



Severn Sound

Remedial Action Plan

STAGE 3 REPORT

THE STATUS OF RESTORATION AND DELISTING OF SEVERN SOUND AS AN AREA OF CONCERN



JUNE 2002



**SEVERN SOUND REMEDIAL ACTION PLAN
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AS AN AREA OF CONCERN**

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Severn Sound Remedial Action Plan**

ENVIRONMENT CANADA

ONTARIO MINISTRY OF ENVIRONMENT AND ENERGY

JUNE 2002

“Our overall effort and success is excellent and the RAP team should be commended. However, there is still life after delisting and we should proceed as if we were approved and passed but forever on probation, lest we become complacent.” (Bob Whittam, former PAC Chair)

FOREWORD

Environment Canada and the Ontario Ministry of Environment and Energy are working with other federal and provincial agencies and local stakeholders in the Severn Sound area to complete a Remedial Action Plan (RAP). The purpose of the RAP is to restore and preserve the beneficial uses of Severn Sound for the present and the future.

In accordance with the International Great Lakes Water Quality Agreement (GLWQA), the Parties are to report on the progress of the RAP at three stages:

1. The first stage of the RAP, that of describing Environmental Conditions and Problem Definition (Severn Sound RAP, 1988) was submitted to the International Joint Commission (IJC) in February, 1989. In June, 1991 the IJC informed the Canadian Government that the Severn Sound RAP has met the requirements of Stage 1 RAP under the terms of Annex 2 of the GLWQA (1987).
2. The second stage, that of providing the detailed remedial action plan following consultation on the remedial options, listing remedial actions, schedules, effectiveness, responsibilities, estimated costs, delisting objectives and a monitoring plan (Severn Sound RAP, 1993) was released in April 1993. Following detailed review of the document by the federal and provincial governments, the document was submitted to the IJC on June 15, 1999. In September 2001, the IJC informed the Canadian Government that the Severn Sound RAP has met the requirements of Stage 2 under the terms of Annex 2 of the GLWQA (1987).
3. The third stage, that of providing details of the status of restoration and delisting objectives for Severn Sound and that the use impairments identified in Annex 2 of the GLWQA (1987) have been restored, is the subject of this report.

This document was prepared in accordance with guidelines and principles of the IJC and the governments of Canada and Ontario for delisting Areas of Concern. The process followed included:

- . Public consultation during the development of the RAP Stage 3 Report
- . Technical review of the delisting status of the Area of Concern by an external Technical Review Team
- . The surveillance and monitoring plan to monitor progress toward achieving the use goals and targets of the plan

The RAP Stage 3 Report has been submitted to the Federal and Provincial Governments for their review and endorsement. The completed Stage 3 will be submitted to the IJC in fulfilment of the Stage 3 requirements of Annex 2 of the GLWQA. Finally, the Federal and Provincial Governments will formally delist Severn Sound as an Area of Concern.

Since writing the document, a confirmed sighting of the King Rail (*Rallus elegans*) was made in a Severn Sound coastal wetland. This bird is designated endangered in Canada (Canadian Species at Risk, November 2001 by Committee on the Status of Endangered Wildlife in Canada) – another indication of a healthy ecosystem.

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The Corporation of the Township of Tiny
The Corporation of the Township of Tay
The Corporation of the Township of Severn
The Corporation of the Township of Oro-Medonte
The Corporation of the Township of Springwater
The Corporation of the Township of Georgian Bay
The County of Simcoe
The District of Muskoka

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EXECUTIVE SUMMARY

The Stage 3 Report describes the strategy implemented to restore beneficial uses and meet locally defined goals in an Area of Concern. Stage 3 of the RAP process presents evidence that beneficial uses of the area have been restored, along with a discussion of the rationale to delist the AOC should some uses remain “impaired.” (COA 1995). The Report represents the conclusions of the RAP Team, the PAC, the local municipalities, the public at large, the Agencies’ Technical Review Team and ultimately, the federal and provincial governments.

Section 2 of the Report summarizes the remedial actions taken in implementing the 38 RAP recommended actions during the last 13 years.

Section 3 details the status and rationale for delisting for each of the impaired beneficial uses (See Table I).

Section 4 outlines the recommended monitoring and surveillance plan for the Severn Sound area. This plan will bring the monitoring capabilities of the federal, provincial and municipal governments together with the Severn Sound community, to provide sustained and scientifically defensible monitoring of the Sound to provide the information that will help to ensure the investment in restoration is maintained.

Public input and involvement throughout the RAP process have been key to the success of the Severn Sound Remedial Action Plan. The activities undertaken since 1987 are summarized in Section 5.

The evidence presented in the report provides the rationale to remove the designation of “Area of Concern” from Severn Sound, in other words, it is time to “delist” the area..

TABLE I SUMMARY OF EVIDENCE FOR DELISTING	
IMPAIRMENT (as defined in the GLWQA)	STATUS AND RATIONALE FOR DELISTING
<p>i. Restriction on fish and wildlife consumption</p> <p>To have no restrictions on consumption of fish and wildlife from Severn Sound attributable to local contaminant sources.</p>	<p>RESTORATION ACHIEVED</p> <p>Current (2001) recommended restrictions on the consumption of sportfish in Severn Sound include consumption advisories for Walleye (>55cm), smallmouth bass (>35cm) and northern pike (>75cm) due to mercury contamination. Walleye samples from Severn Sound show a significant decline in mercury concentrations from 1976 to 1989. Additional collections in 1993 and 1999 continued to show similar mercury residues to 1989. The levels of mercury contamination in Severn Sound walleye are similar to or lower than other areas of Georgian Bay and are thought to reflect regional mercury levels rather than any local mercury source. Carp continue to show low tissue levels of PCBs and other organochlorine chemicals (1982, 1992, 1996, 1999). Severn Sound carp are considered the cleanest carp in the Great Lakes with respect to organo-chlorine chemical contaminants. Values of PCBs for 1999 show that even large carp are suitable for unrestricted consumption. Biomonitoring for active sources of mercury and organochlorine chemicals was conducted in 1987 using young-of-the-year spottail shiners and in the eggs of other indicators such as common tern, red-winged blackbird and tree swallows. Low or undetectable concentrations of mercury and PCBs and other organo-chlorine chemicals were found in Severn Sound biota and in surficial deposition sediments. The concentrations of mercury and other metals in sewage plant biosolids has generally declined or remained the same over the last 15 years. These indicators suggest that the delisting objectives for this use impairment have been met in the Area of Concern and that restrictions are not attributable to local sources.</p>

TABLE I SUMMARY OF EVIDENCE FOR DELISTING	
IMPAIRMENT (as defined in the GLWQA)	STATUS AND RATIONALE FOR DELISTING
iii. Degradation of fish and wildlife populations 1. To protect and rehabilitate fish and wildlife habitat. 2. To restore a balanced, self-sustaining fish community by restoring top-level predators to levels similar to the early 1970's, with these species forming at least 20-30% of the total catch, and walleye forming at least 10% of total catch of trapnet results.	<p>REMAINS IMPAIRED - RESTORATION ACHIEVED WITH EXCEPTION OF OBJECTIVES 2 AND 3.</p> <p>1. See below under xiv)</p> <p>2. As of 2001, <10% of total catch are top-level predator fish with <5% walleye, based on Early Summer Trapnet Survey. Based on ESTN results from 1999 to 2001 the walleye population is considered "at risk" due to harvest. Walleye mean age is decreasing and estimated mortality is increasing. Creel survey results from 2001 suggest that more walleye are being caught by anglers in 2001 than during the early 1990's. ESTN results indicate that catch per trapnet night of other predator species may be declining. Factors other than change in trophic status that could be influencing the top-level predator fish community, but have become apparent after the RAP Stage 2 Report was released, include: increased harvest of fish due to increased angling pressure; native harvest, increased harvest by the Double-crested Cormorant population; the adverse influence of introduced exotic species such as zebra mussels and round goby; and decreased water levels to near record lows during 1999, 2000 and 2001. The delisting objective with respect to top-level predators has not been met, however, delisting can proceed provided the responsible agencies commit to a long-term fish monitoring program in Severn Sound in order to assess the fish community in relation to the Georgian Bay communities and provided that agencies manage the fisheries based on the monitoring results.</p>

TABLE I SUMMARY OF EVIDENCE FOR DELISTING	
IMPAIRMENT (as defined in the GLWQA)	STATUS AND RATIONALE FOR DELISTING
iii. Degradation of fish and wildlife populations continued 3. To maintain a natural diverse fish community, to discourage the introduction of exotic species and to prevent the extinction of native or desirable species.	3. Rich diversity exists with 67 fish species identified in the Severn Sound. There is no indication that diversity is being threatened by factors related to environmental quality in open water and coastal areas. However, recently introduced exotic species such as zebra mussels and round goby may adversely alter the fish community for some sport fish species. Results of DFO fish community sampling (1989-1995) indicate that Severn Sound adult fish biomass and structure is influenced by trophic gradient and the amount and suitability of nearshore habitat. Where the nearshore can be remediated, improved habitat is expected to improve diversity and balance in localized areas. The Index of Biotic Integrity (IBI) for areas within Severn Sound has been greater than 57 (Minns et al. 1994; cf Hamilton Harbour IBI = 29). More recent monitoring of biotic integrity is required to confirm that the IBI remains high with the increased fish harvest and introduction of exotic species factors.
4. To maintain a self-sustaining, diverse community of colonial waterbirds	4. Severn Sound area has a diverse self- sustaining colonial waterbird community including Herring Gulls, Ring Billed Gulls, Caspian terns, Common terns, Double-Crested Cormorants, Black Crowned Night Herons and Great Blue Herons. The waterbird use of the Severn Sound area relates to shoreline disturbance. The community balance is considered acceptable in most areas. Sites with extensive turf areas near shore are known to have depressed diversity and excess of some waterfowl such as Canada geese. Habitat restoration and enhancement projects in these areas have improved diversity (eg. Penetanguishene Waterfront Park, Little Lake Park (Midland)). - Three Important Bird Areas (IBAs) have been established in Severn Sound wetlands where assessments and follow up monitoring of significant local populations of black terns and least bitterns are under way.

TABLE I SUMMARY OF EVIDENCE FOR DELISTING	
IMPAIRMENT (as defined in the GLWQA)	STATUS AND RATIONALE FOR DELISTING
iii. Degradation of fish and wildlife populations continued 5. As part of the Matchedash Bay project of the North American Waterfowl Management Plan (NAWMP) to produce 2450 waterfowl	5. The duck production mentioned in the original Matchedash Bay Project targets has not been assessed directly. Based on expected production levels of similar areas, the estimated general duck production in enhanced and secured wetland areas in Matchedash Bay was 1329 ducks per year.
6. Wildlife populations will be maintained at levels sufficient to provide recreational and economic benefits, ensure environmental quality and ecosystem integrity and ensure public safety	6. Based on the wildlife indicators described above, Severn Sound continues to have a healthy self-sustaining and diverse wildlife community.
7. To re-introduce a self sustained population of Trumpeter Swans in the Severn Sound area.	7. The objective of 15 wild breeding pairs in Ontario has been met, however, not all pairs have bred successfully nor has the population reached self-sustainability (Lumsden and Drever in press). With continued efforts of the Trumpeter Swan Restoration Program in monitoring and managing the population through introductions, it is expected that the population will achieve sustainability in the next few years. Remedial actions to ban the use of lead shot for waterfowl hunting and lead shot remediation in the Wye Marsh and surrounding areas in Severn Sound will reduce the risk of lead poisoning of swans.

TABLE I SUMMARY OF EVIDENCE FOR DELISTING	
IMPAIRMENT (as defined in the GLWQA)	STATUS AND RATIONALE FOR DELISTING
<p>vi. Degradation of benthos</p> <p>1. Appropriate benthic community for Severn Sound.</p> <p>2. Mesotrophic conditions (a) <i>Hexagenia</i> as indicator of ecosystem health (b) sludge worm (tubificid) density < 3,000 /m²</p> <p>3. Absence of acute and chronic toxic effects on benthos</p>	<p>RESTORATION ACHIEVED.</p> <p>A comparison of the benthos community between 1994 and 1998 was made using the BEAST model. The model suggests that the benthic community found at stations off Penetanguishene was stressed in 1994 but has improved by 1998. Four of 25 sites in Severn Sound had benthic communities significantly different than expected of Great Lakes nearshore locations in 1994, all of which were shallow and had rich communities typical of shoreline invertebrate fauna. All locations in 1998 were similar to the reference sites. <i>Hexagenia</i> were found at virtually every location where appropriate habitat conditions existed. Tubificid worms were found in reduced numbers in 1998. Twenty-two of 25 locations had significantly fewer than 3,000 worms/m². Acute and sub-lethal toxicity were investigated in the same locations and were found to be non-toxic (Krantzberg and Sherman 1995).</p>
<p>vii. Restrictions on dredging</p> <p>To meet biological and chemical guidelines for sediment quality such that there are no restrictions on dredging or disposal activities attributable to polluted sediments.</p>	<p>NOT IMPAIRED</p> <p>In general, contaminant levels in Severn Sound open water deposition sediments were near or below the Lowest Effect Level (LEL) of the Provincial Sediment Quality Guidelines (Table 3.1.2). At some locations especially in Penetang Bay the Severe Effect Level was exceeded due to the fine-grained, nutrient-enriched nature of sediments and due to historical industrial sources. However, following bioassessment, no significant toxicity effects were noted even at "worst-case" sites. The normal disposal practice for dredged material continues to be dry land disposal with the applicant responsible for assessing the waste quality prior to dredging. Since upland disposal for small scale dredging operations is practised this impairment is no longer considered to apply to Severn Sound.</p>

TABLE I SUMMARY OF EVIDENCE FOR DELISTING	
IMPAIRMENT (as defined in the GLWQA)	STATUS AND RATIONALE FOR DELISTING
<p>viii. Eutrophication or undesirable algae</p> <p>OPEN WATER</p> <ol style="list-style-type: none"> 1. TP concentration <15 ug/L in open waters and <20 ug/L in Penetang Bay 2. Chlorophyll a concentration <5ug/L in open waters and <7ug/L in Penetang Bay 3. Water clarity to be SDV >3m (or on bottom) in open waters and >2m in Penetang Bay 4. Rooted aquatic plant distribution in Penetang Bay should increase by 30%. Other areas of Severn Sound should maintain the same coverage. 5. Minimum bottom water dissolved oxygen concentration >5mg/L 	<p>RESTORATION ACHIEVED.</p> <p>OPEN WATER</p> <p>Based on ice-free period (May to October) mean euphotic zone values of trophic indicators at open water sites in Severn Sound (total phosphorus concentration, chlorophyll <u>a</u> concentration Secchi disc visibility, bottom water dissolved oxygen concentrations, phytoplankton biovolume and zooplankton density and biomass) delisting objectives for Severn Sound have been met following substantial completion of source control of phosphorus. Possible confounding of improvements with zebra mussel infestation has been investigated. The chlorophyll <u>a</u> - total phosphorus relationship for the period before and after zebra mussel infestation is not significantly different at open water sites monitored.</p>

TABLE I SUMMARY OF EVIDENCE FOR DELISTING	
IMPAIRMENT (as defined in the GLWQA)	STATUS AND RATIONALE FOR DELISTING
<p>viii. Eutrophication or undesirable algae continued</p> <p>SOURCES</p> <ol style="list-style-type: none"> 1. Sewage plants in the Severn Sound AOC to meet effluent total phosphorus concentrations and loading objectives outlined in the Severn Sound RAP Stage 2 Report (Table 4.1). 2. Sewage bypassing and combined sewer overflows to be virtually eliminated. 3. Urban stormwater discharges to be decreased by 20%. 4. Watershed inputs to Severn Sound should have total phosphorus concentrations of less than 0.030 ug/L and loadings decreased by 20%. 5. Private sewage systems to be upgraded where faulty of substandard. 	<ol style="list-style-type: none"> 1. Total phosphorus concentration and loading targets set in the Stage 2 report are met for nine sewage plant effluents in the Severn Sound area. 2. Sewage bypassing and CSOs have been virtually eliminated. 3. The Urban Stormwater Management Strategy is being pursued by area municipalities and loadings targets will be met. Implementation is ongoing. 4. Four major tributaries of six meet the target total phosphorus concentration for 90% of the year. Additional loading reductions from non-point watershed sources are being pursued by SSEA. 5. Ongoing control of shoreline private sewage systems is being pursued through municipal building departments.

TABLE I SUMMARY OF EVIDENCE FOR DELISTING	
IMPAIRMENT (as defined in the GLWQA)	STATUS AND RATIONALE FOR DELISTING
<p>x. Beach closures</p> <p>Geometric mean E. Coli density: <100 org./100ml. Secchi disk visibility: >1.2m Algae densities: <5ug/L (mean ice-free period chlorophyll <u>a</u> conc.)</p>	<p>RESTORATION ACHIEVED WITH COMPLETION OF ACTIONS</p> <p>The quality of the swimming areas within Severn Sound was generally satisfactory with respect to the Provincial Beach Management Objectives. Public swimming areas monitored exceeded the E. coli objective on 2 to 22% of the sampling days from 1997 to 2000. Exceptions are sheltered swimming areas receiving occasional discharges of urban storm water or areas influenced by stream discharges that may have elevated levels of fecal contamination. Management action has been identified and, provided action is taken, the overall quality of swimming areas in Severn Sound is acceptable and the delisting objectives can be considered to have been met.</p> <p>Aesthetic problems due to nuisance algae growths have improved in Penetanguishene Bay and other areas so that impairment due to nuisance algae and poor clarity has been restored. Filamentous algae associated with zebra mussels (established since 1994) have resulted in new undesirable conditions for wading along some shorelines of Severn Sound.</p>
<p>xi. Degradation of aesthetics</p> <p>Algae density <5 ug/L Chlorophyll a reduces incidence of algae blooms.</p>	<p>RESTORATION ACHIEVED.</p> <p>The incidence of season-long algae blooms has been eliminated through phosphorus loading reduction, especially in Penetang Bay. Occasional blue-green blooms are reported for short periods (maximum of one week) in late summer to early fall. Aesthetic problems related to turbidity caused by the blooms has improved with the objective for safe swimming conditions (SDV >1.2m) being met throughout Severn Sound.</p> <p>The infestation of zebra mussels with associated attached filamentous algae in nearshore areas presents new aesthetic problems that are not related to the remedial action undertaken.</p>

TABLE I SUMMARY OF EVIDENCE FOR DELISTING	
IMPAIRMENT (as defined in the GLWQA)	STATUS AND RATIONALE FOR DELISTING
<p>xiii. Degradation of phytoplankton and zooplankton</p> <p>To ensure phytoplankton species and biovolume are representative of mesotrophic conditions and to have a balanced zooplankton community. (ie. more Daphnia)</p>	<p>RESTORATION ACHIEVED.</p> <p>Overall phytoplankton biovolume has decreased to less than 1 mm³/ml from peak values of 6 mm³/ml in the late 1980s and early 1990s. The proportion of large diatoms associated with nutrient enrichment has decreased since the early 1990s in response to reduction in phosphorus loadings. The community and density is consistent with a shift from eutrophic to mesotrophic conditions. However, the community structure may also be influenced by selective filtration of zebra mussels. Increases in blue-green algae such as <i>Microcystis</i> spp. and increased shoreline complaints of filamentous algae such as <i>Mougeotia</i> and <i>Spirogyra</i> have been noted. The response of phytoplankton to changes in nutrient loadings is also being reduced further by zebra mussels. A model predicting phytoplankton biovolume using STP phosphorus load suggests that, the phosphorus control measures taken in Penetang Bay would result in meeting the delisting objectives for open water trophic indicators in the absence of zebra mussels (Todd and Sherman in prep.). Response of phytoplankton in the south end of Penetang Bay was evident prior to zebra mussel infestation.</p>

TABLE I SUMMARY OF EVIDENCE FOR DELISTING	
IMPAIRMENT (as defined in the GLWQA)	STATUS AND RATIONALE FOR DELISTING
<p>xiv. Degradation of fish and wildlife habitat</p> <p>1. To implement the Severn Sound Fish Habitat Management Plan and other policies to enhance and prevent the loss of fish and wildlife habitat</p> <p>2. To encourage the restoration of fish habitat in target areas by proponents of new shoreline development.</p> <p>3. To develop plans for rehabilitation or development of new coastal wetland areas as opportunities arise.</p>	<p>RESTORATION TARGETS ARE MET - ONGOING IMPLEMENTATION REQUIRED.</p> <p>1. Habitat Suitability was classified using physical habitat information collected from 1989 to 1994 for 343 km or 70% (11.8 km² to a depth of 1.5m) of the Severn Sound shoreline (based on a 1:10,000 scale). Ongoing implementation of the Fish Habitat Management Plan is being carried out within local planning documents and by federal, provincial and municipal staff reviewing marine construction proposals that affect habitat. Agencies are exploring the “institutionalizing” of DFO's "no net loss" fish habitat policy. Agreement in-principle has been reached with Parks Canada-Trent-Severn Waterway, OMNR and SSEA for an operational protocol at the dam at Port Severn to protect fish spawning habitat in the downstream operation of Lock 45. A separate agreement is also being pursued with the Township of Severn, OMNR and SSEA to protect fish spawning habitat in the North River.</p> <p>2. See remedial action under section 2</p> <p>3. At least 1 km of degraded habitat have been targeted in Penetanguishene, Midland, Hog and Sturgeon Bay for rehabilitation.(4% of the total shoreline)</p>

TABLE I SUMMARY OF EVIDENCE FOR DELISTING	
IMPAIRMENT (as defined in the GLWQA)	STATUS AND RATIONALE FOR DELISTING
<p>xiv. Degradation of fish and wildlife habitat continued</p> <p>4. As part of the Matchedash Bay project, to:</p> <p>i) secure and manage 1715 ha of wildlife habitat</p> <p>ii) restore and develop 427 ha of habitat for waterfowl and other wetland dependant wildlife</p> <p>iii) maintain and enhance 442 ha of habitat for staging waterfowl.</p> <p>5. To rehabilitate tributaries and riparian areas for fish and wildlife habitats.</p> <p>6. To maintain existing colonial waterbird nesting sites within and near Severn Sound.</p> <p>7. To maintain and increase Osprey nesting sites within Severn Sound.</p>	<p>4. The Eastern Habitat Joint Venture is continuing to implement the Matchedash Bay Project (NAWMP 2000).</p> <p>5. In order to sustain forest cover, planting programs should continue to be sustained. Mechanisms to secure large interior forest patches should also be pursued.</p> <p>6. The colonial waterbird nesting sites (primarily on the Watcher Islands in Georgian Bay) are being maintained by CWS and OMNR.</p> <p>7. The Georgian Bay Osprey Society continues to support the construction of osprey nesting platforms in appropriate locations in Severn Sound.</p>

1. INTRODUCTION

Since 1987, Environment Canada and the Ontario Ministry of Environment have been working with other federal and provincial agencies and local stakeholders in the Severn Sound area to complete a Remedial Action Plan (RAP). The purpose of the RAP is to restore and preserve the beneficial uses of Severn Sound for the present and the future.

The Stage 3 Report describes the strategy implemented to restore beneficial uses and meet locally defined goals in an Area of Concern (AOC). Stage 3 of the RAP process presents evidence that beneficial uses of the area has been restored, along with a discussion of the rationale to delist the AOC should some uses remain “impaired.” (Canada Ontario Agreement, COA 1995). The Report represents the conclusions of the RAP Team, the PAC, the local municipalities, the public at large, the Agencies’ Technical Review Team, and ultimately, the federal and provincial governments. The evidence presented in the report will provide the rationale to remove the designation of “Area of Concern” from Severn Sound, in other words, it is time to “delist” the area.

Delisting Process

In general, at each Canadian AOC, site-specific delisting criteria and restoration targets for each impaired beneficial use are developed by the RAP participants in consultation with government staff and the community. Delisting criteria are benchmarks used to assess progress toward restoring impaired beneficial uses and are usually based on locally defined goals and related environmental objectives for that AOC.

In Severn Sound RAP, available Provincial and Federal guidelines, objectives and standards were reviewed as applicable to use impairments mentioned in the GLWQA, Annex 2. The general Great Lakes and specific Severn Sound research and scientific reviews were used to formulate delisting criteria where appropriate.

Models were used to evaluate the expected response of the environment to remedial actions. In some cases, the models were conceptual and helped to point to appropriate indicators to change. In the case of eutrophication, an empirical model of trophic indicators was used to predict the response of phosphorus control strategies on the open water quality. We were aware of other models that were under study and, although the value of the models was not proven, we sought to collect data that would put us in a position to make use of them once completed.

The GLWQA Use Impairments that apply to Severn Sound are:

- i. Fish and wildlife consumption
- iii. Degradation of fish & wildlife populations
- vi. Degradation of benthos
- viii. Eutrophication
- x. Beach closings
- xi. Degradation of aesthetics
- xiii. Degradation of phytoplankton and zooplankton populations
- xiv. Degradation of fish and wildlife habitat

Delisting objectives relating to each use impairment or RAP goal were developed and reported in the Stage 2 report. In addition, a monitoring plan was developed and has been followed with refinements since 1993 as resources allowed. RAP implementation has proceeded along with monitoring since the beginning of the RAP process in 1987 and has intensified since the release of the Stage 2 report in 1993. The delisting process for Canadian AOCs (COA 1995) flows from the development of site-specific delisting criteria and restoration targets for each impaired beneficial use as documented in the Stage 2 Report. Formal delisting requires:

1.1 The Delisting Process in Severn Sound Area of Concern

1. Technical summaries of each indicator used to assess delisting objectives were prepared for each use impairment. These summaries were supported by technical reports, scientific papers and data summaries prepared by various RAP staff, project partners staff and contractors.
2. A Technical Review Team composed of scientists from government agencies, academic institutions and consultants was assembled to provide an external technical review. The Technical Review Team prepared a brief report stating whether “from a technical perspective, the evidence and scientific rationale put forward in the technical summaries, provides the basis to support the delisting objectives have been met.
3. Concurrent to the Technical Review Process, a public review of the SSRAP technical summaries was carried out at regular monthly Public Advisory Committee meetings, through individual PAC members, interest groups and individuals.
4. A Public Open House was held in order to present poster displays of work undertaken by SSEA and other RAP Technical partners. Responses of the public to each use impairment and to the status of the delisting objectives were actively sought out.
5. Comments from both the technical review team and the public have been addressed in the preparation of the Stage 3 Report, including recommendations regarding delisting, which have been reviewed by the federal and provincial governments.
6. Formal transmittal of the Stage 3 Report to the IJC will occur at the event in June 2002.
7. The IJC will provide a formal response to the Stage 3 document to the governments.
8. Canada and Ontario will then formally delist Severn Sound as an Area of Concern.

1.2 Background of the Severn Sound RAP

The Severn Sound Area of Concern is located in southeastern Georgian Bay (Figure 1.1). The immediate watershed of the Sound covers an area of approximately 1000 km². The contact between the Precambrian shield and the sedimentary bedrock with varying overburden runs down the middle of the Sound. The basin is a complex of sheltered to exposed Bays ranging from 2 to 4 m deep in the eastern end to a 43 m deep basin off the northern end of Beausoleil Island where the Sound meets Georgian Bay. Sheltered areas within the Sound such as Penetang Bay and bays in the Honey Harbour area are almost tributary to the Sound.

Three problems were identified in the Severn Sound RAP:

- i. Eutrophication as reflected in excessive algae growths and in phytoplankton, zooplankton, benthic macroinvertebrate and fish communities.
- ii. Destruction of coastal nearshore, stream riparian and upland habitat as reflected in the diversity and balance of the fish and wildlife community.
- iii. Concern for bacterial contamination of swimming areas and trace contamination of the ecosystem.

Goals of the RAP

The goals for the RAP were developed through a comprehensive community involvement process. The goals were established on the basis of the most restrictive uses from a water quality standpoint.

General Goals

- i. To improve water quality in Severn Sound.
- ii. To maintain a healthy ecosystem in Severn Sound.

Water Use Goals

- i. The water should be swimmable virtually everywhere in Severn Sound.
- ii. The fish and water-based wildlife habitats in Severn Sound should be protected to maintain their healthy, naturally reproducing communities.
- iii. The fish from Severn Sound should be edible.

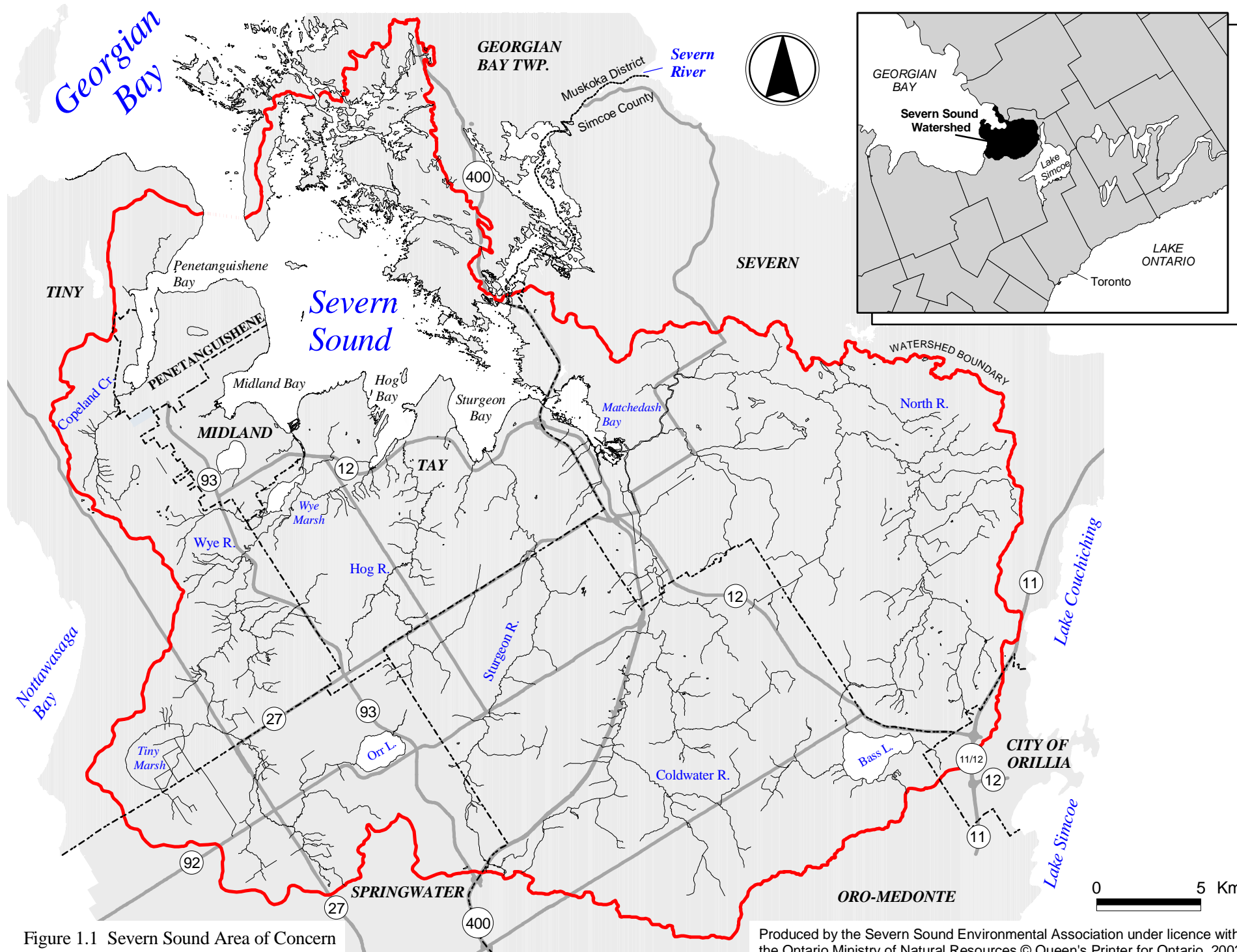


Figure 1.1 Severn Sound Area of Concern

Produced by the Severn Sound Environmental Association under licence with the Ontario Ministry of Natural Resources © Queen's Printer for Ontario, 2002.

2. STATUS OF IMPLEMENTATION OF REMEDIAL ACTIONS

1. IMPROVE SEWAGE PLANT EFFICIENCY

1a. Optimize the use of existing equipment and treatment.

Actions to assist with the optimization of the use of existing equipment and treatment at all Severn Sound Sewage Treatment Plants.

In April 1994, Environment Canada, MOE and the Wastewater Technology Centre (WTC) initiated a program to systematically transfer skills to the owners, operators and regulators of all eight Severn Sound STPs to achieve and sustain RAP effluent objectives.

The Sewage Plant Optimization Project provided technical support and training for the operators of eight sewage treatment plants in the Severn Sound area. It has resulted in an improved understanding of plant operations and a renewed focus on achieving good quality economical effluents.

The optimization of the existing Town of Midland STP Plant was completed in 1994, and continues to take effect with dual point chemical addition to reduce effluent total phosphorus. The new STP in Midland incorporated a substantial capacity to treat hauled waste and a surge tank to accept virtually all combined sewer flows.

The Class EA process was completed in 1996 for Tay Township Port McNicoll STP study. Due to the expanded service area that will service additional shoreline areas on inadequate private systems and the need for existing plant upgrading, the new Port McNicoll STP expansion was larger than originally anticipated in the RAP Stage 2 Report. Construction began in 1996 and the new plant was officially opened in 2001.

From 1994 to 1997, the Core Team, with facilitation support from MOE and WTC, identified two plants as candidates for on-site optimization (CCP) activities because they were not achieving RAP effluent phosphorus objectives. The main factors limiting performance were both operational and administrative factors. Technical assistance focussed on the transfer of skills to address the factors limiting performance. This was done to achieve and sustain the RAP effluent objectives within the existing facilities. MHC staff achieved and sustained the RAP phosphorus objective of 0.3 mg/L with no capital upgrades and reduced the operational and maintenance costs through improved control of chemical addition for phosphorus removal. The optimization efforts at the Coldwater STP have supported lifting a development freeze on the town by the MOE and deferred major plant expansion.

Also from 1994 to 1997, the optimization Core Team participated in strategic planning meetings, implementation training workshops and optimization partnership meetings. The activities supported the Team in planning, prioritization and learning from other's experiences to improve operation and performance. Key activities included a workshop concerning on/off aeration control hosted by the Elmvale staff, and a Severn Sound open-house display. To complete the program, an on-site review and detailed data analysis were conducted. Through discussions with operators, management and through data collection, review, and analysis, the current status of the plants was documented. To provide feedback on the status of the plants and to bring closure to the formal optimization program development phase, an exit meeting was held with the Core Team.

STATUS OF IMPLEMENTATION: Complete

1b. Provide additional treatment where needed.

**Provide partial funding for plant upgrades and treatment improvements at:
Elmvale, Penetanguishene Main and Fox Streets, Midland, Coldwater, Pt. McNicoll
and Victoria Harbour.**

**Provide partial funding for improved operating and maintenance costs for all
sewage plants.**

Since 1991, four of the eight Severn Sound STPs were upgraded, with provincial and federal financial support, to improve their ability to achieve and maintain the RAP effluent objectives.

The Elmvale lagoon system was replaced with an extended aeration plant with tertiary treatment.

Main St. contact stabilization plants were replaced with a modified conventional activated sludge plant with tertiary treatment and Fox St. contact stabilization plant was upgraded with tertiary treatment.

In 1996/97, the Midland conventional activated sludge plant was upgraded with a flow equalization tank, primary clarifier, primary digester and upgrades of the existing digesters for secondary digestion.

In June, 1998, the province announced grants totalling more than \$5 million to support the upgrade of the Port McNicoll sewage treatment plant and service extensions for the community of Port McNicoll in Tay Township. The RAP Office participated in the Class EA and the review of effluent requirements for the new plant.

The new Port Severn Sewage Treatment Plant and the Upgraded Midland Sewage Treatment Plant were officially opened in 1998. Both plants provide a high degree of sewage treatment ensuring that RAP targets for phosphorus loadings to Severn Sound will be met into the future.

An application for provincial funding has also been submitted to upgrade the lift station and force main for the Coldwater plant.

Most of the STP sources have met RAP effluent concentration and/or loading targets through completed or recently committed upgrades. The Coldwater STP upgrade and pumping station upgrade project has been committed to by the Township of Severn. The Coldwater project will complete the sustainable sewage treatment infrastructure projects that are recommended actions in the Stage 2 Report.

STATUS OF IMPLEMENTATION: Complete

1c. Improve outfall dispersion characteristics.

With each project listed above, a review of the outfall characteristics was undertaken to minimize the hydraulic mixing zone of the effluent. As future sewage plant upgrades are planned this review during the design phase will be an ongoing requirement.

STATUS OF IMPLEMENTATION: Complete

1d. Consolidate plants to combine improved treatment with better discharge location.

No action taken or required at this time.

STATUS OF IMPLEMENTATION: Ongoing

1e. Store sludge from sewage plants during the period when spreading is not recommended.

Provide partial funding for expansion of sludge storage facilities serving sewage plants in area municipalities to accommodate the storage of sludge during winter (Nov.30-Apr.15).

Modify Sludge Utilization Guidelines to store rather than spread sewage sludge from freeze-up to spring thaw.

The RAP participated on the inter-municipal committee overseeing the Class Environmental Assessment Study for a sludge storage facility. The SSEA facilitated both federal (Great Lakes 2000 Cleanup Fund) and provincial (Municipal Assistance Program) funding that contributed two thirds of the total cost of that study.

In 1999, the Municipal Technical Committee on Biosolids and Hauled Waste completed its Environmental Assessment study to search for a communal sludge storage facility (facilities) and hauled waste treatment sites in direct response to RAP recommendations. A preferred technology for sewage plant sludge, storage tanks, and a preferred location, south of Midland,

were chosen. The recommended solution for hauled waste is treatment at the Midland STP. Following this EA, municipalities developed individual solutions to provide sludge handling.

New site Certificates of Approval are being written by MOE to prohibit spreading of sludge on land between December 1 and April 1 (sometimes May 1).

Handling of sewage plant biosolids in winter and septage and hauled waste disposal in the Province and in the Severn Sound watershed are outstanding policy/regulatory issues.

The RAP recommendation to store sewage plant sludge during the winter and spring has been addressed in the short-term arrangements that each municipality has developed. The local MOE District Office has placed conditions on each new C.of A. within the Severn Sound watershed to limit the amount of time in a year when spreading can occur. The recently announced Provincial funding for the Biosolids Storage Facility is presently being discussed by the municipal partners as they await the conditions of the grant. The main issue with biosolids storage is cost. The cost of on site storage (at each STP location) versus inter-municipal/communal storage (at a communal location) depends heavily on the provincial funding share. The status of some municipal partners has changed since the application to PWPF was submitted (1997). For example, Severn Township has made an interim agreement with Springwater Township to store Coldwater STP biosolids at the Elmvalle STP through the winter and spring.

STATUS OF IMPLEMENTATION: Ongoing

2. UPGRADE PRIVATE SEWAGE SYSTEMS

2a. Replace faulty or seriously substandard private sewage systems with properly operating systems according to Environmental Protection Act Regulations.

Inspect private sewage systems every three years and enforce the replacement or repair of faulty or seriously substandard systems according to the EPA.

The Shoreline Pollution Control (Fertile Waters in Cottage Country) project involved the systematic detection and correction of faulty private sewage systems in both shoreline residences and pleasure boats. Cooperation with OMOE will ensure that the sewage systems comply with Environmental Protection Act regulations and that phosphorous loadings to the Sound will be controlled. It is expected that a reduction in excess nutrient levels will reduce nuisance algal growth in the Sound. Of approximately 3000 sewage systems surveyed, about 600 were found to require abatement. The abatement of these systems is complete.

With the assistance of the Severn Sound CURB and Rural Non-Point Source Control projects, a total of 101 failing septic systems that were having an impact on surface water quality were replaced.

Following provincial restructuring, septic system inspections are now the responsibility of the municipality and each has chosen a mechanism for delivery. Some have contracted the local District Health Unit; some have hired private consultants and some have trained staff to conduct septic inspections and enforcement.

With the service extensions to shoreline areas that are identified pollution sources from substandard private sewage systems such as the community of Port Severn (recently completed sewage collection system and sewage plant) and Paradise Point - Grandview Beach areas of Tay Township (recently announced PWPF project) phosphorus sources from extensive areas serviced by inadequate private systems should be greatly reduced. Individual private sewage systems are known to be continuing as a lot-by-lot source in other shoreline areas as older systems fail and need replacement. A sustainable solution to the treatment of septage and hauled waste at the Midland sewage treatment plant was recommended in the Class EA but lacks provincial support because land disposal sites within Severn Sound continue to be a permitted option. The municipalities are reluctant to commit capacity for treatment when the province still allows the land disposal practice. A private sewage system reinspection program is under consideration in Georgian Bay Township and would be the first sustainable control of private systems in Severn Sound.

STATUS OF IMPLEMENTATION: Ongoing

2b. Continue with research on phosphorus, nitrogen and bacteria removal efficiency by conventional septic tank and tile field systems on the variable soils found in the Severn Sound ecosystem.

Research is being carried out through Universities and by federal and provincial agencies. Individual companies are marketing new technologies under the new Building Code regulations.

STATUS OF IMPLEMENTATION: Ongoing

3. REDUCE STORM WATER SUPPLY

3a. Virtually eliminate bypass from sewage pumping stations and combined sewer overflows (CSOs) in the Severn Sound area.

Partial funding to upgrade two Midland pumping stations to help eliminate bypassing. Virtually eliminate bypass from sewage pumping stations and combined sewer overflows by improving pumping stations.

Midland pumping stations were upgraded to virtually eliminate bypassing.

A project to optimize the sewer collection system, started in 1998 in the Town of Penetanguishene will lead to reductions in bypassing at the Main Street STP.

Sewage bypassing and CSOs have been virtually eliminated at Midland and Penetanguishene. The Coldwater sewage pumping station remains an ongoing source of untreated sewage bypass. A status report of bypassing and the effect of combined sewers is presently under way with funding support from Environment Canada (GL2000CuF) and municipalities.

Each sewage plant upgrade project usually involved review of the pumping stations associated with the plant.

STATUS OF IMPLEMENTATION: Ongoing

3b. Retain and treat stormwater runoff in existing catchments where locations allow.

Support studies and planning for existing catchments to retain and treat stormwater runoff.

Retain and treat stormwater runoff in existing catchments where locations allow.

The Severn Sound Urban Stormwater Strategy, completed in 1998, provides a comprehensive strategy for the retrofit of urban stormwater catchments in Severn Sound. The Towns of Midland and Penetanguishene and the Townships of Tay and Severn participated in developing the strategy for urban areas, including estimates of stormwater loadings from urban areas, future potential implementation projects, a recommended policy and decision framework on individual urban stormwater projects and storm sewer network maps. The adoption of the Draft Drainage Policy and Protocol for Infrastructure Improvement Projects as by-law by the municipalities is an important part of implementation of the strategy. All four participating municipalities have adopted the policy.

The Penetanguishene Sanitary Sewer Optimization Project conducted a detailed review of the municipal sanitary sewer system in order to minimize bypassing and to support a long-term rehabilitation program for this system. The study developed a comprehensive data base of the sanitary sewer system, established flow rates at various locations within the sanitary sewer system to identify Combined Sewer Overflows (CSOs), defined areas which are subject to excessive infiltration/inflow, and made recommendations for rehabilitation projects for the sanitary sewer system.

A Constructed Wetland for Stormwater Treatment was constructed at the Penetanguishene waterfront (near the Main St. Sewage Treatment Plant) and will now receive stormwater diverted from existing sewers that is currently discharging directly into Penetang Bay. By treating urban stormwater from this catchment, a minimum of 17.5 Kg/yr of phosphorus will be removed from the present loading, making a significant contribution to the phosphorus control strategy of the RAP. The project will also improve fish habitat along the coast of the Bay, add to the wildlife habitat value of the area and enhance the Waterfront Park trail system.

STATUS OF IMPLEMENTATION: Ongoing

3c. Plan all new development proposals to include retention and treatment of stormwater during and after construction.

Implement the Stormwater Quality Guidelines for all new development proposals - include retention and treatment of stormwater during and after construction.

The SSEA office works with municipal staff to review construction projects and stormwater reports, resulting in improved designs for stormwater management for retrofit of existing development in combination with new development areas. Examples of facilitated projects include:

Little Lake Village/Shewfeldt Outfall Stormwater Management Pond - This pond represents a 20.7 Kg/yr Total Phosphorus (TP) reduction from 63.8 ha of new and existing stormwater sources at an approximate capital cost of \$300,000.

Tiffin By The Bay - Comments were provided to the Town of Midland for the Stormwater Management Report prepared for the Aberdeen Cove Phase of this development. Upon completion of the entire development, it is anticipated that stormwater from some 71.3 ha of new and existing development will be treated, representing a potential TP reduction of 14 Kg/yr.

Coldwater Stormwater Management Pond - The Township of Severn has begun the construction of a stormwater management pond in the Community of Coldwater. This initiative will result in the treatment of 15 ha of existing development with an overall TP reduction of 4 Kg/yr.

A confirmed 20% target load reduction of phosphorus from existing urban storm water catchments has been outlined in the Severn Sound Urban Stormwater Strategy. All four participating municipalities (Penetanguishene, Midland, Tay and Severn) have passed enabling bylaws that require consideration of urban stormwater BMPs on a catchment basis when road reconstruction projects, sewer separation projects and new development adjacent to or within existing development areas are considered by municipal staff and Councils. Midland has put in place a storm water fund that will support such projects. Retrofit treatment of existing storm catchments is being successfully melded with treatment of stormwater from new development in the smaller urban areas in Severn Sound. A good example of an economical and effective project in Midland is the combination of stormwater from the Shewfeldt outfall, draining some 46 ha of existing urban area, with two new developments on the shore of Little Lake in one common treatment pond. Another implementation project of the existing downtown catchment of Penetanguishene is being implemented with funding assistance from the Ontario Great Lakes Renewal Foundation.

STATUS OF IMPLEMENTATION: Ongoing

- 3d. Clearing of land prior to construction must be minimized to retain as much natural vegetation cover as possible.**

During proposal review, ensure that clearing of land prior to and during construction is minimized to retain as much natural vegetation cover as possible.

The SSEA office works with municipal staff to review construction projects and makes comments on vegetation cover and recommends re-vegetation, preferably with native species, where cover is removed.

STATUS OF IMPLEMENTATION: Ongoing

- 3e. Develop storm water management plans by municipalities in cooperation with provincial agencies in order to incorporate integrated storm water management on a watershed basis.**

Assist with the development of stormwater management plans on watershed basis.

The Severn Sound Urban Stormwater Strategy, completed in 1998, provides a comprehensive strategy for the retrofit of urban stormwater catchments in Severn Sound. The Towns of Midland and Penetanguishene and the Townships of Tay and Severn participated in developing the strategy for urban areas including estimates of storm water loadings from urban areas, future potential implementation projects, a recommended policy and decision framework on individual urban stormwater projects and storm sewer network maps.

The adoption of the Draft Drainage Policy and Protocol for Infrastructure Improvement Projects as bylaw by the municipalities is an important part of implementation of the strategy. All four participating municipalities have adopted the policy.

STATUS OF IMPLEMENTATION: Completed

4. REDUCE AGRICULTURE SOURCES

4a. Manage runoff from manure storage areas and barnyards.

Assist in funding the modification of manure storage areas or barnyards to reduce runoff.

The Severn Sound RAP delivered the CURB program for four years. Thirteen manure storage projects were constructed. After CURB was discontinued, the initiative was continued through the Severn Sound Rural Non-Point Source Control Project (RNPSC), starting in March 1996 through the Great Lakes 2000 Cleanup Fund.

A variety of practices have been targeted for remediation, including cropping on high erosion potential areas, manure storage and handling, barnyard runoff and milkhouse waste disposal and private sewage disposal. The RNPSC project provides technical and financial assistance to develop and implement plans to remediate the targeted practices.

Since 1996/97, nine manure storage projects have been completed. The project includes evaluation of farms to develop specific plans for reducing pollutant loadings to area streams. Solutions include advice on better management of manure and yard runoff as well as participation in on-farm projects.

The Environmental Farm Plan initiative of the Ontario Farm Environmental Coalition has provided a sound technical basis for landowner self-assessment of problems and recommended solutions through BMP manuals and EFP workshops with landowners. Unfortunately, the funding support needed to implement most of the solutions is inadequate and independent, "third-party" technical advice is lacking.

Uncertain economic conditions in the agriculture sector make it difficult to convince landowners of the environmental sense of large capital outlays necessary for manure storages. The absence of a legal requirement to provide nutrient management facilities or even by-laws requiring Nutrient Management Plans with facilities, means a long-term, locally sustainable, support mechanisms for landowners to obtain funding support and advice for projects is needed.

STATUS OF IMPLEMENTATION: Ongoing

4b. Eliminate spreading of manure on land from freeze-up until land is workable after spring thaw (usually Nov.30-Apr.15).

Modify the Farm Practices Guidelines and fund manure storage areas.

See action 4a above.

Nutrient Management legislation is under consideration by the Provincial government. Municipalities in Simcoe County are also considering local bylaws for intensive operations in their jurisdiction.

STATUS OF IMPLEMENTATION: Ongoing

- 4c. Eliminate the spreading of sludge (from sewage plants) on land from freeze-up until land is workable after spring thaw (usually Nov.30-Apr.15).**

Modify new site Certificates of Approval to exclude spreading of sewage plant sludge on land between Nov. 30 and April 15.

New site Certificates of Approval are being written by MOE to prohibit spreading of sludge on land between December 1 and April 1 (sometimes May 1).

STATUS OF IMPLEMENTATION: Ongoing

- 4d. Eliminate the spreading of septage (from storage or private sewage systems) at any time.**

Land spreading of septage is still permitted. However, MOE will not issue new certificates for the disposal of septage on land. The preferred method of handling septage, considered in the North Simcoe Biosolids EA, is treatment at a sewage treatment plant equipped to receive septage (such as the Town of Midland WTC).

STATUS OF IMPLEMENTATION: Ongoing

- 4e. Direct milkhouse waste to treatment.**

Assist with funding.

The Severn Sound CURB program assisted with funding for three milkhouse waste water treatment projects, including one demonstration project. Through the Severn Sound Rural Non Point Source Control Project (RNPSC), a variety of practices have been targeted for remediation, including milkhouse waste disposal. The RNPSC project provides technical and financial assistance to develop and implement plans to remediate the targeted practices.

Six milkhouse waste projects have been approved through the RNSPC project. An experimental flocculator for the treatment of milk house waste water has been installed as a demonstration on a Lafontaine dairy farm. Once optimized, this project is expected to stop approximately 90 Kg of phosphorus per year from reaching local streams.

STATUS OF IMPLEMENTATION: Ongoing

4f. Restrict livestock access to watercourses.

Assist with funding.

By the end of 2001 more than 132.8 km of river have been fenced and/or remediated, restricting access to approximately 2400 livestock. This project is resulting in the restoration of significant habitat corridors linking larger habitat nodes. It is essential to continue the project because it is leading directly to RAP delisting, the restoration of habitat in the area and the demand from landowners for projects to continue.

STATUS OF IMPLEMENTATION: Ongoing

4g. Encourage conservation tillage, crop rotation and other erosion control practices.

Promote conservation tillage through farm practices guidelines or by the development of funding programs like Land Stewardship.

Through the Rural Non-Point Source Control Project, more than 4900 ha of land have been converted to conservation tillage through 45 projects, representing a reduction in annual soil loss of approximately 4300 tonnes.

The Severn Sound RAP provides a demonstration no-till drill, in partnership with the North Simcoe Soil and Crop Improvement Association, at minimal rental cost to local farmers. The equipment has been used on more than 1200 ha.

STATUS OF IMPLEMENTATION: Ongoing

5. REDUCE SOURCES OF EROSION

5a. Stabilize banks and plant vegetation buffers along watercourses.

Provide continued financial and staff support for the Tributary Rehabilitation Project which aids in stabilizing banks and planting vegetation buffers along watercourses.

Through the Severn Sound Tributary Rehabilitation Project, more than 129,500 trees and shrubs have been planted.

The Natural Shorelines Project was developed with support from Environment Canada's EcoAction Program to restore habitat by working directly with shoreline owners, both public and private. Its purpose is to protect, restore and create habitat as well as to educate shoreline owners and the public about the ecological significance of shoreline habitats. The project offered information, expertise, assistance and plant materials to encourage shoreline owners to become shoreline stewards, and take an active role in the protection, enhancement and

rehabilitation of our shoreline environments.

Subsequently, a Natural Shorelines Project on Bass Lake (Oro-Medonte) was conducted with partnership between the Township, Bass Lake Ratepayers Association, SSEA and Environment Canada (Great Lakes 2000 Cleanup Fund). A contractor was hired to organize two open houses and to contact shoreline landowners. All shoreline owners were contacted and eleven expressed interest in having a plan developed for their shoreline. Individual plans and recommendations have been implemented with property owners. Discussion with the Township on municipal properties is ongoing.

STATUS OF IMPLEMENTATION: Ongoing

5b. Minimize erosion during and after road construction and maintenance practices.

During project review, ensure minimal erosion during and after road construction and maintenance (i.e. maintain as much vegetative cover as possible).

The maintenance of rural ditches in the Severn Sound area has resulted in episodes of high suspended solids and phosphorus discharging to streams. The clean-out procedures vary in the degree to which vegetation in the ditches is removed. Projects are being developed that will outline and evaluate methods of minimizing the degree of vegetation removal and draft specifications for contractors that will reduce the loadings of solids and phosphorus from this source.

A Ditch Workshop was held on Nov. 23, 1999, which included information sessions with SSRAP, OMNR and Department of Fisheries and Oceans officials and discussions between area Works Superintendents and Staff. Monitoring of the effects of a ditch realignment and clean-out in Tay Township is being carried out by the SSEA Tributary monitoring project.

Monitoring of the effects of a ditch realignment and clean-out in Tay Township is being carried out by the SSEA Tributary monitoring project.

STATUS OF IMPLEMENTATION: Ongoing

5c. Restrict the clearing of land prior to and during construction projects.

As above see 3d.

STATUS OF IMPLEMENTATION: Ongoing

6. REDUCE SUPPLY FROM MARINE ACTIVITIES

6a. Enforce Pleasure Craft Black Water Legislation.

Conduct boat inspections and enforce legislation.

Enforcement of the Pleasure Craft Black Water regulations through municipalities should be supported by the Province. Federal jurisdiction over the Great Lakes waters under the Canada Shipping Act may hinder the effectiveness of municipal action.

STATUS OF IMPLEMENTATION: Cooperative action required by federal, provincial and municipal authorities.

6b. Encourage onboard storage of grey water

As above see 6a.

The Severn Sound RAP office produced an information brochure entitled "Environmental Boaters Guide" which provided advice for minimizing harm to the aquatic environment, including on-board storage of grey water. This brochure was printed in both English and French. It has been distributed to marinas in the Severn Sound area and is available at the permanent RAP information display at the Wye Marsh Wildlife Centre.

The Severn Sound RAP also participated in the Steering Committee for the Clean Marine Partnership, which was created in 1994 to promote voluntary environmental stewardship in all boating-related activities in Ontario.

On May 3rd and May 4th, 2001, a workshop was held at The Inn at Christie's Mill in Port Severn. Discussions centred on research, legislation and educational opportunities with respect to boat discharges in our environment. The Severn Sound Environmental Association Office facilitated and produced a summary report of the workshop.

Participants include representatives of municipalities, Ministry of Natural Resources, Ministry of Environment, Environment Canada, Parks Canada, cottage associations, marinas and boating groups from the surrounding areas of SE Georgian Bay. Co-sponsored by the Greater Bay Area Foundation, OMNR (Great Lakes Heritage Coast), Ministry of Environment and the Severn Sound Environmental Association, this workshop considered grey and black water issues and identified feasible, long term opportunities to reduce pleasure boat discharge into Georgian Bay waters.

STATUS OF IMPLEMENTATION: Ongoing

6c. Designate one agency to coordinate the review of all marine construction proposals.

Assist with the coordinated review of marine construction projects.

The Severn Sound Environmental Association is seeking to “institutionalize” the “no net loss” policy of Department of Fisheries and Oceans to assist in the review of marine construction projects with regard to possible impacts on fish habitat. SSEA is also proposing to assist municipalities in incorporating the Fish Habitat Management Plan into Municipal Planning documents.

The Interim Fish Habitat Management Plan for Severn Sound was produced in 1993 to provide assistance to municipal planners and other agencies reviewing marine construction projects. It provided an interim plan for the protection, restoration and enhancement of fish habitat in Severn Sound.

In 1999, a report titled "Development of a Fish Habitat Classification Model for Littoral Areas of Severn Sound, Georgian Bay" documented the GIS database assembled for the littoral habitat areas of Severn Sound and described the methods used to devise a fish habitat classification model. The complete GIS database, including full implementation of the classification model, is available on a CD-ROM.

This exercise has resulted in a scientifically defensible fish habitat classification for most of the Severn Sound coastal near shore at a scale that will be useful for planning decisions on shoreline development and marine construction (collection scale 1:5,000, base mapping scale 1:10,000).

STATUS OF IMPLEMENTATION: Ongoing

6d. Review marine construction proposals under the Interim Fish Habitat Management Plan.

Implement the Interim Fish Habitat Management Plan in the review of all marine construction projects.

See action 6c. above.

STATUS OF IMPLEMENTATION: Ongoing

6e. Stabilize banks and plant vegetation buffers along water courses.

Provide continued financial and staff support for the Severn Sound RAP Tributary Rehabilitation Project.

See action 5a. above.

STATUS OF IMPLEMENTATION: Ongoing

7. FISH AND WILDLIFE PROTECTION AND IMPROVEMENT

7a. Support and incorporate wetlands and other unique and valuable habitat preservation initiatives in proposal reviews and land use controls.

As above see 6c.

Automated Method for Analysing Habitat Framework Targets: The Severn Sound Environmental Association has developed an automated geographic information system (GIS) procedure that can measure several habitat conditions and provide locations of sites most suitable for restoration by combining standard vector GIS methods with innovative analysis techniques. The project produced a step-wise instruction manual on the method for use by resource managers, planners, biologists and other GIS users in other areas of the Great Lakes. A CD with the ArcView® extension required to use the method with ArcView® was prepared with a technical report detailing the methodology.

The method has been refined and applied to 1998 aerial photo coverage of the Severn Sound area to evaluate:

- 1) Changes in habitat conditions and priority areas (i.e. those with most drastic changes) compared to 1982 mapping (OBM) or historical air photos (1953,1971,1989) and
- 2) current status of habitat targets in Severn Sound in order to prioritize rehabilitation sites.

The project combines work on images from OMNR's recent flights, the County of Simcoe's interest in updating their forest layer and their OP designations and the County's interest in participating in the analysis. The work is crucial to targeting remediation and establishing habitat status for delisting the AOC. During 1999, digitizing and registration of 1998 air photos and images for North Simcoe County was completed. A revised forest layer based on the 1998 photos is under way. The forest layer is being extensively used in the development of Natural Heritage Strategies as part of the Municipal Official Plan process.

A biological inventory and evaluation of the Wye Valley began in 2001. Although several studies have been conducted on portions of the Wye Marsh since the 1970's, many changes have occurred in the area during this time and much of the Wye Valley has never been the focus of a study. The main goal on the inventory is to make recommendations regarding the ecological values of the Wye Valley that may relate to future land management decisions for the area.

Field visits were used to check previous vegetation mapping, identify significant species or populations and their associated habitats, and any special ecological features and environmentally sensitive areas. Visits were scheduled to coincide with peak periods of wildlife activity and the flowering of vascular plants throughout the field season. Lists of each species

encountered during the survey were prepared and included in the appendices of the report. These lists include plants, mushrooms, birds, herptiles (amphibians and reptiles), fishes, dragonflies, butterflies, mammals, aquatic invertebrates and terrestrial invertebrates.

STATUS OF IMPLEMENTATION: Ongoing

7.b Create productive fish and wildlife habitats as specific projects or as a result of shoreline and marine development

As above see 6c.

In the Penetang Bay Cleanup and Habitat Restoration project, a two-hectare area of shoreline at the south end of Penetang Bay provided poor habitat and required remediation. In fall 1994, 4000 m³ of wood debris was removed, restoring fish habitat. In 1995, fish and wildlife habitat was restored in a two-hectare area on shore in the waterfront park near the wood debris removal site. An existing drainage channel in the park was also rehabilitated to improve fish habitat.

The three-year Severn Sound Natural Shorelines project addressed the restoration of natural shoreline vegetation. Restoring a buffer zone of natural vegetation on shoreline properties directly reduces nutrient, sediment and pesticide export to Severn Sound, as well as providing wildlife habitat.

The SSRAP Wetland Rehabilitation Project addresses three objectives:

- 1) To restore degraded wetland areas
- 2) To prevent and control pollution of wetlands
- 3) To conserve and protect human and ecosystem health in wetlands

The project has four inter-related components including:

- 1) Wetland rehabilitation
- 2) Lead shot remediation and lead sinker exchange and public education
- 3) Working with landowners and partner agency staff, the project provides direct assistance in rehabilitation, enhancement and protection of wetlands in the Severn Sound area
- 4) Technical advice and education on wetland issues

To date, five wetland rehabilitation projects are under way and three conservation agreements have been concluded, securing 52 ha of wetland. Demand from landowners is increasing for the program.

The Wetland Rehabilitation Program involves working with landowners, volunteers and partner agency staff to protect, restore and enhance wetlands within the Severn Sound AOC.

Utilizing low security protection, 28 hectares of wetland habitat was protected during 2001-02, adding to more than 88 hectares protected in previous years. In addition, 37 hectares of upland

habitat adjacent to wetlands was protected in 2001-02, improving the ecological integrity of the individual wetlands and providing additional habitat for wildlife species. In total, 411 hectares of wetland and their associated uplands have been protected to date.

This project contributes directly to meeting the COA Target for wetland rehabilitation and protection. In 2001-02, wetland rehabilitation work was implemented on 5.5 hectares of wetland in Severn Sound, and almost 30 hectares of wetland habitat was protected through private landowners. Overall, the project has rehabilitated and/or protected a total of 411 hectares of wetland and associated upland habitat to date.

Year one of the biological inventory of Wye Valley was completed with the production of the final report in January of 2002. The 60 page report includes detailed sections on methodology, resource inventory (including geology, geomorphology, heritage, vegetation, birds, herptiles, mammals, fishes, and aquatic and terrestrial invertebrates), significant features, conclusions and recommendations, and references. The 130 pages of appendices to the report include species lists and thematic mapping used in the project.

Also see action 6e. above.

STATUS OF IMPLEMENTATION: Ongoing

7c. Endorse and implement the Interim Fish Habitat Management Plan.

As above see 6c.

STATUS OF IMPLEMENTATION: Ongoing

7d. Rehabilitate fish habitat and buffer vegetation of streams flowing directly to Severn Sound.

Provide funding for, and undertake, the rehabilitation of fish habitat and buffer streams flowing directly into Severn Sound as part of the Severn Sound Tributary Rehabilitation Program.

By the end of 2001, a total of 132 projects were completed through the Tributary Rehabilitation Program. More than 132.8 km of river have been fenced and/or remediated, restricting access to approximately 2400 livestock. More than 129,500 trees and shrubs have been planted. This project is resulting in the restoration of significant habitat corridors linking larger habitat nodes. It is essential to continue the project because it is leading directly to RAP delisting and restoration of habitat in the area and the demand from landowners for projects to continue.

STATUS OF IMPLEMENTATION: Ongoing

- 7e. As an interim measure, stock sufficient numbers of fingerling walleye to restore an abundance of larger predator fish to achieve a healthy, balanced community.**

As above.

Two local conservation groups, the Georgian Bay Hunters and Anglers and the North Simcoe Anglers and Hunters, have operated annual walleye stocking programs since 1986.

STATUS OF IMPLEMENTATION: Ongoing

8. PREVENT CONTAMINATION

8a. Implement the MISA Sewer Use Control Program and MISA STP Program.

The Program was discontinued by the Province. The Province does have a model sewer use bylaw for use by municipalities.

STATUS OF IMPLEMENTATION: Ongoing municipal action

8b. Encourage water conservation in and around the home and in industrial processes.

The Severn Sound RAP produced and distributes an information video and accompanying booklet, "Shoreline Living" which provides advice on water conservation and other environmental protection practices.

The Severn Sound Natural Shoreline project produced a public education package on the importance of natural vegetation, environmentally sound maintenance practices (reducing water, fertilizer and pesticide use) and shoreline rehabilitation; public information packages were distributed to all private, commercial and municipal shoreline property owners.

The SSEA Office provides an information service to the community by distributing SSRAP documents, brochures, fact sheets, and information videos, as well as related agency publications, and maintaining a permanent display in the Wye Marsh Wildlife Centre. In addition to the reference documents available in the Implementation Office, there is now a Severn Sound Environmental Association website available with various fact sheets and information links for residents to encourage water conservation and environmental best management practices.

STATUS OF IMPLEMENTATION: Ongoing

8c. Encourage use of safe alternatives to cleaning products containing phosphorus.

As above see 8b.

The Severn Sound RAP produced and distributes an information video and accompanying booklet, "Shoreline Living" which provides advice on safe alternatives to cleaning products containing phosphorus and other environmental protection practices. The Severn Sound RAP Environmental Boaters Guide (see action #6.b) advises use of alternative cleaning products for boaters.

STATUS OF IMPLEMENTATION: Ongoing

8d. Encourage personal and corporate efforts to eliminate the creation and disposal of pollutants that could add to the contaminant burden of Severn Sound.

**Encourage efforts to eliminate the creation and disposal of pollutants.
Contribute to sewage flow reduction initiatives.**

The Severn Sound Natural Shoreline project produced a public education package on the importance of natural vegetation, environmentally sound maintenance practices (reducing water, fertilizer and pesticide use) and shoreline rehabilitation; public information packages were distributed to all private, commercial and municipal shoreline property owners.

The "Take a Little Lead Out" Program continued its fifth year in the Severn Sound watershed. Its purpose is to provide anglers with the opportunity to voluntarily exchange their lead sinkers and jigs for non-toxic alternatives, thus reducing the amount of lead potentially entering the watershed.

Although interest continues in the project throughout the Severn Sound watershed, the actual amount of lead turned in by anglers has been declining over the past several years. At events, many people commented that they had previously exchanged lead tackle through the project. In 2001-2002, 31.0 lbs of lead was collected through the program.

Information about non-toxic regulations and the use of non-toxic products is provided through a toll-free information hotline set up at the Wye Marsh Wildlife Centre and staffed by RAP. Approximately 200 calls were received on the 1-800 information line during 2001-02, with peak calls in August and September. In addition to calls, approximately 50 direct contacts from the public regarding non-toxic shot were received at events.

This component of the project addresses the degradation of fish and wildlife populations and their habitat within the Severn Sound AOC, since the deposition of lead sinkers and jigs into waterways contributes to the degradation of aquatic habitats. The "Take a Little Lead Out" project is a initiative to educate people on lead toxicity issues and to promote non-toxic tackle

regulations and product availability through public displays and information packages. The lead exchange program provides anglers with the opportunity to exchange their lead tackle for non-toxic alternatives, free of charge. Reducing the input of lead objects into Severn Sound lessens the risk of wildlife being exposed to lead, which will reduce the incidence of lead poisoning in fish and wildlife as a result of ingesting these objects.

Since the inception of the program in 1997, "Take a Little Lead Out" has reduced the amount of lead sinkers and jigs potentially lost in the water of Severn Sound. Participants in the program have exchanged over 570 lbs. of lead sinkers and jigs. However, the total measurable benefits of the project are difficult to assess, since the project has reached hundreds of individuals in addition to exchange participants.

The Severn Sound RAP Golf Course Management Program was implemented in 1994/1995. This program encouraged and assisted eight Severn Sound area golf courses in initiating and implementing plans to improve wildlife habitat on the individual courses, by increasing or enhancing cover, food and water availability in forms useful to wildlife. It encouraged proactive environmental practices in regards to nutrient and pesticide applications, irrigation and habitat management.

The SSEA Office provides an information service to the community by distributing SSRAP documents, brochures, fact sheets, and information videos, as well as related agency publications, and maintaining a permanent display in the Wye Marsh Wildlife Centre. Public inquiries on environmental issues are answered by phone, fax, and mail, which often involves referrals to appropriate agencies or individual agency representatives.

STATUS OF IMPLEMENTATION: Ongoing

8e. Control sources of bacteria.

- i.) Conduct a "Cottage Pollution Control Survey"**
- ii) Conduct a boating inspection program for Severn Sound**
- iii) Develop and implement an urban stormwater retention and treatment strategy**
- iv) Encourage farming practices that minimize the potential for contamination of water by agricultural activities**

The Shoreline Pollution Control (Fertile Waters in Cottage Country) project involved the systematic detection and correction of faulty private sewage systems in both shoreline residences and pleasure boats. Cooperation with OMOE will ensure that the sewage systems comply with Environmental Protection Act regulations and phosphorous loadings to the Sound will be controlled. It is expected that a reduction in excess nutrient levels will reduce nuisance algal growth in the Sound. Of approximately 3000 sewage systems surveyed, about 600 were found to require abatement. The abatement of these systems is complete.

The Severn Sound RAP also participated in the Steering Committee for the Clean Marine Partnership, which was created in 1994 to promote voluntary environmental stewardship in all boating-related activities in Ontario.

Efforts to reduce sources of bacteria include encouraging on-board storage of boat greywater (action 6b).

Stormwater contributes significant pollution to receiving waters, including bacteria from fecal waste of pets and other animals. Elevated bacterial densities in excess of the Provincial Water Quality Guidelines, associated with storm events, may make swimming unsafe. The Severn Sound Urban Stormwater Strategy, completed in 1998, provides a comprehensive strategy for the retrofit of urban stormwater catchments in Severn Sound.

A variety of sources of bacteria are being addressed through the Severn Sound Rural Non Point Source Control Project (RNPSC), including manure storage and handling, barnyard runoff, milk house waste disposal and private sewage disposal. The RNPSC project provides technical and financial assistance to develop and implement plans to remediate the targeted practices. There have been 15 Clean Water Diversion projects completed through this program.

The cooperative approach that has been followed in the Severn Sound RAP Rural Non-point Source Control Project has made progress in reducing phosphorus through project funding assistance to landowners and providing advice on nutrient management. However, agricultural inputs remain a source of phosphorus and require continued implementation. There is a promising trend toward conversion of significant amounts of crop land to conservation tillage practices that reduce soil erosion and phosphorus export (over 5,000 ha to date). Manure management remains a challenge especially with the possibility of increasing size of livestock operations. Milkhouse wash water discharges also remain a technological challenge.

STATUS OF IMPLEMENTATION: Ongoing

8f. Monitor to ensure detection of new sources of contamination and the decline of existing contaminants, especially in fish.

As part of a monitoring and surveillance program, the Severn Sound Environmental Association coordinates the monitoring of trace contaminants. Monitoring includes testing levels of metals and organic chemicals in sewage plant sludge by operating authorities, sport fish by OMNR and MOE and sediments by MOE and EC.

The Severn Sound Sediment Survey was developed by the Severn Sound RAP, the Geological Survey of Canada (GSC), OMOE and the Town of Midland to map the lake bed of selected areas of Severn Sound. In 1995, bathymetric, sub-bottom and side scan sonar profile data was collected to support RAP monitoring and surveillance needs for mapping of deposition sediments in the open areas of the Sound. In 1996, field work to verify the 1995 survey data was

conducted, using the HMCS Cormorant manned submersible and the ROV (DART), the GSC Benthos Corer and the MOE mini-box corer. In 1997, additional data was collected through core samples and an investigation of sediment pore waters. Data interpretation and mapping continue.

Jointly produced by the Ministries of the Environment and Natural Resources, the Guide to Eating Ontario Sports Fish reports on the findings of the Sport Fish Contaminant Monitoring Program. Program staff collect fish and send them to the Ministry of the Environment laboratory in Toronto where they are analyzed for a variety of substances, including mercury, PCBs, mirex, DDT and dioxins. The results are published in the Guide which gives size-specific consumption advice for each species tested from each location. The advice is based on health protection guidelines developed by Health Canada. By testing the same fish species at the same location over a period of years, trends may be determined and the effectiveness of pollution control action may be assessed.

In an effort to reduce the incidence of lead poisoning in waterfowl by ingesting lead shot, Environment Canada implemented bans restricting the use of lead shot for hunting. Although an effective lead shot ban will eliminate the supply of additional lead pellets to wetlands, it does not address the issue of pre-ban pellets remaining in sediment at a depth accessible to foraging waterfowl.

The Lead Shot Remediation Project, a cooperative program between the Friends of Wye Marsh and the Severn Sound Remedial Action Plan, was initiated in the Severn Sound watershed in 1994 in an effort to decrease the risk of Wye Marsh Trumpeter Swans and other waterfowl ingesting remnant lead shot. The project was initiated with financial and technical support from Environment Canada's Great Lakes 2000 Cleanup Fund. The Lead Shot Remediation project developed a prototype vibration device to remediate sites contaminated with lead shot pellets. The device vibrates marsh sediments, to sink lead pellets below the level normally accessed by Trumpeter swans or other waterfowl.

STATUS OF IMPLEMENTATION: Ongoing

9. PLAN INPUT AND REVIEW

9a. Create Official Plan model amendments with RAP objectives for all municipalities within the Severn Sound watershed.

Promote and assist in the creation of Official Plan model amendments with RAP objectives for North Simcoe County and Georgian Bay Township planning documents.

Through the Severn Sound Environmental Association, a partnership of eight local municipalities along with Environment Canada and MOE, RAP objectives are now being communicated directly to municipal politicians and staff as they create or amend Official Plans.

The SSEA office has commented on various municipalities' new Official Plans as they are drafted for review. The Township of Tay, a member municipality in the SSEA, incorporated RAP objectives in its 1996 Official Plan.

Groundwater is a valuable resource to the public health and economic well-being of all the people within the Severn Sound Remedial Action Plan Area. Groundwater provides a reliable water supply of high quality water to domestic, public, agricultural, commercial and industrial users. It is also an important component of streamflow, especially during dry weather periods.

A regional scale study of the groundwater resources of the Severn Sound Area of Concern was conducted from 1995 to 1999 in order to provide a framework for understanding, protecting and monitoring the groundwater in the area.

STATUS OF IMPLEMENTATION: Ongoing

9b. Develop stormwater management plans for all municipalities within the Severn Sound watershed.

As above see 3e.

STATUS OF IMPLEMENTATION: Completed

9c. Encourage OMAFRA to develop farm plans with RAP objectives.

The Environmental Farm Plan (EFP) program was developed by Agriculture Canada and OMAFRA and implemented through the Adaptation Council (a coalition of farm organizations in Ontario).

STATUS OF IMPLEMENTATION: Ongoing

9d. Review all marine construction and development proposals under Interim Fish Habitat Management Plan

As above see 6c.

STATUS OF IMPLEMENTATION: Ongoing

3. STATUS OF BENEFICIAL USES

The Great Lakes Areas of Concern represent some of the most complex areas (physically, chemically, and biologically) where pollution from a variety of sources over varying time-frames has resulted in a variety of impaired uses. The ecosystems are constantly changing in response to various stressors or remediation which, in most cases is poorly understood.

Measuring the response of the ecosystem to remedial actions is a critical task required in order to demonstrate that restoration is occurring or has occurred. In Severn Sound RAP we tried to find specific, reproducible, defensible measures to respond to each of the “use impairments” that applied to the Area of Concern. In some cases, at the time of writing of the Stage 2 Report (1993), we did not have reasonable measures available and left the objective “to be determined.” Since that time additional research on measuring the effect of remedial actions and the status of the ecosystem has been completed. The purpose of this section is to summarize the present status of delisting objectives, to provide a rationale for improved methods of assessing restoration and to report on the response of the Severn Sound ecosystem to the remedial actions.

i) Restrictions on the consumption of fish and wildlife

Delisting Objective:

To have no restrictions on consumption of fish and wildlife from Severn Sound attributable to local contaminant sources.

Rationale:

Persistent environmental contaminants can accumulate in the flesh of fish and wildlife to the extent that consumption of the fish may place people and predatory wildlife at risk of toxic effects. More recently, the guidelines for advisories have been reviewed and revised for both mercury and PCBs as explained in the Guide to Eating Ontario Sport Fish (MOE/OMNR, 2001) and in recent reviews published by Health Canada (1998).

Advisories for fish consumption are developed by measuring the concentration of the contaminant of concern in a series of fish filet samples ranging in size (and age). In 1987, concentrations of mercury at or greater than 0.5 ug/g (wet weight of fillet) and PCB concentrations at or greater than 2 ug/g (wet weight of fillet) were used to indicate the start of increasing restrictions on consumption. The more recent guidelines use a range of concentrations starting at 0.45 ug/g for mercury and starting at 0.5 ug/g for PCBs to indicate the start of restrictions on consumption based on a risk assessment analysis and linear regression of length vs contaminant concentration (MOE/OMNR 2001).

The concentrations of persistent contaminants in fish and wildlife are contributed by general (regional or global) sources and/or local sources. Mercury is a natural element usually found in very low concentrations. The use of mercury in paints and in products such as thermostats and switches has been or is being phased out. The manufacture of PCBs has been discontinued and

their use is also being phased out. On the scale of the Area of Concern, it is important to establish the presence of any local sources of contaminants and to control them. If local sources are present and available, they may result in unusually high concentrations of contaminants in fish and wildlife resident in the local area. Localized biomonitors and assessment of sediment concentrations to suggest the presence or location of active sources is a commonly used approach to determine active sources of contaminants that may be present in trace or undetectable amounts in water samples from discharges. In the absence of any local sources, the concentrations of mercury and PCBs in fish and wildlife should reflect the general pattern for the regional populations and may be in decline with the regional-global source control programs. In order to determine the status of fish consumption in Severn Sound, the trends in contaminant concentrations in sport fish, other organisms such as birds eggs, mussels, young-of-the-year fish and sediment assessment were used.

Indicators used in Severn Sound:

For the presence of active sources or bioavailability:

1. Tissue concentrations of mercury or PCBs in young-of-the-year spottail shiners (*Notropis hudsonius*).
2. Tissue concentrations of mercury or PCBs in sport fish fillets - especially mercury in walleye (*Stizostedion vitreum*) and PCBs in carp (*Cyprinus carpio*).
3. Surficial sediment bulk concentrations of mercury or PCBs augmented with, where necessary, sediment bioavailability testing.
4. Concentrations of mercury or PCBs in municipal sewage plant sludge or biosolids.
5. Other biomonitors providing evidence of potential local sources of mercury or PCBs such as caged mussels (*Elliptio complanta*) or waterbird eggs (especially Caspian Terns, Red-wing Blackbird eggs).

Current Status:

Biomonitoring for active sources of mercury and organochlorine chemicals was conducted in 1987 using young-of-the-year spottail shiners (data of Suns and Hitchin, in Severn Sound RAP, 1993, see **Table 3.1.1**). Spottail shiner residues for mercury ranged between 11 and 40 ng/g wet wt (1 ng/L or nanogram per litre is equal to 0.001 ug/L or micrograms per litre) at sixteen sites throughout Severn Sound. Penetang Bay spottail shiners were well within the overall range (11-29 ng/g w.w., 16 ng/g off Main Street WPCP).

One site of seventeen sampled for spottail PCB residues in Severn Sound in 1987 exceeded the IJC Aquatic Life Guidelines of 100 ng/g (Midland Harbour 164 ng/g). Four other sites had low PCB concentrations (<60 ng/g) while twelve of the seventeen samples were below detection for PCB concentration (<20 ng/g) (Severn Sound RAP 1993 see Table 3.1.1). Some sites were repeated in 1992 (MOE unpublished) with low values for mercury and PCBs. However, no spottail shiners were caught at the Midland Harbour site.

In 1987, the sport fish consumption advisories for the Severn Sound area were similar to other areas of southern Georgian Bay. At that time, advisories based on mercury and polychlorinated biphenyls (PCBs) were in effect in the Severn Sound area (MOE/OMNR 1987). The 2001 Guide to Eating Ontario Sport Fish (MOE/OMNR, 2001) has been revised to include more recent data from Severn Sound and has recognized the statistical similarity of southern Georgian Bay (Guide area GB4), which includes Severn Sound.

The current status of contaminants in sportfish in Severn Sound is shown in Figure 3.1.1 and 3.1.2. Walleye (>55cm), smallmouth bass (>35cm) and northern pike (>75cm) have consumption advisories due to mercury contamination. Walleye samples from Severn Sound show a significant decline in mercury concentrations from 1976 to 1989. Additional collections in 1993 and 1999 continued to show similar mercury residues to 1989. The levels of mercury contamination in Severn Sound walleye are similar to or lower than other areas of Georgian Bay. Levels are thought to reflect regional mercury levels rather than any local Severn Sound source. Carp continue to show low tissue levels of PCBs and other organochlorine chemicals (1982, 1992, 1996, 1999). Severn Sound carp are considered the cleanest carp in the Great Lakes with respect to organo-chlorine chemical contaminants. Values of PCBs for 1999 show that even large carp are suitable for unrestricted consumption (MOE data, Figure 3.1.2).

PCBs have been found in eggs of Tree Swallows and Red-winged Blackbirds, Herring Gulls, Caspian and Common Terns (Martin et al. 1995; Bishop et al. 1995; Weseloh et al. 1997). Martin et al. (1995) indicated that the most sensitive indicators of local contamination in Severn Sound were Common Terns, Red-winged Blackbirds and Tree Swallows. Low or undetectable concentrations of mercury and PCBs were found in the meat of waterfowl from the Severn Sound area as part of a Canada-wide survey of residues in waterfowl and gamebirds (Braune et al. 1999). These investigations indicate that although there is organochlorine contamination in eggs of indicator species, the contamination is low and of a regional or basin wide nature.

Additional sediment sampling since 1988-1990 collections (Krantzberg and Sherman 1995; Sherman et al. 2001) has indicated no change in metals concentrations of open water surficial sediments (Figure 3.1.3, Table 3.1.2). The Wye River, at the site of the former Mitsubishi Plant in Midland, had elevated metals (based on lead and zinc) concentrations in the area immediately off the outfall (approximately 600 m²). The contaminated sediment in the localized area was excavated and disposed of as part of a decommissioning of the plant site following closing of the plant.

A review of mercury and other metals in sewage plant sludge is part of the ongoing biosolids management programs of each municipality operating a sewage plant. The results for the Severn Sound area (Table 3.1.3) suggest that mercury concentration in sewage plant sludge has generally declined, reflecting the reduction in use of mercury in industrial and household products since the early 1990s.

The information summarized above suggests that there are no new or active sources of mercury

or PCB in the Severn Sound AOC and that trends in sport fish suggest declines to low tissue residues of these contaminants. The consensus of the COA technical reviewers and the public was that the delisting objectives for this use impairment have been met in the local area.

Ongoing Actions:

1. continued review of sewage plant biosolids quality results
2. continued sport fish monitoring beyond delisting to track mercury in walleye and PCBs and organochlorine chemicals in carp
3. repeat 1987 YOY spottail sampling to confirm absence of active sources of mercury and PCBs as spottails are available

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**Table 3.1.1 ORGANOCHLORINE AND MERCURY RESIDUES IN YOUNG-OF-THE-YEAR SPOTTAIL SHINERS
FROM SEVERN SOUND - 1987**

Site Number	N	Fish Size (mm)	% Lipid	PCB (ng/g wet)	DDE (ng/g wet)	HCB (ng/g wet)	Mercury (ng/g wet)
1 Beausoleil Island	7	58±4	4.2±0.4	ND	7±2	ND	29±7
2 Penetang Bay - Michaud Pt.	7	54±3	4.2±0.3	ND	6±3	ND	11±4
3 Penetang Bay - Asylum Pt.	7	58±4	4.3±0.4	ND	11±8	2±1	23±5
4 Penetang Bay - Tannery Pt.	7	63±4	5.9±0.8	27±13	6±2	ND	20±8
5 Penetanguishene WPCP	7	52±4	3.7±0.4	ND	5±3	ND	16±8
6 Not Available							
7 Midland - Downtown	7	59±4	4.8±1.1	164±42	9±1	ND	13±8
8 Midland - WPCP	4	66±7	6.6±0.8	55±25	19±19	ND	13±8
9 Wye River	7	62±5	6.1±0.8	ND	9±1	ND	14±8
10 Grandview Beach	7	63±5	6.6±0.6	24±18	13±5	1±1	
11 Port McNicoll	6	55±2	3.8±0.7	ND	7±2	1±1	22±8
12 Hog Bay - West Shore	7	52±3	3.8±0.6	59±30	4±2	ND	26±14
13 Methodist Island	7	52±3	3.1±0.4	ND	4±2	3±2	11±4
14 Victoria Harbour	4	50±3	4.0±1.2	ND	5±0	TR	17±10
15 Sturgeon River	7	72±3*	2.7±0.2	ND	6±2	ND	37±15
16 Sturgeon Bay	7	71±7*	5.7±0.8	ND	12±4	TR	27±10
17 Waubauskene	7	65±6	6.6±0.3	ND	10±3	1±1	11±4
18 Port Severn	7	67±3	2.6±0.1	ND	5±1	1±1	40±0

* Yearling fish

N = number of composite samples (each composite sample consists of approximately 10 fish)

PCB = poly-chlorinated biphenyls

DDE = breakdown product of pesticide DDT

HCB = hexachlorobenzene

ND = non-detect, TR = trace amount, may not be different from non-detect

Table 3.1.2 Surficial Bulk Sediment Quality for Areas in Severn Sound

Parameter	Penetang Bay				Sturgeon Bay						Open Severn Sound		LEL	SEL
	1994 1 mean	sd	1988 2 mean	sd	1994 1 mean	sd	1988 2 mean	sd	1980 3 mean	sd	1996 4 mean	sd		
<i>TP (mg/g)</i>	0.97	0.50	1.41	1.15	0.89	0.10	1.08	0.12	1.10	0.18	1.30	0.10		
<i>TOC (mg/g)</i>	62	24	59	29	40	10	42	7	35	7	41	10		
<i>Hg (µg/g)</i>			0.23	0.13			0.08	0.03	0.04	0.02	0.09	0.03		
<i>Cd</i>	1.22	1.02	0.86	0.33	0.45	0.29	0.29	0.16	0.45	0.12	1.40	0.60	0.60	10.00
<i>Cr</i>	84	45	81	41	78	7	39	9	27	7	48	8	26	110
<i>Cu</i>	76	102	37	11	19	5	15	4	12	4	27	7	16	110
<i>Fe</i>			23693	4967			25236	4674	20583	4188	37600	5300	20000	40000
<i>Pb</i>	70	38	73	28	24	10	21	6	14	7	51	21	31	250
<i>Mn</i>			464	112			576	120					460	1100
<i>Ni</i>	24	10	27	7	22	7	20	5			39	9	16	75
<i>Zn</i>	200	148	142	34	115	36	89	23	73	26	164	35	120	820
<i>Al</i>			16270	3040			17153	3948						

1 from Reynoldson, unpublished

2 from Krantzberg and Sherman 1995

3 from Ontario Ministry of the Environment, unpublished

4 from Sherman et al. in preparation

LEL = Provincial Lowest Effect Level

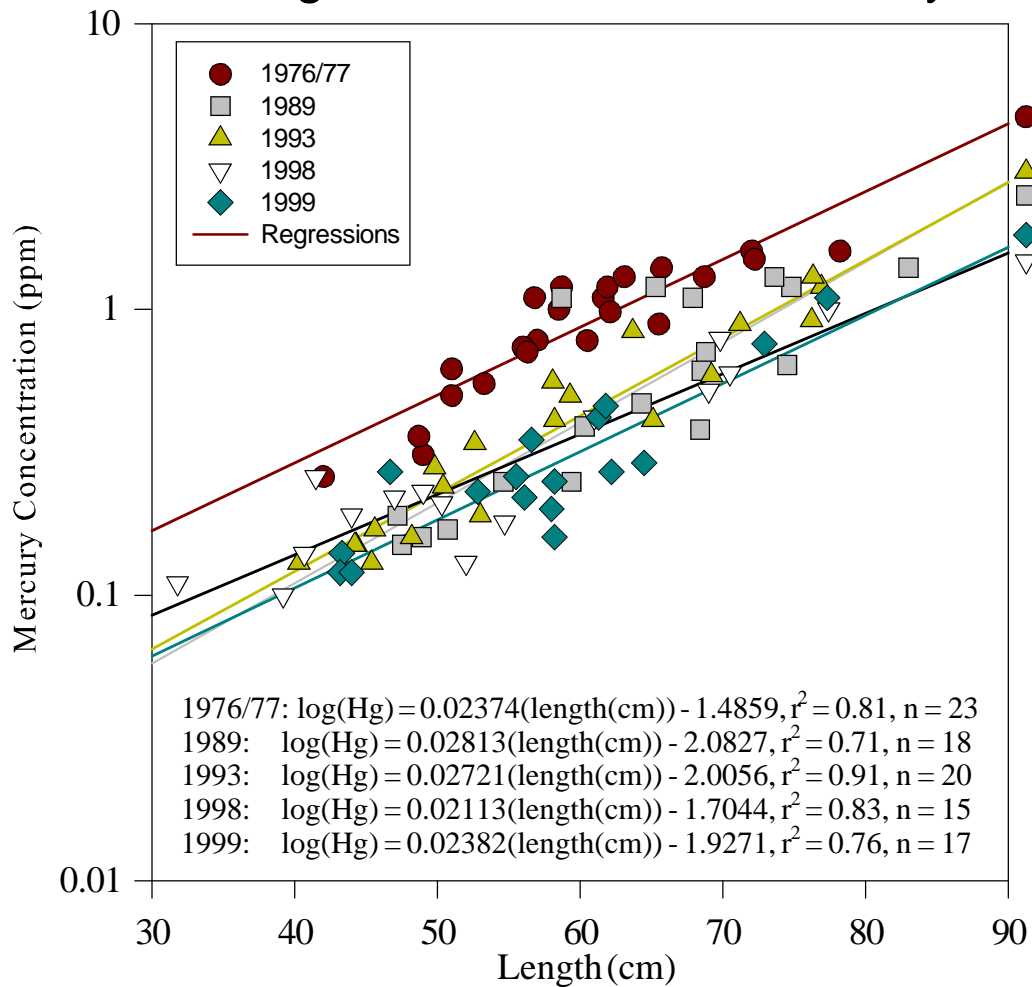
SEL = Provincial Severe Effect Level

Table 3.1.3 Severn Sound Sewage Plant Biosolids Quality Characteristics

(units in mg/L unless otherwise noted)

	As	Cd	Co	Cr	Cu	Hg	Mo	Ni	Pb	Se	Zn	Ammonia +Nitrates	Total P	Total Solids (%)
Penetang Main Street Plant														
1985	0.14	0.15	<0.10	2.67	12.15	0.06	0.26	0.59	5.6	0.17	23.2			
1990/91	0.10	0.09	<0.07	2.88	8.93	0.08	0.17	0.37	2.6	0.09	12.1	53.3	908	2.26
1995	0.11	0.05	0.05	1.15	8.63	0.03	0.02	0.51	4.2	0.02	13.1	276	990	2.67
1999	0.05	0.1	0.05	0.71	7.36	0.03	0.07	0.36	0.9	0.05	8.2	146	543	2.37
Penetang Fox Street Plant														
1990/91	0.13	0.11	0.07	5.65	12.40	0.03	0.21	0.44	3.2	0.12	16.2	82	1350	2.81
1995	0.02	0.06	0.05	0.85	11.80	0.00	0.02	0.20	3.7	0.02	7.7	25	1510	3.37
1999	0.05	0.13	0.09	0.64	6.39	0.01	0.06	0.28	1.2	0.05	6.9	117	325	2.53
Port McNicoll Plant														
1985	0.15	0.10	0.30	2.43	25.33	0.03	0.26	0.38	1.2	0.19	18.0			
1990/91	0.16	0.04	0.35	2.15	22.40	0.04	0.49	0.31	1.9	0.13	11.1	249	1205	2.96
1995	0.02	0.04	0.05	2.11	25.90	0.01	0.02	0.32	3.3	0.05	4.5		1160	3.51
Victoria Harbour Plant														
1985	0.29	0.20	0.29	3.45	25.33	0.06	0.25	1.10	7.2	0.28	54.0			
1990/91	0.23	0.18	0.06	4.14	21.89	0.04	0.41	0.78	4.1	0.19	25.1	202	1560	3.88
1995	0.07	0.13	0.05	1.61	10.70	0.08	0.09	0.46	4.2	0.02	12.5		1078	3.02
Coldwater Plant														
1985	0.08	0.17	0.13	1.07	17.58	0.19	0.23	0.61	2.8	0.12	14.6			
1990/91	0.06	0.07	0.10	0.96	16.82	0.19	0.15	0.69	1.8	0.10	13.5	201	424	2.42
1995	0.02	0.01	0.03	0.69	13.87	0.15	0.02	0.50	0.9	0.02	13.1		325	2.43
1999	0.4	0.1	0.1	2.51	24.88	0.15	0.16	0.52	0.87	0.3	10.26	246	830	3.64
Penetang Mental Health Centre Plant														
1985	0.13	0.58	<0.1	3.10	20.50	0.05	0.27	0.44	2.2	0.21	20.5			
1990/91	0.90	0.11	<0.05	7.98	16.54	0.03	0.25	0.28	3.8	0.15	12.3	22.6	1002	2.26
1995	0.06	0.06	0.05	2.01	11.50	0.00	0.02	0.23	2.9	0.14	5.1	21.9	790	2.07
Elmvale Plant														
1999	0.5	0.1	0.1	1.85	15.2	0.1	0.1	0.86	1.11	0.5	13.2	541	1150	4.11
Port Severn Plant														
1999	<.2	<0.1	<.1	1.91	3.5	0.05	0.11	0.62	0.44	0.2	4.46	13.3	225	0.83
Midland Plant														
1981	0.4	0.31	0.3	49	14	0.12	0.3	113	52	0.05	67			
1990/91	0.2	0.24	2.6	80	33	0.11	1.34	58	25.2	0.12	93	818		3.6
1995	0.17	0.10	0.2	35	24	0.09	0.49	17	8.6	0.11	25	911	1169	3.6
1999	0.13	0.11	0.2	17	16	0.04	0.37	11	2.7	0.06	38	707	943	3.4

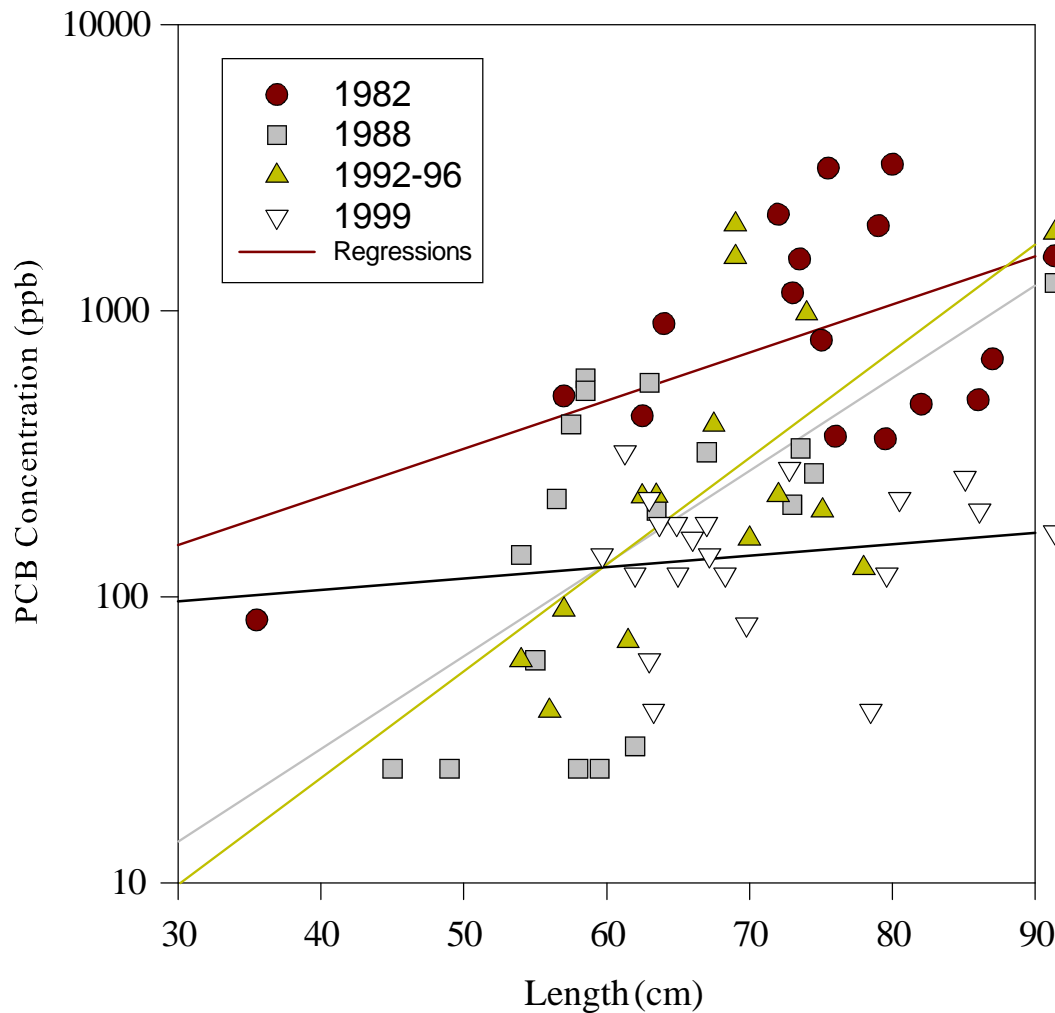
Figure 3.1.1 Mercury Concentrations vs. Fish Length for Severn Sound Walleye



Mercury in Walleye from Severn Sound (GB4)
Sport Fish Consumption Advisories in 2001 Guide

Location	Fish Length (cm)								
	15-20	20-25	25-30	30-35	35-45	45-55	55-65	65-75	> 75
Georgian Bay GB4 Severn Sound							(4)	(4)	(4)
Georgian Bay GB4A Collingwood Harbour							(4)	(4)	(4)
Lake Huron H3							(4)		
Lake Huron H5						(4)	(4)	(4)	
Georgian Bay GB1							(4)	(2)	
Georgian Bay GB3						(4)	(4)	(4)	
North Channel NC1							(4)	(2)	
North Channel NC2									
St. Mary's River						(4)	(4)	(2)	

Figure 3.1.2 PCB Concentrations vs. Fish Length for Severn Sound Carp



1982: $\log(\text{PCB}) = 0.01682(\text{length}(\text{cm})) + 1.6775, r^2 = 0.27, n = 16$

1988: $\log(\text{PCB}) = 0.03245(\text{length}(\text{cm})) + 0.1698, r^2 = 0.25, n = 17$

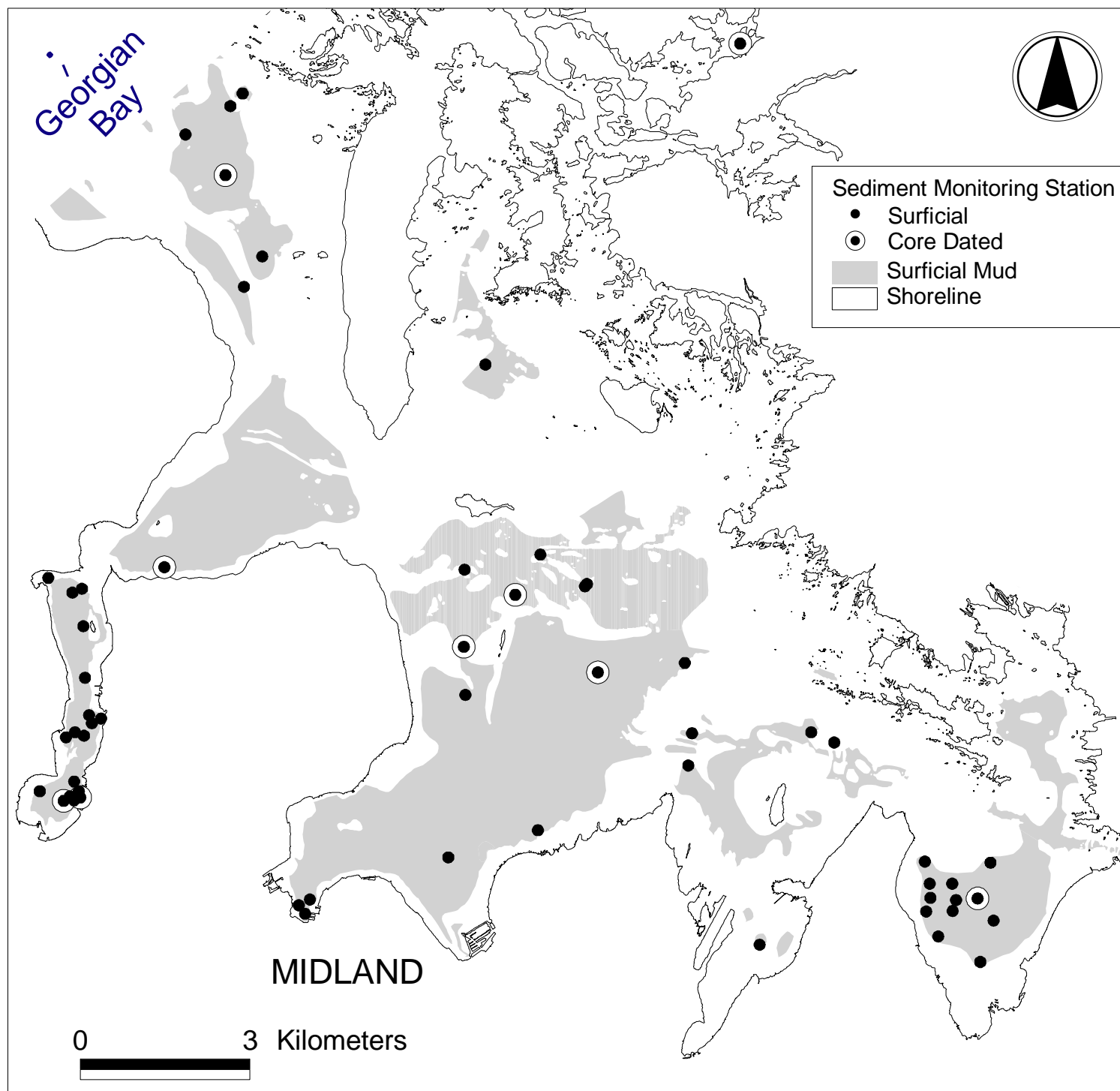
1992-96: $\log(\text{PCB}) = 0.03731(\text{length}(\text{cm})) - 0.1240, r^2 = 0.29, n = 14$

1999: $\log(\text{PCB}) = 0.00398(\text{length}(\text{cm})) + 1.8652, r^2 = 0.02, n = 20$

**PCBs in Carp from Severn Sound (GB4)
Sport Fish Consumption Advisories in 2001 Guide**

Location	Fish Length (cm)								
	15-20	20-25	25-30	30-35	35-45	45-55	55-65	65-75	> 75
Georgian Bay GB4 Severn Sound									
Georgian Bay GB4A Collingwood Harbour						(4)	(2)	(2)	
Lake Huron H1						(4)	(4)	(4)	(4)
Lake Huron H3						(4)	(2)	(1)	
Lake Huron H5								(4)	(2)
North Channel NC2							(4)	(2)	(2)

Figure 3.1.3 Severn Sound Mud Layer and Sediment Monitoring Stations



Source: Blasco, Unpublished

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ii) Tainting of fish and wildlife flavour

Based on interviews with anglers and hunters, Severn Sound continues to have no reported tainting of fish and wildlife flavour. This use impairment does not apply to Severn Sound.

iii) Degradation of fish and wildlife populations

Delisting Objectives:

1. *To protect and rehabilitate fish and wildlife habitat.*
2. *To restore a balanced, self-sustaining fish community by restoring top-level predators including walleye, northern pike, large and smallmouth bass and muskellunge to levels similar to the early 1970's, with these species forming at least 20-30% of the total predator catch, and walleye forming at least 10% of trapnet results.*
3. *To maintain a natural diverse fish community, to discourage the introduction of exotic species and to prevent the extinction of native or desirable species.*
4. *To maintain a self-sustaining diverse community of colonial waterbirds which currently nest in and near the Sound.*
5. *As part of the Matchedash Bay project of the North American Waterfowl Management Plan (NAWMP) to produce 2450 waterfowl including 880 Mallard, 210 Black Duck and 1360 other waterfowl of various species (NAWMP 1991).*
6. *Wildlife populations will be maintained at levels sufficient to provide recreational and economic benefits, ensure environmental quality and ecosystem integrity and ensure public safety (OMNR Land Use Guidelines).*
7. *To reintroduce a self-sustained population of Trumpeter Swans in the Severn Sound area.*
8. *To find no significant toxicity from water column or sediment contaminants in fish and wildlife bioassays.*

Rationale:

1. See use impairment (xiv).
2. Based on changes in the Severn Sound fish community noted in the early 1980's, a return to the proportion of predators found in the mid 1970's was thought to be reasonable. Of the various trapnet locations used in the late 1960s and the early 1970s, a site off Waubaushene in Sturgeon Bay was found to consistently provide a broad representation of the fish community. This site was selected by OMNR Midhurst District Office for a fixed-location spring trapnet survey of the Severn Sound fish community (SSIN). This ran for approximately 25 consecutive days in the spring of the year, from 1975 to 2000.. An additional site near Juanita Point near Port Severn was used to collect additional walleye in order to augment the walleye population data gathered in Sturgeon Bay. SSIN surveys were carried out in 1975, 1980 to 1985 and 1988 to 2000. More recently, OMNR

Upper Great Lakes Management Unit (UGLMU) has adapted the Early Summer Trapnet (ESTN) protocol (OMNR UGLMU, 1998) to assess the status of walleye and other sportfish populations in Georgian Bay.

3. Fish diversity in the nearshore area can be affected by eutrophication and habitat degradation. Fish biomass can be high in eutrophic areas, but often the biomass is dominated by carp (Randall 1993). The diversity and ecological integrity of the fish community in Severn Sound in comparison with other AOCs was assessed by the Department of Fisheries and Oceans (Minns, et al. 1994, Randall et al. 1993, 1998 for field years 1990, 1992 and 1995). The electrofishing was carried out at transects selected to represent a wide variety of near-shore habitat (Randal et al. et al. 1998; Valere 1996).
4. The surveys of nesting colonial water birds were made by CWS and OMNR during 1980, 1989 and 1999 in the Severn Sound area (including the Watcher Islands, 49 colonies including 41A046-41A047 and 31D003-31D044 plus 5 new colonies found in 1999 - compiled by Weseloh). A survey conducted in 1991 and 1992 (Weseloh et al. 1997) provided a basis for assessing the diversity of waterbirds in the Severn Sound area. Additional information on Osprey and Double-crested Cormorants was also available for assessing the health of these populations (Thomas and Bird 1998, CWS/OMNR annual monitoring of Cormorant nesting colonies).
5. The Matchedash Bay Project under the Eastern Habitat Joint Venture recognizes the importance of the Matchedash Bay area in Severn Sound as an internationally important flyway for waterfowl. Targets set at the outset of the project (NAWMP 1991) relate to area of habitat to be secured, restored or enhanced and production of waterfowl. While no specific methods were developed to assess waterfowl production targets, OMNR, Ducks Unlimited and CWS use waterfowl nesting surveys, spring and fall staging counts and hunting statistics to assess the status of the waterfowl of Matchedash Bay.
6. The aspects of this objective pertaining to recreational and economic benefit of wildlife populations in the Severn Sound area relate to uses such as hunting and trapping. Although viewing of wildlife is without doubt, an important recreational use in the area, no statistics were available for the Severn Sound area. Statistics on hunting and trapping are kept by OMNR. The assessment of wildlife community health relates to assessment of key species or groups of species currently being assessed in Severn Sound and other parts of the Great Lakes. Surveys of spring and fall waterfowl staging and muskrat surveys in Matchedash Bay were considered to represent Severn Sound. The Marsh Monitoring Program (MMP) describes a protocol to measure indicators of ecosystem health in wetlands. Several areas in Severn Sound have been monitored over the last five years. The Forest Bird monitoring program also provides a rationale for upland habitat areas.
7. As an extirpated species in Ontario, efforts to reintroduce Trumpeter Swan (*Cygnus buccinator*) to Ontario started in the Wye Marsh in Severn Sound. An objective of the program is to reintroduce a self-sustained population to Ontario (Lumsden and Drever 2001).
8. Testing of sensitive species may reveal the presence of toxic factors not previously measured that will impair the health of fish and wildlife in Severn Sound.

Indicators used in Severn Sound:

Nearshore fish community

The main indicator of restoration of a balanced, healthy fish community was expected to be a higher proportion of predator fish in the nearshore areas, especially walleye. The following techniques were used to assess the response of the Severn Sound nearshore fish community to remedial action and other factors:

- a.) Spring trapnet index survey at one fixed, long-term nearshore site in Severn Sound was conducted through OMNR Midhurst District starting in 1975 (SSIN). Following exploratory trapnetting at a variety of sites within Severn Sound, a site in Sturgeon Bay near Waubaushene was selected because a variety of fish species including walleye were consistently caught there. An additional site, off Juanita Point near the Port Severn spawning area, was surveyed in the early 1980s. A new protocol for Early Summer Trapnet surveys (ESTN) in Lake Huron and Georgian Bay has been utilized by the OMNR UGLMU starting in 1998 to provide an improved statistical method of assessing nearshore fish community in eastern Georgian Bay. The ESTN consists of a “moving” trapnet survey where nets are set at approximately 30 randomly selected sites for one day during the time when temperatures range between 12 to 20 °C. From these data, historical trends in percent catch, catch per unit effort, age at length, age frequency, and relative weight were used to assess the Severn Sound Nearshore fish populations (SSIN used up to 2000). The ESTN protocol was carried out in parallel with the SSIN survey in Severn Sound during 1999 and 2000. The results of the SSIN in 1999 and 2000 were compared to the ESTN results in those years. A similar size/age frequency of walleye was found using either method, suggesting that the historical SSIN population characteristics could be compared with ESTN. In addition to data gathered in the SSIN survey, length, weight and age information from tagging studies carried out in 1969, 1974, 1975 and 1976 were used to evaluate changes in the walleye population (Smith 1969; Fleming 1973; Hogg 1976).
- b.) Nearshore fish community was sampled by DFO using an electrofishing boat to sample 85, 100-m transects which ran parallel to shore approximately following the 1.5-m depth contour in five locations within Severn Sound during 1990, 1992 and 1995 (Valere 1996, Randall et al. 1998). Earlier electrofishing surveys of most Canadian AOCs during 1986 by an OMNR contractor failed to obtain adequate samples in Severn Sound (Booth, 1987). Minns et al. (1994) calculated an ‘Index of Biotic Integrity’ (IBI), a composite indicator of the health of the littoral fish communities. The IBI integrates several biological indicators (species richness and composition, trophic composition and fish abundance and condition) into a single index of ecosystem health (See Smokorowski et al. 1998 for use of the index in Hamilton Harbour).
- c.) Fish community surveys of Severn Sound as part of Georgian Bay or Great Lakes surveys such as OMNR Upper Great Lakes Unit Muskie spawning survey (1998 and 1999). DFO Fish Community Biomass surveys provided additional data to assess the fish community.
- d.) Aerial surveys of fishing boat usage in Georgian Bay were carried out in the late

1950's and 1960's as well as during 2000 (Fleming 1973; Mohr in preparation) as an indication of relative fishing pressure throughout Georgian Bay. Comparable “zone” creel surveys were conducted in 1975, 1987, 1988, 1992 and 2001 where anglers were surveyed on the water regarding their catch (OMNR as summarized in SSRAP 1993; Gonder in preparation).

e.) Shoreline seine surveys by OMNR District (1980,1985), Cam Portt (1989/90)

f.) Larval fish surveys of selected embayments in Severn Sound were carried out by OMNR in 1978 (Loftus 1982) and DFO in 1989 - 1994 (Leslie and Timmins 1994a, 1994b, 1995a, 1995b, 1996, 1997).

Tributary fish community

a.) OMNR Midhurst District (from 1982-2001) conducted an electrofishing survey of tributary fish community biomass of selected reaches in Hog Creek, Sturgeon River and Coldwater River.

b.) One-time stream surveys of reaches throughout the Severn Sound watershed (Portt in prep.).

Waterbirds

a.) Long-term colonial waterbird nesting surveys of sites in the Great Lakes (eg. Watcher Islands, Georgian Bay) - CWS with assistance of OMNR, Parks Canada.

b.) Colonial water bird surveys (CWS with assistance of OMNR, Parks Canada, approx.10-yr freq., 1980, 1989, 1999).

c.) CWS survey of distribution and abundance of waterbirds during summer in Severn Sound (Weseloh et al. 1997).

d.) Spring and fall waterfowl staging surveys in Matchedash Bay (OMNR with assistance of CWS 1989, 1995/96).

e.) Osprey nesting success has been monitored by the Georgian Bay Osprey Society in Georgian Bay including the Severn Sound area.

Matchedash Bay Project

Spring and fall waterfowl staging surveys in Matchedash Bay (OMNR with assistance of CWS 1989, 1995/96, 1998) were used to assess project targets for waterfowl production as well as long-term changes in waterfowl. Matchedash Bay was divided into five sub-areas in 1995 and 1996 with all areas surveyed from shore using a spotting scope. The survey area included shoreline areas and open water (details in Pekarik et al. in prep.). Other surveys of waterfowl have been conducted in the past using various methods. A waterfowl breeding bird index survey after the method of Dzubin (1969) was conducted between 1992 and 1996 in selected areas.

Recreational and economic benefit of wildlife

Hunting statistics for opening day waterfowl harvest, wild turkeys and white-tailed deer were used to assess long-term recreational use of wildlife in the Severn Sound area. Data

for OMNR Wildlife Management Unit 76, available over the last thirty years, was used to represent most of the Severn Sound area. Muskrat trapping statistics for Matchedash Bay and population estimates based on muskrat “pushups” were used as an index of the health of the population of this water-based mammal (OMNR Midhurst District unpublished information).

Wildlife community health

The ecological integrity of interior forest birds was studied by Tate et al. (1998). The study examined the presence of 12 indicator species and nesting success of the Wood Thrush and the Red-eyed Vireo in a range of upland forest habitats in Severn Sound during 1996.

In 1995 and 1996, OMNR and CWS conducted surveys of waterfowl in Matchedash Bay. In 1995, 41 surveys were conducted approximately every six days from March 30 to November 29. In 1996, 9 surveys were conducted approximately every five days from April 11 to May 21. These staging surveys were point counts taken from locations on land and water using a scope.

The Marsh Monitoring Program (MMP, Environment Canada, Long Point Bird Observatory, Bird Studies Canada) monitors the health of marshes by surveying indicator species that utilize these habitats during breeding season. Twelve marsh bird species and five amphibian species were chosen as indicators of the two target groups because:

1. They are susceptible to environmental deterioration and
2. they are easily surveyed by volunteers.

Population studies of Black Terns and Least Bittern have been carried out in three major wetland areas in Severn Sound (Wye Marsh, Matchedash Bay and Tiny Marsh) as part of the Important Bird Areas Program (IBA). Population, nesting locations and nesting success were documented for the 2000 and 2001 field seasons (Wilson and Cheskey 2001a,b,c).

Trumpeter Swans

The Wye Marsh Reintroduction Program includes monitoring of nesting success and population distribution and health in the Severn Sound area and in relation to the Ontario-wide program. At the time of writing of the Stage 2 Report, the interim objective for the reintroduction program was 15 wild breeding pairs of Trumpeter Swans by the year 2000 (Lumsden). This number of pairs was expected to lead to a self-sustaining population.

Toxicity to fish and wildlife

The occurrence of lead poisoning of Trumpeter Swans from residual lead shot in wetlands in the Severn Sound area was used as a measure of health of wetlands for this species and other waterfowl that may be exposed. The health of the wildlife populations, in general was also used as an indication of the presence of toxic factors.

Current Status:

Nearshore fish community

Predators

Aerial boat counts from 1957 to 1967 and 2000 (Figure 3.3.1) indicated that Severn Sound was the most intensively fished area in Southern Georgian Bay (Flemming 1973; Gonder in prep). Smith (1969) and Hogg (1976) identified Severn Sound as a destination walleye fishery in the late 60's and early 70's. Creel surveys carried out in the Severn Sound area during spring, summer and fall between 1960 and 1972 (n=7) indicated a relatively stable catch-per-unit effort (mean CUE of 0.32 fish/rod-hr, range 0.26 to 0.47) (Fleming 1973). Fleming also noted sustained sport fisheries for other predator species including northern pike, smallmouth and largemouth bass as well as the panfish, black crappie. A strong year class of walleye was found during a 1969 spring netting survey in the Port Severn area (Smith 1969). Walleye catch remained relatively stable in subsequent creel surveys (OMNR data see SSRAP 1993) until 1979 when declining catches were noted (Table 3.3.1). Creel surveys were conducted in 1987 and 1988 with very poor walleye catches. Catch of other species during 1987 and 1988, such as northern pike, large and smallmouth bass, fluctuated but remained similar to the 1970s. In the 1992 creel survey, walleye catch remained low and reduced catches of large and smallmouth bass were noted. Northern pike catch in 1992 appeared similar to past surveys. By 1997 anecdotal reports were that the walleye catch was improving. A comparable creel survey was not undertaken until 2001 (Gonder under prep.). Walleye catches in 2001 were improved over the 1988 and 1992 catches (2243 fish caught in 2001 compared to 64 and 45 in 1988 and 1992 respectively). The 2001 creel survey also indicated that primarily young walleye were being caught, reflecting a good year class but not necessarily an increasing population. The other predator species have fluctuated in the period from 1992 to 2001. Northern pike catches declined and smallmouth bass catches increased. (Table 3.3.1)

The proportion of predator species in the SSIN surveys, especially walleye, had shown a dramatic decline in the early 1980s over a comparable survey conducted in 1975 (Figure 3.3.2). By 1992, walleye catch had declined to a very minor portion of the total catch (0.2%). The objective of restoring top-level predator fish in order to promote a healthy balance in the Severn Sound fish community was established in 1992 by considering the proportion of predator fish species in 1975 spring trapnet catch at the fixed index site (SSIN) as representative of a healthy fish community. Restoration of the depressed walleye population of the late 1980's toward that of 1975 levels was considered feasible with implementation of phosphorus control and habitat restoration actions that would lead to improved water quality and habitat conditions (SSRAP 1993). Given the variable nature of the annual trapnet survey catches, predator species of at least 20% of the total catch, with walleye making up at least 10% of that catch were chosen as an arbitrary objectives. The proportion of trapnet catch represented by predators has fluctuated below 20% of the total catch, occasionally reaching that proportion. As of summer 2001, less than 10% of the ESTN catch were predator species with less than 5% of the catch being walleye (Gonder in prep).

Comparisons of Fall Walleye Index Netting survey (FWIN) and ESTN catches indicate that they are directly comparable. Therefore, the catch per unit effort (CUE) benchmarks established for FWIN catches are applicable to ESTN catches. (FWIN Manual). The walleye population in Severn Sound is considered “at risk” with CUE values declining in recent years to 2 fish per trapnet night (Figure 3.3.3). CUE for walleye, northern pike and large and smallmouth bass has dropped over the last three years (Figure 3.3.3). Mean age of walleye is decreasing and mortality is increasing (Figure 3.3.4 and 3.3.5). The declining catch and mean age of walleye when considered along with increasing mortality suggests that walleye harvest has increased in recent years.

Since establishing the delisting objective in 1992, several factors could be influencing the walleye population and other sport fish populations in Severn Sound including:

1. Fishing pressure for walleye and other species has apparently increased in Georgian Bay especially in Severn Sound since the early 1990's.
2. The increase in the Double-crested Cormorant (*Phalacrocorax auritus*) population in Georgian Bay may be having a negative impact on the fish community of Georgian Bay including Severn Sound.
3. The introduced exotic species zebra mussel (*Dreissena polymorpha*) has infested Severn Sound since 1994-95 and has contributed to changes in open water clarity and nearshore habitat conditions. The newly introduced round goby (*Neogobius melanostomus*) may also be adversely influencing walleye and other sport fish populations.
4. The trophic status of Severn Sound has changed due to phosphorus control (possibly in conjunction with the effects of zebra mussels) with decreases in phosphorus concentration, phytoplankton and zooplankton biomass and increases in water clarity in open waters.
5. Water levels decreased starting in 1999, to near record lows, adversely influencing nearshore spawning and nursery areas.

Two indices of the plumpness and physiological condition of the walleye population were used to examine the health of walleye present in Severn Sound. The mean length at age was examined during the period prior 1974 to 1993 (prior to significant zebra mussel infestation) and the post-infestation period 1994 to 2001. There does not appear to be any significant difference in condition between years or between the pre- or post-infestation periods (Figure 3.3.6). The relative weight by size class for walleye (relative weight equation of Murphy et al. 1990, grouped into length classes after Gablehouse 1984), has generally been below the ideal relative weight of 100 after 1988 (Figure 3.3.7) suggesting that walleye condition is below optimal but has similar values from year to year up to 2001. Both of these indices suggest that the condition of Severn Sound walleye may not have changed over the period of record.

Muskellunge surveys have established benchmarks for relative abundance of muskellunge in Severn Sound. Wide ranges of sizes for adult muskellunge suggest successful natural reproduction is occurring.

In summary, the original delisting objective for predator fish has not been met in Severn Sound. CUE of predator species such as walleye, northern pike, large and smallmouth bass appear to be declining. In view of the recent changes in trophic status, water clarity and water levels, the original RAP Stage 2 delisting objective for predator fish may no longer be appropriate for Severn Sound. The fish community in Severn Sound appears to be changing and water quality and pollution issues may no longer be adversely influencing the fish community. Fish community data suggest that harvest levels by various user groups may be impeding the recovery of the fish community rather than water quality impediments. Resolution of recommended changes in harvest (reduced sport catch, review of quotas, control of First Nation harvest of spawning walleye at Port Severn) as well as the continued use of the new ESTN protocol and population status benchmarks from Fall Walleye Index Netting programs (FWIN) will be needed to establish a new objective for Severn Sound walleye and predator populations. Several questions concerning the causes of the declines in predator populations remain unanswered. In addition to Severn Sound, other areas of Georgian Bay (OMNR 2000) and the Great Lakes (OMNR 2001) may be experiencing declines of populations of predator fish due to problems of increased harvest pressure, exotic species introductions and low water levels. There is consensus amongst the COA technical reviewers that the delisting objective with respect to top-level predators has not been met, however, delisting can proceed provided the responsible agencies commit to a long-term fish monitoring program in Severn Sound in order to assess the fish community in relation to the Georgian Bay communities and provided that agencies manage the fisheries based on the monitoring results.

Fish Community Diversity

At the time of writing of the Stage 2 Report, the fish community diversity was considered high relative to other Areas of Concern. During 1990, 1992 and 1995, Randall et al. (1998) conducted electrofishing surveys at five locations in Severn Sound (Penetang Bay, Hog Bay, Sturgeon Bay, Matchedash Bay and the Port Severn area). The average number of fish captured per transect was 38 (range 0-170), average biomass was 3.7 kg (0-34.8 kg), and the average species richness was 5.3 species per transect (0-12 species). Eighteen of the thirty-four species of fish were rare, comprising less than 1% of the total catch in numbers. Average richness and biomass tended to be highest in the protected (low fetch) embayments with medium to high macrophyte abundance.

Most of the fish captured at Severn Sound were cool or warm water species which are usually associated with littoral habitats, often with submerged macrophytes, in embayments in the Great Lakes (Randall et al. 1998).

During the early 1990's, predator fish (piscivores) comprised between 17.6% and 29.8% of the total biomass. Native species of fish made up 88.1% to 99.9% of the total biomass. The electrofishing survey data from Severn Sound (1989 - 1995) indicated the fish communities inhabiting the nearshore areas were diverse, all trophic groups were represented, and there was consistency in the catch data between the bays and areas surveyed.

Randall et al. (1993) compared fish community in littoral habitats of Severn Sound with data

from Hamilton Harbour and the Bay of Quinte, Lake Ontario. Generally, fish biomass was higher in Hamilton Harbour than in other areas, possibly because of the more eutrophic conditions (phosphorus levels). Although total biomass was high, habitat degradation had a negative impact on the trophic structure of the fish communities. The biomass of carp and other non-native species was higher in Hamilton Harbour, while species richness was lower than in the Severn Sound bays (Table 3.3.2).

Top predators (piscivores) comprised a higher proportion of the biomass at Severn Sound than in Hamilton Harbour (Table 3.3.2). Using the nearshore fish community data, Minns et al. (1994) calculated an 'Index of Biotic Integrity' (IBI), a composite indicator of the health of the littoral fish communities. The IBI integrates several biological indicators (species richness and composition, trophic composition and fish abundance and condition) into a single index of ecosystem health. By design and by demonstrated correlation, the IBI integrated the effects of four main factors influencing fish assemblages: exotic fishes, water quality, physical habitat supply, and piscivore abundance (Minns et al. 1994). Significantly, the IBI values for the Severn Sound bays were higher than the IBI values for Hamilton Harbour (Table 3.3.2; also see Smokorowski et al. 1998). Within Severn Sound, the frequency distribution of IBI values by quality class ranged from very poor to excellent, but varied among the survey locations (Randal et al. 1998). IBI scores were lowest in Penetang Harbour, and highest in Matchedash Bay and Port Severn, although the differences in habitat among locations were minimal. Phosphorus concentrations were highest, in inner Penetang Harbour. Minns et al. (1994) cautioned that Penetang Harbour may have been close to the transition from a clear to a turbid state. Water quality conditions in some localized areas prior to 1995 showed signs of degradation. Generally, however, the fish data from the inshore areas of Severn Sound indicated that the fish communities were relatively diverse and healthy. The apparent healthy status of the fish communities in the early 1990's did not support continued time series monitoring of Severn Sound at that time. Since 1995, SSIN and recent ESTN results suggest that the fish community may be changing.

It is not clear with recent changes in the fish harvest and waterlevel changes that the delisting objective with respect to fish diversity has been met. Repeating electrofishing surveys of selected transects from the original DFO studies in conjunction with ESTN will provide data to assess changes in fish community diversity.

Stream fish community diversity

Based on tributary fish biomass surveys from 1982 to 2000 (Ross 1999), the abundance of young-of-the-year rainbow trout is improving in area streams with some fluctuation due to temperature (Figure 3.3.8).

Fish were surveyed at 34 tributary sites across Severn Sound in 2000 by Portt and Associates. A total of 31 species were captured at one or more sites. None of the species are considered rare, threatened or endangered in Ontario.

Waterbirds

Severn Sound and southeastern Georgian Bay have been identified as one of 15 critical areas for waterfowl use in the Great Lakes (Prince et al. 1992). Surveys of waterbird distribution and abundance were made during 1991 and 1992 throughout the coast of Severn Sound (Weseloh et al. 1997). Of 32 sub-areas surveyed, gulls and Caspian Terns were the only species observed throughout the Sound. Common Moorhen, Belted Kingfisher, Common Loon and Green-backed Heron were the least frequently observed. The highest species diversity was found at Wye River, Matchedash Bay (N&S), Hog Bay, Sturgeon Bay, Penetang Bay, Wye River, Roberts Island and Quarry Island. The highest mean density of birds (birds/km excluding gulls) was found at Matchedash Bay N, Hog Bay, Sturgeon Bay S and Matchedash Bay S - all areas adjacent to provincially significant coastal wetlands. Highest gull densities, Canada Geese and Mallards were found in Penetang Bay S and Midland Bay SW - the most urbanized areas in Severn Sound. The areas of high waterbird use appeared to be natural areas of emergent and submergent vegetation, bedrock outcrops or large boulders and support protection of coastal wetlands and restoration of natural shoreline.

Based on censuses of nest numbers (pairs) of colonial waterbirds in Georgian Bay including Severn Sound during 1980, 1989 and 1999 (Table 3.3.3), at least seven species of colonial waterbirds nest within and close to the boundaries of Severn Sound: Herring, Ring-billed and Great Black-Backed Gulls, Common, Caspian and Black Terns and Double-Crested Cormorants. Great Blue Herons and Black-Crowned Night-Herons may also nest in or near the Sound but no nests were found. These two species certainly use the Sound for feeding.

Ring-billed Gulls are the most numerous nesting colonial waterbird in the Sound area with just over 9,000 nests in 1999. From 1980 to 1999, Ring-billed Gull numbers declined by 35%, though they did increase markedly from 1980 to 1989 (Table 3.3.3). From 1980 to 1999, Herring Gull populations declined by 62 % from 614 pairs to 234 pairs and Caspian Tern numbers declined 14%. Numbers of Common Terns and Cormorants have increased over the 20-year period; Terns by 72 % from 83 pairs to 143 pairs, though they did decline from 1989 to 1999. Cormorants have increased astronomically, 50-fold since 1980, from 20 to over 1,000 pairs. Caspian Tern numbers were essentially stable over the 20 years though they did decline from 1989 to 1999.

With one exception, these fluctuations in numbers of colonially nesting waterbirds reflect trends seen elsewhere in Lake Huron or the Great Lakes. Herring and Ring-billed Gull numbers have declined throughout Lake Huron over the last two years (CWS unpubl. data, Morris et al. 2001), Cormorant numbers have increased dramatically throughout the Great Lakes (Weseloh et al. 1995, unpubl. data). Common Terns have shown an increase in the Severn Sound area; this is in contrast to slow declines in most other areas of the Canadian Great Lakes (Pekarik 2002). The increase nesting of Common Terns in Severn Sound may be related to lower water levels in 1999, making more low-lying island habitat available for them.

The Georgian Bay Osprey Society reported 22 Osprey nest sites within Severn Sound as of 2001. Osprey nests in Severn Sound have higher fledging success than nests in northeastern Georgian

Bay areas (field work 1995 - Thomas and Bird 1999).

The waterbird community of Severn Sound was considered self-sustaining and diverse at the time of writing of the Stage 2 Report. The community remains self-sustaining and diverse. The increase in number of Double-crested Cormorants is also being experienced throughout Georgian Bay and the population represents a significant factor in harvest of fish from Severn Sound. This delisting objective has been met.

Matchedash Bay

In 1995, water bird surveys of the Bay took into account all waterbirds, including swans, ducks, geese, gulls, terns, mergansers, swallows, Red-winged Blackbirds, loons, grebes, cormorants, herons, rails, kingfishers, coots, shorebirds, Ospreys and Northern Harriers (Pekarik 2002). In 1996, the following species were not counted due to low numbers in 1995: Great Blue Heron, Great Egret, Killdeer, Tree Swallow, Spotted Sandpiper and Canvasback. A total of 55 species or species groups was identified from Matchedash Bay during these surveys, 27 of these were waterfowl. The most common species recorded was Ring-necked Duck with over 7100 individuals. The next most numerous species were Mallard, Canada Goose, Bufflehead, Common Merganser, Green-winged Teal, Black Duck, scaup, gulls, and Common Goldeneye. These ten species, totalling nearly 19,000 individuals, comprised 90% of all birds recorded. The breakdown of types of waterfowl was as follows: swans - 0.2%, Geese - 15%, dabblers - 27.8%, bay ducks - 41%, *Bucephala* spp. - 9.5%, mergansers - 6.5%. This composition and overall numbers are not unlike those recorded at other noted staging areas in the lower Great Lakes.

According to the organization Ducks Unlimited, the duck production mentioned in the original Matchedash Bay Project targets has not been assessed directly. Based on expected production levels of similar areas, the estimated general duck production in enhanced and secured wetland areas in Matchedash Bay was 1329 ducks per year.

Waterfowl nesting surveys to 1989 indicated that the relative species composition had not changed over the last 40 years (Tymoshuk et al. 1990). Severn Sound has a rich and diverse migratory waterfowl population. Areas with extensive turf without diverse shoreline habitat tends to support use by fewer species of water birds. The continued assessment of the Matchedash Bay project would benefit from a standardized survey design that could be consistently used to monitor trends in waterfowl biology.

Recreational and economic benefit of wildlife

Waterfowl harvest is an important index of the recreational and economic use of Severn Sound. The three main hunting areas monitored by OMNR have been Tiny Marsh, Wye Marsh and Matchedash Bay Provincial Wildlife Areas (Figure 3.3.9). Harvest since 1996 in Wye Marsh and Matchedash Bay was not monitored. Harvest in Tiny Marsh has continued to provide consistent waterfowl hunting opportunities. Although the number of hunters checked has declined over the last twenty years, the number of ducks harvested per hunter has remained relatively stable through the period of record.

Trapping of muskrat (*Ondatra zibethicus*) and the estimated population in the Matchedash Bay has been monitored from 1978 to 1992 by staff of OMNR Midhurst District (LaFrance 1992). Through this period the population supported a sustained harvest. Trapping declined in the early 1990s due to market demand and the population surveys were discontinued. Trapping continues sporadically in Matchedash Bay to the present (Table 3.3.4). The population survey should be repeated in order to monitor trends in the population. However, it would appear that fluctuations in water level influence the muskrat population in Matchedash Bay.

Over-harvesting and loss of habitat extirpated wild turkeys (*Meleagris gallopavo*) in Ontario in the early 1900s. The Ontario Ministry of Natural Resources works in partnership with groups including the Ontario Federation of Anglers and Hunters (OFAH) and the National Wild Turkey Federation; clubs; private landowners and volunteers on the relocation program. OMNR started its restoration program in 1984. Over the following two years 274 birds were obtained from six American states and reintroduced to sites across Ontario. Since then, the population of wild turkeys in Ontario has grown to 30,000 with the species now occupying 15,000 square miles in southern Ontario. The reintroduction of the wild turkey in the Severn Sound area began in 1990 and the population has steadily risen to 2001 and is supporting a sustained hunt (Figure 3.3.10).

According to OMNR Midhurst staff, the white-tailed deer (*Odocoileus virginianus*) population in the 76A,B,C Hunting Units (which include Severn Sound), declined in the early to mid-1990s followed more recently by a slight increase. Low predator populations and mild winters (except for the winter of 2001) were felt to contribute to this increase. Hunter success rates and deer observed are given in Figure 3.3.11.

Reptiles and amphibians

Severn Sound continues to support a diverse community of reptiles (7 species) and amphibians (10 species). The more common species include the American toad (*Bufo terrestris*), spring peeper (*Hyla crucifer*), tetraploid gray treefrog (*Hyla versicolor*), bullfrog (*Rana catesbeiana*), green frog (*Rana clamitans*), northern leopard frog (*Rana pipiens*), wood frog (*Rana sylvatica*), common snapping turtle (*Chelydra serpentina*), painted turtle (*Chrysemys picta*) and common garter snake (*Thamnophis sirtalis*).

Three significant species were encountered. Map turtles (*Graptemys geographica*) occupy the small rocky islets and rocky inland areas and are more common in the northern part of the Sound. Blanding's turtle (*Emys blandingi*) and the spotted turtle (*Clemmys guttata*) are considered uncommon and are widespread in Severn Sound. The five-lined skink (*Eumeces fasciatus*) is restricted to the southern edge of the Precambrian shield (on the north shore of Severn Sound), and is considered to be rare and local. The milk snake (*Lampropeltis dolia*) and the pickerel frog (*Rana paulustris*) are uncommon and widespread in Severn Sound. The Massasauga Rattlesnake (*Sistrurus catenatus*), the Eastern Hog-nosed snake (*Heterodon platyrhinos*) and the Fox Snake (*Elaphe vulpina*) are considered rare and local in the northern part of the Sound. The Common Northern Water Snake (*Natrix sipedon*) is also found in Severn Sound.

Wetland Birds and amphibians

Severn Sound was considered to have a high diversity of marsh birds with all 12 marshbird indicator species and a healthy diversity of amphibians including all five indicator species represented (Long Point Bird Observatory 1997, Weeber and Vallianatos 2000 - MMP). The three larger provincially significant wetlands in Severn Sound (Tiny Marsh, Wye Marsh and Matchedash Bay) have recently been identified as Important Bird Areas by Environment Canada (Wilson and Cheskey 2000a, b, c) with respect to Black terns and Least Bitterns. As of 2001, 40 Black Tern and 15 Least Bittern nests were found in the Wye Marsh (French 2001). Studies for contaminants in Tree Swallows and Red-winged Blackbirds in Port Severn area, Matchedash Bay and the Wye Marsh (Bishop et al. 1995) also noted high hatching and fledging success - indications of healthy populations.

Interior Forest Birds

The ecological integrity of the interior forest bird community of Severn Sound was assessed by Tate et al. (1997). The overall forest bird community integrity was rated as good. The species diversity in the AOC was considered good (near excellent) for a comparable size area in southern Ontario. All fifteen indicator species of interior forest birds were found in the area and the community composition of forest bird habitat was considered fair. The reproductive success of Wood Thrush, Rose-breasted Grosbeak and Red-eyed Vireo was considered fair to good. Despite sufficient forest patch size to support healthy populations of interior forest birds, indications of disturbance of these habitats were noted where Neotropical migrants and non-native, human-associated species were present.

Trumpeter Swans

The objective for the Ontario Trumpeter Swan Restoration Program was to establish 15 wild breeding pairs by the year 2000 (Lumsden 1989). Progress on achieving a sustainable population of reintroduced Trumpeter Swans in Ontario has been reported by Lumsden and Drever (in press). The population of Trumpeter Swans in Severn Sound has been increasing since the initial release in Wye Marsh in 1991. By August 2001, the population in the Severn Sound area was estimated at 103 swans (Coxon, pers. comm.), including the young-of-the-year. The Southern Ontario population is estimated at 348 birds (Lumsden and Drever in press). Although the objective of 15 wild breeding pairs has been met, not all pairs have bred successfully nor has the population reached self-sustainability (Lumsden and Drever in press). With continued efforts of the Trumpeter Swan Restoration Program in monitoring and managing the population through introductions, it is expected that the population will achieve sustainability in the next few years.

The success of the reintroduction effort at Wye Marsh was limited by lead poisoning from spent lead shot. Trumpeter Swans have a high susceptibility to lead poisoning. Ingestion of as few as three pellets is sufficient to cause death. The problem was addressed through a ban on the use of lead shot for waterfowl hunting (starting at Wye Marsh in 1993) and remediation of sediments in wetland pools through a vibration technology developed through the Lead Shot Remediation Project (A joint Severn Sound RAP-Friends of Wye Marsh Inc. project). The vibration device enhances the sinking of lead pellets to depths in the sediment beyond the reach of Trumpeter Swans while minimizing the impacts of sediment disturbance on the surrounding water, plants

and sediment profiles. Eleven hectares of lead shot-contaminated sediment in Wye Marsh were treated with the vibration device during 1997 and 1998, and approximately six hectares of Hog Bay were treated with the remediation device in 2001. Between 1991 and 2001, at least 41 Wye Marsh swans suffered from lead poisoning. However, as a result of compliance with the lead shot ban and lead shot remediation, there has recently been a decreasing trend in the percentage of free-flying swans developing lead poisoning through ingesting spent pellets (refer to Table 3.3.5). By restoring wetland habitat through lead shot remediation, the Severn Sound RAP has taken the furthest action possible to assist the Trumpeter Swan population toward sustainability.

Toxicity

Sewage plant optimization has resulted in nitrification within the plant process resulting in effluents with relatively low ammonia concentrations. Optimization has also greatly reduced chlorine usage due to better solids controls. The potential toxicity from sewage plant effluents to the water column of Severn Sound has been virtually eliminated. No sediment toxicity has been found in “worst case” site tested throughout Severn Sound (Krantzberg and Sherman 1995).

Based on the wildlife indicators described above, Severn Sound continues to have a healthy self-sustaining and diverse wildlife community.

Ongoing Actions:

- Ongoing remediation of coastal, wetland, riparian and upland habitat to ensure the continued support of a healthy ecosystem.
- Creel Survey to continue beyond 2001 and include a winter creel in 2002.
- Continued monitoring of fish community in Severn Sound.
- Continued monitoring of waterbird community of Severn Sound and adjacent areas of Georgian Bay.
- Continued implementation of the Matchedash Bay Project and long-term monitoring of the wildlife community of Matchedash Bay.
- Ongoing monitoring of the recreational benefit of the wildlife community of Severn Sound.
- Continued monitoring of trumpeter swan population.
- Support the Eastern Georgian Bay/North Channel Fisheries Stewardship Committee recommendations for reduced angler harvest through changes in fishing regulations.
- A Federal-Provincial-Municipal-Community Management Plan to protect and enhance the walleye spawning areas at Port Severn and North River in Severn Sound.

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Table 3.3.1 Summary of Summer Creel Surveys on Severn Sound 1975-2001

SPECIES	NUMBERS OF FISH HARVESTED							
	1975	1976	1977	1979	1987	1988	1992	2001
longnose gar	-	-	17	3	-	-	9	7
bowfin	149	149	228	52	161	148	95	-
chinook salmon	-	-	-	-	19	-		99
rainbow trout	-	-	10	-	-	-		-
backcross lake trout	-	-	-	-	-	-	17	-
lake whitefish	-	-	-	14	17	-		-
northern pike	6774	4945	3008	1855	5910	5449	4696	2867
muskellunge	78	141	50	42	34	36	-	-
carp	-	-	9	-	67	45	24	-
brown bullhead	354	202	205	19	212	55	-	41
channel catfish	184	70	117	236	514	295	395	131
white bass	126	143	35	-	43	179	708	291
rock bass	5601	8587	4422	2119	2978	2952	1667	34
pumpkinseed	5730	10097	3443	2344	1697	3144	4482	649
smallmouth bass	9803	11647	10771	6369	6938	10394	1638	2137
largemouth bass	2448	3622	2419	1991	2390	2136	667	461
black crappie	11673	19348	17160	20243	8794	7348	2757	34
yellow perch	3393	6720	4461	2461	6961	7442	5519	8527
walleye	1414	1445	1300	744	64	64	45	2456
Total weight caught (kg)*	23201	28119	20570	14735	19357	20549	10477	17686
Total effort (rod-hours)	165058	161804	119596	105402	136821	136530	120134	87397

* Commonly encountered species were weighed by field crews and the means used to calculate each species total weight caught. Other species weights were taken from the mean Ontario or Canadian averages presented in Scott and Crossman (1973).

Table 3.3.2 Comparison of fish assemblage measures at five areas in Severn Sound and two areas in Lake Ontario. Values are averages (with ranges in parenthesis). The compositional measures (percent trophic groups and percent native) were calculated for transects where the biomass was greater than 0. The 1990 data was from Smokorowski et al. (1998).

Location	Severn Sound					Lake Ontario	
	Penetang	Hog	Sturgeon	Matchedash	Pt. Severn	Quinte	Hamilton
Year of survey	1990	1990	1992	1990	1995	1990	1990
Number of samples	84	28	23	36	27	59	60
Number of samples with 0 catch	3	1	2	0	0	3	1
Fish assemblage measures							
Species richness	5.1 (0-12)	4.8 (0-9)	4.7(1-8)	6.9 (4-12)	6.4(1-10)	6.7 (0-14)	4.1 (0-13)
Biomass	4.8(0.00-21.2)	3.8(0.0-12.8)	2.1(0.1-10.0)	3.7(0.1-9.5)	2.8(0.1-8.2)	7.0(0.0-30.1)	9.1(0-71.9)
% Piscivore biomass	17.8(0-100)	22.9(0-83)	29.8(0-94)	23.8(0-69)	17.6(0-60)	25.1(0-82)	9.5(0-96)
% Generalist biomass	15.6(0-100)	13.3(0-83)	3.1(0-29)	26.4(0-80)	21.5(0-99)	27.6(0-98)	45.5(0-100)
% Specialist biomass	66.6(0-100)	63.8(6-100)	67.0(6-100)	49.8(9-100)	60.9(1-100)	47.3(0-100)	44.9(0-100)
Percent native biomass	91.0(12-100)	88.1(16-100)	99.9(99-100)	90.7(22-100)	90.5(6-100)	77.2(2-100)	37.7(0-100)
Index of Biotic Integrity (IBI)	58.6(0-91)	61.6(0-91)	62.4(46-82)	65.8(39-86)	62.8(25-90)	58.0(0-97)	30.2(0-74)
Adjusted IBI	56.4(0-91)	61.1(0-91)	62.0(46-82)	61.9(28-86)	60.4(24-90)	48.5(0-93)	17.8(0-58)

¹ Adjusted IBI is the Index of Biotic Integrity score adjusted for offshore species (see text)

**Table 3.3.3 Number of nests of colonial waterbirds
in the Severn Sound area**

Species	Year of Census		
	1999	1989	1980
Herring Gull	234	456	614
Ring-billed Gull	9,019	23,261	13,837
Great Black-backed Gull	1	0	0
Common Tern	143	192	83
	1997	1989	1980
Double-crested Cormorant	1,036	663	20
	1998	1989	1980
Caspian Tern	571	785	662
	2001	1991	1980
Great Blue Heron	0	0	0
Black-crowned Night Heron	0	0	0
Great Egret	0	0	0
	2001	1991	
Black Tern	NA	143	
Forster's Tern	NA	0	

* 49 colonies used in the above tabulations including
41A046-41A047 and 31D003-31D044,
plus 5 new colonies found in 1999.

* Data for first two surveys extracted from the Atlas of
colonial waterbirds nesting on the Canadian Great
Lakes, 1989-1991. Part 2. Cormorants, gulls
and island nesting terns on Lake Huron in 1989.

**Table 3.3.4 Muskrat Population estimates and
harvest information for Matchedash Bay
between 1978 and 1990 (LaFrance 1987).**

Trapping Period	House Count Bay	Marsh	Estimated Population	Reported Harvest	Harvest Rate (%)
1978/79	351	81	2160	655	30
1979/80	745	349	5470	1750	32
1980/81	477	244	3605	1875	52
1981/82	ND	ND	ND	893	ND
1982/83	430	216	2230	572	26
1983/84	332	244	2880	645	22
1984/85	318	192	2550	841	33
1985/86	225	343	2840	964	34
1986/87	491	345	4180	1159	28
1987/88	580	285	4325	1042	24
1988/89	ND	ND		72	ND
1989/90	119	145	1320	0	ND
1990/91	ND	ND	ND	0	ND
1991/92	21	21	210	0	ND
1992/93	ND	ND	ND	9	ND
1993/94	ND	ND	ND	105	ND
1994/95	ND	ND	ND	203	ND
1995/96	ND	ND	ND	4	ND
1996/97	ND	ND	ND	0	ND
1997/98	ND	ND	ND	188	ND
1998/99	ND	ND	ND	80	ND
1999/2000	ND	ND	ND	30	ND
2000/2001	ND	ND	ND	0	ND

ND = No
Data

Table 3.3.5 Occurrence of Lead Poisoning in Free-Flying Wye Swans

Calendar Year	Total Swan Population❖	# of Held Swans	# of Free-Flying Swans	# of Confirmed* Cases of Lead Poisoning	Lead Poisoning in Free-Flying Population (%)
1991	16	7	9	1	11.1
1992	20	4	16	2	12.5
1993☒	30	7	23	4	17.4
1994	32	9	23	5	21.7
1995	57	26	31	3	9.7
1996	68	20	48	3	6.3
1997†	63	1	62	4	6.5
1998	75	0	75	5	6.7
1999‡	86	0	86	7	8.1
2000	88	0	88	2	2.3
2001§	116	0	116	5	4.3

❖this number does not include permanent captive breeding pair(s)

* confirmed through blood analysis, radiograph and/or necropsy report

☒ lead shot ban implemented in Wye Marsh

† non-toxic shot required for migratory game birds within 200 m of a watercourse or waterbody; remedial activity implemented in Wye Marsh

‡ non-toxic shot required nationally for migratory game birds

§ remedial activity implemented in Hog Bay

**Figure 3.3.1 Year 2000
Georgian Bay
Aerial Boat Count**

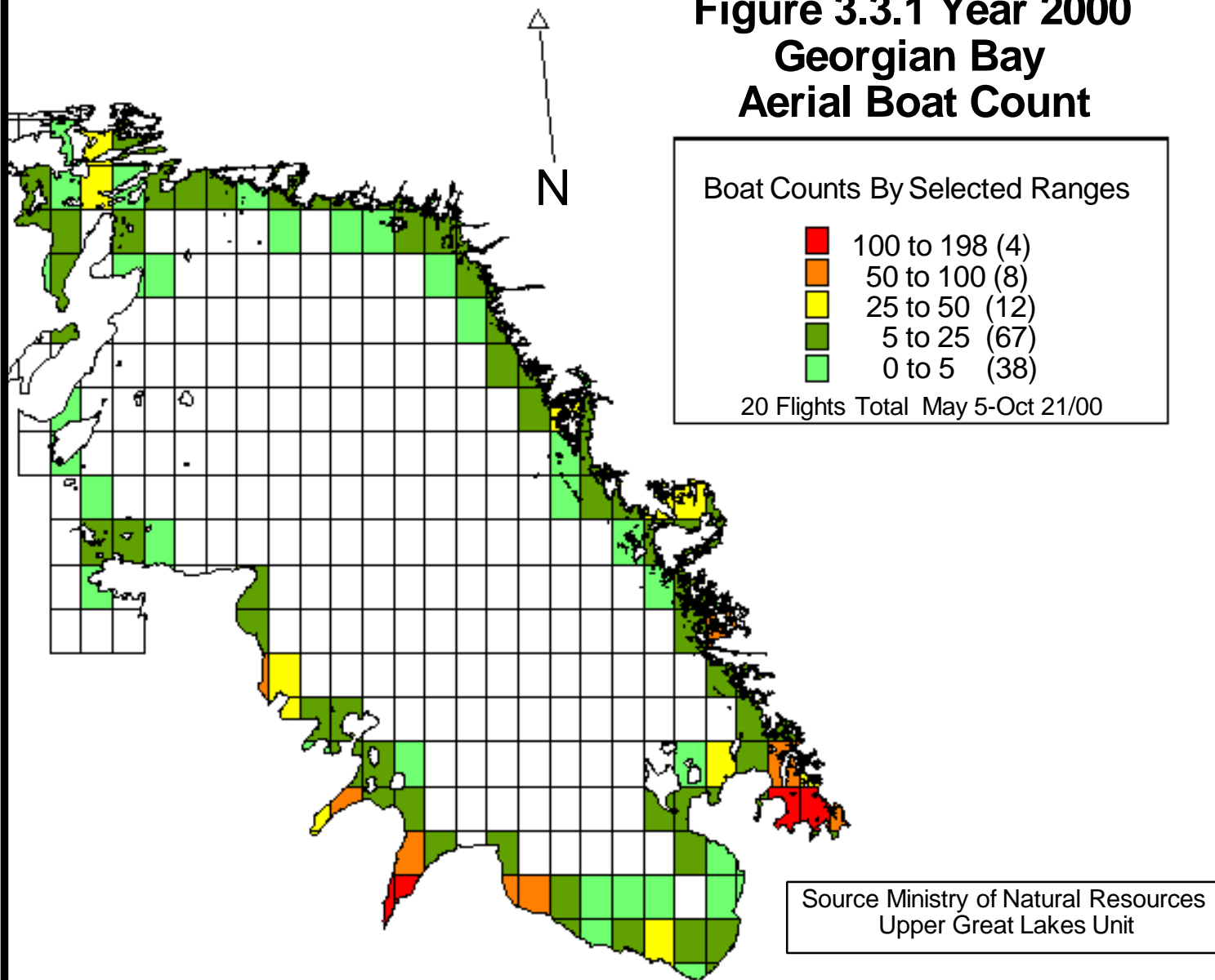
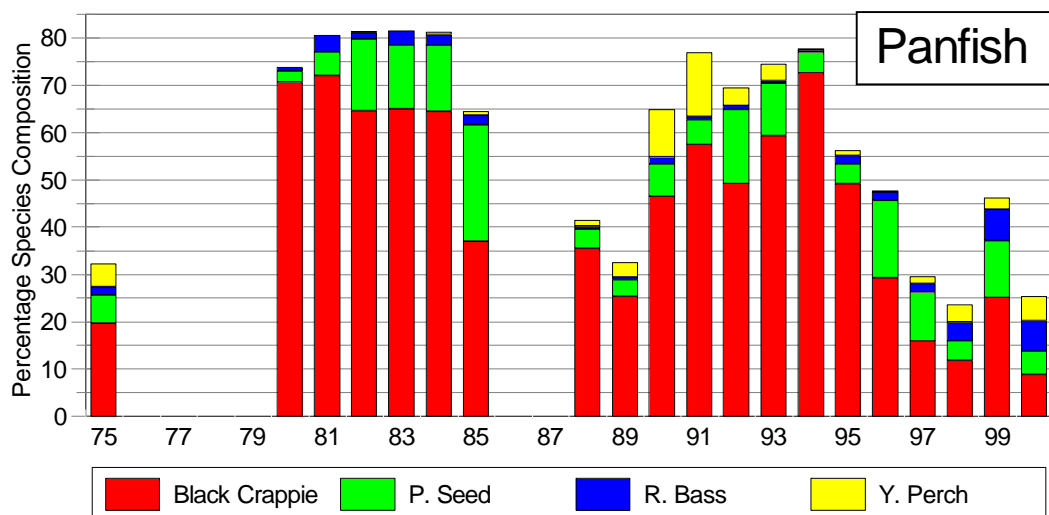
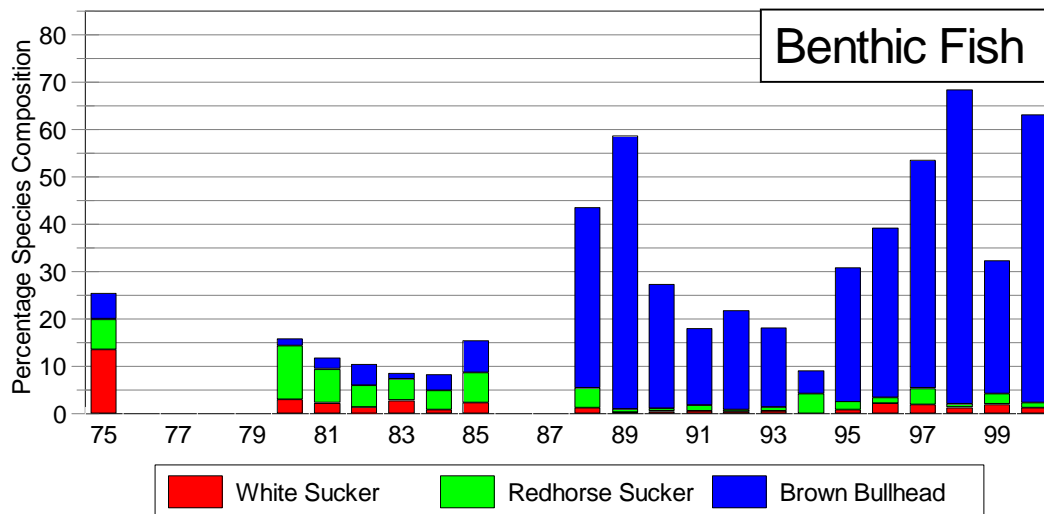
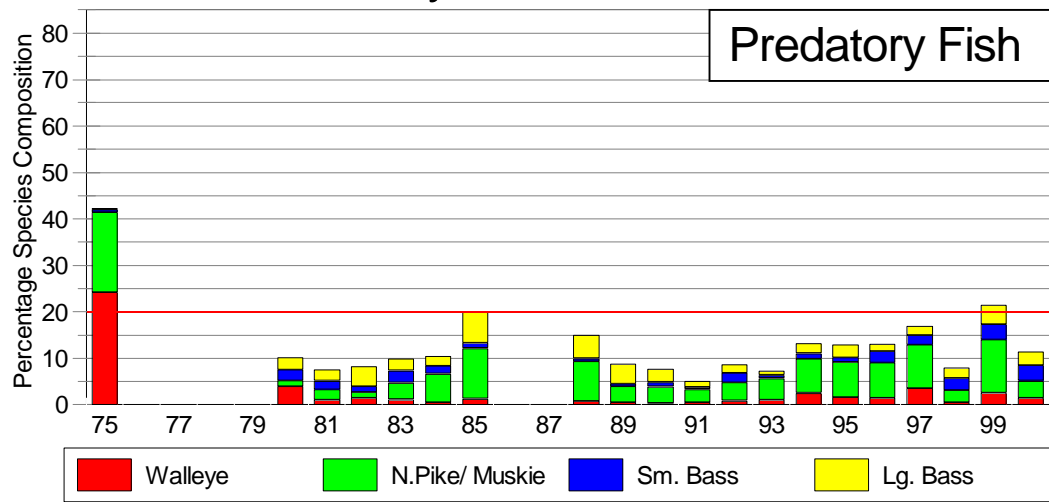
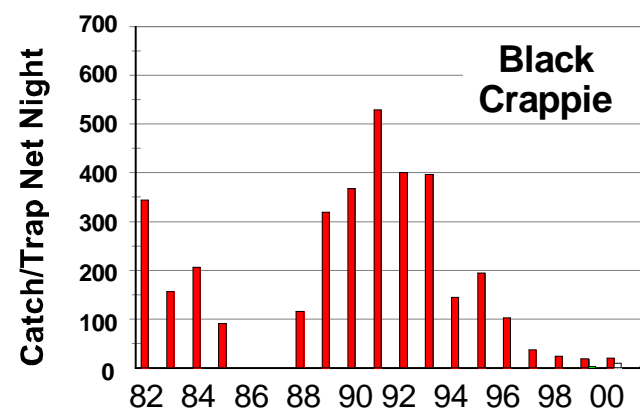
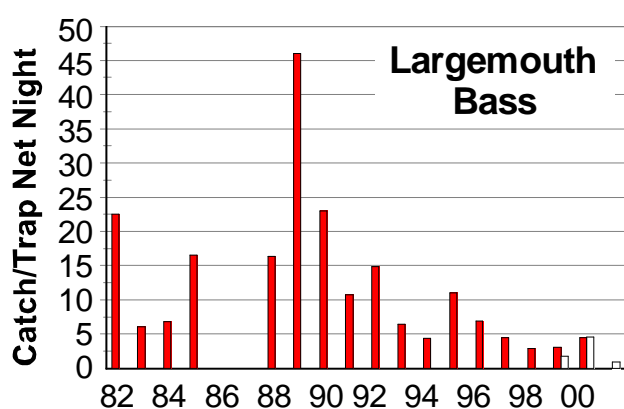
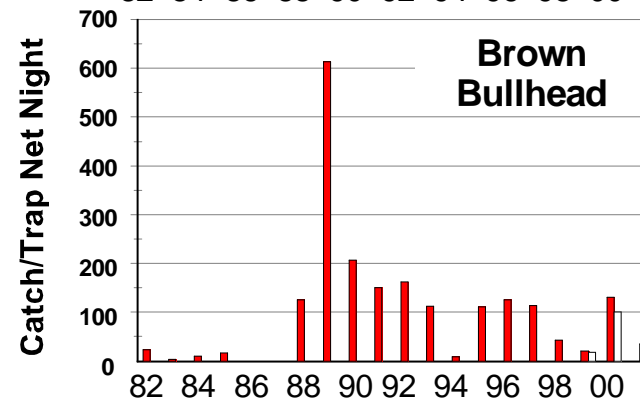
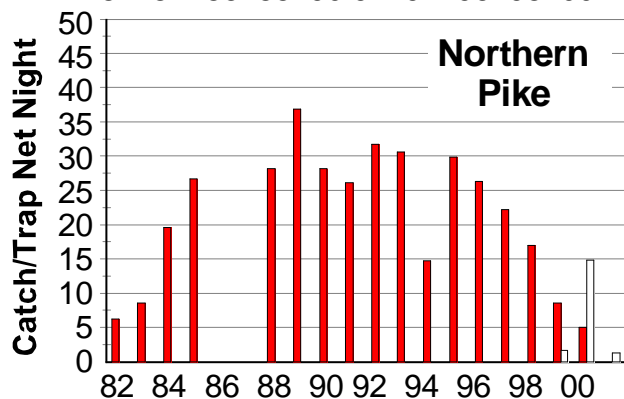
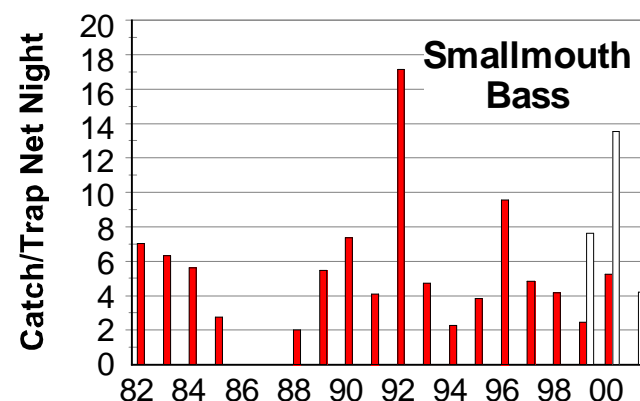
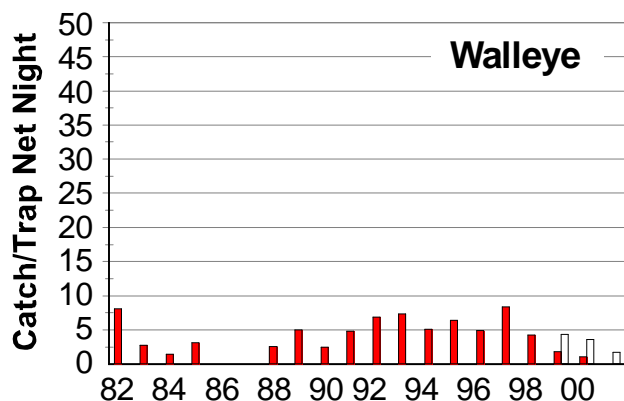
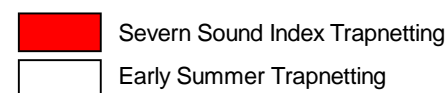


Figure 3.3.2 Composition of catch in Sturgeon Bay, Severn Sound from Spring Index Trapnet Survey 1975 - 2000

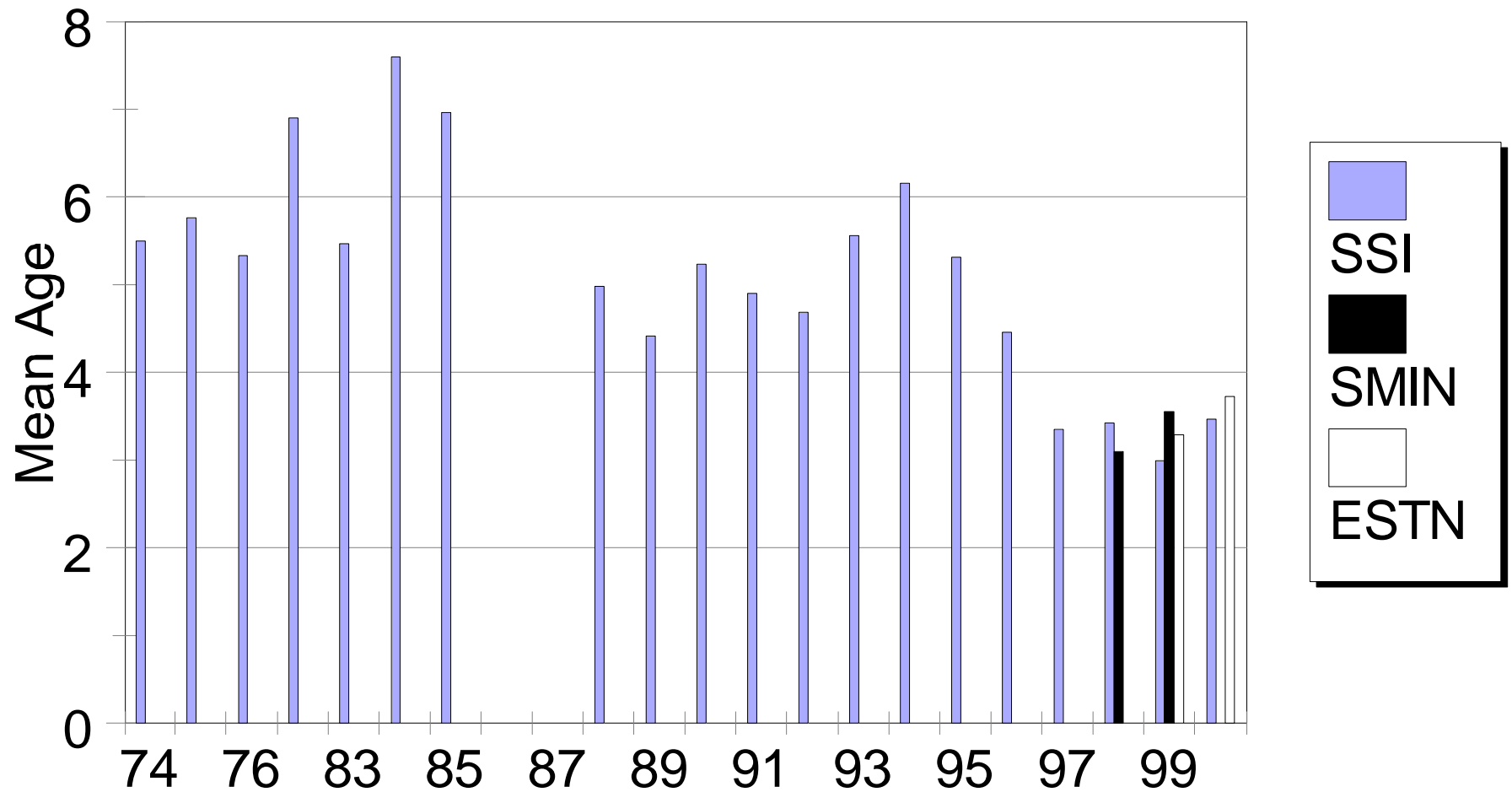


Source: OMNR / Severn Sound Fixed Index Trapnet

Figure 3.3.3 Severn Sound Index Trapnet Survey Catches per Trap Net Night

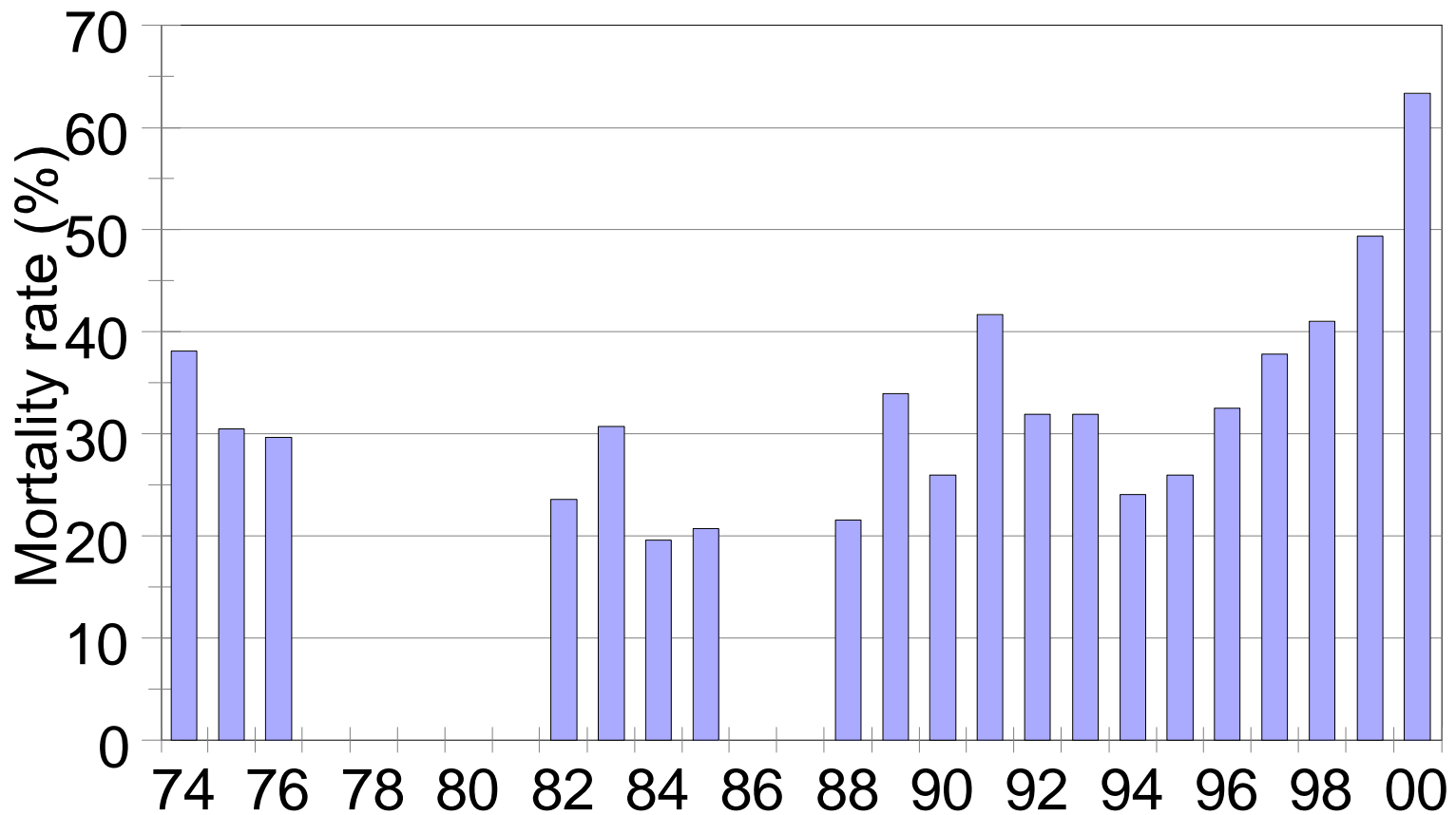


**Figure 3.3.4 Mean age of walleye
from Severn Sound 1974 to 2001**



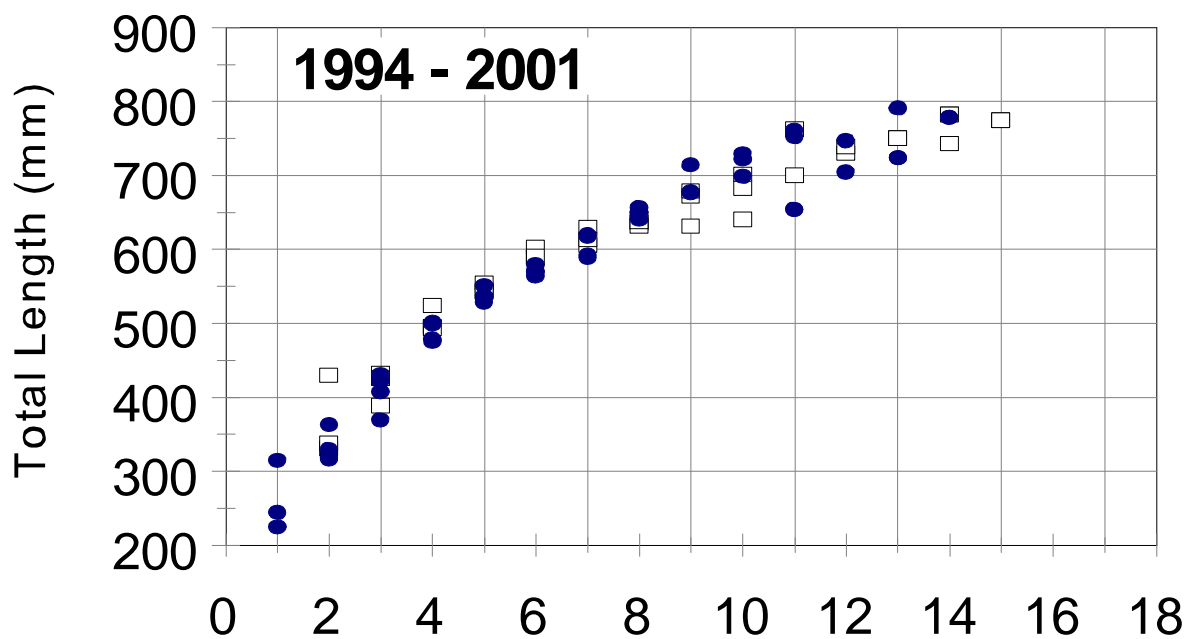
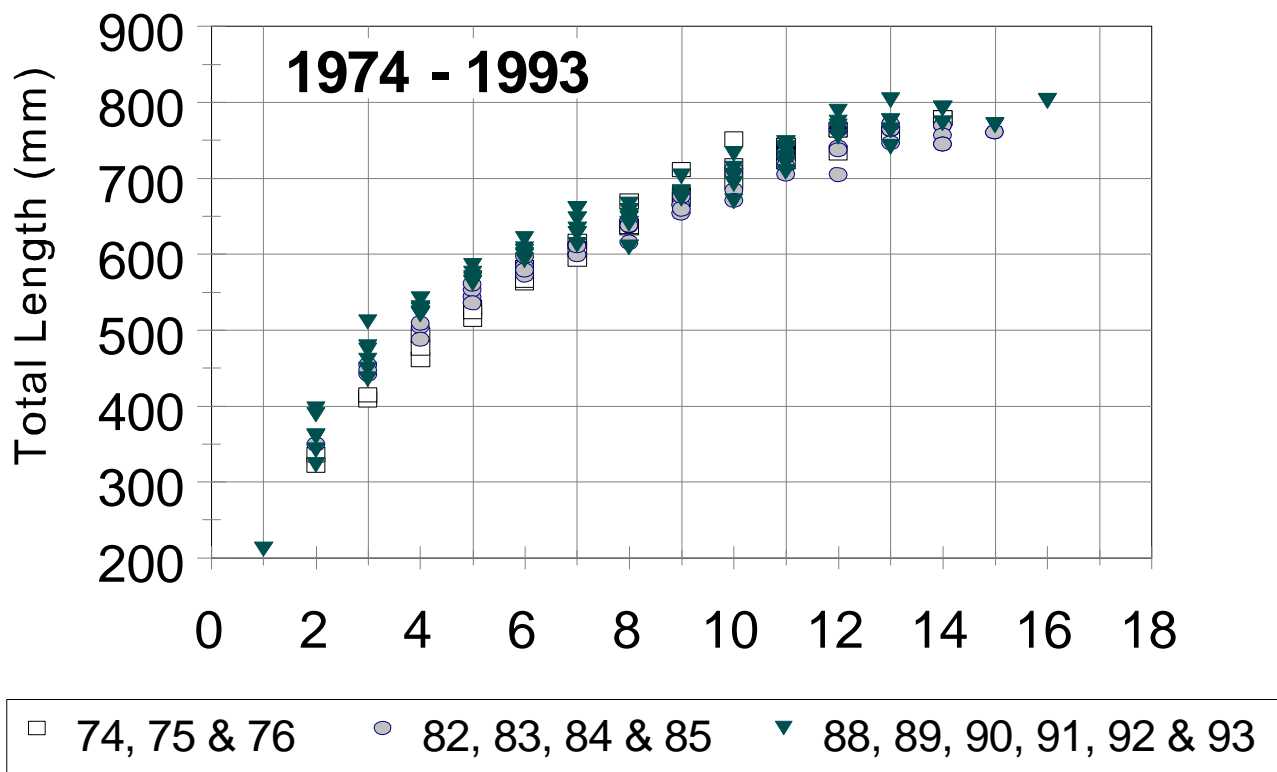
Source: OMNR

**Figure 3.3.5 Mortality rate (%) of walleye
from Severn Sound 1974 to 2000**



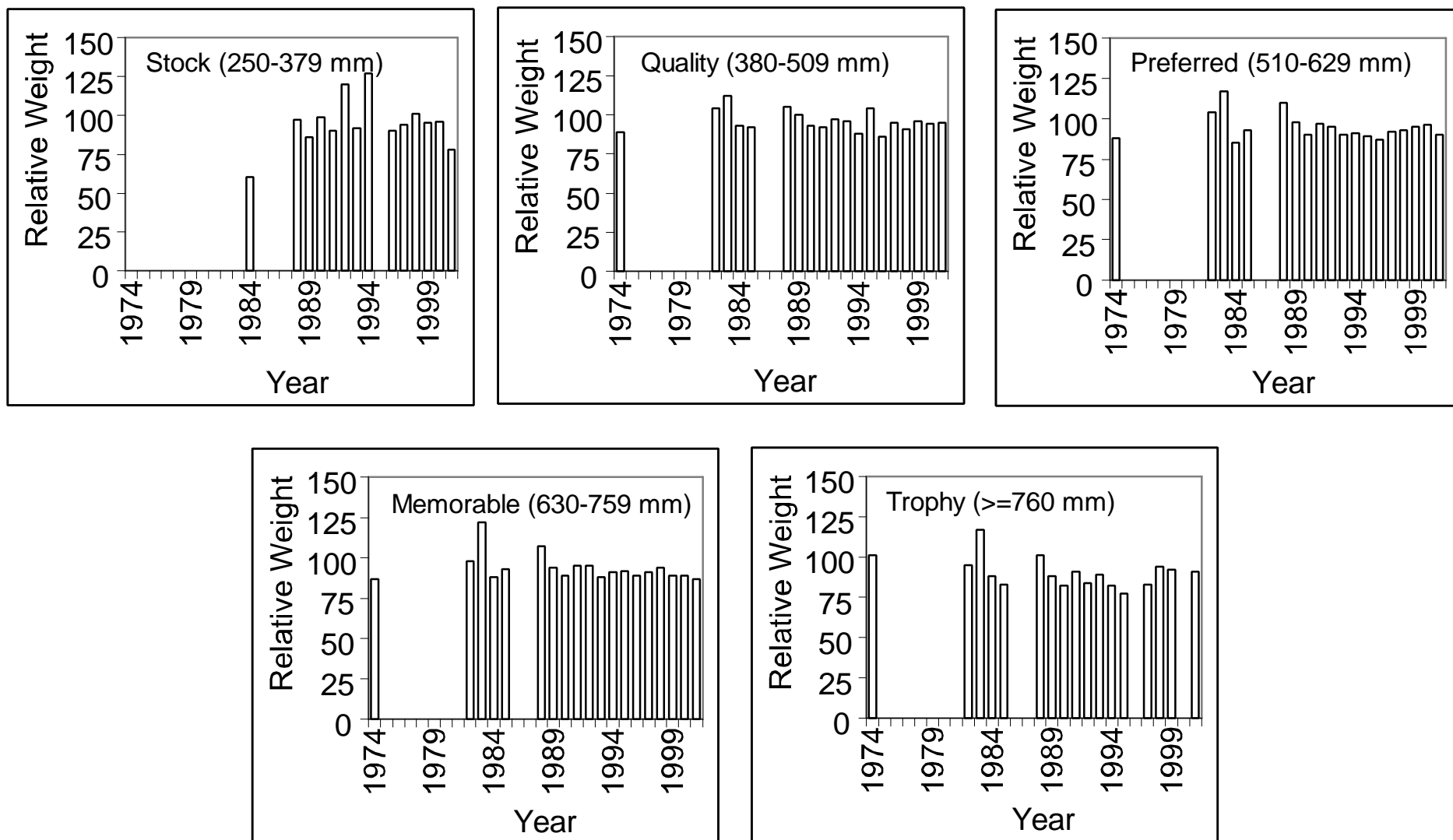
Source: OMNR Gonder et al. 2001

**Figure 3.3.6 Walleye mean length at age
Pre- and Post-zebra mussels**



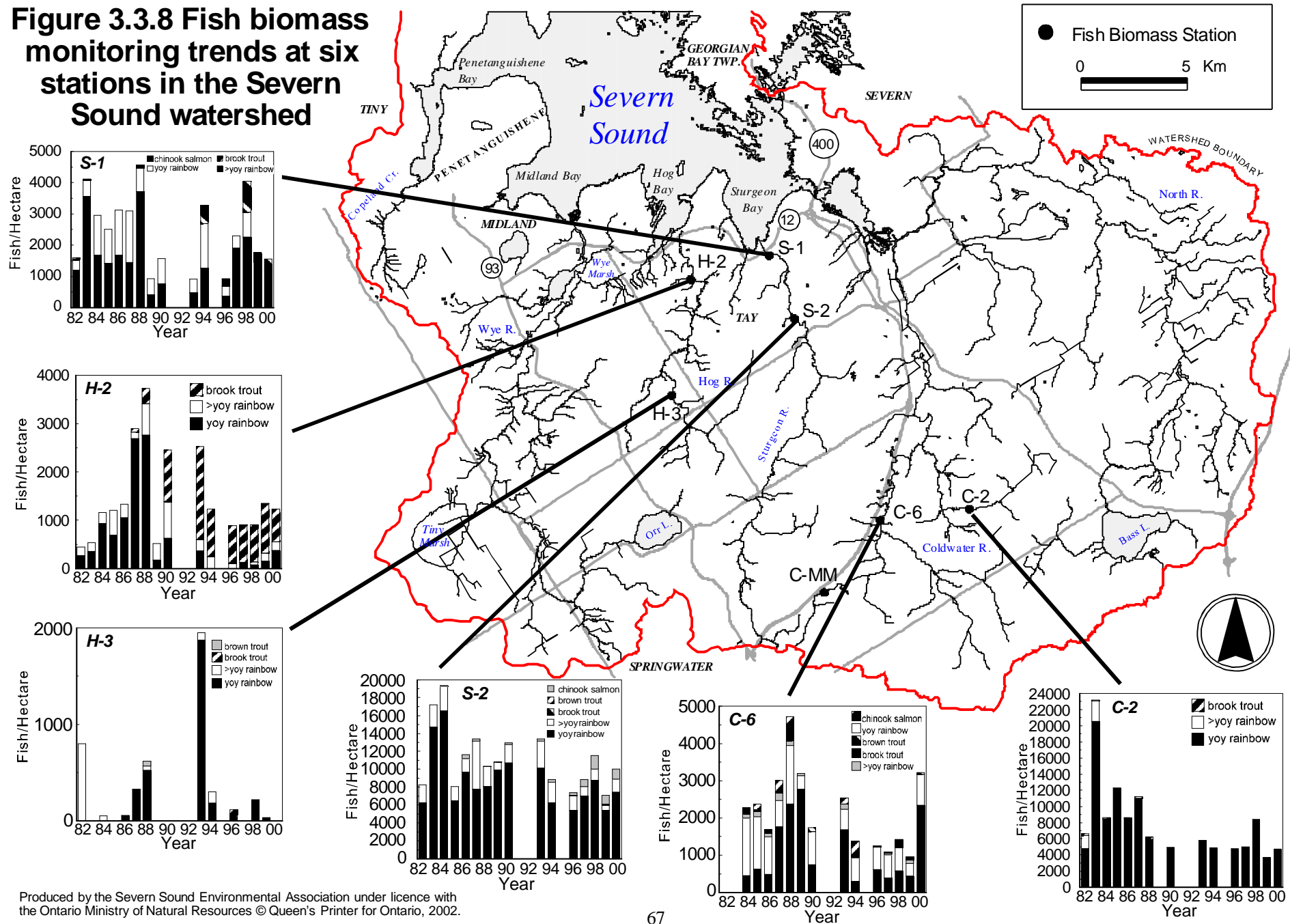
Source: OMNR

Figure 3.3.7 Severn Sound walleye relative weight, by size class, from 1974 to 2001

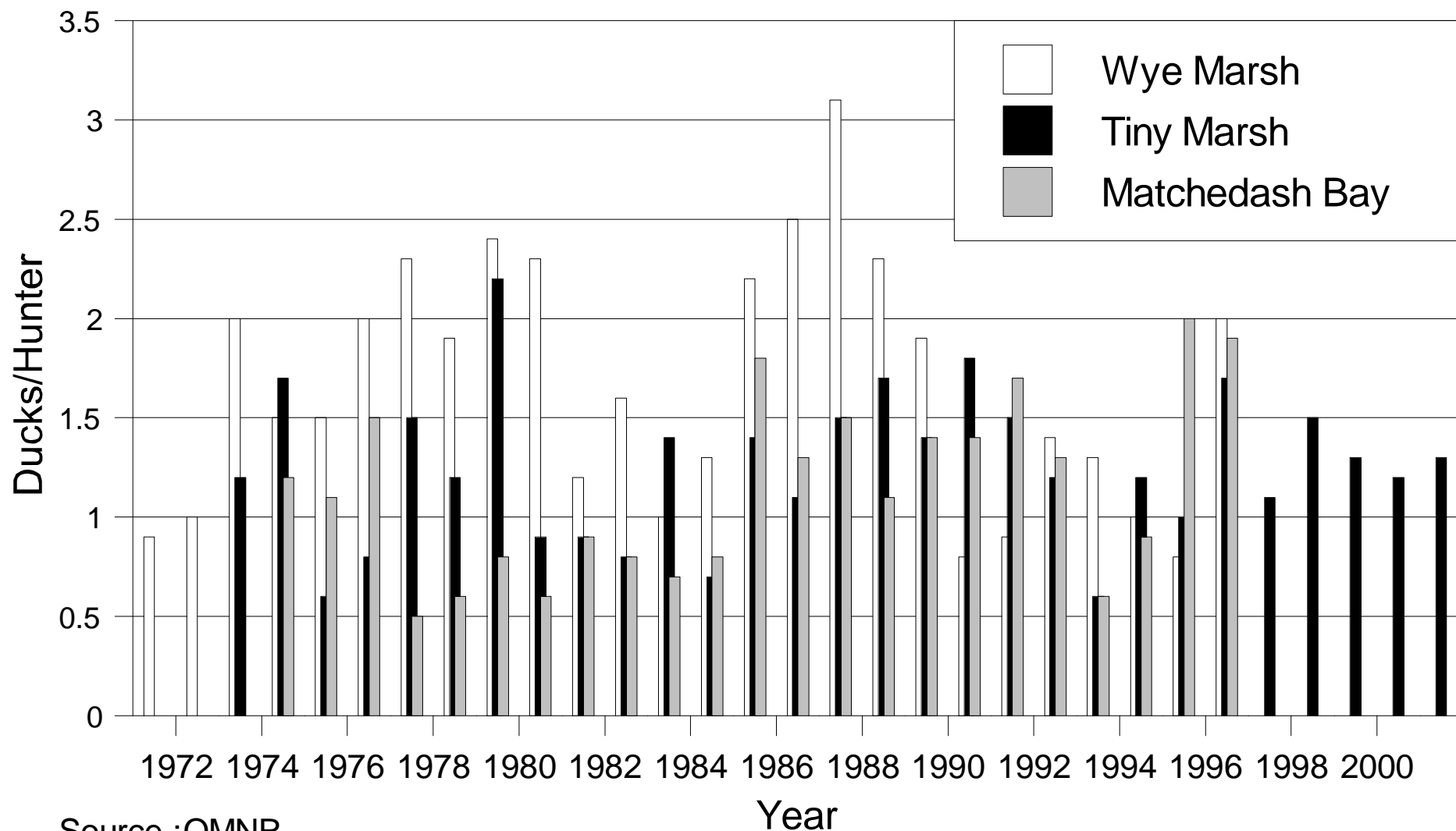


Source: OMNR

Figure 3.3.8 Fish biomass monitoring trends at six stations in the Severn Sound watershed



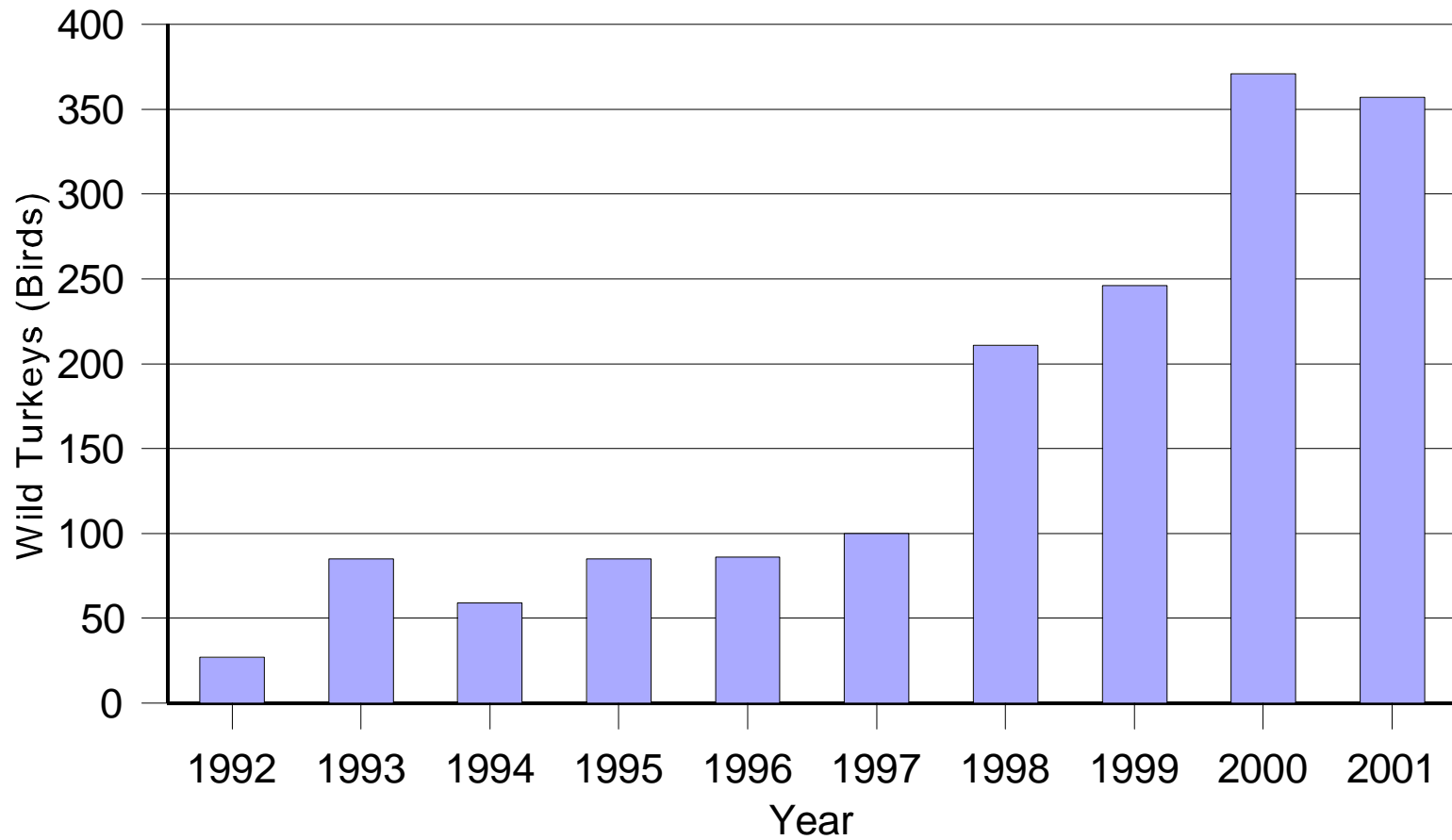
**Figure 3.3.9 Opening Day waterfowl harvest at
three Provincial Wildlife Areas in
the Severn Sound area**



Source : OMNR

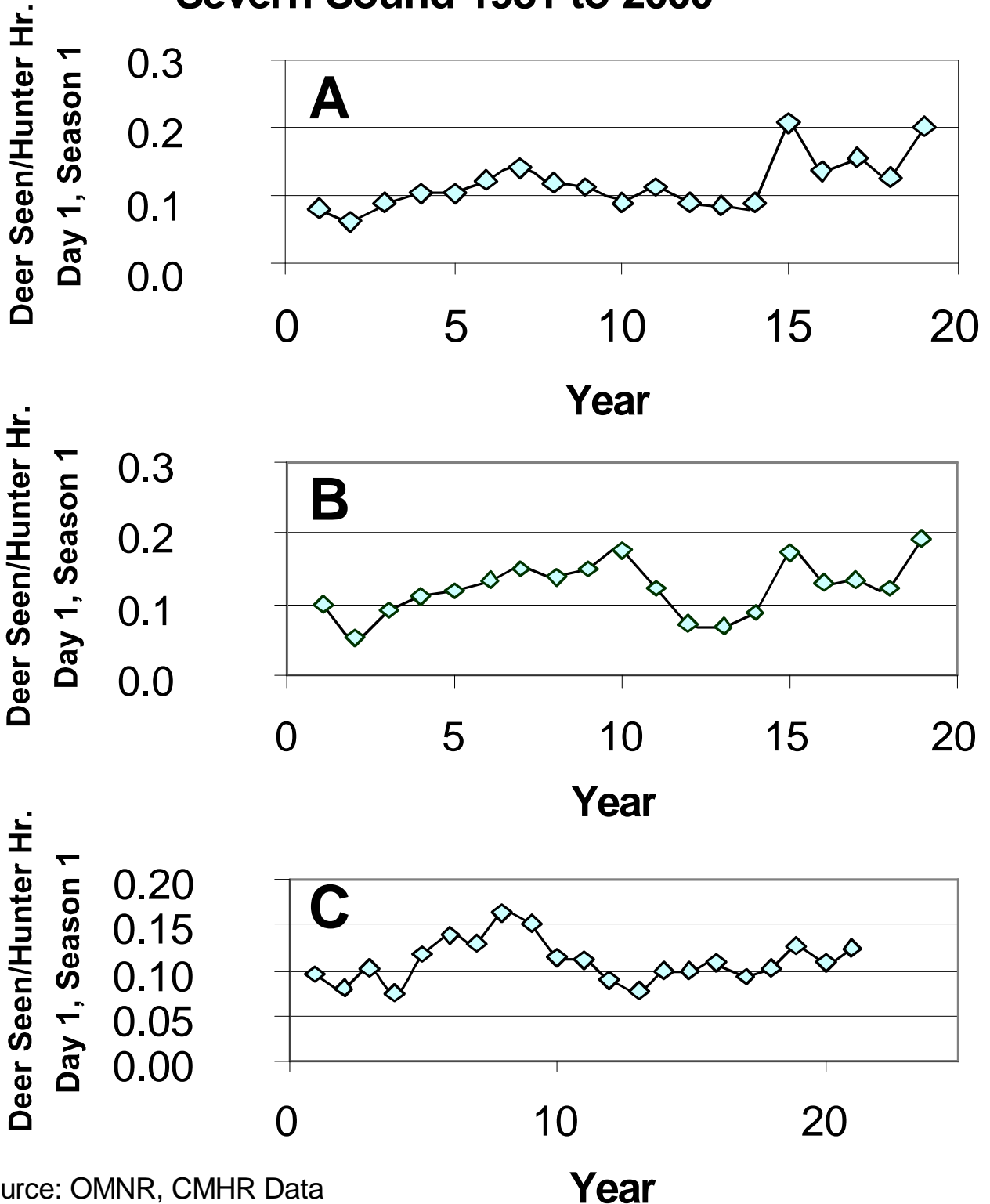
Note: After 1996, data was only available for Tiny Marsh.

**Figure 3.3.10 Wild Turkey Harvest
in the Severn Sound area (WMU76)**



Source :OMNR

Figure 3.3.11 White-tailed deer harvest from Wildlife Management Unit 76,A,B &C in Severn Sound 1981 to 2000



Source: OMNR, CMHR Data

iv) Fish tumours or other deformities and v) Bird or animal deformities or reproduction problems

Severn Sound is considered an unimpacted reference site with respect to tumours and other deformities (CWS & OMNR, 1990). These use impairments do not apply to Severn Sound.

vi) degradation of benthos

Delisting Objective:

1. *To reach appropriate benthic community targets and ecosystem objectives for Severn Sound.*
2. *For the interim, to have benthos characteristic of mesotrophic conditions throughout Severn Sound.*
 - a. *to maintain and enhance presence of the mayfly *Hexagenia* as an indicator of ecosystem health.*
 - b. *to have a sludge worm density, especially *Limnodrilus hoffmeisteri*, less than 3,000/m² in all locations.*
3. *Absence of acute and chronic toxic effects on benthos attributable to trace metals or organic chemicals in sediments throughout Severn Sound.*

Rationale:

OPEN WATER

The use of benthic macroinvertebrates or benthos as indicators of the health of aquatic environments has a long history of use in studies of the effect of pollution sources in lakes and rivers. Benthos are useful because:

- there is a wide diversity of species, life styles and sensitivity
- the benthos are in intimate contact with sediments through most or all of their life cycle and the community of organisms living in a location reflects the degree of sediment contamination
- the benthos are relatively immobile and reflect local conditions
- they are relatively short-lived and can reflect recent conditions
- they are an integral part of aquatic and terrestrial food webs - in many cases they become important food items for fish
- they are easy to sample in sufficient numbers

The community of organisms living in the mud at the bottom of a bay can then reflect both the natural physical or chemical conditions as well as the presence of toxic factors such as the impacts of discharges or the presence of contaminants laid down in the sediments in the past. The numbers of species of benthos and their density and the interactions with their surroundings

can be complicated and pose difficulties in summarizing and interpreting what the community makeup or community structure should be.

Developing models and techniques for assessing impairment of Great Lakes benthos community structure is an ongoing process. In the Great Lakes nearshore deposition areas the model of Reynoldson et al. (1995) has been applied to Georgian Bay and to Severn Sound in particular (Reynoldson and Day 1998).

Hexagenia is used as a sensitive test organism for sediment bioassays (Bedard et al. 1992, Persaud, et al. 1992). The presence of healthy populations in appropriate sediment conditions in the Great Lakes has been used as an indicator of ecosystem health and recovery from nutrient enriched conditions (Schloesser et al. 2001).

High densities of pollution tolerant tubificid worms (eg. *Limnodrilus hoffmeisteri*) indicate nutrient enriched conditions. The presence of tubificid worms in the absence of other biota may indicate the presence of toxic concentrations of metals or other contaminants in the sediments.

Sediment bioassessment protocols call for multiple lines of evidence, with both acute and sublethal test organisms and bioavailability testing of sediment to assess sediment toxicity (Krantzberg and Sherman 1995). Sediment in enriched waters can also be toxic to benthos through accumulation of products of anaerobic decomposition in the interstitial water such as ammonia and hydrogen sulphide following depletion of dissolved oxygen concentration (Charlton in prep.).

TRIBUTARIES

Stream benthic community composition has long been used to assess stream quality and recovery following remediation (Hynes 1960; Cairns 1974, Hilsenhoff 1977, 1988). More recent assessment of benthic community structure in streams has made use of more powerful statistical methods of comparison (Hilsenhoff 1988; Rosenberg and Resh 1993; Resh 1995; Yoder and Rankin 1995; Kilgour et al. 1998; and David et al. 1998). The approach taken in Severn Sound has been to rely most on qualitative collection methods to determine presence/absence of benthic macroinvertebrates (identified to as low a taxonomic level as practical) at a number of sites across the watershed and to collect quantitative samples using a T-sampler at selected sites that would provide indication of year-to-year changes due to natural fluctuations and to remedial efforts (Madill et al. in prep).

Indicators used in Severn Sound:

OPEN WATER

1. Reynoldson and Day (1998) have completed the assessment of a method of determining impairment of benthic community structure in the open waters of the Great Lakes. Severn Sound area was used as a test case for the 1994 data.
2. Ciborowski et al. (2001) compared benthos in 1998 and 1994 using multivariate

- analysis (including Reynoldson et al. 1995 BEAST) and distribution of indicator species *Hexagenia* and tubificids.
3. Distribution of *Hexagenia* spp in Severn Sound recent sediments.
 4. Distribution and density of tubificid worms, especially pollution tolerant species such as *Limnodrillus* and *Tubifex* in recent sediments.
 5. Other factors such as the presence of zebra mussels, low bottom water oxygen conditions, texture or organic content of the sediments, exposure to currents and the presence of rooted aquatic plants were also taken into account when interpreting impairment.
 6. The use of invertebrates as test organisms in sediment toxicity protocols has also been made in Severn Sound as in other areas of the Great Lakes to determine the presence of immediate (acute) or subtle (chronic or sub-lethal) toxic conditions in the lake bed. Test organisms include burrowing mayflies, amphipods, tubificid worms and a midge larvae.

TRIBUTARIES

1. Qualitative and quantitative samples of stream benthic community structure at selected sites in Severn Sound have been carried out by the RAP Office since 1996. Qualitative collections are made by two people conducting 20 minute searches of habitats in a 20m stream reach using sieves and forceps. Quantitative samples were collected using a 'T'-sampler with an inside diameter of 25 cm. Various indices of species richness, similarity and proportion of selected taxa such as Ephemeroptera, Plecoptera and Trichoptera (EPT) were calculated for each stream station sampled.
2. The Stream Assessment Protocol for Ontario (1998) with modification for more detailed benthos collection has been used since 1998.

Current Status:

Benthic community structure was further investigated using multivariate techniques (Baillargeon and Ciborowski 2000 and Ciborowski et al. In press). A comparison of the 1994 pre-zebra mussel, pre-phosphorus control community with the 1998 post-zebra mussel infestation, post-phosphorus control community was also made (Ciborowski et al. In press). The BEAST model suggested that the benthic community found at stations off the Main Street sewage treatment plant outfall was stressed in 1994 but was much improved in 1998 (Figure 3.6.1A,B and C). Four of 25 sites sampled in 1994 had benthic communities significantly different than expected of Great Lakes nearshore locations. But all four locations were shallow and had rich communities typical of shoreline invertebrate fauna. A comparison between 1994 and 1998 was made using the BEAST model. All locations in 1998 were similar to the reference sites.

Hexagenia were found at virtually every location where appropriate habitat conditions existed (Figure 3.6.2). Tubificid worms were found in reduced numbers in 1998. Twenty-two of 25 locations had significantly fewer than 3,000 worms/m², in 1998 indicating that the sediment was recovering from organic pollution.

The 13 long-term stream benthos stations from Severn Sound watershed showed variation in species richness from year to year (Coldwater River (C1,C2,C3,C4), Sturgeon River (S0,S1,S2), Hog Creek (H1,H2,H3), Wye River (W1,W2,W3)). Some sites continue to indicate degraded benthos community structure due to erosion and livestock access (Figure 3.6.2).

Sediment pore water ammonia concentrations in Penetang Bay between 1994 and 2000 suggest that the sediment is responding to reductions in sewage plant loadings of organic matter to the Bay (Figure 3.6.3, Charlton in prep.). Acute and sub-lethal toxicity was investigated in the same locations and were found to be non-toxic (Krantzberg and Sherman 1995).

Ongoing Actions:

Repeat selected stations of the Severn Sound open water benthos surveys of 1994 and 1998.

Continue to monitor selected tributary stations for benthos.

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A scatter plot showing the relationship between Axis 1 and Axis 2. The x-axis (Axis 1) ranges from -1.5 to 1.5, and the y-axis (Axis 2) ranges from -2.5 to 2.0. The plot includes several data series:

- Reference:** Represented by blue open circles, forming a large cloud of points.
- 1994 Sites:** Represented by red solid squares. Labeled points include 552/94, 547/94, 562/94, 559/94, 527/94, 529/94, 523/94, and 554/94.
- 1998 Sites:** Represented by green solid diamonds. Labeled points include 552/98, 553/98, 559/98, 561/98, 529/98, 553/98, 554/98, 561/98, 547/98, 527/98, and 502/98.
- Confidence Limits:** Two concentric blue ellipses are drawn around the data, labeled "90, 99% confidence limits".

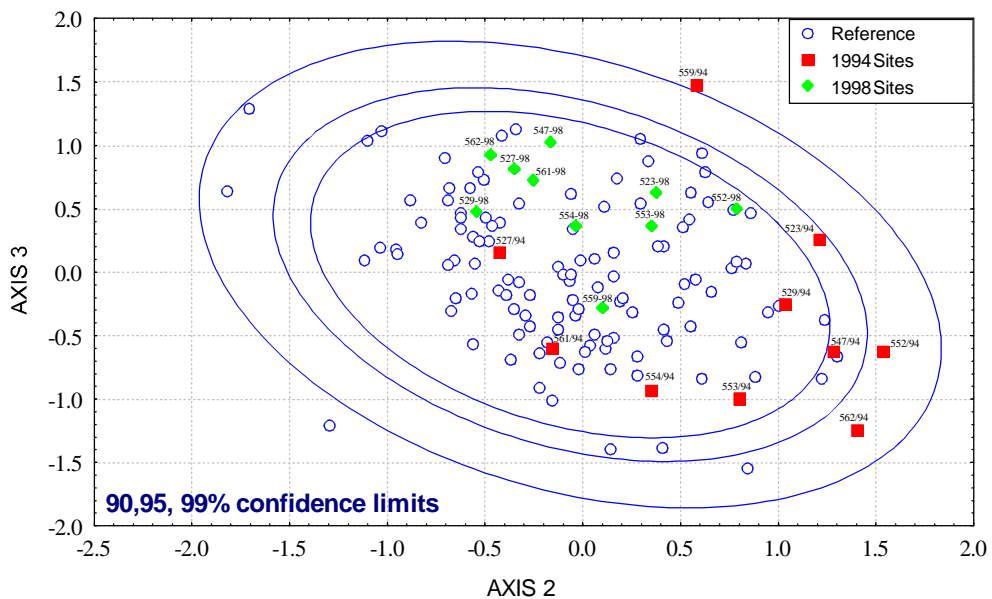
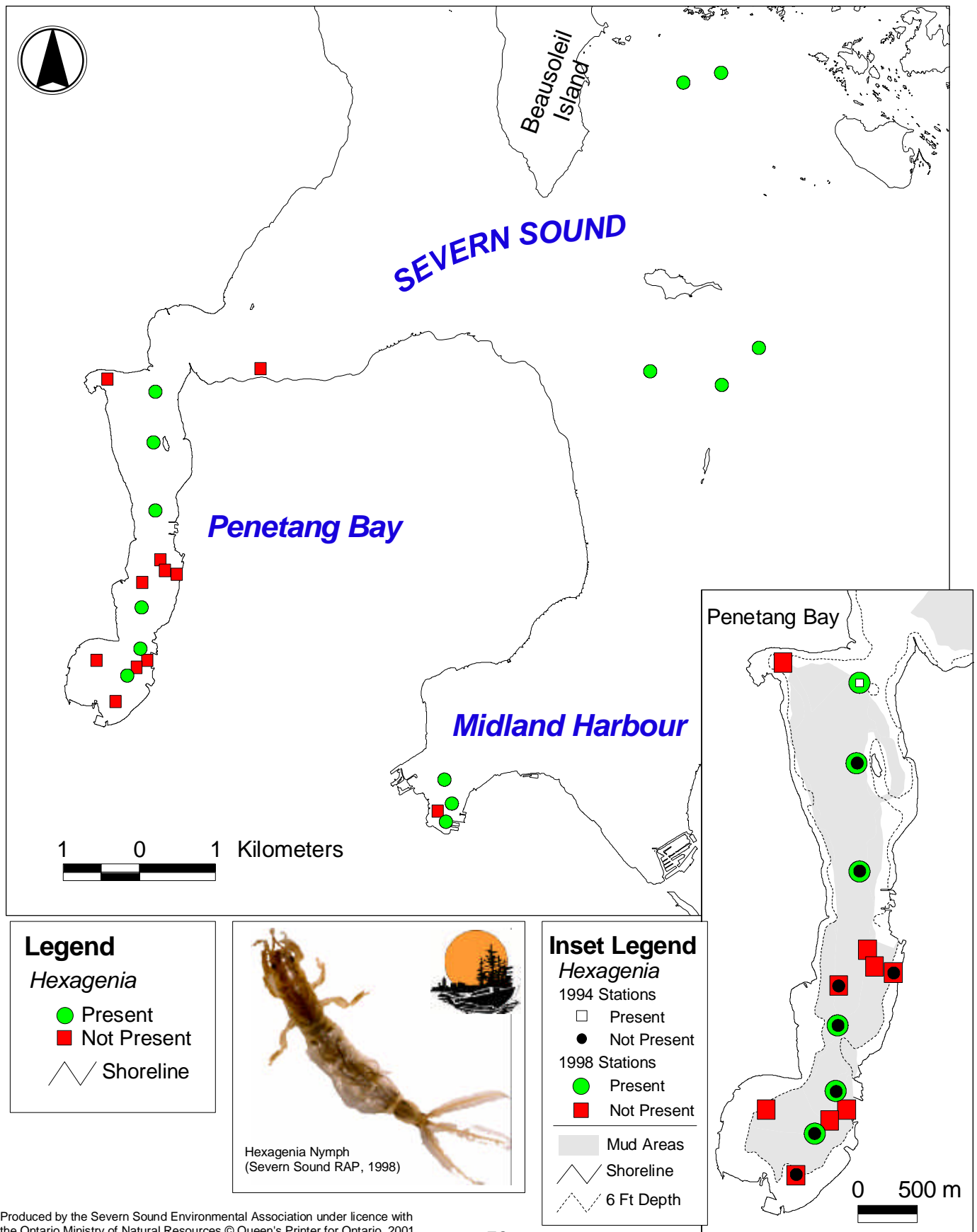
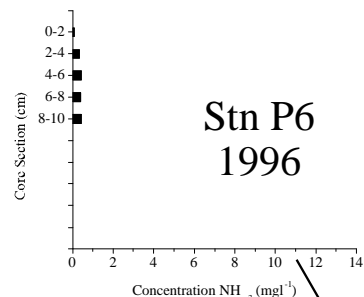
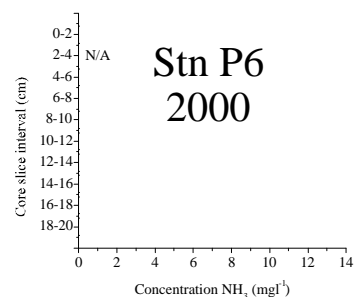
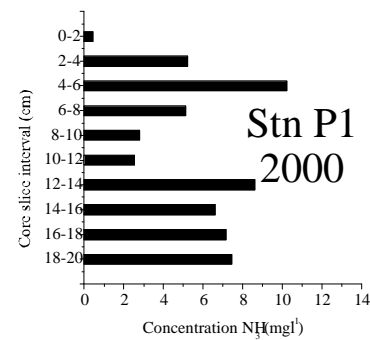
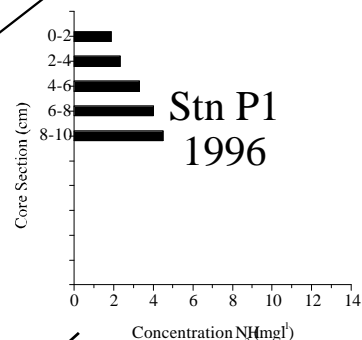
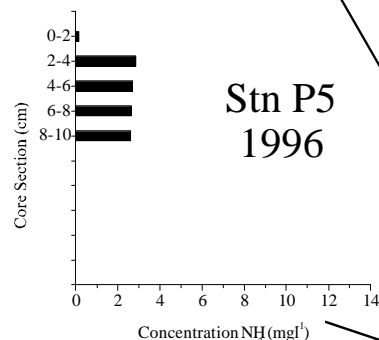
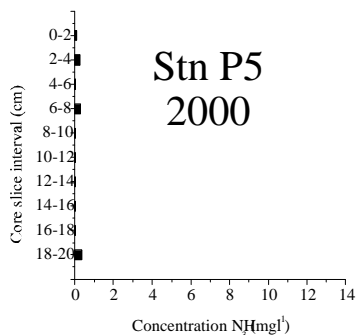
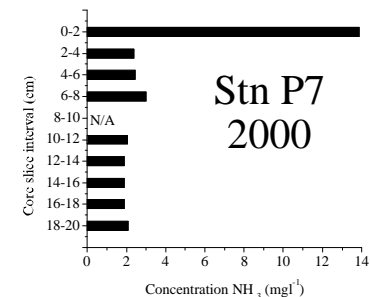
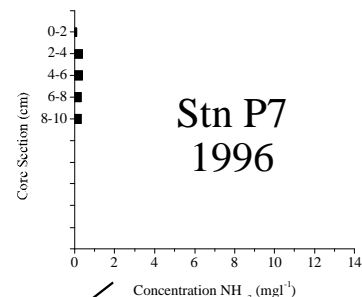


Figure 3.6.2 Distribution of Hexagenia Nymphs 1994 and 1998

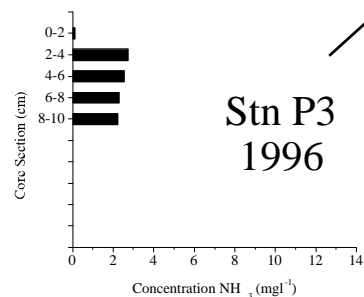
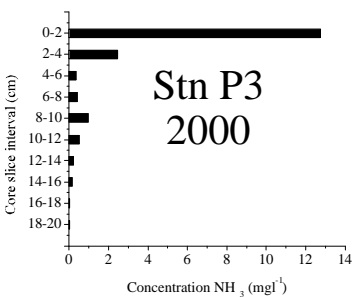
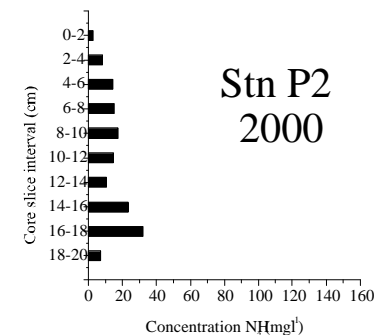
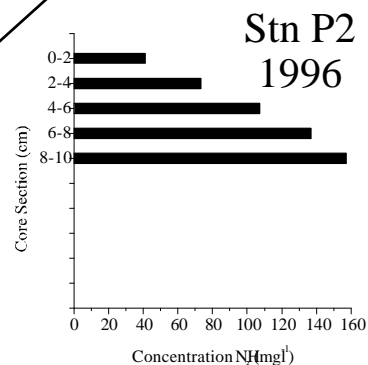
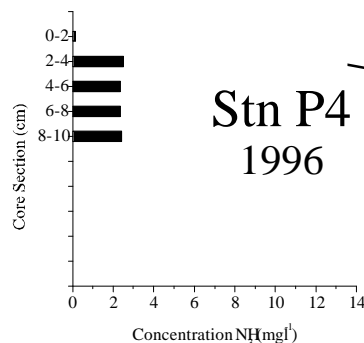




**Figure 3.6.3
Penetanguishene
Harbour
1996/2000
Ammonia**

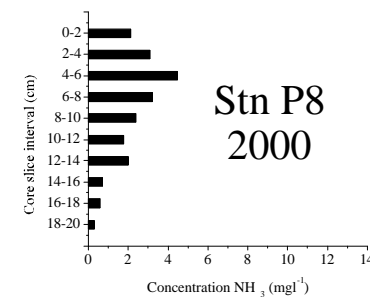
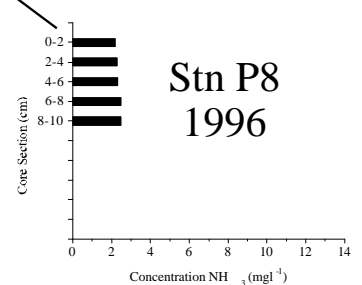


Stn P4 2000
insufficient sediment
for analyses



**NB: Scale on
graph P2!**

Source: Charleton et al. in prep.



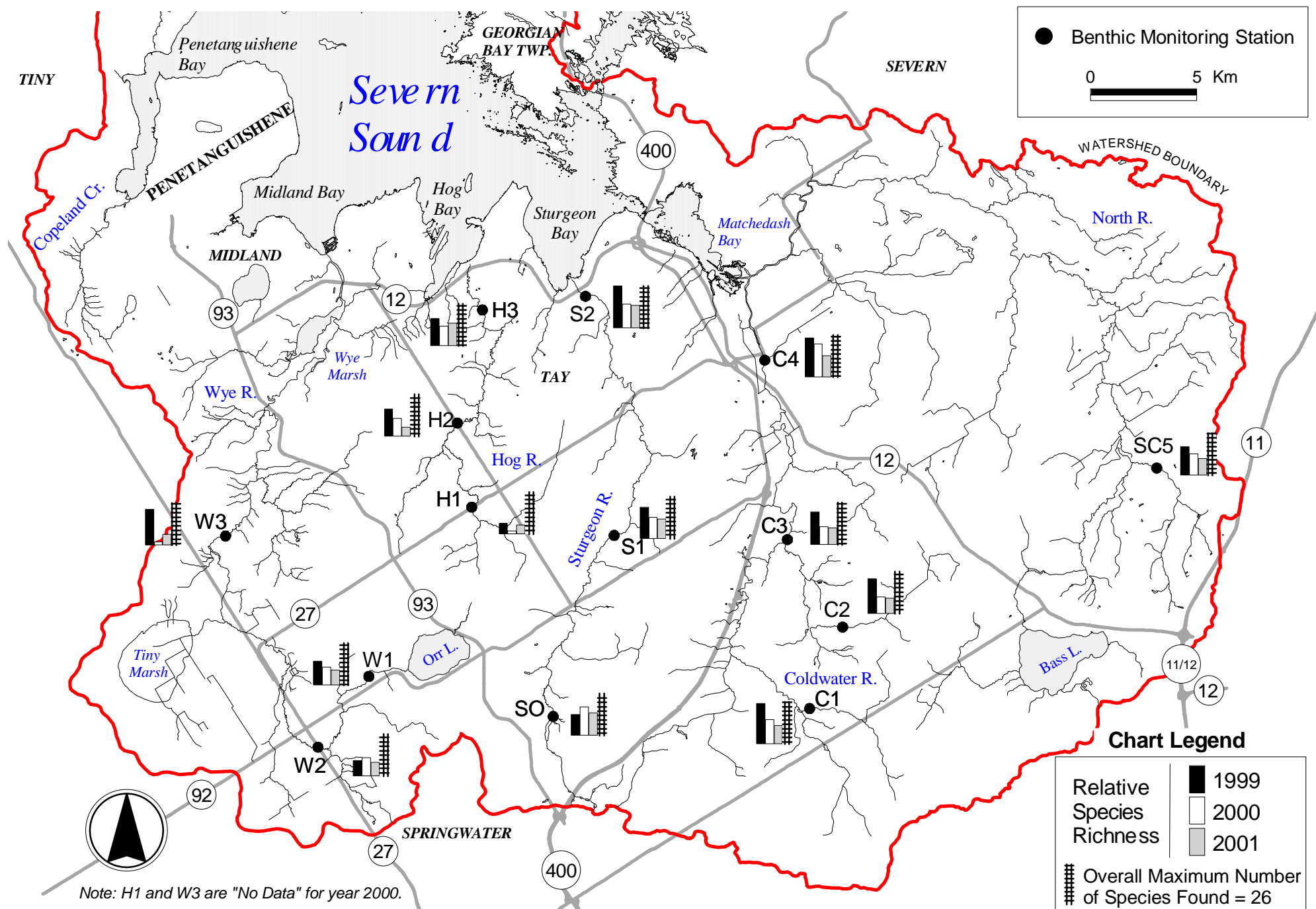


Figure 3.6.4 Long Term Benthic Monitoring Stations in the Severn Sound Watershed

vii) Restrictions on dredging activities

Delisting Objective:

To meet biological and chemical guidelines for sediment quality such that there are no restrictions on dredging or disposal activities attributable to polluted sediments.

Rationale:

The Provincial Sediment Quality Guidelines (Persaud et al. 1993) and the guidance document by Jaagumagi and Persaud (1996) provide a rationale for assessing an area that may be contaminated prior to dredging proposals being carried out. The first phase of the assessment is to determine sediment quality of bulk sediments to be dredged and compare the levels found to the Sediment Quality Guidelines. If sediment bulk quality exceeds the Severe Effect Level then additional assessment of the sediment in that location is required including assessing potential for uptake into biota and toxicity of the sediment to appropriate sensitive indicators. The open water deposition areas of Severn Sound were sampled and bioassessment was carried out on the “worst-case” locations - those with fine organically rich “mud” (Krantzberg and Sherman 1995). Many of the same concerns for uptake by sport fish and other indicators of contaminants have been considered for the use impairment i. “***Restrictions on fish and wildlife consumption***” (see above).

Restrictions on dredging for the protection of fish habitat have also been put in place by the DFO and MNR. Mitigation of adverse effects involves timing the work to avoid fish spawning and nursery periods and measures to control the release of sediment to the surrounding waters.

Indicators used in Severn Sound:

1. Provincial Sediment Quality Guidelines (PSQGs, Persaud et al. 1993) were used to assess bulk sediment quality of surficial sediment from the deposition areas of Severn Sound.
2. Bioassessment protocols of Bedard et al. (1992) were used as outlined in Krantzberg and Sherman (1995). In addition, the guidance document by Jaagumagi and Persaud (1996) was considered with respect to the use impairment.
3. Benthic invertebrate community structure was also determined as part of the assessment of sediment toxicity. (Reynoldson and Day 1998, Ciborowski et al. 2001).
4. The presence of active sources of contaminants was addressed under ***Restrictions on Consumption*** (see above).

Current Status:

Dredging for small craft (or pleasure craft) navigational purposes is carried out at marinas and mooring basins and at their approaches in the nearshore of Severn Sound. The shallow nature of

the small craft navigation channel leading to the Trent Severn Waterway at Port Severn and the channels leading to bays in the Honey Harbour area could be the subject of maintenance dredging projects. There is also occasional removal of logs or rocks that are obstructing the small craft navigational channels. There are currently no requirements for navigational dredging of the commercial port facilities in Midland Harbour. In Severn Sound, routine upland disposal for small scale dredging operations is practised with the applicant responsible for assessing the waste quality prior to dredging.

In general, contaminant levels in Severn Sound open water deposition sediments were near or below the Lowest Effect Level (LEL) of the guidelines (Table 3.1.2). Polychlorinated biphenyls (PCBs) were generally below detection (<20 ng/g d.w.) or found at trace concentrations in urban areas (Severn Sound RAP 1993). At some locations especially in Penetang Bay the Severe Effect Level for some metals was exceeded due to the fine-grained, nutrient-enriched nature of sediments and due to historical industrial sources (Krantzberg and Sherman 1995). However, following bioassessment, no significant toxicity effects were noted even at "worst-case" sites. In addition, the sites were of a depth that dredging for small craft navigation would not be necessary. The assessment (Krantzberg and Sherman 1995) concluded that remedial action was not necessary at the open water locations sampled in the Area of Concern.

Contaminant levels at other locations may exceed Guidelines due to the fine-grained, nutrient-enriched nature of sediments in embayments. The normal disposal practice for dredged material continues to be dry land disposal with the applicant responsible for assessing the waste quality prior to disposal. Localized conditions of sediment contamination could exist in nearshore areas not covered in the open water sampling (eg. outfall off the industrial operation). If dredging is proposed, these areas should be assessed for sediment quality prior to the work on a case-by-case basis. Since upland disposal for small scale dredging operations is practised this impairment is no longer considered to apply to Severn Sound.

Ongoing Actions:

Continued review of dredging projects through agreement between DFO and SSEA

References:

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Persaud, D., Jaagumagi, R. and Hayton, A. 1993. Guidelines for the protection and management of aquatic sediment quality in Ontario. Report of the Ontario Ministry of the Environment ISBN 0-7778-9248-7.

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viii) eutrophication

Delisting Objectives:

OPEN WATER QUALITY

1. *The ice-free mean total phosphorus concentration in the open waters of Severn Sound should be less than 15 ug/L and 20 ug/L in Penetang Bay.*
2. *The ice-free euphotic zone phytoplankton density, as indicated by chlorophyll *a*, should be less than 5 ug/L and 7 ug/L.*
3. *Water clarity as indicated by mean ice-free Secchi disc should be greater than 3m.*
4. *Rooted aquatic plant distribution in Penetang Bay should increase by 30%. Other areas of Severn Sound should maintain the same coverage.*
5. *Minimum bottom water dissolved oxygen concentration should be greater than 5 mg/L unless the shape of the lake bed results in a natural localized oxygen depletion (eg. North Bay).*

SOURCES

1. *Sewage plants in the Severn Sound AOC are to meet effluent total phosphorus concentrations and loading objectives outlined in the Severn Sound RAP Stage 2 Report (Table 4.1).*
2. *Sewage bypassing and combined sewer overflows to be virtually eliminated.*
3. *Urban stormwater discharges to be decreased by 20%.*
4. *Watershed inputs to Severn Sound should have total phosphorus concentrations of less than 0.030 ug.L and loadings decreased by 20%.*
5. *Private sewage systems to be upgraded where faulty or substandard.*

Rationale:

OPEN WATER

Cultural eutrophication has affected Severn Sound, including Penetang Bay, since the 1960s (Veal and Michalski 1971). Problems associated with eutrophication such as nuisance algal growths and changing fish communities have adversely affected recreational uses of the Sound despite efforts at improvement of treated sewage effluents (Nicholls et al. 1988, Severn Sound RAP 1993).

Phosphorus, especially from high concentration sources such as sewage plants, has been identified as a key nutrient controlling the growth of phytoplankton in Penetang Bay as in many areas of the Great Lakes and inland waters (Nicholls and Heintsch, 1992; Nicholls et al. 1977). Relationships have been described between phytoplankton biomass and total phosphorus concentration in nearshore areas of the Great Lakes (Nicholls et al. 1986; 1988). Reductions in open water phosphorus concentrations through source control can be expected to reduce

phytoplankton biomass, reduce nuisance algae conditions and to change trophic status of open water (Nicholls et al. 1988, Dillon et al. 1996, Sherman and Brown 1995).

The open water quality objectives for Severn Sound are based on trophic state indicators associated with a mesotrophic or moderately enriched water body (Dillon et al. 1986). The improved clarity expected in the relatively shallow Penetang Bay following nutrient loading reduction, was expected to result in a 30% increase in the area of the lake bed exposed to sufficient light penetration for submerged aquatic plant growth. Trophic state information from other ecosystem components such as phytoplankton, zooplankton and benthos provide other important indicators of trophic status (see Sections vi and xiii).

Phosphorus in the watersheds draining to Severn Sound represents both a source of nutrient to the Sound and a measure of enrichment of the stream itself. Control of phosphorus concentration in the streams flowing to Severn Sound is aimed at improvement in the quality of the stream during low flow or base flow periods (approximately 90% of the time). During the higher flow events such as spring freshet and other storm events it is expected that total phosphorus concentration will increase with erosional runoff and will represent a major portion of the phosphorus load from the watershed to the Sound. The watershed remedial actions in Severn Sound relate to controlling discharges that influence the stream quality during low flow and also lead to reduced loadings. The Provincial Water Quality Objectives (MOE 1994) indicate that to eliminate excessive plant growth in rivers and streams total phosphorus should be below 30 ug/L. This objective was considered to be a mean.

Indicators used in Severn Sound:

OPEN WATER

A long-term open water monitoring program has been used in Severn Sound since 1973 to collect samples at a series of open water stations representing various bays within Severn Sound (Severn Sound RAP 1993). Euphotic zone composite water samples are collected for chemistry including total phosphorus and Chlorophyll a as well as phytoplankton. Profiles of temperature and dissolved oxygen are also taken using a YSI meter. The sampling program collects samples on a biweekly basis through the ice-free period of the year (May to October) at approximately 10 stations. The long-term sampling program has been maintained at five of these stations.

TRIBUTARIES

A flow weighted sampling program (more samples during higher flows with a minimum of bi-weekly) for long-term stations in the Severn Sound watershed selected to represent river mouth quality and in-stream quality. Samples are collected as grab samples for chemistry including total phosphorus. Flow stations operated by Environment Canada are used to estimate loads and to determine low flow sample dates.

Current Status:

Through the 1990s, phosphorus loading reductions at sewage treatment plants serving the Severn Sound area were accomplished through plant upgrades and optimization of plant operation. Starting in 1994, phosphorus loading from the two sewage plants discharging to Penetang Bay decreased dramatically from 1039 kg/yr in 1989 to 93 Kg/yr in 1997 (Table 3.8.1). Declines in phosphorus loading were significantly related to annual mean total phosphorus concentration in Penetang Bay. Annual mean total phosphorus concentration decreased from 41 ug/L in 1989 to 17 ug/L in 1997 (Figure 3.8.1). A decline in open water total phosphorus concentration was observed from 1989 to 1997 with fluctuations at a new lower concentration at Station P1. Open water trophic indicators (TP, chlorophyll *a*, Secchi disc visibility) are now being met (see Figures 3.8.1, 3.8.2, 3.8.3) following substantial completion of source control. However, there is possible confounding of improvements due to phosphorus control with zebra mussel infestation.

The Severn Sound RAP called for phosphorus source control based on trophic status prior to the infestation of zebra mussels. The same indicators of trophic status change from phosphorus control (open water total phosphorus, chlorophyll *a*, phytoplankton biovolume, zooplankton) have also been shown in other areas of the Great Lakes to be influenced by zebra mussel infestation. In order to separate these effects we examined the relationship between total phosphorus concentration and phosphorus loadings to Penetang Bay and chlorophyll *a* concentration in the open waters of the Bay. The relationship between total phosphorus and chlorophyll *a* prior to 1994 (before zebra mussel infestation) was compared to the same relationship for the period 1994 to 2001 (after zebra mussel infestation). Figure 3.8.4 shows that the regression lines for the two periods are not significantly different. This suggests that zebra mussels are not influencing the former trophic relationship between total phosphorus and chlorophyll *a* established prior to infestation (Gemza 1995, Sherman and Brown 1995). In order to test this assumption we examined the relationship between an independent variable relating to trophic status and chlorophyll *a* concentration. The sewage treatment plant (STP) loads were the most significant controllable source of phosphorus to Penetang Bay and represented an independent predictor of algal biomass. The relationship between STP phosphorus load and chlorophyll *a* (Figure 3.8.5) was used to predict what conditions would be like in the absence of zebra mussels in comparison with measured conditions with zebra mussels, similar to the approach of Nicholls et al. 1993. The modelling seems to show that even if zebra mussels were not present, the phosphorus levels would be reduced and the delisting objective would be met. The model must still be evaluated. Severn Sound is changing from the classical eutrophic state of the late 80's to a mesotrophic status.

Ongoing Action:

Continuation of annual monitoring program is proposed to confirm improvements. Continued source control in watersheds and in urban areas. Stream monitoring should continue to determine trends.

References

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- Todd and Sherman in prep. Recent changes in phytoplankton corresponding with nutrient load reductions and zebra mussel establishment, Penetang Bay, Severn Sound, Georgian Bay. Technical Report in prep.

**Table 3.8.1 Annual Total Phosphorus Loads
from Main St and Fox St WPCPs***

	Main+Fox TP Load (kg/y)	Mean Bay TP (ug/L)	Mean Bay Chl (ug/L)	Mean Bay phyto (um3/ml)
1973	1380.2	30	4.9	
1974	996.0	25	2.9	
1975	1058.0	23	6.5	
1976	1210.4	26	6.4	
1977	1461.0	24	3.5	
1978	1481.5	24	7.0	
1979	1500.0	22	8.6	
1980	1160.0	24	10.8	
1981	1089.3	33	6.2	
1982	809.1	21	4.4	2.502
1983	919.7	20	4.3	2.829
1984	828.3	19	6.6	4.079
1985	668.7	17	7.0	3.932
1986	730.3	19	7.8	6.005
1987	1008.4	18	7.0	5.713
1988	1179.7	22	10.6	3.434
1989	1422.8	24	8.7	5.594
1990	723.6	20	8.9	4.032
1991	999.4	22	7.0	3.421
1992	974.9	19	4.5	1.706
1993	792.4	17	5.1	2.802
1994	530.5	17	4.9	2.720
1995	142.0	14	4.7	2.131
1996	72.1	10	2.6	1.264
1997	93.1	11	2.3	1.033
1998	80.2	12	3.6	0.725
1999	131.1	14	3.4	0.711
2000	126.5	11	3.0	0.563
2001		12	2.8	

Figure 3.8.1 Monitoring trends of mean ice-free total Phosphorus concentration (ug/L)

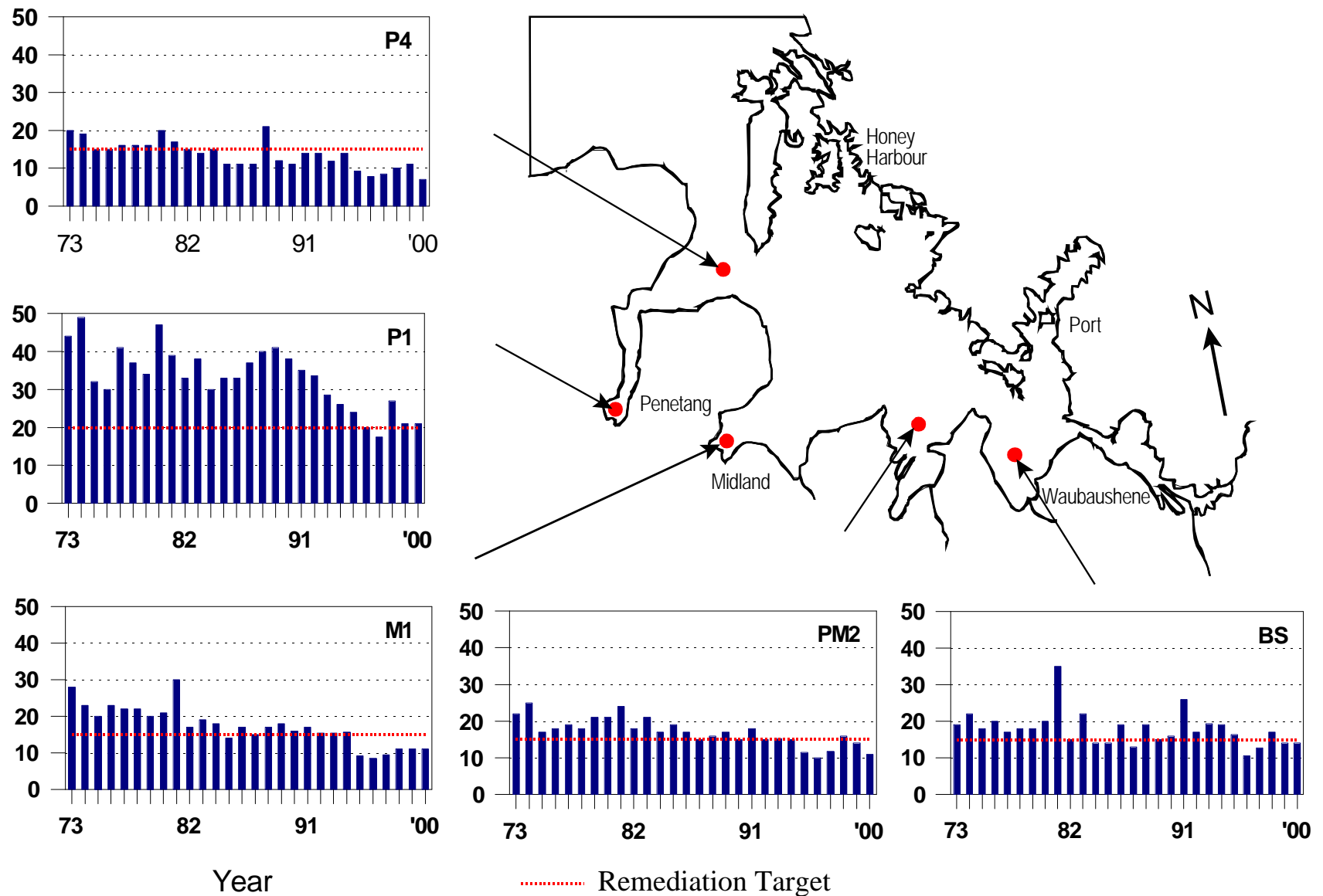
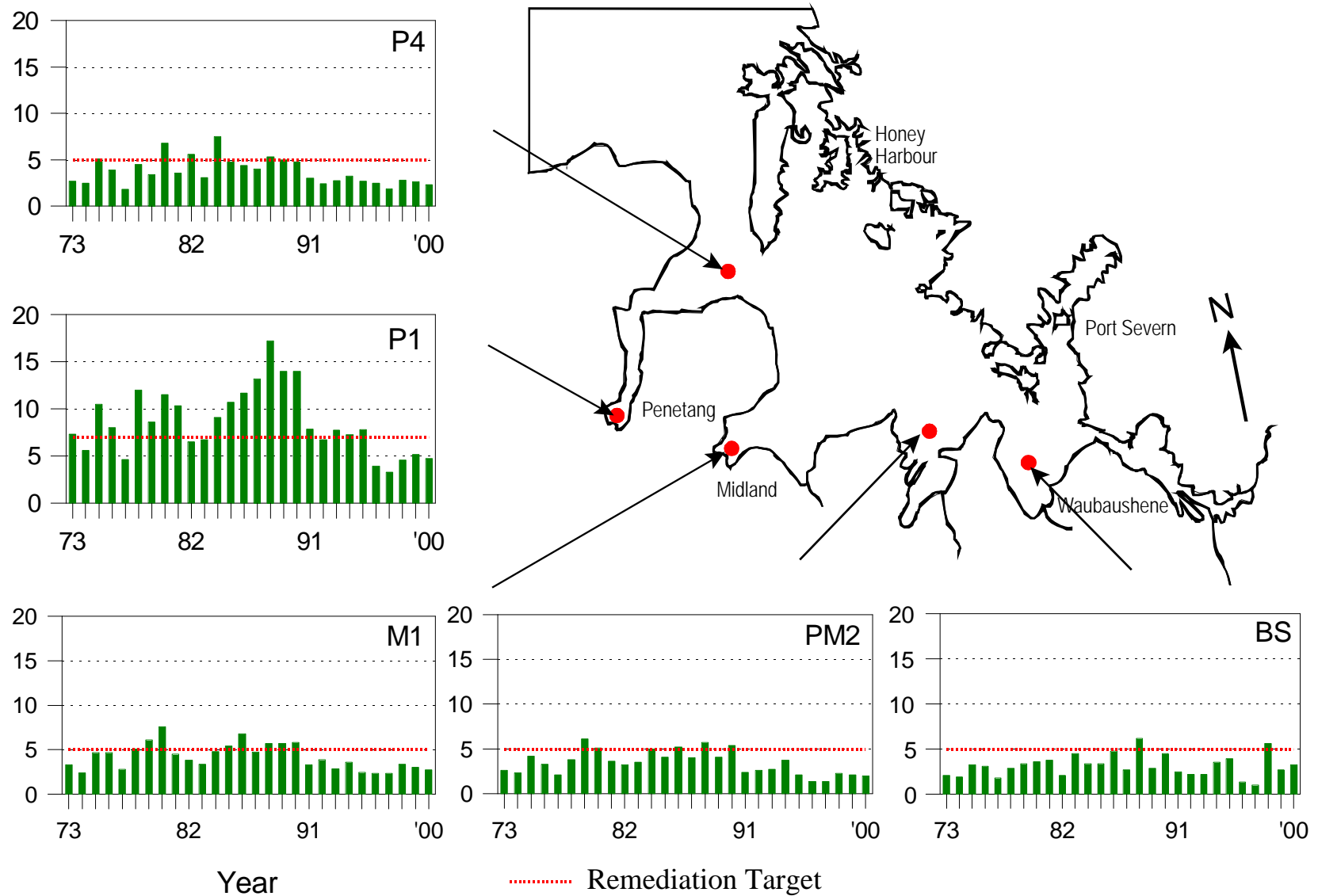


Figure 3.8.2 Monitoring trends of mean ice-free chlorophyll a concentration (ug/L)



**Figure 3.8.3 Monitoring trends of mean ice-free
Secchi disk visibility (m)**

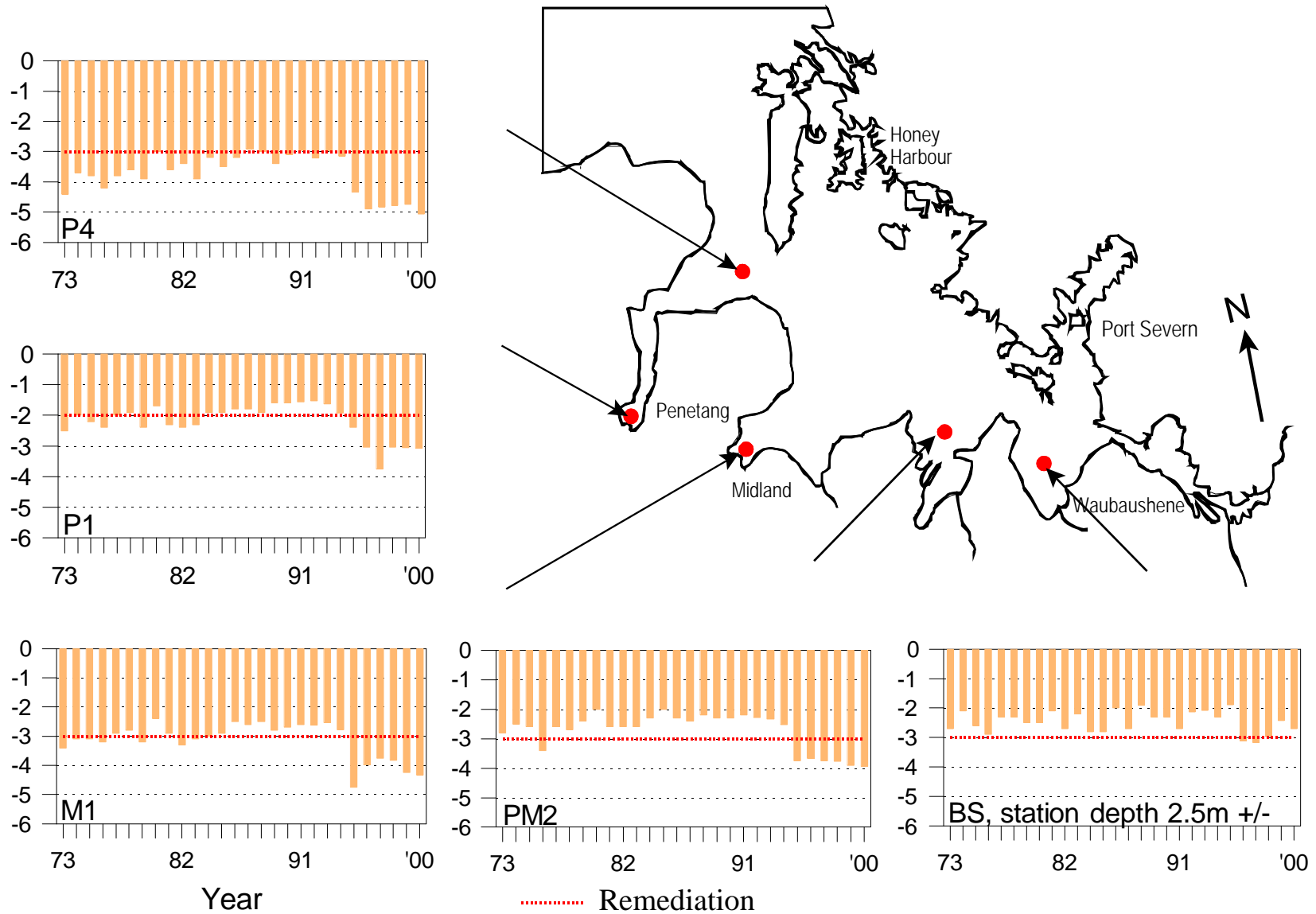
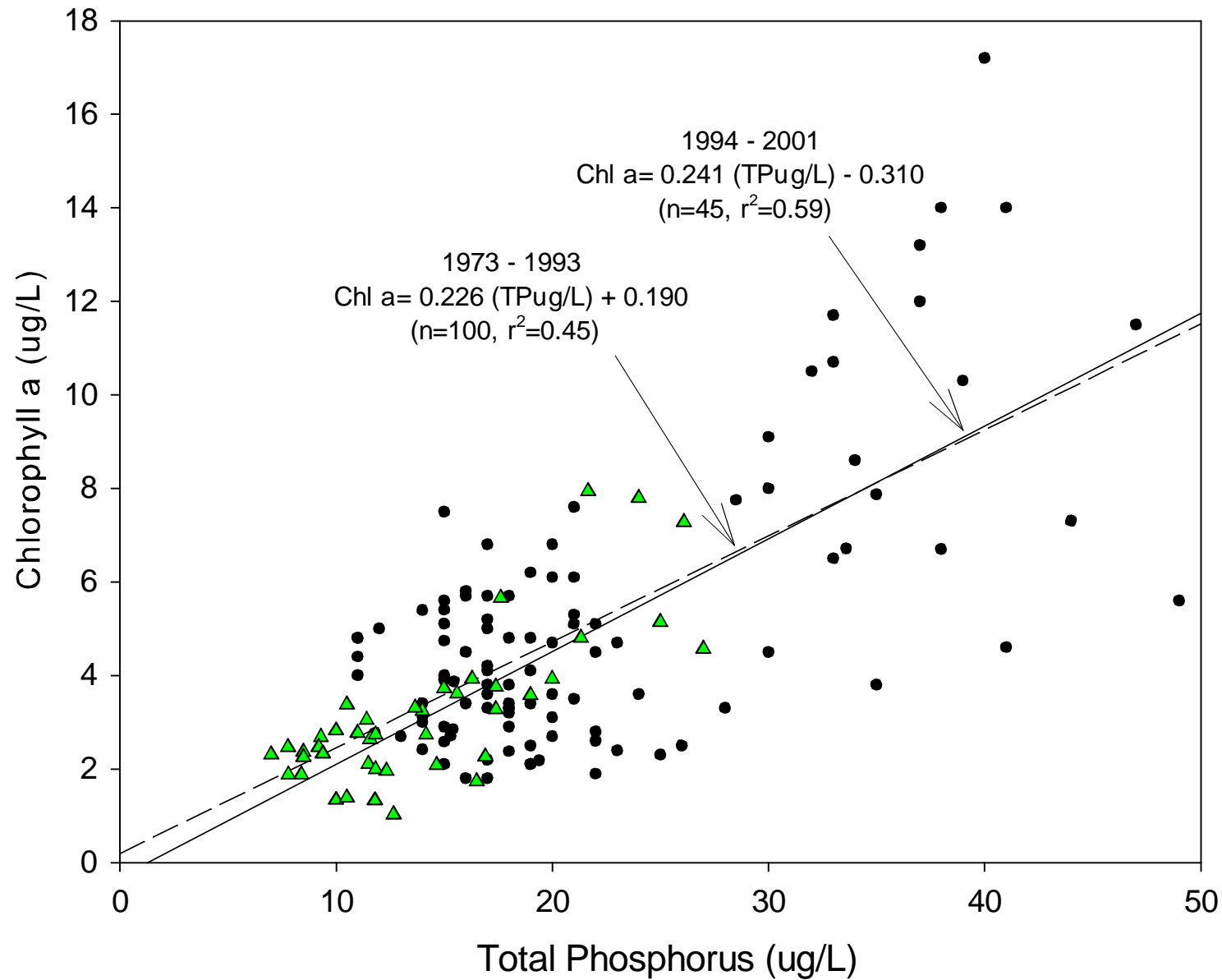
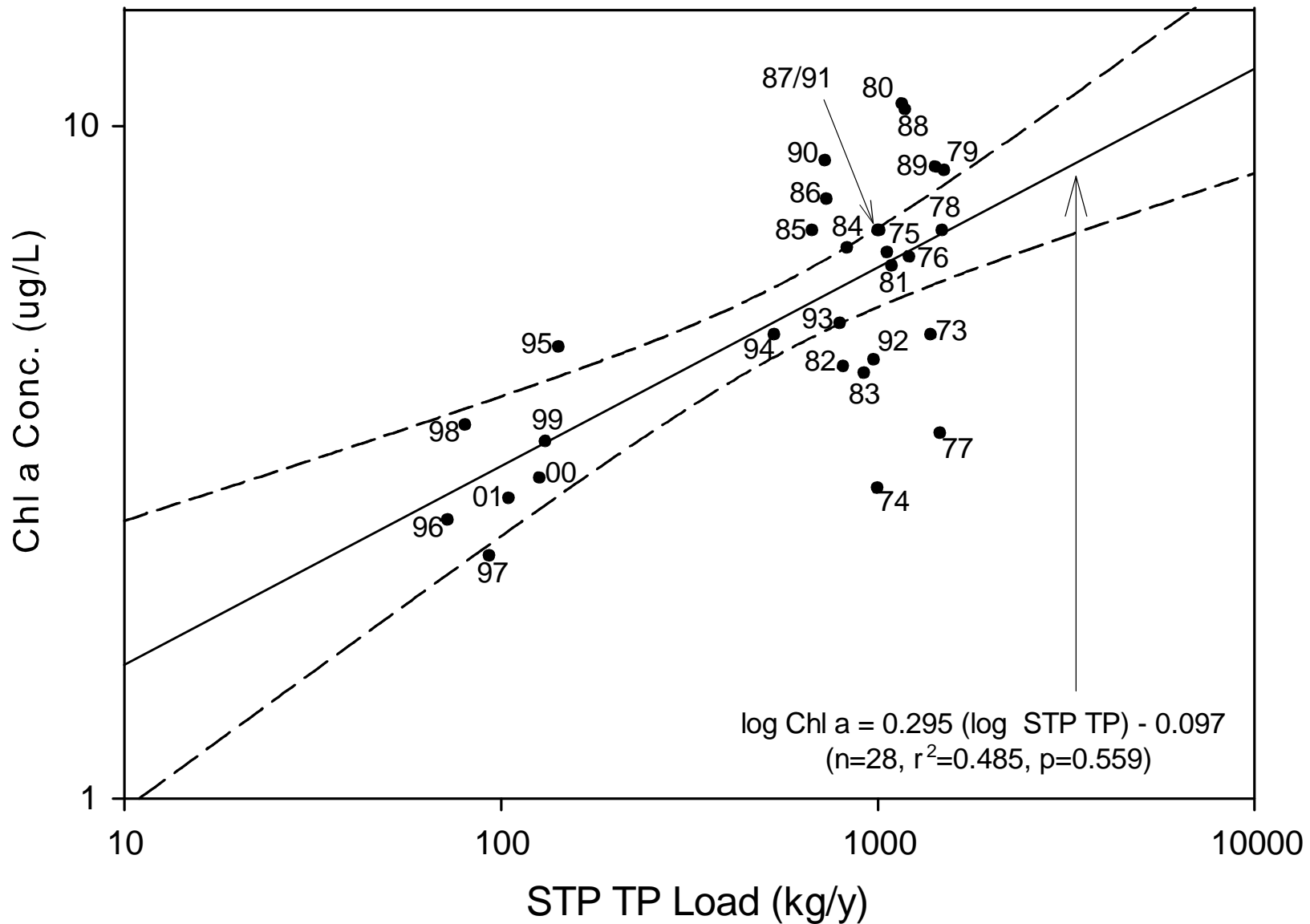


Figure 3.8.4 Mean ice-free chlorophyll a and total phosphorus at stations P1, P4, M1, PM2 and BS in Severn Sound



**Figure 3.8.5 Penetang Bay before and after zebra mussel infestation
mean ice-free chlorophyll a concentration vs. Phosphorus load
annual Sewage Treatment Plant total**



ix) Restrictions on drinking water consumption or taste and odour problems

Ongoing monitoring of surface water supplies by the operating authorities indicates acceptable drinking water quality. This use impairment did not apply to surface water supplies in Severn Sound at the time of preparation of the Severn Sound Stage 2 Report and remains unimpaired provided adequate treatment is practised.

x) Beach closings

Delisting Objective:

To swim virtually anywhere in Severn Sound (water use goal of the Severn Sound RAP)

To meet current provincial objectives for water clarity, pH and bacteria indicator (E.Coli):

Geometric mean E. Coli density: <100 org./100ml.

Secchi disk visibility: >1.2m

Algae densities: <5ug/L (mean ice-free period as chlorophyll)

Rationale:

The rationale for assessing the bacteriological quality of swimming areas has been outlined in the Beach Management Protocol (Ministry of Health 1992) and in the Provincial Water Quality Objectives (Ministry of the Environment and Energy 1994). These guidelines and objectives recognize E.coli as the most suitable and specific bacteriological indicator of fecal contamination.

The Beach Management Protocol recognizes that recreational quality of swimming areas may also be adversely affected by several other factors:

- the presence of potential sources of contamination such as discharges of streams urban stormwater, sewage treatment bypasses, combined sewer overflows, waterfowl or bather load
- the presence of hazardous or infectious materials or conditions that may produce abnormal physiological responses in humans (high temperatures, pH outside the range of 6.5-8.5)
- the presence of nuisance algae, especially blooms of blue-green algae
- poor water clarity that results in inability to see to the bottom in the swimming area in a depth of less than 1.2 m.

Monitoring has been carried out by the Parks Canada, Health Unit, municipal and SSRAP staff since 1987. Aesthetic conditions were monitored as part of the SSRAP open water monitoring program and in response to complaints over nuisance algae.

Indicators used in Severn Sound:

1. Geometric mean of E.coli samples taken according to Health Unit Protocol
2. Aesthetic conditions due to algae densities > 5ug/L chlorophyll - leading to matting of hair, bad odour and poor water clarity for safety (<1.2 m SDV)
3. Consideration of sources of bacterial contamination (urban storm discharges, non-point sources in streams discharging near swimming areas, pleasure craft discharges) impinging on swimming areas

Current Status:

The quality for swimming has met the Provincial Objectives at the majority of swimming areas monitored in Severn Sound over the past twelve years (Mayrand et al. 2001, Figure 3.10.1, Table 3.10.1). Aesthetic conditions due to nuisance algae growths have improved in Penetanguishene Bay and other areas so that impairment due to nuisance algae and poor clarity has been restored. Attached algae and zebra mussels have recently (since 1994) made wading aesthetically undesirable along some shorelines of Severn Sound.

The relationships between factors influencing bacteria counts in embayments at more remote areas such as Beausoleil Island and Honey Harbour swimming areas were investigated by Bilyea and Sherman (1990). The degree of shelter from the wind (or fetch) was inversely related to the geometric mean bacteria count. Since some of the sheltered embayments receive significant pleasure boat use, and little other use, pleasure boat discharges may be adversely influencing the quality of these bays in the north shore of the Area of Concern (Beak 1989, Seyfried, et al. 1997; Schieffer 1999, 2000, 2001). Monitoring of four poor exchange bays by Parks Canada staff from 1997 to 2000 has shown less than 2% of sampling days exceeded a geometric mean of 100 orgs./100ml (Mayrand et al. 2001).

The Coldwater River wharf is not considered a typical swimming area in Severn Sound as it is downstream of the community of Coldwater in a slow moving portion of the Coldwater River. Despite postings by the Township of Severn and repeated warnings by samplers, children continue to use the wharf as a “swimming hole.” It is unlikely that the site will ever meet the Provincial Objectives for more than 50% of the sampling days, even with pristine upstream conditions in the River. Monitoring at the wharf from 1998 to 2000 has shown 91% of sampling days exceeded a geometric mean of 100 orgs./100ml (Mayrand et al. 2001). It should be noted that the Coldwater River has typical bacteria quality to that of other streams draining to Severn Sound from the south.

The subwatershed draining to the vicinity of Pete Pettersen Park was investigated as part of the SSRAP Urban Stormwater Strategy (Mattson, et al. 2000). Urban stormwater was shown to impinge on the beach during a rain event. Modelling indicated that a storm of greater than 20 mm would result in high counts impinging on the beach within two hours following the onset of rain. The urban stormwater discharge could have also been augmented by the effect of the sailing club mooring basin that receives the discharge prior to the beach. Routine beach

monitoring of this swimming area from 1997 to 2000 has shown 9% of sampling occasions exceeded a geometric mean of 100 orgs./100 ml (Mayrand et al. 2001). Should the time-of-travel from the stormwater discharge to the beach be increased by channelizing the water course entering the Sailing Club, the impingement of water with elevated bacteria on the beach is expected to worsen, possibly causing increased exceedance of the objective. It is recommended that a stormwater treatment facility be implemented in the Vinden Street catchment to extend time-of-travel and to provide treatment through settling prior to discharge to the Sailing Club mooring basin.

The GFC campground beach will occasionally be impinged by the discharge of Hogg Creek which contains rural runoff and elevated bacteria counts especially during rain events (Cayley 1996). Source control within the watershed is ongoing. However, even a fully naturalized stream discharges could carry elevated E.coli counts to adjacent swimming areas on occasion (Riedel et al. 1997). Monitoring from 1997 to 2000 has shown 22% of sampling occasions exceeded a geometric mean of 100 orgs./100 ml at this swimming area (Mayrand et al. 2001).

The following recent postings have been made:

- All swimming areas in Georgian Bay Islands National Park (Beausoleil Island) are posted “swim at own risk.” Monitoring of the most sheltered embayments continues to have results that meet the Provincial Objectives. Swimming is encouraged at YMCA Camps on the Island.
- The wharf downstream of Coldwater is posted “No Swimming Contaminated Water” by Township of Severn.
- Pete Pettersen Park’s beach was posted on two occasions during the summer of 2000 at the request of the Health Unit. This means that the routine, weekly geometric mean E.coli for 5 stations, and subsequent re-sampling within 24 hours, exceeded 100 orgs./100 ml for the area.

Riedel et al. (1997) point out that bacterial quality due to a combination of the above-mentioned factors can result in occasional exceedances of the geometric mean E.coli at swimming areas. In Severn Sound, the weekly monitoring can result in occasional exceedances at about 5 to 10% of the sampling dates. The quality of the swimming areas within Severn Sound was generally satisfactory with respect to the Provincial Protocol. Exceptions are sheltered swimming areas receiving occasional discharges of urban storm water or areas influenced by stream discharges that may have elevated levels of fecal contamination. Provided the identified problem areas are addressed in continued management actions, the overall quality of swimming areas in Severn Sound is acceptable and the use delisting objectives can be considered to have been met.

Ongoing Actions:

Public wharf downstream of Coldwater

- continued non-point source control in Coldwater River watershed
- continued urban storm water and sewage bypass control in community of Coldwater

Pete Pettersen Park

- urban stormwater treatment facility in the Vinden Street catchment (called for as part of the SSRAP Urban Stormwater Strategy) to aid in protecting the Pete Petterson Park swimming area
- repair and maintenance of the reservoir area (an area upstream of the Park that retains flow in a small watershed upstream of the Park).

GFC Campground

- continued non-point source control in Hogg Creek watershed - subwatershed planning should be considered for Hogg Creek.

Georgian Bay Islands National Park swimming areas

- information on the effect of pleasure craft discharges for education of boaters using sheltered, poor exchange Bays,
- inspections of pleasure craft sewage systems by MOE

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Table 3.10.1: Status of Index Swimming Areas in Severn Sound 1987-2000														
Swimming Area Name	Bacterial Water Quality (Number of sampling days the geometric mean exceeded 100 counts per 100 mL over the total number of days sampled)													
	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000

Wye River	Gawley Park	0/8	0/7	0/5	0/3	0/6	ND	0/5	0/12	0/13	ND	1/9	0/10	1/11	0/11
	Pettersen Park	ND	ND	ND	ND	0/4	0/2	0/7	2/12	1/13	3/14	1/10	0/10	0/11	3/13
	Patterson Park	1/9	1/6	0/5	1/4	1/3	0/1	3/7	2/12	0/13	0/2	0/9	1/10	0/11	0/11

Hog River	GFC Trailer Pk	5/7	1/6	1/4	0/5	0/3	ND	1/7	2/12	0/13	ND	3/10	3/11	1/11	3/14
	McKenzie Park	6/8	3/7	1/4	1/4	1/3	1/2	4/8	2/12	1/13	0/2	0/9	0/10	0/11	0/11

Sturgeon R	Waubashene	1/5	4/8	0/4	1/4	0/3	1/1	2/6	1/12	0/13	0/2	0/9	0/10	0/11	0/11
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Coldwater R	Coldwater Town Dock	ND	ND	ND	ND	ND	ND	6/6	10/10	13/13	ND	ND	11/11	11/11	8/11
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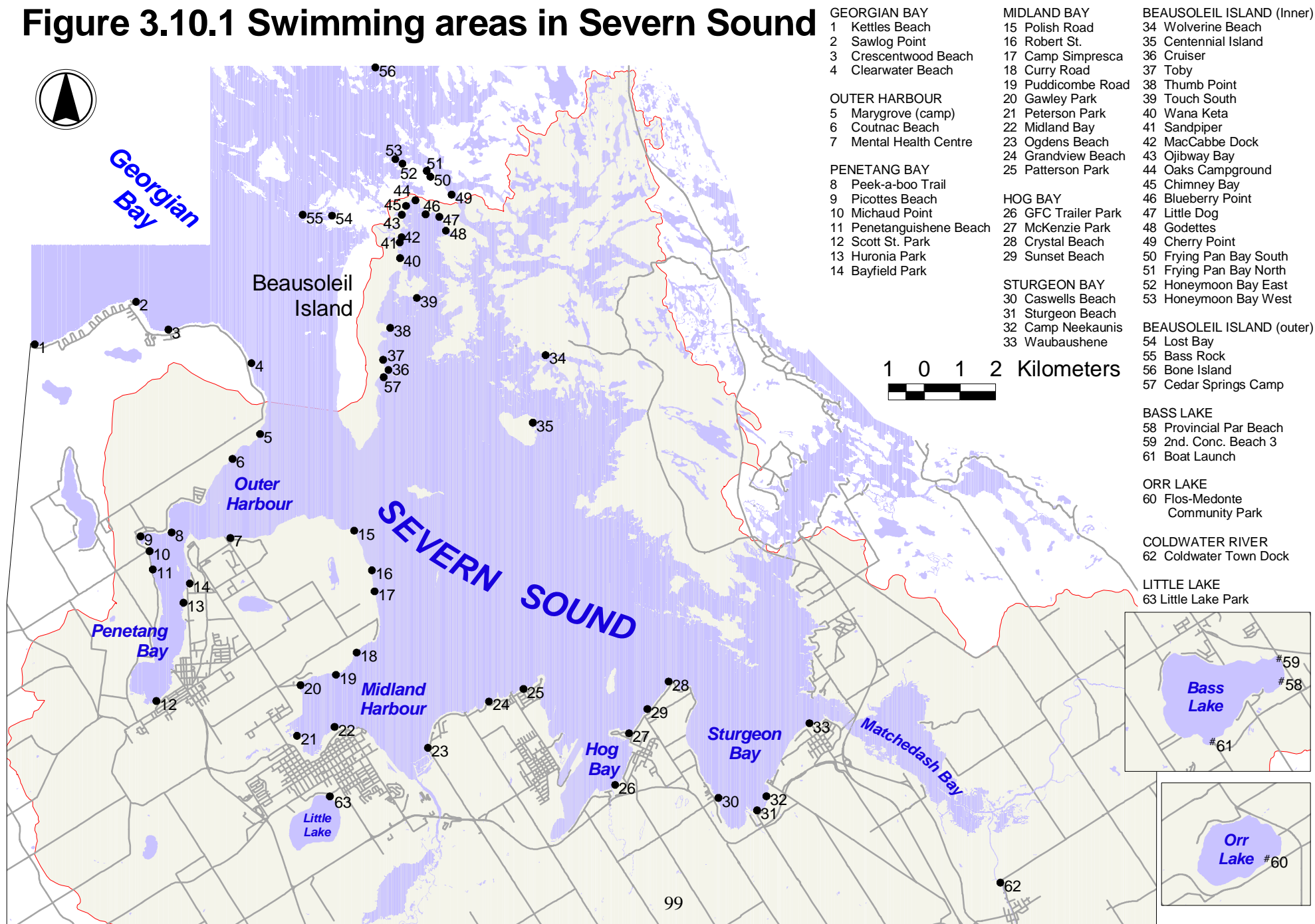
Penetang B	Waterfront Park	1/3	ND	ND	1/3	2/7	1/5	1/6	ND	0/6	1/3	0/5	0/4	1/8	0/4
	Huronian Park	0/3	ND	ND	0/3	0/7	0/5	0/6	ND	0/6	0/2	0/5	0/4	0/8	0/3
	Bayfield Park	0/3	ND	ND	1/3	0/7	0/5	2/6	ND	0/6	0/2	0/5	0/4	0/8	0/3

Beausoleil Is	Ojibwa Bay	4/4	1/4	6/9	14/30	15/37	4/26	1/29	1/30	1/27	1/19	0/21	1/19	0/20	0/9
	Chimney Bay	0/4	0/4	1/8	0/3	0/4	0/21	0/29	0/30	0/27	0/19	0/21	0/19	0/20	0/9
	Frying Pan Bay (north)	0/4	0/0	4/6	11/30	15/37	1/26	1/29	0/30	0/27	1/18	0/21	0/19	1/20	0/9
	Frying Pan Bay (south)	1/3	1/4	7/9	13/30	16/37	0/26	0/29	0/30	1/27	0/17	0/21	1/19	0/19	0/9
	Lost Bay	1/4	0/3	4/8	6/30	14/36	2/26	0/29	0/30	1/27	0/19	0/21	0/18	0/19	0/9

Bass Lake (North R)	Bass Lake Public Beach	ND	ND	ND	ND	ND	2/4	ND	0/5	0/5	1/3	0/13	1/3	0/11	0/11
	Bass Lake Boat Launch	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0/2	0/8	0/10
	Bass Lake Provincial Pk	ND	ND	ND	ND	ND	ND	ND	0/9	0/12	0/10	0/11	2/11	ND	0/9

Little Lake	Little Lake Park	ND	ND	ND	ND	1/13	2/9	0/10	0/6	1/4	0/4	0/5	0/10	0/9	3/10
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Figure 3.10.1 Swimming areas in Severn Sound



xi) Degradation of aesthetics

Delisting Objective:

Algae density less than 5 ug/L Chlorophyll a reduces incidence of algae blooms.

Rationale:

Experience with water quality complaints and studies of mean algae density in relation to algae bloom formation and nuisance algae conditions (Nicholls, et al. 1978; Dillon et al. 1986) suggest that mean algae densities of less than 5 ug/L will provide reasonable protection from nuisance algae conditions. An algae density of 5 ug/L or higher is generally found to interfere with swimmers' expectations for aesthetic quality (based on experience with complaints of swimmers). Severe algae growths can cause turbidity that interferes with safe swimming by reducing water clarity to less than 1.2 m Secchi disc visibility (MOEE 1994). The reduction of phosphorus loads to Severn Sound has been pursued in order to reduce open water total phosphorus concentration and nuisance algae conditions associated with eutrophication.

Indicators used in Severn Sound:

Monitoring of algal community, chlorophyll a concentration, water clarity based on Secchi disc visibility as well as observations of bloom conditions have been used to monitor the status of this impairment.

Current Status:

The incidence of season-long algae blooms has been eliminated through phosphorus loading reduction, especially in Penetang Bay. The chlorophyll a concentration throughout Severn Sound is less than 5 ug/L (see above Figure 3.8.2). Occasional blue-green blooms are reported for short periods (maximum of one week) in late summer to early fall. These blooms, although noticeable to the naked eye, do not significantly increase the mean chlorophyll a concentration so as to exceed 5 ug/L. Aesthetic problems related to turbidity caused by the growths have improved such that the objective for safe swimming conditions (Secchi disc visibility greater than 1.2m) is now being met throughout Severn Sound.

The recent infestation of zebra mussels with associated attached filamentous algae in nearshore areas presents new aesthetic problems that are not related to the remedial action undertaken.

Ongoing Actions:

Continued monitoring of algal conditions through the SSEA.

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xii) Added costs to agriculture or industry

This use impairment does not apply to Severn Sound.

xiii) Degradation of phytoplankton and zooplankton**Delisting Objective:**

To ensure phytoplankton species and biovolume are representative of mesotrophic conditions and to have a balanced zooplankton community. (ie. more Daphnia)

Rationale:

In the Great Lakes, phytoplankton and zooplankton have been used to monitor ecosystem response to changes in physical conditions, nutrient concentrations, and trophic interactions (Nicholls and Hurley 1989, Mazumder 1994, Makarewicz et al. 1998). More specifically, phytoplankton have been used to assess the impacts of nutrient load reductions in eutrophic areas of the Great Lakes (Nicholls and Hopkins 1993, Gemza 1995, Millard et al. 1996).

Indicators used in Severn Sound:

Phytoplankton biovolume of euphotic zone composite samples were used in a biweekly

monitoring program at long-term stations in the open waters of Severn Sound from 1973 to the present (see Nicholls et al. 1977 for phytoplankton analytical procedure, see viii **Eutrophication** summary for sampling program).

Zooplankton were collected as vertical hauls through the water column at monitoring stations using a conical closing zooplankton net (Johannson et al. 1992, McQueen and Yan 1993). Samples were identified, enumerated and measured for biomass calculations using the ZEBRA software.

Current Status:

Overall phytoplankton biovolume has decreased to less than 1 mm³/L from peak values of 6 mm³/L in the late 1980s and early 1990s (Figure 3.13.1). The proportion of large diatoms, *Melosira* and *Stephanodiscus*, associated with nutrient enrichment has decreased since the early 1990s (Figure 3.13.2). However, the community structure may be influenced by selective filtration of zebra mussels. Increases in blue-green algae such as *Microcystis* spp. and increased shoreline complaints of filamentous algae such as *Mougeotia* and *Spirogyra* have been noted. The response of phytoplankton to changes in nutrient loadings is also being reduced further by zebra mussels. A model of predicting phytoplankton biovolume using inputs that are not confounded by zebra mussels (phosphorus loading and temperature) suggests that, the phosphorus control measures taken in Penetang Bay would result in the delisting objectives for open water trophic indicators would still be met in the absence of zebra mussels (Todd and Sherman in prep.). Response of phytoplankton in the south end of Penetang Bay was evident prior to zebra mussel infestation.

Zooplankton species richness has increased and biomass has declined since the early 1990s (Figure 3.13.3, 3.13.4). The predominant species *Bosmina longirostris*, which represented up to 75% of the total biomass in 1990, declined in abundance, biomass and in proportion of the total biomass (Figure 3.13.5). Daphnids are still scarce and represent a small proportion of the total community. Zebra mussel veliger larvae abundance has also declined in recent years at all stations (Figure 3.13.6).

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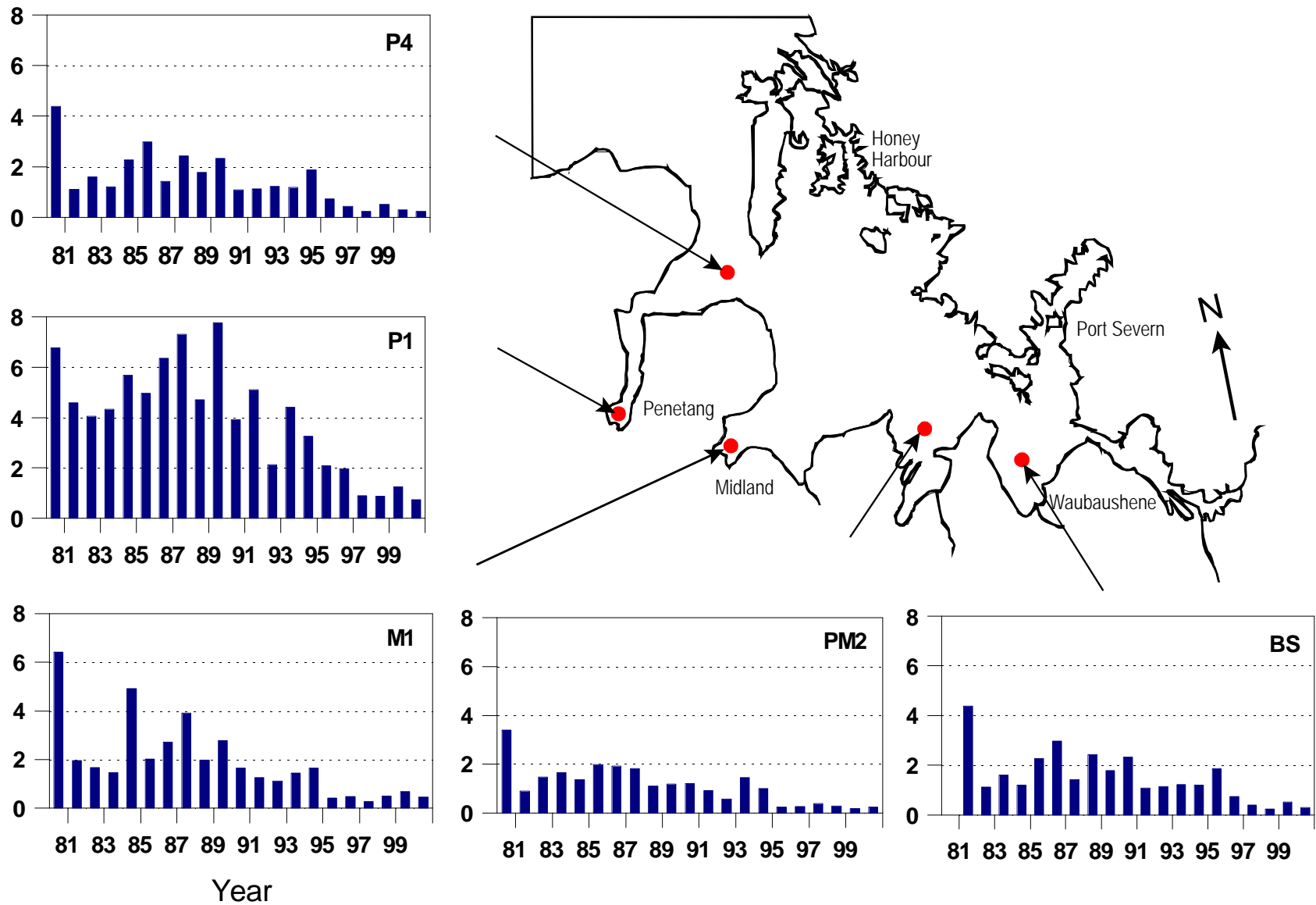
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Figure 3.13.1 Monitoring trends in phytoplankton biovolume (cubic microns per mL)



**Figure 3.13.2 Changes in two common diatoms
from Penetang Bay 1982 to 2000**

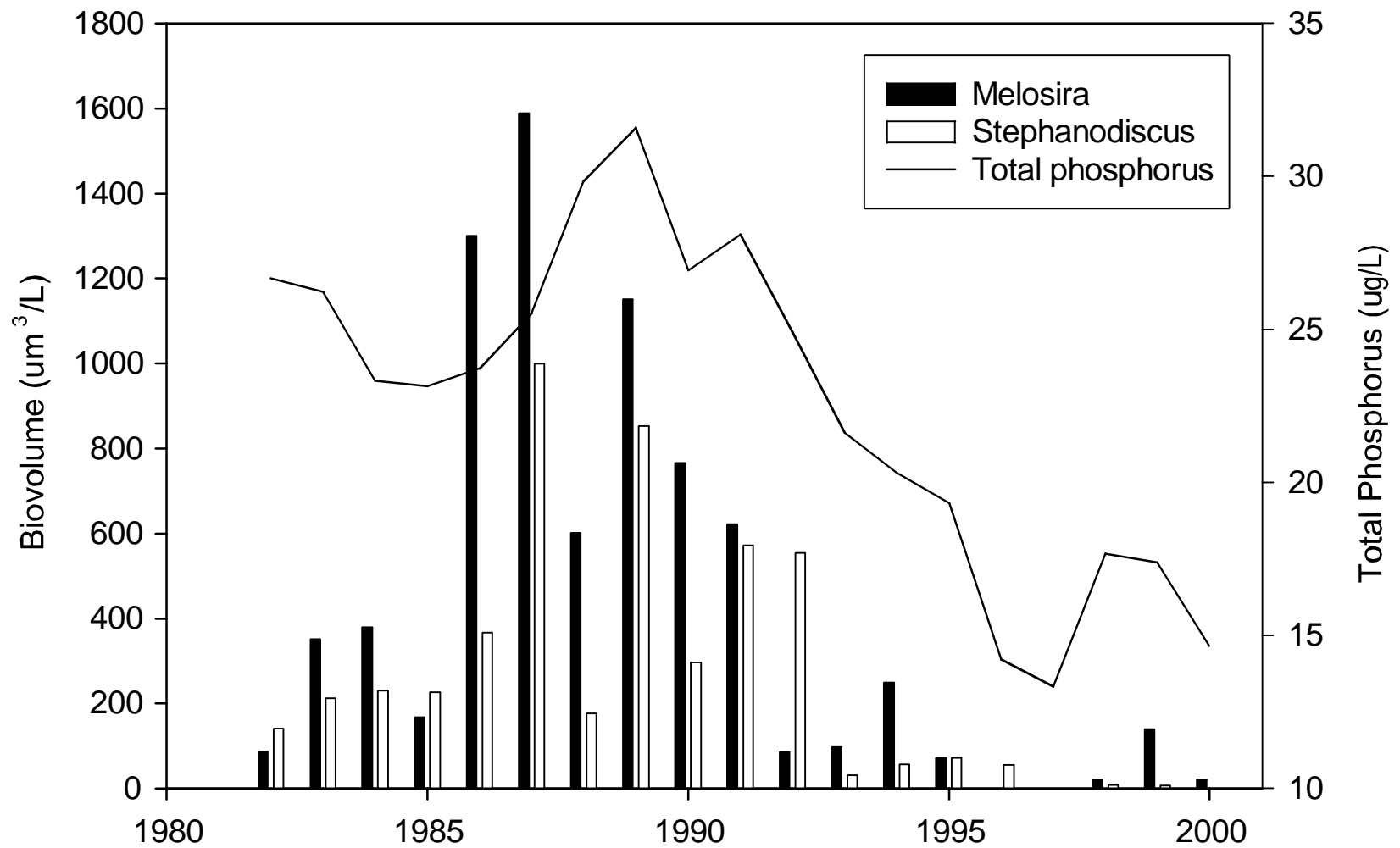


Figure 3.13.3 Ice-free mean zooplankton species richness

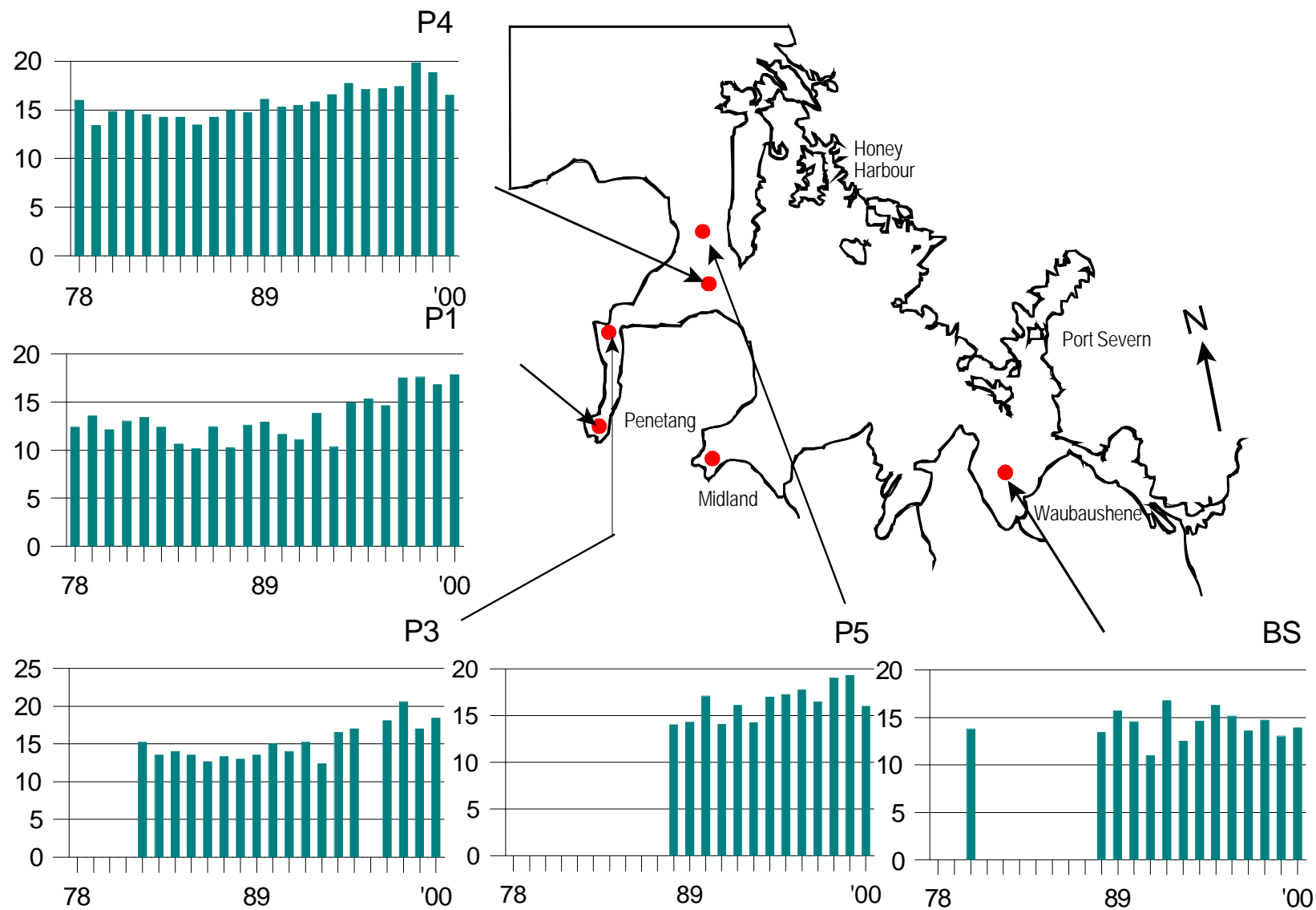


Figure 3.13.4 Biomass of major zooplankton groups

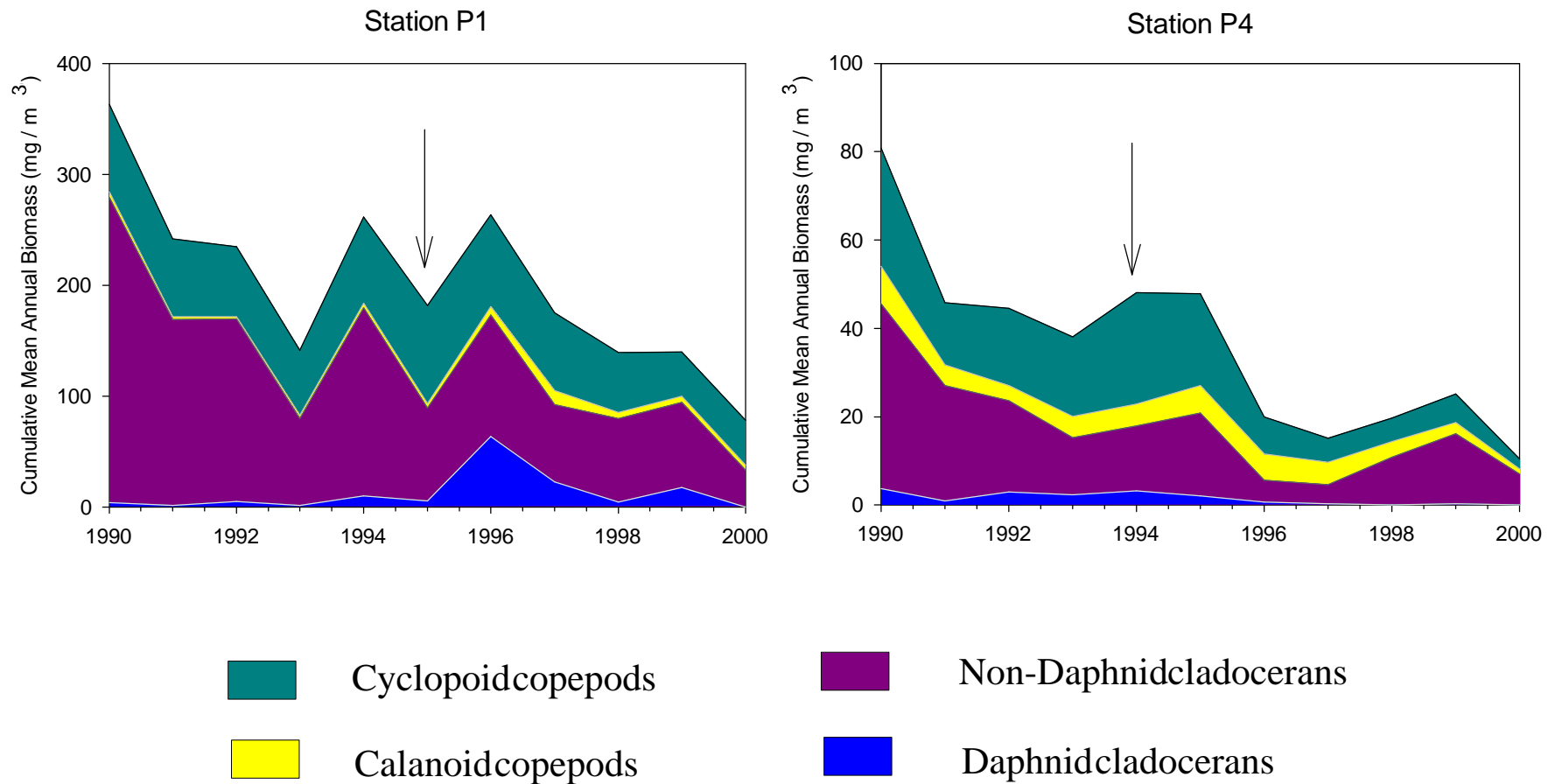
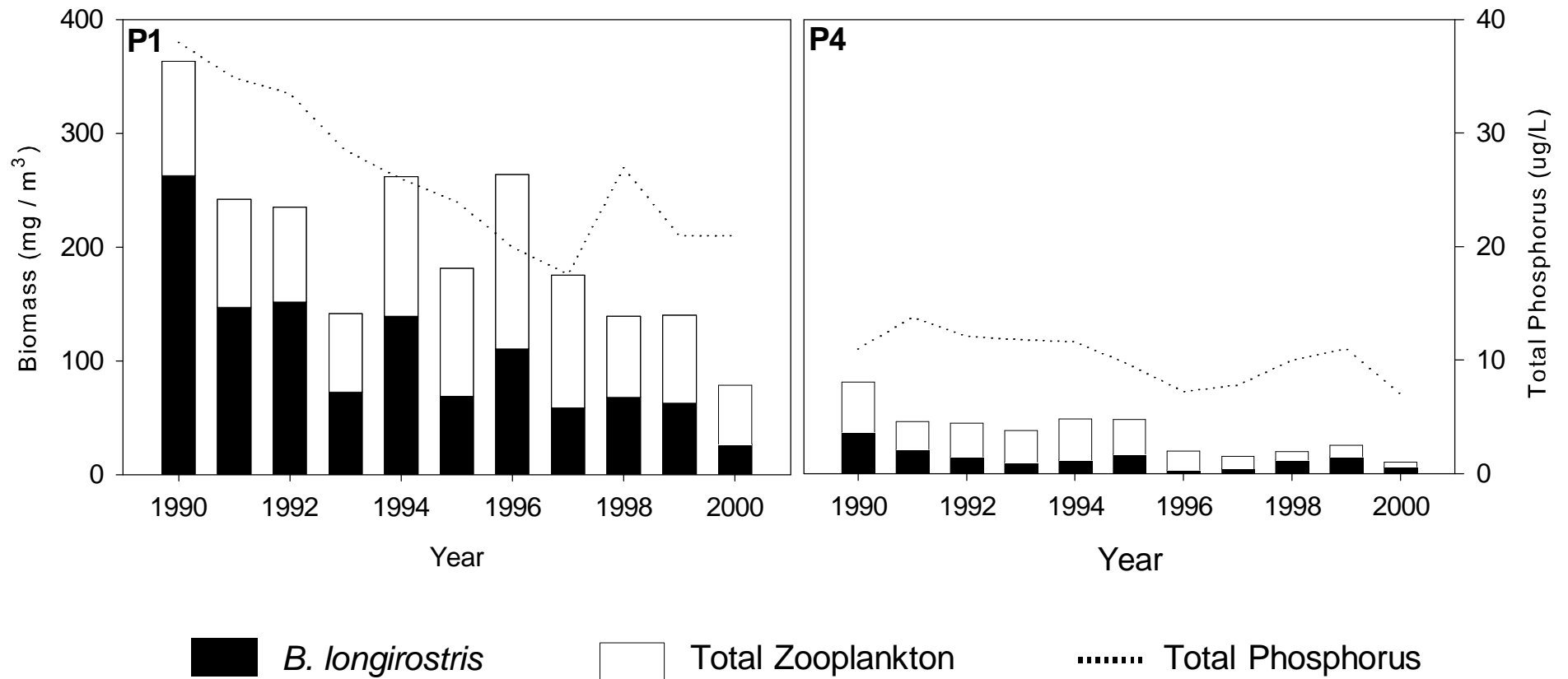
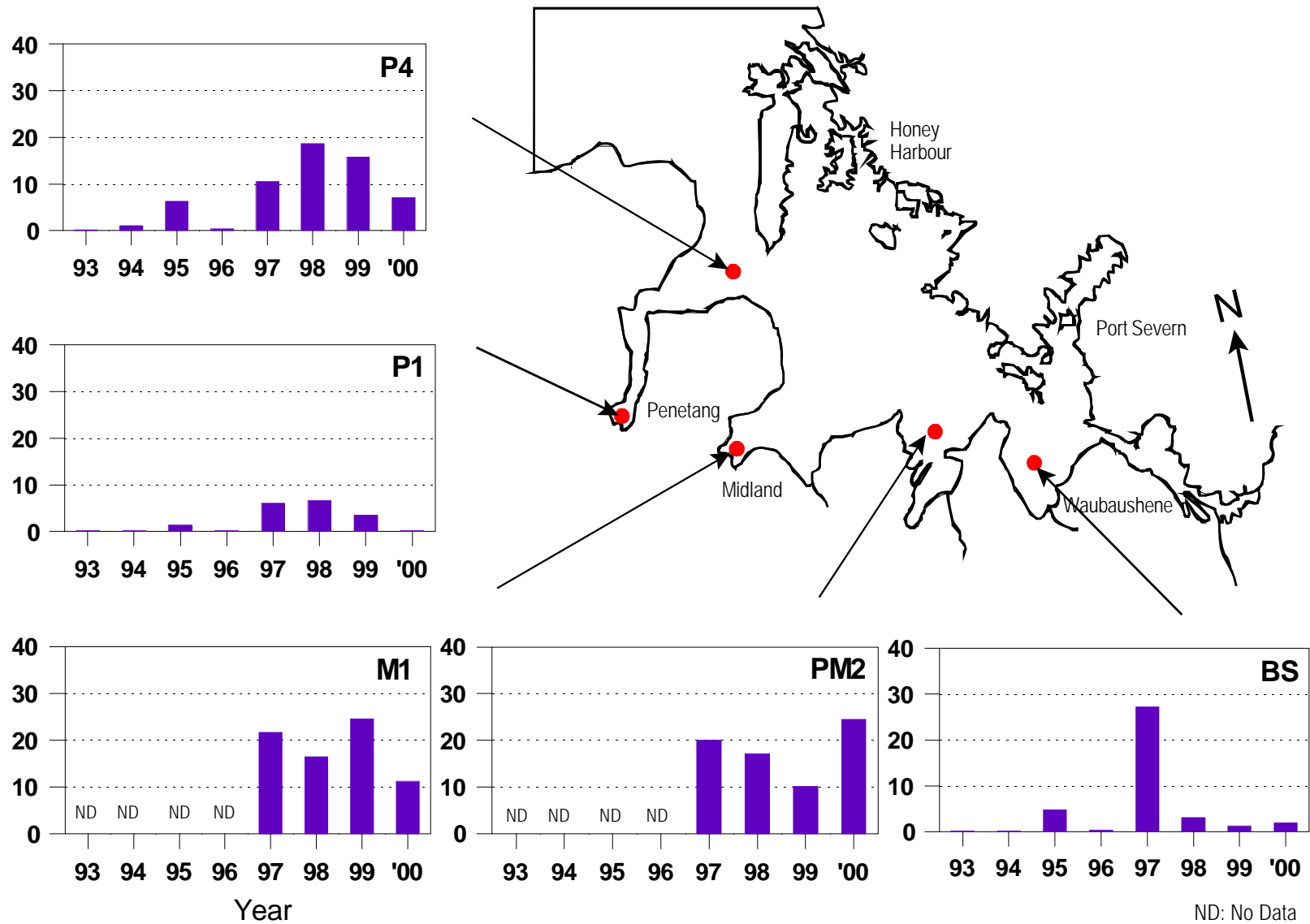


Figure 3.13.5 Biomass of *Bosmina longirostris* at two sites in Penetang Bay 1990 to 2000



**Figure 3.13.6 Ice-free density of
Dreissena veligers (# x 10³/m³)**



xiv) Degradation of fish and wildlife habitat

Delisting Objectives:

1. *To implement the Severn Sound Fish Habitat Management Plan and other policies to enhance and prevent the loss of fish and wildlife habitat.*
2. *To encourage the restoration of fish habitat in target areas by proponents of new shoreline development.*
3. *To develop plans for rehabilitation or development of new coastal wetland areas as opportunities arise.*
4. *As part of the Matchedash Bay project (NAWMP 1991), to:*
 - i) secure and manage 1715 ha of wildlife habitat*
 - ii) restore and develop 1427 ha of habitat for waterfowl and other wetland dependant wildlife*
 - iii) maintain and enhance 442 ha of habitat for staging waterfowl.*
5. *To rehabilitate tributaries and riparian areas for fish and wildlife habitats.*
6. *To maintain existing colonial waterbird nesting sites within and near Severn Sound.*
7. *To maintain and increase Osprey nesting sites within Severn Sound.*

Rationale:

The Severn Sound RAP Stage 2 Report identified that littoral and tributary habitat was important to the fish community of Severn Sound and that this habitat was degraded in several areas (SSRAP Stage 2 1993, SSRAP 1993). The sheltered littoral areas of Severn Sound, especially those with submerged aquatic plants, are considered essential to maintaining a healthy and productive fish community (Leslie and Timmins 1994 and 1997). Most fish species use the nearshore as spawning, nursery and feeding habitats, yet this is the area most often affected by filling, shoreline hardening, dock construction and beach clearing etc. The processes available to protect and enhance fish and wildlife habitat in the AOC involve providing technically defensible management plans and policies under federal and provincial legislation (Fisheries Act, Planning Act, Public Lands Act, etc.) and providing rehabilitation programs to restore and enhance degraded habitat on a site specific basis.

Since the Stage 2 Report was prepared, a Defensible Methods approach has been developed which combines a physical habitat inventory with a model to classify most of the littoral zone fish habitat suitability for different groupings and life stages of fish in Severn Sound (Minns, et al. 1999). In addition, the Habitat Framework Guidelines (Environment Canada, OOMNR and OMOE. 1998) were developed and evaluated in AOCs, including Severn Sound (Gartner Lee Ltd. 1997a, Gartner Lee Ltd. 1997b, Sherman and McPhail 2001, Tate 1998). These Guidelines provide a series of measures that can be used to evaluate upland, riparian and wetland habitat in an area.

Site specific initiatives within the Severn Sound area also provide specific indication of the restoration status of habitat of the AOC. The Eastern Habitat Joint Venture is conducting a large scale habitat protection and improvement project in Matchedash Bay (Tymoshuk and Martin-Downs 1990, NAWMP 1991). The Severn Sound RAP Tributary Rehabilitation Project and the Penetanguishene Shoreline and Wetland Restoration Projects are examples of initiatives that have led to the restoration of habitat.

Indicators used in Severn Sound:

1. The fish habitat classification model for the littoral areas of Severn Sound was developed by Minns et al. (1999) and replaces an interim classification contained in the Stage 2 Report. The model was evaluated using DFO fish community data collected between 1990 and 1995 by Randall et al. (1998). The evaluation found significant correlation between electrofishing catches and habitat suitability indices.
2. The Habitat Framework Guidelines (Environment Canada, OMNR and OMOE. 1998) provide the following restoration guidelines which have been applied to Severn Sound (Sherman and McPhail in prep.). The barriers to achieving these guidelines must be assessed to determine whether they are feasible for a particular subwatershed.

Upland Habitat

- a. percent forest cover >30% of watershed
- b. interior forest with 100m buffer >10%
- c. interior forest with 200m buffer >5%
- d. size of largest forest patch - at least one patch with a minimum of 200 ha, minimum of 500m across
- e. shape and proximity considerations for forest patches and corridors
- f. forest cover should represent full diversity of species composition and age structure found in ecoregion.

Riparian Habitat

- a. percent of stream naturally vegetated - at least 75% of first to third order streams
- b. amount of natural vegetation adjacent to streams - at least 75% of a 30m buffer of natural vegetation on both sides of the streams
- c. percent urbanized - >15% imperviousness in an urbanized watershed
- d. fish communities - based on fish community survey and temperature

Wetland Habitat

- a. percent wetlands in watershed and subwatersheds - >10% of each major watershed, >6% of each subwatershed or restore to original % wetlands
 - b. amount of natural vegetation adjacent - >240m width of adjacent natural vegetation (using adjacent forest cover in Severn Sound)
 - c. wetland type - marshes and swamps suitable for rehabilitation
 - d. wetland size and shape - swamps as large and regular as possible to maximize interior forest, marshes of various sizes with variable shape maximizing interspersed.
3. For specific initiatives within the Severn Sound area additional monitoring methods have been used to assess habitat in the area and status following restoration or enhancement

projects. The walleye spawning area at Port Severn has been enhanced by OMNR (latest modification fall of 2000).

Current Status:

Littoral Fish Habitat

Habitat Suitability was classified using physical habitat information collected from 1989 to 1994 for 343 km or 70% (11.8 km² to a depth of 1.5m) of the Severn Sound shoreline (based on a 1:10,000 scale).

High suitability habitat generally consisted of wide littoral areas with gradual slopes in sheltered areas with sand and silt substrate and high coverage of submergent vegetation and emergent vegetation. Medium suitability habitat was dominated by sand with some silt and pebble substrate and little vegetation. Low suitability habitat generally had steeper sloped littoral, exposed to wind and wave action, bedrock, cobble and bolder substrate with little vegetation. Of the shoreline classified, 39% was considered to have high suitability, 43% was considered medium suitability and 18% was considered low suitability. It should be noted that a small proportion of the shoreline (12 km or 4%) could not be inventoried for physical habitat due to vertical shore walls and pilings (i.e. lack of littoral) and was not classified. These areas are considered highly suitable for rehabilitation and the re-establishment of gradual littoral zones where possible as development proposals are made.

Wetland Habitat

The wetlands evaluated for adjacent natural vegetation included boundaries of provincially significant wetlands in the Severn Sound watershed (with upland "islands" removed) were merged with smaller unclassified wetlands from the OBM wetland layer. The percent wetland area guideline of 10% of watershed was not met with the exception of Sturgeon River and Wye River subwatersheds. The percent wetland area guideline of 6% for subwatersheds was generally met with the exception of Coldwater River (Table 3.14.1).

There was a general increase in mean width of vegetation adjacent to wetlands between 1982 and 1998. Significant decreases were noted in Bass Lake and Silver Creek due to increasing urbanization and, in Purbrook Creek due to an increase of pasture area.

Coastal wetland habitat has been rehabilitated in Penetang Bay, Midland Bay and Hog Bay. The trend in loss of coastal wetland habitat described by Cairns (in Severn Sound RAP 1993) has been greatly reduced through the 1990s. However, increasing pressure to develop shoreline areas, especially during current low water levels (1999, 2000, 2001) have lead to destruction of some areas of Provincially significant wetlands in Sturgeon Bay.

Ongoing implementation of the Matchedash Bay Project (NAWMP 1991) is proceeding by Ducks Unlimited and other partners and agencies

- (i). Securement - 1847 ha have been secured by purchase or by agreement to date

(ii). Restoration - 50 ha developed as Tiffaux Cell in 1992, 60 ha Brereton Cell completed in 1993, future cell planned near Coldwater of approximately 80 ha. Other habitat area restored or enhanced includes prairie tall grass areas, oak savanna, beaver ponds at Cowan site.

(iii). Staging Habitat - projects being developed

The three largest wetland areas in Severn Sound are Matchedash Bay, Wye Marsh and Tiny Marsh. Each of these wetlands is predominantly marsh and all are managed under Ministry of Natural Resources Stewardship Agreements. Matchedash Bay is the only coastal wetland of the three which is subject to lake level fluctuations. All three have managed water level control on some or most (Tiny) of the area. Habitat features in these wetlands are being studied for future interpretation, enhancement and protection.

Riparian Habitat

In Severn Sound the riparian habitat guideline of 75% of first to third order streams with natural vegetation is met in the Upper Coldwater, Carley Creek, Bass Lake, Sturgeon River and Copeland Creek subwatersheds (Table 3.14.1). Values of <50% were found in Bear Creek (37%) and Purbrook Creek (44%). Values in 1998 ranged from 39 to 79% across the area. Riparian vegetation has increased between 1982 and 1998 with the exception of Silver Creek (North River) and McDonald Creek (Wye River). This increase is evidence of improved awareness of the value of natural vegetation in stabilizing stream banks as well as the direct benefit of the Severn Sound RAP Tributary Rehabilitation Project and similar programs that predate the RAP Program such as the OMNR CFIP/CWIP.

Upland Habitat

Although there were significant reductions in largest forest patch size between 1982 and 1998, there has been little net change in forest cover across Severn Sound. The 1998 analysis shows that Upland Habitat guidelines are generally being met for Severn Sound watershed (Table 3.14.1) with the exception of "interior forest" guideline in Hog Creek, and some subwatersheds on the Wye River and the North River. These areas will be the subject of further targeting for remediation where feasible. It would appear from planned or proposed development in some subwatersheds that the reduction in % forest cover will continue in areas close to urban centres. It should also be recognized that the "net" increase results from forest planting that exceeds forest removal. In order to sustain forest cover, planting programs should continue to be sustained. Mechanisms to secure large interior forest patches should also be pursued.

Status of Other Habitat

The colonial waterbird nesting sites (primarily on the Watcher Islands in Georgian Bay) are being maintained by CWS and OMNR. The Georgian Bay Osprey Society continues to support the construction of osprey nesting platforms in appropriate locations in Severn Sound.

Ongoing Actions:

1. The Severn Sound Fish Habitat Management Plan should be updated by sections, corresponding to the municipal boundaries with the timing to correspond with the updating of municipal Official Plans, provided funding for the initial stages is provided by the federal government.
2. Walleye spawning sites need to be protected from spring harvest, as well as water level fluctuations. An agreement in-principle is being developed with Parks Canada-Trent-Severn Waterway, OMNR and SSEA for an operational protocol at the dam at Port Severn to protect fish spawning habitat in the downstream operation of Lock 45. A separate agreement is also being pursued with the Corporation of the Township of Severn, OMNR and SSEA to protect fish spawning habitat downstream of the falls on the North River.
4. Ongoing implementation of the Matchedash Bay Project through the Eastern Habitat Joint Venture (NAWMP 2000).
5. Implementation of Nutrient Management Act Regulations including livestock access restrictions. - Continued implementation of rehabilitation projects through longer term programs to ensure net gain.
6. Ongoing monitoring as restoration projects mature.

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Table 3.14.1 Severn Sound RAP - Habitat Restoration Strategy
Summary of Forest, Riparian and Wetland Habitat Targets for First to Third Order Streams

1982		COLDWATER RIVER					NORTH RIVER										WYE RIVER				
FOREST HABITAT TARGETS	Target	Upper Coldwater	Lower Coldwater	Avon River	Carley Creek	Coldwater River	Upper North	Lower North	Bass Lake	Silver Creek	Bear Creek	Purbrook Creek	North River	Sturgeon River	Hog Creek	Upper Wye	Lower Wye	MacDonald Creek	Wye River	Copeland Creek	
% Forest Cover	> 30%	66%	38%	33%	56%	49%	49%	50%	38%	42%	48%	44%	45%	51%	31%	27%	38%	29%	31%	58%	
Size of Largest Patch (Ha)	> 100 Ha	1171	631	132	646	1211	460	1009	287	168	608	254	1470	863	163	394	460	208	460	300	
% Forest > 100 m from Edge	> 10%	34%	15%	8%	27%	22%	19%	23%	13%	12%	20%	16%	18%	20%	6%	12%	12%	8%	12%	28%	
% Forest > 200 m from Edge	> 5%	18%	6%	1%	13%	10%	7%	10%	4%	3%	10%	6%	7%	8%	0%	6%	4%	1%	5%	13%	
RIPARIAN HABITAT TARGETS																					
% first to third order streams with Natural Veg.	> 75%	74%	50%	46%	67%	60%	50%	35%	66%	59%	33%	26%	42%	62%	46%	29%	51%	49%	40%	57%	
% first to third order streams with > 30m Natural Veg.	> 75%	62%	42%	27%	55%	48%	37%	30%	54%	39%	24%	21%	33%	49%	29%	21%	36%	37%	29%	35%	
% first to third order streams with Natural Veg. plus Wetlands	> 75%	76%	60%	46%	77%	64%	51%	38%	76%	63%	35%	44%	47%	71%	56%	46%	59%	50%	49%	63%	
% first to third order streams with > 30m Natural Veg. plus Wetlands	> 75%	64%	49%	27%	57%	53%	40%	32%	64%	42%	25%	37%	37%	59%	36%	37%	44%	38%	40%	41%	
WETLAND HABITAT TARGETS																					
% Wetlands in Watershed	> 10% (sub > 6 %)	4%	6%	0%	4%	6%	2%	4%	13%	6%	1%	17%	6%	11%	6%	13%	13%	2%	12%	5%	
Amount of Vegetation Mean Width (m)	> 240m	53	142	0	118	105	199	394	117	89	538	141.0	285	129	71	151	89	71	126	172	
1998																					
FOREST HABITAT TARGETS	Target	Upper Coldwater	Lower Coldwater	Avon River	Carley Creek	Coldwater River	Upper North	Lower North	Bass Lake	Silver Creek	Bear Creek	Purbrook Creek	North River	Sturgeon River	Hog Creek	Upper Wye	Lower Wye	MacDonald Creek	Wye River	Copeland Creek	
% Forest Cover	> 30%	65%	43%	38%	58%	52%	44%	52%	39%	42%	48%	46%	45%	56%	38%	29%	43%	32%	34%	63%	
Size of Largest Patch (Ha)	> 100 Ha	1141	623	141	641	1181	469	800	289	180	586	262	941	1033	199	387	633	226	633	280	
% Forest > 100 m from Edge	> 10%	34%	17%	10%	29%	23%	18%	25%	14%	12%	19%	15%	18%	23%	10%	13%	16%	8%	13%	26%	
% Forest > 200 m from Edge	> 5%	19%	8%	1%	14%	11%	7%	11%	5%	3%	8%	4%	7%	10%	2%	6%	5%	1%	5%	11%	
RIPARIAN HABITAT TARGETS																					
% first to third order streams with Natural Veg.	> 75%	77%	56%	64%	76%	67%	52%	40%	68%	59%	38%	32%	46%	69%	57%	39%	64%	61%	51%	69%	
% first to third order streams with > 30m Natural Veg.	> 75%	64%	45%	36%	60%	52%	39%	33%	56%	38%	25%	25%	38%	54%	39%	24%	45%	37%	33%	45%	
% first to third order streams with Natural Veg. plus Wetlands	> 75%	79%	65%	65%	77%	71%	54%	64%	77%	64%	39%	44%	46%	77%	64%	54%	71%	62%	61%	74%	
% first to third order streams with > 30m Natural Veg. plus Wetlands	> 75%	66%	52%	37%	62%	55%	42%	35%	64%	42%	26%	37%	38%	63%	44%	40%	52%	38%	40%	50%	
WETLAND HABITAT TARGETS																					
% Wetlands in Watershed	> 10% (sub > 6 %)	4%	6%	0%	4%	6%	2%	4%	13%	6%	1%	17%	6%	11%	6%	13%	13%	2%	12%	5%	
Amount of Vegetation Mean Width (m)	> 240m	62	187	54	185	157	206	412	92	85	539	100.0	292	165	122	163	104	69	136	275	
Note: Below Target																					
Meets Target																					
Difference Between 1982 and 1998 Results by Watershed																					
FOREST HABITAT TARGETS		Upper Coldwater	Lower Coldwater	Avon River	Carley Creek	Coldwater River	Upper North	Lower North	Bass Lake	Silver Creek	Bear Creek	Purbrook Creek	North River	Sturgeon River	Hog Creek	Upper Wye	Lower Wye	MacDonald Creek	Wye River	Copeland Creek	
% Forest Cover		-1%	5%	5%	2%	3%	-5%	2%	1%	0%	0%	2%	0%	5%	7%	2%	5%	3%	3%	5%	
Size of Largest Patch (Ha)		-30	-8	9	-5	-30	9	-209	2	12	-22	8	-529	170	36	-7	173	18	173	-20	
% Forest > 100 m from Edge		0%	2%	2%	2%	1%	-1%	2%	1%	0%	-1%	-1%	0%	3%	4%	1%	4%	0%	1%	-2%	
% Forest > 200 m from Edge		1%	2%	0%	1%	1%	0%	1%	1%	0%	-2%	-2%	0%	2%	2%	0%	1%	0%	0%	-2%	
RIPARIAN HABITAT TARGETS																					
% first to third order streams with Natural Veg.		3%	6%	18%	9%	7%	2%	5%	2%	0%	5%	6%	4%	7%	11%	10%	13%	12%	11%	12%	
% first to third order streams with > 30m Natural Veg.		2%	3%	9%	5%	4%	2%	3%	2%	-1%	1%	4%	5%	5%	10%	3%	9%	0%	4%	10%	
% first to third order streams with Natural Veg. plus Wetlands		3%	5%	19%	0%	7%	3%	26%	1%	1%	4%	0%	-1%	6%	8%	8%	12%	12%	12%	11%	
% first to third order streams with > 30m Natural Veg. plus Wetlands		2%	3%	10%	5%	2%	2%	3%	0%	0%	1%	0%	1%	4%	8%	3%	8%	0%	0%	9%	
WETLAND HABITAT TARGETS																					
Amount of Vegetation Mean Width (m)		9	45	54	67	52	7	18	-25	-4	1	-41	7	36	51	12	15	-2	10	103	
		Upper Coldwater	Lower Coldwater	Avon River	Carley Creek	Coldwater River	Upper North	Lower North	Bass Lake	Silver Creek	Bear Creek	Purbrook Creek	North River	Sturgeon River	Hog Creek	Upper Wye	Lower Wye	MacDonald Creek	Wye River	Copeland Creek	
Area (Ha)		5082.9	5853.5	3070.2	4774.9	18781.4	8973.7	6724.0	4637.1	2501.1	3969.2	4141.9	30947.0	9813.0	6168.0	12130.7	6436.6	2620.9	21188.3	2412.4	

4. MONITORING AND SURVEILLANCE PLAN

This plan will bring the monitoring capabilities of the federal, provincial and municipal governments together with the Severn Sound community, to provide sustained and scientifically defensible monitoring of the Severn Sound area.

The purposes of the surveillance plan for Severn Sound are to:

1. coordinate activities for effective and efficient monitoring of the Severn Sound area
2. track the effectiveness of remedial actions in restoring impaired uses
3. identify new problems or changes in the Severn Sound ecosystem

4.1 Eutrophication

Cultural eutrophication has affected Severn Sound, including Penetang Bay, since the 1960s (Veal and Michalski 1971). Problems associated with eutrophication such as nuisance algal growths and changing fish communities have adversely affected recreational uses of the Sound despite efforts at improvement of treated sewage effluents (Nicholls et al. 1988, Severn Sound RAP 1993).

The complex interactions of sources of nutrients and human activities that influenced the trophic status of Severn Sound, outlined in the Stage 2 Report (SSRAP 1993 Figure 2.4 p. 35), have become more complex as the implementation proceeded.

Dramatic improvements in water clarity and decreased open water total phosphorus concentrations accompanied significant decreases in phosphorus loadings in most areas of Severn Sound. The loadings reductions were largely accomplished through sewage plant upgrades and non-point source control projects but also accompanied shoreline sewage system upgrades and urban stormwater projects. Accompanying the changes in total phosphorus concentration have been increased N:P ratios and decreases in phytoplankton biovolume and zooplankton biomass. Observed changes in phytoplankton and zooplankton community structure and biomass have generally followed expected changes in that there is reduced predominance of species associated with eutrophication to those of a more mesotrophic association. The changes in the benthos community structure as reduced loadings took effect, suggested improved sediment toxicity due to the accompanying decreases in organic matter off sewage plants.

There are several changes in trophic indicators that do not appear to be following the expected changes resulting from reduced total phosphorus concentration.

- Water clarity of the open waters improved gradually as expected in Penetang Bay. However, abrupt improvements were noted in areas in the open waters of Severn Sound. Recently (since 1999 to 2001), clarity has decreased seasonally to relatively poor
- The proportion of large diatoms associated with nutrient enrichment has decreased since the early 1990s. However, increases in blue-green algae such as *Microcystis* spp. and increased shoreline complaints of filamentous algae such as *Mougeotia* and *Spirogyra*

- have been noted.
- Decreases in the proportion of *Bosmina longirostris*, a species associated with eutrophic conditions has been noted. However, the expected increases in the proportion of large-bodied herbivorous zooplankton (Daphnids) have not occurred.
- Fish community changes accompanying changes in trophic status as yet have not favoured top predators as expected.

Several other changes in the Severn Sound ecosystem since 1993 may be influencing trophic status indicators. These include:

- The introduced exotic zebra mussel has infested Severn Sound since 1994-95 and has contributed to changes in open water trophic characteristics and nearshore habitat conditions. Other areas of the Great Lakes have recently reported decreases in the population densities of zebra mussels. Our monitoring has shown a decreasing trend in zebra mussel veliger density and biomass since 1997 (Figure 3.13.5). The newly introduced round goby (1999) may also be adversely influence the walleye and other sport fish populations.
- Fishing pressure for walleye has apparently increased in Georgian Bay especially in Severn Sound since the early 1990's.
- Water levels have decreased starting in 1999 to near record lows adversely influencing nearshore spawning and nursery areas, and in 2000 and 2001, resulted in a large increase in the amount of dredging and entrainment of sediment into the water column.

Phosphorus, especially from high concentration sources such as sewage plant effluents, has been identified as a key nutrient controlling the growth of phytoplankton in Penetang Bay as in many areas of the Great Lakes and inland waters (Nicholls and Heintsch, 1992; Nicholls et al. 1977). Relationships have been described between phytoplankton biomass and total phosphorus concentration in nearshore areas of the Great Lakes (Nicholls et al. 1986; 1988). Reductions in open water phosphorus concentrations through source control were expected to reduce phytoplankton biomass and reduce nuisance algae conditions and to change trophic status of open water (Nicholls et al. 1988, Dillon et al. 1996). The evaluative model used in the Stage 2 Report to assess expected changes did not take into account the changes in phosphorus-chlorophyll *a* relationships that have been noted in other areas of the Great Lakes (Nicholls et al. 2001). However, a comparison of the relationship between total phosphorus and chlorophyll *a* concentrations measured in Severn Sound does not show a significant difference between the period prior to or after zebra mussel infestation (Figure 3.8.4). Water clarity has also fluctuated from peak values in 1997 to lower mean values in recent years. It is important that the historical open water monitoring program be continued (at least at a subset of sites) in order to be able to track long-term trends and to provide surveillance of the Severn Sound ecosystem (Figure 5.1).

In addition to the main open waters and major embayments in Severn Sound there are specific areas within the Area of Concern where water quality problems are emerging. The Honey

Harbour area includes embayments that are tributary to Severn Sound and have separate source issues that are being addressed through on-going abatement and remedial action programs. Bass Lake, Orr Lake, Silver Creek, Hogg Creek and the Wye River are examples of tributary lakes or streams where separate remedial action plans or subwatershed plans are being developed. As part of the long-term surveillance and monitoring activities, the following activities should be pursued to assess the trophic status of Severn Sound.

1. Continue the long-term monitoring of open water through a biweekly sampling program through the ice-free period of the year Figure 4.1. This monitoring would include temperature and dissolved oxygen profiles, nutrients, community structure and key populations of phytoplankton and zooplankton.
2. Continue the long-term monitoring of sources of nutrients to Severn Sound through enhanced and routine monitoring programs for sewage effluents and watershed sources. Conduct annual technical reviews of the loadings to follow long-term trends.
3. A nearshore monitoring program to systematically measure changes and occurrence of filamentous algae, rooted aquatic plants and benthos should be initiated.
4. Conduct surveys of open water benthos (deposition areas) to track recovery and to act as surveillance sites on a four to five year cycle.
5. Conduct an ongoing assessment of the trophic interactions of monitoring indicators in order to ensure that appropriate models are being used to guide monitoring. This would include assessing the assumptions that were made in the original trophic model used in the Stage 2 Report.
6. Conduct a survey of the quality of raw water at water intakes in use in Severn Sound and compare the quality with adjacent open water sampling sites. This would allow the option of replacing some of the annual open water monitoring programs with intake monitoring of year-to-year changes.

4.2 Nearshore Fish Community

The COA Technical Review Team for the Severn Sound RAP concluded that the delisting objective for "degradation of fish populations" relating to restoring top-level predators has NOT been met. As of spring 2001, less than 10% of the trapnet catch are top-level predator fish with less than 5% of the catch being walleye. In fact, OMNR considers the walleye population to be "at risk" as compared to the recent rating system (Gonder 2001). The mean age of walleye is decreasing and apparent mortality is increasing. Other sport fish populations such as northern pike and largemouth bass are also decreasing.

The recommendation of the Technical Review Team was that the fish community should remain "impaired", but that this need not stop the "delisting" of Severn Sound as an Area of Concern PROVIDED THAT:

- 1) the agencies make a commitment to a long term fish monitoring program in Severn Sound (to better understand what is happening) and
- 2) the agencies act on the results of the monitoring studies.

A new protocol for Early Summer Trapnet surveys (ESTN) in Lake Huron and Georgian Bay has been introduced by the OMNR UGLMU starting in 1998 to provide an improved statistical method of assessing nearshore fish community in eastern Georgian Bay. The ESTN is intended to replace the method used to track progress of the SSRAP to date - the spring index trapnet survey (SSIN). The spring index trapnet survey at two fixed, long-term nearshore sites in Severn Sound was conducted through OMNR Midhurst District from 1975 (SSIN) to 1999. The ESTN consists of a “moving” trapnet survey where nets are set at approximately 30 randomly selected sites for one day during the time when temperatures range between 12 to 20 °C. In particular, the assessment of changes in walleye populations in Georgian Bay should include work on the Severn Sound population to investigate the interactions of top-level predators with other parts of the fish community. Diversity of Severn Sound fish community was considered healthy and diverse for the most part in the studies up to 1995. However, these studies were not continued to assess changes over time.

In order to obtain the necessary information required to assess the health of the fish community and to reassess the delisting objectives for the Severn Sound RAP related to the fish community (top-level predators and diversity), the approach of the project would be to

- 1) repeat a subset of the DFO nearshore fish community surveys done in 1990, 92 and 95 using seasonal electrofishing and
- 2) in the same year, repeat OMNR's Early Summer Index Trapnet Survey using the stratified random sampling protocol developed by the UGLMU for use in Georgian Bay.

4.3 Fish Habitat

The sheltered littoral areas of Severn Sound, especially those with submerged aquatic plants, are considered essential to maintaining a healthy and productive fish community (Leslie and Timmins 1994 and 1997). Most fish species found in Severn Sound use the nearshore as spawning, nursery and feeding habitats, yet this is the area most often affected by filling, shoreline hardening, dock construction and beach clearing etc. The processes available to protect and enhance fish and wildlife habitat in the AOC involve providing technically defensible management plans and policies under federal and provincial legislation (Fisheries Act, Planning Act, Public Lands Act, etc.) and providing rehabilitation programs to restore and enhance degraded habitat on a site specific basis.

Since the Stage 2 Report was prepared, a Defensible Methods approach has been developed which combines a physical habitat inventory with a model to classify most of the littoral zone fish habitat suitability for different groupings and life stages of fish in Severn Sound (Minns, et al. 1999). In addition, the Habitat Framework Guidelines (Environment Canada, OMNR and OMOE. 1998) were developed and evaluated in AOCs, including Severn Sound (Gartner Lee Ltd. 1997a, Gartner Lee Ltd. 1997b, Sherman and McPhail 2001, Tate 1998). These Guidelines provide a series of measures that can be used to evaluate upland, riparian and wetland habitat in an area.

Site specific initiatives within the Severn Sound area also provide specific indication of the restoration status of habitat of the AOC. The Eastern Habitat Joint Venture is conducting a large scale habitat protection and improvement project in Matchedash Bay (Tymoshuk and Martin-Downs 1990, NAWMP 1991). The Severn Sound RAP Tributary Rehabilitation Project and the Penetanguishene Shoreline and Wetland Restoration Projects are examples of initiatives that have led to the restoration of habitat. The management of habitat in Severn Sound, as in most areas of the Great Lakes, is dependent on protection through securement plans where highly suitable habitat is vulnerable to development activities and, for all habitat, to resource agency designations and municipal zoning where possible development activities could lead to destruction or degradation of habitat. The activities are subject to review through federal, provincial or municipal reviews, usually on a case-by-case basis.

The monitoring of these specific activities as well as the littoral, riparian, wetland and upland habitat should be undertaken through a variety of indicators. These include:

1. Littoral fish community assessment through the surveys outlined in Section 8.2 and through repetition of the larval fish surveys of Leslie and Timmins (1989, 1994, 1995, 1997). The frequency of these surveys would be determined based on expected changes to habitat.
2. Selection of long-term monitoring segments of littoral shoreline (based on the nearshore habitat information and project specific studies) for monitoring through time on a 5-year return basis. Within these segments the physical and biological habitat would be assessed for changes due to year-to-year variability and changes with time.
3. Within selected subwatersheds or other units of interest more detailed inventories of habitat should be undertaken in order to support future management decisions and to assess the long-term changes that are expected as natural vegetation changes in upland, riparian and wetland areas.

4.4 Ecosystem Health

The knowledge base of techniques and indicators of ecosystem health are constantly being improved in the scientific and environmental management literature. New indicators and monitoring methods of ecosystem health are expected from ongoing studies of fish, benthos, waterfowl and other organisms in Severn Sound and other areas of the Great Lakes. Results of these studies will add to the tools for assessment that in turn will guide and/or confirm remediation efforts. The following indicators should be included:

1. Fish community interactions (see above for nearshore fish community). Tributary fish community biomass monitoring should also be monitored at a minimum of 8 long-term sites that have been sampled through the Ministry of Natural Resources (see Figure 3.3.8).
2. Severn Sound is considered to have a rich and diverse community of waterbirds including colonial waterbirds, species at risk such as Least Bitterns and Black Terns as well as

migratory waterfowl. Many of these birds depend directly on the healthy, uncontaminated fish resources of Severn Sound for their food supply and as such provide a useful indicator of ecosystem health. Monitoring activities for birds may include annual statistics from hunting and other routine surveys as well as special studies that are repeated on a five or ten year return period.

A. Spring and fall waterfowl staging should be assessed, especially in Matchedash Bay using the land-based method of Pekarik et al. (In Prep.) Other surveys of waterfowl have been conducted in the past and more recently using various methods. A waterfowl breeding index survey after the method of Dzubin (1969) was conducted between 1992 and 1996 in selected areas. This method should be standardized and repeated to provide a continuing record of changes through time.

B. Censuses of nest numbers (pairs) of colonial waterbirds in Georgian Bay including Severn Sound are made on a ten-year basis and should be continued as a surveillance tool for Severn Sound.

C. Waterfowl harvest (especially opening day results) from the three main hunting areas of Severn Sound Tiny Marsh, Wye Marsh and Matchedash Bay will also provide continuing long-term data to assess trend in time for selected species.

D. The Marsh Monitoring Program (MMP, Environment Canada, Long Point Bird Observatory, Bird Studies Canada) monitors the health of marshes by surveying indicator species that utilize these habitats during breeding season. Twelve marsh bird species and five amphibian species were chosen as indicators of the two target groups because:

1. They are susceptible to environmental deterioration and
2. They are easily surveyed by volunteers. In addition, bioinventories of wetlands to support management plans and Natural Heritage Studies for municipal Official Plans provide additional information on the marsh bird community.

E. The Georgian Bay Osprey Society in conjunction with naturalist clubs, monitor the Osprey population in Severn Sound.

F. The Wye Marsh Reintroduction Program includes monitoring of nesting success and population distribution and health in the Severn Sound area and in relation to the Ontario-wide program.

G. The Long-term CWS Forest Bird Monitoring Program as well as the Breeding Bird atlas should be used to assess changes in the ecological integrity of the interior forest bird community of Severn Sound.

3. Other wildlife

Surveying and monitoring individual species or groups of species will continue in order to establish environmental requirements, stress indicators and specific monitoring methods. The Marsh Monitoring Program above uses amphibian species. Additional work on reptiles under the Species at Risk program will provide new monitoring methods in the future for use in the area. Other wildlife species that should be considered for monitoring the health of the Severn Sound ecosystem include: muskrat, white-tailed deer, wild turkeys and moose.

4. Benthos

The use of surveys of open water and stream benthic macroinvertebrates (benthos) have been widely used to assess the health of aquatic ecosystems. The areas of survey of benthos in Severn Sound has included deeper deposition sediment areas with silt or mud sediments, nearshore surveys of invertebrates especially associated with aquatic plants and stream locations where wading is possible. The open water protocol is adapted for the use of the BEAST Model (Reynoldson et al. 1995) and to assess the community structure of similar nearshore Great Lakes sediments within Severn Sound. Locations also allow assessment of discharges for tracking recovery of sediment conditions following remedial measures. The approach taken in Severn Sound streams has been to rely most on qualitative collection methods to determine presence/absence of benthos (identified to as low a taxonomic level as practical) at a number of sites across the watershed and to collect quantitative samples using a T-sampler at selected sites that would provide indication of year to year changes due to natural fluctuations and to remedial efforts. Nearshore (wavewashed zones) samples of benthos have been collected in the past throughout Severn Sound (Stage 1 RAP Report 1989; Barton et al. 1985).

The three monitoring activities for benthos are as follows:

a. Open water

A survey of benthos should be undertaken at 4 to 5 year intervals making use of the historical sampling locations supplemented (where possible) with deposition sediment areas in embayments of Severn Sound. Multivariate techniques should be used to explore the changes in benthos community. In addition, indicator species such as *Hexagenia* spp. should be used to add to the assessment of ecosystem health.

b. Tributaries

At least twelve long-term sampling locations should be continued on an annual basis to establish year-to-year variability over a range of flow regimes. Samples should include qualitative and replicate quantitative (T-samples) samples. The sample locations should also include assessment of water quality, habitat and temperature monitoring.

c. Nearshore

Samples of nearshore benthos using a kick and sweep method and/or artificial substrates should be used to assess nearshore quality. The sample locations should also include sampling of nearshore habitat features and temperature monitoring.

4.5 Bacterial Contamination

Criteria of suitability of water for swimming and other water contact sports have been developed (MOE, 1984; MOH, 1992) in order to provide a low risk of exposure to pathogenic organisms and to ensure that swimming areas are free of aesthetic problems related to algae and floating debris. In general, the waters should:

1. have sufficient water clarity to allow a swimmer in distress to be seen on the bottom;
2. have a low risk of contact with pathogenic organisms or health hazard (<100 orgs./100 ml);
3. not be influenced by sources of bacterial contamination;
4. be relatively free of aesthetic problems related to algae and other debris.

The quality of the swimming areas within Severn Sound was generally satisfactory with respect to the Provincial Protocol. Exceptions are sheltered swimming areas receiving occasional discharges of urban storm water or areas influenced by stream discharges that may have elevated levels of fecal contamination.

Monitoring of public swimming areas has been carried out by staff of Parks Canada, the local municipalities and the Severn Sound Environmental Association in conjunction with the Simcoe County District Health Unit and Parks Canada and the Ontario Public Health Laboratory. Beach Pollution Surveys should include monitoring of source discharges in built up areas on the south shore and in sheltered isolated embayments on the north shore of Severn Sound. Surveys of specific swimming areas indicated in the monitoring to date are being planned to determine the potential for source impingement on swimming areas.

4.6 Trace Contaminants

Extensive assessment of potential sources of trace contaminants through biomonitoring and sediment contaminant assessment has been carried out as part of the RAP development in Severn Sound (Severn Sound RAP, 1988). These studies confirmed that Severn Sound is relatively free of active sources of persistent contaminants. Monitoring activity will therefore focus on screening for undetected sources and tracking trends in contaminant levels of the organisms that will most readily bioaccumulate contaminants and indicate their presence.

Localized fish, the young-of-the-year spottail shiners, have been collected and analysis indicates that little or no active sources of mercury or persistent organic chemicals such as polychlorinated biphenyls or dieldrin currently exist (Suns et al, 1991).

Persistent contaminants that have a direct bearing on consumption of fish and wildlife in Severn Sound include mercury. Other chemicals can have an influence on human health and aquatic life. Often, these substances will have elevated concentrations in discharges or in sediments that can serve to transfer the chemicals to aquatic life. In Severn Sound, substances that have been investigated include: heavy metals (lead, zinc, cadmium, chromium, copper), organochlorine

pesticides and their breakdown products, organotins associated with antifoulant paints and volatile organic chemicals.

Other substances which are not being tested for at present, especially organic chemicals, could influence the health of the Severn Sound ecosystem. Tests of the health of specific organisms are the only indication of toxic substances in the absence of direct chemical measurements. For example, the incidence of liver tumours or reproductive failure/impairment in fish may be the first indication that an unknown chemical is affecting the environment.

Sediment samples from deposition areas of Severn Sound have also been assessed for metal content and organic chemicals for potential as sources to the water column and organic life (see section 2.3). An appropriate surveillance strategy would establish "sentinel tests" to screen sources for contaminants and to track the levels of chemicals in media known to concentrate the substance or in organisms known to register physiological responses to the presence of harmful chemicals. The continued use of Severn Sound as a reference site for biological effects testing would also facilitate continued surveillance. The following specific monitoring activities are recommended to track historical problems:

1. Sewage Plant Sludge

Sewage plant sludge is monitored by municipal operators to assess the quality of sludge for spreading on agricultural lands. The result of the sludge quality analyses and any surveys of chemicals in use at area industries discharging to the sewers provides a useful "sentinel monitor" of contaminants that may pass through to the open water. The sewage plant sludge quality results will be reviewed annually as part of the Severn Sound RAP Surveillance Plan.

2. Mercury in Sport Fish

A sample of selected sportfish will be collected on a 5-year frequency for mercury analysis. The protocol should be that of the MOEE/OMNR fish contaminants program and include a minimum of 20 fish in a size range, sampled at the same location (Index Trapnet location) and time of year. The age of each fish sampled should be included with the sex, weight and length information typically collected. Walleye should be sampled in a similar fashion but on a reduced frequency (every 10 years) as the rehabilitated population allows.

3. Persistent Organic Chemicals in Carp

A sample of carp will be collected on a 5-year frequency for organochlorine pesticides and polychlorinated biphenyls. Similar to the Sport Fish Contaminant Program protocol, a minimum of 20 fish in a size range, sampled at the same location and time of year will be collected in order to track organochlorine chemicals and monitor residual concentrations noted in these fish.

4. Sediment Sampling

Samples of sediment from selected deposition areas will be collected to monitor the continued recovery of sediment quality following sewage plant upgrades and other source control measures as well as to assess sediment deposition rates.

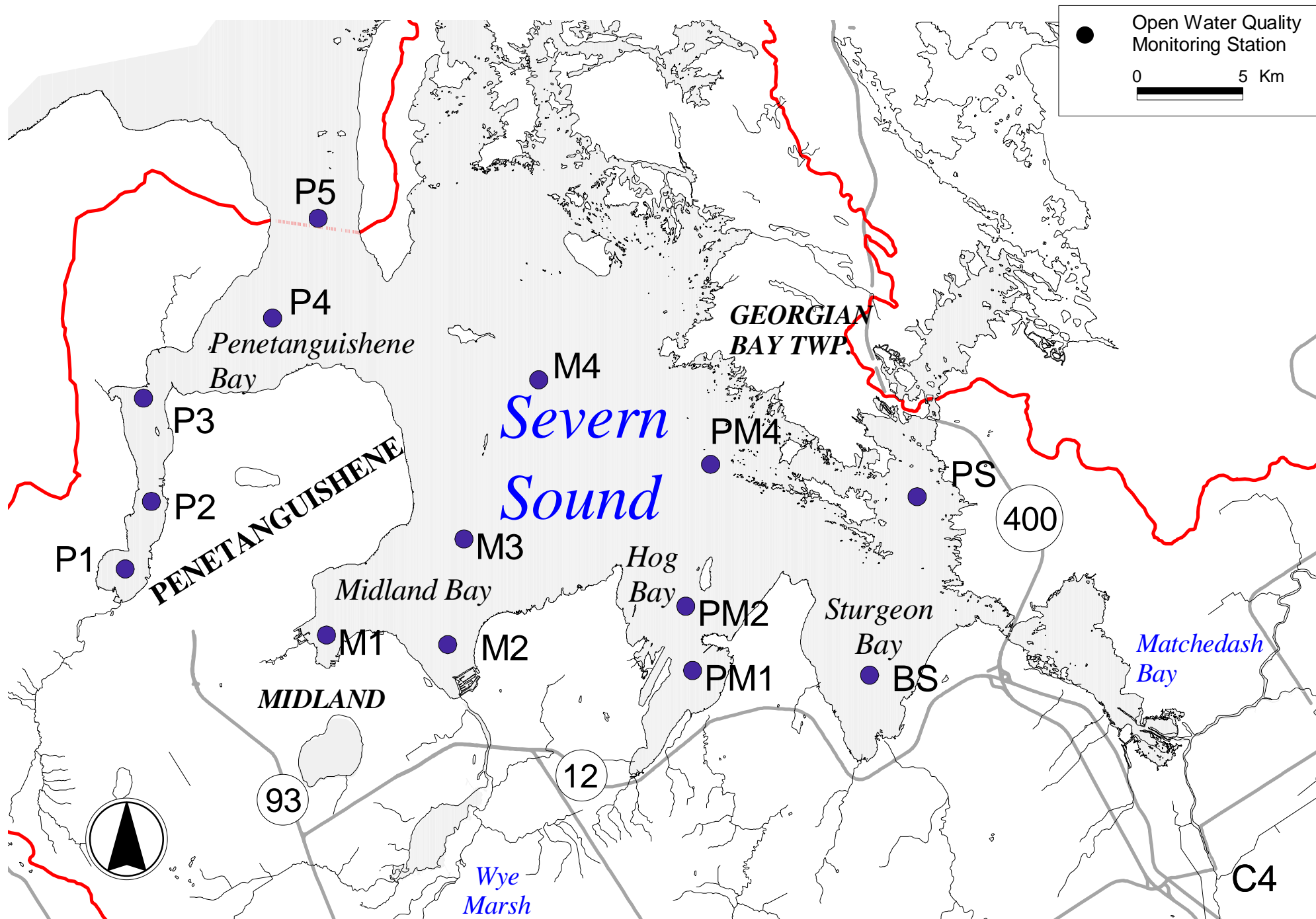


Figure 4.1 Open Water Monitoring Sites in Severn Sound

5. PUBLIC INVOLVEMENT IN THE SEVERN SOUND RAP

The Severn Sound Public Advisory Committee (PAC)

The Severn Sound Remedial Action Plan Public Advisory Committee (PAC) is a volunteer group working on water quality improvements within the Severn Sound Area of Concern and supporting the public involvement program of the Remedial Action Plan. More than 40 members including representatives from conservation clubs, agricultural associations, ratepayer's groups, municipal staff and councils as well as concerned citizens and environmental engineering students. The creation of a Public Advisory Committee (PAC) in February of 1989 marked a focal point for public consultation where ideas could be exchanged between the RAP Team and the general public. The PAC is a blend of opinions and expertise. Membership includes a diversity of private citizens and representatives of the public sector and the government. The RAP Team Coordinator attends all of the meetings which are open to the public and held at the Wye Marsh Wildlife Centre on the second Tuesday of every month at 7:00 p.m. (Severn Sound RAP Stage 2)

Bob Whittam, PAC Chair from 1989 to 1997, stated that ... *“As representatives of the public, all of us should be proudly aware of the extent of public involvement, especially at the local level, that separates RAPs from previous attempts by agencies to consult the public and the process we are making. The Severn Sound RAP consultation process, as all others have done, has recognized the importance of the stakeholders concerns and ideas by providing a variety of opportunities for their involvement in every phase of the program. Citizens have a right to work together with agencies whenever decisions are made. The future of meaningful protection and planning for the environment depends on this cooperation.”* (RAP Coordinators Annual Meeting, October 1992)

Public input and involvement have been key elements of the Severn Sound Remedial Action Plan's success due to incredibly dedicated people like Bob Whittam and the many PAC volunteers who have been a part of this process. Throughout the years, the PAC has taken on many roles. In the beginning, members helped to shape and define the Remedial Action Plan, particularly the development of use goals and developing remedial measures. The PAC lobbied for and were instrumental in regional environmental improvements such as lead bans, restrictions on herbicide use in the water, improved area sewage treatment plants as well as the inclusion of environmental issues and RAP guidelines into municipal Official Plans. They have planted thousands of trees, removed purple loosestrife from wetlands and so much more, making a huge impact in this community. Monthly PAC meetings have now evolved into informative, educational presentations on current environmental issues by expert guest speakers. Attendance to these monthly meetings ranges from 15 to over 50 people, depending on the topic. Public service announcements in the local media and monthly PAC minutes inform the general public and PAC members of the topics and invited guest speakers.

Many presentations of the past year have been of Severn Sound RAP projects and reports,

summarizing the work that has been completed, leading up to delisting. The purpose of the PAC has always been to represent a range of community interests and concerns, provide a basis for community support to implement the RAP, assist with public information and awareness about the RAP and now, in the final stage, review, comment and provide feedback to support the Stage 3 document and recommendations for the future of Severn Sound.

Severn Sound Environmental Association

Since the RAP was released in 1993, the Implementation Office has been based at the Wye Marsh Wildlife Centre, coordinating projects to restore water quality and wildlife habitat. In 1995, both senior governments announced a gradual "sunsetting" of support for the RAP office activities. By fall of 1996, a new strategy to support the RAP office began to take shape. A draft business plan and partnership agreement was presented to potential partners.

In response to this challenge, Environment Canada and the local municipalities formed the Severn Sound Environmental Association (SSEA) in early 1997. The SSEA is a unique partnership among eight municipalities in southeastern Georgian Bay, Environment Canada and Friends of the Wye Marsh Inc. (an environmental non-profit organization). The Association's goals are to oversee the de-listing of Severn Sound as an area of concern and then to complete the transition from the Remedial Action Plan program to a locally sustained environmental office, providing cost effective environmental management that will sustain improvements achieved through the RAP process.

The Severn Sound Environmental Association Implementation Office provides an information service through its public involvement program. SSRAP documents, brochures, fact sheets and information videos, as well as related agency publications, are displayed in the Wye Marsh Wildlife Centre and distributed on request. Public inquiries on environmental issues are answered by phone, fax, mail and email, which often involve referrals to appropriate agencies or individual agency representatives.

The immediate impact of the SSEA has been to consolidate support for RAP restoration projects and activities from the public and the municipalities, which are now full partners in the process. The partnership agreement formalized with the creation of the SSEA has been a major contributing factor in the success of the Severn Sound RAP. SSEA is a "model" for other RAP's in the Great Lakes.

On March 30, 2001 the Severn Sound Environmental Association celebrated the signing of a renewed three-year Agreement from 2001 to 2004. The Association will oversee the RAP Stage 3 documentation, de-listing and then continue the long- term goal of monitoring Severn Sound and sustaining the efforts of the Remedial Action Plan.

The Severn Sound Environmental Association is a community success story. Effective partnerships, such as this one, are the key to environmental conservation and protection. We rely on these partnerships with municipalities, organizations and individuals to raise awareness and

achieve conservation, environmental and stewardship targets.

Public Review Process of Stage 3 Documents

Public response and support have always been an integral part of the Severn Sound RAP process and the public review of the Stage 3 documents encouraged stakeholders to take an active role in this final RAP chapter. Technical documents, summarizing restrictions on fish and wildlife consumption, degradation of fish and wildlife populations, degradation of benthos, restrictions on dredging activities, eutrophication, beach closures, degradation of aesthetics, degradation of phytoplankton and zooplankton communities and degradation of fish and wildlife habitat were prepared for distribution.

These technical documents were distributed to over 50 individuals and groups, including past and present Public Advisory Committee (PAC) members, Severn Sound Environmental Association members, member municipalities, cottage associations, boating organizations, the Hunters and Angler's Club and other local stakeholders. A letter accompanied each package requesting individual written comments on these documents.

The Severn Sound Environmental Association held a special meeting on September 28, 2001 to discuss the de-listing process. At that time, members were asked to review the Stage 3 use impairment technical documents and forward any comments in to the SSEA office and as a stakeholder, each Township should state in writing, or resolution their position on the delisting of the Severn Sound RAP.

On October 9, 2001, the monthly PAC meeting was the most important meeting in the history of the Public Advisory Committee - the discussion of de-listing and the role of PAC in this process. Technical review documents were available for distribution to members. A comment sheet was distributed that allowed the public to comment on individual use impairments and include general notations as well as a recommendation form that could be filled out by individual members of the public, offering their support for de-listing. Members were asked to return these completed comment sheets to the SSEA office. Keith Sherman then walked the members through the Technical Reports, noting how the document should be reviewed.

Long time PAC members, including the two past PAC Chairs, Bob Whittam and T. Milne Dick were invited to attend a special PAC meeting at the Wye Marsh Wildlife Centre on Monday, October 22nd at 1:00 pm. At that time, the invited group of PAC members reviewed the Severn Sound RAP Stage 3 technical documents and issued the official Public Advisory Committee response and comments.

Severn Sound PAC Stage 3 Reviewing Committee

Duncan McLaren
John Nidderly
Don Anderson
Brian Milligan

Bob Whittam
T. Milne Dick
Wes Crown
Murray Rowan
Brian Jones

To assist the public in understanding the technical documents and voice their comments, concerns and questions, a Severn Sound RAP Open House and Public Meeting was held at the Wye Marsh Wildlife Centre on Saturday, October 27, 2001. The Public Meeting began at 10:00am, and included guest speakers; Paul DeVillers, MP Simcoe North, Jack Hunter, Mayor of Tay Township, Bill Thompson, Severn Sound Environmental Association Chair, Dunc McLaren, PAC Chair as well as a presentation and question and answer session with Keith Sherman, SSRAP Coordinator. There were a variety of displays of Severn Sound RAP projects for each use impairment as well as Open Water Monitoring, Tributary Rehabilitation, Erosion, Wetland Rehabilitation, Beach Monitoring, Public Involvement and the Severn Sound Environmental Association. The entire staff was on hand throughout the day to answer any questions. Dave Gonder from the Ministry of Natural Resources, Lake Huron Unit set up a fish population display and made himself available for questions and comments. The Open House was advertised through posters at Municipal Offices, the local media and listed on online local public event calendars.

The Open House was attended by our Member of Parliament, municipal members, Heads of Council, members of the public, PAC members, SSEA members and observers Bruce Kirschner and Ann MacKenzie from the IJC office in Windsor, Ontario.

Written and oral responses were received from:

Roy Schatz, President, Greater Bay Area Foundation
Mary Muter, Vice President & Chair of the Environmental Committee, Georgian Bay Association
Pat Northey, President, Georgian Bay Association
Ticker Stow, PAC member
Laurie Schutt, Executive Director, Wye Marsh Wildlife Centre
Eleanor Rath, Clerk, Springwater Township
Dennis Warrilow, PAC member
Edita Warrilow, PAC member
Angela Coxon, Stewardship Coordinator, Wye Marsh Wildlife Centre
Rob Coulas, PAC Member
T. Milne Dick, former PAC Chair
Dunc McLaren, current PAC Chair
Bob Whittam, former PAC Chair

Official PAC Response

[signoff by PAC Chair]

Public Comments on Individual Use Impairments

i) restrictions on fish and wildlife consumption

The decline of mercury levels in walleye is good news but the fact that advisories remain for smallmouth bass, northern pike and walleye indicate that monitoring needs to be continued to hopefully track a continued decline. However, the source for these contaminants is most likely regional rather than local and should not reflect on delisting. Regional mercury levels remain a concern and more public education on sources should be considered.

iii) degradation of fish and wildlife populations

It is discouraging to see continued evidence of the decline in sport fish populations. However, there are factors influencing the fish populations that are regional rather than local. The introduction of zebra mussels and other invasive species can impact fish communities. Unfortunately, new objectives will have to be established and monitoring continued to assess the impact of changes such as the new reduced catch limits. We have now had three successive years of near record low water levels which is resulting in the loss of spawning habitat.

A sustainable population of top-level predators has not been attained. In fact, they seem to be declining in numbers, mortality is increasing resulting in fewer mature walleye. It would appear that each year more and more large walleye are being caught just prior to going to the spawning beds. Ice fishing harvest restrictions and regulations might also encourage the natives to restrict their harvest. It is now recognized that zebra mussels, low water levels and natural population fluctuations are not strictly Severn Sound problems.

vi) degradation of benthos

The increased presence of the sensitive indicator *Hexgenia* demonstrates the improvement in water quality in Penetanguishene Bay and Midland Harbour.

vii) restrictions on dredging activities

The sediment analysis did not exceed the Provincial Lowest Effect Level (LEL) however, lower water levels over the past few years have caused an increase in dredging activities. The Severn Sound Environmental Association should act as a “watchdog” in all dredging projects presented to municipalities.

viii) eutrophication

We have done well on phosphorus in open water and streams. This is the area where Severn Sound has shown the most improvement. The improvements are dramatic - from sewage

treatment plants to stream point sources. The modelling seems to show that even if zebra mussels were not present, the phosphorus levels would be reduced and the delisting objective would be met. The model must still be tested. Severn Sound is changing from the classical eutrophic state of the late 80's to a mesotrophic status.

x) beach closures

The safety of water for recreational use will always be a concern in Severn Sound as it is a popular tourist destination. Most of Severn Sound is safe for swimming but there are a few areas that still require close supervision, Pete Peterson Park and GFC. There should be continued focus on non-point source control projects and stormwater management plans as well as municipal protection of the land use of high priority headwaters.

xi) degradation of aesthetics

No comments received.

xiii) degradation of phytoplankton and zooplankton communities

The results of this monitoring clearly point to the success of the work carried out in Severn Sound. Continued monitoring of these indicators in light of climate change effects on water temperature will be necessary to ensure continued improvements. There must be a monitoring plan in place to address the concern that zebra mussels may further impact any sustainable targets in the phytoplankton and zooplankton communities. Continued monitoring and public education of exotic and invasive species must be a priority.

xiv) degradation of fish and wildlife habitat

It is felt that the stream rehabilitation and retirement task is a never-ending task. How much is enough? Shoreline protection and tributary rehabilitation projects must continue to protect fish and wildlife habitat. Severn Sound has very important fish habitat areas that provide essential spawning and nursery areas for native fish species. The threats to wetlands and littoral habitats due to development pressure are ever increasing. Greater vigilance is needed to protect these vitally important areas.

Prime undeveloped shoreline is being threatened with tributary shade and natural restoration required, especially in high priority areas. The elimination of shade is allowing water temperatures to rise which in turn is changing the habitat. Legislation that allows alteration of the shoreline during low levels should be modified as courts are considering our current low levels as “seasonal” and allowing shorelines to have rocks and boulders removed and sand added. Shoreline wetlands have become high and dry due to low water levels which has been allowing reclassification of the land for development. These parcels could be purchased by the municipality, donated as an “ecological gift” or provide a conservancy to preserve them.

Summary of Public Response and Process

There is overwhelming support for delisting within the community however, delisting must not mean de-funding. The general comments and concerns of the public relate to the future of the Severn Sound ecosystem and included the following: the SSEA must ensure that municipalities maintain levels set by RAP in their Official Plans and new development projects, continued education and public information of all water quality issues to the general public in Severn Sound, including schools, libraries and municipalities to promote the sustainability of environmental issues, continued monthly informational meetings with public education of environmental issues as the main goal and purpose and continued involvement with public organizations, clubs and associations on water quality issues.

The main concern of everyone who has been involved with the Severn Sound Remedial Action Plan is the necessity of a long term monitoring plan, beyond de-listing. It is now taken for granted that the Severn Sound Environmental Association (SSEA) will be there to fulfill those needs. Municipalities rely on the SSEA for their environmental requirements and concerns. The public perception of the SSEA, based on comments from the public review process, is that years of effort and hard work cannot just come to an abrupt end. Shoreline development, increased population, industrial growth and tourism will not end and will increasingly impact the ecosystem of Severn Sound if a long term monitoring plan is not developed and implemented. There will always be work to be done and programs implemented to ensure that remediation in Severn Sound is sustained.

“The Georgian Bay Association and our member associations will be pleased to continue to work with our Severn Sound neighbours to assure that the gains achieved are entrenched and enhanced.” (Pat Northey, President and Mary Muter, Vice President, GBA)

“Our overall effort and success is excellent and the RAP team should be commended. However, there is still life after delisting and we should proceed as if we were approved and passed but forever on probation, lest we become complacent.” (Bob Whittam, former PAC Chair)

Table 5.1 SEVERN SOUND AREA OF CONCERN SUMMARY OF PUBLIC COMMENTS AND CONCERNS ON STAGE 3 DOCUMENTATION

BENEFICIAL USE	DELISTING CRITERIA	Consensus of Delisting Status	Summary of Public Comments and Concerns
i) Fish and wildlife consumption.	To have no restrictions on consumption of fish and wildlife from the Severn Sound attributable to local contaminant sources.	In general agreement that the delisting objective has been achieved.	<ul style="list-style-type: none"> The advisories that remain for some species of fish indicate that monitoring needs to continue. The advisories are regional rather than local and should not reflect on delisting. Mercury levels remain a concern and more public education on sources should be considered. Would like to see more mercury information available to local dentists - check what other communities are doing to decrease mercury use in dentist offices.
ii) Tainting of fish and wildlife flavour.	To continue to have no tainting of fish and wildlife.	NOT APPLICABLE	
iii) Degradation of fish and wildlife populations.	1. To protect and rehabilitate fish and wildlife habitat.		<p>General Comments:</p> <ul style="list-style-type: none"> There is continued evidence of the decline in sport fish populations but this trend is not just in Severn Sound, indicating a generic problem, not just a local one. Three years of near record low water levels and recent invasive species are factors that have impacted the populations and presumably the habitat. New objectives should be established and monitored to assess the impact of changes. First Nations harvest, increased recreational fishing and existing regulations that do not promote recovery and sustainability must be addressed.

BENEFICIAL USE	DELISTING CRITERIA	Consensus of Delisting Status	Summary of Public Comments and Concerns
<p>iii) Degradation of fish and wildlife populations (continued)</p>	<p>2. To restore a balanced self-sustaining fish community* by restoring top-level predators including walleye, northern pike, large and smallmouth bass and muskellunge to levels similar to the early 1970's with these species forming at least 20-30% of the total predator catch, and walleye forming at least 10% of trapnet results.</p> <p>3. To maintain a natural diverse fish community, to discourage the introduction of exotic species and to prevent the extinction of native or desirable species.</p>	<p>(2iii) It is generally felt that the factors influencing the fish populations are local as well as regional. Provided that there will be a provisional statement regarding this delisting objective and a commitment for long term planning from various agencies, delisting should still proceed.</p> <p>3iii) In general agreement that the delisting objective has been achieved.</p>	<p>(2iii)</p> <ul style="list-style-type: none"> Top level predators seem to be declining in numbers, mortality is increasing resulting in fewer mature walleye Catch limits should be reduced. Ice fishing and harvest regulations should be considered. Walleye harvest - get involved and make recommendations to various agencies who are studying and monitoring walleye regulations in the Great Lakes Monitor increased ice fishing activities and ice fishing pollution Monitoring and public education for invasive species such as zebra mussels and round goby walleye population is very stressed we require a comment on what info is acceptable and what is required for future monitoring. This could be a provisional statement, which need not hold up the process PAC can make recommendations in regards to walleye harvest - agencies currently in the middle of a consultation period ice fishing pollution is increasing increasing use of fish huts and ice fishing total number of top predators down in all areas - not just SS question is if we have not met objective due to other outside influences original objective too big to be able to delist? situation is not completely out of our hands - we can offer suggestions, recommendations and those should be listed. since the objective was set in 1992 based on historical data, zebra mussels arrived, lake levels have fluctuated limiting spawning areas and fisheries have collapsed due to lack of funding, the mean age of fish is decreasing. lack of harvest regulations <p>(3iii)</p> <ul style="list-style-type: none"> protection of head waters critical

BENEFICIAL USE	DELISTING CRITERIA	Consensus of Delisting Status	Summary of Public Comments and Concerns
<p>iii) Degradation of fish and wildlife populations - continued.</p>	<p>4. To maintain a self sustaining diverse community of colonial waterbirds which currently nest in and near the Sound.</p> <p>5. As part of the Matchedash Bay project of the North American Waterfowl Management Plan (NAWMP) to produce 2450 waterfowl including 880 Mallard, 210 Black Duck and 1360 other waterfowl of various species (NAWCC, 1991)¹. These objectives will require revision in light of new assessment methods.</p> <p>6. Wildlife populations will be maintained at levels sufficient to provide recreational and economic benefits, ensure environmental quality and ecosystem integrity and ensure public safety (OMNR Land Use Guidelines).</p> <p>7. To re-introduce a self sustained population of Trumpeter Swans in the Severn Sound area.</p> <p>8. To find no significant toxicity from water column or sediment contaminants in fish and wildlife bioassays.</p>	<p>(4iii) In general agreement that the delisting objective has been achieved.</p> <p>(5iii) In general agreement that the delisting objective has been achieved.</p> <p>(6iii) In general agreement that the delisting objective has been achieved.</p> <p>(7iii) In general agreement that the delisting objective has been achieved.</p> <p>(8iii) In general agreement that the delisting objective has been achieved.</p>	<ul style="list-style-type: none"> • There is a need for a consistent technique for waterfowl surveys • There should be a formal plans for cormorants - CWS is currently studying cormorants which could be a factor in fish populations - the study is experimental • verbal recommendations that habitat is doing better than the ratio - reports pending <ul style="list-style-type: none"> • "sufficient" levels means there is enough to support both the hunters and bird watchers • We need information on white tailed deer, muskrats and waterfowl (ducks) for Tiny and Matchedash. <ul style="list-style-type: none"> • By restoring wetland habitat through lead remediation, the SSRAP has taken the furthest action possible to help the Trumpeter Swan population work towards reaching self-sustaining numbers in Severn Sound.
<p>iv&v) Tumours or other deformities in fish & wildlife.</p>	<p>To maintain the low incidence of tumours and other deformities</p>	<p>NOT APPLICABLE</p>	

¹ NAWCC = North American Wetlands Conservation Council

BENEFICIAL USE	DELISTING CRITERIA	Consensus of Delisting Status	Summary of Public Comments and Concerns
vi) Degradation of benthos.	<p>1. To reach appropriate benthic community targets and ecosystem objectives for Severn Sound.</p> <p>2. For the interim, to have benthos characteristic of mesotrophic conditions throughout Severn Sound.</p> <p>(a) To maintain and enhance presence of the mayfly <i>Hexagenia</i> as an indicator of ecosystem health.</p> <p>(b) To have a sludge worm density, especially <i>Limnodrilus hoffmeisteri</i>, less than 3,000/m² in all locations.</p> <p>3. Absence of acute and chronic toxic effects on benthos attributable to trace metals or organics in sediments throughout Severn Sound.</p>	In general agreement that the delisting objective has been achieved.	<ul style="list-style-type: none"> • Mayflies as an indicator of ecosystem health are showing up in good numbers and in Penetang Bay sediment. The response to sediment loading in Penetang Bay is manifest in less turbidity. • Benthos is okay. • The increased presence of the sensitive indicator <i>Hexagenia</i> demonstrates the improvement of water quality in Penetanguishene Bay and Midland Harbour.
vii) Dredging activities.	To meet biological and chemical guidelines for sediment quality such that there are no restrictions on dredging or disposal activities attributable to polluted sediments.	In general agreement that the delisting objective has been achieved.	<ul style="list-style-type: none"> • Continued consultation with municipalities on dredging applications • Lower water levels over the past few years have caused an increase in dredging activities. • It is suggested that the Severn Sound Environmental Association act as a "watch dog" in all dredging activities presented to municipalities.

BENEFICIAL USE	DELISTING CRITERIA	Consensus of Delisting Status	Summary of Public Comments and Concerns
viii) Eutrophication.	<p>OPEN WATER</p> <ol style="list-style-type: none"> 1. TP Concentration <15 ug/L in open waters and <20 ug/L in Penetang Bay. 2. Chlorophyll <i>a</i> concentration <5 ug/L in open waters and <7ug/L in Penetang Bay. 3. Water clarity to be SDV >3m (or on bottom) in open waters and >2m in Penetang Bay. 4. Rooted aquatic plant distribution in Penetang Bay should increase by 30%. Other areas of Severn Sound should maintain the same coverage. 5. Minimum bottom water dissolved oxygen concentration >5mg/L. <p>SOURCES</p> <ol style="list-style-type: none"> 1. Sewage treatment plants in the Severn Sound AOC to meet effluent total phosphorus concentrations and loading objectives outlined in the Severn Sound RAP Stage 2 Report (table 4.1) 2. Sewage bypassing and combined sewer overflows to be virtually eliminated. 3. Urban stormwater discharges to be decreased by 20%. 4. Watershed inputs to Severn Sound should have total phosphorus concentrations of less than 0.030 ug/L and loading decreased by 20%. 5. Private sewage systems to be upgraded where faulty or substandard. 	In general agreement that the delisting objective has been achieved.	<ul style="list-style-type: none"> • This is the area where Severn Sound has shown the most improvement. • The improvements are dramatic - from sewage treatment plants to stream point source. • We have done well on phosphorus in open water and streams. The question is whether this is a response to zebra mussels or loading restrictions and the modelling seems to show that even if zebra mussels were not present, the phosphorus levels would be reduced to target. The model is confirmed. We are changing from the classical eutrophic state of the late 80's to mesotrophic conditions. (enriched to moderately enriched) • There is a concern over sustainability of what we've gained. • Want to ensure that municipalities maintain levels set by RAP. • More education requested on cruise ships in Severn Sound - sewage, grey water. • Open Water Monitoring must continue to measure and sustain the improvements gained through RAP implementation. • Urban Stormwater Management must continue in all municipalities.
ix) Drinking water.	To maintain surface water quality in Severn Sound in order that raw water would only require standard treatment procedures (coagulation, settling, filtration) and that there be no restrictions on consumption or taste and odour problems.	NOT APPLICABLE	
x) Beach Closings	To meet current provincial objectives for water clarity, pH and bacteria indicator (E.Coli): Geometric mean E. Coli density: <100 org./100ml. Secchi disk visibility: >1.2m Algae densities: <5ug/L (mean ice-free period as chlorophyll)	In general agreement that the delisting objective has been achieved.	<ul style="list-style-type: none"> • The safety of water for recreational use will always be a concern in Severn Sound as it is a popular tourist destination. • There should be continued focus on non-point source control projects and stormwater management plans as well as municipal protection of the land use of high priority headwaters. • Determine an acceptable number of days for closure because there will be some days when E.Coli levels will be over 100 org./100ml • There will always be variability due to waterfowl and rain. • Abatement at Pete Peterson Park in Midland and GF Campground in Victoria Harbour - those areas require close supervision. • It is too much to aim for swimming in Coldwater River.

BENEFICIAL USE	DELISTING CRITERIA	Consensus of Delisting Status	Summary of Public Comments and Concerns
xi) Degradation of aesthetics.	Algae density <5 ug/L Chlorophyll <i>a</i> reduces incidence of algae blooms.	In general agreement that the delisting objective has been achieved.	<ul style="list-style-type: none"> The clarity of the water has improved. Complaints from unnatural foam have decreased.
xii) Agriculture and Industry.	To have no additional cost for treatment of water for agriculture or industry due to deterioration from contaminant sources in Severn Sound.	NOT APPLICABLE	
xiii) Phytoplankton and zooplankton populations.	To ensure phytoplankton species and biovolume are representative of mesotrophic conditions and to have a balanced zooplankton community. (ie. more <i>daphnia</i>)	In general agreement that the delisting objective has been achieved.	<ul style="list-style-type: none"> The results of this monitoring point to the success of the work carried out in Severn Sound. Monitoring of these indicators should continue in light of climate change effects on water temperature. There should be a monitoring plan in place to address the concern that zebra mussels may further impact sustainable targets in the zooplankton and phytoplankton communities. Continued monitoring and public education of exotic and invasive species must be a priority.
xiv) Fish and wildlife habitat.	<p>1. To implement the Severn Sound Fish Habitat Management Plan and other policies to enhance and prevent the loss of fish and wildlife habitat.</p> <p>2. To encourage the restoration of fish habitat in target areas by proponents of new shoreline development.</p> <p>3. To develop plans for rehabilitation or development of new coastal wetland areas as opportunities arise.</p> <p>4. As part of the Matchedash Bay project, to:</p> <p>i) secure and manage 1715 ha of wildlife habitat</p> <p>ii) restore and develop 427 ha of habitat for waterfowl and other wetland dependant wildlife</p> <p>iii) maintain and enhance 442 ha of habitat for staging waterfowl.</p> <p>5. To rehabilitate tributaries and riparian areas for fish and wildlife habitats.</p> <p>6. To maintain existing colonial waterbird nesting sites within and near Severn Sound.</p> <p>7. To maintain and increase Osprey nesting sites within Severn Sound.</p>	In general agreement that the use impairment restoration has been achieved	<p>General Comments:</p> <ul style="list-style-type: none"> Severn Sound has important fish habitat areas that provide essential spawning and nursery areas for native fish species. Tributary shade and restoration work is still required in high priority areas. Threats to wetlands and littoral habitats due to development pressure are ever increasing - they need to be protected. Legislation that allows alteration of the shoreline during low water levels should be modified - courts are considering water levels seasonal. Shoreline protection and tributary rehabilitation projects must continue to protect the fish and wildlife habitats. Private property prohibits a management plan but there could be an increase in landowner education and awareness. We should recognize success and list what still needs to be done Address the need for further involvement with legislation and municipalities. Educate others and point out what is degrading and what can and cannot be done. Municipalities need to take a more active role. Continue monitoring CWS study of cormorants Involvement in programs such as: <ul style="list-style-type: none"> Marsh Monitoring (birds and amphibians) Forest Bird Monitoring Program Ontario Breeding Bird Atlas Project Feeder Watch Christmas Bird Count Frog Watch Greater Georgian Bay Reptile Awareness Program there has been 72 km of stream retired and rehabilitated - there is more to do but this is a never ending task Continued monitoring of Matchedash Bay Project Continued monitoring of the Wye Marsh Wildlife Centre's Trumpeter Swan Reintroduction Program

APPENDIX 1

TECHNICAL REVIEW TEAM REPORT ON THE DELISTING OF SEVERN SOUND AS AN “AREA OF CONCERN”

RECOMMENDATION

THE TECHNICAL EXPERTS APPOINTED TO REVIEW THE SEVERN SOUND REMEDIAL ACTION PLAN STAGE 3 REPORT, RECOMMEND THAT SEVERN SOUND BE DELISTED AS AN AREA OF CONCERN. BASED ON THE EVIDENCE PRESENTED, THEY UNANIMOUSLY AGREE THAT THE IMPAIRED BENEFICIAL USES, AS OUTLINED IN ANNEX 2 OF THE CANADA-US GREAT LAKES WATER QUALITY AGREEMENT, HAVE EITHER BEEN RESTORED OR ARE NOT DUE TO LOCAL SOURCES.

Rimi Kalinauskas, Chair
Severn Sound RAP Stage 3
Technical Review Team

REPORT OF THE TECHNICAL REVIEW TEAM

COA TECHNICAL REVIEW TEAM MEMBERS

IMPAIRED USE	Proposed Technical Team Members
i. Restrictions on fish and wildlife consumption	<u>fish:</u> Alan Hayton, Scientist MOE-EMRB Greg Mierle, Scientist MOE- Dorset <u>wildlife:</u> Chip Weseloh, Biologist EC-CWS
iii. Degradation of fish and wildlife populations xiv. Loss of fish and wildlife habitat	<u>fish:</u> Arunas Liskauskas, Biologist OMNR Upper Great Lakes Management Unit Victor Cairns, Scientist DFO Ken Minns, Research Scientist DFO Brad Allan, Area Biologist, OMNR <u>wildlife:</u> Brad Allan, Area Biologist, OMNR Chip Weseloh, Biologist EC-CWS
vi. Degradation of benthos	Jan Ciborowski, Professor, University of Windsor Lee Grapentine, Scientist, EC-NWRI
vii. Restrictions on Dredging	Duncan Boyd, Group Leader MOE-EMRB Scott Painter, Scientist EC - ECB
viii. Eutrophication or undesirable algae xi. Degradation of Aesthetics	Ken Nicholls, Limnologist Murray Charlton, Research Scientist EC-NWRI Scott Painter, Scientist EC-ECB Duncan Boyd, Group Leader MOE-EMRB
x. Beach Closings	Ted Devine, Health Inspector, Simcoe County District Health Unit
xiii. Degradation of phytoplankton and zooplankton populations	Ken Nicholls, Limnologist Aaron Todd, Scientist MOE-EMRB

COA Technical Review of Use Impairments

The COA Technical Review Team met on September 4, 2001 and dealt with most of the impairments.

For "restrictions on fish and wildlife consumption", and "degradation of benthos" the reviewers reached consensus that the delisting objectives had been met and that the impairments have been restored.

For "eutrophication", "degradation of phytoplankton and zooplankton populations" and "degradation of aesthetics", the reviewers were in general agreement that the targets have been met, however, followup work and further modelling was suggested to be able to distinguish what was accomplished through RAP implementation versus the impact of zebra mussels.

Ongoing and followup actions include:

Aaron Todd (MOE) will be working with Ken Nicholls (consultant) and Keith Sherman to address outstanding analyses on eutrophication and the impact of zebra mussels.

COA Technical Review Meeting On Wildlife

A meeting was held on Sept. 20th to review the technical documentation for the wildlife side of the impairments "degradation of fish and wildlife populations" and "degradation of fish and wildlife habitat". Keith Sherman and Rimi Kalinauskas met with the EC-CWS expert Dr. Chip Weseloh and went through the status/evidence for each of the wildlife objectives. Unfortunately the OMNR technical expert Brad Allan on wildlife was unable to attend the meeting but gave his comments on the documentation in October, 2001. The consensus was that the wildlife objectives have generally been met (and if not commitments and a plan is in place to meet them).

COA Technical Review Meeting On Fish

The COA Technical Review Team "fish experts" assigned to review the status/evidence for delisting the impairments related to "degradation of fish populations" and "degradation of fish habitat" met on Tuesday Oct. 30 in Burlington at CCIW. In attendance were Vic Cairns (DFO), Ken Minns (DFO), Arunas Liskauskas (OMNR), David Gonder (OMNR) and Brad Allan- by teleconference (OMNR).

Degradation of fish populations

The Review Team's conclusion was that the delisting objective for "degradation of fish populations", which is "to restore a balanced, self-sustaining fish community by restoring top-level predators including walleye, northern pike, large and smallmouth bass and muskellunge

to levels similar to the early 1970's, with these species forming at least 20-30% of the total catch and walleye forming at least 10% of trapnet results", has NOT been met. As of spring 2001., less than 10% of the trapnet catch are top-level predator fish with less than 5% of the catch being walleye. In fact, OMNR considers the walleye population to be "at risk" . The mean age of walleye is decreasing and apparent mortality is increasing. Other sport fish populations such as northern pike and largemouth bass are also decreasing.

The experts cited the following factors as influencing the change in fish populations: increase in fishing pressure (including First Nations harvest); zebra mussel infestation (which has contributed to changes in the open water trophic structure and nearshore habitat conditions) ; change in trophic status of Severn Sound (decrease in phosphorus, phytoplankton and zooplankton biomass) due to phosphorus control; and lower water levels (which have adversely affected nearshore spawning and nursery areas). The fish community in Severn Sound is changing and water quality and pollution issues may no longer be the problem. In view of these changes, the original RAP Stage 2 delisting objective for top-level predator fish may no longer be appropriate.

In terms of a path forward, the recommendation of the "fish experts" is that this beneficial use should remain "impaired", but this need not stop the "delisting" of Severn Sound as an Area of Concern PROVIDED THAT:

- 1) the agencies make a commitment to a long term fish monitoring program in Severn Sound (to better understand what is happening) and
- 2) the agencies act on the results of the monitoring studies.

Ongoing and followup actions include:

1. The development of a "cooperative project" involving OMNR, DFO, SSEA and EC as partners. SSEA would facilitate the study in cooperation with OMNR. DFO would provide scientific expertise in designing the study/reviewing results and assist with repeated electrofishing at a subset of the DFO nearshore fish community surveys done in 1990, 92 and 95. This information, together with OMNR's Early Summer Index Trapnet Survey should provide the necessary information required to assess the health of the fish community.
2. OMNR needs to undertake a 2002 winter creel survey in Severn Sound (to get a better picture of current fishing pressure).
3. OMNR has begun to address the increased harvest pressure by: decreasing the walleye quotas for commercial fishermen; consulting with the recreational fishing sector (through the establishment of the "Eastern Georgian Bay Stewardship Council" which has recommended reductions in walleye, northern pike and bass catch and possession limits. In addition, OMNR is liaising with First Nations groups re-managing their harvest.

Degradation of Fish Habitat

With respect to "degradation of fish habitat" the delisting objective is "to implement the Severn

Sound Fish Habitat Management Plan and other policies to enhance and prevent the loss of fish and wildlife habitat". While the RAP has undertaken many fish habitat restoration projects, it is unclear whether there has been an increase or a decrease in fish habitat in Severn Sound given that the area is under strong development pressure. The recommendation of the "fish experts" is that the SSEA should "explore institutionalizing DFO's "no net loss" fish habitat policy". While the Severn Sound Fish Habitat Management Plan has been developed and is being used by DFO and the local municipal planning staff to review new development proposals- this is being done in a reactive/haphazard manner.

As conditions for delisting, the "fish experts" recommend:

1. The fish habitat management plan be updated;
2. DFO's FHM-OGLA enter into a formal agreement with the SSEA whereby all development proposals in Severn Sound will be referred to the SSEA for review/comment and tracking; and
- 3 The local municipalities incorporate the fish habitat management plan in their Official Plans.


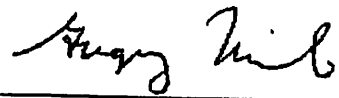
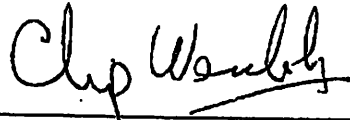
Delisting objectives are met provided ongoing actions are carried out.



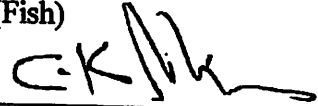


Ongoing and followup actions include:

1. The Severn Sound Fish Habitat Management Plan should be updated by sections corresponding to the municipal boundaries- with the timing to correspond with the updating of municipal Official Plans provided funding for the initial stages is provided by the federal government.
2. Walleye spawning sites need to be protected from spring harvest, as well as water level fluctuations. The recommendation of the "fish experts" is a formal agreement needs to be reached with Parks Canada-Trent-Severn Waterway, OMNR and SSEA for a operational protocol at the dam at Port Severn to protect fish spawning habitat in the downstream operation of Lock 45. A separate agreement should be made with Corporation of the Township of Severn, OMNR and SSEA to protect fish spawning habitat downstream of the the falls on the North River.

FEDERAL/PROVINCIAL TECHNICAL REVIEW TEAM RECOMMENDATIONS FOR DELISTING OF SEVERN SOUND AS AN AREA OF CONCERN

The following tables include signatures and recommendations of technical experts appointed to review the Severn Sound Remedial Action Plan Stage 3 Report and their recommendations for delisting Severn Sound as an Area of Concern.

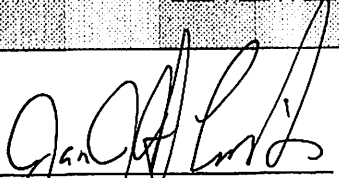
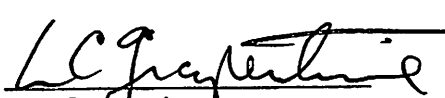
IMPAIRMENT (as defined in the GLWQA)	STATUS AND RATIONALE FOR DELISTING	REVIEWER
<p>i. Restriction on fish and wildlife consumption</p> <p>To have no restrictions on consumption of fish and wildlife from Severn Sound attributable to local contaminant sources.</p>	<p>RESTORATION ACHIEVED</p> <p>Current (2001) recommended restrictions on the consumption of sportfish in Severn Sound include consumption advisories for Walleye (>55cm), smallmouth bass (>35cm) and northern pike (>75cm) due to mercury contamination. Walleye samples from Severn Sound show a significant decline in mercury concentrations from 1976 to 1989. Additional collections in 1993 and 1999 continued to show similar mercury residues to 1989. The levels of mercury contamination in Severn Sound walleye are similar to or lower than other areas of Georgian Bay and are thought to reflect regional mercury levels rather than any local mercury source. Carp continue to show low tissue levels of PCBs and other organochlorine chemicals (1982, 1992, 1996, 1999). Severn Sound carp are considered the cleanest carp in the Great Lakes with respect to organo-chlorine chemical contaminants. Values of PCBs for 1999 show that even large carp are suitable for unrestricted consumption.</p> <p>Biomonitoring for active sources of mercury and organochlorine chemicals was conducted in 1987 using young-of-the-year spottail shiners and in the eggs of other indicators such as common tern, red-winged blackbird and tree swallows. Low or undetectable concentrations of mercury and PCBs and other organo-chlorine chemicals were found in Severn Sound biota and in surficial deposition sediments. The concentrations of mercury and other metals in sewage plant biosolids has generally declined or remained the same over the last 15 years.</p> <p>These indicators suggest that the delisting objectives for this use impairment have been met in the Area of Concern and that restrictions are not attributable to local sources.</p>	<p> Alan Hayton, Group Leader Sport Fish Contaminants Program OMOE-EMRB</p> <p> Greg Mierle, Scientist OMOE-Dorset Research Centre</p> <p> Chip Weseloh, Biologist, CWS</p>
<p>ii. Tainting of fish and wildlife flavour</p>	<p>NOT IMPAIRED</p>	

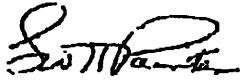
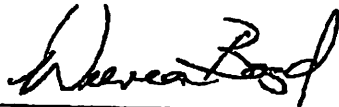
IMPAIRMENT (as defined in the GLWQA)	STATUS AND RATIONALE FOR DELISTING	REVIEWER
<p>iii. Degradation of fish and wildlife populations</p> <ol style="list-style-type: none"> 1. To protect and rehabilitate fish and wildlife habitat. 2. To restore a balanced, self-sustaining fish community by restoring top-level predators to levels similar to the early 1970's, with these species forming at least 20-30% of the total catch, and walleye forming at least 10% of total catch of trapnet results. 	<p>REMAINS IMPAIRED - RESTORATION ACHIEVED WITH EXCEPTION OF OBJECTIVES 2 AND 3.</p> <ol style="list-style-type: none"> 1. See below under xiv) 2. As of 2001, <10% of total catch are top-level predator fish with <5% walleye, based on Early Summer Trapnet Survey. Based on ESTN results from 1999 to 2001 the walleye population is considered "at risk" due to harvest. Walleye mean age is decreasing and estimated mortality is increasing. Creel survey results from 2001 suggest that more walleye are being caught by anglers in 2001 than during the early 1990's. ESTN results indicate that catch per trapnet night of other predator species may be declining. Factors other than change in trophic status that could be influencing the top-level predator fish community, but have become apparent after the RAP Stage 2 Report was released, include: increased harvest of fish due to increased angling pressure; native harvest, increased harvest by the Double-crested Cormorant population; the adverse influence of introduced exotic species such as zebra mussels and round goby; and decreased water levels to near record lows during 1999, 2000 and 2001. The delisting objective with respect to top-level predators has not been met, however, delisting can proceed provided the responsible agencies commit to a long-term fish monitoring program in Severn Sound in order to assess the fish community in relation to the Georgian Bay communities and provided that agencies manage the fisheries based on the monitoring results. 	<div data-bbox="1501 284 1774 381"></div> <div data-bbox="1444 397 1822 479">Arunas Liskauskas, Biologist MNR UGLMU (Fish)</div> <div data-bbox="1512 479 1743 552"></div> <div data-bbox="1444 552 1879 625">Victor Cairns, Research Scientist, DFO (Fish)</div> <div data-bbox="1533 600 1848 706"></div> <div data-bbox="1444 706 1848 779">Ken Minns, Research Scientist, DFO (Fish)</div> <div data-bbox="1501 812 1816 893"></div> <div data-bbox="1444 901 1801 974">Brad Allan, Biologist MNR (Fish and Wildlife)</div> <div data-bbox="1480 982 1774 1096"></div> <div data-bbox="1444 1096 1885 1169">Chip Weseloh, Biologist EC-CWS (Wildlife)</div>

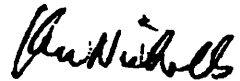
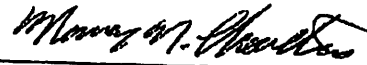

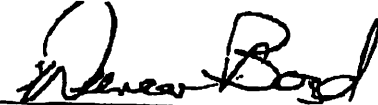
IMPAIRMENT (as defined in the GLWQA)	STATUS AND RATIONALE FOR DELISTING	REVIEWER
<p>iii. Degradation of fish and wildlife populations continued</p> <p>3. To maintain a natural diverse fish community, to discourage the introduction of exotic species and to prevent the extinction of native or desirable species.</p>	<p>3. Rich diversity exists with 67 fish species identified in the Severn Sound. There is no indication that diversity is being threatened by factors related to environmental quality in open water and coastal areas. However, recently introduced exotic species such as zebra mussels and round goby may adversely alter the fish community for some sport fish species. Results of DFO fish community sampling (1989-1995) indicate that Severn Sound adult fish biomass and structure is influenced by trophic gradient and the amount and suitability of nearshore habitat. Where the nearshore can be remediated, improved habitat is expected to improve diversity and balance in localized areas. The Index of Biotic Integrity (IBI) for areas within Severn Sound has been greater than 57 (Minns et al. 1994; cf Hamilton Harbour IBI = 29). More recent monitoring of biotic integrity is required to confirm that the IBI remains high with the increased fish harvest and introduction of exotic species factors.</p>	<p>continued</p>

IMPAIRMENT (as defined in the GLWQA)	STATUS AND RATIONALE FOR DELISTING	REVIEWER
<p>iii. Degradation of fish and wildlife populations continued</p> <p>4. To maintain a self-sustaining, diverse community of colonial waterbirds</p>	<p>4. Severn Sound area has a diverse self- sustaining colonial waterbird community including Herring Gulls, Ring Billed Gulls, Caspian terns, Common terns, Double-Crested Cormorants, Black Crowned Night Herons and Great Blue Herons. The waterbird use of the Severn Sound area relates to shoreline disturbance. The community balance is considered acceptable in most areas. Sites with extensive turf areas near shore are known to have depressed diversity and excess of some waterfowl such as Canada geese. Habitat restoration and enhancement projects in these areas have improved diversity (eg. Penetanguishene Waterfront Park, Little Lake Park (Midland)).</p> <p>- Three Important Bird Areas (IBAs) have been established in Severn Sound wetlands where assessments and follow up monitoring of significant local populations of black terns and least bitterns are under way.</p>	<p>continued</p>
<p>5. As part of the Matchedash Bay project of the North American Waterfowl Management Plan (NAWMP) to produce 2450 waterfowl</p>	<p>5. The duck production mentioned in the original Matchedash Bay Project targets has not been assessed directly. Based on expected production levels of similar areas, the estimated general duck production in enhanced and secured wetland areas in Matchedash Bay was 1329 ducks per year.</p>	


IMPAIRMENT (as defined in the GLWQA)	STATUS AND RATIONALE FOR DELISTING	REVIEWER
6. Wildlife populations will be maintained at levels sufficient to provide recreational and economic benefits, ensure environmental quality and ecosystem integrity and ensure public safety	6. Based on the wildlife indicators described above, Severn Sound continues to have a healthy self-sustaining and diverse wildlife community.	
7. To re-introduce a self sustained population of Trumpeter Swans in the Severn Sound area.	7. The objective of 15 wild breeding pairs in Ontario has been met, however, not all pairs have bred successfully nor has the population reached self-sustainability (Lumsden and Drever in press). With continued efforts of the Trumpeter Swan Restoration Program in monitoring and managing the population through introductions, it is expected that the population will achieve sustainability in the next few years. Remedial actions to ban the use of lead shot for waterfowl hunting and lead shot remediation in the Wye Marsh and surrounding areas in Severn Sound will reduce the risk of lead poisoning of swans.	
iv. Fish tumours or other deformities	NOT IMPAIRED	
v. Bird or animal deformities, reproduction problems	NOT IMPAIRED	



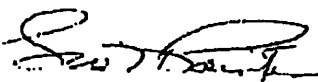

IMPAIRMENT (as defined in the GLWQA)	STATUS AND RATIONALE FOR DELISTING	REVIEWER
<p>vi. Degradation of benthos</p> <p>1. Appropriate benthic community for Severn Sound.</p> <p>2. Mesotrophic conditions (a) <i>Hexagenia</i> as indicator of ecosystem health (b) sludge worm (tubificid) density < 3,000 /m²</p> <p>3. Absence of acute and chronic toxic effects on benthos</p>	<p>RESTORATION ACHIEVED.</p> <p>A comparison of the benthos community between 1994 and 1998 was made using the BEAST model. The model suggests that the benthic community found at stations off Penetanguishene was stressed in 1994 but has improved by 1998. Four of 25 sites in Severn Sound had benthic communities significantly different than expected of Great Lakes nearshore locations in 1994, all of which were shallow and had rich communities typical of shoreline invertebrate fauna. All locations in 1998 were similar to the reference sites. <i>Hexagenia</i> were found at virtually every location where appropriate habitat conditions existed. Tubificid worms were found in reduced numbers in 1998. Twenty-two of 25 locations had significantly fewer than 3,000 worms/m². Acute and sub-lethal toxicity were investigated in the same locations and were found to be non-toxic (Krantzberg and Sherman 1995).</p>	<p> Jan Ciborowski, Professor, University of Windsor</p> <p> Lee Grapentine, Scientist, EC-NWRI</p>

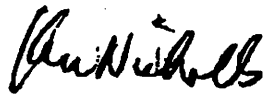

IMPAIRMENT (as defined in the GLWQA)	STATUS AND RATIONALE FOR DELISTING	REVIEWER
<p>vii. Restrictions on dredging</p> <p>To meet biological and chemical guidelines for sediment quality such that there are no restrictions on dredging or disposal activities attributable to polluted sediments.</p>	<p>NOT IMPAIRED</p> <p>In general, contaminant levels in Severn Sound open water deposition sediments were near or below the Lowest Effect Level (LEL) of the Provincial Sediment Quality Guidelines (Table 3.1.2). At some locations especially in Penetang Bay the Severe Effect Level was exceeded due to the fine-grained, nutrient-enriched nature of sediments and due to historical industrial sources. However, following bioassessment, no significant toxicity effects were noted even at "worst-case" sites. The normal disposal practice for dredged material continues to be dry land disposal with the applicant responsible for assessing the waste quality prior to dredging. Since upland disposal for small scale dredging operations is practised this impairment is no longer considered to apply to Severn Sound.</p>	<p> Scott Painter, Scientist EC-ECB</p> <p> Duncan Boyd, Group Leader MOE-EMRB</p>

IMPAIRMENT (as defined in the GLWQA)	STATUS AND RATIONALE FOR DELISTING	REVIEWER
<p>viii. Eutrophication or undesirable algae</p> <p>OPEN WATER</p> <ol style="list-style-type: none"> 1. TP concentration <15 ug/L in open waters and <20 ug/L in Penetang Bay 2. Chlorophyll a concentration <5ug/L in open waters and <7ug/L in Penetang Bay 3. Water clarity to be SDV >3m (or on bottom) in open waters and >2m in Penetang Bay 4. Rooted aquatic plant distribution in Penetang Bay should increase by 30%. Other areas of Severn Sound should maintain the same coverage. 5. Minimum bottom water dissolved oxygen concentration >5mg/L 	<p>RESTORATION ACHIEVED.</p> <p>OPEN WATER</p> <p>Based on ice-free period (May to October) mean euphotic zone values of trophic indicators at open water sites in Severn Sound (total phosphorus concentration, chlorophyll a concentration Secchi disc visibility, bottom water dissolved oxygen concentrations, phytoplankton biovolume and zooplankton density and biomass) delisting objectives for Severn Sound have been met following substantial completion of source control of phosphorus. Possible confounding of improvements with zebra mussel infestation has been investigated. The chlorophyll a - total phosphorus relationship for the period before and after zebra mussel infestation is not significantly different at open water sites monitored, therefore phosphorus control is considered the principal cause of these improved conditions.</p>	<div data-bbox="1402 288 1640 368"></div> <div data-bbox="1339 379 1682 427">Ken Nicholls, Limnologist</div> <div data-bbox="1381 472 1745 536"></div> <div data-bbox="1339 536 1871 608">Murray Charlton, Research Scientist EC-NWRI</div> <div data-bbox="1413 639 1671 719"></div> <div data-bbox="1339 727 1759 767">Scott Painter, Scientist EC-ECB</div> <div data-bbox="1371 775 1745 879"></div> <div data-bbox="1339 879 1892 919">Duncan Boyd, Group Leader MOE-EMRB</div>

IMPAIRMENT (as defined in the GLWQA)	STATUS AND RATIONALE FOR DELISTING	REVIEWER
<p>viii. Eutrophication or undesirable algae continued</p> <p>SOURCES</p> <ol style="list-style-type: none"> 1. Sewage plants in the Severn Sound AOC to meet effluent total phosphorus concentrations and loading objectives outlined in the Severn Sound RAP Stage 2 Report (Table 4.1). 2. Sewage bypassing and combined sewer overflows to be virtually eliminated. 3. Urban stormwater discharges to be decreased by 20%. 4. Watershed inputs to Severn Sound should have total phosphorus concentrations of less than 0.030 ug.L and loadings decreased by 20%. 5. Private sewage systems to be upgraded where faulty of substandard. 	<p>Total phosphorus concentration and loading targets set in the Stage 2 report are met for nine sewage plant effluents in the Severn Sound area.</p> <p>Sewage bypassing and CSOs have been virtually eliminated.</p> <p>The Urban Stormwater Management Strategy is being pursued by area municipalities and loadings targets will be met. Implementation is ongoing. Four major tributaries of six meet the target total phosphorus concentration for 90% of the year. Additional loading reductions from non-point watershed sources are being pursued by SSEA. Ongoing control of shoreline private sewage systems is being pursued through municipal building departments.</p>	<p>Continued</p>

IMPAIRMENT (as defined in the GLWOA)	STATUS AND RATIONALE FOR DELISTING	REVIEWER
ix. Restrictionon drinking water taste and odour problems	NOT IMPAIRED	
x. Beach closures Geometric mean E. Coli density: <100 org./100ml. Secchi disk visibility: >1.2m Algae densities: <5ug/L (mean ice-free period chlorophyll <u>a</u> conc.)	<p>RESTORATION ACHIEVED WITH COMPLETION OF ACTIONS</p> <p>The quality of the swimming areas within Severn Sound was generally satisfactory with respect to the Provincial Beach Management Objectives. Public swimming areas monitored met the E. coli objective on 78 to 98% of the sampling days from 1997 to 2000. Exceptions are sheltered swimming areas receiving occasional discharges of urban storm water or areas influenced by stream discharges that may have elevated levels of fecal contamination. Management action is being pursued on these swimming areas. The overall quality of swimming areas in Severn Sound is acceptable and the delisting objectives can be considered to have been met.</p> <p>Aesthetic problems due to nuisance algae growths have improved in Penetanguishene Bay and other areas so that impairment due to nuisance algae and poor clarity has been restored.</p>	 Ted Devine, Health Inspector, Simcoe County District Health Unit

IMPAIRMENT (as defined in the GLWQA)	STATUS AND RATIONALE FOR DELISTING	REVIEWER
<p>xi. Degradation of aesthetics</p> <p>Algae density <5 ug/L Chlorophyll a reduces incidence of algae blooms.</p>	<p>RESTORATION ACHIEVED.</p> <p>The incidence of season-long algae blooms has been eliminated through phosphorus loading reduction, especially in Penetang Bay. Occasional blue-green blooms are reported for short periods (maximum of one week) in late summer to early fall. Aesthetic problems related to turbidity caused by the blooms has improved with the objective for safe swimming conditions (SDV >1.2m) being met throughout Severn Sound.</p> <p>The infestation of zebra mussels with associated attached filamentous algae in nearshore areas presents new aesthetic problems that are not related to the remedial action undertaken.</p>	<p> Ken Nicholls, Limnologist</p> <p> Murray Charlton, Research Scientist EC-NWRI</p> <p> Scott Painter, Scientist EC-ECB</p> <p> Duncan Boyd, Group Leader MOE-EMRB</p>
<p>xii. Added cost to agriculture and industry</p>	<p>NOT IMPAIRED</p>	

IMPAIRMENT (as defined in the GLWQA)	STATUS AND RATIONALE FOR DELISTING	REVIEWER
<p>xiii. Degradation of phytoplankton and zooplankton</p> <p>To ensure phytoplankton species and biovolume are representative of mesotrophic conditions and to have a balanced zooplankton community. (ie. more Daphnia)</p>	<p>RESTORATION ACHIEVED.</p> <p>Overall phytoplankton biovolume has decreased to less than 1 mm³/ml from peak values of 6 mm³/ml in the late 1980s and early 1990s. The proportion of large diatoms associated with nutrient enrichment has decreased since the early 1990s in response to reduction in phosphorus loadings. The community and density is consistent with a shift from eutrophic to mesotrophic conditions. However, the community structure may also be influenced by selective filtration of zebra mussels. Increases in blue-green algae such as <i>Microcystis</i> spp. and increased shoreline complaints of filamentous algae such as <i>Mougeotia</i> and <i>Spirogyra</i> have been noted. The response of phytoplankton to changes in nutrient loadings is also being reduced further by zebra mussels. A model predicting phytoplankton biovolume using STP phosphorus load suggests that, the phosphorus control measures taken in Penetang Bay would result in meeting the delisting objectives for open water trophic indicators in the absence of zebra mussels (Todd and Sherman in prep.). Response of phytoplankton in the south end of Penetang Bay was evident prior to zebra mussel infestation.</p>	<p> Ken Nicholls, Limnologist</p> <p> Aaron Todd, Water Scientist, MOE, EMRB</p>

IMPAIRMENT (as defined in the GLWQA)	STATUS AND RATIONALE FOR DELISTING	REVIEWER
	<p>Zooplankton biomass has also declined since the early 1990s. The predominant species <i>Bosmina longirostris</i>, which represented up to 75% of the total biomass in 1990, declined in abundance, biomass and in proportion of the total biomass. Daphnids are still scarce and represent a small proportion of the total community. Zebra mussel veliger larvae abundance has also declined in recent years at all stations.</p>	

IMPAIRMENT (as defined in the GLWQA)	STATUS AND RATIONALE FOR DELISTING	REVIEWER
<p>xiv. Degradation of fish and wildlife habitat continued</p> <p>4. As part of the Matchedash Bay project, to:</p> <ul style="list-style-type: none"> i) secure and manage 1715 ha of wildlife habitat ii) restore and develop 427 ha of habitat for waterfowl and other wetland dependant wildlife iii) maintain and enhance 442 ha of habitat for staging waterfowl. <p>5. To rehabilitate tributaries and riparian areas for fish and wildlife habitats.</p> <p>6. To maintain existing colonial waterbird nesting sites within and near Severn Sound.</p> <p>7. To maintain and increase Osprey nesting sites within Severn Sound.</p>	<p>4. The Eastern Habitat Joint Venture is continuing to implement the Matchedash Bay Project (NAWMP 2000).</p> <p>5. In order to sustain forest cover, planting programs should continue to be sustained. Mechanisms to secure large interior forest patches should also be pursued.</p> <p>6. The colonial waterbird nesting sites (primarily on the Watcher Islands in Georgian Bay) are being maintained by CWS and OMNR.</p> <p>7. The Georgian Bay Osprey Society continues to support the construction of osprey nesting platforms in appropriate locations in Severn Sound.</p>	<p>continued</p>

APPENDIX 2 PUBLIC INVOLVEMENT FOR THE SEVERN SOUND RAP FROM 1987 TO 2001

1987

Establishment of Public Consultation Framework

1988

May 1988

Initiation of Phase I Public Involvement Program

Summer 1988

First Newsletter Published and Distributed to the Public

Portable public displays and information tables were set up at a variety of public events.

The Wye Marsh Wildlife Centre entered into an agreement to act as local facilitator for the RAP's public involvement process.

June 20, 1988

A municipal workshop was held for municipal representatives.

A RAP talk and slide show was given to many service clubs, ratepayers and cottage associations and council meetings.

Posters and newsletters were placed in marinas, post offices, general stores, municipal offices, Chambers of Commerce, restaurants and malls throughout Severn Sound.

A RAP questionnaire was added to the OMNR summer creel survey.

In all of these activities, forms were provided for interested members of the public to get involved in the RAP.

October 13, 1988

RAP Public Meeting - shown on local television

October 15, 1988

RAP Public Meeting - shown on local television

Resulting from the above public involvement activities, 450 names were on the stakeholder's list by year end. Summaries from the Public Meetings were sent out to these 450 stakeholders and included a water use questionnaire.

1989

February 14, 1989

Severn Sound RAP Overview and the formation of the Severn Sound Public Advisory Committee (PAC)

February 1989

Marine Practice Workshop to promote environmental awareness

March 14, 1989

First Official PAC Meeting - Goals and Objectives for the PAC

April 11, 1989

PAC Meeting - Household Hazardous Waste Guide - Heather McKinnon

May 9, 1989

PAC Meeting - Fish Habitat - Robin Craig, OMNR, Huronia District

June 13, 1989

PAC Meeting - Septic Systems and Grey Water from Pleasure Boats

July 11, 1989

PAC Meeting - Agriculture in the Severn Sound Watershed - David Morris, Ontario Ministry of Agriculture and Food

July 1989

Newsletter Number 2 - Summer 1989 Distributed to the Public

August 8, 1989

PAC Meeting - Tour of Midland Sewage Treatment Plant

September 12, 1989

PAC Meeting - RAP Involvement in Official Plans of Municipalities

September 28, 1989

Public Meeting - Presentation of RAP Use Goals to the Public

September 30, 1989

Public Meeting - Presentation of RAP Use Goals to the Public

October 10, 1989

PAC Meeting - Georgian Bay Islands National Park (GBI) - Jim Ellsworth, Assistant Superintendent

November 14, 1989

PAC Meeting - Legal Control of Local Environment - Rod Northey

December 12, 1989	PAC Meeting - Penetang Bay Nutrient Budget, Soil Erosion Mapping and Shoreline Development Study - Keith Sherman
1990	
January 9, 1990	PAC Meeting - GBI Water Quality Report - Rob Bilyea
February 13, 1990	PAC Meeting - Land Stewardship and OSCAPAT Programs - Bob Wilson, North Simcoe Soil and Crop Association
April 10, 1990	PAC Meeting - Open Water Quality Monitoring - Andy Gemza, Ministry of Environment, Limnology Section
April 27, 1990	PAC member participation in PAC/RAP Provincial Joint Meeting, Toronto
May 8, 1990	PAC Meeting - Remedial Options Discussion Paper - Keith Sherman and David Evans, Ministry of Environment, Communications
May 1990	Presentation to Victoria Harbour Ratepayers Association
June 12, 1990	Public Meeting & Release of the Severn Sound Remedial Options Discussion Paper
July 10, 1990	PAC Meeting - Presentation by the Citizens Against Metro Garbage - Presentation by citizens opposed to the use of the Uthoff Quarry as a dump site for Toronto.
July 1990	PAC Members gave a RAP talk and slide show to more than 20 organizations that included service clubs, ratepayers' associations and council meetings.
August 14, 1990	PAC Meeting - Municipal/Industrial Strategy for Abatement (MISA) - Tim Toole, Town of Midland, WPCP
September 11, 1990	PAC Meeting - MISA Presentation - John Kinkead, Manager, MISA Municipal Section of Water Resources Branch, Ministry of Environment
October 9, 1990	PAC Meeting - Remedial Options Discussion Paper (RODP) - Planning Session for Public Meetings
October 11, 1990	Public Meeting - RODP - Public Response Forms Distributed
October 13, 1990	Public Meeting - RODP - Public Response Forms Distributed
November 8, 1990	Public Meeting - Town of Penetanguishene - Phosphorus Reduction Strategy
November 13, 1990	PAC Meeting - Report on Public Meetings - Bob Whittam, RAP Facilitator and PAC Chair
December 11, 1990	PAC Meeting - North American Waterfowl Management Plan - Cindy Storey
1991	
January 8, 1991	PAC Meeting - Implementation of RAPs - David Evans, Environment Canada
February 12, 1991	PAC Meeting - Public Response to the (Remedial Options Discussion Paper) RODP - Bob Whittam, RAP Facilitator
March 12, 1991	PAC Meeting - Update of Fish Habitat Workshop - Keith Sherman
March 1991	Newsletter Number 3 - Spring 1991 Distributed by Mail
April 9, 1991	PAC Meeting - Response to RODP - Final Draft Comments from PAC
May 14, 1991	PAC Meeting - Report from Department of Fisheries and Oceans (DFO) - Vic Cairns, DFO, Fisheries Biologist
June 11, 1991	PAC Meeting - PAC Implementation - Keith Sherman, RAP Coordinator

	and Bob Whittam, RAP Facilitator
July 1, 1991	Canada Day Celebrations in Penetanguishene
July 9, 1991	PAC Meeting - Conservation Authorities - Ken Higgs, former GM of Metro Toronto Region Conservation Authority
August 13, 1991	PAC Meeting - Matchedash Bay Wildlife Area Management Plan and the Eastern Habitat Joint Venture - Dan Mansell, Ontario Ministry of Natural Resources, Barrie
August 13, 1991	DO (Dissolved Oxygen) Day
September 10, 1991	PAC Meeting - Implementation of the RAP - Tom Wells, Public Involvement and Communications Coordinator for Provincial RAPs
October 5-6, 1991	Severn Sound RAP participation at the Georgian Bay Association Conference
October 8, 1991	PAC Meeting - Cottage Pollution Control Program - Keith Sherman, RAP Coordinator
December 10, 1991	PAC Meeting - Tributary Rehabilitation Program - Carrie McIntyre, RAP/OMNR
1992	
January 28, 1992	PAC Meeting - Cottage Pollution Control Project - Terry Healy, Area Supervisor for the Cottage Pollution Control Project and Boating Survey
February 11, 1992	PAC Meeting - Municipal Roundtable Discussions - Keith Sherman, RAP Coordinator
March 10, 1992	PAC Meeting - Phosphorus Control Strategy - Keith Sherman, RAP Coordinator
March 26, 1992	NSSCIA Farm Demo
March 27, 1992	Orillia Science Fair
April, 1992	Newsletter Number 4 - Spring 1992 Distributed by mail
April 14, 1992	PAC Meeting - Socio-Economic Study - Karl Schaefer, Geographer, Inland Waters Directorate
April 23, 1992	Municipal Workshop - Introduction and Discussion of the Draft Stage 2
Apr 24-May 9, 1992	Tree Planting for the Tributary Rehabilitation Program - Seven tree plant events with a variety of volunteers planted 13,400 trees
May 2, 1992	RAP/PAC Tree Planting Competition
May 12, 1992	PAC Meeting - PAC Tour of North Simcoe Anglers and Hunters Fish Hatchery in Penetanguishene
June 4, 1992	Tributary Rehabilitation Presentation to /JarrettCoulson Ratepayers
June 5, 1992	CURB Program Announced
June 5, 1992	"Hay Day" NSSCIA in Elmvale
June 9, 1992	PAC Meeting - Tour of Bay Port Marina
June 11, 1992	Municipal Heads of Council Meeting - Further Discussion of Draft Stage 2
July 14, 1992	PAC Meeting - Fish Habitat Management Plan
August 8-9, 1992	Natural Science Weekend at Simcoe County Museum in Midhurst
August 11, 1992	PAC Meeting - Stage 2 Roundtable Process - David Evans, Community Affairs Consultant
August 15-16, 1992	Pro Bass Tournament at the Town Dock in Midland
September 1, 1992	Agricultural Hall of Fame, Simcoe County Museum, Midhurst

September 8, 1992	PAC Meeting - Wetland Policy - Bob Law, Ministry of Natural Resources, District Planner for Midhurst and Grey/Bruce Counties
Sept. 19-20, 1992	Wye Marsh Wildlife Centre Festival
Sept 20, 1992	Coldwater Fall Fair
Sept. 20, 1992	GBI Conference in Honey Harbour
October 9, 1992	Elmvale Fall Fair
October 13, 1992	PAC Meeting - Stage 2 Document Review - David Evans, Community Affairs Consultant
October 14, 1992	Severn Sound RAP Agricultural Community Meeting, Elmvale
October 14, 1992	RAP Agricultural Community Meeting, Tiny Township
November 10, 1992	PAC Meeting - Purple Loosestrife - Jody Boyd, Ontario Federation of Anglers and Hunters
November 17, 1992	PAC Subcommittee Meeting - Stage 2 Implementation
December 1, 1992	Presentation to Bay of Quinte RAP, Trenton
December 8, 1992	PAC Meeting - The Severn Sound RAP and Tourism - Ron Taylor
December 7, 1992	NSSCIA Annual Meeting, Elmvale
December 7-8, 1992	54 th Midwest Fish & Wildlife Conference, Toronto
December 16, 1992	Presentation to Penetanguishene Secondary School
1993	
Jan 6-13, 1993	Simcoe County Farmer's Week
January 12, 1993	PAC Meeting - Stage 2 Implementation and 1993/1994 Work Plan Discussions
January 20, 1993	Simcoe County Cattleman's Association
February 2, 1993	Presentation to the Beavers of Penetanguishene
February 9, 1993	Presentation to the Midland Girl Guides
February 9, 1993	PAC Meeting - Stage 2 Document - Communications and Public Involvement
February 24, 1993	Presentation to Midland Rotary Club
March 2, 1993	Presentation to Elmvale Junior Farmers
March 9, 1993	PAC Meeting - Communications Plan for Stage 2 Document
April 5, 1993	Stage 2 Open House
April 5, 1993	Presentation and Tree Plant with Area Boy Scout Leaders
April 13, 1993	PAC Meeting - Purple Loosestrife - Volunteer Days - Sandy Agnew and Dr. Art Brasseur
April 1993	Newsletter Number 5 - Spring 1993 Distributed by mail
April 27, 1993	Public Meeting - Stage 2
April 27, 1993	NSSCIA No Till Seed Drill Demo Day
May 1, 1993	RAP/PAC Tree Plant Challenge
May 11, 1993	PAC Meeting - Transcanada Pipeline Proposal - John Weyland, P. Eng., Senior Management, Project Development and Paul Scrivener, Government Corporate Relations
May 31, 1993	Victoria Harbour Ratepayers Association Meeting
June 8, 1993	PAC Meeting - RAP Implementation Office and Coordination
July 13, 1993	PAC Meeting - Midland Sewage Treatment Plant Tour

July 17, 1993	Hog Creek Celebration
July 20, 1993	North Simcoe Soil & Crop Association & RAP Car Tour
August 7, 1993	Purple Loosestrife Volunteer Clean-Up, Penetanguishene
August 10, 1993	PAC Meeting - "Friends of the Great Lakes" Plaque Presentations
September 14, 1993	PAC Meeting - Planning Issues: Watershed and Sub-Watershed Issues - Wes Crown, Planning Director for Tay Township
October 12, 1993	PAC Meeting - Fish Habitat Management Plan
November 9, 1993	PAC Meeting - RAP Implementation Structure - Deane Ewart / Midland WPCP Optimization Study - Tim Toole, Manager, Midland Sewage Plant
December 14, 1993	PAC Meeting - Report Card: Contamination - Keith Sherman, RAP Coordinator
1994	
January 11, 1994	PAC Meeting - Little Lake Park - Rev. Lloyd Delaney / Report Card: Tributary Rehabilitation and Beach Quality - Keith Sherman, RAP Coordinator
February 8, 1994	PAC Meeting - Farm Waste Treatment Practices - Mike Toombs, Ontario Ministry of Agriculture and Food
March 8, 1994	PAC Meeting - New Approach to Land Use Planning - Wes Crown, Tay Township Planner and Bob Law, Ministry of Natural Resources
April 12, 1994	PAC Meeting - Bird Studies in Severn Sound and Southeast Georgian Bay - Chip Weseloh, Canadian Wildlife Service Biologist
April 1994	"Waterbirds of Severn Sound" Poster is published and distributed to the public
April 23, 1994	3 rd Annual PAC/RAP Tree Plant Challenge - 6,800 trees and shrubs planted by 173 volunteers
April 30, 1994	PAC members attended M.P. Paul DeViller's Advisory Committee on the Environment and Sustainable Development Meeting
May 10, 1994	PAC Meeting - Index Trapnetting Survey - Dave Ross, Ministry of Natural Resources Biologist
June 14, 1994	PAC Meeting - PAC Tour of Penetanguishene Main Street Sewage Treatment Plant and Tour of Penetanguishene Waterfront Park: Clean Up and Restoration Project Site
June 1994	Tour of RAP project sites with Dr. Peter Victor, Assistant Deputy Minister of Environment and Energy with PAC members and RAP Staff
July 12, 1994	PAC Meeting - COA: Great Lakes Partnerships for Life - Eleanor Kulin, Director, Great Lakes and Corporate Affairs
August 9, 1994	PAC Meeting - Port Severn Sewage and Water Project - Geoff Bache, Director of Environmental Services, District of Muskoka and Guy LePatourel, Paragon Engineering
August 11, 1994	Purple Loosestrife Control Project - Volunteers met at the mouth of Copeland Creek.
September 13, 1994	Public Open House for the Penetanguishene Harbour Cleanup and Habitat Restoration Project
September 16, 1994	Participation by PAC member in the 6 th Annual OPACC Conference, Sarnia, Ontario

September 1994	Presentations by Carol Dimock at the Atlantic Coastal Action Plan Conference, Halifax
October 11, 1994	PAC Meeting - Great Art for Great Lakes - Alan Waffle, Senior Program Coordinator of the Environmental Protection Branch (Environment Canada) and Pamela Sunstom, Great Art for Great Lakes Program
November 8, 1994	PAC Meeting - Currents and Quality Model for Severn Sound - Dr. Ray Dewey, Consultant, Gore & Storrie and Michael D'Andrea, Ministry of the Environment
November 19, 1994	Volunteer Cleanup Day- Penetanguishene Shoreline
December 13, 1994	PAC Meeting - Open Water Quality Summary - Andy Gemza, MOE, Environmental Monitoring and Reporting Branch, Biomonitoring Section
1995	
January 10, 1995	PAC Meeting - Shore Owners Advisory Program (SOAP) - Keith Sherman, RAP Coordinator
January 1995	"Shoreline Living" Video and Companion Booklet Released
February 15, 1995	PAC Meeting - RAP Strategic Plan - Keith Sherman, RAP Coordinator
March 28, 1995	PAC Meeting - Midland's Waterfront Plan: Reclaiming the Edge - Bryan MacKell, Director of Planning, Town of Midland
April 11, 1995	PAC Meeting - Tree Planting - Carrie McIntyre, SSRAP Tributary Rehabilitation Coordinator
April 22, 1995	PAC/RAP Tree Plant Challenge
May 9, 1995	PAC Meeting - Wye Marsh Lead Shot Study - Vince Deschamps, Project Coordinator
May 1995	Herb Connell's Grade 10 Class from Penetanguishene Secondary School Volunteer with Wood Waste Removal Project
June 13, 1995	PAC Meeting - Recent Work in Georgian Bay and 1995 Sediment Survey - Steve Blasco, Geological Survey of Canada
July 11, 1995	PAC Meeting - OPAC Conference - Ken Hall, founding member of PAC and Chairperson of the Ontario Public Advisory Committee (OPAC)
August 8, 1995	PAC Meeting - Presentation by the Sludge and Septage Committee and the Technical Steering Committee for North Simcoe Sludge and Septage
September 12, 1995	PAC Meeting - Severn Sound Swimming Areas - Brian Giles, Health Canada
September 1995	Volunteer Rotary Members Build Two Pedestrian Bridges at the Penetanguishene Waterfront
September 23, 1995	Ecole Le Caron Biology Class Volunteers at the Penetanguishene Waterfront
September 30, 1995	Plants and Shrubs planted at the Penetanguishene Waterfront by 39 Volunteer Gardeners
October 10, 1995	PAC Meeting - Report on IJC Biennial - Sandra De Zotti, Town of Midland / Lead Shot Project Update - Vince Dechamps, SSRAP / Penetang Bay Cleanup Project - Carol Dimock, SSRAP
November 14, 1995	PAC Meeting - The Future of RAP/PAC after Government Cutbacks - Bob Whittam, RAP Facilitator and Keith Sherman, RAP Coordinator
December 5, 1995	Special Public Meeting on the Future of RAP/PAC

December 12, 1995	PAC Meeting - Simcoe County Official Plan - Ian Bender, Planning Director for Simcoe County / Urban Stormwater Study - Aaron Mattson, Project Coordinator
1996	
January 9, 1996	PAC Meeting - Clean Marine Partnership Project - Ken McDonald, President, Ontario Marine Operators Association
February 13, 1996	PAC Meeting - Couchiching Conservancy - Adam Thomson, President, Couchiching Conservancy and President, Federation of Ontario Naturalists
March 12, 1996	PAC Meeting - PAC Terms of Reference - Sandy Agnew
April 9, 1996	PAC Meeting - Matchedash Bay Project - Andy Fletcher, Marsh Manager, Ontario Ministry of Natural Resources
April 13, 1996	Restore the Shore - Clean up Day
April 26, 1996	Presentation to Penetanguishene Mental Health Centre
May 2, 1996	Natural Shorelines Open House
May 14, 1996	PAC Meeting - Midland Rotary Trail - Bryan MacKell, Director of Planning, Town of Midland / Zebra Mussels and Shoreline Owners - Keith Sherman, RAP Coordinator
June 1, 1996	Wye Marsh Swan Swim, Coldwater
June 11, 1996	PAC Meeting - Habitat Restoration Strategy - Brian McHattie, Consultant
June 13, 1996	Presentation for Penetang Habitat
June 15, 1996	Midland Antique and Power Boat Show
June 29, 1996	Canada Day Celebrations in Penetanguishene
July 9, 1996	PAC Meeting - Sediment Survey and Cormorant Project - Bob Harmes, Scientist, Geological Survey of Canada and Darren Keyes, Geophysical Technician, McQuest Marine Research and Development Co. Ltd.
July 18, 1996	Natural Shorelines Open House
July 20, 1996	Midland Pro Bass Tournament
August 13, 1996	PAC Meeting - Ecosystem Monitoring Project, Soil Conservation Project - SSRAP Environmental Youth Corps staff: Paula Madill, Aaron Todd, Jason Zytkevich and Alan DeVillers
August 25, 1996	Wetland Restoration Course, Display and Presentation, Penetanguishene
September 10, 1996	PAC Meeting - Hosting the OPAC Conference - Sandra DeZotti and Brian Milligan, PAC Members / Natural Shorelines Project - Sandy Agnew, Project Coordinator
Sept. 14-15, 1996	Wye Marsh Wildlife Centre Festival
September 1996	"Frog Salvage" Event - With the help of Wye Marsh Junior Conservationists, 435 frogs were collected from development sites and relocated in wetlands.
Sept. 29, 1996	Presentation at 7 th Annual Georgian Bay Association Conference, Honey Harbour
October 4-6, 1996	OPAC Conference Hosted by the Severn Sound PAC
Oct 10-12, 1996	Elmvale Fall Fair
November 12, 1996	PAC Meeting - OPAC Conference Summary - Brian Milligan
December 10, 1996	PAC Meeting - Project Presentations: Soil Conservation - Paula Madill, SSRAP and Natural Shorelines - Sandy Agnew, SSRAP

December 13, 1996	NSSCIA Annual General Meeting
December 16, 1996	Presentation on Natural Shorelines, Georgian Bay Township
1997	
January 14, 1997	PAC Meeting - Wye Valley Study - Bob Whittam, RAP Facilitator
January 21, 1997	Presentation to Penetanguishene Rotary Club
January 28, 1997	Presentation at the Wye Marsh Wildlife Centre - Progress toward Delisting
February 11, 1997	PAC Meeting - North Simcoe Private Land Stewardship Network - Earl Dertinger, Coordinator
February 15, 1997	AFS-SOC Annual Meeting - Presentation "Involving the Community in Wetland Restoration"
March 6, 1997	Fish Habitat Workshop, Barrie
March 7-8, 1997	Sharing Experiences in Habitat Restoration Workshop, Barrie
March 11, 1997	PAC Meeting - Lead Shot Remediation Project - Kim Gavine, Project Coordinator
March 19, 1997	Presentation on Severn Sound STP Optimization Partners, Wye Marsh Wildlife Centre
March 25, 1997	Presentation to Y's Men's Club, Midland
March 28-30, 1997	Cottage Life Show, Toronto
April 8, 1997	PAC Meeting - Report on Open Water Quality Monitoring and Report on Severn Sound Environmental Association - Keith Sherman, RAP Coordinator
April 12, 1997	Wildlife Watchers - Action 21 Display at Wye Marsh
April 21, 1997	Natural Shorelines Presentation to Midland Secondary School Students
April 28-29 1997	Natural Shorelines Open House
May 2, 1997	Formal Signing Ceremony - Severn Sound Environmental Association
May 5, 1997	Natural Shorelines Presentation to Penetanguishene Secondary Students
May 10, 1997	PAC/RAP Tree Plant Challenge
May 12, 1997	Georgian Bay Heritage Festival, Penetanguishene
May 13, 1997	PAC Meeting - PAC's Role in Severn Sound Environmental Association - Keith Sherman, RAP Coordinator
May 31, 1997	Coldwater Swan Swim - Display in Coldwater
June 10, 1997	PAC Meeting - Mitsubishi Property - Environmental Issues - John Fahey, Jim Bishop, Peter Dollar and Ruth Hull from BEAK International and Shane Hashimoto and Terry Walsh from Mitsubishi / Rural Non-Point Source Control Project - Julie Cayley, Project Facilitator
June 14, 1997	Georgian Bay Heritage Festival, Penetanguishene
June 19, 1997	Severn Sound Watershed Tour
June 25-27, 1997	Media Days aboard the HMCS Cormorant, Midland Town Dock
June 28, 1997	Captain's Reception on HMCS Cormorant
June 28, 1997	Canada Day - Penetanguishene
June 28-July 1, 1997	HMCS Cormorant "Open House", Midland Town Dock
July 8, 1997	PAC Meeting - Severn Sound Forest Bird Monitoring Study - Doug Tate, Project Coordinator
July 9, 1997	Presentation by Geological Survey of Canada and Sediment Project Staff, Midland

July 12, 1997	Media Day for 1996 Sediment Survey aboard Monitor VI, Midland Town Dock
July 11, 1997	Steve Blasco presentation on recent work in Georgian Bay
August 1997	Wetland Restoration Course - Penetang Rehabilitation Display and Presentation
August 2, 1997	Georgian Bay Poker Run
August 12, 1997	PAC Meeting - Report on Little Lake RAP - Keith Sherman, RAP Coordinator
September 9, 1997	PAC Meeting - Restoration Status of Severn Sound - Keith Sherman, RAP Coordinator
September 14 1997	Wye Marsh Festival
October 7, 1997	Presentation to the Simcoe County Federation of Agriculture
October 5-6, 1997	Implementation Project Tour
October 14, 1997	PAC Meeting - Report on OPAC Conference - Dunc McLaren and Tanya Brunelle
November 11, 1997	PAC Meeting - Area of Natural Recovery Policy - Keith Sherman, RAP Coordinator
November 18, 1997	Participant/Volunteer Appreciation Night, Penetanguishene
November 26, 1997	Natural Shoreline Presentation to the local Builder's Association
December 5, 1997	Presentation at the Annual Meeting of the Soil and Crop Improvement Association
December 9, 1997	PAC Meeting - Tour of Midland Wastewater Treatment Plant
1998	
January 13, 1998	PAC Meeting - 1997 Severn Sound Interior Forest Bird Study - Mike Cadman, Songbird Biologist, Canadian Wildlife Service
February 10, 1998	PAC Meeting - The Status of the Severn Sound Fish Community - Robin Craig, Ministry of Natural Resources
March 7, 1998	All Day Open House and Presentation by Steve Blasco on the Titanic
March 7, 1998	Partners' Reception
March 10, 1998	PAC Meeting - Provincial Changes to Environmental Legislation: The Impact - Kathleen Cooper, Canadian Environmental Law Association
April 14, 1998	PAC Meeting - Road Salt and Snow Disposal in Severn Sound - Dr. Bill Snodgrass, Senior Scientist, Ministry of Transportation
May 1998	RAP/PAC Tree Plant
May 1998	Natural Shorelines Open House at Baxter Community Centre, Georgian Bay Township
May 1998	Kid's Fishing Derby, Midland Town Dock
May 1998	Display at the Coldwater "Swan Swim"
May 12, 1998	PAC Meeting - Farming Trends and Issues Affecting Severn Sound - "The Moos Brothers" members Grant Robinson and Dave Ritchie
June 9, 1998	PAC Meeting - Double-Crested Cormorant Populations in Georgian Bay - Ron Black, Biologist, Parry Sound District Ministry of Natural Resources
June 1998	Huron No-Till Club Tour

June 1998	Matchedash Heritage Centre Presentation
June 1998	Bass Masters Invitational, Wye Heritage Marina
July 1, 1998	Little Lake Park, Midland - Canada Day
July 1998	Display at Canada Parks Day at Georgian Bay Islands National Park
July 1998	Kid's Fishing Derby, Bass Lake Provincial Park
July 14, 1998	PAC Meeting - Tour of Victoria Harbour Water Treatment Plant
August 1998	Display at "Market Place", Georgian Bay Township
August 1998	Pro Bass Series, Midland Town Dock
August 11, 1998	PAC Meeting - Great Lakes Water Levels - Ralph Moulton, Environment Canada
September 8, 1998	PAC Meeting - Care and Feeding of Your Septic System - Frances Gelder, Inspector, Simcoe County District Health Unit
September 1998	Wye Marsh Wildlife Centre Festival
September 1998	Orillia Fall Fair
September 1998	Habitat Workshop at Tiny Marsh
September 1998	Presentation to the Georgian Bay Association
September 1998	Coldwater Fall Fair
October 1998	Elmvale Fall Fair
October 13, 1998	PAC Meeting - Severn Sound Sediment Survey - Steve Blasco, Geologist, Geological Survey of Canada
December 8, 1998	PAC Meeting - Georgian Bay Nearshore Fish Community Assessment - Arunas Liskauskas, Ontario Ministry of Natural Resources, Lake Huron Unit
1999	
January 5-12, 1999	Simcoe County Farmer's Week
January 13, 1999	PAC Meeting - Severn Sound Open Water Quality Monitoring Program - Aaron Todd, RAP Open Water Monitoring
February 9, 1999	PAC Meeting - Report on Trumpeter Swans as Indicators of Lead Shot Contamination - Michelle Knecht, Wye Marsh Trumpeter Swan Reintroduction Program Coordinator and Michelle Villeneuve, Wetland Rehabilitation Coordinator
February 1999	Open House for Little Lake Prescribed Burn, Midland
February 1999	Wetlands Presentation to Huronia Woodlot Owners' Association
March 9, 1999	PAC Meeting - Process and Progress: A Review of Severn Sound RAP - Keith Sherman, RAP Coordinator
March 1999	Central Ontario Young Farmers Forum, Midhurst
April 13, 1999	PAC Meeting - Severn Sound Stream Fish Community Monitoring - Cam Portt, Fish Biologist
April 16, 1999	Partners' Reception
May 11, 1999	PAC Meeting - Zebra Mussel Control Product Testing - Barb Crosbie, Environmental Scientist, Aquatic Sciences Inc. and Garfield Dunlop
May 12-14, 1999	Regent Public School Presentation at Buffalo Youth Summit
June 11, 1999	Bus Tour of Severn Sound RAP Project Sites
July 1, 1999	Display at Little Lake Park in Midland - Canada Day
July 13, 1999	PAC Meeting - Benthos of Severn Sound - Dr. Jan Ciborowski, Professor of

	Aquatic Ecology, University of Windsor
August 10, 1999	PAC Meeting - Presentations by SSRAP Summer Students - Jim Rice, Ecosystem Health Monitoring, Krista Mayrand, Beach Monitoring and Matt Wilson, Wetland Rehabilitation and Lead Remediation
September 10, 1999	PAC Meeting - Rare and Endangered Species in Severn Sound - Lisa Ladd, Georgian Bay Islands National Park
September 18, 1999	Wye Marsh Wildlife Centre Festival
September 21, 1999	Presentation to Bay Area Restoration Council, Hamilton
September 25, 1999	Presentation at the Georgian Bay Association's 10 th Annual Delewana Conference for Residents of Georgian Bay Township
October 12, 1999	PAC Meeting - The Matchedash Bay Project - Robin Craig, Ministry of Natural Resources
November 9, 1999	PAC Meeting - The Geological Evolution of Georgian Bay and Severn Sound - Steve Blasco, Geologist, Geological Survey of Canada
November 19, 1999	Rural Youth Job Fair, Midhurst
November 23, 1999	Presentation at Municipal Drains & Roadside Ditch Workshop, Severn Township
December 3, 1999	Presentation at the North Simcoe Soil and Crop Improvement Association Annual Meeting
December 14, 1999	PAC Meeting - Fish Habitat and Municipal Drainage Ditches
2000	
January 5, 2000	Participation in "2000 Simcoe County Farmer's Week"
January 11, 2000	PAC Meeting - Penetanguishene Wetland Habitat Creation: Four Years Later - Jim Dougan, Ecologist
February 8, 2000	PAC Meeting - OPAC/IJC Report - Dunc McLaren, PAC Chair
March 14, 2000	PAC Meeting - Report on Stream Benthos - Paula Madill, SSRAP Ecosystem Technician
April 7, 2000	Severn Sound PAC Bob Whittam Environmental Award presented to Fran Westman
April 11, 2000	PAC Meeting - Environmental Bill of Rights and the Office of the Environmental Commissioner of Ontario - Dr. John Ferguson, Public Education Officer with the Environmental Commissioner of Ontario
April 11, 2000	No Till Drill Display
May 9, 2000	PAC Meeting - Fish Community Assessment: 2000 Update - Arunas Liskauskas, Fish Biologist, Ministry of Natural Resources
May 14, 2000	Presentation and Tour with University of Waterloo Students
May 26-28, 2000	Participation in "Waabshkokine", the Federation of Ontario Naturalist's 69 th Annual General Meeting and Conference
June 13, 2000	PAC Meeting - Changes in Sediment Quality in Severn Sound - Keith Sherman, RAP Coordinator
July 1, 2000	Canada Day, Little Lake Park, Midland
July 11, 2000	PAC Meeting - Wye Marsh Wildlife Centre is Designated as an "Important Bird Area" (IBA) - Michelle Hudolin, Swankeeper and Kate Jermyn, IBA Researcher

July 20, 2000	Visit from Hon. Dave Anderson, Minister of Environment
July 21-23, 2000	Coldwater Rodeo
August 8, 2000	PAC Meeting - Severn Sound Environmental Association Business Plan - Keith Sherman, RAP Coordinator
Aug 19-20, 2000	Farmfest, Midhurst
Sept 8-10, 2000	Orillia Fair
September 12, 2000	PAC Meeting - Monitoring of Bathing Beach Quality in Severn Sound - Angie Mayrand, Habitat Restoration Officer, Tay Township
Sept 16-17, 2000	Wye Marsh Festival
Sept 22-24, 2000	Coldwater Fall Fair
October 3, 2000	"A Farmer Comes To Town" Display and Volunteers, Barrie
October 6-7, 2000	Elmvale Fall Fair
October 10, 2000	PAC Meeting - Urban Pesticides - John Struger, Aquatic Environmental Scientist from Ecosystem Health Division of Environment Canada
October 2000	"The Road to Delisting - Addressing RAP Challenges" was published and released - Keith Sherman, RAP Coordinator was involved in the production of this document.
November 2000	Presentation to Grade 7 & 8 Students of the Wyevalle Public School
November 14, 2000	PAC Meeting - Biosolids - Michael Payne, Biosolids Utilization Specialist, OMAFRA
November 15, 2000	Presentation to the Georgian Bay Osprey Society, Toronto
Nov 23-25, 2000	Sharing Experiences in Habitat, Collingwood
December 1, 2000	Presentation at the North Simcoe Soil and Crop Improvement Association Annual Meeting
December 8, 2000	Visit by Environment Minister, Dan Newman and MPP Garfield Dunlop which included a roundtable discussion with area farmers, local politicians and SSEA partners.
2001	
January 9, 2001	PAC Meeting - Severn Sound Land Management Evaluation - Lex McPhail, SSEA Applications Specialist
January 10, 2001	Presentation to Oro-Medonte on Bass Lake Restoration
January 17, 2001	Presentation to the North Simcoe Agricultural Advisory Committee
January, 2001	Participation in the Town of Midland's Communities in Bloom Environmental Sub-Committee
February 9, 2001	Presentation at the North Simcoe Soil and Crop Improvement Association Director's Meeting
February, 2001	Wetland and Take a Little Lead Out Presentation to Grade 6 Students, Elmvale
February, 2001	Display at Wye Marsh Wildlife Centre's Family Fun Day
February 13, 2001	PAC Meeting - Tree By-Laws - Earl Dertinger, North Simcoe Private Land Stewardship Network and Murray Lockhart, By-Law Officer, County of Simcoe
March, 2001	Presentation to Orr Lake Ratepayers Association
March 13, 2001	PAC Meeting - Water Wells - Kim Yee, Senior Inspector/Coordinator of Well Management, Ministry of the Environment

March 31, 2001	Signing Ceremony - Renewal of the Severn Sound Environmental Association
March 31, 2001	Partner's Reception
March 31, 2001	2 nd Annual Severn Sound PAC "Bob Whittam" Environmental Award presented to Brian Jones
April 10, 2001	PAC Meeting - Couchiching Conservancy - Kerry Green, Project Coordinator
April 27, 2001	Presentation to students at Regent Public School
May 3-4, 2001	Facilitated a Boating Workshop Dealing with Grey and Black Water
May 8, 2001	PAC Meeting - Great Lakes Water Levels - Ralph Moulton, Manager of Great Lakes Water Levels Information Office, Environment Canada
May 8, 2001	RAP/PAC/OMNR Tree Plant
May 11, 2001	Presentation to Enbridge Gas
May, 2001	Participation in the Town of Midland's Environmental Day
May 2001	Assisted students from Regent Public School in Midland in preparing for their trip to the Great Lakes Youth Summit. They did a presentation and display on the Severn Sound Remedial Action Plan.
May 2001	Presentation to Twin Lakes and Park Street Schools
May 24, 2001	Presentation to the Midland Probus Club
June 9, 2001	24 Air Cadet volunteers planted 700 trees at the Penetanguishene Waterfront
June 12, 2001	PAC Meeting - Regent Public School: Presentation from the Great Lakes Youth Summit in Buffalo, New York - Sara Knight and students from Regent Public School, Midland
June, 2001	Participation in the IJC Public Forum in Port Severn
July 1, 2001	Display at Little Lake Park, Midland - Canada Day
July 10, 2001	PAC Meeting - Fish Communities of Severn Sound - Cam Portt, Fish Biologist
July 2001	Severn Sound RAP recognized for their environmental contribution to the Town of Midland quest for the National Communities in Bloom competition.
August 14, 2001	PAC Meeting - Mind Over Mussel: A Look at the Success of the SSRAP and the Effects of the Zebra Mussel Infestation - Sean Miller, SSRAP Water Scientist
September 11, 2001	PAC Meeting - Bill 81: Proposed Nutrient Management Plan - Keith Sherman, RAP Coordinator
October 9, 2001	PAC Meeting - Severn Sound RAP Stage 3 Document Review - Keith Sherman, RAP Coordinator
October 19, 2001	Regent Public School students, representing the Severn Sound RAP, presented to the International Joint Commission Forum in Montreal
October 19, 2001	Presentation at the IJC Forum in Montreal
October 2001	Presentation and Tour in Penetanguishene with Queen's University Engineering Students
November 13, 2001	PAC Meeting - Exotic Species: The Round Goby - Bill Ray, Teacher, St. Theresa's High School, Midland

APPENDIX 3

Acronyms

- Al - Aluminum
- AOC - Area of Concern
- As - Arsenic
- AS - Area Sensitivity
- BBS - Breeding Bird Study
- BIA - Biodiversity Investment Area
- BMP - Best Management Plan
- BOD - Biochemical Oxygen Demand
- BSC - Bird Studies Canada
- C of A - Certificate of Approval
- Cd - Cadmium
- [Chl a] - Chlorophyll a concentration
- CMMN - Canadian Migration Monitoring Network
- COA - Canada-Ontario Agreement Respecting the Great Lakes Basin Ecosystem
- COSEWIC - Committee on the Status of Endangered Wildlife in Canada
- Cr - Chromium
- CSO - Combined Sewer Overflow
- Cu - Copper
- CURB - Clean Up Rural Beaches Program
- CWS - Canadian Wildlife Service
- DDE - A breakdown product of DDT
- DDT - Dichlorodiphenyltrichloroethane - a very persistent chlorinated pesticide, phased out in 1969, but still persists in sediments and biota
- DFO - Department of Fisheries and Oceans
- D.O. - Dissolved Oxygen
- DU - Ducks Unlimited
- EC - Environment Canada
- EPA - Environmental Protection Agency
- ESA - Endangered Species Act
- Fe - Iron
- FHMP - Fish Habitat Management Plan
- GBI - Georgian Bay Islands National Park
- GIS - Geographic Information System
- GLWCAP - Great Lakes Wetlands Conservation Action Plan
- GLWQA - Great Lakes Water Quality Agreement
- HC - Health Canada
- HCB - Hexachlorobenzene
- IBA - Important Bird Area
- IBI - Index of Biotic Integrity
- IC - Implementation Committee

- IJC - International Joint Commission
- JR - Jurisdictional Responsibility
- Mg - Magnesium
- MHC - (Penetanguishene) Mental Health Centre
- MISA - Municipal/Industrial Strategy for Abatement
- MMA - Ontario “Ministry of Municipal Affairs”
- MMP - Marsh Monitoring Program
- Mn - Manganese
- MOE - Ontario “Ministry of Environment”
- MOH - Ontario “Ministry of Health”
- MTR - Ontario “Ministry of Transportation”
- NAWCC - North American Wetlands Conservation Council
- NAWMP - North American Waterfowl Management Plan
- Ni - Nickel
- NSSCIA - North Simcoe Soil and Crop Improvement Association
- NWA - National Wildlife Area
- O & M - Operating and Maintenance
- OFA - Ontario Farmers Association
- OMAFRA - Ontario Ministry of Agriculture, Food and Rural Affairs
- OMNR - Ontario “Ministry of Natural Resources”
- OMOE - Ontario Ministry of Environment
- OPAC - Ontario Public Advisory Committee
- PAC - Public Advisory Committee
- PAH - Polynuclear aromatic hydrocarbons
- Pb - Lead
- PCB - Polychlorinated Biphenyl
- PR - Preservation Responsibility
- PWQO/G - Provincial Water Quality Objectives/Guidelines
- RAP - Remedial Action Plan
- RIPAC - RAP Implementation Public Advisory Committee
- RODP - Remedial Options Discussion Paper
- SARA - Species at Risk Act
- SDV - Secchi Disk Visibility
- SOLEC - State of the Lakes Ecosystem Conference
- SSEA - Severn Sound Environmental Association
- SSRAP - Severn Sound Remedial Action Plan
- STP - Sewage Treatment Plant
- [TP] - Total phosphorus concentration
- WPCP - Water Pollution Control Plant
- Zn - Zinc