DEC
PUBLICATION

Oswego River
Remedial Action Plan

Stage I

February 1990

New York State/Department of Environmental Conservation

OSWEGO RIVER

REMEDIAL ACTION PLAN

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New York State Department of Environmental Conservation

This Oswego River Remedial Action Plan, Stage I, was prepared by the New York State Department of Environmental Conservation in cooperation with the Oswego River Citizens' Advisory Committee.

OSWEGO RIVER CITIZENS' ADVISORY COMMITTEE

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Co-Chair

Dr. Ronald Scrudato
Co-Chair

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Auralie Ashley-Marx

Michele Bielman

Michael Cole[2]

Dr. Helen Daly

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Les Monostory

Julia Portmore

Eli Rapaport[3]

Mike Rosen[4]

Dr. Donald Ross

Gary Schoonmaker

Michael Stoll

Sandy Weston

Past Members:

- Robert Burch
- William Cahill
- Tim Eder
- Mark Lichtenstein
- Ronald Woodward

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1 Representing City of Fulton Mayor, Muriel Allerton

2 Representing City of Syracuse Mayor, Thomas Young

3 Representing City of Oswego Mayor, John Sullivan

4 Representing Oswego County Administrator Carolyn Rush

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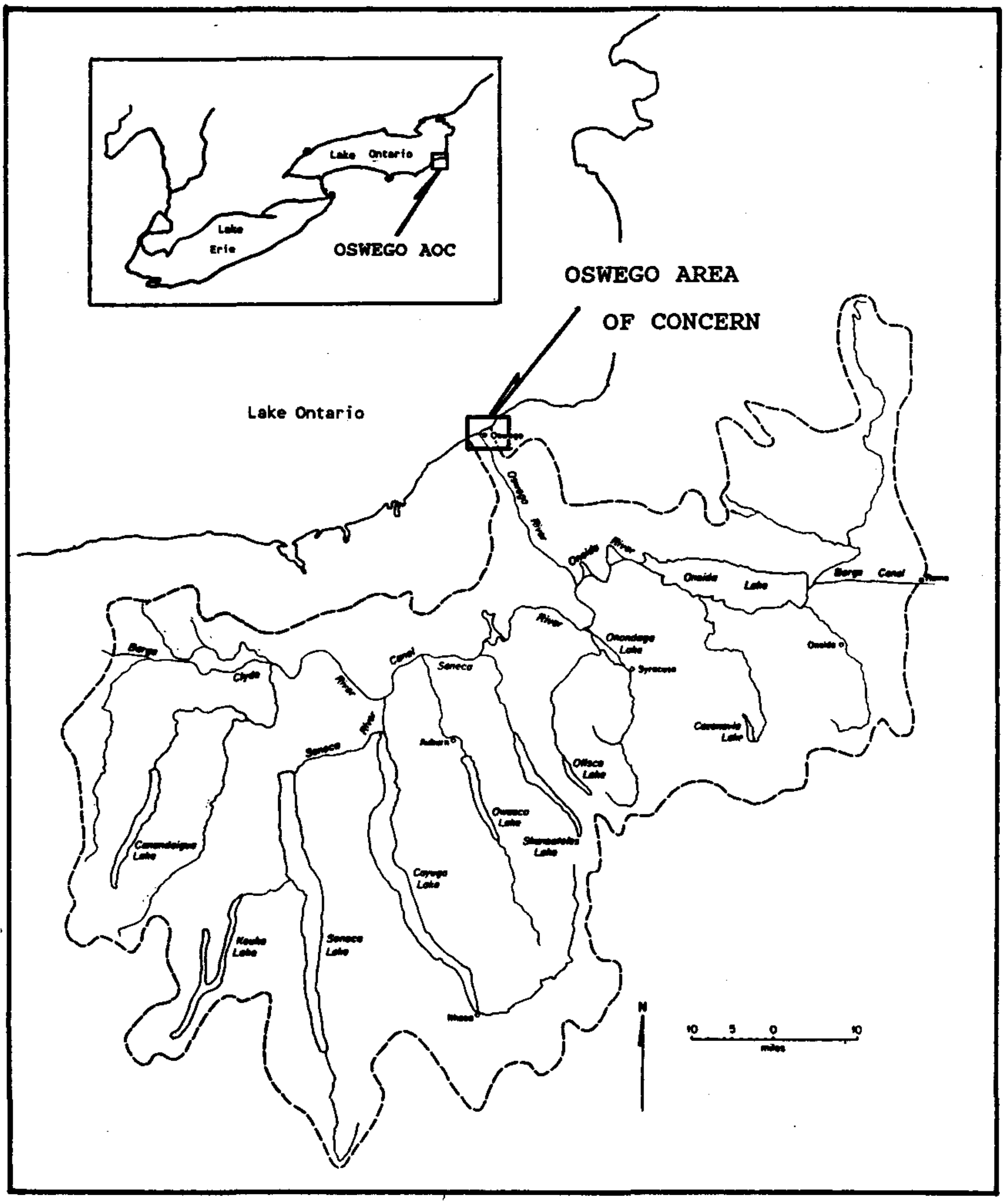
SUMMARY

The Oswego River, with its harbor to Lake Ontario, is a valuable natural resource for industry, commerce, and recreation in central New York State. The lower Oswego River and Oswego Harbor can be characterized as a multiple use resource. Manufacturing plants, commercial storage facilities, and locks to accommodate canal navigation line the shore along with charter docks, a marina, restaurants, suppliers, and services for recreational harbor users and tourists. The tourism and attendant commercial activity generated by the sport fishery are vital to the area's economy.

The average water flow into the Oswego Harbor is 4.2 billion gallons per day. Along with this comes the runoff from more than three million acres of urban, rural, and agricultural land. The Oswego River and its associated tributaries drain a 5,000 square mile watershed, the second largest in New York State. The waters of the Oswego include the drainage from the hills above the Finger Lakes and the treated discharge from sewage treatment plants and industries as far from Oswego as Canandaigua and Ithaca. A dominant urban core (Syracuse and its suburbs) is within the basin, as are eight smaller cities and dozens of villages. There are extensive areas of farmland and forest, and scattered shoreline development. The health of the entire river system is vital to the more than 1.2 million people who live in the drainage basin. A variety of industries use the river's water for processing, for cooling, and for discharging treated wastes. The waters of the river also provide habitat for a variety of fish and waterfowl. Because the Oswego is second only to the Niagara River in size as a tributary to Lake Ontario, pollutants carried by the river also effect the health of Lake Ontario's ecosystem.

THE RAP PROCESS

Past industrial and municipal discharges have contaminated the river and its bottom sediments. Pollutants from the river's drainage basin have traveled through the river and harbor to Lake Ontario, adding to that lake's environmental problems. For these reasons, the International Joint Commission designated the Oswego River and Harbor as one of the 42 Great



The Oswego River Area of Concern Location and
the Seneca-Oswego-Oneida Rivers Basin

Lakes Areas of Concern. New York, together with the other Great Lakes states and the Province of Ontario, is preparing plans for the remediation of the problems in these Areas of Concern. The United States-Canada Great Lakes Water Quality Agreement specifies requirements for such plans, which are called Remedial Action Plans (RAPs). The plans are to serve as an important step toward virtual elimination of persistent toxic substances and toward restoring and maintaining the chemical, physical, and biological integrity of the Great Lakes Basin Ecosystem.

To help prepare the RAP, the New York State Department of Environmental Conservation (NYSDEC) formed a Citizens' Advisory Committee which includes citizens living in the Oswego River Basin, industry representatives, sports people, environmentalists, research scientists, and local government representatives. NYSDEC staff and the Citizens' Advisory Committee are working together to develop the Oswego RAP.

GOAL

The Goal of the Remedial Action Plan, as established by the Citizens' Committee is three-fold:

1. to achieve the purposes of the Great Lakes Water Quality Agreement within the Oswego Area of Concern;

2. to restore the water quality of the AOC so that it is capable of supporting swimming and an edible, diverse, and self-sustaining fishery; and

3. to eliminate adverse impacts to Lake Ontario arising from the Oswego-Oneida-Seneca basin.

Stage I of the RAP describes the Area of Concern's environmental problems, the pollutants causing the problems, and the sources of those pollutants. This document provides a summary of these findings. Stage II will describe a remedial strategy and make specific recommendations for remedial actions to correct identified problems. Work has already begun on Stage II.

PROBLEMS: WATER QUALITY IMPAIRMENTS AND POLLUTANTS

The RAP is intended to identify water quality problems in the Oswego Harbor and lower Oswego River, including potential adverse impacts to Lake Ontario. The procedure used for preparation of the Stage I RAP report was a two-step process. Step 1 involved the identification of impaired uses in the Area of Concern, including human uses such as swimming, fishing, and commercial navigation, as well as those water quality factors affecting fish and wildlife. Step 2 in the process consisted of identifying the causes of use impairments based on best available scientific evidence. In most cases, only limited data were available to identify use impairments and their causes. Further research may therefore be needed to collect additional evidence on impairments. The terms "high confidence" and "low confidence" are used to describe the degree of certainty of the findings based on the sufficiency of available data.

OSWEGO HARBOR PROBLEMS

NYSDEC and the Citizens' Advisory Committee examined information on the water quality in the harbor and lower Oswego River. This information included pollutant concentrations in the water, bottom sediments, fish, and aquatic life. It was compared against the water quality impairment indicators listed in the Great Lakes Water Quality Agreement.

After evaluating available evidence, five of the indicators were identified with high confidence:

1. Restrictions on Fish Consumption:

   Impairment does exist. PCBs and dioxin were identified as the causes.

2. Degradation of Fish and Wildlife Populations:

   Impairment does exist. The known cause is the formation of periodically dry areas below the Varick Dam which causes loss of fish eggs.

3. Oxygen Loss, Undesirable Growth of Algae, Loss of Water Clarity:

   Impairment does exist. The cause has been identified as phosphorus. The problem originates with municipal sewage discharges, combined sewer overflows, and street and agriculture runoff.

4. Added Cost to Agriculture or Industry Due to Water Quality Problems:

   This is not impaired since there are no known uses of water directly from the Area of Concern by industry or agriculture.

5. Restrictions on Dredging:

   This is designated as not impaired since there are no current restrictions on open lake disposal of dredge spoil from the area. The CAC, however, is opposed to open lake disposal since some sampling points in the harbor exhibit elevated levels of cyanide, zinc, barium, lead, grease, and oil.

For six of the indicators, the RAP assigned "low confidence" to the conclusions because of the lack of direct evidence. The need for additional information on these six indicators will be addressed in Stage II of the RAP. Based on indirect evidence, four indicators of impairment may exist. The four are:

1) Degradation of Fish and Wildlife Populations;
2) Bird and Animal Deformities or Reproductive Problems;
3) Degradation of Micro-organisms, Insects, and Small Animals Living in Bottom Sediments.

The indirect evidence on which this judgment is based includes elevated levels of PCBs, octachlorostyrene, and dioxin in fish from the area. There have also been observations of 4) Fish Tumors and Other Deformities from fish in the AOC.

Also falling into the "low confidence" category are two indicators for which indirect evidence suggests impairment may not exist. No reports of 1) Tainting of Fish or Wildlife, have been recorded. Likewise, there has not been evidence of continuing 2) Degradation of Aesthetics, such as unnatural color or odor. There have been incidents of muddy appearance linked to high flow periods, but these are thought to be natural.

One indicator, Degradation of Phytoplankton and Zooplankton, has been determined as unknown. No data exist to determine whether or not these minute plant and animal organisms which float in a waterbody would be impacted by water quality conditions in the Area of Concern.

The two of the three remaining criteria (of the indicators listed in the Great Lakes Water Quality Agreement) were found not to apply to this Area of Concern.

1. Restrictions on Drinking Water Consumption:

   The water from the AOC is not presently a drinking water source.

2. Beach Closings:

   The lake bottom in the harbor, and along the shoreline immediately adjacent, is steep and probably not suitable for swimming beaches.

In connection with the final impairment indicator, Loss of Fish and Wildlife Habitat; the Stage I RAP does not address this indicator because the AOC is in a highly developed urban area where obvious degradation has occurred. The Stage II RAP will recommend habitat improvements which could be made.

LAKE ONTARIO PROBLEMS

In addition to evaluating the Oswego AOC relative to the impairment indicators, the RAP also views the river as a contributor of pollutants to Lake Ontario. To identify problems in Lake Ontario that may originate in the Oswego River and its basin, the RAP began with the Lake Ontario Toxics Management Plan (LOTMP). The LOTMP was adopted in 1989 by the NYSDEC, the US Environmental Protection Agency, the Ontario Ministry of the Environment, and Environment Canada to guide their coordinated attack on the lake's toxics problems. The LOTMP identified seven contaminants hat exceed enforceable standards either in Lake Ontario water or fish flesh. In the RAP, export of these seven pollutants from the Oswego River to Lake Ontario is examined to identify those that are likely to be coming from or through the Oswego River in significant amounts.

Of the seven contaminants, evidence suggests that four; mirex, PCBs, dioxin, and mercury may be entering Lake Ontario from the Oswego River. For the other three contaminants, the evidence suggests it is unlikely that there is a significant net transport of aluminum, chlordane, or iron from the river to Lake Ontario.

POLLUTANT SOURCES

Where an impairment is indicated and its cause is known, environmental and source data were examined to make a preliminary evaluation of the pollutants' possible sources. In some cases, the data are insufficient to make a definite assignment of a source at this stage. The attached table shows the pollutants known to cause certain impairments, and the possible sources of those pollutants.

THE NEXT STEP: STAGE II

In Stage II of the RAP, remedial recommendations will be developed to respond to the problems and sources identified in Stage I. The remedial strategy will aim at restoring the water quality within the Oswego Harbor and lower river, and eliminating adverse impacts to Lake Ontario from pollutants carried by the Oswego River.

The RAP will also describe a long-term strategy for tracking remedial progress and reporting that progress to the public, for making further agency commitments, and for revising the overall remedial strategy as more information becomes available.

Priorities will also be established for gathering additional data on those indicators for which insufficient information is available to evaluate an impairment (the six indicators cited with low confidence).

When the Stage II RAP is completed, DEC will use it as a basis for deciding on remediation priorities, for seeking support from funding agencies, and for committing to specific remedial actions.

SUMMARY OF SOURCES OF POLLUTANTS CAUSING IMPAIRMENTS

Pollutant	Impairments (Confidence)	Possible Sources[a]
PCBs	Fish consumption advisories (high)	Lake Ontario
	Lake Ontario export (low)	Permitted discharges (3) Bottom sediments of Onondaga Lake Hazardous waste sites (9) Owasco and Onondaga Lakes drainage Vicinity of Village of Skaneateles Falls (tentative-specific source unknown) Oswego River drainage between Fulton & Phoenix (tentative-specific source unknown)
dioxin	Fish consumption advisories (high) Lake Ontario export (low)	Unknown
phosphorus	Algal growth	Sewer overflows Sewage treatment plants Agricultural runoff
mercury	Lake Ontario export (low)	Bottom sediments of Onondaga Lake associated with past chlor-alkali manufacturing Bottom sediments in AOC Permitted discharges (7)
mirex and photomirex	Lake Ontario export (low)	Bottom sediments of Oswego River below Fulton Hazardous waste sites (2)
octachlorostyrene	Reduction of bird and animal populations (low)	Lake Ontario

[a] Sources believed to be major are underlined.

CHAPTER 1
INTRODUCTION

The Oswego River is New York's largest tributary to the Great Lakes, the world's largest surface freshwater resource. The Oswego River harbor is a major focus for human activity along the southern shore of Lake Ontario.

Past industrial and municipal discharges of pollutants to the Oswego River's basin have contaminated the river and its bottom sediments. Some of the pollutants have entered Lake Ontario and contributed to ecosystem damage.

Correction of environmental problems in the Oswego River and harbor should also lead to an overall improvement in the environmental quality of Lake Ontario, the St. Lawrence River, and, ultimately, the overall Great Lakes ecosystem. For these reasons, the United States-Canada International Joint Commission (IJC) designated the Oswego River and harbor as one of 42 Areas of Concern (AOC) where pollution problems may affect the health of the Great Lakes ecosystem. IJC requested that the jurisdictions prepare plans for remediation of the AOCs.

The 1987 amendments to the United States-Canada Great Lakes Water Quality Agreement (GLWQA) specify requirements for "Remedial Action Plans" (RAPs) for the Areas of Concern. Each RAP is to define environmental problems and identify actions needed to restore beneficial uses of the waterbody. The plans are to embody a systematic, comprehensive, ecosystem approach to restoring and protecting biota and water quality. They are to serve as an important step toward virtual elimination of persistent toxic substances and toward restoring and maintaining the chemical, physical, and biological integrity of the Great Lakes basin ecosystem. They should set time schedules, name responsible agencies, and describe processes to monitor the AOC environment and track implementation. The lead agency for the RAP should work closely with citizens to develop an ecosystem-based plan that represents the concerns of the local community.

The Oswego RAP was prepared by the New York State Department of Environmental Conservation (NYSDEC) in cooperation with the Oswego River Citizens Advisory Committee (CAC). A steering committee of CAC and NYSDEC members guided development of the RAP and ensured that concerns of citizens in the Oswego River basin were considered throughout the RAP process. The steering committee established the goals of the RAP, mapped out a project workplan, defined responsibilities, and developed and reviewed document drafts in conjunction with the CAC. In addition, the CAC undertook a public outreach program to increase public awareness of the RAP process, to improve the RAP through additional public comment, and to build support for RAP implementation.

The Oswego RAP lays out an overall remedial strategy to correct environmental problems in the Oswego AOC. The RAP will be developed in two stages. Stage I describes the environmental problems and impaired uses of the AOC, the pollutants causing impairments of uses, and the sources of those pollutants. Stage II will describe a remedial strategy, make specific recommendations for remedial work, and describe methods for monitoring progress in remediating the AOC. When Stage II is completed, NYSDEC will use the RAP as a basis for deciding on remediation priorities and for committing to specific actions. NYSDEC will also use the RAP to assist in implementation of the Lake Ontario Toxics Management Plan (LOTMP). The RAP will identify and recommend remedial actions, when necessary, for the sources of the chemicals of concern identified by the LOTMP as exceeding enforceable standards in Lake Ontario.

This RAP will represent the beginning of a continuous process to remediate known problems and carry out investigations needed to further identify water quality impairments and their causes.

A complete set of reference material upon which this RAP was based is maintained in the NYSDEC Albany office. Another set is maintained in the Syracuse Regional Office.

CHAPTER 2
SETTING

To understand the discussion in the following chapters, some knowledge is needed of the Area of Concern and the basin draining into it. Both the environmental and institutional settings are considered in this chapter, including physical characteristics, past and present water quality, water uses that may have affected water quality, and pollution control programs.

ENVIRONMENTAL SETTING

Area of Concern

Introduction

The AOC is located on the southeastern shore of Lake Ontario and is centered in the City of Oswego (Figure 2-1). Since the IJC did not precisely define the Oswego River AOC, NYSDEC, on the advice of the Oswego River Citizens Advisory Committee, defined it as: The area at the mouth of the Oswego River bounded by the breakwalls and an imaginary line connecting the breakwalls; the Oswego River as far south as the first barrier, the Varrick Dam; and the shoreline area from the breakwall on the west to a point on the shore where a line extended from the breakwall on the east would meet the shore (Figure 2-2).

The AOC has the same water level throughout as Lake Ontario and thus, in spite of the flow of the Oswego River, there is always an opportunity for Lake Ontario water to enter the AOC. This occurs most often when a temperature difference between the lake and river water leads to differences in density between the two waters.

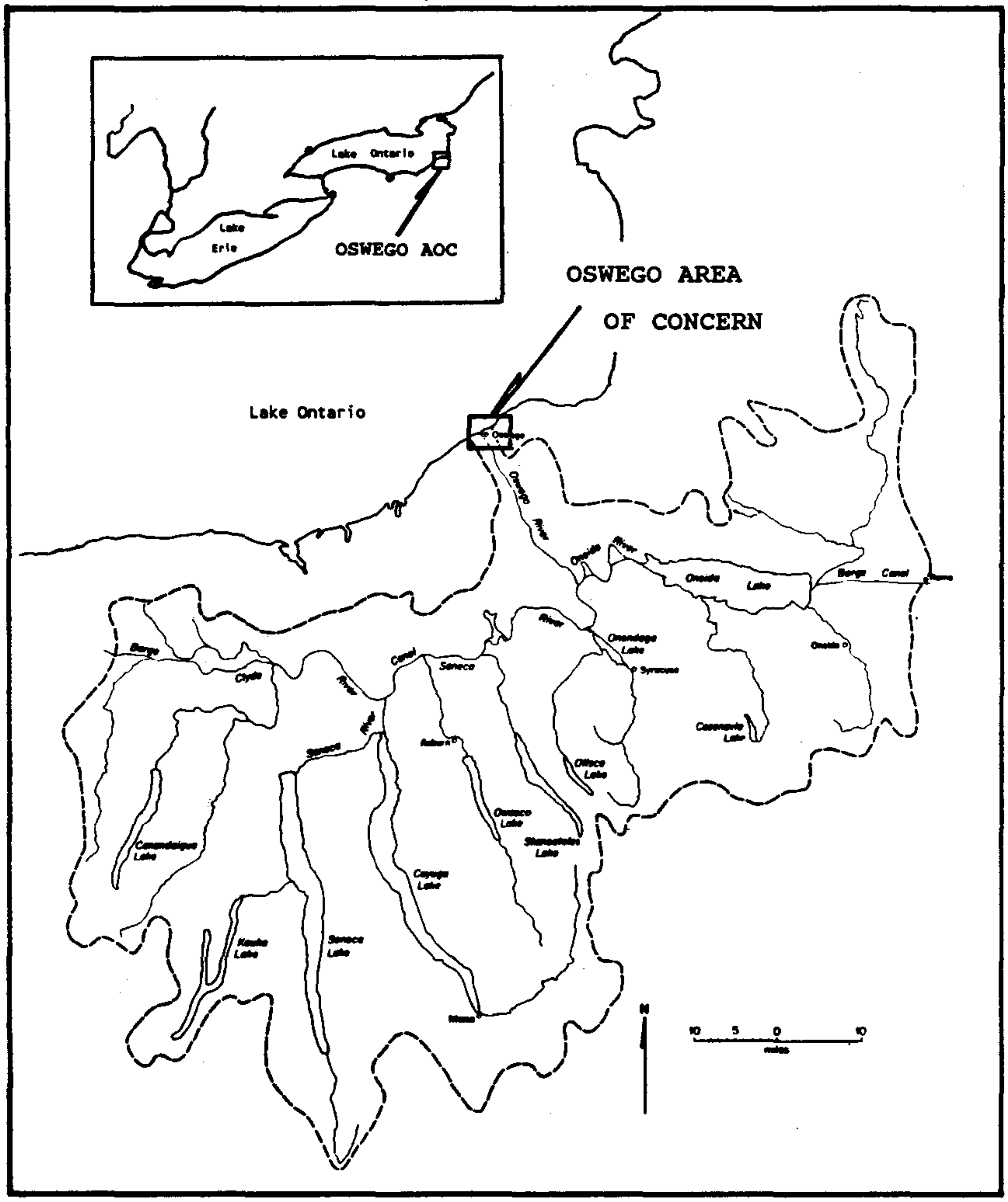


Figure 2-1. The Oswego River Area of Concern Location and the Seneca-Oswego-Oneida Rivers Basin

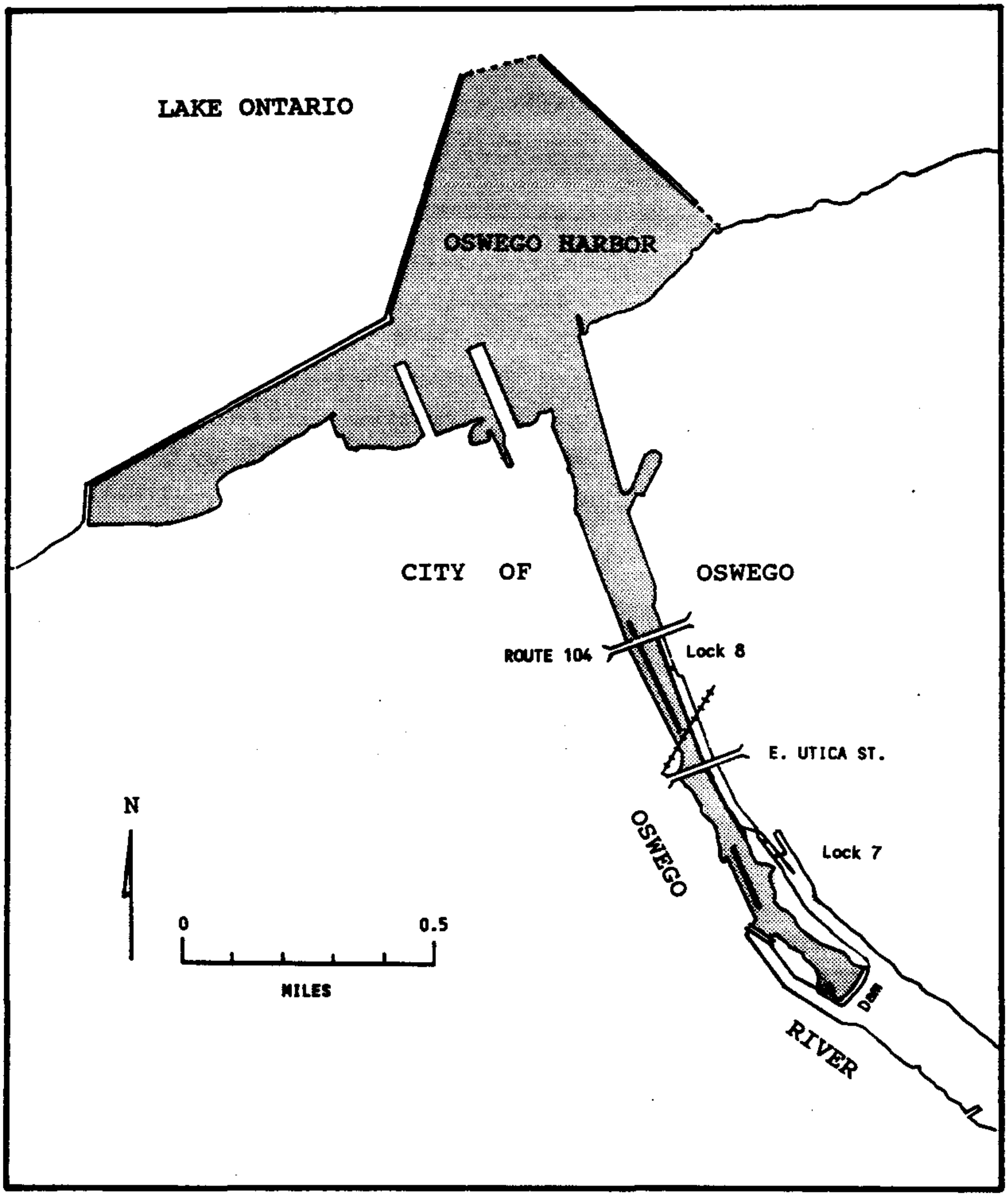


Figure 2-2. The Oswego River Area of Concern

Historical Use

Approximately 400 years ago the Iroquois Indians established a settlement at the natural harbor where the Oswego River flows into Lake Ontario. At that time, aquatic weeds probably obscured the view of the river from the lake, and a sand spit blocked direct entry of the river from the lake.

Cities and villages appeared when European settlers moved into the area. The U.S. Congress designated Oswego as the first freshwater port of entry in 1779. The first dredging of the river took place in the early 1800s. In 1829 the Oswego Canal opened, connecting the river with the Erie Canal and stimulating trade. Oswego was one of the busiest ports in the eastern United States during 1850-1875.

Current Use

The harbor and lower Oswego River are surrounded by the City of Oswego (population 19,793, 1980 census). Industrial and commercial facilities and locks and breakwaters associated with the Oswego Canal border the shoreline of the river within the city. The Oswego Westside sewage treatment plant discharges treated effluent to the western end of the harbor, and Niagara Mohawk Power Company discharges some of its cooling water to the same area.

The harbor currently is an active commercial port with storage and handling facilities for petroleum, grain, cement, and salt.

Recreational boaters also use the harbor. Because of the increased interest in the Lake Ontario fishery, recreational boating pressures have increased in recent years and show every sign of continuing. This pressure is likely to come into conflict with other pressures to expand commercial shipping in a confined area where there is little room for expansion.

Because of the need to keep shipping and boating lanes open in an artificial harbor, periodic dredging is required.

Current Non-Uses

There are no swimming beaches within the AOC, but people have been known to swim in the harbor. The AOC is not used as a drinking water supply, but the City of Oswego water supply intake lies 1.7 miles west of the AOC in Lake Ontario. This intake provides the City of Oswego, much of Onondaga County, industries, and some towns with their water supply.

Past Water Quality

Water quality in the AOC degraded steadily with growth of population and industry until the mid-1960s. Since the 1960s, water quality has improved for two reasons: (1) the construction and upgrading of municipal sewage treatment plants and conveyance systems; and (2) regulation leading to significant reduction of pollution from industry and commerce.

During the 1960s raw sewage was noticeable in the harbor. There were 16 to 18 raw sewage discharges into the Oswego River along its west side from the city line to the harbor. There were two raw sewage discharges directly into the harbor. On the east side, there were about a third as many dischargers as on the west side and seven of these were into the Oswego Harbor or into Lake Ontario directly east of the harbor.

Water quality improved after sewer interceptor lines were installed along the east side of the river in 1969 and construction of the East Side Sewage Treatment Plant began in 1970. The plant went on line in 1974 discharging treated sewage to a Lake Ontario outfall about 0.4 miles east of the Oswego River harbor.

Sewer interceptor lines were installed on the west side of the river in the mid-1970s and the West Side Sewage Treatment Plant went on line in 1978 significantly improving the effluent discharged into the western end of the harbor.

Additional combined sewer flow and facility improvements to reduce overflow were undertaken on the west side in the mid-1980s. A swirl concentrator to remove solids was installed on the combined sewer overflow to the harbor in 1986 to reduce pollution discharged at this point.

In a comment on the water quality of Oswego Harbor, the 1987 IJC Water Quality Board Report listed the following use impairments for the Oswego River and harbor: fish consumption, the fishery, ecosystem productivity and aesthetics. In that report, toxic substances contamination of the water and sediments and probable ammonia toxicity were described as the primary causes of impairment. The data on which the 1987 IJC assessment was based were collected between 1976 and 1983.

Present Water Quality

To assess present water quality, measurements of pollutant concentrations in the water of the Oswego River are compared with numerical standards or guidance values adopted by New York State and Specific Objectives listed in the Great Lakes Water Quality Agreement (GLWQA) between the United States and Canada. Standards and guidance values are based on scientific evidence, usually derived from studies of animals or aquatic life. Pollutant concentrations exceeding standards or guidance values suggest that water quality impairments may occur.

To the extent that water quality and criterion information are available, measurements show that water quality in the AOC is generally consistent with New York State standards and GLWQA Specific Objectives.

Ammonia

- Twenty-two measurements of total ammonia have been made in the lower Oswego River near its mouth by NYSDEC between March, 1986 and April, 1989. They all show ammonia levels that do not exceed the New York State water quality standard (a function of pH and temperature) for A, A-Special, B, and C waters.

<u>Metals</u>

- Chemical analyses of water samples in the AOC between 1981 and 1988 showed that six metals exceeded either a New York State water quality standard or guidance values or a GLWQA Specific Objective at least once. Table 2-1 shows the median values and the number of samples where the measured values exceeded the standard or objective. Caution should be exercised in interpreting these results. The standards and guidance values in Table 2-1 apply to the "acid-soluble form" for all metals except mercury. The measured values are based on total metal. The "total" metal concentration is likely to be larger than the "acid soluble" concentration.

- Zinc exceeds the standard and objective frequently, and this is typical of data for most other watersheds in the state. The <u>Report of the Fixed Station Toxics Surveillance Network, 1985</u> (NYSDEC, June, 1986) states "Zinc is a ubiquitous element and is frequently detected in the network samples. The water column samples will likely contain significant amounts of zinc, but these levels can be elevated by contamination from the preservation acids, containers, and in the analytical laboratory. This problem is being investigated by the Departments of Environmental Conservation and Health, and until a resolution is reached, all zinc data should be regarded with skepticism".

<u>Volatiles</u>

- Five samples were taken in the AOC in 1987 for analysis of 43 volatile halogenated organic substances. All were undetected at 1 ug/L.

- New York State standards or guidance values for Class C waters were available for only five of the 43 volatile organics. These were the three dichlorobenzenes (5 ug/L), trichloroethene (11 ug/L), and tetrachloroethene (1 ug/L). For Class A-Special waters (applicable to boundary waters - see p., 3-4 for a discussion of water

TABLE 2-1 NYSDEC WATER QUALITY MEASUREMENTS IN THE AOC FROM 1982 to 1988[a,b] (ug/L) FOR SUBSTANCES WHERE ONE OR MORE MEASUREMENTS EXCEEDED EITHER A NYS STANDARD, GUIDANCE VALUE, OR GLWQA OBJECTIVE

Substance	NYSDEC Standard or Guidance Value[c]	GLWQA Objective	Median concentration[d,e]	NYSDEC Standard or Guidance Value Exceedences[f]	GLWQA Objective Exceedences[f]
cadmium	2.7	0.2	1	2/48	Detection limit above objective
copper	30.3	5.0	10	1/48	Detection limit above objective
lead	12.9	25.0	10	5/48	4/48
mercury	0.2	0.2	0.2	7/48	7/48
nickel	220	25.0	2	0/48	4/48
zinc	30.0	30.0	20	12/48	12/48

[a]1982-1986 data from Reports of Fixed Station Surveillance Network. NYSDEC. Sampling carried out at the bridge over the Oswego River below Lock 8.

[b]1987-1988 data from Rotating Intensive Basin Studies. NYSDEC files. Sampling carried out at Minetto about 4 miles upstream of the AOC. (See Fig. 2-3.)

[c]The standards and guidance values apply to A, A-Special, B, and C waters.

[d]Since detection limits were reduced for many metals in 1985, the medians are calculated only for the 1985-1988 data.

[e]In 1987, 7 samples were taken at Lock 8, and 5 samples were taken at Lock 7. In 1988, all samples were taken at Minetto. (See Fig. 2-3.)

[f]Number exceeding/total number of measurements.

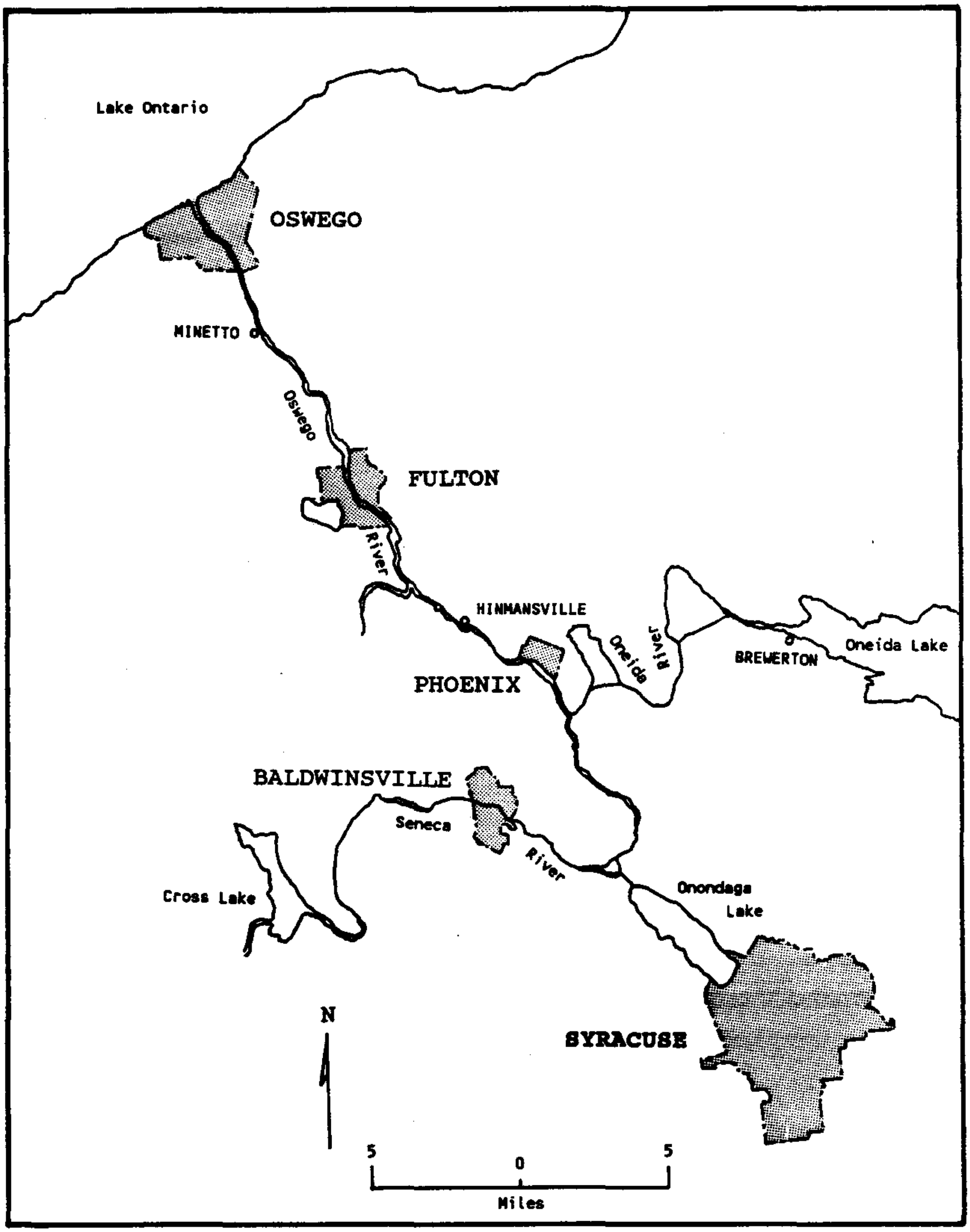


Figure 2-3. The Lower Portion of the Seneca-Oswego-Oneida Rivers Basin

classification), there are standards or guidelines for 25 of these substances. Ten of these are below 1 ug/L which is the detection limit used in the 1987 sampling.

Other Substances

- Benzene was measured 31 times between 1982 and 1986 and was less than 1 ug/L except for two measurements: 1 ug/L in 1982 and 7 ug/L in 1984. The NYS guidance value is 6 ug/L.

- Dissolved oxygen measurements in the AOC have been carried out by the US Geological Survey at Lock 7. Thirty-five measurements were made between 1981 and 1987. In all cases, dissolved oxygen was above the NYS standard (5 mg/L). The GLWQA objective of 6 mg/L was achieved by all but one sample that was at 5.6 mg/L in 1981. DEC made 20 dissolved oxygen measurements in 1986 at Lock 7 and in 1987 at Minetto. All were above 6 mg/L except for one reading of 5.25 mg/L in 1986.

- Pesticide measurements in water samples from the AOC were carried out by NYSDEC in 1983 and 1984 to determine whether or not there were large quantities of these chemicals in New York waters. Because the pesticide detection limits were well above New York State standards and GLWQA objectives, these data cannot be used to draw conclusions regarding whether the ambient concentrations exceeded standards and objectives.

Fish and Wildlife Habitat

The AOC provides good habitat for a variety of fish and waterfowl in spite of extensive habitat modification associated with a major commercial port and recreational facility in the heart of an urban area.

Sport fish species from Lake Ontario are found in the AOC. These include chinook and coho salmon, brown trout, lake trout and rainbow trout. Populations of smallmouth bass and walleye also live in the AOC. Walleye spawn in the river just below the first dam.

Waterfowl winter in the Oswego Harbor area, because of the open water created by the natural flow of the Oswego River and by warm water from the Niagara Mohawk power plant discharge. Scaup, common goldeneye, mergansers, black duck, mallard, oldsquaw, canvasback, and bufflehead use the area.

Scenic and Unique Areas

Scenic vistas include views of Lake Ontario from Wright's Landing, Fort Ontario, and the coastal bluffs east of the fort, and views of the Oswego River from vantage points on both the east and west banks.

Bluffs and bedrock outcroppings along the eastern shoreline are unique geologic areas and are of local interest. These areas are not currently under development pressure, but if this condition should change, the City of Oswego's intent is to use the city's land development review process to protect natural resources from undesirable encroachment.

Drainage Basin

Introduction

The Oswego River drains a basin of 5,123 square miles that also includes the drainage of the Seneca and Oneida rivers. These three major rivers in the basin in turn drain Oneida, Onondaga, Canandaigua, Keuka, Seneca, Cayuga, Owasco and Skaneateles lakes and their drainage basins (Figure 2-4).

The average daily discharge of the three major rivers is:

Oswego - 6,478 cfs
Seneca - 3,409 cfs
Oneida - 2,538 cfs

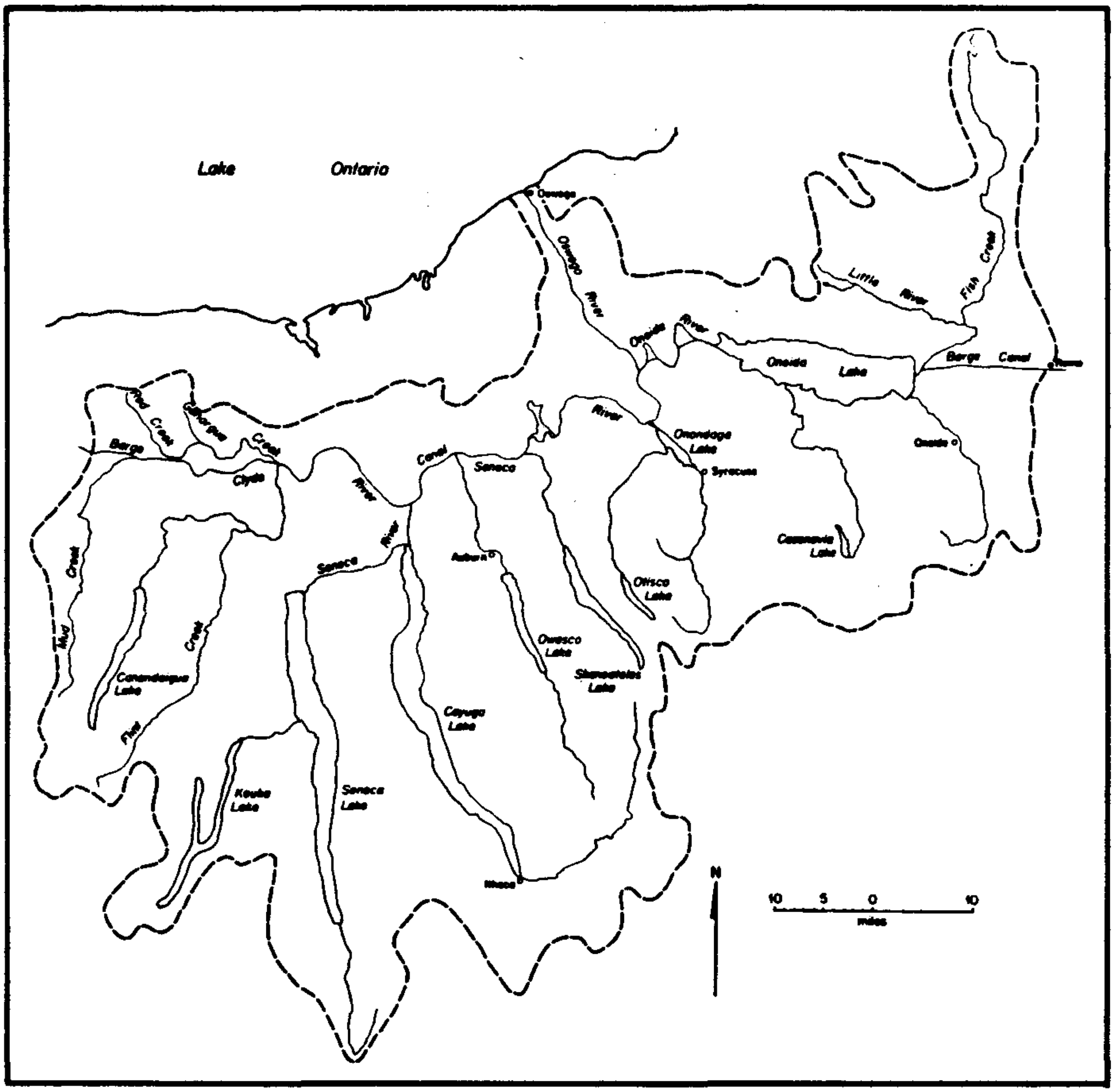


Figure 2-4. The Seneca-Oswego-Oneida Rivers Basin

Regulation, Navigation, and Power Generation

The Oswego River is regulated by dams on the Oneida and Seneca Rivers, and a series of dams and locks along the Oswego River (Table 2-2). These, together with locks on the Seneca and Oneida rivers, provide for recreational and commercial navigation as part of the New York State Barge Canal System. Some of the dams also function to store water for electric power generation.

TABLE 2-2. MILE POINTS AND LOCKS ON THE OSWEGO RIVER

Lock No.	Location	Milepoint
1	Phoenix	21.7
2	Fulton	12.3
3	Fulton	11.6
5	Minetto	5.1
6	Oswego	1.8
7	Oswego	1.4
8	Oswego	0.6

Industry

Manufacturing plants in the basin concentrated along the waterways to take advantage of water power and transportation. Early industry depended upon local resources, but competition from the midwest and transportation improvements changed the character of manufacturing. For example, salt production was the first major industry of Syracuse, but after the Civil War salt production in New York State declined and was replaced by the production of metal products and a more diversified chemical industry, based on the Solvay process for the manufacture of caustic soda and bicarbonate of soda.

The basin's Onondaga Lake is home to several major industries which have manufacturing processes or waste disposal methods that may affect or have affected the AOC.

- Allied was the largest chemical manufacturer in the basin until it closed its Syracuse plant in 1986. Allied produced soda ash (Na_2CO_3, a substance used mainly in glass manufacturing), and discharged sodium chloride, calcium chloride, and mercury wastes to Onondaga Lake and along its shore. Allied also operated a chlorobenzene plant that discharged benzene and other wastes into lagoons near the plant.

- LCP Chemicals acquired the Allied mercury cell plant in 1979 to produce chlorine from brine by electrolysis. LCP discharged mercury, caustic soda, and sodium hypochlorite to Onondaga Lake or its tributaries until it closed its Syracuse plant in 1988.

- Bristol Laboratories operates a penicillin plant that discharges organic chemicals to the Syracuse Metropolitan Treatment Plant, operated by Onondaga County.

- Crucible Steel is a major metal refiner that discharged chromium wastes to the lake. This source was considerably reduced by pollution controls installed in the early 1980's.

Significant industry remains in the basin, but there is an increasing emphasis on the service industry, particularly tourism. New industries, such as brewing, food processing, and tourism, are particularly dependent on a good supply of clean water.

Industries have used and still use the waters of the basin for the discharge of treated wastewater. In addition, large amounts of industrial wastes are contained in municipal and industrial landfills, several of which have been designated as hazardous waste sites. These sites pose a threat to groundwater resources in the basin, as well as an indirect threat to surface waters. Air emissions from industries in the basin, and outside, are a potential source of pollutants to the AOC. Past discharges from industry have also concentrated in the bottom sediments of lakes and rivers where they are a continuing source of pollutants to the water.

Land Use

The six general land use types in the basin are: (1) a dominant urban core represented by Syracuse and its suburbs; (2) the non-metropolitan cities such as Oswego; (3) many small villages and hamlets; (4) extensive areas of farmland and forest; (5) recreational development centered on the many shorelines, parks, and winter sports sites; and (6) random, scattered development.

Cities

The basin is home to 1,235,000 people. It includes Syracuse, the state's fifth largest city, along with other cities such as Auburn, Ithaca, Oneida, Rome, Geneva, Canandaigua, Fulton, and Oswego. These cities were centers for manufacturing in the past, but they now rely on the office, service, and retail trade, in addition to manufacturing, for economic stability. All of these cities discharge treated municipal wastewater to the surface waters in the basin.

REGULATORY AND ENVIRONMENTAL SETTING

While NYSDEC has the primary role in the development and implementation of a RAP for the Oswego River AOC, many other agencies at the federal, state, and local levels are responsible for the management of the river and harbor system. At least 30 public agencies have separate but overlapping roles, including responsibilities for water quality management, flood control, dredging, surface and groundwater supplies, power plant operations, shipping, commerce, and public recreation.

A wide variety of environmental regulatory and remedial programs were instituted gradually over the last 30 years. Public agencies developed these programs in response to serious environmental pollution. That pollution caused effects that are still evident today, particularly in sediment contamination.

Pollution Control Programs in the AOC

Section 208 Area Wide Water Quality Management Program

Under Section 208 of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500), the U.S. Environmental Protection Agency provided major funding to the Central New York Regional Planning and Development Board (CNYRPDB) and selected it to develop area-wide water quality management plans. Development of these regional plans provided a mechanism for shared federal-state-local funding of improved sewage treatment facilities. Within the Oswego River Basin, Onondaga County, the cities of Oswego, Fulton, Auburn, and many other municipalities built new and upgraded existing sewage treatment plants. The municipalities have also implemented programs for pretreating industrial effluent prior to discharge to sewage treatment plants.

With funding provided under Section 208, CNYRPDB published a number of water resources management studies , including the Oswego County Subplan. Oswego County's sub-plan projects wastewater disposal needs through 1995 and makes recommendations for potential water quality and wastewater disposal programs.

Municipal and Industrial Discharges

New York uses a substance-specific approach backed up with biomonitoring to regulate municipal and industrial wastewater discharges. Municipal sewage treatment plants and industries must obtain State Pollutant Discharge Elimination System (SPDES) permits to discharge waste water. These permits, which are issued by NYSDEC, specify the amount of each pollutant (usually in pounds per day) that is allowed to be discharged. The SPDES permit also specifies a monitoring schedule for each pollutant. NYSDEC reviews monitoring reports from dischargers to check compliance with permits. NYSDEC also carries out its own discharge monitoring and inspects dischargers' facilities.

Industrial Pretreatment

The federal and New York State governments require treatment of certain types of wastes before they are discharged by industries to municipal sewer systems. These are wastes that may either pass through a sewage treatment plant untreated, cause an upset in the sewage treatment process, or be incorporated into the sludge from the treatment plant, causing difficulties with sludge disposal.

Combined Sewer Overflows

Many municipal sewer systems have overflow outlets for excessive discharges to prevent sewer back-ups. These overflow outlets are particularly important in combined systems that also handle stormwater discharges from urban areas. Combined sewer overflows can lead to excessive pollutant loading to receiving streams during storm events. Municipal SPDES permits include combined sewer overflows as separate discharge points.

Inactive Hazardous Waste Sites

The New York State Abandoned Sites Act of 1979 provides NYSDEC and the state Department of Health with authority to order responsible parties to clean up hazardous waste sites.

In 1982, New York established the State Superfund to pay for site investigation and remedial programs undertaken by the State. Phase I and Phase II Superfund investigations provide a preliminary characterization of each site. If warranted, further intensive studies are carried out at each site prior to designing appropriate remedial work. Finally, the designed work is carried out on the site. In many cases the process from initial Phase I study to complete remedial action takes 10 years or longer.

Bottom Sediments

No formal programs exist to address contaminated bottom sediment at either the federal or state level.

Nonpoint Sources (Other Than Hazardous Waste Sites and Bottom Sediments)

Nonpoint sources of pollution are difficult to identify and control because they are not associated with a single point or location and they are distributed diffusely over an area. They include runoff from agricultural and suburban land (fertilizers, pesticides) and urban land (oil, metals), runoff from industrial sites, and spills. NYSDEC completed a nonpoint assessment report in 1989 and is currently developing a management program to control nonpoint sources throughout New York State. To date, nonpoint source pollution has been addressed on an ad hoc basis without a comprehensive program.

NYSDEC Actions Recently Taken That Reduce Pollution in The AOC

A number of changes have taken place within the past five years in the Oswego-Seneca-Oneida basin that have caused or are expected to cause improvements in water quality in the AOC:

- SPDES permits for all toxics dischargers within the basin have been upgraded to include limits on toxic substances. Surveillance to ensure that permit limits are being met is an ongoing enforcement need.

- Industrial pretreatment programs are in place for all major municipal treatment plants in the basin including the Oswego Eastside, Oswego Westside, Fulton, and Onondaga County Sewage Treatment Plants.

- Allied has ceased operation at its Onondaga Lake plant. This company was the major discharger of chloride ion in the Seneca-Oneida-Oswego basin. Residual chloride inputs continue from the Allied waste beds. The company has signed a consent order from NYSDEC to evaluate remedial alternatives for the waste beds. NYSDEC and the NYS Attorney General have initiated a lawsuit against Allied to compel remediation of mercury contamination and collect for damages to natural resources.

- LCP ceased mercury discharge to Onondaga Lake in July, 1988. In March 1989, New York State set a large criminal penalty against LCP for years of illegal discharge of hazardous wastes to Onondaga Lake. At the same time, the state initiated legal action to hold LCP, Allied, and other industries in the basin liable for cleanup of the lake and for damages to natural resources from hazardous waste pollution in the lake.

- A Consent Order signed with Anheuser-Busch, Inc., in September 1989 required them to correct operational problems at their brewery in Baldwinsville, New York. This should reduce the loading of phosphorous to the Seneca River. The allowable loading from the discharge to the Seneca River was approximately 67 pounds per day of phosphorous. However, from 1982 through 1988 during the months of June through September, the plant sometimes discharged up to 250 pounds per day of phosphorous.

Local Waterfront Revitalization Program

The City of Oswego and cooperating state and federal agencies have invested considerable resources in development of a program to restore and redevelop waterfront areas within the Oswego Harbor for commercial, industrial, cultural, recreational, and other compatible uses. The City of Oswego Local Waterfront Revitalization Program also describes policies and provisions to protect coastal fish and wildlife habitats, including protection from hazardous wastes and other pollutants which threaten fish and wildlife resources.

Financial assistance for development of the program was provided through the New York State Coastal Zone Management Program and a federal grant obtained under the U.S. Coastal Zone Management Act of 1972. The program was adopted by the City of Oswego Common Council in 1986.

CHAPTER 3

RAP PLANNING PROCESS AND GOALS

The Oswego River RAP will recommend a strategy for correcting the Oswego River AOC's water quality problems and related use impairments. Remedial actions taken under this RAP will also help remedy impairments in Lake Ontario that are caused, in part, by a net transport of pollutants from or through the AOC to Lake Ontario. The strategy is based on a water quality goal developed and adopted by the New York State Department of Environmental Conservation (NYSDEC) and the Oswego River Citizens' Action Committee (CAC). The RAP begins with the goal statement and proceeds in a logical fashion to develop a recommended remedial strategy and specific agency commitments.

THE RAP GOAL

The goal of the Oswego River Remedial Action Plan is three-fold:

1. To achieve the purposes of the Great Lakes Water Quality Agreement within the Oswego River Area of Concern;

2. To restore the water quality of the AOC so that it is capable of supporting swimming and an edible*, diverse, and self-sustaining fishery; and

3. To eliminate adverse impacts to Lake Ontario arising from the Oswego-Oneida-Seneca basin.

This goal is embodied within the federal Clean Water Act and the New York State Environmental Conservation Law.

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*edible means that there is no need for health consumption advisories

THE GREAT LAKES WATER QUALITY AGREEMENT

The Great Lakes Water Quality Agreement (GLWQA) is an agreement between the United States and Canada to carry out certain actions and programs to improve the quality of the Great Lakes. Article IV, Section f of the GLWQA states:

> The Parties recognize that there are areas in the boundary waters of the Great Lakes System where, due to human activity, one or more of the General or Specific Objectives of the Agreement are not being met. Pending virtual elimination of persistent toxic substances in the Great Lakes System, the Parties, in cooperation with State and Provincial Governments and the Commission, shall identify and work toward elimination of Areas of Concern as defined in Annex 2.

Annex 2 of the GLWQA specifies that RAPs be submitted to IJC in stages. Stage I of the Oswego River RAP includes detailed descriptions of the environmental problems and impaired beneficial uses of the AOC, the pollutants causing impairment of uses, and the sources of those pollutants.

Annex 2 defines impairment of beneficial uses as a change in chemical, physical, or biological integrity of the Great Lakes System sufficient to cause any of the following 14 conditions:

(i) Restrictions on fish and wildlife consumption;
(ii) Tainting of fish and wildlife flavour;
(iii) Degradation of fish and wildlife populations;
(iv) Fish tumors or other deformities;
(v) Bird or animal deformities or reproduction problems;
(vi) Degradation of benthos;
(vii) Restrictions on dredging activities;
(viii) Eutrophication or undesirable algae;
(ix) Restrictions on drinking water consumption, or taste and odour problems;
(x) Beach closings;

(xi) Degradation of aesthetics;

(xii) Added costs to agriculture or industry;

(xiii) Degradation of phytoplankton and zooplankton populations; and

(xiv) Loss of fish and wildlife habitat.

In this RAP, these 14 conditions are considered to be indicators of use impairment. The RAP presumes that the purposes of the GLWQA, and hence the RAP goal, will be attained when none of the 14 conditions exists in the AOC. In this RAP, xiv) has been considered as a cause of iii) and hence not a separate indicator of water quality impairment.

The GLWQA does not specify criteria for determining whether an impairment exists. For some of the indicators, such as restrictions on fish and wildlife consumption, the criterion is obvious. Other indicators require additional interpretation; for example, the determination that fish and wildlife populations are degraded depends on the baseline used to define a healthy population.

IJC has developed draft criteria for each indicator to guide the designation and delisting of Areas of Concern. In the absence of criteria for determining whether an impairment exists, the NYSDEC and the CAC modified the IJC criteria for this purpose, and the modified criteria are used in Chapter 4 of this RAP. The modifications are based on the judgment of the people working on the Oswego River RAP.

THE CLEAN WATER ACT

The federal Clean Water Act is the primary legal tool for controlling water pollution in the United States. The Act's goals are:

(i) to eliminate the discharge of pollutants into the navigable waters; and

(ii) wherever attainable, achieve a water quality that protects and allows for the propagation of fish, shellfish, and wildlife, and provides for recreation in and on the water.

THE NYS ENVIRONMENTAL CONSERVATION LAW AND STREAM CLASSIFICATION SYSTEM

New York State's water pollution control program implements the federal Clean Water Act in New York State and emphasizes achievement and maintenance of water quality that supports the best uses of each waterbody. The determination of best use is based on the physical character of the waterbody and its surroundings, how people actually do or could use the waterbody, and the existing water quality. Each waterbody's best use is determined in a public process. NYSDEC then assigns the waterbody a classification that reflects that best use. Each waterbody in the Great Lakes system is assigned one of the following classifications:

Classification	Best Use
A-Special	drinking water, with appropriate treatment, Great Lakes boundary waters
A	drinking water, with appropriate treatment
B	swimming
C	fish propagation
D	fishing

Each classification also includes those uses for the classifications listed below it.

New York State has adopted ambient water quality standards for each classification. The standards are based on scientific evidence of the water quality characteristics necessary to protect each best use. These standards are the state's chief tool for evaluating whether use is protected.

New York's standards have recently been amended for C waters by adding a coliform requirement identical to that required for B waters. Therefore, the standards for B and C waters are the same.

Assignment of a particular classification does not prevent attainment of better water quality than necessary to maintain the best use. For instance, when technology-based wastewater treatment requirements (such as

Best Available Technology guidelines) are used in writing wastewater discharge permits, the water may actually become cleaner than is required by the standards for the water's classification.

The 14 GLWQA impairment indicators are generally consistent with the uses that New York State accommodates in its classification system. The exceptions are: (vii) restrictions on dredging activities, and (xii) added costs to agriculture and industry which are not considered by New York as use impairments.

The Oswego River AOC is classified C water, for fish propagation and fishing. The waters of Lake Ontario outside the breakwall are classified A-Special, drinking water. Cities around Lake Ontario, including Oswego and the Syracuse metropolitan area, use the lake as a drinking water supply. Water from the AOC is not used for drinking.

The Oswego RAP Citizens' Advisory Committee has recommended that the AOC be reclassified as B and has indicated it wants eventual reclassification as A.

HOW THE RAP IS DEVELOPED

1. The goal statement - The RAP begins with development of the water quality goal statement and determination of whether water quality impairments interfere with reaching the goal.

2. The problems - The term "problems" refers to: (1) water quality impairments within the AOC and the pollutants that cause impairments; and (2) pollutants in Lake Ontario, for which there is a significant transport from or through the AOC.

   To identify problems within the AOC, the GLWQA impairment indicators are examined against available environmental data, using proposed IJC criteria, suitably modified for the determination of impairment (Chapter 4). The pollutants and other factors causing the impairments are also identified.

To identify problems in Lake Ontario, the RAP uses the Lake Ontario Toxics Management Plan (LOTMP) which identifies seven contaminants that exceed enforceable standards either in Lake Ontario water or fish flesh. Export of these critical pollutants from the AOC to Lake Ontario is examined to identify those that are likely to be coming from or through the AOC in significant* amounts (Chapter 4). Since the RAP is a continuing process, as the critical pollutants in the Lake Ontario Toxics Management Plan change, so too will those that need to be addressed in the RAP.

3. The sources of pollutants causing impairments - To determine the sources of the seven critical pollutants, the RAP examines both environmental and source data for the entire Oswego-Seneca-Oneida basin, and also considers Lake Ontario as a potential source (Chapter 5). Both Chapters 4 and 5 are based on existing data. Where critical gaps in information exist, and new investigations are warranted, these may be recommended in the Stage II RAP.

4. The remedial strategy and commitments - Remedial objectives are specified for each known source of pollutants. Then an overall remedial strategy is developed to meet the RAP goal. The strategy's recommendations are as specific as possible. Commitments of agencies to specific remedial actions are made to the extent that programs and funding are in place.

5. Monitoring - The RAP includes a monitoring plan to follow progress of remedial actions and to determine whether the remedial actions are correcting the impairments.

6. Tracking, reporting, and revising: - Finally, the RAP describes a long-term strategy for tracking remedial progress and reporting that progress to the public, for making further agency commitments, and for revising the overall remedial strategy as more information becomes available.

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* See discussion of significance on page 4-30.

Stage I of the RAP includes items 1, 2, and 3. Stage II will include items 4, 5, and 6. Each step of the RAP is developed with full participation of the Oswego RAP Citizens' Advisory Committee. A public outreach program also has been undertaken to solicit additional public input.

CHAPTER 4

THE PROBLEMS: IMPAIRMENTS AND THEIR CAUSES

The Oswego RAP is based on two categories of impairments: those associated with the water quality in the Area of Concern; and those identified in the Lake Ontario Toxics Management Plan and based on overall impairment to Lake Ontario water quality. These are discussed in two separate parts of this chapter.

WATER QUALITY IMPAIRMENTS IN AREA OF CONCERN

The Great Lakes Water Quality Agreement, Annex 2, lists 14 indicators of water quality impairment (page 3-2). In the sections that follow, data from the Area of Concern were examined against these indicators. If an impairment was indicated, the data were examined to determine the cause of impairment. The causes are usually the presence of one or more pollutants. Criteria for examining each indicator have been derived by slightly modifying the draft IJC Listing and Delisting Criteria[1]

Statements about impairment based on some indicators can be made with considerable certainty. These are usually indicators of a political-legal type such as the existence of an advisory on fish consumption. For other indicators, where scientific observation and statistical analyses are required, the certainty of drawing a correct conclusion may be much less. To convey the degree of confidence placed on the conclusions, the terms "high confidence" and "low confidence" are appended in parentheses to the conclusion on whether or not an impairment exists and also to the causes of the impairment that are deduced from available data.

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[1]IJC (1989). Focus. Volume 14, Issue 1, March/April

The following confidence classification is used for examining impairment indicators:

Yes (high confidence)	impairment exists - direct evidence that criterion is satisfied;
May Exist (low confidence)	impairment may exist - no direct evidence related to criterion, but there is indirect evidence that the criterion may be satisfied;
No (high confidence)	impairment does not exist - direct evidence that the criterion is not satisfied;
May Not Exist (low confidence)	impairment may not exist - no direct evidence related to criterion, but there is indirect evidence that the criterion may not be satisfied;
Unknown	there is no evidence related to the criterion.

The terms "high confidence" and "low confidence" are also used in describing the degree of certainty with which causes of the impairment are known when an impairment has been identified. The terms are applied to causes as follows:

high confidence -	The cause is present at or near the target at a concentration or intensity consistently above a threshold known to cause the impairment, and with a demonstrated link (legal or technical) to the impairment.
low confidence -	The cause is present at or near the target at a concentration or intensity above a threshold known to cause the impairment, but the link and threshold are only weakly established, or the concentration or intensity are not consistently above the threshold.

Each GLWQA impairment indicator is discussed on the following pages. Evidence is presented and summarized; the criterion for determining whether or not an impairment exists is presented; and conclusions are drawn. A summary of impairments and their causes is presented at the end of this section (Table 4-5).

i) Restrictions on Fish and Wildlife Consumption

Criterion - When public health consumption advisories are in effect or when contaminant levels in fish and wildlife populations exceed current human health related standards, objectives, or guidelines.

Conclusion

Impairment - Yes (high confidence)

Cause - PCBs and dioxin (high confidence)

Summary - The Oswego River AOC does not meet the delisting criteria because public health advisories are in effect as part of a lakewide advisory. The substances causing this advisory are PCBs, mirex, chlordane, and dioxin. Warmwater fish, the only fish for which data are available from Oswego Harbor, show only PCBs and dioxin in excess of the limits used by the State as a basis for consumption advisories.

Evidence

A fish consumption advisory has been issued by NYSDOH in 1987-88 for all of Lake Ontario including tributary streams up to the first barrier[1]. The substances exceeding U.S. FDA guidelines in some Lake Ontario fish are PCBs, mirex, and chlordane[2]. Dioxin levels in some fish from Lake Ontario exceed the NYSDOH guideline for dioxin[3]. There are no advisories specific to the AOC.

Sport fish data reported for Oswego Harbor are shown in Table 4-1. Only for PCBs is the FDA consumption guideline exceeded. In addition, dioxin analyses were carried out on a composite sample of three carp and six smallmouth bass taken from Oswego Harbor in 1987[4]. The carp showed a level of 2,3,7,8-dioxin of 28.3 pg/g which is above the New York consumption advisory guideline of 10 pg/g. The smallmouth bass level was 1.3 pg/g, below the consumption guideline. No data are available on salmonids from Oswego Harbor. These species reflect lakewide contamination and are considered under the Lake Ontario

TABLE 4-1. LEVELS OF PCBs, CHLORDANE, AND MIREX IN FISH COLLECTIONS FROM OSWEGO HARBOR (ug/g-ppm)[a,b]

Species	Year	PCBs Mean	PCBs Range	Chlordane Mean	Chlordane Range	Mirex Mean	Mirex Range
White perch	1981	2.71	2.38-3.25	0.04	0.03-0.05	0.08	0.06-0.10
Smallmouth bass	1981	1.31	1.13-1.66	0.03	0.02-0.03	0.05	0.04-0.06
Smallmouth bass	1984	1.31	1.06-1.74	0.05	0.04-0.07	0.08	0.07-0.09
Smallmouth bass[c]	1988	0.39	0.077-1.68	0.022	0.01-0.045	0.036	0.008-0.15[d]
FDA guidelines for consumption advisory		2.0		0.3		0.1	

[a]NYSDEC (1982). Toxic Substances in Fish and Wildlife, Vol. 5.

[b]NYSDEC (1987). Toxic Substances in Fish and Wildlife Analyses Since May 1, 1982, Vol. 6.

[c]NYSDEC (1988). Memo from L. Skinner, August 11, 1989. Mirex includes mirex plus photomirex (total mirex).

[d]Only one fish exceeded the FDA guideline for total mirex.

Toxics Management Plan in deriving the list of pollutants causing lakewide impairments.

As part of a statewide advisory[1], the NYSDOH recommends that there be no consumption of merganser or common goldeneye ducks. This advisory is caused by flesh contamination with PCBs and mirex in excess of U.S. FDA guidelines[2]. There are no advisories specific to the AOC. There are no data on chemical contamination related to consumption of wildlife taken from the AOC.

References

[1]New York State Fishing, Small Game Hunting, Trapping Regulations Guide, October 1, 1988-September 30, 1989.

[2]NYSDOH Press Release. July 13, 1987.

[3]NYSDOH Press Release. August 5, 1981.

[4]Skinner, L.C. (1989) EPA National Bioaccumulation Study Results. Memo from L.C. Skinner, September 14, 1989.

ii) Tainting of Fish and Wildlife Flavor

Criterion - When survey results have identified tainting of fish or wildlife flavor.

Conclusions

Impairment - May Not Exist (low confidence)

Cause - Not Applicable

Summary - Whether or not the fish and wildlife in the AOC are free from tainting according to the criterion remains to be confirmed. The lack of any reports of tainting in a popular fishing and hunting area makes it appear unlikely that the fish and wildlife are tainted.

Evidence

No survey has been made in the AOC to confirm the lack of tainting. However, numerous fish have been taken by recreational fishermen within the AOC, and DEC has received no reports of tainting in the memory of current staff[1]. Similarly, numerous waterfowl have been taken adjacent to the AOC with no tainting reports[2].

New York State has six water quality standards for C class waters[3] to protect against tainting of fish flavor. These are aminocresols at 5 ug/L, chlorinated benzenes (chloro-, dichloro-, and trichloro-) at 50 ug/L, total unchlorinated phenols at 5 ug/L, and total chlorinated phenols at 1.0 ug/L. In addition, there is a pentachlorophenol standard for C waters of 0.4 ug/L that is so strict that it also protects against tainting. In 1987, chlorobenzene and the three dichlorobenzenes were analyzed for in five samples taken at Minetto, immediately above the AOC, and were not detected at 1 ug/L[4]. Various trichlorobenzenes have been analyzed for in samples taken from 1982 to 1986 and were undetected at 5 ug/L[5].

References

[1]Creech, C. (1989). Personal communication.

[2]Proud, J. (1989). Personal communication.

[3]DOW TOGS 1.1.1. Ambient Water Quality Standards and Guidance Values. NYSDEC, April 1, 1987.

[4]NYSDEC (1987). Rotating Intensive Basin Studies (unpublished).

[5]NYSDEC (1982-86). Report of the Fixed Station Toxics Surveillance Network.

iii) Degradation of Fish and Wildlife Populations

Criterion - When communities of fish or wildlife called for in fish and wildlife management programs are not healthy, self-sustaining, and at expected levels of abundance.

Conclusion

Impairment - Yes (high confidence)

Causes - Periodically dry areas (high confidence), PCBs, octachlorostyrene, and dioxin (low confidence)

Summary - Periodically dry areas have been observed to cause destruction of walleye eggs below the Varick Dam. This has led to a lower walleye population than would be expected. Water quality is unlikely to be adversely affecting fish. Criteria for the protection of fish-eating wildlife are exceeded for three substances and this may indicate that wildlife are being adversely affected.

Evidence

The area contains populations of American eels and naturally reproducing lake sturgeon, trout, Atlantic salmon, smallmouth bass, and other warmwater species. The walleye population is smaller than what it could be because of the creation of periodically dry areas below the dams in the river, particularly Varick Dam at Lock 7. Destruction of walleye eggs laid in these areas has been observed.[1]

There is no direct evidence that water quality has adversely affected fish populations in the AOC. On the other hand, there has been no systematic study of fish communities or their health. Dissolved oxygen measurements carried out between 1981 and 1987 by USGS[2], at Lock 7, show that out of 35 measurements, only one value in 1981 was under the GLWQA objective of 6.0 mg/L. This sample was above the NYSDEC standard of 5.0 mg/L.

Water quality data from the AOC between 1981 and the present show four metals for which concentrations have been found, on at least one occasion, in excess of water quality standards based on the protection of aquatic life. All these metals are found naturally in the basin.

The exceedences of water quality standards or guidance values for the four metals are shown in Table 4-2[2,3,4]. The highest exceedence rate is for zinc at 25%. As discussed in Chapter 2, p., 2-7, zinc data are to be treated with skepticism. Also, as discussed on p., 2-7, the calculated exceedance rate for copper, lead, and zinc is likely to be higher than the true exceedance rate because the comparison is between a standard for the acid-soluble form and a measured value for total metal. The exceedence rate is 15% of the water measurements for mercury (guidance value for A-Special waters is 0.2 ug/L). However, the basis for this value is protection of fish from accumulating mercury above the USFDA guideline for the protection of human consumers.

TABLE 4-2. WATER COLUMN EXCEEDENCES OF DEC STANDARDS AND NUMBER OF MEASUREMENTS FOR FOUR METALS IN THE LOWER OSWEGO RIVER WATER (1982-1987)[a]

Metal	Number of Exceedences	Number of Measurements
copper	1	48
lead	5	48
mercury	7	48
zinc	12	48

[a]NYSDEC. Report of the Fixed Station Toxics Surveillance Network, 1981-86. Rotating Intensive Basin Studies, 1987, 1988. DEC files.

Mercury is not found in fish tissue in excess of the USFDA guideline, but it is found slightly in excess of the GLWQA objective of 0.5 ug/g for the protection of aquatic life and for the protection of fish-eating birds in three out of four collections of sport fish (0.51, 0.60, and 0.64 ug/g)[5]. However, 0.5 ug/g is a protective level only and there is no evidence of effects at this level[6]. Spottail shiner collections in 1985 and 1986 from Oswego Harbor showed levels well below the GLWQA Objective (0.062 and 0.051 ug/g)[7].

DEC has developed fish flesh criteria to protect fish eating birds and animals[8]. Table 4-3 lists these criteria with fish flesh levels observed in Oswego Harbor catches. Since sport fish flesh levels have declined for some substances in the past ten years, the median values for catches from 1984 through 1988 only have been calculated to better reflect current conditions. Criteria are exceeded for PCBs, octachlorostyrene, and dioxin.

Both owls and herring gulls have been found either dead or emaciated in and around the AOC since 1980. In one owl found in Oswego, levels of various chemicals in its brain were DDE-117 ug/g, PCBs-65.4 ug/g, dieldrin-2.85 ug/g, and mirex-6.30 ug/g. According to Stone and Okoniewski (1983)[9], the relationship between the elevated brain levels of DDE, dieldrin, mirex, and PCBs, and the death of the owl cannot be adequately interpreted at present. Herring gulls found dead in the AOC have not shown such high levels of contaminants in their brains as the owl.

References

[1]Creech, C. (1989). Personal communication.

[2]USGS (1981-1987). Water Resources Data. New York Water Year. Vol. 3.

[3]NYSDEC (1982-86). Report of the Fixed Station Toxics Surveillance Network.

[4]NYSDEC (1987). Rotating Intensive Basin Studies (unpublished).

[5]NYSDEC (1987). Toxic Substances in Fish and Wildlife Analysis Since May 1, 1982. Vol. 6.

[6]International Joint Commission (1977). New and Revised Great Lakes Water Quality Objectives, Vol. II., p., 74.

[7]Skinner, L.C., and Jackling, S.J. (1989). Chemical Contaminants in Young-of-the-Year Fish From New York's Great Lakes Basin: 1984 through 1987, NYSDEC.

[8]Newell, A.J., Johnson, D.W.., and Allen, L.K. (1987). Niagara River Biota Contamination Project: Fish Flesh Criteria for Piscivorous Wildlife. NYSDEC.

[9]Stone, W B. and Okoniewski, J. C. (1983). Northeast Environmental Science Vol 2., No. 1, p., 1.

TABLE 4-3. COMPARISON OF FISH FLESH LEVELS OF CHLORINATED ORGANICS IN OSWEGO HARBOR WITH DEC CRITERIA FOR THE PROTECTION OF FISH EATING BIRDS & ANIMALS

		Median Fish Flesh Levels (ug/g-ppm)					
		DEC	EPA Brown	DEC Spottail Shiners[e]			
Substance	Criterion[a] (ug/g)	Sportfish[b,c] 1984-1988	Trout[d] 1978	1984	1985	1986	1987
PCBs	0.11	0.90		0.087	0.069	0.067	0.038
aldrin/dieldrin	0.022	0.01					
DDT/DDD/DDE	0.2	0.20		0.018	0.011	0.008	0.008
chlordane	0.37	0.024		0.0061			
endrin	0.025	< 0.01					
hexachlorobenzene	0.2	< 0.01	0.115	ND			
hexachlorobutadiene	1.3		0.0017				
heptachlor/ heptachlor epoxide	0.2	< 0.01					
mirex and photo-mirex	0.33	0.05		0.00535	ND	ND	0.002
octachlorostyrene	0.02		0.035				
trichlorobenzene	1.3		0.0039				
dioxin (2,3,7,8-TCDD)	0.0000023	0.0000283[f]					

[a]NYSDEC (1987). Newell, A.J., Johnson, D.W., and Allen, L.K. Niagara River Biota: Fish Flesh Criteria for Piscivorous Wildlife.

[b]NYSDEC (1987). Toxic Substances in Fish and Wildlife, Vol. 6.

[c]Skinner, L.C. (1989). Lake Ontario Smallmouth Bass and Carp. Memo, August 11, 1989.

[d]Kuehl, D.W., Johnson, K.L., Butterworth, B.C., Leonard, E.N., and Keith, G.D. (1981). J. Great Lakes Res. 7(3),330.

[e]Skinner, LC., and Jackling, S.J. (1989). Chemical Contaminants from Young-of-the-Year Fish from New York's Great Lakes Basin: 1984 through 1987. NYSDEC.

[f]Skinner, L.C. (1989). EPA National Bioaccumulation Study Results. Memo, September 14, 1989. (Data are for a composite of three carp - a composite of 6 smallmouth bass have a dioxin concentration of 0.0000013 ug/g, which is below the criterion)

iv) Fish Tumors or Other Deformities

Criterion - When the incidence of neoplastic and pre-neoplastic liver tumors exceeds 2% in bullheads or 3.5% in suckers, or other deformities are at incident rates significantly above those in control communities.

Conclusions

Impairment - May Exist (low confidence)

Causes - Not Applicable

Summary - No definitive statement about impairment can be made because the necessary surveys have not been performed. However, reports of tumors or deformities by one fisherman suggest that this impairment may exist.

Evidence

There have been no surveys to examine bullheads or suckers for liver tumors or other deformities.

At the December 5, 1989 RAP workshop in Oswego, a charter boat captain reported that he sees 75 to 100 fish a year with tumors or deformities[1].

PAHs are the only documented anthropogenic cause of tumors in fish. A number of these substances have been tested for in samples collected by the USA COE in 1981[2]. They were detected only infrequently. Table 4-4 shows the USA COE levels[2] and the mean values of the same substances in Buffalo River sediments[3] where fish tumors have been identified as a problem.

TABLE 4-4. OSWEGO HARBOR PAH ANALYSES COMPARED WITH LEVELS FOUND BY NYSDEC AND ERIE COUNTY IN BUFFALO RIVER SEDIMENTS IN ug/g-ppm

Substance	Oswego Harbor (14 Samples)	Buffalo River Mean Values NYSDEC (10 Samples)	Erie County (58 Samples)
acenaphthene	<0.20	----	1.165
acenaphthylene	<0.20	----	1.332
anthracene	<0.10	0.855	4.091
benz(a)anthracene	<0.30	1.336	2.184
benzo(a)pyrene	<0.10	1.229	2.056
benzo(b)fluoranthene	<0.10	1.709	1.161
benzo(ghi)perylene	<0.20	1.355	1.730
benzo(k)fluoranthene	<0.20	0.683	1.641
chrysene	<0.10	0.800	1.639
dibenzo(a,h)anthracene	<0.40	0.869	1.539
fluoranthene	<0.30[a]	4.661	3.919
fluorene	<0.30	0.237	2.097
indeno(1,2,3-cd)pyrene	<0.10	1.539	2.073
naphthalene	<0.30	----	4.435
phenanthrene	<0.10[b]	2.498	4.079
pyrene	<0.20	5.481	3.167

[a]One out of 14 samples showed a detectable amount of fluoranthene - 0.56 ug/g

[b]Two out of 14 samples showed a detectable amount of phenanthrene - 0.76 and 0.55 ug/g.

References

[1]Paeno, J. (1989). Comment at December 5 workshop on draft Oswego RAP.

[2]USACOE (1987). Technical Report I0175-02 from T. P. Associates International, Inc.

[3]NYSDEC (1989). Buffalo River Remedial Action Plan.

v) Bird or Animal Deformities or Reproductive Problems

Criterion - When incidence rates of cross-bill syndrome, reproduction failure, etc., are significantly (95% probability level) higher than incidence rates at control sites or when bald eagle reproduction is less than one eaglet per active nest.

Conclusion

Impairment - May Exist (low confidence)

Cause - PCBs, octachlorostyrene, and dioxin (low confidence)

Summary - Although no definitive studies have been reported, levels of PCBs, octachlorostyrene, and dioxin in fish flesh exceed DEC criteria for the protection of fish-eating wildlife, and hence an impairment may be caused by these substances.

Evidence

There have been no studies to compare bird or animal deformities or reproductive problems in the AOC with a control area. There are no nests of eagles in the vicinity of the AOC[1].

See iii) Degradation of Fish and Wildlife Populations, (p., 4-9) for a discussion of fish flesh criteria and accumulation of chlorinated organics in herring gulls and owls.

References

[1]Nye, P. (1989). Personal communication.

vi) Degradation of Benthos

Criterion - When the benthic macroinvertebrate community structure diverges from unimpacted control sites of comparable physical and chemical characteristics.

Conclusions

Impairment - May Exist (low confidence)

Cause - Unknown

Summary - Although there are no recent definitive studies, toxicity tests carried out on sediments in 1987 suggest benthic macroinvertebrate populations may be impaired.

Evidence

The only data on benthos populations in the AOC are from the macroinvertebrate survey of Simpson (1982)[1] in 1972 and 1978. The number of species found in the AOC was above that found in the upper reaches of the river, but no comparison was made with unimpacted control sites.

D.magna (water flea), P.promelas (fathead minnow), and H.limbata (mayfly) were exposed to sediments collected from Oswego Harbor in 1987 by the USACOE[2]. Percent dead after a 96-hour exposure was significantly above controls for all 11 sites and for all three species. In 21-day exposures to sediment samples collected in 1981, D.magna showed no chronic effects.

References

[1]Simpson, K. W. (1982). Macroinvertebrate Survey of the Seneca-Oswego River System - 1972 and 1978. NYSDOH.

[2]USACOE (1987). Technical Report #I0175-02 from T.P. Associates International, Inc.

vii) Restrictions on Dredging Activities

Criterion - When there are restrictions on the disposal of sediments in open waters or when contamination in sediments prevents a use for the sediments which they would otherwise have.

Conclusion

Impairment - No (high confidence)

Cause - Not applicable

Summary - There have been no restrictions on the disposal of dredged material from Oswego Harbor, and no uses have been proposed for the sediment in the harbor. Therefore, there is no impairment, but the Citizens' Advisory Committee has raised concerns about the open lake disposal of the sediments.

Evidence

There are currently no restrictions on disposal of dredged sediment spoil from Oswego Harbor and no uses for the harbor sediment have been proposed.

Views of Oswego RAP Citizen Advisory Committee (CAC)

The CAC has gone on record as opposing the open lake disposal of dredged material from Oswego Harbor. Cyanide, zinc, lead, barium, and oil and grease are the pollutants that exceed USEPA dredge spoil guidelines at some sampling sites in the harbor.

viii) Eutrophication or Undesirable Algae

Criterion - When there are persistent water quality problems (e.g. dissolved oxygen depletion of bottom waters, nuisance algal accumulation on bathing beaches, nuisance algal blooms, decreased water clarity, etc.) attributed to accelerated or cultural eutrophication.

Conclusion

Impairment - Yes (high confidence)

Cause - Phosphorus (high confidence)

Summary - Because of reports of algal blooms, and the reported enrichment of phytoplankton species associated with eutrophic environments, there is likely to be an impairment. Excess phosphorus is the likely cause.

Evidence

There have been reports of algal blooms in the AOC. The same algal blooms have also been seen in nearshore areas of Lake Ontario. Algal blooms have also been observed in the lower Oswego River above the AOC.

Dissolved oxygen levels are all above the NYS water quality standard of 5 mg/l in measurements made by USGS from 1981-87[1], and all but one are above the IJC objective of 6 mg/l. Samples were taken in the main river flow and may not be representative of stagnant areas.

A study by Makarewicz[2] reported that phytoplankton assemblages observed in Oswego Harbor and River in 1981 were represented by many species widely associated with eutrophic environments. These eutrophic species were in higher abundances at the harbor/river stations than in the nearshore region of Lake Ontario. No data are available on phytoplankton after several improvements were made in sewage treatment systems.

Nutrients of various sorts are necessary for algal growth. They need to be present in high concentration in the water column for algal blooms to occur. Phosphorus is likely to be the nutrient controlling algal growth since the nitrogen to phosphorus atomic ratio in the lower Oswego River averages around 120[1]. This is in the range where phosphorus is considered a limiting nutrient[3].

References

[1]USGS (1981-1987). Water Resources Data. New York Water Year. Vol. 3.

[2]Makarewicz, J.D. (1987). J. Great Lakes Res. 13(1):56-64.

[3]Wetzel, R.G. (1975). Limnology. W.B. Saunders Co., Philadelphia.

ix) <u>Restrictions on Drinking Water Consumption or Taste and Odor Problems</u>

<u>Criterion</u> - When consumption restrictions exist or when any waters (intended for human consumption) contain disease-causing organisms or hazardous concentrations of toxic chemicals or radioactive substances in exceedence of standards, objectives, or guidelines, or when taste or odor problems are present (e.g. taste or odor problems caused by blue-green algae or anthropogenic substances)

<u>Conclusion</u>

Impairment - Not applicable

Cause - Not applicable

<u>Summary</u> - There are no drinking water supply intakes in the AOC and none has been proposed. The waters in the AOC are not classified for human consumption by New York State.

x) Beach Closings

Criterion - When there are recurring beach closings because of contamination from bacteria, fungi, or viruses that may produce enteric disorders or eye, ear, nose, throat, and skin infections or other human diseases and infections.

Conclusions

Impairment - Not applicable

Cause - Not applicable

Summary - There are no beaches in the AOC and swimming is not encouraged.

xi) Degradation of Aesthetics

Criterion - When any substance produces an objectionable deposit, unnatural color or turbidity, or unnatural odor.

Conclusion

Impairment - May Not Exist (low confidence)

Cause - Not Applicable

Summary - Although turbidity occurs occasionally during high flow, it is not excessive, is largely of natural origin, and is not an aesthetic problem.

Evidence

Aesthetics is a highly subjective indicator and no extensive survey of AOC users has been carried out.

During storm events or spring run-off, the Oswego River becomes turbid from a high suspended particle load[1]. The turbidity is much less than in other rivers of similar character (e.g. Genesee River).

References

[1]Eidt, S. (1989). Personal communication.

xii) Added Costs to Agriculture or Industry

Criterion - When there are additional costs required to treat the water prior to use for agricultural purposes (i.e. including but not limited to, livestock watering, irrigation, and crop spraying) or industrial purposes (i.e. intended for commercial or industrial applications and non-contact food processing).

Conclusions

Impairment - No (high confidence)

Causes - Not applicable

Summary - There are no added costs to agriculture or industry. There is no impairment according to this indicator.

Evidence

There are no agricultural uses of the water from the AOC and there are no known additional costs to industry for treatment of water taken from the AOC.

xiii) Degradation of Phytoplankton and Zooplankton Populations

Criterion - When phytoplankton or zooplankton community structure significantly diverges from unimpacted control sites of comparable physicochemical characteristics.

Conclusion

Impairment - Unknown

Cause - Not applicable

Summary - There are no data on phytoplankton or zooplankton in the AOC taken since major remedial measures were completed and a major industrial plant ceased operation.

Evidence

There are no recent data on phytoplankton or zooplankton populations in the AOC. No surveys of zooplankton in the AOC have been reported.

Makarewicz (1987)[1] reported that phytoplankton assemblages observed in the Oswego Harbor and River in 1981 were represented by many species widely associated with eutrophic environments. These eutrophic species were in substantially higher abundances at the harbor/river stations than in the nearshore region of Lake Ontario. Abundant halophilic phytoplankton were found in the AOC as compared to the nearshore stations. Chloride levels in the harbor/river were from two to four times higher than in the lake between April and October.

The evidence is conclusive that phytoplankton assemblages from the AOC in 1981 reflected higher nutrient and chloride ion concentrations than that found in the nearshore areas of Lake Ontario. In 1986 construction was completed on an interceptor that picked up 18 sewage discharges within the City of Oswego. In 1987 salt storage in the harbor was discontinued. Also, the chloride output from Onondaga Lake dropped markedly between 1985 (1800 mg/L) and 1987 (600 mg/L) when the

Allied Chemical discharge was shut down[2]. Whether a water quality impairment currently exists leading to phytoplankton or zooplankton divergence is unknown.

References

[1]Makarewicz, J.C. (1987). J. Great Lakes Res. 13(1):56-64.

[2]Onondaga County Department of Drainage and Sanitation (1989). Onondaga Lake Monitoring Program Annual Report - 1987.

xiv) Loss of Fish and Wildlife Habitat

This impairment indicator is considered a cause of impairment iii) Degradation of Fish and Wildlife Populations.

Recommended habitat improvements in the AOC will be discussed in Stage II of the RAP.

TABLE 4-5. SUMMARY TABLE OF IMPAIRMENTS AND THEIR CAUSES

Indicator	Impairment	Causes: High Confidence	Causes: Low Confidence
High Confidence			
i) Restrictions on fish and wildlife consumption	Yes	PCBs & dioxin	
iii) Degradation of fish and wildlife populations	Yes, periodically dry areas		PCBs, octachlorostyrene, dioxin
vii) Restrictions on dredging activities	No		
xii) Added costs to agriculture or industry	No		
viii) Eutrophication or undesirable algae	Yes	phosphorus	
Low Confidence[a]			
ii) Tainting of fish and wildlife	May not exist		
iv) Fish tumors or other deformities	May exist		
v) Bird or animal deformities/reproduction problems	May exist[b]		PCBs, octachlorostyrene, dioxin
vi) Degradation of benthos	May exist[c]		Unknown
xi) Degradation of aesthetics	May not exist[d]		
Unknown			
xiii) Degradation of phytoplankton/zooplankton	-		
Not applicable to AOC			
ix) Restrictions on drinking water consumption	-		
x) Beach closings	-		
xiv) Loss of fish and wildlife habitat	See iii)		

[a]In addition to lack of direct evidence for all indicators in this sub-section, the amount of indirect evidence is meager. The need for additional studies will be considered in the Stage 2 RAP.

[b]Evidence is: Occasional exceedence of a protective criterion in water or fish flesh.

[c]Evidence is: some laboratory tests.

[d]Evidence is: lack of complaints voiced by people using the AOC and attending public meetings, and casual observation by a small number of people.

WATER QUALITY IMPAIRMENTS IN LAKE ONTARIO

The Lake Ontario Toxics Management Plan was adopted by NYSDEC, USEPA, the Ontario Ministry of the Environment, and Environment Canada in February, 1989. This plan lists seven substances as being of special concern to Lake Ontario because their levels in water or fish flesh exceed enforceable standards. These are aluminum, chlordane, 2,3,7,8-TCDD (dioxin), iron, mercury, mirex (mirex plus photomirex), and PCBs.

The Oswego RAP examines the evidence related to the transport of each of these seven substances through or from the Area of Concern to determine which of them constitute water quality problems that need to be addressed in Stage II of the RAP.

In addition to these seven toxic substances, the GLWQA sets a target load for Lake Ontario of 7,000 metric tonnes of phosphorus per year and estimates that to achieve this, there must be a further reduction in loading of 430 metric tonnes. The parties (U.S. and Canada), are required to allocate this reduction between themselves and to develop plans to achieve the required reduction. This agreement is also discussed in this chapter in terms of phosphorus transport to Lake Ontario.

Each of the seven pollutants of special concern is likely being transported in some amount out of the AOC and into Lake Ontario. The important question is whether or not the amount of transport is significant. There is no agreed on definition of "significant". The significance of the Oswego River transport load will depend on its magnitude relative to other sources of the same pollutant, and the environmental impact that transport from the Oswego River will have on the Lake Ontario ecosystem. Unfortunately, there is little information currently available on either of these factors that will allow a sound judgment of significance to be made.

Data on lakewide loadings of the seven pollutants are incomplete[1] so that any comparison of estimated loadings from the Oswego River with other sources to Lake Ontario, at this time, may be misleading. Recently inaugurated improvements in tributary monitoring on the New York side, and better measurements of air deposition should improve this situation in coming years.

The environmental impact of a particular pollutant source can only be determined prospectively by a modeling calculation that accurately describes the transport and fate of each pollutant within the system. In particular, the relative importance of external loads to the system versus the recycling of the pollutant within the system must be understood. Such models are not available at this time. Efforts to develop such models and assess their reliability are underway[1] and are expected to provide useful products in the next few years.

There is little direct information relative to pollutant loadings to Lake Ontario from the Oswego River. Although monitoring has been carried out on the river just above the AOC, samples have not been taken frequently enough or analyzed at low enough detection limits to warrant calculating loadings.

This Remedial Action Plan uses available information to develop a preliminary, and tentative, estimate of the significance of the Oswego River as a source of the seven pollutants identified as problem pollutants in the Lake Ontario Toxics Management Plan. Much of the information used in this analysis is taken from measurements of pollutant concentration in various media in the AOC and compared with open lake values. The reasoning is based on the expectation that, if the Oswego River were making a significant contribution to Lake Ontario, the environmental levels of the pollutant in the river would be expected to be higher than Lake Ontario values. In cases where transport loads are estimated directly, a comparison is made with loads reported in the Lake Ontario Toxics Management Plan. The conclusions arrived at from this analysis will be refined as results of direct loading estimates from the Oswego River become available, as loads from other sources become refined and extended, and as models that reliably relate input loads of the seven pollutants to environmental effects in Lake Ontario become available.

Summary

The evidence for or against significant transport through or out of the AOC is meager and what is available is circumstantial based largely on comparisons of concentrations of the pollutant in certain media with other parts of Lake Ontario and either lakewide averages or values obtained from areas thought to be representative of whole lake conditions. Conclusions are preliminary and tentative and will be refined as new information becomes available.

For mirex, PCBs, mercury, and dioxin, there is evidence that suggests a small amount of these substances may be entering Lake Ontario from the AOC. The evidence for mirex is found in spottail shiner collections and in water column measurements. The evidence for PCBs is primarily channel catfish data that suggest an input of PCBs into the Oswego River above the AOC. Levels of mercury in the AOC water column are higher than those found generally in Lake Ontario water.

For all other LOTMP chemicals of concern, the evidence suggests it unlikely that there is a significant net transport from the AOC to Lake Ontario.

Although phosphorus is entering Lake Ontario from the Oswego River, reduction of this phosphorus load is not considered necessary to meet New York's target for phosphorus reduction. (However, note that phosphorus is identified on p., 4-20 as a cause of eutrophication within the AOC.)

Conclusion

Pollutants that may have a significant net export from Oswego Harbor to Lake Ontario are:

mirex
PCBs
mercury
dioxin (2,3,7,8-TCDD)

Pollutants likely to have an insignificant net export are:

all other LOTMP substances and phosphorus.

Evidence

There is little direct information on the net export of any of the LOTMP priority toxics.

The seven Lake Ontario Toxics Management Plan (LOTMP) priority toxics are listed in Table 4-6 together with available water quality data and their median concentrations are compared to NYS water quality standards and guidelines and to GLWQA specific objectives. The data are very limited.

aluminum: The aluminum concentration was measured on five whole water samples collected at Minetto, just upstream of the AOC. The mean concentration was 258 ug/L. The lakewide average was 230 ug/L.

chlordane: Although no lakewide mean for chlordane has been reported, concentrations measured in open lake water range from 0.000034 to 0.000108 ug/L[2]. The concentration measured off Oswego Harbor is 0.00005 ug/L[3], well below the NYS water quality standard of 0.002 ug/L. Chlordane was detected in spottail shiners in 1984 in the Oswego AOC.[4] The mean value was 6.1 ng/g compared with a mean in Salmon River spottails of 6.2 ng/g in 1984. On the Genesee and Black Rivers, trans-nonaclor and oxychlordane were occasionally detected at similar levels. Canadian chlordane levels[5] in spottail shiners collected in the 1980s vary from non-detect at a few sample sites to 47 ng/g at Missico Creek. Table 4-7 shows that chlordane was not detected in sediments in Oswego Harbor at a detection level of 0.1 ug/g. There are no open lake sediment values for comparison.

TABLE 4-6. WATER CONCENTRATIONS IN AND AROUND OSWEGO AOC COMPARED WITH NYS WATER QUALITY STANDARDS AND GUIDANCE VALUES AND GLWQA OBJECTIVES FOR LOTMP CHEMICALS OF CONCERN (All values are in ug/L-ppb)

Substance	Median	Range	NYS WQS or Guideline	GLWQA Objective	Mean For Lake Ont.[a]
aluminum	258[b]	-	100[c]	-	230
chlordane	0.00005[d]	-	0.002	0.06	-
dioxin	-	-	0.000001	-	-
iron	36.3[b]	-	300	300	662
	16[e]	3-37			
mercury	0.2[f]	0.1-1.0	0.2	0.2	-
	0.01[d]				
mirex	0.000014[g]	-	0.001	(substantially absent)	-
PCBs	0.0007[d]	-	0.001	-	0.00249

[a]Lake Ontario Toxics Categorization Work Group (1988). Categorization of Toxics in Lake Ontario.

[b]NYSDEC (1988). The mean of five samples collected in 1988. Unpublished.

[c]For soluble aluminum. Measured values are on unfiltered samples and include more than soluble aluminum, and thus are not comparable.

[d]Biberhofer, J., and Stevens, R.J.J. (1987). Organochlorine contaminants in ambient waters of Lake Ontario. Env. Can., Inland Waters Directorate Scientific Series No. 159. Lake Ontario off Oswego - one sample.

[e]USGS (1986, 1987). Water Resources Data. New York Water Year. Vol. 3.

[f]NYSDEC (1982-1988). 7 out of 48 samples exceeded the guidance value of 0.2 ug/L.

[g]Yin, C., and Hassett, J.P. To be published.

TABLE 4-7. BULK SEDIMENT ANALYSES FROM OSWEGO HARBOR COMPARED WITH LAKEWIDE RANGES FOR LOTMP PRIORITY CHEMICALS AND PHOSPHORUS (ug/g-ppm)

Substance	Mean Concentration in Sediment in AOC[a]	Mean Open Lake Sediment Concentration[b]
aluminum	NA	NR
chlordane	<0.1	NR
dioxin	NA	NR
iron	5700	2400-9620[c]
mercury	0.40	0.14-3.95
mirex	NA	NR
PCBs (each aroclor)	<1.0	NR
phosphorus	493	NR

NA - not analyzed
NR - not reported

[a]USACOE. (1987). Technical Report #I0175-02 from T.P. Associates International, Inc. (samples collected in 1987)

[b]Mudroch, A., Sarazin, L., and Lomas, T. (1988). J. Great Lakes Res. 14(2):241-251.

[c]The value of the iron concentration range reported in the reference is 1/1000 of this range - an obvious error.

dioxin: The only environmental data for dioxin in the AOC is from composites of six smallmouth bass and three carp analyzed by U.S. EPA in 1987. These results have been compared with levels in the same and similar species from other waters of New York State. The smallmouth bass levels are similar to those found in fish from other parts of the lake. However, the carp values are high (28.3 pg/g), compared with fish from other areas. The only other carp sample in Lake Ontario was taken at Olcott (Eighteenmile Creek), where the levels were similar. Carp from other sites (Niagara Falls, Buffalo River, and Lake Champlain), were all under 6.4 pg/g.

iron: For iron, the Lake Ontario mean concentration is 662 ug/L[1] and the mean concentration for Oswego Harbor for 1986 and 1987 is 16.8 ug/L[3]. Iron levels in sediments (Table 4-7) were 5700 ug/g in Oswego Harbor compared to an open lake sediment range of 2400 to 9620 ug/g.

mercury: Median mercury levels in the water column do not exceed guidance values in the harbor, but 7 out of 48 observations made between 1982 and 1988 do exceed the guidance value (Table 4-6). Mercury in Lake Ontario waters in 1981-82 was detected only on a few occasions at a detection level of 0.05 ug/L[3]. In Oswego Harbor, NYSDEC detected mercury at a detection level of 0.2 ug/L in 26% of samples between 1984 and 1987. USGS[6] detected mercury at a concentration of 0.2 ug/L or above in Oswego Harbor water samples 54% of the time between 1981 and 1987.

Mean mercury levels in spottail shiners based on one sample per year[4], averaged 56 ng/g from 1984-1987 in the Oswego River AOC. Other areas reported 91 (Genesee River), 57 (Salmon River), and 324 (Cape Vincent). Mercury levels from smallmouth bass in Oswego Harbor collected in 1981[7] were 0.60 ug/g, while those from the same species collected off Galloo Island in 1983 and Stony Island in 1982 were 0.54 ug/g and 0.62 ug/g respectively. Galloo and Stony Island smallmouth bass are likely to reflect Lake Ontario open water levels of mercury.

The mean value in sediments from Oswego Harbor (Table 4-7) was 0.50 ug/g, whereas the open lake sediment concentration varied between 0.14 and 3.95 ug/g. A single core from the harbor showed mercury concentrations varying from 0.09 ug/g in the surface two inches to 0.27 ug/g between 10 and 13 inches[8].

<u>mirex</u>: Yin and Hassett[9] have reported water column measurements for mirex collected approximately once every two months at Lock 8 in the Oswego River between October 1983 and October 1984. The average concentration of mirex was reported as 14.5 pg/L. Measurements in Lake Ontario outside the plume of the Oswego River gave a mean concentration of 13.8 pg/L. Similar values were reported by Mudambi[10] in 1982 in Oswego Harbor and in Lake Ontario off Sandy Pond.

Using the 14.5 pg/L as a yearly mean concentration and a flow of 6,478 cfs as the long-term average flow for the Oswego River (see Chapter 2), would lead to an annual transport of 84 grams of mirex per year to Lake Ontario from the river. This is somewhat larger than the 6 g/yr estimated by Lum, Kaiser, and Comba[11], but still small compared to the estimated load from the Niagara River of 8 kg/yr on sediments alone[12]. In any case, it can only be an approximate figure because the sampling of the Oswego River was not correlated with flow so as to assure that the sample was representative.

Mirex levels in smallmouth bass taken in Oswego Harbor are indistinguishable from those in the same species taken off Galloo and Stony Islands (Table 4-8). The latter would represent general conditions in the off-shore waters of Lake Ontario. Mirex and photomirex have been found in spottail shiner collections from Oswego Harbor at levels of 3.8 and 1.6 ng/g in 1984[4]. Neither was detected in 1985 or 1986, but mirex was found at 2.0 ng/g in 1987. Comparable levels were found in the Salmon River in 1984, 1985, and 1987, and in Black River Bay in 1984.

TABLE 4-8. MIREX IN SMALLMOUTH BASS FROM OSWEGO HARBOR AND GALLOO AND STONY ISLANDS (ug/g-ppm)

Year	Weight	Oswego Harbor	Galloo Island	Stony Island
1981	771	0.12		
1982	963			0.14[a]
1983	498		0.05[a]	
1984	1122	0.08		
1988	729	0.04[a]		
1988	608		0.06[a]	

[a]Mirex plus photomirex

<u>PCBs</u>: A water column concentration of 0.0007 ug/L was found in a sample off Oswego Harbor. This compares with a mean Lake Ontario concentration of 0.00249 (Table 4-6).

Spottail shiner collections from Oswego Harbor[4] show a mean concentration of 38 ng/g in 1987. In the same year, the Salmon River collection showed 52 ng/g. Mean values in spottail shiners for 1984-87 were: Genesee River 65, Oswego River AOC 65, Salmon River 77, and Cape Vincent 101 ng/g. The mean value for 1984 and 1986 at Strawberry Island in the Niagara River where the lowest values were found was 42 ng/g compared with the Oswego River mean of 65 ng/g for 1984, 1985, 1986, and 1987. Canadian spottail shiner data for Lake Ontario coastal areas range from 317 to 676 ng/g in 1985, the latest year of record. The value at Wolfe

Island (where Lake Ontario water enters the St. Lawrence River) was 90 ng/g in 1984[5].

Channel catfish in the Oswego River near Fulton have been found with moderately high PCB concentrations[13]. The mean value from 10 fish caught in 1986 for Aroclor 1254/1260 was 2.87 ug/g and for Aroclor 1016 it was 0.96 ug/g. Upstream at Phoenix, values for the same aroclors were 1.15 and 0.53 respectively. These values suggest inputs to the river in the vicinity of Fulton and, if this occurs, there is likely to be eventual export to Lake Ontario.

phosphorus: The mean phosphorus load exported by the Oswego River in 1983, 1984, and 1985 has been estimated[5] as 390 metric tonnes/year. This is the largest from any New York Lake Ontario tributary, and makes up about 40% of the total New York tributary contribution. New York is close to meeting its target goal for phosphorus reduction to Lake Ontario. Current plans do not call for additional actions within the Oswego River basin to meet this target.

References

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CHAPTER 5

SOURCES OF POLLUTANTS CAUSING IMPAIRMENTS

Pollutants causing impairments to water quality in the Area of Concern, together with the priority pollutants identified in the Lake Ontario Toxics Management Plan that are likely to have a significant transport from or through the Area of Concern and into Lake Ontario, have been identified in Chapter 4. The purpose of Chapter 5 is to identify the likely sources of these pollutants so that remedial measures can be recommended in the Stage II Remedial Action Plan. In addition to pollutants, the occurrence of periodically dry areas has been noted as a cause for impairment. Further discussion of this will be included in the Stage II RAP.

After a general overview of pollutant sources, the six pollutants identified in Chapter 4 (PCBs, dioxin, and phosphorus (all high confidence), and mercury, mirex, and octachlorostyrene (all low confidence) are described. For each pollutant, environmental and use information is presented followed by the evidence for the sources of each pollutant. Where information is available that would suggest sub-basins likely to be the major source of the pollutants, this evidence is presented.

In few, if any, cases is information available that allows major sources to be identified with certainty. In no case are there data sufficient to calculate a definitive mass balance of a pollutant. Where specific measurements are needed to further identify sources in order to proceed with remedial actions, these will be identified in the Stage II RAP.

A summary table linking impairments, pollutants, and sources is included at the end of the chapter (Table 5-10, p., 5-36).

OVERVIEW OF SOURCES

Sources of pollutants to the AOC can be classified as 1) either point or nonpoint sources within the Seneca-Oneida-Oswego Rivers basin or 2) from

Lake Ontario. Pollutants from the latter source can be further tracked back to specific sources within the Lake Ontario basin or in the upper Great Lakes, but this is more appropriately carried out under the Lakewide Management Plans that the federal governments, in the Great Lakes Water Quality Agreement, have agreed to prepare.

Point sources include both industrial and municipal sources within the basin where the discharge is through a regulated outfall such as a pipe. Municipal sewage collection and treatment systems can carry both industrial and domestic wastes. Some municipal systems also handle stormwater flows and are called combined systems. To prevent backup of sewers during heavy storm or snow melt periods, they are equipped with overflow outlets that discharge directly to water courses and bypass the treatment plant. Such combined sewer overflows can be a major source of pollution. There are 66 municipal treatment plants within the Seneca-Oneida-Oswego Rivers basin that vary from small facilities able to handle about 30,000 gallons per day to the Syracuse Metro plant with a design capacity of 86.5 million gallons per day.

Pollutant sources that are diffuse and not concentrated at a specific outfall or pipe are known as nonpoint sources. These include hazardous waste and landfill sites where leachate may run off the site or contaminated groundwater may drain away from the site underground. Runoff from agricultural and developed areas can carry pesticides and fertilizers to water courses. Similarly, runoff from industrial land can carry spilled industrial chemicals into water courses. Pollutants are also deposited from the atmosphere onto land or directly into waterbodies. These pollutants may originate locally or may come from thousands of miles away.

Many pollutants, including pesticides and PCBs, when carried into watercourses, become bound to sediment particles and settle to the bottom of the stream or lake. They may remain there, gradually entering the aquatic life and accumulating in fatty tissues, or they may be gradually or suddenly transported downstream.

The waters of Oswego Harbor are made up partly of what comes down the Oswego River and partly what enters the harbor from Lake Ontario. Little is known of the dynamics of interchange of lake and river waters, but that it occurs is certain. Waters entering from Lake Ontario can carry contaminants with them, as can the fish that swim from Lake Ontario into the harbor.

EVIDENCE AND CONCLUSIONS REGARDING SOURCES OF SPECIFIC POLLUTANTS

PCBs

Properties and Sources

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. The New York State water quality standard is 0.001 ug/L in all waters. The FDA fish flesh consumption guideline is 2 ug/g.

Impairments

PCBs are one of the known causes of fish and wildlife consumption advisories that apply to Lake Ontario, including the AOC. They are known to exceed the FDA consumption guideline in fish samples collected within the AOC. PCBs have also been identified (with low confidence) as may be contributing to a degradation of fish and wildlife populations and bird or animal deformities or reproduction problems. They have been identified as possibly being exported in significant amounts to Lake Ontario from or through the AOC.

Conclusions

a) The lack of identifiable major sources of PCB inputs to the AOC, and the close correlation of AOC fish flesh PCB levels with those generally found in Lake Ontario for the same size and species of fish suggest that the major PCB input to the AOC likely comes from Lake Ontario, either through fish migrating into the AOC from other parts of Lake Ontario, or transfer of PCBs to the harbor from Lake Ontario through the water column, or by forage fish.

b) The basin is likely contributing some PCBs to the AOC. Sources in the basin that may be contributing PCBs include:

- three permitted point source discharges
- seven hazardous waste sites where PCBs are thought to be a likely source of PCBs to the Oswego River and two sites where PCBs have been confirmed but insufficient information exists to determine whether or not migration is occurring from the site;
- the drainage of Owasco and Onondaga Lakes, and the vicinity of the Village of Skaneateles Falls;
- the Oswego River drainage between Phoenix and Fulton, possibly in the bottom sediments;
- the bottom sediments of Onondaga Lake;
- there are likely to be additional, unidentified locations.

Evidence for Sources

Basin Inputs:

a) PCBs are ubiquitous in the Seneca-Oneida-Oswego basin, New York, and the Great Lakes basin. In particular, sport fish from all parts of the state contain measurable amounts of PCBs in their flesh[1] probably from PCBs deposited from the atmosphere. Lake trout in Hemlock Lake, a water supply reservoir with no industrial or municipal discharges, have fish flesh levels of 0.49 ug/g in a 1984 sample. Lake trout in Lake Ontario averaged 2.4 ug/g in 1985 samples[2], considerably above the Hemlock Lake value.

b) PCB levels in fish flesh[1] above those expected from atmospheric deposition alone can serve to pinpoint areas of current or past discharges to the basin.

- Lake trout in Owasco Lake had PCB levels averaging 2.07 ug/g in a 1982 sample. Between 1983 and 1985, Lake trout in the Finger Lakes, within the Oswego-Oneida-Seneca River basin, ranged between 0.17 and 1.45 ug/g.

- Brown trout from Skaneateles Creek below the Village of Skaneateles Falls, in 1984 samples showed an average of 2.86 ug/g compared to samples above the village with 0.25 ug/g concentrations.

- Channel catfish[3] at Fulton on the Oswego River in 1986 had a mean total PCB level of 3.8 ug/g, while a similar collection upstream at Phoenix averaged 1.7 ug/g. There are no known PCB sources in this area but there are a number of possible sources including contaminated bottom sediments in the Oswego River.

c) PCBs in the basin are discharged by GMC-Fisher Guide and Roth Brothers Smelting into Ley Creek, a tributary of Onondaga Lake, and by Industrial Oil Tank Service into Stony Creek, a tributary of Oneida Lake; all three under NYSDEC permits[4]. The permitted limit for the Industrial Oil Tank Service is 0.0003 pounds per day; the limit for Roth Brothers Smelting is 1.0 ug/L from an approximate flow of 13,300 gallons per day of cooling water, or a maximum of 0.0001 pounds per day, plus a similar concentration from an undetermined amount of non-quantified storm water. The permitted limit for GMC-Fisher Guide is 0.0047 pounds per day. These loads should be compared with the estimated 3.4 lbs/day of PCBs entering Lake Ontario from all sources[5].

d) Twenty-one inactive hazardous waste sites in the drainage basin are suspected or confirmed to contain PCBs[3]. These are listed in Table 5-1. The site locations are shown in Figures 5-1 and 5-2. Table 5-2 shows the sites categorized by the likelihood that they are contributing PCBs to the drainage basin that could be reaching the AOC. The basis for the site categorization is shown in Table 5-3. Because of the widespread use and disposal practices connected with PCBs there are likely to be other sites containing PCBs which have not yet been identified.

e) PCBs have been used in the basin and are expected to be in the bottom sediments of lakes and rivers in the basin. Core samples taken from Onondaga Lake[6] show a quantifiable level of aroclor 1248 between zero and six inches, and aroclors 1248 and 1254 at two places down to 47 inches. No sediment measurements for PCBs have been reported for any other parts of the basin outside the AOC.

Lake Ontario Inputs:

a) PCB levels in smallmouth bass from Oswego Harbor are indistinguishable from levels in smallmouth bass samples taken off Galloo and Stony Islands from 1981 to 1983. See Table 5-4. Galloo and Stony Islands are expected to represent open Lake Ontario conditions, but they may be influenced by the Black River, a known PCB source.

TABLE 5-1
SENECA-ONEIDA-OSWEGO RIVERS BASIN
INACTIVE HAZARDOUS WASTE SITES THAT MAY CONTAIN PCBs

Site#	Name	Size (Acres)	Location	Sub-basin
727005	Canastota Landfill	7	Canastota (V) Madison Co.	Oneida River
734006	Otisca Inc.	5	DeWitt (T) Onondaga Co.	Oneida River
734009	Tripoli Landfill	-	Onondaga (T) Onondaga Co.	Onondaga Lake
734013	Quanta	0.75	Syracuse (C) Onondaga Co.	Onondaga Lake
734022	Rockwell	2	Syracuse (C) Onondaga Co.	Onondaga Lake
734028	Split Rock	400	Onondaga (T) Onondaga Co.	Onondaga Lake
734029	Old Syracuse Die.	0.20	Syracuse (C) Onondaga Co.	Onondaga Lake
734030	Onondaga Lake		Onondaga Co.	Onondaga Lake
734034	Clay Landfill	38	Clay (T) Onondaga Co.	Oneida River
734036	Salina Landfill	20	Syracuse (C)	Onondaga Lake
734037	Brighton Landfill	-	Syracuse (C) Onondaga Co.	Onondaga Lake
734039	Syracuse FT	1.0	Syracuse (C) Onondaga Co.	Onondaga Lake
734040	Vals Dodge	20	Solvay (V) Onondaga Co.	Onondaga Lake
734044	Ley Creek PCB	-	Salina (T) Onondaga Co.	Onondaga Lake
734047	Winkelman	0.06	Syracuse (C) Onondaga Co.	Onondaga Lake
738003	Volney Landfill	58	Volney (T) Oswego Co.	Oswego River

TABLE 5-1 (Continued)
SENECA-ONEIDA-OSWEGO RIVERS BASIN
INACTIVE HAZARDOUS WASTE SITES THAT MAY CONTAIN PCBs

Site#	Name	Size (Acres)	Location	Sub-basin
738004	N. Armstrong Landfill	-	Volney (T) Oswego Co.	Oswego River
738004B	S. Armstrong Landfill	-	Volney (T) Oswego Co.	Oswego River
738014	Clothier	3	Granby (T) Oswego Co.	Oswego River
738023	Fulton Terminal	2	Fulton (C) Oswego Co.	Oswego River
738028	Colture	0.05	Fulton (C) Oswego Co.	Oswego River

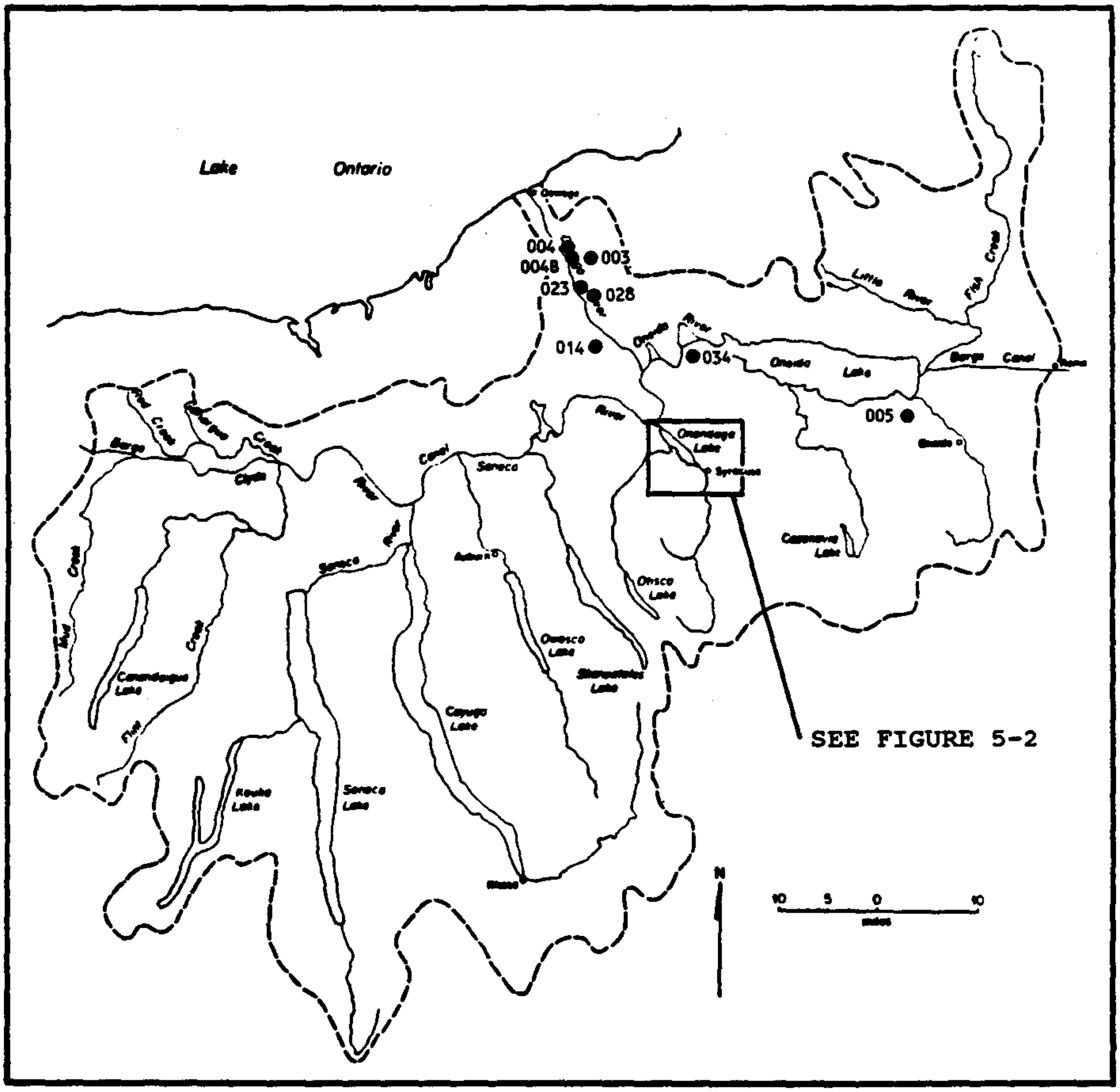

Figure 5-1. Inactive Hazardous Waste Sites in the Seneca-Oneida-Oswego Rivers Basin Known or Suspected to Contain PCBs (Numbers refer to last three digits of site numbers in Table 5-1)

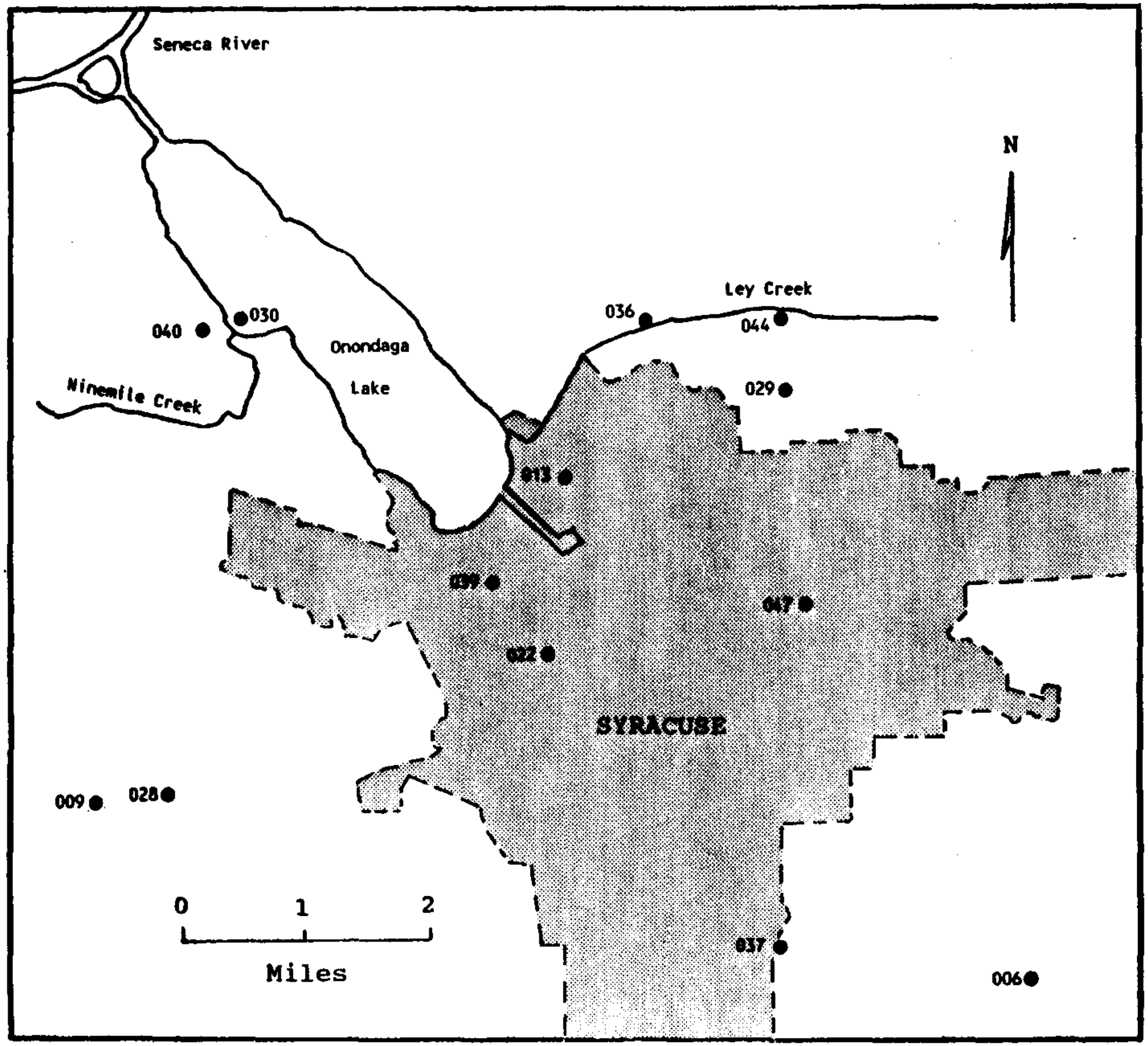

Figure 5-2. Inactive Hazardous Waste Sites in the Syracuse Area Known or Suspected to Contain PCBs (Numbers refer to last three digits of site numbers in Table 5-1)

TABLE 5-2
SENECA-ONEIDA-OSWEGO RIVERS BASIN
INACTIVE HAZARDOUS WASTE SITE CATEGORIZATION

Site#	Name	Evidence
Category A. Thought to be a likely source of PCBs		
734030	Onondaga Lake	PCB contaminated sediments
734044	Ley Creek	PCB contaminated sediments
738004	N. Armstrong Landfill	PCBs disposed at the site with drainage directly to the Oswego River.
738004B	S. Armstrong Landfill	PCBs disposed at the site with drainage directly to the Oswego River.
738003	Volney Landfill	RI/FS*, ROD* completed. Site is capped and a groundwater system is being installed.
738014	Clothier	RI/FS*, ROD*, soil removal completed and remediation is underway. USFWS study found no evidence of environmental damage or risks to wildlife.
738023	Fulton Terminal	RI/FS*, ROD*, soil removal completed. Final remediation still to be implemented.
Category B. Insufficient information to categorize		
734034	Clay Landfill	
734036	Salina Landfill	
Category C. Investigations incomplete; thought to be an unlikely source of PCBs		
727005	Canastota Landfill	Remote from river system.
734009	Tripoli Landfill	PCBs not detected offsite.
734013	Quanta	Distant from AOC with unlikely transport mechanism.
734029	Old Syracuse Die	No direct connection to river system.
734039	Syracuse Fire Training	No direct connection to river system.
734040	Vals Dodge	Low levels of PCBs found to date.
734047	Winkleman	Transformer spill with unlikely transport mechanism to AOC.
734006	Otisca Inc.	Soil removal completed and the site is remote from the river system.
734002	Rockwell	100 gallon PCB spill has been removed. Investigations continuing.
734037	Brighton Landfill	Buried PCB waste remote from the river system. Unlikely transport mechanism to AOC.
738028	Colture	Investigation continuing. However, the type of operation and the amount of contamination indicate an unlikely source for the AOC.
734028	Split Rock	Barrel removal completed. No significant PCB contamination noted. Investigation continuing.

Table 5-3

SENECA-ONEIDA-OSWEGO RIVERS BASIN

INACTIVE HAZARDOUS WASTE SITES CATEGORIZATION CRITERIA

Category A	Criteria - Investigations have shown the site to be a likely source for the Area of Concern because PCBs are or may have been migrating to the river system by a specific pathway such as surface runoff, groundwater migration, contaminated sediments, etc., and remediation has not been completed.
Category B	Criteria - Not enough information is known about the site to determine if it is a potential source of PCBs to the Area of Concern.
Category C	Criteria - The investigations are not complete. However, the site is believed to be an unlikely source of PCBs for the Area of Concern due to distance from the river system, drainage patterns, hydrogeology, surface features, soil characteristics, etc.
Category D	Criteria - The investigations are complete. The site is believed to be an unlikely source of PCBs to the Area of Concern due to distance from the river system, drainage patterns, hydrogeology, surface features, soil characteristics, etc., or remediation is complete.

b) PCB levels in smallmouth bass from Oswego Harbor are higher than levels in the same species from the Oswego River above the harbor, but below Hinmansville. See Table 5-4.

TABLE 5-4. COMPARISON OF FISH FLESH CONCENTRATIONS OF PCBs IN SMALLMOUTH BASS FROM OSWEGO HARBOR AND THE OSWEGO RIVER WITH THE SAME SPECIES FROM GALLOO AND STONY ISLANDS (ug/g)[a]

Year	Oswego Harbor Weight (gms)	Oswego Harbor PCB Conc.	Oswego River Weight (gms)	Oswego River PCB Conc.	Galloo Island Weight (gms)	Galloo Island PCB Conc.	Stony Island Weight (gms)	Stony Island PCB Conc.
1981	795	1.31	522	0.32			836	1.85
1982							963	2.12
1983	671	1.23			498	0.76		
1984	1122	1.31	1224	0.32				

[a]NYSDEC (1987). Toxic Substances in Fish and Wildlife Analyses Since May 1, 1982. Vol. 6.

c) Spottail shiner collections from the harbor from 1984 to 1986[7] show average PCB levels in whole fish samples of 74 ng/g and are in the same range as spottail shiner PCB levels in the Genesee River and Salmon Rivers (65 and 90 ng/g) and considerably below the average value at the mouth of the Black River (808 ng/g). Spottail shiners taken near Wolfe Island[7], where Lake Ontario narrows to form the St. Lawrence River, had a mean concentration of 90 ng/g PCBs.

d) PCBs have not been detected in grab samples of harbor sediments using detection levels of 0.1 ug/g in 1981[8]. A sediment core taken in Oswego Harbor[9] showed no aroclor 1016/1242 or 1260 at a detection limit of 0.001 ug/g; aroclor 1248 varied from 0.0015 at the surface to 0.045 ug/g; and aroclor 1254 varied from 0.0013 to 0.029 ug/g. The average concentration of total PCBs in Lake Ontario sediments is 0.057 ug/g[10].

References

[1]NYSDEC (1987). Toxic Substances in Fish and Wildlife Analyses Since May 1, 1982. Tech., Vol. 6.

[2]IJC (1989). 1987 Report on Great Lakes Water Quality, Appendix B, Volume 1.

[3]NYSDEC (1989). Inactive Hazardous Waste Disposal Sites in New York State.

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[5]NYSDEC, Ontario MOE, USEPA, Env. Canada (1989). Lake Ontario Toxics Management Plan.

[6]NYSDEC (1989). Engineering Investigations at Inactive Hazardous Waste Sites. Draft Phase II Investigation; Mercury Sediments - Onondaga Lake.

[7]Skinner, L.C., and Jackling, S.J. (1989). Chemical Contaminants in Young-of-the-Year Fish From New York's Great Lakes Basin: 1984-1987, NYSDEC.

[8]Macola, Inc. (1981). Analysis of Sediment From Oswego Harbor, Great Sodus Harbor, and Little Sodus Harbor.

[9]Litten, S. (1989) Chemical Contaminants in Sediments of New York Tributaries to Lake Ontario. NYSDEC.

[10]Stevens, R.J.J. (1988). A Review of Lake Ontario Water Quality with Emphasis on the 1981-82 Intensive Years. IJC.

Dioxin

Properties and Sources

Dioxins are chlorinated organic compounds with low water solubility that bind to sediment and soil particles and dissolve in fatty tissues. The most toxic of these compounds is 2,3,7,8-tetrachlorodibenzodioxin (TCDD). Dioxins bioaccumulate moderately in the aquatic environment. They are by-products of combustion in the presence of chlorine and are found in fly ash and other products of these processes. They are also by-products of the alkaline treatment of chlorinated phenols. Rats fed 0.01 ug/day of TCDD show a variety of pathological effects. The New York State water quality standard for TCDD is 0.000001 ug/L in A, A-Special, B, C, and D waters based on prevention of bioaccumulation in fish flesh. There is no FDA guideline for TCDD, but the New York State Department of Health has set 10 ng/kg as a level that would trigger a consumption advisory.

Impairments

Dioxin (2,3,7,8-tetrachlorodibenzodioxin) is a cause (high confidence) of the general fish consumption advisories that apply to the AOC. Dioxin is known to exceed the New York State consumption guideline in fish samples collected within the AOC. Dioxin may also be exported from or through the AOC to Lake Ontario.

Conclusions

No sources of dioxin have been identified.

Evidence for Sources

a) There are no environmental samples within the basin that have been analyzed for dioxin except for the analysis on smallmouth bass and carp taken from the AOC in 1987[1], page 4-36.

b) Dioxin is generally found in Lake Ontario fish with the concentration depending on age and species.

c) There are no permitted discharges of dioxin within the basin.

d) There are no hazardous waste sites reported to contain dioxin. However, dioxin is not analyzed routinely at such sites.

e) Data from a composite of three carp taken in 1987 from the AOC[1] show dioxin levels that may indicate sources in the basin. There is no information that could be used to pinpoint these sources.

References

[1]Skinner, L.C. (1989). EPA National Bioaccumulation Study Results. Memo from L.C. Skinner, September 14, 1989.

Phosphorus

Properties and Sources

Phosphorus occurs naturally in soils, sediments, and the water column. Excess phosphorus in waterbodies can lead to rapid growth of microscopic plant life (phytoplankton) during summer. The decaying phytoplankton removes oxygen from the water that is needed by other water life. It also washes up on beaches as algal mats. Since it is a natural component of animal and plant life, it is found in domestic sewage.

Treatment of sewage reduces the phosphorus load, but some will remain in the effluent. During storm events, discharge of phosphorus will occur through overflows from combined sewer systems. Inadequate treatment of sewage will accentuate problems connected with phosphorus. Phosphorus is a major component of fertilizers and is likely to be found in runoff from agriculture and urbanized land. There is no water quality standard for phosphate and polyphosphate, but there is a 1 mg/L limit required by the GLWQA on all sewage treatment plants discharging more than 1 million gallons per day.

Impairments

Phosphorus has been identified in Chapter 4 as the limiting nutrient connected with excessive algae production in the AOC.

Conclusions

There are numerous sources of phosphorus contributing to the algae impairment in the AOC. Major sources are suspected to be the Fulton and Syracuse Metro sewage treatment plants, the Wetzel Road sewage treatment plant's wet weather overflow and combined sewer overflows from the Syracuse Metro system and other combined systems in the basin. Agricultural and urban runoff to the basin is likely contributing, but there are no measurements of amounts.

Evidence for Sources

a) The three lakes (Oneida, Onondaga, and Cross) close to the head of the Oswego River are eutrophic[1]. They receive nutrients (including phosphorus) discharged from municipal treatment plants, sewer system overflows, and land runoff and discharge these nutrients (in soluble or particulate-bound form or in the form of algal masses) into the Oswego River[1].

b) Direct discharge of phytoplankton to the Oswego River from Onondaga and Oneida Lakes has been observed in 1981[1]. In June, 1981, Onondaga Lake was reported as very rich in blue-green algae, and Oneida Lake at the outlet, was also rich in phytoplankton dominated by blue-green algae. After entering the Oswego River at Three Rivers, blue-green algae remained dominant for the next ten miles.

c) An attempt has been made to construct a mass balance for phosphorus in order to determine the approximate contributions from the three sub-basins of major importance. The results are shown in Table 5-5. The location of the sampling stations can be seen in Figure 5-3. The calculated leads are only approximate because of a number of problems: streamflow gauging is only accurate to about $\pm$ 20%, the Onondaga Lake exit flow is not gauged because the flow at this point reverses under certain conditions, and the sampling for phosphorus measurements was not done in any relation to flow. One would expect the Oswego station load to be equal to the sum of the loads from the three sub-basins plus phosphorus added along the course of the Oswego River. Even though this analysis is crude, it may serve as a beginning point for evaluating phosphorus loads within the basin.

TABLE 5-5 PHOSPHORUS BALANCE FROM SUB-BASINS

Sub-Basin	Station	Flow (cfs)	Phosphorus Concentration (mg/L)	Phosphorus Load (lbs/day)
Oswego River	Oswego	8009[a]	0.065[c]	2807
Seneca River	Baldwinsville	4659[a]	0.060[c]	1505
Oneida River	Brewerton	3021[a]	0.054[c]	879
Onondaga Lake	Onondaga Lake exit[c]	550[b]	0.127[d]	377

[a]1986 flows as measured by USGS gauging stations

[b]Estimated from total inflow to Onondaga Lake between 1971 and 1986

[c]NYSDEC monitoring station values. Mean concentrations for 1986

[d]Onondaga County (1987). Department of Drainage and Sanitation. Unpublished data. A mean phosphorus concentration was estimated from epilimnion samples taken in the northern part of the lake in 1986.

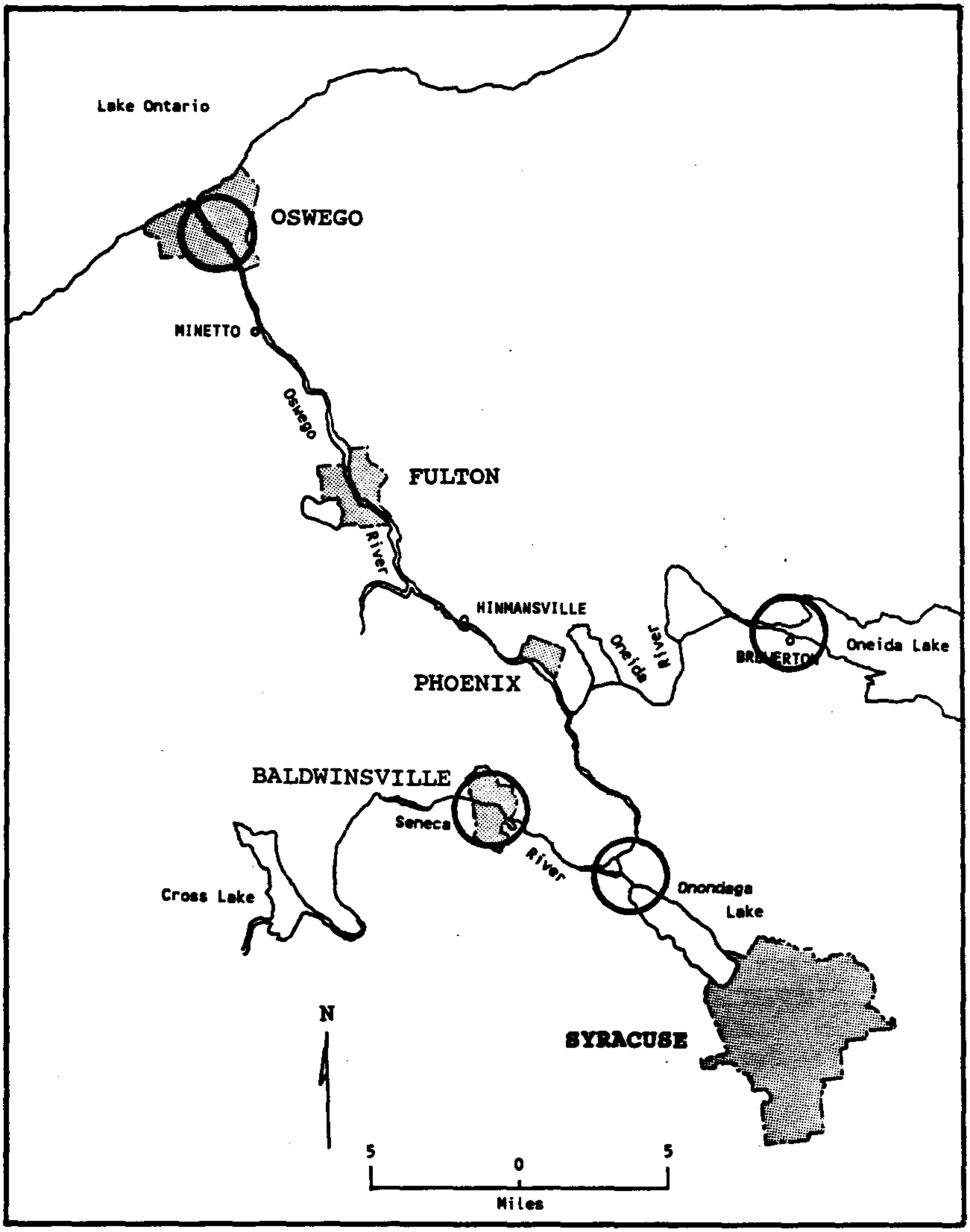

Figure 5-3. The Lower Seneca Basin Showing the Location of Sampling Stations

d) There are 66 municipal sewage treatment plants in the basin varying in design flow from the 3,000 gallon per day Savannah Sewer District #1 plant to the 86.5 million gallon per day (MGD) Syracuse Metro plant[2]. All plants, now provide a minimum of secondary treatment and those with flows greater than 1 MGD operate within permissible limits[3] (1 mg/L under the Great Lakes Water Quality Agreement[3]). The Fulton sewage treatment plant has recently been upgraded. The total current flow from the treatment plants in various sub-basins is shown in Table 5-6. Since the larger plants have permitted limits on phosphorus, 91% of the total sewage treatment plant flow in the basin is covered by phosphorus limits. The Lower Seneca-Oswego River, Oneida River, and Onondaga Lake sub-basins make up 78% of the current sewage treatment plant flows in the basin and 94% of this load is subject to phosphorus limitations. These are the sub-basins expected to have the major impact on water quality in the AOC. They receive 78% of the total sewage treatment plant discharge in the basin.

TABLE 5-6. TOTAL FLOW (MILLION GALLONS PER DAY) FROM MUNICIPAL SEWAGE TREATMENT PLANTS IN THE SENECA-ONEIDA-OSWEGO RIVERS BASIN BY SUB-BASIN

Sub-Basin	Current Flow
Lower Seneca-Oswego Rivers	17.03
Oneida River	15.90
Onondaga Lake	74.93
Skaneateles	0.58
Owasco Creek	8.97
Clyde River	6.69
Upper Seneca River	13.92

Phosphorus discharge information from sewage treatment plants in the three important sub-basins is listed in Table 5-7 together with industrial discharges that have a permitted phosphorus load. Phosphorus loading data are available for most facilities for 1988 so an estimate can be made of the total phosphorus loading. The total estimated loading of phosphorus from municipal and industrial sources within the three sub-basins is 1064 lbs/day.

TABLE 5-7 PHOSPHORUS LOADS IN 1988 FROM MUNICIPAL AND INDUSTRIAL DISCHARGES IN THE THREE MAJOR SUB-BASINS

Sub-Basin	Facility	Phosphorus Loads (pounds per day)	Totals
Lower Seneca-Oswego Rivers	Oswego (C) West	22.0	
	Fulton (C)	229[a]	
	Wetzel Road S.D.	34.2	
	Baldwinsville-Seneca Knolls S.D.	16.0	
	Anheuser-Busch	24.5[b]	
	Miller Brewing, Inc.	0.5	326
Oneida River	Oneida (C)	13.2	
	Lake Shore S.D.	6.7	
	Meadowbrook-Limestone S.D.	22.1	
	Canastota (V)	9.2[c]	
	Oak Orchard S.D.	15.7	
	East Oneida Lake S.D.	3.1	70
Onondaga Lake	Syracuse Metro	474	474

[a]Prior to completion of plant upgrade in 1989. These data reflect a period of time during which portions of the plant were out of service because of the upgrading. The plant will be required to meet the 1 mg/l phosphorous limit specified in the GLWQA.

[b]During the months of June through September, Anheuser-Busch illegally discharged phosphorus not included in this figure (see p., 2-19.)

[c]Measured loads not available - permitted load used.

e) The two major phosphorus dischargers in 1988 were the Syracuse Metro and the Fulton plants making up 84% of the phosphorus load from facilities in these three basins (Table 5-7).

f) Combined sewer systems or overflows caused by excessive stormwater infiltration of separate sanitary systems, can add considerably to the phosphorus load in the receiving water. Two municipal sewer systems, Syracuse Metro and Wetzel Road, are under orders to correct serious overflow problems. There is currently enforcement action against the City of Auburn (Owasco Sub-basin, not listed in Table 5-7). The Wetzel Road facility, as an example, was designed to handle 5.0 MGD. Measurements on the system during 1984 showed up to a peak overflow of 36 MGD, mainly during rain and snowmelt periods.

g) Primary agricultural inputs of phosphorus to the Seneca-Oneida-Oswego River basins are expected to come from the southern shore of Oneida Lake and the extensive agricultural area drained by the Seneca River system. No specific information is available on the agricultural contribution of phosphorus, but the many large lakes would be expected to be a trap for much of the phosphorus that drains into them from agricultural lands.

References

[1]Effler, S.W., Editor. A Preliminary Water Quality Analysis of the Three Rivers System. Upstate Freshwater Institute, Inc.

[2]NYSDEC. Descriptive Data of Sewage Treatment Systems in New York State, Bureau of Wastewater Facilities Design.

[3]NYSDEC. Permit Compliance System Reports.

Mercury

Properties and Sources

Mercury is found as a natural mineral, usually as the sulfide, and is widely used by man in batteries, electrical contacts, and thermometers. Mercury is also found in coal and can be released to the environment during combustion. At one time it was used extensively in the electrolytic production of chlorine from brine, but is no longer used for that purpose. It was also used as a pesticide but mercury pesticides were banned from use in New York effective July 1, 1971. In streams, ponds, and lakes it is bound to sediments but can be transformed by certain bacterial populations to form methyl mercury which is rapidly taken up by aquatic life, particularly fish. Mercury is readily transferred from fish to fish consumers and can cause irreversible central nervous system damage. New York State has a water quality standard of 2 ug/L based on protection of public health in A and A-Special waters and a guideline of 0.2 ug/l in A, A-Special, B, and C waters, based on prevention of bioaccumulation in fish flesh. The FDA fish flesh consumption guideline is 1 mg/kg.

Impairments

Mercury is considered as one of the Lake Ontario Toxics Management Plan priority chemicals with a possibly significant net export to Lake Ontario.

Conclusions

Mercury from past discharges is in the sediments of Onondaga Lake and two of its tributaries, in Oswego Harbor sediments and likely in sediments of the Oswego River. Plant sites adjacent to Onondaga Lake and its tributaries are contaminated. These are possibly contributing mercury to Lake Ontario. There are seven permitted point source discharges of mercury in the basin, but of those sources now operating only the Milliken Generating Station released reportable amounts in 1988.

Evidence of Sources

a) Mercury is commonly found in fish flesh throughout the state. Mercury levels in fish flesh increase with the weight of the fish and vary among species. Lake trout in the Finger Lakes weighing between 1000 and 2000 grams have levels varying between 0.27 and 0.45 ug/g[1].

b) Mercury measurements on smallmouth bass[1] collected from the Oswego River, Cross Lake, and Onondaga Lake from 1980 through 1986 (Table 5-8) show that Onondaga Lake values are higher than those in Cross Lake and the Oswego River. Fish taken at Hinmansville had higher concentrations than those from Oswego Harbor. These data suggest that Onondaga Lake is the main source of mercury to the AOC.

TABLE 5-8 MERCURY LEVELS IN SMALLMOUTH BASS

Source	Year	Weight (g)	Mercury (ug/g)
Onondaga Lake	1980	470	0.92
	1981	485	1.23
	1983	442	1.08
	1984	380	1.03
	1985	513	1.20
	1986	446	1.05
	1986	549	1.18
Cross Lake	1981	817	0.39
Oswego River (below Hinmansville)	1981	522	0.72
Oswego Harbor	1981	795	0.51

c) Samples of lake trout from Skaneateles Lake[1] were from 1/2 to 1/3 the weight of lake trout from other Finger Lakes, but their mercury levels were about twice as high (0.70 ug/g for fish averaging 671 grams, and 0.58 for fish averaging 607 grams in 1980 and 1983 respectively).

d) Measurements of mercury in the water column are limited to Oswego Harbor and Onondaga Lake. Eight measurements of Onondaga Lake water in 1987[2] gave an average concentration of 0.16 ug/L.

e) The principal source of mercury to Onondaga Lake has been the chlorine manufacturing facility operated by Allied Chemical in Geddes from the late 1940s through 1979, and by LCP Chemical in Geddes from 1979 through 1988. The LCP plant shut down in 1988 in response to a DEC complaint and proposed consent order alleging serious chronic violations of a 0.028 pounds per day SPDES permit limit. The plant site is contaminanted with mercury and has been nominated to the State's Registry of Inactive Hazardous Waste Sites. There is currently a SPDES permit in effect for runoff from the plant site that drains to Onondaga Lake.

f) The bottom sediments of Onondaga Lake have been contaminated with past discharges of mercury. They are a listed site in New York's Hazardous Waste Site Registry. An extensive coring of Onondaga Lake sediments was carried out by DEC in 1986 and 1987[2]. The highest concentration detected was 85.37 ug/g. Sixty-nine percent of the 85 samples taken from the first six inches of sediment throughout nearly the entire lake exceeded the background range for New York soils of 0.02 to 0.5 ug/g. Sediments in a tributary of Onondaga Lake, Nine Mile Creek and its tributary, Geddes Brook, are also contaminated with mercury.

g) The Milliken Generating Station located in the Town of Lansing, Tompkins County, discharged 0.01 lbs/day under its SPDES permit to receiving waters in the Oswego River drainage basin. The Clark Specialty Company in Hammondsport, Steuben County; Evans Chemetics of Waterloo, Seneca County; the City of Fulton, Oswego County; GMC-Fisher Guide of Syracuse; the Lockwood Ash Disposal site in the Town of Torrey, Yates County; and Syroco, Inc., in the Town of Van Buren, Onondaga County; have permits to discharge varying amounts of mercury, but in 1988 they did not release reportable amounts of the metal. LCP Chemicals, now closed, discharged an average load of 0.23 lbs/day to Onondaga Lake in 1988 - clearly in excess of their permit limit of 0.028 lbs/day. SPDES monitoring data from the LCP plant site runoff showed an average discharge of 0.014 lbs/day for 1988.

h) Under the pretreatment program, chemical analyses were performed on numerous industrial discharges that enter municipal treatment systems. Industries where mercury was detected in the discharge are shown in Table 5-9 for each of the four systems in the basin that have a pretreatment program.

i) There are no inactive hazardous waste sites at which mercury has been reported, except those listed under e) and f) above.

References

[1]NYSDEC (1987). Toxic Substances in Fish and Wildlife. Analyses Since May 1, 1982.

[2]NYSDEC (1989). Draft Engineering Investigations at Inactive Hazardous Waste Sites. Phase II Investigation; Mercury Sediments - Onondaga Lake.

Table 5-9

INDUSTRIES WHERE INDUSTRIAL PRETREATMENT PROGRAM SAMPLING SHOWED DETECTABLE CONCENTRATIONS OF MERCURY

City of Fulton - Morrill Press Company

City of Ithaca - None

City of Oswego - None

Onondaga County - Allied Corporation, Solvay

Allied Industrial Laundry, Solvay

Coyne Textile Services, Syracuse

General Electric, Court Street, Syracuse

King Laboratories, Syracuse

LCP Chemical, Solvay

Strathmore Chemical Coatings, Syracuse

Unifirst Corporation, Liverpool

Mirex/Photomirex

Properties and Sources

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, New York. It is no longer produced or used in New York. Mirex was used for experimental purposes by Armstrong Cork near Fulton, New York in the 1960s and then discarded. Much of it went into the Oswego River. Mirex bioaccumulates in the aquatic food chain and is an animal carcinogen. The New York State water quality standard is 0.001 ug/L for all waters. The FDA fish flesh consumption guideline is 0.1 mg/kg.

Impairments

Mirex has been identified (with low confidence) as having a small net export to Lake Ontario. The Lake Ontario Toxics Management Plan lists mirex as causing an impairment in Lake Ontario.

Conclusions

a) In the mid-1960s the Oswego River was a major known source of mirex to eastern Lake Ontario. Recent measurements on the water column, sport fish, and sediments suggest that most of the mirex contaminated sediments have been buried beneath clean sediments and although a small amount of mirex is being released to the Oswego River from these sediments it is having little effect on the ecosystem.

b) Other possible sources of mirex to Lake Ontario are the two inactive hazardous waste sites in the Town of Volney.

Evidence for Sources

a) Numerous fish collections across the state have been analyzed for mirex between 1981 and the present[1]. Mirex has not been detected, with only a few exceptions, (detection level of 0.01 ug/g) in collections outside of the Niagara River, Lake Ontario, the Oswego River, St. Lawrence River, and the mouths of Lake Ontario tributaries. Where detections have occasionally been observed outside of these areas, concentrations are always very close to the detection limit.

b) There are no permitted point source discharges of mirex in the basin.

c) Discharge of mirex on a single occasion from the Armstrong Cork Company, just north of Fulton, in the mid-1960s contaminated the Oswego River, harbor, and adjacent Lake Ontario[2]. The chemical settled to the bed of the stream along the 14 km stretch from the plant to the harbor. This is the only known source of mirex to the Oswego River.

In 1976, bottom sediment samples collected by the NYSDEC[2] in the Oswego River at points 0.6 to 14.5 km from the river's mouth revealed a median of 18.5 ng/g of mirex from a range of non-detect above Armstrong Cork to 1666 ng/g about 0.4 km below the plant. Even at this time, about ten years after the discharge to the river, a sediment core taken 0.8 km below Armstrong Cork showed that considerable burial to depths of 10 inches or greater had already occurred. Mirex concentrations in sediments of the lower river were not appreciably above levels in Lake Ontario off Oswego Harbor (10 ng/g)[3].

d) In 1981, Macola, Inc. used a detection level of 50 ng/g for 11 samples collected in the harbor and found no detectable amount of the chemical[4]. Scrudato and DelPrete[5] collected core and grab samples in the Oswego Harbor in 1979. A core sample collected in the harbor contained 30 ng/g at a depth of 9 to 10 cm; the upper

3 cm were below the detection level of 3 ng/g. In 1979, Scrudato and DelPrete collected 11 sediment samples from 3.5 km to upstream of 14 km from the lake. The median concentration of mirex was reported to be 7.3 ng/g (ranging from non-detect to 1834 ng/g immediately below Armstrong Cork).

A single core sample taken in Oswego Harbor by NYSDEC in 1988[6] showed no mirex down to a depth of 33 cm. at a detection level of 1 ng/g.

e) Two inactive hazardous waste sites are listed in the NYS Hazardous Waste Inventory as containing mirex[7] (738004 and 738004B). Both are owned by Armstrong Cork and have been used as dumping spots for the industrial waste from its manufacturing process. 738004 has been confirmed as a repository of mirex; the other (738004B) is a suspected repository. Both are in the Town of Volney, Oswego County, and received wastes from Armstrong Cork Company prior to closure in 1969. Both are adjacent to the river. Both sites have since been capped.

f) Ten Channel catfish collected at Fulton and analyzed for mirex included six specimens below the detection level of 0.005 ug/g, with a highest value of 0.017 ug/g[8]. These fish were free to travel in the stretch of river off shore of Armstrong Cork. Ten fish of the same species taken upstream at Phoenix and cut off by dams from the Fulton stretch included seven fish below the detection level, and a highest value of 0.011 ug/g. Considering the smaller average size of the Phoenix fish (928 grams compared to 1231 grams), there is no appreciable difference in the mirex levels of the two samples. Photomirex was not detected in either sample at a detection limit of 0.010 ug/g.

<u>References</u>

[1]NYSDEC (1987). Toxic Substances in Fish and Wildlife Analyses Since May 1, 1982. Vol. 6.

[2]Hetling, L.J. and Collin, R.L. (1978) Status Report. The Problem of Mirex in Lake Ontario. NYSDEC Technical Paper #53.

Holdrinet, M.V.H., Frank, R., Thomas, R.L., and Hetling, L.J. (1978). J. Great Lakes Res. 4(1),69-74.

[3]IJC (1987). 1987 Report on Great Lakes Water Quality, Appendix B., Vol.1.

[4]Macola, Inc. (1984). Analysis of Sediment From Oswego Harbor, Great Sodus Harbor, and Little Sodus Harbor.

[5]Scrudato, R.J. and DelPrete, A. (1982). J. Great Lakes Res. 8(4), 695.

[6]Litten, S. (1989). Chemical Contaminants in Sediments of New York Tributaries to Lake Ontario. NYSDEC.

[7]NYSDEC (1989). Inactive Hazardous Waste Disposal Sites in New York State.

[8]NYSDEC (1989). Data files.

Octachlorostyrene

Properties and Sources

Octachlorostyrene is insoluble in water and partitions to sediment and soil particles and to fatty tissue. It is a by-product of the electrolysis of brines in processes that use graphite electrodes. During the 1970s, techniques were adopted for electrolysis of brines that prevented the production of octachlorostyrene. Sediment cores show maximum concentrations at depths corresponding to around 1970 with a sharp decline after that[1]. It appears in sediments of Lake Ontario at concentrations above 15 ng/g off the Niagara River, along the south shore of Lake Ontario west of Rochester, and off the Oswego River[1]. The latter deposition shows octachlorostyrene at levels between 50 and 100 ng/g. Toxicological data are scarce, but indicate that the compound has low to moderate toxicity to rats. There are no New York State standards or guidance values. There is no fish flesh guideline for human consumption.

Impairments

Octachlorostyrene has been identified in Chapter 4, with low confidence, as contributing to a possible reduction in communities of waterfowl, raptors, mink, and otter populations in the AOC, and again with low confidence, as contributing to possible bird or animal deformities.

Conclusions

There are no known or suspected sources of octachlorostyrene in the AOC or the basin. The source of octachlorostyrene found in the brown trout samples is suspected to be general Lake Ontario contamination.

Evidence for Sources

a) Data on octachlorostyrene have been obtained from brown trout from Lake Ontario at Oswego in 1978[2] where it was reported at 35 ng/g. Levels in lake trout from Cape Vincent at the head of the St. Lawrence River were 281 ng/g, and from Stony Island they were at 86 ng/g in the same study.

b) Routine DEC monitoring of the Oswego River at Minetto has not detected octachlorostyrene at a detection of 5 ng/1 in four samples taken in 1989[3].

c) There are no permitted point source discharges of octachlorostyrene in the basin.

d) There are no hazardous waste sites in the basin where octachlorostyrene has been reported.

e) Octachlorostyrene was undoubtedly discharged from brine electrolysis near Onondaga Lake prior to 1970. It likely reached Lake Ontario where it remains, together with octachlorostyrene from other sources, in bottom sediments. Oliver, et al[4], have estimated that 1 metric tonne of octachlorostyrene is contained in Lake Ontario bottom sediments. Contaminated sediments in Onondaga Lake and the Oswego are probably buried under clean material deposited after 1970.

<u>References</u>

[1]Kaminsky, R. and Hites, R.A. (1984). Environ. Sci. Technol. <u>18</u>, 275.

[2]Kuehl, D.W., Johnson, K.L., Butterworth, B.C., Leonard, E.N., and Veith, G.D. (1981). J. Great Lakes Res. 7(3),330.

[3]NYSDEC (1989). Memo of G. Hansen and F. Estabrooks, September 14, 1989.

[4]Oliver, B.G., Charlton, M.N., and Durham, R.W. (1989). Environ. Sci. Technol. <u>23</u>, 200.

SUMMARY AND CONCLUSIONS

There are three pollutants causing impairments in the AOC that have been identified with high confidence: PCBs, dioxin, and phosphorus. The available information on the sources of these substances leads to the following conclusions:

PCBs - The major source causing an impairment to fish in the AOC is likely to be Lake Ontario. A number of other potential sources have been identified that may be making small contributions to the AOC.

Dioxin - Unknown.

Phosphorus - Major sources of phosphorus to the AOC are suspected to be overflows from municipal combined sewer systems, including the Syracuse Metro system, the Syracuse Metro sewage treatment plant, and the Wetzel Road sewage treatment plant's wet weather overflow. Agricultural and urban runoff also likely contributors of phosphorus.

Mercury, mirex, and dioxin have been identified as substances that are causing impairments in Lake Ontario and that may be transported through or out of the AOC and into Lake Ontario in significant amounts. The largest source of mercury is the bottom sediments of Onondaga Lake. The largest source of mirex is the sediments in the lower Oswego River. A number of other potential sources have been identified that may be making small contributions to the mercury and mirex loads entering the AOC. No sources of dioxin have been identified.

Octachlorostyrene has been identified, with low confidence, as possibly contributing to impairment of fish-eating wildlife. Lake Ontario is the likely major source of this substance to the AOC.

The source conclusions are summarized in Table 5-10.

TABLE 5-10. SUMMARY OF SOURCES OF POLLUTANTS CAUSING IMPAIRMENTS

Pollutant	Impairments (Confidence)	Possible Sources[a]
PCBs	Fish consumption advisories (high)	Lake Ontario
	Lake Ontario export (low)	Permitted discharges (3)
		Bottom sediments of Onondaga Lake
		Hazardous waste sites (9)
		Owasco and Onondaga Lakes drainage
		Vicinity of Village of Skaneateles Falls (tentative-specific source unknown)
		Oswego River drainage between Fulton & Phoenix (tentative-specific source unknown)
dioxin	Fish consumption advisories (high)	Unknown
	Lake Ontario export (low)	
phosphorus	Algal growth	Sewer overflows
		Sewage treatment plants
		Agricultural runoff
mercury	Lake Ontario export (low)	Bottom sediments of Onondaga Lake associated with past chlor-alkali manufacturing
		Bottom sediments in AOC
		Permitted discharges (7)
mirex and photomirex	Lake Ontario export (low)	Bottom sediments of Oswego River below Fulton
		Hazardous waste sites (2)
octachlorostyrene	Reduction of bird and animal populations (low)	Lake Ontario

[a]Sources believed to be major are underlined.

CHAPTER 6

CITIZEN PARTICIPATION

INTRODUCTION

The Oswego River RAP public participation activities were designed to involve interested parties in development of the RAP, to raise public awareness of the RAP process, and to build support for the final product; a remedial plan for the Oswego River/Harbor and its basin. The effort to encourage citizen participation is part of the NYSDEC commitment to an open decision-making process and to public access and involvement in New York State environmental policy development.

The NYSDEC created a Citizens' Advisory Committee to work in partnership with the Department on the RAP. Through the efforts of this committee, a dialogue between Department staff and local citizens developed. Public input and public review have added a constituent perspective to the remedial plan.

HISTORY OF THE PUBLIC PARTICIPATION PROCESS

NYSDEC Commissioner, Henry Williams, named an 18 member Citizens' Advisory Committee and chaired its first meeting in April, 1987. The committee consisted of governmental officials, industrial representatives, sports people, environmentalists, and research scientists. The full committee met regularly with regional NYSDEC staff throughout the RAP preparation. Additionally, there were sub-committees formed to deal with particular aspects of the RAP. The Technical Sub-committee was formed to assist the NYSDEC in gathering and evaluating the available data and in identifying the gaps or needs for additional information. A sub-committee on Uses and Use Impairments looked at current and past activities and conditions in the Area of Concern. The Citizen Participation Sub-committee was designated by the Committee to prepare a plan for community outreach and to serve as liaison with the local media. The sub-committees met on an as-needed basis during development of the RAP.

A Steering Committee was formed from NYSDEC Central and Regional office staff with three members from the Citizens' Advisory Committee in March, 1989. It was given the task of preparing the Stage I RAP. Since that time, the Steering Committee has served as the team that wrote the RAP and provided the mechanism for an interchange of information and views between the NYSDEC and the Citizens' Advisory Committee.

PUBLIC PARTICIPATION ACTIVITIES

Early in the RAP development, the Public Participation Sub-committee prepared a plan for encouraging citizen involvement in the RAP preparation. It identified target groups and other local interest groups. Activities were designed to reach specific groups as well as the general public. Information on the RAP process and progress was disseminated regularly through mailings and notices to local media. Citizens' Advisory Comitee meetings were public and were held in the Area of Concern, Oswego, as well as in Fulton and Syracuse both within the basin. The media were notified of all meetings, attended most, and reported regularly on the progress and problems in the RAP preparation.

Meetings

Two series of public meetings were held to encourage the general public and interested parties to participate in the RAP process. In April of 1988, meetings were held in Syracuse and Oswego. The sessions attracted over 75 local residents who questioned NYSDEC staff and Committee members. These meetings were geared toward obtaining descriptions of harbor uses from those living in the region. Their input was focused on past and future uses of the Oswego Harbor area. During the summer of 1989, a second series of two public meetings was conducted to update the public on the RAP progress and to again seek their input. These meetings, particularly the ones in Oswego, illustrated the strong local recognition of the importance of the harbor to the future of the city. The meetings also illustrated the lack of local consensus on future activities desired in the harbor and in the near shore area. The continuation of current multiple uses of the harbor is inherent in this draft RAP. Deciding on harbor use is essentially a function of the involved governments, the affected publics, and the commercial interests. It was not essential to the RAP process that specific future uses be formally designated.

In the final stages of the preparation of Chapters 4 and 5, a meeting of scientists, sponsored jointly by the Great Lakes Research Consortium and NYSDEC, was held to make sure all available information was included and to obtain the views of outside scientists on the interpretation of the information used in those chapters.

Written Materials

The minutes of all CAC meetings and the data central to their discussions were forwarded to a key list of approximately 50 individuals. This list included the local media, the heads of local civic and environmental groups, the local officials and representatives of relevant State agencies.

Several newsletters were prepared and distributed to a mailing list which grew from approximately 150 initially to over 500. This list includes all who attended any of the public meetings. Mailing lists from several civic and environmental organizations have been used for a wider distribution of RAP newsletters.

One newsletter distributed in mid-1988, prior to public meetings, included a citizen survey. In an effort to obtain a wide public distribution, copies of the survey were made available at various community locations. The survey topics were concentrated on current and future uses of the Oswego River and Harbor. The survey also solicited local opinion on the perceived condition of the water in the Area of Concern. Although more than 1500 surveys were distributed to the communities, fewer than 50 were returned with comments.

Two brochures were prepared for distribution to local groups and at summer events in he local area. The initial brochure was prepared during the summer of 1988, and 1500 copies were distributed in the AOC. Most were handed out and the remainder were mailed to local citizens. The second brochure, a revision with an update on RAP progress, was distributed at summer events during 1989.

Events

The Citizens' Advisory Committee and its Citizen Participation Sub-committee have used several community events as opportunities to distribute information and to discuss the committee activities with the public. Two Harborfests in Oswego provided an opportunity to acquaint local people and visitors with the RAP process and the problems in the AOC. In 1989, a similar activity, the Fulton River Festival, was attended by Citizens' Advisory Committee members who distributed a brochure and other RAP materials.

Other

Aside from newsletters, brochures, and press releases, the NYSDEC, at the request of the Citizens' Advisory Committee, produced a two-color poster depicting the Oswego Harbor and its many current recreational and commercial activities. The poster has been distributed in the Area of Concern in an effort to raise awareness of the value of the harbor and the existence of the local committee working on a remedial action plan. In a similar vein, to increase local awareness of the existence of the Citizens' Advisory Committee and the upcoming issuance of the remedial action plan, a bumper sticker urging "Keep Lake Ontario Great - Support the RAP" was made available at the 1989 Oswego Harborfest and at the Fulton River Days. Distribution of these collateral visual materials will continue.

EVALUATION OF CITIZEN PARTICIPATION IN THE RAP PREPARATION

Citizen participation in the RAP preparation process proceeded on two fronts. The first effort consisted of solicitation of a wide spectrum of Citizens' Advisory Committee members to represent the views of as many individuals within the Area of Concern and Oswego River basin as possible. The goal was to obtain a diverse group of volunteers to research, compile, review, and assist the NYSDEC with preparation of the Oswego River RAP.

This core group was also the vehicle to disseminate information about the process and pollution problems to the public at large. Despite efforts on several occasions to obtain more active participation from under-represented segments of the community, a number of important community segments did not participate.

The second effort included solicitation of public input in defining the scope of the problem and determining the direction the RAP process should go. This effort was also coupled with education about the Oswego River basin and the relationship of pollutants to humans and other organisms. Despite public involvement efforts of the Citizens' Advisory Committee during the two years leading to the production of Stage I of the RAP, citizens did not participate in large numbers.

The consensus of the Citizens' Advisory Committee is that participation of certain community segments and of individuals was limited by the absence of a perceived pollution crisis. Also, the long-term nature of the RAP process does not lend itself to creation of a sense of urgency which could generate wider or more intense local involvement.

APPENDIX 1

Units of Concentration

The following units are used for contaminant concentrations in sediments and fish flesh:

mg/g - milligrams per gram
ug/g - micrograms per gram
ng/g - nanograms per gram

The following units are used for contaminant concentrations in water:

mg/L - milligrams per liter
ug/L - micrograms per liter
ng/L - nanograms per liter
pg/L - picograms per liter

Concentrations are also given in ppm (parts per million) and ppb (parts per billion) in same places in the text.

The following table is useful for conversion between units:

1 milligram is 10^{-3} grams

1 microgram is 10^{-6} grams

1 nanogram is 10^{-9} grams

1 picogram is 10^{-12} grams

There are 454,000,000,000,000 picograms in one pound.

APPENDIX 2

Responsiveness Summary

Two public workshops were held on the draft RAP; one in Oswego, and one in Syracuse, at which about 50 people attended. Comments were received at that time. In addition, draft copies of the RAP were distributed to the general public and other government agencies, and their comments were solicited.

The substantive comments (aside from those that were purely editorial) are listed below along with the NYSDEC response.

Chapter 1. Introduction

No comment

Chapter 2. Setting

Comment: It would be appropriate to identify Oswego Harbor's current NYSDEC water quality classification (class C) and the designated uses associated with that classification.

Response: The intent of this section is to discuss the actual uses made of the water. A discussion of classification is included in Chapter 3.

Comment: Because primary contact is a designated use of class C waters, swimming should be placed under current uses with a notation that it is not encouraged.

Response: (See response to previous comment).

Chapter 3. RAP Planning Process and Goals

Comment: The term "edible" is a subjective term and should be replaced in the goal statement on p., 3-1 by something more specific. The words "self-sustaining fishery" should be replaced by "diverse fishery" since even stocked fish should be able to swim in the AOC.

Response: The word "edible" has been footnoted to clarify its meaning. The word "diverse" has been added to clarify that the goal does not refer to a single species of fish.

Comment: On p., 3-3 it should be recognized that there is a substantial controversy among Great Lakes governments over the methods and assumptions which should be employed to formulate consumption advisories.

Response: Since this RAP applies only to New York waters, New York State consumption advisories are the only ones that apply.

Chapter 4. The Problems: Impairments and Their Causes

Comment: A charter boat captain reported that he has observed 75-100 fish per year with tumors or deformities.

Response: This has been noted under impairment indicator iv) on p., 4-14 and the conclusion has been changed to "May exist (low confidence)".

Comment: There is a general statewide consumption advisory on fish that is less restrictive than the one that applies to Lake Ontario. This may cause some confusion on interpreting the criterion that applies to impairment indicator i).

Response: Common sense will apply. When the Lake Ontario fish become less contaminated than the statewide average, the indicator will lose its usefulness and a specific assessment of health implications of the fish caught in Oswego Harbor will need to be made.

Comment: If water quality of the Oswego River were improved, would it be considered for drinking water purposes? The classification of the AOC should not impinge on the applicability of the criterion for indicator ix).

Response: The criterion for indicator ix) does not refer to classification. The indicator is not applicable because the waters are not intended for human consumption; there are no drinking water intakes. Since the criterion cannot be tested, it is considered not to apply to this situation.

Comment: The discussion on the beach closings impairment indicator (p., 4-22) is inconsistent with the goal statement.

Response: There is no inconsistency. The goal refers to water quality that would be capable of supporting swimming. The impairment indicator is the closing of a beach because of poor water quality. Since there are no beaches in the AOC, this particular indicator cannot be tested.

Comment: Habitat modifications such as dredging cause a use impairment and should be discussed.

Response: The focus in considering impairments has been on water quality. Since the AOC is a commercial and recreational port, there is no question that the physical habitat has been impaired. We will present recommendations for physical habitat improvement in Stage II.

Comment: Under impairment indicator iii), the statement is made that "Based on the observed populations, water quality is unlikely to be adversely affecting fish." But there are a number of observations suggesting that fish and wildlife populations are impaired.

Response: There is no evidence that fish themselves are suffering from water quality problems. However, because of chemicals in fish tissue, the wildlife that eat fish may be adversely affected.

Comment: Although the RAP states that there are no current restrictions on disposal of dredged material from the harbor, there are, in fact, restrictions that are currently placed on disposal of sediment from a proposed dredging project in Oswego Harbor. EPA has told the USA COE that further sampling must be undertaken before open lake disposal of the dredged material can be permitted.

Response: Technically, the commentor is correct; a restriction does exist. However, it is not the type of restriction based on the existence of a water quality problem. The fact that more sampling is required is not evidence that water quality is impaired.

Comment: A discussion of nonpoint source runoff problems should be included in Chapter 4.

Response: The purpose of Chapter 4 is to present evidence for or against water quality impairment and to determine the pollutants causing the impairment. It was not meant to discuss the sources of the pollutants. This is covered in Chapter 5 on a pollutant-by-pollutant basis.

Chapter 5. Sources of Pollutants Causing Impairments

Comment: The statement that "Small concentrations (of PCBs) in the food chain can accumulate to amounts that cause injuries to man" may not be universally acceptable to health authorities.

Response: This sentence has been deleted.

Comment: It would be more accurate to say that PCBs are entering the AOC from the drainage basin.

Response: The wording on p., 5-4 has been changed to reflect this comment.

Comment: The RAP has not documented the permitted and accidental releases into Oswego Harbor by local industries.

Response: We have no evidence that chemicals of concern are entering the harbor from local industries. If the commentor had such evidence, this evidence should have been presented during the comment period so it could have been included.

Comment: The RAP has not documented permitted and accidental releases into the Oswego River drainage basin from industries, landfills, and sediments in the drainage basin.

Response: The RAP has indeed documented releases of chemicals of concern from such sources where evidence is available. If the RAP has missed information, it should have been presented during the comment period.

General Comments

Comment: Several commentors called for the collection of more data on water quality impairments.

Response: Collection of more data may be recommended in the Stage II RAP.

Comment: The Area of Concern should be larger.

Response: There was considerable discussion of the AOC boundaries early in the process by the NYSDEC and the Citizens' Advisory Committee, and the current boundaries were agreed to. They are arbitrary, but we believe they are sufficiently large to allow identification of the important problems that may be affecting Great Lakes water quality from the Oswego-Oneida-Seneca Rivers basin.