

STATE OF THE ENVIRONMENT

RECREATIONAL WATER QUALITY



MIDDLESEX-LONDON HEALTH UNIT

LONDON, ONTARIO

MAY 1995



Dental Health • Education & Research • Environmental Health • Family Planning • Home Care
Program Immunization & Communicable Disease Control • Learning & Behaviour Clinic •
Nutrition Services • Public Health Nursing

An Accredited Teaching Health Unit

May 25, 1995

Mr. John King
St. Clair Region Conservation Authority
205 Mill Pond Crescent
Strathroy, Ontario
N7G 3P9

Dear John:

Re: Middlesex-London Health Unit
State of the Environment Report on Recreational Water Quality

The above noted report and its recommendations were endorsed by the Board of Health for Middlesex County and the City of London at their May 4th board meeting.

Due to the subject matter, we have included your organization on the distribution list for this first in a series of local State of the Environment Reports from the Middlesex-London Health Unit.

As some of the recommendations may involve additional follow-up with your organization, a representative of the health unit's Environmental Health Division will be in contact with you, or one of your representatives, in the near future. Additionally, a very brief form will be directed to your organization to help in the evaluation of this document.

Your interest in this regard is most appreciated. If you would like additional copies, or have any questions, I can be reached at (519) 663-5317, extension 2504.
Yours truly,

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Assistant Director of Environmental Health
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pc. Mr. Robert Rowe - Secretary-Treasurer, Middlesex-London Health Unit

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STATE OF THE ENVIRONMENT

RECREATIONAL WATER QUALITY

by

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MIDDLESEX-LONDON HEALTH UNIT

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ABOUT THE MIDDLESEX-LONDON HEALTH UNIT

STATE OF THE ENVIRONMENT REPORTS:

The Middlesex-London Health Unit (MLHU) under the Ontario Health Protection and Promotion Act and the Mandatory Programs and Services Guidelines, produces a State of the Environment Report on a regular basis.

The State of the Environment Report (SER) provides an opportunity for the systematic description of environmental conditions and trends which may reveal linkages between human activities, natural processes, environmental conditions, and community health.

The production of a series of SERs allows for a review of the local State of the Environment by individual media, namely, AIR, WATER, and LAND.

The MLHU State of the Environment Reports will help answer the following questions:

- What is the link between environment and health?
- What is the state of the Middlesex-London environment?
- Is it getting better or worse? How do we know?
- What is being done to reduce environmental health risk?
- What more needs to be done?

ABOUT THIS STATE OF THE ENVIRONMENT REPORT:

This first in a series of reports focuses on the Recreational Water Quality in the Middlesex-London area.

The assessment of public beaches by the MLHU and the standards applied will be reviewed, as well as the variety of other initiatives related to surface water protection being conducted by local, provincial, and federal interest. The link between environment and health, as it relates to the growing variety of exposure opportunities to local surface water, is considered.

Environmental indicators will be considered which measure the health of our surface water, thereby giving us a sense of our Recreational Water Quality.

Recommendations for improvements to Programs, Communications, Policy, and Research are provided.

ACKNOWLEDGEMENTS

The guidance, support, and direction of the health unit's SER management advisory panel was of great assistance during this report's developmental process. We acknowledge Dr. Graham Pollett, Dr. Verna Mai, Robert M. Carson, and Peter Parkhouse.

We also appreciate and recognize all of those from various government and non-government agencies who provided information, data and support.

We particularly recognize the contributions of Yvonne Tymi, our Middlesex-London Health Unit Librarian, who continues to help gather valuable sources of information for us. We would also like to thank Bernie Lueske who prepared the maps.

RECOMMENDATIONS

Recreational Water Quality and the State of the Environment Report process, support these new strategic directions for current programs, communications, policy, and research, which relate to recreational water quality and community health within Middlesex-London.

These recommendations represent our response to the question "What more needs to be done?"

It is recommended that:

1. The Middlesex-London Health Unit provide an overview of the Beach Management Protocol for operators of public bathing beaches within Middlesex- London.

This dialogue should include specifications related to rainfall and levels of *Escherichia coli* in recreational surface waters.

2. To complement the present activities of the Recreational Water Quality Program, The Middlesex-London Health Unit conduct, at each designated public bathing beach, an annual Environmental Health Assessment.
3. The Middlesex-London Health Unit consult with external stakeholders to complement current educational programs which relate to Recreational Water Quality and the natural environment.
4. The Middlesex-London Health Unit increase its current role with respect to land use planning and surface water quality throughout Middlesex-London.
5. The Middlesex-London Health Unit continue to monitor the water quality of the Thames River, and provide guidelines which address citizen health and the recreational use of the River.
6. The Middlesex-London Health Unit determine the incidence of morbidity associated with the use of recreational waters within Middlesex-London.
7. The Middlesex-London Health Unit collaborate with external stakeholders to collect and co-ordinate environmental health indicators for surface water quality in Middlesex-London.

8. The environmental indicators for surface and recreational water quality, referred to in Recommendation #7, include those listed in Appendix 4.
9. The Clean Up Rural Beaches Program be reviewed to ensure that all possible sources of surface water pollution have been considered, including industrial sources not addressed by the Municipal Industrial Strategy for Abatement Program.
10. The Middlesex-London Health Unit explore strategies with the City of London, which would minimize the effect of combined sewerage outfalls which discharge into the natural environment.
11. The Middlesex-London Health Unit and the municipalities of Middlesex County also explore ways to decrease the effect of combined sewerage outfalls which discharge into the natural environment.
12. The Middlesex-London Health Unit support the expansion of the Hazardous Waste Collection Service operated by the City of London.
13. The Middlesex-London Health Unit and the Ministry of the Environment and Energy examine ways to minimize or eliminate the discharge of untreated, or partially treated sewage, from municipal sewage treatment plants.
14. The Middlesex-London Health Unit and the Ministry of the Environment and Energy jointly review the present sewage effluent quality standards for sewage treatment plants in order to maintain and protect surface water quality.
15. To recognize and promote rural and agricultural practices which coincide to protect surface water quality, the Middlesex-London Health Unit review the Environmental Farm Plan Program, with the Ontario Soil and Crop Improvement Association, and the Ontario Ministry of Agriculture, Food & Rural Affairs.

INTRODUCTION

The public bathing beaches in Middlesex-London offer an appropriate setting for many water related recreational activities. Some sites support the traditional pastimes of swimming and wading, while others accommodate sport fishing and canoeing. The arrival of new sports, such as jet-skiing and wind sailing, illustrate the increasing use of the natural environment for leisure and recreation.

However, the enjoyment of these activities prompts us to examine the environment in which they take place. These sites must support human health and they must demonstrate sufficient environmental quality. The link between health and environment is an interdependent connection; few health benefits can be realized amidst a deteriorating environment.

THIS MODULE

This Module, *Recreational Water Quality*, examines the state of the environment with respect to the public bathing areas within Middlesex-London. It will describe the environmental assessment procedure used to evaluate each designated bathing beach. This Module will demonstrate the association between environment and health using documented reports which link contaminated recreational water with adverse health effects. In addition, sources of pollution which contribute to poor beach water quality will be identified and discussed.

Next, a summary of local environmental health initiatives will be described. Some represent traditional approaches, others present more distinctive methods used to confront environmental health challenges.

Finally, the closing will discuss the Recommendations listed at the front of this Module. These Recommendations address future initiatives and present program areas. Changes to traditional roles and practice are suggested.

State of the Environment Reporting examines the link between human health and the environment in order to sustain and maximize the potential benefits of both. This Module explores the link between recreational water quality and community health in Middlesex-London.

MIDDLESEX-LONDON HEALTH UNIT ASSESSMENT OF BEACH SITES

USING THE STANDARD: ESCHERICHIA COLI

The Recreational Water Quality Guideline Committee, established by the Ministry of Health, recommended that *Escherichia coli* (*E. coli*) be used as the indicator organism for the determination of bacterial pollution in recreational waters (May 1992). In the past, measurements of total and faecal coliforms were used. However, *E. coli* has been recognized as the most appropriate indicator for faecal or sewage contamination.

Limitations of the use of E. coli

Levels of *Escherichia coli* are not always reliable predictors of human pathogens which may be present in recreational waters. For example, studies which have compared levels of faecal coliforms and enterovirus in beach water find little correlation between the two pathogens (Guidelines for Canadian Recreational Water Quality [GCRWQ], 1992). Also, the presence of schistosomes, toxin from blue-green algae, and *Giardia lamblia* cannot be predicted using levels of *E. coli*.

Further, concentrations of *E. coli* are not a suitable indicator for upper respiratory, or dermal infections caused by *Pseudomonas* and *Staphylococcus spp* (GCRWQ, 1992). Other research suggests that levels of *E. coli*, or a faecal coliform, should be supplemented with levels of total staphylococci (Seyfried *et al*, 1985) or enterococci (GCRWQ, 1992) in order to accurately relate potential illness with exposure to contaminated recreational waters.

THE BEACH MANAGEMENT PROTOCOL

In Ontario, the Mandatory Health Programs and Services Guidelines provide the required standards for the delivery of the program - Water Quality. The mandate to carry out this responsibility is assigned to the Medical Officer of Health, who is required to identify and monitor recreational water premises within the health unit region.

In Middlesex-London, the Environmental Health Division of the Middlesex-London Health Unit, conducts annual Environmental Health Beach Assessments. Using the Beach Management Protocol endorsed by the Ministry of Health, public health inspectors survey several conditions and circumstances which can affect beach water quality. These include potential sources of pollution: municipal or industrial waste discharge outfalls, sewage treatment plant overflow/by-pass events, and inadequate private sewage disposal systems.

Other factors to document which can impair water quality include agricultural or industrial land uses, and physical hazards.

Physical hazards such as rocks or trees, steep slopes, and bottom debris are noted. An estimation of potential sediment activity is also made. If disturbed, bottom sediment can increase the bacterial load of the surrounding water. This re-suspended sediment can contain pathogens. The beach assessment can record additional characteristics such as water clarity, depth, and presence of undertow.

Sampling Protocol

Each beach is tested weekly during the swimming season which begins during May and ends in early September. Some bathing beaches are tested by the local Conservation Authority. During each sampling inspection, five water samples are obtained, then examined for *E. coli* by the Regional Public Health Laboratory in London, Ontario. Should the historical record for a beach indicate consistently satisfactory *E. coli* water sample results, the sampling frequency may be reduced.

Field Data Report

A Field Data Report is made during each sampling inspection. Water conditions, gull estimates, bather load, plus any recent weather conditions may be noted.

Despite the inherent challenges involved with the management of an outdoor recreational location, this data, plus the water sample test results, can be used to provide an effective level of public health and safety.

What more needs to be done?

The Middlesex-London Health Unit should provide an overview of the Beach Management Protocol for operators of public bathing beaches within Middlesex-London.

This dialogue should include specifications related to rainfall and levels of Escherichia coli in recreational surface waters.

To complement the present activities of the Recreational Water Quality Program, the Middlesex-London Health Unit should conduct, at each designated public bathing beach, an annual Environmental Health Assessment.

THE LINK BETWEEN ENVIRONMENT AND HEALTH

MAKING THE EPIDEMIOLOGIC CONNECTION

Intuitively, we suspect that exposure to polluted water in the recreational setting may lead to illness. Is there a correlation between exposure to poor water quality and adverse health outcomes? If there is, how is this link between environment and human health determined?

Various studies from the medical and scientific literature have reported adverse health outcomes among swimmers (Cabell, 1980; Seyfried, 1985; Walker, 1992; Dewailly, 1986; Corbett, 1993). Even though these symptoms can have other causes, researchers have attributed human illness to polluted recreational water. This is the epidemiologic connection.

This connection is made by comparing the number of swimmer-reported symptoms with the number of symptoms reported from non-swimmers. Where polluted water is implicated, the swimmers report more illness than non-swimmers. Levels of statistical significance lend further credence to the strength of the relationship.

Studies have examined this link between environment and health to learn more. For example, exposures can be classified. Bathers who swallow water, immerse their head, or fall into the water, represent a high-contact exposure. Conversely, those who stay out of the water, or simply wade close to shore, represent a low-contact exposure. More symptoms are reported from swimmers who experience a high degree of water contact than those whose exposure is low or minimal (Dewailly, 1986; Rosenberg, 1976; Corbett, 1993).

OVERVIEW OF SYMPTOMS AND CONDITIONS

The adverse health effects from exposure to contaminated recreational water cited in the medical and scientific literature, reveal a variety of symptoms and conditions. These maladies usually affect the part of the body exposed to the contaminated water. The most prevalent adverse effects include gastrointestinal illness, skin, eye, and ear conditions.

Gastrointestinal illness has been reported from swimmers usually within 48 hours. Episodes of vomiting, fever, nausea, diarrhoea, and stomach ache are common, especially from children

who accidentally swallow beach water.

Respiratory symptoms which have been reported include: sore throat, cough, chest cold, nasal congestion, and tightness in chest. Water contact with mucous membranes and the inhalation of spray are suggested causes for these adverse effects.

Other symptoms have also been reported. Most skin conditions present as a rash or a wound infection. Conjunctivitis and ear infections have also been reported.

Outbreaks of Disease

Although outbreaks of disease associated with the use of recreational water are rare, there are documented cases. Linked with serious forms of illness, beyond the somewhat self-limiting symptoms just presented, these outbreaks demonstrate the potential risk to human health posed by recreational water.

Shigellosis

While usually associated with contaminated food or water, outbreaks of Shigellosis have also been linked to bathing beach water. A case-control study of swimmers and non-swimmers revealed an epidemiologic link between patients diagnosed with Shigellosis and swimming at a rural lake in the mid-Western United States (Makintubee, 1987). Other outbreaks involving *Shigella spp* have been reported from California (Sorvillo, 1987) and Iowa (Rosenburg, 1976).

Recreational water has also been implicated in the transmission of Hepatitis A (Bryan, 1974), adenovirus serotype-3 upper respiratory infection (unauthored, see Outbreak of ..., 1992), and Leptospirosis (Jackson, 1993). Swimmer's itch (Grossman, 1993) and *Giardia lamblia* have also been associated with contaminated bathing water in the outdoor setting.

For those who wish to pursue the health benefits available through aquatic recreation in the natural environment, a risk to health presents an undesirable possibility. The natural environment must be able to support health, not impair it.

What more needs to be done?

The Middlesex-London Health Unit should determine the incidence of morbidity associated with the use of recreational waters within Middlesex-London.

THE STATE OF THE ENVIRONMENT IN MIDDLESEX-LONDON

PUBLIC BEACH SITES

Within Middlesex-London, six public bathing beaches have been designated (See Appendix 1). Four of these sites regularly provide safe water quality. In 1994, two beaches were posted; each restriction lasted for two weeks. These beaches are located at the Parkhill Conservation Area and The Circle R Ranch. In addition, the bathing beach at Cold-stream Conservation Area was posted throughout the 1994 bathing beach season. High bacterial levels and excessive algae growth have also restricted the use of this facility.

Fanshawe Reservoir

Managed by the Upper Thames River Conservation Authority, Fanshawe Reservoir is a man-made lake created by a dam on the North Branch of the Thames River. With a surface area of 645 acres it is the largest reservoir in Middlesex-London.

The swimming area is protected by a submerged "curtain" which isolates a volume of water within the lake near the shore. This is the swimming area. This protective barrier excludes the entrance of foreign materials. The water within this enclosure is disinfected using an ultra violet light treatment device. The bacterial water quality is satisfactory.

Coldstream

Within the St. Clair Region Conservation Authority, this beach is just west of the village of Coldstream, in Lobo Township. Formed by a dam on the Sydenham River, the swimming area at this reservoir has not provided a consistent history of satisfactory water quality. This beach has been posted for the 1994 swimming season. Recreational water quality is not expected to improve in the near future.

Lake Whittaker

Lake Whittaker is a spring-fed kettle lake in North Dorchester Township within the territory covered by the Kettle Creek Conservation Authority. The bathing beach is situated within the campground at Lake Whittaker. Water quality has been satisfactory, although some decline was evident during the summer of 1994.

Circle R Ranch

Apart from a two-week period during the summer of 1994, this beach has demonstrated acceptable water quality-below the maximum allowable concentration of 100 *E. coli*/ 100 millilitres of water.

Parkhill

This beach is located within the district managed by the Ausable-Bayfield Conservation Authority. Formed by a dam on the Parkhill Creek, this 80-hectare reservoir has a history of satisfactory water quality. Although a warning was posted during the 1994 season, it was removed following a 2-week period.

Sharon Creek

This beach is located within the Sharon Creek Conservation Area which is managed by the Lower Thames River Conservation Authority. This bathing beach, on Sharon Creek, is used for various water-related activities. Water quality has been satisfactory.

THE THAMES RIVER SURVEY, 1993

The Thames River presents a unique emerging environmental health concern. Since the study of the Thames River ecosystem (MNR & MOEE) in 1975, some improvement to water quality has been reported. In addition, the parkland along the River provides an attractive natural environment which belies its proximity to downtown London. Prime riverside landscape also lends a pleasant setting for annual events which attract citizens and tourists. The use of the River Thames for sport fishing, canoeing, and some water-contact sports has been increasing.

This resurgence notwithstanding, the Thames River remains a receiving watercourse for various forms of urban and rural pollution. Despite improvements to water quality over the past few decades, health officials are concerned. The increasing attraction the River presents, if not managed appropriately, could present a substantive risk to public health.

The Thames River Survey

During the summer of 1993, the Environmental Health Division conducted a survey to determine the recreational water quality of the Thames River. The water sample results, could possibly identify sections of the River which could be used for public recreation. The results of the survey could also provide an environmental health baseline from which future comparisons of river water quality could be made.

Eighteen locations within the Middlesex-London area were selected. Eight were within the city of London, and the remaining ten were outside city borders (See Map Appendix 2). Each location was sampled once per week. Six samples from each site were collected during the period from June to September 1993.

Survey Results

The geometric means of five sites were below 100 *E. coli* per 100 ml of water:

Site #	Name	Geometric Mean
#1	West Nissouri, 7	70
#14	Kilworth	95
#16	Ekfrid, 9	37
#17	Big Bend	31
#15	Delaware	83

Ranging from a low of 134 to a high of 518 - the geometric means for 10 out of 18 sites exceeded the standard:

Site #	Name	Geometric Mean
#2	West Nissouri, 29	134
#13	Springbank	164
#3	Lake Fanshawe Dam	232
#4	Broughdale	325
#5	Medway	345
#9	Dorchester	411
#10	Chelsea Green	518
#11	Thames Park	401
#12	Riverside	373
#18	Mosa Boundary	207

The three remaining sites were grossly above the standard:

Site #	Name	Geometric Mean
#6	Carling Creek	3332
#7	Harris Park	891
#8	Putnam	1260

***The Thames
In London***

All sites within London exceeded the standard. The geometric means for these 8 locations ranged from 164 to a high of 3332 *E. coli* per 100 ml water (See map - Appendix 3).

These results suggest that, within London, no section of the Thames River is suitable for sustained public recreation. Immersion activities which involve a high-contact water exposure, such as swimming, could present a substantive risk to health. Incidental immersion, from occasional falls during water-skiing or jet-skiing, could also present a risk to health.

***The Thames River
Working Group***

In March of 1994 the Environmental Health Division sought to address the increasing recreational use of the Thames River and the concomitant risk to public health. To strengthen the effectiveness of this initiative, several local and provincial authorities were invited to participate.

Each had an interest to support the safe use of the Thames River. Eventually, the size of the team grew to include the London Fire Department, the London Police Department, local city officials, the Ministry of the Environment and Energy, the Ministry of Natural Resources, and the Upper Thames River Conservation Authority.

With different contributions offered from each stakeholder, the scope of the project expanded to address the greater health and safety issues associated with the use of the Thames River. These included physical hazards such as water temperature, current speed, bottom debris and occupational safety concerns, in addition to the public health risks associated with the increasing use of The Thames as a site for aquatic recreation.

***The Health and
Safety Message***

The Team integrated their concerns to create a health and safety message. Delivered to the public through the local news media, the text of the message acknowledged the positive aspects of the Thames River as an environmental and economic asset. The message extolled the various recreational activities associated with the Thames and the parks system throughout the city of London. However, the use of the Thames River for swimming and other immersion activities was discouraged.

The message was released as an *Environmental Health Advisory* from the Board of Health of the Middlesex-London Health Unit. It was published in the local newspaper, *The London Free Press*.

The Thames River Working Group and the Environmental Health Division will continue to address emerging environmental health concerns which relate to the use of the Thames River. Partnering with its stakeholders, the Health Unit supports the use of the River as a recreational asset, but also recognizes the need to offer guidance.

The Message From The Working Group

LOOK! but don't LEAP ... into the Thames River !

The Thames River is the primary environmental resource of London. The safe use of the Thames contributes to the health of people and the community.

Health officials are aware that many people participate in recreational activities on the Thames. After consulting with several agencies, members of the Board of Health have issued the following statement. We:

- encourage people to use the park and the trail system along the river banks;
- encourage people to enjoy fishing as a recreational or sporting activity and recommend catch and release;
- endorse the City's efforts to encourage boaters to use the river responsibly by following safety rules without causing noise, nuisance, or bank erosion;
- caution people who use the river to be aware of physical hazards:
 - debris on the river bed could cause injury;
 - currents, particularly in high water conditions, may be too fast for safety;
 - cold water temperatures in the Spring, Fall, and Winter can produce severe hypothermia;
- discourage swimming or immersion activities except in swimming areas controlled and operated by the Upper Thames River Conservation Authority.

Many sources of contamination in the river have been removed. However, some contaminants, which may cause illness, remain.

The Board of Health encourages the citizens of London and Middlesex to follow these guidelines, enjoy the Thames River, and maintain good health.

What more needs to be done?

The Middlesex-London Health Unit should consult with external stakeholders to complement current educational programs which relate to Recreational Water Quality and the natural environment

The Middlesex-London Health Unit should increase its current role with respect to land use planning and surface water quality throughout Middlesex-London.

The Middlesex-London Health Unit should continue to monitor the water quality of the Thames River, and provide guidelines which address citizen health and the recreational use of the River.

The Middlesex-London Health Unit should collaborate with external stakeholders to collect and co-ordinate environmental health indicators for surface water quality in Middlesex-London. These environmental indicators for surface and recreational water quality, should include those listed in Appendix 4.

SOURCES OF WATER POLLUTION

Several sources of pollution can impair water quality at public bathing beaches, and other outdoor recreational facilities within Middlesex-London. Discharges of untreated or partially treated sewage from municipal sewage treatment plants can degrade surface water quality. These discharge events are often the result of sudden heavy rainfall. When so much volume appears for treatment, it exceeds the handling capacity of the plant. As a result, it is discharged into the natural environment. In London, this is the Thames River system.

The effluent from combined sanitary and storm sewers is also directed to the natural environment. Combined sewerage systems rely upon the dilution factor of a receiving water to "handle" waste. Combined sewers are no longer constructed to service new development. However, in London, there are 250 outfalls - which direct wastes into the Thames River system.

In the rural setting, manure handling, milkhouse waste discharges, and faulty septic systems can contribute to the pollution of rural beaches. These sources of pollution, which can impair surface water quality, must be addressed in order to effect meaningful improvement.

WHAT IS BEING DONE? ENVIRONMENTAL HEALTH INITIATIVES

Throughout the Middlesex-London region there are various initiatives in place which address the state of the environment. Some of these initiatives are presented as a response to the question, "What is being done?"

THE BIOMAP PROGRAM

In Ontario, the Ministry of the Environment and Energy (MOEE) has a mandate under the Ontario Water Resources Act to provide water protection programs. The Provincial Water Quality Monitoring Network (PWQMN) measures 16 chemical and 4 bacteriological parameters at over 700 sites each month. However, there are some limitations with the use of this data to describe the state of the environment. Chemical and bacteriological parameters alone, do not provide a complete picture.

Therefore the MOEE developed the Biological Monitoring and Assessment Program (BioMAP) which measures the health of an environment by examining the creatures within it. Macrophytes, algae, benthic invertebrates, and fishes comprise the life forms which can provide information about the natural environment. In particular, the benthic macro-invertebrates, the bottom dwelling life forms of developing insects, are important as these creatures integrate the effects of pollutants and environmental conditions over time. An examination of this aspect can provide a more holistic measure of water quality and ecological health (Griffiths, 1993).

The State of the Environment in Middlesex-London

Benthic studies from BioMap stations are incomplete at this time, but the MOEE reports that impaired water quality is suspected at most, if not all, sites within Middlesex- London (Griffiths, 1994).

THE CLEAN UP RURAL BEACHES (CURB) PROGRAM

To address surface water quality at rural beach sites, the Ministry of the Environment and Energy established the Clean Up Rural Beaches (CURB) Program. Approximately \$57 million in financial assistance is available to rural property owners. Applicants who demonstrate that a proposed construction project will improve farm waste management practices may be eligible to receive a grant.

Administered in association with local Conservation Authorities, there are four types of rural projects eligible for financial assistance. They are: milkhouse waste disposal, private sewage disposal systems, manure storage areas, and livestock fence construction.

Milkhouse Waste Treatment

Milkhouse wastes contain high levels of phosphorus. Undesirable algae growth can occur in water courses where this waste is discharged. This can impact water quality downstream - at rural public bathing beaches.

Milkhouse wastes should be treated appropriately. CURB grants are available to divert milkhouse wastewater to a liquid manure storage area, or to a runoff storage system. Pits are another alternative which allow the waste to be collected in a separate concrete tank, or earthen pit, before it is spread on land.

Private Sewage Disposal Systems

Domestic sewage includes all wastewater discharged from the home - including greywater. Discharges from laundry facilities, showers, and dishwashers are all classified as domestic sewage. These wastes must receive appropriate treatment. For the rural home, a septic tank and tile bed is the most common method of sewage treatment and disposal. Grants for the installation or repair of sewage systems can assist the home owner to protect the environment. Improper sewage hook-ups - which discharge to the natural environment or municipal drains - can be eliminated.

Manure Waste Management

To prevent manure from contaminating the environment, specific storage and disposal measures on the farm are recommended. Stored manure can be protected from rainfall with an impermeable cover. In addition, rainwater run off can be contained with the construction of im-permeable barriers.

Livestock Restriction

It is no longer an acceptable practise to allow livestock to roam freely into streams and creeks. The contamination from defecating animals can increase phosphorus and nitrogen levels which can impair water quality. Fence construction which restricts livestock access to watercourses can provide effective protection. Such fences can also help reduce soil erosion by maintaining the integrity of stream banks from cattle traffic.

All of these projects can minimize the effects of pollution which can contribute to poor water quality. Through the administration of the CURB program, and the expertise of Conservation Authority personnel, this environmental health initiative will continue to address water quality at rural Ontario beach sites.

The CURB Program In Middlesex-London

Since the beginning of the CURB program in 1991, there have been 101 projects completed (Willson, 1994). This represents more than one half million dollars allocated to reduce pollution and protect rural beach water quality.

The chart below provides a list of the number of projects completed in Middlesex- London. Listed by Conservation Authority and project, the figures reveal the total activity since the beginning of the CURB Program in 1991 (Wilson, 1994).

CURB ACTIVITY IN MIDDLESEX-LONDON

Conservation Authority	Project Type (No. of Projects)			
	Sewage System	Manure	Milk House	Livestock
Ausable- Bayfield	24	32	6	11
Upper Thames	13	4	3	3
St. Clair	3	1	-	1
Totals	40	37	9	15

Note: The Kettle Creek Conservation Authority reports that 4 projects, in the Middlesex-London area, have been approved to receive funds.

SPORT FISH CONTAMINANT MONITORING PROGRAM

The Sport Fish Contaminant Monitoring Program also relates environment and health with the use of our recreational water premises. This is a program to examine fish for the presence of various organic and inorganic substances - which do not occur

naturally in the environment. From these examinations, fish consumption guidelines for the sport fish enthusiast are published in the *Guide to Eating Ontario Sport Fish* (1994).

Sport fish from various geographic locations in Ontario are tested for residuals of mercury, polychlorinated biphenyls (PCBs), mirex and other pesticides, dioxins and furans, chlorinated benzenes, and polyaromatic hydrocarbons (PAHs) which can accumulate in body tissue.

It may take several years before some contaminants in the environment reveal a declining trend. However, where government legislative requirements have curtailed or eliminated the release of chemicals into the environment, a decreasing trend is apparent. For example, levels of polychlorinated biphenyls, DDTs, and mercury have declined (*Guide to Eating Ontario Sport Fish*, 1994).

***Highlights for
Middlesex-London***

Anglers can receive advice from the 17th edition of *Guide to Eating Ontario Sport Fish 1993-1994*. The fish species tested, location, and the length of the specimen, are factors which determine the consumption guideline.

In Middlesex-London consumption guidelines for fish from the Thames River are based upon levels of: mercury, PCBs, mirex, and pesticides, PAHs, and dioxins and furans. There are no cases where a complete consumption restriction is recommended. One restriction, however, is stated for the Thames River between Springbank Park and Fanshawe Dam (GEOSF, 1994). Restrictions are indicated for Rock Bass (15-20 centimetres) and Carp over 65 centimetres.

There are some limitations with the use of this information. Suggested guidelines are reported for the species and length of fish caught for examination; it may not apply to all species. Also, it is not always possible to compare information for the same species and length across separate geographic zones. The results may not be comparable because the same species of fish are not always caught and examined.

POLLUTION CONTROL - CITY OF LONDON

There are seven sewage treatment plants (STPs) within the city of London, including the newly annexed lands. The Ministry of the Environment and Energy grants a Certificate of Approval to these facilities.

Meeting Effluent Standards

This is a process which ensures that each STP operates according to the standards of the Ontario Water Resources Act (April, 1990).

One aspect of operation which has important environmental implications is the quality of the sewage effluent discharged to the natural environment - the Thames River system.

Tests conducted to determine the quality of the effluent measure biochemical oxygen demand, suspended solids, dissolved oxygen, nitrogen/ammonia, and phosphorus. These aspects of operation are reviewed each year by the MOEE as part of the continuing approval of STP operations.

State of the Environment - City of London

The City Engineer reports that effluent quality regularly meets or exceeds the MOEE standards. A study of the Thames River, completed by the Engineering Department, reports that water quality has improved since monitoring was initiated in 1963 (1992).

A recent change to the treatment process uses ultra violet light instead of chlorine to kill bacteria. This last-stage treatment maintains satisfactory effluent quality without the discharge of chlorine into the natural environment.

There is sewage discharge activity, common to many urban communities, which can impair the natural environment. Within London, combined sewerage outfalls (approximately 250) discharge into the natural environment - a practice no longer continued in newly developed areas. The effect of sewage treatment plant overflow and by-pass events can also contribute to impaired surface water quality.

These sources of pollution should be addressed. A plan to reduce or eliminate the impact of these chronic discharges could mitigate environmental damage.

What more needs to be done?

The Clean Up Rural Beaches Program should be reviewed to ensure that all possible sources of surface water pollution have been considered, including industrial sources not addressed by the Municipal Industrial Strategy for Abatement Program.

The Middlesex-London Health Unit should explore strategies with the City of London, which would minimize the effect of combined sewerage outfalls which discharge into the natural environment.

The Middlesex-London Health Unit and the municipalities of Middlesex County should explore ways to decrease the effect of combined sewerage outfalls which discharge into the natural environment.

The Middlesex-London Health Unit should support the expansion of the Hazardous Waste Collection Service operated by the City of London.

The Middlesex-London Health Unit and the Ministry of the Environment and Energy should examine ways to minimize or eliminate the discharge of untreated, or partially treated sewage, from municipal sewage treatment plants.

The Middlesex-London Health Unit and the Ministry of the Environment and Energy should jointly review the present sewage effluent quality standards for sewage treatment plants in order to maintain and protect surface water quality.

To recognize and promote rural and agricultural practices which coincide to protect surface water quality, the Middlesex-London Health Unit should review the Environmental Farm Plan Program, with the Ontario Soil and Crop Improvement Association, and the Ontario Ministry of Agriculture, Food & Rural Affairs.

OVERVIEW AND COMMENTARY

WHAT IS THE STATE OF THE ENVIRONMENT IN MIDDLESEX-LONDON?

Recreational Water Quality is the first Module in a series of reports which examines the State of the Environment in Middlesex-London.

The Beach Management Protocol is used to provide assessment and monitoring programs for the public bathing beaches in Middlesex-London. Administered by the Middlesex-London Health Unit, and the Regional Conservation Authorities, these programs are designed to protect public health. However, enhanced health and well-being cannot be assured amidst declining environmental quality; environments must support health.

This report confirms that the public bathing beaches in Middlesex-London operate within the standards set by the Ministry of Health in order to protect public health.

IS IT GETTING BETTER OR WORSE? How Do WE KNOW?

The evaluation of environmental quality to determine the state of the environment is not always a straightforward task. In order to state "better or worse" we rely upon environmental indicators. In Ontario, the faecal bacterium *E. coli* is used as the indicator. A satisfactory water quality result is expressed as a maximum allowable concentration of *E. coli* bacteria which is at or below 100 organisms per 100 millilitres of water sample. However, the maximum acceptable concentration approved by the Federal Working Group, recommends a standard of 200 *E. coli*/100 ml (GCRWQ, 1992). This was addressed by the Recreational Water Quality Guideline Committee (Ontario) in May of 1992. This Committee recommended that the (Ontario) Ministry of Health maintain the current standard of 100 *E. coli*/100 ml. Compared with the Federal standard, the Ontario level lowers the "cut-off point" from 200 to 100 *E. coli* per 100 ml. The Committee decided that it could not provide adequate reason to adopt the Federal standard. Deploying a standard which is "stricter" may provide an increased protection against the transmission of disease. Yet, the use of a higher standard is not wholly indicative of quality assurance.

In order to judge "better or worse", more information is required. For example, what is the prevalence of illness associated with the use of public bathing beaches in Middlesex-London?

While the link between environment and health has been presented, this discussion is limited to the sporadic and anecdotal incidents reported in the literature. Statistics which track local health effects are not compiled by Health Units in Ontario. Prevalence studies may be useful, especially if the enumeration of adverse health effects reflects a substantial level of morbidity.

Another aspect of "better or worse" could be explored by obtaining a historical picture of *E. coli* levels at public bathing beaches. For example, a comparison of today's results with those from 10 years ago, might reveal an improving or declining environmental trend.

Although there may be additional challenges related to recreational water quality, the use of appropriate standards which protect public health, and the collection of relevant data, are steps in the right direction.

WHAT IS BEING DONE To REDUCE ENVIRONMENTAL HEALTH RISK?

The risk to health posed by public bathing beaches is managed effectively by the Middlesex-London Health Unit and the local Conservation Authorities. Using the protocol issued by the Ministry of Health, including the strict *E. coli* standard, these beaches provide a high level of public health and safety.

Other programs carried out by the MOEE, which include the Fish Contaminant Monitoring Program and the BioMap Program, are also in place which can identify trends in the environment and water quality. While these monitoring programs do not apply remediation, in and of themselves, they can provide information which can help determine the state of the environment.

The City of London - Engineering Department - can also provide a response to the question "What's being done?" There are 4 sewage treatment plants in London which currently use a final-stage ultra violet light (UVL) treatment. Before the effluent is discharged into the natural environment this UVL treatment reduces bacterial load - without the resultant chlorine discharge.

"What's being done?" can also be answered by referring to the CURB program. This initiative addresses specific agricultural practices known to adversely affect water quality and the environment. Sources of nitrogen, phosphorus, and faecal bacteria are reduced by the construction projects funded by the

CURB Program. However, this is a voluntary program, and it does not apply to rural commercial/industrial enterprises. Applying increased abatement and enforcement activities using the Municipal Industrial Strategy for Abatement (MISA) Program may be effective.

"What's being done to reduce environmental health risk?" is also illustrated by the approach the Middlesex-London Health Unit adopted to address the increased use of the Thames River. Several concerns from various stakeholders were combined in a comprehensive health and safety statement. The subsequent Environmental Health Advisory provided guidance for the community. Offering such public health advice - especially when perceptions of environmental quality appear to be in conflict - may be necessary as other complex environmental health concerns emerge.

The Thames River Working Group may be expanded to include citizen representatives from the local environmental community. Professionals may require increased skills, such as group facilitation and community development. Initiatives such as environmental health advocacy, promotion, and education may also be useful.

WHAT MORE NEEDS TO BE DONE? THE RECOMMENDATIONS

The Recommendations presented at the beginning of this report, suggest changes to current communications, policy, programs, and research. While some propose expansion of existing stakeholder operations, others suggest change for the Middlesex-London Health Unit, and the role of the Environmental Health Division. These Recommendations may also initiate effective strategies which can be applied to protect the environment and community health within Middlesex-London.

REFERENCES

- Bryan, John A., Lehmann, James D., Setiady, Ignatius, & Hatch, Milford. (1974). An outbreak of Hepatitis-A associated with recreational lake water. *American Journal of Epidemiology*, 99, 145-154.
- Cabelli, V.J., Dufour, A.P., McCabe, L.J., & Levin, M.A. (1982). Swimming-associated gastroenteritis and water quality. *American Journal of Epidemiology*, 115, 606-616.
- Corbett, Stephen J., Rubin, G.L., Curry, G.K., & Kleinbaum, D.G. (1993). Sydney Beach Users Study Advisory Group. The health effects of swimming at Sydney Beaches. *American Journal of Public Health*, 83, 1701-1706.
- Dewailly, Eric, Poirier, Claude, Meyer, Francois M. (1986). Health hazards associated with windsurfing on polluted water. *American Journal of Public Health*, 76, 690-691.
- Engineering Department, City of London. (1993). *Thames River Survey, 1993*.
- Engineering Department, City of London. (1992). *The 1992 Thames River Benthic Macroinvertebrates (Bottom Fauna) Study*.
- Federal-Provincial Working Group on Recreational Water Quality. (1992). Guidelines for Canadian Recreational Water Quality. Minister of National Health and Welfare.
- Griffiths, R.W. (1993). *BioMAP: Concepts, Protocols, and Sampling Procedures for the Southwestern Region of Ontario*. Ministry of the Environment and Energy.
- Grossman, M., & Azimi, Parvin H. (1993). Rash and pruritus after a camping trip. *The Paediatric Infectious Disease Journal*, 12, 966-969.
- Hayman, Dave. (1986). *Clean Up Rural Beaches (CURB) Plan for the Fanshawe, Pittock, and Wildwood Reservoirs*. Upper Thames River Conservation Authority.

Jackson, L.A., Kaufmann, A.F., Adams, W., Phelps, M., Andreasen, C., Langkop, C., Francis, B., & Wenger, J. (1993). Outbreak of leptospirosis associated with swimming. *The Paediatric Infectious Disease Journal*, 12, 48-54.

Makintubee, S., Mallonee, J., & Istre, G. (1987). Shigellosis outbreak associated with swimming. *American Journal of Public Health*, 77, 166-168.

Ministry of the Environment and Energy, & Ministry of Natural Resources. (1993). *Guide to Eating Ontario Sport Fish - 1993-1999*, 17th Edition. Queens Printer for Ontario, 1993.

Ministry of the Environment, & Ministry of Natural Resources. (1975). *Water Management Study: Thames River Basin. Ontario Water Resources Act*. (1990). Queens Printer for the Government of Ontario.

Outbreak of pharyngoconjunctival fever at a summer camp-North Carolina. (1992). *Infection Control and Hospital Epidemiology*, 13, 499-500.

Rosenberg, Mark L., Hazlet, Kenneth, K., Schaefer, John, Wells, Joy G., & Pruneda, Rudy C. (1976). Shigellosis from swimming. *Journal of the American Medical Association*, 236, 1849-1852.

Seyfried, Patricia L., Tobin, Richard S., Brown, Nancy E., & Ness, Peter F. (1985). A prospective study of swimming-related illness I. Swimming-associated health risk. *American Journal of Public Health*, 75, 1068-1070.

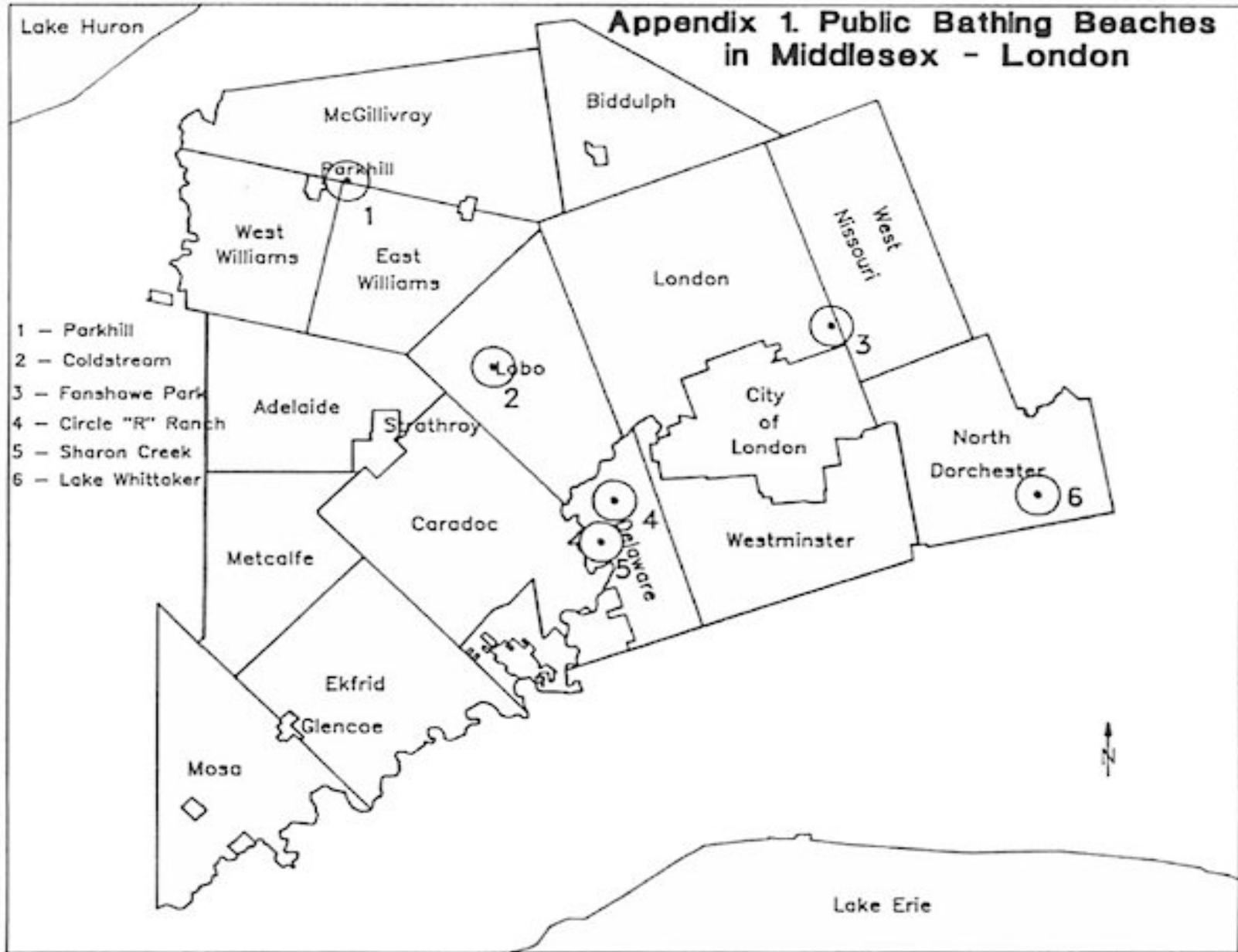
Seyfried, Patricia L., Tobin, Richard S., Brown, Nancy E., & Ness, Peter F. (1985). A prospective study of swimming-related illness II. Morbidity and the microbiological quality of water. *American Journal of Public Health*, 74, 1071-1075.

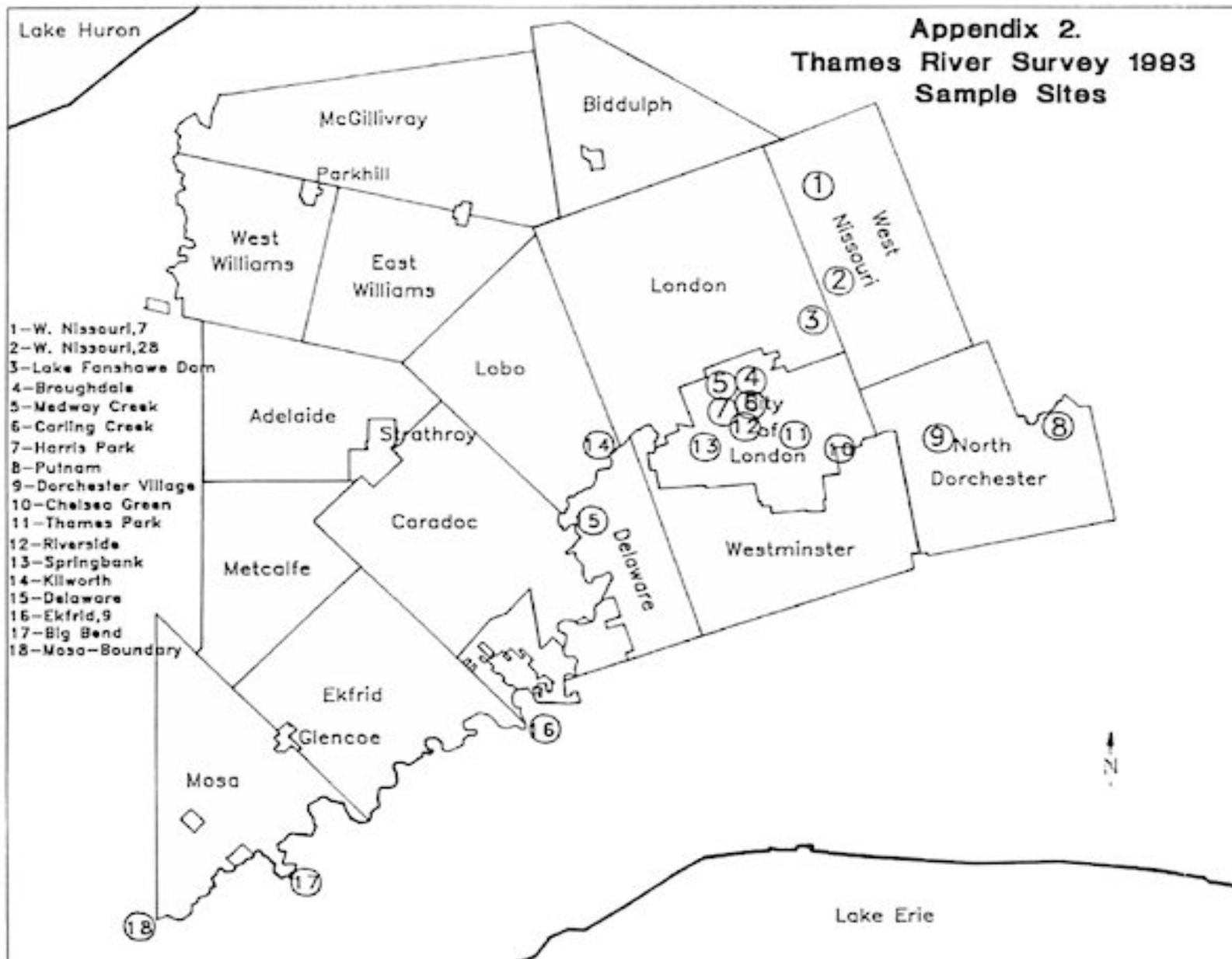
Seyfried, Patricia, L., & Cook, Ronald. (1984). Otitis externa infections related to *Pseudomonas aeruginosa* levels in five Ontario lakes. *Canadian Journal of Public Health*, 75, 83-91.

Sorvillo, Frank J., Waterman, Stephen H., Vogt, Jacqueline K., & England, B. (1998). Shigellosis associated with recreational water contact in Los Angeles County. *American Journal of Tropical and Medical Hygiene*, 38, 613-617.

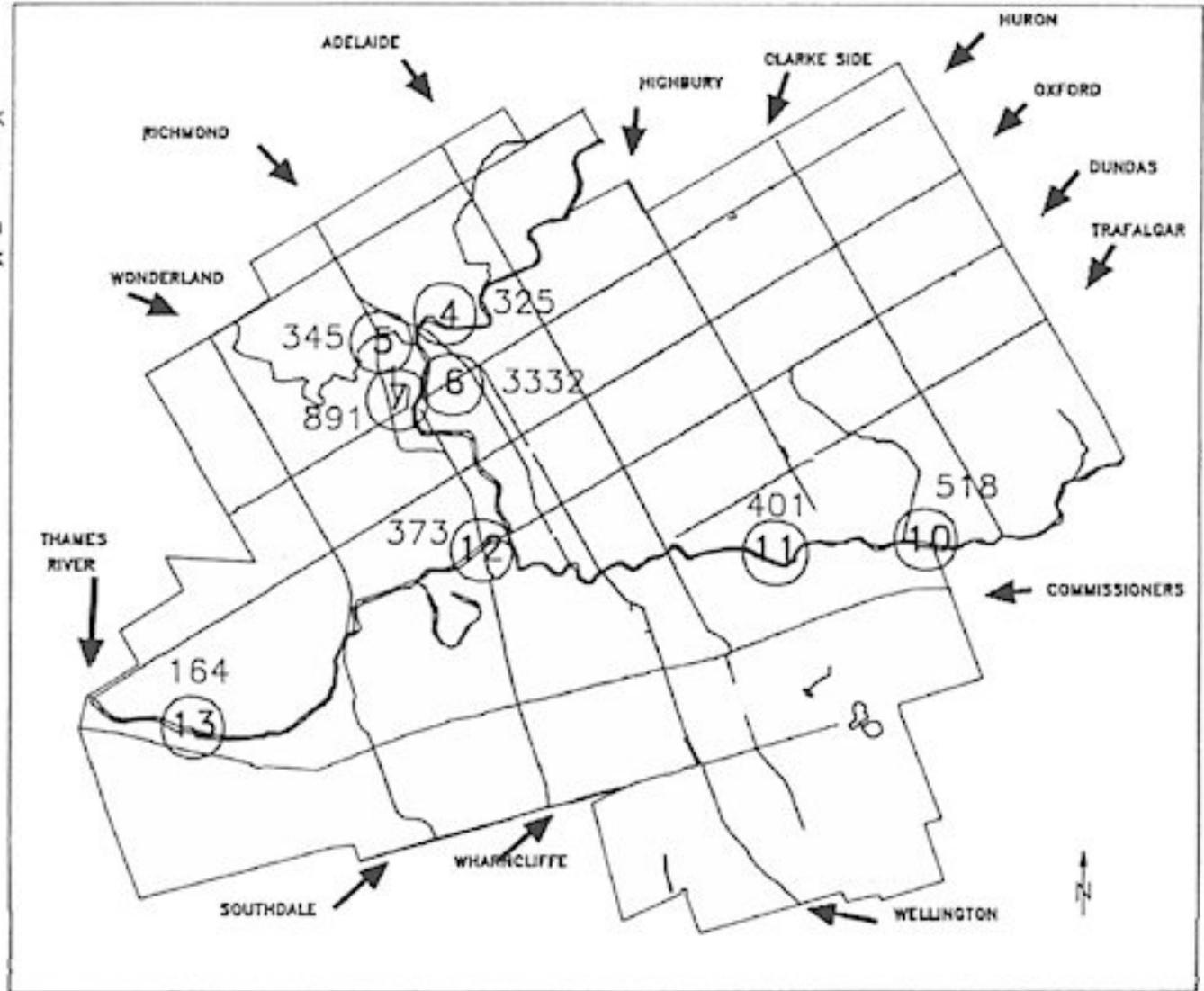
Walker, Alison. (1992). Swimming - the hazards of taking a dip. *British Medical Journal*, 304, 242-245.

Westwood, J.D. & Johns, M. (1993). *Environmental Assessment of the Tees water River at the Village of Teeswater, Bruce County*. Ministry of the Environment and Energy.





- 4-Broughdale
- 5-Medway Creek
- 6-Carling Creek
- 7-Harris Park
- 10-Chelsea Green
- 11-Thames Park
- 12-Riverside
- 13-Springbank



**APPENDIX 4
LIST OF ENVIRONMENTAL INDICATORS**

Media	Indicators	Guidelines
Recreational Water Quality	Surface Water Quality: % days Beach Warning Posted	OMOH Beach Protocol
	E. coli #/100ml	100
	Phosphorus mg/L	0.02 mg/L
	BOD mg/L	
	Suspended Solids mg/L	
	Lead mg/L	0.05 mg/L
	Aluminum mg/L	0.1 mg/L
	DDT ng/L	3 ng/L
	Mirex ng/L	
	PCB ng/L	1 ng/L
	Sediment Quality: Enteric Bacteria	
	Total Organic Carbon µg/g	
	Total Phosphorus µg/g	1000 µg/g
	Total PCB's µg/g	0.05 µg/g
	Aluminum µg/g	
Lead µg/g	50 µg/g	
Cadmium µg/g	1 µg/g	
* Including those listed as Tier I and Tier II substances under the COA.		
	Sewage Treatment Plant: Final Effluent Analyses Suspended Solids mg/L BOD mg/L Phosphorus mg/L	
	Effluent discharged from industry (estimated) cubic metres. Effluent discharged from agriculture Total Effluent Discharged cu metres.	
* COA denotes the "Canada-Ontario Agreement" respecting the Great Lakes Basin Ecosystem. (11 Tier I Pollutants and 26 Tier II).		