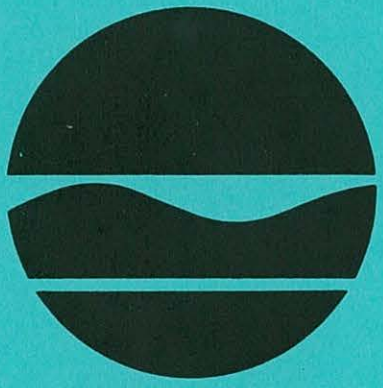
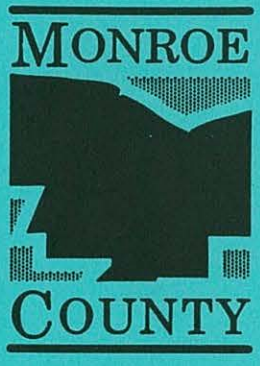
Executive Summary

Rochester Embayment
Remedial Action Plan
Stage I





August 1993

New York State Department of Environmental Conservation
MARIO M. CUOMO, *Governor* THOMAS C. JORLING, *Commissioner*
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Monroe County Department of Planning and Development
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ROCHESTER EMBAYMENT

REMEDIAL ACTION PLAN

STAGE 1 - EXECUTIVE SUMMARY

AUGUST 1993

Copies available from: Monroe County Department of Planning and Development
47 South Fitzhugh Street
Rochester, N.Y. 14614

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PREFACE:

This executive summary provides highlights of the full Stage I of the Rochester Embayment Remedial Action Plan. The full report contains much more specific information of interest to many people. We urge you to review the full Stage I document. For information on how to view, borrow, or purchase a copy, contact the Monroe County Department of Planning & Development, 47 South Fitzhugh Street, Room 200, Rochester, NY 14614 or call 428-5461.

I. INTRODUCTION

A. Goal, Purpose and Approach of the Remedial Action Plan

1. The Rochester Embayment and its Remedial Action Plan

The Rochester Embayment refers to a portion of Lake Ontario and a portion of the Genesee River near Rochester, New York. For a description of the embayment, and a map of the embayment, see Page 5 and Figures 1 and 2.

The Remedial Action Plan (RAP) will identify water quality problems, and identify specific actions that need to be taken by various parties to address the problems. The Remedial Action Plan effort has been undertaken due to an international agreement to improve the water quality of the Great Lakes water system. The international agreement, known as the Great Lakes Water Quality Agreement (GLWQA), was signed by the U.S. and Canada in 1978 to "...restore and maintain the chemical, physical, and biological integrity of the waters of the Great Lakes Basin ecosystem". The International Joint Commission (IJC) was formed in 1909 to address issues that affect both the U.S. and Canadian boundary waters. Today the IJC is composed of equal numbers of U.S. and Canadian commissioners who work cooperatively to resolve water quality problems and other related problems.

The International Joint Commission has identified 43 Areas of Concern (AOC) where persistent toxic substances and conventional pollutants are impairing local uses of the water. The Rochester Embayment is one of those AOCs. This means that there are impaired uses due to water pollution in the Rochester Embayment that a Remedial Action Plan needs to be prepared. The GLWQA established a Water Quality Board which in a 1981 document, identified the Rochester Embayment as one of 39 Areas of Concern. It stated the Rochester Embayment was an AOC with "...moderate violations of water quality objectives and some indications of fish contamination in the Rochester Harbor and Irondequoit Bay. Surveys from the harbor from 1967 to 1973 found some of the sediments to be heavily polluted with metals and phosphorus."

The RAP is being prepared in two stages:

The Stage I RAP: This document, which is referred to as the Stage I Rochester Embayment Remedial Action Plan, outlines what is and what is not known about Rochester Embayment water quality conditions. The Stage I RAP considers the water quality conditions in the context of the total environment. Therefore, information on geography, population, land use and community organization and goals is also included. It also provides the information base for decision-making about what kinds of actions are needed to remediate impaired uses, to prevent additional water quality problems, and to protect human health.

The Stage II RAP: The Stage II RAP is expected to be complete in 1993. Information contained in the Stage I RAP will provide the basis for the Stage II RAP. The Stage II RAP will consist of a list of priority pollutants, an analysis of possible remedial measures including who should conduct the remedial actions and where funding should come from. In the Rochester Embayment, work has already begun on the Stage II RAP through the analysis of several possible actions to achieve the goals outlined in the Stage I RAP. The Stage II RAP will also include a schedule for implementation of chosen remedial actions including monitoring actions, along with any commitments made to implement the actions.

The Stage III RAP: The Stage III RAP is implementation.

2. **Goal of the Remedial Action Plan:** The overall goals of the Remedial Action Plan (RAP) are to:

   (a) identify existing use impairments in the Rochester Embayment Area of Concern and to identify actions that will be implemented to remediate the impairments. (The list of impairments that are determined to exist in the Rochester Embayment are shown in Table 1.)
   (b) prevent further pollution of our waters, and
   (c) protect human health.

3. **The Watershed/Ecosystem Approach to the Remedial Action Plan**

   (a) Irondequoit Bay Watershed Plan: At the time the RAP was brought to the attention of Monroe County staff, Monroe County had recently completed the Irondequoit Bay watershed plan and had begun its implementation. This was done after a great deal of research on the significance of non-point sources of pollution (primarily that which comes with stormwater runoff). In the Irondequoit Bay watershed (tributary to the Rochester Embayment), it was found that non-point sources of pollution, particularly from urban stormwater runoff, were the greatest remaining pollutant sources. The nature of non-point source pollution requires that the problem be dealt with on a watershed basis.

   (b) Ecosystem Approach: As part of the development of the Irondequoit Bay Watershed Plan, research conducted as part of the Nationwide Urban Runoff Program (NURP) indicated that atmospheric deposition (deposition of pollutants from the air onto the ground) played a significant part in the amount of pollutants washed off urban areas into waterways. This finding led local officials to recognize the need to manageour water resources using an ecosystem approach. The ecosystem approach recognizes that all of our systems (air, water, land) are connected, and calls for considering all possible pollutant sources and transport methods in any plans to protect and/or improve water resources.

   (c) The Four-Plan Approach: Because of the pollutant source knowledge gained from the NURP program and the watershed approach taken in the Irondequoit Bay watershed, Monroe County proposed that the Remedial Action Plan be developed using a watershed and ecosystem approach. The ecosystem approach and the watershed approach are both consistent with IJC, U.S. Environmental Protection Agency, and State ideals for water quality management. The specific method to

achieve a watershed and ecosystem approach is to write a Remedial Action Plan for the Area of Concern and, in addition, write three basin plans - one for each of the three basins that flow to the Rochester Embayment. The three basins that flow to the embayment are, the Genesee River Basin, portions of the Lake Ontario West Basin and portions of the Lake Ontario Central Basin. The Irondequoit Bay Watershed is part of the Lake Ontario Central Basin.

B. The Rochester Embayment RAP Process

1. RAP and Basin Plan Writing:

(a) RAP Technical Group: A technical group was established in 1988 to guide the writing of the Rochester Embayment RAP. The technical group consisted of individuals with interest and knowledge in water quality issues and included representatives of the advisory (stakeholder) groups. The technical group met throughout the Stage I RAP preparation to guide the writing of the RAP and deal with technical issues when questions were raised.

(b) RAP Consultant Selection & Role: After interviews and deliberation, a consulting team consisting of the Center for Governmental Research (CGR) and Environmental Design and Research (EDR), and Larsen Engineers was chosen. The primary responsibility for researching and writing much of the Stage I RAP was that of CGR.

(c) Stakeholders Group Involvement in Writing: While the bulk of the writing of the Stage I RAP and Basin Plans was done by the consultant team and the RAP Technical Group, the Water Quality Management Advisory Committee (WQMAC) and its basin subcommittees (the stakeholders groups) played a major role in developing two portions of the Stage I RAP. In order to determine what use impairments existed, the WQMAC sponsored several workshop/educational sessions to insure a full understanding of the 14 use impairments listed by the IJC. Members of the basin subcommittees (described in more detail in the next section) also conducted volunteer stream surveys to identify water quality problems and use impairments.

The other area in which the stakeholders' groups played a major role was in the development of goals for the AOC and the basins. These goals were developed by the committees after lengthy deliberations that considered use impairments and other problems. The stakeholders groups also reviewed and commented on all of the chapters written by the consultant and RAP Technical groups.

2. Advisory (Stakeholder) Group Structure

A total of six stakeholder groups were initially formed to advise and participate in the development of the RAP and the three basin plans.

(a) Water Quality Management Advisory Committee (WQMAC): The primary advisory group is the Water Quality Management Advisory Committee (WQMAC) consisting of 27 voting members. The members changed somewhat during that time period due to resignations, but the voting members consisted of equal numbers of representatives from economic interests, elected officials, citizens, and public interest groups. In order to insure coordination between the Basin Plans and the RAP, the basin subcommittees have representatives on the WQMAC. Several ex-officio non-voting members also serve on the WQMAC to provide expertise in special areas.

(b) Lake Ontario Central / Irondequoit Basin Subcommittee: This subcommittee was reorganized out of the original Irondequoit Basin Subcommittee which had existed since 1980 when work on Irondequoit Bay watershed research began in earnest. This subcommittee reorganized to help develop the Lake Ontario Central Basin Plan in May of 1989. Membership on this committee is not limited to any specific number of people. Anyone who has shown an interest in participating has been welcomed.

(c) Lake Ontario West Basin Subcommittee: This subcommittee was established in November of 1989 . Membership to this subcommittee is not limited to any specific number of people. Anyone who has shown an interest in participating has been welcomed.

(d) Genesee Basin Subcommittees: The Genesee Basin Subcommittee was initially established in September of 1990. This subcommittee covered a large geographic area (major portions of five counties) and was open to anyone who showed an interest in participating. This group met regularly from September of 1990 to May of 1992 at which time it was reorganized. The reorganization resulted in the establishment of 2 committees: The Monroe County Genesee Basin Subcommittee and a Genesee Basin Coordinating Committee. The Monroe County Genesee Basin Subcommittee reactivated interested members and recruited some new members from within Monroe County and began meeting in September of 1992. The Genesee Basin Coordinating Committee membership consists of one person from each County in the Genesee Basin. The size is small because each of these counties has its own Water Quality Coordinating Committee, each of which are preparing their own water quality strategies.

(e) Government Policy Group: A Government Policy Group, made up of elected local officials from Monroe County, and the Counties in the watershed, was established to insure a forum for elected officials to get involved in the RAP. The purpose of this Government Policy Group is to give the policy makers information, and to provide the RAP writers with appropriate feedback from elected officials. This committee is of importance since many water quality problems in the AOC are believed to be of a non-point source nature that will require local governments to get involved by looking at their land use powers as a way to address non point source pollution.

(f) The Public Outreach Subcommittee of the WQMAC was formed in January of 1990 to fulfill the following three roles: 1) identify appropriate mechanisms to inform and involve county and regional residents of the RAP and basin plans, 2) develop, advise on, and implement ideas for general water quality education, and 3) advise the WQMAC regarding appropriate long-term educational mechanisms that should be included in the RAP and basin plans.

This subcommittee chose, as its major project during the Stage I efforts, the development of a pamphlet about the Lake Ontario fish consumption advisory aimed at populations of low socio-economic groups who eat locally caught fish for sustenance. It was written to inform people of the toxic chemicals in many Lake Ontario fish. The need for such a pamphlet came from the concerns of Mr. Kenneth Goode, a member of the WQMAC in 1990. He made the WQMAC aware of the fact that many segments of the local population rely on locally caught fish for sustenance. Drafts of the pamphlet were sent out to many people and agencies for review. After strong opposition from economic fishing interests, a meeting was held with Dr. Andrew Doniger, Director of Health ,

representatives of the fishing interests, and representatives of the Public Outreach Subcommittee. Dr. Doniger heard the concerns of all parties and he took responsibility for choosing the final language of the pamphlet. From April through December of 1992, efforts have been under way to finalize the pamphlet, and to test the pamphlet with a sample of the target population. Publication is planned in 1993.

3. Other Outreach/Education Efforts

(a) RAP Workshops: The Rochester Embayment RAP was first announced at a public meeting in November of 1988. At that meeting, those in attendance outlined what they perceived as local water pollution problems. During the development of the Stage I RAP, several forums were held for stakeholder groups and for the public on subjects related to the RAP (eg. zebra mussels, air deposition, and toxic chemicals).

(b) RAP Handouts and Displays: A RAP Fact sheet was prepared and distributed to interested citizens, and at public places from the start of the project. Another written document that describes the RAP and the various groups involved in the RAP was also prepared and made available to those who showed interest in learning more about the RAP. A RAP Display board was developed and used at many public events over the course of the Stage I RAP development.

(c) Speaking/Educational Opportunities: Throughout the development of the Stage I RAP, county staff spoke with adults and children about the RAP and about water quality.

(d) Articles: The Rochester Embayment RAP has had publicity in written materials. Two newsletters were published and widely distributed at the beginning of the RAP. Since then, articles about the RAP have been published in local newspapers. Local RAP staff also wrote a chapter on the Rochester Embayment RAP for inclusion in a book edited by John Hartig and Mike Zarull entitled "Under RAPs". The title of the chapter is "Rochester Embayment's Water Quality Management Process and Progress, 1887-1990."

(e) Public Meetings: Four public meetings were held during the week of January 25, 1993 to inform and get feedback on the Draft Stage I RAP which was published in early January. Over 100 people attended the meetings. A responsiveness summary has been prepared to address all of the comments that were made by individuals at the public meetings, or subsequent to the public meetings. The responsiveness summary is included in the full Stage I RAP.

II. ENVIRONMENTAL SETTING INFORMATION

A. Geographic Scope of the Rochester Embayment

The historic description of the Rochester Embayment is an area of Lake Ontario formed by the indentation of the Monroe County Shoreline between Bogus Point in the Town of Greece and Nine Mile Point in the Town of Webster, both in Monroe County (about 35 square miles of open water). (See Figures 1 and 2.) The northern boundary, therefore, is the straight line between these two points. It is recognized that the northern boundary is arbitrary since currents in the embayment and the lake change from day to day, thus changing the bounds of the embayment ecosystem. The southern boundary of the embayment also includes approximately six miles of the Genesee River that are influenced by lake levels, from the river's mouth to the Lower Falls. Both the lake itself and the tributary waterways have an effect on the

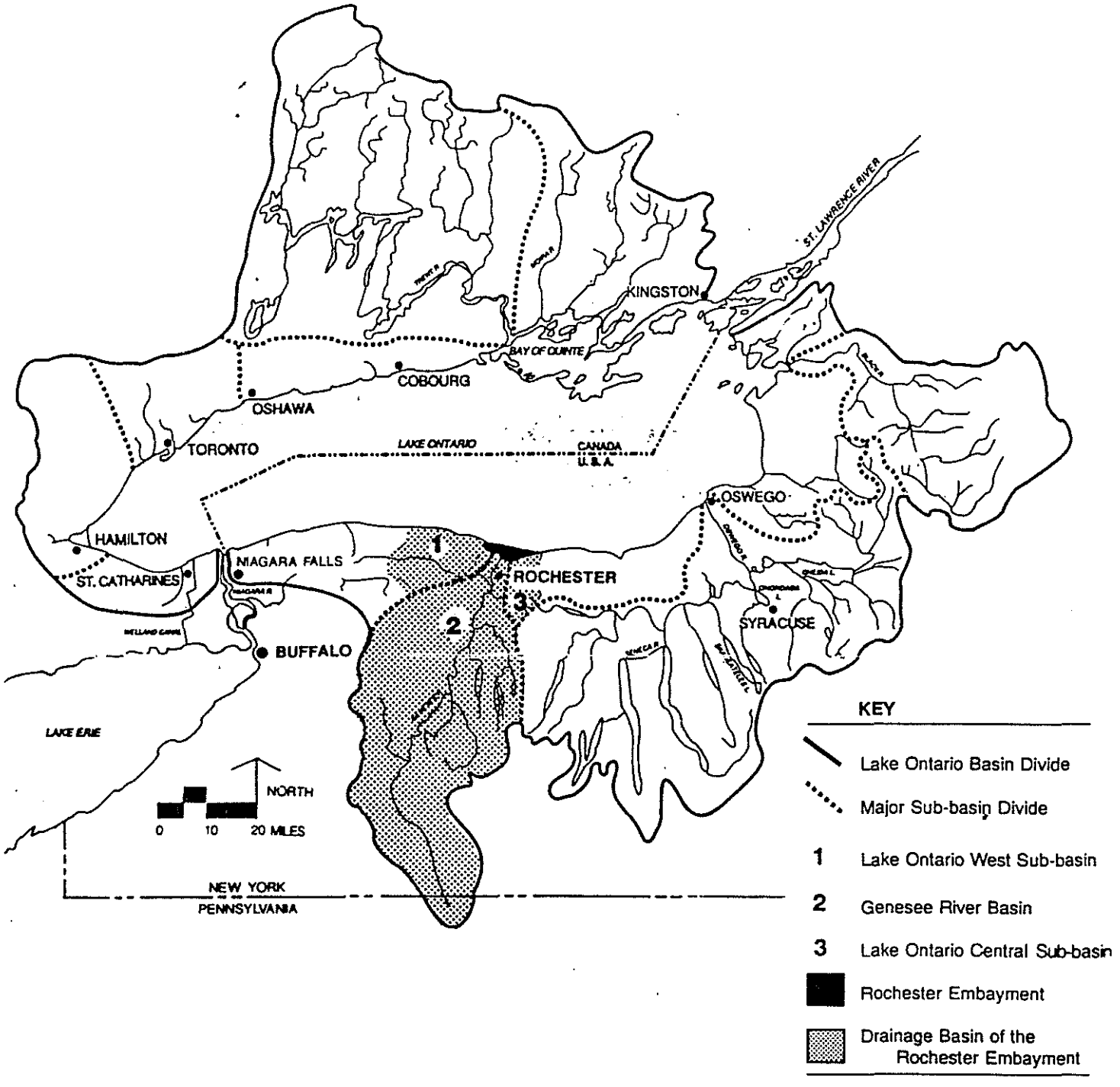

FIGURE 1. LOCATION MAP: ROCHESTER EMBAYMENT AREA OF CONCERN AND ITS DRAINAGE BASIN.

Source: Lake Ontario Toxics Management Committee (1989) (modified)

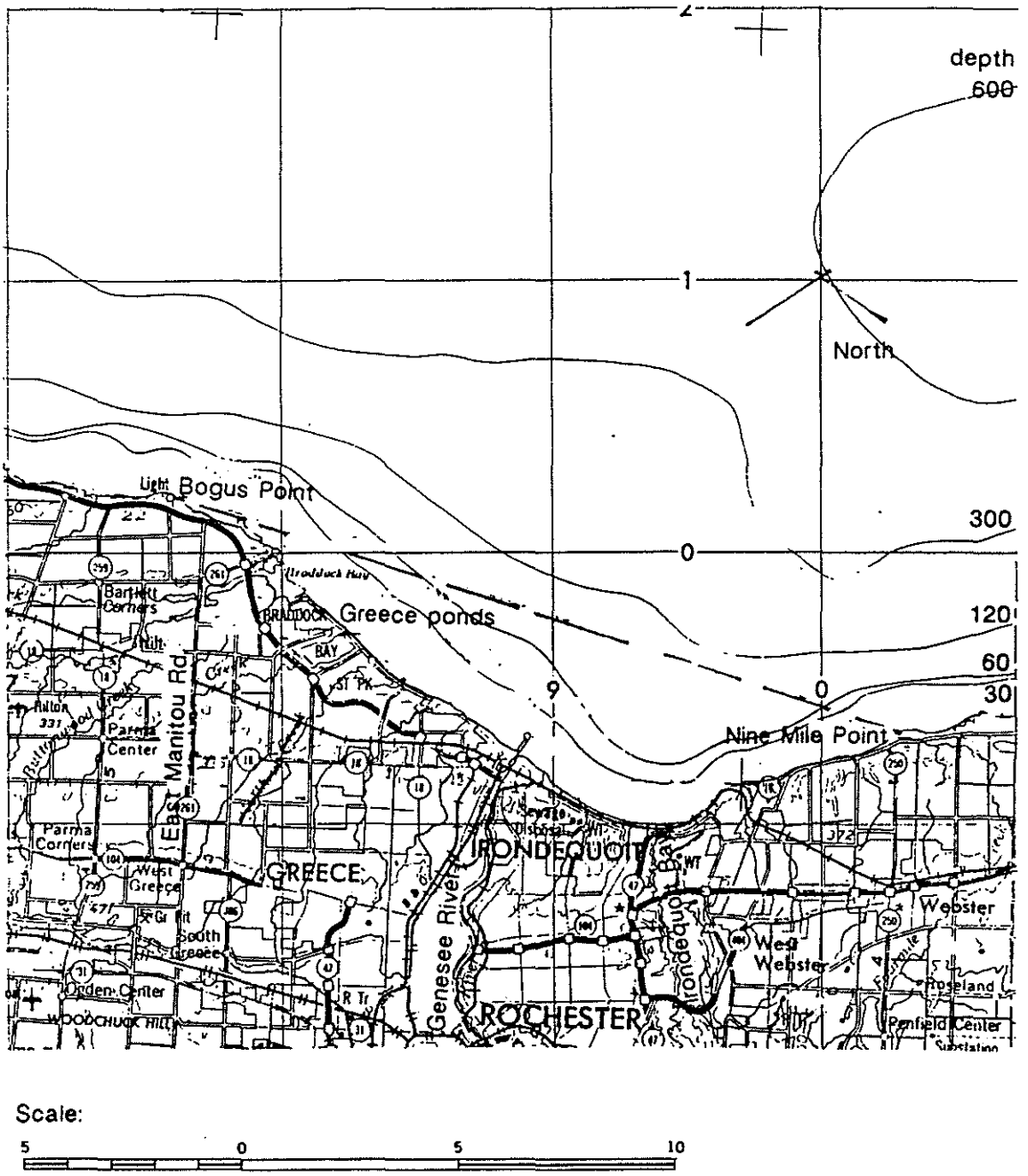

FIGURE 2. DETAIL OF LAKESIDE PORTION OF ROCHESTER EMBAYMENT AREA OF CONCERN: Bogus Point to Nine Mile Point

water quality of the embayment.

B. Drainage Areas of the Rochester Embayment

The drainage area of the embayment is over 3000 square miles in area. It consists of the entire Genesee River Basin and parts of two other basins: the easternmost area of the Lake Ontario West Basin and the westernmost area of the Lake Ontario Central drainage basin. Please note: The term 'basin' refers to the entire drainage basin whereas 'sub-basin' refers only to that portion draining into the Rochester Embayment. For example, the Lake Ontario West Basin spans from Niagara County to Monroe County , but the sub-basin for purposes of the RAP consists only of Monroe County and eastern Orleans County. The Genesee River Basin covers 2500 square miles and includes parts of ten counties (see Figure 3). The Genesee River collects water from 52 tributaries and six lakes and has a flood control dam at Mt. Morris in Livingston County. The River is used for hydroelectric power generation, receiving wastewater, commercial shipping and recreation.

The Lake Ontario West Sub-basin includes 309 square miles in Monroe and Orleans Counties (see Figure 4). Streams in the sub-basin are used for fishing, recreation, and wastewater discharge. Significant habitats include Braddock Bay, Sandy Creek, and the Lake Ontario Shoreline.

The Central Sub-basin includes 224 square miles in Monroe and Wayne Counties with suburban residential areas being the dominant land use (see Figure 5). This sub-basin includes Irondequoit Bay, the Erie Canal, and several smaller streams which are used for fishing, recreation, and receiving wastewater. Significant natural areas include: wetlands in Irondequoit Bay and Creek; the Lake Ontario Shoreline; and significant habitats in Shipbuilders Creek, Thousand Acre Swamp, and Durand Eastman Park.

C. The Ecosystem

An ecosystem approach takes into account all the factors that affect water quality such as sediments, adjacent lands and land uses, air quality, and waters entering the AOC. What occurs in the ecosystem can have a profound effect on the water quality of the Rochester Embayment of Lake Ontario. The following are some of the many factors that affect the ecosystem within the lake: physical features of Lake Ontario; water flow into the lake; water levels; temperature and wind; temperature stratification and natural vertical mixing of lake water; wave action; the food web and bioaccumulation (the concentration of chemicals in larger animals who eat other animals); and eutrophication (an overabundance in productivity, often resulting in unwanted algae blooms). In addition, the climate, topography, and geology of the land in the drainage basins is of significance.

D. Major Waterways and Water Uses

The major flow into the Rochester Embayment comes from the Genesee River which, on average, discharges about 2794 cubic feet per second. Sediment loadings in the Genesee River water are high and turbidity is common. Stream bank erosion throughout the drainage system is thought to be the primary source of sediments.

The Erie Canal, which flows west to east beginning at Lake Erie, is the second largest channel in the drainage basin. The canal impacts the Genesee River and streams by both discharging to, and receiving water from, these areas. The canal is used primarily for recreation and also for

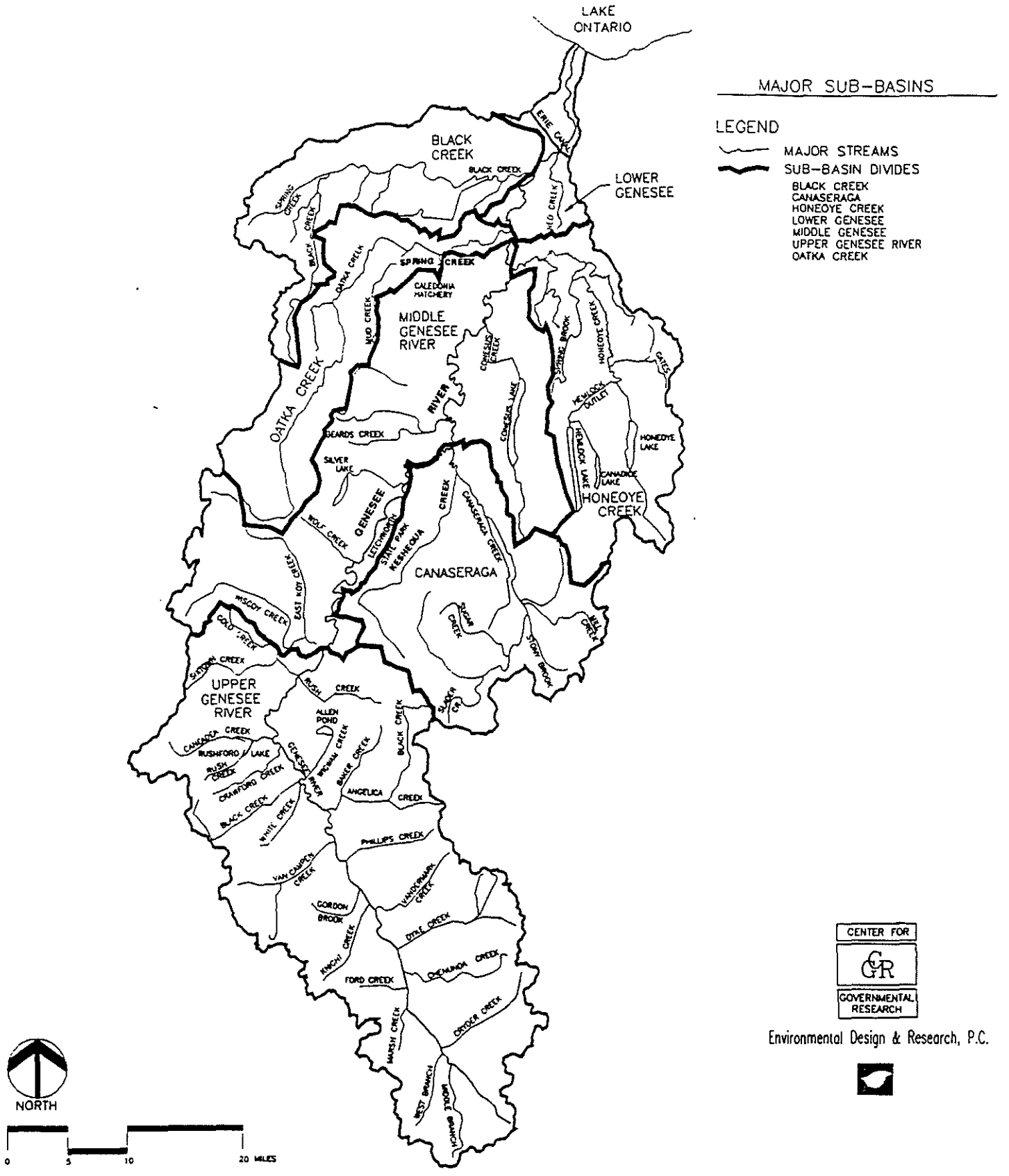

FIGURE 3 GENESEE RIVER BASIN

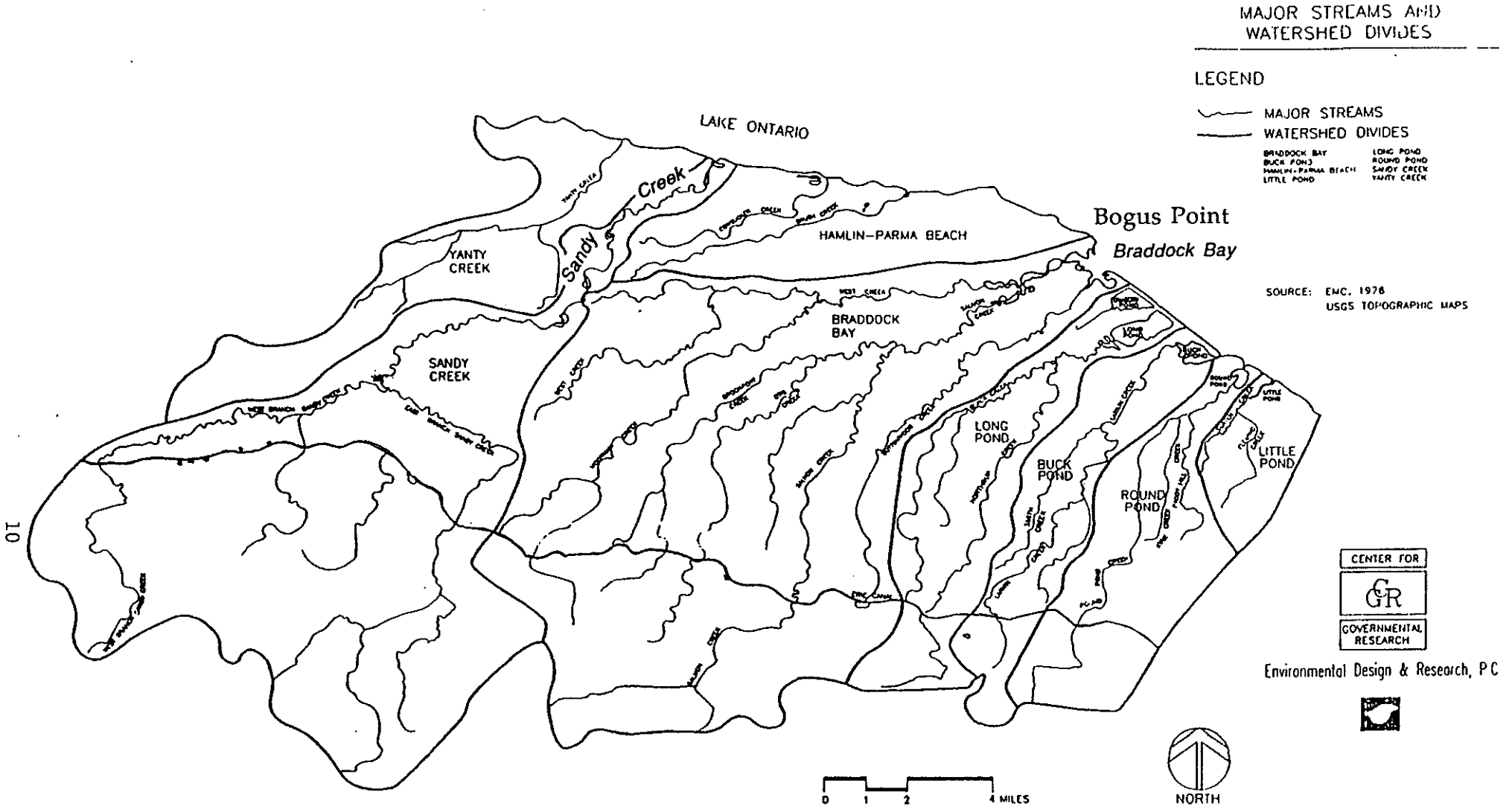

FIGURE 4 LAKE ONTARIO WEST SUB-BASIN

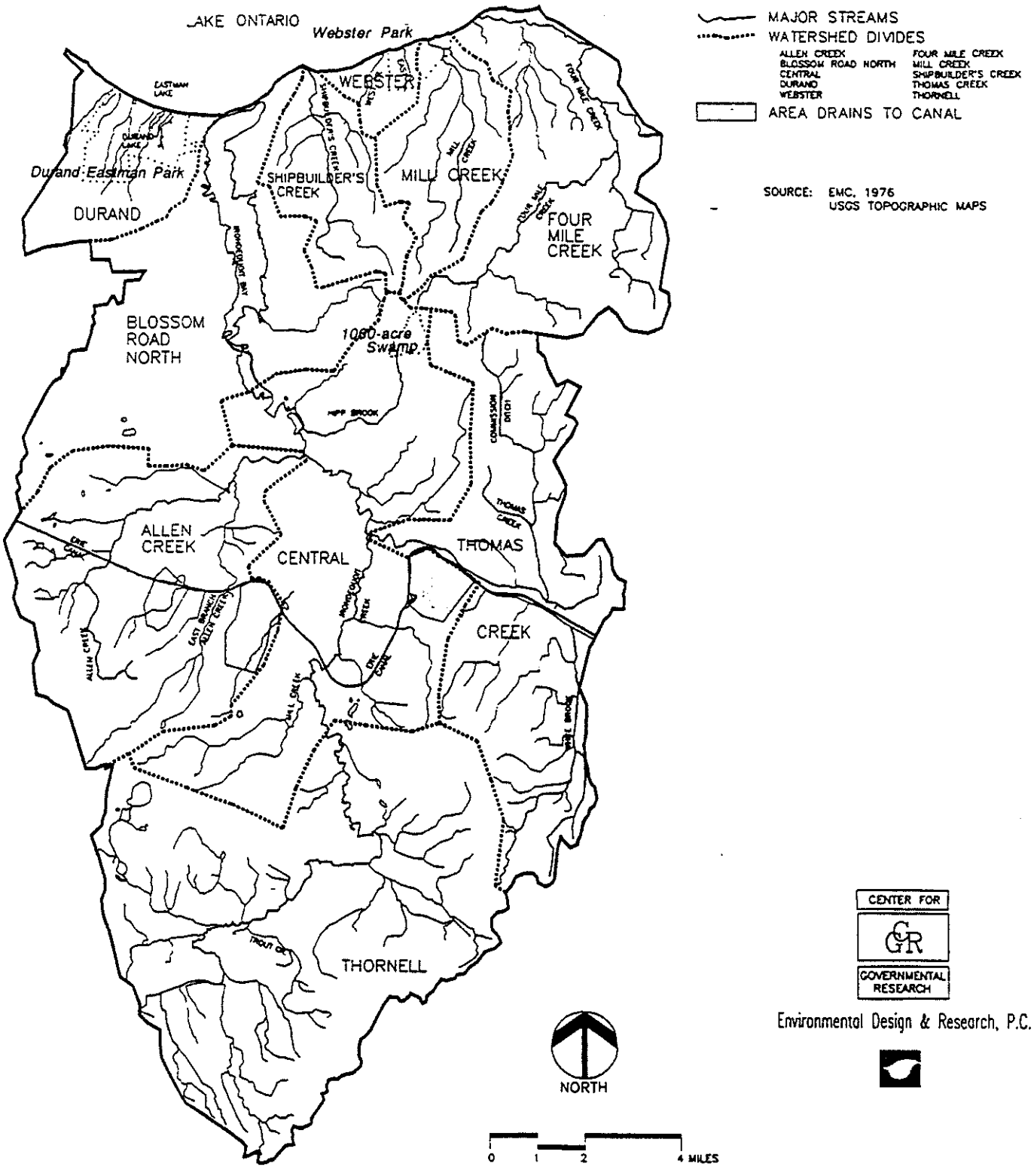

FIGURE 5 LAKE ONTARIO CENTRAL SUB-BASIN

receiving treated wastewater.

Irondequoit Bay and Creek have a 163 square mile watershed. The Bay is heavily used for recreation, and is a harbor of refuge. A major use of the embayment is as a drinking water source. Most of Monroe County, outside the City of Rochester, receives Lake Ontario water for drinking. Eastman Kodak, the largest industrial user in the basin, also draws water from the lake via an independent system.

Most of the wastewater from industry and homes throughout the drainage basin is discharged into the Genesee River, Lake Ontario, streams, the ground or the Erie Canal. Many of the discharges are regulated by the New York State Department of Environmental Conservation via a permit system. Transportation, commercial shipping, and commercial and recreational fishing are also important uses of the embayment.

E. Population and Land Uses

Monroe County accounts for about 84% of the total population and about 15% of the total land area of the embayment's drainage area. The simplified map (Figure 6) below shows that forest and agriculture are about 90% of the land use within the combined drainage basins.

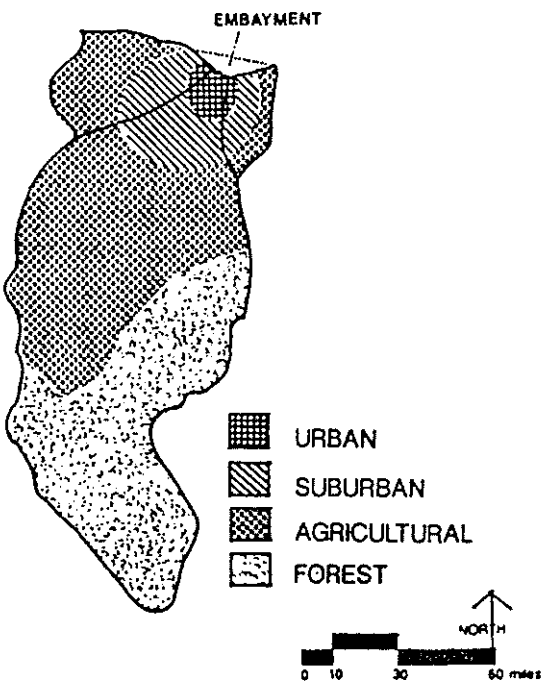

Figure 6. DOMINANT LAND USE PATTERNS IN THE ROCHESTER EMBAYMENT BASIN.

Source: Landre (1990). (Note: generalized -- in reality some agricultural use in area designated as forest and vice versa)

F. Planning/Regulating Jurisdictions

Governing bodies whose jurisdiction can potentially impact water quality within the Area of Concern range from private owners of parcels that drain directly into the embayment or

streams, to the International Joint Commission itself which has called for this Remedial Action Plan. Intermediate governments which have active roles in water quality planning include: local government (towns, villages and cities); Counties; County Soil and Water Conservation Districts; New York State Departments of Environmental Conservation, Transportation, Health, and State; Regional Planning Agencies; the U.S. Environmental Protection Agency; the U.S. Army Corps of Engineers; and, the National Oceanic and Atmospheric Administration.

G. Natural Features

Significant sand beaches of the embayment are found at Hamlin Beach State Park, Bogus Point, Ontario Beach, and Durand Eastman Beach. Significant bluffs are located at Webster Park and Nine Mile Point. The major wetland areas include: Braddock Bay area, wetlands south of Irondequoit Bay, wetlands along the lower Genesee River.

III. WATER USE AND QUALITY GOALS AND OBJECTIVES

The Rochester Embayment Remedial Action Plan is being prepared to address water quality problems that are impairing the beneficial uses of the water in the Area of Concern. Many actions have already been taken to improve and protect water quality and restore beneficial uses in the Area of Concern.

A. Existing Human Uses

Many of the existing human uses of the Rochester Embayment Area of Concern were discussed in Chapter 2 and include the following:

Recreation-
Because of its geographic location, the Rochester Embayment provides an ideal opportunity for waterfront recreation. A public swimming beach is located at Ontario Beach Park. Boating is a popular use that continues to grow. Fishing in the embayment attracts tourists from many areas.

Wastewater Discharges-
The embayment acts as a receiving water for treated wastewater discharges as permitted by the New York State Department of Environmental Conservation (NYSDEC). Detailed data on wastewater discharges is available in the complete Stage I RAP.

As mentioned earlier, the embayment is also used for drinking water supply, industrial water supply and commercial and recreational navigation.

B. Existing Biological Uses

The support of an ecological community is recognized as an important use of the Area of Concern both for its own sake and because of the benefits it provides to humans. The waters of the embayment are considered eutrophic (high in plant productivity) and contain a diverse warm and cold water fishery. The Genesee River is a highly productive warm water fishery and contains valuable wetland areas for support of fish and wildlife populations. Braddock Bay and Salmon Creek at the western edge of the Embayment comprise one of the largest and most important coastal freshwater complexes in New York State. The wetlands contain essential breeding grounds, feeding areas, and habitat for fish and wildlife. Throughout the year,

Braddock Bay is a major concentration area for many species of migratory birds.

C. Goals in Laws and Regional Plans

A number of federal and state laws establish goals for water pollution control and coastal protection that are directly related to the RAP. Although clean water and coastal management laws have similar goals of protecting natural resources, the water laws have extensive regulatory powers while the coastal zone laws are primarily advisory and are carried out by means of Local Waterfront Revitalization Plans. These laws include: Clean Water Act; Coastal Zone Management Act; New York Environmental Conservation Law; New York State Waterfront Revitalization and Coastal Resources Act; and, the New York State Freshwater Wetlands Act.

Goals from the following regional and local documents are outlined in detail in Chapter 3 of the complete Stage I RAP: Great Lakes Water Quality Agreement; Lake Ontario Toxics Management Plan, 1991 Update; New York State 25-Year Plan for the Great Lakes; New York Coastal Management Program; Monroe County Comprehensive Development Plan and the Pure Waters Master Plan; and the City of Rochester goals.

D. Local Goals Developed in the RAP Process

The following goals and objectives for the Rochester Embayment have been developed by the Monroe County Water Quality Management Advisory Committee as part of their work on this RAP. The WQMAC used the following definitions for goals and objectives. Goal: A goal is a statement of purpose about the end result (desired state of being) of a proposed management activity. Objectives: An objective is a specific, quantifiable step that will lead to fulfilling the goal (statement of condition). Specific actions to achieve the goals and objectives will be included in the Stage II RAP.

These goals are consistent with the International Joint Commission's philosophy of virtual elimination of persistent toxic substances as stated in the Great Lakes Water Quality Agreement.

In the following objectives, "virtual elimination" or "elimination" refers to a process that must be negotiated among all affected parties in order to obtain reasonable and achievable results. For toxic chemicals, it is recognized that the most effective way to achieve this objective of virtual elimination is by dealing with the toxics at the source.

GOAL: Virtual elimination of toxic substances causing fish consumption advisories.

-Objectives:

Scheduled elimination of the releases and runoff of persistent toxic substances that necessitate health advisories for the Rochester Embayment of Lake Ontario

Continued monitoring of persistent toxic chemicals which are concentrated in the fish populations within the Rochester Embayment of Lake Ontario.

A formal system is in place which mandates the coordination with other RAP jurisdictions in order to develop a schedule for eliminating the discharge of persistent toxic substances.

GOAL: Public beaches in the Rochester Embayment are open for swimming, based upon best available health and safety standards.

-Objectives:

Targeted reduction of beach closures due to human waste contamination of water.

Targeted reduction of beach closures due to stormwater runoff.

GOAL: Shorelines and waterways are free of aesthetically objectionable materials.

-Objectives:

Reduction of *Cladophora* (algae) and zebra mussels within the Rochester Embayment to below nuisance levels.

Continuous improvement of water clarity throughout the Embayment, including the lower Genesee River.

Virtual elimination of raw or untreated sewage discharges into the Embayment.

Maintenance of fisheries' trophic (food chain) relationships to minimize fish die- offs and fouled beaches.

Waterways free of debris, trash, oil and other visible pollutants.

GOAL: Contaminated sediments in the lower Genesee River have no negative impact upon the water quality and biota in the Rochester Embayment; sediment quality is suitable for open lake disposal.

-Objectives:

Dredging in the lower Genesee River is restricted to maintenance of established commercial and recreational channels.

Scheduled elimination of discharges of chemicals that contaminate sediments and harm aquatic life.

GOAL: Water and shore habitats within the Rochester Embayment support thriving fish and wildlife populations.

-Objectives:

Maintenance of all present water and shore habitats which are critical to aquatic and terrestrial organisms.

Prohibition of discharges into the Rochester Embayment which adversely affect aquatic habitats.

Public education programs which focus upon the importance of wetlands and other

habitats necessary to support fish and wildlife populations.

GOAL: Diversity of plant and animal communities within the Rochester Embayment.

-Objectives:

Continuing maintenance and enhancement of animal and plant populations.

Self-sustaining populations of walleye, Lake trout, *Hexagenia* (Mayfly larvae), and fish eating birds and mammals (ospreys, mink, eagles),

Protective legislation, policies, and enabling powers for appropriate agencies in order to assure maintenance and enhancement of diverse and self-sustaining fish and wildlife populations.

GOAL: Drinking water produced from Lake Ontario has no unusual or unpleasant taste.

-Objective:

Minimal algae blooms in the Embayment.

GOAL: The benthic macroinvertebrate community (e,g, clams, worms, insect larvae, crayfish) in the lower Genesee River is not degraded by pollution.

-Objective:

Scheduled elimination of sources of sediment- associated toxic contaminants and other pollutants, including sediments that impede the survival of a healthy and diverse benthic macroinvertebrate community.

GOAL: The littoral zone (shoreline area) of the Rochester Embayment is mesotrophic (intermediate levels of algae production) rather than eutrophic (high levels of algae production).

-Objectives:

The biological community of the Embayment is mesotrophic, as indicated by USEPA lists of phytoplankton (algae) indicator species.

Scheduled elimination of point and non-point discharges that impede survival of a healthy and diverse planktonic community.

GOAL: Water from the embayment and its tributary drainage basins which is used for agricultural and industrial purposes can be used with minimum added cost due to exotic species (zebra mussels, etc.).

Since there are three watersheds (Lake Ontario West Basin, Lake Ontario Central Basin, and Genesee Basin) that drain into the Rochester Embayment of Lake Ontario, the full Stage I RAP lists their goals and objectives as developed by the three basin advisory subcommittees of the Water Quality Management Advisory Committee.

F. Water, Sediment, and Biota Guidelines and Objectives

Detailed objectives for the quality of water, sediment, and biota in the U.S. have been developed by federal and state agencies and are based on the protection of human health and aquatic life. Some of the standards are not enforceable (sediment, for example) but other pollutants are regulated on a permit basis by state agencies. Numerical standards work towards achieving the broad goals set forth in legislation and in the Great Lakes Water Quality Agreement. For example, the Agreement states that any organic compounds that are persistent and likely to be toxic should be present at a level below thedetection limit. The federal Clean Water Act, as amended, requires states to classify waters according to their best uses and to adopt substance-specific water quality standards that support those uses.

The Rochester Embayment, as a part of Lake Ontario, is classified by NYSDEC as a Class A water (can be used for drinking), and an international boundary water (bordered by both the U.S. and Canada) as defined under the Great Lakes Water Quality Agreement. The best uses are: source of drinking water, culinary or food processing purposes, primary contact recreation and any other uses. The six-mile stretch of the Genesee River below the lower falls is a Class B water, whose best uses are primary contact recreation and any other uses except drinking, culinary or food processing purposes.

IV. WATER QUALITY CONDITIONS/PROBLEMS

This chapter summarizes current indicators of water quality conditions that affect the Rochester Embayment Area of Concern and establishes the basic environmental impairments and their causes using a systematic review of evidence against use impairment guidelines for each of the Great Lakes Water Quality Agreement indicators.

A. Impaired Uses

1. Guidelines for Problem Definition

   The Great Lakes Water Quality Agreement (GLWQA)defines "impairment of beneficial uses" as a change in the chemical, physical or biological integrity of the Great Lakes System sufficient to cause any of 14 use impairments. These "impairments" or problems are described below.

B. Impaired Uses Identified by RAP Process

The Monroe County Water Quality Management Advisory Committee (WQMAC) is the primary citizens' advisory committee for the Remedial Action Plan. The WQMAC has identified use impairments based on a careful assessment of local conditions and the IJC guidelines (Table 1). Since some impairments only affect one portion of the AOC, the WQMAC has divided the embayment Area of Concern into two segments: the lower Genesee River and the part of Lake Ontario within the Rochester Embayment. A use is considered impaired if it is impaired in either the river or the lake.

1. Impaired Uses in the Rochester Embayment Area of Concern

   Each GLWQA use impairment indicator is discussed and the IJC listing guidelines are

TABLE 1
EXISTENCE OF USE IMPAIRMENTS IN ROCHESTER EMBAYMENT AREA OF CONCERN

		Portion of Area of Concern	
		Lower Genesee River	Rochester Embayment of Lake Ontario
(1)	Restrictions on Fish and Wildlife Consumption	YES	YES
(2)	Tainting of Fish and Wildlife Flavor	UNKNOWN	UNKNOWN
(3)	Degradation of Fish and Wildlife Populations	YES	YES
(4)	Fish Tumors or Other Deformities	UNKNOWN	UNKNOWN
(5)	Bird OR Animal Deformities OR Reproductive Problems	YES	YES
(6)	Degradation of Benthos	YES	UNKNOWN
(7)	Restrictions on Dredging Activities	YES	NO
(8)	Eutrophication or Undesirable Algae	N/A*	YES
(9)	Restrictions on Drinking Water, or Drinking Water Taste and Odor Problems	N/A*	YES
(10)	Beach Closings	N/A*	YES
(11)	Degradation of Aesthetics	YES	YES
(12)	Added Costs to Agriculture Or Industry	YES	YES
(13)	Degradation of Phytoplankton and Zooplankton Populations	YES	UNKNOWN
(14)	Loss of Fish and Wildlife Habitat	YES	YES

* N/A= not applicable. See narrative for explanation of why each of these are not applicable.

presented. Evidence and causes are given for each. The numbering of these impairments corresponds with the numbers on Table 1.

(1) **RESTRICTIONS ON FISH AND WILDLIFE CONSUMPTION.** IJC Guidelines: *When public health advisories are in effect for human consumption of fish and wildlife, and contaminant levels are due to contaminant input from the watershed.*

Status: Impaired.

Evidence: The New York State Department of Health issued the following 1992 advisories for Lake Ontario:

WOMEN OF CHILDBEARING AGE AND CHILDREN UNDER 15 SHOULD EAT NO FISH FROM LAKE ONTARIO. (This means all females who may have children at some point should eat none.)

ADVICE FOR PERSONS OTHER THAN ABOVE:
American eel, channel catfish, lake trout, chinook salmon, coho salmon over 21", rainbow trout over 25", and brown trout over 20": EAT NONE.

White sucker, white perch, smaller coho salmon, rainbow trout and brown trout: EAT NO MORE THAN ONE MEAL PER MONTH. In the western half of Lake Ontario (not including the Rochester Embayment), the NYSDOH recommends eating no white perch.

Carp in Irondequoit Bay: EAT NONE.

WILDLIFE CONSUMPTION RESTRICTIONS THROUGHOUT NEW YORK STATE:

Merganser waterfowl (ducks that eat fish): EAT NONE.

Other waterfowl: SKIN AND TRIM. EAT NO MORE THAN TWO MEALS PER MONTH.

Snapping turtles: DISCARD FAT, LIVER AND EGGS.

Causes (known): The State Health Department issues consumption advisories when one or more contaminants exceed FDA action levels or tolerance limits. Long-term exposure to high levels of these chemicals has been linked to health effects such as cancer (in laboratory animals) or nervous system disorders (in humans) (NYSDOH 1992). The Health Department considers multiple chemical contaminant concentrations in fish when making their advisory (Forti, T. pers. comm. 12/92)

The contaminants primarily responsible for the advisories in Lake Ontario fish and wildlife are mirex, PCBs and dioxin .

The fish analyzed in Lake Ontario, such as trout, salmon, bass and white perch, range throughout the lake and could pick up contaminants anywhere throughout their territory. The watersheds that flow to the Rochester Embayment area have not been identified as a significant source of mirex or dioxin, most of which are believed

to originate from the Niagara River area. Another known source of mirex to Lake Ontario is from the Oswego River. However, chemicals such as PCBs and chlordane, which were once in widespread use, may have sources within the watershed and may be contributing to lakewide fish consumption advisories.

(3) DEGRADATION OF FISH AND WILDLIFE POPULATIONS. IJC Guidelines: *When fish and wildlife management programs have identified degraded fish or wildlife populations due to a cause within the watershed, or when bioassays confirm toxicity from water column or sediment contaminants.*

Status: Impaired for mink.

Evidence: Among wildlife species in the area of concern, population degradation has been observed for mink. Mink, which are high level predators that eat mostly fish, are believed to be highly sensitive to toxins. Previous studies of captive mink have demonstrated harmful effects such as reproductive failure from a diet of fish with very low PCB concentrations.

The lower Genesee River is an area of suspected fish population degradation. Anglers using sonar have alleged a "fishless" segment of the river downstream of the Lower Falls and upstream of the Riverside Cemetery. In the past, occasional fish kills occurred in the lower Genesee. At the request of the Water Quality Management Advisory Committee, the NYSDEC is conducting a two-year study in 1992-93 to determine the relationship between toxics and the condition of fish and invertebrate populations in the area.

Causes (probable): For mink, as discussed above, the consumption of fish contaminated with PCBs probably contributed to population degradation.

(5) BIRD OR ANIMAL DEFORMITIES OR REPRODUCTION PROBLEMS. IJC Guidelines: Impairment exists when wildlife survey data confirm the presence of deformities (e.g. cross bill syndrome) or other reproductive problems (e.g. eggshell thinning) in wildlife species. Impairment does not exist when the incidence rates of deformities or reproductive problems in wildlife species do not exceed background levels in inland control populations.

Status: Mink reproduction impaired; bird or animal deformities unknown.

Evidence: See evidence cited under Impairment #3, "Degradation of fish and wildlife populations."

(6) DEGRADATION OF BENTHOS. IJC Guidelines: *When the benthic macroinvertebrate community structure significantly diverges from unimpacted control sites, or when bioassays show elevated toxicity of sediment contaminants.* (Benthos are those invertebrate animals that live on the bottom of the lake or river.)

Status: Impaired for Genesee River, unknown for Rochester Embayment.

Evidence: The DEC Division of Water, Bureau of Monitoring and Assessment sampled benthos in the Genesee River portion of the embayment in 1974, 1980 and 1990 as part of its Rotating Intensive Basin Studies (RIBS). The studies evaluated

community structure to assess overall water quality. Results indicate that the benthos is more degraded toward the mouth of the river.

Causes (known): The water quality implications of limited diversity of organisms--specifically those that are related to "polluted" waters is historically due to oxygen depletion.

Causes (possible): Organisms from the NYSDEC's river sample sites, with the exception of the Route 104 bridge location, were tested for chemical contaminants in 1989-90 as part of the Rotating Intensive Basin Study (Bode et al. 1992). Silver, copper, nickel, iron and PCBs were found at concentrations above background levels. The presence of elevated levels of contaminants in tissues suggests that pollutants are adversely affecting the benthic communities, but more specific tests would be needed to determine exact cause and effect relationships.

(7) RESTRICTIONS ON DREDGING ACTIVITIES. IJC Guidelines: *When contaminants in sediments exceed standards, criteria or guidelines such that there are restrictions on dredging or disposal activities.*

Status: Impaired in Genesee River.
Note: The restrictions that are in place prohibit a method of dredging known as "overflow" dredging. These restrictions should be maintained even if sediment quality is improved in order to prevent excessive turbidity at public beaches. Navigational dredging methods other than the "overflow" method are allowed.

Evidence: At the request of Monroe County, the Department of Environmental Conservation has restricted the type of dredging in Rochester Harbor. Overflow dredging, which allows low density mud to overflow at the dredging site, is prohibited.

As of 1992, sediments from the Genesee River are deemed suitable for open lake disposal.

Causes (known): The main reasons for requiring no overflow dredging are to reduce the release of chemicals (e.g. ammonia, which is toxic to fish) to the river , to reduce incidents of increased oxygen consumption in the river, and to reduce the impact of resuspended sediments and fecal coliform on the swimming beach. The river is more susceptible to negative impacts from overflow dredging because it has lower dissolved oxygen than the embayment. Disturbance of sediment in the River also has a direct impact on the nearby swimming beach.

(8) EUTROPHICATION OR UNDESIRABLE ALGAE. IJC Guidelines: *When there are persistent water quality problems (e.g. ,dissolved oxygen depletion, nuisance algal blooms, decreased water clarity, etc.) attributed to cultural eutrophication.*

Status: Impaired in Lake Ontario, not applicable in Genesee River.

Evidence: While the central lake water quality targets for phosphorus have been met, the littoral zone (close to the shorelines) still experiences massive blooms of cladophora and other algae. *Cladophora* , which adheres to rocks and other

submerged objects, is visible along the Lake Ontario shore and sometimes contribute to beach closings at Ontario Beach. When the *Cladophora* breaks away from its attachments, it accumulates along the shore, where it harbors and promotes coliform bacteria as it decomposes.

This impairment contributes to other impairments: drinking water taste and odor problems (9), beach closings (10), degradation of aesthetics (11), and degradation of phytoplankton and zooplankton populations (13).

Causes (known): Excess phosphorus from non-point source runoff still causes problems in local nearshore areas. See Chapter 5 for information on sources of phosphorus.

(9) **RESTRICTIONS ON DRINKING WATER CONSUMPTION OR TASTE AND ODOR PROBLEMS.** IJC Guidelines: *When treated drinking water supplies are impacted to the extent that ... taste and odor problems are present.*

Status: Impaired occasionally in Lake Ontario, not applicable in Genesee River because drinking water is not drawn from the River.

Evidence: Some taste and odor problems are noticed by customers of the Monroe County Water Authority, whose water intake is in the Embayment. The problems occur primarily in August, when prolonged hot temperatures promote blue-green algae blooms.

Causes (known): Non-point source phosphorus. Weather phenomena can cause problems in water treatment as well. Sudden wind shifts can alter currents, changing the temperature or turbidity of the water reaching the supply intakes. See Chapter 5 for further information on sources of phosphorus.

(10) **BEACH CLOSINGS.** IJC Guidelines: *When waters, which are commonly used for total body contact or partial body contact recreation, exceed standards, objectives, or guidelines for such use.*

Status: Impaired in Lake Ontario, not applicable in Genesee River because there are no beaches along the River.

Evidence: Webster Beach along Lake Ontario in Webster Park was closed to swimming in 1965 due to massive algae problems, and facilities were removed. This beach has suffered from shoreline erosion, and remains officially closed, but is accessible to the public.

Durand Beach along Lake Ontario in Durand Eastman Park was closed to swimming in 1966, and public facilities were removed. Because of a lack of funds for its restoration, this beach remains officially closed, although it is accessible and is heavily used by the public.

Ontario Beach immediately west of the Genesee River is currently the only public beach in operation, but was closed to swimming from 1967 to 1976 after the State Public Health Law set standards for coliform bacteria that could not be met. Ontario Beach reopened in 1976, using monitoring and weather-based models to measure

and predict water quality (Burton, 1976). Permit conditions require bathing restrictions on days when the model predicts unacceptable water quality.

Causes (known): Coliform bacteria, algae *(Cladophora)*, turbidity.

In the past, the Genesee River plume was considered responsible for many of the beach closings; however, bacteria levels in the river have shown a decrease since implementation of the Combined Sewer Overflow Abatement Program (CSOAP) and the river plume should be a less significant problem in the future. *Cladophora* algae is another reason for swimming restrictions. Accumulated masses of *Cladophora* washed up on shore serve as breeding grounds for coliform bacteria that cause beach closings.

(11)DEGRADATION OF AESTHETICS. IJC Guidelines: *When any substance in water produces a persistent objectionable deposit, unnatural color or turbidity, or unnatural odor.*

Status: Impaired.

Evidence: Algae *(Cladophora)* clings to rocks and washes up on shorelines, causing visual impairments along the lake shore. The presence of silt gives the river and part of the Embayment a muddy look. Litter and sediment are also visible, primarily in the lower river after storms.

Objectionable odors from rotting algae and from a chemical seep at the Lower Falls of the Genesee River are occasionally evident.

At times, alewives in Lake Ontario experience massive die-offs and accumulate on beaches. Salmon also die off after spawning in the Genesee River.

Causes (known): Algae related to excess phosphorus, chemical seeps at the Lower Falls, natural die-off of stocked fish, turbidity, littering, and an imbalance in the food chain (e.g. for alewives).

(12)ADDED COSTS TO AGRICULTURE OR INDUSTRY. IJC Guidelines: *Impairment exists when there are added costs required to treat the water prior to use for agricultural or industrial purposes. Impairment does not exist when there are no such costs.*

Status: Impaired due to zebra mussels.

Evidence: Significant added costs to agriculture or industry do not exist for reasons other than zebra mussels.

Zebra mussels in Lake Ontario and the lower Genesee River have resulted in extra water treatment costs primarily to industrial and municipal water uses. Increased costs include the cost of chlorination at the intakes, and extra maintenance of water-carrying infrastructure.

(13)DEGRADATION OF PHYTOPLANKTON AND ZOOPLANKTON POPULATIONS. IJC Guidelines: *When phytoplankton and zooplankton*

community structure significantly diverges from unimpacted control sites of comparable physical and chemical characteristics or ***when plankton bioassays confirm toxicity in ambient waters.***

Status: Impaired in Lower Genesee River. Unknown in Lake Ontario.

Evidence: Toxicity Testing performed as part of the 1989-90 Rotating Intensive Basin Studies (RIBS) using *Ceriodaphnia dubia* (zooplankton) indicated several occurrences of significant presumptive chronic toxicity (7-day Reproductive Impairments) at five of six sites in the Genesee Basin, and one occurrence of significant presumptive acute toxicity (7-day Survival) at one site. Results are shown in the full Stage I RAP. The RIBS report indicates the coincidence of elevated phenols in several samples taken at the Genesee Docks at Boxart Street within the Embayment Area of Concern boundaries which showed significant toxicity. However, no measured toxicants were present in adequate concentrations to account for the decreased reproduction.

In general, plankton in Lake Ontario are doing well, but due to the reduction in phosphorus inputs, the entire plankton community in the lake is undergoing changes in quantity and type that indicate improving trophic status (Makarewicz, 1991). In nearshore areas, however, waters are eutrophic and nutrients are still overabundant, as shown by the excessive growth of *Cladophora* algae.

At the time of this writing, we are not aware of any research documenting that Zebra mussels have had an impact on reducing populations of zooplankton and phytoplankton, but there is anecdotal evidence that this may be occurring.

(14)LOSS OF FISH AND WILDLIFE HABITAT. IJC Guidelines: *When fish and wildlife management goals have not been met as a result of loss of fish and wildlife habitat due to a perturbation in the physical, chemical or biological integrity of the Boundary Waters, including wetlands.*

Status: Impaired.

Evidence: Loss of habitat is apparent when comparing past areas of wetlands and riparian habitat to those of today. This habitat loss over the long term has contributed to the decline of native fish species such as Atlantic salmon, lake trout, cisco, blue pike, sturgeon and walleye. Bald eagles no longer nest in the Rochester area due to lack of habitat.

In reference to present fish and wildlife management goals, black terns are known to be suffering population declines in the Braddock Bay area. It is possible that toxins in fish or other unknown causes are affecting the terns, which are at the western edge of their range here.

Causes (known): General habitat losses have been caused by filling of wetlands along the last few miles of the Genesee river; filling and drainage of other wetlands; deforestation and agriculture; sedimentation (some of it natural); development of lake, bay and pond shorelines. These changes are for the most part irreversible, but further degradation can be minimized.

Causes (possible): With regard to black terns, boat traffic is a suspected cause of nest disturbance.

2. Uses with Impaired Status not known for the Rochester Embayment Area of Concern

This section summarizes the reasons why the WQMAC has determined that certain impairments are not known to exist in the AOC. Each possible use impairment is preceded by the impairment number corresponding to Table 1. The IJC's guidelines for identifying the impairments are summarized for each.

(2) TAINTING OF FISH AND WILDLIFE FLAVOR. IJC Guideline: *When ambient water quality standards, objectives or guidelines for the anthropogenic substances(s) known to cause tainting are being exceeded or survey results have identified tainting of fish or wildlife flavor.*

Status: Unknown

Evidence: The New York State Department of Environmental Conservation (NYSDEC) has received approximately 6-8 complaints from anglers over the past five years who reported a chemical odor in salmonids caught in the lower Genesee. Survey results have not identified examples of tainting.

(4) FISH TUMORS OR OTHER DEFORMITIES. IJC Guidelines: *When the incidence rates of fish tumors or other deformities exceed rates at unimpacted control sites and when survey data confirm the presence of neoplastic or preneoplastic liver tumors in bullheads or suckers.*

Status: Unknown

Evidence: Electrofishing and netting in the Embayment and in Sandy Creek are conducted by SUNY Brockport as part of its fisheries management courses. The fish are checked for visible deformities, but not for liver tumors. One large bullhead caught in Sandy Creek in 1990 had a skin tumor that was confirmed as cancerous. Since this is an isolated incident that could have a natural origin, it was not considered sufficient evidence to warrant listing fish tumors as an impairment (WQMAC, 6/7/91). Also, anglers have not complained about tumors or deformities. In order to determine if this impairment exists, an investigation into liver tumors is needed.

3. Impairments in the Rochester Embayment AOC with Unknown Causes

Although suspected causes have been identified above, cause and effect relationships have not been firmly established for the following two impairments: Degradation of fish and wildlife populations, and Degradation of Benthos.

4. Impairments in the watersheds tributary to the Rochester Embayment.

As part of the preparation of the Rochester Embayment RAP, three watershed plans have been developed for each of the three basins that flow to the Rochester Embayment of Lake Ontario. The basins are: the Lake Ontario Central Basin, the Lake Ontario West Basin, and the Genesee River Basin. Subcommittees of the Water Quality Management

Advisory Committee worked to identify the use impairments that exist in each of these basins. Many of the use impairments, pollutants causing the impairments, and the sources of pollutants are the same or similar to those summarized for the Rochester Embayment. For further information, the reader should see the respective Basin Plans.

V. IDENTIFICATION OF POLLUTANT SOURCES

A. Introduction

This chapter discusses the sources of the pollutants believed to be causing impairments in the Area of Concern (AOC) and of persistent toxics that might have sources in the AOC drainage basin. The chapter acknowledges that pollutant sources that affect local waters do not all originate in our AOC. Chapter 5 in the full Stage I RAP provides further data on pollutant sources along with a discussion of the relative importance of point and nonpoint sources using the Genesee River as an example.

Pollutants Identified and Investigated:
The pollutants investigated are: those that are associated with impaired uses (see Section IV for use impairments); the nine priority pollutants that are exceeding criteria in Lake Ontario; and additional pollutants identified in the Lake Ontario Toxics Management Plan, 1991 Update and supplemented by a subcommittee of the RAP Technical Group (the Loading Task Group). A preliminary list of pollutants investigated is presented in Table 2.

Of this initial list of chemicals, an additional technical group (The Priority Pollutant Task Group) determined which pollutants were of greatest concern to the AOC based on toxicity, environmental effects, bioaccumulation, persistence, linkage with the use impairments identified in Chapter 4, and the known local pollutant loadings. This list is presented in Table 3 but is not yet in any order of priority. The Priority Pollutant Task Group is in the process of finalizing this list which will become a part of the Stage II RAP.

Pollutant loading estimates are based entirely on available data. In some cases existing databases did not have the type, quantity, or quality of data necessary to make accurate loading estimates. Additional data will be collected in the later stages of the RAP.

B. Pollutant Sources

1. Point Source Discharges

The State Pollution Discharge Elimination System (SPDES) is a permit-based system where certain amounts of a chemical are legally limited in discharges. The SPDES permits are issued and regularly reviewed and updated by the New York State Department of Environmental Conservation. Point source pollution is tracked by looking at SPDES permits. Phosphorus and Total Suspended Solids are substances that have relatively large discharges from point sources, though all individual point sources appear to be meeting their permit limits. These substances are known to cause many of the use impairments described in the previous section. For further information on other pollutants discharged, see the full Stage I RAP.

2. Atmospheric Deposition

The Canadian Center for Inland Waters (CCIW) in a 1992 report has estimated the atmospheric deposition for Lake Ontario for a large number of chemicals not previously

TABLE 2. PRIORITY POLLUTANTS FOR THE ROCHESTER EMBAYMENT

Inorganics	Organics	
Metals	**Pesticides**	**Other organics (cont.)**
Aluminum	Aldrin	Di-n-octyl phthalate
Arsenic	Chlordane[1,2]	Dioxin (2,3,7,8-TCDD)[1,2,3]
Barium	Dieldrin[2,3]	Fluoranthene
Cadmium	DDT and metabolites[2,3]	Furan (2,3,7,8-TCDF)
Chromium	Endosulfan, total	Haptanone
Cobalt	Endrin	Hexachlorobenzene[2,3]
Copper[1]	Heptachlor & Hep. epoxide	Hexachlorobutadiene
Iron[1]	Hexachlorocyclohexane (BHC),	Hexane
Lead	total	Methylene chloride
Manganese	Methoxychlor	Methyl ethyl ketone
Mercury[2,3]	Mirex and photomirex[1,2,3]	Octachlorostyrene[2]
Molybdenum	Toxaphene [3]	Pentachlorobenzene
Nickel[1]	**Other organics**	Pentachlorophenol
Selenium	Acetone	Phenol[1]
Silver[1]	Benzene	PCB (Polychlorinated biphenyls)[1,2,3], total
Strontium	Benzo (a) anthracene	Pyrene
Vanadium	Benzo (a) pyrene	1,2,3,4-Tetrachlorobenzene
Zinc	Benzo (b) fluoranthene	1,2,4,5-Tetrachlorobenzene
	Benzo (k) fluoranthene	Tetrachloroethene (or - ethylene)
Other inorganics	Bis (2-ethylhexyl) phthalate	2,3,4,5-Tetrachlorophenol
Alkylated lead	Carbon tetrachloride	2,3,5,6-Tetrachlorophenol
Cyanide[1]	Chloroform	Tetrahydrofuran
Phosphorus[1]	Chlorinated dibenzofurans[3]	Toluene
Sediment[1]	2-Chlorotrifluorotoluene	1,2,3-Trichlorobenzene
	4-Chlorotrifluorotoluene	1,2,4-Trichlorobenzene
	Chrysene	1,3,5-Trichlorobenzene
	1,2-Dichlorobenzene	1,1,1-Trichloroethylene
	1,3-Dichlorobenzene	Trichloroethene (or - ethylene)
	1,4-Dichlorobenzene	2,4,5-Trichlorophenol
	Dichlorobromomethane	2,4,6-Trichlorophenol
	2,4-Dichlorotrifluorotoluene	2,3,6-Trichlorotoluene
	3,4-Dichlorotrifluorotoluene	2,4,5-Trichlorotoluene

[1] Known or suspected of causing use impairments in the Rochester Embayment.
[2] Exceeds standards or criteria for Lake Ontario (Lake Ontario Toxics Management Plan).
[3] IJC critical pollutant.

See Appendix D for further information on how the list was derived by the RAP Pollutant Loadings Committee. **Note:** It is recognized that this pollutant list should be dynamic and responsive to new information. This list should change as new information becomes available.

Table 3
PRELIMINARY LIST OF HIGH PRIORITY POLLUTANTS

The Priority Pollutant Task Group of the RAP Technical Group began work on October 2, 1992 to identify the highest priority pollutants from the list identified in Table 5-1. To date, (11-16-92) that group has identified 20 chemicals deemed to be of highest priority. At this time (11-16-92) the Priority Pollutant Task Group is going through a process to prioritize these top 20 pollutants. Until that is done, the following list, in no particular order, is outlined below. The prioritized list will be included in the Stage II RAP.

Dioxin
Furan
Mirex
PCB
DDT & Metabolites
Aldrin
Dieldrin
Heptachlor & Epoxide
Chlordane
Toxaphene
Mercury
Benzo (a) Pyrene (PAH's)
Hexachlorobenzene
Alkylated Lead
Phosphorus
Cadmium
Silver
Cyanide
Methylene Chloride (also known as dichloromethane)
Phthalates (Bis-2-ethylhexyl and Di-n-octyl)

NOTE: This is not a permanent list. This will change with new information. The process is flexible and is intended to respond to new information. This table will be revised during the development of the Stage II RAP, and included in the Stage II RAP.

measured from monitoring data as part of the Integrated Atmospheric Deposition Network. It is important to realize that not all of the pollutants that fall to the ground from atmospheric deposition will find their way into the water. In general, in areas where there is a great deal of impervious surface area (pavement, rooftops, etc.), there will be a greater chance of rainfall or stormwater washing the settled atmospheric deposition into a nearby waterway.

Locally, atmospheric deposition is measured at Mendon Ponds Park in southern Monroe County and at Brockport in the western part of the county. The full set of data in the Stage I RAP indicates that atmospheric deposition may be a significant source of phosphorus and other pollutants of concern. Some atmospheric deposition estimates indicate that about twice as much phosphorus comes from the air than from SPDES permitted discharges. It is unknown exactly how much air deposition washes off the land and into the water.

3. Air Emissions/Ambient Air Quality

Although atmospheric pollutants are transported to the AOC from a continent-wide area, local atmospheric discharges are important to recognize because each small area contributes to the problem as a whole and because they can be controlled locally.

Permitted discharges to the air are not sampled regularly, as are discharges to water. Instead, they are estimated based on limited testing and predictions based on that testing. Air discharges are not reported or filed on a watershed basis, so the data must be retrieved by county. The New York State Department of Environmental Conservation is responsible for issuing permits for air emissions.

Available data shows that of five counties that affect the Rochester Embayment (Allegany, Livingston, Genesee, Monroe, and Orleans), the largest quantity of chemical discharges comes from Monroe County. Also, Monroe County was the largest discharger for all but two chemicals tested (phenols and dioctyl phthalate).

Local and regional ambient air quality data can help us understand the potential for airborne pollutants to fall to the ground and be discharged into local waterways. As of November of 1992, there are three sources of ambient air quality information that may be useful to consider to help understand current conditions, and to use as a baseline to compare against in the future. They are: the New York State Air Monitoring System, and monitoring data from Eastman Kodak Company and Xerox. Data on air emissions and ambient air quality is included in the full Stage I RAP.

4. Landfills, Hazardous Waste Sites

The full list of inactive hazardous waste sites in the drainage basin that have been found to contaminate groundwater, soil, or sediment near the site and the substances they contain can be found in Chapter 5 of the full Stage I RAP. The total number of hazardous waste sites for each county are: Monroe (59); Orleans (3); Genesee (2); Wyoming (3); Livingston (5); Ontario (1); and, Allegany (6). Of the list of 84 pollutants of concern in the Rochester Embayment AOC, 49 of these pollutants are found in one or more of these hazardous waste sites.

There are three hazardous waste sites that have been found to contaminate

groundwater, soil or sediment near the waste site and are in proximity to the Embayment or its major tributaries. They are:

- The Genesee River Gorge in the City of Rochester which extends from the Upper Falls to the Lower Falls, and forms the southern boundary of the Rochester Embayment.

- The inactive 28-acre Old Rochester City Landfill, also known as the Pattenwood Landfill is located on the east side of the Genesee River, approximately one half mile south of the Lake Ontario Shoreline.

- The Rochester Fire Academy site is a 21-acre site on the west bank of the Genesee River in the City of Rochester. It is located approximately 11.5 miles upstream from the mouth of the Genesee River, and is technically outside the area of concern. Because of its close proximity to the River, further information on the site is of importance.

5. Nonpoint Source Runoff

Nonpoint source pollutants are difficult to measure because they originate from a wide area and cannot be traced to any one "source". Available data (presented in the full Stagel RAP) shows that suspended solids or sediments, and phosphorus are two substances that are of concern to the RAP that come from nonpoint sources.

To date, the most comprehensive local study on nonpoint sources is the Nationwide Urban Runoff Program (NURP) completed in 1986. Estimates of nonpoint source loadings into the Rochester Embayment were based on this study.

6. Spills

Hazardous material spills and leaks are a historical and potential intermittent source of chemical contamination in the drainage basin. The Monroe County Office of Emergency Preparedness compiled spill data from the Monroe County Health Dept., the NYSDEC, the Nuclear Regulatory Commission and the Rochester Fire Department between 10/1/89 and 7/17/91. A summary of those spills is available in the complete Stage I RAP. The most frequent spills were petroleum based products and solvents. Petroleum products include polyaromatic hydrocarbons,which are suspected to cause fish tumors.

7. Combined Sewer Overflows (CSO)

The number of active Combined Sewer Overflows (CSOs) and the frequency of discharge to the Genesee River and Irondequoit Bay have been greatly reduced as a result of the Combined Sewer Overflow Abatement Program (CSOAP) in the City of Rochester. Prior to the CSOAP program, the sewage and stormwater flowed through the same pipe. During heavy rainfall events the sewer pipes would fill up and overflow a combination of raw sewage and stormwater into the Genesee River and Irondequoit Bay. The CSOAP program has created larger tunnels which can accommodate large loads of sewage and rainfall combined and which rarely allow overflows into the River or Bay.

8. Sanitary Sewer Overflows

In addition to the occasional overflows from combined sanitary and storm sewers in the City of Rochester, there are locations in Monroe County where sewage must be conveyed by pumping. At these locations, sanitary sewage is discharged occasionally when a major mechanical/and or electrical failure occurs at the pump station.

C. The Pollutants and Factors Causing Impairments in the AOC

1. Mirex/Photomirex

   Mirex is a persistent chlorinated compound that is resistant to biological and chemical degradation. It is converted to photomirex by sunlight with the loss of one chlorine atom per molecule. Both compounds are insoluble in water but dissolve in fatty tissue and adhere to sediment particles. Mirex was originally used as an insecticide and fire retardant and was produced in Niagara Falls, NY. It is no longer produced or used in New York State.

   There are no known local sources or mirex. The current source of Mirex to the Rochester Embayment is Lake Ontario itself. The historic sources of mirex affecting the Rochester Embayment are probably the site of the former Hooker Chemical Co. in Niagara Falls and the contaminated sediments and dumps associated with it, and the Oswego River. Once mirex is in the lake environment, it accumulates in the fatty tissue of fish and their predators. It can be transported around the lake and its basin through the movement of animals.

2. Dioxin

   Dioxins are chlorinated organic compounds with low water solubility that bind to sediment and soil particles and concentrate in fatty tissues. Dioxins bioaccumulate moderately in the aquatic environment. They are by-products of incomplete combustion in the presence of chlorine and are found in fly ash and other products of these processes.

   The principal source of dioxin in the biota of Lake Ontario is the Niagara River drainage basin, where toxic chemicals have been discharged to the environment or stored in a large number of waste sites. There are no known local sources of dioxin. However, since dioxins can be produced by the combustion of chlorine-containing items such as industrial chemicals, plastic, and bleached paper, incinerators and fly-ash disposal sites are possible sources.

3. Polychlorinated Biphenyls (PCB's)

   PCBs are mixtures of chlorinated biphenyls with different degrees of chlorination. They are quite insoluble in water and adhere readily and strongly to sediments, soils, and fatty tissue. Because they are non-flammable and have useful heat exchange and electrical insulation properties, they have been used extensively in the electrical industry in capacitors and transformers. They were also used in lubricating and cutting oil formulations as well as in pesticide formulations, adhesives, plastics, inks, paints, and sealants. The use of PCBs, except in closed systems, has been banned in the United States since the late 1970s.

   Most of the tributary input in the AOC is believed to come from atmospheric deposition on the watershed. Elevated PCB levels in fish are found throughout New York State. The large percentage of PCBs that are volatilized from water ensures that PCBs continually

cycle between air and water. Once PCBs are in the lake environment, they accumulate in the fatty tissue of fish and their predators, can be transported around the lake and its basin through the movement of animals. When the fish die and decay, the PCB's remain in the water.

There are no permitted dischargers of PCB to waterways in the Rochester Embayment AOC drainage basin, but there is one air discharger in Monroe County, emitting 2 lbs/yr. or less.

Other potential sources of PCBs within the basin are related to the once-widespread use of PCB-containing items. Because PCBs were used in electrical equipment, they remain in some older appliances, medical equipment, transformers, capacitors, electric motors, etc. that were made before PCBs were phased out. PCBs may exist at junkyards or scrap processors where these items have been stored or recycled. PCB's were also used in some inks and papers.

4. Chlordane

Chlordane is a pesticide that has been banned in New York State since 1985. It was once used for fumigation of homes and for agricultural crops. Residues could remain in building materials, soils and sediments.

5. Polynuclear Aromatic Hydrocarbons (PAHs)

PAHs are formed as a result of incomplete combustion of organic compounds. They are present in the environment from both natural sources and human activities. As a group, they are widely distributed in the environment.

PAHs dissolved in the water column are believed to degrade by direct photolysis at a rapid rate. Benzo(a)pyrene is one of the most toxic PAHs. It has been documented to cause liver tumors in freshwater fish.

Common sources of PAHs include petroleum and its derivatives, coal tar and derivatives, bitumen-based paints and coatings, diesel engine exhaust, used crankcase oil, incinerator residues, and fly ash. Possible local sources of PAHs are old coal gas production facilities in the Genesee Gorge, nearby landfill sites, and fly ash dumps in the gorge and near the river mouth.

6. Oxygen Depletion

The depletion of dissolved oxygen in the water occurs when organic matter such as sewage decomposes and uses up oxygen (biological oxygen demand), or when chemical wastes react with oxygen (chemical oxygen demand). Oxygen-demanding substances can remain in sediments for many years, consuming oxygen when the sediments are disturbed. One of the problems with a waterbody having a high oxygen demand is that there is sometimes little oxygen left for fish survival and propagation.

The dissolved oxygen content in the lower river improved dramatically after Kodak upgraded its facility to include secondary treatment in 1972, but combined sewer overflows and stormwater continue to lower the oxygen levels periodically and to contribute to sediment oxygen demand.

7. Metals

Metals can reach the water system from natural sources such as soil and rock, and from waste discharges, dumpsites, and atmospheric deposition. Most metals adhere to sediments and are eventually deposited at the bottom of lakes and rivers, where they may be remobilized by benthic organisms (those that live on the bottom of the lake or river).

Metals that are discharged into the AOC include: cadmium, chromium, copper, lead, mercury, nickel, silver and zinc, and arsenic. The Van Lare treatment plant and Eastman Kodak are two of the larger point source dischargers. However, nonpoint sources appear to supply the majority of all of these metals with the exception of silver.

Nonpoint sources of arsenic are primarily agricultural lands where arsenic-based pesticides were applied in the past. Nonpoint sources of lead include airborne lead-based fuels and the combustion of waste oil and trash. The corrosion of copper plumbing pipes is responsible for a portion of the copper that is received by wastewater treatment plants.

8. Cyanide

High levels of cyanide are found in both Genesee River and Irondequoit Bay sediments. Cyanide is used in plating industries and was a by-product of coal gas production. It was once a component of commonly-used pesticides, and remains in the soil in some agricultural areas.

9. Fecal Coliform Bacteria

Fecal coliform are bacteria that live in enormous numbers in the intestines of all humans and most other warm-blooded animals. They are used as an indicator of fecal contamination, indicating the probable presence of pathogenic bacteria such as Salmonella. Fecal coliform can grow in wet, decomposing organic debris like leaf piles.

Fecal coliform bacteria are used as an indicator of beach water quality. They reach the beaches via streams and the river, where their numbers increase sharply with stormwater runoff. The bacteria get into the stormwater via many pathways including improper connections of sanitary sewers with storm sewers, broken sanitary sewer laterals, rotting organic debris (much of which is natural such as leaf fall and *Cladophora* algae), and the feces of domestic and wild animals, including seagulls that feed on contaminated debris.

10. Ammonia

Ammonia has been of concern in the lower Genesee River during dredging activities. When the river is dredged, ammonia in the sediments is released to the water column where it can be acutely toxic to fish. The sources of ammonia are complex, since ammonia can be formed from other nitrogen-containing compounds through chemical reactions and bacterial activity. Nitrogenous wastes come from many sources, including sewage, fertilizer, and natural debris such as plant material and manure.

11. Phenols

Phenols are listed as possible sources of fish tainting because in 1981, the EPA measured high values of phenol at the mouth of the Genesee River. The source of the high readings is not known. EPA toxics monitoring in subsequent years found no detectable phenol in the River.

12. Sediment (measured as total suspended solids- TSS)

Suspended solids loadings come from both point and nonpoint sources. Total suspended solids are known to have a relatively high discharge from regulated point sources. Soil erosion from agricultural areas and urban erosion are examples of nonpoint sources of suspended solids.

In urban and suburban areas, as in rural areas, suspended solids come from unprotected soil and streambank erosion; however, the causes of those conditions are different. In urban and suburban areas, unprotected soil is more likely to be associated with construction sites than with agriculture. Streambank erosion also can be accelerated by real estate development due to the increase in impervious (paved) surfaces, which cause increased storm flows in local streams. Numerous studies in individual watersheds have shown construction sites to be the greatest sources of sediment in urban areas. Soil erosion is most common where bare earth is exposed.

13. Phosphorus

Calculations for the Genesee Basin earlier in this chapter show that approximately 10% of the total phosphorus discharged by the river is from permitted point sources. The total amount of phosphorus discharged by the river decreased from over 800 tons in 1975 and over 500 tons in 1976 to less than 400 tons in 1989-90. The decrease in point source and total loadings is consistent with the efforts to remove direct wastewater discharges from the River.

The highest phosphorus loadings per unit area come from intensive agricultural lands and from cultivated mucklands in the Genesee River Basin.

The NURP study in the Irondequoit Basin found that nonpoint phosphorus loadings generally increased with an increase in impervious surfaces, with a high density residential area having the greatest phosphorus yields during storms. An active construction site that was monitored had similarly high phosphorus loadings. Atmospheric phosphorus deposition on the watershed equalled 65% of the annual yield measured in Irondequoit Creek (Kappel *et al.* 1986).

14. Litter

Litter reaches waterways through direct littering and dumping from shore or boats, and through the transport of litter via storm sewers and stream flows. Litter on the bottom of the Genesee River can be brought up during dredging and drift onto nearby beaches.

15. Dead Fish

The annual die-off of Pacific salmon in the Genesee River is a natural occurrence that

results in aesthetic problems of odors and unsightliness. The abundance of the fish is a result of the salmon stocking program. The periodic die-offs of alewives are due to population explosions and crashes that these fish experience. The two phenomena are related because the salmonids are stocked partly to reduce the numbers of alewives so that population crashes will be less likely. Recently the population of alewives in the lake has been declining to the point where it is feared they might not supply adequate prey for the usual numbers of stocked game fish. Zebra mussels complicate the picture by consuming plankton and possibly restricting the amount of food available to other organisms such as alewives. The management of trophic relationships between several non-native species in Lake Ontario is a complicated task that is not always predictable.

Locally, fish cleaning by anglers in the lower Genesee creates dead fish odors in the area. The City of Rochester has established a fish cleaning station in the area that is helping to alleviate this problem.

16. Chemical Seeps at Lower Falls

The chemical seeps at the Lower Falls allow pollutants to directly enter the Genesee River. The seeps are on the face of the Lower Falls on the western side. Those near the top of the falls contain high levels of benzene, toluene and xylene (BTX). A separate seep further down contained an oily, creosote-like substance, and a contaminant pool at the base of the falls contains PAHs. Chemicals from inactive hazardous waste sites travel through the fractured rock and under the river. The specific sources of each type of contamination are not known. However, both the RCRA Environmental and the City of Rochester studies find that the most probable source of the contaminants at the base and face of the lower falls and in the RG&E tunnel are from coal tar.

17. Physical Disturbances

Physical disturbances include filling and draining of wetlands, removal of protective vegetation, and development near shorelines. Local trends are that residential, commercial and recreational development have spread throughout the area and are continuing rapidly.

D. Other Persistent Toxics

The pollutants discussed in Section C were those that have been linked to impairments in the AOC. There may also be a need to reduce the discharge of persistent toxics due to potential concerns for human health. Work is being done as part of the Stage II RAP to identify all pollutants of concern. These will be addressed further in the Stage II RAP.

VI. SUMMARY OF THE LINKAGES BETWEEN IMPAIRED USES, POLLUTANTS CAUSING IMPAIRED USES, AND SOURCES OF POLLUTANTS

The following chart is a summary of the water quality problems, their sources, and the pollutants causing the problems. This chart concludes Stage I of the Rochester Embayment Remedial Action Plan. Stage II will outline the specific remedial actions that need to be taken to improve water quality conditions and restore beneficial uses determined to be impaired in the Stage I RAP.

TABLE 4

ROCHESTER EMBAYMENT
USE IMPAIRMENTS, CAUSES AND SOURCES

INDICATOR (USE IMPAIRMENT)	LOCATION G. River	LOCATION L. O./Embmt.	CAUSES (Known)	CAUSES (Possible)	SOURCES[1] (Known)	SOURCES (Possible)[2]
Restrictions on fish and wildlife consumption	Yes	Yes	PCB		Atmospheric deposition Electrical equipment still in use Junkyards Landfills, dumps Recycling through sediments, water, air	Electrical equipment in storage
			Mirex		Niagara River area Oswego area	
			Dioxin		Atmospheric deposition/ incineration Niagara River area	
			Chlordane (Irondequoit Bay)		Past agricultural and residential use	
Tainting of fish and wildlife flavor	Unknown	Unknown		Phenols		Atmospheric deposition. Industrial and Municipal wastewater
Degradation of fish and wildlife populations	Yes (for mink; unknown for other species)	Yes (for mink; unknown for other species)		PCB	Atmospheric deposition Electrical equipment still in use Junkyards Landfills, dumps Recycling through sediments, water, air	Electrical equipment in storage
				Mercury		Atmospheric deposition
Fish tumors or other deformities	Unknown	Unknown		PAHs in sediments		Ash fill Asphalt runoff Coal tar Atmospheric deposition Petroleum product spills
Bird or animal deformities or reproductive Problems	Yes (mink)	Yes (mink)		PCB (see Degradation of fish & wildlife populations)		
Degradation of benthos	Yes	Unknown	Oxygen depletion		CSOs and other past discharges (lasting effects in sed.)[3] IndustrialWastewater Stormwater	
				Copper	Nonpt. sources Industrial and Municipal Wastewater	
				Iron	Nonpt. sources Landfill dumps	
				Nickel	Nonpt. sources Industrial and Municipal Wastewater	
				Silver	Kodak	

NOTES:

[1]SOURCES (known) lists known sources of the pollutants in question, but does not attempt to prioritize the importance of those sources. The relative magnitude of the sources can be determined for some pollutants but not for others. A more complete discussion of this is included in Chapter 5. When a particular point source is listed (e.g. Kodak), it appears from preliminary calculations to account for most of the loading other than that accounted for by nonpoint sources. Other point sources that appear to contribute a very small percentage of the total loading are not listed. Treatment plants discharging to the lake are not listed here, since their effluent is discharged where it is designed to have a minimal effect on the embayment.

[2]SOURCES (Possible) includes those sources that have already been identified as possible contributors to the impairments listed. Others may be identified as a result of further study.

[3]Combined Sewer Overflows (CSOs) are listed as sources of pollutants in several categories, even though the CSOAP program has now diverted most of the combined sewage to the Van Lare treatment plant and future overflows are expected to be rare. The reason CSOs are listed is that the impairments have been identified based on data collected during the past several years, when CSOs were a contributing factor. Some impairments may diminish in the future due to the CSOAP program. But of necessity, the table reflects information from the recent past. Data on operation of the CSOAP system will be collected in accordance with permit requirements and for review and analysis.

INDICATOR (USE IMPAIRMENT)	LOCATION G. River	LOCATION L. O./Embmt.	CAUSES (Known)	CAUSES (Possible)	SOURCES (Known)	SOURCES (Possible)
Degradation of benthos (cont'd)				PCB	Atmospheric deposition Electrical equipment still in use Junkyards Landfills, dumps Recycling through sediments, water, air	Electrical equipment in storage
Restrictions on dredging activities	Yes	No	Oxygen depletion		CSOs and other past discharges (lasting effects in sed.) [3] Industrial wastewater Stormwater	
			Fecal coliform		CSOs[3] Stormwater	
			Ammonia		Stormwater Wastewater	
			Turbidity (sediment)		Agricultural runoff Construction sites CSOs[3] Dredging Natural causes Streambank erosion Urban stormwater	
Eutrophication or undesirable algae	N/A[4]	Yes	Excess nutrients (phosphorus)		Agricultural runoff Atmospheric deposition CSOs[3] Dredge spoil On-site waste disposal systems Municipal and Industrial Wastewater effluent Urban stormwater	
Drinking water taste and odor problems	N/A[5]	Yes	Algae (phosphorus)		Agricultural runoff Atmospheric deposition CSOs[3] Dredge spoil On-site waste disposal systems Municipal and Industrial Wastewater effluent Urban stormwater	
			Turbidity and temperature changes		Weather conditions	

NOTES:

[3]Combined Sewer Overflows (CSOs) are listed as sources of pollutants in several categories, even though the CSOAP program has now diverted most of the combined sewage to the Van Lare treatment plant and future overflows are expected to be rare. The reason CSOs are listed is that the impairments have been identified based on data collected during the past several years, when CSOs were a contributing factor. Some impairments may diminish in the future due to the CSOAP program. But of necessity, the table reflects information from the recent past. Data on operation of the CSOAP system will be collected in accordance with permit requirements and for review and analysis.

[4]This impairment is not applicable in the Genesee River because flowing rivers are not subject to the process of eutrophication.

[5]The Lower Genesee River is not used as a source of drinking water.

INDICATOR (USE IMPAIRMENT)	LOCATION G. River	LOCATION L.O./Embmt.	CAUSES (Known)	CAUSES (Possible)	SOURCES (Known)	SOURCES (Possible)
Beach closings	N/A[6]	Yes	Algae (phosphorus)		Agricultural runoff Atmospheric deposition On-site waste disposal systems Municipal and Industrial Wastewater effluent CSOs[3] Dredge Spoil Urban stormwater	
			Fecal coliform		CSOs and stormwater (Genesee River)[3] Decomposing algae (see above) Dredging (distributes bacteria from sediments) Sewer cross-connections Stormwater runoff (West Sub-basin)	
			Turbidity (sediment)		Agricultural runoff Construction sites CSOs[3] Dredging Natural causes Streambank erosion Urban stormwater	
Degradation of aesthetics	Yes	Yes	Algae (phosphorus)		Agricultural runoff Atmospheric deposition CSOs[3] Municipal and Industrial Wastewater On-site waste disposal systems Dredge Spoil Urban stormwater	
			Turbidity (sediment)		Agricultural runoff Construction sites CSOs[3] Dredging Natural causes Streambank erosion Urban stormwater	

NOTES:

[3]Combined Sewer Overflows (CSOs) are listed as sources of pollutants in several categories, even though the CSOAP program has now diverted most of the combined sewage to the Van Lare treatment plant and future overflows are expected to be rare. The reason CSOs are listed is that the impairments have been identified based on data collected during the past several years, when CSOs were a contributing factor. Some impairments may diminish in the future due to the CSOAP program. But of necessity, the table reflects information from the recent past. Data on operation of the CSOAP system will be collected in accordance with permit requirements and for review and analysis.

[6]There are no beaches on the Lower Genesee River.

INDICATOR (USE IMPAIRMENT)	LOCATION G. River	LOCATION L.O./Embmt.	CAUSES (Known)	CAUSES (Possible)	SOURCES (Known)	SOURCES (Possible)
Degradation of Aesthetics (continued)			Litter		CSO[3] Dredging Littering Storm sewers	
			Dead fish below Lower Falls		Natural die-off Fish cleaning	
			Chemical seeps at Lower Falls			Creosote from beams in RG&E tunnel Buried tank from old furniture factory or other industrial use Former dump in gully
Added costs to agriculture or industry	Yes	Yes	Zebra Mussels		Exotic species	
				Turbidity		Weather
Degradation of phytoplankton and zooplankton populations	Yes	Unknown		Eutrophication (excess nutrients)	Agricultural runoff Atmospheric deposition CSOs[3] On-site waste disposal systems Municipal and Industrial Wastewater Urban stormwater	
				Predation		Zebra mussels
				Phenols		
Loss of fish and wildlife habitat	Yes	Yes	Filling/draining of wetlands		Development near shorelines	
			Removal of riparian vegetation		Development near shorelines	
			Sedimentation		Natural causes Urban stormwater Agricultural runoff Streambank erosion	
				Rough water conditions		Boat traffic in Braddock Bay may disturb tern nests.

6/93