Because of this new methodology for determining attainment of the aquatic life use, certain waters that were formerly considered as fully supporting the use are now judged to be partially supporting, and vice versa.

In the absence of biomonitoring or fisheries surveys, the presence of toxic conditions was used to determine if the environment was stressful to fishlife. Un-ionized ammonia, and deviations from natural pH are used following USEPA's recommended procedures for assessing aquatic life use attainment. A waterway or segment was judged to be fully supporting aquatic life use if no violations of acute criteria were observed within the 5-year period of assessment. If one violation was recorded during the assessment period, the waterway was judged to be partially meeting use. If two or more violations were noted, the waterway was assessed to be not meeting use.

It should be noted that many factors affect the ability of a waterway to support a healthy aquatic community. Only a limited range of parameters which cause stress to aquatic life are reviewed during ambient chemical monitoring in New Jersey. Therefore, community conditions may be rated as "not supporting aquatic life use" based upon chemical monitoring, but actual biological conditions could be quite different from what this use support rating implies. New Jersey regards such assessments (those based upon chemical analyses alone) as being designed for USEPA's use for the purpose of performing nation-wide comparisons. We do not regard an assessment of "no aquatic life support" based upon even a few transgressions of water quality criteria of such parameters as un-ionized ammonia as necessarily reflecting the true biotic conditions within a stream. The only accurate method of assessing the successful support of aquatic biota is to examine the aquatic community itself.

Because of the intensity of land use within New Jersey, the dense population, economic pressures for development, and the ubiquitous nature of nonpoint source pollution throughout the state; all waters assessed as fully supporting designated use in this report are classified as threatened. This applies to both the primary contact recreation use and the aquatic life use statewide.

B: RIVER AND STREAM

Water Quality

This section summarizes the quality of the freshwater rivers and streams in New Jersey and is based on detailed watershed assessments performed by the New Jersey Department of Environmental Protection and Energy. This report has assessed 525 monitored freshwater miles for primary contact use (swimming). Aquatic life support assessments are based upon 300 monitored miles and approximately 1100 evaluated stream miles.

The freshwater river and stream mileage in the State which are supporting the primary contact use (swimmable use) and aquatic life use (fish propagation and maintenance designated use) are presented in Table III-1.

TABLE III-1

DESIGNATED USE:

ASSESSMENT CATEGORY	Primary Contact Recreation	Aquatic Life Support
Fully Supports:	0	0
Fully Supports But Threatened:	80 (15.2%)	1,039 (73.1%)
Partially Supports:	40 (7.6%)	216 (15.2%)
No Support:	405 (77%)	166 (11.7%)
Total Miles Assessed:	525	1,421

Note: Figures indicate linear stream miles. Percentages denote proportions taken from the total miles assessed for each designated use.

In view of the level of development within our state, the population density, and the intensity of land use even within protected watersheds; the Department regards all waters of the State as Threatened, even when designated uses are fully supported. In applying the guidelines provided by USEPA for the 1992 Inventory Report, waters in New Jersey fully meeting designated uses are classified as "fully supporting use but threatened" in this Report. This differs from previous Inventory Reports where the "threatened" category was classified as a subset of "fully meeting use". In response to USEPA's Guidelines, "threatened" is now its own category, separate from "fully meeting use".

Of the total 525 linear stream miles monitored for primary contact use, 80 miles or 15 percent fully support the primary contact (swimmable) use but are threatened (Table III-1). Another 40 linear miles (8 percent of assessed waters) partially support the use. Primary contact use is not supported in 405 miles (77 percent). High fecal coliform concentrations are the principal reason why so many waterways are not of swimmable quality. Waters classified as swimmable are those often in protected watersheds or directly downstream of an impoundment where the settling action of the impoundment is likely to reduce the instream bacteria levels.

The proportion of New Jersey's freshwaters supporting healthy and reproducing fish populations is considerably better (Table III-1). Of the approximately 1,421 stream miles evaluated and monitored, 1,039 or 73 percent of assessed waters are believed to be fully supporting the aquatic life use (fish propagation and maintenance designated use). But again, these miles are regarded as threatened. Waters which have moderately degraded fish communities are considered to be partially meeting the aquatic life use; fifteen percent of the assessed waters fall into this category. Only 12 percent are classified as not meeting the use, or in other words have severely degraded communities. As a rough generalization, one can say that streams classified as fully the supporting primary contact recreation use are of sufficient quality that they also fully support the aquatic life use.

Comparison with prior assessments of the proportion of waters supporting the aquatic life use are not encouraged because different assessment methodologies are now employed to determine use attainment than were used in the past. Extensive macroinvertebrate assessments have replaced many of the older fisheries surveys previously utilized. Still earlier editions of this report relied principally on water chemistry data before moving to fisheries surveys. Slight changes in the assessment of the primary contact use have also made comparisons difficult. The Department has changed its criteria to conform to USEPA's "standardized" nation-wide assessment procedure for primary contact recreation. Although these changes are not significant, they none-the-less make comparisons with previous assessments misleading.

Sources and Causes of Water Quality Degradation in Freshwaters

The great majority of New Jersey's monitored freshwater streams contain elevated nutrients (phosphorus and nitrogen compounds) and bacteria (fecal coliform) levels. Table III-2 summarizes which pollutants are found in the State and their relative impact, based upon a 1988 assessment. The table shows that nutrients and pathogens/bacteria are excessive in 81 percent of the monitored freshwaters. Other pollutants which are suspected of having statewide and significant impacts on water quality include organic enrichment/depressed 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, metals, ammonia, pH deviations, and temperature or thermal modifications. These problems have been detected in monitoring activities, and they range from being elevated in one percent of the monitored waters (metals) to 14 percent (ammonia). Most other categories of pollutants, as defined by EPA (Table III-2), 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 source of these water quality problems is very difficult to assess. Table III-3 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 directed towards specific applications such as wasteload allocations. As such, they analyze low flow conditions and hence are focused principally towards point source contributions.

Generally, the 1,400 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 are more limited in scope and include silvicultural activities, resource extraction, and hydrologic/habitat modification. Combined sewer outfalls, surcharging sewage conveyance lines/pump stations, illegal discharges, and

TABLE III-2. SUMMARY OF POLLUTANTS FOUND IN NEW JERSEY'S FRESHWATERS
Numbers denote percentages of monitored freshwaters containing the pollutant in what the Department regards as elevated levels. Based on a total of 590 monitored miles.

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.

TABLE III-3. 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 Sources		
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.

facilities in permit noncompliance 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.

Water Quality Trends in Rivers and Streams

Trends in water quality were assessed by the USGS (Hay and Campbell, 1990) for both an 11 year (1976-1986) and 6 year (1980-1986) periods using parametric and nonparametric methods. Results are summarized in Table III-4. Several trends were relatively consistent on a statewide bases:

- In general, dissolved oxygen (DO) improved throughout the state in both the 7 and 11 year periods, however, there were some locations where DO had declined.

- Fecal Streptococcus bacteria displayed increases during both periods of review. Fecal Coliform, in contrast, exhibited both increases and decreases state-wide, depending upon location, during both 11 and 7 year periods.

- There were statewide increases in dissolved sodium, chloride, calcium, magnesium, as well as specific conductance in both 7 and 11 year studies.

- Trace metals declined generally in both study periods.

- Nutrients displayed mixed trends. Total ammonia exhibited declines overall within the 7 year period, increases over the 11 year period. Total organic carbon declined over the 11 year period. Organic nitrogen displayed decreases over the 7 year period. Total nitrogen and total phosphorus both showed mixed results - see accompanying table.

Each parameter assessed in this study the product of a multitude of processes that occur within a watershed. It is not clear on a general statewide basis what specific causes or activities are bringing about these observed trends. Efforts are currently underway at USGS to study these process as they relate to land use and the presence of point sources in an effort to better understand the significance of these trends in the light of human activities within watersheds.

A significant parameter to consider when assessing water quality is dissolved oxygen, and as previously stated, this parameter has increased state-wide over both the 11 year and the 7 year periods. This suggests a reduction in the discharge of oxygen-demanding materials into the state's waterways - perhaps resulting from improvements in the quality of point source discharges such as the upgrade of sewage treatment plants. Also influencing this observation may be the regionalization of sewage treatment plants whereby significant amounts of treated effluent are routed out to the ocean and to the lower Delaware River instead of being discharged into in-state freshwaters. These improvements in point source discharges may also be at least partially responsible for the decline in ammonia seen over the 7 year period and total organic carbon during the 11 year period.

Although the data suggest reductions in oxygen-demanding materials - a positive trend; on the negative side, the data also points to increasing amounts of dissolved salts in state waters. Of note are the increases in the dissolved constituents such as sodium, chlorides, calcium, and specific conductance.

TABLE III-4: SIGNIFICANT STATEWIDE WATER QUALITY TRENDS OVER 11 YEAR (1976-1986) AND 7 YEAR (1980-1986) PERIODS (see Hay and Cambell, 1990).

Parameter	11 Year	7 Year
Nitrogen, Total	▲ ▾	▼ ▴
Dissolved Oxygen	▲	▲
Nitrogen, Organic		▼
Organic Carbon, Total	▼	
Phosphorus, Total	▼ ▲	▲ ▾
Ammonia, Total	▲	▼
Fecal Streptococcus	▲	▲
Fecal Coliform	▲ ▼	▲ ▼
Alkalinity	▲	
Specific Conductance	▲	▲
Lead, Total	▼	
Calcium, Dissolved	▲	▲
Magnesium, Dissolved	▲	▲
Sodium, Dissolved	▲	▲
Chloride, Dissolved	▲	▲
Sulfate, Dissolved	▲ ▼	▲ ▼
pH	▲ ▼	▲ ▼
Solids, Dissolved		▲
Potassium, Dissolved	▲	▼
Floride, Dissolved	▲	▼
Trace Metals	▼	▼

Legend:

▲: General Statewide Increase
▼: General Statewide Decrease
▲▼: Parameter Exhibited Both Increases and Decreases
▲ ▾: Parameter Exhibited Mostly Increases
▼ ▴: Parameter Exhibited Mostly Decreases

C: LAKE QUALITY

Lake Quality Statewide

Most lake monitoring in New Jersey is conducted under the umbrella of the The Clean Lakes program. The purpose and scope of this program is discussed in detail in Chapter V of this Report. The Clean Lakes program, as implemented by The Department's Bureau of Monitoring Management under the guidance of USEPA, monitors public lakes for the purpose of assessing trophic status. In New Jersey there are 380 public lakes with a total acreage of 24,000 acres. Of these to date, 109 lakes, with a total of 10,299 acres, have been evaluated through a combination of state funded intensive surveys, and federally funded lake assessment projects.

Trophic assessments are based on Trophic State Criteria, as described in USEPA's Clean Lakes Program Guidance Manual. Parameters used in the assessment are total phosphorus, chlorophyll a, and Secchi disk transparency. Trophic status may also be determined by documented recreational use impairments caused by excessive macrophyte populations, bacterial contamination, and sedimentation. A lake is regarded as eutrophic if total phosphorus levels are equal to or greater than 0.02 mg/l, and/or if macrophyte growth is extensive enough to impair recreational usage, and/or chlorophyll a levels exceed 10 ug/l.

Beyond the issue of trophic status, there is little current information regarding issues such as acid precipitation and toxic contamination in lakes. The Clean Lakes Program does not directly monitor for nor address the effects of acidity or toxics in the State's lakes. However, a detailed discussion of acid precipitation and its overall effects upon state waters is presented in both the 1988 and the 1990 Inventory Reports. The reader is referred to these reports for such information. With regards to toxic contamination, the following lakes have been reported by the Clean Lakes Program as being impacted by toxics:

Lake	Area(acres)	Source
Alcyon Lake	30	Landfill (Superfund site)
Newton Lake	30	Unknown
Cooper River Lake	150	Unknown
Strawbridge Lake	25	Unknown
Stewart(Woodbury) Lake	45	Unknown

As with rivers and streams, the Department has taken the position that all of the State's public lakes are at the very least threatened with deteriorating water quality. For lakes that as yet have not been assessed, the official status assigned by the

Clean Lakes Program is "Designated Water Quality Uses Threatened, Pending Further Information." Professional judgment combined with some limited data have caused the Clean Lakes Program to conclude that overall water quality in all of the State's lakes is either threatened or actively deteriorating. There is however, not enough data to establish a strong statistical trend assessment for lake water quality.

Lakes Water Quality Assessment For 1991

Sixteen lakes totaling 1000 acres were monitored during 1991 as part of the 1992 New Jersey Lake Water Quality Assessment Report. This assessment was a prerequisite for eligibility in the USEPA Clean Lakes Program. The objective was to acquire limited limnological data from specific public lakes so that a baseline trophic status could be determined for each lake. This information will be used to monitor future lake water quality trends. Lakes were selected based on the following factors;

1) The lake must provide public access as defined in 40 CFR part 35 (USEPA Program Regulations).

2) Lakes should provide primary contact recreation and high quality fisheries. The higher the resource value, the more likely the lake will be monitored.

3) The lake's importance to the community as a source of recreation along with a high degree of local public support for, and involvement in, efforts to restore a lakes recreational use.

Monitoring extended from August through November 1991. Each lakes was monitored twice: once during summer and once during fall. This information was then extrapolated in order to characterize the lake status throughout the year. Lakes were sampled at the principal incoming tributaries as well as at a central location that best characterized the lake as a whole. All samples were analyses for the following parameters:

Total phosphorus	Ortho-phosphorus
Temperature	Alkalinity
Dissolved oxygen (D.O.)	pH
Secchi disk (in-lake only)	Aquatic macrophytes
Algal identification (in-lake only)	
Bacteria (fecal & total coliform, fecal streptococcus or enterococcus)	

The lakes selected for study as listed by county were:

Burlington County:	Atsion Lake, Batsto Lake, Pakim Pond.
Cumberland County:	Shaws Mill Pond.
Hunterdon County:	Round Valley Reservoir Recreation Lake.
Mercer County:	Etra Lake.

Monmouth County:	Allentown Lake, Assunpink Lake, Rising Sun Lake, Silver lake.
Ocean County:	Oakford Lake, Turn Mill Pond.
Salem County:	Parvin lake, Thundergust Lake.
Sussex County:	Lake Marcia, Lake Wawayanda.

Summary of Findings

Heavy macrophyte growth was the most significant source of lake use impairment. Those lakes most impaired by macrophytes included Batsto, Silver, Shaws Mill, and Wawayanda. Myriophyllum spicatum and M. humile (water milfoil) and Utricularia spp. (bladderwort) were the most prevalent nuisance species found. The heaviest algal blooms were found in those lakes whose watersheds consisted mainly of agricultural land. They included Assunpink lake in Monmouth County and Parvin and Thundergust Lakes of Salem County. Silver Lake in Monmouth County also had a heavy algal bloom during the summer but its watershed is mainly urban. A large waterfowl population was suspected to be a significant source of nutrients to this lake.

All sixteen lakes studied exceeded at least one of the trophic status criterion and are considered eutrophic, although several of the lakes are considered to be only marginally so. Both Atsion and Turn Mill Lakes were considered eutrophic because of nuisance macrophyte growth. In both cases, Utricularia spp. (bladderwort) was growing in naturally shallow, hard sand bottom areas. Bladderwort is capable of growing in low nutrient conditions as long as sufficient sunlight is available. Pakim Pond is also considered to be a borderline eutrophic lake; the only criteria exceeded was total phosphorus, which occurred during the fall turnover period. Lake Wawayanda is considered eutrophic because it has excessive macrophyte growth, although its water quality is still good enough to support a year-round trout fishery.

Nonpoint source pollution is believed to be the cause of water quality degradation in most of the lakes studied. The principal nonpoint source suspected was runoff from agriculture, urban areas, and construction sites. Lakes that had the lowest levels of total phosphorus (<0.02 mg/l); Atsion lake, Pakim pond, Turn Mill Pond, and Lake Wawayanda; were all located in undeveloped watersheds. All but Lake Wawayanda are located within the Pine Barrens.

One lake, Oakford is known to have point sources discharging into its feeder streams. Wrightstown MUA is permitted to discharge 200,000 gallons of treated wastewater per day into the North Run, which feeds into the lake. Two other sewage treatment plants, Sparta Village Trailer Park and New Egypt Education Authority, have permitted discharges that release 38,000 and 20,000 gallons of treated wastewater per day, respectively, into streams that in turn feed into the lake. For those lakes sampled during 1991, Oakford had the highest levels of total phosphorus (0.27 mg/l) in the water column. Fecal coliform levels in the North Run, between the Wrightstown MUA and the lake were 16,000 MPN/100ml. These levels dissipated to 230 mpn/100ml in the lower lake.

The following are descriptions of each lake's morphology, and summations of the problems that may be impairing their recreational use.

Allentown Lake, Monmouth County: Allentown Lake is 32 acres with a maximum depth of about 6 feet. Slightly elevated levels of total phosphorus (0.03 mg/l) supported algal blooms during the summer and fall. The shallow depth of this lake precludes any thermal stratification but a dissolved oxygen gradient existed during the summer between the surface (11.28 mg/l) and near the bottom (3.60 mg/l).

Assunpink Lake, Assunpink Wildlife Management Area, Monmouth County: Assunpink Lake is 200 acres with a maximum depth of about 14 feet. The lake provides excellent fishing opportunities for largemouth bass, pickerel and panfish, and also has a hybrid striped bass population. Heavy growth of Nuphar spp. (spatterdock) and Myriophyllum spicatum (water milfoil) restrict some boating and fishing opportunities in the upper-most part of the lake. Elevated total phosphorus levels in the water column supported heavy algal productivity during the summer (chlorophyll a 87.56 ug/l). Thermal stratification during the summer produced a dissolved oxygen gradient with surface concentrations of 10.0 mg/l reduced to 3.0 mg/l in the hypolimnion.

Atsion Lake, Wharton State Forest, Burlington County: Atsion Lake is 90 acres with a maximum depth of 6 feet. Water quality was very good because of low nutrient levels and algal productivity. There was some growth of Utricularia spp. (bladderwort) in the shallower coves and upper reaches of the lake that had a slight impact on boating and fishing.

Batsto Lake, Wharton State Forest, Burlington County: Batsto Lake is a 62 acre lake with a maximum depth of 6 feet. The upper one-third of the lake is inundated with heavy macrophyte growth, which impairs some boating and canoeing. The dominant species was Myriophyllum humile (water milfoil). Total phosphorus levels (0.07 mg/l) in the water column supported the macrophyte growth.

Etra Lake, Mercer County: Etra Lake is a 19 acre body of water with a maximum depth of about 8 feet. Some boating and fishing opportunities are impaired by heavy macrophyte growth. The heaviest growth was located in the upper end and along much of the shoreline. Species found included Myriophyllum spicatum (water milfoil), Cabomba caroliniana (fanwort), and Utricularia spp. (bladderwort). Fecal coliform levels during the summer were 270 mpn/100ml.

Lake Marcia, High Point State Park, Sussex County: Lake Marcia is 19 acres and has a maximum depth of about 20 feet. Nutrient and chlorophyll a levels were relatively low and no emergent macrophyte growth was observed during the sampling runs. However, park officials indicated that there was a heavy filamentous algal bloom during the late spring and early summer. Gypsy moth defoliation within the watershed is considered to be a potential nutrient source.

Oakford Lake, Ocean County: Oakford Lake is 25 acres with a maximum depth of about 6 feet. Boating activities are impaired at the uppermost end of the lake due to sedimentation and Nuphar spp. (spatterdock) growth. Algal productivity was moderately high (chlorophyll a 16.34 ug/l) and was supported by very high levels of total phosphorus (0.27 mg/l). Fecal coliform counts of 230 mpn/100ml as well as enterococcus counts of 94/100ml were detected in-lake. Higher levels of each were found in the tributary waters.

Pakim Pond, Lebanon State Forest, Burlington County: Pakim Pond is 8 acres with a maximum depth of 6 feet. Nutrient and chlorophyll a levels were low and there were some small areas of Nuphar spp. (spatterdock). Water clarity was poor but this was due to the dark brown water common to lakes in the Pine Barrens.

Parvin lake, Parvin State Park, Salem County: Parvin Lake is 95 acres with a maximum depth of 5 feet. Park personnel indicated that it is an excellent fishery for largemouth bass. Boating and fishing opportunities were precluded from some areas in the lower end of the lake due to sedimentation and Nuphar spp. (spatterdock) growth. The clarity of the water was poor due to heavy algal blooms during the summer and fall (chlorophyll a was as high as 30.12 ug/l). The algal productivity was supported by total phosphorus levels as high as 0.14 mg/l.

Rising Sun Lake, Assunpink Wildlife Management Area, Monmouth County: Rising Sun Lake is 38 acres and has a maximum depth of 25 feet. Rising Sun provides very good fishing opportunities for largemouth bass, panfish and pickerel. The dam structure has a variable water release feature, which allows oxygen depleted water from the hypolimnion to be drawn off if necessary. Chlorophyll a levels were slightly elevated and ranged from 16.78 to 10.05 ug/l during the summer and fall, respectively.

Round Valley Reservoir Recreation Lake, Hunterdon County: Round Valley Reservoir Recreation Lake is 20 acres with a maximum depth of 28 feet. Fishing is impaired at the northern and southern ends because of heavy macrophyte growth. The dominant species was Myriophyllum spicatum (water milfoil). Algal productivity was moderately high (chlorophyll a as high as 17.84 ug/l). Total phosphorus levels (0.11 mg/l) supported the biological productivity. This lake was thermally stratified and there was a dissolved oxygen gradient between the surface (8.4 mg/l) and near the bottom (1.2 mg/l).

Shaws Mill Pond, Edward G. Bevan Wildlife Management Area, Cumberland County: Shaws Mill Pond, is a 25 acre lake with a maximum depth of 11 feet. It is considered to be one of the better largemouth bass fisheries in the southern part of the state. Boating and fishing opportunities, however, are impaired in the upper one-third of the lake due to heavy submerged and floating macrophyte growth. There was also heavy growth in the lower two-thirds of the lake from the shoreline out to 7 foot depths but these plants remained 2 or more feet below the surface. The dominant species were Myriophyllum humile (water milfoil) and Utricularia spp. (bladderwort).

Silver Lake, Monmouth County: Silver Lake is 15 acres with a maximum depth of 5 feet. Boating and fishing opportunities are impaired in the northeastern and southwestern quarters of the lake due to macrophyte and sedimentation problems. The dominant macrophyte was Anacharis spp. (waterweed). The clarity of the water during the summer was poor due to heavy algal productivity. Chlorophyll a levels as high as 100.63 ug/l were supported by total phosphorus levels as high as 0.13 mg/l. The shallowness of this lake precludes any thermal stratification. There was however a dissolved oxygen gradient from the surface (16.4 mg/l) to near the bottom (3.5 mg/l). Elevated enterococcus levels (33 to 49 per 100ml) as well as nutrient levels may have been caused or enhanced by a large resident waterfowl population.

Thundergust Lake, Parvin State Park, Salem County: Thundergust Lake is a 12 acre lake with a maximum depth of 5 feet. During the summer, the water had a pea-green appearance due to heavy algal productivity (chlorophyll a 121.53 ug/l). Because of shallow depth, this lake does not thermally stratify. However, there was a dissolved oxygen gradient in the water column from the surface (18.7 mg/l) to near the bottom (11.1 mg/l).

Turn Mill Pond, Colliers Mill Wildlife Management Area, Ocean County: Turn Mill Pond is 100 acres with a maximum depth of 7 feet. This lake provides good opportunities for bass, perch and pickerel fishing. Total phosphorus (<0.02) and chlorophyll a (as high as 4.37 ug/l) levels were low. There was heavy growth of Utricularia spp. (bladderwort) in the shallow areas. There was no growth in areas where depth exceeded 4 feet.

Lake Wawayanda, Wawayanda State Park, Sussex County: Lake Wawayanda is 240 acres with a maximum depth of about 90 feet. It maintains a year round trout population as well as very good largemouth bass, pickerel and panfish populations. Boating and fishing activities are impaired in areas where the depth is 8 feet or less. These areas include the boat launch and rental facility. The dominant species present include Myriophyllum spicatum (water milfoil), Ceratophyllum demersum (coontail), and Potamogeton spp. (pondweed). Algal productivity and total phosphorus levels were low. In the lower half where depth was 50 feet, thermal stratification was evident however, a dissolved oxygen gradient was not present. Dissolved oxygen at the surface (10.1 mg/l) was unchanged in the hypolimnion (10.0 mg/l).

D: COASTAL WATER QUALITY

This section describes the water quality as well as the sources and causes of impairment of the coastal waters under the jurisdiction of the New Jersey Department of Environmental Protection and Energy. Large portions of this state's coastal waters however, are under the watch of the two interstate agencies; the Delaware River Basin Commission (DRBC), and the Interstate Sanitation Commission (ISC). For a detailed assessment of the Delaware River and Bay see Delaware River and Bay Water Quality Assessment (DRBC, 1992). Descriptions of Newark, Raritan, and New York Bays; the Hudson River; the Arthur Kill; and the Kill Van Kull are provided in Status Report on the Interstate Sanitation District Waters (ISC, 1992). These interstate agencies submit their own 305(b) reports separately to USEPA. Summaries of these reports are presented at the end of the Water Quality Inventory within this Chapter, however, the reader is referred to these reports for more detailed information regarding these waters.

It should be noted that coastal water quality monitoring historically has been limited. In general, data collection had been largely restricted to coliform bacteria, salinity, and temperature data taken from shellfish harvesting areas and from bathing beaches. However, beginning in 1989 a Marine/Estuarine monitoring study was initialed. The study monitors several parameters on a quarterly basis taken from 200 stations in the marine and estuarine areas of the State. Current use support assessments within the coast currently focus upon primary and secondary contact recreation, and shellfish and finfish restrictions.

Primary Contact Recreation

OCEAN: The Coastal Cooperative Monitoring Program (CCMP) monitoring results from the early 1980's up to 1991 indicate that the New Jersey coastal beaches from Sandy Hook south to Cape May are fully swimmable. Some beaches however are threatened by occasional short-term elevations of bacterial levels which have resulted in beach closures for brief periods (NJDEPE, 1989a, 1992).

BAY AND ESTUARY: Beach closures in bay regions occur in such a manner that make generalizations difficult. It can be said that back-bay beach closures are a serious problem on a local basis. Many beaches are subjected to frequent short-term closures. Other locations have only occasional closures while some regions, not designated for swimming for obvious reasons, have chronically elevated bacterial levels and are not supporting the primary contact use at all (NJDEPE, 1989, 1992).

Shellfish and Finfish Restrictions

The Department's Bureau of Marine Water Classification and Analysis (BMWC&A) 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 nonpoint discharges. The sanitary water quality is determined through actual measurements of coliform concentrations in the water column, through hydrographic (tracing), and through shoreline surveys.

In 1990, a total of 439 square miles of coastal (ocean) and 614 square miles of estuary and bay waters were assessed for sanitary fitness for shellfish harvesting. Of these totals, classifications are presented below:

Estuary/bay and ocean waters (as square miles) assessed for sanitary fitness for shellfish harvesting

BAY AND ESTUARY:

Fully Supporting	No Support	Partially Supporting	Total
440	53	121	614

OCEAN:

Fully Supporting	No Support	Total
321	118	439

See Section 38 of this Chapter for a detailed discussion of shellfish resources and harvesting area classifications. Restrictions and alerts regarding the consumption of finfish due to toxic contamination are presented in section E: Toxics, under "Fish Advisories" within this Chapter.

Sources and Causes of Water Quality Degradation

Tables III-5 and III-6 represent pollutants and pollution source categories, as defined by USEPA, that impact ocean waters. Pollutants and pollution source categories that impact estuarine water quality are denoted on Tables III-7 and III-8.

Ocean Waters

The principal source for elevated bacterial levels affecting coastal bathing beach closures is stormwater discharge along the

TABLE III-5 SUMMARY OF POLLUTANTS FOUND IN NEW JERSEY'S OCEAN WATERS[1] (SQUARE MILES)

Pollutant Categories	Major/Statewide Impacts Monitored	Major/Statewide Impacts Suspected	Moderate/Localized/Minor Impacts Monitored	Moderate/Localized/Minor Impacts 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-6 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-7 SUMMARY OF POLLUTANTS FOUND IN NEW JERSEY'S ESTUARIES (SQUARE MILES)

Pollutant Categories	Major/Statewide Impacts Monitored	Major/Statewide Impacts Suspected	Moderate/Localized/Minor Impacts Monitored	Moderate/Localized/Minor Impacts 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-8 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		

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

coast as suggested by Coastal Cooperative Monitoring Program (CCMP) data (NJDEPE, 1989a, 1992). 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 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 specific sources of floating garbage such as sewage sludge, greaseballs, plastics, timbers, medical waste, etc., washing up on New Jersey beaches have been studied (NJDEPE, 1987) and evidence indicates that floatables arise in the Hudson/Raritan estuary: specifically the dense population centers of the New York/New Jersey metropolitan area. Significant sources of floatables were found to include raw sewage discharges, CSO's, and marine transfer stations including the Fresh Kills Landfill. The study states that currents and tidal patterns in the region are such that any floating material could become deposited on the New Jersey coast. Under the proper conditions, the deposited materials can be refloated and subsequently redeposited on the recreational beaches at points farther and farther south along our coast.

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 a large extent 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 (NJDEPE, 1985b). Twice this amount may be discharged during storm events by combined sewage outfalls. A use attainability study (NJDEPE, 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 (NJDEPE, 1989a, 1992). 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 compounded 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. Hence, for bay CCMP stations which exceeded sanitary standards, the specific cause of the increased fecal coliform concentrations could not be determined.

The Department's Bureau of Marine Water Classification and Analysis agrees that based upon their observations; 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 Department also suspects that additional bacterial contamination is coming from tributary inputs to the bays. These tributary inputs carry additional runoff and septic tank leachate from sources upstream.

While the Department is encouraged by recent gains in water quality and the associated improvements in coastal water classifications, there are, none-the-less, concerns for the immediate future. There is extensive building pressure for commercial, residential, and industrial facilities in coastal communities. The major concern regarding this construction is the degraded stormwater runoff that is associated with developed areas. Of concern, also, are the presence of marinas and the grouping of boat docking facilities, and their corresponding impacts upon shellfish harvesting water quality and habitat. Water quality gains resulting from the regionalization of wastewater treatment could be negated through extensive new construction and its associated runoff. The estuarine waters of the coastal areas which are jeopardized by this development are often among the most productive in the State.

E. TOXICS

The NJDEPE maintains an ongoing program assessing waters where impairment is suspected due to toxic discharges from point sources. Toxic discharges as defined here are what USEPA has defined as 126 "priority pollutants". Use impairment in these waters are currently only suspected; these are not necessarily waters with known problems. This list is based upon violations of USEPA's federal acute toxicity criteria as observed in Discharge Monitoring Reports in concert with ambient monitoring water quality data from the receiving water in question.

Waterbody Name	Waterbody Description
Hackensack River	From the Oradell Reservoir to the confluence with Newark Bay.(Reach #:02030103001)
Upper New York Bay	From the confluence of the East River to the confluence with the Kill Van Kull. (Reach #:02030104001)
Newark Bay/Arthur Kill	From the confluence with the Passaic and Hackensack Rivers to the confluence with the Rahway River and the confluence with the Upper New York Bay. (Reach #:02030104002)
Arthur Kill	From the confluence of the Rahway River to the confluence with the Raritan River Bay. (Reach #:02030104003)
Raritan Bay	From the confluence of the Arthur Kill/Raritan River to the confluence with the Waackaack Creek. (Reach #:02030104005)
Lower Millstone River	From the confluence with Bedens Brook to the

Waterbody Name	Waterbody Description
	confluence with the Raritan River. (Reach #:02030105026)
Mid Millstone	From the confluence with Stony Brook to the confluence with Bedens Brook. (Reach #:02030105028)
Lower Pequest River	From the confluence with Bear Creek to the confluence with the Delaware River. (Reach #:02040105013)
Whippany River	From the headwaters to the confluence with the Rockaway River. (Reach #:02030103024)
Passaic River	From the confluence of the Dead River to the confluence with the Whippany River. (Reach #:02030103025)
Raccoon Creek	From the confluence with the South Branch Raccoon Creek to the confluence with the Delaware River. (Reach #:02040202004)
Kings Creek	From the headwaters to the confluence with the Rahway River.
Hudson River	From the New York/New Jersey State boundary to the confluence with the East River. (Reach # 02030101005 and 02030101009)

The following are stream locations where toxics are suspected of impairing waters based upon biological monitoring evidence. Such evidence is 1: a significant number of physical abnormalities detected on the bodies of aquatic insects collected during intensive biological monitoring (a significant number in this case is defined as deformities in more than 10 percent of total numbers of individuals collected) or 2: is an unexplainable low biomass present at the study site.

Water Way	Location
Wallkill River	Sussex
Clove River	Rose Marrow Road
West Branch of Papakating Creek	Blumbsock
Ramsey Brook (trib. to Saddle River)	Mahwah
Valentine Brook (trib. to Saddle River)	near Allendale
Valentine Brook (trib. to Saddle River)	Allendale
Hohokus Brook (trib. to Saddle River)	Allendale and Ridgewood
Saddle River	Ridgewood, Rochelle Park, and Garfield
Whippany River	Hanover Twp.
Bear Brook (trib. to Millstone River)	Entire length
Stony Brook (trib. to Millstone River)	Princeton
Millstone River	Blackwells Mills, and Manville

Fish Advisories

Ocean:

The NJDEPE 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 New Jersey territorial ocean waters from Barnegat Inlet northward (NJDEPE, 1983, 1986b).

Freshwater/Estuary:

The NJDEPE has found high levels of PCBs and certain pesticides (primarily chlordane) in finfish taken from the following State and interstate waters (Kennish, et al, 1992., NJDEPE, 1982, 1983, 1985c, 1990):

Arthur Kill
Kill Van Kull
Tidal Passaic River
Tidal Raritan River

Hudson River	Tidal Hackensack River
Lower Cooper River	Mainstem Pennsauken Creek
Raritan Bay	Sandy Hook Bay
Newark Bay	So. Branch Pennsauken Creek

As a result, commercial fishing bans and recreational fishing advisories have been issued by the State for these waters. Recommendations to limit consumption are in effect on striped bass, bluefish, white perch, white catfish, and American eel. Commercial sale of striped bass and American eel taken from most of these waters is prohibited.

Extensive sampling has turned up widespread dioxin contamination in certain finfish and crustaceans in both the tidal Passaic River and New York Bight Apex waters. Because tissue concentrations of dioxin above the U.S. Food and Drug Administration's "level of concern" were identified, 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.

It should be noted that PCB's are not widely distributed in high concentrations statewide, but are encountered in high concentrations in the sediments within the New Jersey metropolitan areas (Kennish, et al, 1992). The sources of these PCBs in the State's waters include direct discharges, tributary loads, dredged spoils, and ocean dumped sewage sludge. Sewage sludge and dredged materials dumping are reported to be the principal sources of PCBs in the New York Bight apex waters (Kennish, et al, 1992).

F. WATER QUALITY INVENTORY/SURFACE WATER RATING SYSTEM

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, streams, and coastal waters. An evaluation of whether designated uses (swimmable and fish propagation/maintenance) are being supported is also presented. The information gathering methodologies that supply the information for the assessments in this section are described in the first part of this chapter; section A.

Thirty-seven watershed assessments are provided this report, as well as a summary of shellfish growing water 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 near the end of this chapter. This section closes with an update of the Surface Water Rating System, a series of numerical indices assigned to waterways, that provides a relative ranking of their water quality as well as their resources value.

Water Quality Inventory

This 1992 Water Quality Assessment represents an update of water quality conditions through 1990 for the State's major rivers and streams. Water quality data used in this assessment originates from three ambient monitoring networks that are described in detail in the first section of this chapter. The primary source of data for the Water Quality Assessment is that collected at approximately 110 ambient freshwater monitoring stations around the State between 1986 through 1990. The results of special or intensive surveys are also utilized when available. The assessment also includes fish community descriptions provided by the NJ Division of Fish, Game, and Wildlife for the 1988 Report. Intensive biomonitoring of macroinvertebrate communities is utilized in the water quality assessment when available. Five major rivers had their macroinvertebrate community assessed in 1990; these included the Millstone system, the Whippany River, the Saddle River, the Wallkill system, and the North Branch Raritan River.

The primary waterways assessed in this section are listed in Table III-9. 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' table. The wastewater discharge inventories, in contrast to earlier Inventory Reports, are now grouped together in alphabetical order by river-basin, and located after the ISC summary.

TABLE III-9 WATERSHEDS EVALUATED IN THE WATER QUALITY INVENTORY

Wallkill River Basin (New Jersey Portion)

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, 1987-1989, 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

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.

This report utilizes the water quality indexing procedure first 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).

The Water Quality Index transforms water data to a value between 0 (best or no pollution) and 100 (worst case conditions or gross pollution) 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 procedure aggregates indices by Pollution Category, and within each Category, by Component Parameters. Table III-10 presents the Pollution Categories and Components used to prepare the WQI for New Jersey's waters. Between the extremes of 0 and 100, the WQI scale is divided into excellent, good, fair, poor and very poor conditions as follows:

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.

WQI	Classification/ Condition	Description
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.

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 database. WQI values are calculated for ambient water quality monitoring stations located throughout New Jersey and interstate waters. The WQI also serves as the basis for the water quality component of the Surface Water Rating System presented at the end of this chapter and assists in performing the water quality assessments in this chapter. The WQI procedure provides summary statements of the raw data including the number of values, the mean, geometric, mean and percent exceeding criterion. These 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.

The information used to describe pollution sources and causes comes from a variety of sources. The point source inventory identifies the relative contribution of point source loadings to the stream. The Department's Enforcement Unit provides descriptions of surface water dischargers currently under enforcement action which are causing deleterious impacts on surface waters. This listing of enforcement cases is used to help determine pollution sources. The State's hazardous waste sites which are contaminating local surface waters are also included in the point source part of the Problem and Goal Assessment. More detailed information on the sites can be found in <u>Site Status Reports on the Hazardous Waste Management Program in New Jersey</u> (NJDEP, 1988). Other sources of information used in this section are prior 305(b) reports; Construction Grants

TABLE III-10. 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/l
	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

projects completed, under construction, or being planned; and other site-specific studies.

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 predominantly 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 land is increasing. 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 in New York State; Papakating Creek at Sussex; and Black Creek near Vernon. These stations represent approximately 30 monitored stream miles. As reported in previous Inventory Reports, water quality of the Wallkill River itself continues to be generally good at all three stations, although conditions degrade somewhat to fair during the summer months at Franklin and Sussex, and in early winter at Unionville. Total phosphorus and fecal coliform continue to be 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. Data indicate a slight increase in nutrients, notably total phosphorus, in the Wallkill as one travels downstream. Some increase is also observed in fecal coliform levels, with geometric means going from 134 MPN/100ml at Franklin to 323 MPN/100ml at Sussex and 314 MPN/100ml at Unionville. Papakating

Creek contain levels of phosphorus and fecal coliform that exceed state criteria in 46 and 85 percent, respectively, of all samples collected. Water quality in Papakating Creek is fair throughout the year, its poorest condition being 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 elevated lead concentrations were recorded in the Wallkill River at Franklin and Unionville.

Extensive macroinvertebrate sampling was performed in 1991 throughout the watershed. Results overall showed the Wallkill River itself to be in very good condition biologically. Some evidence of nutrient enrichment was observed at Franklin and at Sussex. In contrast, Clove Brook and Papakating Creek show impairment. A certain percentage of macroinvertebrates collected at the middle reach of Clove Brook show abnormalities. Toxic materials within the sediments are suspected to be the cause. If toxic materials are present, agricultural chemicals such as pesticide and/or herbicides could be the agents. The downstream-most reach on the Clove is severely impaired.

The West Branch of the Papakating Creek shows only very slight impairment. Concern is noted at Blumbstock, where 11 percent of the samples revealed abnormalities. This leads us to suspect the possible presence of toxic contaminants either in the water column or within the sediments. These abnormalities were not recorded downstream at McCoys Corner. The headwaters of the mainstem Papakating Creek show excellent biological health. Macroinvertebrate communities at Pellettown and McCoys Corner, however, reveal some impairment reflected in a decline in local diversity. Based upon the resistant forms comprising the communities, siltation is strongly suspected as the principal cause of impairment, most likely from agricultural activity. Possible pollution sources observed by Department biologists at the lower reaches of the Creek include herds of cattle and unstable stream-banks.

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 while 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 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 in general appear to have poorer water quality in the warm weather months, indicating that point or continuous sources may be significant contributors to stream degradation. Two wastewater discharges continue to be under enforcement action and are suspected of causing water pollution problems (see Point Source Pollution Table). The Sussex Boro Treatment Plant (Clove Brook) is in noncompliance with its permit. During times of heavy flow (rain events) this facility experiences raw sewage overflows. Discharge treatment under these conditions is limited to chlorination. Ames Rubber Corporation remains under enforcement action for the release of excess volatile organic compounds.

Two discharges into tributaries of the Wallkill, the Sparta Plaza STP and the Alpine School STP, were formally under enforcement action, but have upgraded their discharges and are no longer reported out of compliance. 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 resulting from 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 detention 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 as 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 cited 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 Assessment

Assessments of the "aquatic life support" designated use in the Wallkill River, Papakating Creek, and Clove Brook are based upon recent instream macroinvertebrate evaluations. The Wallkill River, except for the very downstream-most miles, fully supports the use. The last few miles of the river partially support the use. The West Branch of Papakating Creek is partially supporting the use while the main stem of Papakating Creek is partially supporting the use. Clove Brook partially supports aquatic life use except in its lowermost reach where the use is not supported. Based upon older fishery assessments; Black Creek, Wawayanda Creek, and Pochuck Creek are assessed as fully supporting the aquatic life use.

All 25 monitored stream miles of the watershed contain excessive fecal coliform bacteria and, as a result, will not support the primary contact (swimmable) use.

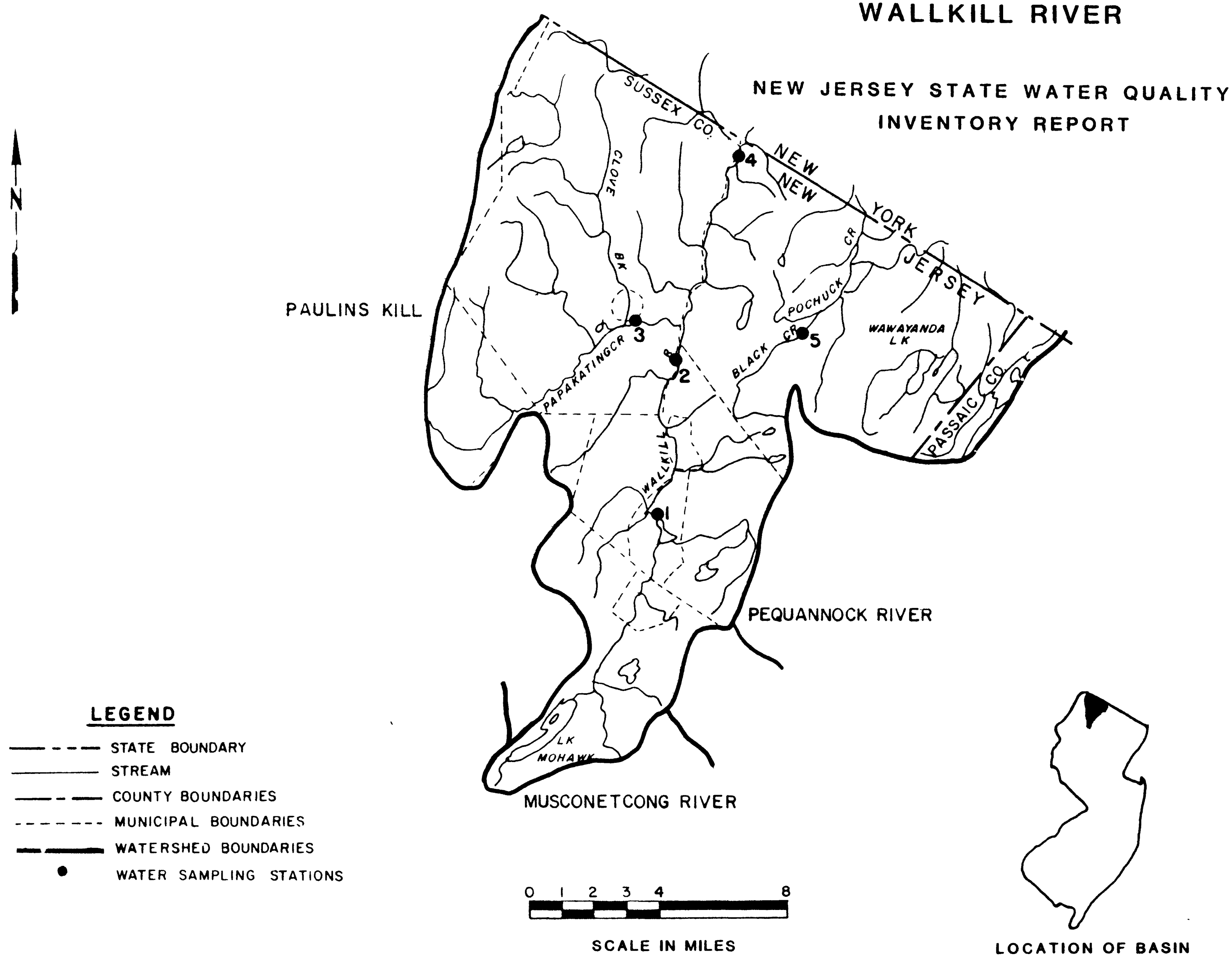
Monitoring Station List

Map Number	Station Name and Classification
1	Wallkill River at Franklin, NJ, FW-2 Trout Maintenance,
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 PROFILES 1986-1990: **WALLKILL RIVER**

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVG. AND WORST 3-MONTH CONDITION
Wallkill River at Franklin	AVG. WQI:	12	8	6	23	9	10	3	18	19 GOOD
	WORST 3 MONTHS:	JULY-SEPT	JUNE-AUG.	MAR.-MAY	APRIL-JUNE	JULY-SEPT.	AUG.-OCT.	JUNE-AUG.	NOV.-JAN.	35 FAIR JUNE-AUG.
Wallkill River near Sussex	AVG. WQI:	1	9	4	27	12	12	3	4	16 GOOD
	WORST 3 MONTHS:	JULY-SEPT.	MAY-JULY	MAR.-MAY	JUNE-AUG.	JULY-SEPT.	AUG.-OCT.	FEB.-APRIL	JUNE-AUG.	29 FAIR JUNE-AUG.
Wallkill River near Unionville	AVG. WQI:	2	18	4	32	14	10	2	10	23 GOOD
	WORST 3 MONTHS:	JUNE-AUG.	JULY-SEPT.	DEC.-FEB.	NOV.JAN.	MAY-JULY	JULY-SEPT.	JULY-SEPT.	AUG.-OCT.	32 FAIR NOV.-JAN.

LEGEND: WATER QUALITY INDEX DESCRIPTION

Note: an index value of 20 is equivalent to the level of water quality criteria.

WQI	Condition	Description
0-10	Excellent	Pollution minimal or absent; water uses met throughout the year.
11-25	Good	Pollution generally in low amounts; water uses periodically not met.
26-60	Fair	Pollution varies from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution present in high levels; water uses not met.
81-100	Very Poor	Pollution present in extremely high levels; severe stress to streamlife; water uses not met.
ID	Insufficient Data	

WATER QUALITY INDEX PROFILES 1986-1990: **WALLKILL RIVER continued**

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVG. AND WORST 3-MONTH CONDITION
Papakating Cr. at Sussex	AVG. WQI:	1	21	3	47	16	7	3	5	33 FAIR
	WORST 3 MONTHS:	JULY-SEPT	JUNE-AUG.	FEB.-APRIL	AUG.-OCT.	JUNE-AUG.	SEPT.-NOV.	APRIL-JUNE	JUNE-AUG.	54 FAIR JULY-SEPT.
Black Cr. near Vernon	AVG. WQI:	1	22	4	30	12	15	2	5	24 GOOD
	WORST 3 MONTHS:	JULY-SEPT	JUNE-AUG.	FEB.-APRIL	JULY-SEPT	JUNE-AUG.	SEPT.-NOV.	JUNE-AUG.	NOV.-JAN.	44 FAIR JULY-SEPT.

LEGEND: WATER QUALITY INDEX DESCRIPTION Note: an index value of 20 is equivalent to the level of water quality criteria.

WQI	Condition	Description
0-10	Excellent	Pollution minimal or absent; water uses met throughout the year.
11-25	Good	Pollution generally in low amounts; water uses periodically not met.
26-60	Fair	Pollution varies from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution present in high levels; water uses not met.
81-100	Very Poor	Pollution present in extremely high levels; severe stress to streamlife; water uses not met.
ID	Insufficient Data	

POINT SOURCE POLLUTION TABLE
WATERSHED: Wallkill River

FACILITIES IN NONCOMPLIANCE

FACILITY	RECEIVING WATER	POLLUTANT	COMMENTS
Sussex Borough STP NJPDES 0021857	Clove Brook	Discharge of 0.242 mgd. Heavy precipitation events cause raw sewage overflows into the Clove Brook. Total Residual Chlorine Limit has consistently been exceeded.	An Administrative Consent order was executed in June of 1988 to set up a compliance schedule for an upgrade to the facility. Dechlorination facilities have put on line. The final compliance date was extended.
Ames Rubber Corp. Hamburg Borough, Sussex County. NJPDES 0000141	Wallkill River	Discharge of process wastewater containing volatile organic chemical compounds, including 1,2 dichloroethane, 1,1,1-trichlorethane and trichloroethane.`	Ames Rubber has eliminated the discharge of process wastewater into the Wallkill but volatile organic chemicals continue to exceed permit limitations. An Administrative Consent Order was executed in 1991 to set up a compliance schedule and to settle outstanding penalty liability for permit violations.

POINT SOURCE POLLUTION TABLE
WATERSHED: Wallkill River (continued)

IMPROVEMENTS TO FACILITIES AFFECTING WATER QUALITY

FACILITY	RECEIVING WATER	POLLUTANT	COMMENTS
Sparta Plaza STP, Sussex County NJPDES 0027057	Wallkill River	Discharged Treated Sanitary Wastewater. Biochemical Oxygen Demand , Total Suspended Solids, Total Residual Chlorine , Oil&Grease and dissolved Oxygen have been violated frequently.	The facility completed an upgrade in June 1991 pursuant to an Administrative Consent Order dated June 1988.
Sparta-Alpine School, Sussex County NJPDES 0027065	Tributary of the Wallkill River	Discharge of Treated Sanitary Wastewater. Total Residual Chlorine and Phosphorous Limitations were frequently violated.	An Administrative Consent Order was executed on August 1, 1988 to memorialize a compliance schedule. The facility has achieved compliance with effluent limitations. The ACO was terminated August, 1990.

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 drainage area runs along the western boundary of Sussex County into the Delaware River; 1.5 miles downstream of Flatbrookville. Sub-watersheds of this drainage area 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 accommodate bathing beaches and recreational fishery resources. There are few point sources in the watershed. The Flat Brook and its tributaries are classified, for the most part, as either FW-1 or 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 1986 and 1991 indicate that water quality is good. Periodic problems occur during the summer because of elevated stream temperatures which threaten the cold water fisheries. Dissolved oxygen and almost all nutrients levels were within appropriate State criteria throughout the period of review. Occasional violations of State criteria were observed with regards to fecal coliform levels; however, the overall geometric mean determined for this parameter was low (52 MPN/100ml).

An overall improvement in Flat Brook water quality has been reported between 1977 and 1987 in past Inventory Reports. This improvement is the result of increasing dissolved oxygen levels; and decreasing nitrogen-containing compound levels, and total mercury concentrations. pH values have also shown significant increases. This 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. The 1986 305(b) report observed that water quality degraded to fair conditions in the summer months. Such seasonal degradation was not detected between 1983 and 1987 but has reappeared in the present assessment.

Biomonitoring at Flatbrookville had indicated some water quality improvements in the past. The benthic macroinvertebrate community was indicative of a healthy stream with improving community structure and diversity from 1977 to 1984. From 1984 to 1988, however, the percentage of pollution-tolerant forms has increased, suggesting that nutrient enrichment may be on the rise at this location.

The New Jersey Division of Fish, Game, and Wildlife describes Little Flat Brook, Bears Creek, Flat Brook, 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 supporting natural trout reproduction throughout the year.

Problem Assessment

Point Source Assessment

A limited number of point sources are present in the Flat Brook watershed. One, the N.J. Department of Corrections Mountainview-Stokes unit is currently under enforcement action and will soon have its wastewater hauled off site (see Point Source Pollution Table).

Nonpoint Source Assessment

The waters of the Flat Brook watershed are among the least polluted in the state. The conversion of summer 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 are categorized as fully supporting the "aquatic life support" designated use. Monitoring of fecal coliform bacteria indicates that the Flat

Brook appears to be partially supporting the primary contact (swimmable) designated use.

Monitoring Station List

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

See page III-56 for a map of the Flat Brook watershed.

WATER QUALITY INDEX PROFILES 1986-1990: **FLAT BROOK**

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVG. AND WORST 3-MONTH CONDITION
Big Flat Brook at Flatbrookville	AVG. WQI:	10	6	5	14	8	5	2	18	12 GOOD
	WORST 3 MONTHS:	JUNE-AUG.	JUNE-AUG.	JULY-SEPT.	JUNE-AUG.	JUNE-AUG.	JULY-SEPT.	JULY-SEPT.	SEPT.-NOV.	31 FAIR JUNE-AUG

LEGEND: WATER QUALITY INDEX DESCRIPTION

Note: an index value of 20 is equivalent to the level of water quality criteria.

WQI	Condition	Description
0-10	Excellent	Pollution minimal or absent; water uses met throughout the year.
11-25	Good	Pollution generally in low amounts; water uses periodically not met.
26-60	Fair	Pollution varies from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution present in high levels; water uses not met.
81-100	Very Poor	Pollution present in extremely high levels; severe stress to streamlife; water uses not met.
ID	Insufficient Data	

POINT SOURCE POLLUTION TABLE:
WATERSHED: Flat Brook

FACILITIES IN NONCOMPLIANCE

FACILITY	RECEIVING WATER	POLLUTANT	COMMENTS
N.J. Dept. of Corrections Moutainview-Stokes Unit. NJPDES 0029874	Tributary of the Big Flat Brook	Discharge of Treated Sanitary Wastewater.	The facilities NJPDES permit required cessation of discharges to surface water by July 1988. On June 1991, an Administrative Consent Order was executed to memorialize a compliance schedule. Wastewater will soon be hauled off site.

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 commercial lands. 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 as one proceeds 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 a total of 10 monitored stream miles. The Paulins Kill at Balesville experiences excessive fecal coliform and phosphorus concentrations, as well as some elevations in cadmium levels. Fecal coliform counts averaged 446 MPN/100 ml over the period of assessment, with 71 percent of all values exceeding the primary contact recreation criterion. Eighty-six percent of all phosphorus values exceeded the 0.05 mg/l criterion; with the average phosphorus value being 0.13 mg/l. This suggests that the stream is moderately enriched at this location. Metals analyses revealed some undesirable cadmium levels within the water column.

The Balesville station experiences deteriorated water quality during warm weather months, approaching poor conditions. High stream temperatures in July and August may cause periodic stress to the cold-water fishlife present.

Monitoring data from the Paulins Kill at Blairstown reveal better water quality as evidenced by reduced levels of phosphorus and fecal coliform bacteria. Coliform samples, although lower than upstream, still reveal impairment. Bacteria levels violated the state criterion in 42 percent of all samples from 1986 to 1990; hence, primary contact recreation in the stream is not recommended. Other chemical parameters do show generally good conditions, in contrast to Balesville, with total phosphorus and metals at acceptable levels. As at Balesville, elevated stream temperatures during warm weather are common, possibly causing stress to cold water fisheries.

In the uppermost reaches of the Paulins Kill, the East Branch has been evaluated by the Division of 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 Creeks 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 Assessment

Point Source Assessment

Past Inventory Reports have reported that the Upper Paulins Kill, from Newton to Paulins Kill Lake, was significantly impacted by the Newton sewage treatment facility. This facility has completed an upgrade and is no longer under enforcement action. It had been estimated that up to 95 percent of the nutrient loading in the Upper Paulins Kill had been from this facility. Improvements have also been completed in the Kittatiny Regional Board of Education STP, and Blair Academy STP (see Point Source Pollution Table). No facilities are reported to be currently under enforcement action within the watershed. In the Lower Paulins Kill reduced point source loadings and increased reaeration and dilution tend to improve water quality.

Nonpoint Source Assessment

A number of swampy areas from which the Paulins Kill flows and the contribution of suburban/agricultural runoff have acted to overload the assimilative capacity of the stream. This contributes to the fair water quality at Balesville and the eutrophication of Paulins Kill Lake below Balesville.

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 severe problem at times, although believed to be on the decline. Nonpoint sources have caused eutrophication in many of the lakes in this watershed, including Swartswood Lake.

Designated Use Assessment

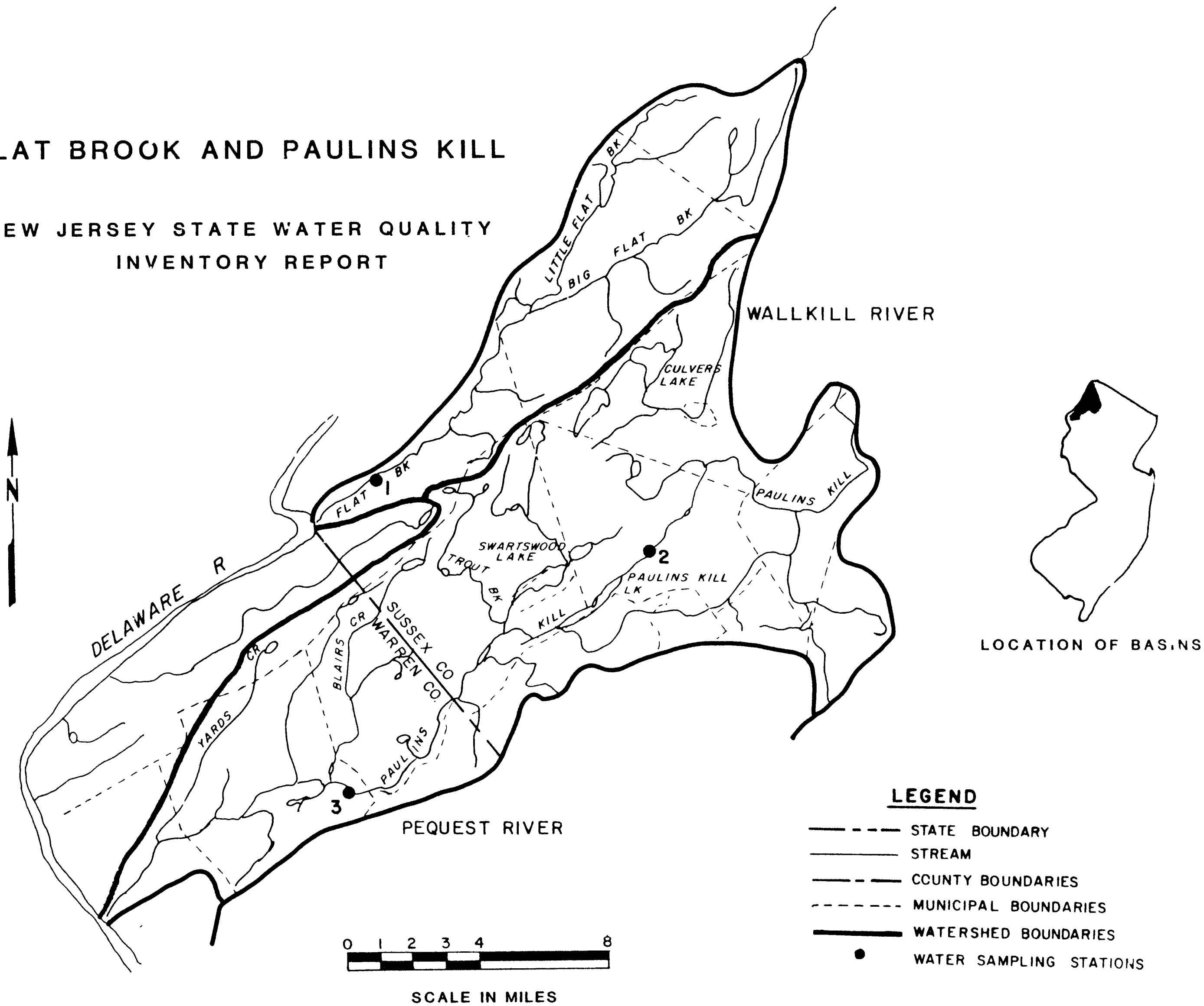
The Paulins Kill is not considered swimmable in the area where monitoring takes place. All waters appear to be supporting the "aquatic life support" designated use based upon fishery assessments. However, some stress to cold water fishlife (trout and smallmouth bass populations) from high water temperature in summer months may be occurring. Increased residential and commercial development forecasted for the watershed will undoubtedly 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



WATER QUALITY INDEX PROFILES 1986-1990: **PAULINS KILL**

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVG. AND WORST 3-MONTH CONDITION
Paulins Kill at Blairstown	AVG. WQI:	13	8	8	20	12	10	5	17	18 GOOD
	WORST 3 MONTHS:	JULY-SEPT.	FEB.-APRIL	MAR.-MAY	MAY-JULY	MAY-JULY	AUG.-OCT.	JUNE-AUG.	NOV.-JAN.	31 FAIR JULY-SEPT.
Paulins Kill at Balesville	AVG. WQI:	10	11	11	32	36	10	3	18	41 FAIR
	WORST 3 MONTHS:	JUNE-AUG.	OCT.-DEC.	OCT.-DEC.	JULY-SEPT.	JULY-SEPT.	AUG.-OCT.	JULY-SEPT.	APRIL-JUNE	58 FAIR JULY-SEPT.

LEGEND: WATER QUALITY INDEX DESCRIPTION

Note: an index value of 20 is equivalent to the level of water quality criteria.

WQI	Condition	Description
0-10	Excellent	Pollution minimal or absent; water uses met throughout the year.
11-25	Good	Pollution generally in low amounts; water uses periodically not met.
26-60	Fair	Pollution varies from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution present in high levels; water uses not met.
81-100	Very Poor	Pollution present in extremely high levels; severe stress to streamlife; water uses not met.
ID	Insufficient Data	

POINT SOURCE POLLUTION TABLE
WATERSHED: Paulins Kill

IMPROVEMENTS TO FACILITIES AFFECTING WATER QUALITY

FACILITY	RECEIVING WATER	POLLUTANT	COMMENTS
Kittatinny Regional High School NJPDES 0028894	Paulins Kill	Discharges 0.0038 MGD of Treated Sanitary Wastewater. Total Residual Chlorine and Phosphorous were frequently exceeded.	An Administrative Consent Order was executed July 1988 to memorialize a compliance schedule. Compliance was achieved and the ACO was terminated October 1990.
Newton STP NJPDES 0020184	Moore's Brook	Discharges about 1.0 mgd Total Residual Chlorine, Biochemical Oxygen Demand, Suspended Solids, Phosphorous and Ammonium-Nitrogen Limitations were exceeded frequently.	The facility was under an Administrative Consent Order for facility upgrade. The upgrade has been completed and the facility is substantially in compliance with its NJPDES Permit.
N. Warren Regional High School STP, Blairstown Warren County. NJPDES 0031046	Paulins Kill	Discharges Treated Sanitary Wastewater. Biochemical Oxygen Demand, Carbonaceous and Nitrogenous Biochemical Oxygen Demand, Ammonia - Nitrogen, Fecal Coliform Bacteria, Total Suspended Solids and Residual Chlorine Limitations have been violated.	An Administrative Consent Order for Discharge Noncompliance was issued. Permit compliance subsequent to the issuance of the order has improved. A compliance evaluation inspection conducted on July 1991 did not reveal any serious permit effluent violations.
Blair Academy STP NJPDES 0022101	Blair Brook	The STP has been discharging excessive Phosphorous levels.	Due to an Administrative Consent Order the facility has installed Phosphorous removal equipment.

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 commercial development is intensifying. 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 1986 through 1990 is characterized as good, although conditions do degrade to fair quality during warm-weather months. In addition, there are concerns over metals detected in water samples.

The Pequest River in the lower watershed is a cool, fast moving stream with numerous riffles. Therefore, reaeration results in sufficient in-stream dissolved oxygen levels during critical periods. Fecal coliform contamination, elevated phosphorus, and inorganic nitrogen are the principal water quality problems for the Pequest River at Pequest. Forty percent of all fecal coliform values exceeded 200 MPN/100ml, and all values resulted in a geometric mean of 227 MPN/100ml during the period of review. Total phosphorus was above the state water quality criterion for 45 percent of all values, indicating moderate nutrient enrichment. Inorganic nitrogen exceeded 2.5 mg/l in 15 percent of the samples collected. In the past, periodic high warm-weather un-ionized ammonia levels were detected. The present assessment found no such occurrence. Also, in contrast to the 1983-1987 reporting period, stream temperatures during the current assessment remained below the criterion for trout maintenance waters during July and August, indicating less thermal stress during these months than in the past.

The lower Pequest, from the confluence of Bear Creek down to the Delaware River, is regarded by the Department as an impaired waterway due to toxic discharges emanating from point sources. The contaminants of concern include arsenic, mercury, cadmium, lead, and beryllium. The criteria violated are USEPA's Federal Aquatic Life chronic criteria and USEPA's Federal human health criteria for exposure to carcinogens.

Biological monitoring of the Pequest River at Pequest from 1977 to 1984 for macroinvertebrates has shown some improvement in species diversity and the percentage of pollution intolerant individuals; however, the stream community is indicative of somewhat nutrient enriched conditions. 1988 biological sampling revealed the presence of chemical toxicity impacting the biota and reducing the numbers of taxa present. Oxford Textile is a suspected source of the contamination (see Point Source Assessment below).

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. Another exception is Furnace brook and the region on the lower Pequest just below Furnace Brook where a fish kill occurred in 1988 (see Point Source Assessment below).

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 Assessment

Point Source Assessment

Point source impacts to the Pequest River are thought to be limited (see Point Source Pollution Table for this watershed). Enforcement action will soon be lifted from the Pequest Sewer Company because of improvements in their discharge to the lower reach of the river. The Warren County Resource Recovery project in Oxford Township discharges stormwater into a tributary to the Pequest. This discharge continues to be in violation for excess suspended solids and hydrocarbons. Oxford Textiles Inc. (discharge to Furnace Brook) also continues to violate its permit limitations.

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 occurring 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 Assessment

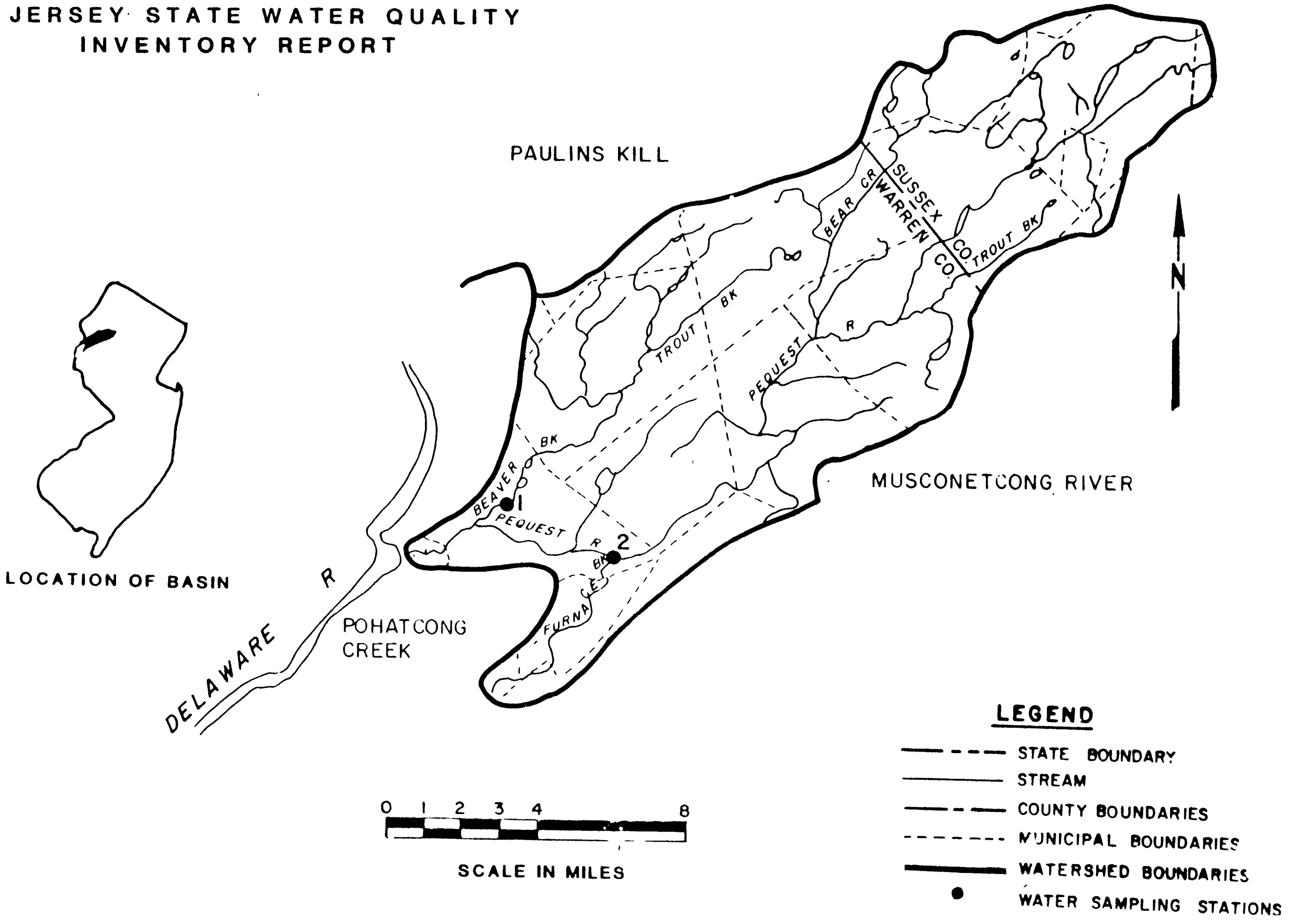
Because of bacterial contamination, the Lower Pequest cannot be considered swimmable. The Pequest River contains both Trout Maintenance and Nontrout waters. Where natural trout populations exist, summer water quality conditions may cause periodic stress to the fishlife because of high stream temperature and nutrient enrichment. Overall, fish communities of approximately 80 stream miles are assessed as healthy and therefore will support the "aquatic life 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 PROFILES 1986-1990: **PEQUEST RIVER**

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVG. AND WORST 3-MONTH CONDITION
Pequest River at Pequest	AVG. WQI:	7	8	15	25	22	12	5	18	23 GOOD
	WORST 3 MONTHS:	JUNE-AUG.	JAN.-MAR.	OCT.-DEC.	JULY-SEPT.	SEPT.-NOV.	JAN.-MAR.	MAY-JULY	AUG.-OCT.	34 FAIR JULY-SEPT.

LEGEND: WATER QUALITY INDEX DESCRIPTION

Note: an index value of 20 is equivalent to the level of water quality criteria.

WQI	Condition	Description
0-10	Excellent	Pollution minimal or absent; water uses met throughout the year.
11-25	Good	Pollution generally in low amounts; water uses periodically not met.
26-60	Fair	Pollution varies from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution present in high levels; water uses not met.
81-100	Very Poor	Pollution present in extremely high levels; severe stress to streamlife; water uses not met.
ID	Insufficient Data	

POINT SOURCE POLLUTION TABLE
WATERSHED: Pequest River

FACILITIES IN NONCOMPLIANCE

FACILITY	RECEIVING WATER	POLLUTANT	COMMENTS
N.J. Resource Recovery Plant. Oxford Twp., Warren County. NJPDES 0062065	Tributary of the Pequest River.	Discharge of Stormwater Runoff . Total Suspended Solids and Oil & Grease Permit Limitations are frequently violated.	None to report.
Oxford Textile Inc., Oxford Twp. Warren County. NJPDES 0004901	Furnace Brook via Cat Swamp.	Discharge of Treated Process Wastewater. Biochemical Oxygen Demand and Acute Toxicity Limitations have been violated.	An Administrative Order for Discharge Noncompliance was issued in 1991.

IMPROVEMENTS TO FACILITIES AFFECTING WATER QUALITY

FACILITY	RECEIVING WATER	POLLUTANT	COMMENTS
Pequest Sewer Co. NJPDES 0020605	Pequest River	Discharged excessive levels of Chlorine .	The facility has installed Dechlorination equipment.Two Administrative Orders for discharge Noncompliance have been issued for Chlorine and other Permit violations.

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 few NJPDES permitted discharges here. 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, a station located midway along the stream's length. Monitoring at this location represents approximately five stream miles. Water quality is fair at this location, with very high concentrations of fecal coliform, especially during the warmer seasons. Also present are high levels of total phosphorus, and elevated stream temperatures from June through August. Because of these problems, overall water quality declines to poor conditions during the summer.

Fecal coliform concentrations averaged nearly 1,090 MPN/100ml with 88 percent exceeding the 200 MPN/100ml criterion. Total phosphorus levels averaged over twice the 0.1 mg/l state criterion and were above this level in almost 80 percent of all samples collected. Other water quality indicators that show periodic problems are elevated stream temperatures, inorganic nitrogen, and un-ionized ammonia. Stream temperatures above the 19 degrees Celsius criterion for trout maintenance streams were frequent throughout the June to August period. Seven percent of the un-ionized ammonia values were greater than the state criterion for protection of coldwater fisheries. This coincidence of high temperatures and unionized 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 Assessment

Point Source Assessment

Pohatcong Creek and tributaries drain a predominantly agricultural area with one population center, Washington Borough in 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 Phillipsburg STP is currently under enforcement action (see Point Source Pollution Table for the Pohatcong Creek).

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 non-point 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 is 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 Assessment

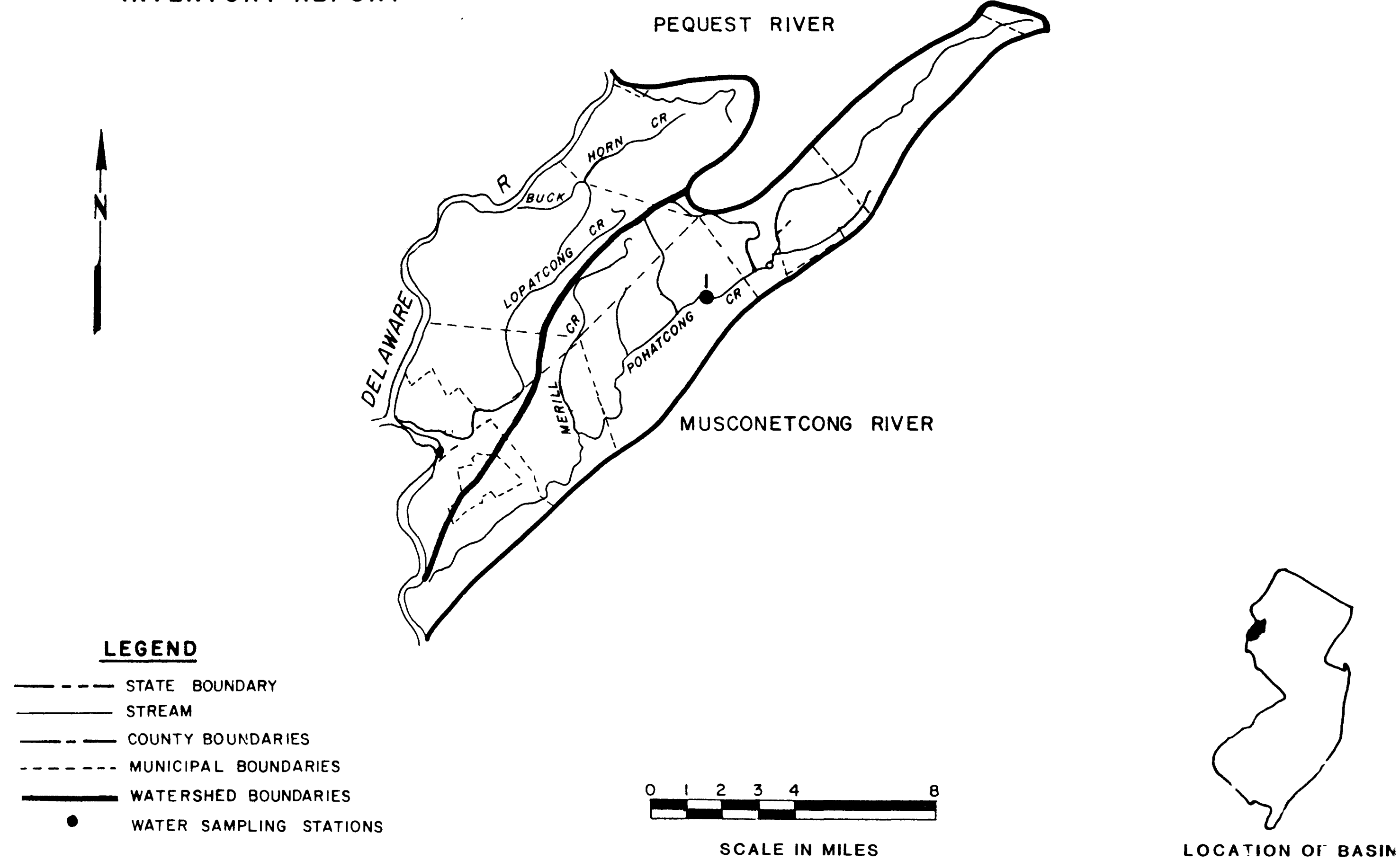
The monitored waters of Pohatcong Creek will not meet the swimmable designated use because of high fecal coliform levels. All streams will meet the "aquatic life support" designated use. Some waters, however, appear to be threatened: in the area of Washington, Pohatcong Creek's fisheries are threatened by wastewater discharges, while Merrill Creek's fish community is threatened by the construction of a 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



WATER QUALITY INDEX PROFILES 1986-1990: **POHATCONG CREEK**

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVG. AND WORST 3-MONTH CONDITION
Pohatcong Cr. at New Village	AVG. WQI:	10	18	8	42	24	5	5	18	39 FAIR
	WORST 3 MONTHS:	JUNE-AUG.	MAR.-MAY	MAR.-MAY	JUNE-AUG.	JULY-SEPT.	JULY-SEPT.	MAR.-MAY	SEPT.-NOV.	62 POOR JUNE-AUG.

LEGEND: WATER QUALITY INDEX DESCRIPTION

Note: an index value of 20 is equivalent to the level of water quality criteria.

WQI	Condition	Description
0-10	Excellent	Pollution minimal or absent; water uses met throughout the year.
11-25	Good	Pollution generally in low amounts; water uses periodically not met.
26-60	Fair	Pollution varies from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution present in high levels; water uses not met.
81-100	Very Poor	Pollution present in extremely high levels; severe stress to streamlife; water uses not met.
ID	Insufficient Data	

POINT SOURCE POLLUTION TABLE
WATERSHED: Pohatcong Creek

FACILITIES IN NONCOMPLIANCE

FACILITY	RECEIVING WATER	POLLUTANT	COMMENTS
Phillipsburg STP Warren County NJPDES 0024716	Lopatcong Creek	Discharge of Treated Sanitary and Industrial Wastewater. Oil and grease limitations are frequently violated. There are also collection system overflows and a bypass, resulting in the discharge of partially treated wastewater during heavy rains.	An Administrative Consent Order was executed in 1988 for eventual compliance by 1992.

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 has also been 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. The waters 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 based upon a yearly average, the Musconetcong River shows good water quality throughout its length. This is in contrast to the 1985-1987 assessment where overall water quality was only rated fair in the lower watershed. All stations during the present assessment however, degrade to fair conditions during the summer months.

The Musconetcong River 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 as pollution sinks to prevent nutrients from entering the river. The only water quality problem in the Musconetcong River at the outlet of Lake Hopatcong was elevated stream temperatures during the summer months that could pose a threat to the cold-water fish populations.

The Musconetcong River at Lockwood, although having good overall quality, experiences greater water pollution problems than at Hopatcong, with higher phosphorus and fecal coliform concentrations. Fecal bacteria levels are highest during periods of warm weather. Stream temperatures exceed the trout maintenance criterion also at this location during summer months. The quality of the Musconetcong at Beattystown is similar to that at Lockwood with regards to overall water quality and warm weather stream temperatures. At Beattystown, however, concentrations of total phosphorus are higher. Water quality criteria were exceeded in 43 percent of all samples collected from 1986 through 1990 (23 percent exceeded at Lockwood). Also in contrast to Lockwood, fecal coliform level were slightly lower at Beattystown. There was one high un-ionized ammonia level recorded at this station while none were observed at Lockwood.

Overall water quality at the two monitoring stations in the lower watershed, near Bloomsbury and at Riegelsville, contain good quality waters and show some improvement over the past period of review where both were classified as only fair. Both stations continue to exhibit excessive amounts of fecal coliform and total phosphorus. Both also show excessive amounts of total inorganic nitrogen in twenty-one percent of samples at Bloomsbury and thirty-three percent at Riegelsville. High stream temperatures in warm weather are a problem at Riegelsville. At Bloomsbury, supersaturated oxygen conditions occasionally exceed recommended levels. Riegelsville, in contrast to Bloomsbury, continues to have occasional violations of unionized ammonia and copper.

Biomonitoring in the Musconetcong near Bloomsbury confirms the presence of enriched stream conditions. In 1986, a high percentage of filter feeders were observed suggesting enrichment, while typical clean water organisms had accounted for slightly over half of the total sample. Subsequent biological monitoring in 1988 has indicated that enrichment continues and that instream water quality has further declined since 1986.

All 42 miles of the Musconetcong support 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 are 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 support healthy fish communities. All three support warm water species, while Cranberry Lake also contains populations of cold water fish.

Problem Assessment

Point Source Assessment

The Upper Musconetcong is impacted by industrial point sources in the Hackettstown region. Four point sources are presently under DEPE enforcement action for discharging inadequately treated wastewater (refer to the "Point Source Pollution" table for details). Two point sources previously under enforcement action are now in full permit compliance: M&M Mars in Hacketstown, and the Byram Township Intermediate School.

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 agricultural 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.

Willis 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 appear 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 Assessment

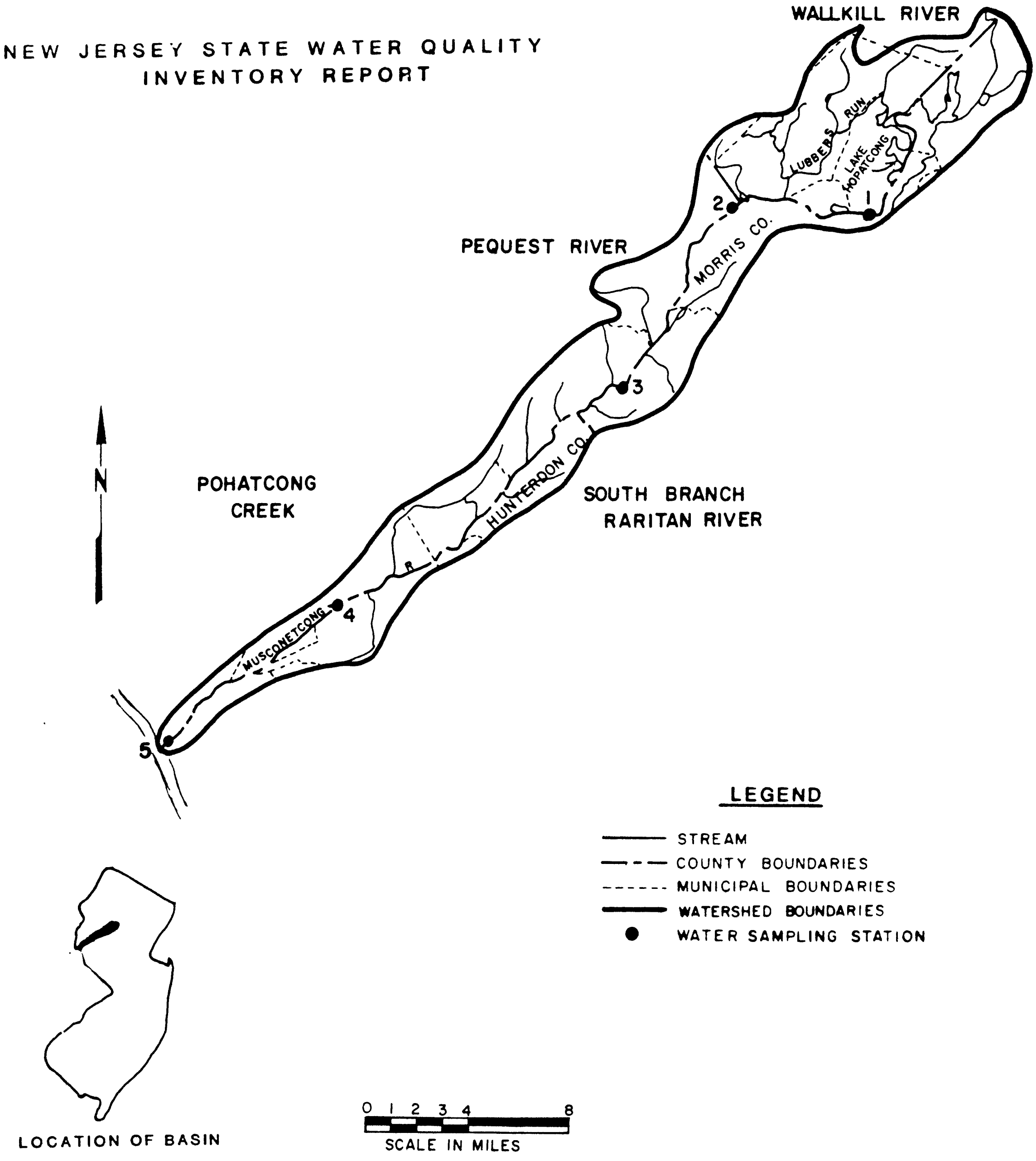
Approximately 20 of the 25 monitored miles of the Musconetcong River are considered not swimmable, only the section immediately below Lake Hopatcong will meet this designated use. The Musconetcong River contains generally healthy trout and smallmouth bass fisheries and is heavy stocked and utilized by fishermen.

As such, the river will fully support the "aquatic life designated use". A section of the river in the Bloomsbury area, however, is threatened by industrial pollution. Willis Brook contains a moderately degraded fisheries resource because of wastewater discharges. Hances and Trout Brooks have healthy fisheries, but they are also threatened. Lakes in the watershed generally support both the primary contact (swimmable) and "aquatic life designated uses".

Monitoring Station List

Map Number	Station Name and Classification
1	Musconetcong River at the outlet 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 PROFILES 1986-1990: **MUSCONETCONG RIVER**

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVG. AND WORST 3-MONTH CONDITION
Musconetcong River near Bloomsbury	AVG. WQI:	9	12	9	40	23	9	2	18	14 GOOD
	WORST 3 MONTHS:	JUNE-AUG.	JUNE-AUG.	FEB.-APRIL	JUNE-AUG.	SEPT.-NOV.	JULY-SEPT.	MAY-JULY	OCT.-DEC.	50 FAIR JUNE-AUG.
Musconetcong River at Lockwood	AVG. WQI:	12	7	4	21	12	8	7	17	17 GOOD
	WORST 3 MONTHS:	JUNE-AUG.	AUG.-OCT.	JAN.-MAR.	JULY-SEPT.	JULY-SEPT.	JULY-SEPT.	AUG.-OCT.	MAR.-MAY	35 FAIR JULY-SEPT.
Musconetcong River at Beattystown	AVG. WQI:	11	6	10	20	16	8	11	17	19 GOOD
	WORST 3 MONTHS:	JUNE-AUG.	DEC.-FEB.	JULY-SEPT.	APRIL-JUNE	AUG.-OCT.	SEPT.-NOV.	JULY-SEPT.	AUG.-OCT.	31 FAIR JUNE-AUG.

LEGEND: WATER QUALITY INDEX DESCRIPTION

Note: an index value of 20 is equivalent to the level of water quality criteria.

WQI	Condition	Description
0-10	Excellent	Pollution minimal or absent; water uses met throughout the year.
11-25	Good	Pollution generally in low amounts; water uses periodically not met.
26-60	Fair	Pollution varies from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution present in high levels; water uses not met.
81-100	Very Poor	Pollution present in extremely high levels; severe stress to streamlife; water uses not met.
ID	Insufficient Data	

WATER QUALITY INDEX PROFILES 1986-1990: **MUSCONETCONG RIVER continued**

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVG. AND WORST 3-MONTH CONDITION
Musconetcong River at Riegelsville	AVG. WQI:	11	6	9	32	19	9	5	18	25 GOOD
	WORST 3 MONTHS:	JUNE-AUG.	MAR.-MAY	FEB.-APRIL	JUNE-AUG.	AUG.-OCT.	AUG.-OCT.	JULY-SEPT.	AUG.-OCT.	43 FAIR JUNE-AUG.
Musconetcong River at Lake Hopatcong	AVG. WQI:	17	6	10	10	11	7	3	18	18 GOOD
	WORST 3 MONTHS:	JUNE-AUG.	AUG.-OCT.	AUG.-OCT.	JUNE-AUG.	APRIL-JUNE	APRIL-JUNE	JUNE-AUG.	JUNE-AUG.	37 FAIR JUNE-AUG.

LEGEND: WATER QUALITY INDEX DESCRIPTION

Note: an index value of 20 is equivalent to the level of water quality criteria.

WQI	Condition	Description
0-10	Excellent	Pollution minimal or absent; water uses met throughout the year.
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61-80	Poor	Pollution present in high levels; water uses not met.
81-100	Very Poor	Pollution present in extremely high levels; severe stress to streamlife; water uses not met.
ID	Insufficient Data	

POINT SOURCE POLLUTION TABLE WATERSHED: Musconetcong River

FACILITIES IN NONCOMPLIANCE

FACILITY	RECEIVING WATER	POLLUTANT	COMMENTS
Garden State Truck Plaza. Bloomsbury Borough, Hunterdon County. NJPDES 0023094	Musconetcong River	Discharge of Treated Sanitary Wastewater. An Administrative Order for Discharge Noncompliance was issued in March of 1991 for Total Residual Chlorine , Dissolved Oxygen , Oil, Grease and Chemical Oxygen Demand Effluent violations	An Administrative Hearing has been requested.
Mt. Arlington Sanitation, Morris County. NJPDES 0026212	Lake Hopatcong	Discharge of Treated Sanitary Wastewater. NJPDES permit calls for the cessation of discharge by July 1988.	An Administrative Order and Notice of Civil Administrative Penalty assessment was issued in 1990 for the facilities failure to comply. The matter is before the office of Administrative Law.
Musconetcong Sewerage Authority. NJPDES 0027821	Willis Brook	Discharge of Treated Domestic Wastewater.	The facility is upgrading and expanding to achieve compliance with Advanced Secondary Treatment Limitations pursuant to a Judicial Consent Order with final compliance slated for September 1993.
Diamond Hill Estates STP. NJPDES 0028592	Hances Brook	Discharge of Treated Sanitary Wastewater, Dissolved Oxygen, Biochemical Oxygen Demand, Suspended Solids, Residual Chlorine, Oil and Grease Effluent Limitations are repeatedly violated.	Administrative Orders for Discharge Noncompliance were issued August 1989 and March 1987 but violations continue to occur at the same frequency.

IMPROVEMENTS TO FACILITIES AFFECTING WATER QUALITY

FACILITY	RECEIVING WATER	POLLUTANT	COMMENTS
M&M Mars, Hackettstown , Warren County. NJPDES 0004928	Bower's Brook	Discharge of Cooling Water and Stormwater Runoff. Chemical Oxygen Demand, Total Dissolved Solids, Oil & Grease and Total Suspended Solids Limitations have been violated.	In April ,after an Administrative Order for Discharge Noncompliance was issued ,the cooling water discharge was ceased and further violations ceased.
Byram Twp. Intermediate School. Sussex County. NJPDES 0022632	Lubber's Run	Discharge of Treated Sanitary Wastewater. Residual Chlorine and Phosphorous limitations had been violated.	The facility completed an upgrade and achieved compliance with these parameters pursuant to an Administrative Consent Order executed June 1988.

7. DELAWARE RIVER TRIBUTARIES - HUNTERDON COUNTY

Watershed Description

The tributaries to this 45 mile length of the Delaware River include Hakihokake, Harihokake, Nishisakawick, 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 Wickecheoke 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 Reservoirs, 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. 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 which lies between the Musconetcong River and the Assunpink Creek. The streams in this section are small with summer flows generally falling below 20 cfs. Wickecheoke Creek has good overall water quality, with conditions degrading to fair in mid-summer. Water quality problems in this creek include elevated stream temperatures in warm weather periods and excessive levels of total nitrogen. Some limited violations (7 percent) of State criteria for fecal coliform were recorded yet the geometric mean for the period of assessment (68 MPN/100 ml) was low. Total inorganic nitrogen records exceeded recommended levels in 44 percent of samples collected with most elevated readings occurring during the late spring and summer months.

Un-ionized ammonia exceeded the State water quality criterion for trout maintenance waters in 10 percent of all samples with violations usually occurring in July. pH values indicate highly alkaline conditions due to the nature of the region's bedrock material. No excessive metal values within the water column were observed during this period of assessment.

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. Wickecheoke 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 fresh water streams to species tolerant of extremely saline conditions.

Problem Assessment

Point Source Assessment

Any introduction of pollutants into these streams can have a deleterious impact, especially during low flow periods. No permitted facilities are currently reported to be out of compliance within this watershed as of the end of 1991 (see Point Source Pollution Table).

The Texas Eastern facility in West Amwell, Hunterdon County, is a hazardous waste site and is suspected to be polluting Alexauken Creek with PCBs, PHC and dioxin.

Nonpoint Assessment

Locatcong and Wicheckeoke Creeks are 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 Assessment

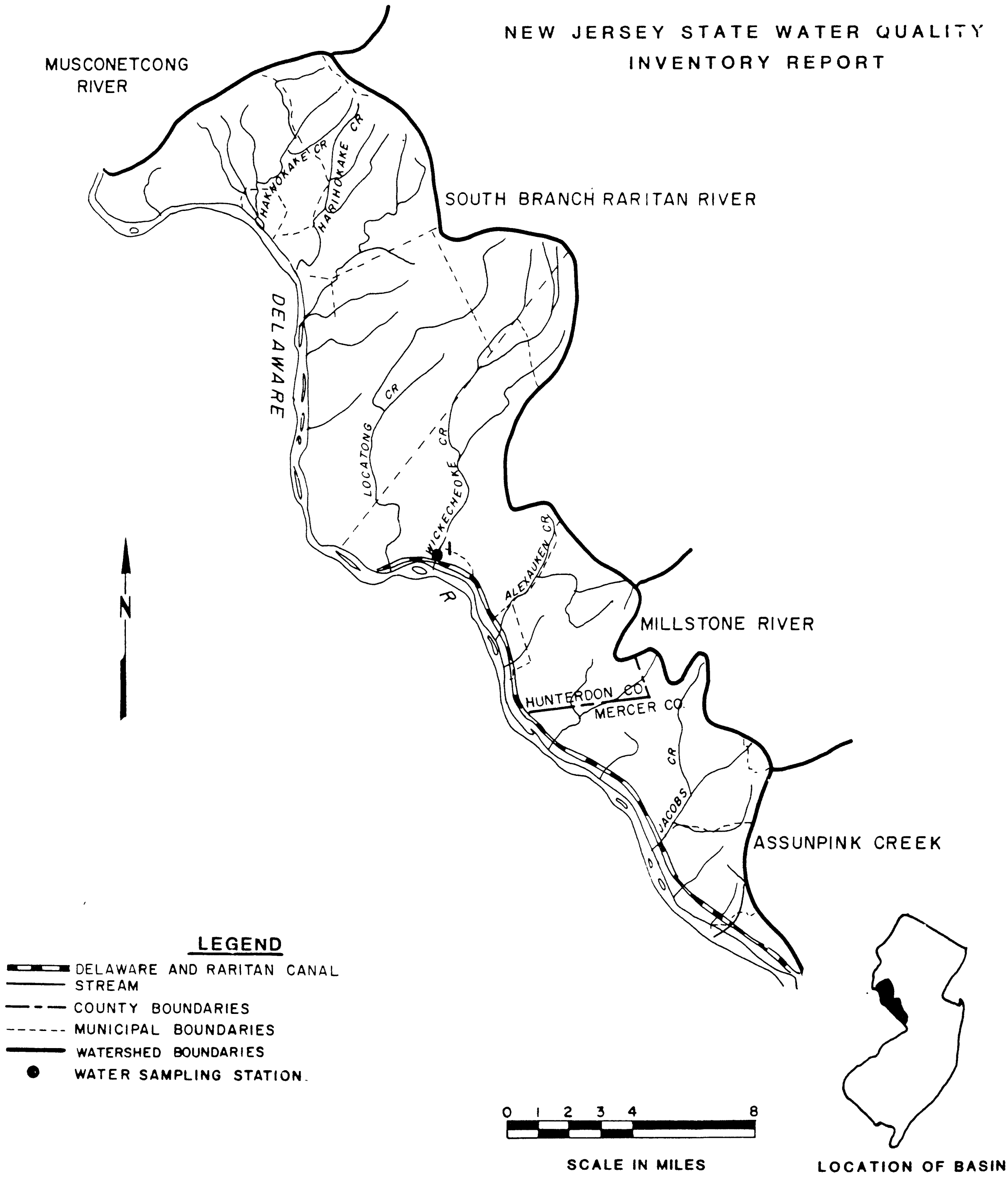
Of the Delaware River tributaries discussed in this segment, Wickecheoke is the only tributary monitored for instream water quality and does not support primary contact recreation based upon fecal coliform levels.

Based upon fishery assessments, Lockatong and Alexauken Creeks support the "aquatic life support" designated use (approximately 20 miles). Wickecheoke Creek (14 stream miles) in contrast, is considered to have a moderately degraded fishery and, hence, is assessed as partially supporting this designated use.

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 PROFILES 1985-1990: **DELAWARE RIVER TRIBUTARIES: HUNDERTON COUNTY**

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVG. AND WORST 3-MONTH CONDITION
Wickecheoke Cr. at Stockton	AVG. WQI: WORST 3 MONTHS:	12 JULY-SEPT.	7 MAY-JULY	14 JULY-SEPT.	14 APRIL-JUNE	21 JUNE-AUG.	6 FEB.-APRIL	6 JULY-SEPT.	17 SEPT.-NOV.	20 Good 39 Fair JUNE-AUG.

LEGEND: WATER QUALITY INDEX DESCRIPTION Note: an index value of 20 is equivalent to the level of water quality criteria.

WQI	Condition	Description	WQI	Condition	Description
0-10	Excellent	Pollution minimal or absent; water uses met throughout the year.	61-80	Poor	Pollution present in high levels; water uses not met.
11-25	Good	Pollution generally in low amounts; water uses periodically not met.	81-100	Very Poor	Pollution present in extremely high levels; severe stress to streamlife; water uses not met.
26-60	Fair	Pollution varies from moderate to high levels; certain water uses prohibited.	ID	Insufficient Data	

POINT SOURCE POLLUTION TABLE
WATERSHED: Delaware River Tributaries

FACILITIES IN NONCOMPLIANCE

FACILITY	RECEIVING WATER	POLLUTANT	COMMENTS
Lester D. Wilson School STP. NJPDES 0027553	Nishisakawich Creek	Discharge of Treated Sanitary Wastewater. The facility continues to violate Biochemical Oxygen Demand and Ammonium-Nitrogen permit limitations.	The facility is upgrading pursuant to an Administrative Consent Order issued June 1991.
Trap Rock Industries, Delaware Twp., Hunterdon County. NJPDES 0032271	Delaware and Raritan Canal.	Discharge of Stormwater Runoff containing High Suspended Solids.	An Administrative Order for Discharge Noncompliance was issued March 29, 1991. A hearing has been requested. Some improvements have been implemented.
Johnstone Training Center. NJPDES N/A	Delaware River	Municipal Discharger exceeding Biochemical Oxygen Demand and Total Suspended Solids.	None to report.
Mercer County Correctional Facility. NJPDES N/A	Moores Creek	Municipal Discharger exceeding Biochemical Oxygen Demand and Total Suspended Solids.	None to report.

POINT SOURCE POLLUTION TABLE
WATERSHED: Wickecheoke Creek

IMPROVEMENTS TO FACILITIES AFFECTING WATER QUALITY

FACILITY	RECEIVING WATER	POLLUTANT	COMMENTS
Delaware Twp. MUA NJPDES 0027561	Wickecheoke Creek	Discharge of about .065 MGD. The discharge had exceeded the permit limitations for Total Residual Chlorine.	The facility installed dechlorination equipment and has been in compliance with it's NJPDES permit since.
Magnesium Elektron, Kingwood Twp, Hunterdon County. NJPDES 0027537	Wickecheoke Creek	Discharge of Process Wastewater. Total Organic Carbon limitations were also frequently violated.	An Administrative Consent Order for Discharge Noncompliance was issued July of 1989. The facility ceased discharging subsequent to issuance of the order.
Delaware Twp. MUA NJPDES 0027561	Wickecheoke Creek	Discharge of about .065 MGD. The discharge had exceeded the permit limitations for Total Residual Chlorine.	The facility installed dechlorination equipment and has been in compliance with it's NJPDES permit since.
Magnesium Elektron, Kingwood Twp, Hunterdon County. NJPDES 0027537	Wickecheoke Creek	Discharge of Process Wastewater. Total Organic Carbon Limitations were also Frequently violated.	An Administrative Consent Order for Discharge Noncompliance was issued July of 1989. The facility ceased discharging subsequent to issuance of the order.

POINT SOURCE POLLUTION TABLE
WATERSHED: Delaware River Tributaries (continued)

IMPROVEMENTS TO FACILITIES AFFECTING WATER QUALITY

FACILITY	RECEIVING WATER	POLLUTANT	COMMENTS
James River Corp. Milford Mill Facility. Milford Boro, Hunterdon County. NJPDES 0004456	Delaware River	Discharge of Treated Process Wastewater. Biochemical Oxygen Demand Limitations were frequently violated. The facility completed an upgrade pursuant to an Administrative Consent Order executed April 1989. The Consent Order was terminated May 10, 1991.	The facility has recently been bypassing secondary treatment to avoid overflows from the primary clarifier during heavy rain when stormwater overloads this unit. The facility has proposed remedial measures slated to be put in by December 1991.
Frenchtown STP, Hunterdon County. NJPDES 0029831	Delaware River	Biochemical Oxygen Demand and Total Suspended Solids limitations were frequently violated.	The facility completed an upgrade pursuant to an Administrative Consent Order dated June 1988.
Carney's Point Twp. STP. NJPDES 0021601	Delaware River	Sanitary Wastewater	Completed a facility upgrade pursuant to an Administrative Consent Order.
Penns Grove STP NJPDES 0024023	Delaware River	Sanitary Wastewater	Completed a facility upgrade pursuant to an Administrative Consent Order.
Pennsville STP NJPDES 0021598	Delaware River	Sanitary Wastewater	Completed an upgrade pursuant to an Administrative Consent Order.
East Greenwich STP NJPDES N/A	Tributary of the Delaware	Sanitary Wastewater	Facility has closed and is now sending it's effluent to the Gloucester County MUA.

POINT SOURCE POLLUTION TABLE
WATERSHED: Delaware River Tributaries (continued)

IMPROVEMENTS TO FACILITIES AFFECTING WATER QUALITY

FACILITY	RECEIVING WATER	POLLUTANT	COMMENTS
Palmyra STP NJPDES N/A	Delaware River	Facility now complies with the federally mandated secondary treatment or has eliminated sub standard discharges	None to report.
Riverton STP NJPDES N/A	Delaware River	Facility now complies with the federally mandated secondary treatment or has eliminated sub standard discharges	None to report.
Baldwin Run STP NJPDES 0024481	Delaware River	Sanitary Wastewater	Due to reagionalization in Camden County, this facility has ceased discharging and it's effluent is now being treated at the Camden County MUA Delaware No. 1 facility in Camden City. The effluent is then discharged into the Delaware River.
Oaklyn STP NJPDES 0025003	Delaware River	Sanitary Wastewater	Due to reagionalization in Camden County, this facility has ceased discharging and it's effluent is now being treated at the Camden County MUA Delaware No. 1 facility in Camden City. The effluent is then discharged into the Delaware River.
Pennsauken STP NJPDES 0025348	Delaware River	Sanitary Wastewater	Due to reagionalization in Camden County, this facility has ceased discharging and it's effluent is now being treated at the Camden County MUA Delaware No. 1 facility in Camden City. The effluent is then discharged into the Delaware River.

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. Shabacunk Creek and Miry Run are the major tributaries to the Assunpink. A number of impoundments exist along Assunpink Creek and its tributaries for flood control and other purposes.

Land uses in this watershed are both agricultural/undeveloped and urban/suburban. Population is centered in Trenton and surrounding areas. 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 the Assunpink 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 concentrations where total phosphorus was above its criterion in 53 percent of samples collected. Fecal coliform levels averaged 31 MPN/100ml during the 1986 to 1990 period with only 3 percent exceeding the 200 MPN/100ml criterion. This represents a slight improvement over conditions observed in the prior assessment. Overall stream quality is recorded to be relatively stable throughout the year at this location.

The Assunpink Creek at Trenton contains water quality conditions that are typical of highly developed urban areas of the State. fecal and total coliform levels averaged 1,289 and 5,530 MPN/100ml, respectively. These values represent roughly twice the levels observed in the last assessment. Seventy-five percent of all fecal coliform samples exceeded state criteria during the present period of assessment. All total phosphorus samples were above the 0.1 mg/l recommended limit. The mean phosphorus level at this station was 0.6 mg/l, or six times the recommended limit.

Total inorganic nitrogen levels also indicate high nutrient enrichment of the creek; seventy-three percent of all samples exceeded recommended levels. Overall, water quality conditions in the lower Assunpink degrade to poor conditions during the fall months.

Biomonitoring of Assunpink Creek at Trenton continues to indicate excessive nutrient enrichment and some toxic influence from an unknown source. Only 1 - 2% of the macroinvertebrate population sampled were regarded as intolerant of organic enrichment or low dissolved oxygen conditions. In contrast, the remaining 98% were all forms tolerant of varying degrees of pollution. Previous biological data reveal polluted conditions existing at this station since the biological monitoring began in 1977. In 1984 the impact of toxic substances (or substance) began to make an observable influence upon the biota by depressing the numbers of individuals and taxa in the region. This condition has since been observed to the present time.

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 as evidenced by 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.

<u>Problem Assessment</u>

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. No dischargers are currently reported to be out of compliance in this watershed.

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 Assessment

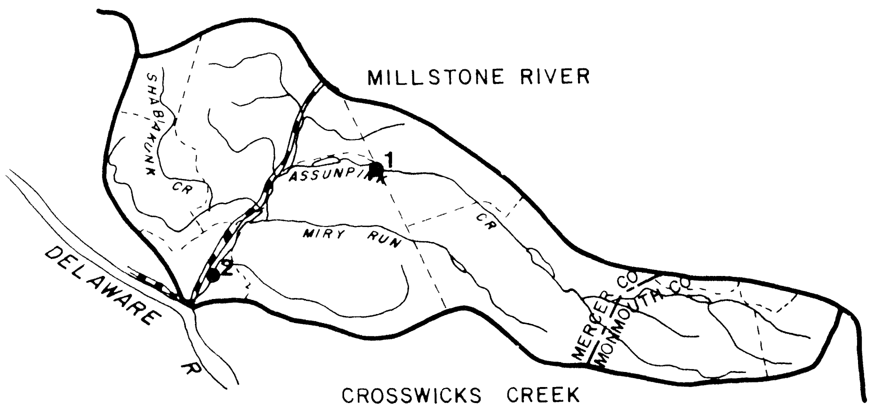
The "aquatic life support" designated use is supported in the upper Assunpink Creek watershed, and partially supported in the Trenton area, (the lower 5 miles) based upon fishery assessments. The highly enriched conditions in the Lower Assunpink and degraded biological community indicates that stress occurs to the resident warm water fisheries. The primary contact (swimmable) use is fully supported at the Clarksville monitoring location, and not supported 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



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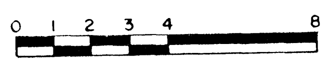
LEGEND

- STATE BOUNDARY
- STREAM
- COUNTY BOUNDARIES
- MUNICIPAL BOUNDARIES
- WATERSHED BOUNDARIES
- WATER SAMPLING STATIONS



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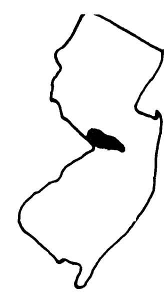


LOCATION OF BASIN

WATER QUALITY INDEX PROFILES 1986-1990: **ASSUNPINK CREEK**

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVG. AND WORST 3-MONTH CONDITION
Assunpink Cr. near Clarksville	AVG. WQI: WORST 3 MONTHS:	3 JUNE-AUG.	10 SEPT-NOV	9 OCT.-DEC.	9 NOV.-JAN.	27 JULY-SEPT.	3 NOV.-JAN.	0 JULY-SEPT.	9 NOV.-JAN.	16 GOOD 22 GOOD JULY-SEPT.
Assunpink Cr. at Trenton	AVG. WQI: WORST 3 MONTHS:	4 JUNE-AUG.	20 OCT.-DEC.	14 FEB.-APRIL	49 MAY-JULY	42 JULY-SEPT.	7 JAN.-MAR.	1 JAN.-MAR.	15 JULY-SEPT.	55 FAIR 78 POOR SEPT.-NOV.

LEGEND: WATER QUALITY INDEX DESCRIPTION Note: an index value of 20 is equivalent to the level of water quality criteria.

WQI	Condition	Description
0-10	Excellent	Pollution minimal or absent; water uses met throughout the year.
11-25	Good	Pollution generally in low amounts; water uses periodically not met.
26-60	Fair	Pollution varies from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution present in high levels; water uses not met.
81-100	Very Poor	Pollution present in extremely high levels; severe stress to streamlife; water uses not met.
ID	Insufficient Data	

9. CROSSWICKS CREEK

Watershed Description

Crosswicks Creek is 25 miles long and 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 include 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. 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. A third ambient monitoring station, Crosswicks Creek at Groveville, was discontinued in 1983.

Water quality in Crosswicks Creek at Extonville is observed to be fair with monitoring indicating elevated fecal coliform and phosphorus levels. Although biochemical oxygen demand is periodically high (over 5.0 mg/l), dissolved oxygen concentrations were within the State criterion. Dissolved oxygen saturation levels are on occasion low, but this may be due to ground water contribution to the base stream flow. The fecal coliform geometric average at Extonville from 1986 through 1990 was 271 MPN/100ml. Total phosphorus averaged 0.25 mg/l with 90 percent of the values being greater than the State criterion. Inorganic nitrogen is also occasionally high. pH readings in the creek were predominantly neutral.

The Upper Crosswicks Creek watershed appears to be moderately to severely degraded. Intensive survey results from 1984 reveal nutrient enrichment, 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, noticeable chlorine odors and chloroform were reported in Upper Crosswicks Creek. Macroinvertebrate sampling of the Upper Crosswicks Creek watershed also indicate generally poor water quality, with pollution tolerant organisms prevalent throughout.

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. Most (86%) of total phosphorus samples taken exceeded the 0.1 mg/l State criterion, while fecal coliform was excessive in 88 percent of all samples. Doctors Creek experiences reduced overall 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) support healthy warm water fish communities. A second Black Creek (4 miles), a tributary to Crosswicks Creek, was assessed to be in the same condition. Duck Creek's warm water fishery is moderately degraded, as was North Run (9 miles), a tributary to Crosswicks, because of poor bass reproduction. An unnamed tributary to Doctors Creek supports a healthy warm water fish population.

Problem Assessment

Point Source Assessment

Historically, sewage treatment plant effluent, together with runoff and other nonpoint sources, have been suspected of causing nutrient enrichment and poor water quality in the headwaters of Crosswicks Creek. The only facility currently under enforcement action within the watershed is the Albert Wagner Youth Correctional Facility which discharges into Crosswicks Creek (see Point Source Pollution Table). The sewage treatment plant serving the Northern Burlington County High School (a former discharger of excess BOD, suspended solids, and chlorine) has improved its discharge and is no longer regarded as contributing to water quality problems in the watershed.

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 have 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, are 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 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 road and bridge construction.

The 17 mile long Doctors Creek receives 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 receives 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 receives increasing amounts of storm sewer effluent. Back Creek is believed to be 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 receive high levels of siltation from local plant nursery stock operations.

Designated Use Assessment

Most portions of the Crosswicks Creek watershed previously assessed by the New Jersey Division of Fish Game and Wildlife are regarded as supporting the "aquatic life" designated use - only Duck Creek and North Run are regarded as partially supporting the use. Up-to-date biological assessments of Crosswicks and Doctors Creek are currently unavailable; hence, no recent determination of aquatic life support is available. The macroinvertebrate community of Crosswicks Creek itself was performed in 1984. Data suggested that fishlife may be stressed in the upper watershed. As such, this section is considered to be partially supporting the "aquatic life" use. The survey indicated, however, that the use is met in the lower reaches of Crosswicks Creek.

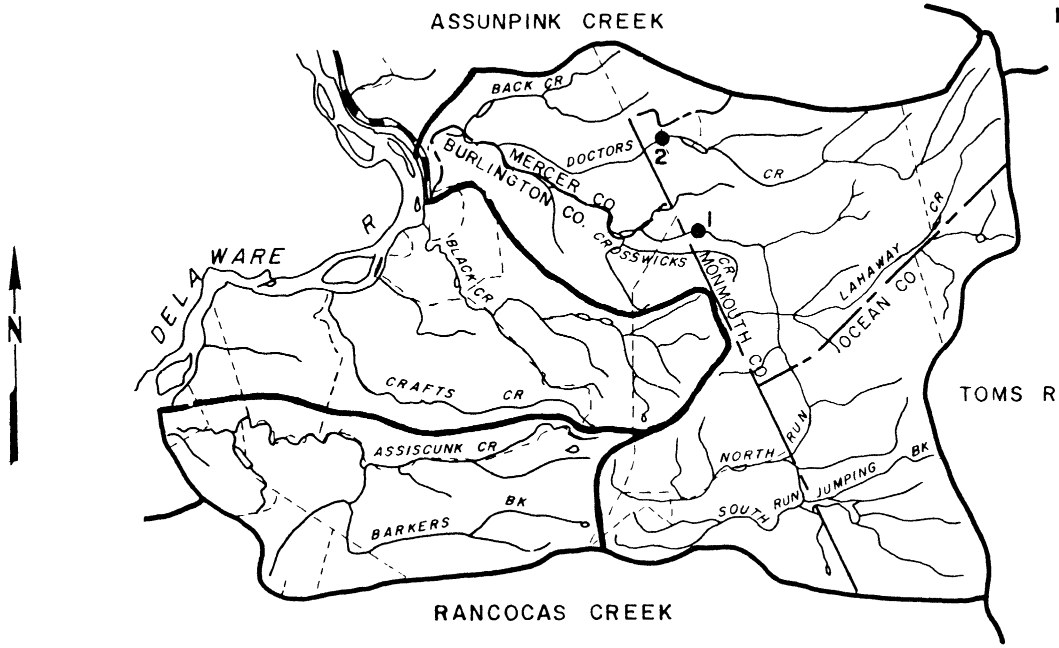
Swimmable status can not be assigned to either Crosswicks or Doctors Creek based upon the fecal coliform bacterial levels recorded at the two monitoring locations.

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

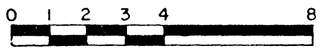
CROSSWICKS CREEK

NEW JERSEY STATE WATER QUALITY INVENTORY REPORT

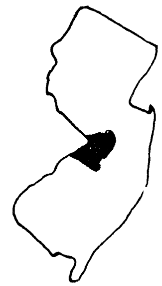


LEGEND

- STATE BOUNDARY
- STREAM
- COUNTY BOUNDARIES
- MUNICIPAL BOUNDARIES
- WATERSHED BOUNDARIES
- WATER SAMPLING STATIONS



SCALE IN MILES



LOCATION OF EASIN

WATER QUALITY INDEX PROFILES 1986-1990: **CROSSWICKS CREEK**

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVG. AND WORST 3-MONTH CONDITION
Crosswicks Cr. at Extonville	AVG. WQI:	3	24	13	25	27	5	2	7	29 FAIR
	WORST 3 MONTHS:	JUNE-AUG.	SEPT.-NOV.	JAN.-MAR	JUNE-AUG.	JULY-SEPT.	SEPT.-NOV.	JUNE-AUG.	MAR-MAY	45 FAIR MAY-JULY
Doctors Cr. at Allentown	AVG. WQI:	3	13	14	41	23	4	4	5	31 FAIR
	WORST 3 MONTHS:	JUNE-AUG.	AUG.-OCT.	JUNE-AUG.	MAY-JULY	AUG.-OCT.	JAN-MAR.	JUNE-AUG.	JUNE-AUG.	44 FAIR MAY-JULY

LEGEND: WATER QUALITY INDEX DESCRIPTION

Note: an index value of 20 is equivalent to the level of water quality criteria.

WQI	Condition	Description
0-10	Excellent	Pollution minimal or absent; water uses met throughout the year.
11-25	Good	Pollution generally in low amounts; water uses periodically not met.
26-60	Fair	Pollution varies from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution present in high levels; water uses not met.
81-100	Very Poor	Pollution present in extremely high levels; severe stress to streamlife; water uses not met.
ID	Insufficient Data	

POINT SOURCE POLLUTION TABLE:
WATERSHED: Crosswicks Creek

FACILITIES IN NONCOMPLIANCE

FACILITY	RECEIVING WATER	POLLUTANT	COMMENTS
Albert C. Wagner Youth Correctional Facility. NJPDES N/A	Crosswicks Creek	Municipal Discharger of Biochemical Oxygen Demand and Total Suspended Solids.	None to report

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 of 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 approximately 20 to 25 NJPDES permitted discharges here, of which some 17 to 20 are municipal and the rest 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

The North and South Branches have background pH ranges which are indicative of the Pinelands area: 3.5 - 5.5 SU. Ambient monitoring records in the overall watershed indicate water quality to range from excellent to fair: water quality is best in the upper reaches of the North Branch, and in the waters within local State forestlands; and poorest in the lower reaches of the South Branch Rancocas.

McDonalds Branch, a tributary of the North Branch Rancocas, is sampled as part of the USGS National Hydrologic Benchmark Program for determining natural or background conditions. This location is in Lebanon State Forest in the heart of the Pinelands area and represents unimpaired background physical and water quality characteristics indicative of the Pinelands area. Dissolved oxygen saturation is low, averaging 39 percent, due principally to the fact that groundwater is providing much of the base flow at this location, and that surface flow is often slack which in turn can slow aeration. The mean pH was 4.1 SU based upon records from 1986 to 1990. Also typical of unimpacted Pinelands waters: nutrient inputs are very limited.

The North Branch of Rancocas Creek is routinely sampled in downstream order, at Browns Mills, at Pemberton, and at Mt. Holly. Overall water quality at these three locations can be characterized as good to excellent, with fair conditions occurring during the warm months at Mt. Holly. Dissolved oxygen concentrations are adequate for warm-water fisheries in the North Branch. Nutrient enrichment is low at both Browns Mills and Pemberton. At Mt. Holly, however, excessive nutrient inputs occur as evidenced by total phosphorus levels and above normal pH values. Total phosphorus exceeded the State criterion in 73 percent of samples taken at Mt. Holly during the period of review. Fecal coliform counts gradually increase as one proceeds downstream. Observed levels are comparatively low at Browns Mills and slightly higher at Pemberton, with geometric means being 10 and 42 MPN/100ml respectively. At Mt. Holly, coliform levels increase significantly (mean = 163 MPN/100ml) with 57 percent exceeding the State criterion. One elevated value each of lead and copper were found at Pemberton between 1983 and 1987. This was not observed during the present period of review, however, an elevated mercury value was detected at Mt. Holly.

The South Branch of Rancocas Creek is of good to fair quality as sampled at Vincentown and Hainesport respectively. During the late spring, water quality degrades at both stations; however, quality does remain within the category of "fair" through these periods. Both stations show the effects of pollution in the form of high nutrient and fecal bacteria concentrations. As in the North Branch, water quality worsens in a downstream direction. Total phosphorus averages 0.17 mg/l at Vincentown and 0.25 mg/l at Hainesport. At Vincentown 66 percent of all total phosphorus records exceeded standards, while at Hainesport all samples were in violation of standards. Fecal coliform increased from a geometric mean of 193 MPN/100ml at Vincentown (46% in violation) to 693 MPN/100ml (83% in violation) at Hainesport during the period of review. The low dissolved oxygen saturation values during the summer may indicate ground water discharges to base stream flows.

Biological monitoring of the South Branch Rancocas at Lumberton reveals a fauna adapted to heavy silt deposition and to moderate levels of nutrient enrichment. Data from 1986 suggest similar conditions.

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 Assessment

Point Source Assessment

The North and South Branches of Rancocas Creek suffer from low to moderate amounts of water pollution coming from both point and nonpoint sources. Delran STP (discharge to mainstem) is still under Department enforcement action and is the only point source enforcement action currently underway in the watershed (see Point Source Pollution Table). The following two dischargers have improved the quality of their discharge and are no longer undergoing enforcement action: the Riverside STP (discharge to mainstem) and the Elmwood Road STP in Evesham Twp. (discharge to South West Branch Rancocas). 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 (sediment) 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 fish kills are suspected to be the result of pollution coming from the spreading of sludge on local farm 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 of suffering 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 of being 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 Assessment

Fecal coliform bacteria monitoring indicates that the McDonalds Branch fully supports primary contact (swimming) recreation as does the North Branch Rancocas at Browns Mills. Primary contact use is partially supported in the North Branch Rancocas at Pemberton. Swimming is not supported on the North Branch at Mount Holly or the South Branch Rancocas at Vincentown and Hainsport.

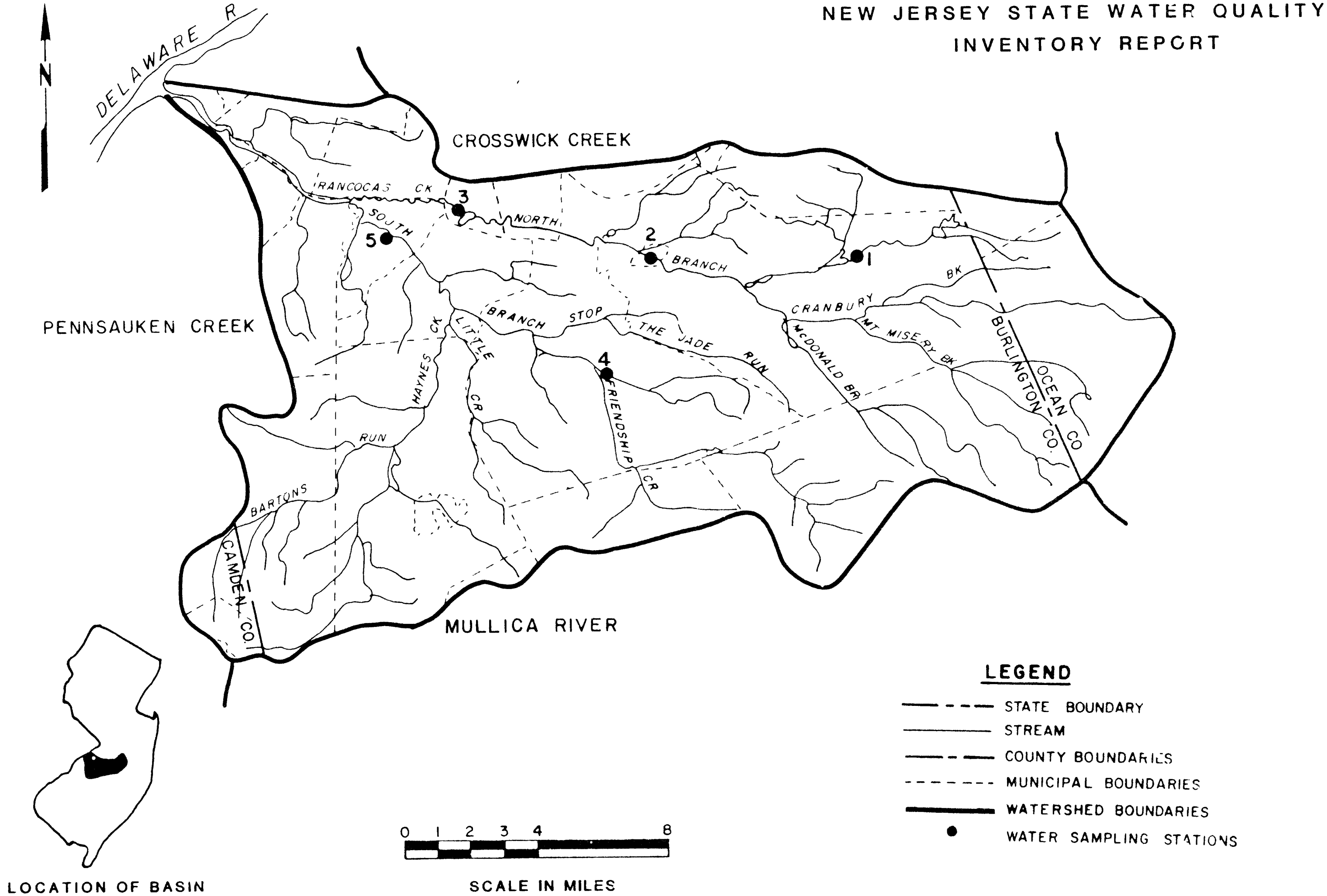
Fishery assessments indicate that both the North Branch Rancocas and Cranberry Branch fully support the "aquatic life support" designated use. The South Branch mainstem cannot be assessed because of a lack of biological data. Tributaries to the South Branch have been studied by the Division of Fish, Game, and Wildlife and results indicate that of those studied, almost all fully supported the "aquatic life" use. Only Mill Creek is assessed as partially supporting the aquatic life 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 QUALITY INVENTORY REPORT



WATER QUALITY INDEX PROFILES 1986-1990: **RANCOCAS CREEK**

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	<u>OVERALL AVG.</u> AND WORST 3-MONTH CONDITION
NB Rancocas Cr. at Browns Mills	AVG. WQI: WORST 3 MONTHS:	3 JULY-SEPT.	6 MAY-JULY	17 JULY-AUG.	6 SEPT.-NOV.	14 JULY-SEPT.	1 APRIL-JUNE	0	7 APRIL-JUNE	<u>9 EXCEL.</u> 16 GOOD JUNE.-AUG.
NB Rancocas Cr. at Pemberton	AVG. WQI: WORST 3 MONTHS:	2 JUNE-AUG.	19 JULY-SEPT.	6 JULY-SEPT.	11 MAY-JULY	8 JUNE-AUG.	1 JAN.-MAR.	0	7 MAR.-MAY	<u>10 EXCEL.</u> 17 GOOD MAY-JULY
NB Rancocas Cr. at Mt. Holly	AVG. WQI: WORST 3 MONTHS:	3 JUNE-AUG.	9 APRIL-JUNE	4 FEB.-AUG.	26 MAY-JULY	21 JUNE-AUG.	3 SEPT.-NOV.	0 MAY-JULY	11 JULY-SEPT.	<u>19 GOOD</u> 29 FAIR MAY-JULY

<u>**LEGEND: WATER QUALITY INDEX DESCRIPTION**</u>

Note: an index value of 20 is equivalent to the level of water quality criteria.

WQI	Condition	Description
0-10	Excellent	Pollution minimal or absent; water uses met throughout the year.
11-25	Good	Pollution generally in low amounts; water uses periodically not met.
26-60	Fair	Pollution varies from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution present in high levels; water uses not met.
81-100	Very Poor	Pollution present in extremely high levels; severe stress to streamlife; water uses not met.
ID	Insufficient Data	

POINT SOURCE POLLUTION TABLE
WATERSHED: Rancocas Creek

FACILITIES IN NONCOMPLIANCE

FACILITY	RECEIVING WATER	POLLUTANT	COMMENTS
Delran Sewerage Authority NJPDES N/A	Rancocas Creek	Municipal Discharger of Biochemical Oxygen Demand and Total Suspended Solids	None to report.

IMPROVEMENTS TO FACILITIES AFFECTING WATER QUALITY

FACILITY	RECEIVING WATER	COMMENTS
Riverside STP NJPDES N/A	Rancocas Creek	None to report
Evasham-Elmwood STP NJPDES N/A	Rancocas Creek	Facility now complies with the federally mandated secondary treatment or has eliminated substandard discharges

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. Based upon records from 1988, there were 15 NJPDES permitted discharges here, 13 of which were municipal and two 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 experience very high 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 that degrades to poor conditions during low flow periods (August through October). Ninety-three percent of the samples collected from 1986 to 1990 contained total phosphorus in excess of the State criterion with a mean level of 0.213mg/L. Sixty-four percent of the samples had fecal coliform counts greater than the 200 MPN/100ml criterion for freshwater streams. Fecal coliform levels exceeding 9,000 MPN/100ml were frequent with one sample in the spring of 1989 reaching 16,000. Levels of Biochemical Oxygen Demand in the North Branch Pennsauken were quite high.

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 many times the State criterion. Individual total phosphorus values often exceed 1.0 mg/l. Fecal coliform geometric means were determined to be over 3,600 MPN/100ml and 92 percent of the samples exceeded State standards. Unionized ammonia levels exceed the State criterion for protection of warm-water fisheries during summer months. Total inorganic and Kjeldahl nitrogen was also elevated in almost all samples collected. Five-day biochemical oxygen demand was often very high; with many values greater than 8 mg/l - indicating significant organic loadings in the stream. Despite this, daytime dissolved oxygen concentrations appear to be adequate; but extreme diurnal fluctuations, with the possibility of severely depressed night-time oxygen levels, can be expected. Dissolved oxygen saturation was usually less than 80 percent, and averaged 64 percent during the period of review.

Previous Inventory Reports have discussed high levels of chlordane and PCBs in fish that have been taken from the Pennsauken Creek mainstem and from the South Branch from Strawbridge Lake downstream. These levels, were and are still, regarded as posing a potential health hazard; and, as a result, recreational fishing continues to be banned in these waterways. The North Branch Pennsauken Creek was assessed by the New Jersey Division of Fish, Game and Wildlife as supporting a healthy warm water fish community.

Problem Assessment

Point Source Assessment

The severe water quality problems found in Pennsauken Creek are due to the large amount of treated wastewater as well as stormwater discharged to the stream, combined with the Creek's limited assimilative capacity.

The three Cherry Hill STPs discharging to the South Branch watershed (Kingston, Pennsauken Cr., and Colwick Cr.) were formally under enforcement action and were suspected of having water quality impacts upon their receiving waters. All three have ceased their discharge as a result of local regionalization (see Point Source Pollution Table). They now discharge to the Camden Co. MUA regional facility in Camden City, which in turn discharges to the Delaware River.

Nonpoint Source Assessment

The North Branch of the Pennsauken (10 stream miles) is evaluated as receiving pollution from several nonpoint sources. These include 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 which causes siltation.

Designated Use Assessment

Limited support of designated uses occur in this watershed. Primary contact recreation is precluded in the waterways due to excess fecal coliform bacteria levels. The "aquatic life" use is fully supported in the North Branch, but evidence suggests that the biota is stressed. The South Branch is considered to have a degraded fish community because of pollution sources and habitat destruction and, hence, will not support the "aquatic life" designated use. Chlordane contamination of fish tissue has been detected in the past and this 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-118 for a map of the Pennsauken Creek watershed.

WATER QUALITY INDEX PROFILES 1986-1990: **PENNSAUKEN CREEK**

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVG. AND WORST 3-MONTH CONDITION
NB Pennsauken Cr. at Moorestown	AVG. WQI:	4	20	6	39	48	8	3	6	49 FAIR
	WORST 3 MONTHS:	JUNE- AUG.	AUG.-OCT.	JUNE- AUG.	SEPT.-NOV.	AUG.-OCT.	DEC.-FEB.	JUNE- AUG.	MAR.-MAY	62 POOR AUG.-OCT.
SB Pennsauken Cr. at Cherry Hill	AVG. WQI:	2	40	11	61	53	10	15	8	81 V. POOR
	WORST 3 MONTHS:	JUNE- AUG.	JUNE- AUG.	AUG.-OCT.	JUNE- AUG.	OCT.-DEC.	FEB.-APRIL	JUNE- AUG.	MAR.-MAY	99 V. POOR JUNE- AUG.

LEGEND: WATER QUALITY INDEX DESCRIPTION

Note: an index value of 20 is equivalent to the level of water quality criteria.

WQI	Condition	Description
0-10	Excellent	Pollution minimal or absent; water uses met throughout the year.
11-25	Good	Pollution generally in low amounts; water uses periodically not met.
26-60	Fair	Pollution varies from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution present in high levels; water uses not met.
81-100	Very Poor	Pollution present in extremely high levels; severe stress to streamlife; water uses not met.
ID	Insufficient Data	

POINT SOURCE POLLUTION TABLE
WATERSHED: South Branch, Pennsauken Creek

IMPROVEMENTS TO FACILITIES AFFECTING WATER QUALITY

FACILITY	RECEIVING WATER	POLLUTANT	COMMENTS
Kingston STP NJPDES 0025071	South Br. Pennsauken Creek	Discharge of Sanitary Wastewater	This STP has come under regionalization and currently discharges it's wastewater at the Camden County MUA's Delaware 1 Facility, located in Camden City. The treated effluent is discharged into the Delaware River
Pennsauken Creek STP NJPDES 0025089	South Br, Penns. Cr.	Discharge of Sanitary Wastewater	See above
Colwick STP NJPDES 0025127	South Br. Penns. Cr.	Discharge of Sanitary Wastewater	See above

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.

Overall land use in this watershed is primarily urban/suburban. The streams in the watershed have been classified FW-2 Nontrout. Recent estimates (1991) suggest that there are 7 NJPDES permitted discharges in the watershed: 3 are industrial and 3 are municipal.

Water Quality Assessment

Cooper River, like Pennsauken Creek, is a highly degraded urban stream receiving significant amounts of sewage treatment plant 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 poor quality as it flows through Camden and adjoining towns. In addition, pesticide contamination in stream sediments and fishlife has resulted in recreational fishing bans 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. Summertime dissolved oxygen concentrations are acceptable. Fecal coliform counts are low; a geometric mean of 31 MPN/100 ml was calculated from data collected between 1986 through 1990.

By the time the Cooper River reaches Lawnside, it has received wastewaters from a number of municipal treatment facilities. Water quality is now poor with high amounts of nutrients and fecal coliform bacteria. Warm weather dissolved oxygen levels were severely depressed during the initial period of review: 1986 and 1987. However, these levels showed rapid improvement in 1988 - due largely to an extensive municipal discharge regionalization plan (see Point Source Assessment, below). Nutrient inputs to the Cooper River showed a sudden decline in 1988 at this station and at Haddonfield. Total phosphorus, total Kjeldahl nitrogen, and total inorganic nitrogen levels declined by roughly a factor of 10 between 1987 and 1988 at Lawnside. This was in turn, at Lawnside, reflected in a corresponding decline in BOD levels and an upsurge in dissolved oxygen levels. Conditions are, however, still stressed at Lawnside; overall total phosphorus still exceeded the State criterion in nearly all samples collected between 1986 through 1990, and averaged 0.84 mg/l. Total Kjeldahl nitrogen and inorganic nitrogen averaged 4.3 mg/l and 4.9 mg/l, respectively; overall slightly less than twice the recommended limits. BOD levels, although not as severe as during earlier periods, are still often quite high. Approximately one-third of un-ionized ammonia concentrations were above the criterion (0.05 mg/l) for protection of warm-water fisheries during summer months.

Unlike nutrient levels, fecal coliform values remained unchanged at Lawnside during the period of review and were roughly equal to the levels recorded during previous assessment. Fecal coliform values were above the 200 MPN/100ml criterion in 85 percent of all samples.

Similar water quality improvements brought about by the extensive regionalization of the wastewater treatment plant system in the Cherry Hill/Camden area can be observed downstream at Haddonfield, and like Lawnside, the Cooper River is still severely polluted and in poor condition at this location even after a significant reduction in nutrient loading. Between 1986 through 1990, total phosphorus averaged 0.6 mg/l and nitrogen-containing compounds continued to be excessive, with levels similar to those found at Lawnside. Fecal coliform had a geometric mean of 1,370 MPN/100ml with 90 percent exceeding standards. Daytime dissolved oxygen concentrations were adequate, even in 1986 and 1987 - all dissolved oxygen concentrations were above the criterion for nontrout waters. High primary productivity in the stream has been suspected in maintaining these daytime levels. The Department's enforcement unit had reported improvements in water quality in the 1990 Inventory Report and this present assessment bears this out. Substantial improvements to water quality seem to be hampered, however, by runoff, benthic oxygen demand, and the remaining municipal dischargers still on the waterway.

Biomonitoring at Haddonfield in 1988 confirmed the presence of a very unhealthy stream environment. The dominant organism was the pollution tolerant bryozoan <u>Plumatella repens</u>, a filter feeder which comprised almost 80% of the community sampled. Organisms tolerant of nutrient enrichment made up 83% of the sampled population. A review of earlier biomonitoring data suggests that water quality at this location may have improved somewhat from 1979 through 1986. The 1988 data, however, more closely reflect the fauna observed in 1979.

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

Problem Assessment

Point Source Assessment

The water quality problems of the Cooper River are the result of excessive municipal and industrial wastewater discharges, combined with the effects of urban stormwater runoff and the limited assimilative ability of the stream. The Camden County U.A. regional sewage system is currently eliminating most of the discharges to the Cooper River. Construction of the Camden County Municipal Utilities Authority's regional wastewater treatment system is continuing under terms of a 1986 Consent Order. Seventeen individual sewage treatment plants that were discharging inadequately treated wastewater into the Cooper River, it's tributaries, as well as neighboring watersheds; have now been taken off-line and all flows conveyed to the upgraded and expanded Camden Co. MUA facility located in Camden City. An additional twenty-one plants are scheduled to be abandoned over the upcoming year. The Department's enforcement office reports that fecal coliform levels have declined and water overall surface water quality has improved as a result of this regionalization. The Point Source Pollution Table for the Cooper River lists three of the former discharges which, in the past, were under enforcement action but have been corrected through the regionalization process.

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 occasional 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.

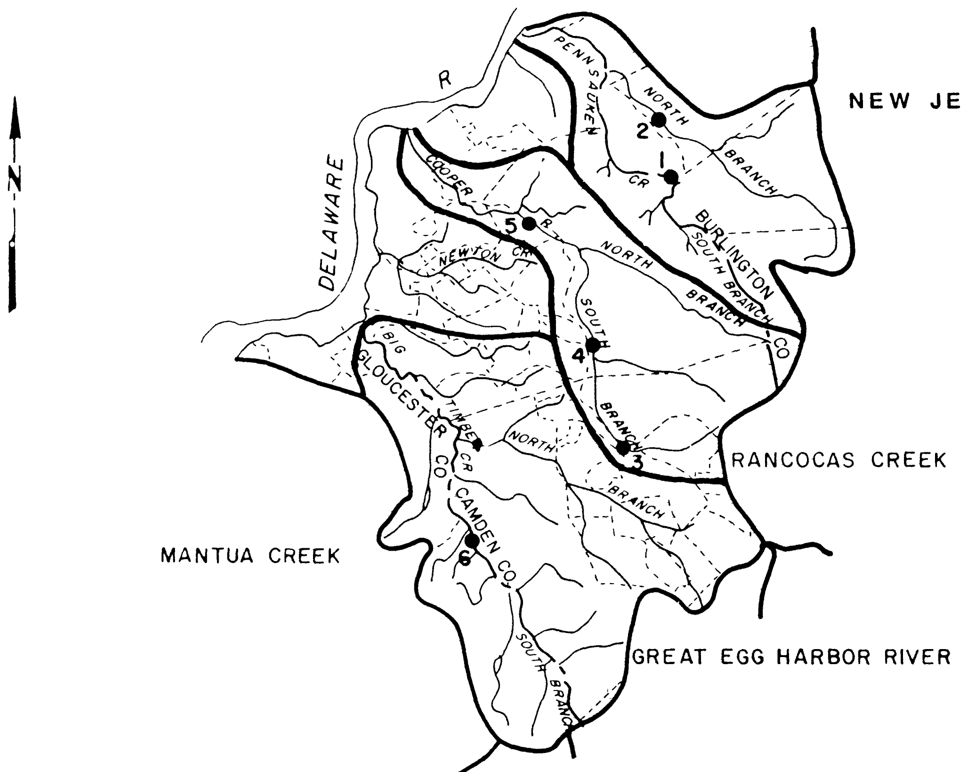
Designated Use Assessment

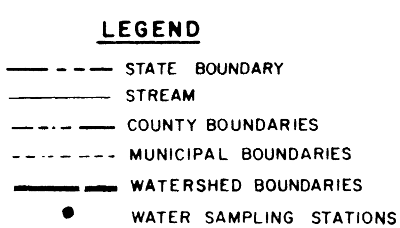
The Cooper River partially supports the swimmable (primary contact) designated use only in the headwater reaches. At Lindenwold the Cooper River is considered partially swimmable, but downstream of this location it does not support the use. The "aquatic life" designated use is supported at Lindenwold - but again, not at the two downstream sites. Tindale Run is currently supporting the "aquatic life" designated use, but might be in danger of being stressed from the various pollution sources.

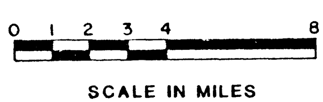
Monitoring Station List

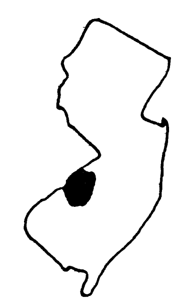
Map Number	Station Name and Classification
3	Cooper River at Lindenwold, FW-2 Nontrout
4	Cooper River at Lawnside, FW-2 Nontrout
5	Cooper River at Haddonfield, FW-2 Nontrout

PENNSAUKEN CREEK, BIG TIMBER CREEK AND COOPER RIVER









WATER QUALITY INDEX PROFILES 1986-1990: **COOPER RIVER**

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVG. AND WORST 3-MONTH CONDITION
Cooper River at Linndinwald	AVG. WQI:	4	16	9	15	18	2	1	5	15 GOOD
	WORST 3 MONTHS:	JUNE-AUG.	AUG.-OCT.	MAR.-MAY	JUNE-AUG.	NOV.-JAN.	JAN.-MAR.	JAN.-MAR.	MAR.-MAY	26 FAIR JUNE-AUG.
Cooper River at Lawnside	AVG. WQI:	2	28	10	54	73	7	10	6	78 POOR
	WORST 3 MONTHS:	JULY-SEPT.	JUNE-AUG.	JULY-SEPT.	APRIL-JUNE	NOV.-JAN.	JUNE-AUG.	JUNE-AUG.	APRIL-JUNE	90 V. POOR JUNE-AUG.
Cooper River at Haddonfield	AVG. WQI:	3	23	10	51	73	6	10	10	76 POOR
	WORST 3 MONTHS:	JUNE-AUG.	JULY-SEPT.	FEB.-APRIL	JULY-SEPT.	JULY-SEPT.	FEB.-APRIL	FEB.-APRIL	JULY-SEPT.	91 V. POOR JULY-SEPT.

LEGEND: WATER QUALITY INDEX DESCRIPTION

Note: an index value of 20 is equivalent to the level of water quality criteria.

WQI	Condition	Description
0-10	Excellent	Pollution minimal or absent; water uses met throughout the year.
11-25	Good	Pollution generally in low amounts; water uses periodically not met.
26-60	Fair	Pollution varies from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution present in high levels; water uses not met.
81-100	Very Poor	Pollution present in extremely high levels; severe stress to streamlife; water uses not met.
ID	Insufficient Data	

POINT SOURCE POLLUTION TABLE
WATERSHED: Cooper River

IMPROVEMENTS TO FACILITIES AFFECTING WATER QUALITY

FACILITY	RECEIVING WATER	POLLUTANT	COMMENTS
NJ Turnpike - 3S NJPDES 0020753	Cooper River	Discharge of Sanitary Wastewater	This STP has come under regionalization and currently discharges it's wastewater at the Camden County MUA's Delaware 1 Facility, located in Camden City. The treated effluent is discharged into the Delaware River
Barclay Farms STP NJPDES 0025046	Cooper River	Discharge of Sanitary Wastewater	"
Old Orchard STP NJPDES 0025054	Cooper River	Discharge of Sanitary Wastewater	"

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 about 14 NJPDES permitted discharges here, most of which (10) are municipal. 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 the Glendora monitoring station was discontinued in 1983. The South Branch at Blackwood Terrace is of good water quality throughout most of the year, degrading to fair quality during late spring and early summer. Total phosphorus and fecal coliform levels generally exceed the State criteria. The concentrations of total phosphorus averaged 0.16 mg/l during the current period of review, with 63 percent of the values greater than the State criterion. Fecal coliform determinations exceeded 200 MPN/100ml in 67 percent of the samples collected. The South Branch has adequate dissolved oxygen readings, despite the presence of occasionally high biochemical oxygen demand. Water quality during the current period of review (1986 through 1990) is very similar to the previous water quality assessments presented in the 1988 and 1990 Inventory Reports.

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 Assessment

Point Source Assessment

Big Timber Creek is subject to a variety of potential pollution sources due to the large number of point sources within the watershed. A major regionalization has occurred in this watershed with the elimination of a significant number of treatment plants (see Point Source Pollution Table). The regions formerly served by these plants are now tied into the Camden County MUA (see "Point Source Assessment" for the Cooper River for details). This regionalization of municipal treatment systems in Camden County has eliminated a large number of problem dischargers and water quality is expected to improve with time.

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 determined by local authorities to be receiving a wide range of pollutants from nonpoint sources. These include 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 Assessment

The South Branch Big Timber Creek generally contains healthy warm-water fisheries, but they are threatened from a variety of pollution sources. Although this Branch is assessed as fully supporting the "aquatic life" designated use, stressful conditions are suspected to be occurring in the urbanized and tidal areas during warm weather. High fecal coliform levels preclude the use of the South Branch 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-118 for a map of the Big Timber Creek watershed.

WATER QUALITY INDEX PROFILES 1986-1990: **BIG TIMBER CREEK**

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVG. AND WORST 3-MONTH CONDITION
SB Big Timber Cr. at Blackwood Terr.	AVG. WQI:	3	11	11	31	21	4	1	9	23 GOOD
	WORST 3 MONTHS:	JUNE-AUG.	JULY-SEPT.	APRIL-JUNE	JUNE-AUG.	MAY-JULY	FEB.APRIL	APRIL-JUNE	MAR.-MAY	40 FAIR MAY-JULY

LEGEND: WATER QUALITY INDEX DESCRIPTION

Note: an index value of 20 is equivalent to the level of water quality criteria.

WQI	Condition	Description
0-10	Excellent	Pollution minimal or absent; water uses met throughout the year.
11-25	Good	Pollution generally in low amounts; water uses periodically not met.
26-60	Fair	Pollution varies from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution present in high levels; water uses not met.
81-100	Very Poor	Pollution present in extremely high levels; severe stress to streamlife; water uses not met.
ID	Insufficient Data	

POINT SOURCE POLLUTION TABLE
WATERSHED: Big Timber Creek

IMPROVEMENTS TO FACILITIES AFFECTING WATER QUALITY:

All the following sanitary treatment plants have come under regionalization and are currently discharging their wastewater to the Camden County MUA's Delaware 1 Facility, located in Camden City. The treated effluent is discharged into the Delaware River

FACILITY	**FORMER RECEIVING WATER**	**FACILITY**	**FORMER RECEIVING WATER**
Runnamede STP NJPDES 0026859	Beaver Brook	Stratford STP NJPDES 0022624	Big Timber Creek
Barrington STP NJPDES 0026875	Beaver Brook	Brooklawn STP NJPDES 0022748	Big Timber Creek
Bellmawr STP NJPDES 0026743	Big Timber Creek	Catalina Hills STP NJPDES 0026492	North Branch, Big Timber Creek.
Clementon STP NJPDES 0020320	Big Timber Creek	Mardale Manor STP NJPDES 0026484	Signey Run
Gloucester City STP NJPDES 0026620	Big Timber Creek	Lakeland Hospital STP NJPDES 0029840	South Branch,Big Timber Creek.
Blackwood STP NJPDES 0026476	Big Timber Creek	Magnolia STP NJPDES 0021431	Otter Creek
Chews Landing STP NJPDES 0026468	Big Timber Creek	Mt. Ephraim STP NJPDES 0023817	Little Timber Creek

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 commercial development in much of the watershed. There are approximately six NJPDES permitted discharges in the Raccoon Creek watershed: 2 municipal and 4 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 station represents approximately five stream miles. Results indicate that the creek is of good quality with conditions declining to fair quality in the fall. There are concerns over metal levels which have been detected in the water column over time. The creek experiences elevated total phosphorus, inorganic nitrogen, and fecal coliform levels. 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 2.0 mg/l and, as a result, is not believed to have a significant effect on dissolved oxygen levels. The pH of the stream is neutral to slightly acidic.

Fecal coliform counts exceeded the State criterion in 50 percent of the samples collected between 1986 through 1990; the geometric mean for this period was 200 MPN/100 ml. Total phosphorus was above the State criterion of 0.1 mg/l in 58 percent of all samples collected during the period of review and averaged 0.55 mg/l. Total inorganic nitrogen was highest during the winter and spring with 58 percent of the observed levels being over the recommended level of 2.0 mg/l.

Raccoon Creek is regarded by the Department as an impaired waterway due to toxic discharges emanating from point sources. The contaminants of concern are arsenic, copper, mercury, cadmium, chromium, lead, zinc, nickel, and silver. The criteria violated are USEPA's Federal Aquatic Life chronic criteria, USEPA's Federal Human Health-water and fish ingestion criteria, and USEPA's Federal human health criteria for exposure to carcinogens.

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

Problem Assessment

Point Source Assessment

Raccoon Creek is a moderately enriched waterway, based on the nutrient levels present. Agricultural runoff combined with municipal point sources are the likely sources of these nutrients. One municipal discharger and one industrial facility, both formally under enforcement action, have undergone upgrades (see Point Source Pollution Table) and are no longer under enforcement action. No dischargers are currently reported to be under enforcement action for inadequately treated wastewater within this watershed. A regional Gloucester County UA sewerage system is also planned for the western sections of the watershed that may 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 receives nonpoint source pollution from agricultural sources as well as from 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 of 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 Assessment

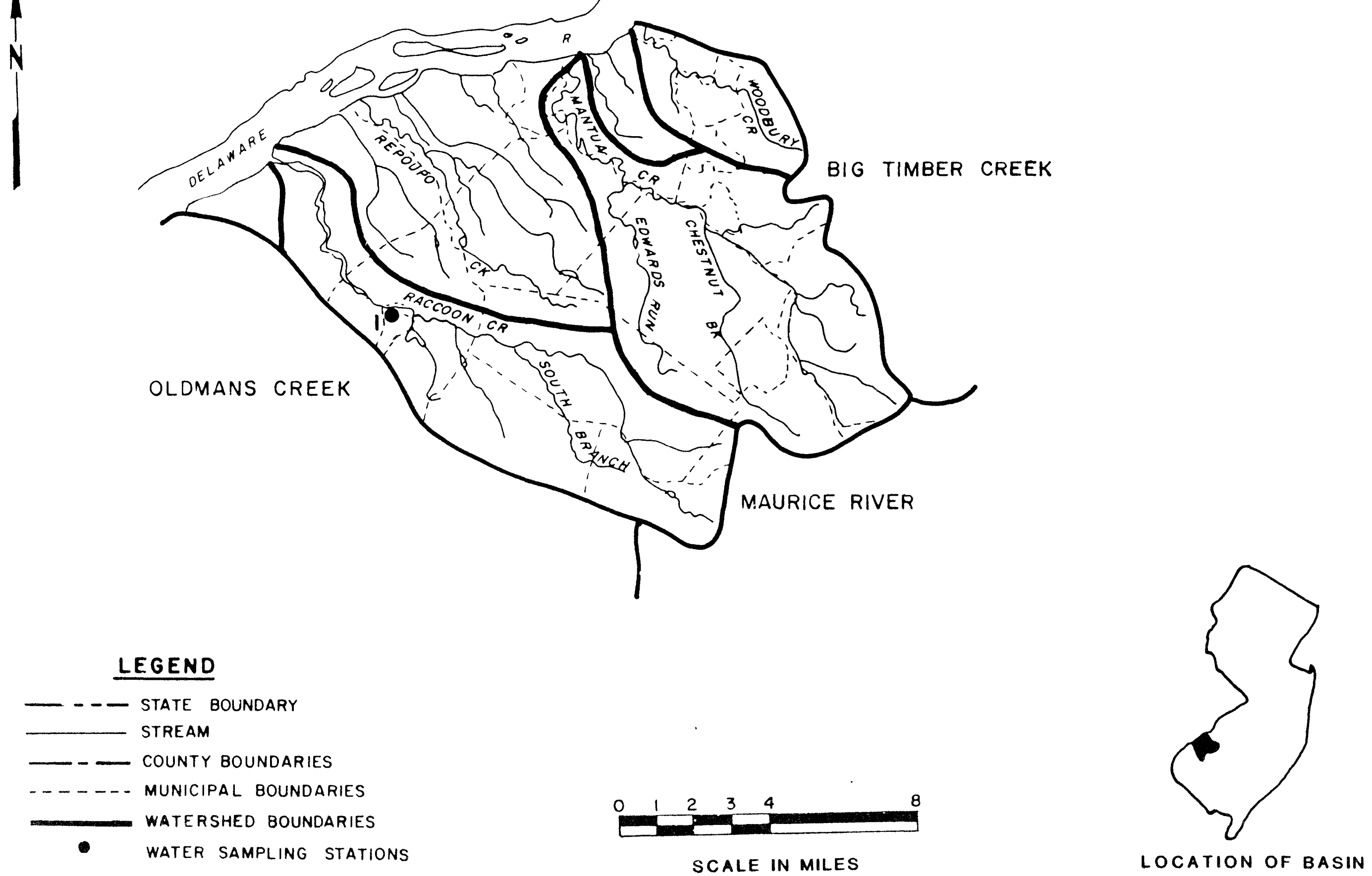
Fisheries assessments indicate that the South Branch Raccoon Creek partially supports the "aquatic life support" designated use. The 4 mile long Repaupo Creek, a nearby Delaware River tributary, is fully supporting this use. The creek is not achieving swimmable status: elevated fecal coliform concentrations 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 PROFILES 1986-1990: **RACCOON CREEK**

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVG. AND WORST 3-MONTH CONDITION
Raccoon Cr. near Swedesboro	AVG. WQI:	2	13	9	24	27	5	0	5	22 GOOD
	WORST 3 MONTHS:	JUNE-AUG.	MAY-JULY	JUNE-AUG.	SEPT.NOV.	JAN.-MAR.	AUG.-OCT.	JULY-SEPT	JUNE-AUG.	26 FAIR SEPT.-NOV.

LEGEND: WATER QUALITY INDEX DESCRIPTION

Note: an index value of 20 is equivalent to the level of water quality criteria.

WQI	Condition	Description
0-10	Excellent	Pollution minimal or absent; water uses met throughout the year.
11-25	Good	Pollution generally in low amounts; water uses periodically not met.
26-60	Fair	Pollution varies from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution present in high levels; water uses not met.
81-100	Very Poor	Pollution present in extremely high levels; severe stress to streamlife; water uses not met.
ID	Insufficient Data	

POINT SOURCE POLLUTION TABLE
WATERSHED: Mantua and Raccon Creeks

IMPROVEMENTS TO FACILITIES AFFECTING WATER QUALITY

FACILITY	RECEIVING WATER	POLLUTANT	COMMENTS
Pennwalt Corp. NJPDES 0005185	Little Mantua Creek	N/A	Facility is udergoing continual upgrades and improvements.
Swedesboro STP NJPDES 0022021	Raccoon Creek	Sanitary Wastewater	Facility is udergoing continual upgrades and improvements.

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. Only a few NJPDES permitted discharges are located in the watershed; most if not all are industrial. Oldmans Creek and tributaries have been classified FW-2 Nontrout, except the tidal portions, which are classified SE-1.

Water Quality Assessment

Oldmans Creek is routinely monitored at Porches Mill, which is regarded as representing approximately one-half of the stream's length. Although overall quality is considered good, conditions degrade to fair quality during the fall and early winter. Principal water quality problems are high bacterial and nutrient concentrations. Fecal coliform bacteria levels exceeded State criteria in 42 percent of the samples collected between 1986 through 1990. A geometric mean of 161 MPN/100ml was determined from the data. Total phosphorus and total inorganic nitrogen levels averaged 0.10 and 1.9 mg/l, respectively. Forty-four percent of the phosphorus values exceeded the 0.1 mg/l criteria, while 37 percent of the inorganic nitrogen values exceeded the recommended level of 2.0 mg/l. Dissolved oxygen concentrations are adequate in Oldmans Creek with all values above 4.0 mg/l.

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

Problem 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 Assessment

Monitored waters of Oldmans Creek will not support the swimmable (primary contact) designated use because of excessive bacteria levels. The creek will support the "aquatic life support" designated use, although the warm-water fishery present is considered threatened from nonpoint sources.

Monitoring Station List

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

See page III-139 for a map of the Oldmans Creek watershed.

WATER QUALITY INDEX PROFILES 1986-1990: **OLDMANS CREEK**

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVG. AND WORST 3-MONTH CONDITION
Oldmans Cr. at Porches Mill	AVG. WQI:	3	18	13	22	22	5	1	7	22 GOOD
	WORST 3 MONTHS:	JULY-SEPT	OCT.DEC.	APRIL-JUNE	SEPT.-NOV.	DEC.-FEB.	JULY-SEPT	APRIL-JUNE	MAR.-MAY	26 FAIR OCT.-DEC.

LEGEND: WATER QUALITY INDEX DESCRIPTION

Note: an index value of 20 is equivalent to the level of water quality criteria.

WQI	Condition	Description	WQI	Condition	Description
0-10	Excellent	Pollution minimal or absent; water uses met throughout the year.	61-80	Poor	Pollution present in high levels; water uses not met.
11-25	Good	Pollution generally in low amounts; water uses periodically not met.	81-100	Very Poor	Pollution present in extremely high levels; severe stress to streamlife; water uses not met.
26-60	Fair	Pollution varies from moderate to high levels; certain water uses prohibited.	ID	Insufficient Data	

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. There are approximately 10 NJPDES permitted discharges here - about half are municipal and half 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. In the short distance between the two stations (approximately 4 miles) conditions degrade from Woodstown to Courses Landing. Based on sampling from these two locations, overall water quality conditions are assessed as fair. In the summer, however, conditions degrade, remaining within the fair classification at Woodstown, but reaching poor levels at Courses Landing. Both locations contain elevated fecal coliform and nutrient concentrations.

The Salem River at Woodstown is monitored at the outlet of Memorial Lake and, 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 0.29 mg/l during 1986 through 1990, three times the State criterion for flowing waterways. Ninety-three percent of all total phosphorus samples exceeded the State criteria. Total inorganic nitrogen was also elevated with 58 percent of the samples collected being greater than 2.0 mg/l. The overall geometric mean of fecal coliform levels was 371 MPN/100ml during the period of review. Sixty-seven percent of all observations were above the 200 MPN/100ml level. Daytime dissolved oxygen appears to be adequate throughout the year. Stream temperatures periodically approached the 28 degrees Celsius criterion during the summer months and two measurements exceeded this level 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 most pollutants are somewhat higher. In late summer and early fall the quality of the river degrades to poor conditions. Total phosphorus averaged 0.33 mg/l with all values above the State criterion of 0.1 mg/l. Total inorganic nitrogen concentrations are similar to those identified at Woodstown. The geometric mean of fecal coliform was 378 MPN/100ml. Warm weather dissolved oxygen concentrations were occasionally below 4.0 mg/l, with percent saturation averaging only 78 percent. Biochemical demand is moderate but highly variable in the river. Although one elevated concentration of lead was found in the river at this location during the 1983 to 1987 period of review, no such elevations were observed during the present period of review.

Biomonitoring was conducted at Woodstown for periphyton and macroinvertebrates in 1988. Filter feeders dominated the macroinvertebrate population sampled. Here, they made up 96% of the overall sample community - suggesting the presence of significant amounts of suspended organic material (most likely algae) at the station. Only one percent of the individuals observed were forms intolerant of low dissolved oxygen levels. Previous sampling was performed at Courses Landing in 1986, where similar conditions were observed.

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) both contain severely degraded warm water fish communities.

Problem Assessment

Point Source Assessment

The upper watershed of the Salem River contains water quality problems resulting from the combined effects of both point and nonpoint sources. An advanced treatment upgrade of the region's municipal dischargers is believed necessary in order to improve overall water quality conditions here. In tidal sections of the Salem River, conditions are thought to be generally poor. A limited assimilative capacity together with numerous point sources in the lower watershed are considered to be reasons for these conditions.

Two municipal and one industrial/commercial dischargers are reported to be releasing effluent of poor quality in the watershed and are under enforcement action. These are listed in the Point Source Pollution Table for the Salem River.

Nonpoint Source Assessment

The Upper Salem River is believed to be receiving occasional, yet increasing, amounts of nonpoint source 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.

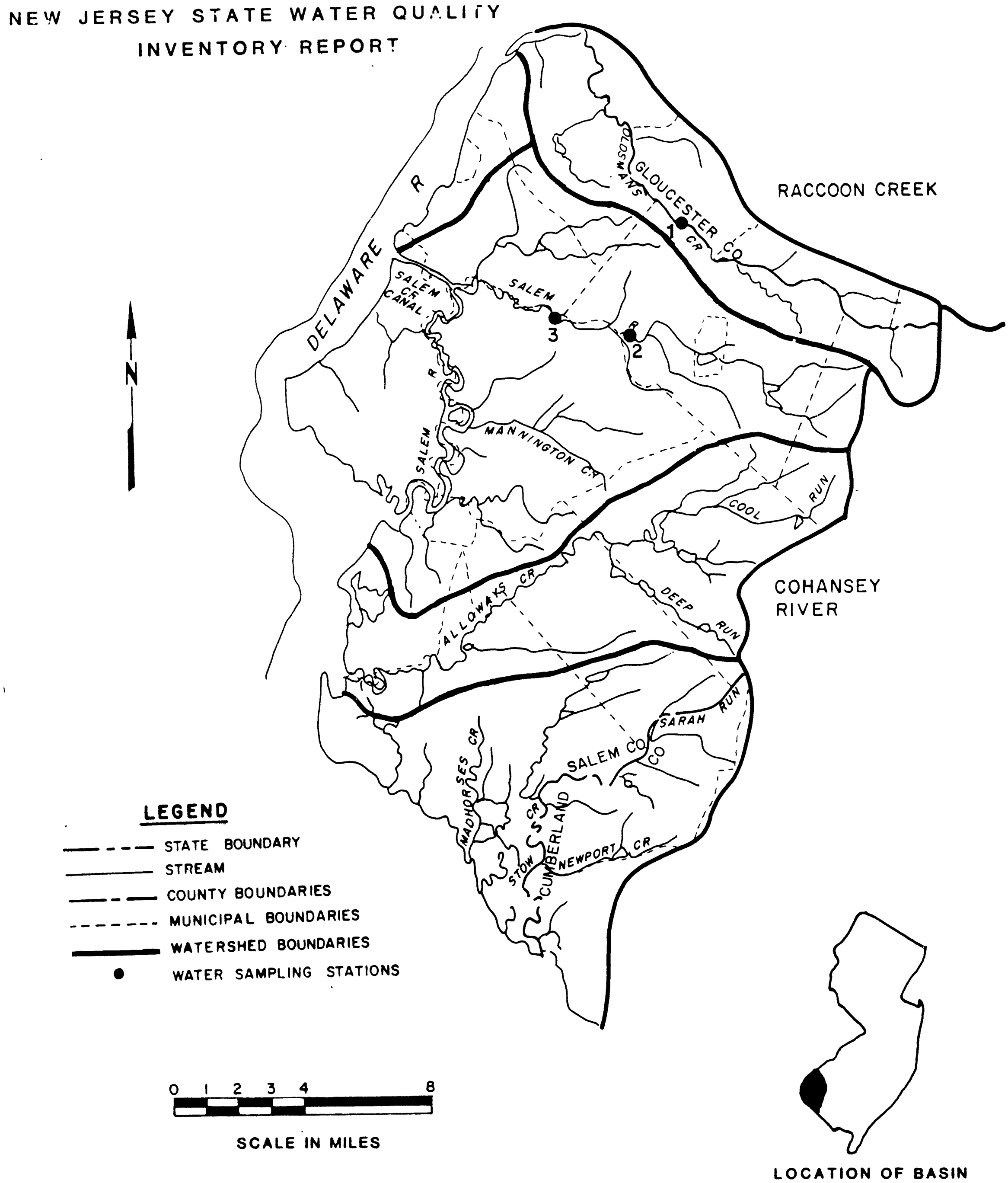
Designated Use Assessment

The Salem River, despite its water quality problems, will support the aquatic life support designated use. This is also the case for Game Run. Swedes Run, in contrast, is considered to be partially supporting the use. The swimmable (primary contact) use is not met at Woodstown nor at 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 PROFILES 1986-1990: **SALEM RIVER**

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVG. AND WORST 3-MONTH CONDITION
Salem River at Woodstown	AVG. WQI:	5	13	20	35	27	6	6	5.	35 FAIR
	WORST 3 MONTHS:	JULY-SEPT.	MAY-JULY	JULY-SEPT.	NOV.-JAN.	JUNE-AUG.	APRIL-JUNE	JUNE-AUG.	MAR.-MAY	54 FAIR JUNE-AUG.
Salem River at Courses Landing	AVG. WQI:	5	39	12	38	32	7	2	11	52 FAIR
	WORST 3 MONTHS:	JUNE-AUG.	AUG.-OCT	NOV.-JAN.	JAN.-MAR.	MAY-JULY	JULY-SEPT.	JULY-SEPT.	AUG.-OCT	67 POOR AUG.-OCT.

LEGEND: WATER QUALITY INDEX DESCRIPTION

Note: an index value of 20 is equivalent to the level of water quality criteria.

WQI	Condition	Description
0-10	Excellent	Pollution minimal or absent; water uses met throughout the year.
11-25	Good	Pollution generally in low amounts; water uses periodically not met.
26-60	Fair	Pollution varies from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution present in high levels; water uses not met.
81-100	Very Poor	Pollution present in extremely high levels; severe stress to streamlife; water uses not met.
ID	Insufficient Data	

POINT SOURCE POLLUTION TABLE
WATERSHED: Salem River

IMPROVEMENTS TO FACILITIES AFFECTING WATER QUALITY

FACILITY	RECEIVING WATER	POLLUTANT	COMMENTS
Salem City STP,. NJPDES 0024856	Salem River	Sanitary Wastewater	Completed an upgrade pursuant to an Administrative Concent Order
Richman Ice Cream NJPDES 0004308	Salem River	Sanitary Wastewater	Completed an upgrade pursuant to an Administrative Concent Order
Woodstown STP NJPDES 0022250	Rock Brook	Sanitary Wastewater	Completed an upgrade pursuant to an Administrative Consent Order

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, from which the river becomes tidal. 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 only a few NJPDES permitted discharges in the watershed. 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/DEPE 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 spring. 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 0.10 mg/l with 72 percent above the 0.05 mg/l criterion for waters flowing into lakes and impoundments. Total inorganic nitrogen averaged 4.0 mg/l during this period, with all readings greater than 2.0 mg/l.

Sixty percent of the fecal coliform samples between 1986 through 1990 were greater than the 200 MPN/100ml level. Dissolved oxygen concentrations are above the 4.0 mg/l warm-water criterion throughout the year. Biochemical oxygen demand is low to moderate in the watershed. Water quality in the Cohansey at the Seeley station is identical to quality observed in the last period of assessment: 1983 to 1987

Within the two sub-watersheds 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 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.

No enforcement actions are currently reported in this watershed at present. In addition, there are no hazardous waste sites in the watershed 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, house 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 Assessment

The Cohansey River does not support the swimmable (primary contact) use based on monitoring at Seeley. The river and tributaries do support the aquatic life support use. The tidal sections of Cohansey do 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-151 for a map of the Cohansey watershed.

WATER QUALITY INDEX PROFILES 1986-1990: **COHANSEY RIVER**

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVG. AND WORST 3-MONTH CONDITION
Cohansey at Seeley	AVG. WQI:	2	18	6	33	45	5	0	5	40 FAIR
	WORST 3 MONTHS:	JULY-SEPT	SEPT.-NOV.	NOV.-JAN.	APRIL-JUNE	JAN-MAR.	JUNE-AUG.	NOV.-JAN.	NOV.-JAN.	50 FAIR APRIL-JUNE

LEGEND: WATER QUALITY INDEX DESCRIPTION

Note: an index value of 20 is equivalent to the level of water quality criteria.

WQI	Condition	Description
0-10	Excellent	Pollution minimal or absent; water uses met throughout the year.
11-25	Good	Pollution generally in low amounts; water uses periodically not met.
26-60	Fair	Pollution varies from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution present in high levels; water uses not met.
81-100	Very Poor	Pollution present in extremely high levels; severe stress to streamlife; water uses not met.
ID	Insufficient Data	

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, Muskee 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 area 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 15 to 20 NJPDES permitted discharges in the watershed, most 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. Water quality at Norma is excellent, degrading to good in late spring to summer. The station near Millville reveals normally good conditions, degrading to fair conditions in the winter months. Stream degradation, however, 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 these waters being condemned to shellfishing.

The Upper Maurice River, as monitored at Norma, contains relatively low fecal coliform levels as well as fairly low amounts of nutrients. Total phosphorus was below applicable State criteria in all samples. Ten percent of inorganic nitrogen values observed during the period of review exceeded 2.0 mg/l. All daytime dissolved oxygen values were well above the 4.0 mg/l criterion necessary to support warmwater fisheries. One mercury sample was recorded as exceeding State standards.

Stream monitoring near Millville shows much higher levels of nutrient inputs than found upstream. Forty-seven percent of total phosphorus and seventy-seven percent of inorganic nitrogen recordings exceeded recommended levels. Fecal coliform bacteria levels are somewhat higher here than observed at Norma; however, only ten percent of samples were above standards. Dissolved oxygen recordings are acceptable, being similar to those observed at Norma.

Overall water quality appears to have remained the same at these two stations between 1983 and 1990.

Intensive surveys were performed on two tributaries in 1984 to determine the impacts of industrial discharges that were under enforcement 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. Macroinvertebrate sampling revealed a population where almost 70% of the individuals observed were intolerant of low dissolved oxygen levels.

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 Assessment

Point Source Assessment

The good water quality conditions of the Upper Maurice River indicate few pollution problems and no enforcement activities are currently underway in this watershed. Two facilities are presently undergoing upgrades that will improve their effluent quality: Millville STP, and American National Can (see Point Source Pollution Table).

The New Jersey 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 wastewaters, both of which are suspected 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 impairment 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 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 moderate to severe levels of cropland and pastureland runoff, pollution from road and housing construction sites, surface mining, and sludge disposal.

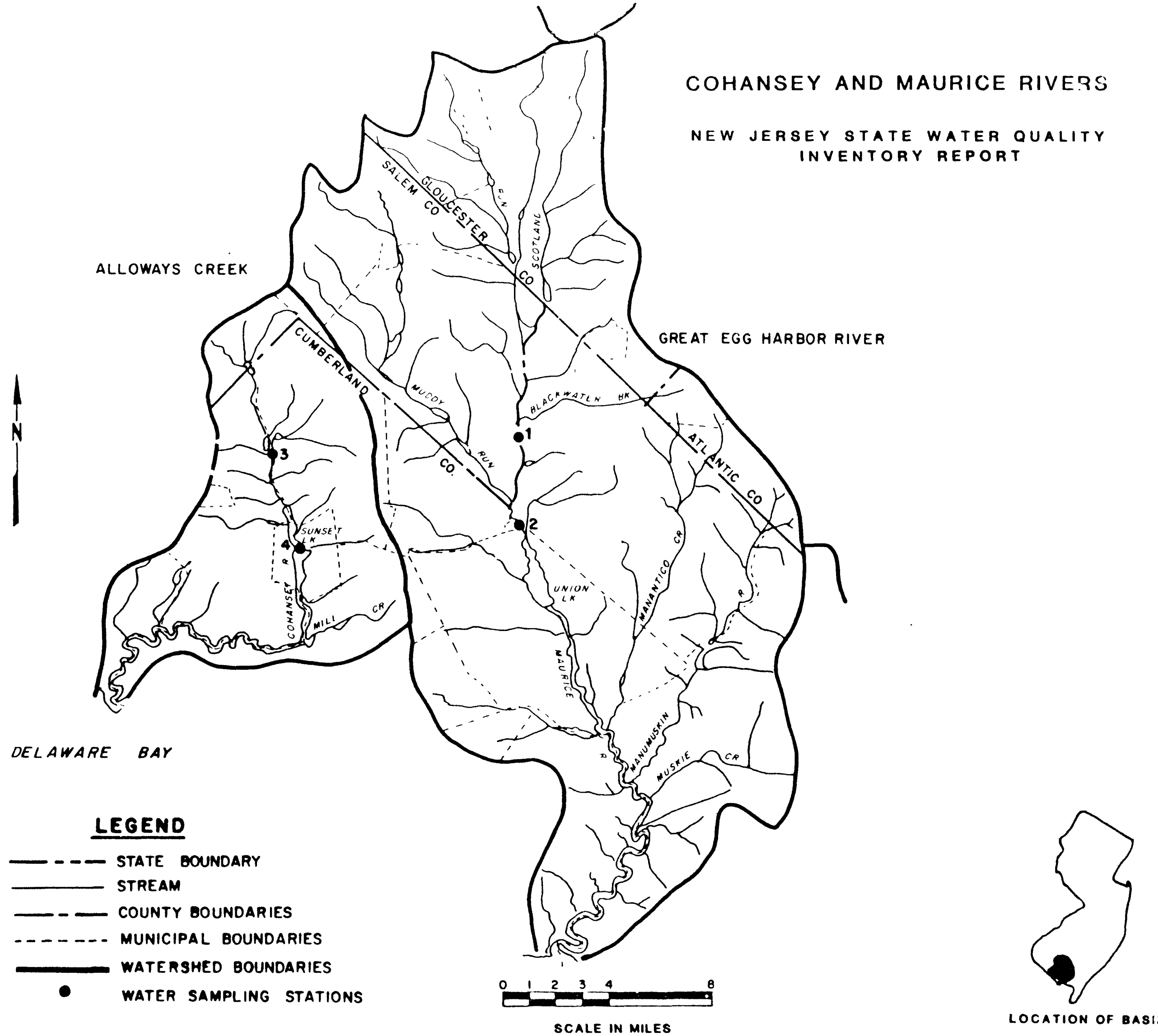
Designated Use Assessment

The Maurice River at Norma and near Millville is considered to be meeting the swimmable (primary contact) designated use, based on monitoring information.

The river is also considered to be supporting the aquatic life support designated use at Millville, but only partially supporting this use at Norma due to mercury contamination. Tributaries within the watershed are classified as either fully meeting this use (40 miles), or partially meeting the use (20 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
ALLOWAYS CREEK
GREAT EGG HARBOR RIVER
DELAWARE BAY
N
GLOUCESTER CO
SALEM CO
CUMBERLAND CO.
ATLANTIC CO
SCOTLAND
BLACKWATER BK
MUDDY RUN
SUNSET LK
UNION LK
MAURICE R
MANANTICO CR
MANUMUSKIN R
MUSKIE CR
COHANSEY R
MILL CR
1
2
3
4
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 PROFILES 1986-1990: **MAURICE RIVER**

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVG. AND WORST 3-MONTH CONDITION
Maurice R. at Norma	AVG. WQI:	2	15	4	8	14	2	0	6	8 EXCL.
	WORST 3 MONTHS:	JUNE-AUG.	MAY-JULY	FEB.-APRIL	MAY-JULY	DEC.-FEB.	MAR.-MAY		MAR.-MAY	13 GOOD MAY-JULY
Maurice R. near Millville	AVG. WQI:	3	27	4	17	24	3	1	10	23 GOOD
	WORST 3 MONTHS:	JUNE-AUG.	MAY-JULY	SEPT.-NOV.	DEC.-FEB.	JAN.-MAR.	AUG.-OCT.	JULY-SEPT.	JULY-SEPT.	26 FAIR JAN.-MAR.

LEGEND: WATER QUALITY INDEX DESCRIPTION

Note: an index value of 20 is equivalent to the level of water quality criteria.

WQI	Condition	Description
0-10	Excellent	Pollution minimal or absent; water uses met throughout the year.
11-25	Good	Pollution generally in low amounts; water uses periodically not met.
26-60	Fair	Pollution varies from moderate to high levels; certain water uses prohibited.

WQI	Condition	Description
61-80	Poor	Pollution present in high levels; water uses not met.
81-100	Very Poor	Pollution present in extremely high levels; severe stress to streamlife; water uses not met.
ID	Insufficient Data	

POINT SOURCE POLLUTION TABLE
WATERSHED: Maurice River

IMPROVEMENTS TO FACILITIES AFFECTING WATER QUALITY

FACILITY	RECEIVING WATER	POLLUTANT	COMMENTS
Millville STP NJPDES 0029467	Maurice River	Sanitary Wastewater	Facility is upgrading and improving itself continually.
American National Can NJPDES 0005398	Petticoat Creek	N/A	Upgrades and continual improvements are underway at this facility

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 approximately 12 NJPDES permitted discharges here, about half are municipal and half 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 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 from good to fair quality in the downstream portions of the river. 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 elevated to near neutral levels. Stream conditions are most severe during the late spring and early summer months. Total phosphorus averaged 0.44 mg/l during the 1986 through 1990 period of review with almost all (96 percent) of the values greater than the applicable State criterion. Total inorganic nitrogen also appeared excessive in nearly 30 percent of the samples collected. Dissolved oxygen concentrations drop below

4.0 mg/l during summer months and percent saturation averaged only 61 percent during the period of review. Biochemical oxygen demand frequently exceeded 3.0 mg/l. Stream pH averages 6.1 SU, significantly greater than the recommended 3.5 to 5.5 range for Pineland surface waters. Bacterial contamination was regarded as moderate with 26 percent of samples exceeding the 200 MPN/100ml State criterion.

Downstream near Blue Anchor the Great Egg Harbor River recovers somewhat from the problems at Sicklerville. Total phosphorus is still high with 82 percent of recordings being above the State criterion, but total inorganic nitrogen is significantly lower with only 3 percent of samples exceeding recommended levels. Also in contrast to Sicklerville, dissolved oxygen levels here were adequate; no recordings fell below recommended levels. Instream pH values do show reductions, although they continue to average above what is considered natural background for Pineland streams. Fecal coliform counts are similar to those encountered upstream.

Farther downstream at Folsom water quality remains fair, degrading to poor during the summer months. Although all inorganic nitrogen recordings fell within acceptable levels, all total phosphorus samples were elevated beyond State standards. Bacterial levels remained within the levels encountered at the more upstream stations. Surface water pH measurements show a rise in mean level, reflecting the slight decline in water quality here as apposed to Blue Anchor, with 85 percent of the recorded pH levels exceeding the levels recommended for Pinelands waters. Daytime dissolved oxygen was observed to be within acceptable levels. Elevated copper values, also noted in previous Inventory Reports, continue to be observed at this station.

Water quality in the river at Weymouth shows substantial improvement over all upstream stations. Total phosphorus remains elevated but concentrations are lower, exceeding criteria in 58 percent of samples. All inorganic nitrogen values were acceptable. The average pH value is 5.3, showing a return to more natural conditions. Dissolved oxygen concentrations are sufficient for the protection and maintenance of warm-water fisheries.

Various portions of the non-tidal reaches of the Great Egg Harbor River are regarded by the Department as being impaired due to toxic discharges emanating from point sources. The contaminants of concern are arsenic, copper, nickel, mercury, cadmium, chromium, lead, zinc, and beryllium. The criteria violated are USEPA's Federal Aquatic Life chronic criteria, USEPA's Federal Human Health-water and fish ingestion criteria, and USEPA's Federal human health criteria for exposure to carcinogens.

Past Inventory Reports have indicated that the Tuckahoe River had failed to meet public health fecal coliform standards for primary contact recreation during the spring and summer periods. Past intensive sampling revealed that the primary source of this contamination was 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. Pollution intolerant macroinvertebrates comprised 30% of the substrate sample in 1988, indicating favorable dissolved oxygen levels. Biomonitoring over the past ten years has suggested that there has been a gradual improvement in water quality through time at this station. No fisheries evaluations were made by the New Jersey Division of Fish, Game and Wildlife of streams in the Great Egg Harbor River watershed.

Problem 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; however, a number of enforcement cases have led to improvements in facilities discharging into the watershed. The Berlin Borough STP, which has been a problem in the past, has been converted into a pump station with the effluent now being processed at the Camden County MUA in Camden. The effluent is now discharged directly into the Delaware River. The Buena Borough STP (discharge to the Batsto River) is currently undergoing an upgrade and is shifting from surface water to a ground water discharge. Two additional facilities are listed (see Point Source Pollution Table for this watershed) as having ceased discharging within the last two years. No facilities are currently reported as undergoing enforcement action at the present time within the Great Egg Harbor River Watershed.

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 Harbor River 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 of nonpoint source pollution. Squankum Branch (7 miles long) and Four Mile Branch are both 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 suspected of receiving sediment loads (believed to be declining). Mill Branch is suspected of being 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 are suspected of 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. Patcong Lake is "silting in" from runoff; the suspected source being housing construction and suburban surfaces.

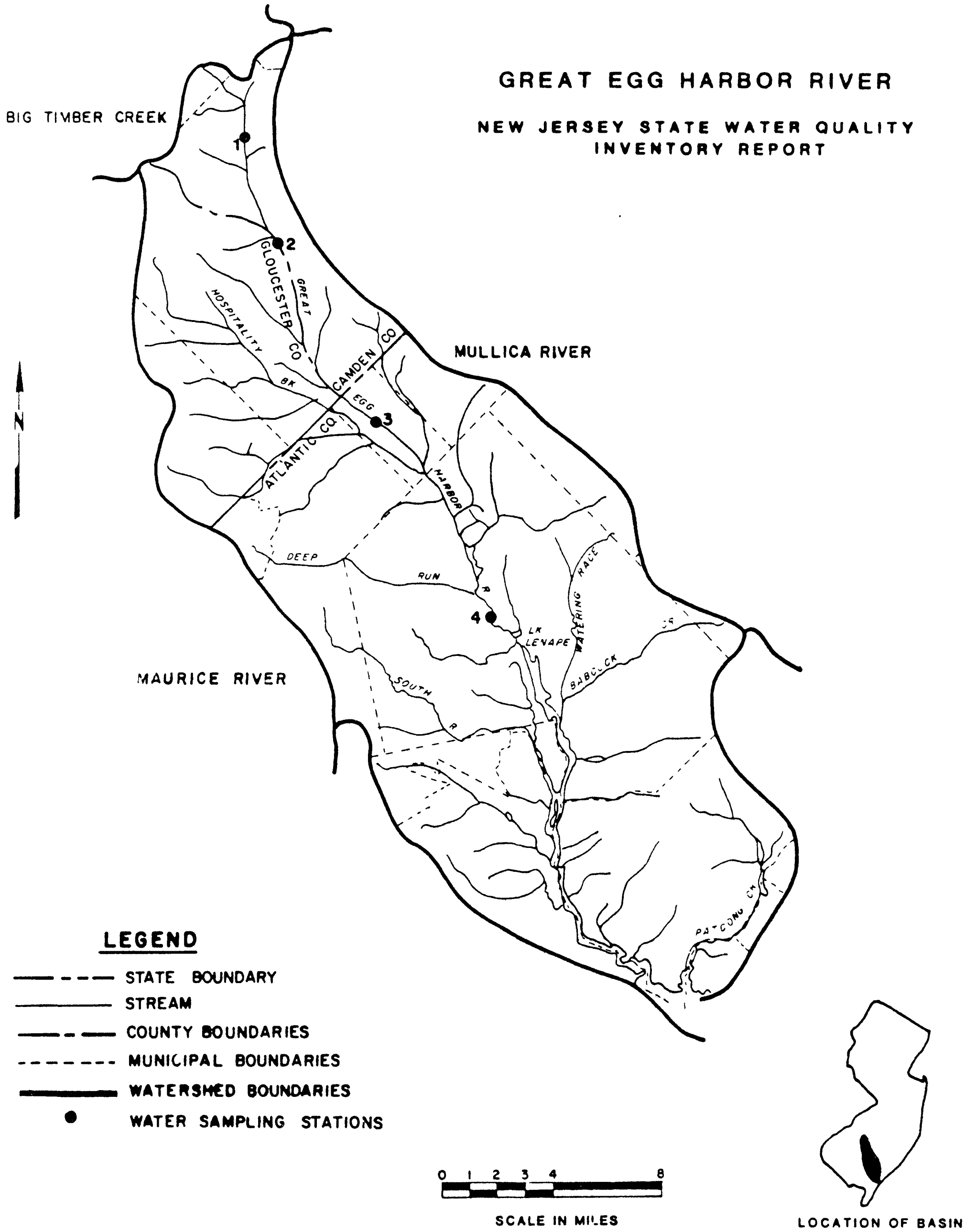
Designated Use Assessment

Most of the monitored portions of the Great Egg Harbor River will not support the swimmable (primary contact) use due to levels of fecal coliform bacteria. Only the station at Folsom is assessed as partially supporting the swimmable use.

The freshwater reaches of the river are assessed as not supporting the aquatic life support use because of elevated pH levels that are believed to be seriously affecting the acid tolerant aquatic community in the river. The uppermost tidal sections of the river are classified as condemned for the direct harvesting of shellfish. Below the confluence with Powell Greek the river's shellfish classification becomes either special restricted or seasonal. At a point just upstream of the confluence with the Tuckahoe River out to and including the Great Egg Harbor Bay, the waters are fully approved for shellfishing.

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
HOSPITALITY BK
GREAT EGG HARBOR R
DEEP RUN
LK LENAPE
SOUTH R
PATCONG CR
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 PROFILES 1986-1990: **GREAT EGG HARBOR RIVER**

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVG. AND WORST 3-MONTH CONDITION
Great Egg Harbor R. near Sticklerville	AVG. WQI:	1	44	44	17	62	3	0	5	75 V. POOR
	WORST 3 MONTHS:	JUNE-AUG.	MAY-JULY	APRIL-JUNE	MAY-JULY	APRIL-JUNE	AUG.-OCT.	APRIL-JUNE	SEPT.-NOV.	93 V. POOR MAY-JULY
Great Egg Harbor R. near Blue Anchor	AVG. WQI:	1	26	38	18	20	2	0	4	34 FAIR
	WORST 3 MONTHS:	JUNE-AUG.	MAY-JULY	APRIL-JUNE	JUNE-AUG.	JUNE-AUG.	JULY-SEPT.		JUNE-AUG.	51 FAIR MAY-JULY
Great Egg Harbor R. at Weymouth	AVG. WQI:	2	17	18	12	25	2	0	11	19 GOOD
	WORST 3 MONTHS:	JUNE-AUG.	MAY-JULY	JUNE-AUG.	AUG.-OCT.	JUNE-AUG.	MAY-JULY		APRIL-JUNE	33 FAIR JUNE-AUG.
Great Egg Harbor R. at Folsom	AVG. WQI:	1	21	48	19	34	2	0	14	50 FAIR
	WORST 3 MONTHS:	JUNE-AUG.	OCT.-DEC.	AUG.-OCT.	NOV.-JAN.	JULY-SEPT.	FEB.-APRIL	JUNE-AUG.	JULY-SEPT.	68 POOR OCT.-DEC.

LEGEND: WATER QUALITY INDEX DESCRIPTION

Note: an index value of 20 is equivalent to the level of water quality criteria.

WQI	Condition	Description
0-10	Excellent	Pollution minimal or absent; water uses met throughout the year.
11-25	Good	Pollution generally in low amounts; water uses periodically not met.
26-60	Fair	Pollution varies from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution present in high levels; water uses not met.
81-100	Very Poor	Pollution present in extremely high levels; severe stress to streamlife; water uses not met.
ID	Insufficient Data	

POINT SORCE POLLUTION TABLE
WATERSHED: Great Egg Harbor River

IMPROVEMENTS TO FACILITIES AFFECTING WATER QUALITY

FACILITY	RECEIVING WATER	POLLUTANT	COMMENTS
NJ Expressway Central Manintainance NJPDES 0026522	Pennypot Creek	Sanitary Wastewater	Facility ceased discharging on August 19, 1991. It's wastewater is being treated at the Atlantic County MUA. STP.
NJ Expressway Farley Plaza. NJPDES 0026531	Makepeace Stream	Sanitary Wastewater	Facility ceased discharging on September 11, 1991 and it's wastewater is now being treated at the Atlantic County MUA. STP.
Buena Boro STP NJPDES 0021717	Deep Run	Sanitary Wastewater	Upgrades and continual improvements are underway at this facility.

20. MULLICA RIVER

Watershed Description

The Mullica River and tributaries are considered the primary drainage system for the Pinelands. The total area of the drainage basin (Mullica River and tributaries) is some 561 square miles. The Mullica River itself is about 45 miles long. Major tributaries within the watershed 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 consists of state parks and forests, with the remainder being agricultural and developed areas. Of the approximately 7 NJPDES permitted discharges here, roughly half are municipal/institutional and half 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. Also sampled are Hammonton Creek, Batsto River, West Branch of the Wading River, Oswego River and the East Branch of the Bass River. The Mullica watershed is for the most part undeveloped forests within State parks. 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 itself contains excellent water quality at Atsion, but degrades to generally fair quality downstream at Green Bank. At Atsion, no nutrient indicators contravened State criteria in samples collected. Some minor impairment is evident, however, in the pH recordings, of which 33 percent exceeded the recommended ranges for these acid waters. Also observed at this location were some minor bacterial violations, and one elevated copper sample.

The Mullica River at Green Bank degrades notably from the quality observed at Atsion. At Green Bank samples reveal moderately excessive bacteria and nutrient concentrations, as well as pH recordings which are often greater than natural background. Dissolved oxygen levels are, however, adequate when measured as milligrams per liter. The geometric mean of fecal coliform counts during the period from 1986 through 1990 was 85 MPN/100ml, with 22 percent greater than 200 MPN/100ml. Total phosphorus was considered high in 38 percent of the samples from this period. High conductivity values, especially during summer months, indicates the influx of brackish tidal water at Green Bank.

The Batsto River at Batsto, the West Branch Wading River at Maxwell, and the Oswego River at Harrisville all possess excellent water quality. The East Branch Bass River at New Gretna is rated good because of some depressed dissolved oxygen recordings observed in 1990. These oxygen recordings are, however, within the lower end of the acceptable levels established for warm water fisheries. In all streams fecal coliform and nutrient concentrations are low and are generally indicative of natural background conditions. One elevated mercury concentration was detected in the Batsto during this period of analysis.

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 typical Pineland's water. During summer months water quality worsens to yet even poorer conditions. Dissolved oxygen sometimes approached 3 mg/l in summer months with biochemical oxygen demand frequently above 4.0 mg/l. Dissolved oxygen saturation averaged only 53 percent from 1986 through 1990 and thirty percent of the dissolved oxygen values were less than 4.0 mg/l. Total phosphorus averaged 0.83 mg/l with all values contravening the State criterion. Total inorganic nitrogen was excessive in the majority of the samples collected.

Hammonton Creek is regarded by the Department as an impaired waterway due to toxic discharges emanating from point sources. The contaminants of concern are arsenic, mercury, cadmium, lead, zinc, and nickel. The criteria violated are USEPA's Federal Aquatic Life chronic criteria, USEPA's Federal Human

Health/water and fish ingestion criteria, and USEPA's Federal human health criteria for exposure to carcinogens.

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 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.

A summary of point source discharges affecting water quality is provided in the Point Source Pollution Table for the Mullica watershed. Hammonton Creek has historically been severely impacted by the Hammonton MUA wastewater discharge which releases excess nutrients and oxygen-demanding substances. The plant continues to be under enforcement action and is scheduled to be replaced with a new, more efficient treatment facility. The Egg Harbor City STP, reported to have had a deleterious impact on Union Creek, has ceased its discharge and its effluent is now transported to the Atlantic County MUA and discharged into the Atlantic Ocean.

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 suspected of releasing volatile organics, pesticides, and metals to nearby cranberry 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 suspected of being 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 reported 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 reported to be impacted by moderate yet increasing amounts of urban stormwater runoff. Landing Creek is also suspected to be impacted by occasional leachate from local landfills.

In the Lower Mullica/Great Bay sub-watersheds, the Wading River is suspected of being severely impacted by hazardous waste sites. The problem is reported to be 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 reported by local authorities to have no observable nonpoint source pollution problems.

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

Designated Use Assessment

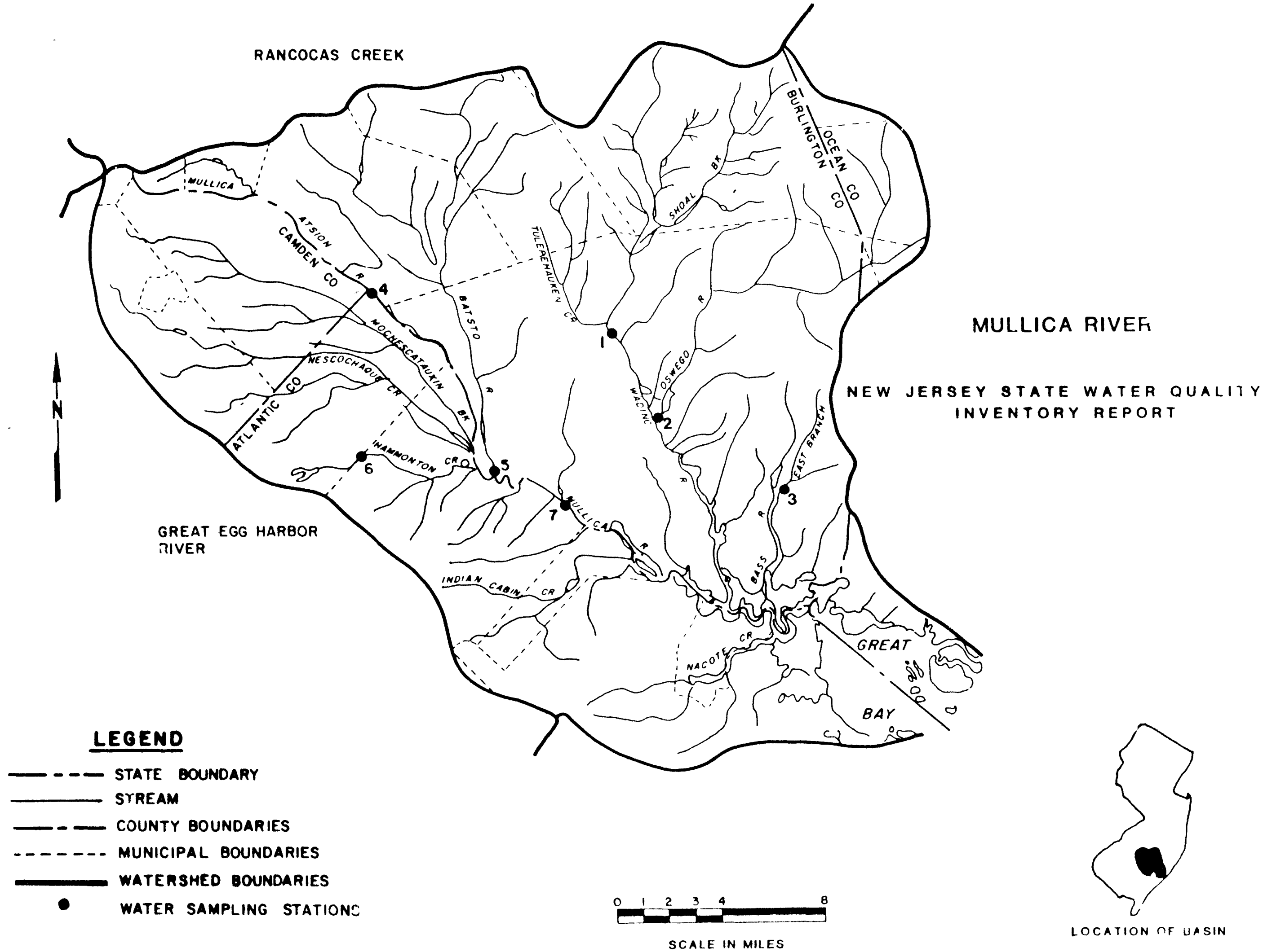
The Mullica River fully supports the primary contact recreation (swimming) designated use at Atsion, and partially supports the use at Green Bank. Hammonton Creek does not support the primary contact use at Westcoatville. All other fixed monitoring stations within the watershed are fully swimmable.

All waters in the Mullica River system, with the exception of Hammonton Creek, will support the aquatic life support designated use. Most streams in the watershed are believed to be supporting health aquatic communities, Hammonton Creek is considered to be partially supporting the aquatic life use because of very poor water quality conditions.

Tidal sections of the Mullica River and tributaries are classified as "special restricted", "seasonal", or "fully approved" with regard to shellfish harvesting, depending on location. The Mullica itself is classified as special restricted above Moss Point. Between Moss Point and Doctors Point, the waters are "seasonal restricted". Downstream of Doctors Point, the waters are "fully approved" for shellfish harvesting.

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


MULLICA RIVER
NEW JERSEY STATE WATER QUALITY INVENTORY REPORT
RANCOCAS CREEK
GREAT EGG HARBOR RIVER
MULLICA
ATSION
CAMDEN CO
BATSTO
R
MOCHESCATAUXIN
NESCOCHAQUE CR
ATLANTIC CO
BK
HAMMONTON CR
MULLICA
R
INDIAN CABIN CR
NACOTE CR
BASS
R
EAST BRANCH
OSWEGO
WADING
R
SHOAL BK
BURLINGTON CO
OCEAN CO
GREAT
BAY
1
2
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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 PROFILES 1986-1990: **MULLICA RIVER**

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVG. AND WORST 3-MONTH CONDITION
WB Wading River at Maxwell	AVG. WQI:	2	17	5	4	4	1	0	7	6 EXCEL.
	WORST 3 MONTHS:	JUNE-AUG.	JULY SEPT.	DEC.-FEB.	MAY-JULY	JUNE-AUG.	DEC.-FEB.		APRIL-JUNE	7 EXCEL. JULY SEPT.
Oswego River at Harrisville	AVG. WQI:	3	9	3	7	5	1	0	11	5 EXCEL.
	WORST 3 MONTHS:	JUNE-AUG.	AUG.-OCT.	MAY-JULY	JULY SEPT.	JULY SEPT.	DEC.-FEB.		MAR.-MAY	6 EXCEL. JUNE-AUG.
E. B. Bass R. near New Gretna	AVG. WQI:	1	27	3	8	5	1	0	8	13 GOOD
	WORST 3 MONTHS:	JULY SEPT.	AUG.-OCT.	OCT.-DEC.	JULY SEPT.	JULY SEPT.	DEC.-FEB.		SEPT.-NOV.	22 GOOD AUG.-OCT.
Hammonton Creek at Westcoatville	AVG. WQI:	2	54	56	20	56	3	2	26	91 V.POOR
	WORST 3 MONTHS:	JUNE-AUG.	JULY-SEPT.	JAN.-MAR.	JULY SEPT.	AUG.-OCT.	AUG.-OCT.	JAN.-MAR.	SEPT.-NOV.	100 V.POOR JULY-SEPT.

LEGEND: WATER QUALITY INDEX DESCRIPTION

Note: an index value of 20 is equivalent to the level of water quality criteria.

WQI	Condition	Description
0-10	Excellent	Pollution minimal or absent; water uses met throughout the year.
11-25	Good	Pollution generally in low amounts; water uses periodically not met.
26-60	Fair	Pollution varies from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution present in high levels; water uses not met.
81-100	Very Poor	Pollution present in extremely high levels; severe stress to streamlife; water uses not met.
ID	Insufficient Data	

WATER QUALITY INDEX PROFILES 1986-1990: **MULLICA RIVER continued**

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVG. AND WORST 3-MONTH CONDITION
Mullica River at Atsion Lake	AVG. WQI:	3	14	14	9	8	1	0	7	10 EXCEL.
	WORST 3 MONTHS:	JUNE-AUG.	AUG.-OCT.	SEPT.- OCT.	JULY-SEPT.	OCT.-DEC.	JULY-SEPT.		SEPT.-NOV.	18 GOOD AUG.-OCT.
Mullica River at Green Bank	AVG. WQI:	5	15	57	29	15	11	1	11	50 FAIR
	WORST 3 MONTHS:	JUNE-AUG.	JUNE-AUG.	AUG.-OCT.	MAR.-MAY	JULY-SEPT.	NOV.-JAN.	JULY-SEPT.	JULY-SEPT.	75 POOR JULY-SEPT.
Batsto River at Batsto	AVG. WQI:	3	14	13	9	9	1	0	11	9 EXCEL.
	WORST 3 MONTHS:	JUNE-AUG.	JUNE-AUG.	OCT.-DEC.	JULY-SEPT.	DEC.-FEB.	DEC.-FEB.		MAR.-MAY	11 GOOD JUNE-AUG.

LEGEND: WATER QUALITY INDEX DESCRIPTION

Note: an index value of 20 is equivalent to the level of water quality criteria.

WQI	Condition	Description
0-10	Excellent	Pollution minimal or absent; water uses met throughout the year.
11-25	Good	Pollution generally in low amounts; water uses periodically not met.
26-60	Fair	Pollution varies from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution present in high levels; water uses not met.
81-100	Very Poor	Pollution present in extremely high levels; severe stress to streamlife; water uses not met.
ID	Insufficient Data	

POINT SOURCE POLLUTION TABLE
WATERSHED: Mullica River

IMPROVEMENTS TO FACILITIES AFFECTING WATER QUALITY

FACILITY	RECEIVING WATER	POLLUTANT	COMMENTS
Egg Harbor City STP. NJPDES 0024589	Union Creek	Sanitary Wastewater	This facility has ceased it's discharge. The effluent is now transported to the Atlantic County MUA and discharged into the Atlantic Ocean.
NJ Highway - Atlantic City Service Area. NJPDES 0027189	Mattily Run	Sanitary Wastewater	This facility has ceased it's discharge. The effluent is now transported to the Atlantic County MUA and discharged into the Atlantic Ocean.
Hammonton STP	Hammonton Creek	Sanitary Wastewater	Currently under an amended administrative consent order for permit violations. Plant is scheduled to be closed and replaced with a new, modern treatment plant.

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 which feed into the Toms River. The larger tributaries include Davenports Branch, Union Branch, and Wrangle Brook. Sub-watersheds 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 approximately 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 waters are also designated trout maintenance), FW-1, FW-2 Nontrout, and SE-1.

Water Quality Assessment

An evaluation of water quality data collected from the Toms River near the Borough 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 Borough contains excellent water quality all year round. There appears to be some upgrade in water quality since the previous report, as the river now reflects the excellent water quality it was reported to have had in the first half of the 1980's. Fecal coliform, which was at problematic levels in the last assessment, appears to have improved somewhat. Fecal coliform exceeded the State criterion of 200 MPN/100 ml in 14 percent of the samples in the present period of review. In contrast, during the previous assessment, 38 percent of the samples exceeded standards.

Surface and ground waters are naturally acidic in this region. While pH averaged 4.9 SU between 1986 through 1990, 20 percent of the values were greater than the 5.5 SU upper criterion for Pinelands waters. Nutrients were within respective criteria in all samples. Daytime dissolved oxygen concentrations are sufficient throughout the year and biochemical oxygen demand is consistently less than 2.0 mg/l. One mercury sample was found to be in violation of water quality criteria.

Ocean County Health Department monitoring of the Upper Toms River in the first half of this decade had 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 Assessment

Point Source Assessment

The Toms River does not suffer from any severe pollution problems, based on the ambient monitoring. A few minor point sources are present in the watershed, but they do not appear to have significant effects on stream quality.

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 potentially affecting the Toms River with volatile organics and metals.

Nonpoint Source Assessment

Nonpoint source 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 predominant 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 prominent source of nonpoint pollution in this central New Jersey region is 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 greater 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 water quality resulting from the impacts of urban surface runoff and septic tank leachate. These sources have caused high ammonia levels in the stream and have correspondingly threatened the stream's recreational use.

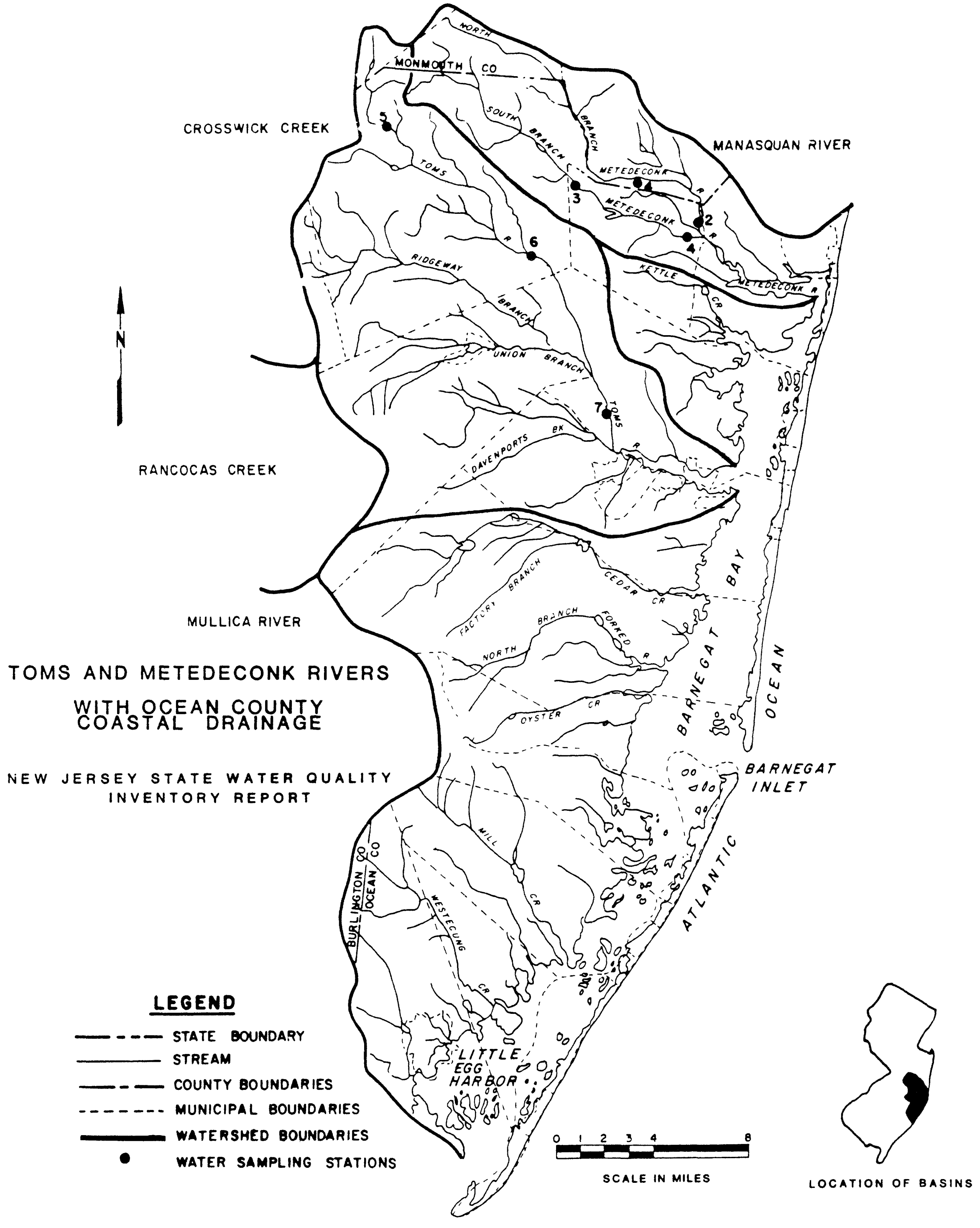
Pine Lake in Manchester Township has had beach closures because of pollution brought about by urban surface runoff combined with municipal sewage treatment plant effluent.

Designated Use Assessment

The Toms River only partially supports the swimmable (primary contact) use in the freshwater sections because of occasional unacceptable fecal coliform concentrations. The Toms River itself has not undergone a biological assessment and hence, its support of the aquatic life use has not been determined. Numerous local tributaries, however, have been assessed and are fully supporting the aquatic life use. It is feared, however, that the increasing amounts of runoff present within the watershed may begin to threaten some of the acid-tolerant fish populations. The tidal reaches the Toms River are 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


CROSSWICK CREEK
MANASQUAN RIVER
MONMOUTH CO
NORTH
SOUTH BRANCH
BRANCH
METEDECONK
METEDECONK
R
TOMS
R
RIDGEWAY
BRANCH
UNION BRANCH
KETTLE
CR
METEDECONK R
TOMS
R
DAVENPORTS BK
RANCOCAS CREEK
MULLICA RIVER
FACTORY BRANCH
CEDAR CR
NORTH BRANCH
FORKED R
OYSTER CR
BARNEGAT BAY
OCEAN
BARNEGAT INLET
ATLANTIC
MILL CR
WESTECUNG CR
BURLINGTON CO
OCEAN CO
LITTLE EGG HARBOR
TOMS AND METEDECONK RIVERS
WITH OCEAN COUNTY COASTAL DRAINAGE
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
LOCATION OF BASINS
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1
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5
6
7

WATER QUALITY INDEX PROFILES 1986-1990: **TOMS RIVER**

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVG. AND WORST 3-MONTH CONDITION
Toms River near Toms River	AVG. WQI:	1	9	11	10	5	2	0	8	6 EXCEL.
	WORST 3 MONTHS:	JUNE-AUG.	MAY-JULY	OCT.-DEC.	JULY SEPT.	JUNE-AUG.	SEPT.-NOV.		FEB.-APRIL	8 EXCEL. JULY SEPT.

LEGEND: WATER QUALITY INDEX DESCRIPTION

Note: an index value of 20 is equivalent to the level of water quality criteria.

WQI	Condition	Description
0-10	Excellent	Pollution minimal or absent; water uses met throughout the year.
11-25	Good	Pollution generally in low amounts; water uses periodically not met.
26-60	Fair	Pollution varies from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution present in high levels; water uses not met.
81-100	Very Poor	Pollution present in extremely high levels; severe stress to streamlife; water uses not met.
ID	Insufficient Data	

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 large-scale development is taking place in many areas. There are a number of small lakes and ponds, most of which are used for recreational purposes. Of the 11 NJPDES permitted discharges in the watershed, one is municipal, the rest are industrial/commercial. The waters are classified FW-1, FW-2 Trout Maintenance, FW-2 Nontrout, 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 have good water quality with conditions becoming somewhat reduced during the summer months. Water quality appears to have improved in both rivers during the past few years. This is based on comparing present water quality indices with those obtained during the prior review period.

At Squankum the Manasquan contains moderately excessive levels of nutrients and fecal coliform bacteria. Daytime dissolved oxygen is consistently at acceptable levels for trout maintenance waters. Stream temperature is at times higher than that recommended for cold-water fisheries. Fecal coliform levels averaged 107 MPN/100ml between 1986 through 1990, with 33 percent of the values greater than 200 MPN/100ml. These figures represent lower levels than were observed during the prior review period when fecal coliform levels averaged 625 MPN/100ml and all samples exceeded the State criterion.

As previously stated, water quality is also good in Marsh Bog Brook, a major tributary to the Manasquan. As with the Manasquan, moderately high bacterial levels are present at this location. Fecal coliform was excessive in 42 percent of samples since 1986, and averaged 168 MPN/100ml during this period. These values are lower than those obtained during the prior review period when although 65 percent of the samples exceeded criteria (similar to this assessment) the geometric mean was 536 MPN/100ml. These findings suggest a possible decline in bacterial inputs at this location.

In the prior review, Marsh Bog Brook showed excessive levels of total phosphorus (75 percent of the samples), total inorganic nitrogen (30 percent of samples), and organic nitrogen (also 30 percent of recordings). In contrast, the present review period indicates some probable reductions in nutrient loadings: no excessive levels of nitrogen were observed, either organic or inorganic; and total phosphorus was high in only 10 percent of samples. Daytime dissolved oxygen concentrations were sufficient throughout the period of review.

Biomonitoring conducted on the Manasquan River at Squankum found less than favorable community structures in 1984 and in 1988. Organisms intolerant of low dissolved oxygen comprised only 14% of the individuals observed in 1988. Since 1978, forms tolerant to low dissolved oxygen have gradually increased over time, replacing more intolerant species at this location.

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 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. The only facility currently under enforcement action by the Department within the watershed is Arthur Brisbane, a municipal discharger releasing inadequately treated effluent into Brisbane Lake (see Point Source Pollution Table).

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 contamination of waterways is a widespread and significant problem.

In the Manasquan River itself, agricultural nonpoint source pollution 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 Assessment

The Manasquan River and Marsh Bog Brook will not support the swimmable (primary contact) designated use because of elevated fecal coliform levels.

These streams in general will support the aquatic life support designated use based upon fishery assessments. However, the aquatic communities are stressed in sections (due to the water's highly enriched condition and occasional reduced dissolved oxygen) and is assessed as partially supporting the aquatic life use at Squankum based upon macroinvertebrate studies.

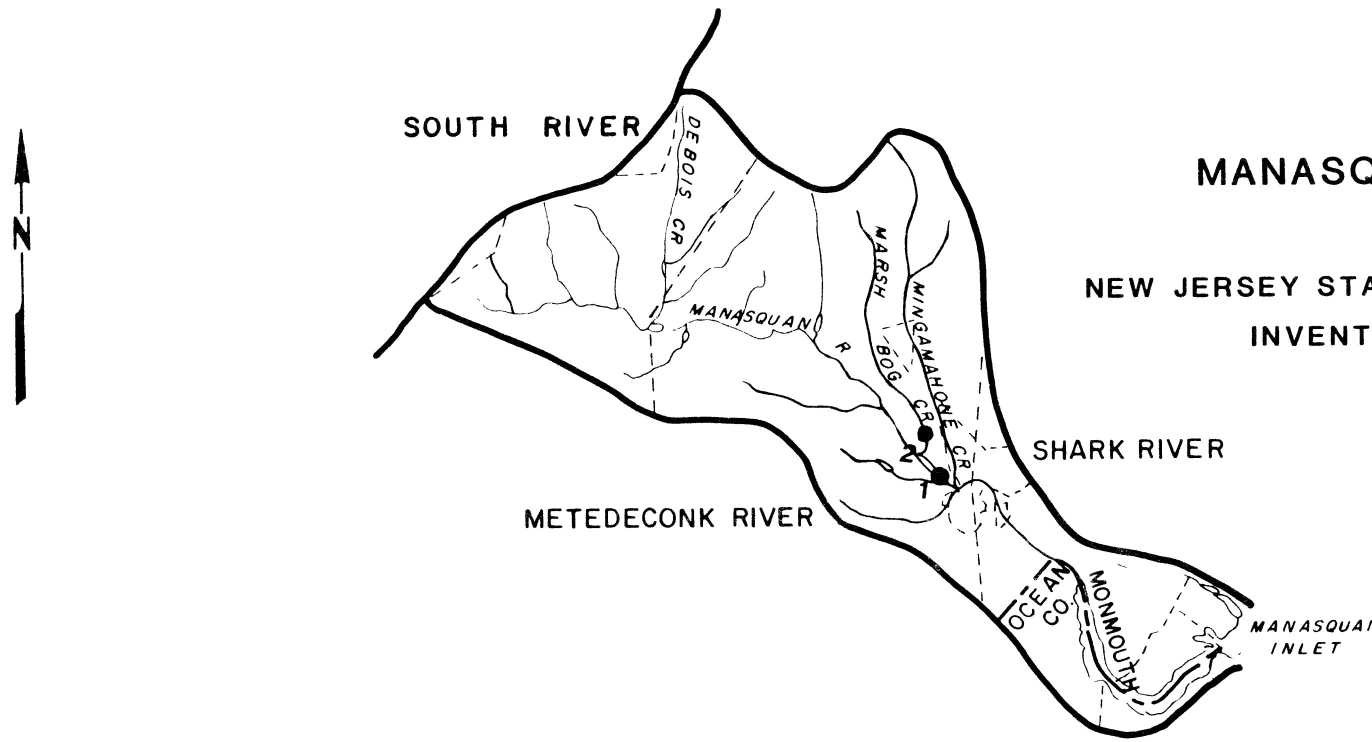
The tidal Manasquan River is condemned for the harvesting of shellfish in the tidal reaches downstream to the Rt 70 bridge. Below the bridge the waters are classified as Special Restricted.

Monitoring Station List

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

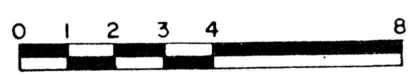
MANASQUAN RIVER

NEW JERSEY STATE WATER QUALITY INVENTORY REPORT



LEGEND

- STATE BOUNDARY
- STREAM
- COUNTY BOUNDARIES
- MUNICIPAL BOUNDARIES
- WATERSHED BOUNDARIES
- WATER SAMPLING STATIONS



SCALE IN MILES

LOCATION OF BASIN

WATER QUALITY INDEX PROFILES 1986-1990: **MANASQUAN RIVER**

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVG. AND WORST 3-MONTH CONDITION
Marsh Bog Brook at Squankum	AVG. WQI:	1	14	9	23	14	4	0	7	14 GOOD
	WORST 3 MONTHS:	JUNE-AUG.	JUNE-AUG.	OCT.-DEC.	JULY-SEPT.	APRIL-JUNE	AUG.-OCT.	SEPT.-NOV.	MAY-JULY	21 GOOD JUNE-AUG.
Manasquan River at Squankum	AVG. WQI:	7	13	11	18	13	5	2	18	14 GOOD
	WORST 3 MONTHS:	JUNE-AUG.	MAY-JULY	DEC.-FEB.	JULY-SEPT.	JULY-SEPT.	FEB.-APRIL	NOV.-JAN.	JULY-SEPT.	21 GOOD JUNE-AUG.

LEGEND: WATER QUALITY INDEX DESCRIPTION

Note: an index value of 20 is equivalent to the level of water quality criteria.

WQI	Condition	Description
0-10	Excellent	Pollution minimal or absent; water uses met throughout the year.
11-25	Good	Pollution generally in low amounts; water uses periodically not met.
26-60	Fair	Pollution varies from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution present in high levels; water uses not met.
81-100	Very Poor	Pollution present in extremely high levels; severe stress to streamlife; water uses not met.
ID	Insufficient Data	

POINT SOURCE POLLUTION TABLE
WATERSHED: Manasquan River

FACILITIES IN NONCOMPLIANCE

FACILITY	RECEIVING WATER	POLLUTANT	COMMENTS
Arthur Brisbane NJPDES N/A	Brisbane Lake	Municipal Discharger exceeding Biochemical Oxygen Demand and Total Suspended Solids with respect to permit limitations.	None to report.

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. 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 to the Navesink; 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, as well as the Swimming River Reservoir and the Glendola Reservoir - both major potable water impoundments.

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 approximately 35 NJPDES permitted discharges, one-quarter are municipal and three-quarters 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, both near Neptune City are the only ambient water quality monitoring locations in these watersheds. Monitoring was discontinued on both Willow Brook and Yellow Brook in 1983.

Water quality is considered excellent and good based on sampling in Jumping Brook and the Shark River, respectively. The only water quality indicators found at problematic levels in Jumping Brook are occasional (25 percent) fecal coliform counts greater than 200 MPN/100ml. In the Shark River, nutrient and fecal coliform levels are slightly higher than in Jumping Brook. Fecal coliform levels had a geometric mean of 121 MPN/100ml with 39 percent of samples being greater than the State criterion. Total phosphorus was above the 0.1 mg/l criterion in 13 percent of the samples collected during the present period of review. 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 Assessment

Point Source Assessment

Point sources contribute to water quality problems in many of the coastal streams of Monmouth County. Willow Brook has in the past been reported to be suffering from the contribution of both point and nonpoint sources. A number of industrial point sources combined with suburban/agricultural runoff and septic systems are all suspected causes of the elevated nutrients and bacteria found in the brook. The only reported permit violation currently within this watershed is the Monmouth County Racetrack which is reported to be discharging stormwater contaminated with fecal coliform bacteria into the Shrewsbury River.

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 NJDEPE 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. Widespread 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 headwaters at 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. Agricultural runoff from croplands, pastures, and animal holding areas are believed to be contributing excess nutrients, silt, and bacteria to surface water. Horse manure at Monmouth Race Track contributes high levels of bacteria to the river. Increases in suburban and commercial construction in the watershed and runoff from storm sewers and suburban surfaces have sent 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 as originating from septic systems and waste disposal sites.

Designated Use Assessment

The aquatic life support designated use is supported in the Shark and Navesink Rivers, but the biota in portions of the Navesink River and tributaries may be stressed from poor water quality. The fisheries of the Shrewsbury River are partially degraded and, therefore, the river is considered to be partially supporting the aquatic life support use. Shellfish growing waters in this region are classified as special restricted (further treatment required) for harvesting.

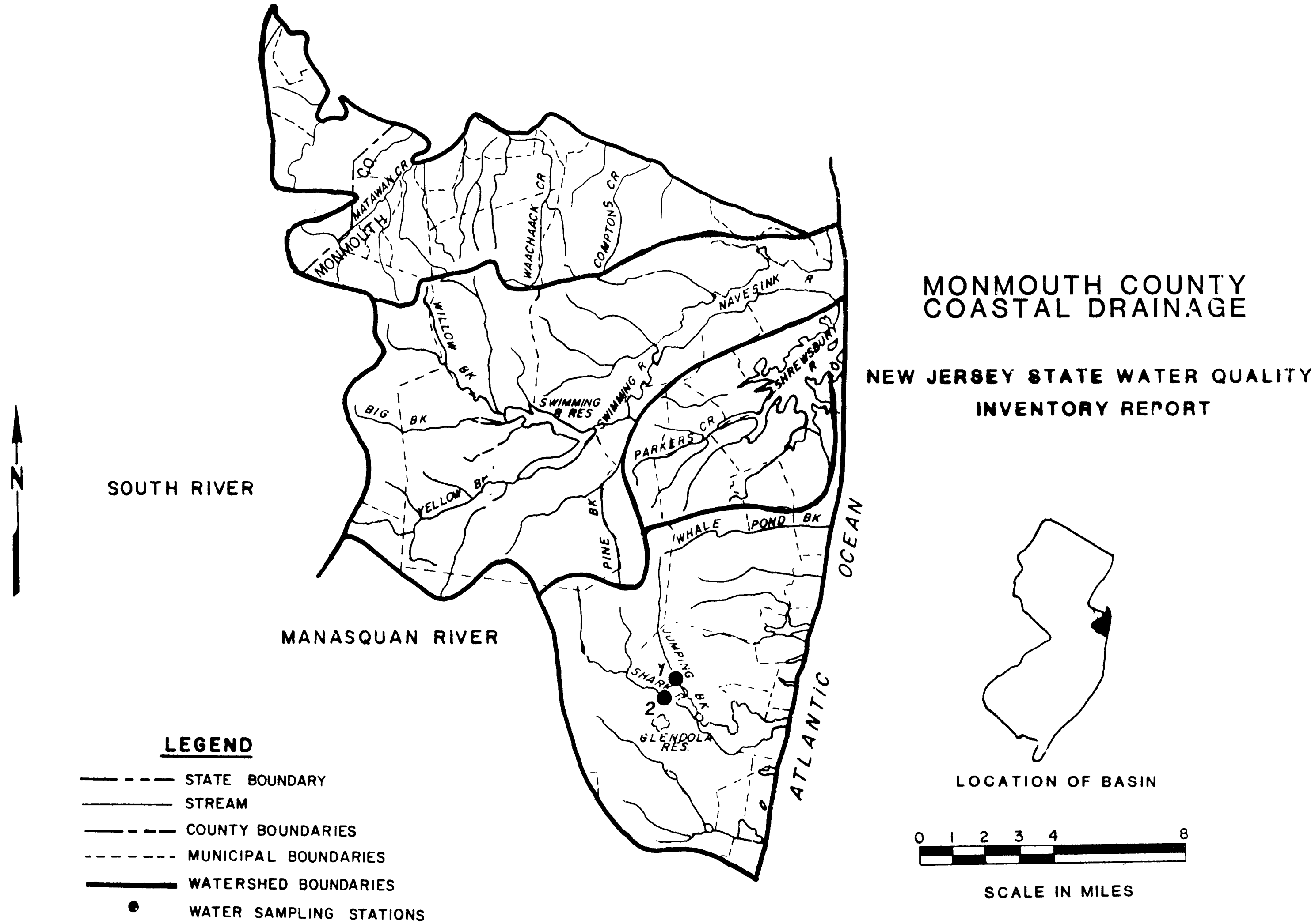
Based upon fecal coliform data, Jumping Brook will partially support the swimmable (primary contact) use, while the Shark River does not support the use.

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 Trout Maintenance

MONMOUTH COUNTY COASTAL DRAINAGE

NEW JERSEY STATE WATER QUALITY INVENTORY REPORT



WATER QUALITY INDEX PROFILES 1986-1990: **COASTAL MONMOUTH COUNTY**

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVG. AND WORST 3-MONTH CONDITION
Jumping Brook near Neptune City	AVG. WQI: WORST 3 MONTHS:	2 JUNE-AUG.	10 APRIL-JUNE	11 DEC.-FEB.	17 AUG.-OCT.	9 SEPT.-NOV.	5 DEC.-FEB.	0 SEPT.-NOV.	5 SEPT.-NOV.	10 EXCEL. 17 GOOD AUG.-OCT.
Shark River near Neptune City	AVG. WQI: WORST 3 MONTHS:	2 JULY-SEPT.	15 SEPT.-NOV.	11 SEPT.-NOV.	18 JUNE-AUG.	11 JUNE-AUG.	5 DEC.-FEB.	0 MAY-JULY	7 MAR.-MAY	14 GOOD 24 GOOD AUG.-OCT.

LEGEND: WATER QUALITY INDEX DESCRIPTION Note: an index value of 20 is equivalent to the level of water quality criteria.

WQI	Condition	Description	WQI	Condition	Description
0-10	Excellent	Pollution minimal or absent; water uses met throughout the year.	61-80	Poor	Pollution present in high levels; water uses not met.
11-25	Good	Pollution generally in low amounts; water uses periodically not met.	81-100	Very Poor	Pollution present in extremely high levels; severe stress to streamlife; water uses not met.
26-60	Fair	Pollution varies from moderate to high levels; certain water uses prohibited.	ID	Insufficient Data	

POINT SOURCE POLLUTION TABLE
WATERSHED: Coastal Monmouth County

FACILITIES IN NONCOMPLIANCE

FACILITY	RECEIVING WATER	POLLUTANT	COMMENTS
Monmouth County Racetrack NJPDES N/A	Shrewsbury River	Discharges Stormwater Runoff containing Fecal Coliform	None to report

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 approximately 23 NJPDES permitted discharges here, half are municipal, and half 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 monitoring indicate that the South Branch watershed contains generally good to fair quality waters - the South Branch itself being of good quality.

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 temperatures, elevated nutrients, and fecal coliform bacterial levels. The river, trout maintenance at these two locations, frequently has summer stream temperatures above the recommended criterion for the protection of cold-water fisheries. Fecal coliform exceeded the State criterion in 57 and 53 percent of the samples collected from 1986 through 1990 at Middle Valley and High Bridge, respectively. Total phosphorus was excessive in roughly one-half of the samples at both stations.

In the Lower South Branch, as measured at Stanton Station and Three Bridges, water quality continues to show good conditions with indicators at levels similar to those recorded at the two upstream stations. At Stanton Station stream temperatures are often high during warm-weather months for trout maintenance waters. Fecal coliform and total phosphorus were elevated in 26 and 15 percent of their samples respectively. Downstream at Three Bridges, the South Branch is classified as nontrout waters, with problematic levels of fecal coliform and total phosphorus. The geometric mean of fecal coliform counts during the period of review was 261 MPN/100ml, with 60 percent of samples above the criterion of 200 MPN/100ml. Total phosphorus was elevated in 66 percent of the samples and averaged 0.15 mg/l. At both locations all dissolved oxygen readings were above the criterion throughout the review period. Biochemical oxygen demand was variable but 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 to fair water quality in Spruce Run, and fair quality in the Neshanic River and Mulhockaway Creek. 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 much better quality: all coliform determinations were within accepted levels and only 13 percent of total phosphorus concentrations exceeded the criterion.

The remaining tributary monitored is the Neshanic River. This river as observed at Reaville is of fair quality all year, although quality worsens somewhat in the summer. The river appears to be enriched and experiences supersaturated dissolved oxygen during spring and summer as a result of elevated primary productivity. Both total phosphorus and total inorganic nitrogen appear in generally high amounts, exceeding recommended levels in 23 and 40 percent of samples respectively. Fecal coliform was above the 200 MPN/100ml criterion in 75 percent of samples collected, with a geometric mean of 542 MPN/100ml. Also occurring as a periodic problem are excessive un-ionized ammonia concentrations. Occasional excesses in total dissolved solids, reported in the previous assessment, were not observed during the present period of review.

Biological monitoring of the South Branch at Stanton Station in 1988 found generally healthy conditions; macroinvertebrate sampling revealed 47% of the sample to be forms intolerant of low dissolved oxygen levels. The sampling, however, did indicate some nutrient enrichment. Macroinvertebrate sampling over the past ten years has suggested continuing good conditions at this station.

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 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. NJDEPE enforcement actions are currently directed against five facilities (see Point Source Pollution Table). The Table also lists three facilities that were formally under enforcement action but have upgraded their discharge and are no longer considered to be impairing water quality.

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 on the rise in the Upper South Branch watershed and these are known to be sources of excessive sediment loading. 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 a severe problem in this watershed; especially the increasing number of older systems which are failing in the High Bridge and Califon areas.

Agriculture is suspected of contributing nutrient and sediment loads to the South Branch. Local authorities suggest that while runoff from pasture lands may be 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 evaluated for NPS impacts 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. The Mulhockaway Creek subwatershed is said to be experiencing significant amounts of housing development, which is 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. These problems arise from 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 Assessment

Based upon fecal coliform bacterial data, the Neshanic River, Mulhockaway Creek, South Branch, and the upper portions of Spruce Run will all not support the swimmable (primary contact) use. Below Spruce Run Reservoir, Spruce Run will support the designated us.

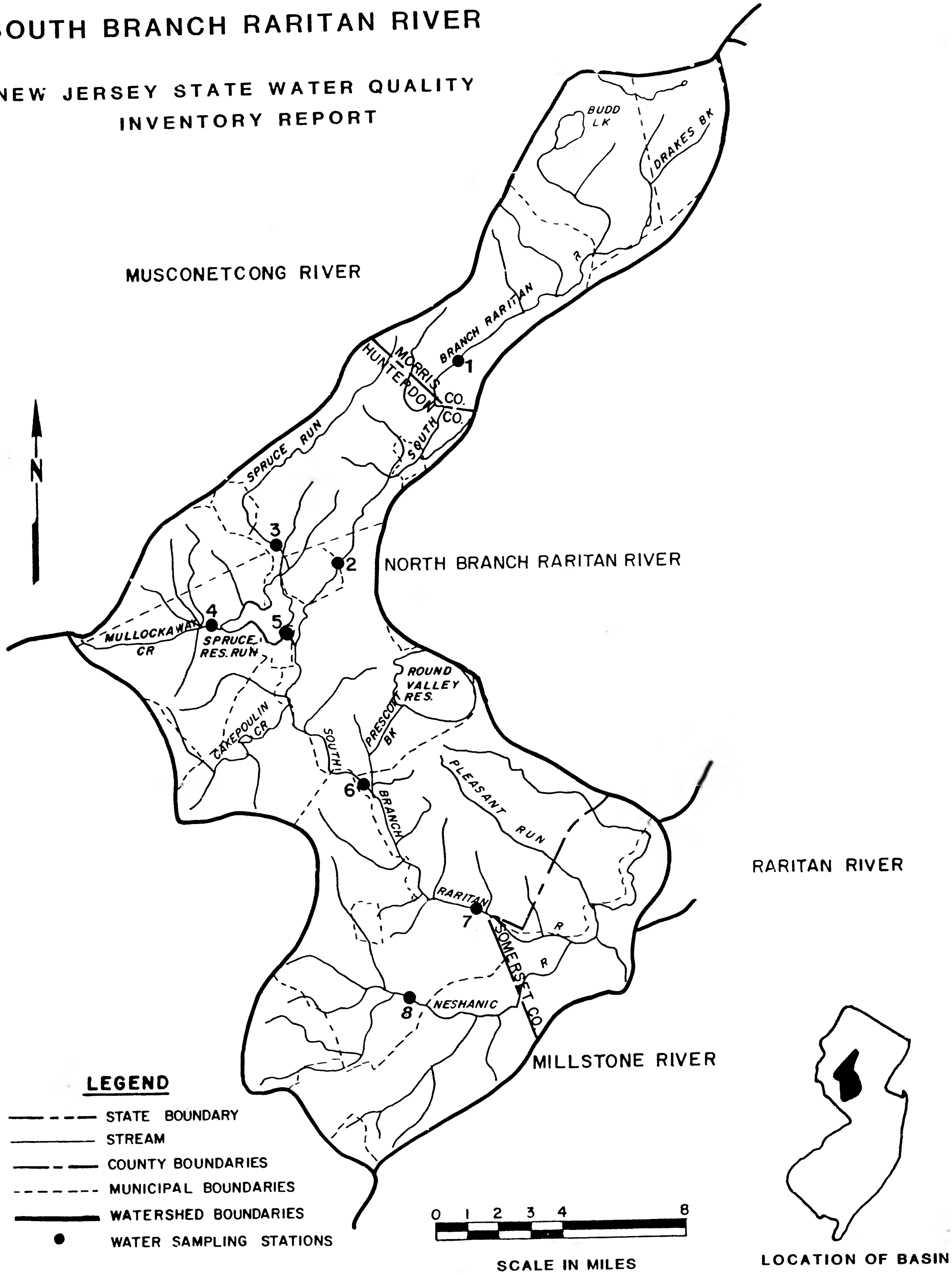
All waters will support the aquatic life support designated use and are recognized as having healthy cold and warm-water fisheries. The health of the fisheries of most streams, however, are threatened in sections because of increasing pollution loads.

Monitoring Station List

Map Number	Station Name and Classification
1	South Branch Raritan River at Middle Valley, FW-2 Trout Maintenance
2	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 PROFILES 1986-1990: **SOUTH BRANCH RARITAN RIVER**

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVG. AND WORST 3-MONTH CONDITION
SB Raritan River at Middle Valley	AVG. WQI:	8	7	10	25	19	6	4	15	21 GOOD
	WORST 3 MONTHS:	JUNE-AUG.	MAY-JULY	FEB.-APRIL	MAY-JULY	JULY -SEPT.	JULY SEPT.	JUNE-AUG.	APRIL-JUNE	36 FAIR JUNE-AUG.
SB Raritan River at High Bridge	AVG. WQI:	11	8	10	28	15	6	6	15	22 GOOD
	WORST 3 MONTHS:	JUNE-AUG.	DEC.-FEB.	FEB.-APRIL	JULY -SEPT.	JULY -SEPT.	JULY -SEPT.	JULY -SEPT.	OCT.-DEC.	39 FAIR JUNE-AUG.
SB Raritan R. at Stanton Station	AVG. WQI:	15	15	15	18	15	6	8	14	22 GOOD
	WORST 3 MONTHS:	MAY -JULY	APRIL-JUNE	OCT.-DEC.	JUNE-AUG.	JAN.-MAR.	APRIL-JUNE	MAY -JULY	DEC.-FEB.	41 FAIR MAY JULY
SB Raritan River at Three Bridges	AVG. WQI:	3	11	15	24	21	6	9	5	24 GOOD
	WORST 3 MONTHS:	JULY -SEPT.	AUG.-OCT.	SEPT.-NOV.	JULY -SEPT.	DEC.-FEB.	DEC.-FEB.	NOV.-JAN.	AUG.-OCT.	37 FAIR AUG.-OCT.

LEGEND: WATER QUALITY INDEX DESCRIPTION

Note: an index value of 20 is equivalent to the level of water quality criteria.

WQI	Condition	Description
0-10	Excellent	Pollution minimal or absent; water uses met throughout the year.
11-25	Good	Pollution generally in low amounts; water uses periodically not met.
26-60	Fair	Pollution varies from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution present in high levels; water uses not met.
81-100	Very Poor	Pollution present in extremely high levels; severe stress to streamlife; water uses not met.
ID	Insufficient Data	

WATER QUALITY INDEX PROFILES 1986-1990: **SO. BR. RARITAN RIVER continued**

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVG. AND WORST 3-MONTH CONDITION
Spruce Run near Glen Gardner	AVG. WQI:	8	7	8	31	30	4	1	18	30 FAIR
	WORST 3 MONTHS:	JUNE-AUG.	SEPT.-NOV,	OCT.DEC.	MAY-JULY	JULY-SEPT.	AUG.-OCT.	JUNE-AUG.	JUNE-AUG.	48 FAIR JUNE-AUG.
Spruce Run at Clinton	AVG. WQI:	14	9	12	10	9	4	3	16	14 GOOD
	WORST 3 MONTHS:	JUNE-AUG.	APRIL-JUNE	FEB.-APRIL	APRIL-JUNE	MAR.-MAY	JUNE-AUG.	MAY-JULY	APRIL-JUNE	23 GOOD MAY-JULY
Mulhockaway Cr. at Van Syckel	AVG. WQI:	10	7	8	35	29	5	2	18	34 FAIR
	WORST 3 MONTHS:	JUNE-AUG.	JULY-SEPT.	FEB.-APRIL	JUNE-AUG.	JULY-SEPT.	JUNE-AUG.	JULY-SEPT.	JUNE-AUG.	58 FAIR JULY-SEPT.
Neshanic River at Reaville	AVG. WQI:	3	27	26	38	18	9	9	6	44 FAIR
	WORST 3 MONTHS:	JULY-SEPT.	JUNE-AUG.	NOV.-JAN.	OCT.-DEC.	DEC.-FEB.	AUG.-OCT.	APRIL-JUNE	JUNE-AUG.	54 FAIR JUNE-AUG.

LEGEND: WATER QUALITY INDEX DESCRIPTION Note: an index value of 20 is equivalent to the level of water quality criteria.

WQI	Condition	Description	WQI	Condition	Description
0-10	Excellent	Pollution minimal or absent; water uses met throughout the year.	61-80	Poor	Pollution present in high levels; water uses not met.
11-25	Good	Pollution generally in low amounts; water uses periodically not met.	81-100	Very Poor	Pollution present in extremely high levels; severe stress to streamlife; water uses not met.
26-60	Fair	Pollution varies from moderate to high levels; certain water uses prohibited.	ID	Insufficient Data	

POINT SOURCE POLLUTION TABLE
WATERSHED: South Branch Raritan River.

FACILITIES IN NONCOMPLIANCE

FACILITY	RECEIVING WATER	POLLUTANT	COMMENTS
Garrett W. Hagedorn Center for Geriatrics. Glen Gardner, Hunterdon County. NJPDES 0022144	Rocky Run	Discharge of Treated Sanitary Wastewater. Total Suspended Solids, Ammonia-Nitrogen, Residual Chlorine and Biochemical Oxygen Demand permit limitations have been violated.	The facility is upgrading persuant to an Administrative Consent Order with final compliance slated for March 1, 1993.
Lentine Aggregates, Glen Gardner, Hunterdon County. NJPDES 0026450	Spruce Run Creek	Discharge of Process Wastewater, Cooling Water, and Stormwater Runoff.	An Administrative Order for Discharge Noncompliance was issued in February 1991 for Total Suspended Solids effluent limitation violations. A hearing on the matter is pending
Mountainview Youth Correctional Institute. NJPDES 0028487	Beaver Brook	Discharges Treated Sanitary Wastewater. Biochemical Oxygen Demand, Total Suspended Solids , Phosphorous, Total Kjeldahl Nitrogen and Total Residual Chlorine are frequently violated.	An Administrative Consent Order was executed in June of 1991, to memorialize a compliance schedule. Final compliance is slated for November 1, 1995
Runyon Water Works. NJPDES N/A	Tenant Brook	Total Suspended Solids and Iron	Classified as an industrial discharger.
Meenan Oil Co.,Clinton Twp. Hunterdon County. NJPDES 0028754	Tributary of the South Branch Raritan River.	Discharge of Stormwater Runoff . Chemical Oxygen Demand , Oil, Grease and Total Suspended Solids are frequently violated.	An Administrative Order for Discharge Noncompliance was issued in August of 1990. A hearing is pending.

POINT SOURCE POLLUTION TABLE
WATERSHED: South Branch of the Raritan River (continued)

IMPROVEMENTS TO FACILITIES AFFECTING WATER QUALITY

FACILITY	RECEIVING WATER	POLLUTANT	COMMENTS
Skyview STP. Roxbury Twp, Morris County. NJPDES 0022683	Flanders Brook	Discharge of Treated Sanitary Wastewater. Dissolved Oxygen, Residual Chlorine, Fecal Coliform , and Phosphorous Limitations had been violated.	The facility completed an upgrade in September 1989 pursuant to an Administrative Consent Order dated July 1988.
Equity Plaza Shopping Center, Mt Olive Twp. Morris County. NJPDES 0035220	South Branch Raritan River.	Discharged Treated Sanitary Wastewater. Ammonium-Nitrogen, exess surfectants and Total Dissolved Solids were frequently violated.	The facility ceased it's discharge to surface water subsequent to an Administrative Order for Discharge Noncompliance issued December 1989.
Ledgewood Days Inn STP. NJPDES 0028304	Tributary of Drakes Brook	Discharges Treated Sanitary Wastewater. Phosphorous and Suspended Solids were frequently violated.	The facility completed an upgrade pursuant to Administrative Consent Order dated July 1988. Violations continued to occur after the ACO was terminated and an Administrative Consent Order for Discharge Noncompliance was issued Sept 1990. A hearing is pending. Meanwhile operational changes have been initiated since the enforcement action and effluent quality has improved as a result.

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. Subwatersheds 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 of Rts. 24, 206, and highways 22, 287, and 78. Of the over 20 NJPDES permitted discharges here, roughly half are municipal, and half are industrial/commercial. The streams in this watershed have been classified along various stretches as FW-2 Trout Production, FW-2 Trout Maintenance, and FW-2 Nontrout.

Water Quality Assessment

The North Branch Raritan River and tributaries contains generally fair to good water quality - all stations being fair during their worst 3-month period. Ambient monitoring is performed on the North Branch near Chester, at Burnt Mills, and at North Branch. Sampling of tributaries include the Lamington River near Ironia, near Pottersville, at Burnt Mills; and on the Rockaway Creek at Whitehouse.

The Lamington River, the major tributary of the North Branch, contains good water quality with the exception of the headwater station near Ironia. The Upper Lamington, as assessed near Ironia, is rated as having fair quality, but conditions approach poor quality in the early summer period. When considering the present period of review as a whole, this location has had elevated levels of nutrients and fecal coliform bacteria, and up until 1988, reduced dissolved oxygen during low flow that may have posed a threat to in-stream fisheries. Both total phosphorus and total inorganic nitrogen appeared at high concentrations. Total phosphorus exceeded criteria in 80 percent of samples. In addition, 11 percent of organic nitrogen recordings exceeded recommended levels.

Approximately midway into the assessment period at the Ironia station, water quality data reveal an apparent reduction in organic nitrogen levels and what may be a gradual decline in total phosphorus. Confirmation of a phosphorus trend will require a statistical trend assessment - an analysis not employed in the present evaluation. The decline in organic nitrogen seems to coincide with what appears to be a drop in biochemical oxygen demand; and as noted previously - a cessation of dissolved oxygen violations after 1988.

Downstream near Pottersville and at Burnt Mills water quality improves as dissolved oxygen is above criteria in samples collected since 1986. Total phosphorus and nitrogen are noticeably lower: nitrogen remained within recommended levels, and total phosphorus violations have dropped down to 27 and 37 percent of samples at Pottersville and Burnt Mills respectively. Fecal coliform counts, appearing lower at Pottersville, increase again at Burnt Mills. Geometric means of fecal coliform measurements near Pottersville and at Burnt Mills were 131 and 354 MPN/100ml, respectively. The Lamington River near Pottersville is a trout production stream and, as such, summertime stream temperature frequently exceeded the temperatures recommended for these waters.

Rockaway Creek, a tributary to the Lower Lamington River, is sampled at Whitehouse. Results indicate that the stream is of fair quality year-round, with conditions degrading further during the early summer. The creek has generally acceptable nitrogen levels but approximately one-half of the total phosphorus values were greater than the State criterion. In addition, the creek reveals high fecal coliform counts at this location. Fecal coliform determinations exceeded 200 MPN/100ml in 66 percent of the samples collected between 1986 through 1990, and had a geometric mean of 368 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 as measured near Chester has fair quality waters and contains elevated nutrient and fecal coliform concentrations. In addition, stream temperatures are periodically above recommended levels for trout production waters during the summer. Total phosphorus was greater than the State criterion in almost all of the samples collected and averaged 0.3 mg/l. Total inorganic nitrogen concentration were also high averaging 1.7 mg/l during the period of review. The geometric mean of fecal coliform bacterial samples during this period was 466 MPN/100ml with 77 percent above 200 MPN/100ml. These bacterial recordings suggest a possible decline in sanitary quality as compared to the previous assessment. Visual inspection of the data, however, shows significant variability through time; therefore, definitive conclusions are difficult to draw in this case within the limited period of review. Daytime dissolved oxygen appears to remain well above the 7.0 mg/l criterion for trout waters. During the prior assessment, one elevated cadmium level was recorded on the North Branch at this location; the present assessment found no such violation.

In the Lower North Branch water quality is generally good - although fecal coliform bacterial recordings are frequently high. Geometric means were 754 MPN/100ml with 82 percent of samples in violation of standards at Burnt Mills, and 477 MPN/100 ml with 60 percent in violation at North Branch. Total phosphorus is moderately high at both locations; with approximately 40 to 45 percent of recordings exceeding the criteria. Dissolved oxygen levels are adequate at both stations; no measured concentrations fell below 4.0 mg/l.

Biomonitoring of the North Branch at North Branch in 1984 found generally healthy conditions with balanced populations. In contrast, macroinvertebrate sampling farther downstream at Raritan in 1988 suggest excessive nutrient enrichment at this location. Further macroinvertebrate sampling was conducted in 1991 at Mendham, Far Hills, and Branchburg. Burnetts Brook, a tributary to the upper North Branch, as well as the North Branch itself, all showed excellent biological health. Sampling in the North Branch at Mendham did show impairment due to a temporary malfunction of the India Brook STP. Department biologists inform us, however, that this facility normally turns out an effluent of very good quality and the quality of the downstream waters in turn are normally of excellent quality.

The Lamington River, Trout Brook, and the North Branch Raritan River all support 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 Assessment

Point Source Assessment

The North Branch Raritan River and tributaries experience water quality degradation in the vicinity of a number of point sources. Four enforcement actions involving facilities impacting stream quality are currently underway within the watershed and are listed in the Point Source Pollution Table for the North Branch Raritan. The Roxbury Township-Ajax Terrace STP, a discharger to the Lamington River that previously was under enforcement action, has been replaced by a new facility and is no longer under enforcement action (see Point Source Pollution Table).

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 with 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 problem because of crop production and poorly managed pastures. 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.

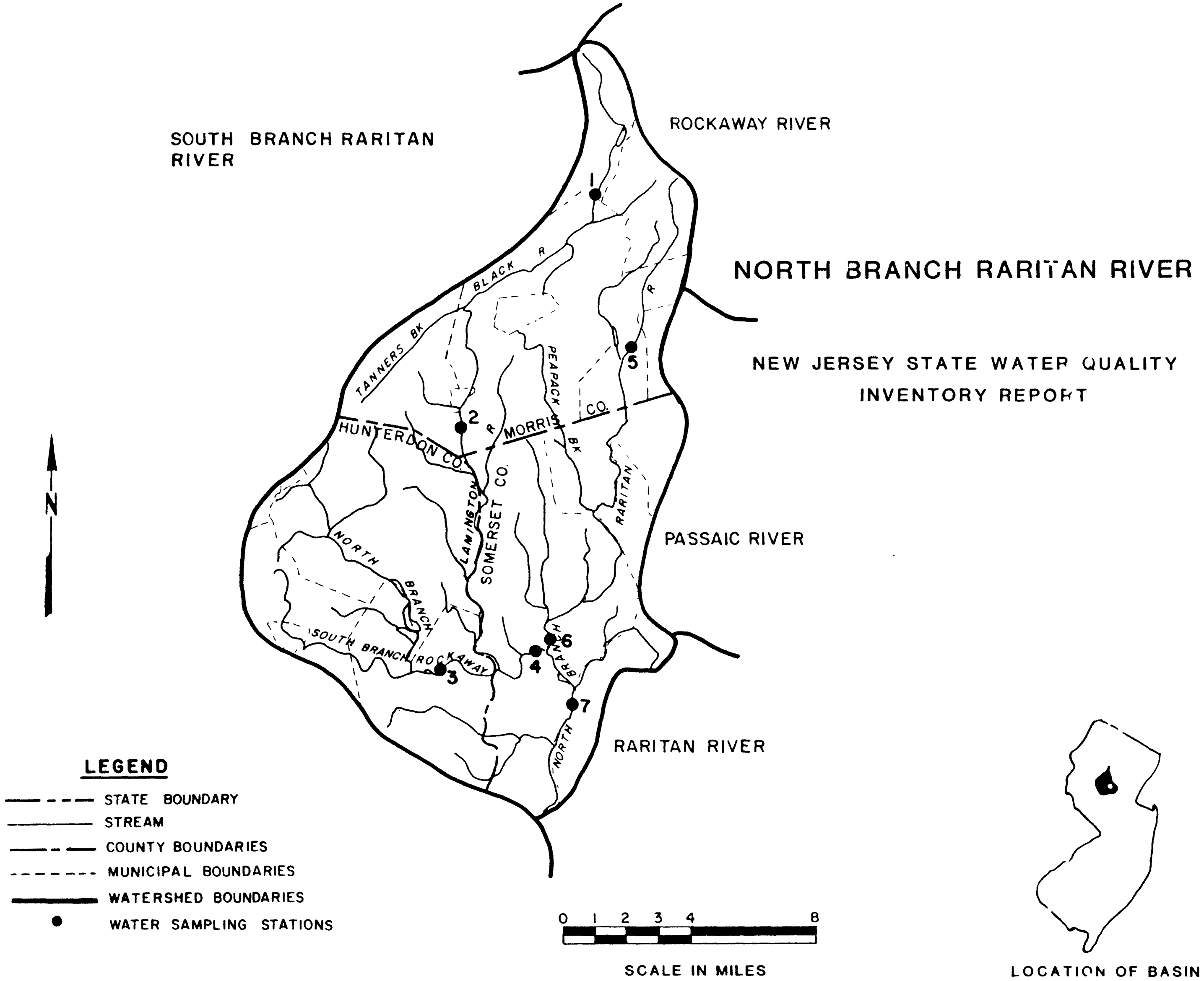
The North Branch Raritan River is impacted much the same way as is the Lamington. Active suburban development along much of its length, especially in the Pluckemin and Mendham areas, is known to contribute to the excessive loading of nutrients and sediments. Another suspected suburban pollution source 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 Assessment

Monitored waters of the North Branch and tributaries do not support primary contact recreation due to fecal coliform concentrations. They do, however, contain generally healthy fish communities; recreational fishing for trout and smallmouth bass is heavy in many streams of the watershed. These waters, hence, do support the aquatic life support designated use. There are concerns about water quality problems in some sections of the Lamington and North Branch which may threaten the quality of the fisheries within those reaches.

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
LAMINGTON R
NORTH BRANCH
SOUTH BRANCH ROCKAWAY
NORTH BRANCH RARITAN R
HUNTERDON CO.
MORRIS CO.
SOMERSET CO.
1
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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 PROFILES 1986-1990: **NORTH BRANCH RARITAN RIVER**

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVG. AND WORST 3-MONTH CONDITION
NB Raritan R. near Chester	AVG. WQI:	9	6	3	33	29	6	5	17	30 FAIR
	WORST 3 MONTHS:	JULY-SEPT.	JUNE-AUG.	JAN.-MAR.	MAR.-MAY	JUNE-AUG.	DEC.-FEB.	NOV.-JAN.	NOV.-JAN.	41 FAIR MAY-JULY
NB Raritan R. at Burnt Mills	AVG. WQI:	2	8	7	38	17	6	2	5	24 GOOD
	WORST 3 MONTHS:	JUNE-AUG.	MAY-JULY	JUNE-AUG.	JULY-SEPT	MAY-JULY	DEC.-FEB.	JUNE-AUG.	NOV.-JAN.	35 FAIR MAY-JULY
NB Raritan R. at North Branch	AVG. WQI:	2	7	6	36	21	6	1	9	26 FAIR
	WORST 3 MONTHS:	JUNE-AUG.	MAR.-MAY	APRIL-JUNE	JUNE-AUG.	AUG.-OCT.	MAY-JULY	APRIL-JUNE	JULY-SEPT	43 FAIR JUNE-AUG.
Lamington R. near Ironia	AVG. WQI:	2	32	3	26	31	10	5	7	37 FAIR
	WORST 3 MONTHS:	JUNE-AUG.	MAY-JULY	FEB.-APRIL	AUG.-OCT.	MAY-JULY	DEC.-FEB.	MAY-JULY	MAR.-MAY	59 FAIR MAY-JULY

LEGEND: WATER QUALITY INDEX DESCRIPTION

Note: an index value of 20 is equivalent to the level of water quality criteria.

WQI	Condition	Description
0-10	Excellent	Pollution minimal or absent; water uses met throughout the year.
11-25	Good	Pollution generally in low amounts; water uses periodically not met.
26-60	Fair	Pollution varies from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution present in high levels; water uses not met.
81-100	Very Poor	Pollution present in extremely high levels; severe stress to streamlife; water uses not met.
ID	Insufficient Data	

WATER QUALITY INDEX PROFILES 1986-1990: **N B RARITAN RIVER continued**

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVG. AND WORST 3-MONTH CONDITION
Lamington R. near Pottersville	AVG. WQI: WORST 3 MONTHS:	13 JUNE-AUG.	5 JUNE-AUG.	4 JAN.-MAR.	21 FEB.-APRIL	15 JULY-SEPT.	5 AUG.-OCT	2 MAY-JULY	18 MAY-JULY	18 GOOD 29 FAIR JUNE-AUG.
Lamington R. at Burnt Mills	AVG. WQI: WORST 3 MONTHS:	2 JUNE-AUG.	7 APRIL-JUNE	6 APRIL-JUNE	31 APRIL-JUNE	16 MAY-JULY	5 FEB.-APRIL	2 JUNE-AUG.	5 JUNE-AUG.	18 GOOD 27 FAIR APRIL-JUNE
Rockaway Cr. at Whitehorse	AVG. WQI: WORST 3 MONTHS:	2 JULY-SEPT.	12 MAR.-MAY	17 MAR.-MAY	31 JUNE-AUG.	20 DEC.-FEB.	6 SEPT.-NOV.	6 MAR.-MAY	13 SEPT.-NOV.	29 FAIR 34 FAIR SEPT.-NOV.

LEGEND: WATER QUALITY INDEX DESCRIPTION

Note: an index value of 20 is equivalent to the level of water quality criteria.

WQI	Condition	Description
0-10	Excellent	Pollution minimal or absent; water uses met throughout the year.
11-25	Good	Pollution generally in low amounts; water uses periodically not met.
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61-80	Poor	Pollution present in high levels; water uses not met.
81-100	Very Poor	Pollution present in extremely high levels; severe stress to streamlife; water uses not met.
ID	Insufficient Data	

POINT SOURCE POLLUTION TABLE
WATERSHED: North Branch Raritan River

FACILITIES IN NONCOMPLIANCE

FACILITY	RECEIVING WATER	POLLUTANT	COMMENTS
Bernardsville Boro STP, Somerset County. NJPDES 0026387	Mine Brook	Discharge of Treated Sanitary Wastewater. Total Kjeldahl Nitrogen, Dissolved Kjeldahl Nitrogen (as N) and Biochemical Oxygen Demand limitations are frequently violated.	The facility is upgrading pursuant to a July 1988 Administrative Consent Order with final compliance slated for April of 1992.
Vianini Pipe Co. NJPDES 0032328	Chambers Brook	Discharge of Treated Stormwater Runoff and Process Wastewater. Total Aluminum , ph, and Total Suspended Solids Permit Limitations have been violated.	An Administrative Order for Discharge Noncompliance were issued in April 1989 and April 1990.
Valley Road Sewerage Co. Pottersville STP. NJPDES 0022781	Lamington River	Discharge of .048 mgd which exceeds it limits for Biochemical Oxygen Demand Percent Removal, Dissolved Oxygen and Ammonia-Nitrogen.	None to report.
A.M. Best Co. Tewksbury Township, Hunterdon County. NJPDES 0028452	Rockaway Creek	Discharge of Treated Sanitary Wastewater. Ammonia-Nitrogen, Dissolved Oxygen and Total Residual Chlorine parameters are frequently violated.	None to report.

POINT SOURCE POLLUTION TABLE
WATERSHED: North Branch Raritan River (continued)

IMPROVEMENTS TO FACILITIES AFFECTING WATER QUALITY

FACILITY	RECEIVING WATER	POLLUTANT	COMMENTS
Roxbury Twp.-Ajax STP. NJPDES 0022675	Lamington River	Discharge of Treated Sanitary Wastewater. Biochemical Oxygen Demand and Suspended Solids Minimum Percent Removal requirements were frequently exceeded.	An Administrative Consent Order was executed in September 1987 to memorialize a compliance schedule for the construction of a new wastewater treatment plant. The new facility is complete and functioning.

26. MILLSTONE RIVER

Watershed Description

The Millstone River drains an area of 271 square miles - including 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. Most of the lower half of the river flows adjacent to the Delaware and Raritan Canal. The population centers in this drainage basin are Princeton Township and Borough, Manville, South Brunswick Twp, East and West Windsor Townships, Hightstown, and Pennington Boro. 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 Twp., 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 over 40 NJPDES permitted discharges here, approximately half are municipal and half industrial/commercial. All surface waters in the Millstone basin are classified as FW-2 Nontrout.

Water Quality Assessment

Seven ambient monitoring stations currently exist in the Millstone watershed: the Millstone River near Manalapan, at Grovers Mill, Kingston, Blackwells Mills, and at Weston; Stony Brook is monitored at Princeton; and Bedens Brook is monitored near Rocky Hill. Results of this monitoring from 1987 through 1990 show that generally good to fair quality waters exist in the watershed.

The Upper Millstone River (above Carnegie Lake) is sampled near Manalapan and at Grovers Mill. The Manalapan location has good overall water quality all year long. Both fecal coliform bacteria and total phosphorus are moderately excessive. Fecal coliform samples averaged 93 MPN/100ml and thirty-five percent exceeded water quality criteria. Total phosphorus averaged 0.09 mg/l, and thirty percent exceeded recommended levels. Dissolved oxygen concentrations were above 4.0 mg/l at all times.

At Grovers Mill the Millstone River has its worst water quality. Here, the river is of fair to poor water quality; with conditions degrading further during late spring/early summer. Both total phosphorus and total inorganic nitrogen are highly elevated, averaging 0.33 mg/l and 3.3 mg/l, respectively. Fecal coliform exceeded the State criterion in 50 percent of all samples collected and had a geometric mean of 213 MPN/100 ml. Twenty percent of dissolved oxygen concentrations were measured below 4.0 mg/l, and when analyzed as percent saturation, it was below 80 percent in 65 percent of the values and averaged only 66 percent. Biochemical oxygen demand often is greater than 4.0 mg/l. Elevated concentration of lead and copper recorded during the last assessment were not found in the current review; instead an elevated chromium record is observed.

Stony Brook, a tributary of Carnegie Lake, is sampled at Princeton. Water quality here is fair with conditions slightly worse during the summer. Nutrients (primarily phosphorus) and fecal coliform appear to be the main problem indicators in the brook. Total phosphorus averaged 0.08 mg/l with 71 percent of the values greater than the 0.05 mg/l State criterion. Fecal coliform exceeded its recommended level in 50 percent of the samples analyzed and had a geometric mean of 270 MPN/100ml. Dissolved oxygen saturation is frequently above 120 percent indicating supersaturated conditions brought about by photosynthetic activity.

At the outlet of Carnegie Lake in Kingston the Millstone River emerges with good quality waters with regard to nutrients and bacteria. Conditions degrade slightly during summer months when good to fair conditions are present. Total phosphorus and total inorganic nitrogen were above recommended levels in 79 and 10 percent of the samples collected, respectively. The geometric mean of fecal coliform bacteria was 121 MPN/100ml with 40 percent greater than 200 MPN/100ml. This central segment of the Millstone River (from the confluence with Stony Brook to the confluence with Bedens Brook) is regarded by the Department as being impaired by toxic discharges emanating from point sources. The contaminants of concern here are arsenic, beryllium, mercury, cadmium, chromium, lead, zinc, and beryllium. The criteria violated include USEPA's Federal Aquatic Life chronic criteria, USEPA's Federal Human Health-water and fish ingestion criteria, and USEPA's Federal human health criteria for exposure to carcinogens.

Downstream at Blackwells Mill, water quality degrades to fair quality. Nutrients and bacterial levels are higher than at Kingston; however, dissolved oxygen recordings do remain above 4mg/l. The Millstone at Blackwells Mills seems to be highly enriched. Total phosphorus averaged 0.40 mg/l, while inorganic nitrogen had a mean value of 2.2 mg/l. Fecal coliform exceeded the criterion in 55 percent of the samples and had a geometric mean of 430 MPN/100ml.

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

This last reach of the Millstone, from Bedens Brook to the confluence with the Raritan River is regarded by the Department as also being impaired due to toxic discharges from point sources. The contaminants identified at this location are arsenic, mercury, cadmium, chromium, and lead. The criteria violated are the same as noted above: USEPA's Federal Aquatic Life chronic criteria, and USEPA's Federal Human Health-water and fish ingestion criteria.

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

One of the Millstone River's most severe problems is elevated nutrient concentrations coming from both point and nonpoint sources. The individual point and nonpoint source contributions to overall pollution in the upper Millstone watershed was evaluated by the Department (NJDEP, 1991). The study estimated that under wet conditions BOD, total suspended solids, and fecal coliform bacteria were largely contributed by nonpoint sources. In contrast, ammonia and total phosphorus are largely from point sources. The study focused upon the watershed upstream of Carnegie Lake in Princeton. A modeling study of the Upper Millstone, completed in 1987 by the Department for determining wasteload allocations, found that nitrogenous biochemical oxygen demand was the major sink for dissolved oxygen in the river. The study also determined that the lower sections of the study area are enriched with ammonia from treatment plant discharges and that phosphorus appeared to be the nutrient limiting primary production.

Extensive biomonitoring was performed throughout the Millstone River watershed. The headwaters of the Millstone River at Millstone township showed a community of macroinvertebrates that indicated good water quality. At sites farther downstream at Bergen Mills, near Cranbury, and at Princeton Junction; the

Millstone begins to show some impairment. Biological diversity is lower than at the Millstone Township site, and pollution tolerant forms begin to make up significant portions of the macroinvertebrate community. Further downstream at Blackwells Mills, biological degradation is severe: the community structure suggests excess siltation and nutrient loading. Diversity was low and the population was comprised principally of filter-feeders and scavengers. Physical abnormalities were evident in 37 percent of the insects collected, suggesting toxic contamination at this location. The downstream-most study site at Manville exhibited similar but slightly less impairment than observed at Blackwells Mills. Physical abnormalities were again evident, but in 11 percent of the insects collected. Toxic contamination again is suspected but not of the severity as that suspected at the Blackwells Mills site.

Cranbury Brook, a tributary to the upper Millstone River, is assessed throughout its length. The two upstream stations, at Monroe Township and near Cranbury Station, both show some biological impairment but the causes are believed to be the product of local natural conditions and not human activity. At Cranbury, biomonitoring indicates severe impairment; a eutrophic lake located just upstream of the station is suspected to be influencing conditions at the study site. The biota suggest excessive siltation and organic pollution. Evidence suggests that dissolved oxygen is very low here. Two stations further downstream in Plainsboro indicate that there is some recovery and an overall improvement in the water quality. Bear Brook, a tributary to the upper Millstone River in the same area as Cranbury Brook, is sampled at Princeton Junction. Biological community assessment suggests excessive organic enrichment, perhaps being released from a nearby lake located upstream. Physical abnormalities in 21 percent of the insects recovered suggest the influence of toxic contaminants at this location.

Two tributaries to the Millstone River were also assessed as to their macroinvertebrate communities: Stony Brook at Princeton, and Bedens Brook in Rocky Hill. Biomonitoring in Stony Brook revealed a severely degraded biota. Community analysis suggests excessive siltation and organic enrichment. Insects collected suggest that dissolved oxygen appears to be adequate, maintained perhaps by a rapid flow brought about by steep downstream gradients. Physical abnormalities were observed in 15 percent of the insects collected, suggesting the possible influence of toxic contaminants. Between 1987 and 1990, an oil leak occurred within the vicinity of the Johnson and Johnson estate near Rt 206 which impacted portions of Stony Brook. Although efforts were made to clean the spill, oil retained by the soil is still suspected of contaminating the stream. A biological survey performed in the Brook prior to the oil spill found a much healthier biological community than that found after the spill in 1991. This site is

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Bedens Brook, studied both in 1987 and 1991, showed a decline in biological health from the past to the current survey. Data suggest nutrient enrichment to be one source of impairment. Both the past and the current study observed abnormalities in a percentage of the insects collected (16% in 1991) suggesting the influence of toxic contamination.

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.

Point Source Assessment

Treatment plant effluents from the Hightstown and East Windsor plants are major contributors to dissolved oxygen and nutrient problems in the river. Because of the need for additional sewage flows in the upper watershed, level 4+ treatment is required for discharge during critical low flow periods. In the lower Millstone River, the Stony Brook Regional SA is enlarging inorder to accommodate new development in the region.

Department enforcement actions involving facilities having an impact on surface water quality in the Millstone watershed are listed in the Point Source Pollution Table for 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 in the past. 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.

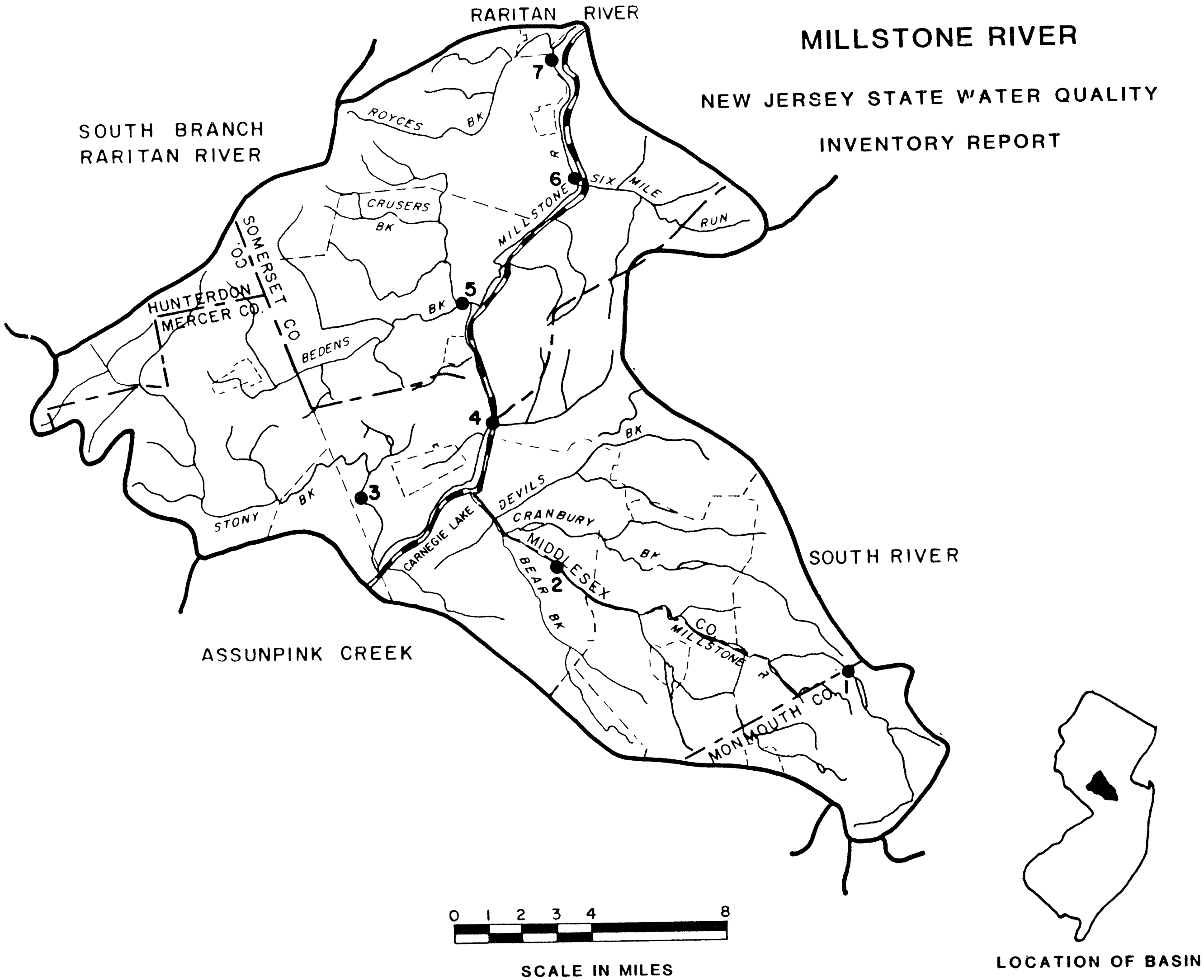
Designated Use Assessment

The monitored waters of the Millstone River and tributaries are classified as not swimmable because of excessive fecal bacteria concentrations.

The Millstone River and tributaries vary in their support of the aquatic life support designated use. The uppermost headwaters of the Millstone itself fully support the use, but the bulk of the river only partially supports the use based upon macroinvertebrate analyses. A stretch of the river at Blackwells Mills revealed a severely impaired macroinvertebrate community and, as such, is assessed as not supporting the aquatic life use. The upstream-most portion of Cranbury Brook is fully supporting the use, but most of the stream only partially supports the use. Cranbury Brook does not support the aquatic life use at Cranbury. Other streams were assessed in the watershed: Stony Brook as not supporting aquatic life use, Bear Brook and Bedens Brook both as partially supporting the use.

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
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HUNTERDON CO
MERCER CO
BEDENS BK
STONY BK
CARNEGIE LAKE
DEVILS BK
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0 1 2 3 4 8
SCALE IN MILES
LOCATION OF BASIN

WATER QUALITY INDEX PROFILES 1986-1990: **MILLSTONE RIVER**

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVG. AND WORST 3-MONTH CONDITION
Millstone R. near Manalapan	AVG. WQI:	1	10	11	15	18	3	1	6	12 GOOD
	WORST 3 MONTHS:	JUNE-AUG.	OCT.-DEC.	SEPT.-NOV..	JUNE-AUG.	JAN.-MAR.	DEC.FEB.	FEB.-APRIL	MAY-JULY	16 GOOD JUNE-AUG.
Millstone R. at Grovers Mill	AVG. WQI:	3	36	7	24	59	5	3	12	57 FAIR
	WORST 3 MONTHS:	JUNE-AUG.	JUNE-AUG.	NOV.-JAN.	MAY-JULY	MAY-JULY	DEC.FEB.	APRIL-JUNE	JUNE-AUG.	86 POOR MAY-JULY
Millstone R. at Kingston	AVG. WQI:	5	8	15	21	21	5	6	6	19 GOOD
	WORST 3 MONTHS:	JUNE-AUG.	SEPT.-NOV..	MAY-JULY	FEB.-APRIL	AUG.-OCT.	DEC.FEB.	MAY-JULY	JUNE-AUG.	27 FAIR MAY-JULY
Millstone R. at Weston	AVG. WQI:	3	19	4	27	29	6	3	6	29 FAIR
	WORST 3 MONTHS:	JUNE-AUG.	MAY-JULY	JULY-SEPT.	JUNE-AUG.	MAY-JULY	OCT.-DEC.	JUNE-AUG.	SEPT.-NOV.	50 FAIR JUNE-AUG.

LEGEND: WATER QUALITY INDEX DESCRIPTION

Note: an index value of 20 is equivalent to the level of water quality criteria.

WQI	Condition	Description
0-10	Excellent	Pollution minimal or absent; water uses met throughout the year.
11-25	Good	Pollution generally in low amounts; water uses periodically not met.
26-60	Fair	Pollution varies from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution present in high levels; water uses not met.
81-100	Very Poor	Pollution present in extremely high levels; severe stress to streamlife; water uses not met.
ID	Insufficient Data	

WATER QUALITY INDEX PROFILES 1986-1990: **MILLSTONE RIVER continued**

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVG. AND WORST 3-MONTH CONDITION
Millstone R. at Blackwells Mills	AVG. WQI:	2	15	4	33	38	5	3	9	36 FAIR
	WORST 3 MONTHS:	JUNE-AUG.	JULY-SEPT.	JULY-SEPT.	JULY-SEPT.	AUG.-OCT.	MAR.-MAY	APRIL-JUNE	JULY-SEPT.	60 FAIR JUNE-AUG.
Stony Brook at Princeton	AVG. WQI:	4	18	10	28	28	6	5	13	32 FAIR
	WORST 3 MONTHS:	JUNE-AUG.	JUNE-AUG.	AUG.-OCT.	DEC.FEB.	JUNE-AUG.	MAY-JULY	JUNE-AUG.	JULY-SEPT.	53 FAIR JUNE-AUG.
Bedens Brook near Rocky Hill	AVG. WQI:	3	15	4	28	23	6	3	11	26 FAIR
	WORST 3 MONTHS:	JUNE-AUG.	APRIL-JUNE	MAR.-MAY	AUG.-OCT.	AUG.-OCT.	JUNE-AUG.	MAY-JULY	JULY-SEPT.	48 FAIR JULY-SEPT.

LEGEND: WATER QUALITY INDEX DESCRIPTION

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0-10	Excellent	Pollution minimal or absent; water uses met throughout the year.
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81-100	Very Poor	Pollution present in extremely high levels; severe stress to streamlife; water uses not met.
ID	Insufficient Data	

POINT SOURCE POLLUTION TABLE
WATERSHED: Millstone River

FACILITIES IN NONCOMPLIANCE

FACILITY	RECEIVING WATER	POLLUTANT	COMMENTS
Valley Road Sewerage Co. River Road STP. NJPDES 0022781	Millstone River	Discharge of .117 mgd which exceeds permit limitations for Dissolved Oxygen, Biochemical Oxygen Demand, Total Residual Chlorine and Fecal Coliform.	None to report.
GSA Depot, Hillsborough Twp. Somerset County. NJPDES 0020656	Pike Run	Discharge of sanitary wastewater.	The facilities permit calls for cessation of the discharge prior to July 1988. The facility expects closure of the STP in the near future.
N. Princeton Developmental Center, Montgomery Twp. Somerset County. NJPDES 0022390	Rock Brook	Discharge of treated sanitary wastewater. Biochemical Oxygen Demand, Dissolved Oxygen, Suspended Solids, Ammonia-Nitrogen, Phosphorus, Residual Chlorine and Fecal Coliform are frequently violated.	An Administrative Consent Order sets in place a compliance schedule for upgrade of the facility. Compliance is set for June 1, 1993.
Fieldhedge STP. Valley Road Sewerage Co. Hillsbourough Twp. Somerset County. NJPDES 0022772	Royce Brook	Discharge of Treated Sanitary Wastewater.	The facilities NJPDES permit calls for cessation of the discharge by November 1987. The company has yet to successfully negotiate permission to tie into the Hillsborough Township collection system due to infiltration and inflow issues.

IMPROVEMENTS TO FACILITIES AFFECTING WATER QUALITY

FACILITY	RECEIVING WATER	POLLUTANT	COMMENTS
Carrier Foundation STP. NJPDES 0023663	Cruser Brook	Excessive levels of Suspended Solids and.Phosphorous have been discharged.	An Administrative Consent Order was executed in July 1988 to complete an upgrade to the facility. Construction was completed in 1990
Princeton Sewer Operating Committee NJPDES N/A	Stony Brook	None to report.	Facility now complies with the federally mandated secondary treatment or has eliminated sub standard discharges.
Princeton Farms NJPDES N/A	Stony Brook	None to report.	Facility now complies with the federally mandated secondary treatment or has eliminated sub- standard discharges

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 about 5 NJPDES permitted discharges in the watershed, all are municipal. Waters have been classified FW-2 Nontrout and SE-1.

Water Quality Assessment

Three ambient monitoring stations exist in the South River watershed: 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. Manalapan Brook has good quality waters, while Matchaponix Brook is of fair quality. The South River had good water quality based upon past monitoring which had occurred in the early 1980's.

Water quality in Manalapan Brook remains relatively constant as one travels downstream. Both monitoring stations have good overall water quality, however the Manalapan location degrades to fair conditions during the summer months. Total phosphorus is higher at Manalapan, exceeding State criteria in 80 percent of the samples collected between 1986 through 1990, while at Spotswood standards were exceeded in 36 percent of total records. Fecal coliform values were similar between the two stations: Manalapan Brook's geometric mean was 104 MPN/100ml with 32 percent exceeding criteria, while Spotswood revealed a geometric mean of 76 MPN/100ml with 20 percent exceeding criteria.

Dissolved oxygen levels appears adequate for the protection of warm-water fisheries. Manalapan and Matchaponix Brooks are both moderately acidic waterways. During the 1983-1987 assessment, pH in Manalapan Brook at Spotswood sometimes fell below 4.5 SU. This may have been due to highly acidic soils being disturbed from development activities. The present review found only one pH sample falling below 4.5.

Matchaponix Brook contains higher nutrient concentrations than does Manalapan Brook. Total phosphorus has averaged 0.12 mg/l with 56 percent of samples being above the criterion of 0.05 mg/l for waters flowing into an impoundment. Total inorganic nitrogen is also elevated, exceeding 2.0 mg/l in 87 percent of the samples and averaging 4.3 mg/l. Total Kjeldahl nitrogen is also on occasion excessive. Dissolved oxygen concentrations remained above 4.0 mg/l during summer months. Fecal coliform concentrations in Matchaponix Brook had a geometric mean from 1986 through 1990 of 91 MPN/100ml (34% of samples violate criteria) and hence are similar to those levels found in Manalapan Brook. Overall conditions in Matchaponix Brook degrade 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 allow 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 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. Only one facility, Raceway Park, is reported to be under enforcement action for discharging excess fecal coliform bacteria, BOD, and suspended solids into Matchaponix Brook.

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 primarily 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 threatened with toxic contamination from the Burnt Fly Bog waste disposal site located near Deep Run, a tributary to the South River.

Designated Use Assessment

Waters of the South River and tributaries will support the aquatic life designated use, but state fisheries biologists feel that these fish communities are threatened with various point and nonpoint sources. Based upon fecal coliform bacteria, Manalapan Brook at Spotswood is assessed as partially supporting the primary contact (swimming) designated use. Manalapan Brook near

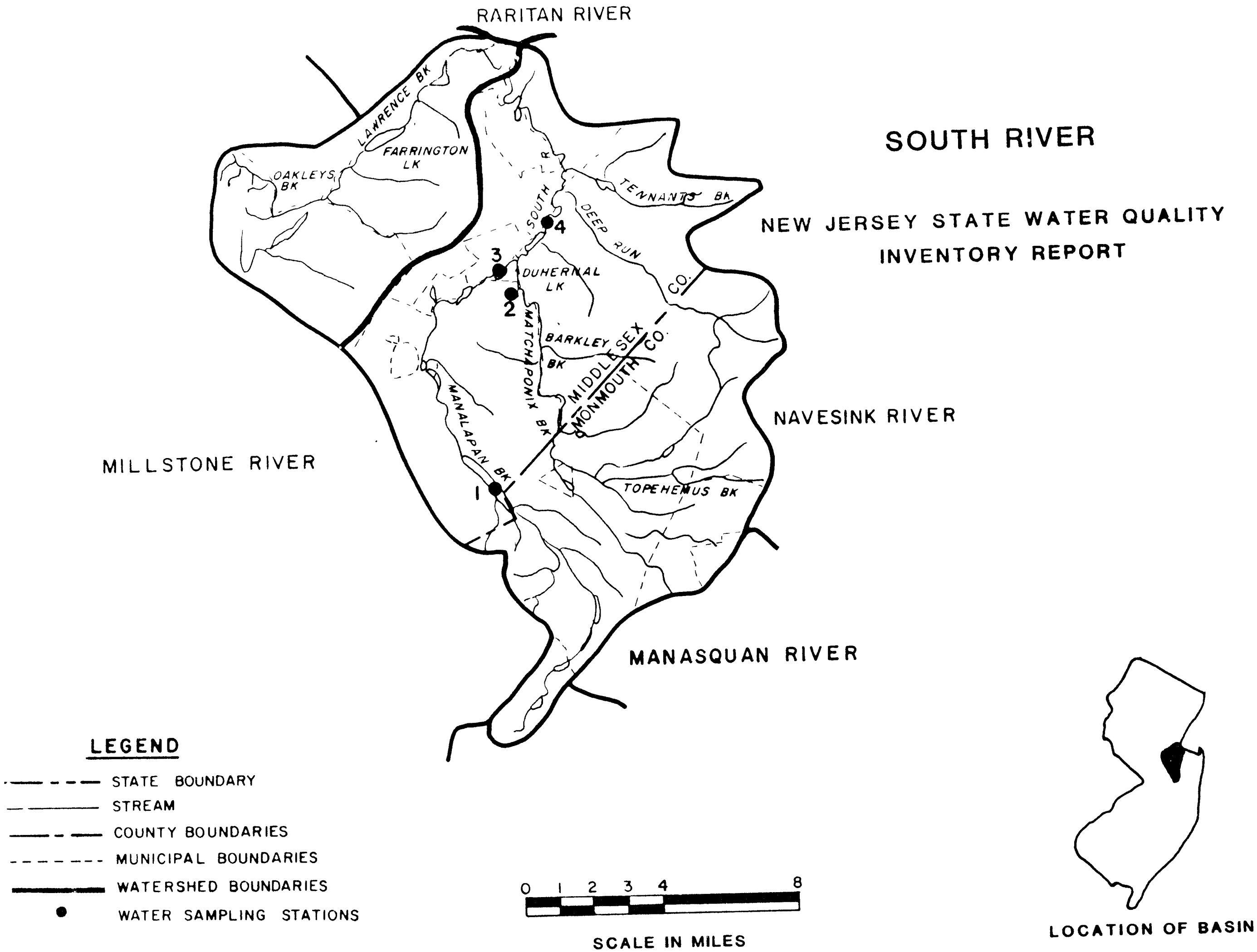
Manalapan and the Matchaponix at Spotswood do not support the use.

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 QUALITY INVENTORY REPORT



WATER QUALITY INDEX PROFILES 1986-1990: **SOUTH RIVER**

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVG. AND WORST 3-MONTH CONDITION
Manalapan Bk. near Manalapan	AVG. WQI: WORST 3 MONTHS:	2 JUNE-AUG.	8 NOV.-JAN.	10 SEPT.-NOV.	17 JUNE-AUG.	29 MAY-JULY	3 AUG.-OCT.	1 AUG.-OCT.	5 AUG.-OCT.	19 GOOD 29 FAIR JUNE AUG.
Manalapan Bk. at Spotswood	AVG. WQI: WORST 3 MONTHS:	2 JUNE-AUG.	14 SEPT.-NOV.	13 FEB.-APRIL	15 SEPT.-NOV.	22 MAR.-MAY	3 FEB.-APRIL	0	6 MAY-JULY	14 GOOD 19 GOOD AUG.-OCT.
Matchaponix Bk. at Spotswood	AVG. WQI: WORST 3 MONTHS:	2 JUNE-AUG.	19 SEPT.-NOV.	9 OCT.-DEC.	15 AUG.-OCT.	46 SEPT.-NOV.	6 JUNE-AUG.	0 AUG.-OCT.	6 SEPT.-NOV.	32 FAIR 49 FAIR SEPT.-NOV.

LEGEND: WATER QUALITY INDEX DESCRIPTION

Note: an index value of 20 is equivalent to the level of water quality criteria.

WQI	Condition	Description
0-10	Excellent	Pollution minimal or absent; water uses met throughout the year.
11-25	Good	Pollution generally in low amounts; water uses periodically not met.
26-60	Fair	Pollution varies from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution present in high levels; water uses not met.
81-100	Very Poor	Pollution present in extremely high levels; severe stress to streamlife; water uses not met.
ID	Insufficient Data	

POINT SOURCE POLLUTION TABLE
WATERSHED: South River

FACILITIES IN NONCOMPLIANCE

FACILITY	RECEIVING WATER	POLLUTANT	COMMENTS
Raceway Park NJPDES N/A	Matchaponix Creek	Municipal Discharger of Fecal Coliform, Biochemical Oxygen Demand, and Total Suspended Solids.	None To Report

28. RARITAN RIVER

Watershed Description

The Raritan River, its tributaries, and branches drain an area totalling over 1,100 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, Surprise 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 about 73 NJPDES permitted discharges here, some 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: at Raritan, at Manville, and from the Queens Bridge at South Bound Bridge.

The Raritan River at Raritan contains generally good water quality while at Manville conditions worsen somewhat to fair. The two stations are similar with respect to total phosphorus, inorganic nitrogen, and bacterial data, all three indictors being at elevated levels at the two locations. At Raritan, fecal coliform bacteria data generated a geometric mean of 245 MPN/100ml with 57 percent of samples exceeding state criteria.

Total phosphorus averaged 0.1 mg/l and inorganic nitrogen 1.2 mg/l, with 50 percent of the phosphorus and 6 percent of the inorganic nitrogen records in excess of recommended levels. At Manville, nutrient and sanitary conditions were found to be almost identical to those recorded at Raritan. Manville records however showed occasional levels of unionized ammonia in excess of State standards. Dissolved oxygen was above 4.0 mg/l in all samples from 1986 through 1990 at Raritan, and almost all at Manville (3% in violation). Records of biochemical oxygen demand exceeded 3 mg/l in 11 and 18 percent of samples at Raritan and Manville respectively.

Downstream at South Bound Brook, ambient monitoring has detected fair water quality with conditions worsening in the mid/late summer. Total phosphorus values averaged 0.22 mg/l from 1986 through 1990 with 95 percent of samples exceeding State criteria. Fecal coliform bacteria are found at problematic levels, having a geometric mean of 232 MPN/100ml with 58 percent of samples exceeding standards. These values are lower than those encountered in the previous assessment (1983 to 1987) when the geometric mean was calculated to be 752 MPN/100ml and 72 percent of samples exceeded standards. Daytime dissolved oxygen appears to be adequate, but because biochemical oxygen demand regularly exceeds 3 mg/l in this section (50 percent of samples), large diurnal fluctuations during warm weather are expected. Significant improvements in the Raritan River at South Bound Brook have been observed since the beginning of the 1980's and are attributed to the gradual reduction in discharge flows from the American Cyanamid facility. In 1985 the company's discharge had been eliminated with flows being transferred to the Somerset Raritan Valley SA treatment plant.

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.

Biological monitoring of macroinvertebrate communities was performed at Manville, just up-stream of the confluence of the Millstone, and at Fieldville. The Manville station indicated some impairment due perhaps to nutrient enrichment. Overall diversity had declined somewhat as compared to nonimpacted reference stations. Examination of the species present suggest that dissolved oxygen levels do tend to stay at acceptable levels. The Fieldville cite however, showed a community severely impaired by numerous municipal/industrial and stormwater discharges.

Problem 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.

Facilities under Department enforcement action which have known impacts on surface water quality are listed in the Point Source Pollution Table for the Raritan River. The Middlesex Co. UA regional waste treatment plant (discharge to Raritan Bay) had been listed in the last Inventory Report as being under enforcement action. This facility but has eliminated its substandard discharge and is now in compliance with its discharge permit.

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), KinBuc 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 Assessment

The upper freshwater portions of the Raritan River, upstream of the confluence with the Millstone River, are considered to be partially supporting the aquatic life support designated use. The fisheries in this part of the river are thought to be stressed by the pollution sources present. The lower reaches, below the confluence with the Millstone River, are assessed as not supporting the aquatic life support use. Those portions of Raritan Bay monitored by New Jersey for suitability for shellfish harvesting are classified as either prohibited or special restricted (requiring special processing) depending upon location. In addition, there is a fishing advisory in effect because of PCBs contamination in certain fishes in the tidal section of the river

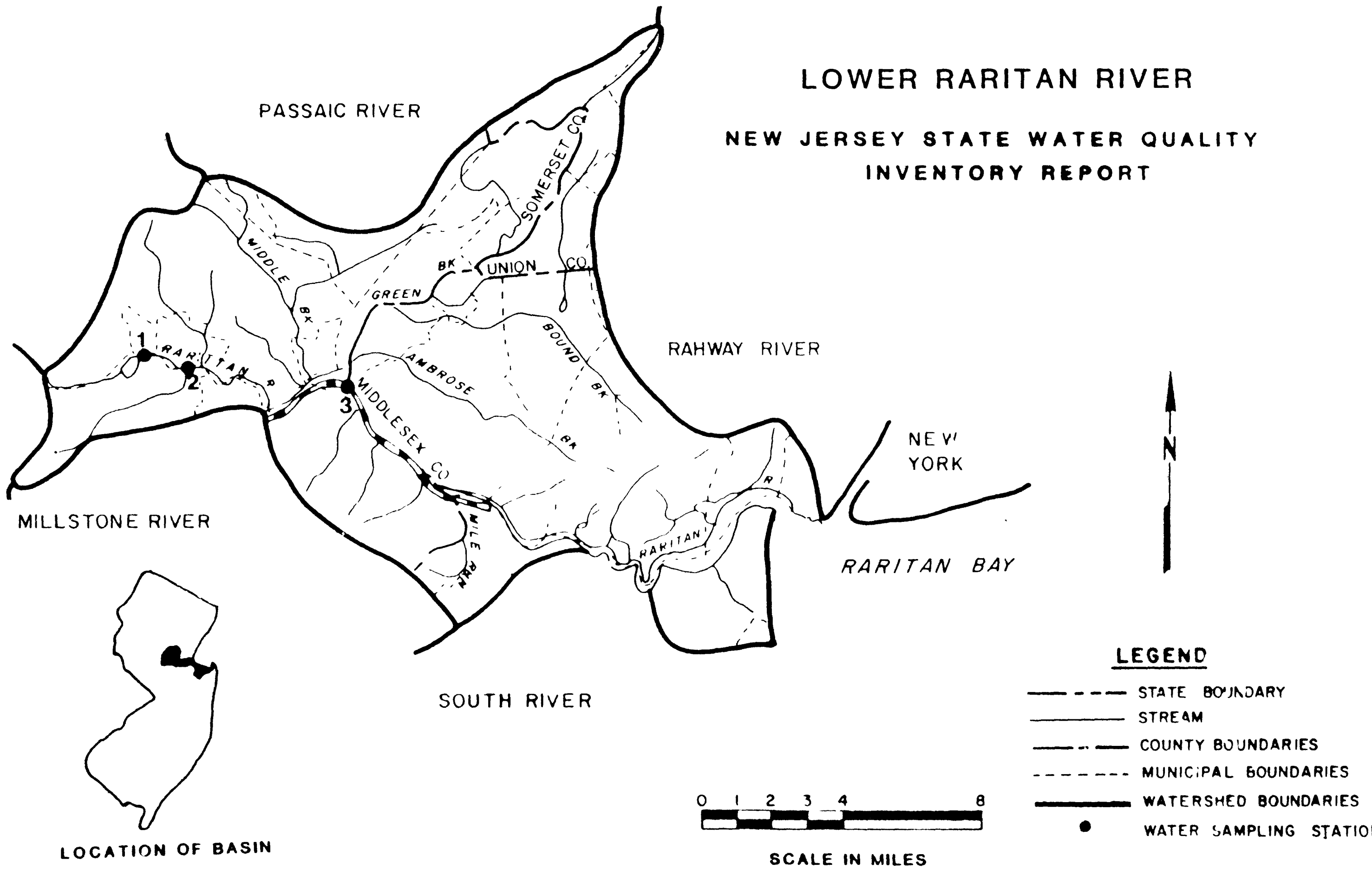
The Raritan River fails to support the swimmable (primary contact) designated use at all three monitoring stations due to elevated fecal coliform bacteria.

Monitoring Station List

Map Number	Station Name and Classification
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



WATER QUALITY INDEX PROFILES 1986-1990: **RARITAN RIVER**

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVG. AND WORST 3 MONTH CONDITION
Raritan River at Raritan	AVG. WQI:	3	7	8	27	16	6	4	6	18 GOOD
	WORST 3 MONTHS:	JULY-SEPT.	MAR.-MAY	FEB.-APRIL	MAY-JULY	JUNE-AUG.	SEPT.-NOV.	JULY-SEPT.	OCT.-DEC.	28 FAIR MAY-JULY
Raritan River at Manville	AVG. WQI:	4	17	16	27	16	6	7	6	26 FAIR
	WORST 3 MONTHS:	MAY-JULY	MAR.-MAY	MAR.-MAY	NOV.-JAN.	JUNE-AUG.	MAR.-MAY	MAR.-MAY	SEPT.-NOV.	33 FAIR MAR.-MAY
Raritan River at Queens Bridge	AVG. WQI:	4	7	4	30	27	6	8	5	26 FAIR
	WORST 3 MONTHS:	JUNE-AUG.	AUG.-OCT.	DEC.-FEB.	AUG.-OCT.	JUNE-AUG.	MAY-JULY	JULY-SEPT.	SEPT.-NOV.	41 FAIR JULY-SEPT.

LEGEND: WATER QUALITY INDEX DESCRIPTION

Note: an index value of 20 is equivalent to the level of water quality criteria.

WQI	Condition	Description
0-10	Excellent	Pollution minimal or absent; water uses met throughout the year.
11-25	Good	Pollution generally in low amounts; water uses periodically not met.
26-60	Fair	Pollution varies from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution present in high levels; water uses not met.
81-100	Very Poor	Pollution present in extremely high levels; severe stress to streamlife; water uses not met.
ID	Insufficient Data	

POINT SOURCE POLLUTION TABLE
WATERSHED: Raritan River

FACILITIES IN NONCOMPLIANCE

FACILITY	RECEIVING WATER	POLLUTANT	COMMENTS
U.S. Bronze Powders Inc. Raritan Twp. Hunterdon County. NJPDES 00003336	Mill Creek	Discharge of Treated Stormwater Runoff and Cooling Water. Zinc, Copper, Chemical Oxygen Demand, Dissolved Solids, and Acute Toxicity Limits have been violated.	Administrative Order for Discharge Noncompliance issued in 1989 and 1990. Hearings have been requested and some remedial action has been taken.
Somerset Raritan Valley Sewerage Authority, Bridgewater Twp. Somerset County. NJPDES 0024864	Cuckels Brook	Discharges Treated Sanitary and Industrial Wastewater. Suspended Solids, Ammonia-Nitrogen, Biochemical Oxygen Demand, Kjeldahl Nitrogen, Oil and Grease limitations have been violated.	The facility is upgrading pursuant to a June 1990 Administrative Concent Order, with final compliance slated for July of 1992.
Johnson & Johnson, Montgomery Twp, Somerset County. NJPDES 0026140	Back Brook	Discharge of Treated Process Wastewater. Total Suspended Solids, Biochemical Oxygen Demand, Ammonium-Nitrogen, Fecal Coliform and, pH had violated permit lmitations.	The facility is upgrading pursuant to a June 1991 Administrative Consent Order.
Raritan River Steel. NJPDES	Raritan River Steel	Industrial Discharger of Total Suspended Solids and Iron.	None Available.
GMC-Delco Remy New Brunswick, Middlesex County. NJPDES N/A	Six Mile Run Brook	Industrial Discharger of Lead.	None Available
Stavola Const. Materials, Bridgewater Twp. Somerset County. NJPDES 0002895	Middle Brook	Discharge of excessive Total Suspended Solids in Stormwater runoff.	Administrative Order and Notice of Civil Administrative Penalty issued in 1989 and 1990.

POINT SOURCE POLLUTION TABLE
WATERSHED: Raritan River (continued)

FACILITIES IN NONCOMPLIANCE

FACILITY	RECEIVING WATER	POLLUTANT	COMMENTS
Fanwood Crushed Stone. NJPDES 0001228	Green Brook	Stormwater Runoff and Total Suspended Solids.	Administrative Order or Discharge Noncompliance issued in 1990. Water Quality Standards continue to be violated.
New Jersey Transit Rail Yard. Raritan Borough, Somerset County. NJPDES 0023914	Gaston Brook	Discharge of Treated Stormwater Runoff. Total Suspended Solids, Chemical Oxygen Demand, Petroleum Hydrocarbons, Turbidity, and pH permit limits have been violated.	This facility is currently upgrading in connection with a June 1988 Administrative Consent Order.
Manville Boro STP. Somerset County. NJPDES 0028762	Raritan River	Discharges of Treated Sanitary and Industrial Wastewater. Total Suspended Solids, Biochemical Oxygen Demand, Dissolved Oxygen Flow violations, Total Residual Chlorine, and Fecal Coliform Limitations are frequently violated. Overflows from the collection system occur during high flows.	The Boro is in the process of eliminating the STP via connection to Somerset Raritan Valley Sewerage Authority. Collection system overflows are to be eliminated pursuant to an Administrative Consent Order.
Aberdeen-Strathmore STP. NJPDES N/A	Mohingson Brook	Municipal Discharger exceeding Biochemical Oxygen Demand and Total Suspended Solids.	None to report
Aberdeen-Cliffwood Beach. NJPDES N/A	Whale Creek	Municipal Discharger exceeding Biochemical Oxygen Demand and Total Suspended Solids.	None to report
Aberdeen-River Gardens. NJPDES N/A	Matawan Creek	Municipal Discharger exceeding Biochemical Oxygen Demand and Total Suspended Solids	None to report

POINT SOURCE POLLUTION TABLE
WATERSHED: Raritan River (continued)

IMPROVEMENTS TO FACILITIES AFFECTING WATER QUALITY

FACILITY	RECEIVING WATER	COMMENTS
Middlesex County Utilities Authority	Raritan River	Facility now complies with the federally mandated secondary treatment or has eliminated sub standard discharges

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 over 50 NJPDES permitted discharges identified in the Rahway and Elizabeth watersheds, all except about 5 are industrial/commercial. 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 some improvement in conditions in the downstream direction. The Elizabeth River is severely degraded (rated fair to poor), especially during the mid to late winter.

The West Branch Rahway River has fair overall quality with conditions approaching poor quality in late fall and early winter. Fecal coliform, total phosphorus, and total dissolved solids are found at problematic levels. Fecal coliform counts had a geometric mean of 1,126 MPN/100ml from 1986 through 1990 with 85 percent of samples found to be greater than 200 MPN/100ml. Total phosphorus has averaged 0.07 mg/l, during which 63 percent of samples exceeded the State criterion. Total dissolved solids have averaged 511 mg/l - among the highest of all monitoring stations in the State. Dissolved oxygen concentrations have appeared adequate at this location.

Near Springfield, the Rahway River has its worst water quality based upon monitored data. Although overall quality is considered fair, it is poor during the summer. Excessive total phosphorus and extremely elevated fecal coliform concentrations are found at this location. Periodically, low dissolved oxygen and high total dissolved solids measurements also occur. Fecal coliform counts had a geometric mean of 2,203 MPN/100ml here with almost all samples exceeding criteria, while total phosphorus concentrations averaged 0.1 mg/l with 36 percent of samples in violation of standards. Occasionally high inorganic nitrogen was also detected. Dissolved oxygen saturation averaged only 73 percent near Springfield, with some low dissolved oxygen concentrations often approaching the 4.0 mg/l warm-water limit during spring and summer. Solids are present at elevated but acceptable levels with sporadic recordings exceeding established standards.

At Rahway, conditions are improved over what is found near Springfield. Fecal coliform records are still excessive, but levels are much lower. Fecal coliform had a geometric mean of 781 MPN/100ml with 81 percent of samples above the State criterion. Total phosphorus is found at levels similar to those near Springfield. Solids are present again at high but acceptable levels.

Kings Creek, a tributary to the Rahway River, is regarded by the Department as an impaired waterway due to toxic discharges emanating from point sources. The contaminants of concern are arsenic, copper, mercury, cadmium, lead, zinc, and nickel. The criteria violated are USEPA's Federal Aquatic Life chronic criteria, USEPA's Federal Human Health-water and fish ingestion criteria, and USEPA's Federal human health criteria for exposure to carcinogens.

The Elizabeth River drains highly developed urban lands adjacent to the Rahway watershed. Water quality in the Elizabeth River is fair to poor with poor conditions in January to March. The river, channelized in sections, has fecal coliform concentrations which averaged 1,000 MPN/100ml from 1986 through 1990 as well as excessive phosphorus and nitrogen. Total phosphorus was above the State criterion in 66 percent of the samples, while inorganic nitrogen was excessive in 14 percent of the measurements taken. Dissolved oxygen saturation sometimes exceeds 120 percent during summer months - indicating elevated primary productivity. Total dissolved solids have also occurred at elevated levels, averaging 438 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 Assessment

Point Source Assessment

Water quality of the Rahway and Elizabeth Rivers are reflective of urbanized streams. The presence of high levels of nutrients, fecal coliform bacteria, 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 5 Department enforcement actions against discharges that are impacting water quality in these two watersheds (see Point Source Pollution Table). Hazardous waste sites are present in these watersheds, but none have been identified to be contaminating surface waters.

Nonpoint Source Assessment

The Rahway River watershed is highly urbanized and its waterways are severely degraded by nonpoint source pollution and by the physical alterations of the stream channel 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 Assessment

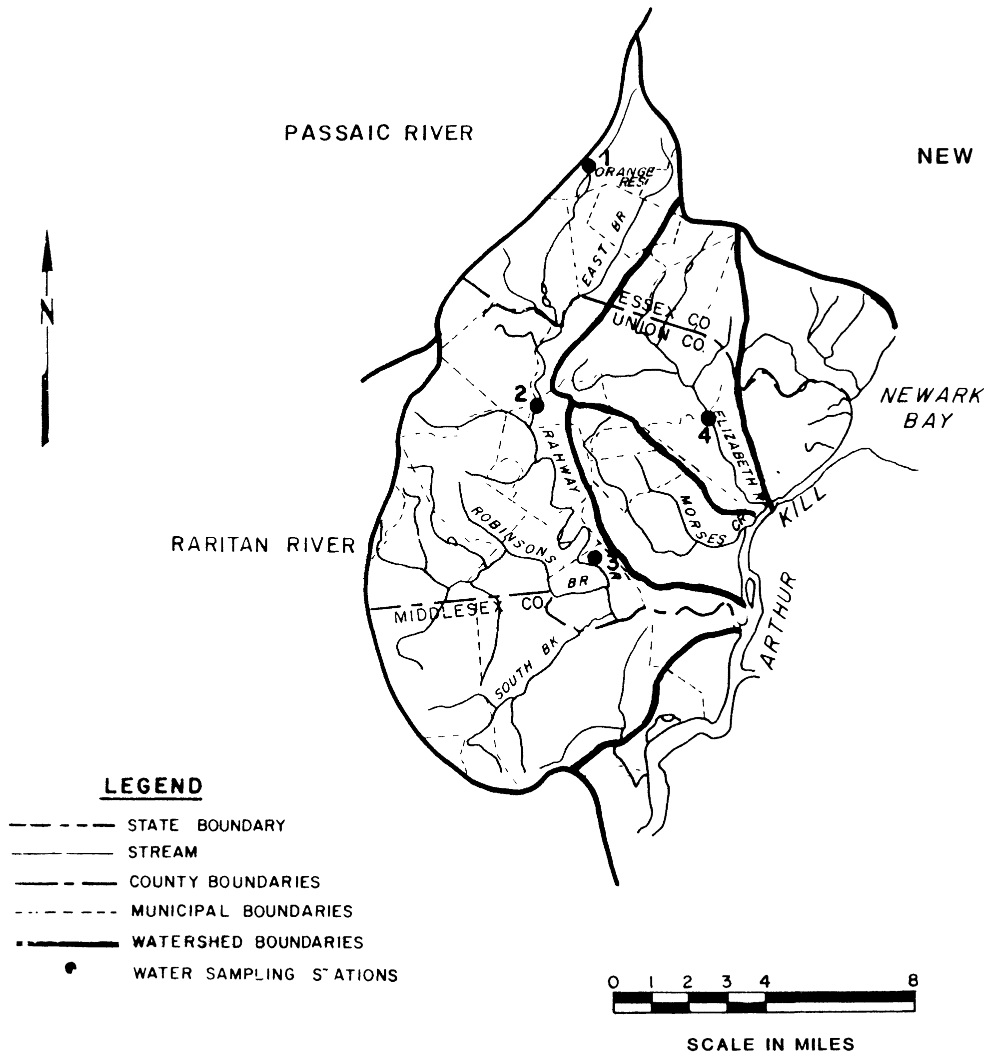
The Rahway and Elizabeth Rivers are not of swimmable quality. Severe pollution in the Elizabeth River along with channelization have resulted in a degraded fish community in the river. Therefore, the freshwater Elizabeth River is classified as not supporting the "aquatic life" use. The freshwater Rahway River is considered to be partially supporting the "aquatic life" use because of a moderately degraded fish community. Designated use attainment 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 Rahway 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



LOCATION OF BASIN

WATER QUALITY INDEX PROFILES 1986-1990: **RAHWAY AND ELIZABETH RIVER**

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVG. AND WORST 3-MONTH CONDITION
WB Rahway R. at West Orange	AVG. WQI:	2	16	2	48	28	22	1	9	43 FAIR
	WORST 3 MONTHS:	JUNE-AUG.	JUNE-AUG.	AUG.-OCT.	NOV.-JAN.	NOV.-JAN.	JAN.-MAR.	JUNE-AUG.	APRIL-JUNE	60 FAIR NOV.-JAN.
Rahway R. near Springfield	AVG. WQI:	2	34	3	49	16	16	2	5	45 FAIR
	WORST 3 MONTHS:	JUNE-AUG.	JUNE-AUG.	NOV.-JAN.	JULY-SEPT.	JUNE-AUG.	DEC.-FEB.	MAY-JULY	MAR.-MAY	63 POOR JUNE-AUG.
Rahway R.at Rahway	AVG. WQI:	3	12	5	40	19	12	4	6	26 FAIR
	WORST 3 MONTHS:	JUNE-AUG.	JUNE-AUG.	MAR.-MAY	JUNE-AUG.	MAY-JULY	JAN.-MAR.	MAY-JULY	JUNE-AUG.	33 FAIR JUNE-AUG.
Elizabeth R. at Ursino Lake	AVG. WQI:	3	14	4	72	20	22	6	ID	55 FAIR
	WORST 3 MONTHS:	JUNE-AUG.	JUNE-AUG.	AUG.-OCT.	JUNE-AUG.	JAN.-MAR.	DEC.-FEB.	JULY-SEPT.		62 POOR JAN.-MAR.

LEGEND: WATER QUALITY INDEX DESCRIPTION Note: an index value of 20 is equivalent to the level of water quality criteria.

WQI	Condition	Description
0-10	Excellent	Pollution minimal or absent; water uses met throughout the year.
11-25	Good	Pollution generally in low amounts; water uses periodically not met.
26-60	Fair	Pollution varies from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution present in high levels; water uses not met.
81-100	Very Poor	Pollution present in extremely high levels; severe stress to streamlife; water uses not met.
ID	Insufficient Data	

POINT SOURCE POLLUTION TABLE
WATERSHED: Rahway River

FACILITIES IN NONCOMPLIANCE

FACILITY	RECEIVING WATER	POLLUTANT	COMMENTS
Sun Chemical NJPDES 0062821	Robinson's Creek	Stormwater Runoff, Chemical Oxygen Demand,	None to report.
CP Chemicals NJPDES N/A	Woodbridge Creek	Industrial discharge containing Metals	None to report.
Witco NJPDES N/A	Spa Spring Creek	Industrial discharger of PCB's and Total Suspended Slids.	None to report.
Merck NJPDES 0002348	Kings Creek	Storm Water Runoff, Chemical Oxygen Demand, Total Suspended Solids.	Administrative Consent Order executed in 1991 to address Stormwater and Significant Industrial Use Deficiencies.
IMTT- Bayonne NJPDES 000134	Plattykill Creek	Stormwater Runoff, Chemical Oxygen Demand, PHC	Administrative Order for Discharge Non Compliance issued in 1991.

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 delineated: 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 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 some 30 NJPDES permitted discharges identified in this watershed, of which slightly more than half are municipal and the rest 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, near Chatham, and at Two Bridges. Results from this monitoring indicate 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 0.15 and 0.43 mg/l near Millington and Chatham, respectively. Sixty-six percent of the values were greater than 0.1 mg/l near Millington, while 96 percent exceeded this level near Chatham. The Passaic River near Chatham also contains generally high inorganic nitrogen with concentrations averaging 2.0 mg/l from 1986 through 1990. Fecal coliform bacterial counts were above the 200 MPN/100ml level in 29 and 81 percent of the samples taken from near Millington and

Chatham, respectively. Both locations also experience reduced dissolved oxygen concentrations during summer months. Near Millington some dissolved oxygen records dipped below 4.0 mg/l while at Chatham levels approached but did not exceed this level. Saturation averaged only 63 percent near Millington and 76 percent near Chatham. Biochemical oxygen demand is often greater than 4.0 mg/l near Chatham. Nutrient loading near Millington appears to occur more in late spring than in late summer/early fall as it does at the other two stations. This suggests that nonpoint sources may be an important contributing factor in the nutrient budget at the Millington location as opposed to the other stations in the upper Passaic.

At Two Bridges, the Passaic River has been subjected to numerous municipal wastewater discharges. These discharges, combined with the limited assimilative capacity of the river as it flows through a swampy area, creates fair overall water quality degrading to very poor conditions during low flow periods. Nutrients and ammonia are excessive and dissolved oxygen is severely depressed during this critical period. Total phosphorus has averaged 0.49 mg/l at this location, while total inorganic nitrogen concentrations averaged 2.7 mg/l. Un-ionized ammonia is present in problematic levels during low flow and exceeded the State criterion in 14 percent of all samples collected during the present review period. Dissolved oxygen concentrations averaged below the 4.0 mg/l criterion during the months of August through October, while dissolved oxygen saturation was below 80 percent in almost every sample. Data revealed that dissolved oxygen levels below the recommended level of 4.0 mg/l were recorded in 1987 and 1988. No violations had been observed in 1989, 1990, and up through September of 1991; suggesting that water quality at this location may be improving with regards to dissolved oxygen. Future data will, hopefully, produce a clearer picture of what trends may be occurring here with regards to this parameter. Fecal coliform is also excessive in the river at this location; a geometric mean of 323 MPN/100 ml was calculated with 65 percent of samples exceeding standards.

The NJDEPE 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 interbasin 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.

Portions of the upper Passaic River are regarded by the Department as impaired due to toxic discharges emanating from point sources. The contaminants of concern are cyanide, arsenic, copper, mercury, cadmium, and lead. The criteria violated are USEPA's Federal Aquatic Life chronic criteria and USEPA's Federal human health criteria for exposure to carcinogens.

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 evident.

Problem Assessment

Point Source Assessment

The Passaic River has a very limited capacity to assimilate wastewaters discharged to it as well as the 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 are listed in the Point Source Pollution Table for this watershed. Also listed are three dischargers that have improved their discharges. The list includes the Livingston STP, which was cited as a problem in the 1990 Inventory Report. 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 all 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.

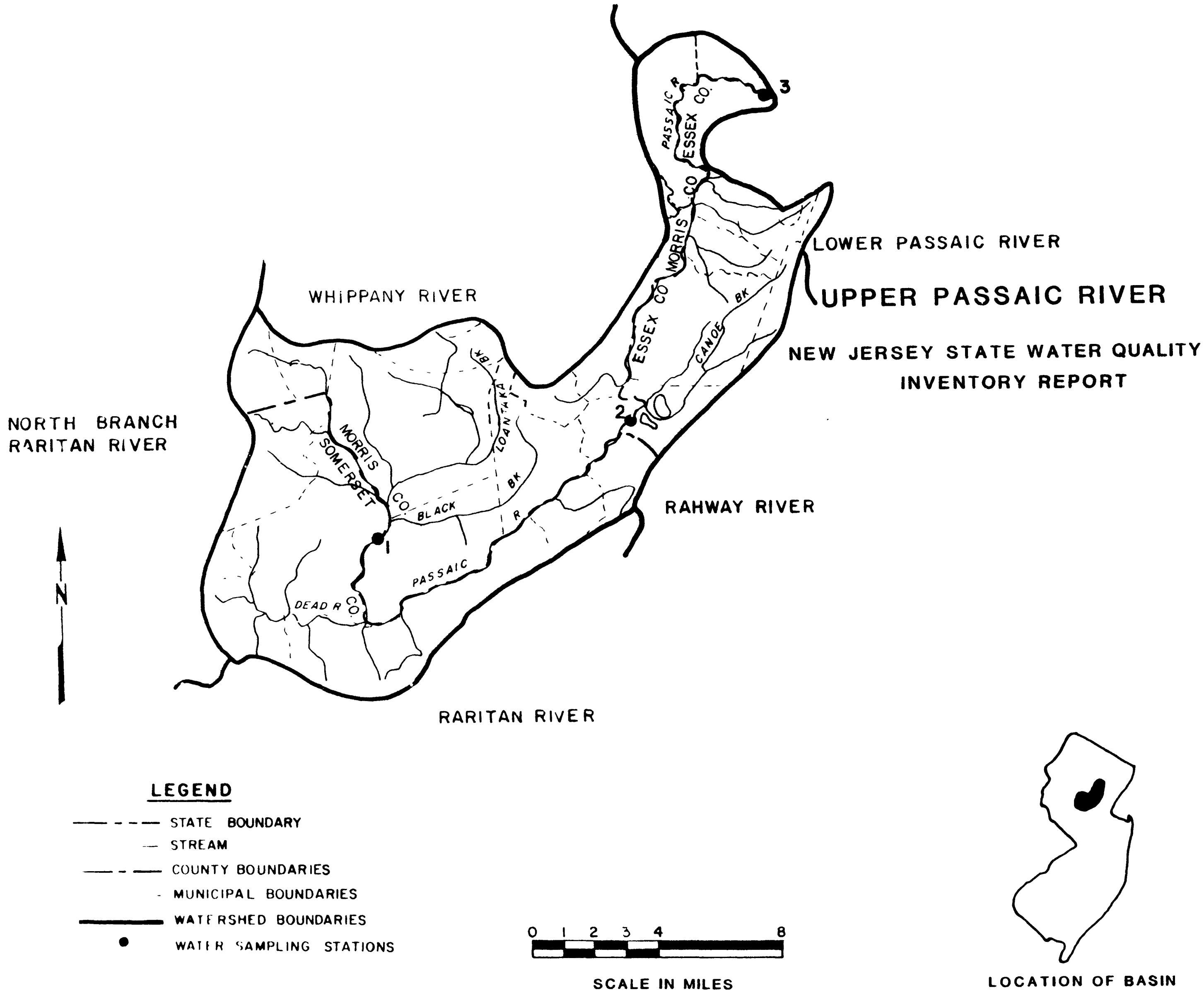
The impacts to the river from urbanization increase in severity along the stretch from Chatham to Livingston. Siltation is suspected of being the principal agent of habitat destruction in this portion of the river. It is here that the fishery begins to noticeably degrade, so that few game species are present. Those species which do survive 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. This destruction has been 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 Assessment

The Upper Passaic River will fully support the "aquatic life" use only in portions of the river. This is the section from the river's headwaters to Chatham. From Chatham to Livingston, the Passaic is partially supporting this use because of a moderately degraded fishery. From Livingston the river is considered not to be supporting the designated use. 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
ESSEX CO.
PASSAIC R
MORRIS CO
ESSEX CO
CANOE BK
LOANTAKA BK
MORRIS
SOMERSET
CO
BLACK BK
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 PROFILES 1986-1990: **UPPER PASSAIC RIVER**

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVG. AND WORST 3-MONTH CONDITION
Passaic River near Millington	AVG. WQI:	2	41	4	19	19	6	0	6	30 FAIR
	WORST 3 MONTHS:	JUNE-AUG.	MAY-JULY	MAY-JULY	MAY-JULY	MAY-JULY	DEC.-FEB.	AUG.-OCT.	MAR.-MAY	60 FAIR MAY-JULY
Passaic River near Chatham	AVG. WQI:	2	32	8	41	38	9	7	6	51 FAIR
	WORST 3 MONTHS:	JUNE-AUG.	MAY-JULY	OCT.-DEC.	MAY-JULY	AUG.-OCT.	JUNE-AUG.	JULY-SEPT.	SEPT.-NOV.	76 POOR MAY-JULY
Passaic River at Two Bridges	AVG. WQI:	3	48	4	30	40	10	10	7	56 FAIR
	WORST 3 MONTHS:	JUNE-AUG.	AUG.-OCT.	AUG.-OCT.	JULY-SEPT.	AUG.-OCT.	JAN.-MAR.	JULY-SEPT.	JUNE-AUG.	86 V. POOR AUG.-OCT.

LEGEND: WATER QUALITY INDEX DESCRIPTION Note: an index value of 20 is equivalent to the level of water quality criteria.

WQI	Condition	Description
0-10	Excellent	Pollution minimal or absent; water uses met throughout the year.
11-25	Good	Pollution generally in low amounts; water uses periodically not met.
26-60	Fair	Pollution varies from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution present in high levels; water uses not met.
81-100	Very Poor	Pollution present in extremely high levels; severe stress to streamlife; water uses not met.
ID	Insufficient Data	

POINT SOURCE POLLUTION TABLE
WATERSHED: Upper Passaic River

FACILITIES IN NONCOMPLIANCE

FACILITY	RECEIVING WATER	POLLUTANT	COMMENTS
Precision Rolled Products, East Hanover Twp. Morris County. NJPDES 0001881	Black Brook	Discharge of Treated Sanitary and Industrial Wastewater. The facility has violated permit limitations for Dissolved Oxygen, Total Suspended Solids, Ammonia-Nitrogen and Total Residual Chlorine.	An Administrative Order and Notice of Civil Administrative Penalty Assessment was issued in 1990. The facility initiated some improvements subsequent to the enforcement action and an Administrative Hearing is pending.
Chatham Twp. Main STP., Morris County. NJPDES 0020290	Black Brook	Discharge of Treated Sanitary Wastewater. Suspended Solids, Ammonia-Nitrogen, Phosphorous, Residual Chlorine, Carbonaceous and Nitrogenous Biochemical Oxygen Demand limitations have been violated.	The Facility is currently upgrading pursuant to an Administrative Concent Order executed in 1988.

POINT SOURCE POLLUTION TABLE
WATERSHED: Upper Passaic River (continued)

IMPROVEMENTS TO FACILITIES AFFECTING WATER QUALITY

FACILITY	RECEIVING WATER	POLLUTANT	COMMENTS
Warren Twp Stage IV STP. Somerset County. NJPDES 0022497	Dead River	Discharge of Treated Sanitary Wastewater. Biochemical Oxygen Demand, Carbonaceous and Nitrogenous Biochemical Oxygen Demands, Suspended Solids, Ammonia-Nitrogen, and Total Residual Chlorine permit limitations have been violated.	The facility is upgrading pursuant to a July 1989 Administrative Consent Order with final compliance set for June of 1992.
Passaic Twp. STP NJPDES 0024465	Passaic River	Discharges .819 mgd. Biochemical Oxygen Demand , Suspended Solids, Total Suspended Residual Chlorine, Ammonia-Nitrogen, Nitrogenous and Carbonaceous Biochemical Oxygen Demand effluent limitations are frequently exceeded.	An Administrative Consent Order was executed on July 1988 to memorialize a compliance schedule for upgrade of the facility.
New Providence NJPDES 0021636	Passaic River	STP Effluent, Chemical and Biochemical Oxygen demand.	Administrative Consent Order executed in 1991 to upgrade to level 4 treatment.
Woodland STP, Morris Twp., Morris County. NJPDES 0024929	Loantaka Brook	Discharges Treated Sanitary Wastewater. Biochemical Oxygen Demand, Carbonaceous and Nitrogenous Biochemical Oxygen Demand. Ammonia - Nitrogen and Phosphorous limitations have been violated.	The facility is being upgraded pursuant to an Administrative Consent Order executed July 1988.

POINT SOURCE POLLUTION TABLE
WATERSHED: Upper Passaic River (continued)

IMPROVEMENTS TO FACILITIES AFFECTING WATER QUALITY

FACILITY	RECEIVING WATER	POLLUTANT	COMMENTS
Caldwell STP NJPDES 0020427	Passaic River	None to report.	Facility completed upgrade to level 4 treatment and is in compliance with Permit Limits
Livingston STP NJPDES 0024511	Passaic River	None to report.	Facility completed upgrade to level 4 treatment and is in compliance with Permit Limits
Milford Manor Nursing Home STP. West Milford, Passaic County. NJPDES 0026981	Tributary of Nozenzo Pond	Discharged Treated Sanitary Wastewater . The STP is capable of secondary treatment. The facilities current permit calls for level four treatment.	The facility has ceased discharge in accordance with an Administrative Consent Order. The facility has been hauling it's wastewater off site and is ready to connect to the Highview Acres Sewage Treatment Plant.

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 confluence with 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 approximately 30 NJPDES permitted discharges, a little more than half are industrial/commercial and the remaining are municipal. Streams in this watershed have been classified FW-2 Trout Production and FW-2 Nontrout.

Water Quality Assessment

The Whippany River is routinely monitored at Morristown and at Pine Brook. Both stations have fair overall water quality; however, the Pine Brook station degrades to poor conditions during mid to late summer. The Whippany River at Morristown has shown a notable increase in water quality as compared to the previous period of review. In the past, the Whippany River at Morristown had been impacted by a large raw sewage overflow which had led to very poor water quality conditions characterized by extremely high fecal coliform counts and elevated nutrients. Data collected from 1987 through 1990 indicate that although still elevated, fecal coliform bacterial levels have been reduced to a fair extent and nutrient levels have been lowered slightly. The present assessment found the geometric mean of fecal coliform bacteria to be 1,048 MPN/100 ml with 78 percent of the values above the State criterion. Nutrients were also high at this location with average values of total phosphorus and inorganic nitrogen being 0.26 mg/l and 1.6 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 was a problem in past reviews; present levels are regarded as acceptable. Dissolved oxygen concentrations seem to be adequate; however, wide diurnal fluctuations are still suspected to be occurring. Elevated dissolved oxygen concentrations during warm water periods suggest high primary productivity in the river.

Downstream at Pine Brook, the Whippany River has much lower fecal coliform counts than found at Morristown; however, dissolved oxygen is generally lower than at Morristown, and nutrients are still high. Fecal coliform counts were above the State criterion in 84 percent of the samples, the geometric mean being 524 MPN/100ml. Total phosphorus records averaged 0.26 mg/l with 100 percent of samples exceeding criteria. Total inorganic nitrogen was elevated in 70 percent of all samples, averaging 2.6 mg/l. Un-ionized ammonia has also been found to be above the State criterion in warm weather periods. Records show that oxygen may on occasion drop below 4.0 mg/l during summer months and saturation is severely reduced during this time.

Biological monitoring performed in 1991 showed the biological health of the Whippany River to go from a healthy state in its headwaters to a severely impaired condition in its middle and lower reaches. Biomonitoring upstream of Morristown show a healthy biota. Downstream at a study site within the town of Morristown, the fauna exhibit severe impairment due to pollution. Diversity is low as is overall biomass, and pollutant-tolerant forms constitute the principal inhabitants of the community. Biological evidence suggests that dissolved oxygen is low. A similar condition was encountered in prior biomonitoring performed in 1985. Downstream in Hanover Township, conditions are similar to Morristown. Department biologists report a strange absence of periphyton at this location. Periphyton, a complex community of algae and protozoa which form a coating on almost any stable and submerged surface within a stream, would be expected at this location. Their absence has caused biologists to suspect the influence of toxic contamination within the water column at this location.

The Whippany River is regarded by the Department as an impaired waterway due to toxic discharges emanating from point sources. The contaminants of concern are arsenic, copper, mercury, cadmium, chromium, lead, zinc, and beryllium. The criteria violated are USEPA's Federal Aquatic Life chronic criteria and USEPA's Federal Human Health-water and fish ingestion criterion.

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 of 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 Assessment

Point Source Assessment

The Whippany River has a number of municipal and industrial wastewater discharges in its watershed. Seven facilities are reported to be under enforcement action for water quality violations and are listed in the Point Source Pollution Table for the Whippany River. The Morristown STP remains under NJDEPE enforcement action for violating the BOD, suspended solids, chlorine, and ammonia limitations of its permit. Other long running enforcement cases in the watershed include Sandoz Pharmaceutical in East Hanover, Butterworth STP in Morris Twp., Hanover Sewerage Authority STP, and Greystone Park STP in Parsippany-Troy Hills Twp. (discharge to Jacqui Pond).

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 fish kills 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 Assessment

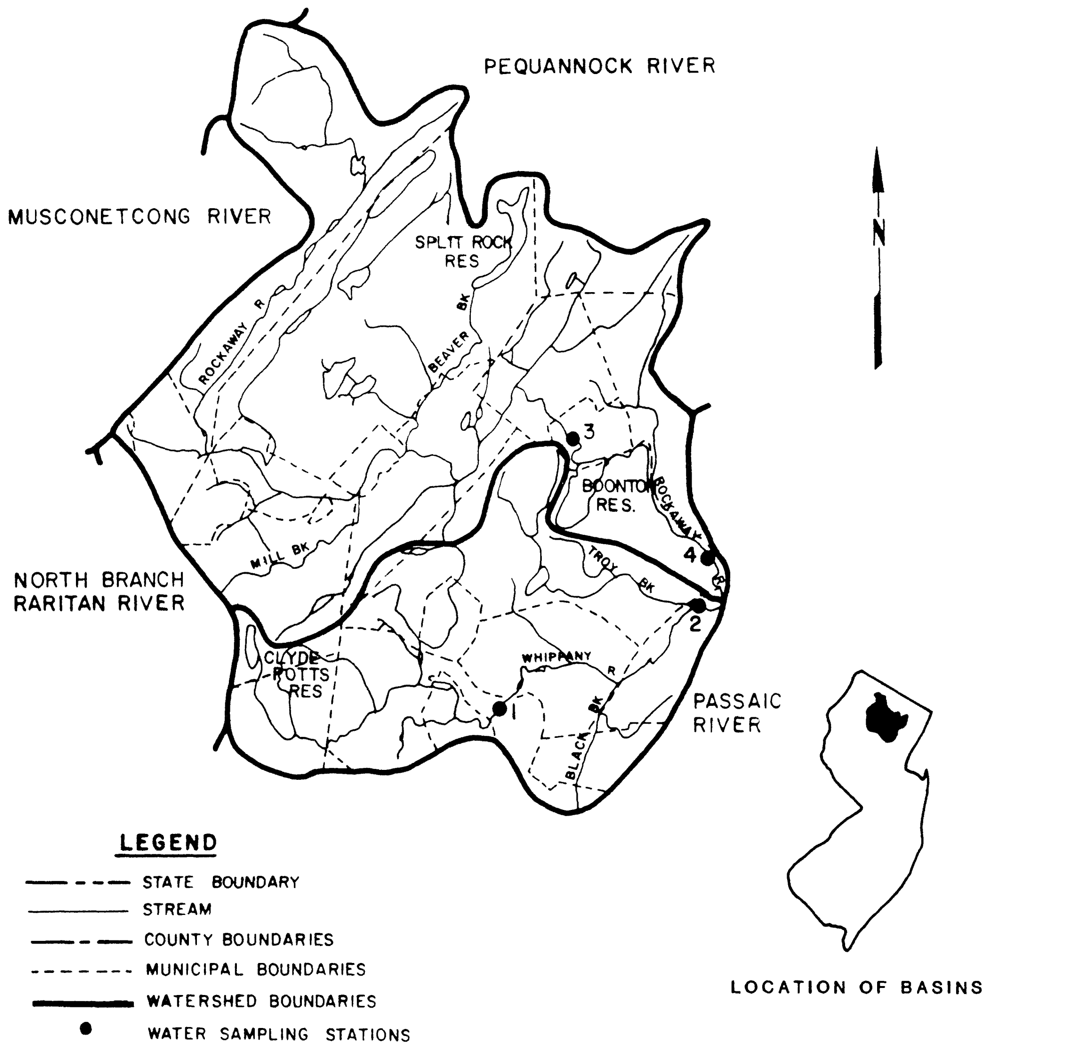
The Whippany River will support the "aquatic life" designated use in the upper half of the watershed; but the lower half of the river contains a severely impaired biota and, as such, is not supporting the "aquatic life" use. The river will not achieve swimmable status because of fecal coliform concentrations.

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



WATER QUALITY INDEX PROFILES 1986-1990: **WHIPPANY RIVER**

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVG. AND WORST 3-MONTH CONDITION
Whippany River at Morristown	AVG. WQI:	2	8	6	41	27	8	8	5	33 FAIR
	WORST 3 MONTHS:	JUNE-AUG.	MAR.-MAY	MAR.-MAY	JULY-SEPT.	MAY-JULY	DEC.-FEB.	MAR.-MAY	MAY-JULY	40 FAIR JULY-SEPT.
Whippany River at Pine Brook	AVG. WQI:	3	33	2	36	38	11	11	8	49 FAIR
	WORST 3 MONTHS:	JUNE-AUG.	JUNE-AUG.	OCT.-DEC.	AUG.-OCT.	MAY-JULY	DEC.-FEB.	JUNE-AUG.	AUG.-OCT.	70 POOR JULY-SEPT.

LEGEND: WATER QUALITY INDEX DESCRIPTION

Note: an index value of 20 is equivalent to the level of water quality criteria.

WQI	Condition	Description
0-10	Excellent	Pollution minimal or absent; water uses met throughout the year.
11-25	Good	Pollution generally in low amounts; water uses periodically not met.
26-60	Fair	Pollution varies from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution present in high levels; water uses not met.
81-100	Very Poor	Pollution present in extremely high levels; severe stress to streamlife; water uses not met.
ID	Insufficient Data	

POINT SOURCE POLLUTION TABLE
WATERSHED: Whippany River

FACILITIES IN NONCOMPLIANCE

FACILITY	RECEIVING WATER	POLLUTANT	COMMENTS
Sandoz Pharmaceuticals Corp. East Hanover Twp. Morris County. NJPDES 0001155	Black Brook, Pinch Brook,and Whippany River	The facility has been in significant noncompliance with permit limitations for Total Suspended Solids and Chemical Oxygen Demand.	An Administrative Consent Order was executed in 1991 to set up a compliance schedule and settle penalty liability for violations dating back to 1987.
Hanover Sewerage Authority, Hanover Twp. Morris County. NJPDES 0024902	Whippany River	Discharge Treated Sanitary and Industrial Wastewater. Biochemical Oxygen Demand, Carbonaceous and Nitrogenous Biochemical Oxygen Demand. Ammonia-Nitrogen and Total Residual Chlorine limitations have been violated.	An Administrative Consent Order Was executed in March of 1988 to memorialize a compliance schedule for facility upgrade. Compliance is slated for March 1992.
Butterworth STP Morris Twp. , Morris County . NJPDES 0024911	Whippany River	Discharges Treated Sanitary Wastewater. Biochemical Oxygen Demand, Carbonaceous and Nitrogenous Biochemical Oxygen Demand. Ammonia-Nitrogen limitations have been violated.	The facility is upgrading pursuant to an Administrative Consent Order issued July 1988.

POINT SOURCE POLLUTION TABLE
WATERSHED: Whippany River (continued)

FACILITIES IN NONCOMPLIANCE

FACILITY	RECEIVING WATER	POLLUTANT	COMMENTS
St. Mary's Abbey, Morris Twp. Morris County. NJPDES 0026751	Tributary of the Whippany River	Discharge of Treated Sanitary Wastewater Ammonia-Nitrogen and Nitrogenous Biochemical Oxygen Demand have been violated frequently	The facility is upgrading pursuant to an Administrative Consent Order issued June 1988..
Morristown STP, Morris County. NJPDES 0025496	Whippany River	Discharge of about 3.3 mgd. Total Residual Chlorine, Fecal Coliform, Suspended Solids, Biochemical Oxygen Demand, and Ammonium- Nitrogen are frequently exceeded.	The facility is currently upgrading pursuant to an Administrative Consent Order.
Southeast Morris County MUA, Hanover Twp. Morris County. NJPDES 0063070	Black Brook. Lower Whippany River.	Discharge of Filter Backwash Water, Residual Chlorine, Chemical Oxygen Demand and Suspended Solids Permit effluent Limitations have been violated.	An Administrative Order for Discharge Noncompliance was issued October 15,1990. A hearing has been requested and some improvements have been initiated.
N.J. Psychiatric Institution (Greystone). Parsippany Twp, Morris County. NJPDES 0026689	Jaqui Pond	Discharge of Treated Sanitary Wastewater. Biochemical Oxygen Demand, Carbonaceous and Nitrogenous Biochemical Oxygen Demand, Total Suspended Solids, Phosphorus, Ammonia-Nitrogen, Residual Chlorine and Fecal Coliform Limitations are frequently violated.	The facility is upgrading pursuant to an Administrative Consent Order dated June 1991, with final compliance set for May 1994.

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.

The land use patterns in this area are complex and include wooded/vacant areas, park lands, residential development, with some areas having industrial and commercial uses. Development is occurring in much of the vacant area. There are approximately 30 NJPDES permitted dischargers here, of which about two-thirds are industrial/commercial and one-third 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 moderate levels of total phosphorus. The geometric mean of fecal coliform counts from 1986 through 1990 was 80 MPN/100ml with 26 percent of samples exceeding the State criterion. Total phosphorus was elevated in 45 percent of the samples and averaged 0.13 mg/l, just below the 0.05 mg/l criterion for prevention of impoundment/lake eutrophication. Daytime 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 (sometimes 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 poorer than those at Boonton - significantly poorer during the summer. Elevated nutrients, BOD, and fecal coliform bacteria, along with reduced dissolved oxygen result in fair overall quality, with very poor conditions occurring during the late summer.

At Pine Brook, total phosphorus averaged 0.48 mg/l during 1986 through 1990. Eighty-three percent of the samples were greater than the 0.1 mg/l criterion. Total inorganic nitrogen is also high, averaging 3.3 mg/l. Although the past assessment reported excessive levels of total Kjeldahl nitrogen and frequent violations of un-ionized ammonia criteria in samples taken, recordings made during the present assessment found both parameters to be within acceptable levels. Fecal coliform bacterial samples were above 200 MPN/100ml in 69 percent of all values and had a geometric mean of 503 MPN/100ml during the period of review. This is notably higher than the bacterial levels observed in the 1983-1987 assessment when the geometric mean was determined to be 169 MPN/100ml. No daytime dissolved oxygen recordings in the Rockaway River at Pine Brook dropped below 4.0 mg/l, however DO saturation averaged 88 percent, indicating less than optimum conditions.

Biological monitoring of the Rockaway River at Boonton prior to 1990 found the waterway to contain a healthy environment for macroinvertebrates. The percentage of pollution-tolerant organisms was low, and no single species dominated the community. Excess nutrient enrichment, however, is evidenced. Historically, the macroinvertebrate community appears to have improved over the past decade.

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 Assessment

Point Source Assessment

Point source facilities in non-compliance as well as those formerly under enforcement action that have improved their discharges are listed in the Point Source Pollution Table for the watershed. The Rockaway River appears to be impacted by a combination of point and nonpoint sources. The Randolph High School STP discharge to Mill Brook continues to be under enforcement action because of poor quality wastewaters. Improvements have been reported regarding Picattiny Arsenal, which has begun eliminating many of its discharges. Septic systems are also suspected of 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. 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. In the lower Rockaway watershed, improvements in water quality are expected as a result of two of the three Montville Twp. Municipal Authority plants being eliminated during the summer of 1989 via connection to the Parsippany-Troy Hills STP. Prior to this connection the plants in question, Brook Valley STP and Norrland Estates STP (both discharging to Valhalla Brook) had provided minimal wastewater treatment and had frequently been in violation of their discharge permits.

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 Borough.

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 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. Further downstream of the reservoir, the impacts from these sources become more severe and, together with the effects of point sources, causes the fish population to degrade to one limited to species such as carp, which are pollution tolerant.

Many other streams in this watershed are also impacted by urbanization. Construction and urban runoff (sewers, urban surfaces) have degraded Jackson Brook - where fish kills 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 Assessment

The Rockaway River will only support the "aquatic life support" use in the segment above Dover. From Dover to the Boonton Reservoir the river partially supports the use, while below the Boonton Reservoir it does not support the use. Various tributaries either support, partially support, or do not support the "aquatic life" use. The river will not achieve swimmable status because of fecal coliform bacteria.

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-260 for a map of the Rockaway watershed.

WATER QUALITY INDEX PROFILES 1986-1990: **ROCKAWAY RIVER**

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVG. AND WORST 3-MONTH CONDITION
Rockaway River at Boonton	AVG. WQI:	2	7	5	22	26	7	3	10	21 GOOD
	WORST 3 MONTHS:	JUNE-AUG.	JULY-SEPT	AUG.-OCT.	MAY-JULY	AUG.-OCT.	FEB.-APRIL	JUNE-AUG.	JULY-SEPT	43 FAIR JUNE-AUG.
Rockaway River at Pine Brook	AVG. WQI:	2	15	6	34	38	8	3	7	37 FAIR
	WORST 3 MONTHS:	JUNE-AUG.	AUG.-OCT.	OCT.-DEC.	JULY-SEPT.	JULY-SEPT.	JULY-SEPT.	JUNE-AUG.	SEPT.-NOV.	62 POOR JULY-SEPT.

LEGEND: WATER QUALITY INDEX DESCRIPTION

Note: an index value of 20 is equivalent to the level of water quality criteria.

WQI	Condition	Description
0-10	Excellent	Pollution minimal or absent; water uses met throughout the year.
11-25	Good	Pollution generally in low amounts; water uses periodically not met.
26-60	Fair	Pollution varies from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution present in high levels; water uses not met.
81-100	Very Poor	Pollution present in extremely high levels; severe stress to streamlife; water uses not met.
ID	Insufficient Data	

POINT SOURCE POLLUTION TABLE
WATERSHED: Rockaway River

FACILITIES IN NONCOMPLIANCE

FACILITY	RECEIVING WATER	POLLUTANT	COMMENTS
Randolph High School STP, Morris County. NJPDES 0026603	Mill Brook	Discharge of Treated Sanitary Wastewater. Nitrogenous Biochemical Oxygen Demand, Dissolved Oxygen, Ammonia-Nitrogen and Carbonaceous Biochemical Oxygen Demand are frequently exceeded. An Administrative Consent Order was executed to implement a compliance schedule to eliminate the discharge and to settle penalty liability.	None to report.
Berkshire Sand and Stone Co. NJPDES 0029394	Rockaway River	Discharge of Process and Stormwater at two outfalls into the Rockaway River. Total Suspended Solid limitations are frequently violated.	None to report.

IMPROVEMENTS TO FACILITIES AFFECTING WATER QUALITY

FACILITY	RECEIVING WATER	POLLUTANT	COMMENTS
Norrland Estates STP, Montville Twp. Morris County. NJPDES 0030317	Valhalla Brook	Discharged Treated Sanitary Wastewater. Biochemical Oxygen Demand, Total Residual Chlorine, Total Suspended Solids, Flow and Fecal Coliform were frequently exceeded..	The facility ceased discharging pursuant to an Administrative Consent Order
Picattiny Arsenal NJPDES 0002500	Green Pond Brook	Discharge of .400 mgd. The discharge exceeds permit limitations for Total Residual Chlorine. Permit limitations for pH and Chemical Oxygen Demand at a .04 mgd cooling water discharge were exceeded	An Administrative Consent Order was executed to memorialize a schedule for elimination of the sewage treatment plant discharge. Some of the facilities other discharges have been eliminated.
Montville Twp. MUA-Brook Valley STP. Morris County. NJPDES 0030287	Valhalla Brook	Discharged Treated Sanitary Wastewater. Biochemical Oxygen Demand, Total Residual Chlorine, Total Suspended Solids, Flow and Fecal Coliform were frequently violated.	The facility ceased discharging pursuant to an Administrative Consent Order.

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; the major impoundments being 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 in Bloomingdale Townships.

The great majority of the land in this watershed is forested and protected for water supply purposes and parklands. The remaining lands are under residential and industrial/commercial use. There are just under 20 NJPDES permitted discharges; one-third are municipal and two-thirds are 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 where the river is classified as trout maintenance. Based on this monitoring the Pequannock River has good overall water quality, with fair quality during summer months. The only significant water quality problem identified in ambient monitoring is stream temperature, which is often above the recommended trout maintenance criterion from June to August. Dissolved oxygen is sufficient at all times and biochemical oxygen demand is always less than 3.0 mg/l. Only one fecal coliform bacterial sample had counts exceeding the 200 MPN/100ml criterion from 1986 through 1990, and the geometric mean for the 5-year period was a relatively moderate to low value of 38 MPN/100ml. Nutrients are also low, as total phosphorus averaged 0.04 mg/l and exceeded the 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 healthy communities, but some nutrient enrichment or the presence of detritus is indicated. The communities showed no evidence of depressed dissolved oxygen in the environment.

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 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. Enforcement activities are underway against one facility (see the Point Source Pollution Table). The Kinnelon High School STP, formally in violation of its discharge permit, has completed an upgrade and is no longer under enforcement action.

Nonpoint Source Assessment

The principal source of nonpoint pollution in the Pequannock River watershed from Stockholm to the Pompton River is 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. Additional 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 Assessment

The Pequannock River will support the "aquatic life support" designated use in most parts of the river. The lower five miles, evaluated to contain a moderately degraded fishery, is classified as partially supporting the designated use. Monitoring at the Macopin Intake finds that the river will support the swimmable use at this location.

Monitoring Station List

Map Number	Station and Classification
1	Pequannock River at Macopin Intake, FW-2 Trout Maintenance

See page III-283 for a map of the Pequannock River watershed.

WATER QUALITY INDEX PROFILES 1986-1990: **PEQUANNOCK RIVER**

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVG. AND WORST 3-MONTH CONDITION
Pequannock R. at Macopin Intake	AVG. WQI: WORST 3 MONTHS:	14 JUNE-AUG.	9 JUNE-AUG.	9 AUG.-OCT.	11 JUNE-AUG.	8 NOV.-JAN.	5 MAY-JULY	2 JUNE-AUG.	18 OCT.-DEC.	16 GOOD 37 FAIR JULY-SEPT

LEGEND: WATER QUALITY INDEX DESCRIPTION

Note: an index value of 20 is equivalent to the level of water quality criteria.

WQI	Condition	Description
0-10	Excellent	Pollution minimal or absent; water uses met throughout the year.
11-25	Good	Pollution generally in low amounts; water uses periodically not met.
26-60	Fair	Pollution varies from moderate to high levels; certain water uses prohibited.

WQI	Condition	Description
61-80	Poor	Pollution present in high levels; water uses not met.
81-100	Very Poor	Pollution present in extremely high levels; severe stress to streamlife; water uses not met.
ID	Insufficient Data	

POINT SOURCE POLLUTION TABLE
WATERSHED: Pequannock River

FACILITIES IN NONCOMPLIANCE

FACILITY	RECEIVING WATER	POLLUTANT	COMMENTS
Frank's Sanitation, Riverdale Boro, Morris County NJPDES 0065862	Pequannock River	Discharge of Stormwater Runoff and Truck wash water. Chemical Oxygen Demand, Total Suspended Solids and Petroleum Hydrocarbon permit limitations are frequently violated.	An Administrative Order for Discharge Noncompliance was issued July 1990 for effluent violations from 5/89 through 1/90.

IMPROVEMENTS TO FACILITIES AFFECTING WATER QUALITY

FACILITY	RECEIVING WATER	POLLUTANT	COMMENTS
Stony Brook High School STP. NJPDES 0022276	Pequannock River	Discharge of Treated Sanitary Wastewater. Total Residual Chlorine and Ammonium-Nitrogen Limitations have been violated.	The facility Completed an upgrade pursuant to an Administrative Consent Order dated July 1988. The Order was terminated in August of 1990.
Camp Vacamas STP, West Milford Twp, Passaic County. NJPDES 0030201	Pequannock River	Discharged Treated Sanitary Wastewater. Biochemical Oxygen Demand, Carbonaceous and Nitrogenous Biochemical Oxygen Demand, Ammonia - Nitrogen, Fecal Coliform, Phosphorous and Residual Chlorine Limitations have been violated.	The Facility ceased discharging in 1990 pursuant to a July 1988 Administrative Consent Order and it's amendment.
Kinnelon High School STP. NJPDES 0022284	Pequannock River	Discharge of Treated Sanitary Wastewater. Residual Chlorine, Phosphorous, and Ammonium-Nitrogen Limitations had been violated.	The facility has completed an upgrade pursuant to an Administrative Consent Order executed July 1988. The Consent Order was terminated August 27, 1990.

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 further 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 live 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 approximately 10 NJPDES permitted discharges here, about one-third are commercial/industrial, and two-thirds 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 located at Wanaque. This is just downstream of the dam at the 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 good quality with little pollution. Although the 1983 to 1987 assessment found excellent water quality with very little seasonal change in quality, the present study showed water quality to be good, not excellent, and degrading to fair quality in late fall/early winter.

With some minor exceptions, the Wanaque River at Wanaque has few water quality problems overall. Fecal coliform counts had a geometric mean of 13 MPN/100 ml during the present review period with all but two samples having counts less than 200 MPN/100 ml. Total phosphorus was similarly low, averaging 0.04 mg/l. Dissolved oxygen, as measured as concentration and percent saturation, is generally adequate for warm water fisheries throughout the year. Water quality does seem to have undergone a slight decline overall at this location and a notable downturn during the fall/early winter months. Generally lower dissolved oxygen levels with a few measurements below 4.0 mg/l coupled with an apparent increase in coliform bacterial levels account for much of the decline. The reasons for these observations is as yet undetermined.

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 supports a moderately degraded warm water fish community.

Problem 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.

Point sources affecting water quality in the Wanaque are listed on the Point Source Pollution Table. Only two facilities were reported to be discharging inadequately treated effluent. Of note is the Wanaque Valley Regional STP, discharging to the Wanaque River, which has been mentioned in previous Inventory Reports. This facility discharges excess BOD, ammonia, and suspended solids in violation of their permit limits. An unnamed industrial discharge to Belcher Creek is suspected of degrading the fishery of the creek. Two other facilities, which were reported as being formerly in noncompliance, have either upgraded their discharge, or have ceased discharging all together. 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. These sources have degraded the fishery habitat by contributing to excessive siltation and elevated stream temperatures. West Brook, for example, a unique trout production stream, is threatened by nonpoint source from such development. This stream is special in that it is one of the few streams in our state with a naturally reproducing rainbow trout population.

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 has further contributed to stream degradation.

Designated Use Assessment

The Wanaque River is swimmable as it emerges from the Wanaque Reservoir. It is not known if the river maintains good bacterial quality downstream. The Wanaque River will support the "aquatic life" use above the reservoir, but is thought to only partially support the use below the impoundment.

Monitoring Station List

Map Number	Station Name and Classification
2	Wanaque River at Wanaque, FW-2 Nontrout

See page V-283 for a map of the Wanaque Watershed.

WATER QUALITY INDEX PROFILES 1986-1990: **WANAQUE RIVER**

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVG. AND WORST 3-MONTH CONDITION
Wanaque River at Wanaque	AVG. WQI:	1	17	2	12	8	4	1	7	13 GOOD
	WORST 3 MONTHS:	JULY-SEPT	OCT.-DEC.	JAN.-MAR.	NOV.-JAN.	OCT.-DEC.	FEB.-APRIL	OCT.-DEC.	MAY-JULY	32 FAIR OCT.-DEC.

LEGEND: WATER QUALITY INDEX DESCRIPTION

Note: an index value of 20 is equivalent to the level of water quality criteria.

WQI	Condition	Description
0-10	Excellent	Pollution minimal or absent; water uses met throughout the year.
11-25	Good	Pollution generally in low amounts; water uses periodically not met.
26-60	Fair	Pollution varies from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution present in high levels; water uses not met.
81-100	Very Poor	Pollution present in extremely high levels; severe stress to streamlife; water uses not met.
ID	Insufficient Data	

POINT SOURCE POLLUTION TABLE
WATERSHED: Wanaque River

FACILITIES IN NONCOMPLIANCE

FACILITY	RECEIVING WATER	POLLUTANT	COMMENTS
Marshall High School, West Milford Twp., Passaic County. NJPDES 0033308	Belcher's Creek	Discharge of Treated Sanitary Wastewater.	The Facility upgraded pursuant to an 1988 Administrative Consent Order but continues to violate Phosphorous Limitations. An Administrative Order for Discharge Noncompliance was issued and subsequently settled for Phosphorous violations from December, 1989 through April 1991. A Notice of Civil Administrative Penalty assesment was also issued.
Wanaque Valley Regional Sewerage Authority. Wanaque Boro, Passaic County. NJPDES 0053759	Wanaque River	Discharge of Treated Domestic Wastewater. Biochemical Oxygen Demand, Suspended Solids, Ammonia-Nitrogen, And Carbonaceous and Nitrogenous Biochemical Oxygen Demand limitations have been violated.	Excessive inflow and infiltration has caused facility upsets during wet weather.

IMPROVEMENTS TO FACILITIES AFFECTING WATER QUALITY

FACILITY	RECEIVING WATER	POLLUTANT	COMMENTS
James Drive STP, Ringwood Boro, Passaic County. NJPDES 0027006	High Mountain Brook	Discharged Treated Sanitary Wastewater. Biochemical Oxygen Demand, Total Residual Chlorine and Carbonaceous and Nitrogenous Biochemical Oxygen Demand permit limitations have been violated.	The facility completed upgrading in August 1990 pursuant to a July 1988 Administrative Consent Order.
Peter Cooper School STP. Ringwood Boro, Passaic County. NJPDES 0034169	Fountain Spring Brook	Discharges Treated Sanitary Wastewater. Phosphorous, Nitrogenous Biochemical Oxygen Demand and Residual Chlorine limitations have been violated.	An Administrative Consent Order was executed July, 1988 to memorialize a compliance schedule for upgrading the facility. The facility ceased discharging in January,1991 and has been pumping and hauling it's wastewater off -site for disposal. Continued use of the facility as a holding tank may be unacceptable to the DEPE.

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/commercial/industrial. New development is extensive in many areas of the watershed. There are approximately 25 NJPDES permitted discharges present in the two watersheds - over 15 of which are municipal and the remaining are industrial. Waters have been classified FW-2 Trout Production and FW-2 Nontrout.

Water Quality Assessment

The Ramapo and Pompton Rivers each have one ambient monitoring station. The Ramapo River is sampled at Mahwah, and the Pompton River at Packanack Lake. Results of this monitoring finds that both rivers overall show good quality that borders on fair. Fair conditions occur in the Ramapo in summer, in the Pompton in late fall/early winter.

The Ramapo River is afflicted by excessive fecal coliform and nutrient concentrations. Fecal coliform bacterial records exceeded the State criterion in 69 percent of all samples, and had a geometric mean of 548 MPN/100ml. High concentrations of total phosphorus are also found. Total phosphorus averaged 0.18 mg/l from 1986 through 1990 with 76 percent of samples above the criterion of 0.1 mg/l. Total inorganic nitrogen was found to be high in 17 percent of the samples collected. Dissolved oxygen concentrations were above the criterion in all measurements. Biochemical oxygen demand appears to periodically be greater than 4.0 mg/l.

In the Pompton River, conditions are similar to those found in the Ramapo. Good quality waters from the Pequannock and Wanaque Rivers appear to be maintained in the Pompton River. As in the Ramapo, the Pompton River contains elevated bacterial and nutrient concentrations. Total phosphorus was elevated in 37 percent of the samples, and averaged 0.11 mg/l. Total inorganic nitrogen is occasionally high, averaging 1.0 mg/l. Fecal coliform bacterial samples yielded a geometric mean of 618 MPN/100ml during the period of review, with 68 percent of samples being greater than the 200 MPN/100ml criterion. This represents a substantial increase over the bacterial levels recorded during the previous assessment when the geometric mean was determined to be 143 MPN/100ml. BOD concentrations are periodically elevated. One elevated lead concentration was found in the Pompton River during the period of review. Cadmium violations, reported in the last assessment, were not observed during the present review.

Pompton Lake may still be impacted by contaminated sediments emanating from Acid Brook. The sediments of Acid Brook have been contaminated by heavy metals, principally lead and mercury, from a Dupont facility through which the Brook flows. Remediation efforts are continuing, focusing on preventing further movements of the contaminated sediments from the original sites of contamination.

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, contains 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 Assessment

Point Source Assessment

The Ramapo and Pompton Rivers have water quality problems emanating from both point and nonpoint sources. Point source pollution issues for these waters are summarized in the Point Source Pollution Tables. The Ramapo has a significant discharge to it in New York State before it flows into New Jersey. Pompton Lakes Borough MUA STP continues to be a problem and is under Department enforcement action for discharging inadequately treated wastewater into the Ramapo.

A number of municipal dischargers to the Pompton River have been either upgraded or eliminated (see the Point Source Pollution Table under "Improvements to facilities..."). Only one facility was reported to be under Department enforcement action for violating discharge permits: Laurel Homes STP in Pequannock Township.

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, combined with runoff from urban surfaces and storm sewers, have contributed significantly to pollution in the waterways. The construction of Interstate 287 has been having a significant impact upon the Ramapo. Habitat loss in this river has been expanded and intensified by local dredging and channelization. The fisheries in the Ramapo are also considered threatened by agricultural activity in the watershed.

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 that are tolerant of degraded conditions; few game fish are present and species diversity is low in many areas of the river.

Designated Use Assessment

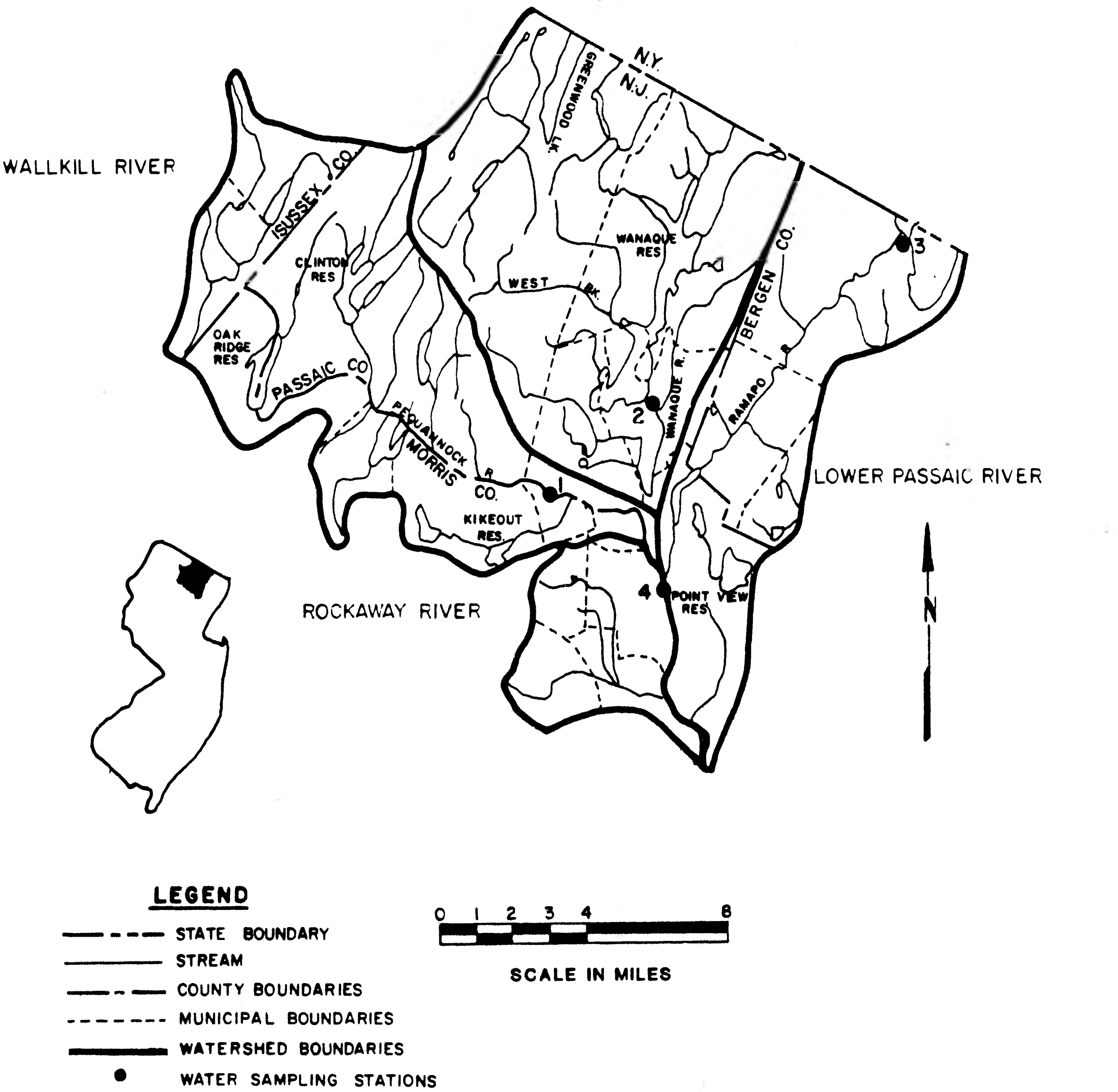
The Ramapo River will support the "aquatic life" designated use, but the waterway's fisheries are threatened by agricultural pollution. The Pompton River will partially support this designated use because of moderately degraded fisheries. Both rivers are not of swimmable quality due to elevated fecal 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



WATER QUALITY INDEX PROFILES 1986-1990: **RAMAPO AND POMPTON RIVERS**

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVG. AND WORST 3-MONTH CONDITION
Ramapo River near Mahwah	AVG. WQI:	2	10	4	29	23	9	5	5	22 GOOD
	WORST 3 MONTHS:	JUNE-AUG.	AUG.-OCT.	APRIL-JUNE	JUNE-AUG.	AUG.-OCT.	JULY-SEPT.	JULY-SEPT.	MAY-JULY	37 FAIR JUNE-AUG.
Pompton R. at Packanack Lake	AVG. WQI:	2	10	5	38	17	7	5	9	25 GOOD
	WORST 3 MONTHS:	JUNE-AUG.	SEPT.-NOV.	SEPT.-NOV.	NOV.-JAN.	JULY-SEPT.	JAN.-MAR.	JUNE-AUG.	NOV.-JAN.	34 FAIR OCT.-DEC.

LEGEND: WATER QUALITY INDEX DESCRIPTION

Note: an index value of 20 is equivalent to the level of water quality criteria.

WQI	Condition	Description
0-10	Excellent	Pollution minimal or absent; water uses met throughout the year.
11-25	Good	Pollution generally in low amounts; water uses periodically not met.
26-60	Fair	Pollution varies from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution present in high levels; water uses not met.
81-100	Very Poor	Pollution present in extremely high levels; severe stress to streamlife; water uses not met.
ID	Insufficient Data	

POINT SOURCE POLLUTION TABLE
WATERSHED: Pompton River

FACILITIES IN NONCOMPLIANCE

FACILITY	RECEIVING WATER	POLLUTANT	COMMENTS
Laurel Homes STP, Pequannock Twp. Morris County. NJPDES 0022926	Pompton River	Discharge of Treated Sanitary Wastewater. Biochemical Oxygen Demand, Carbonaceous and Nitrogenous Biochemical Oxygen Demand , Suspended Solids, Ammonia-Nitrogen, Dissolved Oxygen, Phosphorous and Residual Chlorine Limitations have been violated. Interim improvements have resolved Residual Chlorine Limitations.	The facility will soon cease discharging pursuant to a June 1988 Administrative Consent Order.

IMPROVEMENTS TO FACILITIES AFFECTING WATER QUALITY

FACILITY	RECEIVING WATER	POLLUTANT	COMMENTS
Plains Plaza Shopping Center, Pequannock Twp, Morris County. NJPDES 0026514	Pompton River	Discharges Treated Sanitary and Commercial Wastewater. Biochemical Oxygen Demand, Total Residual Chlorine and Carbonaceous and Nitrogenous Biochemical Oxygen Demands have been violated.	The facility has upgraded in connection with a September 1988 Administrative Consent Order.
GAF Corp, Wayne Twp. Passaic County. NJPDES 0028291	Preakness Brook	Discharges Treated Sanitary and Industrial Wastewater. Ammonium-Nitrogen, Biochemical Oxygen Demand and Total Suspended Solids were frequently violated.	The facility completed upgrading in August 1990 pursuant to a May, 1989 Administrative Consent Order
Sheffield Hills STP. Wayne Twp, Passaic County. NJPDES 0026841	Pompton River	The facility was permitted to discharge 1.75 mgd of Treated Sanitary Wastewater. The facilities NJPDES permit called for cessation of the discharge by July 1988. The facility ceased it's discharge in November 1990 pursuant to an April 1988 Administrative Consent Order.	Wastewater flows are now conveyed to the Mountainview STP, Wayne Twp. Passaic County.

POINT SOURCE POLLUTION TABLE
WATERSHED: Ramapo River

FACILITIES IN NON COMPLIANCE

FACILITY	RECEIVING WATER	POLLUTANT	COMMENTS
Urban Farms Shopping Center. Franklin Lakes , Bergen County NJPDES 0026441	Pond Brook	Treated Sanitary Wastewater, Biochemical Oxygen Demand,Total Suspended Solids.	Administrative Order for Discharge Non Compliance issued 1990. Facility will be connected to Passaic Valley Sewerage Commisioners.
Pompton Lakes MUA. Water Pollution Control Plant. NJPDES 0023698	Ramapo River	Discharge of approximately 0.976 mgd of Treated Wastewater. Total Residual Chlorine has exceeded Permit limits. The facility also experiences Biochemical Oxygen Demand and Fecal Coliform excursions.	Facility is upgrading pursuant to an Administrative Consent Order executed July of 1988.

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.

Land in this watershed is extensively developed and contains many older cities and industrial centers. There is little open space except in the Upper Saddle River Watershed. Of the approximately 120 NJPDES permitted discharges located in the watershed, about 100 are industrial/commercial and the remaining 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 quality conditions in the region's surface waters are reflective of numerous point sources, significant nonpoint 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 at Lodi.

Water quality in the Lower Passaic River from 1986 through 1990 varied from the better end of the fair quality range at Singac and at Little Falls to the poorer end of the fair range at Elmwood Park. The improvement in water quality at Little Falls is probably due to reaeration caused by a number of small falls in the river. Problems in the river include excessive fecal coliform, in-stream oxygen demand, and elevated nutrient concentrations. All three Passaic River monitoring stations had total phosphorus records averaging from 0.35 to 0.47 mg/l, with nearly all samples containing excessive amounts. Total inorganic nitrogen was also high, averaging around 2.2 mg/l at the three locations, with roughly half of all samples exceeding recommended levels at each station. During the previous period of review, the Singac station contained occasionally high total Kjeldahl nitrogen with 26 percent of the values being greater than 2.5 mg/l. In contrast, the present assessment showed no records exceeding this level. Un-ionized ammonia is elevated in the Passaic River at all three stations during low-flow periods.

Fecal coliform concentrations varied widely at the Lower Passaic stations. Geometric means ranged from 243 MPN/100ml at Little Falls to 2,113 MPN/100 ml at Elmwood Park. Exceedence of the 200 MPN/100ml criterion occurred in 57, 60, and 89 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. Recordings of dissolved oxygen saturation levels below 80 percent were relatively rare at all three locations. Observations of biochemical oxygen demand exceeding 4 mg/l are common in the Lower Passaic.

In the Saddle River, overall conditions are poor at both monitoring stations and very poor during the late summer/fall period. Water quality here is degraded because of extremely high nutrient and fecal coliform bacterial levels as well as from moderately elevated biochemical oxygen demand. Total phosphorus averaged 0.91 and 0.71 mg/l at Fair Lawn and Lodi, respectively, from 1986 through 1990. All samples contained total phosphorus in excess of the State criterion. Total inorganic nitrogen and total Kjeldahl nitrogen are found at very high concentrations. Total inorganic nitrogen averaged 5.3 mg/l at Fair Lawn and 4.7 mg/l at Lodi. Total Kjeldahl nitrogen had a mean of 2.4 mg/l at Fair Lawn and 1.9 mg/l at Lodi. Un-ionized ammonia appears high in the Saddle River, often exceeding the State criterion for the protection of a warm-water fishery.

Fecal coliform are also found in high amounts in the Saddle River: geometric means of 1,921 and 1,518 MPN/100 ml are recorded at Fair Lawn and Lodi, respectively. These counts are somewhat higher than those recorded during the last assessment and are significantly higher than those recorded in the early 1980's. Dissolved oxygen occasionally falls below 4.0 mg/l at Lodi, but appears sufficient at Fair Lawn.

Extensive biomonitoring was performed in 1991 on the Saddle River/Hohokus Brook watershed. The Saddle River had healthy macroinvertebrate communities in both branches at Upper Saddle River. Downstream at Saddle River, conditions show stress. Biological diversity is good; however, the community structure suggests the presence of excessive organic matter suspended in the water. Biological indicators suggest that instream dissolved oxygen is remaining at acceptable levels. Some impairment is suspected because of the channelization that has occurred on portions of the stream bank at this location. In Ridgewood, as the stream passes through areas of intense suburbanization, the macroinvertebrate communities show greater and greater degrees of impairment. Here the biological diversity has declined and is comprised of more pollutant-tolerant forms. A local pond which supports a large waterfowl population is believed to be adding significant quantities of organic nutrients into the River. Eleven percent of the individuals within the biological sample showed physical abnormalities which suggests that some toxic contamination, in the water column and/or stream sediments, may be present.

Further downstream at Fairlawn and Rochelle Park, macroinvertebrate communities show poor diversity, and pollution tolerant filter feeders and scavengers become more predominant. Dissolved oxygen seems to be well below acceptable levels. Even if chemical sampling indicates DO to be acceptable during daylight hours, the macroinvertebrate evidence suggests that night-time DO could be plummeting to unacceptable levels. Twelve percent of the sample population revealed physical abnormalities suggesting toxic contamination. This portion of the river is subjected to severe urbanization with numerous municipal and industrial discharges, and stormwater runoff. The downstream-most study site, in Garfield, maintains the continuum of impairment due to urbanization. Both sides of the River are channelized at this location. Biological diversity is low, oxygen is low, and 13 percent abnormalities again suggest toxic contamination.

Unlike the Saddle River which had healthy biological conditions in its headwaters, the Hohokus Brook system was severely impaired at all study sites. Both Ramsey Brook and Valentine Brook exhibit severe biological impairment due to suburban and urban development. Total numbers of individuals, whether pollutant tolerant or not, were very low. Biota suggest that dissolved oxygen may be very low at these locations. Fifteen percent of the individuals collected at Ramsey had physical abnormalities suggesting the possible impact of toxics contaminants at this location. The presence of toxics is also suspected in Valentine Brook at Allendale. Similar evidence of severe impairment continues at all study sites on the Hohokus Brook, which flows through an intensely urbanized region of the State. The biota collected at Franklin Lakes suggest the presence of low dissolved oxygen and large amounts of organic matter. At Allendale, dissolved oxygen appears to recover; however 47 percent of the insects collected had physical abnormalities, strongly suggesting the presence of toxic contamination either in the water column or within the sediments. Downstream at Ridgewood, evidence of impairment continues. What fauna is present is limited to only pollutant-tolerant forms, and here also some limited toxic impact is suspected.

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 severely degraded with no aquatic life evident.

Problem 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 by inputs of polluted waters from further downstream during high-tidal periods. 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 (see Point Source Pollution Table for the lower Passic River). As of 1991, 4 are having impacts on surface water quality (3 to the Passaic River and tributaries, and 1 to the Saddle River). A number of municipal treatment facilities have been eliminated or upgraded in the watershed. Included are the upgraded Verona STP and an improved Wayne Township STP. 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. One enforcement action is underway against a discharge to the Saddle River that is affecting surface water quality.

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 vegetation 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 Assessment

The waters of the Lower Passaic River and Saddle River will not support the primary contact (swimmable) designated use. The Passaic River from the Pompton River to Little Falls will not support the "aquatic life support" designated use because of degraded fisheries. The river from Little Falls to Garfield will partially support this use. The tidal Passaic River will not meet water quality criteria for the designated uses assigned to SE-2 and 3 waters. This tidal reach of the Passaic River as well as 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 consumption use. Lack of water quality data in the tidal Passaic River prevents determination of designated use attainment for fish maintenance in SE-3 waters.

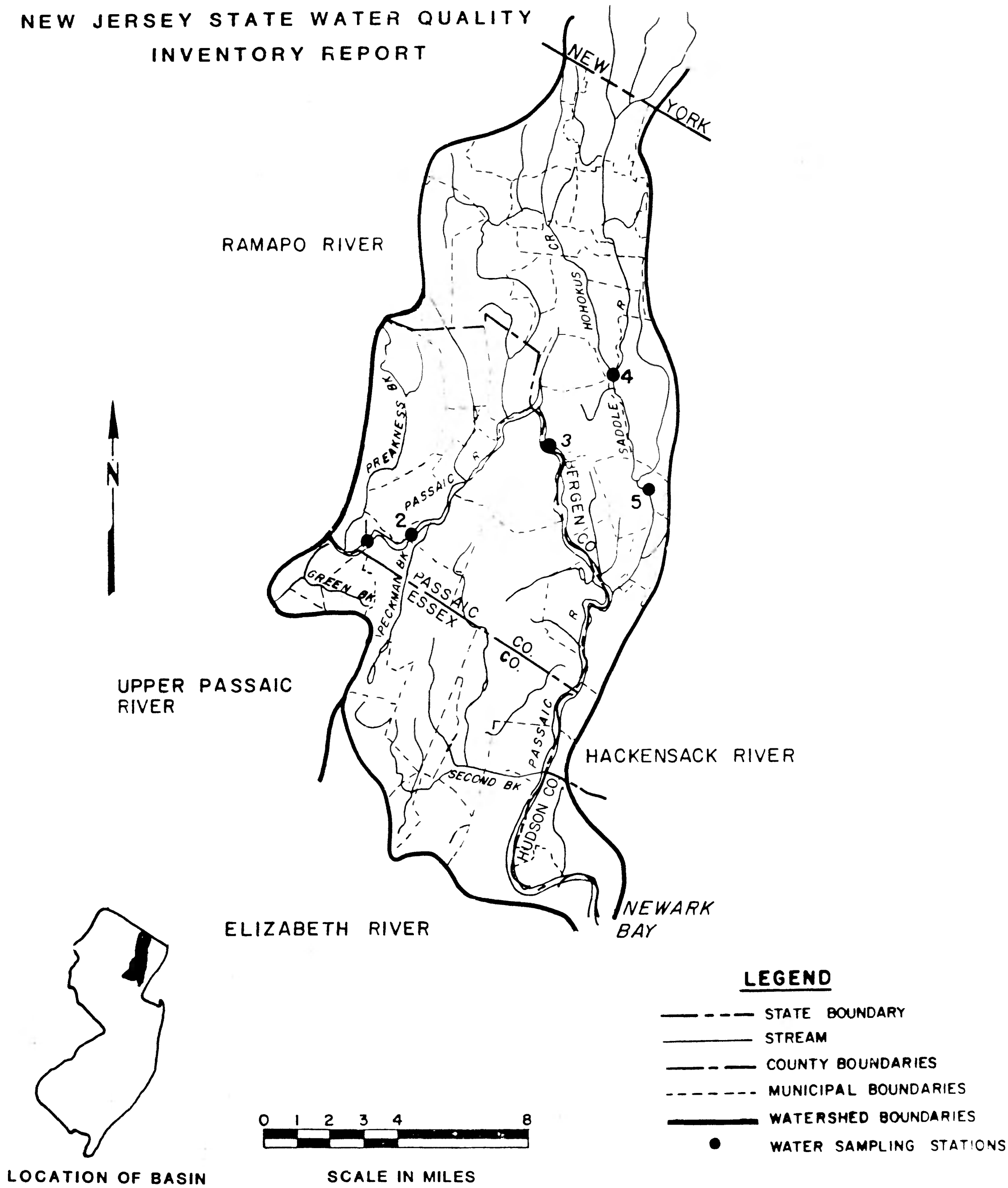
The uppermost Saddle River (3 miles) is fully supporting the "aquatic life support" use. The middle 9 miles partially supports the "aquatic life" use, and the lower 8 miles do not support the use. The 10 mile long Hohokus Brook was assessed as not supporting the "aquatic life" use, as was Ramsey Brook and Valentine Brook. Other, smaller tributaries to the Passaic River (Deepvaal Brook, Second River, and Notch Brook) have been assessed as not supporting "aquatic life" use because of degraded fisheries as assessed by the New Jersey Office of Fish, Game, and Wildlife.

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 PROFILES 1986-1990: **LOWER PASSAIC RIVER**

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVG. AND WORST 3-MONTH CONDITION
Passaic River at Little Falls	AVG. WQI:	3	6	5	28	33	9	12	7	30 FAIR
	WORST 3 MONTHS:	JUNE-AUG.	MAR.-MAY	NOV.-JAN.	JUNE-AUG.	SEPT.-NOV.	JAN.-MAR.	JUNE-AUG.	JUNE-AUG.	44 FAIR JUNE-AUG.
Passaic River at Rt. 46 in Singac	AVG. WQI:	3	8	4	36	37	10	7	18	38 FAIR
	WORST 3 MONTHS:	JUNE-AUG.	SEPT.-NOV.	MAR.-MAY	OCT.-DEC.	JULY-SEPT.	FEB.-APRIL	MAR.-MAY	OCT.-DEC.	59 FAIR SEPT.-NOV.
Passaic River at Elmwood Park	AVG. WQI:	3	12	7	58	37	11	9	15	54 FAIR
	WORST 3 MONTHS:	JUNE-AUG.	APRIL-JUNE	MAR.-MAY	OCT.-DEC.	SEPT.-NOV.	FEB.-APRIL	APRIL-JUNE	OCT.-DEC.	65 POOR SEPT.-NOV.

LEGEND: WATER QUALITY INDEX DESCRIPTION Note: an index value of 20 is equivalent to the level of water quality criteria.

WQI	Condition	Description
0-10	Excellent	Pollution minimal or absent; water uses met throughout the year.
11-25	Good	Pollution generally in low amounts; water uses periodically not met.
26-60	Fair	Pollution varies from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution present in high levels; water uses not met.
81-100	Very Poor	Pollution present in extremely high levels; severe stress to streamlife; water uses not met.
ID	Insufficient Data	

WATER QUALITY INDEX PROFILES 1986-1990: **LOWER PASSAIC RIVER continued**

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVG. AND WORST 3-MONTH CONDITION
Saddle River at Fair Lawn	AVG. WQI:	2	14	4	51	62	15	21	5	66 POOR
	WORST 3 MONTHS:	JUNE-AUG.	AUG.-OCT.	MAR.-MAY	AUG.-OCT.	AUG.-OCT.	JAN.-MAR.	OCT.-DEC.	SEPT.-NOV.	83 V. POOR AUG.-OCT.
Saddle River at Lodi	AVG. WQI:	2	26	4	48	55	14	20	ID	68 POOR
	WORST 3 MONTHS:	JUNE-AUG.	JUNE-AUG.	OCT.-DEC.	JULY-SEPT.	JULY-SEPT.	JAN.-MAR.	JAN.-MAR.		90 V. POOR JULY-SEPT.

LEGEND: WATER QUALITY INDEX DESCRIPTION

Note: an index value of 20 is equivalent to the level of water quality criteria.

WQI	Condition	Description
0-10	Excellent	Pollution minimal or absent; water uses met throughout the year.
11-25	Good	Pollution generally in low amounts; water uses periodically not met.
26-60	Fair	Pollution varies from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution present in high levels; water uses not met.
81-100	Very Poor	Pollution present in extremely high levels; severe stress to streamlife; water uses not met.
ID	Insufficient Data	

POINT SOURCE POLLUTION TABLE
WATERSHED: Lower Passaic River

FACILITIES IN NONCOMPLIANCE

FACILITY	RECEIVING WATER	POLLUTANT	COMMENTS
N. Jersey Developmental Center. Totowa Borough, Passaic County. NJPDES 0021261	A tributary of the Passaic River.	Discharge of Treated Sanitary Wastewater.	The facilities NJPDES permit called for the cessation of the discharge by July 1, 1988. An Administrative Consent Order was executed in June of 1991 which instituted a compliance schedule for the cessation of discharge. Final discharge is to be achieved by Dec. 1, 1993.
Robert Erskine School. Ringwood Boro , Passaic County. NJPDES 0029432	Erskine Brook	Discharge of Treated Sanitary Wastewater. Biochemical Oxygen Demand, Carbonaceous and Nitrogenous Biochemical Oxygen Demand, Ammonia -Nitrogen, Dissolved Oxygen, Phosphorous and Residual Chlorine Limitations have been violated.	An upgrade was completed in November 1991 pursuant to a 1988 Administrative Consent Order. However further improvements may be needed for permit compliance.
Willowbrook Car Wash, Passaic County. Wayne Twp. NJPDES 0034053	Passaic River	Discharge of Treated Process Wastewater.	An Administrative Order for Discharge Noncompliance was issued May 31, 1991 for Biochemical Oxygen Demand and Total Suspended Solids violations from February 1989 through January 1991.
Farmland Dairies NJPDES 0033511	Saddle River	Stormwater Runoff, Filter Backwash, Chemical Oxygen Demand, Total Suspended Solids.	Administrative Order for Discharge Noncompliance issued in 1990. Facility continues to violate limits.

IMPROVEMENTS TO FACILITIES AFFECTING WATER QUALITY

FACILITY	RECEIVING WATER	POLLUTANT	COMMENTS
Verona STP NJPDES 0024490	Peckman River	None to report	Facility completed an upgrade to level 4 treatment and is in compliance with permit limitations.
Mountain View STP., Wayne Twp. Passaic County. NJPDES 0028002	Singac Brook	Discharger of treated sanitary and industrial. wastewater. The facility has been in violation of it's Total Residual Chlorine permit limitations	An Administrative Order and Notice of Civil Administrative Penalty Assesment was issued on June 14, 1990 for permit violations dating back to June 1988. Dechlorination equipment was subsequently installed in October 1990.
Contract Packaging, Totowa Boro, Passaic County. NJPDES 0052884	Tributary of the Passaic River.	Discharging of Liquid Wastes from a trash compactor and Spilled Materials into receiving water via the storm sewer system.	None to report.

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 in this watershed is undeveloped, with more than 30 percent being residential. The remainder is commercial/industrial. Of the approximately 80 NJPDES permitted discharges here, about 10 are municipal and the remaining are industrial/commercial. 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 at River Vale, and fair quality at New Milford.

Elevated fecal coliform and moderately elevated total phosphorus concentrations are present in the Hackensack River at River Vale. Fecal coliform bacterial samples had a geometric mean of 238 MPN/100ml from 1986 through 1990, with 55 percent of the values above the State criterion. Total phosphorus averaged 0.07 mg/l during the period of review. Sixty-six percent of the phosphorus readings were greater than the 0.05 mg/l criterion for the prevention of eutrophication in impoundments. Dissolved oxygen concentrations are adequate throughout the year, although saturation often falls below 80 percent. One-third of biochemical oxygen demand recordings were over 4.0 mg/l. Conditions in the Hackensack at River Vale worsen significantly during the late summer months. Biological monitoring of macroinvertebrate communities in the mid-1980's strongly reflected nutrient enrichment at this station.

Monitoring of the Hackensack River at New Milford reflects the condition of the Oradell Reservoir discharge more than it does true stream conditions. This is because pollutant concentrations tend to be reduced as a result of the settling action of the reservoir; hence the Hackensack River is characterized as being the better part of fair quality at this location. Fecal coliform bacterial records are low and total phosphorus levels are moderately elevated, both indicators occurring at problematic levels in 31 and 50 percent respectively of the samples collected. Dissolved oxygen concentrations were above 4.0 mg/l in all samples collected during the assessment period. Elevated mercury, lead, and chromium concentrations have been found in the Hackensack River during the period of review. This is in contrast to the previous assessment when only mercury was found to be in violation of water quality criteria.

The Hackensack River from below the Oradell Reservoir to the confluence with Newark Bay is regarded by the Department as an impaired waterway due to toxic discharges emanating from point sources. The contaminants of concern are arsenic, mercury, lead, zinc, and nickel. The criteria violated are USEPA's Federal Aquatic Life chronic criteria and USEPA's Federal human health criteria for exposure to carcinogens.

The Hackensack Meadowlands Development Commission has conducted annual summer monitoring of the tidal Hackensack River and tributaries since 1971. Results have shown 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 bacteria. Water quality data show notable differences between monitoring sites, indicating that impacts do occur locally.

Fishery assessments 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 support moderately degraded fish communities. The Cresskill contains cold water fish species while the Overpeck supports warm water forms.

Problem Assessment

Point Source Assessment

A large number of industrial and municipal wastewater discharges are present in the lower Hackensack River watershed (see Point Source Pollution Table). Five dischargers in the watershed, which are under enforcement action as of 1992, are having deleterious impacts on stream water quality. Problems range from raw sewage bypasses to illegal discharges and failures to meet permit limitations.

Seven hazardous waste or Superfund sites which are known or suspected to be contaminating local surface waters are found in the Hackensack watershed. In addition, extensive mercury contamination of Berry's Creek has occurred. Certain fish from the Lower Hackensack River have been identified to contain high PCB and chlordane concentrations. As a result, the sale and consumption of striped bass and blue crabs is prohibited. Thermal discharges in this area also impact water quality in the tidal Hackensack by reducing the water's ability to hold dissolved oxygen.

Nonpoint Source Assessment

Water quality in the Hackensack River above the Oradell Reservoir appears to primarily be affected by nonpoint sources. Oradell Reservoir is highly eutrophic and the Hackensack Water Company occasionally treats it in order to kill aquatic weed growth. Nonpoint sources within the overall watershed include extensive urban/suburban development and 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, 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 portions of the river due to riparian vegetation removal and flow regulation efforts. There are also severe impacts from chemical spills, landfills, hazardous waste disposal sites, and in-place contaminants.

Designated Use Assessment

The Upper Hackensack River (above the Oradell Reservoir) will support the "aquatic life" designated use, but will not support the swimmable (primary contact) use. In the tidal Hackensack, both the "aquatic life" use and the primary contact use cannot be met. Based on the Hackensack Meadowlands Development Commission's sampling of the tidal Hackensack and tributaries, this region is not 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

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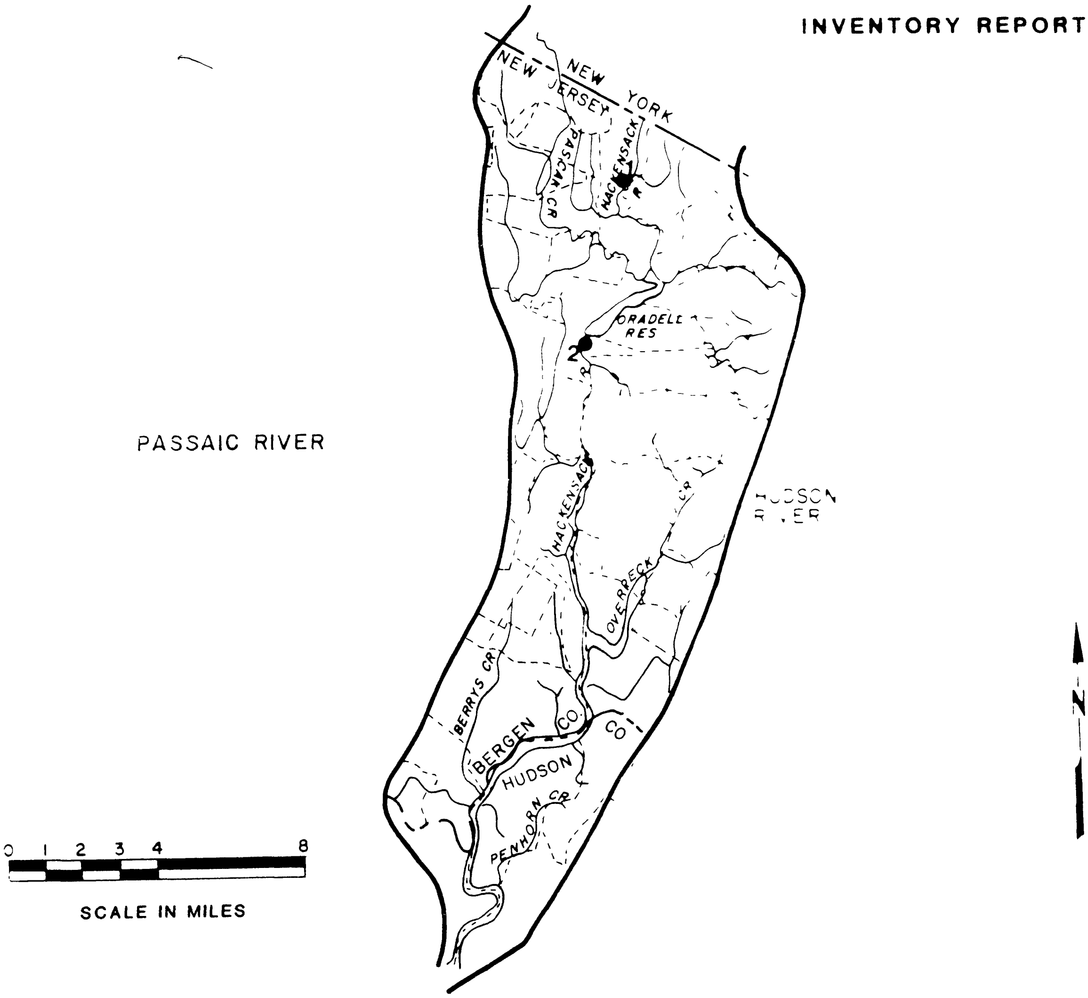

LEGEND

- STATE BOUNDARY
- STREAM
- COUNTY BOUNDARIES
- MUNICIPAL BOUNDARIES
- WATERSHED BOUNDARIES
- WATER SAMPLING STATIONS

LOCATION OF BASIN

WATER QUALITY INDEX PROFILES 1986-1990: **HACKENSACK RIVER**

STATION		TEMP	OXYGEN	PH	BACTERIA	NUTRIENTS	SOLIDS	AMMONIA	METALS	OVERALL AVG. AND WORST 3-MONTH CONDITION
Hackensack River at River Vale	AVG. WQI:	2	15	4	23	24	10	5	10	21 GOOD
	WORST 3 MONTHS:	JUNE-AUG.	JUNE-AUG.	SEPT.-NOV.	OCT.-DEC.	JULY-SEPT.	FEB.-APRIL	JULY-SEPT.	APRIL-JUNE	37 FAIR JUNE-AUG.
Hackensack River at New Milford	AVG. WQI:	3	16	6	16	21	10	3	35	30 FAIR
	WORST 3 MONTHS:	JUNE-AUG.	OCT.-DEC.	SEPT.-NOV.	OCT.-DEC.	AUG.-OCT.	FEB.-APRIL	MAY-JULY	OCT.-DEC.	53 FAIR OCT.-DEC.

LEGEND: WATER QUALITY INDEX DESCRIPTION

Note: an index value of 20 is equivalent to the level of water quality criteria.

WQI	Condition	Description
0-10	Excellent	Pollution minimal or absent; water uses met throughout the year.
11-25	Good	Pollution generally in low amounts; water uses periodically not met.
26-60	Fair	Pollution varies from moderate to high levels; certain water uses prohibited.
61-80	Poor	Pollution present in high levels; water uses not met.
81-100	Very Poor	Pollution present in extremely high levels; severe stress to streamlife; water uses not met.
ID	Insufficient Data	

POINT SOURCE POLLUTION TABLE
WATERSHED: Hackensack River

FACILITIES IN NONCOMPLIANCE

FACILITY	RECEIVING WATER	POLLUTANT	COMMENTS
Bergen County UA NJPDES 20028	Hackensack River	Untreated Sanitary Wastewater, Fecal Coliform, Biochemical Oxygen Demand.	Facility discharges from unpermitted sanitary overflows.
Consolidated Bleach NJPDES 56014	Bellman's Creek	Untreated Sanitary Wastewater, Fecal Coliform, Biochemical Oxygen Demand.	An Administrative order for discharge non-compliance was issued 1/30/91. The facility continues to discharge.
North Bergen Regulators NJPDES 34339 (W)	Penhorn Creek	Untreated Sanitary Wastewater, Fecal Coliform, Biochemical Oxygen Demand.	An Administrative Consent Order was executed 6/91 addressing the continuous discharges.
NJ Transit-Meadows NJPDES 31992	Hackensack River	Stormwater Runoff, Total Suspended Solids, Chemical Oxygen Demand.	An Administrative Consent Order was issued 6/91 to upgrade the facility to meet it's permit limitations.
North Bergen Regulators	Cromakill Creek	Untreated Sanitary Wastewater, Fecal Coliform, Biochemical Oxygen Demand.	An Administrative Consent Order was executed 6/91 addressing the continuous discharges.

IMPROVEMENTS TO FACILITIES AFFECTING WATER QUALITY

FACILITY	RECEIVING WATER	COMMENTS
American Commercial NJPDES 0028584	Tributary of the Hackensack River.	Facility connected to Secaucus MUA and ceased it's discharge to a tributary of the Hackensack River.
City of Hackensack NJPDES 0030805	Hackensack River	Administrative Consent Order executed June 1990. Upgrading of regulators nearing completion
Secaucus MUA NJPDES 0025038	Mill Creek	Facility completed upgrade to level 3 treatment.

38. SHELLFISH RESOURCES AND HARVEST AREA CLASSIFICATIONS, 1990 - 1992, AND RELATED ESTAURINE 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), within the Department, 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 nonpoint 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 1990 12,313 clamming licenses (hard and soft clams) were issued of which 1,958 were commercial. Also, the Bureau issued 92 oyster tonger licenses during 1990, up from only 39 in 1988.

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. Aquaculture programs are currently enhancing the numbers of this species being marketed.

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 and 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 resulting from of an over 5,000 acre upgrade was recorded. During 1981 an additional net gain of approximately 2,500 acres 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 notable 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. In 1989 approximately 14,946 acres were upgraded, resulting in a net gain. Most of this (13,000 acres) was the result of an upgrade of portions of Raritan Bay from Seasonal Special Restricted to Special Restricted. Of the remaining estuarine and ocean areas, only 240 acres received down graded classifications.

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 7:12-4.1: seasonal areas Approved November 1 through April 30, Condemned May 1 through October 31; and 4.2: 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 and Energy 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 and Energy.

5) Prohibited - Waters where the harvesting of shellfish is prohibited for any purpose except depletion and the bait harvesting of sea clams under special permit. Prohibited shellfish growing areas are closed for the harvesting of shellfish at all times.

6) Condemned - Water not meeting the established sanitary standards as recommended by the National Shellfish Sanitation Program of the Interstate Shellfish Sanitation Conference as administrated by 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 and Energy. Condemned areas are further divided into the following subclassifications: Prohibited, Special Restricted, Seasonal Special Restricted, and Seasonal.

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 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 and Energy presently operates a program which allows the relaying of 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 is analyzed for bacterial quality prior to being released for reharvesting and marketing. An additional benefit of the program is that by reducing the quantity of the shellfish resource contained within condemned/restricted waters, illegal clamming operations are discouraged, thus contributing to the protection of consumer health.

The Relay Program was initially begun during the early 1970's in the vicinity of Atlantic City. This area included Lakes Bay, Absecon Bay and Scull Bay plus the vast complex of interwinding waterways. The program was 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 specially designated beds in Barnegat Bay, Little Egg Harbor, and occasionally to Great 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 specified 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 also used and to a less frequent extent the Manasquan and Shark Rivers also. In 1991 and 1992 approximately 25 percent of the total landing of hard clams for New Jersey were from the relay.

Depuration Program

New Jersey's depuration program, like the relay program, relies on the natural ability of shellfish to purge themselves of bacterial contamination when placed in a clean environment. The program, under provision of a special permit issued by the Bureau of Marine Water Classification and Analysis (BMWC&A), allows the harvesting of hard and soft shelled clams from areas classified as Special Restricted and requires the clams to be subjected to 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 sanitary water quality. Following the depuration process, laboratory analyses are performed to verify that the shellfish meet appropriate standards. The depurated shellfish are then released for marketing. Specially marked 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, shellfish are transported 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. The depuration plant itself is licensed by the N.J. Department of Health and is monitored by video camera.

Currently the State of New Jersey has one licensed plant for the depuration of hard clams. New Jersey's one depuration plant, located in Highlands in Monmouth County, has had its operations suspended by the New Jersey Department of Health (DOH) in 1988 in response to numerous regulatory infractions. In addition, both the DEP&E and DOH imposed a moratorium on the establishment of any further clam depuration operations until new regulations governing the program could be revised and additional enforcement personnel made available.

New revised DEP&E and DOH regulations, which encompass <u>both</u> hard and soft clam depuration, became effective in November 1991. In February the BMWC&A received from the DOH a set of proposed plans for the depuration plant to be located in Highlands. A response document which included input from both DEP&E and DOH was sent on

May 1991 but as of August 1991; no comments as yet have been received.

Status of New Jersey's Shellfish Growing Waters

For the purpose of this Report, 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.

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. Seventy-five percent of the available acreage is classified Special Restricted. Based on earlier data collected during the period of disinfection and non-disinfection a new classification (Seasonal Special Restricted) was developed that allowed the harvest of shellfish for depuration during certain periods of the year. Now that wastewater treatment plant effluent discharge to this basin is disinfected on a year round basis, those areas previously classified as Seasonal Special Restricted have been upgraded effective July 1989 to Special Restricted.

Reclassifications in the Raritan River Basin since 1988 include:

July 1989
Raritan Bay: 13,000 acres, Seasonal Special Restricted to Special Restricted. Expanded dates available for relay and depuration.

Raritan River Basin - Nonpoint Source Assessment

This region has been severely impacted principally from nonpoint 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, and roads. It is this urban surface run-off which is suspected of being one of the more 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 Department's BMWC&A.

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 1989 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 (1989) of the total available acreage Condemned, and 10-15 percent (1989) classified as Seasonally Approved. Under the Shellfish Relay Program, clams are removed from certain Condemned and Special Restricted waters of the Raritan River Basin as well as 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 1988 include:

May 1988
Little Egg Harbor: 15 acres Approved to Special Restricted

July 1988
Little Egg Harbor (Tuckerton Cove): 112 acres, Seasonal to Approved

August 1990
Manasquan River: 424 acres, Special Restricted to Prohibited

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 nonpoint 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 occurring within the watersheds. Agricultural sources of pollution include run-off from crop production, pasture lands, feedlots and animal holding areas.

Throughout Barnegat Bay waterfowl and other wildlife, as well as urban/suburban 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 within the Department; 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 designated 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 1988 include:

July 1989
Reed Bay: 10 acres, Seasonal to Special Restricted

Shelter Island Bay: 57 acres Special Restricted to Seasonal

Great Egg Harbor Bay: 706 acres Seasonal to Approved

Ludlam Bay: 285 acres Special Restricted to Approved

Townsend Sound and Mill Thorofare: 243 acres Seasonal to Approved

Great Channel: 248 acres Special Restricted to Seasonal

August 1990
Absecon Bay: 140 acres Seasonal to Approved

Ship Channel: 107 acres Approved to Seasonal

Ludlam Bay: 74 acres Approved to Special Restricted

Ludlam Thorofare: 38 acres Prohibited to Approved

Ware Thoro-Mill Creek: 51 acres Prohibited to Approved

Great Sound Area: 281 acres Seasonal to Approved

Great Channel: 437 acres Prohibited to Seasonal

Jenkins Sound Area: 1034 acres Prohibited to Seasonal

Grassy Sound/Richardson Sound: 1724 acres Prohibited to Seasonal

Maurice River Cove: 389 acres Approved to Seasonal

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/suburban sources such as construction activities, surface run-off. Additional bacterial inputs 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 tributaries.

Designated Use And Goal Assessment

Based upon criteria established by the Department's BMWC&A; 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 Condemned or Seasonally approved in 1989. That is still the case today.

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 seed oysters.

Delaware River Basin - Nonpoint Source Assessment Pollution, Source Assessment

The Delaware River Basin, because of its vast size, is subject to numerous natural and anthropogenic sources of pollution, their sources being both on and offshore. Significant land based point sources are wastewater treatment plants with effluent discharges to the bay's tributaries. Nonpoint sources of pollution include urban, suburban, and rural runoff, sanitary landfills, agriculture, wildlife, and marinas. Offshore sources of pollution to Delaware Bay include the many commercial ships plying the shipping lanes of the estuary. Pollutants associated with this industry include everything from sanitary discharges to accidental toxic chemical spills. With regard to shellfish harvesting, Delaware Bay over the past 11 years has experienced some localized water quality degradation as reflected in various downgrading classifications.

Designated Use And Goal Assessment

Based upon criteria established by the NJDEPE; 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 1988 are as follows:

May 1988
Atlantic Ocean (Ocean County - Dover Township Area): Prohibited to Approved 1045 acres

Atlantic Ocean (Absecon Inlet Area): Prohibited to Approved 590 acres

Atlantic Ocean (Wildwood Area): Approved to Prohibited 2795 acres

July 1989

Atlantic Ocean (Cape May Area): Prohibited to Approved 295 acres, Approved to Prohibited 230 acres

August 1990
Atlantic Ocean (Hereford Inlet area): Prohibited to Approved
2,760 acres

Summary of Shellfish Waters and Resources

It is important to be aware, when examining the historical records pertaining to shellfish landings in New Jersey, that 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 are not evaluated but nevertheless affect these statistics are: 1) catches from non-state harvest areas that are included in these figures; 2) out-of-state fishermen who use New Jersey's harvest areas and then take their catches to other states for processing; and 3) shellfish harvested by sports fishermen. When considering these three factors, one can readily see the difficulty involved when attempting to assess past and future harvest trends. Based upon what information the state has, the overall trend appears to have been an increase in total pounds harvested over time.

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 commercial, residential and industrial facilities in coastal communities. The major concern regarding this construction is the cumulative effects of coastal development and the 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.

39. WATER QUALITY IN INTERSTATE WATERS; DELAWARE RIVER, NEW YORK/NEW JERSEY INTERSTATE WATERS

A. DELAWARE RIVER AND BAY WATER QUALITY ASSESSMENT 1990 - 1991 305(b) REPORT

DELAWARE RIVER BASIN COMMISSION
WEST TRENTON, NEW JERSEY
MARCH 1992

EXECUTIVE SUMMARY

Delaware River and Bay Water Quality Assessment
1990-91 305(b) Report

The Delaware River is one of the smallest U.S. rivers, draining 0.4 percent of the U.S. land area. It is, however, one of the most intensely used rivers providing almost 10 percent of the nation's population with potable and industrial water supply.

The Delaware River and Bay comprise part of the boundary of four states: Delaware, New Jersey, New York and Pennsylvania. The non-tidal portion of the main stem from Hancock, New York to Trenton, New Jersey is 197 miles long and is one of the nation's premier free-flowing recreational rivers. Fifty-six 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 and Bay also support significant recreational use. Use of the estuary is rising dramatically as ~~the~~ result of pollution abatement successes.

The Delaware Estuary from Trenton, New Jersey to Liston Point, Delaware is 85 miles long and 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 1990-91, 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 shellfish. Recreation and navigation are important as well. Located along the bay are major state and federal wildlife refuges.

Summary of Conditions

The water quality of the Delaware River, the Delaware Bay and the lower nine mile portion of the West Branch Delaware River was assessed for the degree to which the goals outlined in Section 101 of the Clean Water Act have been met for the 1990-91 period. The assessments were made following U.S. Environmental Protection Agency *Guidelines for the Preparation of the 1992 State Water Quality Assessments (305(b) Reports)*, August 1991. The assessments were made based on biological, evaluative, chemical, pathogenic and other indicators for the water use designations defined by the U.S. EPA. The use designations and status on how the waters support the uses differ from previous Water Quality Assessments. This reflects EPA's efforts toward improving the consistency and usefulness of reported information from the States, Territories and interstate Commissions which is summarized in the National Water Quality Inventory Report to Congress.

The assessments of water quality are presented in Tables 1, 2 and 3 for the Delaware River, Estuary and Bay, respectively. Note that the free-flowing portion of the river is presented in river miles, while the tidal portions are expressed in square miles. In terms of "Overall Use," the Delaware River and Bay are considered threatened because of the potential of spills and other non-point sources impacting water quality. Where "Fish Consumption Advisories" have been issued by any of the signatory parties, the affected waters are noted as "Not Supporting." In the case of the Delaware Bay, a major portion has been identified as "Not Assessed." There is a paucity of routine monitoring data for much of the Bay.

The assessment information has also been entered into the U.S. EPA's Waterbody System, a computerized database. The Waterbody System is a compendium for all the waters of the United States and Territories. Summary reports generated by the Waterbody System for each zone of the Delaware River are included in Appendix A.

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.

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 have been completed. The 1988-89 305(b) report presented the data findings obtained from the use attainability study as well as special studies such as the seasonal disinfection study, the Delaware Estuary Toxics Management Program and the Commission/National Park Service Scenic Rivers Water Quality Monitoring Program.

Table 1
Individual Use Support Summary
Type of Waterbody: Delaware River
(includes 9 miles of the West Branch Delaware River)

USE	SUPPORTING	SUPPORTING BUT THREATENED	PARTIALLY SUPPORTING	NOT SUPPORTING	NOT ATTAINABLE	NOT ASSESSED
Overall Use		206.3 mi				
Fish Consumption	200.7 mi			5.6* mi		
Shellfishing						
Aquatic Life	206.3 mi					
Swimmimg	206 3 mi					
Secondary Contact						
Drinking Water	206.3 mi					

* A fish consumption advisory has been issued on the taking of White Suckers for an undefined portion of the river near the Delaware Water Gap because of chlordane levels. This has not been included in the total for "Not Supporting." The reach "Not Supporting" extends from Yardley, PA. to the head of tide at Trenton, N.J. A fish consumption advisory has been issued for this reach on the taking the American eel, channel catfish and white perch because of chlordane and PCB levels in fish tissue.

Table 2

Individual Use Support Summary
Type of Waterbody: Delaware Estuary

USE	SUPPORTING	SUPPORTING BUT THREATENED	PARTIALLY SUPPORTING	NOT SUPPORTING	NOT ATTAINABLE	NOT ASSESSED
Overall Use		84 mi^2				
Fish Consumption	59 mi^2			25 mi^2		
Shellfishing						
Aquatic Life		59 mi^2	25 mi^2			
Swimmimg	73 mi^2					
Secondary Contact	11 mi^2					
Drinking Water[1]	14 mi^2					

Fish consumption advisories have been issued for those waters listed as "Not Supporting." The advisories extend from the head of tide to the Delaware/Pennsylvania boundary on the taking of the American eel, channel catfish and white perch because of chlordane and PCB levels in fish tissue.

[1] Only the portion of the Delaware Estuary extending from the head of tide to the mouth of the Big Timber Creek has been designated for public water supply use

Table 2

Individual Use Support Summary
Type of Waterbody: Delaware Estuary

USE	SUPPORTING	SUPPORTING BUT THREATENED	PARTIALLY SUPPORTING	NOT SUPPORTING	NOT ATTAINABLE	NOT ASSESSED
Overall Use		84 mi^2				
Fish Consumption	59 mi^2			25 mi^2		
Shellfishing						
Aquatic Life		59 mi^2	25 mi^2			
Swimmimg	73 mi^2					
Secondary Contact	11 mi^2					
Drinking Water[1]	14 mi^2					

Fish consumption advisories have been issued for those waters listed as "Not Supporting." The advisories extend from the head of tide to the Delaware/Pennsylvania boundary on the taking of the American eel, channel catfish and white perch because of chlordane and PCB levels in fish tissue.

[1] Only the portion of the Delaware Estuary extending from the head of tide to the mouth of the Big Timber Creek has been designated for public water supply use

Table 3

Individual Use Support Summary
Type of Waterbody: Delaware Bay

USE	SUPPORTING	SUPPORTING BUT THREATENED	PARTIALLY SUPPORTING	NOT SUPPORTING	NOT ATTAINABLE	NOT ASSESSED
Overall Use		132 mi^2				≈650 mi^2
Fish Consumption	132 mi^2					≈650 mi^2
Shellfishing				42 mi^2		≈740 mi^2
Aquatic Life	132 mi^2					≈650 mi^2
Swimmimg	132 mi^2					≈650 mi^2
Secondary Contact						
Drinking Water[1]						

The waters "Not Supporting" represent areas for which advisories have been issued prohibiting either year round or seasonal taking of shellfish.

[1] Not applicable for these waters

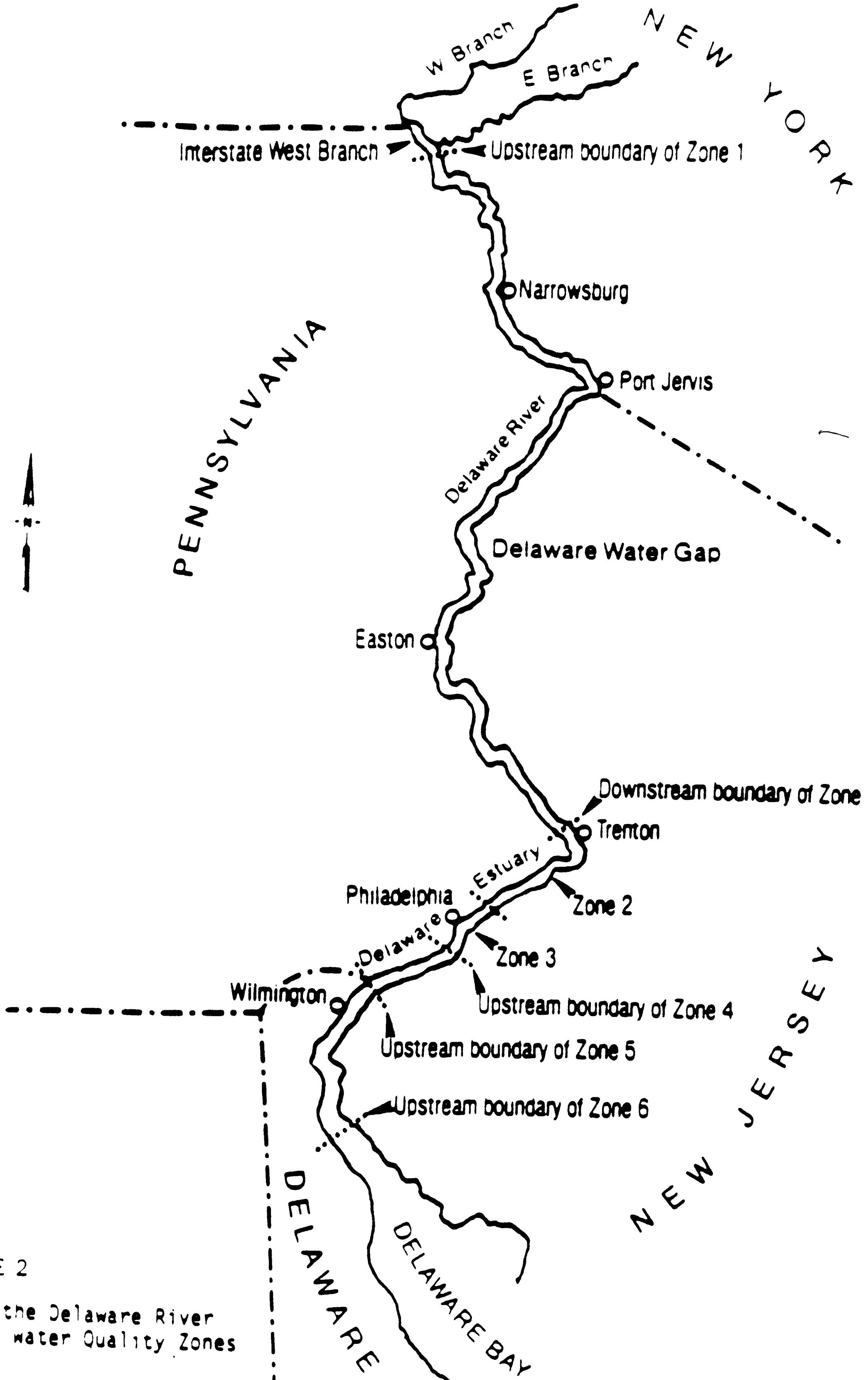

FIGURE 2

Map of the Delaware River Showing Water Quality Zones

POINT SOURCE POLLUTION TABLE
WATERSHED: Delaware River Tributaries

FACILITIES IN NONCOMPLIANCE

FACILITY	RECEIVING WATER	POLLUTANT	COMMENTS
Lester D. Wilson School STP. NJPDES 0027553	Nishisakawich Creek	Discharge of Treated Sanitary Wastewater. The facility continues to violate Biochemical Oxygen Demand and Ammonium-Nitrogen permit limitations.	The facility is upgrading pursuant to an Administrative Consent Order issued June 1991.
Trap Rock Industries, Delaware Twp., Hunterdon County. NJPDES 0032271	Delaware and Raritan Canal.	Discharge of Stormwater Runoff containing High Suspended Solids.	An Administrative Order for Discharge Noncompliance was issued March 29, 1991. A hearing has been requested. Some improvements have been implemented.
Johnstone Training Center. NJPDES N/A	Delaware River	Municipal Discharger exceeding Biochemical Oxygen Demand and Total Suspended Solids.	None to report.
Mercer County Correctional Facility. NJPDES N/A	Moores Creek	Municipal Discharger exceeding Biochemical Oxygen Demand and Total Suspended Solids.	None to report.

POINT SOURCE POLLUTION TABLE
WATERSHED: Delaware River Tributaries (continued)

IMPROVEMENTS TO FACILITIES AFFECTING WATER QUALITY

FACILITY	RECEIVING WATER	POLLUTANT	COMMENTS
James River Corp. Milford Mill Facility. Milford Boro, Hunterdon County. NJPDES 0004456	Delaware River	Discharge of Treated Process Wastewater. Biochemical Oxygen Demand Limitations were frequently violated. The facility completed an upgrade pursuant to an Administrative Consent Order executed April 1989. The Consent Order was terminated May 10, 1991.	The facility has recently been bypassing secondary treatment to avoid overflows from the primary clarifier during heavy rain when stormwater overloads this unit. The facility has proposed remedial measures slated to be put in by December 1991.
Frenchtown STP, Hunterdon County. NJPDES 0029831	Delaware River	Biochemical Oxygen Demand and Total Suspended Solids limitations were frequently violated.	The facility completed an upgrade pursuant to an Administrative Consent Order dated June 1988.
Carney's Point Twp. STP. NJPDES 0021601	Delaware River	Sanitary Wastewater	Completed a facility upgrade pursuant to an Administrative Consent Order.
Penns Grove STP NJPDES 0024023	Delaware River	Sanitary Wastewater	Completed a facility upgrade pursuant to an Administrative Consent Order.
Pennsville STP NJPDES 0021598	Delaware River	Sanitary Wastewater	Completed an upgrade pursuant to an Administrative Consent Order.
East Greenwich STP NJPDES N/A	Tributary of the Delaware	Sanitary Wastewater	Facility has closed and is now sending it's effluent to the Gloucester County MUA.

POINT SOURCE POLLUTION TABLE
WATERSHED: Delaware River Tributaries (continued)

IMPROVEMENTS TO FACILITIES AFFECTING WATER QUALITY

FACILITY	RECEIVING WATER	POLLUTANT	COMMENTS
Palmyra STP NJPDES N/A	Delaware River	Facility now complies with the federally mandated secondary treatment or has eliminated sub standard discharges	None to report.
Riverton STP NJPDES N/A	Delaware River	Facility now complies with the federally mandated secondary treatment or has eliminated sub standard discharges	None to report.
Baldwin Run STP NJPDES 0024481	Delaware River	Sanitary Wastewater	Due to reagionalization in Camden County, this facility has ceased discharging and it's effluent is now being treated at the Camden County MUA Delaware No. 1 facility in Camden City. The effluent is then discharged into the Delaware River.
Oaklyn STP NJPDES 0025003	Delaware River	Sanitary Wastewater	Due to reagionalization in Camden County, this facility has ceased discharging and it's effluent is now being treated at the Camden County MUA Delaware No. 1 facility in Camden City. The effluent is then discharged into the Delaware River.
Pennsauken STP NJPDES 0025348	Delaware River	Sanitary Wastewater	Due to reagionalization in Camden County, this facility has ceased discharging and it's effluent is now being treated at the Camden County MUA Delaware No. 1 facility in Camden City. The effluent is then discharged into the Delaware River.

B. INTERSTATE SANITATION COMMISSION WATER QUALITY STATUS REPORT 1990 - 1991 305(b)

APRIL 1992

PREPARED BY THE
INTERSTATE SANITATION COMMISSION
311 WEST 43rd STREET
NEW YORK, N.Y. 10036

INTERSTATE SANITATION COMMISSION

A TRI-STATE ENVIRONMENTAL AGENCY

B.

STATUS REPORT

ON THE

INTERSTATE SANITATION DISTRICT WATERS

Prepared by the

Interstate Sanitation Commission
for the
State of New Jersey 305(b) Report
to the
U.S. Environmental Protection Agency

April 1992

311 WEST 43rd STREET • NEW YORK, N.Y. 10036
212-582-0380

I. EXECUTIVE SUMMARY

The creation of the Interstate Sanitation Commission (ISC) was a direct result of the recommendations of the Tri-State Treaty Commission of 1931. The States of New York and New Jersey agreed to enact the Tri-State Compact in 1936; it was ratified by Connecticut in 1941. As a regulatory agency, it is the Commission's mandate to address the abatement of existing water pollution and the control of future negative impacts to the tidal waters of the Metropolitan Area. In 1962, air pollution was added to the Commission's regional responsibilities. The Commission was designated as the official planning and coordinating agency for the New Jersey-New York-Connecticut Air Quality Control Region in 1970.

All programs of the ISC, including field and laboratory support, are goal-oriented to address specific environmental deficiencies or to assure compliance with the Tri-State Compact and the Commission's Water Quality Regulations. Samplings done by the Commission -- whether at sewage treatment plants, industries, in the ambient waters or in the air -- are for gathering information for enforcement actions, opening waters for shellfishing, opening waters for swimming, the development of water quality and/or effluent criteria and other specific situations, as necessary.

The Interstate Sanitation District encompasses approximately 797 square miles of estuarine waters in the Metropolitan Area and includes waterways that are shared by the States of New Jersey, New York and Connecticut. New Jersey surface waters, specifically the Arthur Kill/Kill Van Kull, lower Hudson River, Newark Bay, Raritan Bay, Sandy Hook Bay and Upper New York Bay comprise approximately 72 square miles of the District.

During the 1990-91 reporting period, District waters have improved, in general, with respect to dissolved oxygen (D.O.) and coliform bacteria densities. Although surface waters meet D.O. requirements during the winter, episodes of hypoxia occur during the summer. The reduction of coliform bacteria concentrations, due to a great extent to the Commission's year-round disinfection regulations which took effect in 1986, enabled the New York State Department of Conservation (NYS DEC) to extend the season for 16,000 acres of shellfish beds in the Atlantic Ocean off the Rockaways for direct harvesting in 1987. Subsequently, all seasonal restrictions were removed on December 14, 1988. The New Jersey Department of Environmental Protection and Energy (NJ DEPE) remanded the seasonal restriction for 13,000 acres in Sandy Hook/Raritan Bays for depuration harvesting in 1989. At the request of the NYS DEC, the Commission sampled the New York portion of Raritan Bay in early 1990. As a result of this data collection effort, supplemented by data previously collected by ISC and NYS DEC, the NYS DEC was able to open 12,000 acres in Raritan Bay for transplant harvesting of hard clams in mid-May 1990. Approximately one-half of the area sampled met the criteria for depuration harvesting.

The great amounts of expenditures for water pollution abatement has come to fruition these past years throughout the District, yet there is much room for improvement. It has always been the Commission's contention that receiving water quality can be improved or at least maintained if the infrastructure is in place. During this reporting period, thirteen primary facilities region-wide (11 in 1990 and 2 in 1991) have been upgraded or diverted flows to a regional plant for treatment. As universal secondary treatment is attained, one of the next goals is the elimination of combined sewer overflows (CSOs) or the amelioration of the effects of CSOs.

The Commission's programs address special regional concerns for the improvement of these waters, in cooperation with the states, and 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 ambient waters;

(5) to establish necessary pollutant limitations for discharges into District waters;

(6) to monitor ambient waters by analysis of samples obtained from intensive water quality 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 limitations;

(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

Analysis;

(11) to promote CSO abatement and/or elimination programs;

(12) to eliminate CSO dry weather discharges; and

(13) to continue to take an active role in the Long Island Sound Estuary Study, the New York-New Jersey Harbor Estuary Program, the New York Bight Restoration Plan and the Dredged Material Management Plan for the Port of New York and New Jersey.

Background

Atlas - New Jersey Portion of the Interstate Sanitation District

Population *	3,307,400
Interstate border miles (sq. miles)	67
Square Miles of estuaries/harbors/bays	72
Total coastal miles	48
Names of Interstate border waterways	Hudson River The Kills Raritan Bay Upper New York Bay

* Estimated population served by wastewater treatment plants discharging into Interstate Sanitation District waters. Population figures supplied by sewerage authorities and municipalities

Summary of Classified Uses

New Jersey Portion of the Interstate Sanitation District

Classified Use	Total Size (sq. mi.) of Estuaries (1) Classified For Use
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.

DESIGNATED USE SUPPORT

Type of Waterbody: ESTUARINE (1)

Degree of Use Support	Assessment Basis		Total Assessed (Sq. Mi.)
	Evaluated (Sq. Mi.)	Monitored (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.

POINT SOURCE POLLUTION TABLE : I.S.C. Waters

Watershed: Hudson River
FACILITIES IN NONCOMPLIANCE

FACILITY	RECEIVING WATER	POLLUTANT	COMMENTS
Avante Products NJPDES 0053040	Hudson River	Process Water, Cyanide, Cadmium	None to report.
Lighthouse Bar NJPDES 0029246	Hudson River	Partially Treated Sanitary Wastewater ,Fecal Coliform, Biochemical Oxygen Demand	None to report
Roc Harbour Condominiums NJPDES N/A	Hudson River	Untreated Sanitary Wastewater, Fecal Coliform, Biochemical Oxygen Demand.	An Administrative Consent Order for Discharge Non Compliance was issued in 1990 and 1991. DEPE is currently seeking action in Superior Court.
West NY STP NJPDES 0025321	Hudson River	STP Effluent, Biochemical Oxygen Demand, Total Suspended Solids.	Administrative Consent Order issued in 1987 and a Federal Judicial Consent order issued in 1991 to upgrade to secondary treatment.
Hoboken STP NJPDES 0026085	Hudson River	STP Effluent ,Biochemical Oxygen Demand. Total Suspended Solids.	Under an Administrative Consent Order issued in 1986 to upgrade to secondary treatment.

Watershed: Hudson River continued
IMPROVEMENTS TO FACILITIES AFFECTING WATER QUALITY

FACILITY	RECEIVING WATER	COMMENTS
N Bergen-Woodcliff NJPDES 0029084	Hudson River	Facility completed construction upgrade to secondary treatment.

POINT SOURCE POLLUTION TABLE : I.S.C. Waters Continued

WATERSHED: Kill Van Kull
IMPROVEMENTS TO FACILITIES AFFECTING WATER QUALITY

FACILITY	RECEIVING WATER	POLLUTANT	COMMENTS
Standard Tank Cleaning. NJPDES 0003085	Kill Van Kull	N/A	Superior Court Order prohibits discharge from the facility to the Kill Van Kull River.

WATERSHED: Newark Bay
IMPROVEMENTS TO FACILITIES AFFECTING WATER QUALITY

FACILITY	RECEIVING WATER	POLLUTANT	COMMENTS
Kearny STP. NJPDES 0022161	Newark Bay	Sanitary Wastewater	Facility Connected to Passaic Valley Sewerage Commisioners November 1990 and has ceased it's discharges to Newark Bay.

40. SURFACE WATER RATING SYSTEM

The "Surface Water Rating System" is utilized in this Report to give a comparative assessment of water quality and water uses (resource value) between the principal waterways of the state. The Rating System is comprised of two separate indices; a Water Use Index, and a Water Quality Index; each being assigned to a waterway segment. Each index represents a scale from 0 to 100. The results of the Rating System are displayed in the table provided at the end of this section.

The **Water Use Index** indicates the relative resource value of a segment and incorporates information on potable water supplies, freshwater fisheries, shellfisheries, and bathing beaches taken up through mid-1989. Although in theory the index does go up to 100 as stated previously, values calculated up till now have not exceeded fifty. Potable water supply points are based on the amount of surface waters diverted for drinking purpose during 1986 and 1987. Fisheries points are assigned on the basis of fishes (both cold and warm-water species) stocked in the segment from 1986 through 1988 by the Division of Fish, Game and Wildlife. The relative densities of shellfish populations in the coastal/estuarine segments 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 1986 through 1988 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.

The **Water Quality Index** (WQI), discussed in detail the Water Quality Inventory section of Chapter III, denotes the relative degree of water quality impairment within a reach. The Index values listed in this Rating System represent the <u>annual index values</u> determined for each waterway listed in the table.

RESULTS OF THE SURFACE WATER RATING SYSTEM

Note: NA = No ambient water quality data available
* = Water Quality data from before 1985

SEGMENT	WATER QUALITY INDEX	WATER USE INDEX
WALLKILL RIVER BASIN:		
Upper Wallkill River	19	26
Mid Wallkill River	16	-
Lower Wallkill River	23	3
Papakating Creek	33	4
Black Creek	24	5
UPPER DELAWARE BASIN:		
Delaware Tribs. (Sussex Co.)	NA	5
Big Flat Brook	12	24
Swartswood Lake	NA	11
Upper Paulins Kill	41	20
Lower Paulins Kill	18	7
Upper Pequest River	NA	14
Lower Pequest River	23	7
Pohatcong Creek	39	8
Upper Musconetcong River	18	43
Mid Musconetcong River	19	-
Lower Musconetcong River	20	22
Delaware Tribs. (Warren Co.)		1
Delaware Tribs. (Up. Hunterdon)	NA	2
Beaver Brook	21*	2
Lopatcong Creek	51*	1
Hakihokake Cr/Warford Cr	30	2
Wickecheoke Creek	20	1
Alexauken Creek/Gold Run	24*	10
Mid Assunpink Creek	16	2
Lower Assunpink Creek	55	1
LOWER DELAWARE BASIN:		
Upper Crosswicks Creek	80*	0
Mid-Crosswicks Creek	29	1
Doctors Creek	31	0
Blacks Creek	48*	0
Craft Creek & nearby tribs	38*	2
Assicunk Creek	36*	0
Upper North Branch Rancocas Creek	9	3
Mid North Branch Rancocas Creek	10	-
Lower North Branch Rancocas Creek	19	1
Upper South Branch Rancocas Creek	24	1
Lower South Branch Rancocas Creek	47	0
South West Branch Rancocas Creek	NA	11
Lower Rancocas Creek - Mainstem	NA	2
North Branch Pennsauken Creek	49	0

RATING SYSTEM Continued

SEGMENT	WATER QUALITY INDEX	WATER USE INDEX
South Branch Pennsauken Creek	81	0
Upper Cooper River	15	0
Mid Cooper River	77	1
Big Timber Creek	23	7
Mantua Creek	26*	2
Raccoon Creek	22	2
Oldmans Creek	22	2
Delaware Tribs.(Burington Co.)	NA	1
Delaware Tribs.(Gloucester Co.)	NA	1
Delaware Tribs.(Upper Salem Co.)	NA	1
Mid Salem River	25	1
Lower Salem River	45	1
Delaware Tribs. (Central Salem County)	N.A.	0
Upper Cohansey River	40	1
Lower Cohansey River	47*	3
Still Run	NA	4
Scotland Run	NA	1
Mid Maurice R (Norma)	8	1
Mid Maurice R (Millville)	23	1
Muddy Run	NA	3
East and West Creeks	NA	4
Dennis Creek	NA	3
Delaware Bay Tribs.(Cape May Co.)	NA	1
DELAWARE RIVER:		
Zone 1C (Port Jervis, NJ-Del Water Gap)	5	37
Zone 1D (Del Water Gap - Lehigh R)	11	37
Zone 1E (Lehigh R - Trenton)	14	37
Zone 2 (Trenton - Riverton Yact Club)	29	9
Zone 3 (Yact Club - Big Timber Cr)	65	0
Zone 4 (Big Timber Cr - Marcus Hook)	58	0
Zone 5 (Marcus Hook - Head of Del Bay)	36	0
Zone 6 (Delaware Bay)	22	21
PASSAIC RIVER AND HACKENSACK RIVER BASINS:		
Elizabeth R. (incl. Morses Creek)	55	0
Rahway River (overall)		7
Mid Rahway River	45	-
Lower Rahway River	26	-
Arthur Kill	50	-
Kill Van Kull	34	-
Newark Bay	58	-
Upper Passaic River	41	19
Mid-Passaic River (New R - Pompton R)	56	0

RATING SYSTEM Continued

SEGMENT	WATER QUALITY INDEX	WATER USE INDEX
Mid-Passaic R (Pompton R - Fairlawn)	34	9
Lower Passaic R (Fairlawn - Elmwood Pk)	54	8
Whippany River	41	2
Rockaway River	29	28
Pequannock River	16	30
Wanaque River	13	39
Ramapo River	22	12
Pompton River	25	7
Saddle River	67	6
Upper Hackensack River	26	30
Lower Hackensack River	NA	1
Hudson River (GW Bridge)	54	0
Hudson River (Battery)	69	-
RARITAN RIVER BASIN:		
Lamington River (overall)		7
Upper Lamington River	37	-
Mid & Lower Lamington River	18	-
Upper North Branch Raritan River	30	2
Lower North Branch Raritan River	25	7
Upper South Branch Raritan River	21	19
Middle South Branch Raritan River	22	31
Lower South Branch Raritan River	23	9
Neshanic River	44	0
Upper Millstone River	12	-
Upper-Mid Millstone (Grover's Mill)	57	0
Lower-Mid Millstone (Kingston)	19	-
Lower Millstone (Blackwells & Weston)	33	6
Stony Brook	32	6
Bedens Brook	26	-
Lawrence Brook	23*	9
Upper Manalapan Brook	19	1
Lower Manalapan Brook	14	-
Matchaponix Brook	32	1
South River	17*	0
Upper Raritan River	22	8
Lower Raritan River	26	25
Raritan Bay and Tribs.	26	31
Sandy Hook Bay	NA	24
ATLANTIC OCEAN BASIN:		
Navesink River	32*	40
Shark River	14	20
Manasquan River	14	28
Shrewsbury River		24
North Branch Metedeconk River	27*	3

RATING SYSTEM Continued

SEGMENT	WATER QUALITY INDEX	WATER USE INDEX
South Branch Metedeconk River	22*	5
Metedeconk River	NA	11
Kettle Creek & North Barnegat Bay	21*	4
Upper Toms River	25*	2
Lower Toms River	6	11
Ridgeway Branch	29*	0
Cedar Creek	15*	18
Forked River	18*	24
Oyster Cr & Central Barnegat Bay	20*	22
Mill Creek, Cedar Run, Westecunk Creek, & Lower Barnegat Bay:	21*	24
Tuckerton Cr & Little Egg Harbor	16	25
Harbor Bay (Low Little Egg)	NA	23
Batsto River	9	0
Upper Mullica River	10	4
Mid-Mullica River	50	3
Oswego River	5	0
West Branch Wading River	6	0
Lower Mullica River	-	22
Hammonton Creek	91	-
Great Bay	NA	24
Upper Great Egg Harbor River	75	0
Mid-Gt. Egg Harbor R (Blue Anchor)	34	5
Mid-Gt. Egg Harbor R (Folsom)	50	5
Lower Great Egg Harbor River	19	3
Patcong Creek and Lakes Bay	NA	25
Cape May/Atlantic Tribs.		33
Tuckahoe River	11*	24
Doughty Creek, Reeds Bay,	NA	25
Absecon Bay		26
Absecon Cr.	NA	1

41. PERMITTED POINT SOURCE DISCHARGES

The following is a list of point source discharges to both state and interstate waters, listed by watershed. The list contains the NJPDES number, discharge and facility type (see key below), facility name, location in terms of county and municipality, and the receiving water.

Note that the final entries have not been cataloged by watershed but rather by the latitude and longitude coordinates reflecting the facilities locations.

KEY:

DISCHARGE TYPE

A = Sanitary Surface Water Discharge

B = Industrial/Commercial Surface Water Discharge

C = Thermal Surface Water Discharge

FACILITY TYPE

I = Industrial

M = Municipal

NJPDES NUMBER	DISCHARGE TYPE	WATERSHED	FACILITY TYPE	FACILITY NAME	COUNTY	MUNICIPALITY	RECEIVING WATER
NJ0069353	B	ARTHUR KILL,KILL VAN	I	AMAX SPECIALITY COPP	MIDDLESEX	EDISON TWP.	
NJ0000221	B	ARTHUR KILL,KILL VAN	I	CHEVRON USA INC	MIDDLESEX	PERTH AMBOY CIT	
NJ0003867	B	ARTHUR KILL,KILL VAN	I	CP CHEMICALS INC	MIDDLESEX	WOODBRIDGE TWP.	
NJ0028878	B	ARTHUR KILL,KILL VAN	I	TR-METRO CHEMICALS I	MIDDLESEX	WOODBRIDGE TWP.	
NJ0003824	C	ARTHUR KILL,KILL VAN	I	NEWARK INTERNATIONAL	ESSEX	NEWARK	AIRPORT PERIPH
NJ0050423	A	ARTHUR KILL,KILL VAN	M	HANCOCKS BRIDGE WAST	SALEM	LOWER ALLOWAYS	ALLOWAYS CREEK
NJ0024643	A	ARTHUR KILL,KILL VAN	M	RAHWAY VALLEY SEWERA	UNION	RAHWAY CITY	ARHTUR KILL
NJ0024571	A	ARTHUR KILL,KILL VAN	M	CARTERET STP , BOROU	MIDDLESEX	CARTERET BORO	ARTHUR KILL
NJ0024741	A	ARTHUR KILL,KILL VAN	M	JOINT MEETING SEWAGE	UNION	ELIZABETH CITY	ARTHUR KILL
NJ0024953	A	ARTHUR KILL,KILL VAN	M	LINDEN ROSELLE SEWAG	UNION	LINDEN CITY	ARTHUR KILL
NJ0002640	B	ARTHUR KILL,KILL VAN	I	E I DUPONT DE NEMOUR	UNION	LINDEN CITY	ARTHUR KILL
NJ0001899	B	ARTHUR KILL,KILL VAN	I	AMAX REALTY DEVELOPM	MIDDLESEX	CARTERET BORO	ARTHUR KILL
NJ0000248	B	ARTHUR KILL,KILL VAN	I	FMC CORPORATION	MIDDLESEX	CARTERET BORO	ARTHUR KILL
NJ0000019	B	ARTHUR KILL,KILL VAN	I	GAF CHEMICAL CORPORA	UNION	LINDEN CITY	ARTHUR KILL
NJ0001384	B	ARTHUR KILL,KILL VAN	I	HESS SECOND RESERVE	MIDDLESEX	WOODBRIDGE TWP.	ARTHUR KILL
NJ0000680	BC	ARTHUR KILL,KILL VAN	I	PSE&G SEWAREN GENERA	MIDDLESEX	WOODBRIDGE TWP.	ARTHUR KILL
NJ0056707	B	ARTHUR KILL,KILL VAN	I	CRODA STORAGE INC.	UNION	ELIZABETH CITY	ARTHUR KILL
NJ0030929	B	ARTHUR KILL,KILL VAN	I	NORTHVILLE LINDEN TE	UNION	LINDEN CITY	ARTHUR KILL (DS
NJ0055271	C	ARTHUR KILL,KILL VAN	I	WATCHUNG DIE CASTING	UNION	GARWOOD BORO	GARWOOD BROOK
NJ0035149	B	ARTHUR KILL,KILL VAN	I	WAKEFERN	UNION	ELIZABETH CITY	GREAT DITCH
NJ0036013	B	ARTHUR KILL,KILL VAN	I	COASTAL OIL NEW YORK	HUDSON	BAYONNE CITY	KILL VAN KULL
NJ0060968	B	ARTHUR KILL,KILL VAN	I	GARDEN STATE CONTAIN	HUDSON	BAYONNE CITY	KILL VAN KULL
NJ0025836	A	ARTHUR KILL,KILL VAN	M	BAYONNE STP	HUDSON	BAYONNE CITY	KILL VAN KULL
NJ0025640	B	ARTHUR KILL,KILL VAN	I	CONSTABLE TERMINALS	HUDSON	BAYONNE CITY	KILL VAN KULL
NJ0003361	B	ARTHUR KILL,KILL VAN	I	POWELL DUFFRYN TERMI	HUDSON	BAYONNE CITY	KILL VAN KULL
NJ0001511	B	ARTHUR KILL,KILL VAN	I	EXXON BAYWAY REFINER	UNION	LINDEN CITY	MORSES CREEK
NJ0034509	B	ARTHUR KILL,KILL VAN	I	DEVELOPMENT MOLDING	UNION	KENILWORTH BORO	MORSES CREEK
NJ0034827	C	ARTHUR KILL,KILL VAN	I	COURTAULDS CPD INC	ESSEX	NEWARK	NEWARK BAY
NJ0034231	B	ARTHUR KILL,KILL VAN	I	BP NORTH AMERICA PET	ESSEX	NEWARK	NEWARK BAY
NJ0063738	B	ARTHUR KILL,KILL VAN	I	REICHHOLD CHEMICALS	ESSEX	NEWARK	NEWARK BAY
NJ0000949	C	ARTHUR KILL,KILL VAN	I	CAS CHEM INC	HUDSON	BAYONNE CITY	NEWARK BAY
NJ0000329	C	ARTHUR KILL,KILL VAN	I	NEWARK REFRIGERATED	ESSEX	NEWARK	NEWARK BAY
NJ0002241	C	ARTHUR KILL,KILL VAN	I	HUMKO CHEMICAL DIV-W	ESSEX	NEWARK	NEWARK BAY

NJPDES NUMBER	DISCHARGE TYPE	WATERSHED	FACILITY TYPE	FACILITY NAME	COUNTY	MUNICIPALITY	RECEIVING WATER
NJ0027022	A	ARTHUR KILL,KILL VAN	M	JERSEY CITY STP	HUDSON	JERSEY CITY	NEWARK BAY
NJ0032719	B	ARTHUR KILL,KILL VAN	I	DIAMOND CRYSTAL SALT	ESSEX	NEWARK	NEWARK BAY
NJ0035815	B	ARTHUR KILL,KILL VAN	I	MATCHLESS-UNITED COM	UNION	LINDEN CITY	PEACH ORCHARD B
NJ0063487	B	ARTHUR KILL,KILL VAN	I	KARNAK CHEMICAL CORP	UNION	CLARK TWP.	RAHWAY RIVER
NJ0062821	C	ARTHUR KILL,KILL VAN	I	POLYCHROME CORPORATI	UNION	CLARK TWP.	ROBINSON'S CREE
NJ0003778	B	ARTHUR KILL,KILL VAN	I	LCP CHEMICALS - NEW	UNION	LINDEN CITY	SOUTH BRANCH CR
NJ0035807	C	ARTHUR KILL,KILL VAN	I	ALPHA CHEMICAL & PLA	ESSEX	NEWARK	STORM SEWER TO
NJ0021016	A	ARTHUR KILL,KILL VAN	M	PASSAIC VALLEY SEWER	ESSEX	NEWARK	UPPER NEW YORK
NJ0034118	C	ARTHUR KILL,KILL VAN	I	UNITED STATES GYPSUM	MIDDLESEX	WOODBRIDGE TWP.	WOODBRIDGE CREE
NJ0058076	A	ASSISCUNK CREEK	M	ROUTE 295 REST AREA	BURLINGTON	SPRINGFIELD TWP	
NJ0053007	A	ATLANTIC COASTAL	M	WILDWOOD/LOWER REGIO	CAPE MAY	WILDWOOD CITY	
NJ0052990	A	ATLANTIC COASTAL	M	SEVEN MILE/MIDDLE RE	CAPE MAY	AVALON BORO	
NJ0035343	A	ATLANTIC COASTAL	M	OCEAN CITY WASTE WTF	CAPE MAY	OCEAN CITY	ATLANTIC OCEAN
NJ0068799	C	ATLANTIC COASTAL	I	STRAND THEATRE	CAPE MAY	OCEAN CITY	ATLANTIC OCEAN
NJ0068772	C	ATLANTIC COASTAL	I	VILLAGE THEATRE	CAPE MAY	OCEAN CITY	ATLANTIC OCEAN
NJ0024473	A	ATLANTIC COASTAL	M	ATLANTIC COUNTY UTIL	ATLANTIC	ATLANTIC CITY	ATLANTIC OCEAN
NJ0005550	BC	ATLANTIC COASTAL	I	OYSTER CREEK NUCLEAR	OCEAN	LACEY TWP.	SOUTH BR. FORKE
NJ0099741	C	BACK, CEDAR, AND NAT	I	REDPACK FOODS INC	CUMBERLAND	LAWRENCE TWP.	CEDAR CREEK
NJ0026859	A	BIG TIMBER CRK	M	RUNNEMEDE SEWERAGE A	CAMDEN	RUNNEMEDE BORO	BEAVER BROOK BR
NJ0026743	A	BIG TIMBER CRK	M	BELLMAWR SEWERAGE AU	CAMDEN	BELLMAWR BORO	BIG TIMBER CREE
NJ0026620	A	BIG TIMBER CRK	M	GLOUCESTER CITY WWTP	CAMDEN	GLOUCESTER CITY	BIG TIMBER CREE
NJ0026476	A	BIG TIMBER CRK	M	BLACKWOOD WASTEWATER	CAMDEN	GLOUCESTER TWP.	BIG TIMBER CREE
NJ0020320	A	BIG TIMBER CRK	M	CLEMENTON SEWAGE AUT	CAMDEN	CLEMENTON BORO	BIG TIMBER CREE
NJ0022748	A	BIG TIMBER CRK	M	BROOKLAWN SEWAGE TRE	CAMDEN	BROOKLAWN BORO	BIG TIMBER CREE
NJ0022624	A	BIG TIMBER CRK	M	STRATFORD S.A. W.W.T	CAMDEN	STRATFORD BORO	BIG TIMBER CRK
NJ0026468	A	BIG TIMBER CRK	M	CHEWS LANDING WTF	CAMDEN	GLOUCESTER TWP.	DELAWARE RIVER
NJ0026492	A	BIG TIMBER CRK	M	CATALINA HILLS WASTE	CAMDEN	GLOUCESTER TWP.	GRAVELY RUN
NJ0025844	B	BIG TIMBER CRK	I	NATIONAL PARK WTP	GLOUCESTER	NATIONAL PARK B	HESSIAN RUN
NJ0023817	A	BIG TIMBER CRK	M	MT EPHRIAM,BOROUGH O	CAMDEN	MOUNT EPHRAIM B	LITTLE TIMBER C
NJ0025593	A	BIG TIMBER CRK	M	GLOUCESTER CITY WATE	CAMDEN	GLOUCESTER CITY	NEWTON CREEK SO
NJ0021440	A	BIG TIMBER CRK	M	WEST COLLINGSWOOD HE	CAMDEN	HADDON TWP.	NEWTONS CREEK
NJ0021431	A	BIG TIMBER CRK	M	MAGNOLIA SEWERAGE AU	CAMDEN	MAGNOLIA BORO	OTTER BR CREEK
NJ0026484	A	BIG TIMBER CRK	M	MARDALE WASTEWATER T	CAMDEN	GLOUCESTER TWP.	SIGNEY RUN

NJPDES NUMBER	DISCHARGE TYPE	WATERSHED	FACILITY TYPE	FACILITY NAME	COUNTY	MUNICIPALITY	RECEIVING WATER
NJ0035891	B	BIG TIMBER CRK	I	DUN-RITE SAND & GRAV	GLOUCESTER	WASHINGTON TWP.	SLAB BRIDGE BRA
NJ0029840	A	BIG TIMBER CRK	M	CAMDEN CNTY STP	CAMDEN	GLOUCESTER TWP.	SOUTH BRANCH BI
NJ0026026	B	BIG TIMBER CRK	I	GULF OIL/CUMBERLAND	GLOUCESTER	WOODBURY CITY	WOODBURY CREEK
NJ0023949	A	BLACK CREEK	M	GREAT GORGE'S MNT VI	SUSSEX	VERNON TWP.	BLACK CREEK
NJ0024139	A	BLACKS CREEK	M	LAUREL RUN WASTE TRE	BURLINGTON	BORDENTOWN TWP.	BACON RUN
NJ0024678	A	BLACKS CREEK	M	BLACK'S CREEK WWTP	BURLINGTON	BORDENTOWN CITY	BLACKS CR.
NJ0065510	B	CEDAR CREEK	I	ORG MAINTENANCE SHOP	UNION	PLAINFIELD CITY	STORM SEWER TO
NJ0025780	B	CENTRAL BARNEGAT BAY	I	ISLAND BEACH STATE P	OCEAN	BERKELEY TWP.	BARNEGAT BAY
NJ0034282	A	COOPER RIVER	M	LEISURE ARMS	SALEM	LOWER ALLOWAYS	COOPER CREEK
NJ0025054	A	COOPER RIVER	M	CHERRY HILL TOWNSHIP	CAMDEN	CHERRY HILL TWP	COOPER R.
NJ0005053	B	COOPER RIVER	I	CAMPBELL SOUP CO	CAMDEN	CAMDEN CITY	COOPER RIVER
NJ0003999	B	COOPER RIVER	I	VICTORY CO	CAMDEN	CHERRY HILL TWP	COOPER RIVER
NJ0029564	B	COOPER RIVER	I	COLLINGSWOOD WATER P	CAMDEN	COLLINGSWOOD BO	MAIN BRANCH OF
NJ0020753	A	COOPER RIVER	M	NEW JERSEY TURNPIKE	CAMDEN	CHERRY HILL TWP	TINDALE'S RUN
NJ0021709	A	CRAFTS CRK & NEARBY	M	BURLINGTON TWP MAIN	BURLINGTON	BURLINGTON TWP.	TANNERS RUN
NJ0004235	BC	CRAFTS CRK & NEARBY	I	OCCIDENTAL CHEMICAL	BURLINGTON	BURLINGTON TWP.	UNLINED DITCHES
NJ0034304	AB	DELAWARE BAY TRIBS	M	CAPE MAY LEWES FERRY	CAPE MAY	CAPE MAY CITY	CAPE MAY CANAL
NJ0027197	A	DELAWARE BAY TRIBS	M	GARDEN LAKE MOBILE H	CAPE MAY	MIDDLE TWP.	GRESSE CREEK
NJ0055395	B	DELAWARE RIVER	I	BURLINGTON COUNTY RE	BURLINGTON	FLORENCE TWP.	
NJ0071340	C	DELAWARE RIVER	I	PANDROL,INC.	BURLINGTON	WASHINGTON TWP.	
NJ0055000	B	DELAWARE RIVER	I	VINELAND ACQUISITION	CAMDEN	VOORHEES TWP.	BARTON RUN
NJ0021601	A	DELAWARE RIVER	M	CARNEYS POINT SEWAGE	SALEM	CARNEY'S POINT	CARNEYS POINT
NJ0021792	C	DELAWARE RIVER	I	STRUTHERS-DUNN INC	GLOUCESTER	MANTUA TWP.	CHESTNUT BRANCH
NJ0004278	B	DELAWARE RIVER	I	AIR PRODUCTS & CHEMI	GLOUCESTER	PAULSBORO BORO	CLONMELL CREEK
NJ0031640	B	DELAWARE RIVER	I	INTERSTATE WASTE REM	BURLINGTON	BORDENTOWN TWP.	CRYSTAL LAKE &
NJ0025003	A	DELAWARE RIVER	M	OAKLYN STP	CAMDEN	OAKLYN BORO	DELAWARE R.
NJ0024660	A	DELAWARE RIVER	M	BURLINGTON CITY STP	BURLINGTON	BURLINGTON CITY	DELAWARE R.
NJ0024686	A	DELAWARE RIVER	M	GLOUCESTER COUNTY UA	GLOUCESTER	WEST DEPTFORD T	DELAWARE R.
NJ0024481	A	DELAWARE RIVER	M	BALDWIN RUN STP	CAMDEN	CAMDEN CITY	DELAWARE R.
NJ0021610	A	DELAWARE RIVER	M	RIVERTON SEWAGE TREA	BURLINGTON	RIVERTON BORO	DELAWARE R.
NJ0024007	A	DELAWARE RIVER	M	CINNAMINSON SEWERAGE	BURLINGTON	CINNAMINSON TWP	DELAWARE R.
NJ0020915	A	DELAWARE RIVER	M	LAMBERTVILLE SEWAGE	HUNTERDON	LAMBERTVILLE CI	DELAWARE R.
NJ0020923	A	DELAWARE RIVER	M	TRENTON SEWAGE TREAT	MERCER	TRENTON CITY	DELAWARE RIVER

NJPDES NUMBER	DISCHARGE TYPE	WATERSHED	FACILITY TYPE	FACILITY NAME	COUNTY	MUNICIPALITY	RECEIVING WATER
NJ0008460	B	DELAWARE RIVER	I	WITCO CORPORATION	WARREN	PHILLIPSBURG TO	DELAWARE RIVER
NJ0005622	BC	DELAWARE RIVER	I	PSE&G SALEM GENERATI	SALEM	LOWER ALLOWAYS	DELAWARE RIVER
NJ0024023	A	DELAWARE RIVER	M	PENNS GROVE SEWERAGE	SALEM	PENNS GROVE BOR	DELAWARE RIVER
NJ0023701	A	DELAWARE RIVER	M	FLORENCE TOWNSHIP ST	BURLINGTON	FLORENCE TWP.	DELAWARE RIVER
NJ0021598	A	DELAWARE RIVER	M	PENNSVILLE SEWERAGE	SALEM	PENNSVILLE TWP.	DELAWARE RIVER
NJ0021890	A	DELAWARE RIVER	M	MILFORD SEWER UTILIT	HUNTERDON	MILFORD BORO	DELAWARE RIVER
NJ0004219	B	DELAWARE RIVER	I	E I DUPONT DE NEMOUR	GLOUCESTER	GREENWICH TWP.	DELAWARE RIVER
NJ0004383	B	DELAWARE RIVER	I	AMERADA HESS CORP PE	CAMDEN	PENNSAUKEN TWP.	DELAWARE RIVER
NJ0004375	B	DELAWARE RIVER	I	HOEGANAES CORPORATIO	BURLINGTON	RIVERTON BORO	DELAWARE RIVER
NJ0004545	C	DELAWARE RIVER	I	AIRCO SPECIAL GASES	BURLINGTON	RIVERTON BORO	DELAWARE RIVER
NJ0004456	B	DELAWARE RIVER	I	MILFORD MILL	HUNTERDON	MILFORD BORO	DELAWARE RIVER
NJ0005002	B	DELAWARE RIVER	I	PSE&G BURLINGTON GEN	BURLINGTON	BORDENTOWN CITY	DELAWARE RIVER
NJ0004995	B	DELAWARE RIVER	I	PSE&G MERCER GENERAT	MERCER	TRENTON CITY	DELAWARE RIVER
NJ0004952	B	DELAWARE RIVER	I	HOFFMAN-LA ROCHE INC	WARREN	WHITE TWP.	DELAWARE RIVER
NJ0004782	B	DELAWARE RIVER	I	FRENCHTOWN CERAMICS	HUNTERDON	FRENCHTOWN BORO	DELAWARE RIVER
NJ0004669	B	DELAWARE RIVER	I	GEORGIA PACIFIC CORP	CAMDEN	PENNSAUKEN TWP.	DELAWARE RIVER
NJ0005096	B	DELAWARE RIVER	I	AMSTED IND/GRIFFIN P	BURLINGTON	FLORENCE TWP.	DELAWARE RIVER
NJ0005100	B	DELAWARE RIVER	I	E I DUPONT DE NEMOUR	SALEM	CARNEY'S POINT	DELAWARE RIVER
NJ0005096	B	DELAWARE RIVER	I	AMSTED IND/GRIFFIN P	BURLINGTON	FLORENCE TWP.	DELAWARE RIVER
NJ0005100	B	DELAWARE RIVER	I	E I DUPONT DE NEMOUR	SALEM	CARNEY'S POINT	DELAWARE RIVER
NJ0005045	B	DELAWARE RIVER	I	MONSANTO COMPANY	GLOUCESTER	LOGAN TWP.	DELAWARE RIVER
NJ0005029	B	DELAWARE RIVER	I	PAULSBORO REFINERY	GLOUCESTER	GREENWICH TWP.	DELAWARE RIVER
NJ0005002	B	DELAWARE RIVER	I	PSE&G BURLINGTON GEN	BURLINGTON	BORDENTOWN CITY	DELAWARE RIVER
NJ0005142	B	DELAWARE RIVER	I	HERCULES INCORPORATE	BURLINGTON	BURLINGTON TWP.	DELAWARE RIVER
NJ0005118	A	DELAWARE RIVER	M	BASF CORP.COATING &	WARREN	BELVIDERE TOWN	DELAWARE RIVER
NJ0005100	B	DELAWARE RIVER	I	E I DUPONT DE NEMOUR	SALEM	CARNEY'S POINT	DELAWARE RIVER
NJ0005363	BC	DELAWARE RIVER	I	DEEPWATER GENERATING	SALEM	PENNSVILLE TWP.	DELAWARE RIVER
NJ0005185	B	DELAWARE RIVER	I	PENNWALT CORPORATION	GLOUCESTER	WEST DEPTFORD T	DELAWARE RIVER
NJ0005517	C	DELAWARE RIVER	I	GILBERT GENERATING S	HUNTERDON	HOLLAND TWP.	DELAWARE RIVER
NJ0005622	B	DELAWARE RIVER	I	PSE&G SALEM GENERATI	SALEM	LOWER ALLOWAYS	DELAWARE RIVER
NJ0005495	B	DELAWARE RIVER	I	AMSPEC CHEMICAL CORP	CAMDEN	GLOUCESTER CITY	DELAWARE RIVER
NJ0005363	C	DELAWARE RIVER	I	DEEPWATER GENERATING	SALEM	PENNSVILLE TWP.	DELAWARE RIVER
NJ0024449	A	DELAWARE RIVER	M	PALMYRA STP	BURLINGTON	PALMYRA BORO	DELAWARE RIVER

NJPDES NUMBER	DISCHARGE TYPE	WATERSHED	FACILITY TYPE	FACILITY NAME	COUNTY	MUNICIPALITY	RECEIVING WATER
NJ0024635	A	DELAWARE RIVER	M	USATC AND FORT DIX P	SALEM	OLDMANS TWP.	DELAWARE RIVER
NJ0025411	B	DELAWARE RIVER	I	PSE&G HOPE CREEK GEN	SALEM	LOWER ALLOWAYS	DELAWARE RIVER
NJ0025348	A	DELAWARE RIVER	M	PENNSAUKEN SEWERAGE	CAMDEN	PENNSAUKEN TWP.	DELAWARE RIVER
NJ0025747	B	DELAWARE RIVER	I	TRENTON WATER PLANT,	MERCER	TRENTON CITY	DELAWARE RIVER
NJ0026182	A	DELAWARE RIVER	M	CAMDEN COUNTY MUA	CAMDEN	CAMDEN CITY	DELAWARE RIVER
NJ0025411	C	DELAWARE RIVER	I	PSE&G HOPE CREEK GEN	SALEM	LOWER ALLOWAYS	DELAWARE RIVER
NJ0025411	BC	DELAWARE RIVER	I	PSE&G HOPE CREEK GEN	SALEM	LOWER ALLOWAYS	DELAWARE RIVER
NJ0027481	A	DELAWARE RIVER	M	BEVERLY STP	BURLINGTON	BEVERLY CITY	DELAWARE RIVER
NJ0027375	A	DELAWARE RIVER	M	JOHNSTONE TRAINING C	BURLINGTON	BORDENTOWN TWP.	DELAWARE RIVER
NJ0027545	A	DELAWARE RIVER	M	LOGAN TOWNSHIP MUA	GLOUCESTER	LOGAN TWP.	DELAWARE RIVER
NJ0031810	A	DELAWARE RIVER	M	FIELDSBORO,BOROUGH O	BURLINGTON	FIELDSBORO BORO	DELAWARE RIVER
NJ0029831	A	DELAWARE RIVER	M	FRENCHTOWN, BOROUGH	HUNTERDON	FRENCHTOWN BORO	DELAWARE RIVER
NJ0030406	B	DELAWARE RIVER	I	EXXON CHEMICAL AMERI	SALEM	OLDMANS TWP.	DELAWARE RIVER
NJ0004006	B	DELAWARE RIVER	I	J T BAKER INC	WARREN	PHILLIPSBURG TO	DELAWARE RIVER
NJ0004219	B	DELAWARE RIVER	I	E I DUPONT DE NEMOUR	GLOUCESTER	GREENWICH TWP.	DELAWARE RIVER
NJ0004197	B	DELAWARE RIVER	I	GATX TERMINALS CORP	GLOUCESTER	PAULSBORO BORO	DELAWARE RIVER
NJ0004090	B	DELAWARE RIVER	I	MAC ANDREWS & FORBES	CAMDEN	CAMDEN CITY	DELAWARE RIVER
NJ0069841	B	DELAWARE RIVER	I	NEW JERSEY-AMERICAN	BURLINGTON	CINNAMINSON TWP	DELAWARE RIVER
NJ0035360	C	DELAWARE RIVER	I	HUNTERDON INDUSTRIAL	HUNTERDON	FRENCHTOWN BORO	DELAWARE RIVER
NJ0035114	A	DELAWARE RIVER	M	BELVIDERE AREA WWTF	WARREN	BELVIDERE TOWN	DELAWARE RIVER
NJ0004189	C	DELAWARE RIVER	I	GENERAL ELECTRIC AER	CAMDEN	CAMDEN CITY	DELEWARE RIVER
NJ0033022	BC	DELAWARE RIVER	I	AFG INDUSTRIES INC	BURLINGTON	CINNAMINSON TWP	DELEWARE RIVER
NJ0004219	B	DELAWARE RIVER	I	E I DUPONT DE NEMOUR	GLOUCESTER	GREENWICH TWP.	DELEWARE RIVER
NJ0068721	B	DELAWARE RIVER	I	TUFTS ROAD WTP	SALEM	PENNSVILLE TWP.	DRAINAGE DITCH
NJ0068705	B	DELAWARE RIVER	I	HERON AVENUE WTP	SALEM	PENNSVILLE TWP.	DRAINAGE DITCH
NJ0002089	B	DELAWARE RIVER	I	EXXON CO USA-BAYONNE	HUDSON	BAYONNE CITY	KILL VAN KULL
NJ0033952	B	DELAWARE RIVER	I	COLONIAL PIPELINE CO	GLOUCESTER	WEST DEPTFORD T	MANTUA CREEK
NJ0005584	BC	DELAWARE RIVER	I	B P OIL COMPANY	GLOUCESTER	PAULSBORO BORO	MANTUA CREEK (D
NJ0004391	B	DELAWARE RIVER	I	OCCIDENTAL CHEMICAL	BURLINGTON	BURLINGTON TWP.	MARTIN'S DITCH
NJ0064297	B	DELAWARE RIVER	I	EXXON SERV STA #3-01	MERCER	HAMILTON TWP.	POND RUN
NJ0030449	C	DELAWARE RIVER	I	RONA PEARL INC	HUDSON	BAYONNE CITY	SE3
NJ0061077	B	DELAWARE RIVER	I	N J TRANSIT CORPORA	MERCER	TRENTON CITY	STORM SEWER TO
NJ0031291	B	DELAWARE RIVER	I	CONSUMERS OIL CORPOR	MERCER	TRENTON CITY	UNNAMED DITCH T

NJPDES NUMBER	DISCHARGE TYPE	WATERSHED	FACILITY TYPE	FACILITY NAME	COUNTY	MUNICIPALITY	RECEIVING WATER
NJ0033570	C	DELAWARE RIVER	I	BUDD CHEMICAL CO	SALEM	CARNEY'S POINT	UNNAMED TRIBUTA
NJ0034851	B	DELAWARE RIVER	I	BREEN COLOR CONCENTR	HUNTERDON	LAMBERTVILLE CI	UNNAMED TRIBUTA
NJ0025909	B	DELAWARE RIVER	I	ULTRAMAR PETROLEUM I	BERGEN	MONTVALE BORO	UPPER NEW YORK
NJ0025909	B	DELAWARE RIVER	I	ULTRAMAR PETROLEUM I	BERGEN	MONTVALE BORO	UPPER NEW YORK
NJ0020257	A	DELAWARE RIVER	M	U S MILITARY OCEAN T	HUDSON	BAYONNE CITY	UPPER NEW YORK
NJ0030333	A	DELAWARE RIVER	M	GREENWICH TOWNSHIP S	GLOUCESTER	GLASSBORO BORO	WIGGINS POND
NJ0036005	B	DELAWARE TRIBS(ALEXA	I	LEHIGH FLUID POWER I	HUNTERDON	ALEXANDRIA TWP.	ALEXAUKEN CREEK
NJ0034665	B	DELAWARE TRIBS(ALEXA	I	TRENTON COUNTRY CLUB	MERCER	EWING TWP.	DELAWARE & RARI
NJ0027715	A	DELAWARE TRIBS(ALEXA	M	MERCER CO CORRECTION	MERCER	HOPEWELL TWP.	FIDLER CREEK
NJ0004031	B	DELAWARE TRIBS(ALEXA	I	HOMASOTE COMPANY	MERCER	EWING TWP.	GOLD RUN
NJ0034321	B	DELAWARE TRIBS(ALEXA	I	ROLLER BEARING CO OF	MERCER	EWING TWP.	GOLDRUN CRK
NJ0023779	A	DELAWARE TRIBS(ALEXA	M	PUBLIC WORKS DEPT OF	MERCER	EWING TWP.	JACOB CR.
NJ0067784	B	DELAWARE TRIBS(ALEXA	I	FERNWOOD MAINTENANCE	MERCER	TRENTON CITY	STORM SEWER TO
NJ0027561	A	DELAWARE TRIBS(LOCKA	M	DELAWARE TOWNSHIP MU	HUNTERDON	DELAWARE TWP.	DELAWARE RIVER
NJ0027537	B	DELAWARE TRIBS(LOCKA	I	MAGNESIUM ELEKTRON I	HUNTERDON	KINGWOOD TWP.	WICKECHOEKE CRE
NJ0004405	B	DIVIDING CREEK	I	UNIMIN CORP - DIVIDI	CUMBERLAND	MILLVILLE CITY	DIVIDING CREEK
NJ0020206	A	DOCTORS CREEK	M	ALLENTOWN WTP	MONMOUTH	ALLENTOWN BORO	DOCTORS CREEK
NJ0027588	B	DOUGHTY CREEK, REEDS	I	STOCKTON STATE COLLE	ATLANTIC	BRIGANTINE CITY	BONITA TIDEWAY
NJ0021989	A	EAST AND WEST CREEKS	M	BAYSIDE STATE PRISON	CUMBERLAND	MAURICE RIVER T	RIGGIN'S DITCH
NJ0061867	C	ELIZABETH RIVER	I	EMCO GRAPHICS, INC.	UNION	HILLSIDE TWP.	
NJ0020648	A	ELIZABETH RIVER	M	ELIZABETH, CITY OF	UNION	ELIZABETH CITY	ELIZABETH R.
NJ0002291	BC	ELIZABETH RIVER	I	SCHERING CORPORATION	UNION	UNION TWP.	ELIZABETH RIVER
NJ0060194	C	ELIZABETH RIVER	I	AMERICAN ALUM CASTIN	ESSEX	IRVINGTON TOWN	ELIZABETH RIVER
NJ0034266	C	ELIZABETH RIVER	I	TUSCAN DAIRY FARMS I	UNION	UNION TWP.	ELIZABETH RIVER
NJ0035980	C	ELIZABETH RIVER	I	ATLAS TOOL COMPANY	UNION	HILLSIDE TWP.	ELIZABETH RIVER
NJ0031186	B	ELIZABETH RIVER	I	ECD INC	UNION	HILLSIDE TWP.	STORM SEWER TO
NJ0034070	C	ELIZABETH RIVER	I	SPRINGFIELD DIE CAST	UNION	KENILWORTH BORO	WEST BROOK
NJ0035947	B	ELIZABETH RIVER	I	GENERAL MOTORS CORP	UNION	LINDEN CITY	WEST CRK TO ART
NJ0053040	B	HUDSON RIVER	I	AVANTE PRODUCTS INC	HUDSON	NORTH BERGEN TW	HUDSON RIVER
NJ0029084	A	HUDSON RIVER	M	WOODCLIFF SEWERAGE T	HUDSON	NORTH BERGEN TW	HUDSON RIVER
NJ0027014	A	HUDSON RIVER	M	JERSEY CITY STP	HUDSON	JERSEY CITY	HUDSON RIVER
NJ0026085	A	HUDSON RIVER	M	HOBOKEN SEWAGE TREAT	HUDSON	HOBOKEN CITY	HUDSON RIVER
NJ0025321	A	HUDSON RIVER	M	WEST NEW YORK	HUDSON	WEST NEW YORK T	HUDSON RIVER

NJPDES NUMBER	DISCHARGE TYPE	WATERSHED	FACILITY TYPE	FACILITY NAME	COUNTY	MUNICIPALITY	RECEIVING WATER
NJ0020591	A	HUDSON RIVER	M	EDGEWATER STP	BERGEN	EDGEWATER BORO	HUDSON RIVER
NJ0060895	B	HUDSON RIVER	I	RFE INDUSTRIES INC	HUDSON	JERSEY CITY	MORRIS CANAL BA
NJ0000663	BC	HUDSON RIVER	I	PSE&G LINDEN GENERAT	UNION	LINDEN CITY	PILES CREEK (DS
NJ0003328	B	HUDSON RIVER	I	HAAGEN-DAZS CO	MIDDLESEX	WOODBRIDGE TWP.	SPA SPRING CREE
NJ0055255	B	KETTLE CREEK & BARNE	I	REDI-FLO CORPORATION	OCEAN	LONG BEACH TWP.	POLHEMUS BRANCH
NJ0002861	B	LAMINGTON RIVER	I	COUNTY CONCRETE CORP	MORRIS	ROXBURY TWP.	BLACK RIVER
NJ0000876	AB	LAMINGTON RIVER	I	HERCULES INC	MORRIS	ROXBURY TWP.	BLACK RIVER
NJ0022781	A	LAMINGTON RIVER	M	VALLEY ROAD SEWERAGE	HUNTERDON	TEWKSBURY TWP.	LAMINGTON R.
NJ0021865	A	LAMINGTON RIVER	M	LAMINGTON RIVER FARM	SOMERSET	BEDMINSTER TWP.	LAMINGTON RIVER
NJ0022675	A	LAMINGTON RIVER	M	ROXBURY-AJAX TER STP	MORRIS	ROXBURY TWP.	LAMINGTON RIVER
NJ0028452	A	LAMINGTON RIVER	M	BEST A M CO INC	HUNTERDON	TEWKSBURY TWP.	NORTH BRANCH RO
NJ0002917	BC	LAMINGTON RIVER	I	OLDWICK MATERIALS IN	HUNTERDON	TEWKSBURY TWP.	ROCKAWAY CREEK
NJ0098922	A	LAMINGTON RIVER	M	REGIONAL STP	HUNTERDON	READINGTON TWP.	ROCKAWAY CREEK
NJ0028487	A	LAMINGTON RIVER	M	MOUNTAINVIEW CORRECT	HUNTERDON	CLINTON TWP.	SOUTH BRANCH RA
NJ0020338	A	LAMINGTON RIVER	M	FOX HOLLOW STP	SOMERSET	SOMERVILLE BORO	TRIB TO N BRANC
NJ0033499	B	LAWRENCE BROOK	I	ADAMS MAINTENANCE OF	MIDDLESEX	NORTH BRUNSWICK	FARRINGTON LAKE
NJ0025259	B	LAWRENCE BROOK	I	MIDEAST ALUMINUM IND	MIDDLESEX	SOUTH BRUNSWICK	STORM SEWER TO
NJ0057339	B	LAWRENCE BROOK	I	NJE CORPORATION	BURLINGTON	WOODLAND TWP.	TRIBUTARY TO DE
NJ0024716	A	LOPATCONG CREEK	M	PHILLIPSBURG, TOWN O	WARREN	PHILLIPSBURG TO	LOPATCONG CR.
NJ0031895	C	LOWER ASSUNPINK CREE	I	AMERICAN BILTRITE IN	MERCER	HAMILTON TWP.	ASSUMPINK CREEK
NJ0024759	A	LOWER ASSUNPINK CREE	M	EWING-LAWRENCE SEWER	MERCER	LAWRENCE TWP.	ASSUNPINK CR.
NJ0032913	B	LOWER ASSUNPINK CREE	I	HYDROCARBON RESEARCH	MERCER	LAWRENCE TWP.	ASSUNPINK CREEK
NJ0032832	C	LOWER ASSUNPINK CREE	I	TRANE CAC INC	MERCER	HAMILTON TWP.	ASSUNPINK CREEK
NJ0032832	B	LOWER ASSUNPINK CREE	I	TRANE CAC INC	MERCER	HAMILTON TWP.	ASSUNPINK CREEK
NJ0004677	B	LOWER ASSUNPINK CREE	I	IMO INDUSTRIES INC	MERCER	HAMILTON TWP.	ASSUNPINK CREEK
NJ0004626	BC	LOWER ASSUNPINK CREE	I	GOODALL RUBBER CO.	MERCER	HAMILTON TWP.	ASSUNPINK CREEK
NJ0004677	B	LOWER ASSUNPINK CREE	I	IMO INDUSTRIES INC	MERCER	HAMILTON TWP.	ASSUNPINK CREEK
NJ0001198	B	LOWER ASSUNPINK CREE	I	GARDEN STATE WATER C	MERCER	HAMILTON TWP.	POND RUN
NJ0033278	B	LOWER ASSUNPINK CREE	I	WENCZEL TILE COMPANY	MERCER	TRENTON CITY	STORM SEWER TO
NJ0024651	A	LOWER COHANSEY RIVER	M	CUMBERLAND COUNTY FA	CUMBERLAND	BRIDGETON CITY	COHANSEY R.
NJ0025992	A	LOWER COHANSEY RIVER	M	PETRUNIS REALTY CO	CUMBERLAND	BRIDGETON CITY	STORM DRAIN TO
NJ0027511	A	LOWER CROSSWICKS CRK	M	CALIFORNIA VILLA MOB	BURLINGTON	NORTH HANOVER T	CROSSWICKS CREE
NJ0022578	A	LOWER CROSSWICKS CRK	M	MCGUIRE AIR FORCE BA	BURLINGTON	WRIGHTSTOWN BOR	SOUTH RUN

NJPDES NUMBER	DISCHARGE TYPE	WATERSHED	FACILITY TYPE	FACILITY NAME	COUNTY	MUNICIPALITY	RECEIVING WATER
NJ0027464	A	LOWER CROSSWICKS CRK	M	HANOVER MOBILE VILLA	BURLINGTON	NORTH HANOVER T	TRIBUTARY OF CR
NJ0021393	A	LOWER GREAT EGG HARB	M	HAMILTON TOWNSHIP WW	ATLANTIC	HAMILTON TWP.	BABCOCK STR.
NJ0005444	BC	LOWER GREAT EGG HARB	I	B L ENGLAND GENERATI	CAPE MAY	UPPER TWP.	GREAT EGG HARBO
NJ0005177	BC	LOWER GREAT EGG HARB	I	LENOX CHINA	ATLANTIC	GALLOWAY TWP.	JACK PUDDING BR
NJ0020028	A	LOWER HACKENSACK RIV	M	BERGEN CNTY STP	BERGEN	LITTLE FERRY BO	
NJ0002798	C	LOWER HACKENSACK RIV	I	HENKEL CORPORATION	BERGEN	CARLSTADT BORO	
NJ0061492	B	LOWER HACKENSACK RIV	I	BERGEN CO RESOURCE R	BERGEN	RIDGEFIELD BORO	
NJ0062651	B	LOWER HACKENSACK RIV	I	EXXON SERVICE STATIO	BERGEN	ENGLEWOOD CITY	
NJ0034339	A	LOWER HACKENSACK RIV	M	CENTRAL SEWAGE TREAT	HUDSON	NORTH BERGEN TW	
NJ0052736	C	LOWER HACKENSACK RIV	I	ATLAS PLASTICS INC	BERGEN	LITTLE FERRY BO	
NJ0051373	B	LOWER HACKENSACK RIV	I	HAWORTH WATER TREATM	BERGEN	HAWORTH BORO	
NJ0002721	B	LOWER HACKENSACK RIV	I	MATHESON GAS PRODUCT	BERGEN	EAST RUTHERFORD	ACKERMAN'S CREE
NJ0061468	C	LOWER HACKENSACK RIV	I	MEER CORP	HUDSON	NORTH BERGEN TW	BELLMAN'S CREEK
NJ0025186	A	LOWER HACKENSACK RIV	M	WOOD-RIDGE STP	BERGEN	WOOD-RIDGE BORO	BERRY 'S CREEK
NJ0005754	C	LOWER HACKENSACK RIV	I	TECHNICAL OIL PRODUC	BERGEN	CARLSTADT BORO	BERRY'S CREEK
NJ0052540	BC	LOWER HACKENSACK RIV	I	UNITED WIRE HANGER C	BERGEN	HASBROUCK HEIGH	BERRY'S CREEK
NJ0031194	B	LOWER HACKENSACK RIV	I	TEXACO FUEL STORAGE	BERGEN	SOUTH HACKENSAC	BERRYS CREEK
NJ0030970	B	LOWER HACKENSACK RIV	I	ARSYNCO INC	BERGEN	CARLSTADT BORO	BERRYS CREEK
NJ0002798	C	LOWER HACKENSACK RIV	I	HENKEL CORPORATION	BERGEN	CARLSTADT BORO	BERRYS CREEK
NJ0003344	C	LOWER HACKENSACK RIV	I	YOO-HOO BEVERAGE CO	BERGEN	CARLSTADT BORO	BERRYS CREEK
NJ0003468	C	LOWER HACKENSACK RIV	I	HOWMEDICA INC	BERGEN	RUTHERFORD BORO	BERRYS CREEK
NJ0068080	B	LOWER HACKENSACK RIV	I	PEGASUS INDUSTRIAL C	BERGEN	ELMWOOD PARK BO	COOPER POND
NJ0023566	A	LOWER HACKENSACK RIV	M	MEADOWVIEW HOSPITAL	HUDSON	SECAUCUS TOWN	DRAINAGE DITCH
NJ0035025	C	LOWER HACKENSACK RIV	I	OWENS-CORNING FIBERG	HUDSON	KEARNY TOWN	FLOOR DRAIN TO
NJ0002101	BC	LOWER HACKENSACK RIV	I	TRANSCONTINENTAL GAS	BERGEN	CARLSTADT BORO	HACKENSACK RIV
NJ0001031	C	LOWER HACKENSACK RIV	I	BENEDICT-MILLER INC	BERGEN	LYNDHURST TWP.	HACKENSACK RIVE
NJ0000655	BC	LOWER HACKENSACK RIV	I	PSE&G KEARNY GENERAT	HUDSON	KEARNY TOWN	HACKENSACK RIVE
NJ0000647	B	LOWER HACKENSACK RIV	I	PSE&G HUDSON GENERAT	HUDSON	JERSEY CITY	HACKENSACK RIVE
NJ0000621	BC	LOWER HACKENSACK RIV	I	PSE&G BERGEN GENERAT	BERGEN	RIDGEFIELD BORO	HACKENSACK RIVE
NJ0022161	A	LOWER HACKENSACK RIV	M	KEARNY, TOWN OF	HUDSON	KEARNY TOWN	HACKENSACK RIVE
NJ0030996	C	LOWER HACKENSACK RIV	I	GENERAL AUTOMOTIVE S	BERGEN	CARLSTADT BORO	HACKENSACK RIVE
NJ0031992	B	LOWER HACKENSACK RIV	I	MEADOWS MAINTENANCE	ESSEX	NEWARK	HACKENSACK RIVE
NJ0032921	A	LOWER HACKENSACK RIV	M	SECAUCUS MUN UTILITI	HUDSON	SECAUCUS TOWN	HACKENSACK RIVE

NJPDES NUMBER	DISCHARGE TYPE	WATERSHED	FACILITY TYPE	FACILITY NAME	COUNTY	MUNICIPALITY	RECEIVING WATER
NJ0032590	C	LOWER HACKENSACK RIV	I	SPEAR PACKING CORPOR	BERGEN	CARLSTADT BORO	HACKENSACK RIVE
NJ0028584	A	LOWER HACKENSACK RIV	M	GILBERT SYSTEMS WWTP	HUDSON	SECAUCUS TOWN	HACKENSACK RIVE
NJ0035131	C	LOWER HACKENSACK RIV	I	STANDARD TOOL & MFG	BERGEN	LYNDHURST TWP.	HACKENSACK RIVE
NJ0035769	B	LOWER HACKENSACK RIV	I	DUBOIS CHEMICALS INC	BERGEN	EAST RUTHERFORD	HACKENSACK RIVE
NJ0031607	B	LOWER HACKENSACK RIV	I	PENNZOIL PRODUCTS CO	BERGEN	LYNDHURST TWP.	KINGSLAND CREEK
NJ0025038	A	LOWER HACKENSACK RIV	M	KOELLE BLVD WTP - SE	HUDSON	SECAUCUS TOWN	MILL CR.
NJ0003719	C	LOWER HACKENSACK RIV	I	METAL IMPROVEMENT CO	BERGEN	CARLSTADT BORO	MOONACHIE CREEK
NJ0050300	C	LOWER HACKENSACK RIV	I	ALFA INK DIV/LAKELAN	BERGEN	CARLSTADT BORO	MOONACHIE CREEK
NJ0034339	A	LOWER HACKENSACK RIV	M	CENTRAL SEWAGE TREAT	HUDSON	NORTH BERGEN TW	NONE
NJ0061808	B	LOWER HACKENSACK RIV	I	TELEDYNE ISOTOPES	BERGEN	WESTWOOD BORO	ORADELL RESERVO
NJ0002402	B	LOWER HACKENSACK RIV	I	OCCIDENTIAL CHEMICAL	HUDSON	JERSEY CITY	PENHORN CREEK
NJ0027251	A	LOWER HACKENSACK RIV	M	CLIPPER EXXPRESS COM	HUDSON	JERSEY CITY	PENHORN CREEK
NJ0020508	A	LOWER HACKENSACK RIV	M	DAILY NEWS INC	HUDSON	NORTH BERGEN TW	PENHORN CREEK
NJ0000132	B	LOWER HACKENSACK RIV	I	COLORITE PLASTICS	BERGEN	RIDGEFIELD BORO	PLATTY KILL CRE
NJ0023868	B	LOWER HACKENSACK RIV	I	HAWARD CORPORATION	BERGEN	NORTH ARLINGTON	SAW MILL CREEK
NJ0033448	B	LOWER HACKENSACK RIV	I	HMDC BALER WWTP (DSW	BERGEN	DEMAREST BORO	SMALL CREEK
NJ0033669	C	LOWER HACKENSACK RIV	I	TAKASAGO INTERNATION	BERGEN	TETERBORO BORO	STORM SEWER TO
NJ0003646	C	LOWER HACKENSACK RIV	I	UNITED STATES PRINTI	BERGEN	EAST RUTHERFORD	STORM SEWER TO
NJ0002011	BC	LOWER HACKENSACK RIV	I	SIKA CHEMICAL CORPOR	BERGEN	LYNDHURST TWP.	TRIBUTARY TO BE
NJ0032522	BC	LOWER HACKENSACK RIV	I	COSAN CHEMICAL CORP	BERGEN	CARLSTADT BORO	TRIBUTARY TO BE
NJ0001856	C	LOWER HACKENSACK RIV	I	STANDARD CHLORINE CH	HUDSON	KEARNY TOWN	UNNAMED TRIB TO
NJ0051373	B	LOWER HACKENSACK RIV	I	HAWORTH WATER TREATM	BERGEN	HAWORTH BORO	UNNAMED TRIBUTA
NJ0034819	C	LOWER HACKENSACK RIV	I	POLYCAST TECHNOLOGY	BERGEN	HACKENSACK CITY	WEST RISER
NJ0031500	B	LOWER HACKENSACK RIV	I	T R METRO CHEMICALS	BERGEN	RIDGEFIELD BORO	WOLFS CREEK
NJ0029581	B	LOWER MAURICE RIVER	I	JOHN T HANDY COMPANY	CUMBERLAND	COMMERCIAL TWP.	MAURICE RIVER
NJ0026051	B	LOWER MAURICE RIVER	I	PORT NORRIS OYSTER C	CUMBERLAND	COMMERCIAL TWP.	MAURICE RIVER
NJ0004766	B	LOWER MAURICE RIVER	I	SURFSIDE PRODUCTS IN	CUMBERLAND	COMMERCIAL TWP.	MAURICE RIVER
NJ0035301	A	LOWER MILLSTONE RIVE	M	STONY BROOK REGIONAL	MERCER	PRINCETON TWP.	BEDEN BROOK
NJ0032417	A	LOWER MILLSTONE RIVE	M	BEDENS BROOK CLUB	SOMERSET	MONTGOMERY TWP.	BEDENS BROOK
NJ0020656	A	LOWER MILLSTONE RIVE	M	GENERAL SERVICE ADMI	SOMERSET	HILLSBOROUGH TW	BRANCH CRUISERS
NJ0023663	A	LOWER MILLSTONE RIVE	M	CARRIER CLINIC	SOMERSET	MONTGOMERY TWP.	CRUISERS BROOK
NJ0000191	B	LOWER MILLSTONE RIVE	I	COLUMBIAN CHEMICALS	MIDDLESEX	SOUTH BRUNSWICK	HEATHCOTE BROOK
NJ0003794	B	LOWER MILLSTONE RIVE	I	MC LEAN ENGR LABS IN	MERCER	WEST WINDSOR TW	LITTLE BEAR BRO

NJPDES NUMBER	DISCHARGE TYPE	WATERSHED	FACILITY TYPE	FACILITY NAME	COUNTY	MUNICIPALITY	RECEIVING WATER
NJ0032565	B	LOWER MILLSTONE RIVE	I	INGERSOLL-RAND RESEA	SOMERSET	MONTGOMERY TWP.	MILLSTONE RIVER
NJ0031119	A	LOWER MILLSTONE RIVE	M	STONY BROOK TP - RIV	MERCER	PRINCETON TWP.	MILLSTONE RIVER
NJ0026905	A	LOWER MILLSTONE RIVE	M	STAGE II TREATMENT P	SOMERSET	MONTGOMERY TWP.	MILLSTONE RIVER
NJ0026913	A	LOWER MILLSTONE RIVE	M	SLEEPY HOLLOW STP	SOMERSET	MONTGOMERY TWP.	PIKE BROOK
NJ0003255	B	LOWER MILLSTONE RIVE	I	3M COMPANY	SOMERSET	MONTGOMERY TWP.	ROARING BROOK
NJ0022390	A	LOWER MILLSTONE RIVE	M	NORTH PRINCETON DEV	SOMERSET	MONTGOMERY TWP.	ROCK BROOK
NJ0022772	A	LOWER MILLSTONE RIVE	M	FIELDHEDGE STP	SOMERSET	HILLSBOROUGH TW	ROYCE BR.
NJ0020036	A	LOWER MILLSTONE RIVE	M	DEPT OF VETERANS AFF	SOMERSET	SOMERVILLE BORO	ROYCEFIELD BROO
NJ0023523	C	LOWER MILLSTONE RIVE	I	OKONITE COMPANY THE	MIDDLESEX	NORTH BRUNSWICK	SIX MILE RUN
NJ0060992	B	LOWER MILLSTONE RIVE	I	BENTON FIBRE DRUM CO	MONMOUTH	MILLSTONE TWP.	TRIBUTARY TO MI
NJ0067156	B	LOWER MILLSTONE RIVE	I	WATER TREATMENT PLAN	MONMOUTH	MARLBORO TWP.	TRIBUTARY TO PI
NJ0036021	C	LOWER MILLSTONE RIVE	I	AETNA GAS PRODUCTS.	SOMERSET	HILLSBOROUGH TW	TRIBUTARY TO RO
NJ0023019	B	LOWER MILLSTONE RIVE	I	INDUSTRIAL TUBE CORP	SOMERSET	SOMERVILLE BORO	UNNAMED TRIBUTA
NJ0028223	C	LOWER MULLICA RIVER	I	EASTERN BREWING CORP	ATLANTIC	HAMMONTON TOWN	CEDAR BROOK
NJ0027189	A	LOWER MULLICA RIVER	M	ATLANTIC CITY SERVIC	ATLANTIC	GALLOWAY TWP.	MATTILY RUN
NJ0025569	A	LOWER MUSCONETCONG R	M	BLOOMSBURY WATER COM	HUNTERDON	BLOOMSBURY BORO	MUSCONETCONG RI
NJ0028657	B	LOWER MUSCONETCONG R	I	BP PERFORMANCE POLYM	WARREN	MANSFIELD TWP.	MUSCONETCONG RI
NJ0031208	C	LOWER MUSCONETCONG R	I	ASBURY GRAPHITE MILL	WARREN	FRANKLIN TWP.	MUSCONETCONG RI
NJ0023094	B	LOWER MUSCONETCONG R	I	GARDEN STATE TRUCK P	HUNTERDON	BLOOMSBURY BORO	MUSCONETCONG RI
NJ0004448	BC	LOWER MUSCONETCONG R	I	RIEGEL - FITCHBURG D	HUNTERDON	HOLLAND TWP.	MUSCONETCONG RI
NJ0003638	B	LOWER NORTH BRANCH R	I	TAYLOR FORGE STAINLE	SOMERSET	BRANCHBURG TWP.	DRAINAGE DITCH
NJ0027227	A	LOWER NORTH BRANCH R	M	JOHN Z DELOREAN	SOMERSET	BEDMINSTER TWP.	MIDDLE BROOK
NJ0026387	A	LOWER NORTH BRANCH R	M	BERNARDSVILLE, BOROU	SOMERSET	BERNARDSVILLE B	MINE BROOK
NJ0005509	BC	LOWER NORTH BRANCH R	I	SYBRON CHEMICALS INC	BURLINGTON	PEMBERTON TWP.	NORTH BRANCH OF
NJ0027596	A	LOWER NORTH BRANCH R	M	SPARTAN VILLAGE MOBI	BURLINGTON	WRIGHTSTOWN BOR	NORTH RUM
NJ0024821	A	LOWER NORTH BRANCH R	M	PEMBERTON TOWNSHIP M	BURLINGTON	PEMBERTON TWP.	RANCOCAS CR.
NJ0024015	A	LOWER NORTH BRANCH R	M	MOUNT HOLLY SEWERAGE	BURLINGTON	MOUNT HOLLY TWP	RANCOCAS CREEK
NJ0021768	A	LOWER NORTH BRANCH R	M	NEW LISBON DEVELOPME	BURLINGTON	WOODLAND TWP.	RANCOCAS CREEK
NJ0002569	C	LOWER NORTH BRANCH R	I	HARRIS SEMICONDUCTOR	SOMERSET	BRIDGEWATER TWP	TRIB OF NORTH B
NJ0054755	C	LOWER NORTH BRANCH R	I	PENN COLOR INC	HUNTERDON	FLEMINGTON BORO	UNNAMED TRIBUTA
NJ0029483	BC	LOWER PASSAIC RIVER	I	WITCO CHEMICAL CORP	MIDDLESEX	PERTH AMBOY CIT	
NJ0029505	B	LOWER PASSAIC RIVER	I	GOODY PRODUCTS INC	HUDSON	KEARNY TOWN	DEAD HORSE CREE
NJ0034959	B	LOWER PASSAIC RIVER	I	INTERSTATE RTE 280 N	HUDSON	KEARNY TOWN	FRANK'S CREEK

NJPDES NUMBER	DISCHARGE TYPE	WATERSHED	FACILITY TYPE	FACILITY NAME	COUNTY	MUNICIPALITY	RECEIVING WATER
NJ0031313	B	LOWER PASSAIC RIVER	I	KLEER KAST DIV OF PM	HUDSON	KEARNY TOWN	FRANKS CREEK
NJ0034983	C	LOWER PASSAIC RIVER	I	SWENSON CO INC	HUDSON	KEARNY TOWN	HACKENSACK RIVE
NJ0029335	BC	LOWER PASSAIC RIVER	I	PEERLESS TUBE CO INC	ESSEX	BLOOMFIELD TOWN	LLOYDS BROOK
NJ0029815	BC	LOWER PASSAIC RIVER	I	DURO-TEST CORPORATIO	PASSAIC	CLIFTON CITY	MACDONALDS BROO
NJ0031348	B	LOWER PASSAIC RIVER	I	TENNECO OIL COMPANY	HUDSON	HARRISON TOWN	PASSAIC RIVER
NJ0026034	B	LOWER PASSAIC RIVER	I	GETTY PETROLEUM CORP	ESSEX	NEWARK	PASSAIC RIVER
NJ0028185	B	LOWER PASSAIC RIVER	I	Q PETROLEUM INC	ESSEX	NEWARK	PASSAIC RIVER
NJ0027901	B	LOWER PASSAIC RIVER	I	RIVER OIL TERMINAL	PASSAIC	PASSAIC CITY	PASSAIC RIVER
NJ0027901	B	LOWER PASSAIC RIVER	I	RIVER OIL TERMINAL	PASSAIC	PASSAIC CITY	PASSAIC RIVER
NJ0020214	C	LOWER PASSAIC RIVER	I	ITT AVIONICS	PASSAIC	CLIFTON CITY	PASSAIC RIVER
NJ0002283	C	LOWER PASSAIC RIVER	I	PERIDOT CHEMICALS	ESSEX	NEWARK	PASSAIC RIVER
NJ0002194	C	LOWER PASSAIC RIVER	I	FRANKLIN PLASTICS CO	HUDSON	KEARNY TOWN	PASSAIC RIVER
NJ0000370	C	LOWER PASSAIC RIVER	I	GARDEN STATE PAPER C	BERGEN	GARFIELD CITY	PASSAIC RIVER
NJ0000124	C	LOWER PASSAIC RIVER	I	KALAMA CHEMICAL INC	BERGEN	GARFIELD CITY	PASSAIC RIVER
NJ0000566	C	LOWER PASSAIC RIVER	I	PSE&G HARRISON GAS P	HUDSON	HARRISON TOWN	PASSAIC RIVER
NJ0000639	B	LOWER PASSAIC RIVER	I	PSE&G ESSEX GENERATI	ESSEX	NEWARK	PASSAIC RIVER
NJ0000124	B	LOWER PASSAIC RIVER	I	KALAMA CHEMICAL INC	BERGEN	GARFIELD CITY	PASSAIC RIVER
NJ0033430	C	LOWER PASSAIC RIVER	I	FAIRMOUNT CHEMICAL C	ESSEX	NEWARK	PASSAIC RIVER
NJ0034193	BC	LOWER PASSAIC RIVER	I	MANSOL CERAMICS INDU	ESSEX	BELLEVILLE TOWN	PASSAIC RIVER
NJ0035572	C	LOWER PASSAIC RIVER	I	P F LABORATORIES INC	PASSAIC	PASSAIC CITY	PASSAIC RIVER
NJ0028410	A	LOWER PASSAIC RIVER	M	SECAUCUS MOTOR LODGE	HUDSON	SECAUCUS TOWN	PENHORN CREEK
NJ0070271	C	LOWER PASSAIC RIVER	I	NEW YORK TWIST DRILL	BERGEN	RAMSEY BORO	RAMSEY BROOK
NJ0029441	B	LOWER PASSAIC RIVER	I	THERMO ELECTRIC CO.,	BERGEN	SADDLE BROOK TW	SCHROEDERS BROO
NJ0055808	B	LOWER PASSAIC RIVER	I	FLEXON INDUSTRIES CO	ESSEX	BELLEVILLE TOWN	STORM DRAINAGE
NJ0052078	B	LOWER PASSAIC RIVER	I	LUMMUS CREST INC.	ESSEX	BLOOMFIELD TOWN	THIRD RIVER
NJ0020435	C	LOWER PASSAIC RIVER	I	ITT DEFENSE COMMUNIC	ESSEX	NUTLEY TOWN	THIRD RIVER
NJ0003760	C	LOWER PASSAIC RIVER	I	NATIONAL STARCH & CH	ESSEX	BLOOMFIELD TOWN	THIRD RIVER
NJ0001287	C	LOWER PASSAIC RIVER	I	SHULTON INC	PASSAIC	LITTLE FALLS TW	WEASEL BROOK
NJ0020478	C	LOWER PASSAIC RIVER	I	PANTASOTE POLYMERS I	PASSAIC	PASSAIC CITY	WEASEL BROOK
NJ0034932	C	LOWER PASSAIC RIVER	I	CLIFTON ENTERPRISES	PASSAIC	CLIFTON CITY	WEASEL BROOK
NJ0068349	C	LOWER PAULINS KILL	I	KASCO CORPORATION	SUSSEX	WANTAGE TWP.	QUARRYVILLE BRO
NJ0031631	C	LOWER PEQUEST RIVER	I	PARAGON SUPPLIES	WARREN	HOPE TWP.	BEAVER BROOK
NJ0004901	B	LOWER PEQUEST RIVER	I	OXFORD TEXTILE INC	WARREN	OXFORD TWP.	FURNACE BROOK

NJPDES NUMBER	DISCHARGE TYPE	WATERSHED	FACILITY TYPE	FACILITY NAME	COUNTY	MUNICIPALITY	RECEIVING WATER
NJ0005291	C	LOWER PEQUEST RIVER	I	SOUTHLAND CORP	WARREN	INDEPENDENCE TW	PEQUEST RIVER
NJ0020605	A	LOWER PEQUEST RIVER	M	PEQUEST SEWER CO	WARREN	ALLAMUCHY TWP.	PEQUEST RIVER
NJ0029033	B	LOWER PEQUEST RIVER	I	PEQUEST WATER CO	WARREN	ALLAMUCHY TWP.	PEQUEST RIVER
NJ0035483	A	LOWER PEQUEST RIVER	M	OXFORD AREA WTF	WARREN	OXFORD TWP.	PEQUEST RIVER
NJ0052523	C	LOWER PEQUEST RIVER	I	HOFFMAN-LA ROCHE INC	WARREN	BELVIDERE TOWN	STORM SEWER TO
NJ0050954	C	LOWER PEQUEST RIVER	I	NEWTON T&M CORP	SUSSEX	FREDON TWP.	TRIBUTARY TO PE
NJ0005151	BC	LOWER SALEM RIVER	I	ANCHOR GLASS CONTAIN	SALEM	SALEM CITY	FENWICK CREEK
NJ0035742	B	LOWER SALEM RIVER	I	SALEM WTP, CITY OF	SALEM	SALEM CITY	KEASBEY CREEK
NJ0005614	C	LOWER SALEM RIVER	I	MANNINGTON MILLS INC	SALEM	MANNINGTON TWP.	PLEDGER CREEK
NJ0024856	A	LOWER SALEM RIVER	M	SALEM SEWAGE TREATME	SALEM	SALEM CITY	SALEM R.
NJ0023990	A	LOWER SOUTH BRANCH R	M	RANCOCAS WOODS STP	BURLINGTON	MOUNT LAUREL TW	RANCOCAS CREEK
NJ0063975	B	LOWER SOUTH BRANCH R	I	EXXON SERVICE STATIO	BURLINGTON	EVESHAM TWP.	SOTH BRANCH OF
NJ0020354	A	LOWER SOUTH BRANCH R	M	BRANCHBURG NESHANIC	SOMERSET	BRANCHBURG TWP.	SOUTH BRANCH RA
NJ0003051	B	LOWER SOUTH BRANCH R	I	WILSON-FIBERFIL/DART	SOMERSET	BRANCHBURG TWP.	SOUTH BRANCH RA
NJ0005746	B	LOWER TOMS RIVER	I	HERITAGE MINERALS IN	OCEAN	MANCHESTER TWP.	GREEN BRANCH OF
NJ0005649	B	LOWER TOMS RIVER	I	TOMS RIVER WATER CO	OCEAN	DOVER TWP.	TOMS RIVER
NJ0050580	A	LOWER WALLKILL RIVER	M	HAMPTON COMMONS STP	SUSSEX	HAMPTON TWP.	
NJ0021857	A	LOWER WALLKILL RIVER	M	SUSSEX BORO OF	SUSSEX	SUSSEX BORO	WALLKILL R.
NJ0053473	B	MANALAPAN BROOK	I	B & J WARREN & SONS	MIDDLESEX	MONROE TWP.	
NJ0055581	B	MANASQUAN RIVER	I	FARMINGDALE WATER TR	MONMOUTH	KEANSBURG BORO	
NJ0022977	A	MANASQUAN RIVER	M	ARTHUR BRISBANE CHIL	MONMOUTH	WALL TWP.	BRANCH OF MANAS
NJ0005606	C	MANASQUAN RIVER	I	NESTLE/HILLS COFFEE	MONMOUTH	FREEHOLD BORO	DEBOIS CREEK
NJ0029661	B	MANASQUAN RIVER	I	FIRST BRANDS CORPORA	MONMOUTH	FREEHOLD BORO	DITCH/BURKES CR
NJ0050270	B	MANASQUAN RIVER	I	HOWELL-FREEHOLD CAR	MONMOUTH	COLTS NECK TWP.	LONG BROOK
NJ0031917	C	MANASQUAN RIVER	I	CAPSCAN CABLE COMPAN	MONMOUTH	HOWELL TWP.	MANASQUAN RIVER
NJ0004910	C	MANASQUAN RIVER	I	PEERLESS TUBE COMPAN	MONMOUTH	FREEHOLD TWP.	MANASQUAN RIVER
NJ0028622	B	MANASQUAN RIVER	I	FREQUENCY ENGINEERIN	MONMOUTH	FARMINGDALE BOR	MINGAMAHONE BRO
NJ0053511	B	MANASQUAN RIVER	I	U S MILITARY SEALIFT	MONMOUTH	FREEHOLD BORO	TRIBUTARY OF TH
NJ0067164	B	MANASQUAN RIVER	I	GORDON'S CORNER WATE	MONMOUTH	MARLBORO TWP.	TRIBUTARY TO BI
NJ0004961	B	MANASQUAN RIVER	I	BORDEN'S CLAM PRODUC	CAPE MAY	LOWER TWP.	UPPER THOROFARE
NJ0032956	C	MANASQUAN RIVER	I	HARWOOD COMPANY	MONMOUTH	FARMINGDALE BOR	YELLOW BROOK CR
NJ0057771	B	MANTUA CREEK	I	PAULSBORO WATER TREA	GLOUCESTER	PAULSBORO BORO	
NJ0026191	B	MANTUA CREEK	I	PAULSBORO W T P WELL	GLOUCESTER	PAULSBORO BORO	CLONMELL CREEK

NJPDES NUMBER	DISCHARGE TYPE	WATERSHED	FACILITY TYPE	FACILITY NAME	COUNTY	MUNICIPALITY	RECEIVING WATER
NJ0004146	B	MANTUA CREEK	I	INVERSAND COMPANY-SE	GLOUCESTER	MANTUA TWP.	KNIGHTS RUN
NJ0036153	B	MANTUA CREEK	I	NALCO CHEMICAL CO	GLOUCESTER	PAULSBORO BORO	LITTLE MANTUA C
NJ0035831	B	MANTUA CREEK	I	HUNTSMAN POLYPROPYLE	GLOUCESTER	WOODBURY CITY	MANTUA CREEK
NJ0033588	C	MANTUA CREEK	I	ICI POLYURETHANES GR	GLOUCESTER	WOODBURY CITY	MANTUA CREEK
NJ0064921	B	MANTUA CREEK	I	SEAVIEW PETROLEUM CO	GLOUCESTER	WEST DEPTFORD T	MANTUA CREEK
NJ0062782	B	MANTUA CREEK	I	AMOCO SERVICE STATIO	GLOUCESTER	PITMAN BORO	MANTUA CREEK
NJ0004413	C	MANTUA CREEK	I	SONY MUSIC ENTERTAIN	GLOUCESTER	PITMAN BORO	MANTUA CREEK
NJ0032531	B	MANTUA CREEK	I	HAUSMAN BUS SALES IN	GLOUCESTER	PITMAN BORO	ST SEW TO DITCH
NJ0023728	A	MATCHAPONIX BROOK	M	PINE BROOK STP	MONMOUTH	MANALAPAN TWP.	W MONMOUTH UTIL
NJ0029467	A	MAURICE RIVER/UNION	M	MILLVILLE CITY OF	CUMBERLAND	MILLVILLE CITY	
NJ0062731	B	MAURICE RIVER/UNION	I	SEABROOK PLANT	OCEAN	LACEY TWP.	
NJ0004618	B	MAURICE RIVER/UNION	I	NEW JERSEY SILICA SA	CUMBERLAND	MILLVILLE CITY	MANUMUSKIN RIVE
NJ0004499	C	MAURICE RIVER/UNION	I	O I KIMBLE STS INC	CUMBERLAND	VINELAND CITY	MAURICE RIVER
NJ0005398	B	MAURICE RIVER/UNION	I	AMERICAN NATIONAL CA	CUMBERLAND	MILLVILLE CITY	MAURICE RIVER
NJ0029696	B	MAURICE RIVER/UNION	I	BIVALVE PACKING CO.,	CUMBERLAND	COMMERCIAL TWP.	MAURICE RIVER
NJ0004880	C	MAURICE RIVER/UNION	I	PROGRESSO FOODS, PET	CUMBERLAND	VINELAND CITY	PARVIN BRANCH
NJ0004171	C	MAURICE RIVER/UNION	I	WHEATON GLASS COMPAN	CUMBERLAND	MILLVILLE CITY	PETTICOAT STRM
NJ0004499	C	MAURICE RIVER/UNION	I	O I KIMBLE STS INC	CUMBERLAND	VINELAND CITY	PINE BRANCH OF
NJ0004499	C	MAURICE RIVER/UNION	I	O I KIMBLE STS INC	CUMBERLAND	VINELAND CITY	PINE BRANCH OF
NJ0004499	C	MAURICE RIVER/UNION	I	O I KIMBLE STS INC	CUMBERLAND	VINELAND CITY	PINE BRANCH OF
NJ0062430	C	MAURICE RIVER/UNION	I	R B WHITAKER & SON(I	CUMBERLAND	MILLVILLE CITY	STORM SEWER TO
NJ0023744	C	MAURICE RIVER/UNION	I	WEST COMPANY	CUMBERLAND	MILLVILLE CITY	WHEETON POND TO
NJ0020737	A	MID CROSSWICKS CREEK	M	NEW JERSEY TURNPIKE	MERCER	HAMILTON TWP.	CROSSWICK'S CR.
NJ0024121	A	MID CROSSWICKS CREEK	M	MILE HOLLOW STP	BURLINGTON	BORDENTOWN TWP.	CROSSWICKS CR.
NJ0028649	B	MID CROSSWICKS CREEK	I	BORDENTOWN WATER DEP	MERCER	HAMILTON TWP.	CROSSWICKS CREE
NJ0026301	A	MID CROSSWICKS CREEK	M	HAMILTON TOWNSHIP WT	MERCER	HAMILTON TWP.	CROSSWICKS CREE
NJ0026719	A	MID CROSSWICKS CREEK	M	AC WAGNER/GARDEN ST	BURLINGTON	BORDENTOWN TWP.	CROSSWICKS CREE
NJ0004332	B	MID CROSSWICKS CREEK	I	YATES INDUSTRIES INC	BURLINGTON	BORDENTOWN TWP.	MILE HOLLOW BRO
NJ0004324	C	MID GREAT EGG HARBOR	I	SCOTT PAPER CO	ATLANTIC	BUENA BORO	DEEP RUN
NJ0026531	A	MID GREAT EGG HARBOR	M	NEW JERSEY EXPRESSWA	ATLANTIC	HAMILTON TWP.	MAKEPEACE STREA
NJ0021717	A	MID GREAT EGG HARBOR	M	BUENA STP	ATLANTIC	BUENA BORO	TRIBUTORY TO TH
NJ0065986	B	MID MAURICE RIVER	I	ROBBIN & ROBBINS INC	CUMBERLAND	COMMERCIAL TWP.	MAURICE RIVER
NJ0069001	B	MID MAURICE RIVER	I	KINGS CRAB RANCH	CUMBERLAND	COMMERCIAL TWP.	MAURICE RIVER

NJPDES NUMBER	DISCHARGE TYPE	WATERSHED	FACILITY TYPE	FACILITY NAME	COUNTY	MUNICIPALITY	RECEIVING WATER
NJ0025160	A	MID MULLICA RIVER	M	HAMMONTON WTP	ATLANTIC	HAMMONTON TOWN	HAMMONTON CR.
NJ0005428	B	MID MULLICA RIVER	I	CARPENTER REALTY INC	BURLINGTON	WASHINGTON TWP.	MULLICA RIVER
NJ0005428	BC	MID MULLICA RIVER	I	CARPENTER REALTY INC	BURLINGTON	WASHINGTON TWP.	MULLICA RIVER
NJ0024210	B	MID MULLICA RIVER	I	WHITEHALL LABORATORI	ATLANTIC	HAMMONTON TOWN	SERIES OF PONDS
NJ0024589	A	MID MULLICA RIVER	M	EGG HARBOR CITY WWTP	ATLANTIC	EGG HARBOR CITY	UNION CREEK
NJ0024511	A	MID PASSAIC RIVER	M	TWP OF LIVINGSTON ST	ESSEX	LIVINGSTON TWP.	PASSAIC R.
NJ0024431	A	MID PASSAIC RIVER	M	FOREST PARK STP	MORRIS	MONTVILLE TWP.	PASSAIC RIVER
NJ0020427	A	MID PASSAIC RIVER	M	CALDWELL STP	ESSEX	CALDWELL BORO	PASSAIC RIVER
NJ0052337	C	MID PASSAIC RIVER	I	HOFFMAN-LAROCHE INC	PASSAIC	TOTOWA BORO	SINGAC BROOK
NJ0063509	C	MID PASSAIC RIVER	I	GARFIELD INDUSTRIES	ESSEX	FAIRFIELD BORO	
NJ0030902	C	MID PASSAIC RIVER	I	KEARFOTT GUIDANCE &	PASSAIC	LITTLE FALLS TW	
NJ0027758	A	MID PASSAIC RIVER	M	US POSTAL SERVICE	HUDSON	KEARNY TOWN	DEAD HORSE CREE
NJ0028096	C	MID PASSAIC RIVER	I	PCI INCORPORATED	ESSEX	WEST CALDWELL B	DEEPAVAAL BROOK
NJ0002976	B	MID PASSAIC RIVER	I	CURTISS-WRIGHT FLIGH	ESSEX	FAIRFIELD BORO	DEEPAVAAL BROOK
NJ0067636	C	MID PASSAIC RIVER	I	M L MANUFACTURING IN	ESSEX	FAIRFIELD BORO	DEEPAVAAL BROOK
NJ0054089	C	MID PASSAIC RIVER	I	SYNFAX MANUFACTURING	ESSEX	FAIRFIELD BORO	DEEPAVAAL BROOK
NJ0034428	C	MID PASSAIC RIVER	I	SPECIALTY TONER CORP	ESSEX	FAIRFIELD BORO	DEEPAVAAL BROOK
NJ0003450	C	MID PASSAIC RIVER	I	CONSUMER HEALTH CARE	MORRIS	PARSIPPANY TROY	EASTMANS BROOK
NJ0033146	C	MID PASSAIC RIVER	I	CUSTOM CHEMICALS CO	PASSAIC	PATERSON CITY	FLEISHERS BROOK
NJ0002577	C	MID PASSAIC RIVER	I	FAIR LAWN BAKERY	BERGEN	FAIR LAWN BORO	HENDERSON BROOK
NJ0021121	A	MID PASSAIC RIVER	M	SEAVILLE SERVICE ARE	CAPE MAY	DENNIS TWP.	LUDLAMS BROOK
NJ0033235	C	MID PASSAIC RIVER	I	PHILIPS ELECTRONIC I	BERGEN	MAHWAH TWP.	MASONICUS BROOK
NJ0003964	B	MID PASSAIC RIVER	I	HALEDON WATER DEPT,	PASSAIC	NORTH HALEDON B	MOLLY ANN BROOK
NJ0001589	C	MID PASSAIC RIVER	I	STONE INDUSTRIES INC	PASSAIC	HALEDON BORO	MOLLY ANNS BROO
NJ0028541	A	MID PASSAIC RIVER	M	BIRCH HILL PARK STP	PASSAIC	WANAQUE BORO	MUSCONETCONG RI
NJ0025607	B	MID PASSAIC RIVER	I	PASSAIC VALLEY WATER	PASSAIC	TOTOWA BORO	PASSAIC RIVER
NJ0031801	C	MID PASSAIC RIVER	I	UNION CAMP CORPORATI	PASSAIC	WAYNE TWP.	PASSAIC RIVER
NJ0030112	B	MID PASSAIC RIVER	I	REXON TECHNOLOGY COR	ESSEX	FAIRFIELD BORO	PASSAIC RIVER
NJ0030104	C	MID PASSAIC RIVER	I	REXON TECHNOLOGY COR	PASSAIC	WAYNE TWP.	PASSAIC RIVER
NJ0030074	B	MID PASSAIC RIVER	I	PRESTIGE PLASTICS &	MORRIS	RIVERDALE BORO	PASSAIC RIVER
NJ0030031	B	MID PASSAIC RIVER	I	PAN CHEMICAL CORPORA	PASSAIC	HAWTHORNE BORO	PASSAIC RIVER
NJ0021288	B	MID PASSAIC RIVER	I	KEARFOTT GUIDANCE &	PASSAIC	WEST PATERSON B	PASSAIC RIVER
NJ0021288	BC	MID PASSAIC RIVER	I	KEARFOTT GUIDANCE &	PASSAIC	WEST PATERSON B	PASSAIC RIVER

NJPDES NUMBER	DISCHARGE TYPE	WATERSHED	FACILITY TYPE	FACILITY NAME	COUNTY	MUNICIPALITY	RECEIVING WATER
NJ0001651	B	MID PASSAIC RIVER	I	GIVAUDAN CORP	MORRIS	EAST HANOVER TW	PASSAIC RIVER
NJ0000906	C	MID PASSAIC RIVER	I	KEM MANUFACTURING CO	BERGEN	FAIR LAWN BORO	PASSAIC RIVER
NJ0001651	BC	MID PASSAIC RIVER	I	GIVAUDAN CORP	MORRIS	EAST HANOVER TW	PASSAIC RIVER
NJ0002453	C	MID PASSAIC RIVER	I	BASF CORP-CHEMICAL D	PASSAIC	HAWTHORNE BORO	PASSAIC RIVER
NJ0035009	C	MID PASSAIC RIVER	I	MONA INDUSTRIES INC	PASSAIC	PATERSON CITY	PASSAIC RIVER
NJ0035173	C	MID PASSAIC RIVER	I	MAAS & WALDSTEIN CO	ESSEX	NEWARK	PASSAIC RIVER
NJ0034053	B	MID PASSAIC RIVER	I	WILLOWBROOK CAR WASH	PASSAIC	WAYNE TWP.	PASSAIC RIVER
NJ0035459	C	MID PASSAIC RIVER	I	FCM INC	BERGEN	GARFIELD CITY	PASSAIC RIVER
NJ0060909	C	MID PASSAIC RIVER	I	PRIVATE LABEL COSMET	BERGEN	FAIR LAWN BORO	PASSAIC RIVER
NJ0021687	A	MID PASSAIC RIVER	M	ESSEX COUNTY SANITOR	ESSEX	CEDAR GROVE TWP	PECKMAN R.
NJ0024490	A	MID PASSAIC RIVER	M	VERONA WTP	ESSEX	VERONA BORO	PECKMAN R.
NJ0025330	A	MID PASSAIC RIVER	M	CEDAR GROVE STP	ESSEX	CEDAR GROVE TWP	PECKMAN RIVER
NJ0027847	B	MID PASSAIC RIVER	I	SERVOMETER CORPORATI	ESSEX	CEDAR GROVE TWP	PECKMAN RIVER
NJ0021270	C	MID PASSAIC RIVER	I	KEARFOTT GUIDANCE &	PASSAIC	WEST PATERSON B	PECKMAN RIVER
NJ0034941	B	MID PASSAIC RIVER	I	SCHMID PRODUCTS CO.	PASSAIC	PASSAIC CITY	PECKMAN RIVER
NJ0023698	A	MID PASSAIC RIVER	M	POMPTON LAKES BOROUG	PASSAIC	POMPTON LAKES B	POMPTON RIVER
NJ0026514	A	MID PASSAIC RIVER	M	PLAINS PLAZA SHOPPIN	MORRIS	PEQUANNOCK TWP.	POMPTON RIVER
NJ0071706	C	MID PASSAIC RIVER	I	PROLL MOLDING CO., I	ESSEX	BLOOMFIELD TOWN	SECOND RIV TO P
NJ0028002	A	MID PASSAIC RIVER	M	MOUNTAIN VIEW STP	PASSAIC	WAYNE TWP.	SINGAC BROOK
NJ0034185	B	MID PASSAIC RIVER	I	HOFFMANN-LA ROCHE IN	ESSEX	NUTLEY TOWN	ST. PAUL'S BROO
NJ0052531	C	MID PASSAIC RIVER	I	CUSTOM MOLDERS CORPO	UNION	SCOTCH PLAINS T	STORM SEWER TO
NJ0029751	C	MID PASSAIC RIVER	I	CHEMSPRAY PACKAGING	PASSAIC	TOTOWA BORO	STORM SEWER TO
NJ0031623	C	MID PASSAIC RIVER	I	H & N CHEMICAL COMPA	PASSAIC	TOTOWA BORO	STORM SEWER TO
NJ0003841	B	MID PASSAIC RIVER	I	SUN CHEMICAL CORPORA	BERGEN	EAST RUTHERFORD	STORM SEWER TO
NJ0031003	B	MID PASSAIC RIVER	I	UNIMATIC MANUFACTURI	ESSEX	FAIRFIELD BORO	TRIBUTARY TO PA
NJ0003573	B	MID PASSAIC RIVER	I	FINETEX INC	BERGEN	ELMWOOD PARK BO	UNNAMED TRIB TO
NJ0030317	A	MID PASSAIC RIVER	M	MONTVILLE TOWNSHIP M	MORRIS	MONTVILLE TWP.	VALHALLA BRK
NJ0027430	C	MID PASSAIC RIVER	I	ALFRED HELLER HEAT T	PASSAIC	CLIFTON CITY	WABASH BROOK
NJ0002615	CB	MID PASSAIC RIVER	I	OKONITE COMPANY	PASSAIC	PASSAIC CITY	WEASEL BROOK
NJ0000035	C	MID PASSAIC RIVER	I	ATHENIA STEEL DIVISI	PASSAIC	CLIFTON CITY	WEASEL BROOK
NJ0029327	C	MID PASSAIC RIVER	I	PEERLESS TUBE CO INC	ESSEX	BLOOMFIELD TOWN	WIGWAM BROOK
NJ0028436	A	MIDDLE SOUTH BRANCH	M	RARITAN TWP MUA	HUNTERDON	FLEMINGTON BORO	BUSHKILL CREEK
NJ0022144	A	MIDDLE SOUTH BRANCH	M	HAGEDORN CENTER FOR	HUNTERDON	LEBANON BORO	ROCKY RUN

NJPDES NUMBER	DISCHARGE TYPE	WATERSHED	FACILITY TYPE	FACILITY NAME	COUNTY	MUNICIPALITY	RECEIVING WATER
NJ0003298	C	MIDDLE SOUTH BRANCH	I	TREDEGAR INDUSTRIES	HUNTERDON	RARITAN TWP.	SOUTH BRANCH
NJ0022047	A	MIDDLE SOUTH BRANCH	M	RARITAN TOWNSHIP STP	HUNTERDON	FLEMINGTON BORO	SOUTH BRANCH OF
NJ0020389	A	MIDDLE SOUTH BRANCH	M	CLINTON TOWN OF WWTP	HUNTERDON	CLINTON TWP.	SOUTH BRANCH RA
NJ0003905	B	MIDDLE SOUTH BRANCH	I	MERCK & CO INC	SOMERSET	HILLSBOROUGH TW	SOUTH BRANCH RA
NJ0026735	A	MONMOUTH COUNTY	M	NORTHEAST MONMOUTH C	MONMOUTH	MONMOUTH BEACH	ATLANTIC OCEAN
NJ0025241	A	MONMOUTH COUNTY	M	ASBURY PARK STP	MONMOUTH	ASBURY PARK CIT	ATLANTIC OCEAN
NJ0024872	A	MONMOUTH COUNTY	M	TNSA WATER POLLUTION	MONMOUTH	NEPTUNE TWP.	ATLANTIC OCEAN
NJ0024520	A	MONMOUTH COUNTY	M	OCEAN SA TOWNSHIP O	MONMOUTH	OCEAN TWP.	ATLANTIC OCEAN
NJ0024562	A	MONMOUTH COUNTY	M	SOUTH MONMOUTH REGIO	MONMOUTH	WALL TWP.	ATLANTIC OCEAN
NJ0024872	A	MONMOUTH COUNTY	M	TNSA WATER POLLUTION	MONMOUTH	NEPTUNE TWP.	ATLANTIC OCEAN
NJ0024783	A	MONMOUTH COUNTY	M	LONG BRANCH SEWERAGE	MONMOUTH	LONG BRANCH CIT	ATLANTIC OCEAN
NJ0024694	A	MONMOUTH COUNTY	M	MONMOUTH CO BAYSHORE	MONMOUTH	MIDDLETOWN TWP.	ATLANTIC OCEAN
NJ0022586	A	NAVESINK RIVER	M	MARLBORO PSYCHIATRIC	MONMOUTH	MATAWAN BORO	BIG BROOK
NJ0027529	A	NAVESINK RIVER	M	HOLMDEL NURSING & CO	MONMOUTH	HOLMDEL TWP.	BRANCH WILLOW
NJ0026816	A	NAVESINK RIVER	M	WICKATUNK VILLAGE IN	MONMOUTH	MARLBORO TWP.	DEEP RUN
NJ0063827	B	NAVESINK RIVER	I	GETTY SERVICE STATIO	MONMOUTH	ATL. HIGHLANDS	MANY MIND CREEK
NJ0031771	A	NAVESINK RIVER	M	COLTS NECK INN	MONMOUTH	COLTS NECK TWP.	MINE BROOK
NJ0061107	B	NAVESINK RIVER	I	RED BANK WTP	MONMOUTH	RED BANK BORO	NAVESINK RIVER
NJ0000485	B	NAVESINK RIVER	I	BELL LABS CRAWFORD H	MONMOUTH	HOLMDEL TWP.	RAMANESSIN RIVE
NJ0023540	A	NAVESINK RIVER	M	NAVAL WEAPONS STATIO	MONMOUTH	COLTS NECK TWP.	TRIB TO YELLOW
NJ0067172	B	NAVESINK RIVER	I	GORDON'S CORNER WATE	MONMOUTH	MARLBORO TWP.	TRIBUTARY TO BI
NJ0035718	A	NAVESINK RIVER	M	PRUDENTIAL PROPERTY	MONMOUTH	HOLMDEL TWP.	WILLOW BROOK
NJ0001481	B	NAVESINK RIVER	I	PENNWALT/S.S. WHITE	MONMOUTH	HOLMDEL TWP.	WILLOW BROOK (D
NJ0029408	A	OCEAN COUNTY	M	CENTRAL WATER POLLUT	OCEAN	BERKELEY TWP.	ATLANTIC OCEAN
NJ0029408	A	OCEAN COUNTY	M	CENTRAL WATER POLLUT	OCEAN	BERKELEY TWP.	ATLANTIC OCEAN
NJ0028142	A	OCEAN COUNTY	M	NORTHERN WATER POLLU	OCEAN	BRICK TWP.	ATLANTIC OCEAN
NJ0026018	A	OCEAN COUNTY	M	OCEAN COUNTY UTILITI	OCEAN	STAFFORD TWP.	ATLANTIC OCEAN
NJ0034622	A	OCEAN COUNTY	M	SEA AVE STORMWATER P	OCEAN	POINT PLEASANT	ATLANTIC OCEAN
NJ0004286	BC	OLDMANS CREEK	I	BF GOODRICH CO	SALEM	OLDMANS TWP.	TRIBUTARY TO DE
NJ0053350	A	PAPAKATING CREEK	M	UPPER WALL VALLEY WP	SUSSEX	HARDYSTON TWP.	
NJ0024040	A	PENNSAUKEN CREEK	M	WOODSTREAM STP	BURLINGTON	EVESHAM TWP.	LANDING CREEK
NJ0028746	A	PENNSAUKEN CREEK	M	MAPLE SHADE TOWNSHIP	BURLINGTON	MAPLE SHADE TWP	NORTH BRANCH OF
NJ0025577	B	PENNSAUKEN CREEK	I	MAPLE SHADE WTP NO 1	BURLINGTON	MAPLE SHADE TWP	NORTH BRANCH PE

NJPDES NUMBER	DISCHARGE TYPE	WATERSHED	FACILITY TYPE	FACILITY NAME	COUNTY	MUNICIPALITY	RECEIVING WATER
NJ0024996	A	PENNSAUKEN CREEK	M	MOORESTOWN TOWNSHIP	BURLINGTON	MOORESTOWN TWP.	PENNSAUKEN CR.
NJ0025127	A	PENNSAUKEN CREEK	M	CHERRY HILL STP-COLD	CAMDEN	CHERRY HILL TWP	PENNSAUKEN CR.
NJ0025089	A	PENNSAUKEN CREEK	M	CHERRY HILL TOWNSHIP	CAMDEN	CHERRY HILL TWP	PENNSAUKEN CR.
NJ0025071	A	PENNSAUKEN CREEK	M	CHERRY HILL TOWNSHIP	CAMDEN	CHERRY HILL TWP	PENNSAUKEN CREE
NJ0031984	B	PENNSAUKEN CREEK	I	MORRIS-DELAIR WAT TR	CAMDEN	PENNSAUKEN TWP.	PENNSAUKEN CREE
NJ0004588	C	PENNSAUKEN CREEK	I	AKZO CHEMICALS INC.	BURLINGTON	MAPLE SHADE TWP	PENNSAUKEN CRK
NJ0031879	A	PENNSAUKEN CREEK	M	KINGS HIGHWAY WATER	BURLINGTON	MAPLE SHADE TWP	SOUTH BRANCH PE
NJ0027201	A	PEQUANNOCK RIVER	M	REFLECTION LAKES GAR	PASSAIC	WEST MILFORD TW	
NJ0050717	B	PEQUANNOCK RIVER	I	ORG MAINTENANCE SHOP	MORRIS	RIVERDALE BORO	
NJ0025721	B	PEQUANNOCK RIVER	I	BUTLER WATER DEPARTM	MORRIS	BUTLER BORO	KAKEOUT BROOK
NJ0026867	A	PEQUANNOCK RIVER	M	JEFFERSON TWP - WHIT	MORRIS	JEFFERSON TWP.	MITTS POND
NJ0025712	B	PEQUANNOCK RIVER	I	VIBRATION MOUNTING &	PASSAIC	BLOOMINGDALE BO	PEQUANNOCK RIVE
NJ0025500	B	PEQUANNOCK RIVER	I	PASSAIC CRUSHED STON	PASSAIC	POMPTON LAKES B	PEQUANNOCK RIVE
NJ0001601	B	PEQUANNOCK RIVER	I	RIVERDALE QUARRY CO	MORRIS	RIVERDALE BORO	PEQUANNOCK RIVE
NJ0069582	B	PEQUANNOCK RIVER	I	CHARLOTTEBURG WATER	ESSEX	NEWARK	PEQUANNOCK RIVE
NJ0065862	B	PEQUANNOCK RIVER	I	PAN AUTOMOTIVE PARTS	MORRIS	RIVERDALE BORO	PEQUANNOCK RIVE
NJ0029394	B	PEQUANNOCK RIVER	I	BERKSHIRE SAND & STO	PASSAIC	WEST MILFORD TW	SWAMP TRIBUTARY
NJ0062243	B	PEQUANNOCK RIVER	I	RAIA INDUSTRIES	MORRIS	RIVERDALE BORO	UNNAMED TRIBUTA
NJ0027685	A	PEQUANNOCK RIVER	M	HIGH VIEW ACRES	PASSAIC	WEST MILFORD TW	VREELAND POND
NJ0021113	A	POHATCONG CREEK	M	WASHINGTON BOROUGH S	WARREN	WASHINGTON BORO	SHABBECONG CRK
NJ0033642	C	POMPTON RIVER	I	PILOT METAL FABRICAT	PASSAIC	WAYNE TWP.	PEQUANNOCK RIVE
NJ0026841	A	POMPTON RIVER	M	WAYNE, TOWNSHIP OF	PASSAIC	WAYNE TWP.	POMPTON RIVER
NJ0029386	A	POMPTON RIVER	M	TWO BRIDGES SEWERAGE	MORRIS	LINCOLN PARK BO	POMPTON RIVER
NJ0002232	C	POMPTON RIVER	I	J.L. PRESCOTT CO.	PASSAIC	PASSAIC CITY	POMPTON RIVER
NJ0029971	C	POMPTON RIVER	I	CLIFTON ADHESIVE INC	PASSAIC	WAYNE TWP.	STORM SEWER TO
NJ0028291	B	POMPTON RIVER	I	GAF CORPORATION	PASSAIC	WAYNE TWP.	STORM SEWER TO
NJ0020532	A	RACCOON CREEK	M	MULLICA HILL STP	GLOUCESTER	HARRISON TWP.	RACCOON CR.
NJ0022021	A	RACCOON CREEK	M	SWEDESBORO, BOROUGH	GLOUCESTER	SWEDESBORO BORO	RACCOON CREEK
NJ0005240	B	RACCOON CREEK	I	ROLLINS ENVIRONMENTA	GLOUCESTER	LOGAN TWP.	RACCOON CREEK
NJ0023299	B	RACCOON CREEK	I	LOGAN WELLS WATER CO	GLOUCESTER	LOGAN TWP.	TRIB TO RACOON
NJ0029416	C	RAHWAY RIVER	I	TELEDYNE ADAMS	UNION	UNION TWP.	AQUIFER RAHWAY
NJ0001058	B	RAHWAY RIVER	I	AMERICAN CYANAMID CO	UNION	LINDEN CITY	ARTHUR KILL
NJ0000311	B	RAHWAY RIVER	I	GULF OIL CO LINDEN	UNION	LINDEN CITY	BK RAHWAY RIVER

NJPDES NUMBER	DISCHARGE TYPE	WATERSHED	FACILITY TYPE	FACILITY NAME	COUNTY	MUNICIPALITY	RECEIVING WATER
NJ0001554	B	RAHWAY RIVER	I	MONSANTO CHEMICAL CO	UNION	KENILWORTH BORO	BLACK BROOK
NJ0003395	B	RAHWAY RIVER	I	SOLAR COMPONDS CORPO	UNION	LINDEN CITY	DITCH TO KINGS
NJ0025429	A	RAHWAY RIVER	M	TURTLE & HUGHES INC	UNION	LINDEN CITY	KINGS CREEK
NJ0022225	A	RAHWAY RIVER	M	BESLER, INC	UNION	LINDEN CITY	KINGS CREEK
NJ0002348	B	RAHWAY RIVER	I	MERCK & CO INC	UNION	LINDEN CITY	KINGS CREEK (DS
NJ0003433	B	RAHWAY RIVER	I	AMERICAN HARVARD	UNION	UNION TWP.	LIGHTNING CREEK
NJ0034568	C	RAHWAY RIVER	I	ROTARY PEN CORPORATI	UNION	KENILWORTH BORO	MORSES CREEK
NJ0052931	B	RAHWAY RIVER	I	CARPENTER TECHNOLOGY	UNION	UNION TWP.	RAHWAY RIVER
NJ0035921	C	RAHWAY RIVER	I	PETRO PLASTIC CO INC	UNION	GARWOOD BORO	RAHWAY RIVER
NJ0003883	C	RAHWAY RIVER	I	HUFFMAN & KOOS CO IN	UNION	RAHWAY CITY	RAHWAY RIVER
NJ0001121	C	RAHWAY RIVER	I	SONOCO FIBRE DRUM IN	MIDDLESEX	CARTERET BORO	RAHWAY RIVER
NJ0001058	B	RAHWAY RIVER	I	AMERICAN CYANAMID CO	UNION	LINDEN CITY	RAHWAY RIVER
NJ0029416	C	RAHWAY RIVER	I	TELEDYNE ADAMS	UNION	UNION TWP.	RAHWAY RIVER
NJ0031127	B	RAHWAY RIVER	I	DUREX INDUSTRIES INC	UNION	UNION TWP.	RAHWAY RIVER
NJ0032751	C	RAHWAY RIVER	I	KOP-COAT INC	UNION	WESTFIELD TOWN	RAHWAY RIVER
NJ0031411	C	RAHWAY RIVER	I	WITCO CHEMICAL CORP.	UNION	CLARK TWP.	ROBINSON'S BRAN
NJ0026280	B	RAHWAY RIVER	I	GATX TERMINALS CORP	MIDDLESEX	CARTERET BORO	RUM CREEK
NJ0000582	BC	RAHWAY RIVER	I	PSE&G CENTRAL GAS PL	MIDDLESEX	EDISON TWP.	SILVER LAKE BRO
NJ0062138	C	RAHWAY RIVER	I	DRI-PRINT FOILS, INC	UNION	RAHWAY CITY	SO BRANCH OF RA
NJ0055514	B	RAHWAY RIVER	I	ZETA PRODUCTS, INC	UNION	UNION TWP.	STORM SEWER TO
NJ0064777	B	RAHWAY RIVER	I	ORG MAINTENANCE SHOP	ESSEX	WEST ORANGE TOW	STORM SEWER TO
NJ0067326	C	RAHWAY RIVER	I	ACCURATE BUSHING HOL	UNION	GARWOOD BORO	STORM SEWER TO
NJ0002305	C	RAHWAY RIVER	I	SCHERING CORPORATION	UNION	KENILWORTH BORO	UNNAMED TRIB TO
NJ0056219	B	RAHWAY RIVER	I	SCHAIBLE OIL COMPANY	UNION	SPRINGFIELD TWP	UNNAMED TRIBUTA
NJ0001350	B	RAMAPO RIVER	I	E I DUPONT DE NEMOUR	PASSAIC	POMPTON LAKES B	ACID BROOK
NJ0021261	A	RAMAPO RIVER	M	NJ DEVELOPMENTAL CEN	PASSAIC	TOTOWA BORO	NATCHUNK BR.
NJ0022926	A	RAMAPO RIVER	M	LAUREL HOMES STP	MORRIS	PEQUANNOCK TWP.	POMPTON RIVER
NJ0026441	A	RAMAPO RIVER	M	URBAN FARMS SHOPPING	BERGEN	FRANKLIN LAKES	POND BROOK
NJ0021946	A	RAMAPO RIVER	M	USATC AND FORT DIX (	BERGEN	MAHWAH TWP.	RAMAPO R.
NJ0021342	A	RAMAPO RIVER	M	OAKLAND BOROUGH OF	BERGEN	OAKLAND BORO	RAMAPO R.
NJ0030139	B	RAMAPO RIVER	I	GEM CAR WASH	PASSAIC	WAYNE TWP.	RAMAPO RIVER
NJ0029858	A	RAMAPO RIVER	M	OAKLAND CARE CENTER	BERGEN	OAKLAND BORO	RAMPO RIVER
NJ0068845	B	RAMAPO RIVER	I	B&D AUTOMOTIVE (FORM	PASSAIC	WEST MILFORD TW	STORM SEWER TO

NJPDES NUMBER	DISCHARGE TYPE	WATERSHED	FACILITY TYPE	FACILITY NAME	COUNTY	MUNICIPALITY	RECEIVING WATER
NJ0053112	A	RAMAPO RIVER	M	OAKLAND BORO <CHAPEL	BERGEN	OAKLAND BORO	TRIB OF RAMAPO
NJ0002704	B	RAMAPO RIVER	I	FMC ASSEMBLY PLANT	BERGEN	MAHWAH TWP.	UNLINED DITCH I
NJ0027774	A	RAMAPO RIVER	M	OAKLAND,DPW, BOROUGH	BERGEN	OAKLAND BORO	UNNAMED TRIB RA
NJ0029548	B	RANCOCAS CREEK-MAINS	I	MOORESTOWN TOWNSHIP_	BURLINGTON	MOORESTOWN TWP.	KENDALL'S RUN
NJ0030741	B	RANCOCAS CREEK-MAINS	I	WILLINGBORO MUA WATE	BURLINGTON	WILLINGBORO TWP	MILL CREEK
NJ0099597	B	RANCOCAS CREEK-MAINS	I	CONWED CORPORATION	BURLINGTON	DELANCO TWP.	NELLIE'S POND
NJ0065838	C	RANCOCAS CREEK-MAINS	I	DRG MEDICAL PACKAGIN	BURLINGTON	MOUNT HOLLY TWP	NORTH BRANCH RA
NJ0020745	A	RANCOCAS CREEK-MAINS	M	NEW JERSEY TURNPIKE	BURLINGTON	MOUNT LAUREL TW	PARKERS CREEK
NJ0025178	A	RANCOCAS CREEK-MAINS	M	HARTFORD ROAD WTP	BURLINGTON	MOUNT LAUREL TW	RANCOCAS CR.
NJ0028665	A	RANCOCAS CREEK-MAINS	M	MOBILE ESTATES OF SO	BURLINGTON	SOUTHAMPTON TWP	RANCOCAS CREEK
NJ0023361	A	RANCOCAS CREEK-MAINS	M	WILLINGBORO MUA STP	BURLINGTON	WILLINGBORO TWP	RANCOCAS CREEK
NJ0023507	A	RANCOCAS CREEK-MAINS	M	DELRAN SEWERAGE AUTH	BURLINGTON	DELRAN TWP.	RANCOCAS CREEK
NJ0024031	A	RANCOCAS CREEK-MAINS	M	ELMWOOD STP	BURLINGTON	EVESHAM TWP.	RANCOCAS CREEK
NJ0022519	A	RANCOCAS CREEK-MAINS	M	RIVERSIDE STP	BURLINGTON	RIVERSIDE TWP.	RANCOCAS RIVER
NJ0022543	A	RARITAN BAY AND TRIB	M	STRATHMORE STP	MONMOUTH	ABERDEEN TWP	
NJ0002186	B	RARITAN BAY AND TRIB	I	AIRCO INDUSTRIAL GAS	MIDDLESEX	METUCHEN BORO	AMBROSE BROOK
NJ0050245	B	RARITAN BAY AND TRIB	I	SAYREILLE BOROUGH OF	MIDDLESEX	SAYREVILLE BORO	CHEESEQUAKE CRE
NJ0025453	B	RARITAN BAY AND TRIB	I	SHORELANDS WATER PLA	MONMOUTH	OCEANPORT BORO	EAST CREEK
NJ0033651	B	RARITAN BAY AND TRIB	I	ANCHOR GLASS CONTAIN	MONMOUTH	ABERDEEN TWP	LONG NECK CREEK
NJ0001775	AB	RARITAN BAY AND TRIB	M	COMDATA SYSTEMS INCO	MONMOUTH	HOLMDEL TWP.	MAHORAS BROOK
NJ0034924	B	RARITAN BAY AND TRIB	I	ATLANTIC HIGHLANDS.,	MONMOUTH	ATL. HIGHLANDS	MANY MIND CREEK
NJ0022829	A	RARITAN BAY AND TRIB	M	RIVER GARDENS STP #1	MONMOUTH	ABERDEEN TWP	MATAWAN CREEK
NJ0003913	B	RARITAN BAY AND TRIB	I	SOUTH AMBOY WATER TR	MIDDLESEX	SOUTH AMBOY CIT	PD TO RARITAN B
NJ0023825	A	RARITAN BAY AND TRIB	M	MORGAN STP	MIDDLESEX	SAYREVILLE BORO	RARITAN BAY
NJ0023833	A	RARITAN BAY AND TRIB	M	MELROSE STP	MIDDLESEX	SAYREVILLE BORO	RARITAN BAY
NJ0022471	A	RARITAN BAY AND TRIB	M	OLD BRIDGE TOWNSHIP	MIDDLESEX	EAST BRUNSWICK	RARITAN BAY
NJ0020141	A	RARITAN BAY AND TRIB	M	MIDDLESEX COUNTY UTI	MIDDLESEX	SAYREVILLE BORO	RARITAN BAY
NJ0064581	B	RARITAN BAY AND TRIB	I	MCCORMACK AGGREGATES	MIDDLESEX	SOUTH AMBOY CIT	RARITAN BAY
NJ0000779	B	RARITAN BAY AND TRIB	I	BELFORD SEAFOOD COOP	MONMOUTH	MIDDLETOWN TWP.	SANDY HOOK BAY
NJ0062669	B	RARITAN BAY AND TRIB	I	BUHLER & BITTER AUTO	MONMOUTH	HAZLET TWP.	STORM DRAIN TO
NJ0033294	BC	RARITAN BAY AND TRIB	I	ENGINEERED PRECISION	MONMOUTH	MIDDLETOWN TWP.	UNNAMED TRIBUTA
NJ0022535	A	RARITAN BAY AND TRIB	M	CLIFFWOOD BEACH STP	MONMOUTH	ABERDEEN TWP	WHALE CREEK
NJ0034142	B	RARITAN BAY AND TRIB	I	ABERDEEN TOWNSHIP MU	MONMOUTH	ABERDEEN TWP	WILKSON CREEK

NJPDES NUMBER	DISCHARGE TYPE	WATERSHED	FACILITY TYPE	FACILITY NAME	COUNTY	MUNICIPALITY	RECEIVING WATER
NJ0034495	B	RARITAN RIVER	I	ACADEMY DIE CASTING	MIDDLESEX	EDISON TWP.	AMBROSE BROOK
NJ0030571	B	RARITAN RIVER	I	CAPTIVE PLASTICS, IN	MIDDLESEX	PISCATAWAY TWP.	AMBROSE BROOK
NJ0002381	C	RARITAN RIVER	I	PETROLEUM SPECIALITI	MIDDLESEX	PERTH AMBOY CIT	AQUIFER RARITAN
NJ0026140	B	RARITAN RIVER	I	JOHNSON & JOHNSON BA	SOMERSET	MONTGOMERY TWP.	BACK BROOK
NJ0035084	B	RARITAN RIVER	I	EXXON RESEARCH & ENG	HUNTERDON	CLINTON TWP.	BEAVER BROOK
NJ0035084	B	RARITAN RIVER	I	EXXON RESEARCH & ENG	HUNTERDON	CLINTON TWP.	BEAVER BROOK
NJ0030023	C	RARITAN RIVER	I	KENTILE FLOOR INC	MIDDLESEX	SOUTH PLAINFIEL	BOUND BROOK
NJ0029629	B	RARITAN RIVER	I	DESIGN & MOLDING SER	MIDDLESEX	PISCATAWAY TWP.	BOUND BROOK
NJ0034886	C	RARITAN RIVER	I	RONPAK INC	MIDDLESEX	SOUTH PLAINFIEL	BOUND BROOK TRI
NJ0001210	C	RARITAN RIVER	I	L A DREYFUS COMPANY	MIDDLESEX	SOUTH PLAINFIEL	CEDAR BROOK (PL
NJ0068942	B	RARITAN RIVER	I	UNISYS (FORMER)	SOMERSET	WARREN TWP.	CORYS BROOK
NJ0000175	B	RARITAN RIVER	I	UNION CARBIDE INDUST	MIDDLESEX	WOODBRIDGE TWP.	CROWS MILL CREE
NJ0024864	A	RARITAN RIVER	M	SOMERSET RARITAN VAL	SOMERSET	BRIDGEWATER TWP	CUCKEL'S BR.
NJ0035190	B	RARITAN RIVER	I	NORTH BRUNSWICK TOWN	MIDDLESEX	NORTH BRUNSWICK	DELAWARE & RARI
NJ0052655	C	RARITAN RIVER	I	WEBCRAFT TECHNOLOGIE	MIDDLESEX	METUCHEN BORO	DISMAL SWAMP
NJ0020672	BC	RARITAN RIVER	I	TINGLEY RUBBER CORPO	MIDDLESEX	MIDDLESEX BORO	DISMAL SWAMP ST
NJ0032034	C	RARITAN RIVER	I	PROSPECT INDUSTRIES	MIDDLESEX	NORTH BRUNSWICK	MILE RUN
NJ0003816	B	RARITAN RIVER	I	W A CLEARY PRODUCTS	SOMERSET	FRANKLIN TWP.	MILE RUN
NJ0003336	BC	RARITAN RIVER	I	US BRONZE POWDERS CO	HUNTERDON	RARITAN TWP.	MILL CREEK
NJ0001333	C	RARITAN RIVER	I	NATIONAL STARCH & CH	UNION	GARWOOD BORO	MUNICIPAL STORM
NJ0000345	B	RARITAN RIVER	I	WELDON CONCRETE	MIDDLESEX	PERTH AMBOY CIT	RARITAN RIVER
NJ0002950	B	RARITAN RIVER	I	CARBORUNDUM CO	MIDDLESEX	WOODBRIDGE TWP.	RARITAN RIVER
NJ0002950	B	RARITAN RIVER	I	CARBORUNDUM CO	MIDDLESEX	WOODBRIDGE TWP.	RARITAN RIVER
NJ0002381	C	RARITAN RIVER	I	PETROLEUM SPECIALITI	MIDDLESEX	PERTH AMBOY CIT	RARITAN RIVER
NJ0001791	B	RARITAN RIVER	I	HULS AMERICA INC	MIDDLESEX	EDISON TWP.	RARITAN RIVER
NJ0002747	BC	RARITAN RIVER	I	SAYREVILLE GENERATIN	MIDDLESEX	SAYREVILLE BORO	RARITAN RIVER
NJ0026727	A	RARITAN RIVER	M	SEPTEMBERS ON THE HI	SOMERSET	WATCHUNG BORO	RARITAN RIVER
NJ0022764	A	RARITAN RIVER	M	VALLEY ROAD SEWERAGE	SOMERSET	BOUND BROOK BOR	RARITAN RIVER
NJ0023213	A	RARITAN RIVER	M	PERTH AMBOY, CITY OF	MIDDLESEX	PERTH AMBOY CIT	RARITAN RIVER
NJ0068365	C	RARITAN RIVER	I	ACME TUBE INC.	HUNTERDON	FRANKLIN TWP.	RARITAN RIVER
NJ0029874	A	RARITAN RIVER	M	MOUNTAINVIEW YOUTH C	SUSSEX	MONTAGUE TWP.	SOUTH BRANCH RA
NJ0033090	C	RARITAN RIVER	I	HOLOPHANE COMPANY IN	MIDDLESEX	EDISON TWP.	STORM DRAIN TO
NJ0070220	C	RARITAN RIVER	I	SPEAR PACKING CORPOR	MIDDLESEX	NEW BRUNSWICK C	STORM SEWER TO

NJPDES NUMBER	DISCHARGE TYPE	WATERSHED	FACILITY TYPE	FACILITY NAME	COUNTY	MUNICIPALITY	RECEIVING WATER
NJ0030881	B	RARITAN RIVER	I	SILVATRIM CORP OF AM	MIDDLESEX	SOUTH PLAINFIEL	TRIB BOUND BRK
NJ0033723	B	RARITAN RIVER	I	K52 BUILDING-EVANS P	MIDDLESEX	PISCATAWAY TWP.	TRIBUTARY OF AM
NJ0034835	C	RARITAN RIVER	I	METZ METALLURGICAL C	MIDDLESEX	SOUTH PLAINFIEL	TRIBUTARY TO BO
NJ0034835	B	RARITAN RIVER	I	METZ METALLURGICAL C	MIDDLESEX	SOUTH PLAINFIEL	TRIBUTARY TO BO
NJ0033251	B	RARITAN RIVER	I	REAGENT CHEMICAL & R	MIDDLESEX	MIDDLESEX BORO	TRIBUTARY TO RA
NJ0026255	B	RARITAN RIVER	I	MOBIL CHEMICAL COMPA	MIDDLESEX	EDISON TWP.	UNNAMED TRIBUTA
NJ0034720	C	ROCKAWAY RIVER	I	IVEX CORPORATION	MORRIS	ROCKAWAY BORO	BEAVER BROOK
NJ0031755	B	ROCKAWAY RIVER	I	JIM SALERNO PONTIAC	MORRIS	RANDOLPH TWP.	BLACK RIVER
NJ0001261	B	ROCKAWAY RIVER	I	KEUFFEL & ESSER CO	MORRIS	ROCKAWAY TWP.	BURNT MEADOW BK
NJ0002500	B	ROCKAWAY RIVER	I	DEPARTMENT OF THE AR	MORRIS	ROCKAWAY TWP.	GREEN POND BROO
NJ0003077	C	ROCKAWAY RIVER	I	HEWLETT-PACKARD CO I	MORRIS	ROCKAWAY TWP.	HIBERNIA BROOK
NJ0003506	B	ROCKAWAY RIVER	I	ADRON INC	MORRIS	PARSIPPANY TROY	LAKE INTERVALE
NJ0003409	B	ROCKAWAY RIVER	I	MT HOPE ROCKS PRODUC	MORRIS	WHARTON BORO	MOUNT HOPE LAKE
NJ0002500	B	ROCKAWAY RIVER	I	DEPARTMENT OF THE AR	MORRIS	ROCKAWAY TWP.	PICATINNY LAKE
NJ0064033	B	ROCKAWAY RIVER	I	VAN DOREN OIL COMPAN	HUNTERDON	READINGTON TWP.	ROCKAWAY CREEK
NJ0061140	C	ROCKAWAY RIVER	I	ST CLARES HOSPITAL	MORRIS	DENVILLE TWP.	ROCKAWAY RIVER
NJ0034134	C	ROCKAWAY RIVER	I	GREEN HAMMER METAL P	MORRIS	DOVER TOWN	ROCKAWAY RIVER
NJ0002593	C	ROCKAWAY RIVER	I	GHA LOCK JOINT	MORRIS	WHARTON BORO	ROCKAWAY RIVER
NJ0002496	C	ROCKAWAY RIVER	I	MC WILLIAMS FORGE CO	MORRIS	ROCKAWAY BORO	ROCKAWAY RIVER
NJ0003611	C	ROCKAWAY RIVER	I	LE CARPENTER & COMPA	MORRIS	WHARTON BORO	ROCKAWAY RIVER
NJ0022349	A	ROCKAWAY RIVER	M	ROCKAWAY VALLEY REG	MORRIS	PARSIPPANY TROY	ROCKAWAY RIVER
NJ0001635	B	ROCKAWAY RIVER	I	HOWMET TURBINE COMPO	MORRIS	ROCKAWAY TWP.	ROCKWAY RIVER
NJ0030287	A	ROCKAWAY RIVER	M	MONTVILLE TOWNSHIP M	MORRIS	MONTVILLE TWP.	VALHALLA BROOK
NJ0053759	A	ROCKAWAY RIVER	M	WANAQUE VALLEY REG S	PASSAIC	WANAQUE BORO	WANAQUE RIVER
NJ0035785	B	ROCKAWAY RIVER	I	ROCKAWAY TOWNSHIP WT	MORRIS	ROCKAWAY TWP.	WHITE MEADOW BR
NJ0025674	C	ROCKAWAY RIVER	I	ACTION TECHNOLOGY CO	MORRIS	ROCKAWAY TWP.	WHITE MEADOW BR
NJ0063312	C	SADDLE RIVER	I	WYCKOFF QUALITY BAKE	BERGEN	WYCKOFF TWP.	
NJ0035262	C	SADDLE RIVER	I	BERGEN CABLE TECHNOL	BERGEN	LODI BORO	COLES BROOK
NJ0098469	B	SADDLE RIVER	I	INTERNATIONAL WIRE	BERGEN	WYCKOFF TWP.	HO-HO-KUS BROOK
NJ0024813	A	SADDLE RIVER	M	NORTHWEST BERGEN COU	BERGEN	WALDWICK BORO	HO-HO-KUS BROOK
NJ0024791	A	SADDLE RIVER	M	RIDGEWOOD VILLAGE OF	BERGEN	GLEN ROCK BORO	HOHOKUS BROOK
NJ0003182	C	SADDLE RIVER	I	STEPAN COMPANY	BERGEN	MAYWOOD BORO	LODI BROOK
NJ0028827	A	SADDLE RIVER	M	APPLE RIDGE COUNTRY	BERGEN	MAHWAH TWP.	SADDLE RIVER

NJPDES NUMBER	DISCHARGE TYPE	WATERSHED	FACILITY TYPE	FACILITY NAME	COUNTY	MUNICIPALITY	RECEIVING WATER
NJ0023931	A	SADDLE RIVER	M	HEARTHSTONE AT MAHWA	BERGEN	MAHWAH TWP.	SADDLE RIVER
NJ0052949	C	SADDLE RIVER	I	FLORAL GLASS INDUSTR	BERGEN	MOONACHIE BORO	SADDLE RIVER
NJ0033511	B	SADDLE RIVER	I	FARMLAND FAIR LAWN D	BERGEN	WALLINGTON BORO	SADDLE RIVER
NJ0033987	BC	SADDLE RIVER	I	IBM CORPORATION	BERGEN	PARAMUS BORO	SPROUT BROOK
NJ0020109	B	SADDLE RIVER	I	IBM CORPORATION	BERGEN	FRANKLIN LAKES	WEST BRANCH HOH
NJ0020109	B	SADDLE RIVER	I	IBM CORPORATION	BERGEN	FRANKLIN LAKES	WEST BRANCH HOH
NJ0025658	C	SCOTLAND RUN	I	PIONEER METAL FINISH	GLOUCESTER	FRANKLIN TWP.	SCOTLAND RUN
NJ0098647	B	SHARK RIVER	I	ALLENHURST WATER DEP	MONMOUTH	ALLENHURST BORO	
NJ0050563	C	SHARK RIVER	I	ADAM SPENCE CORPORAT	MONMOUTH	WALL TWP.	HURLEY'S POND B
NJ0034258	C	SHARK RIVER	I	MOLECU WIRE CORP	MONMOUTH	WALL TWP.	SHARK RIVER
NJ0063134	B	SHARK RIVER	I	EAST COAST ICE	MONMOUTH	NEPTUNE CITY BO	SHARK RIVER
NJ0021148	A	SHARK RIVER	M	MONMOUTH SERVICE ARE	MONMOUTH	WALL TWP.	SHARK RIVER
NJ0032239	B	SHARK RIVER	I	NEW JERSEY GRAVEL &	MONMOUTH	WALL TWP.	WRECK POND BRK
NJ0002623	B	SHREWSBURY RIVER	I	ALLIED SIGNAL AEROSP	MONMOUTH	EATONTOWN BORO	HUSKY BROOK
NJ0069477	B	SHREWSBURY RIVER	I	TAKANASSEE BEACH CLU	MONMOUTH	LONG BRANCH CIT	LAKE TAKANASSEE
NJ0002623	B	SHREWSBURY RIVER	I	ALLIED SIGNAL AEROSP	MONMOUTH	EATONTOWN BORO	NE MONMOUTH RSA
NJ0002135	B	SHREWSBURY RIVER	I	ELECTRONIC ASSOCIATE	MONMOUTH	WEST LONG BRANC	SOUTH TURTLE MI
NJ0035041	B	SOUTH BRANCH METEDEC	I	MAPLE GLEN PARK	OCEAN	JACKSON TWP.	METEDECONK RIVE
NJ0031887	B	SOUTH RIVER	I	HARBOR ROAD WTP	MONMOUTH	MARLBORO TWP.	DEEP RUN
NJ0028771	B	SOUTH RIVER	I	QUIGLEY COMPANY INC	MIDDLESEX	EAST BRUNSWICK	DEEP RUN & SOUT
NJ0001023	BC	SOUTH RIVER	I	HERCULES INC/AQUALON	MIDDLESEX	SAYREVILLE BORO	POND CREEK (DSN
NJ0002470	C	SOUTH RIVER	I	GIST BROCADES FOOD I	MIDDLESEX	EAST BRUNSWICK	SOUTH RIVER
NJ0000159	C	SOUTH RIVER	I	E.I. DU PONT DE NEMO	MIDDLESEX	SAYREVILLE BORO	STORM SEWER TO
NJ0000159	B	SOUTH RIVER	I	E.I. DU PONT DE NEMO	MIDDLESEX	SAYREVILLE BORO	STORM SEWER TO
NJ0067181	B	SOUTH RIVER	I	GORDON'S CORNER WATE	MONMOUTH	MANALAPAN TWP.	TEPEHEMUS BROOK
NJ0067181	B	SOUTH RIVER	I	GORDON'S CORNER WATE	MONMOUTH	MANALAPAN TWP.	TEPEHEMUS BROOK
NJ0063851	B	SOUTH RIVER	I	GORDONS CORNER WATER	MONMOUTH	MANALAPAN TWP.	TRIBUTARY TO MI
NJ0021326	A	SOUTH WEST BRANCH RA	M	MEDFORD LAKES BOROUG	BURLINGTON	MEDFORD LAKES B	AETNA RUN
NJ0026832	A	SOUTH WEST BRANCH RA	M	MEDFORD TOWNSHIP OF	BURLINGTON	MEDFORD TWP.	SW BR RANCOCAS
NJ0032361	B	STILL RUN	I	RON-SON MUSHROOM PRO	GLOUCESTER	GLASSBORO BORO	STILL RUN
NJ0005312	B	STILL RUN	I	GLASSBORO CLOSURE PL	GLOUCESTER	GLASSBORO BORO	STILL RUN
NJ0000809	B	STONY BROOK	I	AT&T	MERCER	PRINCETON TWP.	CLEVELAND BROOK
NJ0022560	A	STONY BROOK	M	PRINCETON FARMS WTP	MERCER	HOPEWELL TWP.	HONEY BR TRIB S

NJPDES NUMBER	DISCHARGE TYPE	WATERSHED	FACILITY TYPE	FACILITY NAME	COUNTY	MUNICIPALITY	RECEIVING WATER
NJ0022110	A	STONY BROOK	M	EDUCATIONAL TESTING	MERCER	PRINCETON TWP.	STONY BROOK
NJ0020770	A	STONY BROOK	M	PRETTY BROOK STP	MERCER	PRINCETON TWP.	STONY BROOK
NJ0000795	B	STONY BROOK	I	MOBIL TECHNICAL CENT	MERCER	PRINCETON TWP.	STONY BROOK
NJ0035319	A	STONY BROOK	M	STONY BROOK RSA'S	MERCER	PRINCETON TWP.	STONY BROOK
NJ0005541	BC	UPPER ASSUNPINK CREE	I	AMERICAN CYANAMID CO	MERCER	WEST WINDSOR TW	ASSUMPINK CR
NJ0022918	A	UPPER ASSUNPINK CREE	M	ROOSEVELT BORO STP	MONMOUTH	ROOSEVELT BORO	ASSUNPINK CREEK
NJ0022918	A	UPPER ASSUNPINK CREE	M	ROOSEVELT BORO STP	MONMOUTH	ROOSEVELT BORO	ASSUNPINK CREEK
NJ0027618	B	UPPER ASSUNPINK CREE	I	BRISTOL-MYERS SQUIBB	MERCER	PRINCETON TWP.	MAN MADE LAKE T
NJ0004537	C	UPPER ASSUNPINK CREE	I	CONGOLEUM CORP	MERCER	HAMILTON TWP.	MIRY RUN
NJ0004502	C	UPPER ASSUNPINK CREE	I	FERMENTA ANIMAL HEA	MERCER	LAWRENCE TWP.	SAND RUN CREEK
NJ0033006	C	UPPER COHANSEY RIVER	I	SEABROOK BROTHERS &	CUMBERLAND	UPPER DEERFIELD	BRIDGETON FORMA
NJ0004855	A	UPPER CROSSWICKS CRE	M	USATC & FORT DIX (WA	BURLINGTON	NEW HANOVER TWP	CROSSWICKS CR
NJ0022985	A	UPPER CROSSWICKS CRE	M	WRIGHTSTOWN MUA	BURLINGTON	WRIGHTSTOWN BOR	CROSSWICKS CR.
NJ0030848	B	UPPER CROSSWICKS CRE	I	ALLENTOWN BORO WTP	MONMOUTH	ALLENTOWN BORO	INDIAN RUN
NJ0026972	A	UPPER GREAT EGG HARB	M	BERLIN BOROUGH WPC P	CAMDEN	BERLIN BORO	EGG HARBOR RIVE
NJ0026522	A	UPPER GREAT EGG HARB	M	CENTRAL MAINT MP 275	ATLANTIC	HAMMONTON TOWN	PENNY POT CREEK
NJ0020800	AC	UPPER GREAT EGG HARB	M	FAA TECHNICAL CENTER	ATLANTIC	EGG HARBOR TWP.	S. BR. DOUGHTY'
NJ0032441	C	UPPER GREAT EGG HARB	I	SCHOLLER INC.	ATLANTIC	MULLICA TWP.	TRIBUTARY TO MI
NJ0052558	B	UPPER HACKENSACK RIV	I	OMNI CHEMICAL CORP	BERGEN	LYNDHURST TWP.	
NJ0054801	B	UPPER HACKENSACK RIV	I	CALMONT INDUSTRIES,	BERGEN	NORTHVALE BORO	
NJ0003310	B	UPPER HACKENSACK RIV	I	NEW MILFORD FILTRATI	BERGEN	ORADELL BORO	HACKENSACK RIV
NJ0032620	B	UPPER HACKENSACK RIV	I	WEYERHAUSER COMPANY	BERGEN	CLOSTER BORO	ORADELL RESERVO
NJ0003786	C	UPPER HACKENSACK RIV	I	HOKE INCORPORATED	BERGEN	CRESSKILL BORO	TENAKILL BROOK
NJ0036129	B	UPPER MAURICE RUN	I	MARSHALL SERVICE INC	GLOUCESTER	NEWFIELD BORO	
NJ0004103	B	UPPER MAURICE RUN	I	SHIELDALLOY METALLUR	GLOUCESTER	NEWFIELD BORO	HUDSON BRANCH
NJ0032182	BC	UPPER MAURICE RUN	I	VINELAND ELEC AUTH	CUMBERLAND	VINELAND CITY	LITTLE ROBIN BR
NJ0003832	B	UPPER MILLSTONE RIVE	I	HIGHTSTOWN, BOROUGH	MERCER	HIGHTSTOWN BORO	AQIUFER ROCKY
NJ0002666	B	UPPER MILLSTONE RIVE	I	CARTER-WALLACE INC	MIDDLESEX	CRANBURY TWP.	AQUIFER CRANBUR
NJ0021695	A	UPPER MILLSTONE RIVE	M	LA GORCE SQUARE PLAN	BURLINGTON	BURLINGTON TWP.	ASSISCUNK CR.
NJ0098663	A	UPPER MILLSTONE RIVE	M	HOMESTEAD TREATMENT	BURLINGTON	MANSFIELD TWP.	ASSISCUNK CREEK
NJ0024104	A	UPPER MILLSTONE RIVE	M	PRINCETON MEADOWS UT	MIDDLESEX	PLAINSBORO TWP.	CRANBURY BROOK
NJ0002666	B	UPPER MILLSTONE RIVE	I	CARTER-WALLACE INC	MIDDLESEX	CRANBURY TWP.	CRANBURY BROOK
NJ0031445	B	UPPER MILLSTONE RIVE	I	FIRMENICH INCORPORAT	MIDDLESEX	PLAINSBORO TWP.	DEVILS BROOK (D

NJPDES NUMBER	DISCHARGE TYPE	WATERSHED	FACILITY TYPE	FACILITY NAME	COUNTY	MUNICIPALITY	RECEIVING WATER
NJ0004561	BC	UPPER MILLSTONE RIVE	I	COCA-COLA FOODS	MERCER	HIGHTSTOWN BORO	E WINDSOR MUA
NJ0004243	B	UPPER MILLSTONE RIVE	I	NL INDUSTRIES, INC/R	MERCER	HIGHTSTOWN BORO	MILLSTONE RIVER
NJ0023922	B	UPPER MILLSTONE RIVE	I	PRINCETON PLASMA PHY	MIDDLESEX	PLAINSBORO TWP.	MILLSTONE RIVER
NJ0023787	A	UPPER MILLSTONE RIVE	M	EAST WINDSOR WATER P	MERCER	EAST WINDSOR TW	MILLSTONE RIVER
NJ0027731	BC	UPPER MILLSTONE RIVE	I	FMC CORPORATION	MIDDLESEX	PLAINSBORO TWP.	MILLSTONE RIVER
NJ0000272	BC	UPPER MILLSTONE RIVE	I	DAVID SARNOFF RESEAR	MERCER	WEST WINDSOR TW	MILLSTONE RIVER
NJ0029475	A	UPPER MILLSTONE RIVE	M	HIGHTSTOWN STP	MERCER	HIGHTSTOWN BORO	ROCKY BROOK
NJ0004561	BC	UPPER MILLSTONE RIVE	I	COCA-COLA FOODS	MERCER	HIGHTSTOWN BORO	ROCKY BROOK (DS
NJ0064700	B	UPPER MILLSTONE RIVE	I	GIBSON TUBE INC	SOMERSET	BRIDGEWATER TWP	TRIBUTARY OF CU
NJ0031950	C	UPPER MILLSTONE RIVE	I	HUB SERVALL RECORD M	MIDDLESEX	SOUTH BRUNSWICK	TRIBUTARY TO SH
NJ0032611	B	UPPER MILLSTONE RIVE	I	NATIONAL METALIZING	MIDDLESEX	CRANBURY TWP.	TRIBUTARY TO SH
NJ0035823	B	UPPER MILLSTONE RIVE	I	LAIRD & COMPANY	MONMOUTH	COLTS NECK TWP.	TRIBUTARY TO YE
NJ0027821	A	UPPER MUSCONETCONG R	M	MUSCONETCONG WATER P	MORRIS	MOUNT OLIVE TWP	WILLS BK
NJ0021369	A	UPPER MUSCONETCONG R	M	HACKETTSTOWN MUA WPC	MORRIS	WASHINGTON TWP.	BUNGALOW BROOK
NJ0026212	A	UPPER MUSCONETCONG R	M	MT ARLINGTON SANITAT	MORRIS	MOUNT ARLINGTON	DELAWARE BASIN
NJ0028592	A	UPPER MUSCONETCONG R	M	DIAMOND HILL ESTATES	WARREN	MANSFIELD TWP.	HANCES BROOK
NJ0021369	A	UPPER MUSCONETCONG R	M	HACKETTSTOWN MUA WPC	MORRIS	WASHINGTON TWP.	MUSCONETCONG
NJ0004600	C	UPPER MUSCONETCONG R	I	US MINERAL PRODUCTS	SUSSEX	STANHOPE BORO	MUSCONETCONG RI
NJ0004812	C	UPPER MUSCONETCONG R	I	ELASTIMOLD DIV AMERA	MORRIS	WASHINGTON TWP.	SCHOOLEY'S MOUN
NJ0004812	C	UPPER MUSCONETCONG R	I	ELASTIMOLD DIV AMERA	MORRIS	WASHINGTON TWP.	SCHOOLEY'S MOUN
NJ0026450	B	UPPER MUSCONETCONG R	I	LENTINE AGGREGATES	HUNTERDON	GLEN GARDNER BO	SPRUCE RUN
NJ0055026	B	UPPER NORTH BRANCH R	I	ITW THIELEX	MIDDLESEX	PISCATAWAY TWP.	BOUND BROOK
NJ0021334	A	UPPER NORTH BRANCH R	M	MENDHAM BOROUGH STP	MORRIS	MENDHAM TWP.	INDIA BROOK
NJ0028479	A	UPPER NORTH BRANCH R	M	JAMESBURG SCHOOL FOR	MIDDLESEX	MONROE TWP.	MATCHAPONIX BRO
NJ0029637	B	UPPER NORTH BRANCH R	I	BERNARDSVILLE QUARRY	SOMERSET	BERNARDSVILLE B	MINE BROOK
NJ0021881	A	UPPER NORTH BRANCH R	M	PEAPACK & GLADSTONE	SOMERSET	PEAPACK-GLADSTO	PEAPACK BR.
NJ0004731	B	UPPER NORTH BRANCH R	I	GREEN STREET WTP	BURLINGTON	MOUNT HOLLY TWP	RANCOCAS CREEK
NJ0029807	A	UPPER NORTH BRANCH R	M	NEW JERSEY DOT-MAINT	SOMERSET	BEDMINSTER TWP.	RARITAN RIVER
NJ0028495	A	UPPER NORTH BRANCH R	M	BEDMINSTER STP	SOMERSET	BEDMINSTER TWP.	RARITAN RIVER N
NJ0033995	A	UPPER NORTH BRANCH R	M	ENVIRONMENTAL DISPOS	SOMERSET	BEDMINSTER TWP.	UNNAMED TRIBUTA
NJ0052710	C	UPPER PASSAIC RIVER	I	MAC NAUGHTON EINSON	BERGEN	FAIR LAWN BORO	
NJ0052256	A	UPPER PASSAIC RIVER	M	CHATHAM TWP-CHATHAM	MORRIS	CHATHAM TWP.	
NJ0061875	C	UPPER PASSAIC RIVER	I	RKO TAPE CORP.	ESSEX	WEST CALDWELL B	

NJPDES NUMBER	DISCHARGE TYPE	WATERSHED	FACILITY TYPE	FACILITY NAME	COUNTY	MUNICIPALITY	RECEIVING WATER
NJ0062146	C	UPPER PASSAIC RIVER	I	RICHARDS INDUSTRIES	ESSEX	WEST CALDWELL B	
NJ0024929	A	UPPER PASSAIC RIVER	M	WOODLAND SEWAGE TREA	MORRIS	MORRIS TWP.	
NJ0024937	A	UPPER PASSAIC RIVER	M	MOLITOR WATER POLLUT	MORRIS	CHATHAM BORO	
NJ0029912	A	UPPER PASSAIC RIVER	M	NEW JERSEY DOT	MORRIS	HARDING TWP.	
NJ0020290	A	UPPER PASSAIC RIVER	M	CHATHAM TOWNSHIP MAI	MORRIS	CHATHAM TWP.	BLACK BK.
NJ0024414	B	UPPER PASSAIC RIVER	I	W MILFORD SHOPPING C	PASSAIC	WEST MILFORD TW	BELCHER'S CR.
NJ0027677	A	UPPER PASSAIC RIVER	M	OLDE MILFORD ESTATES	PASSAIC	WEST MILFORD TW	BELCHERS CREEK
NJ0022497	A	UPPER PASSAIC RIVER	M	STAGE IV SEWAGE TREA	SOMERSET	WARREN TWP.	DEAD RIVER
NJ0050369	A	UPPER PASSAIC RIVER	M	WARREN STAGE V STP	SOMERSET	WARREN TWP.	DEAD RIVER
NJ0022845	A	UPPER PASSAIC RIVER	M	HARRISON BROOK STP	SOMERSET	BERNARDS TWP.	DEAD RIVER TRIB
NJ0021938	A	UPPER PASSAIC RIVER	M	US NIKE 79/80 STP	MORRIS	EAST HANOVER TW	PASSAIC R.
NJ0021636	A	UPPER PASSAIC RIVER	M	NEW PROVIDENCE BOROU	UNION	NEW PROVIDENCE	PASSAIC R.
NJ0020281	A	UPPER PASSAIC RIVER	M	PARK CENTRAL SEWAGE	MORRIS	CHATHAM TWP.	PASSAIC R.
NJ0022489	A	UPPER PASSAIC RIVER	M	STAGE I AND II STP	SOMERSET	WARREN TWP.	PASSAIC RIVER
NJ0027961	A	UPPER PASSAIC RIVER	M	WATER POLLUTION CONT	UNION	BERKELEY HEIGHT	PASSAIC RIVER
NJ0024465	A	UPPER PASSAIC RIVER	M	PASSAIC TOWNSHIP STP	MORRIS	PASSAIC TWP.	PASSAIC RIVER
NJ0025518	A	UPPER PASSAIC RIVER	M	FLORHAM PARK STP	MORRIS	FLORHAM PARK BO	PASSAIC RIVER
NJ0029319	B	UPPER PASSAIC RIVER	I	EASTERN MOLDING CO I	ESSEX	BELLEVILLE TOWN	PASSAIC RIVER
NJ0032573	C	UPPER PASSAIC RIVER	I	NATIONAL MANUFACTURI	MORRIS	CHATHAM TWP.	PASSAIC RIVER
NJ0000540	BC	UPPER PASSAIC RIVER	I	CIBA-GEIGY CORP	UNION	SUMMIT CITY	PASSAIC RIVER
NJ0001490	C	UPPER PASSAIC RIVER	I	ORANGE PRODUCTS INC	MORRIS	FLORHAM PARK BO	PASSAIC RIVER
NJ0059625	B	UPPER PASSAIC RIVER	I	NESOR ALLOY CORPORAT	ESSEX	FAIRFIELD BORO	PASSAIC RIVER
NJ0062791	BC	UPPER PASSAIC RIVER	I	SILLCOCKS PLASTICS I	UNION	BERKELEY HEIGHT	PASSAIC RIVER
NJ0069957	C	UPPER PASSAIC RIVER	I	BOMONT PLASTICS CORP	PASSAIC	TOTOWA BORO	PASSAIC RIVER
NJ0031739	B	UPPER PASSAIC RIVER	I	JERSEY SPECIALTY CO	PASSAIC	WAYNE TWP.	STORM SEWER TO
NJ0026981	A	UPPER PASSAIC RIVER	M	MILFORD MANOR NURSIN	PASSAIC	WEST MILFORD TW	TRIB OF NOSENZO
NJ0029963	C	UPPER PASSAIC RIVER	I	GLASFLEX CORPORATION	SOMERSET	WARREN TWP.	TRIB TO PASSAIC
NJ0002551	B	UPPER PASSAIC RIVER	I	REHEIS CHEMICAL CO.	UNION	BERKELEY HEIGHT	UNNAMED TRIB TO
NJ0020184	A	UPPER PAULINS KILL	M	NEWTON TOWN OF	SUSSEX	NEWTON TOWN	MOORE'S BROOK
NJ0005711	B	UPPER PAULINS KILL	I	SCHERING CORPORATION	SUSSEX	LAFAYETTE TWP.	PAULINS KILL
NJ0022063	A	UPPER PAULINS KILL	M	SUSSEX COUNTY SERVIC	SUSSEX	FRANKFORD TWP.	PAULINS KILL RI
NJ0005711	B	UPPER PAULINS KILL	I	SCHERING CORPORATION	SUSSEX	LAFAYETTE TWP.	PAULINS KILLORM
NJ0052272	C	UPPER PAULINS KILL	I	EAST HANOVER MAINTEN	SUSSEX	NEWTON TOWN	STORM SEWER TO

NJPDES NUMBER	DISCHARGE TYPE	WATERSHED	FACILITY TYPE	FACILITY NAME	COUNTY	MUNICIPALITY	RECEIVING WATER
NJ0004791	B	UPPER PAULINS KILL	I	LIMECREST PLANT SPAR	SUSSEX	SPARTA TWP.	TRIBUTARY TO PA
NJ0062979	C	UPPER RARITAN RIVER	I	MASON CO DIV OF STAN	MIDDLESEX	MIDDLESEX BORO	BOUND BROOK
NJ0063002	B	UPPER RARITAN RIVER	I	GOLD MINE ESTATES WA	MORRIS	MOUNT OLIVE TWP	BUDD LAKE
NJ0028762	A	UPPER RARITAN RIVER	M	MANVILLE SEWER PLANT	SOMERSET	MANVILLE BORO	CONFLUENCE RARI
NJ0029921	C	UPPER RARITAN RIVER	I	CRESTLINE DIV OF N A	SOMERSET	RARITAN BORO	GASTON AVE BROO
NJ0069973	B	UPPER RARITAN RIVER	I	BUTRICO AUTO BODY SH	MIDDLESEX	SOUTH PLAINFIEL	NEW MARKET POND
NJ0053198	B	UPPER RARITAN RIVER	I	MARSULEX INC-SAYREVI	MIDDLESEX	SOUTH AMBOY CIT	RARITAN RIVER
NJ0029271	B	UPPER RARITAN RIVER	I	TAYLOR OIL CO INC	SOMERSET	SOMERVILLE BORO	STORM SEWER TO
NJ0060143	B	UPPER RARITAN RIVER	I	PIEZO ELECTRIC PRODU	MIDDLESEX	METUCHEN BORO	STORM SEWET TO
NJ0000965	B	UPPER RARITAN RIVER	I	RARITAN MILLSTONE PL	SOMERSET	BRIDGEWATER TWP	TRIBUTARY TO RA
NJ0020761	A	UPPER SALEM RIVER	M	NEW JERSEY TURNPIKE	SALEM	OLDMANS TWP.	PLAYTON LAKE
NJ0022250	A	UPPER SALEM RIVER	M	WOODSTOWN SEWERAGE A	SALEM	WOODSTOWN BORO	SALEM RIVER
NJ0004308	B	UPPER SALEM RIVER	I	RICHMAN ICE CREAM CO	SALEM	WOODSTOWN BORO	SALEM RIVER
NJ0052400	C	UPPER SALEM RIVER	I	ALU CHEM INC.	SALEM	SALEM CITY	SUB-SURFACE DRA
NJ0068357	C	UPPER SOUTH BRANCH R	I	CHESTER SPRINGS SHOP	MORRIS	CHESTER TWP.	
NJ0021954	A	UPPER SOUTH BRANCH R	M	CLOVERHILL TREATMENT	MORRIS	MOUNT OLIVE TWP	DRAKES BR.
NJ0028304	A	UPPER SOUTH BRANCH R	M	DAYS INN	MORRIS	ROXBURY TWP.	DRAKES BROOK
NJ0033367	B	UPPER SOUTH BRANCH R	I	STOKES OF VINCENTOWN	BURLINGTON	SOUTHAMPTON TWP	RANCOCAS CREEK
NJ0033901	B	UPPER SOUTH BRANCH R	I	RUNYON WATER TREATME	MIDDLESEX	PERTH AMBOY CIT	RUNYON POND
NJ0023736	A	UPPER SOUTH BRANCH R	M	SOUTHAMPTON WTP	BURLINGTON	SOUTHAMPTON TWP	SO BR RANCOCAS
NJ0023493	A	UPPER SOUTH BRANCH R	M	WASHINGTON TOWNSHIP	MORRIS	WASHINGTON TWP.	SO.BR.RARITAN
NJ0032662	C	UPPER SOUTH BRANCH R	I	DARTCO MANUFACTURING	SOMERSET	BRANCHBURG TWP.	ST. SEWER TO AN
NJ0026824	A	UPPER SOUTH BRANCH R	M	CHESTER SHOPPING CEN	MORRIS	CHESTER BORO	TIGER BROOK - B
NJ0022683	A	UPPER SOUTH BRANCH R	M	SKYVIEW STP	MORRIS	ROXBURY TWP.	TRIBUTARY DRAKE
NJ0034797	C	UPPER SOUTH BRANCH R	I	EASTERN STEEL BARREL	MIDDLESEX	PISCATAWAY TWP.	TRIBUTARY TO BO
NJ0001236	BC	UPPER SOUTH BRANCH R	I	WELSH FARMS INC	MORRIS	WASHINGTON TWP.	TRIBUTARY TO SO
NJ0031267	A	UPPER TOMS RIVER	M	OAK TREE MOBILE HOME	OCEAN	JACKSON TWP.	TOMS RIVER
NJ0035653	A	UPPER TOMS RIVER	M	FOUNTAINHEAD PARK IN	OCEAN	JACKSON TWP.	TRIB METEDECONK
NJ0027006	A	WANAQUE RIVER	M	RINGWOOD ACRES TREAT	PASSAIC	RINGWOOD BORO	HIGH MT BROOK
NJ0029769	B	WANAQUE RIVER	I	AMERICAN CANDLE CO I	PASSAIC	WANAQUE BORO	PASSAIC RIVER
NJ0025470	C	WANAQUE RIVER	I	NATIONAL BERYLLIA DI	PASSAIC	WANAQUE BORO	POST BROOK
NJ0001317	B	WANAQUE RIVER	I	ARROW GROUP INDUSTRI	PASSAIC	WANAQUE BORO	POSTS BROOK
NJ0027669	A	WANAQUE RIVER	M	AWOSTING STP	PASSAIC	WEST MILFORD TW	WANAQUE RIVER

NJPDES NUMBER	DISCHARGE TYPE	WATERSHED	FACILITY TYPE	FACILITY NAME	COUNTY	MUNICIPALITY	RECEIVING WATER
NJ0029947	C	WANAQUE RIVER	I	SOLAR PRODUCTS INC	PASSAIC	POMPTON LAKES B	WANAQUE RIVER
NJ0032395	A	WANAQUE RIVER	M	RINGWOOD PLAZA STP	PASSAIC	RINGWOOD BORO	WANAQUE RIVER
NJ0026689	A	WHIPPANY RIVER	M	GREYSTONE PARK PSYCH	MORRIS	MORRIS TWP.	
NJ0031305	B	WHIPPANY RIVER	I	ALLIED-SIGNAL INC	MORRIS	MORRISTOWN TOWN	BLACK BROOK
NJ0001155	C	WHIPPANY RIVER	I	SANDOZ PHARMACEUTICA	MORRIS	EAST HANOVER TW	BLACK BROOK
NJ0003476	BC	WHIPPANY RIVER	I	EXXON RESEARCH & ENG	MORRIS	FLORHAM PARK BO	BLACK BROOK
NJ0035777	C	WHIPPANY RIVER	I	EXXON CENTRAL SERVIC	MORRIS	FLORHAM PARK BO	BLACK BROOK
NJ0032166	C	WHIPPANY RIVER	I	ASCO ELECTRIC	MORRIS	PARSIPPANY TROY	EASTMANS BROOK
NJ0001155	C	WHIPPANY RIVER	I	SANDOZ PHARMACEUTICA	MORRIS	EAST HANOVER TW	PINCH BROOK
NJ0025739	B	WHIPPANY RIVER	I	LITTON INDUSTRIES IN	MORRIS	MORRIS PLAINS B	TRIB OF WHIPPAN
NJ0063070	B	WHIPPANY RIVER	I	BLACK BROOK TREATMEN	MORRIS	HANOVER TWP.	UNNAMED DITCH T
NJ0033685	B	WHIPPANY RIVER	I	CHAMPION INTL DAIRYP	MORRIS	MORRISTOWN TOWN	UNNAMED TRIBUTA
NJ0003514	B	WHIPPANY RIVER	I	PPF INTERNATIONAL IN	MORRIS	EAST HANOVER TW	WATER FILLED DI
NJ0002542	C	WHIPPANY RIVER	I	WARNER-LAMBERT CO	MORRIS	MORRIS PLAINS B	WATNONG BROOK
NJ0024911	A	WHIPPANY RIVER	M	BUTTERWORTH STP	MORRIS	MORRIS TWP.	WHIPPANY R.
NJ0024902	A	WHIPPANY RIVER	M	HANOVER SEWERAGE AUT	MORRIS	HANOVER TWP.	WHIPPANY R.
NJ0024970	A	WHIPPANY RIVER	M	ADVANCED WASTEWATER	MORRIS	PARSIPPANY TROY	WHIPPANY R.
NJ0025739	B	WHIPPANY RIVER	I	LITTON INDUSTRIES IN	MORRIS	MORRIS PLAINS B	WHIPPANY RIVER
NJ0025496	A	WHIPPANY RIVER	M	MORRISTOWN TOWN OF	MORRIS	MORRISTOWN TOWN	WHIPPANY RIVER
NJ0029734	B	WHIPPANY RIVER	I	FABRICATED PLASTICS	MORRIS	MORRISTOWN TOWN	WHIPPANY RIVER
NJ0003697	C	WHIPPANY RIVER	I	COLLOID CHEMICAL INC	MORRIS	HANOVER TWP.	WHIPPANY RIVER
NJ0003697	B	WHIPPANY RIVER	I	COLLOID CHEMICAL INC	MORRIS	HANOVER TWP.	WHIPPANY RIVER
NJ0001155	C	WHIPPANY RIVER	I	SANDOZ PHARMACEUTICA	MORRIS	EAST HANOVER TW	WHIPPANY RIVER
NJ0035238	C	WHIPPANY RIVER	I	MENNEN COMPANY	MORRIS	MORRISTOWN TOWN	WHIPPANY RIVER
NJ0036081	B	WHIPPANY RIVER	I	EAST HANOVER TWP WEL	MORRIS	EAST HANOVER TW	WHIPPANY RIVER
NJ0054127	B	WHIPPANY RIVER	I	SIMMONDS PRECISION	MORRIS	HANOVER TWP.	WHIPPANY RIVER
NJ0064734	B	WHIPPANY RIVER	I	AMOCO SERVICE STATIO	MIDDLESEX	CARTERET BORO	WHIPPANY RIVER
NJ0035238	C	WHIPPANY RIVER	I	MENNEN COMPANY	MORRIS	MORRISTOWN TOWN	WHIPPANYRIVER
NJ0034517	A	000000--------000000	M	FORT LEE BOROUGH	BERGEN	FORT LEE BORO	
NJ0062391	C	000000--------000000	I	WHEELABRATOR GLOUCES	GLOUCESTER	WEST DEPTFORD T	
NJ0069094	B	000000--------000000	I	N J DEPT OF TRANSPO	HUDSON	BAYONNE CITY	KILL VAN KULL
NJ0035203	B	000000--------000000	I	ALOYCO INC	UNION	LINDEN CITY	KINGS CREEK
NJ0063932	B	000000--------000000	I	EGG HARBOR CITY WATE	ATLANTIC	EGG HARBOR CITY	LANDING CREEK

NJPDES NUMBER	DISCHARGE TYPE	WATERSHED	FACILITY TYPE	FACILITY NAME	COUNTY	MUNICIPALITY	RECEIVING WATER
NJ0098485	C	000000--------000000	I	INTERSTATE MOTOR PLA	BERGEN	MAHWAH TWP.	MASONICUS CREEK
NJ0050130	A	000000--------000000	M	RIVERSIDE FARMS STP	SOMERSET	MONTGOMERY TWP.	MILLSTONE RIVER
NJ0030732	C	000000--------000000	I	PHILIP A HUNT CHEMIC	BERGEN	PALISADES PARK	OVERPECK CREEK
NJ0020443	B	000000--------000000	I	AT&T TECHNOLOGIES	HUDSON	KEARNY TOWN	PASSAIC RIVER
NJ0073741	C	000000--------000000	I	HONEYCOMB PLASTICS C	HUDSON	KEARNY TOWN	PASSAIC RIVER
NJ0026701	A	000000--------000000	M	SUSSEX CNTY BRD FREE	SUSSEX	FRANKFORD TWP.	PAULINSKILL TRI
NJ0033189	B	000000--------000000	I	PEQUEST TROUT HATCHE	WARREN	LIBERTY TWP.	PEQUEST RIVER
NJ0062391	C	000000--------000000	I	WHEELABRATOR GLOUCES	GLOUCESTER	WEST DEPTFORD T	RETENTION BASIN
NJ0069167	A	000000--------000000	M	MAPLE SHADE TOWNSHIP	BURLINGTON	MAPLE SHADE TWP	SOUTH PENNSAUKE
NJ0064271	B	000000--------000000	I	BOONTON WATER FILTRA	MORRIS	MONTVILLE TWP.	STONY BROOK
NJ0069205	B	000000--------000000	I	DUELL FUEL COMPANY	ATLANTIC	PLEASANTVILLE C	STORM SEWER TO
NJ0062201	A	000000--------000000	M	CANTON VILLAGE STP	SALEM	SALEM CITY	STOW CREEK
NJ0027073	A	000000--------000000	M	SPARTA BD OF ED HIGH	SUSSEX	SPARTA TWP.	TRIB OF WALKILL
NJ0021776	A	000000--------000000	M	BEAR TAVERN ROAD SCH	MERCER	HOPEWELL TWP.	TRIBUTARY OF DE
NJ0032255	B	322500--------541055	I	STERLING DRUG, INC.	MERCER	TRENTON CITY	STORM SEWER TO
NJ0023809	B	390015--------745600	I	LOWER TOWNSHIP OF MU	CAPE MAY	LOWER TWP.	COX HALL CREEK
NJ0029670	B	391406--------750051	I	REED & REED	CUMBERLAND	COMMERCIAL TWP.	MAURICE RIVER
NJ0053775	B	391820--------744140	I	ARVEY CORPORATION	ESSEX	CEDAR GROVE TWP	PECKMAN RIVER
NJ0005339	B	391930--------745620	I	PORT ELIZABETH SAND	CUMBERLAND	MAURICE RIVER T	MUSKEE CREEK
NJ0066231	B	392330--------750230	I	WARE AVE WATER TREAT	CUMBERLAND	MILLVILLE CITY	MAURICE RIVER
NJ0061018	C	392512--------751407	I	CUMBERLAND DAIRY INC	CUMBERLAND	BRIDGETON CITY	
NJ0005304	C	392740--------750155	I	O-I/SCHOTT PROCESS S	CUMBERLAND	VINELAND CITY	MAURICE RIVER
NJ0028797	A	393800--------752300	M	SALEM COUNTY VOC TEC	SALEM	MANNINGTON TWP.	MAJOR RUN CREEK
NJ0068730	B	393958--------753045	I	WATERSTREET WTP	SALEM	PENNSVILLE TWP.	DRAINAGE DITCH
NJ0057860	B	394045--------752845	I	PILOT OIL CORPORATIO	SALEM	SALEM CITY	DRAINAGE DITCH
NJ0004413	B	394430--------750730	I	SONY MUSIC ENTERTAIN	GLOUCESTER	PITMAN BORO	MANTUA CREEK
NJ0064696	B	394905--------751115	I	CHEVRON USA-GULF TER	GLOUCESTER	WOODBURY CITY	STORM SEWER TO
NJ0005355	C	395112--------751400	I	ESSEX CHEMICAL CORPO	GLOUCESTER	PAULSBORO BORO	DELAWARE RIVER
NJ0052612	B	395230--------750000	I	RYDER TRUCK RENTAL,	CAMDEN	CHERRY HILL TWP	COOPER RIVER
NJ0005401	B	395240--------750950	I	COASTAL EAGLE POINT	GLOUCESTER	WEST DEPTFORD T	DELAWARE RIVER
NJ0005401	B	395240--------750950	I	COASTAL EAGLE POINT	GLOUCESTER	WEST DEPTFORD T	DELAWARE RIVER
NJ0069230	BC	395800--------750230	I	SCHAEVITZ ENGINEERIN	CAMDEN	PENNSAUKEN TWP.	
NJ0022438	A	395900--------743900	M	PEMBERTON TOWNSHIP B	BURLINGTON	PEMBERTON TWP.	NO BR RANCOCAS

NJPDES NUMBER	DISCHARGE TYPE	WATERSHED	FACILITY TYPE	FACILITY NAME	COUNTY	MUNICIPALITY	RECEIVING WATER
NJ0031011	A	400100--------752005	M	PEMBERTON TOWNSHIP B	BURLINGTON	PEMBERTON TWP.	N B RANCOCAS
NJ0021091	A	400103--------743310	M	JEFFERSON MIDDLE & H	MORRIS	JEFFERSON TWP.	ROCKAWAY R.
NJ0004642	C	400142--------741855	I	NAVAL AIR ENGINEERIN	OCEAN	MANCHESTER TWP.	MANAPAQUA BROOK
NJ0021571	A	400210--------744211	M	SPRINGFIELD TWP BD O	BURLINGTON	SPRINGFIELD TWP	BARKERS CREEK
NJ0021407	A	400420--------743143	M	PLUMSTED TWP SCHOOL	OCEAN	PLUMSTEAD TWP.	CROSSWICKS CREE
NJ0031542	B	400447--------740531	I	POINT PLEASANT BOROU	OCEAN	POINT PLEASANT	BARNEGAT BAY
NJ0022381	A	400530--------744112	M	NORTHERN BURLINGTON	BURLINGTON	MANSFIELD TWP.	BACON RUN TO BL
NJ0035041	A	400610--------742720	M	MAPLE GLEN PARK	OCEAN	JACKSON TWP.	METEDECONK RIVE
NJ0029513	A	400633--------742022	M	JACKSON TOWNSHIP BD.	OCEAN	JACKSON TWP.	NORTH BRANCH OF
NJ0051403	B	400910--------743931	I	COLONIAL PIPELINE AL	BURLINGTON	BORDENTOWN TWP.	
NJ0028894	A	401147--------744516	M	KITTATINNY REGIONAL	SUSSEX	NEWTON TOWN	PAULINS KILL
NJ0057649	B	401500--------741500	I	AGWAY PETROLEUM CORP	MONMOUTH	FREEHOLD BORO	APPLEGATES CREE
NJ0002623	C	401757--------740322	I	ALLIED SIGNAL AEROSP	MONMOUTH	EATONTOWN BORO	HUSKY BROOK
NJ0031674	A	401930--------741200	M	REMINGTON'S RESTAURA	MONMOUTH	HOLMDEL TWP.	NAVESINK RIVER
NJ0027031	A	402040--------741012	M	HOLMDEL VILLAGE SCHO	MONMOUTH	HOLMDEL TWP.	RAMANENSSIN BRK
NJ0032263	B	402057--------744823	I	PENNINGTON QUARRY	MIDDLESEX	SOUTH BRUNSWICK	BALDWINS CREEK
NJ0032263	B	402057--------744823	I	PENNINGTON QUARRY	MIDDLESEX	SOUTH BRUNSWICK	BALDWINS CREEK
NJ0068071	B	402150--------741821	I	EXXON SERVICE STATIO	MIDDLESEX	OLD BRIDGE TWP.	UNNAMED TRIBUTA
NJ0099147	B	402400--------743430	I	BFI SOUTH BRUNSWICK	MIDDLESEX	CRANBURY TWP.	HEATHCOTE BROOK
NJ0098710	C	402440--------740946	I	REVLON	MONMOUTH	HOLMDEL TWP.	
NJ0022306	A	402505--------741835	M	OLD BRIDGE BOARD OF	MIDDLESEX	OLD BRIDGE TWP.	TENNENTS BROOK
NJ0026891	A	402518--------744025	M	BURNT HILL STP	SOMERSET	MONTGOMERY TWP.	BACK BROOK
NJ0023124	A	402521--------744020	M	MONTGOMERY HIGH SCHO	SOMERSET	MONTGOMERY TWP.	KING'S CREEK, B
NJ0067733	A	402600--------743845	M	OXBRIDGE SEWAGE TREA	SOMERSET	MONTGOMERY TWP.	
NJ0005762	B	402625--------740336	I	OHMSETT	MONMOUTH	MIDDLETOWN TWP.	SANDY HOOK BAY
NJ0060038	A	402704--------743857	M	PIKE BROOK TREATMENT	SOMERSET	MONTGOMERY TWP.	
NJ0030392	B	402821--------742829	I	GMC DELCO REMY	MIDDLESEX	NEW BRUNSWICK C	MILE RUN BRK
NJ0000060	B	402830--------742730	I	RHONE-POULENC CORP	MIDDLESEX	NEW BRUNSWICK C	
NJ0028754	B	403000--------745524	I	MEENAN OIL CO INC	HUNTERDON	CLINTON TWP.	UNNAMED TRIB
NJ0069515	C	403015--------741430	I	ENGRAPH INC	UNION	HILLSIDE TWP.	STORM SEWER TO
NJ0023311	A	403025--------750025	M	KINGWOOD TOWNSHIP BD	HUNTERDON	KINGWOOD TWP.	KRIAL POND
NJ0061727	B	403158--------741536	I	KOCH ASPHALT COMPANY	MIDDLESEX	PERTH AMBOY CIT	ARTHUR KILL
NJ0075094	B	403345--------743000	I	POSSUMTOWN ROAD LAND	MIDDLESEX	PISCATAWAY TWP.	

NJPDES NUMBER	DISCHARGE TYPE	WATERSHED	FACILITY TYPE	FACILITY NAME	COUNTY	MUNICIPALITY	RECEIVING WATER
NJ0027553	A	403401--------750133	M	LESTER WILSON ELEM S	HUNTERDON	ALEXANDRIA TWP.	DELAWARE RIVER
NJ0035670	A	403422--------750040	M	ALEXANDRIA SCHOOL ST	HUNTERDON	FRANKLIN TWP.	CAKEPAULIN CR
NJ0026697	A	403423--------744449	M	READINGTON TOWNSHIP	HUNTERDON	READINGTON TWP.	HOLLAND BROOK
NJ0020991	A	403504--------743826	M	SAINT BERNARDS CHURC	SOMERSET	BRIDGEWATER TWP	LOCHIEL CREEK
NJ0068713	B	403610--------741554	I	UNION COUNTY RESOURC	UNION	RAHWAY CITY	RAHWAY RIVER
NJ0062138	B	403610--------741630	I	DRI-PRINT FOILS, INC	UNION	RAHWAY CITY	SO BRANCH OF RA
NJ0026671	B	403625--------741443	I	RAHWAY RIVER TANKFIE	UNION	LINDEN CITY	RAHWAY RIVER
NJ0054119	B	403643--------741542	I	ANCHOR MOTOR FREIGHT	UNION	LINDEN CITY	STORM SEWER TO
NJ0001058	C	403730--------741437	I	AMERICAN CYANAMID CO	UNION	LINDEN CITY	ARTHUR KILL
NJ0028363	A	403735--------745245	M	NO HUNTERDON REGIONA	HUNTERDON	CLINTON TWP.	CRAMER CREEK TO
NJ0024091	A	403752--------750800	M	UNION TOWNSHIP BD OF	HUNTERDON	HAMPTON BORO	MULHOCAWAY CR.
NJ0023175	A	403800--------745000	M	CLINTON TOWNSHIP BD	HUNTERDON	CLINTON TWP.	SOUTH BRANCH OF
NJ0064599	BC	403803--------740646	I	COGEN TECHNOLOGIES-B	HUDSON	BAYONNE CITY	KILL VAN KULL
NJ0053015	C	403856--------742111	I	LORD & TAYLOR - WEST	UNION	WESTFIELD TOWN	UNNAMED TRIBUTA
NJ0030449	B	403920--------740640	I	RONA PEARL INC	HUDSON	BAYONNE CITY	SE3
NJ0021083	A	403949--------743352	M	VA MEDICAL CENTER	SOMERSET	BERNARDSVILLE B	
NJ0029963	B	403955--------742900	I	GLASFLEX CORPORATION	SOMERSET	WARREN TWP.	TRIB TO PASSAIC
NJ0004049	BC	404112--------751003	I	INGERSOLL-RAND COMPA	WARREN	PHILLIPSBURG TO	
NJ0030791	C	404200--------740700	I	DEGEN OIL & CHEMICAL	HUDSON	JERSEY CITY	HACKENSACK R
NJ0002887	B	404227--------742004	I	UNION COUNTY	UNION	SPRINGFIELD TWP	BRIANT BROOK
NJ0025631	B	404310--------740624	I	COLUMBIA TERMINAL IN	HUDSON	KEARNY TOWN	HACKENSACK RIVE
NJ0061522	B	404400--------740230	I	NEWPORT CENTRE REGIO	HUDSON	JERSEY CITY	
NJ0000566	B	404403--------740928	I	PSE&G HARRISON GAS P	HUDSON	HARRISON TOWN	PASSAIC RIVER
NJ0031747	B	404411--------740445	I	EASTERN OF NEW JERSE	HUDSON	JERSEY CITY	HACKENSACK RIVE
NJ0020711	A	404434--------750137	M	WARREN COUNTY TECHNI	WARREN	FRANKLIN TWP.	POHATCONG CR.
NJ0035025	B	404437--------740517	I	OWENS-CORNING FIBERG	HUDSON	KEARNY TOWN	FLOOR DRAIN TO
NJ0034894	B	404445--------745322	I	DIAMOND AEROSOL CORP	HUNTERDON	LEBANON BORO	SPRUCE RUN CREE
NJ0032905	A	404459--------744730	M	HOPEWELL VALLEY CENT	MERCER	PENNINGTON BORO	STONY BROOK
NJ0065382	C	404600--------740747	I	TEXSTAR CHEMICAL COR	HUDSON	KEARNY TOWN	CULVERT REAR OF
NJ0023001	A	404604--------750030	M	SALVATION ARMY CAMP	HUNTERDON	ALEXANDRIA TWP.	
NJ0054747	C	404605--------740807	I	PFAFF TOOL & MANUFAC	HUDSON	KEARNY TOWN	STORM SEWER TO
NJ0034592	B	404621--------741350	I	ORANGE CITY OF WATER	ESSEX	ORANGE CITY	EAST BRANCH RAH
NJ0029246	B	404700--------740000	I	LIGHTHOUSE BAR & RES	HUDSON	WEST NEW YORK T	HUDSON RIVER

NJPDES NUMBER	DISCHARGE TYPE	WATERSHED	FACILITY TYPE	FACILITY NAME	COUNTY	MUNICIPALITY	RECEIVING WATER
NJ0026751	A	404700--------743200	M	ST MARY'S ABBEY	MORRIS	MORRIS TWP.	PASSAIC RIVER
NJ0077828	A	404716--------740003	M	WEST NEW YORK INTERI	HUDSON	WEST NEW YORK T	HUDSON RIVER
NJ0063517	C	404719--------710104	I	KEYSTONE METAL FINIS	HUDSON	SECAUCUS TOWN	
NJ0055778	B	404730--------740630	I	KINGSLAND PARK SAN.	BERGEN	LITTLE FERRY BO	
NJ0072605	C	404755--------742047	I	AMERACE CORPORATION	ESSEX	LIVINGSTON TWP.	PASSAIC RIVER
NJ0004847	B	404815--------750000	I	OXTECH INDUSTRIES IN	WARREN	OXFORD TWP.	FURNACE BROOK
NJ0063479	C	405000--------740000	I	NOVEL KNIT INC	BERGEN	FAIRVIEW BORO	
NJ0050024	B	405000--------742615	I	ANCHOR SWIM CLUB	MORRIS	HANOVER TWP.	MALAPARDIS BROO
NJ0054682	B	405010--------740201	I	ANDRILL OIL COMPANY	BERGEN	LITTLE FERRY BO	
NJ0074268	B	405050--------742528	I	PARSIPPANY-TROY HILL	MORRIS	PARSIPPANY TROY	EASTMAN'S BROOK
NJ0026603	A	405053--------743415	M	RANDOLPH HIGH SCHOOL	MORRIS	RANDOLPH TWP.	MILL BROOK
NJ0054216	C	405100--------740500	I	JOHN DEERE TECH INC	BERGEN	WOOD-RIDGE BORO	SADDLE RIVER
NJ0055719	B	405118--------740349	I	EXXON CO USA	BERGEN	TETERBORO BORO	WEST RISER DITC
NJ0035220	A	405119--------744531	M	EQUITY SHOPPING PLAZ	MORRIS	MOUNT OLIVE TWP	RARITAN RIVER
NJ0070599	B	405330--------745930	I	GETTY SERVICE STATIO	BERGEN	ENGLEWOOD CITY	OVERPECK CREEK
NJ0064220	B	405335--------740848	I	EXXON SERVICE STATIO	BERGEN	ELMWOOD PARK BO	
NJ0076082	A	405415--------744330	M	INTERNATIONAL TRADE	MORRIS	MOUNT OLIVE TWP	WILLS BROOK
NJ0000523	BC	405421--------743438	I	AIR PRODUCTS & CHEMI	MORRIS	WHARTON BORO	ROCKAWAY
NJ0052949	B	405427--------740610	I	FLORAL GLASS INDUSTR	BERGEN	MOONACHIE BORO	SADDLE RIVER
NJ0025674	B	405449--------743000	I	ACTION TECHNOLOGY CO	MORRIS	ROCKAWAY TWP.	WHITE MEADOW BR
NJ0029432	A	405500--------741000	M	ROBERT ERSKINE SCHOO	PASSAIC	RINGWOOD BORO	ERSKINE BROOK
NJ0067857	B	405700--------745300	I	JOHNSONBURG PRESBYTE	WARREN	FRELINGHUYSEN T	GLOVERS POND TO
NJ0021105	A	405820--------743524	M	ARTHUR STANLICK SCHO	MORRIS	WHARTON BORO	LAKE SHAWNEE
NJ0024457	A	405830--------742300	M	OUR LADY OF THE MAGN	MORRIS	KINNELON BORO	BUTLER RESERVOI
NJ0031046	A	405830--------745830	M	NORTH WARREN REG HIG	WARREN	BLAIRSTOWN TWP.	PAVLINS KILL
NJ0021156	A	405835--------743614	M	CONSOLIDATED SCHOOL	MORRIS	JEFFERSON TWP.	LAKE HOPATCONG
NJ0022632	A	405909--------744228	M	BYRAM TOWNSHIP BD OF	SUSSEX	BYRAM TWP.	EAST BROOK
NJ0022284	A	405949--------742224	M	KINNELON BOARD OF ED	MORRIS	KINNELON BORO	TRIBUTARY PEQUA
NJ0022276	A	410000--------742230	M	STONYBROOK SCHOOL	MORRIS	KINNELON BORO	PEQUANNOCK RIVE
NJ0027065	A	410120--------744037	M	SPARTA BD OF ED-ALPI	SUSSEX	SPARTA TWP.	TRIB OF WALKILL
NJ0021253	A	410127--------741344	M	INDIAN HILLS HIGH SC	BERGEN	OAKLAND BORO	CRYSTAL BROOK
NJ0020419	A	410155--------744230	M	LONG POND SCHOOL	SUSSEX	NEWTON TOWN	DELAWARE R.
NJ0064238	B	410200--------740800	I	EXXON SERVICE STATIO	BERGEN	ALLENDALE BORO	RAMSEY BROok

NJPDES NUMBER	DISCHARGE TYPE	WATERSHED	FACILITY TYPE	FACILITY NAME	COUNTY	MUNICIPALITY	RECEIVING WATER
NJ0030384	A	410200--------741200	M	MANITO SCHOOL WASTEW	BERGEN	OAKLAND BORO	RAMAPO RIVER
NJ0027049	A	410210--------743800	M	POPE JOHN XXIII HIGH	SUSSEX	LAFAYETTE TWP.	TRIB OF WALKILL
NJ0064157	B	410230--------740300	I	MUNICIPAL SWIMMING P	BERGEN	PARK RIDGE BORO	MILL BROOK
NJ0027081	A	410316--------743415	M	SPARTA HIGH SCHOOL -	SUSSEX	SPARTA TWP.	TRIB OF WALKILL
NJ0024163	A	410330--------744430	M	BIG "N" SHOPPING CEN	SUSSEX	LAFAYETTE TWP.	PAULINS KILL
NJ0034169	A	410345--------741630	M	PETER COOPER SCHOOL	PASSAIC	RINGWOOD BORO	HIGH MOUNTAIN B
NJ0030201	A	410537--------742314	M	CAMP VACAMAS ASSOC O	PASSAIC	WEST MILFORD TW	PASSAIC RIVER
NJ0072427	B	410630--------741000	I	SHORECO NORTH	BERGEN	MAHWAH TWP.	RAMAPO RIVER
NJ0071871	B	410630--------741000	I	SHORECO SOUTH	BERGEN	MAHWAH TWP.	RAMAPO RIVER
NJ0033308	A	410800--------742100	M	MARSHALL HILL SCHOOL	PASSAIC	WEST MILFORD TW	NE/LOWER HUDSON
NJ0024414	A	410815--------742130	M	W MILFORD SHOPPING C	PASSAIC	WEST MILFORD TW	BELCHER'S CR.
NJ0069621	C	411228--------742830	I	AMES RUBBER CO.	SUSSEX	VERNON TWP.	BLACK CREEK
NJ0031585	A	411230--------743838	M	HIGH POINT REGIONAL	SUSSEX	WANTAGE TWP.	PAPAKATING CREE
NJ0023841	A	411330--------743030	M	LOUNSBERRY HOLLOW MI	SUSSEX	VERNON TWP.	BLACK CR.
NJ0031429	C	413000--------744400	I	CARTER-WALLACE INC	MERCER	TRENTON CITY	ASSUNPINK CREEK
NJ0026115	B		I	REGION OIL COMPANY	SUSSEX	FREDON TWP.	DRAINAGE DITCH
NJ0006661	B		I	PLASTOID CORP	SUSSEX	HARDYSTON TWP.	DRAINAGE DITCH
NJ0027057	A		M	SPARTA TWP STP	SUSSEX	SPARTA TWP.	TRIB OF WALKILL
NJ0029041	A		M	REGENCY APARTMENT	SUSSEX	WANTAGE TWP.	TRIBUTARY TO WA
NJ0031038	B		I	FRANKLIN BOARD OF PU	SUSSEX	FRANKLIN BORO	WALLKILL RIVER
NJ0020885	BC		I	PLASTOID CORPORATION	SUSSEX	HAMBURG BORO	WALLKILL RIVER
NJ0004596	B		I	STERLING MINE	SUSSEX	OGDENSBURG BORO	WALLKILL RIVER
NJ0000141	BC		I	AMES RUBBER CORPORAT	SUSSEX	HAMBURG BORO	WALLKILL RIVER
NJ0033472	B		I	TRI-COUNTY WATER CON	SUSSEX	SPARTA TWP.	WALLKILL RIVER

BIBLIOGRAPHY AND LITERATURE CITED

Brown, R.M., N.I. McClellend, R.A. Deininger and R.G. Tozer. 1970. A Water Quality Index - Do We Dare? Water and Sewage Works; October, pg. 339-343.

Delaware River Basin Commission. 1990. Delaware River Water Quality Assessment. 1988-1989 305(b) Report. Delaware River Basin Commission; Gerald M. Hansler, Executive Director. West Trenton, New Jersey.

Hay, L.E. and Campbell, J.P. 1990. Water-Quality Trends In New Jersey Streams. U.S. Geological Survey Water-Resources Investigations Report 90-4046. U.S. Geological Survey, West Trenton, New Jersey.

Interstate Sanitation Commission. 1990. Status Report on the Interstate Sanitation District Waters; Alan I. Mytelka, Ph.D. Director and Chief Engineer. 311 West 43rd Street, New York, New York 10036.

Kennish, M.J., Belton, T.J., Hauge, P., Lockwood, K., Ruppel, B.E. 1992. Polychlorinated Biphenyls in Estuarine and Coastal Marine Waters of New Jersey: A Review of Contamination Problems. Reviews in Aquatic Sciences, 6(3,4):275-293.

Morgan, Mark D. and Good, Ralph E. 1988. Stream Chemistry in the New Jersey Pinelands: The Influence of Precipitation and Watershed Disturbance. Water Resources Res. Vol. 24, no. 7, pp 1091-1100.

NJ Department of Environmental Protection and Energy. 1983. PCB's in Selected Finfish Caught Within New Jersey Waters 1981-1982 (With Limited Chlordane Data). NJDEPE; Trenton, New Jersey.

Ibid. 1985a. Surface Water Quality Standards, N.J.A.C. 7:9-4.1 et seq. Division of Water Resources; Trenton, New Jersey.

Ibid. 1985b. Use Attainability Analysis of the New York Harbor Complex. Division of Water Resources; Trenton, New Jersey.

Ibid. 1985c. A Study of Toxic Hazards to Urban Recreational Fisherman and Crabbers. Office of Science and Research; Trenton, New Jersey.

Ibid. 1986. New Jersey 1986 State Water Quality Inventory Report. Division of Water Resources, Bureau of Water Resources Management Planning; Trenton, New Jersey.

Ibid. 1987. New Jersey Floatables: Possible Sources, Transport, and Beach Survey Results. Prepared for the Division of Water Resources, Bureau of Monitoring Management; Trenton, New Jersey.

Ibid. 1988. 1988 Status Reports on The Hazardous Waste Management Program In New Jersey; Site Specific Information. Division of Hazardous Waste Management; Trenton, New Jersey.

Ibid. 1989a. The Cooperative Coastal Monitoring Program, 1988. Division of Water Resources, Bureau of Monitoring Management; Trenton, New Jersey.

Ibid. 1989b. Biological Assessment of Macroinvertebrate and Periphyton Communities; Fixed Station Biomonitoring Network 1988. Division of Water Resources, Bureau of Monitoring Management; Trenton, New Jersey

Ibid. 1989c. Summary of Phytoplankton Blooms and Related Conditions in New Jersey Coastal Waters, Summer of 1989. Division of Water Resources, Bureau of Monitoring Management. Biological Services Unit; Trenton, New Jersey.

Ibid. 1989d. New Jersey Nonpoint Source Assessment and Management Program. Division of Water Resources, Bureau of Water Quality Planning; Trenton, New Jersey

Ibid. 1990. Cooperative Coastal Monitoring Program, 1989. Division of Water Resources, Bureau of Monitoring Management; Trenton, New Jersey.

U.S. Environmental Protection Agency. 1987a. Green Tide Monitoring Survey for 1986: Results. Prepared by Science Applications International Corp., 8600 Westpark Dr., Mclean, Va. 22102. Prepared for USEPA, Region II, 26 Federal Plaza, New York, New York.

Ibid. 1987b. New York Bight Water Quality, Summer of 1986. Surveillance and Monitoring Branch; Edison, New Jersey.

Ibid. 1988. Chemical Characteristics of Streams in the Mid-Atlantic and Southeastern United States (National Stream Survey - Phase 1). Office of Acid Deposition, Environmental Monitoring and Quality Assurance. Washington, D.C.

Stansley, W. 1988. Trout Reproduction in Van Campens Brook. New Jersey Dept. of Environmental Protection, Division of Fish, Game, and Wildlife; Lebanon, New Jersey.

OTHER REFERENCES

New Jersey Department of Health. 1988. A Study of the Relationship Between Illnesses and Ocean Beach Water Quality. Division of Occupational and Environmental Health, Environmental Health Service; Trenton, New Jersey.

NJ Department of Environmental Protection and Energy. 1987. New Jersey Floatables Study: Possible Sources, Transport, and Beach Survey Results. Prepared by Science Applications International Corp., Mclean, Va. Prepared for NJDEP, Bureau of Monitoring and Data Management; Trenton, New Jersey.

Ibid. 1988. New Jersey's Coastal Ocean. Prepared by the Planning Group, Office of the Commissioner, NJDEP; Trenton, New Jersey.

Ibid. 1990. Polychlorinated Biphenyls (PCBs), Chlordane, and DDT's in Selected Fish and Shellfish from New Jersey Waters, 1986-1987: Results from New Jersey's Toxics in Biota Monitoring Program. NJDEPE; Trenton, New Jersey.

Ibid. 1992. Shellfish Growing Water Classification Charts. Bureau Of Marine Water Classification and Analysis; Trenton, New Jersey.

New Jersey Coastal Commission. 1987. A Proposal for the Coast. State of New Jersey, Office of the Governor; Trenton, New Jersey.

CHAPTER IV

GROUND WATER QUALITY AND MANAGEMENT

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GROUND WATER QUALITY AND MANAGEMENT

A. INTRODUCTION

Ground water is an extremely important resource for the people of New Jersey. It provides approximately 50 percent of the State's potable water, with 39 percent coming from public-supply wells and 11 percent from domestic-supply wells. It also provides baseflow to streams and is intimately associated with the ecology of the State's wetlands. New Jersey has regulations and programs aimed at protecting this precious resource. This chapter summarizes information on the State's ground water quality, quantity, and protection programs.

Ground Water Hydrology and Applicable Definitions

A **contaminant** is defined by the New Jersey Safe Drinking Water Act (N.J.A.C. 7:10) as "any physical, chemical, biological or radiological substance or matter in water." Accordingly, a contaminant can be natural or artificially introduced. Most contaminants are dissolved, like Na^+ (sodium) and Cl^- (chloride) in water, or immiscible, like oil in water. Their migration is controlled by the hydrodynamic and hydrogeochemical setting and the physical and chemical characteristics of the specific *contaminant. Some contaminants are highly mobile in the aqueous* environment whereas others are highly immobile. Dissolved contaminants generally flow with ground water, light nonaqueous-phase liquids such as light oils float on the water table, and dense nonaqueous phase liquids like the undissolved fraction of trichloroethylene will sink in ground water.

Other important definitions used in this chapter are: **pollutant** as paraphrased from DEPE (1988 N.J.A.C. 7:14A-1.9); **maximum contaminant level** (MCL); **primary drinking water regulations**; and **secondary drinking water regulations**, from DEPE (1985b the New Jersey Safe Drinking Water Act, N.J.A.C. 7:10-1.1 through 7.3). A pollutant, in brief, is any contaminant discharged directly or indirectly by humans to land, ground water, or surface water. The maximum contaminant level is "the maximum permissible level of a contaminant in water measured at the point at which water is delivered to the free-flowing outlet of the ultimate user of a public water system or other water system to which state primary drinking water regulations apply." The primary drinking water regulation "...specifies contaminants which, in the judgment of the Commissioner, may have an adverse affect on the health of persons..." The secondary drinking water regulation

"...specifies the <u>recommended</u> upper and/or lower levels of substances that are necessary to protect the public welfare...".

Pollutants enter the ground water system either by migrating from at or near the surface down through the unsaturated zone or by direct discharge into the saturated zone (e.g., septic systems, a leaking underground storage tank, etc.). The unconfined aquifer is usually the first aquifer affected and may be the only one impacted depending on the hydrogeologic setting and the physical and chemical character of the contaminant. If ground water flows downward and/or contaminants sink because of their density then confined units may also be affected.

Sources of ground water pollution are thought of as either **point** or **nonpoint sources**. These are defined somewhat differently when the same terms are applied to surface water pollution. Point sources are localized discharges, such as a leaking underground storage tank or chemical spill, and nonpoint sources are larger area discharges of regional significance, such as agricultural chemicals from agricultural areas or septic wastes from areas with a high septic use. Under surface water terminology, all these sources are regarded as nonpoint.

Undesirable constituents in ground water are not always anthropogenic in origin. In many cases exceedences of the federal and state primary and secondary drinking water regulations are due to natural ground water chemistry. Natural ground-water quality is mainly a function of the composition of the water recharging the ground water system, the composition and mineralogy of the formation material that the ground water passes through, and the residence time of the ground water in the formation. The longer the residence time of ground water in a formation, the more time water has to dissolve minerals and become more mineralized.

B. GENERAL GROUND WATER QUALITY AND QUANTITY

Quantity Status

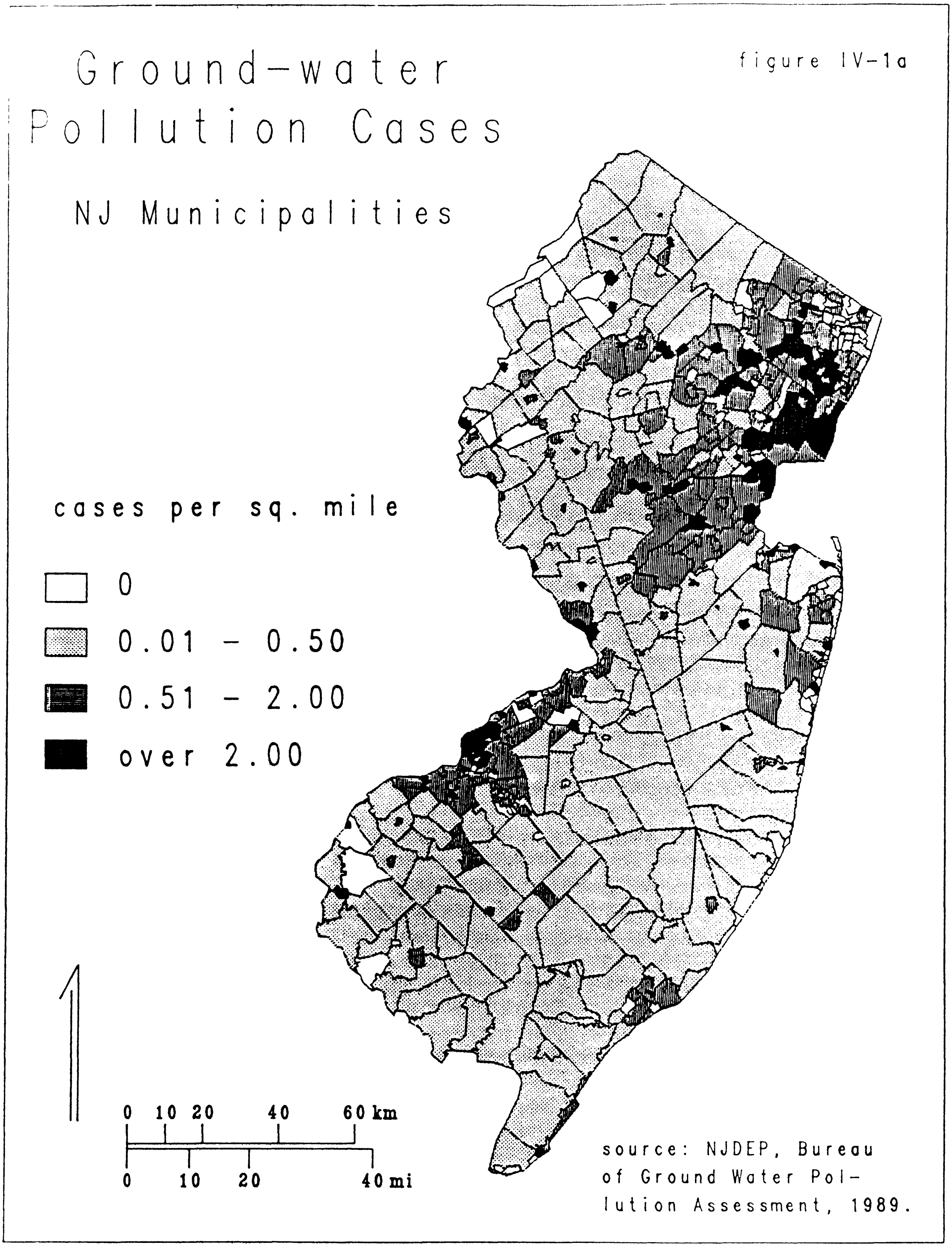
The available data suggest that at present there is an ample supply of good quality ground water in the State of New Jersey. However, ground water quantity (and quality) problems are usually concentrated in areas where the greatest volumes of ground water are needed. For example, ground water pollution and overpumping are usually concentrated in areas with high population densities. Overpumping in these areas has created hydraulic gradients that sometimes result in the recharge of aquifers from undesirable sources such as seawater, polluted surface waters, or severely contaminated ground water. Proper management of ground water resources in these areas is critical to insure a constant supply of good-quality water. Also, the statewide impact of ground water quality degradation from nonpoint sources of pollution, like agricultural areas, has not been fully assessed. Studies leading to a better understanding of the State's ground water resources are being conducted to guide management practices.

Quality Status

Ambient ground water quality throughout the State is generally good for most purposes. Treatment for some undesirable naturally occurring contaminants and characteristics is needed, however, in some areas due to the physical and chemical nature of geologic materials comprising the aquifer. The most widespread violations of naturally occurring contaminants involve the State's recommended secondary drinking water regulations. These contaminants include iron, total dissolved solids, sulfate and hardness. Less common, yet significant, naturally occurring contaminants that violate the primary drinking water regulations also exist. These contaminants and characteristics include manganese, corrosivity, sodium, and chloride. Radon will be included in this group when a final MCL has been established.

Anthropogenic contaminant discharges to ground water have had a significant undesirable impact on water quality in the State. As of 1989, there were 3,086 ground water pollution investigations in the State (figure IV-1a). When the distribution of these pollution cases in figure IV-1a is compared to population density throughout the State in figure IV-1b it is obvious that the two are directly related. This clearly shows the deleterious effect of human activities on ground water quality.

An extensive data base that includes the number of ground water pollution investigations by major source, type of site, remedial

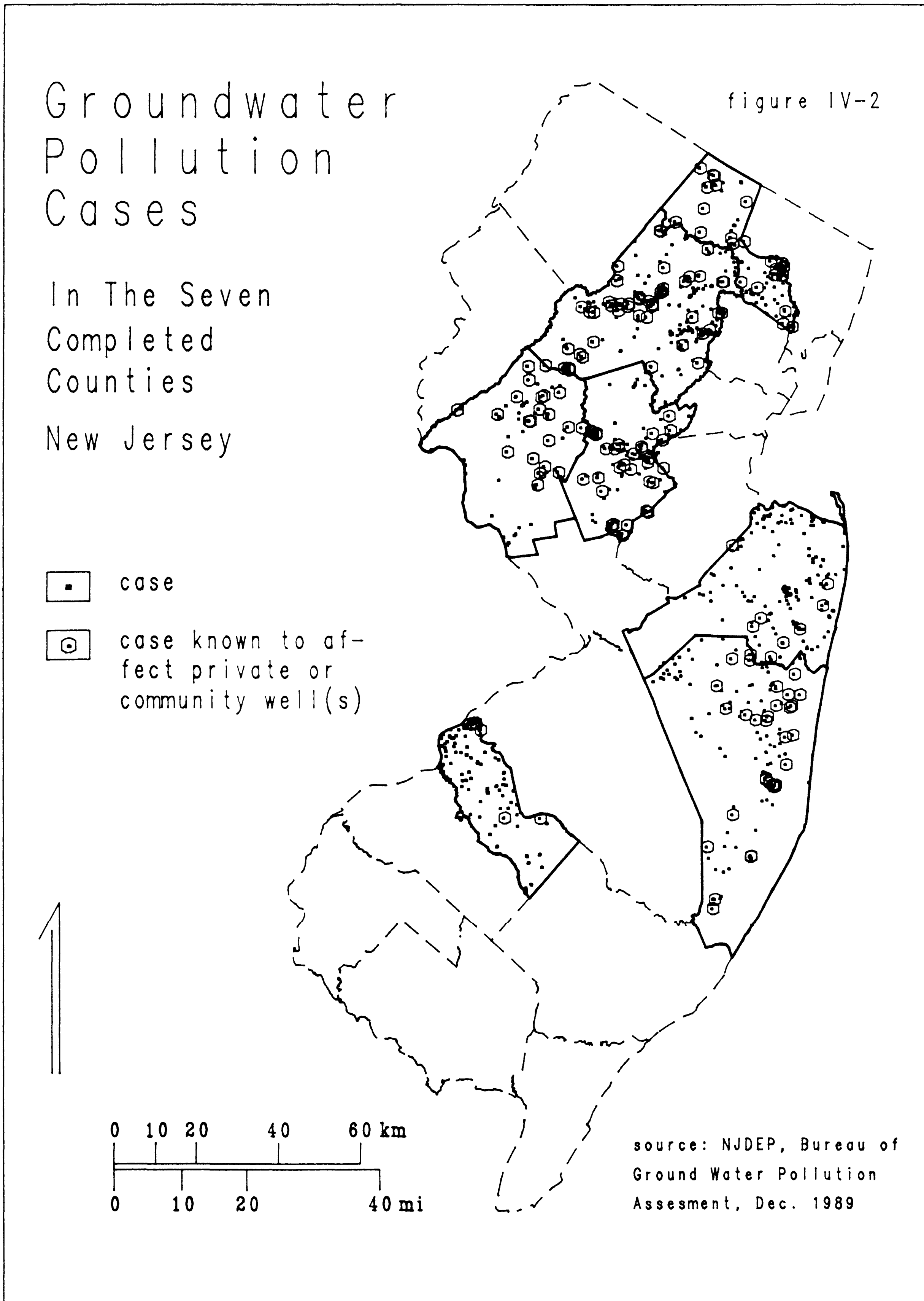

Ground-water
Pollution Cases
figure IV-1a
NJ Municipalities
cases per sq. mile
0
0.01 - 0.50
0.51 - 2.00
over 2.00
0 10 20 40 60 km
0 10 20 40 mi
source: NJDEP, Bureau of Ground Water Pollution Assessment, 1989.

program, and pollutant type(s) has been compiled by the Bureau of Wellfield Remediation. These data were compiled by county, and as of 1990, seven counties had been completed. As of March 1992, all the remaining state counties had been completed, however, detailed breakups as to pollution sources are available for only the original seven counties discussed in the 1990 Inventory Report. Detailed investigations have yet to be performed on the more newly reported cases; hence, data regarding their respective pollution sources are presently unavailable. Figure IV-2 shows the distribution of ground water pollution cases in those original seven counties. For those cases investigated, the database also includes estimated volume of polluted ground water, number of private and community wells affected and threatened by ground water pollution, the monitor wells, and the well restriction and ground water impact areas.

The seven completed counties are diverse in terms of geographic distribution, hydrogeologic setting, population density, and land use/land cover. Hunterdon, Morris, Passaic, and Somerset lie north of a line (known as the "fall line") separating the hard rock Piedmont Province from the lower lying Coastal Plain Province. Camden, Monmouth, and Ocean Counties are located south of the "fall line" (see figure IV-3a). Infiltration rates, aquifer characteristics, and ground water flow patterns vary significantly between northern and southern counties. Land use/land cover characteristics are similarly diverse in these two areas. Both have significant industrial, urban, and suburban areas, as well as farmlands, forests, and wetlands. The different land uses and land covers in these two regions create a variety of ground water pollution settings. It is believed that the ground water pollution situation in these seven counties is somewhat indicative of Statewide conditions.

Of the 1,200 pollution cases in the seven counties assessed as of 1990, more than 40 percent have unknown sources. Of those sources that are known, the number of underground storage tank (UST) cases is highest with 236 (19.7 percent of the total number of cases). Landfills, surface spills, lagoons, and industrial or commercial septic systems each account for at least 5 percent of all cases. Table IV-1a shows the major sources of ground water pollution, the number of cases by source, and their percentage of the total. Table IV-1b ranks the major sources based on the number of threatened and affected wells per case.

All of the contamination sources listed in Tables IV-1a and IV-1b are based on data from the ground water pollution investigation database. In some instances, the actual number of ground water contaminant investigations associated with a particular major source may be much less than the potential number of cases from that source. For example, only one agricultural pollution case is listed out of a total of 1,200 cases for the seven counties.


Groundwater Pollution Cases
In The Seven Completed Counties
New Jersey
figure IV-2
case
case known to affect private or community well(s)
0 10 20 40 60 km
0 10 20 40 mi
source: NJDEP, Bureau of Ground Water Pollution Assesment, Dec. 1989

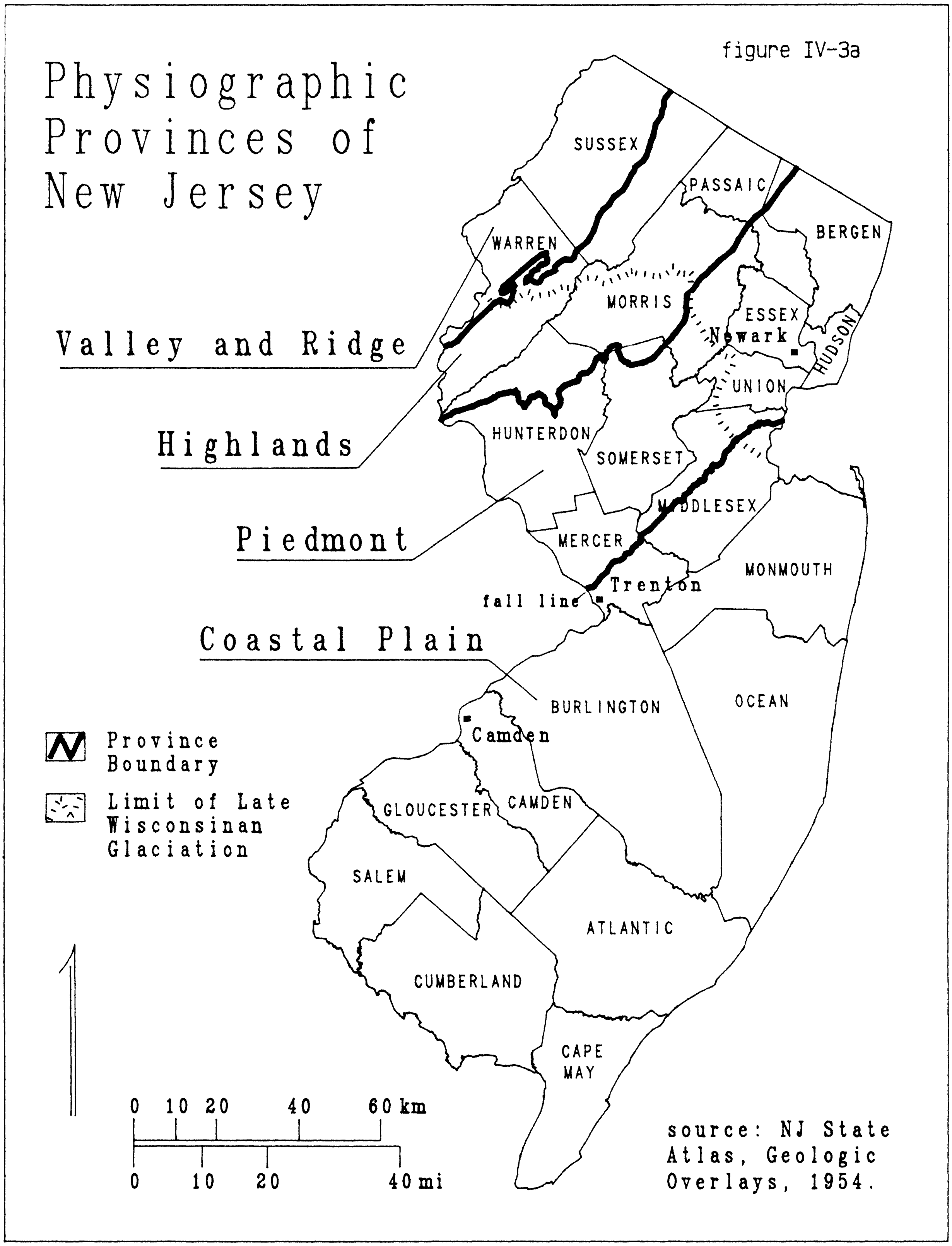


figure IV-3a
Physiographic Provinces of New Jersey
SUSSEX
PASSAIC
BERGEN
WARREN
MORRIS
ESSEX
Newark
HUDSON
UNION
HUNTERDON
SOMERSET
MIDDLESEX
MERCER
MONMOUTH
Trenton
fall line
Valley and Ridge
Highlands
Piedmont
Coastal Plain
BURLINGTON
OCEAN
Camden
Province Boundary
Limit of Late Wisconsinan Glaciation
GLOUCESTER
CAMDEN
SALEM
ATLANTIC
CUMBERLAND
CAPE MAY
0 10 20 40 60 km
0 10 20 40 mi
source: NJ State Atlas, Geologic Overlays, 1954.

Table IV- 1a: Major Sources of Ground-Water Pollution

Source	No.of Cases	% of Total Cases
Agriculture	1	0.08
Above Ground Storage Tank	4	0.33
Coal Tar	8	0.67
Drums	11	0.92
Lagoon	72	6.00
Land Spray Application	1	0.08
Landfill	159	13.25
None	4	0.33
Other	16	1.33
Road Salt Pile	1	0.08
Septic System	67	5.58
Surface Spill	134	11.17
Unknown	486	40.50
Underground Storage Tank	236	19.67
Total	1200	100.00

source: NJDEP, Bureau of Ground Water Pollution Assessment, 12/89.

Table IV- 1b: Ground-Water Contamination Sources, Ranked

Source	Relative Priority	Wells Per Case
Underground Storage Tanks	1	22.1
Industrial/Commercial Septic Systems (incl. class V injection wells)	2	11.2
Surface Spills	3	7.4
Landfills (incl. municipal, industrial, and other)	4	6.1
Unidentified and Miscellaneous Sources	5	4.7
Drums	6	2.6
Above Ground Storage Tanks	7	2.5
Road Salt Piles	8	2.0
Lagoons (incl. surface impoundments)	9	1.2
Residential Septic Systems	10	unknown
Coal Tar Discharges	11	0
Agricultural Activities	11	0
Land Spray Application/Treatment	11	0
Salt Water Intrusion	11	0
Injection Wells (class I-IV)	11	0
Oil and Gas Brine Pits	11	0

*Rank is based on the number of private and community wells affected or threatened per case with identified specific major sources of pollution in the seven counties for which data is available.

source: NJDEP, Bureau of Ground Water Pollution Assessment, 2/90.

Data gathered for the pesticides and nutrients in ground water studies clearly showed that there are violations of the State's drinking water quality regulations from agricultural inputs. This discrepancy is due to past program focus. Such discrepancies should decline as new initiatives are undertaken and the program focus broadens.

The most common pollutants encountered at the 1,200 ground water investigations were: volatile organic compounds (VOs), metals, base neutrals, acid extractables, and PCBs/pesticides. Table IV-2a summarizes the sampling results of the five pollutants. Of all the investigations where ground water was sampled for VOs, 87.4 percent were positive, a far greater percentage than the next two highest: base neutrals and metals with 58.3 percent and 55.0 percent respectively. Landfill contaminants, undifferentiated petroleum hydrocarbons, gasoline and fuel oil also ranked high in the long list of ground water pollutants. The contaminants found in the State's ground water are listed and assigned relative priority in Table IV-2b.

Table IV-3 lists the number of private and community wells affected by major pollution sources in 1989. A total of 1,610 wells in the seven counties were known to be affected by ground water pollution. Of this total, 1,519 were private wells and 91 were community supply wells. As is the case in Table IV-1a (number of cases by major source of pollution), unknown sources tops the list with 737 affected wells. An unknown source is one that is affecting wells but has either not yet been identified or not yet been investigated. Data collected in 1991 identifies 1,723 wells in the seven county study area and a total of 4,650 wells in New Jersey as being affected by major pollutants.

Of the known sources, USTs affect the most wells (405). Industrial and commercial septic systems affect a disproportionately large number of wells (202) considering the number of septic system cases reported (Table IV-1a).

Table IV-4 shows the number of ground water pollution cases, as of 1990, in the seven counties by major source of pollution and by county. Morris County, which is north of the Fall Line, had the highest number of ground water pollution cases (282) at that time while Monmouth, in the Coastal Plain, had the second highest (192). These two counties are similar not only in their high numbers of pollution cases, but also in terms of their land use characteristics which range from moderately high density town centers to large-lot residential areas. Both have large rural areas as well, and lack the large, very dense cities and heavy industrial areas that are found in, for example, Camden and Passaic Counties. They are also similar in population and population density. Like most New Jersey counties, both have experienced high rates of growth during the past decade. As of

Table IV-2a: Most Commonly Encountered Ground-Water Pollutants

Pollutant	Total Sampled	No. of Positive	Percent Positive
Volatile Organics(VOs)	595	520	87.4
Metals	327	180	55.0
Base Neutrals	295	172	58.3
Acid Extracbles	234	83	35.5
PCBs/Pesticides	192	39	20.3

source: NJDEP, Bureau of Ground Water Pollution Assessment, 12/89.

Table IV-2b: Ground-Water Contamination Substances, Priority Checklist

Substance	Relative Priority
Volatile Organic Chemicals (incl.volatile petroleum hydrocarbons)	1
Metals (incl. chromium, mercury, and lead)	2
Radionuclides	2
Inorganic Miscellaneous (excluding metals)	3
Base Neutral Chemicals (incl. base/neutral petroleum hydrocarbons)	3
Other Metals	4
PCB/Pesticides	4
Acid Extractable Chemicals	4
Asbestos	4
Dioxin	5
Bacteria	5
Other Substances	5

Highest Priority = 1 Lowest Priority = 5

*Relative Priority based on several factors including number of private and community wells affected or threatened by each substance and the number of cases reporting identification of the substance in the ground water in the seven counties for which data is available.

source: NJDEP, Bureau of Ground-Water Pollution Assessment, 1/90.

TABLE IV-3: Number of Private and Community Wells Affected by Major Pollution Sources. Values represent both the absolute number of cases and the percentage of total cases.

MAJOR SOURCES OF POLLUTION	PRIVATE WELLS AFFECTED		PRIVATE WELLS THREATENED		COMMUNITY WELLS AFFECTED		COMMUNITY WELLS THREATENED	
	#	%	#	%	#	%	#	%
AGRICULTURE	0	0.0	0	0.0	0	0.0	0	0.0
ABOVE GROUND STORAGE TANK	3	0.2	7	0.1	0	0.0	0	0.0
COAL TAR	0	0.0	0	0.0	0	0.0	0	0.0
DRUMS	8	0.5	21	0.2	0	0.0	0	0.0
LAGOON	38	2.5	44	0.5	0	0.0	6	5.1
LAND SPRAY APPLICATION	0	0.0	0	0.0	0	0.0	0	0.0
LANDFILL	89	5.9	868	10.0	0	0.0	14	11.9
NONE	2	0.1	0	0.0	0	0.0	1	0.8
OTHER	10	0.7	2	0.0	0	0.0	0	0.0
ROAD SALT PILE	2	0.1	0	0.0	0	0.0	0	0.0
SEPTIC SYSTEM	178	11.7	536	6.2	23	25.3	15	12.7
SURFACE SPILL	105	6.9	852	9.8	10	11.0	28	23.7
UNKNOWN	689	45.4	1590	18.3	48	52.7	31	26.3
UNDERGROUND STORAGE TANK	395	26.0	4776	54.9	10	11.0	23	19.5
TOTAL	1519	100.0	8696	100.0	91	100.0	118	100.0

TABLE IV-4: Major Sources of Anthropogenic Pollution Listed by County. Numbers denote number of pollution cases (both as absolute number and as a percentage of total cases) segragated by county.

MAJOR SOURCES OF POLLUTION	COUNTY							
	CAMDEN		HUNTERDON		MONMOUTH		MORRIS	
	#	%	#	%	#	%	#	%
AGRICULTURE							1	100.0
ABOVE GROUND STORAGE TANK			1	25.0				
COAL TAR			1	12.5				
DRUMS			1	9.1	5	45.5		
LAGOON	10	13.9	5	6.9	25	34.7	13	18.1
LAND SPRAY APPLICATION			1	100.0				
LANDFILL	24	15.1	6	3.8	38	23.9	21	13.2
NONE			1	25.0			2	50.0
OTHER			3	18.8	4	25.0	1	6.3
ROAD SALT PILE								
SEPTIC SYSTEM	2	3.0	8	11.9	4	6.0	30	44.8
SURFACE SPILL	11	8.2	10	7.5	30	22.4	11	8.2
UNKNOWN	88	18.1	37	7.6	45	9.3	152	31.3
UNDERGROUND STORAGE TANK	28	11.9	15	6.4	36	15.3	51	21.6
TOTAL	**163**		**89**		**187**		**282**	

TABLE 4: continued.

MAJOR SOURCES OF POLLUTION	COUNTY						
	OCEAN		PASSAIC		7-COUNTY SOMERSET		TOTALS
	#	%	#	%	#	%	
AGRICULTURE							**1**
ABOVE GROUND STORAGE TANK	2	50.0			1	25.0	**4**
COAL TAR	2	25.0					**8**
DRUMS	3	27.3	1	9.1	1	9.1	**11**
LAGOON	5	6.9	6	8.3	8	11.1	**72**
LAND SPRAY APPLICATION							**1**
LANDFILL	43	27.0	7	4.4	20	12.6	**159**
NONE					1	25.0	**4**
OTHER	7	43.8			1	6.3	**16**
ROAD SALT PILE					1	100.0	**1**
SEPTIC SYSTEM	9	13.4	7	10.4	7	10.4	**67**
SURFACE SPILL	13	9.7	37	27.6	22	16.4	**134**
UNKNOWN	61	12.6	53	10.9	50	10.3	**486**
UNDERGROUND STORAGE TANK	19	8.1	26	11.0	61	25.8	**236**
TOTAL	**164**		**137**		**173**		**1200**

April 1992, the number of ground water pollution cases listed by county is as follows:

County	Number of Pollution Cases	County	Number of Pollution Cases
Atlantic	231	Middlesex	399
Bergen	445	Monmouth	255
Burlington	205	Morris	400
Camden	240	Ocean	199
Cape May	94	Passaic	237
Cumberland	104	Salem	72
Essex	301	Somerset	270
Gloucester	179	Sussex	152
Hudson	196	Union	266
Hunterdon	122	Warren	115
Mercer	168		

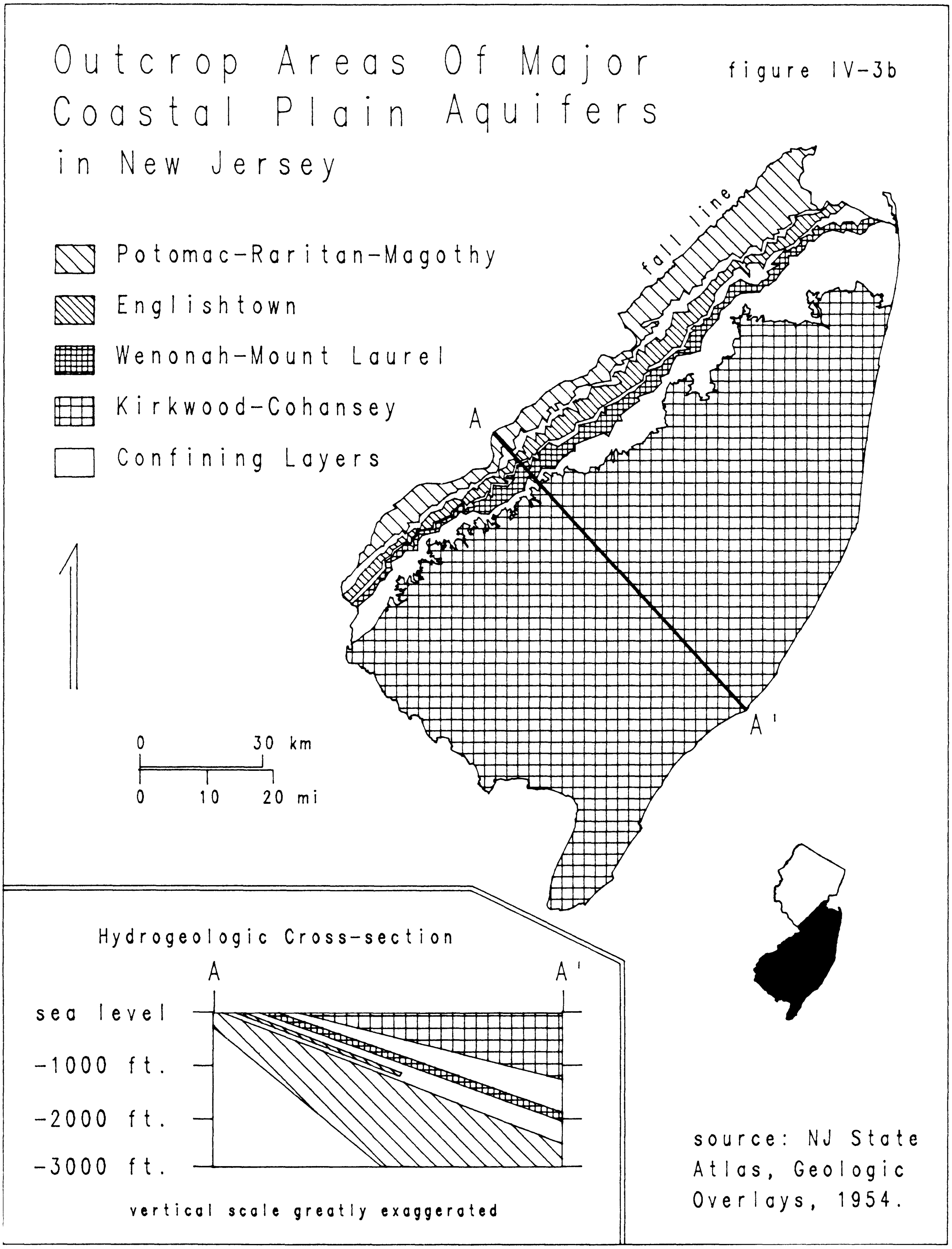
One can see that Morris County is surpassed in 1992 by Bergen County with respect to the greatest number of ground water pollution cases. Salem County had the least number: 72 cases.

Ground Water In The State's Physiographic Provinces

New Jersey has four geomorphologically distinct physiographic provinces covering the State's approximately 7,500 square miles (Figure IV-3a). They are from south to north: the Coastal Plain, Piedmont, Highlands, and Valley and Ridge. There are general structural and lithologic disparities existing between each physiographic province which makes them hydrogeologically distinct from one another. In addition, the northern provinces contain glacially deposited materials which have a unique hydrologic character. The geology, hydrology, and water quality characteristics of each province, and the glacial deposits, are discussed below.

Coastal Plain

The Coastal Plain is the largest of the physiographic provinces in New Jersey, covering an area of 4,689 square miles (Figure IV-3a, 3b). It is a southeasterly dipping and thickening wedge of stratified unconsolidated sediments that vary in age from Cretaceous, 144-66.4 million years ago (mya), to the end of the Tertiary (1.6 mya). A veneer of more recent alluvial sediments has been locally deposited on the older wedge. This seaward thickening sedimentary wedge of sand, gravel, silt and clay overlies an eroded surface of pre-Cretaceous bedrock. The sediment thickness is known to vary from a feather edge along the


Outcrop Areas Of Major Coastal Plain Aquifers in New Jersey
figure IV-3b
Potomac-Raritan-Magothy
Englishtown
Wenonah-Mount Laurel
Kirkwood-Cohansey
Confining Layers
fall line
A
A'
0
30 km
0
10
20 mi
Hydrogeologic Cross-section
A
A'
sea level
-1000 ft.
-2000 ft.
-3000 ft.
vertical scale greatly exaggerated
source: NJ State Atlas, Geologic Overlays, 1954.

Fall Line to at least a documented 6,407 feet in Cape May County (Loyd Mullikin, N.J.G.S., oral communication, 1990).

The changing depositional environment during the Coastal Plain's formational history produced a multilayered aquifer system consisting of 1 major unconfined aquifer and 4 major confined aquifer systems. These systems from youngest to oldest (and shallowest to deepest) are the unconfined Kirkwood-Cohansey aquifer system, and the confined, Kirkwood 800-Foot Sand, Wenonah-Mount Laurel aquifer, Englishtown aquifer system, and Potomac-Raritan-Magothy (PRM) aquifer system (Zapecza, 1984). All of these confined aquifers become unconfined in their outcrop areas to the northwest. Additional confined aquifers such as the Vincentown and Piney Point may be found in local areas of Monmouth County and the southernmost counties respectively.

Ground water supplies most of the potable water to the inhabitants of the Coastal Plain. Seventy-one percent of the total purveyor-supplied water in the province consists of ground water and seventy-five percent of its inhabitants rely on municipal or domestic ground water supplies. Population growth in the Coastal Plain to the year 2000 is estimated to average 20 percent, which will undoubtedly put further demands on the ground water in the province (NJDEP, 1985).

The unconfined Kirkwood-Cohansey aquifer system is composed mostly of quartz sand and covers approximately 3,000 square miles of the Coastal Plain. Here, shallow ground water flow is mostly controlled by local topography and deeper regional flow by the location of major discharge areas. Ground water in the shallow local flow systems discharges chiefly to streams or, in the regional flow system, the Atlantic Ocean through submarine outcrops. The environmentally sensitive Pine Barrens region, that is protected by the New Jersey Pinelands Protection Act of 1979, is directly underlain and intimately associated with the Kirkwood-Cohansey aquifer system. In much of the Coastal Plain, this aquifer system is the major supplier of water to domestic wells.

Previous work on this unconfined system (for example Rhodehamel, 1970, Means and others, 1981) has shown that because of the chemical inertness of the quartz aquifer material, the major element cycles are mainly controlled by precipitation chemistry. Work by Demir (1989) in McDonalds Branch Basin, Lebanon State Forest, Burlington County, New Jersey showed that some minor and trace elements are also controlled by precipitation chemistry. For example, iron and manganese in shallow ground water here are mostly derived from geochemical weathering whereas most of the lead, copper and cadmium originated from precipitation. The lead levels fluctuated seasonally and often exceeded the action level for lead of 15 parts per billion. The maximum lead level analyzed in ground water for this study was 83 parts per billion. Ground water in the Kirkwood-Cohansey aquifer is acidic with a pH generally less than 6.0. It is low in total dissolved solids, usually less than 100 mg/L. Such water can be strongly corrosive to plumbing systems (Barringer 1989). Because of the chemical inertness of the quartz sands, ground water in this aquifer is highly susceptible to pollution from anthropogenic sources (Rhodehamel, 1970; Means and others, 1981).

Natural flow in the confined aquifers is from the outcropping recharge areas in the northwest, with an area of approximately 1,400 square miles, to suboceanic discharge areas to the southeast. Water may also flow from one confined aquifer to another; such flow is controlled by the hydraulic gradient between aquifers and the conductivities of intervening confining layers. Overpumping in some of these aquifers has resulted in water level declines in four major regional areas (Leahy and others, 1987). These are: 1) the Potomac-Raritan-Magothy aquifer around Camden; 2) the Atlantic City 800-Foot Sand aquifer around Atlantic City; 3) the Old Bridge and Farrington aquifers of the PRM system at the South River/Raritan Bay area; and 4) Mount Laurel and Englishtown in Monmouth and Ocean Counties (USGS WRIR 86-4028). These areas are characterized by extensive cones of depression in the regional flow field deep enough to cause saltwater encroachment from nearby saltwater bodies. The lower hydraulic head in these areas also results in increased flow or recharge from adjacent aquifers. Studies have been conducted by the New Jersey Geological Survey (NJGS) within NJDEPE in cooperation with the United States Geological Survey (USGS) within the U.S. Department of the Interior to more fully understand this problem so that water supply planners can effectively manage the State's ground water supply.

In general, ground water quality in the major confined aquifers of the Coastal Plain is suitable for most uses with minor treatment. The most ubiquitous problems are iron, manganese, and high chloride concentrations in aquifers affected by saltwater intrusion. The confined aquifers are most susceptible to anthropogenic pollution in their outcrop areas where they lack a protective layer of low permeability. Water quality in the Kirkwood-Cohansey aquifer system is generally good but the water may require treatment for high iron, sometimes manganese, and corrosiveness (Rhodehamel, 1970; Harriman and Sargent, 1985). Water from some wells near the Kirkwood outcrop area have reported radium and gross alpha levels above the EPA-established maximum contaminant levels of 5 picocuries per liter and 15 picocuries per liter respectively. These radiological contaminants are thought to occur naturally and the USGS is presently studying their occurrence in the Coastal Plain. Mercury levels exceeding the MCL of 2 parts per billion have also been found in ground water from other wells in the same geologic setting. The origin of the mercury is unknown, however, this problem is being investigated by the DEPE and USGS.

Piedmont

The Piedmont Physiographic Province is an approximately 1,580 square mile lowland region that coincides with the geologic trend of the Newark Basin in New Jersey. This basin is a down-faulted trough that was filled with non-marine stream and lake deposited sediments during the Triassic (245-208 mya) and the early Jurassic (208-187 mya) periods. It is part of the greater Newark Supergroup which extends discontinuously from South Carolina to Nova Scotia. From older to younger the major units include the sedimentary Stockton, Lockatong, and Passaic Formations. These and younger sedimentary formations of the Jurassic-aged Brunswick Group include, and are intruded by and interlayered with, igneous diabase and basalt (Olsen, 1980). Basically, the sedimentary units are comprised of shale, mudstones, siltstones, sandstones, and minor conglomerate. Reddish brown mudstones, siltstones, and sandstones of the Passaic Formation are the most widespread surface exposure.

Approximately two-thirds of New Jersey's population resides in this Province. It is estimated that approximately 59 percent of the purveyor-supplied water here is ground water. In addition more than 71,000 domestic wells supply approximately 9 percent of the inhabitants with water (NJDEP, 1985). Most ground water flow in the bedrock is through a complex network of interconnected fractures, bedding-plane partings, and intergranular pores. Preferential fracture alignment throughout much of this basin results in anisotropic ground water flow. The density of hydraulically connected fractures decreases with depth and Kasabach (1966) noted that most ground water storage in the Stockton and Passaic (Brunswick Shale) Formations is restricted to the upper 500 feet in Hunterdon County, New Jersey. The bedrock aquifers are generally unconfined near the surface and semiconfined at depth. Wells chiefly case off the unconsolidated overburden and draw water from bedrock in an open borehole. Based on available data, Houghton and Flynn (1988) determined that the mean yields for residential wells in the Newark Basin aquifers are:

Aquifer	Mean yield (gpm)	no. wells used in mean
Stockton	20.0	309
Passaic	16.3	1,196
basalt	11.8	94
Lockatong	9.5	393
diabase	7.4	141

Ground water quality in the three major formations in the Newark Basin is generally good but locally may require treatment for undesirable contaminants and characteristics. The most common water quality violations are for the State recommended secondary drinking water standards. In Table IV-5 the percent of each characteristic and contaminant exceeding the secondary standard are: manganese (27% of samples exceeded the standard), maximum hardness (20.6%), corrosivity (18.2%), total dissolved solids (14.2%), iron (14.2%), sodium (8.5%), sulfate (7.8%), and chloride (0.7%) (Serfes, M.E., 1992). These high concentrations are characteristic of the deep ground water in this area (Carswell, 1976). Others have noted a decline in water quality with depth in the basin (Kasabach, 1966; Anderson, 1968).

In the urbanized lower Hackensack River Basin and the nearby Newark area, water quality is generally poor due to anthropogenic and natural factors. Saltwater intrusion due to overpumping and the pumping of deep, slowly moving, naturally mineralized water and the dredging of ship canals in Newark Bay and the Passaic River (Nichols, 1968) has resulted in poor water quality here. Localized salt water intrusion has degraded ground water quality with chloride concentrations as high as 1,900 parts per million being recorded (Nichols, 1980).

A study of natural radioactivity in the ground water of the Newark Basin was conducted by Zapecza and Szabo (1987a,b). They showed that uranium enrichment occurs in black mudstones near the Lockatong-Passaic contact and that complex hydrogeochemical relationships account for radionuclide activities. Gross alpha particle activities and radium-226 activities are directly related to uranium decay and locally exceed MCLs of 15 and 5 picocuries per liter (pCi/L), respectively. The MCL of 5 pCi/L for radium is for radium-226 plus radium-228. Radium-228 was outside the scope of the 1987 study. Based on 260 ground water samples, gross alpha particle activities ranged from less than 0.1 to 124 pCi/L; 5 percent exceeded the MCL. Radium-226 concentrations ranged from less than 0.01 to 22.5 pCi/L. Barium levels exceeding the primary drinking water standard or MCL of 1.0 mg/L were reported in Zapecza and Szabo (1987b) and a level of 2.13 mg/L in Hunterdon County is under investigation by the DEPE. Barite ($BaSO_4$) mineralization occurs locally throughout the Newark Basin (Dombroski, 1980) and accounts for most of the barium found in ground water here. However, anthropogenic inputs of barium into the ground water environment are also possible.

Highlands

The Highlands Province is 1,016 square miles in area and is characterized as a belt of northeast-southwest trending ridges separated by broad valleys. These upland ridges are generally

Table IV-5. Statistcal summary of analyses of water from the Brunswick Group, Lockatong and Stockton Formations in New Jersey[1] Includes: the chemical characteristic and constituent sampled and reporting units; the number of samples where parameter was analyzed; the minimum value, 25th percentile, median or 50th percentile, and maximum value in the population of analytical values (this is a standard way of reporting positional measures as it yields information concerning the population distribution); the primary (p) and secondary (s) Maximum Contaminant Levels (MCL) for applicable characteristics and constituents; and the percent of the sample population exceeding or outside the MCL limits.

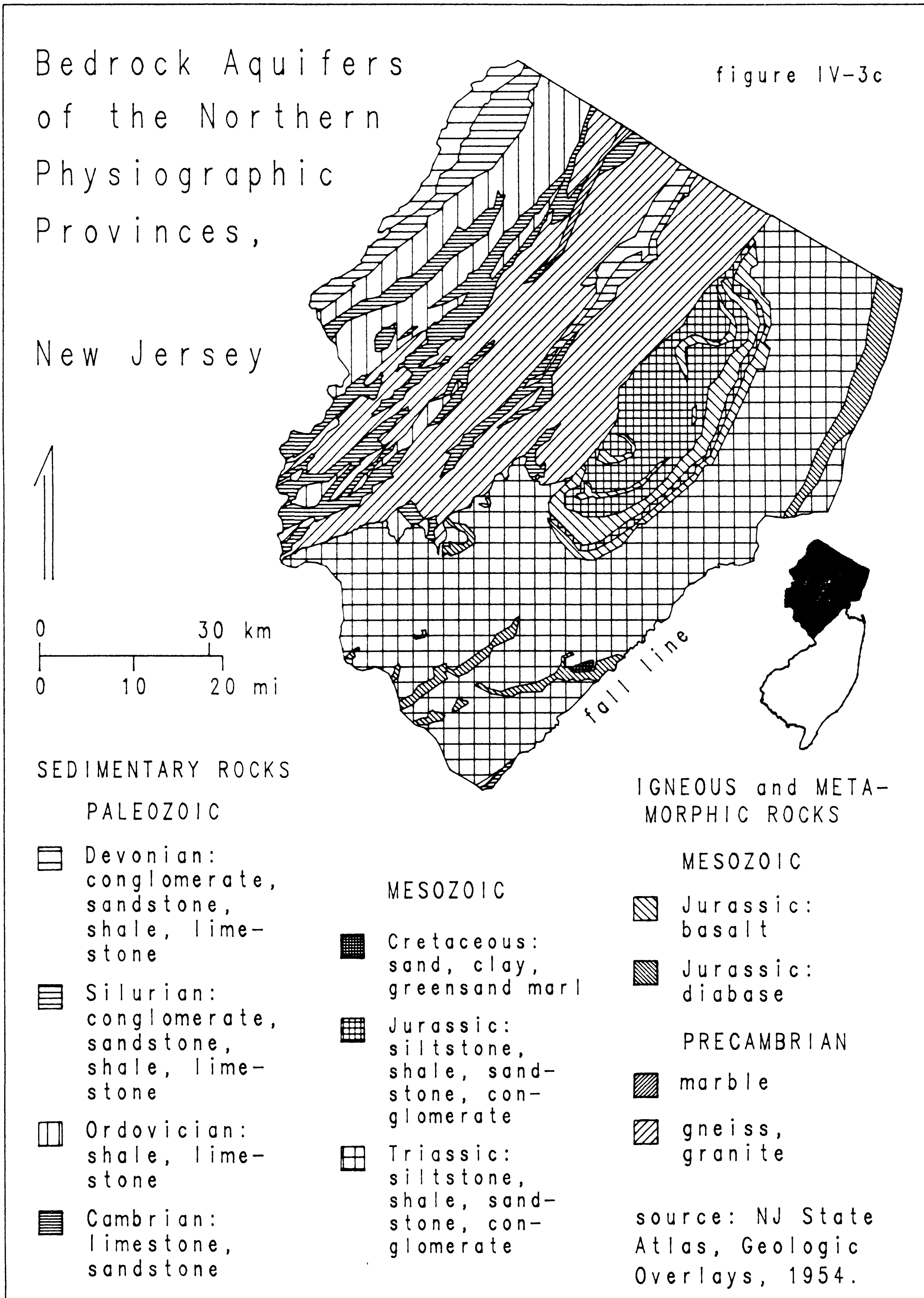
[p, primary drinking water standard; s, secondary drinking water standard; uS/cm, microsiemens per centimeter, mg/L; milligrams per liter; ug/L, micrograms per liter; --, no data available]

CHARACTERISTIC OR CONSTITUENT	Number of Samples	Minimum	25th percentile	Median	75th percentile	Maximum	Maximum Contaminant Level p:primary s:secondary	percent exceeded
CHARACTERISTICS								
Temperature (C)	149	9.5	12.5	13	13.5	16.5	--	--
Specific Conductance (uS/cm)	149	140	350	419	550	2040	--	--
Oxygen, dissolved (mg/L)	147	<0.1	.5	2.7	5.0	14.7	--	--
pH (standard units)	150	5.5	7.1	7.6	7.8	9.3	6.5-8.5^{s}	6.0<(6.5), 3.3>(8.5)
Field Alkalinity (mg/L as $CaCO_3$)	149	21	104	138.5	161	338	--	--
Solids[2], dissolved (mg/L)	149	106	265	317	416	1540	500^{s}	14.2
Corrosivity (pH units)[3]	146	-4.25	-1.08	-.62	-.44	.64	-1 to 1^{s}	31.5<(-1), 0>(1)
Hardness,(mg/L as $CaCO_3$)	149	12	140	180	220	1100	50-250^{s}	3.5<(50) 20.6>(250)
MAJOR AND MINOR DISSOLVED CONSTITUENTS (mg/L)								
Calcium	149	2.5	35	45	62	365	--	--
Magnesium	149	.27	11	15	19	69	--	--
Sodium	149	2.1	12	15	27	270	50^{s}	8.5
Potassium	149	.4	1	1.3	2	6.6	--	--
Chloride	149	1.7	11	17	28	320	250^{s}	.7
Sulfate	149	1.1	22	36	64	1200	250^{s}	7.8
Fluoride	44	<.01	.1	.1	.2	1.4	4^{p}	0
Silica	149	11	19	22	27	45	--	--
NUTRIENTS, DISSOLVED (mg/L)								
Nitrogen, NH_3, (as N)	55	<.01	<.01	<.01	.03	.28	--	--
Nitrogen, NO_2, (as N)	56	<.01	<.01	<.01	<.01	.02	1^{p}	0
Nitrogen, NH_3 + Organic, (as N)	54	<.2	.2	.3	.5	1.1	--	--
Nitrogen, NO_2+NO_3, (as N)	56	<.1	.33	1.6	3.0	7.6	10^{p}	0
Nitrate, [NO_2+NO_3]-[NO_2], (as N)	56	<.1	.33	1.6	3.0	7.4	10^{p}	0
Phosphorous Ortho, (as P)	50	<.01	.01	.02	.05	.16	--	--
Phosphorous, (as P)	41	<.01	.02	.04	.06	.3	--	--
TRACE AND MINOR DISSOLVED CONSTITUENTS (ug/L)								
Aluminum	58	<10	<10	<10	10	20	50 - 200^{s}	0
Arsenic	44	<1	<1	1.5	3	19	50^{p}	0
Barium	121	<2	34.5	110	200	1200	2000^{p}	0
Beryllium	121	<.5	<.5	<.5	<.5	1	--	--
Cadmium	147	<1	<1	<1	<1	3	5^{p}	0
Chromium	43	<1	<1	<1	<1	5	100^{p}	0
Cobalt	122	<3	<3	<3	<3	<3	--	--
Copper	147	<10	<10	<10	<10	200	1300^{p}	--
Iron	147	<3	<3	7	24	11000	300^{s}	14.2
Lead	147	<10	<10	<10	<10	16	15^{p}	.7
Lithium	121	<4	9	20	29	100	--	--
Manganese	147	<1	<1	5	55	1600	50^{s}	27

Table IV-5 Continued.

Mercury	44	<.1	<.1	<.1	<.1	.3	2[p]	0
Molybdenum	121	<10	<10	<10	<10	170	--	--
Strontium	121	50	227.5	430	712.5	11000	--	--
TRACE AND MINOR DISSOLVED CONSTITUENTS (ug/L)								
Vanadium	121	<6	<6	<6	<6	25	--	--
Zinc	147	<3	9	22	54	1100	5000[s]	0
ORGANIC CONSTITUENTS								
Carbon, Organic, (mg/L, as C)	44	.3	.7	.8	1.4	3.1	--	--
Phenols Total, (ug/L)	39	<1	1	2	3	7	--	--

[1] Analyses from wells sampled twice were averaged into one value and are counted here as one sample.
[2] Product of constant derived using linear regression analysis and specific conductance
[3] pH unit below or above $CaCO_3$ satuation defined as zero using the Langelier Index (American Water Works Association, 1975).


Bedrock Aquifers of the Northern Physiographic Provinces, New Jersey
figure IV-3c
0 30 km
0 10 20 mi
fall line
SEDIMENTARY ROCKS
PALEOZOIC
Devonian: conglomerate, sandstone, shale, limestone
Silurian: conglomerate, sandstone, shale, limestone
Ordovician: shale, limestone
Cambrian: limestone, sandstone
MESOZOIC
Cretaceous: sand, clay, greensand marl
Jurassic: siltstone, shale, sandstone, conglomerate
Triassic: siltstone, shale, sandstone, conglomerate
IGNEOUS and METAMORPHIC ROCKS
MESOZOIC
Jurassic: basalt
Jurassic: diabase
PRECAMBRIAN
marble
gneiss, granite
source: NJ State Atlas, Geologic Overlays, 1954.

composed of resistant Precambrian (> 570 mya) crystalline metamorphosed rocks that were originally igneous and sedimentary. Less resistant Paleozoic (245 to 570 mya) sedimentary rock generally make up the valleys and are in fault and unconformable contact with the older crystalline rocks. The rocks are a major source of water for domestic, industrial, and municipal consumers in the Highlands (Figure IV-3c).

Ground water flow in the Highlands is mainly unconfined and is controlled by topography, fracture, and foliation plane geometry. Flow is from upland areas to valleys where ground water either discharges to surface waters, or continues to flow down-valley within the saturated zone. Local flow systems dominate and intervalley regional flow is not known to occur (NJDEP, 1985b). The optimum depth for domestic wells in crystalline rocks is considered by Davis and Turk (1964) to be 150 - 250 feet. This depth agrees closely with the findings of Gill and Vecchioli (1965), Kasabach (1966), and Miller (1974). Well yields vary locally but James (1967) found that yields are generally higher in lowland than upland areas. He also observed that yields in different rock types become progressively less as one progressed from pyroxene granite and gneiss, through hornblende granite, biotite gneiss, amphibolite, to quartz diorite.

Ground water quality in the Highlands is satisfactory for most uses, however, localized high iron, hardness, marginally low pH, and total dissolved solids problems occur (Kasabach, 1966; Miller, 1974). Minerals containing radioactive elements are found in a variety of crystalline rocks in the Highlands (Volkert, 1988) and, therefore, the potential exists for radionuclide release to ground water. In 1987, 154 wells in these crystalline rocks were sampled by NJDEPE for radon. The radon values in the water ranged from 36 to 24,000 pCi/L and 90 percent of the wells sampled had radon levels greater than USEPA's proposed MCL for radon in drinking water of 300 pCi/L (NJDEPE, 1992).

Valley and Ridge

This province is 515 square miles in area and mainly comprised of thick sequences of Paleozoic (570-245 mya) sedimentary units with subordinate occurrences of unrooted Precambrian crystalline rocks to the southeast near the Highlands province and minor intrusives. Sedimentary rock types include dolomite, limestone, sandstone, shale, and siltstone. The Paleozoic rocks are folded and faulted with the most intense deformation found in the southwest.

This province has a relatively low population and the predominant land uses are recreational in the northwest and agricultural in the southeast. A compilation of hydrologic data by Miller (1974) showed that ground water supplied 60 percent of the daily water consumption and most of the ground water was obtained from bedrock wells.

Ground water flow is through fractures in all rock types, in solution channels through limestone and dolomite, and through pores in the unconsolidated stratified drift. The structural controls on local and regional ground water flow in these rocks are complex as discussed in Herman (1988). Moderate to large supplies of water are obtained from stratified drift, cavernous limestone and dolomite, and shear zones near faults. Lesser yields are obtainable from Precambrian crystallines, noncavernous limestone and dolomite, shale, and quartzite (Miller, 1974). Most of the ground water storage is within 300 feet of the land surface.

The ambient ground water quality in this province is generally satisfactory for most purposes. However, in places ground water must be treated for hardness, low pH, high iron, and high sulfate content (Miller, 1974). Some of these problems are more characteristic of one rock type than another. For example, water from limestone and dolomite generally is harder than from other rock types; however, this water is also rarely low in pH, and iron problems are less common. Lead exceeding the MCL of 50 parts per billion was found in water from some domestic wells in the Lafayette Meadows area in Sussex County. An investigation by NJDEPE in the early 1980s indicated that the source of this lead is a nearby lead-zinc mineralized zone occupying secondary fractures within the limestone bedrock. Similar undiscovered problem areas may exist in this province. The New Jersey Geological Survey is currently promoting studies to better understand this problem so that a systematic approach to recognizing similar problem areas can be developed.

Glacial Deposits

New Jersey has been glaciated at least three times. The last major glaciation, and most important for aquifer formation, peaked approximately 21,000 years ago during the late Wisconsinan stage of the Pleistocene epoch (Ridge, 1983). From 21,000 to approximately 17,000 years ago, the ice front receded and the meltwater deposited stratified drift in most valleys north and south of the Terminal Moraine.

Where stratified drift is thick and permeable it may produce significant quantities of water. For example, in Morris and Essex counties, 77 percent and 81 percent respectively of the pumped ground water is from stratified-drift deposits with yields from individual wells ranging from 20 to 2,200 gallons per minute (gpm) (Van Abs, 1986).

Ground water chemistry in these aquifers is variable and is mainly a function of the source of the recharge water, the chemistry and grain size of the aquifer material, and the residence time of the ground water. Water quality in the glacial aquifers is generally suitable for most uses; however, concentrations may locally exceed the secondary drinking water standards for iron, dissolved solids and hardness (Miller, 1974). Many of these aquifers have ground water pollution problems due to their shallow depth.

C. GROUND WATER MANAGEMENT IN NEW JERSEY

Introduction

New Jersey is taking an active and progressive approach to the management of the State's ground water. Several federal, state county, and municipal offices are involved in ground water management activities ranging from resource evaluation to the cleanup and restoration of contaminated aquifers. New Jersey considers its efforts in ground water protection and pollution control to be a priority and has made major commitments to managing its ground water. New Jersey's ground water management program has seven major components:

1. **Strategy Development:** The Department's Ground Water Strategy for New Jersey coordinates the many ground water programs that have been established by the Legislature. The Strategy outlines the State's fundamental ground water policies, describes the major management issues, and outlines the Department's approach to solving these issues.

2. **Program Planning:** Statewide water quality and supply planning is performed by the Department of Environmental Protection and Energy, which develops the Ground Water Quality Standards, prepares and updates the New Jersey Statewide Water Supply Master Plan, and plans initiatives proposed by the Ground Water Management Strategy. Regulatory planning is conducted by regulatory elements as needed.

3. **Resource Evaluation:** Resource evaluation involves the monitoring, investigation, and assessment of ground water resource quantity and quality, the collection of basic quantity and quality data, and the development of methodologies to evaluate and model ground water.

4. **Research:** Research (as distinct from resource evaluation) provides an understanding of fundamental processes in ground water movement, pollution migration, and physical/chemical interactions between ground water and the subsurface environment.

5. **Program Implementation:** Implementation involves all regulatory programs that manage, protect, and restore ground water. These actions are accomplished through various permit and review functions and through remedial programs.

6. **Enforcement:** Enforcement includes all actions designed to ensure compliance with the Department's regulations for ground water, including permit compliance monitoring, enforcing against

unpermitted or illegal activities, and identifying the party responsible for pollution.

7. **Outreach/Education:** The Department provides education and information programs for the general public, local and county governments, and the news media. The Department conducts research aimed at more effective risk communication. Citizens advise the Department on ground water issues through advisory councils and task forces.

Program Planning and a Ground Water Strategy For New Jersey

Coordination of New Jersey's many laws and programs affecting ground water management will occur through A Ground Water Strategy for New Jersey. It establishes major new initiatives for protecting the potability of aquifers and enhancing the effectiveness of pollution mitigation programs. The Strategy was approved in 1989. Coordination of programs is necessary for effective management. The most critical initiatives are outlined below.

The Case Management System will coordinate case assignments, priorities, and technical standards for pollution cases involving hazardous substances. This system will result in faster action to protect public health where wells are polluted, through concurrent analysis of water supply remedies and ground water pollution mitigation options so that the fastest, most effective, and least costly remedies will be implemented.

Also, the Department will develop rapid remedies for imminent or existing pollution of drinking water wells or sensitive ecosystems. The lengthy schedules of normal remedial efforts are not acceptable in such situations. After a remedy is in place, any remaining pollution at the site will be addressed through the normal remedial process.

Ground Water Quality Standards establish objectives for controlling the discharge of pollutants to ground water and the correction of pollution from past discharges. The standards contain numerical criteria for many pollutants, and are fundamental to the implementation of the New Jersey Water Pollution Control Act. New standards were promulgated in 1993. The standards contain a new system for classifying ground water of the state, numerical criteria for many pollutants, and a policy which protects good quality ground water from significant degradation due to future discharges.

Well Head Protection will further protect the quality of water which flows into drinking water wells, both public and domestic. Congress required in 1986 that all states develop and implement well head protection programs. In New Jersey, public water supply wells and clusters of domestic wells will receive protection due to their importance as water supply sources. A program plan adopted by the Department in 1990 is awaiting USEPA approval.

Aquifer Recharge Area Protection: In 1990, the Department prepared guidance for voluntary municipal use in mapping and protecting aquifer recharge areas. By the end of 1992, the Department will prepare maps of the major aquifer recharge areas, as required by State law.

Nonpoint Sources of Pollution: Certain nonregulated sources are a major concern for ground water quality, as they are for surface water quality. Nonpoint sources of pollution include urban runoff, road runoff, agricultural and lawn care practices, and myriad sources of pollutants (e.g., residential septic systems) which are individually small but so ubiquitous as to pose significant pollution concerns. Nonpoint source management is needed which ensures that ground water quality standards are met to the greatest extent practicable. For example, industrial and municipal stormwater permitting programs requiring the use of Best Management Practices (BMPs) for pollution abatement are currently being developed by the Department to implement these policies.

Resource Evaluation: Monitoring Networks

The State, both alone and in conjunction with other agencies, has been conducting ground water resource investigations for several decades. The scope of the resource investigations has been expanded in recent years. Resource evaluation results in the description of surface and subsurface geology and an analysis of ground water quality and quantity. Both the N.J. and U.S. Geological Surveys help implement resource assessment management strategies by conducting field investigations and developing ground water data bases.

New Jersey has two long-term, continuous ground water quality monitoring networks. One is the <u>Saltwater Monitoring Network</u>. It consists of over 400 wells located along the Atlantic Ocean, Delaware Bay, and Raritan Bay, and provides an early warning system for saltwater intrusion. The Saltwater Monitoring Network has been in existence since 1923. A second network, the <u>Ambient Ground Water Quality Network</u>, provides water quality information on 36 common chemical parameters, as well as volatile organic compounds (VOCs), on a regional basis. This baseline information will regionally characterize ground water quality, as a function of aquifer and rock type, throughout the state. The Ambient Ground Water Quality Network has been in existence since 1982.

The USGS has a large scale computerized system, WATSTORE, for the storage and retrieval of the nation's water data. The national database in Reston, Virginia and a smaller database in the USGS branch office in New Jersey have much ground water quality and quantity data for the state. The NJGS is currently developing an ambient ground water quality and aquifer parameter database that will store data from NJGS projects and other programs. Much of that type of data is not entered into WATSTORE. For example, most ambient ground water quality data gathered from the NJPDES permit program and the Bureau of Safe Drinking Water's New Well DataBase are not in WATSTORE.

Research

Basic research on ground water quality issues has been reduced in the Department, due to budgetary restrictions. However, some research is conducted through the various Divisions, including the Division of Science & Research. The Department first attempted an overview of ground water quality in a study conducted from 1977-80. More recent research has studied the fate of toxic substances in soil and aquifer systems. Current research is studying the presence of fertilizers and the newer pesticides in ground water, radon levels in drinking water, the effects of acid deposition on the State's ground water resources, new methods of detecting ground water contamination, and ground water related community health problems.

Ground Water Quality Management

Methods to regulate and control sources of ground water pollution are, to a large degree, a function of the variability of the sources themselves. As shown in Tables IV-1a and 1b, not all sources of ground water pollution are from activities where a discharge is intended. Many activities cause ground water pollution due to poor design, operation, or awareness of potential pollution problems. Further, many causes of ground water pollution are due not to intentional waste disposal but rather to accidental discharges such as leaking underground storage tanks, incidental discharges (for example, leaching of pesticides) or induced contamination such as saltwater intrusion.

State ground water pollution programs focus first on pollution prevention: the control of the sources and causes of ground water pollution. Then secondly, on the correction of pollution. This emphasis acknowledges the difficulty and cost for the restoration of ground water. Current regulatory programs address three categories of ground water quality concerns: regulated discharges, ground water remedial action, and indirect sources of pollutants.

Five programs regulate the actual or potential discharge of pollutants from active facilities: 1) the Resource Conservation and Recovery Act (RCRA); 2) the NJ Pollutant Discharge Elimination System (NJPDES); 3) the Underground Storage Tank (UST) program; 4) the Realty Improvement Act (Chapter 199); and 5) the Solid Waste Management Act. Additional site remedial actions occur under the federal Comprehensive Environmental Response, Compensation and Liability Act (CERCLA, also called Superfund), the NJ Spill Compensation and Control Act (Spill Act), and the NJ Environmental Cleanup Responsibility Act (ECRA). These programs are described below.

Resource Conservation and Recovery Act (RCRA): This program controls the treatment, storage, and disposal of hazardous wastes. The universe of facilities with regulated activities has dropped from approximately 600 in 1980 to approximately 200 today. RCRA permitting is integrated with the NJPDES program, where there is an existing, planned, or potential discharge of pollutants to ground water or surface water. Performance, operational, and construction (minimum technology) standards are used. The performance standard is zero discharge for all hazardous constituents. Stringent closure, post-closure and remedial standards include additional ground water protection requirements. Past disposal units on a site may also be evaluated, and cleanup compelled.

New Jersey Pollutant Discharge Elimination System (NJPDES): The NJPDES program, as it is related to the protection of ground water, is divided into two major programs: the remedial discharges, and the operational discharges. The remedial discharges include the reinjection of ground water that has been treated under such remediation programs as the Industrial Site Recovery Act (ISRA), CERCLA, and other Department remediation programs. The operational discharges include the regulation of major septic systems, as well as land applications that include infiltration/percolation lagoons, surface impoundments, landfills, and resource recovery uses of sludge and compost. Closure and post-closure activities for hazardous waste land disposal units are also regulated under NJPDES.

Underground Storage Tanks -- New Jersey's Underground Storage of Hazardous Substances Act, as passed in 1986, regulates underground storage tanks (UST) containing hazardous substances. In accordance with the act, DEP's Bureau of Underground Storage Tanks is identifying and registering all tanks containing hazardous substances or petroleum products. Approximately 125,000 USTs at 85,000 facilities are subject to the State law. A subset consisting of 50,000 tanks at 15,000 facilities are also subject to Federal law. Facilities regulated under the State law contain heating oil or motor fuel above a certain storage volume, or any underground storage tank used to contain any regulated hazardous substance or waste.

Program components include registration, annual certification, and technical standards. Standards include: new tank design standards, construction permits, closure approvals, retrofitting existing tanks, periodic testing, monitoring systems, corrosion control, inventory control, and financial responsibility. Certain size and use categories of USTs need not comply with all standards.

Chapter 199, Realty Improvement Act -- "Chapter 199" refers to P.L. 1954, Chapter 199, the Realty Improvement Act. Under this act, the local planning board approves the construction of individual sewage disposal systems and the construction official monitors compliance. The NJPDES program regulates multiple connections to a single septic system. The State also must review subdivisions with 50 or more dwelling units for adequate water and sewerage and compliance with applicable State standards.

Regulation of Landfills -- The Department regulates the design, construction, operation, closure and post-closure monitoring of all solid waste facilities including landfills. The Department has required a large number of existing facilities to either close or prepare designs and plans for upgrading to reflect the required level of technical sophistication. Facilities are required to be permitted by the Division of Solid Waste Management. Landfills and other facilities often require both the solid waste facility permit and a NJPDES permit for ground water monitoring.

Under the Sanitary Landfill Facility Closure and Contingency Fund Act, all facilities are required to submit and obtain approval of a Closure Plan, which describes the activities necessary to properly terminate the facility, estimates the closure costs, and ensures sufficient funds for these costs.

Remedial Action -- The NJPDES and RCRA programs, discussed above, involve ground water discharge permits which address ground water monitoring, discharge limits, and technology requirements for the regulated facilities. Remedial action may be required to control and/or remove the discharge source and pollution mitigation. Discharge sources must be controlled to minimize damage.

Four laws focus on remedial action for nonpermitted discharges of hazardous substances: 1) ECRA; 2) the NJ Spill Act; 3) CERCLA (also known as Superfund); and 4) the Underground Storage Tank

Law (UST). In each program, ground water pollution is a major facet of the site assessment and remedial action. These programs also deal with the contamination of soil, surface water, air, and surface disposal.

1. **ECRA** imposes preconditions on the sale, transfer, or closure of industrial establishments involved in the generation, manufacture, refining, transportation, treatment, storage, handling, or disposal of hazardous substances or wastes. The facility owner must provide information on site conditions and receive approval that no remedial actions are needed or that required remedial actions will result in acceptable site quality.

2. **The Spill Act** mandates that responsible parties notify the Department of discharges of hazardous substances. The Department may take emergency remedial action and may implement long term cleanups when the responsible party will not. The Department may seek treble damages against responsible parties where public funds are used.

3. **CERCLA** is similar in many ways to the NJ Spill Act. Triple damages against responsible parties may be sought when public funds are used for remedial action. CERCLA provides for an assessment and ranking of sites nationally on the National Priority List.

4. New Jersey's Underground Storage of Hazardous Substances Act requires maximum expediency to correct ground water contamination. Tank owners must certify that all requirements were met. If ground water pollution has occurred, additional requirements are imposed which extend beyond the self-certification program.

Under the Spill Act, Water Pollution Control Act, and the Solid Waste Management Act responsible parties may enter Administrative Consent Orders or Memoranda of Agreement to conduct investigations, remedial alternative analyses, and/or remedial actions at contaminated sites.

Ground Water Supply Management (Quantity Protection)

One major purpose for ground water quality management is the protection of potable ground water supplies. The Department is responsible for protecting ground water through the allocation of supplies and regulation of public water supply systems. The Water Supply Management Act of 1981 is the primary authority for these programs. The Department must approve any withdrawals of water, including ground water, which exceeds 100,000 gallons per day on average. Approximately 1,000 water allocation permits exist, many of which are for ground water. The Department also must approve the drilling and construction of any new well, including monitor wells, test holes, and supply wells for potable, industrial, commercial, and agricultural uses. Over 20,000 well drilling permits are approved each year.

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 where severe water supply problems exist. In order to alleviate these supply problems, the State has been 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. The four aquifers included in this area are: Englishtown, Mount Laurel-Wenonah, and the Upper and Lower Potomac-Raritan-Magothy formations. The authority of the State to impose water withdrawal limitations in Critical Area Number 1 has been legally challenged. A 1989 court decision refuted the State's authority on this matter. New regulations are currently being written for this area.

Critical Area Number 2 includes portions of Camden, Burlington, Gloucester, Salem, Cumberland, Atlantic, Monmouth, and Ocean Counties. The affected aquifer is the Potomac-Raritan-Magothy. The regulation for the establishment of critical areas allows for the reduction of existing diversion allocations when alternative supplies become available, and promotes water conservation and the development of alternative supplies.

Should the need arise, the Water Supply Management Act allows the Governor to designate other Water Supply Critical Areas, upon the recommendation by the Commissioner of the Department that severe water supply problems exist. In such areas, stringent water withdrawal controls may be exercised on a regional basis. The Governor has not as yet designated any new Critical Areas, but the Department has identified several potential candidates.

In recognition of the importance of New Jersey's ground water for potable water supplies (almost 50 percent of population relies on ground water), the USEPA responded to a petition by the Department in 1985 and designated most of New Jersey as "sole source aquifers" which provides additional protection of the aquifers from actions by federally-funded programs. This petition recognized the vulnerability of the State's ground water to many known and potential pollution sources in the State. At present, approximately 80 percent of the State, the highest percentage of any state, is located within these designated Aquifers.

Enforcement

The Department has enforcement responsibilities under the programs described above. The Department can enforce the statutes and regulations, mitigate immediate hazards, seek permit compliance or require the responsible party to clean up ground water pollution.

The Office of Regulatory Affairs (ORA) is responsible for ensuring the legal and policy consistency of the Department's programs. ORA advises the programs on general legal issues and the promulgation of rules concerning ground water protection, and helps the divisional enforcement units develop case strategies and resolve legal issues. Through ORA, the Department may refer cases to the Office of the Attorney General to pursue court action.

Ground Water Programs Of Other Agencies

Other agencies and governmental bodies have ground water programs which complement or supplement NJDEPE roles in ground water protection through management strategies, monitoring, and legislation. More information is available by contacting the following:

U.S. Geological Survey (Water Resources Division)

The U.S. Geological Survey, Water Resources Division (USGS/WRD) is the Nation's largest water resource investigating agency. The USGS/WRD investigates the occurrence, quantity, quality, distribution, uses, and movement of surface and ground waters to develop and disseminate scientific knowledge and understanding of the nation's water resources, including New Jersey's. The USGS/WRD (NJ) and the State of New Jersey have had a cooperative agreement since 1923 to work on water-related projects. The USGS/WRD conducts various special studies in cooperation with the Department.

U.S. Environmental Protection Agency

The U.S. Environmental Protection Agency (USEPA) coordinates USEPA funded ground water programs in New Jersey. They provide both monetary and technical support for the implementation of the USEPA's ground water protection goals. USEPA is responsible for implementing the Safe Drinking Water Act, RCRA, CERCLA, and the Clean Water Act which include ground water protection measures. USEPA provides funding to the State under these laws for planning, development of regulations, and program implementation.

USEPA provides extensive support for hazardous waste cleanup work. New Jersey administers most of the federal programs on behalf of USEPA. USEPA's Region II office in New York City is New Jersey's liaison with USEPA.

Delaware River Basin Commission

The Delaware River Basin Commission (DRBC) is a regulatory and planning agency for the Delaware River basin, established in 1961 by Congress and the States of Delaware, New Jersey, New York, and Pennsylvania. The Commission's Comprehensive Management Plan provides for consistent management of the water resources of the basin. DRBC issues permits for water resources projects, conducts research and studies, forecasts stream and ground water levels and future water demand, monitors water quality, and enforces its water resource requirements.

Counties

Counties have the authority to implement environmental health programs through the County Environmental Health Act (N.J.S.A. 26:3A2-21), as long as certain overall performance standards are met. Cooperative program agreements are used for monitoring, inspection, and enforcement activities among local agencies, counties, and the State.

Municipalities

Municipalities have the authority to protect ground water on the local level through ordinances. The Municipal Land Use Law empowers the municipality to protect the environment and public health through zoning and subdivision and site plan control. The **Realty Improvement Sewerage and Facilities Act** requires that the Local Board of Health review the sufficiency of any proposed water supply system and sewage treatment facility for proposed realty improvements.

Public/Private Organizations

New Jersey has nine major watershed organizations, over one hundred environmental organizations, and over two hundred municipal Environmental Commissions and Committees. Many of these organizations deal with the protection and enhancement of water resources management, including ground water. Their activities include public education programs, newsletters, research, technical assistance, recycling drives, lobbying, and outdoor recreational activities.

D. FINDINGS OF CURRENT RESEARCH ON GROUND WATER IN NEW JERSEY

Studies of ground water quality and quantity problems in New Jersey are continuing; recent investigations are examining four such issues (see Figure IV-4):

1. naturally occurring radionuclides in ground water.

2. pesticide and fertilizer pollution of ground water.

3. models that demonstrate the effect that hypothetical ground water withdrawals will have on stressed aquifers in the Passaic River basin.

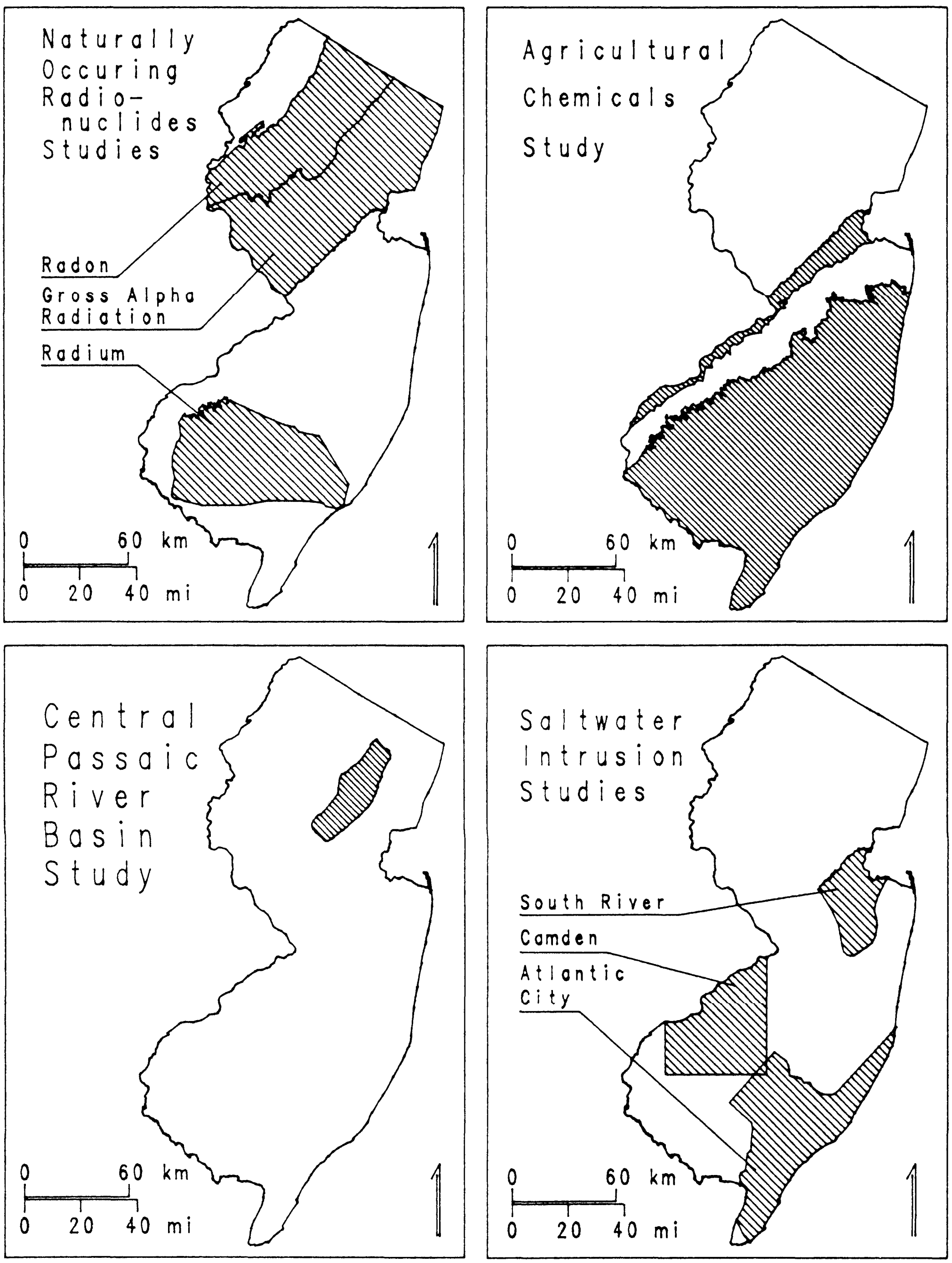
4. the water levels in Coastal Plain aquifers in order to determine the potential for saltwater intrusion.

Naturally Occurring Radionuclides: Three separate studies focusing on the occurrence of naturally derived radionuclides in ground water in three geologically distinct areas have been, or are being, conducted.

i. In 1987 the NJDEPE, in cooperation with Princeton University, sampled 154 wells that draw water from crystalline rocks in the Reading Prong for radon. These radon levels were observed to range from 36 to 24,000 picocuries per liter (pCi/L), and 5.4 percent of the wells sampled were found to have levels exceeding 10,000 pCi/L. A level of 10,000 pCi/L in ground water is believed to correlate with a level of 1 pCi/L in the air of a residence (Cothern, 1987). The USEPA proposed MCL for radon in drinking water of 300 pCi/L was exceeded in 90 percent of the samples collected.

ii. A study in the Newark Basin by the U.S. Geological Survey (USGS), in cooperation with the NJDEPE, determined gross alpha-particle activity and geochemical field parameters in 260 wells (Zapecza and Szabo, 1987a,b). Selected samples were analyzed for radium-226, uranium, radon-222 and trace metals. Gross alpha-particle activities ranged from less than 0.1 to 124 pCi/L, 5.7 percent exceeding the MCL of 15 pCi/L. Radium-226 levels ranged from 0.1 to 22.5 pCi/L, 3.9 percent exceeded the MCL of 5 pCi/L. However, this is a minimum percentage exceedence because radium-228 was not considered. Radon-222 ranged from 71 to 15,900 pCi/L and uranium ranged from 0.1 to 40 pCi/L. The major source of the radionuclides is a laterally continuous, vertically narrow, uranium-rich layer that is shallow enough in the far northeast and southwest parts of the basin to be tapped by some wells. The highest radionuclide concentrations in ground figure IV-4

Major Ground-water Studies in New Jersey
General Study Areas



water in the basin coincide with the distribution of the two parts of the layer.

iii. A USGS study, in cooperation with the NJDEPE, is focusing on high radium levels in the Kirkwood-Cohansey aquifer system in the Coastal Plain of southern New Jersey. Levels of radium-226 plus -228, and gross alpha particle activities exceed their MCLs in many wells. Preliminary results (Karl Muessig, NJDEPE/N.J. Geological Survey; oral communication, 1990) indicate that out of 82 widely distributed wells tested, 26 percent exceeded the MCL for radium. Radium-226 usually exceeds radium-228 but here radium-228 frequently predominates. This indicates that its parent isotope, thorium-232 occurs in widespread concentrations. Higher radium concentrations correlate with decreasing pH and increasing barium concentrations.

Agricultural Chemicals: A study by the NJDEPE, in cooperation with the USGS, sought to determine if agricultural chemicals such as pesticides and nutrients have adversely affected the quality of ground water in New Jersey (Louis and Vowinkle, 1989; and Louis, written communication, 1989). The project was designed to examine agricultural wells in areas where ground water is most susceptible to contamination. The outcrop areas of Coastal Plain aquifer systems--the Potomac-Raritan-Magothy and the Kirkwood-Cohansey--and the bedrock aquifers in northwestern New Jersey were studied. Water samples were collected from domestic, irrigation, and public-supply wells located within 800 meters of agricultural land. One hundred and twenty wells in ten counties were sampled from 1986 to 1988. The samples were analyzed for nutrients, volatile organic fumigants, herbicides and insecticides. Residues of 22 pesticides and 3 pesticide metabolites were detected in concentrations ranging from 0.01 to 13 parts per billion (ppb). Dissolved nitrate concentrations exceeded the primary drinking water standard of 10 milligrams per liter (mg/L) in 24 percent of the samples. This study clearly indicates that agricultural chemicals are having an adverse affect on ground water quality.

Ground Water Quantity in the Central Passaic River Basin: Ground water quantity in the Central Passaic River basin is currently being studied by the NJGS in cooperation with the USGS. Here, the buried valley aquifer system has experienced increasingly heavy ground water withdrawals. Ground water levels here have declined as much as 80 feet since the turn of the century. To better manage the limited ground water resources in this basin the NJDEPE will be using a three-dimensional computer model to predict the aquifer-system's response to variable ground water withdrawals (Hoffman, 1988). This will help predict aquifer-system response to any proposed ground water withdrawals.

Saltwater Intrusion Studies: Overpumping of ground water and its relationship to saltwater intrusion have been the subject of several recent studies in the New Jersey Coastal Plain. One on-going study showed significant declines in ground water levels in major artesian aquifers of the Coastal Plain. Overpumpage has caused large regional cones of depression to develop; the most extensive of these are in the Potomac-Raritan-Magothy aquifer system. Here, from 1978 through 1983, heads declined as much as 23 feet. In the Englishtown aquifer system, heads declined as much as 29 feet during the same period; however, the cones were not as extensive (Eckel and Walker, 1983). From 1983 to 1988, declines were as much as 52 feet. The lowering of heads indicates not only potential ground water quantity problems, but also potential quality problems. Saltwater from adjacent surface water bodies may recharge the aquifers in response to the lowered heads. Recent USGS and NJGS investigations have found signs of saltwater intrusion in several coastal plain aquifers including those in the South River, Camden, and Atlantic City areas (Leahy and Paulachok, 1987). A study in progress in Cape May County focuses simultaneously on ground water pumpage and saltwater intrusion. The goal is to define optimal withdrawals that will safeguard water quality.

BIBLIOGRAPHY AND LITERATURE CITED

American Geological Institute, 1976, Dictionary of geological terms: Anchor Press/Doubleday, Garden City, New York, 472 p.

Anderson, H.R., 1968, Geology and ground-water resources of the Rahway area, New Jersey: Special Report no. 27, New Jersey Department of Conservation and Economic Development, Division of Water Policy and Supply, 72 p.

Barringer, J.L., 1989, Corrosive ground water in the New Jersey Coastal Plain: Abstract, Proceedings Northeast Section G.S.A., 24th annual meeting, New Brunswick, New Jersey.

Carswell, L.D., 1976, Appraisal of water resources in the Hackensack River Basin, New Jersey: U.S. Geological Survey, Water Resources Investigation 76-74, 43 p.

Cothern, C.R., 1987, Estimating the health risks of radon in drinking water: American Water Works Association Journal, v. 79, no. 4, p. 153-158.

Davis, S.N., and Turk, L.J., 1964, Optimum depth of wells in crystalline rocks: Ground Water, v. 19, p. 407-417.

Dombroski, D.R., 1980, A geological and geophysical investigation of concealed contacts near an abandoned barite mine, Hopewell, New Jersey: Unpublished Masters Thesis, Rutgers University, New Brunswick, New Jersey, 33 p.

Demir, Ilham, 1989 Temporal variations and sources of Pb, Cd, Cu, Ni, Fe, and Mn in shallow ground water of the McDonalds Branch Basin, Lebanon State Forest, Burlington County, New Jersey: New Jersey Geological Survey Report 20, 19 p.

Cherry, J.A., and Freeze, R.A., 1979, Groundwater, Englewood Cliffs, N.J., Prentice-Hall Inc.

Eckel, J.A., and Walker, R.L., Water levels in major artesian aquifers of the New Jersey Coastal Plain, 1983: U.S. Geological Survey Water Resources Investigations Report 68-4028, 62 p., 7 plates.

Gill, H.E., and Vecchioli, J., 1965, Availability of ground water in Morris County, New Jersey: Special Report 25, New Jersey Department of Conservation and Economic Development, Division of Water Policy and Supply, 56 p.

Harriman, D.A., and Sargent B.P., 1985, Ground-water quality in east-central New Jersey and a plan for sampling networks: U.S. Geological Survey Water Resources Investigations report 85-4243, 114 p.

Herman, G.C., 1988, The Paleozoic geology and related geohydrologic aspects of northern New Jersey: Proceedings, Geology and Hydrology of New Jersey - A two day field course presented by Rutgers University, Department of Geological Sciences in cooperation with Cook College, New Brunswick, New Jersey, p. C1-C29.

Hoffman, J.L., 1988, Plan of study for the central Passaic River basin hydrologic investigation: New Jersey Geological Survey Open-File Report 88-4, 22 p.

Houghton, H.F., and Flynn, J.J. 1988, Geology and hydrogeology of the Piedmont Lowlands Province: The early Mesozoic Newark Basin in New Jersey ; Proceedings, Geology and Hydrology of New Jersey - A two day field course presented by Rutgers University, Department of Geological Sciences in cooperation with Cook College, New Brunswick, New Jersey, p. E1-E57.

James, A.D., 1967, The occurrence of water in the Precambrian crystalline rocks of the New Jersey Highlands: Unpublished Masters Thesis, Rutgers University, New Brunswick, New Jersey, 74 p.

Kasabach, H.F., 1966, Geology and ground-water resources of Hunterdon County, N.J.: New Jersey Division of Water Policy and Supply Special Report 24, 128 p.

Leahy, P.P., Paulachok, G.N., Navoy, A.S., and Pucci, A.A., 1987, Plan of study for the New Jersey bond issue ground-water supply investigations: New Jersey Geological Survey Open-File Report 87-1, 53 p.

Louis, J.B., and Vowinkle, E.F., 1989, Effect of agricultural chemicals in ground-water quality in the New Jersey Coastal Plain, Conference-Pesticides in Terrestrial and Aquatic Environments, sponsored by the Virginia Water Resources Research Center, Virginia Polytechnic Institute and State University, March 11-12, 1989, Richmond, VA.

Means, J.L., Yuretich, R.F., Crerar, D.A., Kinsman, D.J.J., and Borcsik, M.P., 1981, Hydrochemistry of the New Jersey Pine Barrens: Department of Environmental Protection, New Jersey Geologic Survey Bulletin 76, 107p.

Miller, J.W., Jr., 1974, Geology and ground-water resources of Sussex County and the Warren County portion of the Tocks Island impact area: Department of Environmental Protection, Bureau of Geology and Topography, Bulletin 73, 143 p.

New Jersey Dept. of Environmental Protection, 1985, Sole source aquifer designation petition: Aquifer systems of the Coastal Plain, Piedmont, Highlands, and Valley and Ridge physiographic provinces. Submitted to C. Daggett, Regional Administrator, U.S. Environmental Protection Agency.

New Jersey Dept. of Environmental Protection, 1985b, New Jersey Safe Drinking Water Act, N.J.A.C. 7:10-1.1 through 7.3, 22p.

New Jersey Dept. of Environmental Protection, 1988, Regulation implementing the New Jersey Water Pollution Control Act, N.J.S.A. 58:10A: 7:14A-1 NJPDES regulations, variously paginated.

New Jersey Dept. of Environmental Protection and Energy, 1992, Influence of Geology on Radon in Ground Water Supplies in New Jersey's Reading Prong: Research Project Summary. Division of Science and Research.

Nichols, W.D., 1968, Ground-water resources of Essex County, New Jersey: Special Report No. 28, New Jersey Department of Conservation and Economic Development, Division of Water Policy and Supply, 56 p.

Olsen, P.E., 1980, The latest Triassic and early Jurassic formations of the Newark basin (eastern North America, Newark Supergroup): N.J. Acad. Sci. Bull., v. 25, p. 25-51.

Rhodehamel, E.C., 1970, A hydrologic analysis of the Pine Barrens region. N.J. Water Policy Board Circular no. 22, 35p.

Ridge, J.C., 1983, The surficial geology of the Great Valley section of the Ridge and Valley province in eastern Northhampton County, Pennsylvania and Warren County, New Jersey, Unpublished Masters Thesis, Lehigh University, Bethlehem, PA, 234 p.

Serfes, M.E., 1993, Natural Ground Water Quality in bedrock of the Newark Basin. New Jersey Geological Survey Report. In Press.

Spencer, E.W., 1977, Introduction to the structure of the earth: McGraw-Hill, New York, 640 p.

Szabo, Zoltan, Zapecza, O.S., and Nawyn, J.P., 1989, Effects of ground-water geochemistry on the distribution of dissolved uranium and radium-226 in the Newark Basin, New Jersey: Proceedings-Conference on ground water in the Piedmont, in Charlotte, North Carolina.

Van Abs, D.J., 1986, The buried valley aquifer systems: resources and contamination: Passaic River Coalition, Basking Ridge, NJ, 394 p.

Volkert, R.A., 1988, Geology, ground-water occurrence, and ground-water quality in the middle Proterozoic rocks of the New Jersey Highlands; Proceedings Geology and Hydrology of New Jersey - A two day field course presented by Rutgers University, Department of Geological Sciences in cooperation with Cook College, New Brunswick, New Jersey, p. B1-B35.

Zapecza, O.S., 1984, Hydrogeologic framework of the New Jersey Coastal Plain: U.S. Geological Survey Open-File Report 84-730, 61 p.

Zapecza, O.S., and Szabo, Zoltan, 1987a, Source and distribution of natural radioactivity in ground water in the Newark Basin, New Jersey: Proceedings: Radon, Radium, and other Radioactivity in Ground Water - National Water Well Association conference, Somerset, New Jersey, p. 47-68.

Zapecza, O.S., and Szabo, Zoltan, 1987b, Relation between natural radionuclide activities and chemical constituents in ground water in the Newark Basin, New Jersey: Proceedings: Radon, Radium, and other Radioactivity in Ground Water-National Water Well Association conference, Somerset, New Jersey, p. 47-68.

CHAPTER V

WATER POLLUTION CONTROL PROGRAMS

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A: POINT SOURCE CONTROL PROGRAMS

Introduction

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 $3.4 billion in federal and State funds have been obligated in the State for the construction of wastewater treatment works. The 1990 National Needs Survey, however, reports that approximately $4.4 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 1990 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 Assistance Program, the New Jersey Pollutant Discharge Elimination System Program, the Treatment Works Approval Program for domestic sewage facilities, the industrial pretreatment program, and enforcement-related activities.

New Jersey Municipal Wastewater Assistance Program

The NJDEPE, through its Municipal Wastewater Assistance 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 Assistance Program. That program consists of the traditional federal Construction Grants Program administered by the State on behalf of the USEPA, the State Wastewater Treatment Financing Program, and the Pinelands Infrastructure Trust Program. The program also consists of two aspects of the Sewage Infrastructure Improvement Act program, namely the combined overflow abatement section of the Act (N.J.S.A. 58:25-28), and the planning and design grants for interconnection and cross connection abatement under N.J.S.A. 58:25-29(b).

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 NJDEPE and is capitalized with federal and state funds. Together, these programs provide for loans at approximately 50%

TABLE V-1. NEW JERSEY 1990 NEEDS SURVEY RESULTS FOR SEWERAGE SYSTEMS

CURRENT 1990 PUBLICLY-OWNED WASTEWATER TREATMENT NEEDS ELIGIBLE FOR FEDERAL FINANCIAL ASSISTANCE

CATEGORY	STATE ESTIMATED CURRENT NEEDS*
Secondary Treatment	1,868
Advanced Treatment	190
Infiltration/Inflow	246
Replacement/Rehabilitation	343
New Collector Sewers	368
New Interceptor Sewers	240
Combined Sewer Overflows	1,149
Total	4,404

* All Figures Are In Millions of Dollars

From: USEPA, 1991.

of the market interest rate. Terms of the loans are from 20-23 years. The State Wastewater Treatment Financing Program issued low interest loans in State Fiscal Years 1989, 1990, 1991, and 1992 for approximately $190 million, $147 million, $170 million and $131 million respectively. In applying for funding, applicants must meet deadlines for each of the following steps: commitment, planning, design, and formal application.

New Jersey Pollutant Discharge Elimination System

The NJDEPE administers the New Jersey Pollutant Discharge Elimination System (NJPDES permit program) as prescribed under the Water Pollution Control Act (N.J.S.A. 58:10A-1 et sig.) and other statutes. 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, 307 discharge to surface water, 163 to ground water. Of the industrial facilities, 1,028 discharge to surface water, 166 to ground water. There are also, 77 indirect industrial discharges: industries that discharge pretreated wastewater to municipal wastewater facilities. There are 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 NJDEPE 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.

Treatment Works Approval Program For Domestic Sewage Facilities

The Department issues Treatment Works Approval (TWA) permits which authorize the construction and operation of wastewater treatment, storage, and conveyance facilities. These facilities include, but are not limited to, municipal sewage treatment plants, privately-owned package plants, gravity sewer extensions, pumping stations, force mains, holding tanks, certain septic system designs, and equalization tanks (see N.J.A.C. 7:14A-12; 7:9; and 7:9A). The purpose of the TWA program is to protect the integrity of State waters by preventing their pollution from inadequately functioning sewage treatment facilities. The Department reviews TWA applications to assure proper conveyance to and adequate treatment by receiving treatment facilities, consistency with areawide water quality management plans, and conformance with the State Design Standards and Regulations.

A sewer connection ban is imposed on a wastewater facility for violations of the plant's NJPDES Discharge Permit over a three consecutive month period (based on an average). In addition, bans may also be imposed for inadequate conveyance capacity in the municipal collection system (refer to N.J.A.C. 7:14A-12.21). A sewer connection ban prohibits the connection of new sewage generating facilities to a collection system unless the project has received an exemption from the ban, pursuant to N.J.A.C. 7:14A-12.22. Sewer connection bans are rescinded in accordance with the provisions of N.J.A.C. 7:14A-12.21(e). In the fiscal year 1991, 172 of approximately 400 publicly-owned sewage treatment plants within the State were under sewer connection bans, impacting 249 municipalities.

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 (NJDEPE, 1987).

In 1981, New Jersey was delegated authority from the USEPA for a pretreatment program. In implementing this program, the NJDEPE 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 NJDEPE-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, 1987).

Enforcement-Related Activities

The Office of Enforcement Policy monitors compliance with, and enforces as necessary, all permits issued under the NJPDES permit program for surface water, ground water, landfill, and indirect discharges to Publicly Owned Treatment Works (POTW). In addition to the self monitoring reports submitted by the permittee, periodic on-site compliance evaluation inspections are carried out by enforcement staff as a means to evaluate the facilities compliance with all conditions of their permit. In addition, the compliance sampling inspections serve as a means of checking the validity of the self-monitoring data and previously conducted compliance inspections.

The Clean Water Enforcement Act (CWEA), was adopted in 1990 and thereby amended the N.J. Water Pollution Control Act. The CWEA requires the Department to perform additional inspections, discharge compliance sampling, and follow-up inspections for "Significant Non-Compliance" (SNC). "Significant noncompliers" are permit holders having serious violations the same pollutants within any two months during a six month period, or an exceedence by any percentage for a pollutant in four months of a six month period. Significant noncompliers also include permittees who have failed to submit a complete Discharge Monitoring Report (self-monitoring report) in any two of six months.

The Department is also required to inspect every facility having a NJPDES permit within six months of a permit expiration. The Clean Water Enforcement Act requires the Department to impose mandatory minimum penalties against a permittee that is guilty of a serious violation or found to be in SNC. A serious violation means that an effluent limitation in a NJPDES permit has been exceeded by 20 percent for a hazardous pollutant or a non-hazardous pollutant has been exceeded by 40 percent or more. Penalties assessed and collected pursuant to the Clean Water Enforcement Act will be deposited into the "Clean Water Enforcement Fund" to be used by the Department to implement and enforce the State's water pollution control programs.

The Clean Water Enforcement Act also requires the Department to prepare an annual report on the implementation and enforcement actions taken by the Department and delegated to local agencies during the preceding year. The report will describe the types of enforcement actions issued against each violator, the products produced, penalties assessed, and the status of the penalty collection process.

As of July 1, 1988 (pursuant to Section 301 of the Federal Clean Water Act), publicly-operated treatment works are required to meet secondary or water quality based effluent limitations, whichever are more stringent. One hundred and twenty-one facilities were unable to meet this deadline and it will be necessary for the NJDEPE to issue Administrative Consent Orders (ACO's) to bring the facilities into compliance. As of July 1, 1991, 83 facilities have completed their upgrades, and 38 continue to proceed on their compliance schedules.

New Jersey's historically aggressive water enforcement program, when combined with the new powers and responsibilities manifested by the Clean Water Enforcement Act, will create a formidable incentive for the regulated community to achieve compliance (or resolve temporary noncompliance) with the effluent limitations contained in their NJPDES permits at the earliest possible time. Table V-2 summarizes the numbers of inspections conducted by the Water & Hazardous Waste Enforcement Element within the Office of Enforcement Policy, the percentage of dischargers found to be out of compliance (i.e., not meeting permit limitations), and the penalties assessed.

TABLE V-2 SUMMARY OF NJPDES PERMIT COMPLIANCE INSPECTIONS AND PENALTY ASSESSMENTS

FISCAL YEAR 1990

	MUNICIPAL	**INDUSTRIAL**
Surface Water Inspections:	In compliance 89 Non-compliance 164 **Total = 253** % Non-compliance=62%	In compliance 642 Non-compliance 541 **Total = 1,183** % Non-compliance=46%
Ground Water Inspections:	In compliance 17 Non-compliance 22 **Total = 39** % Non-compliance=56%	In compliance 391 Non-compliance 371 **Total = 762** % Non-compliance=49%
Penalties Assessed:	SW $13,613,750 GW $351,250	SW $52,051,799 GW $2,678,796
	Total = $13,965,000	**Total = $54,730,595**

FISCAL YEAR 1991

	MUNICIPAL	**INDUSTRIAL**
Surface Water Inspections:	In compliance - 126 Non-compliance - 122 **Total 248** % Non-compliance=49%	In compliance - 737 Non-compliance - 499 **Total 1,236** % Non-compliance=40%
Ground Water Inspections:	In compliance - 19 Non-compliance - 17 **Total 36** % Non-compliance=47%	In compliance - 470 Non-compliance - 391 **Total 861** % Non-compliance=45%
Penalties Assessed:	SW $11,395,500 GW $973,500	SW $23,028,000 GW $2,762,784
	Total = $12,369,000	**Total = $25,790,784**

B: NONPOINT SOURCE POLLUTION PROGRAMS

Introduction

The 1990 State Water Quality Inventory Report identified nonpoint source (NPS) pollution as a major reason why fishable and swimmable clean water goals have not been met in many of our assessed streams and rivers, and some of our estuaries and ocean waters. In addition, seasonal monitoring of swimming beaches reveals that nonpoint source pollution has been the cause of greater than 70% of all beach closings in New Jersey. Clearly, nonpoint source pollution threatens the water resources of the State as well as our economy and quality of life.

The majority of nonpoint pollution affecting New Jersey's waterways is carried by rain water flowing overland or through stormwater sewer systems. Because New Jersey is a very densely populated state, the Department's management program must focus on urban and suburban nonpoint source pollution categories in addition to the more traditional focus on agricultural sources. The urban/suburban pollution source categories include residential, industrial, and commercial properties; construction sites; and roadways. These sources have all been identified as significant contributors to nonpoint source pollution.

In 1990, The Department received approval of its Section 319(h) Nonpoint Source Assessment and Management Program from USEPA. In the two years since, the Department has embarked on several nonpoint source control initiatives associated with the Program that are funded under section 319(h) of the Federal Clean Water Act (CWA). Additional NPS planning activities have also been developed, funded under other federal programs such as sections 205(j), 604(b), and 402(p) of the CWA. An additional federal mandate comes from Section 6217 of the Federal Coastal Zone Management Act. This Act requires the development of a nonpoint source control plan within the designated coastal zone boundary of New Jersey.

State mandates for nonpoint source control are currently directed under the New Jersey Sewage Infrastructure Improvement Act which is discussed below.

The following is a summary of all major NPS control activities that either have begun or have been completed and not reported since the 1990 305(b) reporting cycle.

- Many waterbodies in the four coastal counties receive discharges from a large number of stormwater outfalls. For example, Barnegat Bay, Manahawkin Bay, Matawa River, Navesink River, Raritan Bay, Sandy Hook Bay, Shark River, and the Shrewsbury River; each receive discharges from over 200 stormwater outfalls.

- Between 1987 and 1991, there were 62 ocean beach closures and 697 bay beach closures.

- The New Jersey Cooperative Coastal Monitoring Program (CCMP) has concluded that the majority of beach closures are the result of elevated levels of bacteria occurring after rainfall events. The identification and management of stormwater discharges is necessary to prevent future beach closings. Indeed, the CCMP currently estimates that up to 70% of ocean beach closures could be prevented through the implementation of the SIIA.

Phase II - Final Mapping and Monitoring

Under Phase II of the program, each municipality will develop a final map of all stormwater and sanitary sewer lines within the geographical boundary of their municipality. The final maps shall also identify all crossconnections and interconnections found within that municipality. The final map shall include the entire stormwater system including stormwater lines, outfalls, management basins, manholes, and other appurtenances. Rules containing the final mapping requirements were adopted on June 17, 1991. These rules appropriate $5.535 million in state grant money, and 677,000 in federal funds, for the 94 affected municipalities. Grant applications have been received by the Department from all 94 municipalities.

Phase III - Nonpoint Source Pollution Abatement

Based on the information being gathered in Phases I and II, the Department is currently developing NPS abatement regulations under Phase III. The regulations, once adopted, will require 94 coastal communities to develop municipal nonpoint source abatement plans and begin implementing abatement measures. These measures will provide control of nonpoint source pollution from new development, as well as remediation from existing urbanized areas. These measures will include the establishment of:

- municipal ordinances for long term NPS control
- implementation schedules for BMP operation and maintenance
- ongoing NPS education programs
- a long term monitoring program to evaluate BMP effectiveness.

Watershed Prioritization

The NJDEPE plans to identify priority watersheds in order to provide a basis for the implementation of nonpoint source pollution control programs. These will include NPS abatement plans, grants, loans, ordinances, special BMPs, and intensive education efforts. A separate ground water NPS priority system has been established. The Department will coordinate these lists to ensure that there is a comprehensive priority system that avoids conflicts between the surface and ground water management programs.

Model Ordinance

As an aspect of the Sewage Infrastructure Improvement Act requirements proposed for Phase III of that program, the Department is developing a model nonpoint source abatement ordinance for use by local communities, particularly the 94 municipalities along the coast. This ordinance will stress the concept of pollution prevention and source control. The ordinance will be closely tied to the NPS Best Management Practices Manual and will serve as a guide to municipalities in abating NPS pollution. The ordinance is intended to be used by municipal governments in meeting NPS control needs for non-permitted runoff as well as for reducing pollution from runoff leading to permitted facilities. Initially, this activity will emphasize coastal municipal NPS needs but will also eventually be applicable to the rest of the State.

Barnegat Bay Management Plan (BBMP)

The BBMP is a comprehensive land use and environmental management plan for the Barnegat Bay watershed, developed in cooperation with local governments. The plan identifies standards, controls, and institutional alternatives for effectively controlling NPS pollution within the Bay watershed. Once the Plan is finalized, the Department will use it to provide specific recommendations to the Legislature, other State agencies, county, and municipal agencies; with regards to NPS pollution control. These recommendations will be either integrated into existing regulations, or used to develop new requirements, and are all designed to ensure effective implementation. The BBMP is currently (April 1992) in draft form and has been distributed for public review and comment.

Middlesex County Aquifer Protection Demonstration Project

The purpose of this project is to develop a case study document and guidance manual that demonstrates the planning and implementation of NPS pollution controls for aquifer recharge protection. The major component of the project involves a case study, performed with the cooperation of the Middlesex County Planning Board, to identify and protect recharge and well head protection areas in several cooperating townships. The project will include a delineation of the geographic areas involved, a survey of pollutant sources (point and nonpoint), an identification of appropriate management techniques (including BMPs developed by NJDEPE and its consultants), and an implementation of the management techniques through local and county ordinances.

Ground Water BMP Development

The Department has developed guidance for implementing Best Management Practices for ground water protection. This guidance is in the form of a series of public information brochures designed for distribution to targeted municipalities throughout the State. They will also be incorporated into the Department's BMP manual discussed above. The brochures cover topics such as:

- Road Salting
- Septic Management
- Motor Vehicle Services
- Small Unregulated Storage Tanks
- Urban/Suburban Landscaping

2. Planning Activities Funded Under Sections 205(j) and 604(b) of the CWA

Industrial Stormwater Permitting

This program issues permits to stormwater discharges associated with certain industrial activities. One of the major implementation objectives of the Permit Program is to maximize the use of pollution prevention strategies and source controls that are designed to minimize or eliminate contact between rainfall and pollution sources.

NJDEPE will accomplish this objective through a progressive system of general and industry-specific permits. Two basic or general permits have been proposed by the Department that will apply to most regulated industries, construction activities, as well as certain mining activities. These permits will require the preparation of stormwater pollution prevention plans. These plans are intended to identify potential sources of pollutants and to develop strategies for implementing best management practices designed to prevent contact between stormwater and on-site potential pollution sources. Potential pollution sources include raw materials, final products, and/or process sites themselves that are exposed to rainwater. These general permits will be followed by another series of <u>industry-specific permits</u> developed in coordination with the industrial community, and will require specialized control strategies aimed at pollution sources that are specific to certain industries. The overall goal of these permits is to encourage industries to eliminate pollutant contact with stormwater pollution to the maximum extent practicable; thereby, preventing the pollutants from actually getting into the stormwater.

Pass Through Grants

- <u>Delaware River Basin</u>: A study is being conducted to determine the distribution of toxics in Delaware Bay sediments (DRBC, 1992). A resulting report will discuss the magnitude and distribution of the toxic pollutants and compare the results to previous data. In addition, the report will discuss the relationship between the toxics in the sediments and those in the water column.

- <u>Mercer County Soil Conservation District</u>: This study compares the level of maintenance required in stormwater detention basins lined with wildflower cover as compared to basins lined with turfgrass. Ten basins located in Mercer County were seeded with commercially available wildflower seed mixes and evaluated. A practical guidance has resulted from the study that serves to identify suitable wildflower mixtures and procedures necessary for the successful seeding of stormwater detention basin linings.

- <u>Somerset County Department of Public Works</u>: This study assesses what changes in water quality in Mac's Brook may have occurred as a result of the development of the Bridgewater Commons Mall, which has a stormwater discharge to the Brook. Baseline water quality information characterizing Mac's Brook before the mall was built is available from sampling data routinely collected at a USGS monitoring station located immediately downstream from the Mall.

- <u>Cape May County Wellhead Protection Program</u>: This program is designed to locate and delineate private domestic well cluster areas within the county for ground water resource preservation. Wellhead Protection areas will be delineated for private well clusters, and management for these areas will be developed and implemented. All research and analysis developed under this program will be formulated for Geographical Information System (GIS) compatibility.

- <u>Ocean County Wellhead Protection Program</u>: This program will delineate wellhead protection areas for public water supply wells. Potentially hazardous land uses within the wellhead protection areas will be mapped. Land use controls will be recommended and land use ordinance options designed to provide water supply protection will be explored.

- Hopatcong Borough: A grant was awarded to Hopatcong Borough to develop a municipal nonpoint source abatement program for Lake Hopatcong. The development of the abatement plan is similar to the approach that is being followed by municipalities in the coast under the Sewage Infrastructure Improvement Act. The Borough is conducting a stormwater facility inventory and is mapping all outfall structures and existing controls. In addition, the Borough is organizing stream walks designed to promote citizen involvement and also to identify obvious major NPS problems. The Borough is collecting water quality samples at selected locations. All of the information gathered during these activities will be analyzed and used to develop a NPS Abatement Program for the Borough.

- Upper Millstone River Storm Runoff Impact Study: This study was conducted to quantify pollutant loadings contributed by nonpoint sources in relation to existing land uses. The Study also evaluated the potential impact of future nonpoint source pollution generated by the future development that is anticipated within the lower reach of the Upper Millstone River watershed. The Study employed a comprehensive mathematical storm runoff model (SWWM-4). The study area borders Mercer and Middlesex Counties and includes the subbasins of Rocky Brook and Upper Millstone River, above the confluence with Cranbury Brook, with about 41 square miles of drainage area. Based on model projections, the pollutant loading trend increases with the degree of urbanization. The loading for TSS, BOD, total phosphorus, total nitrogen, and ammonia will increase about 20, 10, 10, 4 and 3 times respectively as 80% of farm and forested lands located in the study area are converted to urban land use.

3. Educational Efforts Funded from a Variety of Funding Sources

Nonpoint source education is one of the most important aspects of NJDEPE's NPS Management Program. Effective public education aimed at describing the NPS problems in the State and the resulting heightening of public awareness regarding NPS issues is essential to the success of the Program. Components of the nonpoint source education effort include the following:

New Jersey Water Watch

The Department has organized Water Watch as an outreach and citizen involvement initiative. Water Watch provides a channel for citizen involvement to assist the Department with water resource management, and has a strong focus on nonpoint source pollution control. Participants in the program are encouraged to play a role in maintaining or improving the quality of their local waterways. Activities undertaken by the program include organizing litter clean-ups, water quality monitoring, canoe trips, nature trail development, wildlife surveys, and providing community education.

Other Education Efforts

Over the past several years the Department has either conducted or participated in numerous NPS seminars, workshops, and conferences. The Department also has either alone or in cooperation with other agencies developed various NPS educational and informational materials. "Beneath The Shell", a popular teacher's guide to NPS pollution and its effects upon shellfish, is one example of some of the excellent educational materials produced by the Department.

C: 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 NJDEPE's primary surface water quality monitoring unit is the Office of Water 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 Water Monitoring's monitoring activities. One such trend has been an expansion of biological monitoring. Another trend is the broadening in scope of the ambient monitoring program to include both surface water and ground water monitoring. A third trend has been a greater emphasis on the coastal area with a corresponding decrease in inland surface water monitoring. In order to expand the State's overall capability to extensively monitor, especially within the coastal regions, the Department 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). The present emphasis in the State's inland monitoring activities is still on point sources and as a result, little nonpoint source-related monitoring data is currently available. In coastal regions, most sources of contamination are nonpoint (including storm-sewers); hence, in these regions nonpoint source monitoring are regarded as extensive.

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: state-wide routine fresh water monitoring, estuarine and ocean monitoring, biological monitoring, and regional 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. All of the monitoring activities discussed below are conducted by the Bureau of Monitoring Management unless otherwise indicated.

The data taken from freshwaters presented in this report was collected from a routine monitoring system as described below. This monitoring system has since undergone modifications, however, and these are described in the section entitled "Primary Monitoring Network" below. These changes will be reflected in the water quality data presented in future Inventory Reports.

State-Wide Fresh Water Routine Monitoring

Basic Fresh 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 (calcium, magnesium, sodium), and metals (arsenic, cadmium, chromium, copper, mercury, lead).

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 82 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.

Recently the NJDEPE and the USGS reevaluated and subsequently modified the combined Primary/Basic networks discussed above in an effort to assure that the overall fixed station monitoring system would meet current as well as future regulatory and assessment needs with regards to the location of sampling sites, the frequency of sample collection, and the parameters monitored. Twenty-five stations were discontinued because they were either in close proximity to a neighboring station (and hence redundant), could not provide reliable discharge data (for flow-correction procedures), or monitored very small drainage areas. As a result of the changes, the Primary and Basic systems were combined and treated as one system with common parameters and sampling schedules. A total of eighty-three sampling sites will exist in the system. For the purpose of maintaining the historical continuity of the system, stations were not moved, nor new sampling points established within the new combined system. All water column constituents are to be sampled five times a year. Dissolved metals will continue to be sampled twice per year during high and low base flows. Bottom sediment samples will continue to be taken once a year during low flows in October.

The parameter list has been revised to include the analysis of dissolved as well as total constituents. These additions will provide a more detailed level of nutrient assessment, allowing a better understanding of the cycling, transport, and fate of nutrients and organic carbon in State waters. The following water column analyses will be added to the existing system of analyses: suspended solids, dissolved nitrate/nitrite, dissolved Kjeldahl nitrogen, dissolved phosphorus, BOD, and COD (the later two at selected sites).

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.

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 NJDEPE: the Cooperative Coastal Monitoring Program (CCMP) discussed below, and the New Jersey Bureau of Marine Water Classification and Analysis (BMWC&A). The Bureau of Marine Water Classification and Analysis 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. Both the CCMP and BMWC&A sampling has been traditionally limited to coliform bacteria measurements in bathing beaches and shellfish harvesting waters respectively. Recently however, the CCMP has expanded its sanitary monitoring to include sampling for enterococcus bacteria (see CCMP below). The BMWC&A has expanded its monitoring role by significantly increasing the number of water quality parameters for which it monitors (see <u>New Jersey Marine and Estuarine Water Quality Monitoring Network</u>, below).

In addition, daily helicopter observations are performed by the Department's Office of Enforcement Policy during the bathing season. The program provides for a rapid assessment of coastal conditions which could impact bathing beaches such as the presence of floating material, pollution slicks, and algal blooms. In the 1989 summer season there were approximately 120 such low level flights along the New Jersey coast.

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.

<u>Cooperative Coastal Monitoring Program (CCMP)</u>: The CCMP is authorized by the County Environmental Health Act (N.J.A.C. 7:18 et seq.) and is designed to monitor sanitary water quality (bacteria levels) in coastal waters with respect to both public health and water quality perspectives. The program (see NJDEP, 1992) is overseen by the New Jersey Department of Environmental Protection and Energy and the Department of Health in cooperation with the county health departments of Cape May, Monmouth, Atlantic, and Ocean; as well as the regional health agencies of Atlantic City, Long Beach Island, Long Branch, Matawan, and Middletown.

The program monitors bathing zone waters in the ocean and bay areas of the previously mentioned counties. Water column samples are taken once a week, May through September from bathing-zone waters. In 1991 the program sampled a total of 174 ocean stations and 160 Bay stations for fecal coliform bacteria and enterococci.

New Jersey Marine and Estuarine Water Quality Monitoring Network: Historically, water quality sampling in the State's coastal waters has focused on sanitary quality (bacterial sampling) due largely to the intense concentration of recreational bathing and shellfish harvesting in New Jersey's coastal waters. Efforts are currently underway to expand coastal monitoring so as to encompass a wider range of water quality parameters.

This monitoring, performed by the Bureau of Marine Water Classification and Analysis, represents an effort by the State to provide baseline data on general water quality throughout the State's coastal waters beyond traditional sanitary monitoring to include both conventional and toxic pollutants. The program covers all major bodies of saline waters, including the Atlantic Ocean to within two nautical miles of the coastline, through the use of over 200 sampling locations. All stations represent the preexisting shellfish sanitation monitoring network. Parameters sampled for include nutrients, DO, solids, salinity, fecal coliform bacteria, and ammonia. All samples will be taken from the water column. No sediment sampling as yet is scheduled.

Delaware Estuary Toxics Management Program: An interstate cooperative effort coordinated by the DRBC designed to develop policies and procedures to control the release of toxic substances from point sources to the tidal portion of the Delaware River. The first year of the study will involve the establishment of a database of toxic substances impacting the estuary (DRBC, 1992).

Biological Monitoring

NJDEPE/USEPA Cooperative New York Bight Water Quality Survey: This project involves phytoplankton and chlorophyll "a" analysis on twelve stations along the New Jersey coast and within the Raritan estuary. Samples are collected weekly, May through September.

NJDEPE Ambient Biomonitoring Program: These studies involve the intensive collection, analysis, and reporting of macroinvertebrate data for candidate freshwater streams using EPA's Rapid Assessment Protocol as applied to macroinvertebrate communities.

Compliance Monitoring

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.

Region-Specific Intensive Surveys/Special Studies

DRBC/NPS Scenic Rivers Study: In order to protect that portion of the Delaware River included in the National Wild and Scenic River System, the Delaware River Basin Commission in cooperation with the National Park Service has supplemented the water quality monitoring performed by the three states bordering the river (DRBC, 1992).

New Jersey Pinelands Surface Water Quality Monitoring Network: The Pinelands Commission in cooperation with the participating county health departments maintain a regional pinelands surface water quality monitoring and data management program (N.J. Pinelands Commission, 1991). The objectives of the program are the collection, organization, and distribution of Pinelands surface water quality data. Water quality monitoring is performed at 214 stream stations located within Ocean, Burlington, and Cape May Counties.

Navesink River Water Quality Improvement Project: Both the Navesink River and the Shrewsbury River represent the only significant commercial source of soft shell clams in the State. The Navesink, in addition, supports a large population of hard clams. Because of excessive bacterial contamination, these shellfish resources have been closed to direct harvesting since the 1960's. The Navesink River Water Quality Improvement Project is part of the Department's overall Water Quality Management Program Plan pursuant to the New Jersey Water Quality Planning Act, and the Federal Clean Water Act. The major goal of this project is to reduce bacterial pollution brought about by nonpoint source pollution to a degree sufficient to allow the direct harvesting of shellfish from the Navesink. In 1986 the USEPA, U.S. Department of Agriculture, the NJDEPE, the N.J. Department of Agriculture, and eleven local agencies and academic institutions signed a Memorandum of Understanding, pledging support to the project.

The primary focus of the program since 1980 has been to assess the sources of fecal coliform contamination in the Navesink River. Towards that end, numerous intensive surveys assessing bacterial contamination, land use analysis, and shoreline surveys have been performed. These studies represent cooperative efforts between this Department, local health departments, as well as other local, state, and federal agencies.

Efforts to identify pollution sources are now evolving towards the institution of nonpoint source control measures throughout the watershed. The most notable move toward pollution control at this point in time is a comprehensive $1.3 million Watershed Plan established by the U.S. Department of Agriculture and administered by the Soil Conservation Service and the Freehold Soil Conservation District.

Interest in improving the water quality of the Navesink River continues to grow, especially on the local level. An Implementation Plan guiding the institution of best management practices, further monitoring, and research has been developed. Success of this plan will rely on the continued cooperation of many agencies at all levels, with significant input from local interest groups.

D: OTHER WATER QUALITY MANAGEMENT PROGRAMS

Clean Lakes Program: The Clean Lakes program is designed to help communities restore and maintain the recreational value of their local public lakes through the use of State and/or Federal funded grant projects. The program is implemented by the Department under the guidance of USEPA. In New Jersey there are 380 public lakes representing 24,000 acres.

The restoration projects are administered in two distinct Phases: a diagnostic/feasibility study (Phase I), and an implementation phase (Phase II). The objectives of Phase I are to acquire water quality data for the lake and watershed, determination the lake trophic status, and to develop a lake restoration/management plan. Phase II focuses upon the identification of sources of impairment as well as methods and programs to control pollutant sources. Phase II lake restoration activities include land use planning, stormwater management, septic management, dredging, weed harvesting, lake aeration, and fisheries management.

Grants are be awarded according to a lake prioritization system, with this ranking being reevaluated every year. In order to be considered for a grant award, a "Phase I Project Proposal" is submitted to the Department. Project Proposals are reviewed by the Department's Bureau of Water Monitoring, and forwarded to USEPA to await Federal funding. If Federal funding is not available, or if the project is not approved for Federal funding, the proposal will be evaluated for State funding.

Projects are funded through available USEPA and N.J. Clean Lakes Program funds, and require some contribution from local funding sources. Current funding formulas are -

Phase I

1) 70% USEPA, 15% State, 15% Local
2) 50% State, 50% Local (if federal funding is not available)

Phase II

1) 50% USEPA, 40% State, 10% Local
2) 75% State, 25% Local (if federal funding is not available)

Note: Projects that are funded by special appropriations may have a different funding formula.

To date, 109 lakes, with a total of 10,299 acres, have been evaluated for trophic status in New Jersey. Trophic assessments are based on Trophic State Criteria, as described in USEPA's <u>Clean Lakes Program Guidance Manual</u>. These criteria are total phosphorus, chlorophyll a, and Secchi disk transparency. Trophic status may also be determined by documented impairments caused by other factors such as excessive macrophyte populations, bacterial contamination, or sedimentation.

National Estuary Program: The National Estuary Program (NEP) was established by Section 320 of the Clean Water Act as amended. The purpose of the National Estuary Program is to identify estuaries of national significance that have been threatened by overuse, pollution, and development. A Management Conference, comprised of various committees, is convened for a five-year period to develop a Comprehensive Conservation and Management Plan (CMP) for each designated estuary.

The CMP will address water quality, living resources, and habitat. Although the USEPA administers this program, the states provide a 25% match for all federal funds. Each estuary receives approximately one million dollars per year to conduct scientific characterization studies and public participation/education programs. The Management Conference, comprised of various governmental agencies at all levels and representatives of the public, operates in a consensus-building process. This program is unique in that it is currently the only national planning effort which addresses the comprehensive issues of the ecosystem while building a constituency for regional planning.

New Jersey has two estuary programs: The NY-NJ Harbor Estuary Program (HEP) and the Delaware Estuary Program (DELEP). In response to concerns about the degradation of water quality and marine resources, the United States Congress passed the Marine Plastic Pollution Research and Control Act of 1987 which, in part, requires the USEPA to prepare a restoration plan for the New York Bight. Because the Harbor Estuary and the New York Bight are inextricably linked, USEPA has proceeded to make the New York Bight Restoration Plan (NYBRP) a product of the Harbor Management Conference.

The NEP is characterized by a phased management process. Phase I, building a management framework, has been completed. Both programs are involved with Phase II, scientific characterization, which will be used to develop pollution control strategies in the Phase III CMP development. Phase IV includes implementation strategies for the CMP on a state-wide basis. Both programs publish Request for Proposals for some of the scientific studies.

The NYBRP focuses on pollutant-related use impairments in the ocean sector of the New York and New Jersey coastlines. The HEP focuses on the impairment of beneficial uses within the Harbor (i.e. closed beaches and shellfish beds, declining fish and wildlife populations and habitat, and threats to safe navigation and commerce) and remedial actions to reduce the severity of these impairments. An action plan for floatables was adopted in 1989 and a Beach/Shellfish Closure Action Plan, treating short-term pathogen-related pollution events, was developed in 1990.

The HEP is conducting scientific characterization studies leading to management strategies for floatables, pathogens, toxics, nutrients, hypoxia effects, habitat, and hydrological modifications. A wasteload allocation strategy will be developed for toxic metals and organics which exceed water quality standards. A monitoring/modeling plan for nutrients will be developed and implemented. To address early implementation actions, a nonpoint source demonstration project was developed in cooperation with the borough of Red Bank in the Navesink River watershed to examine the effectiveness of regular catch basin maintenance and street sweeping schedules.

The HEP and DELEP include extensive public outreach programs that include several public advisory committees such as a Citizens, a Science/Technical, a Local Government, and a Financial Planning Committee. Educational activities for the HEP include a Citizens Lifestyle Guide, Harbor videotape, and a library reference collection located in New Jersey at Liberty State Park. Both programs have quarterly newsletters.

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. 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. 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.

In New Jersey the chemical, physical, and biological integrity of wetlands are protected under both Federal and State laws. Federal protection is provided under sections 303, 401 and 404 of the Federal Clean Water Act. Section 401 is designed to allow the State to control any discharges to its waters which may result from the issuance of a Federal permit or licence, through a certification process. Section 404 addresses and regulates the discharge of dredge and/or fill material into wetlands and other waters of the State and is presently the responsibility of the U.S. Army Corps of Engineers. Section 303 provides protection through the antidegradation provisions of the Surface Water

TABLE V-3. WETLANDS ACREAGE (APPROXIMATE) 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

* Based upon aerial photography

Quality Standards. In the near future the State will add wetlands to the definition of "surface waters" and will proceed to establish water quality standards for wetlands thereby expanding the role of section 303 in the protection of these waters.

Several New Jersey statutes provide various levels of protection to wetlands including the New Jersey Water Quality Planning Act (N.J.S.A. 58:11A-1), the Flood Hazard Area Control Act (N.J.S.A. 58:16A-50 et seq.) and the New Jersey Water Pollution Control Act (N.J.S.A. 58:10A-1). Specific protection is provided for New Jersey tidal wetlands through the Wetlands Act of 1970. In addition, since July 1, 1988, the State has protected its "inland" wetlands through the Freshwater Wetlands Protection Act (FWPA) (N.J.S.A. 13:9B-1 et seq.). Prior to enactment of the FWPA, several different state laws afforded various levels of protection to "inland" wetlands. One of the goals of the Act was to consolidate the protection of wetlands into one program. It should be noted however, that the FWPA does not affect wetlands previously regulated under the Wetlands Act of 1970. In addition, the FWPA exempted areas under the jurisdiction of the Hackensack Meadowlands Development Commission and the Pinelands Commission and therefore, activites in these areas do not require a freshwater wetlands permit nor are they subject to transition area requirements.

The FWPA regulates all activities in freshwater wetlands and the discharge of dredge or fill material into State open waters. The 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. The State designates wetlands using the three parameter approach: hydrology, soils, and vegetation.

The FWPA authorizes the issuance of Statewide general permits for specific activities defined by regulation such as underground utility crossings, minor road crossings, and construction of headwalls; and individual permits for all other activities which do not fall into one of the General permit categories. Since the implementation of the Act in 1988, the State has authorized 2535 Statewide general permits and 51 Individual permits resulting in the filling of 466.6 acres of wetlands and State open waters (see attached Table). It is estimated that prior to the adoption of the State law, several thousand acres of wetlands were lost on an annual basis as a result of the implementation of the federal 404 program in New Jersey.

The FWPA also authorizes the issuance of waivers by the NJDEP&E for prohibited activities in transition areas: ecological "buffer" zones adjacent to freshwater wetlands. These prohibited activities include: (1) removal, excavation, or disturbance of the soil; (2) dumping or filling with any materials; (3) erection of structures; (4) placement of pavements; and (5) destruction of plant life which would alter the existing pattern of vegetation.

Under the new transition area rules, the size of the transition area is determined by the resource value classification of the freshwater wetland that it encompasses. Exceptional resource value wetlands are those which provide habitat for threatened or endangered species and those which feature high water quality. A transition area of 150 feet is required adjacent to these wetlands. Ordinary resource value wetlands are defined as small, isolated, human-impacted wetlands, drainage ditches or swales. There is no transition area required adjacent to ordinary resource value wetlands. All other wetlands are defined as intermediate resource value wetlands and require a fifty-foot transition area. On July 3, 1989, the rules to implement the transition area provisions of the FWPA were adopted.

As stated previously, section 404 of the federal Clean Water Act addresses the regulation of wetlands and waters of the State and is presently the responsibility of the U.S. Army Corps of Engineers. The FWPA requires that the State take appropriate action to assume the Federal 404 Permit program from the Army Corps. The State intends to submit a package to EPA for consideration by the end of 1992.

With respect to other wetlands-related activities, the State is presently involved in a comprehensive mapping project to identify and classify all wetlands statewide. Approximately 60 percent of the State has been completed to date. The addition of this information to the State's Geographic Information System, together with data on permit activity, will allow an evaluation of the cumulative impacts to wetlands resulting from the State permitting program on a county, regional, or watershed basis.

BIBLIOGRAPHY AND LITERATURE CITED

Delaware River Basin Commission. 1992. Delaware River and Bay Water Quality Assessment, 1990-1991 305(b) Report. Delaware River Basin Commission. West Trenton, New Jersey.

Ibid. 1987. Site Status Reports on Hazardous Waste Remediation. Division of Hazardous Waste Management. Trenton, New Jersey.

Ibid. 1989. Nonpoint Source Assessment and Management Program. Office of Regulatory Policy. Trenton, New Jersey.

Ibid. 1992. Cooperative Coastal Monitoring Program, Annual Report for 1991. Office of Enforcement. Trenton, New Jersey.

Ibid. Undated. The Barnegat Bay Study: Executive Summary. Division of Science and Research. Trenton, New Jersey.

New Jersey Register. 1992. Freshwater Wetlands Protection Act Rules (Rules Adopted). Volume 24. Number 6.

NJ Pinelands Commission. 1991. New Jersey Pinelands Surface Water Quality Data 1990-1991. The Pinelands Commission, New Lisbon, New Jersey.

N.J.S.A. 13:9B-1 et seq. 1987. Freshwater Wetlands Protection Act.

Tiner, Jr., Ralph W. 1985. Wetlands of New Jersey. U.S. Fish and Wildlife Service. Newton Corner, Massachusetts.

US Environmental Protection Agency. 1991. 1990 Needs Survey Report to Congress. EPA 430/09-91-024. Washington, D.C.