

CHAPTER 3 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 embayment. Many actions have already been taken to improve and protect water quality and restore beneficial uses in the AOC. This chapter is intended to describe the water quality goals relating to human and biological uses of the AOC. It will also outline goals to restrict or discontinue uses in order to improve water quality, and goals for new uses that could be added or restored in the future.

A. Existing Uses of the Rochester Embayment of Lake Ontario

1. Existing Human Uses

a. Recreation

Recreation is one of the primary uses of the AOC. Because the City of Rochester developed around the falls of the Genesee River and later around the Erie Canal, the lakefront was never industrialized as it was in many other Great Lakes cities. As a result, parks, marinas and private homes border the waterfront.

(1) Waterfront Recreation

Braddock Bay, Ontario Beach, Durand Eastman and Webster are the large lakefront parks along the embayment. The steep banks of the Genesee gorge are bordered by Maplewood, Turning Point, and Seneca Parks (see Figure 3-1).

According to the County's Waterfront Recreation Opportunities Study (EDR, 1989), existing and designated uses in the embayment area include 13 marinas and yacht clubs, 13 boat launch sites, 7 established fishing access sites, 5 areas with hiking trails, one campground, one amusement park, and one swimming beach. Many recreational opportunities also exist at Hamlin Beach State Park, west of the embayment. Primary contact recreation other than swimming includes waterskiing and surfing.

(2) Swimming

Ontario Beach Park, located on Lake Ontario immediately west of the mouth of the Genesee River, is the only location along the embayment where public swimming is permitted. A beach water quality model has been developed by the Monroe County Department of Health to determine when the beach should be closed. A water quality sampling program has been continued in order to verify or modify beach closure criteria. The beach is closed when the model predicts that water clarity or fecal coliform bacteria make the beach unsuitable for primary contact recreation.

(3) Boating

As of 1987, there were over 26,000 boats registered in Monroe County, and the number had grown 30% in the previous ten years. Over 90% of the boats were small (less than 26 feet long). More boats are registered to Monroe County residents than to residents of any other New York county except for Nassau and Suffolk on Long Island (EDR, 1989). Rochester Harbor had the greatest number of the boat slips in the county,

not including those at private homes and cottages. Many of the boats that dock at nearby locations, such as Irondequoit Bay, also use the waters of the embayment extensively.

(4) Fishing, Hunting, and Trapping

Fishing is a popular activity in the AOC for residents and tourists. Over 70,000 fishing licenses are sold annually in Monroe County, and several charter boat services operate. Popular species caught in the area include trout and salmon (which are stocked by NYSDEC), perch, largemouth and smallmouth bass, northern pike, sunfish, and bullheads. The Empire State Lake Ontario (ESLO) Trout and Salmon Derby, based in Rochester, draws thousands of anglers and their boats to Monroe and six other counties three times a year (EDR, 1989; Rochester/Monroe County Convention and Visitors Bureau, no date).

The area near the Lower Falls of the Genesee River is a particularly attractive fishing spot during the salmon runs in the spring and fall.

For some segments of Rochester's population, local fish apparently represent a regular portion of the diet. These fish are usually caught along the shore or acquired from friends or unlicensed fish vendors. Concern has been expressed to the Monroe County Water Quality Management Advisory Committee that some residents, primarily in Rochester's Black, Asian and Hispanic communities, are consuming unsafe quantities and varieties of fish. The County is attempting to provide better information about the NYSDOH fish consumption advisory, due to toxic chemicals in Lake Ontario fish, and to provide suggestions about reducing the hazards that may accompany ingestion of contaminated fish.

Hunting of waterfowl also occurs along the Lake Ontario shoreline as does trapping of muskrats, raccoon, fox, and beaver. Hunting is popular throughout the AOC watershed for deer, small game, turkeys, and grouse.

b. Receiving Water for Wastewater

Wastewater discharges are discussed in Chapter 2, and will be addressed in greater detail in Chapter 5 (Identification of Pollutant Sources).

Wastewater enters the embayment via rivers and streams throughout the drainage basins, and from permitted discharges flowing directly into the embayment. The only permitted dischargers into the Genesee River below the lower falls are Kodak and several combined sewer overflows. Kodak, with a treated wastewater discharge averaging over 26 million gallons per day, is the largest industrial discharger (except for cooling water dischargers) in the watershed of the embayment. However, it should be noted that other permitted wastewater dischargers exist upstream in the Genesee, Lake Ontario West, and Lake Ontario Central basins and they may have an impact on the lower Genesee and/or the embayment.

There are no direct discharges of wastewater into the Rochester Embayment of Lake Ontario itself. (See Chapter 2 for a definition of the bounds of the embayment). Discharging into the lake near or beyond the outer limits of the embayment are the Monroe County Van Lare wastewater treatment plant, the Northwest Quadrant wastewater treatment plant, and the Town of Webster wastewater treatment plant.

Since at least 1970, the embayment has been used as a dump site for annual sediment dredging of the Genesee River channel sponsored by the U.S. Army Corps of Engineers (Figure 2-10.)

The Monroe County Pure Waters Master Plan report (1969), which set forth the ongoing process of consolidating and improving the treatment of wastewater in the county, identified Lake Ontario and the Genesee River as the only local water bodies judged to have enough conventional pollutant assimilation capacity to be receiving waters for wastes. Treatment plant discharges to smaller streams were to be phased out as soon as possible, with elimination of discharges to the Genesee as a long-term goal. At the same time, the report described the Rochester Embayment as an inappropriate site for major wastewater discharges due to the tendency of the winds and currents to bring wastewater back to shore instead of into the open lake. Plan implementation included relocating the outfall of the Van Lare wastewater treatment plant to the outer limits of the embayment, and the Combined Sewer Overflow Abatement Program to reroute combined sewage from the City of Rochester to the Van Lare plant instead of allowing it to discharge to the Genesee River and Irondequoit Bay.

The Pure Waters Master Plan also called for industrial effluents, except for cooling water and process water relatively free of pollutants, to be discharged to municipal treatment plants. This goal has not been fully realized; however, Monroe County does have an industrial wastewater pretreatment program that regulates industrial users of the public sewer system.

The discharge of wastewater to the most appropriate receiving waters improves water quality locally. But for some pollutants, such as persistent toxics that bioaccumulate, the total loading to the Great Lakes system is of primary importance, and this is unaffected by relocation of the discharge.

In addition to the point source discharges mentioned above, the embayment is also the ultimate receiving water for non-point source pollution carried with stormwater runoff. Largely uncontrolled stormwater runoff flows to creeks and tributaries, eventually bringing silt, nutrients and chemical contaminants into the embayment.

c. Drinking Water Supply

The waters of Lake Ontario provide drinking water for over 700,000 residents served by the Monroe County Water Authority and some residents served by the City of Rochester Water Bureau. Water intakes are within the western portion of the Rochester Embayment offshore of the Town of Greece (see Figure 3-1).

d. Industrial Water Supply

Eastman Kodak and RG&E draw water from the lake through intakes in the western portion of the embayment offshore of the Town of Greece. Many other industries use water purchased from the City of Rochester or the Monroe County Water Authority. The availability of clean water is an extremely important asset to local industries and to the potential economic development opportunities in the area.

e. Commercial Navigation

Navigation in the embayment is almost entirely recreational. The only freight hauling is done by Essroc Materials, Inc., which has cement loading facilities on the western side of the Genesee River below the Lower Falls. It receives deliveries 45-50 times per year.

The Army Corps of Engineers maintains a navigation channel from 21 to 24 feet in depth in the river mouth and out into the lake in order to facilitate shipping (see Figure 3-1).

2. Existing Biological Uses

The support of an ecological community is recognized as an important use of the embayment both for its own sake and because of the benefits it provides to humans.

The waters of the Rochester Embayment are considered eutrophic, in contrast to the mesotrophic waters along the coast on either side (EPA, 1988). The fishes inhabiting the embayment are more diverse than those of the open lake; the embayment supports warm and cool water species as well as the cold water fish common in the lake. Table 3-1 lists fish species found in the embayment offshore of Rochester Gas and Electric's Russell Station in 1976. With trophic changes in the lake since 1976, the same species are found in different proportions in 1993.

The New York Department of State has identified the lower Genesee River and Braddock Bay as two of 50 significant fish and wildlife habitats along the Great Lakes and St. Lawrence River within the state. Both of these areas contain wetlands, which are essential breeding grounds, feeding areas and habitats for many types of fish and wildlife.

The Genesee River significant habitat is the segment from the Lower Falls to the mouth. Here the waters are slow-moving and mingle with those of the lake. The banks below the falls are steep and wooded, with little development, and within the gorge are extensive stands of emergent vegetation. Further toward the mouth, however, the river is diked and surrounded by dense development.

The Coastal Fish and Wildlife Habitats Program (New York Department of State 1991b) describes the lower Genesee River as follows:

The Genesee River is a highly productive warmwater fisheries habitat, supporting concentrations of many resident and Lake Ontario based fish species. Among the more common resident species are smallmouth bass, brown bullhead, northern pike, channel catfish, walleye, carp, and white sucker. Lake-run species found in the Genesee River include white bass, yellow perch, white perch, smelt, sheepshead, rock bass, and American eel. These fish populations are supplemented by seasonal influxes of large numbers of trout and salmon. In the spring, steelhead run up the river, and lake trout occur at the mouth. In fall, concentrations of coho and chinook salmon, brown trout, and steelhead, are found throughout the river during their spawning runs. The salmonid concentrations in the Genesee River are among the highest occurring in tributaries of Lake Ontario, and are largely the result of an ongoing effort by the NYSDEC to establish a major salmonid fishery in Lake Ontario through stocking.

Wildlife use of the Genesee River is not well documented, but appears to be limited to those species that can inhabit a relatively narrow riparian corridor, and are somewhat tolerant of human activities in adjacent areas. Possible or confirmed bird species include mallard, wood duck, great horned owl, red-tailed hawk, spotted sandpiper, belted kingfisher, red-winged blackbird, swamp sparrow, and various woodpeckers and woodland passerine birds. Several beaver colonies inhabit the lower Genesee... Spotted salamander (SC)¹ and spotted turtle (SC) have been observed in the Lower Genesee River Gorge but the extent of use by these

¹ (SC) = species of special concern; (T) = threatened; (E) = endangered.

species is not well documented. Other wildlife species occurring in the area probably include raccoon, muskrat, northern water snake, and painted turtle.

Braddock Bay and Salmon Creek are described as follows (New York Department of State, 1991a):

Braddock Bay and Salmon Creek comprise one of the largest and most important coastal freshwater wetland complexes in New York State. This area supports large concentrations of many fish and wildlife species. Throughout the year, Braddock Bay is a major concentration area for many species of migratory birds. From late winter through early spring, large concentrations of waterfowl congregate in the bays, including such species as canvasback, redhead, greater scaup, and Canada goose. Northern harriers (T), rough-legged hawks, short-eared owls (SC), and snowy owls commonly winter in the bay area. Probable or confirmed nesting species at Braddock Bay include green-backed heron, northern harrier, black tern (SC), least bittern (SC), American bittern, sedge wren (SC), Henslow's sparrow (SC), grasshopper sparrow (SC), eastern bluebird (SC), mallard, blue-winged teal, wood duck, Virginia rail, sora, common moorhen, and marsh wren. The abundance and diversity of breeding birds in this area is rare in the Great Lakes Plain ecological region. Extremely large numbers of hawks, herons, waterfowl, shorebirds, warblers, and other birds pass through the area during their spring and fall migrations. Approximately 60,000 raptors were observed moving through the Braddock Bay area during the spring of 1984, and 70,000 raptors during 1985, including bald eagle (E), golden eagle (E), and osprey (T).

Other fish and wildlife species found in Braddock Bay and Salmon Creek include muskrat, mink and raccoon... Also found here are Jefferson salamander (SC) and spotted salamander (SC). A very diverse fishery exists in Braddock Bay and Salmon Creek. Warmwater fish species present include white sucker, smallmouth bass, largemouth bass, white perch, and brown bullhead. The bay provides one of the few areas in western Lake Ontario where northern pike and largemouth bass spawn. Coldwater fish species found in the bay and in Salmon Creek include chinook and coho salmon, brown trout, and steelhead. These salmonids migrate into Salmon Creek to spawn (although unsuccessfully in most instances) (New York Dept. of State, 1991a).

Slater Creek, Sandy Creek, and Irondequoit Bay and Creek have also been identified as significant habitats. They are considered in further detail in the individual basin plans.

B. Goals

Goals and objectives for water bodies are contained in the Great Lakes Water Quality Agreement and in laws and policies of the federal, state and local governments. The Monroe County Water Quality Management Advisory Committee (WQMAC) has developed locally-oriented goals as part of the RAP process. Appendix B compares the goals and objectives of the Great Lakes Water Quality Agreement to some of the most relevant state, federal and local policies.

1. General Goals

a. Federal and State Laws Supporting Water Quality

A number of federal and state laws establish goals for water pollution control and coastal protection that are directly applicable to the RAP. These goals are quoted directly in this section. Note that 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 (LWRPs).

- (1) **Water Pollution Prevention and Control, U.S. Code Title 33 Section 1251 (Clean Water Act):**

To restore and maintain the chemical, physical, and biological integrity of the Nation's waters.

The discharge of pollutants into navigable waters [should] be eliminated.

Wherever attainable, an interim goal of water quality which provides for the protection and propagation of fish, shellfish and wildlife and provides for recreation in and on the water [should] be achieved.

- (2) **Coastal Zone Management Act, U.S. Code Title 16 Section 1452:**

To preserve, protect, develop, and where possible, to restore or enhance, the resources of the Nation's coastal zone for this and succeeding generations.

("Coastal zone" refers to coastal waters and adjacent shorelands. All Great Lakes and connecting bays, estuaries etc. within the U.S. are defined as coastal waters.)

- (3) **New York Environmental Conservation Law, ECL 15-1501:**

To control and conserve State water resources for the benefit of all inhabitants of state, and public right to benefit of such resources.

- (4) **New York Environmental Conservation Law, ECL 17-0101:**

To maintain reasonable standards of purity of the waters of the state consistent with public health and public enjoyment thereof, the propagation and protection of fish and wild life [sic], including birds, mammals and other terrestrial and aquatic life, and the industrial development of the state, and to that end require the use of all known available and reasonable methods to prevent and control the pollution of the waters of the state of New York.

New York Environmental Conservation Law, ECL 17-1401:

To safeguard the waters of the state from nonpoint source pollution by controlling and abating new and existing sources of nonpoint source pollution.

- (5) **New York State Waterfront Revitalization and Coastal Resources Act:**

To achieve a balance between economic development and preservation that will permit the beneficial use of coastal resources while preventing loss of living marine resources and wildlife, diminution of open space areas and public access to the waterfront, shoreline erosion, impairment of scenic beauty, or permanent adverse changes to ecological systems.

- (6) **New York State Freshwater Wetlands Act, ECL 24-0403:**

To preserve, protect and conserve freshwater wetlands and the benefits derived therefrom, to prevent the despoliation and destruction of freshwater wetlands, and to regulate use and development of such wetlands to secure the natural

benefits of freshwater wetlands, consistent with the general welfare and beneficial economic, social and agricultural development of the state.

(7) Other Applicable Legislation

Great Lakes Critical Programs Act (1990): Calls for the Administrator of the U.S. EPA to prepare a proposed water quality guidance for the Great Lakes system by June 30, 1991 to conform to the policy objectives and provisions of the Great Lakes Water Quality Agreement.

Nonindigenous Aquatic Nuisance Prevention and Control Act (1990): Calls for prevention of the introduction of exotic species into the Great Lakes. Includes the Great Lakes Fish and Wildlife Restoration Act, which seeks to protect and restore fish habitat.

Many other state and federal laws, particularly those dealing with hazardous waste management, have some bearing on the RAP as well.

b. Goals for Lake Ontario and the Area of Concern

Goal statements are quoted below from the Great Lakes Water Quality Agreement, the Lake Ontario Toxics Management Plan, state documents, and documents from Monroe County and the City of Rochester.

- (1) Great Lakes Water Quality Agreement. International Joint Commission, 1978 (amended 1987). The Great Lakes Water Quality Agreement calls for pollution control activities covering point sources (including shipping), nonpoint sources, atmospheric sources, and in-situ sources (sediments). Its stated goals are as follows:

The purpose of the Parties is to restore and maintain the chemical, physical, and biological integrity of the waters of the Great Lakes Basin Ecosystem. In order to achieve this purpose, the Parties agree to make a maximum effort to develop programs, practices and technology necessary for a better understanding of the Great Lakes Basin Ecosystem and to eliminate or reduce to the maximum extent practicable the discharge of pollutants into the Great Lakes System.

Consistent with the provisions of the Agreement, it is the policy of the Parties that:

- (a) The discharge of toxic substances in toxic amounts be prohibited and the discharge of any or all persistent toxic substances be virtually eliminated;
- (b) Financial assistance to construct publicly owned waste treatment works be provided by a combination of local, state, provincial, and federal participation;
- (c) Coordinated planning processes and best management practices be developed and implemented by the respective jurisdictions to ensure adequate control of all sources of pollutants.

- (2) Lake Ontario Toxics Management Plan, 1991 Update. Lake Ontario Secretariat. 1991. The Lake Ontario Secretariat was formed in 1987 by the EPA, NYSDEC, Environment Canada and the Ontario Ministry of the Environment. The plan's stated goal is as follows:

The goal of the Lake Ontario Toxics Management Plan is a lake that provides drinking water and fish that are safe for unlimited human consumption and that

allows natural reproduction, within the ecosystem, of the most sensitive native species, such as bald eagles, ospreys, mink and river otter.

- (3) New York State 25-Year Plan for the Great Lakes. New York State Department of Environmental Conservation. June, 1992. Four of the plan's six goals are water-quality related. They are:

Achieve chemical, physical and biological integrity of the waters of the Great Lakes to improve and sustain healthy diverse plant and animal communities and provide for safe public use and benefits.

Manage the Basin's water resources to meet current and future human and ecosystem needs, recognizing its true value (costs) and major uncertainties regarding its abundance, levels and impacts.

Ensure that natural and cultural resources of the ecosystem are managed to achieve healthy and diverse biological communities, and compatible coastal uses and benefits.

Achieve environmentally sustainable economic development through ecologically sensitive public and private decisionmaking that balances social, economic and environmental concerns.

- (4) New York Coastal Management Program. New York Department of State.

The Coastal Management Program is intended to carry out the intent of state and federal coastal zone legislation. It has 44 policies, which local communities adapt to their own circumstances in preparing their Local Waterfront Revitalization Plans. Four of those most relevant to the RAP are listed below:

Significant coastal fish and wildlife habitats shall be protected, preserved, and, where practical, restored so as to maintain their viability as habitats.

Expand recreation use of fish and wildlife resources in coastal areas by increasing access to existing resources, supplementing existing stocks and developing new resources. Such efforts shall be made in a manner which ensures the protection of renewable fish and wildlife resources and considers other activities dependent on them.

Activities or development in the coastal areas will be undertaken so as to minimize damage to natural resources and property from flooding and erosion and by protecting natural protective features including beaches, dunes, barrier islands and bluffs.

Protect, maintain and increase the levels and types of access to public water-related recreation resources and facilities so that these resources and facilities may be fully utilized by the public in accordance with reasonably anticipated public recreation needs and the protection of historic and natural resources.

Recommendations of the Governor's Task Force on Coastal Resources (1991) build upon these and other goals with specific actions that could help meet the goals.

- (3) Monroe County Goals

Goal and objectives from "Environment: A Policy Element of the Monroe County Comprehensive Development Plan," Sept., 1978:

To protect and improve the general well-being of present and future residents of Monroe County by preserving and enhancing the natural features of the environment.

To bring under control the pollution of water resources in Monroe County.

To protect from adverse development or uses the important land resources of Monroe County, including wetlands, floodplains and drainageways, woodlands, areas of steep slopes and erosive soils, and the Lake Ontario shoreline and its associated bays and ponds.

Pure Waters Master Plan Report, 1969:

The Pure Waters Master Plan was prepared by the County Pure Waters Agency. Its goal is the same as that of state law for water pollution control (see ECL 17-0101 in the previous section). Individual programs intended to meet this goal include consolidating wastewater treatment facilities; eliminating discharges to smaller water bodies; and treating combined sewage and industrial waste at municipal facilities.

(5) City of Rochester Goals

Included among many goals and policies affecting the city's waterfront areas are the following:

From the Lower Genesee River Land Use Plan, City of Rochester, 1979:

Protect environmentally sensitive, natural features of the river area such as wetlands, waterfalls, wooded areas and gorge walls.

From the Local Waterfront Revitalization Plan (LWRP), City of Rochester, 1989:

The Genesee River shall be protected, preserved, and if necessary and practical, restored so as to maintain its viability as a habitat.

(For more information on specific goals, see the approved LWRP.)

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 (WQMAC) as part of their work on this RAP. The Monroe County Water Quality Management Advisory Committee is the stakeholders group that has been advising throughout the RAP process. For further information on who the WQMAC is, see chapter 1.

The WQMAC used the following definitions for goals and objectives in the development of the following: Goals: 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 toxics, 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 a 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 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, it is appropriate to list the following goals and objectives that were developed by the three citizen advisory subcommittees of the Water Quality Management Advisory Committee. These subcommittees are advising on the development of watershed plans for each of these three watershed basins:

LOCALLY-DEVELOPED WATER QUALITY GOALS FOR THE GENESEE BASIN

GOAL: Streambank stabilization & erosion prevention.

GOAL: Maintenance of high quality of drinking water in the lakes that are used for that purpose.

GOAL: Maintenance of high water quality in streams and lakes in the Genesee Basin.

GOAL: Groundwater should be free of chemical contamination.

-Objective:

Meet all relevant safety standards for drinking water.

GOAL: Water quality should be able to support native fish populations.

GOAL: Preservation/enhancement of natural wetlands.

-Objective:

Management of stormwater runoff from development in watersheds where there are wetlands.

GOAL: Shorelines and waterways will be free of odors, and visible material that is injurious to fish and wildlife and that degrades water quality and its appearance.

GOAL: No accelerated eutrophication in lakes and streams.

GOAL: Sediments should be free from contaminants.

GOAL: Better information base on zebra mussels as they affect water quality and the food chain.

GOAL: Maintenance of navigable waters.

-Objective:

Allocate federal funds for cleanup of waterways.

GOALS and OBJECTIVES FOR THE LAKE ONTARIO WEST BASIN

GOAL: Shorelines and waterways are free of objectionable materials which degrade water quality and appearance.

-Objectives:

No trash on shorelines or in waterways.

No oil on shorelines or in waterways.

No unnatural foam on shorelines or in waterways.

Maintain unobstructed stream flow (that may have been altered due to ice storm debris, litter, etc.).

GOAL: Stabilized soil/reduced siltation.

-Objective:

Stabilization of streambanks and reduction of erosion from bare or exposed soil (eg. construction sites).

GOAL: Increased citizen awareness of water quality/environmental issues.

-Objectives:

More public access to water for environmental education.

More public access to water for recreation purposes/land acquisition.

GOAL: Preservation of natural wetlands/no net reduction of wetlands.

-Objectives:

Maintain and protect present wetlands.

Creation of new wetlands.

GOAL: Provide good fish and wildlife habitat.

-Objective:

Maintain shorelines, wetlands, and waterways.

GOAL: Improved communication between all parties involved in water quality management.

-Objective:

Land use/water quality information exchange network.

GOAL: Optimum water quality of streams, bays and ponds.

-Objectives:

Control plant and algal growth in ponds and waterways.

Reduction of toxic substances in water bodies.

LAKE ONTARIO CENTRAL BASIN/IRONDEQUOIT BASIN WATER QUALITY GOALS & OBJECTIVES

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

-Objectives:

An inventory of sources of pollutants.

A sustainable debris removal and trash removal/prevention program.

Mitigation methods for sources that are difficult to control, e.g., nonpoint source pollutants.

Continuous improvement of water clarity in waterways of the Central/Irondequoit Basin.

Virtual elimination of raw or untreated sewage discharges into waterways.

GOAL: Integrity of steep slopes and stream banks.

-Objectives:

Land use plans which conform to best currently available information regarding maintenance of steep slopes, erosive soils, and sensitive vegetation.

Conservation, by public acquisition or protective agreements, of slopes and stream banks prone to erosion and unlikely to survive the usage restrictions possible on privately-owned land.

GOAL: Ecological and aesthetic balance of Irondequoit Bay and waterways.

-Objectives:

Appropriate mix of flora and fauna to achieve ecological balance.

Best attainable control of odor causing factors.

Environmental awareness of the value of wetlands, streams and other water bodies.

Preservation of natural wetlands and other sensitive areas.

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

Dredging in Irondequoit Bay is restricted to maintenance of established commercial and recreational channels.

Minimal algal blooms in Irondequoit Bay and other waterways.

GOAL: Water entering streams, ponds, lakes and wetlands maintained at highest achievable quality.

-Objectives:

Continuing improvements in control over pollutants entering streams.

Improvements in stream standards which reflect up-to-date technological capability.

Goal: Fish caught in Irondequoit Bay and other waters in the Central/Irondequoit Basin watershed are safe to eat according to dietary standards which are generally accepted by the scientific community.

-Objectives:

Virtual elimination of discharges and runoff of persistent toxic substances that necessitate health advisories.

Continued monitoring of persistent toxic chemicals which are concentrated in fish populations.

Goal: The deep areas of Irondequoit Bay is mesotrophic (intermediate levels of plankton production) rather than eutrophic (high levels of plankton production).

-Objectives:

The biological community in deep areas of Irondequoit Bay is mesotrophic, as indicated by USEPA lists of phytoplankton indicator species.

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

2. 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 IJC, EPA and the Food and Drug Administration (FDA), and in New York by the NYSDEC and the New York State Department of Health (NYSDOH). They are based on the protection of human health and aquatic life.

The ambient standards with some regulatory basis are the NYSDEC water quality standards, which are used to develop effluent discharge permits, and the FDA standards, which are used

to determine whether fish are suitable for human consumption, and the EPA/NYSDEC drinking water standards, which apply to treated water supplies and groundwater that is consumed untreated. Numerical standards work towards achieving the broad goals set forth in legislation and in the Great Lakes Water Quality Agreement, such as eliminating pollutant discharges or reducing them to the extent practicable.

a. Water Quality Guidelines

The Great Lakes Water Quality Agreement, in Annex 1, contains specific objectives for many water quality parameters. It also states that any organic compounds that are persistent and likely to be toxic should be present at a level below detection. A supplement to Annex I recognizes that detection levels will be subject to change as technology improves and new levels are adopted. The EPA has developed water quality criteria for a long and growing list of chemicals, but these criteria are not enforceable by the federal government. Instead, 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. State standards are to be based on the water quality criteria published by EPA, or on other "scientifically defensible" grounds (40 CFR 131.11). States enforce the water quality standards primarily through the regulation of point source dischargers. The 1987 Federal Water Quality Act strengthened previously existing law by requiring states to adopt numerical criteria for toxic substances that impair designated uses, or to use biomonitoring methods to support their narrative standards. It also required states to develop strategies for controlling non-point source pollution. New York State controls point source dischargers through the State Pollutant Discharge Elimination System (SPDES). The state has set criteria for many toxics. The State has also prepared a non-point source strategy.

The Rochester Embayment, as a part of Lake Ontario, is classified by NYSDEC as a Class A water, or an international boundary water as defined under the Great Lakes Water Quality Agreement. The best uses are: source of water for drinking, culinary or food processing purposes, primary contact recreation and any other uses. The 6-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.

NYSDEC water quality standards may be found in the state rules and regulations, 6NYCRR Parts 700-705 (updated September, 1991). State standards for conventional pollutants (such as coliform bacteria, turbidity and dissolved solids) in the Class A Special category incorporate most of the IJC objectives for these pollutants.

EPA criteria are listed in Quality Criteria for Water, 1992, published by the U.S. Government Printing Office. NYSDEC guidance values (unenforceable criteria) are published in the Ambient Water Quality Standards and Guidance Values, Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1.

Standards and criteria for several pollutants that are particular problems in Lake Ontario and/or the Rochester Embayment are presented in Tables 3-2 and 3-3. Table 3-2 shows enforceable standards, and Table 3-3 shows criteria that are not enforceable but should be taken into account when setting standards.

In addition to the chemicals for which there are specific objectives, the IJC has identified hundreds of "hazardous polluting substances" based on their toxicity and risk of discharge to the Great Lakes system. The goal is to minimize or eliminate the risk of their release (Annex 10, GLWQA).

The DEC has been tightening pollutant discharge permit limits over the years, first controlling conventional pollutants, then metals, then organic solvents and pesticides. Now all discharges in NYSDEC Region 8 have been brought into compliance with water quality standards via the State Pollution Discharge Elimination System (SPDES) permits. But SPDES permits do not yet reflect the IJC goal of virtual elimination of persistent toxics, nor the goals of pollutant elimination in state and federal law. The NYSDEC Division of Water is advancing a Water Quality Enhancement and Protection Policy to augment ambient standards and treatment technologies in dealing with pollution-sensitive areas, persistent toxic substances, and waters that are of high quality. It will add new categories for water classification, a new process for reviewing water quality impacts, and substance bans to move towards the Clean Water Act goal of eliminating discharges to waters (Monaghan, 1991).

b. Sediment Guidelines

Many pollutants are associated with sediments. There are no legally enforceable sediment standards for the waters of New York, but there are guidelines available. The EPA has produced guidelines for designating sediments as nonpolluted, moderately polluted, or heavily polluted, and is currently developing sediment criteria. In addition, the IJC has identified background levels of 18 substances in sediments in the Great Lakes. That includes data on 10 substances (two nutrients, 7 metals, and volatile solids) in the Rochester Basin of Lake Ontario. The IJC Surveillance Work Group recognizes that additional work is necessary to quantify background levels of pollutants in the basins where no data currently exists. The Work Group suggests that sediment with concentrations less than or equal to background levels is acceptable. (Surveillance Work Group, 1987). For further information on sediment guidelines and background levels, see Appendix C.

The DEC has developed sediment criteria to assist in evaluating the threat of contaminated sediments to fish and wildlife and other aquatic organisms. The NYSDEC clean-up standards task force is also currently evaluating different approaches to defining clean-up criteria for the protection of human health and the environment.

c. Biota Guidelines

The concern about contaminants in water and sediments is sparked by the effect of these contaminants on fish, wildlife, agricultural products and humans. Increasingly it is recognized that natural communities should be monitored as well as water and sediments. Natural communities can show, for example, the combined effects of different pollutants whose interaction could not have been predicted.

Lake Ontario and the Genesee River can never be expected to return to their pre-development condition. Irreversible changes have occurred due to the arrival of new species and the effects of human settlement, including the removal of the forest cover along spawning streams and the alteration of shoreline habitats. But realistic goals can be set for the biological community, given present conditions and the prospect of remedial actions.

(1) Ecosystem Objectives

Ecosystem objectives are being developed by the IJC for various types of lake environments, based primarily on the presence and health of certain indicator species. Ecosystem objectives for shallow, nearshore waters such as the

Rochester Embayment have not yet been published, although smallmouth bass was recommended as a possible indicator species (Ecosystem Objectives Subcommittee, 1990). But the Ecosystem Objectives Subcommittee has recommended three general ecosystem objectives for Lake Ontario (Lake Ontario Secretariat, 1991):

The Lake Ontario ecosystem should be maintained and as necessary restored or enhanced to support self-reproducing diverse biological communities.

The presence of contaminants shall not limit the use of fish, wildlife and waters of the Lake Ontario basin by humans and shall not cause adverse health effects in plants and animals.

We as a society shall recognize our capacity to cause great changes in the ecosystem, and we shall conduct our activities with responsible stewardship for the Lake Ontario Basin.

To attain these goals, the committee recommended five ecosystem objectives:

Aquatic communities: The waters of Lake Ontario shall support diverse healthy, reproducing and self-sustaining communities in dynamic equilibrium, with an emphasis on native species.

Wildlife: The perpetuation of a healthy, diverse and self-sustaining wildlife community that utilizes the lake for habitat and/or food shall be ensured by attaining and sustaining the waters, coastal wetlands and upland habitats of the Lake Ontario basin in sufficient quality and quantity.

Human Health: The waters, plants and animals of Lake Ontario shall be free from contaminants and organisms resulting from human activities at levels that affect human health or aesthetic factors such as tainting, odor and turbidity.

Habitat: Lake Ontario offshore and nearshore zones and surrounding tributary, wetland and upland habitats shall be of sufficient quality and quantity to support ecosystem objectives for health, productivity and distribution of plants and animals in and adjacent to Lake Ontario.

Stewardship: Human activities and decisions shall embrace environmental ethics and a commitment to responsible stewardship.

In most areas of the AOC, more baseline data are needed for assessing both the abundance and the condition of naturally occurring species. But, as stressed by the subcommittee, habitat maintenance is essential if any biota goals are to be attained.

(2) **Wetlands Protection**

In the AOC, wetlands are the most crucial habitats deserving of protection. Both state and federal laws, described above, seek to preserve wetlands. In order to encroach upon a wetland area, a permit must be obtained from NYSDEC and/or from the U.S. Army Corps of Engineers, which is charged with implementing

Section 404 of the Clean Water Act. State designated wetlands have a minimum size of 12.4 acres, but the Corps regulates wetlands of one acre or more in size. Farmers participating in federal farm programs can be penalized for encroaching upon wetlands.

The Great Lakes Water Quality Agreement (Annex 13) contains the following statement related to wetlands, as part of its proposed program of non-point source controls:

Significant wetland areas in the Great Lakes System that are threatened by urban and agricultural development and waste disposal activities should be identified, preserved and, where necessary, rehabilitated.

(3) Fish Consumption

For some chemicals, standards have been established for concentrations in fish. These standards are for protection of humans or fish-eating wildlife. They are shown in Tables 3-2 and 3-3.

C. Proposals for Desired Uses

Proposals for enhanced uses of the Rochester Embayment include the elimination of the toxic materials in edible fish, and the removal of water quality-based swimming restrictions along the embayment. Durand Eastman Park and Webster Park once had public swimming, but discontinued this use due to poor water quality. The County has developed a long-term goal of opening a swimming beach at Durand Eastman Park (EDR, 1989). If the beach is reopened, it will require new bathing facilities, and will likely use a water quality model similar to that used at Ontario Beach.

Increased recreational access to the lake, river and shoreline is another generally recognized goal, as long as development is consistent with ecosystem objectives. In 1982 the DEC and the Office of Parks, Recreation and Historic Preservation issued the Strategic Plan for Economic Development through Expansion of Waterway Access to the Great Lakes. It provided for state construction of harbors, breakwaters, boat ramps, etc., intended to stimulate local development of marinas and associated facilities.

In 1983 the Statewide Comprehensive Recreation Plan (revised 1988) called for development of available resources to their optimum recreational potential while preserving unique natural and cultural assets.

The New York State Coastal Management Program (Policy 9) advocates "increasing access to existing fish and wildlife resources, supplementing existing stocks, and developing new resources" (NY Dept. of State, 1991c). Monroe County recently completed its Waterfront Opportunities Study, and is considering additional marinas, fishing access sites, and trails for several areas along the shore. The City of Rochester and the towns of Penfield, Webster, Irondequoit and Greece are participating in the Local Waterfront Revitalization Program administered by the Department of State. In Rochester the plans call for major renovations of the Charlotte waterfront and the development of an Urban Cultural Park along the Genesee River. These waterfront developments depend on a healthy aquatic environment and financing for their success.

The enhancement of biological resources is also stressed by state and federal policies. The policies include habitat restoration as well as pollution abatement, as stated in the policies of the New York State Coastal Management Program (described above). The federal Great Lakes Fish

and Wildlife Restoration Act of 1990 proposes to provide assistance "to encourage cooperative conservation, restoration and management of the fish and wildlife resources and their habitat of the Great Lakes Basin." The Great Lakes Water Quality Agreement (Annex 13) also calls for restoring significant wetlands if necessary.

The enhancement of commercial fishing and the development of commercial aquaculture in Lake Ontario are other goals that have been identified in the state's proposed fisheries management plan (Eckert, 1989) and in the Coastal Management Program. The Office of General Services, DEC and the Corps of Engineers have devised an aquaculture permit system (NYSDEC, 1989), but whether any such enterprises will occur in the embayment depends on the interest of private companies and individuals as well as on the condition of the water and sediments.

The State Coastal Management Program and related efforts, such as fisheries enhancement and the Waterway Access Expansion Program, encourage water-dependent uses and increase local attention to waterfront areas. This is resulting in the intensification of all types of shoreline land uses. It is important when planning recreational and development programs to be sensitive to the value of the littoral zone for biological uses. Frequently, these programs and the private development they foster can lead to the loss of wetlands and degradation of habitats (NYSDEC, 1985). The appropriate balance will enhance human uses while still protecting natural resources, particularly coastal wetlands that sustain biological productivity in the embayment.

D. Proposals for Discontinued or Restricted Uses

Many proposals for discontinued and restricted uses are contained in the laws and policies outlined in Section B. They include virtual elimination of the discharge of persistent toxic substances (LJC), elimination of discharge of all pollutants (U.S. Clean Water Act), prevention of new pollution (New York law), cessation of discharge of municipal and industrial waste into the embayment (Pure Waters Master Plan), and control of non-point source pollution. All levels of government have some commitment to reducing the use of water bodies as sinks for pollutants from urban runoff and erosion.

The Pure Waters Master Plan includes as a goal the relocation of dredge spoil disposal to sites outside the embayment. This proposal was extensively researched, but the community and the Corps of Engineers agreed instead to minimize pollutant inflows, primarily from Kodak and CSO's, in order to improve the quality of the sediments (Monroe County Dept. of Planning, 1990). There are no plans to cease commercial navigation in the lower Genesee River to reduce the need for dredging. However, the U.S. Army Corps of Engineers has indicated verbally to the WQMAC that they intend to dredge every other year rather than every year. The state Department of Transportation actively encourages commercial navigation on the Great Lakes, and the City of Rochester's LWRP mentions the transport of products like cement as an important water-dependent use in the coastal zone.

Other proposals for restricted uses relate to the land along the shoreline. The County's 1978 Comprehensive Development Plan states an intention to discourage nonrecreational development along Lake Ontario. This would take a great deal of political will to achieve, and it is not completely supported by the LWRPs that are being developed by the towns and the city. The LWRPs are based on the 44 coastal management policies developed by the New York Department of State. The first two policies are:

Restore, revitalize and redevelop deteriorated and underutilized waterfront areas for commercial, industrial, cultural, recreational and other compatible uses.

Facilitate the siting of water-dependent uses and facilities on or adjacent to coastal waters.

Water-dependent uses can include commerce and industry, although other policies call for recreational uses to be accommodated if possible.

The Coastal Management Program, the County Comprehensive Plan and the local LWRPs advocate careful development that avoids problems with flooding and erosion and protects natural features like beaches and bluffs. Restrictions would be most stringent in the Significant Coastal Fish and Wildlife Habitats that have been designated and mapped.

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TABLE 3-1

FISH NET SURVEY
 SUMMARY OF SPECIES ABUNDANCE ^①
 RUSSELL POWER STATION
 MAY-OCTOBER 1976

| <u>Species</u> | <u>Total Specimens</u> | <u>Per Cent of Total Catch</u> |
|---|----------------------------|--|
| Alewife <u>Alosa pseudoharengus</u> | 895 | 46.1% |
| Spottail shiner <u>Notropis hudsonius</u> | 358 | 18.4% |
| White perch <u>Morone americana</u> | 345 | 17.8% |
| Rainbow smelt <u>Osmerus mordax</u> | 114 | 5.9% |
| Gizzard shad <u>Dorosoma cepedianum</u> | 64 | 3.3% |
| Brown trout <u>Salmo trutta</u> | 50 | 2.6% |
| Carp <u>Cyprinus carpio</u> | 41 | 2.1% |
| White bass <u>Morone chrysops</u> | 30 | 1.5% |
| Steelhead/Rainbow trout <u>Salmo gairdneri</u> | 11 | 0.6% |
| White sucker <u>Catostomus commersoni</u> | 7 | 0.4% |
| Yellow perch <u>Perca flavescens</u> | 6 | 0.3% |
| Coho salmon <u>Oncorhynchus kisutch</u> | 5 | 0.3% |
| Redhorse sucker <u>Moxostoma sp.</u> | 3 | 0.2% |

TABLE 3-1 (continued)

| <u>Species</u> | <u>Total Specimens</u> | <u>Per Cent of Total Catch</u> |
|---|----------------------------|--|
| Rock bass <u>Ambloplites rupestris</u> | 2 | 0.1% |
| Smallmouth bass <u>Micropterus dolomieu</u> | 2 | 0.1% |
| Brown bullhead <u>Ictalurus nebulosus</u> | 2 | 0.1% |
| Freshwater drum <u>Aplodinotus grunniens</u> | 2 | 0.1% |
| Burbot <u>Lota lota</u> | 1 | 0.1% |
| Golden shiner <u>Notemigonus crysoleucas</u> | 1 | 0.1% |
| Longnose gar <u>Lepisosteus osseus</u> | 1 | 0.1% |
| Northern pike <u>Esox lucius</u> | 1 | 0.1% |
| Walleye <u>Stizostedion vitreum</u> | 1 | 0.1% |
| TOTAL | 1942 | |

NOTE: 1. These data reflect total individuals per species taken over all sampling stations and dates.

Source: Bio Systems Research, Inc. (1977). Rochester Gas and Electric Corporation fish net survey (1976). Biological monitoring program, Russell Power Station. Buffalo, NY: Author.

TABLE 3.2. WATER QUALITY AND FISH TISSUE - ENFORCEABLE STANDARDS

| | <u>NYSDEC SURFACE WATER QUALITY STANDARDS</u> | | | | <u>FDA FISH TISSUE</u> |
|-----------------------|---|--------------------|------------------|------------------|------------------------|
| | <u>AQUATIC LIFE</u> | | | <u>HUM. HLTH</u> | <u>HUMAN HEALTH</u> |
| | <u>Survival</u> | <u>Propagation</u> | <u>Bioaccum.</u> | | |
| | ug/l | ug/l | ug/l | ug/l | ppm fillet |
| Chlordane (total) | | | | | 0.3 |
| DDT + metabolites | | | 0.001 | | 5.0 |
| Dieldrin | | | | 0.001* | 0.3 |
| Mirex | 0.001 | 0.001 | | 0.04 | 0.1 |
| Dioxin (2,3,7,8 TCDD) | | | | 0.000001 | 0.00005 |
| Hexachlorobenzene | | | | | |
| Octachlorostyrene | | | | | |
| PCB (total) | | | 0.001 | 0.01 | 2.0 |
| Cyanide | 22 | 5.2 | | 100 | |
| Aluminum (ionic) | | 100 | | | |
| Arsenic | 360 | 190 | | 50 | |
| Cadmium | 3.9** | 1.13** | | 10 | |
| Copper | 18.** | 11.8** | | 200 | |
| Iron | 300 | 300 | | 300 | |
| Lead | 82.** | 3.2** | | 50 | |
| Mercury | | | | 2.0 | 1.0 |
| Nickel | 1844.** | 96.** | | | |
| Silver | 4.1** | 0.1 (ionic) | | 50 | |
| Zinc | 321.** | 30 | | 300 | |

* Aldrin + dieldrin **Hardness-dependent; value assumes 100 mg/l hardness.

NOTE: Aquatic standards for cadmium, lead, nickel, silver and zinc are for the acid soluble form (except where noted for silver). Aquatic standards for copper are for the dissolved form.

Sources:

Lake Ontario Secretariat. (1990). Lake Ontario Toxics Management Plan. Draft Update.

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TABLE 3.3. WATER QUALITY AND FISH TISSUE - UNENFORCEABLE CRITERIA FOR PROTECTION OF AQUATIC LIFE

| | WATER QUALITY | | | | FISH TISSUE | | |
|-----------------------|---------------------------|------------|--------|--------|----------------|-----------------|----------------|
| | EPA | | NYSDEC | IJC | NYSDEC | | IJC |
| | Acute | Chronic | | | Tox. | Carcin. | |
| | ug/l | ug/l | ug/l | ug/l | ppm whole fish | ppm whole fish | ppm whole fish |
| Chlordane (total) | 2.4 | 0.0043 | 0.002 | 0.06 | 0.5 | 0.37 | |
| DDT + metabolites | 1.1 | 0.001 | | 0.003 | 0.2 | 0.27 | 1.0 |
| Dieldrin | 2.5 | 0.0019 | 0.001* | 0.001* | 0.022* | | |
| Mirex | | 0.001 | | 0.005 | 0.33 | Below detection | |
| Dioxin (2,3,7,8 TCDD) | <0.01 | <0.00001 | | | 0.000003 | 0.0000023 | |
| Hexachlorobenzene | | | | | 0.33 | 0.2 | |
| Octachlorostyrene | | | | | 0.02 | | |
| PCB (total) | 2 | 0.014 | | | 0.11 | 0.11 | 0.1 |
| Cyanide | 22 | 5.2 | 5 | | | | |
| Aluminum | | | | | | | |
| Arsenic | 360.(tri.) 850.(pent.) | 190.(tri.) | | | | | |
| Cadmium | 3.9 | 1.1 | 0.2 | | | | |
| Copper | 18.** | 11.8** | 5 | | | | |
| Iron | | 1000 | 300 | | | | |
| Lead | 82.** | 3.2** | 3.2** | 5 | | | |
| Mercury | 2.4 | 0.012 | 0.2 | 0.2 | | | 0.5 |
| Nickel | 1400 | 160.** | 96.** | 25 | | | |
| Silver | 4.1 | | 0.1 | | | | |
| Zinc | 120 | 110 | 30 | | | | |

* aldrin + dieldrin **Hardness-dependent; value assumes 100 mg/l hardness. The value of the criterion increases as the hardness of the water increases. The hardness value of Lake Ontario is 120 mg/L.

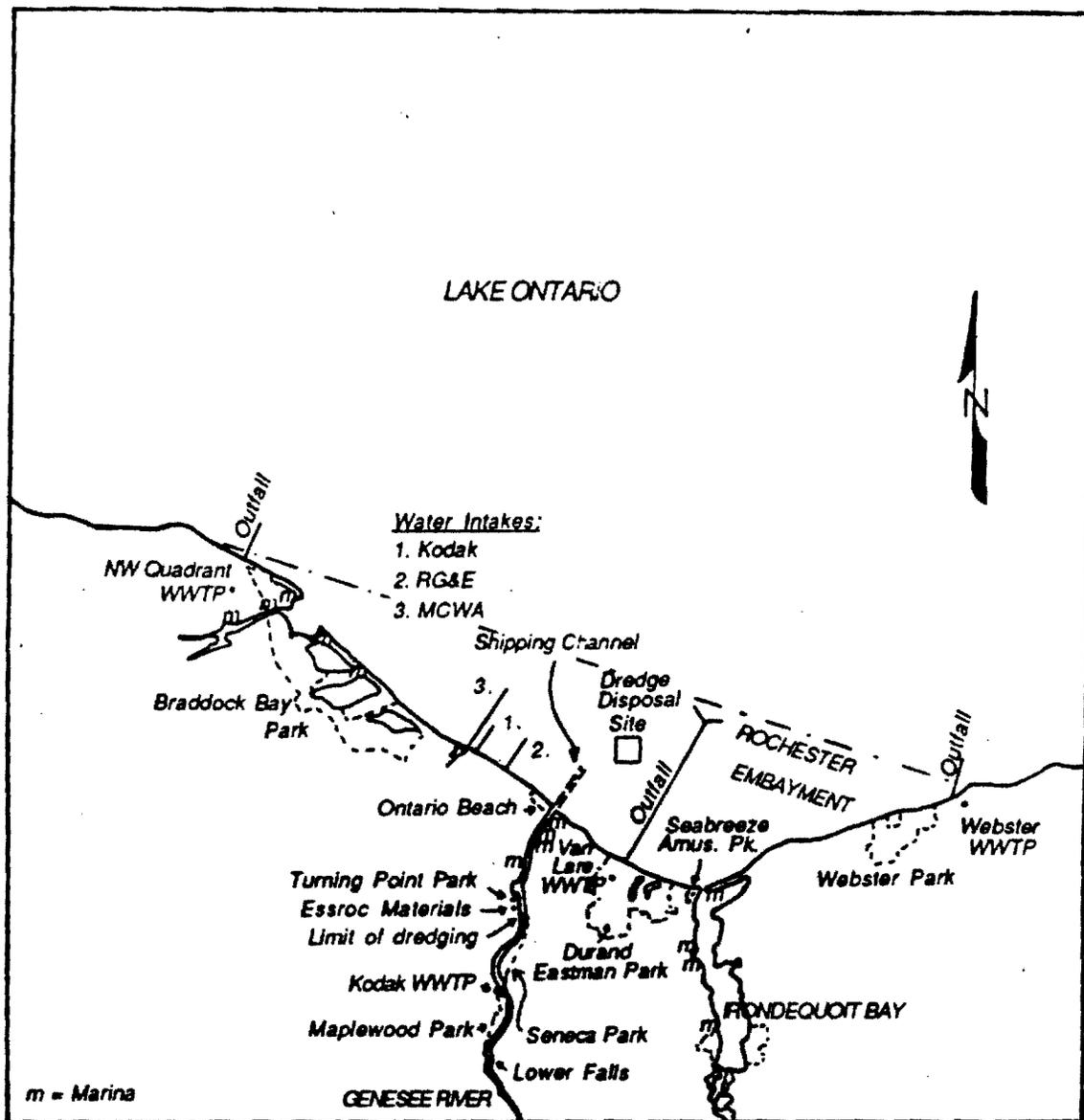
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SCALE



FIGURE 3-1 HUMAN USES OF EMBAYMENT