1998

A Binational Conference on Rehabilitating and Conserving Detroit River Habitats

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Stony Island

REHABILITATING AND CONSERVING DETROIT RIVER HABITATS

A Binational Conference

Humbug Island and Marsh

Hosted by:
University of Windsor's
Great Lakes Institute
for Environmental Research
and
Citizens Environment Alliance of
Southwestern Ontario

Peche Island

1998

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A BINATIONAL CONFERENCE ON

REHABILITATING AND CONSERVING DETROIT RIVER HABITATS

Edited by:
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OF SOUTHWESTERN ONTARIO

1998

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A suggested citation for this document: Tulen L. A., J. H. Hartig, D. M. Dolan, and J. J. H. Ciborowski (eds). 1998. Rehabilitating and Conserving Detroit River Habitats. Great Lakes Institute for Environmental Research Occasional Publication No. 1. Windsor, Ontario. 65 pp.

ACKNOWLEDGMENTS

This report is a summary of the presentations and panel discussions from the March 4, 1998 Conference entitled "Rehabilitating and Conserving Detroit River Habitats" at the University of Windsor. This Conference was organized by the University of Windsor's Great Lakes Institute for Environmental Research and the Citizens Environment Alliance of Southwestern Ontario. Other funding partners and co-sponsors in this event included: Canadian Auto Workers Local 444, The Canadian Salt Company Limited, The City of Windsor, Dean Construction Company Ltd., Detroit Edison, Environment Canada, the International Joint Commission's Council of Great Lakes Research Managers, the International Joint Commission's Great Lakes Water Quality Board, Lafontaine, Cowie Burratto and Associates Consulting Engineers, Michigan Sea Grant, Michigan State University, Windsor and District Labour Council, and the Windsor Harbour Commission (Appendix 3). We thank these funding partners and co-sponsors for their support of this Conference.

The primary objective of the Conference was to share habitat rehabilitation and conservation success stories. Nine success stories about Detroit River fish and wildlife habitat rehabilitation and conservation efforts were highlighted by presenters. Two panel discussions provided an opportunity to further discuss on-going projects and conservation efforts, and for participants to ask questions and provide comments. We gratefully acknowledge the contributions of the speakers, panelists, and moderators.

The Conference was well attended by local citizens, students, citizen groups, government agencies, researchers, and industry representatives from both Canada and the United States. We would like to acknowledge these stakeholders for their significant role in making this event a success. Their insights and knowledge were instrumental in developing the findings and conclusions from this conference. We feel that the level of stakeholder participation in this conference is a clear indication of the enthusiastic interest and strong commitment to future conservation and rehabilitation of Detroit River habitats. A special thanks is extended to Jeanie Laforge of the Great Lakes Institute for Environmental Research for her efforts in organizing this Conference.

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SYNOPSIS

The Detroit River is a 51 km (32 mi) international connecting channel linking Lake St. Clair and Lake Erie. The Detroit River is one of 42 Areas of Concern in the Great Lakes basin ecosystem where a remedial action plan (RAP) is being developed and implemented to restore beneficial uses. The Detroit River RAP identifies "loss of fish and wildlife habitat" as one of the impaired beneficial uses. Significant loss of Detroit River wetlands and other habitats has occurred as a result of conversion of land to agriculture practices, urban development, and industrial growth. For example, 97% of the coastal wetlands on the U.S. mainland of the Detroit River have been lost to development, and the remaining 3% are threatened by development pressures. Further loss of habitat due to contaminated sediment is also documented.

On March 4, 1998, the University of Windsor's Great Lakes Institute for Environmental Research, the Citizens Environment Alliance of Southwestern Ontario, and other partners convened a binational conference entitled "Rehabilitating and Conserving Detroit River Habitats".

The primary objective of the conference was to share success stories of habitat rehabilitation and conservation from both sides of the Detroit River. Secondary objectives were to:

- provide an understanding of the effectiveness of these projects from the perspective of ecosystem structure and function (i.e., What ecological results have been achieved? What remains to be done?);
- identify potential opportunities to link habitat enhancement activities with complementary remedial activities addressing other use impairments (e.g., dredging, land use changes); and
- identify priorities and opportunities for research, funding, and further action to rehabilitate and conserve Detroit River habitats.

The conference was a major success, attracting over 170 participants. Presentations describing successful habitat rehabilitation and conservation projects were well received. The conference not only highlighted Detroit River success stories, but it also allowed stakeholders to learn what steps are necessary to move forward on habitat rehabilitation and conservation projects, and of the need to recruit new "champions" to this field.

Major conclusions of the conference included recognition that:

- there is an urgent need to protect the few remaining natural areas along the Detroit River (e.g., islands and coastal wetlands such as Humbug Marsh and Peche Island; unique prairie habitats);
- management agencies must take the lead in using available guidance tools to set priorities for habitat rehabilitation and conservation (e.g., Environment Canada's "*A Draft Framework for Guiding Habitat Rehabilitation in Great Lakes Areas of Concern*") and move forward with habitat rehabilitation and conservation projects;

- individuals and organizations who have habitat expertise must get involved prominently and early in the planning processes of waterfront development, shoreline modification, and similar projects;
- habitat rehabilitation and conservation projects should be recognized as important experiments from which we can learn – we must therefore explicitly link research/monitoring with planning and management of habitats; and
- greater emphasis must be placed on quantifying the economic, social, and ecological benefits of habitat rehabilitation and conservation projects.

Conference participants recognized the urgent need for "champions" – credible individuals or groups willing to propose, publicize and implement specific habitat projects and conservation efforts. In addition, a high profile must be sustained for Detroit River habitat rehabilitation and conservation, and for related environmental issues.

The Great Lakes Institute for Environmental Research, its partners and conference co-sponsors all recognize the important role of the transfer of scientific knowledge, and of the need to couple research with management and public issues. They pledge to convene similar conferences and public meetings in the future to promote and sustain open dialogue.

INTRODUCTION

The Detroit River is a 51 km (32 mi) international connecting channel linking Lake St. Clair and Lake Erie. The Detroit River is also one of 42 Areas of Concern in the Great Lakes Basin Ecosystem where a remedial action plan (RAP) is being developed and implemented to restore beneficial uses. The Detroit River RAP identifies "loss of fish and wildlife habitat" as one of the impaired beneficial uses (Michigan Department of Natural Resources and Ontario Ministry of Environment 1991). Significant loss of Detroit River wetlands and other habitats has occurred as a result of conversion of land to agriculture practices, urban development, and industrial growth. For example, 97% of the coastal wetlands on the U.S. mainland of the Detroit River have been lost to development and the remaining 3% are threatened by development pressures. Further loss of habitat due to contaminated sediment is also documented (Michigan Department of Natural Resources and Ontario Ministry of Environment 1991).

On March 4, 1998, the University of Windsor's Great Lakes Institute for Environmental Research, the Citizens Environment Alliance of Southwestern Ontario, and other partners convened a binational conference entitled "Rehabilitating and Conserving Detroit River Habitats." This binational conference was one of a number of events held to help celebrate the opening of the University of Windsor's new Great Lakes Institute for Environmental Research facility along the Detroit River. The primary objective of the conference was to share success stories of habitat rehabilitation and conservation from both sides of the Detroit River. Secondary objectives were to:

- provide an understanding of the effectiveness of these projects from the perspective of ecosystem structure and function (i.e., What ecological results have been achieved? What remains to be done?);
- identify potential opportunities to link habitat enhancement activities with complementary remedial activities addressing other use impairments (e.g., dredging, land use changes); and
- identify priorities and opportunities for research, funding, and further action to rehabilitate and conserve Detroit River habitats.

The purpose of this report is to convey information from the success stories of habitat rehabilitation and conservation, and to summarize the discussions and key findings.

CONFERENCE DESIGN AND PROGRAM

The conference was designed to share success stories of habitat rehabilitation and conservation, including ecological results, and to address key habitat issues (see Appendix 1 for Conference Program). The target audience for the conference was habitat practitioners and advocates (i.e., Detroit River stakeholders representing academia, government, industry, business, and non-governmental organizations, students, and other citizens who have an interest in rehabilitating and conserving habitats). Over 170 people attended the conference (Appendix 2).

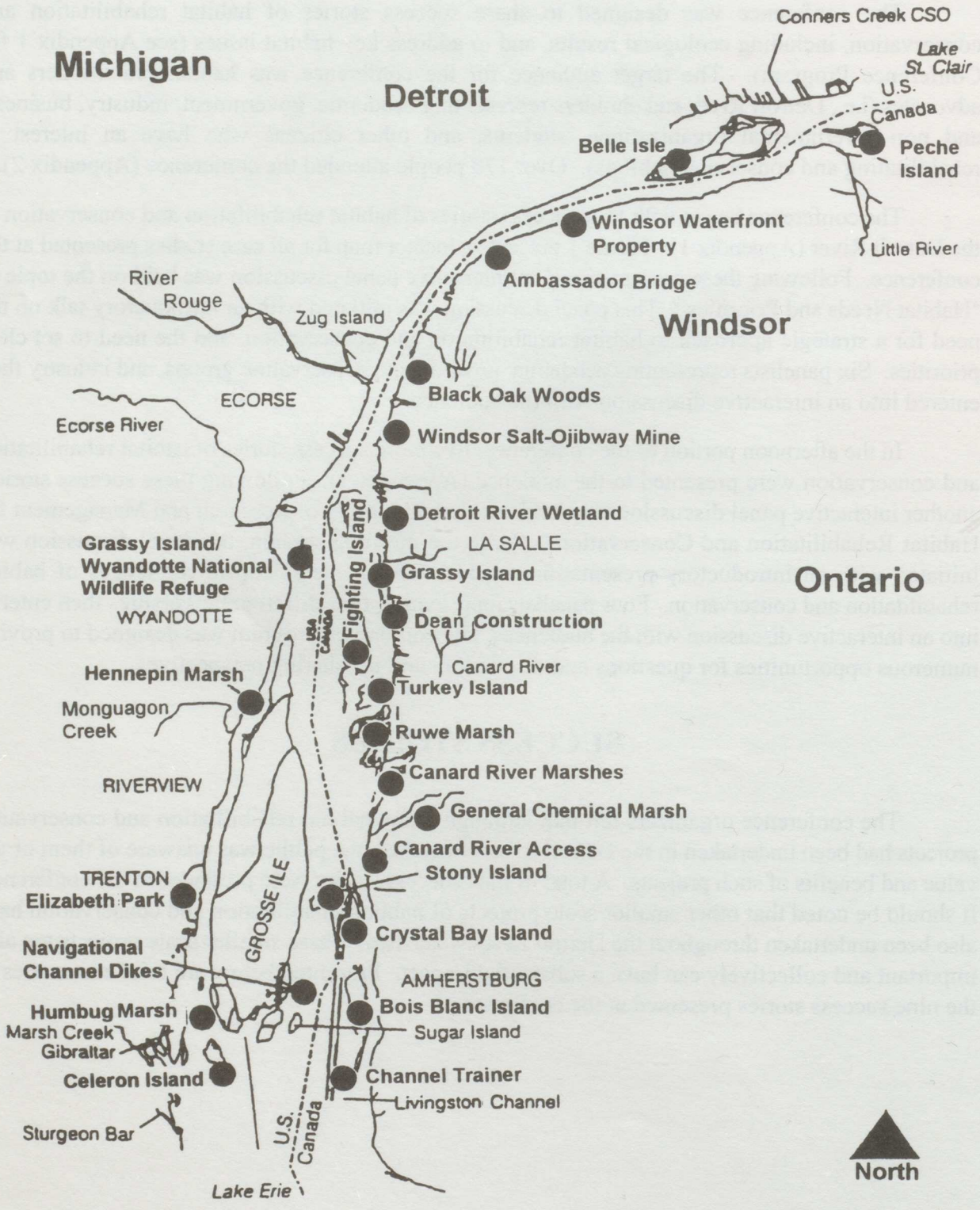
The conference began with four success stories of habitat rehabilitation and conservation in the Detroit River (Appendix 1). Figure 1 presents a locator map for all case studies presented at the conference. Following these presentations, an interactive panel discussion was held on the topic of "Habitat Needs and Priorities." This panel discussion was initiated with an introductory talk on the need for a strategic approach to habitat rehabilitation and conservation, and the need to set clear priorities. Six panelists representing academia, government, conservation groups, and industry then entered into an interactive discussion with the audience.

In the afternoon portion of the conference, five more success stories of habitat rehabilitation and conservation were presented to the audience (Appendix 1). Following these success stories, another interactive panel discussion was held entitled "Coupling of Research and Management for Habitat Rehabilitation and Conservation." As in the morning session, the panel discussion was initiated with an introductory presentation, in this case on the scientific challenges of habitat rehabilitation and conservation. Four panelists representing four different universities then entered into an interactive discussion with the audience. The conference program was designed to provide numerous opportunities for questions and discussion, and for sharing perspectives.

SUCCESS STORIES

The conference organizers felt that although many habitat rehabilitation and conservation projects had been undertaken in the Detroit River watershed, the public was unaware of them or the value and benefits of such projects. A total of nine success stories were presented at the conference. It should be noted that other smaller scale projects of habitat rehabilitation and conservation have also been undertaken throughout the Detroit River watershed. These smaller scale projects are also important and collectively can have a substantial impact. Presented below are brief summaries of the nine success stories presented at the conference.

Figure 1. Detroit River locator map for the case studies presented at the Conference.



***Detroit River* - 51 km (32 mi)**

Rehabilitation of the Belle Isle Lakes and Canals

Douglas Denison and Gary Crawford, JJR Incorporated
Cynthia Silveri and Richard Hautau, City of Detroit Recreation Department

History

Belle Isle is a 398 ha (982 acres) island park located in the Detroit River. Native Americans called the island "Mah-nah-be-zee" or Swan Island; the French settlers called it "Isle St. Claire." During the 18th century, the island was used by farmers as a safe haven for their animals, thus the name, Hog Island. The island was renamed Belle Isle, which translates to "beautiful island." By 1845 it was a popular picnic spot for city residents. The City of Detroit purchased Belle Isle for $200,000 (U.S.) in 1879 and designated it as a park in 1881. The original park, designed by Frederick L. Olmsted, featured only recreational canals; however, in the early 1900s, the City built Lake Takoma, Lake Okonoka and some other canals.

Historically, walkways along the water, ornate bridges and covered bandstands were popular attractions. Canoeing was an important recreational activity for island visitors. In the 1930s the Civilian Work Authority (CWA) labored with shovels, wheel barrows and small tractors to create more canals and lakes on the island. Belle Isle supports 3.5 km (2.2 mi) of canals and four lakes ranging from 7-17 ha (18-43 acres). Unfortunately, 15 years of neglect had resulted in stagnant water, excessive aquatic weed growth, and poor aesthetic character turning visitors away from these historic water features.

Today, Belle Isle is the most heavily used park in the City of Detroit. It provides many of its four million annual visitors opportunities to participate in a variety of recreational experiences within a unique natural environment. Recognizing the value of this resource, the City of Detroit Recreation Department has committed to restoring basic water recreational activities which have historically been part of the Belle Isle experience.

In 1992, JJR Incorporated (JJR) was retained by the City of Detroit Recreation Department to complete an extensive study, *Belle Isle Canal Rehabilitation,* outlining a comprehensive rehabilitation program that included habitat restoration, selective dredging, streambank stabilization, relocation of a pump station, modifications to outlet structures, creation of fish habitat, wetland creation, public involvement, and development of a sustainable management program. JJR has completed four of the five phases of the rehabilitation program. Although the project continues, the benefits of the work already completed have been realized as the lakes and canals are once again inviting island visitors to canoe, fish and explore the natural wonders of this "jewel" in the Detroit River.

Actions

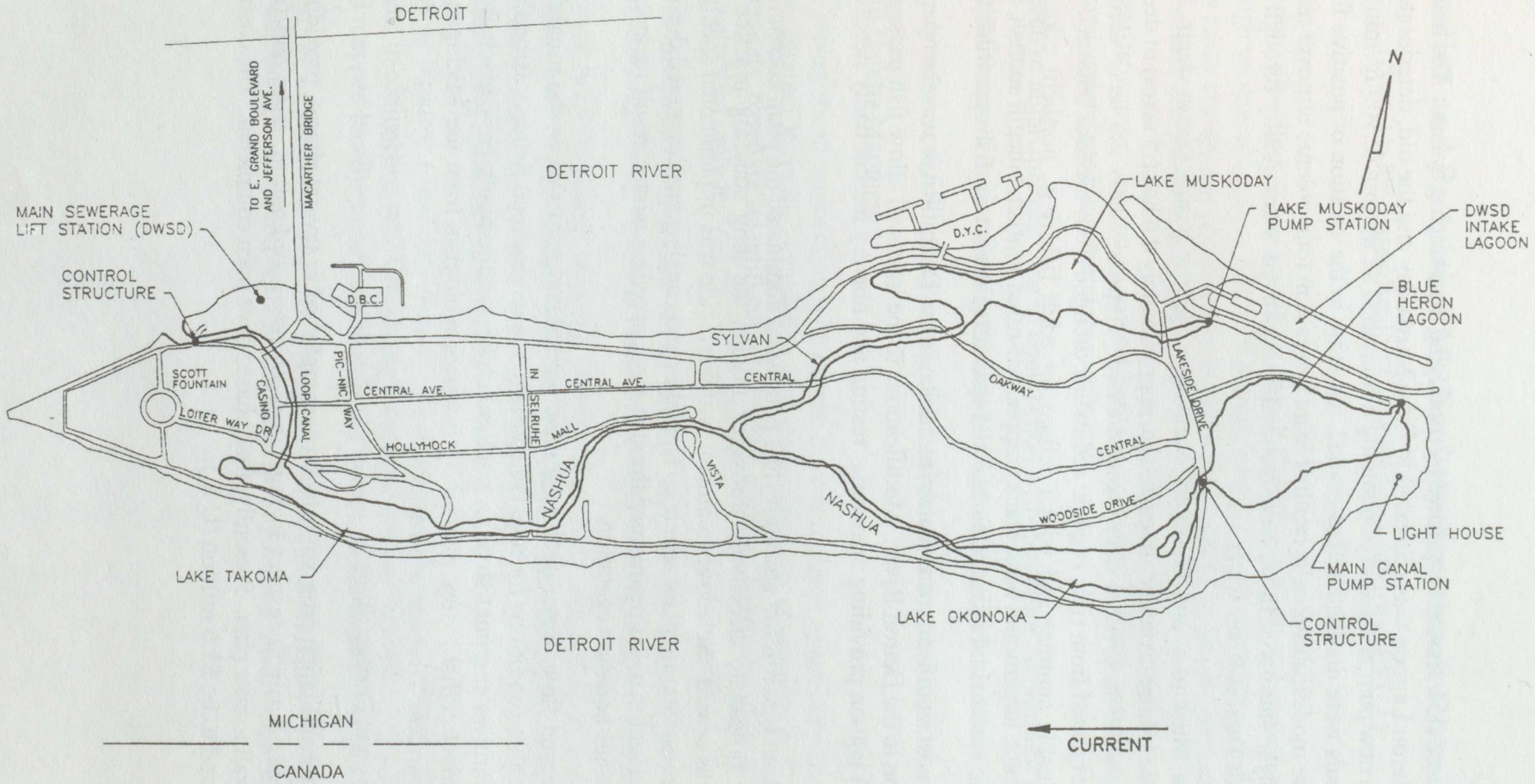
Investigative assessment of water quality, hydrology, aquatic resources, pumping systems and land use provided identification of factors responsible for degradation of the water feature. The lakes and canals were eutrophic and exhibited poor water quality, low dissolved oxygen, excessive plant growth, algal blooms, and invasive, non-native aquatic plants. There had been a decline in the

fishery resource, an increase in public health concerns, and a decline in aesthetic quality. The primary causes of deterioration were lack of positive water flow through the system, excessive nutrient and bacterial inputs from point and nonpoint sources, and poor maintenance practices. This study led to the development of a comprehensive program. Recommendations included rehabilitating physical and biological variables, providing for an improvement of existing conditions. Table 1 summarizes the changes resulting from implementing the Belle Isle Habitat Restoration Project. Figure 2 illustrates the various locations where rehabilitation efforts within the water feature occurred.

Table 1. Summary of past and present conditions of important habitat variables resulting from Belle Isle Habitat Restoration Project implementation.

Habitat Variable	Past Condition	Present Condition
Flow	<0.1 m^3/s (0.2 to 0.3 ft^3/s)	0.7 m^3/s (22.8 ft^3/s)
Pumping Rate	0.8 m^3/s (28.5 ft^3/s)	1.4 m^3/s (49.0 ft^3/s)
Total System Volume Replacement	45 days	5 days
Canal Side Slope (rise:reach)	1 to 1	1 to 3
Average Canal Depth	30-61 cm (1-2 ft)	1.2 m (4 ft)
Emergent Wetland	<0.2 ha (<0.5 acres)	2.8 ha (7.0 acres)
Deep Water Habitat	0.0 ha (0.0 acres)	1.2 ha (3.0 acres)
Aquatic Plant Communities	11 genera	16 genera
Fishery Resource	Dominated by roughfish and stunted panfish	Roughfish populations reduced and brood stock of channel catfish, largemouth bass introduced.
Aesthetics	Excessive growths of exotic aquatic plants and algae, and widespread erosion of canal banks	Annual treatment of nuisance aquatic vegetation and over 3.2 km (2 mi) of canal banks re-graded

Figure 2. Belle Isle Lake and Canal habitat restoration project location.



Increased flow was accomplished by modifying the pumping system. The main pump station at the Blue Heron Lagoon was relocated to Lake Muskoday and the old, deteriorated pumps were replaced with new pumps capable of pumping a combined 82 m^3/min (2,900 ft^3/min). Over 3.2 km (2 mi) of canals were dredged and re-graded, assisting in the creation of positive flow throughout system. These modifications have resulted in an increase in total volume turnover rate from 45 days to just five days. Improved flows have resulted in improved water quality through the continuous exchange with Detroit River water.

Lakes Muskoday and Okonoka were very shallow basins (mean depth 1.2 m or 4 ft), exhibiting little habitat diversity. In each lake, approximately 0.6 ha (1.5 acres) of deep water habitat (approximately 3.7 m or 12 ft deep) were created. Approximately 2.8 ha (7 acres) of emergent wetland were created from rich, organic sediments dredged from the lake bottoms. The lakes now serve as valuable summer and winter refuge for adult fish (e.g., northern pike, yellow perch, smallmouth bass, largemouth bass, black crappie, red-eared sunfish, bluegill sunfish, channel catfish) inhabiting the system and nursery, forage and spawning habitat for fish and wildlife.

The most significant contribution to habitat in the Detroit River was the opening of the Blue Heron Lagoon to the Detroit River. Modifications to the inlet will allow fish passage into this 17.4 ha (43 acres) lagoon providing spawning, resting and nursery habitat badly needed in the Detroit River.

Eurasian watermilfoil and curleyleaf pondweed dominated the plant communities. Because these plants propagate effectively through cuttings, the long standing practice of mechanical harvesting was ceased. Selective treatment with herbicide was implemented specifically targeting these invasive and exotic plant species. The lakes and canals were dewatered during the dredging operation. Drawdown was maintained through the succeeding winter, resulting in considerable die-back of nuisance aquatic vegetation.

Improved flow, water quality, aquatic habitat and reduction in the roughfish populations created favorable conditions for re-establishment of a recreational fishery. Brood stock of several species of warmwater gamefish (e.g., smallmouth bass, largemouth bass, black crappie, red-eared sunfish, channel catfish) were planted by fisheries biologists from the Michigan Department of Natural Resources - Division of Fisheries.

Effectiveness and Further Steps

The rehabilitation program is being accomplished in several phases, providing flexibility for project completion with respect to regulatory agency coordination, costs and funding, and the island's overall master plan. Presently, four phases have been completed. The costs of the program were estimated to be $1.6 million (U.S.).

Identification and Protection Mechanisms for Detroit River Habitats

Stan Taylor, Essex Region Conservation Authority (ERCA)

Introduction

Protection of habitats on the Canadian side of the Detroit River and its watersheds is being achieved through various programs. ERCA is playing a lead role in coordinating and implementing programs with many community partners. An effective program to ensure the protection of habitats has several essential components including:

- identification/evaluation of natural heritage areas and habitats based on scientifically-sound and defensible criteria/approaches;
- effective municipal planning in conjunction with numerous community stakeholders;
- acquisition programs to secure the most threatened significant habitats; and
- regulations to control filling or other harmful disruption of habitats.

Inventories and Habitat Mapping

ERCA biologists, in conjunction with others, have completed several key studies that have resulted in the detailed mapping, evaluation and documentation of significant natural heritage features and habitats, based on scientifically-defensible criteria. Examples of these studies in the Detroit River watershed include:

- *Environmentally Significant Areas (ESAs) Study* (1983, updated 1994): This study identified regionally significant sites in the Detroit River corridor/watershed area.
- *Detroit River Wetlands Mapping* (1994): This study, conducted in conjunction with Ontario Ministry of Natural Resources (OMNR), identified provincially significant wetlands along the Detroit River corridor in the Town of La Salle and Town of Amherstburg (formerly Anderdon).
- *City of Windsor Candidate Natural Heritage Sites Biological Inventory* (1992): This study, in conjunction with City Departments of Planning/Parks and Recreation, evaluated and mapped locally-significant sites in the Detroit River watershed area.
- *Town of La Salle National Heritage Areas Biological Inventory* (1997): This study, conducted in conjunction with the municipality, identified locally-significant sites.

Inventories and Habitat Identification

The identification of significant natural heritage and habitats in municipal planning documents is essential for the protection of these features. ERCA has worked closely with the municipalities in the Detroit River area to achieve success. These successful planning initiatives have been based on the scientifically-sound evaluation of significant sites, in conjunction with extensive landowner contact programs, as well as special planning studies initiated by municipalities, and other technical studies. The successes have also been due to the broad-based community acknowledgment of the importance of natural heritage, largely fostered by the publicity efforts of municipalities in conjunction with ERCA. The following are some examples of Planning Documents and related studies which have assisted in Detroit River area habitat protection in recent years:

- *Canard River Environmentally Significant Areas and Wetlands, Townships of Anderdon (now part of Amherstburg) and Colchester North*: This study resulted in protected land use designation of all regionally- and provincially-significant areas, representing most of the Canard River corridor.

- *Town of La Salle Official Plan*: This study provided protected designation for all provincially-significant wetlands (Detroit River and Turkey Creek) and all regionally-significant natural heritage sites. Impact studies are now required for development at locally-significant sites, and key linkage corridors must be provided.

- *City of Windsor Environmental Policies*: This study resulted in protected designation for several sites, and the requirement for further environmental evaluations for all locally-significant natural areas.

- *Peche Island Development Constraints Study*: This study, conducted in conjunction with City of Windsor and OMNR, documented natural heritage features, development constraints and requirements for further evaluation.

- *Subwatershed Plans in conjunction with Windsor, La Salle, Sandwich South*: This study, performed in partnership with provincial ministries and other partners, is nearing completion. Its goal is to identify all key natural heritage sites and habitat corridors in the Turkey Creek and Little River Watersheds, and the Windsor portion of the Detroit River watershed, for input into new Official Plans.

Acquisitions

Many significant natural areas, particularly in the Turkey Creek, Detroit River watershed in Windsor and La Salle, have been previously approved for development through zoning and/or plans of subdivision. These areas are extremely threatened by development. In such cases it is necessary to have acquisition plans in place using mechanisms such as land exchange, tax relief or other incentives.

In some cases it is necessary to directly purchase lands that are to be conserved. This requires full community support and commitment at all levels of government. A recent successful example is the fund-raising campaign "It's Our Nature." Community partners were organized by the Essex Region Conservation Foundation, which has targeted several key sites for protection through purchase, including the La Salle Woods ESA in the Turkey Creek Watershed, where acquisition has already begun in conjunction with the Town of La Salle. The Springarden Area of Natural and Scientific Interest (ANSI) in Windsor is being considered for a similar program. Once acquired, the sites are fully protected and also provide important recreation and research opportunities.

Controls on Wetland Filling

ERCA has had regulations in place along tributary waterways since the mid 1980s and along the Detroit River since the early 1990s, requiring permits for placing fill in floodplains or for works in and around water. These regulations encompass all significant wetlands and are effective at preventing filling, which would otherwise be very difficult to control.

Since 1993, ERCA has had an agreement with OMNR whereby ERCA is the sole provider of permits for work in and around water. This provides effective protection of fish habitat, in consultation with OMNR/Department of Fisheries and Oceans where needed. In addition, as an extension of this "one window" service for approvals of developments near habitat areas, ERCA works closely with developers to implement habitat enhancement and protection measures as a part of the development. The Crystal Harbour Dockominium site in La Salle is one excellent example where fish habitat and wetland enhancements were implemented, resulting in a better quality development.

Effectiveness and Further Steps

An effective habitat protection program must be well coordinated, watershed-based, and have the active participation and support of key community partners. Canadian habitat protection programs in place on the Detroit River and its watershed (which ERCA plays a lead role in coordinating and implementing) have been relatively successful in protecting significant natural heritage and habitats. To ensure continued success of the overall Detroit River habitat protection and restoration, it is essential that these protection programs be continued and strengthened in conjunction with habitat restoration strategies and implementation projects.

Conserving Critical Habitats in the Conservation Crescent
The Stony Island Story

Mary Ginnebaugh, Grosse Ile Nature and Land Conservancy

Introduction and History

The Detroit River has been designated by state, provincial and federal governments of Canada and U.S. as an international Area of Concern. This "distinction" was made because of the river's recognized environmental problems and ecological impairments stemming from urban growth and industrial development. Since the late 1800s, it has been well documented that over 95% of the Detroit River's original wetland habitat has been lost through urban and industrial development. Many areas of the Detroit River and Trenton Channel have sediments contaminated with high concentrations of metals and organic compounds which are a legacy of industrial practices and a naive understanding of the ecosystem.

Although the historical impacts have played a significant part in the river's environmental problems, there continues to be environmental degradation. Municipal and industrial discharges, poor land use practices, combined sewer overflows, urban and agricultural runoff and contaminants from air deposition continue. To address these environmental problems and improve the overall quality of the Detroit River ecosystem, binational efforts have been made to develop and implement a meaningful Remedial Action Plan. A high priority for action is the identification and protection of the remaining fish and wildlife habitat in the Detroit River watershed.

Much of the existing, high quality habitat can be found in the lower reaches, near the mouth of the Detroit River. The "Conservation Crescent" has been identified as the area that surrounds the southern portion of Grosse Ile and includes the smaller islands and shoreline areas along the Canadian and U.S. sides of the river. Stony Island anchors the northeast portion of the Crescent and Humbug Marsh anchors the northwest portion.

Stony Island was originally Potawatomie Indian territory used for hunting and fishing. After being deeded to the Macombs of Grosse Ile in 1781, it became part of a railroad-ferry river crossing between Canada and the U.S. for the Canadian Southern Railroad during the late 1800s. During the 1930s, the island was used as a center of operations to create the Livingstone Channel, and then later as a base for dredging the shipping channel. A small residential community existed on the island during this time. These homes no longer exist, however, abandoned machine shops and several sunken non-motorized barges remain. The Island is currently a part of Grosse Ile Township and is a residentially zoned area. No utilities are available, however.

As a direct response to the continued pressures on Grosse Ile for development and a constant threat of permanently losing natural areas on the island, the Grosse Ile Nature and Land Conservancy was formed. The mission of the organization is to acquire natural areas on Grosse Ile through purchase, conservation easements and donations, for the purpose of preservation, protection and public benefit. The Conservancy recognized the ecological benefit of Stony Island in the lower

Detroit River and pursued acquisition of the island in 1994 for the purpose of habitat protection and conservation.

Characteristics

The Stony Island area is a mix of upland, wetland and swift-moving, shallow water, and is one of the largest remaining wildlife habitat and fish spawning areas in the lower Detroit River. The Island is roughly 40.5 ha (100 acres) and is protected by a limestone armoured barrier that encloses a large shallow bay area used extensively by waterfowl for staging during migration. Over 23 species of migrating waterfowl have been identified here (Manny *et al.* 1988). There are approximately 20.2 ha (50 acres) of upland area which includes a mix of vegetation; massive chinkapin oak, hackberry and cottonwood are among the old growth. The hard bottom shoal of limestone provides spawning for 65 species fish, including perch and walleye (Manny *et al.* 1988). The surrounding macrophyte beds also provide habitat for a variety of fish.

Actions

The ability to secure the $750,000 (U.S.) to purchase Stony Island did not come without a tremendous amount of persistence and effort by members of the Conservancy, support from federal and state agencies and important contacts made by Township officials. Stony Island was nominated for public land acquisition through the Natural Resources Trust Fund Board in 1995 and again in 1996. After a special meeting between Grosse Ile Township officials and Michigan's Governor Engler, Stony Island was recommended by the Board for purchase through the Michigan Natural Resources Trust Fund in 1997. This purchase has now been finalized, thus ensuring the protection and preservation of this important piece of the Conservation Crescent.

Effectiveness and Further Steps

The next step in the process of the island's protection is the completion of a level one contamination study for remediation. This is being conducted through the Michigan Department of Natural Resources with the assistance of Grosse Ile Township. The contamination is primarily from fuel, machinery and equipment used during the dredging operations conducted on the island and is confined to the area where remaining buildings and sunken barges exist on the eastern side. Once clearly identified, remediation will take place.

The need to acquire land for the purpose of habitat protection and conservation in the Detroit River is very great. Yet, the means to achieve this goal is very difficult. Land acquired through conservation easements or donations is desirable, but the reality is that landowners prefer to develop these areas for profit. Acquiring Stony Island for preservation and protection through the Natural Resources Trust Fund is remarkable. It took vision, persistence and connections to make it happen. With a continued effort by many dedicated individuals, organizations, and groups, the goal of increasing the fish and wildlife habitat in the Detroit River can be realized.

Ruwe Marsh Restoration Project

Lisa Tulen, Citizens Environment Alliance

Introduction

The Detroit River has suffered severe losses of wetland habitat since early settlement resulting in an estimated loss of more than 95% of historical wetland habitat. The Detroit River has been identified as an Area of Concern for more than 15 years, partly due to the loss of historical fish and wildlife habitat. In addressing this impaired beneficial use, the OMNR compiled a document entitled "Survey of Candidate Sites on the St. Clair and Detroit Rivers for Potential Habitat Rehabilitation/Enhancement." This comprehensive document outlined 17 Canadian sites along the Detroit River that had potential for fish and wildlife habitat restoration, and provided the rationale for Ruwe Marsh being one of the sites for future habitat restoration.

History and Characteristics

The objective of the project was to repair an existing finger dike structure at the Ruwe Marsh in an effort to protect existing habitat in an ecologically important area of the Detroit River. Despite habitat losses, the Detroit River, found within the Mississippi flyway, continues to provide habitat for 29 species of waterfowl (OMNR data 1997) and 65 species of fish (Manny *et al.* 1988).

Ruwe Marsh is privately owned and located in the lower Detroit River, south of Fighting Island and north of the Canard River, a major tributary to the Detroit River. This marsh complex is 580 ha (1,434 acres) in area and is composed of both a closed cell surrounded by a clay dike overgrown by trees and vegetation, and an open cell which at one time had extended around forming another closed cell of wetland. Over time this outermost dike eroded to the point where the only visible portion remaining was a finger dike extending from the north wall of the closed cell perpendicular to the river. This finger dike protected the downstream marsh vegetation along with the still existing closed cell dike and redirected the water and ice moving south down the Fighting Island channel away from the marsh.

Ruwe Marsh is the third most significant marsh in Canada for canvasback ducks, after Long Point and marshes along the eastern shore of Lake St. Clair. This is primarily due to the large stands of wild celery (Vallisneria americana), a principle food source for canvasback and redhead ducks. Wild celery, a native, submersed aquatic plant, requires specific conditions for growth. Loss of 72% of wild celery in the lower Detroit River between 1955 and 1990 coincided with the declining use of the Detroit River by diving ducks such as the canvasback duck (Schloesser and Manny 1990). Over time the existing finger dike at the Ruwe Marsh had eroded allowing strong water currents and ice to funnel through openings in the finger dike, threatening the wild celery beds in the open cell of the marsh.

Restoration

The Ruwe Marsh Restoration Project was initiated and carried out over a span of six months. Initial contact was made with a fellow marsh owner who spoke with the lessees about Ruwe Marsh. The lessees of the marsh responded with a letter showing their interest in a habitat project. The initial project description, as outlined in the Candidate Sites report, was given to the lessees of the property and the project was initiated.

Several steps were initiated in order for this project to proceed, including government approvals, funding applications, letters of support, engineering drawings, partnership agreements and tendering of the contract. It was necessary to organize the project to ensure everything occurred in a positive progression.

Several government approvals were required for the project to proceed, including a Provincial Class Environmental Assessment, Federal Environmental Assessment Review Process (as Federal funds were used for the project), Fisheries Act, and Flood and Fill Regulations. Many of the approvals, such as the Environmental Assessment, required a period of public notice, while others simply required time for response from agencies. Unfortunately, it was not possible to extend the repairs of the dike to its original, historic form, as approval under the Navigable Waters Act was not possible.

The majority of funding for this aspect of the project came from Environment Canada's Great Lakes Cleanup Fund, now called the Great Lakes 2000 Fund. A number of partnerships provided in-kind support for this project. The OMNR provided project facilitation, procured funding, prepared engineering designs, and oversaw monitoring programs. On-site construction management was provided by the Essex Region Conservation Authority. Ducks Unlimited Canada provided preliminary plans for construction of the dike.

Construction of the dike wall took place in the spring of 1995. It was difficult to pick an optimum time for construction of the dike, as the area provided habitat for an endangered species. Spring fish spawning was also a consideration. All construction material was clean and did not have excessive soil. This special consideration was outlined in the tender, and the marine construction company (Cable Marine) took great care in ensuring construction was carried out in the most responsible manner possible.

Due to the delicate state of the existing dike, it was extremely likely that if construction had not been carried out at that time the dike would not survive another winter and would require extensive repairs, which would end up being more costly in the future. Construction was tendered out to a local construction company and administered by the OMNR tendering process.

Effectiveness and Further Steps

Ruwe Marsh Restoration Project resulted in the repair of 1,125 m (1,230 yds) of deteriorated dike protecting 366 ha (904 acres) of downstream wetland as well as providing additional protection to the dike walls of the enclosed wetland. Follow-up monitoring at Ruwe Marsh included Global Positioning System (GPS) mapping of existing wetland vegetation, and fish and wildlife inventories.

Fish monitoring at the Ruwe Marsh following dike reconstruction, showed an increase in the number of fish species from 24 in 1994 to 36 in 1995. Fish species recorded included three classified as 'vulnerable' by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC): the pugnose minnow (Notropis emilae), spotted sucker (Minytrema melanops) and the greenside darter (Etheostoma blennioides). This is the first record of the greenside darter in the Detroit River. Marsh bird monitoring was initiated at the Ruwe Marsh in 1995 by a local volunteer from the Essex County Field Naturalist Club and continues to provide valuable information on the importance of the marsh to migrating and nesting marsh birds.

As purple loosestrife (Lythrum salicaria) was the predominant species in the enclosed part of the marsh. Ruwe Marsh was also included in the University of Guelph's purple loosestrife biological control program. Gallerucella sp., a leaf eating beetle, was introduced in the marsh in hopes that this species would proliferate and provide a means of biological control for purple loosestrife.

In the years following dyke repair, the OMNR recorded the highest number of waterfowl species (29 in 1997) and the highest counts of canvasback ducks (17,711 in 1996) and redhead ducks (10,965 in 1997) for the lower Detroit River, Lake St. Clair and Rondeau Bay area since surveys were initiated in 1987 (Chatham OMNR).

Currently, canvasback duck populations in Ontario are higher than they have been for years and biologists are predicting a recovery in wild celery beds in the Detroit River. The reconstructed dike walls at the Ruwe Marsh are now covered in newly established vegetation. Ruwe Marsh remains a significant habitat for a large and diverse community of waterfowl, as well as fish and other wildlife due in large part to the repair of the dike.

Ecological Restoration of Grassy Island and the Wyandotte National Wildlife Refuge in the Detroit River

Bruce A. Manny, U.S. Geological Survey
Biological Resources Division, Great Lakes Science Center

Introduction and History

Grassy Island appears on maps of the Detroit River dating back to 1796 as a marshy area about 2.4 ha (6 acres) in size west of Fighting Island and north of Grosse Ile. Then, the river bottom around the island sloped gradually off on all sides into deeper channels. This area was first called "Ile Marecageuse" on a map compiled in 1796 and "Grassy Island" on later maps. An 1873 fisheries report contains a line drawing of the "Grassy Island Pond Fishery" for spawning whitefish that shows a large seine being drawn in by two horse-drawn windlasses inside two of several sheds constructed on the island (Milner 1873). This enterprise employed 30 men, working night and day, September to November and produced 45,000 adult whitefish per spawning season. Thereafter, the U.S. Coast Guard installed three navigation lights near the island for ships down bound in the Fighting Island Channel. In 1959, the island area began to be used by the Army Corps of Engineers (ACOE) as a Confined Disposal Facility (CDF) for polluted dredge spoils.

In 1955, Grassy Island was under the jurisdiction of the U.S. Treasury Department, which had reserved it for installation of navigation aids by the U.S. Coast Guard (Larson 1981). In September 1959, the ACOE began diking a proposed 121 ha (300 acres) area around Grassy Island for disposal of dredge spoils from the Rouge River. In October 1959, at a meeting between the ACOE, the U.S. Bureau of Sport Fisheries and Wildlife, and the Michigan Department of Conservation, Congressman John D. Dingell negotiated an agreement that the ACOE could continue construction of the Grassy Island CDF. In January 1960, Mr. Dingell introduced federal legislation to designate Grassy Island and surrounding shoals as a National Wildlife Refuge because wild celery (Vallisneria americana) is abundant and widely distributed near Grassy Island and is the preferred food of diving ducks, such as canvasbacks, redheads, and scaup. The area attracts thousands of diving ducks during their fall and spring migration when these ducks consume large numbers of wild celery tubers (Manny *et al.* 1988). In July 1960, the Department of Interior agreed that at such time as the Interior Department received jurisdiction over the Grassy Island area, it would not object to continued use by the ACOE of the a 29 ha (72 acres) CDF for dredge spoils from the Rouge River (Larson 1981). An act to create the Wyandotte National Wildlife Refuge, including Grassy Island and surrounding shoals out to a water depth of 2 m (6 ft) and an area of about 121 ha (300 acres) extending downstream to the Mamajuda Light near Point Hennepin, became law on August 3, 1961 (Larson 1981). Grassy Island is presently administered as a satellite under the Shiawassee National Wildlife Refuge of the Fish and Wildlife Service near Saginaw, Michigan.

Grassy Island was originally a marshy, low-lying area of emergent and submersed vegetation that might be classified today as a Great Lakes coastal marsh. On an 1815 map, such marshes are contiguous along both sides of the entire 51 km (32 mi) length of the Detroit River. However by 1982, such habitat had been reduced by shoreline development to less than 3% of its original area in Michigan waters. Today, only remnants of that marsh, such as Humbug Marsh and portions of

Stony Island and Gilbraltar Bay at the southern end of Grosse Ile, remain in Michigan waters of the river. These remnants contain stands of bottom-land hardwoods, glacial lakeplain prairie, coastal plain pond communities, and a variety of wetland types. Such coastal marshes are used as spawning, nursery, feeding, migration, overwintering, and refuge habitat by many of the 47 species of fish that spawn in the lower Detroit River, including northern pike, muskellunge, largemouth and smallmouth bass, walleye, and possibly lake sturgeon, and as feeding and resting habitat by more than 17 species of birds of prey (raptors), including eagles, hawks, falcons, and kestrels, and 48 species of non-raptors, including loons, herons, neotropical songbirds, cranes, and cattle egrets, that migrate through the Detroit River area each year.

Comparison of Detroit River maps drawn in 1815 and 1982 reveals that: over 97% of wetlands in Michigan waters have disappeared under shoreline modifications; 90% of the remnant wetlands in the Detroit River are found downstream of Grassy Island; and about 40% of these remnant wetlands are in Humbug Marsh and on small, undeveloped islands forming the "Conservation Crescent" around the southern tip of Grosse Ile (Jones 1997). Because wetland habitats are essential to a high diversity of fish and wildlife species at various stages of their life cycle, such Great Lakes coastal marshes have been classified as globally unique and significant in biological diversity by The Nature Conservancy (1994).

Objectives

In 1994, Grassy Island on the Wyandotte refuge was selected by the U.S. Department of Interior as a demonstration site for hazardous materials management. The goal of the initiative is to demonstrate the ability of Interior bureaus to work together to develop remedial action plans and field test innovative technologies for cleanup of Interior lands. The objectives are to address concerns about land use requirements, trust responsibilities, environmental protection, and natural resource management, while achieving cleanup goals more rapidly and at less cost than current methods. In 1997, the U.S. Geological Survey's Biological Resources Division investigated contamination of surficial soils on Grassy Island and of wild celery tubers growing on shoals surrounding the island. Then also, the Survey's Water Resources Division investigated groundwater movements around the island and contaminants in subterranean soils and water.

Characteristics

At least 20 species of submersed aquatic macrophytes occur in the Detroit River: wild celery (Vallisneria americana), water stargrass (Heteranthera dubia), waterweed (Elodea canadensis), Eurasian watermilfoil (Myriophyllum spicatum), bushy pondweed (Najas flexilis) and redhead grass (Potamogeton richardsonii) predominate in the vicinity of Grassy Island (Schloesser and Manny 1986). Shallow water habitat, gradually sloping off into deeper waters, exists only on the west side of Grassy Island in a small 9.1 ha (20 acres), unnamed embayment. Wild celery is abundant and widely distributed near Grassy Island. Because it is the preferred food of canvasbacks, redheads, and scaup, the refuge attracts and holds thousands of diving ducks during their fall and spring migrations. Because of its strategic location, its continued supply of food resources, and secure resting space it provides in an area heavily impacted by human activities, the Wyandotte National

Wildlife Refuge and Detroit River are mentioned as essential waterfowl habitat in the North American Waterfowl Management Plan.

Terrestrial plants on Grassy Island include giant reed grass (Phragmites communis), cattails (Typha spp.), as well as aspen, cottonwood, willow, wild cherry and box elder trees that provide little suitable habitat for animals. Wildlife use of small ponds on Grassy Island has not been fully characterized.

Lake sturgeon once spawned on the rocky bottom in swift currents just northeast of Grassy Island, one of seven historic spawning areas in the Detroit River (Goodyear *et al.* 1982). This fish is listed as "threatened" by 19 of the 20 states in its original range, and by seven of the eight Great Lakes states, including Michigan. Recent, incidental catches of genetically unique, juvenile lake sturgeon in Lake Erie near the Detroit River suggest that sturgeon are reproducing again in the Detroit River. More than 10 million walleye, white bass, steelhead, and salmon migrate through the Detroit River each year and attract many sport fishers to the refuge.

Bald eagles, a federally endangered species, have nested recently near Grassy Island and tens of thousands of canvasback and redhead ducks winter on the refuge. Pheasant, swallow, red-wing blackbird, gulls, terns, Canada geese, woodcock, wood duck, loon, kingfisher, and many species of shore birds inhabit the refuge.

Coyote, gray fox, whitetail deer, raccoon, woodchuck, spotted turtle, and muskrat have either been seen or identified by signs they left on Grassy Island. Two years ago, a family of river otter were seen near the lower Detroit River, beaver have recently returned to nearby Livingston, Oakland, and Washtenaw Counties, and in 1998 a wild black bear wandered down the I-75 right-of-way into suburban Detroit. This was the first sighting of a wild black bear in Oakland County since the early 1800s. In time, some of these animals may recolonize the Wyandotte refuge.

Effectiveness and Further Steps

The Grassy Island CDF contains no impermeable liner or cap and ponds on it are above river level. Therefore, the potential for leakage of contaminants from the Grassy Island CDF is being evaluated. Pathways for contaminant movement include leakage under the dike and exposure to dredge spoils at the island's surface. The risk to biological resources posed by exposure to contaminants in the river and on the island needs to be assessed.

The quality of existing habitats for production of fish and wildlife is low on Grassy Island, due to the monotypic dominance of giant reed grass and exposure to dredged sediments, and medium on shoals surrounding Grassy Island, due to contamination of river bottom sediments. The condition of historic fish spawning grounds on the refuge is unknown. The amount of marsh vegetation on the Wyandotte refuge is limited.

Questions which the U.S. Geological Survey's Biological Resources Division may address in the future include:

- Is it feasible to increase biodiversity on the refuge by planting native prairie grasses on Grassy Island, surrounding the island with coastal marshes, and modifying surrounding shoals on the refuge to create varied, shallow-water, fish and wildlife habitats?
- How much do Grassy Island and surrounding shoals now contribute to the productivity and survival of numerous trust resources in the river, including the bald eagle, migratory waterfowl, and lake sturgeon?
- To what extent do bald eagles and lake sturgeon use the Wyandotte refuge?
- What exactly attracts migratory waterfowl to or limits their use of the Wyandotte refuge?
- Does the refuge provide spawning and nursery habitat for lake sturgeon?

The little remaining riverside marsh and shallow-water habitat on gradually sloping, undeveloped shorelines in the Detroit River now limits the production of many resident fish and wildlife species there. The Wyandotte National Wildlife Refuge has potential for restoration of diverse habitats that would sustain unique and globally significant, resident and migratory, fish and wildlife.

A Multi-Partner Initiative to Wetland and Prairie Restoration in the St. Clair River Watershed (the MacDonald Park Project) with Applications to the Detroit River

Don Hector, Ontario Ministry of Natural Resources

Introduction

A wetland and prairie restoration project was carried out in a day-use park area along the St. Clair River (Chenal Ecarte) from September 1995 to July 1997. This initiative involved a wide variety of non-governmental groups and government agencies, and numerous funding partners in completing its many components. The work was initiated through the St. Clair River RAP process in helping to restore fish and wildlife habitat in the St. Clair River watershed. This particular project was one of 28 areas originally identified in a earlier report (Survey of Candidate Sites on the St. Clair and Detroit River for Potential Habitat Rehabilitation/Enhancement). Wetland creation, improvement of shoreline riparian areas and establishment of Tallgrass Prairie habitat were the main objectives. The secondary objective was to use this project as a key demonstration area for a variety of aquatic and riparian restoration techniques.

Characteristics

MacDonald Park is one of 17 river-side park areas owned and managed by the St. Clair Parkway Commission. Use of this network of parks includes picnicking, camping, boat launching/mooring, swimming, and associated passive recreational activities. This particular site was chosen due to its high potential for a variety of aquatic and upland restoration techniques, the visibility and accessibility along a commonly traveled roadway, and the strong interest of the landowner (the St. Clair Parkway Commission). The project involved the creation of 1 ha (2.5 acres) of wetland, 1 ha (2.5 acres) of Tallgrass Prairie complete with an interpretive trail, improvement of 200 m (219 yds) of shoreline riparian area, as well as interpretive signs and brochures.

Actions

The original site consisted of maintained grass, used mainly as a picnic area. The wetland component consisted of the excavation of 4,588 m^3 (6,000 yd^3) of material, treatment of the littoral areas with topsoil and stabilization using biodegradable coir mat. A variety of wildlife and fisheries components including spawning mounds, submerged habitat structures, aquatic vegetation plantings, and basking logs, were placed in the newly created wetland area. The bank areas of the wetland were planted with shrubs.

Shoreline areas surrounding the site and bordering dredged canal areas were reshaped, gently sloped and stabilized using live willow stakes and brush bundles to establish riparian cover and as a means to reduce erosion. Planting of aquatic vegetation in the nearshore waters adjacent to these areas occurred in a subsequent phase. Experimental biolog floating barriers and bogmat islands were installed to establish in-water structure and provide erosion protection in local shoreline areas. Approximately 200 m (219 yds) of shoreline area were rehabilitated using these techniques.

In the 1 ha (2.5 acres) upland site 22,000 Tallgrass Prairie plugs of 23 different forb and grass species were planted. A slightly elevated horseshoe shaped trail system was constructed using excavated material from the wetland area to allow trail users an improved view of the prairie plant species at the height of their growing season.

Effectiveness and Further Steps

A variety of qualitative and quantitative monitoring has occurred on the site. A fish inventory was undertaken in the newly created wetland in late August 1996, one month following the completion of the wetland component. These results indicated four fish species present in the system: largemouth bass, bluegill, central mudminnow and an esocid species. In 1997, young of year northern pike and largemouth bass were documented in the wetland area. Visual monitoring of both the wetland and prairie components have indicated excellent establishment of plant communities. Informal records are being maintained for amphibians, birds and reptiles that appear at the project site. There are future plans by a local naturalist group to document insect use of the Tallgrass Prairie area with an emphasis on butterflies.

The MacDonald Park Restoration Project was supported by the following funders and volunteers:

Great Lakes 2000 Cleanup Fund, National Fish and Wildlife Foundation, Roy Investment Ltd., St. Clair Parkway Commission, Rural Lambton Stewardship Network, Ontario Ministry of Natural Resources, Eastern Habitat Joint Venture, Ontario Ministry of Environment and Energy, Shell Environmental Fund, St. Clair Region Conservation Authority, Aqua-Terre Environmental Consultants, Wallaceburg District Secondary School, Wallaceburg and District Boy Scouts, Bluewater Anglers Association, Farmers and Friends Conservation Club of Lambton, St. Clair Binational Public Advisory Council and Lambton Wildlife Inc.

Much of the work carried out in this project was well suited to volunteer activities. Over the length of this project, over 75 individuals contributed over 1,300 hours of hands-on work. Key groups in this volunteer effort included Wallaceburg District High School students, local naturalist groups, fish and game organizations, local landowners and Scouts Canada.

Although the total area of habitat created was relatively small (2 ha or 5 acres), the benefits of this project lie in its demonstration value, both visually and as an example of how local community groups can make a meaningful contribution to the environment. It is also an example of how some of the traditional views of waterfront park design or usage can be broadened. These new concepts and techniques can be transferred to many other shoreline park areas along the Great Lakes, particularly where artificial steel or concrete shorelines predominate. The St. Clair Parkway Commission is extremely pleased with the results of this project and are interested in exploring further habitat restoration projects along their other waterfront park properties. This site continues to be of interest to new groups wishing to become involved in activities at this site. For example, a turtle nesting habitat project has been proposed by a Sarnia group and a prescribed burn, a required habitat management technique for Tallgrass Prairie, is proposed for the spring of 1998.

Many other areas along the Great Lakes, including the Detroit River, have similar opportunities to explore. Along both sides of the Detroit River, a mosaic of municipal, private, and associated undeveloped waterfront properties may have potential for alternate passive or recreational land uses with varying levels of fish and wildlife habitat possibilities. Organizations with multiple land holdings across a wide area or a riverfront property type which may be commonly found along a particular river stretch would be a key criteria in determining priority sites for demonstration projects. Road endings or road allowances, roadside parks, boat launch areas or drain/creek outlet areas may provide potential for integrating fish and wildlife habitat improvements. All opportunities, both short and long term, should be explored.

The Crosswinds Marsh Wetland Restoration and Creation Project

Donald L. Tilton, Tilton & Associates, Inc.

Introduction and History

In 1992, the Wayne County Detroit Metropolitan Airport filled wetlands in order to expand the runway complex at the airport. As a requirement for filling the wetlands, the airport created and restored approximately 162 ha (400 acres) of wetland habitat at a site located 24 km (15 mi) southwest of the airport (i.e., Crosswinds Marsh).

Objectives

The objective of this project was to re-establish wetland values and functions lost due to airport expansion by restoring and creating wetlands. Wetland habitat to be restored and created included submergent, emergent, scrub-shrub, and forested areas. Primary wetland functions and values that were to be created were fish and wildlife habitat, water quality improvement, flood storage, and passive recreation.

Characteristics

An environmental impact statement was prepared for the expansion of the airport. This laid the foundation for project design, including a revegetation program which complemented the local gene pool, increased plant diversity, and controlled invasive species. In addition, existing habitats were conserved and new habitats created for endangered and threatened species, and species of special concern. Fish and wildlife habitats were interspersed throughout the site. Stormwater storage was accomplished through the use of passive low-maintenance retention structures. A system of shallow wetlands was designed to remove pollutants from runoff.

Actions

The wetlands were created by altering the drainage profile of existing drains and rerouting flow from within the subwatershed to create hydrological conditions suitable for wetland establishment. A combination of treatments was used to create wetlands, with some areas being planted and seeded, and other areas allowed to colonize naturally by wetland plant species. In addition to different seeding treatments, some wetland areas received new topsoil, some had a surface application of sand, and some were undisturbed. Monitoring of vegetation, hydrology, and wildlife habitat development has occurred on an annual basis. New and restored wetlands were compared to existing wetlands that were retained on the project site as reference wetlands.

Effectiveness and Further Steps

Wetland hydrology of the area has developed in accordance with the model predictions. Wetland hydrological conditions (saturated or ponded soil) were observed at all wetland locations. Wetland vegetation has developed successfully, with 80% plant cover by wetland species in all new or restored wetland areas within two years of completing construction (Tables 2-4).

Unplanted wetlands areas developed in a similar fashion compared to planted wetlands with similar percentage of cover, number of native species, and total number of species. In monitoring the wetlands, a measure of the natural quality of vegetation was developed in order to characterize the relative dominance of non-native plant species. Unplanted wetlands tended to have similar numbers of non-native species compared to natural or planted wetland areas. Wildlife species observed at Crosswinds Marsh include seven species of amphibians and 52 species of birds, most notable of which is a pair of bald eagles which are frequently observed at the site.

Table 2. Vegetation monitoring data from pre-existing wetlands (excluding 3L wetlands) in Crosswinds Marsh.*

Pre-Existing Wetland Habitat	No. of Plots	Average Percent Cover		Average Wetland Indicator		Average Native Species		Average Total Species		Average Natural Quality	
		1994	1995	1994	1995	1994	1995	1994	1995	1994	1995
Forested Wetland	8	68.13	93.75	-1.69	-1.38	4.75	5.13	5	5.25	4.5	6.7
Wet Meadow	21	84.54	93.1	-1.43	-1.84	5.33	5.14	7.24	6.19	4.2	4.9
Emergent Wetland	0	0	0	0	0	0	0	0	0	0	0
Average		50.89	62.28	-1.04	-1.07	3.36	3.42	4.08	3.81	2.9	3.9

* 3L refers to replacement wetlands for the 3L runway extension project. Average wetland indicator refers to numeric values assigned to the rating assigned plant species in the National List of Plant Species that occur in wetlands. The rankings range from obligate wetland plants (-5) to wetland plants (5). A site with an average wetland Natural Quality indicator of less than one is considered dominated by wetland vegetation. Average Natural Quality was calculated by summing the coefficients of conservatism of an inventory of all plant species in each habitat, dividing by the total number of plant species, and multiplying by the square root of the total number of plant species. The average natural quality is based on the Floristic Quality Assessment developed by Michigan Department of Natural Resources. The average number of species refers to the number of species per square meter.

Table 3. Results of different planting mixes in 3L wetlands in Crosswinds Marsh.

Revegetation Treatment	No. of Plots	Average Percent Cover		Average Wetland Indicator		Average Native Species		Average Total Species		Average Natural Quality	
		1994	1995	1994	1995	1994	1995	1994	1995	1994	1995
3L Forested/Wet Meadow Woody-Mix 1	2	100	100	-0.15	-0.5	3	2	8.5	4.5	5.48	2.23
3L Forested/Wet Meadow Woody-Mix 2	1	100	100	1.25	0	5	4	12	6	5.37	8.5
3L Forested/Wet Meadow Woody-Mix 3	2	100	100	0.09	-0.85	3	4	6	6.25	5.52	4.97
3L Wet Meadow Seed Mix 2 & 2A tubers	4	78.75	75	-3.46	-4.05	3.75	4.75	4.75	5.75	6.38	6.3
3L Emergent Wetland/Wet Meadow Seed Mix 2 & 2A & Tubers	10	78	80	-4.1	-4.71	4.1	4.6	5.2	5	7.06	6.38
3L Emergent Wetland Seed-Mix-1A	1	95	100	-4.5	-5	3	2	4	2	5.66	5.66
Average		91.96	92.5	-1.81	-2.52	3.64	3.58	6.74	4.92	5.91	5.67

Table 4. Vegetation monitoring data from unplanted created wetlands (excluding plots from 3L and pre-existing wetlands) in Crosswinds Marsh.

Habitat	No. of Plots	Average Percent Cover		Average Wetland Indicator		Average Native Species		Average Total Species		Average Natural Quality	
		1994	1995	1994	1995	1994	1995	1994	1995	1994	1995
Unplanted Forested Wetland	17	80.29	93.24	0.77	0.77	4	4.76	7.44	7.82	1.69	3.31
Unplanted Wet Meadow	10	63	85	-0.72	-0.74	5.3	5.4	8.6	7.5	4.78	5.17
Unplanted Emergent Wetland	19	46.11	74.74	-1.98	-3.3	2.95	3.95	3.63	4.68	3.24	4.55
Unplanted Shallow Water	2	0	50	-5	-5	0	1	0	1.5	0	4
Unplanted Deep Water	1	0	0	5	0	0	0	0	0	0	0
Average		37.88	60.6	-0.39	-1.65	2.45	3.02	3.93	4.3	1.94	3.4

Habitat Rehabilitation and Enhancement Projects in the Detroit River and Tributary Watersheds

Jim Hartman, Essex Region Conservation Authority (ERCA)

Introduction

Since 1850, approximately 96% of Essex region's original wetland area and 95% of the original forest area have been lost as the result of forest clearing and wetland drainage for agriculture and urban development (Oldham 1983). Of the 1,722 km^2 (665 mi^2) in the Essex region, approximately 94% is used for agriculture or has been urbanized. ERCA is committed to the protection, enhancement and rehabilitation of fish and wildlife habitat. The following is a discussion of fish and wildlife habitat rehabilitation and enhancement projects implemented by ERCA in the Detroit River and tributary watersheds.

Little River Rehabilitation Project (Twin Oaks Business Park)

The Little River Rehabilitation Project is being implemented on the Little River at the former site of the Twin Oaks Golf Course in the City of Windsor. The Twin Oaks site is bordered by the E.C. Row Expressway to the north, the Lauzon Parkway to the west and CPR railway to the south.

The City of Windsor is servicing an 81 ha (200 acres) parcel of land (Twin Oaks Business Park) in the south-east portion of the city for future commercial and industrial development. The land is traversed by an 1,150 m (1,258 yds) section of Little River. The 1992 Little River Comprehensive Stream Study (LRCSS) identified the section of Little River at Twin Oaks as having degraded environmental quality. This degradation has been largely attributed to effects of channelization and construction of a river dam. These channel adjustments were made prior to the development of regulations that prevent such activities. Preliminary analysis of the natural features in the Little River and Turkey Creek subwatershed study (currently on-going) identified this section of the Little River as having high potential for renaturalization.

As part of the servicing requirements, a stormwater management plan has been developed for this portion of the watershed. Included in the plan are provisions for improving the natural habitat and water quality of this section of the river.

The following activities are being undertaken: restoration of the natural floodplain in a 1 km (0.62 mi) river section (*Completed*); restoration a 1 m (1.1 yds) deep low flow river section (*Completed);* restoration of 2,300 m (2,515 yds) of riparian habitat (in-stream and along banks) (*Planned for fall 1998*); installation of a stormwater quality system (*Completed*); construction of a trail linking habitat corridors and providing public access (*Under construction*); and monitoring of habitat and water quality improvements (*In progress*).

Restoration initiatives included the creation of a low flow channel as part of a 1 km (0.62 mi) natural stream channel design. A stormwater quality system was also constructed to ensure that the naturalized river section would not be degraded by runoff from the development complex.

Granular stone was placed on the bottom of the meandering stream channel to improve habitat for aquatic invertebrates and fish. Vortex weirs will be installed in the summer of 1998 to create riffle and pool sections to further enhance fish habitat. Ephemeral pools will be established within meandering flats of the river. These pools will intermittently become flooded during high water events and will retain water for extended periods providing habitat, particularly for amphibian reproduction during the spring season.

Bioengineering techniques, such as live staking, were used along the lower slopes of the floodplain to stabilize the banks and prevent erosion during high water periods. Sandbar willow cuttings (0.5 m or 0.55 yds in length) were staked into riverbanks and have begun to grow. Once mature, the stakes will prevent erosion and provide shading and riparian wildlife habitat. The entire floodplain has been planted with a cover crop of white clover, perennial rye, creeping red fescue, tall fescue, birdsfoot trefoil, and timothy grass to stabilize the newly graded floodplain. During the summer of 1998, volunteers from local schools and the Little River Enhancement Group will be planting more than 3,000 shrubs, 900 bareroot trees, and 150 large trees. A trail is also being constructed to allow general public access to this newly restored natural area.

The project will contribute to achieving Detroit River RAP recommendations, delisting fish and wildlife habitat impaired beneficial uses in the Area of Concern and meeting Canada-Ontario Agreement Habitat Targets. The total cost is estimated at $1.02 million (Canadian).

The project involves numerous partners, including the City of Windsor, Little River Enhancement Group, Essex County Field Naturalists, University of Windsor's Great Lakes Institute for Environmental Research (GLIER), OMNR, Ontario Ministry of the Environment (OMOE), Lafontaine, Cowie, Buratto & Associates, and Great Lakes 2000 Cleanup Fund.

Turkey Creek Improvements

The Turkey Creek Wetland is a provincially designated Class 3 wetland, consisting of many significant features, including abundant species of wildlife and plants. The wetland has varying topography with a robust emergent-plant community, areas of wooded swamp, and open embayments surrounded by cattails. Historically, channelization in the wetland created spoil-banks, which reduced the amount of water flowing into the marsh, causing stagnation and reduced biological activity.

The Turkey Creek Improvements project was initiated in 1992 as a flood control project in the municipalities of La Salle and Windsor. The project evolved to include a number of environmental benefits. Sediment in the upper reaches of Turkey Creek was contaminated due to residential septic systems until 1987, when municipal sewer systems were installed. Polluted sediment was removed and fish habitat enhanced with numerous rock-riffles and deep pools. More than 1,600 native hardwood trees and shrubs were planted along the improved banks of Turkey Creek.

The final phase of the Turkey Creek improvements included excavation of old spoil banks in specific areas to allow for re-establishment of water flow into the marsh, restoring the natural biological and hydrological activities required for improved water quality as well as flood control.

Fish and wildlife habitat were also improved through the creation of a pond and island network. This work was done under frozen conditions during the winter to minimize disturbance to vegetation and wildlife. Approximately $3.5 million (Canadian) were spent on improving more than 3.5 km (2.1 mi) of the Turkey Creek. The improvements have partially restored what was once known as one of the most polluted watercourses in Ontario into a major amenity for the community and the region. The project involved numerous partners including: OMNR, the Town of La Salle, City of Windsor, 200 landowners, Ministry of Transportation Ontario (MTO), MacLaren Engineers, LCBA, and Sherway Contracting.

Central Avenue Stormwater Facility

The Central Pond is located at south-east corner of Central Avenue in Windsor on the Grand Marais Drain, a tributary of Turkey Creek. The 4 ha (10 acres) pond/wetland is designed to function as a regional stormwater management facility. It will collect and detain stormwater run-off from the upstream tributaries of the Upper Grand Marais Drain. By only allowing a nominal base flow of stormwater to escape downstream during any storm event, the pond/wetland will relieve the flooding along the upstream reaches of the Upper Grand Marais Drain. The goals of this project are to:

1. reduce flooding in the Upper Grand Marais Drain area by managing stormwater;
2. improve stormwater quality leaving the wetland; and
3. enhance the natural environment in the process by constructing a functioning wetland.

The project involved the construction of a stormwater retention pond/wetland, undertaken as part of the on-going Turkey Creek Channel improvement works to alleviate flooding in the Turkey Creek Watershed. As well, to enhance the natural environment in that area, several special design modifications have been implemented to allow the pond to function as a constructed wetland under normal operating conditions. These design modifications include:

1. the routing of low flow waters through a serpentine wetland channel prior to discharge;
2. the protection and use of existing on-site plant and tree species to speed up the post-construction naturalization process; and
3. the planting of diverse wetland species to increase plant diversity.

The project facilitated land use changes in the Grand Marais Drainage area, including a 16 ha (40 acres) expansion at the nearby Chrysler Canada Plant. This is an excellent example of environmental and economic interests working together. Partners for the Central Avenue Pond project include Chrysler Canada, the City of Windsor, and ERCA. The total cost of implementing the Central Pond project was $600,000 (Canadian).

Canard River Improvements

The objectives of the Canard River Improvements project were to reduce sedimentation of the river and to improve flood control. As part of the project, fish habitat was improved, obstructions to fish migration were removed, and the low flow channel of the river was restored. Additional benefits

included reconnection of the river to ephemeral pool areas and removal of garbage, debris, and artificial blockages.

The improvements were implemented over 37 km (23 mi) of the river at a cost of $250,000 (Canadian). The project provided an environmentally-sound alternative to typical, or engineered channel improvements for flood control.

Canard Marsh and Turkey Island Restoration and Enhancement Project

At the mouth of the Canard River in the Town of Amherstburg (formerly the Township of Anderdon), exists a large marsh complex, known as the Canard Marshes. This area has been identified as important fish and wildlife habitat, particularly for staging waterfowl. To the north of the Canard Marsh complex in the Detroit River is Turkey Island.

The purpose of the Canard Marsh and Turkey Island Habitat project is to protect and enhance wetland habitat in the Canard Marsh Complex by:

1. Repairing the south marsh cell dike and the south finger dike (see the Ruwe Marsh Restoration Project section for more details). The south marsh cell requires an estimated 150 m (500 ft) of dike stabilization. The south finger dike requires an estimated 150 m (500 ft) of dike restoration and 150 m (500 ft) of dike stabilization. The restoration and stabilization work on the dikes will involve the protection of the dike face with rip-rap and native materials such as willows, dogwoods and rootwads. The repairs will restore and stabilize the dike and protect 60 ha (148 acres) of calm, shallow water areas used by migratory birds and will create fish and wildlife habitat.

2. Developing the Turkey Island Habitat Management Plan. This initiative will prioritize habitat rehabilitation and enhancement works for the two sites and develop detailed implementation plans.

The dike repair works will be completed in 1998. A second phase for this project is being proposed which would extend the south dike spit 30 m (33 yds) and would study the feasibility of a filtering calm water marsh cell which would extend from the south dike spit to the existing managed marsh cells.

The Canard Marsh/Turkey Island project will aid in delisting the impaired beneficial use of "loss of fish and wildlife habitat." In addition, the project will aid in meeting Canadian-Ontario Agreement Habitat Targets. Project partners included the landowner, OMNR, Great Lakes 2000 Cleanup Fund and Ducks Unlimited Canada. The total cost of the project is $150,000 (Canadian).

Dean Construction Habitat Enhancement Project

The Dean Construction site is located on the shoreline of the Detroit River directly east of the of Grassy Island in the Town of La Salle. Dean Construction presently operates its marine contracting operation at this shoreline site.

The Canadian Salt Company is removing salt piles at the shore of the Detroit River, consisting over 152,400 tonnes (150,000 tons) of mine waste salt. Removal of the salt piles is necessary for the construction of the wetland component of the project.

Monitoring activities conducted prior to, during and following construction will demonstrate the effectiveness of wetland and riparian rehabilitation projects in protecting and creating fish and wildlife habitat and in protecting threatened habitat. Further, the project will contribute to achieving Detroit River RAP recommendations, delisting the impaired beneficial use of "loss of fish and wildlife habitat" and meeting Canada-Ontario Agreement Habitat Targets.

The project will demonstrate the ability of public interest and government agencies working together with industry to rehabilitate fish and wildlife habitat. The partners for the project include: The Canadian Salt Company Limited, Dean Construction Company, GLIER, OMNR, OMOE, and Scouts Canada (Windsor Chapter). The total cost of the project is estimated at $500,000 (Canadian).

Detroit River Rural Nonpoint Source Remediation Program

The Rural Nonpoint Source Remediation Program addresses pollution run-off problems in the Canard River, Little River and Turkey Creek watersheds in the Detroit River Area of Concern. Intensive cash cropping, combined with a high percentage of open municipal drains increases the potential for pollution in run-off from nonpoint sources to the Detroit River. The objective of the project is to reduce nonpoint source pollution resulting in contamination of the Detroit River. ERCA completed the second phase of this four year project in 1997-1998.

A landowner participation program has been set up in these watersheds to encourage farmers to:

1. change to no-till corn production;
2. plant buffer strips and trees along watercourses;
3. install soil erosion protection structures; and
4. upgrade faulty septic systems to improve water quality and wildlife habitat.

A monitoring program has been set up to quantify progress towards achieving water quality targets (delisting impaired beneficial uses). This consists of regularly sampling a limited number of long-term data sites (index stations) as well as using a survey approach based on subwatershed characteristics.

Monitoring stations have been selected and baseline conditions established. The water sampling program allows ERCA to assess annual sediment and nutrient loadings. Pesticide monitoring will be added after surveys have been completed to determine which pesticides are of concern. Biological communities are also being monitored (amphibian surveys, bird counts, benthic collections) to quantify change and stress in these communities. Soil erosion models are also being used to estimate reductions in soil loss and sediment loading as a result of projects implemented. Data from individual projects will be used to run these models.

The project addresses several recommendations of the Detroit River RAP. Enhanced water and habitat quality resulting from remediation will contribute towards delisting impaired beneficial uses of degradation of benthos, beach closings, and loss of fish and wildlife habitat. The project also aids in meeting Canada-Ontario Agreement targets with regard to water quality and habitat rehabilitation.

Partners for the project are numerous and include OMOE, Essex County Stewardship Network, Essex Soil and Crop Improvement Association, OMNR, Essex County Federation of Agriculture, Essex Conservation Club, Ontario Ministry of Agriculture, Food and Rural Affairs, Agriculture and Agri-Food Canada, GLIER, Environment Canada, and Great Lakes 2000 Cleanup Fund. Participating landowners contribute at least two thirds of the cost of each project.

BASF Corporation's Rehabilitation of Fighting Island

Jack Lanigan, BASF, Ecology Services Department

Introduction and History

BASF Corporation and its predecessor companies have owned Fighting Island since 1918. The southern three-quarters of the island was divided into three settling beds. The beds serve as the final disposition for alkaline by-products predominantly from the manufacture of soda ash and other lime-based products. The beds were in service between 1924 and 1982. The beds hold approximately 20 million m^3 (706 million ft^3) of material.

The alkaline by-products consist mostly of calcium chloride, sodium chloride, coke ashes, un-reacted limestone, and limestone impurities such as silica, alumina, and metallic oxides. These by-products were pumped in slurry form to Fighting Island where they were allowed to dry and decant. The grain size typically is in the silt to fine silt range.

Characteristics/Initial Steps

Beginning in the mid-1970s and continuing today, BASF actively encourages re-vegetation on Fighting Island. The early efforts targeted increasing the stability of the perimeter containment dikes. The re-vegetation goals expanded steadily to include reducing dust problems, increasing wildlife habitat, controlling runoff, and enhancing the physical appearance.

Many factors contribute to discourage vegetative growth in these materials. The factors include: high pH, high moisture content, general absence of organic components, high concentrations of salts, and the very smooth ground surface. The smooth surface promotes transport by wind and discourages resident time for seeds to root. The high moisture content along with the materials' fine grain size combine to inhibit any kind of large-scale tilling.

Actions

BASF's primary methods for increasing vegetative cover fall into six categories. A discussion for each method follows.

Reduce the water content of surficial deposits to promote plant growth: Assessments by the OMOE beginning in 1982 concluded that the high moisture content significantly inhibited plant growth. BASF reduced the soil's moisture content by building and excavating channels through the beds. These channels enhance drainage on all the beds and carry excess water to the decant channels.

Build wind breaks at strategic locations to catch dust, seeds, and blowing soil: BASF brought in thousand of bails of hay and straw to build approximately 9.6 km (6 mi) of wind breaks that catch

dust and seeds. As the wind breaks decay, they provide good organic base matter for plant growth. Additionally, several thousand stick and mulch plots on the beds act as small isolated wind breaks.

Transplant trees and shrubs to develop deeper root and soil zones: Since the mid-1980s, BASF planted approximately 45,000 trees and seedlings on Fighting Island. Early survival rates were marginal, but several species do very well. These species include poplars, Russian olives, and cottonwood. BASF purchased most seedlings and saplings from the Seedling Nursery Stock Program through the ERCA. Recently, BASF transplanted a significant number of trees and shrubs from the northern marsh area on Fighting Island to the settling beds.

Acquire and apply yard wastes from local communities to increase organic content: BASF acquired and maintains an Organic Soils Conditioning Permit to apply leaves on the Island. Beginning in the early 1990s, BASF began accepting leaves from the Town of La Salle free of charge. The leaves are spread inside the perimeter dikes and are allowed to decay for a few years. BASF then seeds the decayed leaves with grasses. Branches are placed in humps across the beds where they act as small wind breaks and seed areas. The branches also help increase the organic content of surface soils.

Acquire and apply organic biosolids (if available) also to increase organic content organic: BASF worked with several local groups to increase the fertility of the lime beds through the application of bio-solids (wastewater treatment plant sludge). In 1981 and 1982, BASF participated in a pilot scale project using bio-solids from the City of Detroit. The sludge was blended with the spoils at various percentages to find the optimum mix ratio, and test plots were planted with a variety of vegetation. Although the pilot project was declared an overall success, the project was discontinued because of elevated concentrations of metals in the sludge and perceived political complications. Two additional opportunities arose in the 1990s to apply bio-solids from the Windsor Wastewater Treatment Plant to Fighting Island. These initiatives, in cooperation with the Fighting Island Development Group (a.k.a. Dean Construction Company), also were unsuccessful primarily due to budget concerns in Windsor's City Council.

Encourage use of the island by waterfowl: Waterfowl, especially gulls, are moving onto Fighting Island in ever increasing numbers. The contribution of bio-solids from this source has been an unexpected benefit to increasing organic content of the spoils. Since realistic estimates of the gull population began in 1991, their numbers have increased by over 230% (currently estimated at over 350,000 individuals). While it may be difficult to demonstrate that BASF encourages gulls to live on Fighting Island, BASF in fact discourages them from congregating on its other river front properties, most notably on the North Works.

Effectiveness and Further Steps

Overall vegetative cover on the southern three-quarters of the island increased from less than 40% in 1987 to nearly 80% in 1997. The fruits of these rehabilitation efforts include decreased runoff of alkaline waters into the Detroit River, decreased incidents of dust rising from the lime beds that once caused problem for local residents, increased habitat for resident and migratory birds, and a more aesthetically pleasing appearance for residents on both sides of the Detroit River.

PANEL DISCUSSION: HABITAT NEEDS AND PRIORITIES

The morning panel discussion was held to identify and help focus on habitat needs and priorities for the Detroit River and its watershed. The panel discussion was initiated with an introductory talk for which an abstract is presented below.

Habitat Restoration and Enhancement Guidelines and Priorities for the Detroit River and Canadian Sub-Watersheds

Dan Lebedyk, Essex Region Conservation Authority (ERCA)

The Habitat Technical Work Group of the Detroit River RAP has developed recommendations to address the loss of fish and wildlife habitat through the following two objectives:

- preserve and protect existing habitat; and
- restore and enhance habitat to maintain a healthy, diverse and self-sustaining fish and wildlife community.

The following priority recommendations from the RAP would indirectly address all of the impaired beneficial uses to the Detroit River Area of Concern, including *Loss of fish and wildlife habitat* and *Degradation of fish and wildlife populations*:

- *Develop a Habitat Inventory (Upland and Aquatic) for the Detroit River Area of Concern* - A habitat inventory is needed to obtain baseline information on existing wetland habitat, wildlife, and fishery resources. A habitat inventory would provide the information needed to proactively give developers and municipalities some guidance regarding habitat sensitivity, appropriate land zoning and permitted uses. Within the Area of Concern, a wetlands inventory has been completed for the Canadian side of the Detroit River.

- *Develop a Habitat Management Plan for the Detroit River RAP* - A management plan is needed to present clear strategies and a rationale for the protection, restoration and enhancement of fish and wildlife habitat in the Area of Concern. This would proactively provide information to municipalities and developers that could be incorporated into planning documents. In addition, the plan could delineate areas suitable for public access development and environmental appreciation and education that would foster a better understanding of the relationship between humans and their environment. The OMNR and ERCA have evaluated wetlands within the Canadian portion of the Area of Concern.

Currently, there is no existing habitat management plan/strategy for the greater Detroit River Area of Concern. A completed strategy would provide a "road map" of the extent of existing habitat and identify what is required for habitat protection, restoration and enhancement. The Detroit River RAP has identified this as essential for: governmental organizations in their regulatory and planning activities; developers with real estate interests; and recreational and environmental groups. Environment Canada, in partnership with other governmental agencies, has developed a document entitled "*A Draft Framework for Guiding Habitat Rehabilitation in Great Lakes Areas of Concern*" which provides a methodology to establish habitat restoration guidelines and priorities for degraded ecosystems utilizing Geographical Information Systems (GIS) technology. This document will provide the technical basis upon which a Conservation Biodiversity Strategy will be developed.

ERCA is currently producing a spatial database of all natural areas within the five Ontario sub-watersheds of the greater Detroit River Area of Concern (i.e., Detroit River, Little River, Turkey Creek, Canard River, and Big Creek) and is undertaking an analysis of the natural vegetation within terrestrial, wetland, and aquatic habitats to help set priorities for habitat rehabilitation and enhancement. Strategic planning for the rehabilitation and restoration of ecosystem features focusses on identifying high priority opportunities to help restore or improve environmental features and ecological functions that have been lost or degraded. The overall objective is to increase the size, extent, and quality of key natural heritage features, natural corridors, and greenway linkages, thereby improving the ecosystem diversity and ecological functions of the watersheds. This is the first step to constructing a healthy, self-sustaining, natural heritage system. This holistic approach that works towards restoring, to the extent possible, the functions and diverse species composition that comprise a whole ecosystem is more likely to ensure that maximum biodiversity is conserved over the long term.

Considerable information was compiled to construct the GIS database. The Canadian 1:50,000 and Ontario 1:10,000 topographic base maps (i.e., drainage, roads, vegetation, etc.), and Ontario Ministry of Agriculture and Food 1:25,000 drainage maps, were obtained prior to the start of this project. Information on Environmentally Significant Areas (ESAs) and sub-watersheds was obtained from ERCA. Information on Areas of Natural and Scientific Interest (ANSI) and provincially significant wetland boundaries was obtained from the OMNR. Soils and physiography data (1:63,360 maps) were obtained form the Ontario Ministry Agriculture, Food, and Rural Affairs. Wetland boundary mapping (1:2,000) data were acquired from the Town of La Salle. Forest cover and other landcover information was obtained from Landsat Satellite images, through contacts at Parks Canada. All digital information was imported into an ARC/INFO-GIS software package to conduct spatial analysis. This GIS database will help in generating maps and documentation to describe the current state of natural vegetation and adjacent land use, and ultimately areas for possible rehabilitation. A scale of 1:50,000 will be used only for a broad view of existing habitat in an area as a first attempt at identifying possible habitat rehabilitation areas. Detailed maps (1:10,000) will incorporate information gathered through research with Parks Canada, satellite imagery, 1:8,000 aerial photography, and landowner contact. This will provide the basis for the development of a habitat strategy for all five sub-watersheds, and specifically for priority restoration areas.

ERCA is coordinating the development of a Conservation Biodiversity Strategy in association with a technical steering committee made up of various representatives from the professional and local community. Spatial analysis, using overlay and buffering techniques, was the primary technique used throughout this project to determine how the various study areas met the restoration guidelines developed by the steering committee. ERCA will also use its GIS and existing digital data to model soil loss and loading into watersheds at 1:50,000 scale. This modelling will define initial priority areas and direct the landowner contact program to areas which are of high concern, rather than general contact throughout watersheds. This will focus the implementation strategies on areas which are not only "best bets" from a landowner perspective, but more importantly, areas which are high priority for habitat restoration from a biological perspective.

This effort is developing appropriate interim environmental guidelines to protect/maintain, restore/enhance and monitor all the various habitat types of the sub-watersheds. The guidelines will be based on input from the technical subcommittee, the results of on-going investigations and realistic expectations for the long-term health of the sub-watersheds. The environmental guidelines will be used to develop and provide support and rationale for restoration/management strategies. Accordingly, the guidelines reflect an overall desire to ensure that the ecosystem integrity of the sub-watersheds is maintained and, where possible, enhanced after potential and proposed land use changes are made. In addition, the guidelines are aimed at restoring, within practical limits, healthy, self-sustaining, resource-rich conditions, those aspects of the ecosystem that have been lost or degraded over time (Tables 5-7).

Table 5. An example of riparian habitat guidelines being used to protect and enhance ecological health of subwatersheds.

Percent of natural vegetation along first to third order streams

- 75% of stream length should be naturally vegetated - either woody or grassy

Amount of natural vegetation adjacent to streams

- generally, a 30 m naturally vegetated buffer on both sides would be optimal for specific functions:
    - species diversity - 3 to 100 m
    - wildlife movement (corridors) - 3 to 200 m
    - sediment removal - 10 to 60 m
    - nutrient removal - 3 to 90 m
    - water temperature moderation - 15 to 30 m

Total suspended solids concentration

- below 25 mg/L for the majority of the year

Percent of a watershed that is impervious

- less than 15%

Pool to riffle ratio

- 1:1

Table 6. An example of guidelines being used to promote healthy, self-sustaining woodland ecosystems.

Percent forest cover
- ERCA Strategic Plan recommends: 12%; Environment Canada recommends: 30%

Size of largest forest patch
- at least one 100 ha forest patch which is a minimum 500 m in width

Percent of watershed that is forest cover 100 m and 200 m from edge
- 100 m or farther from the edge > 10%
- 200 m or farther from the edge > 5%

Forest shape and proximity to other areas
- circular or square in shape
- in close proximity to adjacent patches (within 2 km)

Fragmented landscapes and the role of corridors
- corridors designed to facilitate species movement should be a minimum of 100 m wide
- corridors designed for specialist species should be a minimum of 500 m wide

Forest quality - species composition and age structure (OMNR 1990; 1993)
- species composition - as diverse as possible
- age structure - ideal basal area (m^2/ha):
  - polewood (10-24 cm) - 4*
  - small (26-38 cm) - 6
  - medium (40-48 cm) - 5
  - large (50+ cm) - 5
  - Total - 20

*This is a relatively new protocol, established by OMNR foresters for managing a forest stand for structural quality. The above numbers represent different age classes of trees and the relative proportion of these in a forest stand for optimal structural diversity. The units of the numbers are in meters squared per hectare and represent the total basal area of the different age classes of trees in the stand using a special prism for measurement. It is felt that if a total basal area is around 20 and the proportions listed above are achieved, the forest is healthy, productive, and diverse from a structural standpoint.

Table 7. An example of guidelines for the protection and restoration of wetlands.

Percent wetlands in watershed or sub-watershed • 10% in each major watershed; 6% in each sub-watershed; or original percentage
Amount of natural vegetation adjacent to wetland • 120-240 m of adjacent habitat be herbaceous or woody vegetation
Wetland type • marshes and swamps
Wetland location • original headwater swamps • on-stream or floodplain marshes and swamps on second and third order watercourses • lacustrine wetlands • any other location
Wetland size • swamps - as large as possible • marshes - range of sizes
Wetland shape • swamps - regularly shaped with minimum edge and maximum interior habitat • marshes - irregularly shaped with maximum interspersion

Due to the history of land use in the Essex region, especially agricultural land clearing, there are few natural areas remaining. Consequently, further losses should be prevented to the greatest extent possible. Coordinated steps should be taken to rebuild a pattern in the landscape of nodes and corridors of natural features that will improve and diversify the ecology of the greater Area of Concern. A set of principles and goals have been developed to: protect and enhance the sub-watershed natural features and ecological functions; restore those features/functions that have been degraded; and guide future development in a manner that will ensure the long-term health of the environment. These principles and goals will guide the development of a habitat strategy. Goal achievement will be accomplished through full implementation of the strategy. Presented below is an overview of these principles and goals:

- To stop further losses of significant natural features and to minimize other losses

Goals: • identify and preserve significant environmental features and ecological functions (fish and aquatic habitat, significant woodlands, significant wetlands, and significant habitats of endangered and threatened species)

- perpetuation of existing significant communities
- no loss of natural areas
- no loss of habitat along streams
- identify and preserve sensitive water quality and quantity features and hydrologic functions

- To achieve a net increase in natural cover and enhance the existing ecological resources

Goals:
- restoration of appropriate biological communities to yield diverse composition and age structure of vegetation
- natural communities - to increase the area of naturally sustaining or progressing vegetation
- uplands - to retain and improve the existing woodland communities without losses
- wetlands - to retain and improve the existing wetland communities without losses
- aquatic habitat - to retain existing aquatic habitat and restore riparian communities
- Tallgrass Prairie/savannah/alvar habitats - to retain existing prairie/savannah/alvar habitats and restore where appropriate
- reduce the impacts of existing agricultural and/or urban land uses on the environment in an effort to reduce stresses currently placed on the environment

- To create and improve linkages between natural areas

Goals:
- net gain of appropriate, priority linkages

- To prescribe for the creation/restoration of larger contiguous areas of natural communities
- To monitor ecological objectives and goals, as they provide a direct measure of the state of the environment; and modify as appropriate so as to accommodate new information and/or changes that occur

Panel Discussion

Following the introductory talk, panelists entered into an interactive discussion with the audience. Panelists included:

Dan Ballnik *(Ford Motor Company, Dearborn, MI)*;
Lynda Corkum (*University of Windsor, Windsor, ON* - Moderator);
Brooks Dean *(Dean Construction Company, La Salle, ON)*;
Jon Lovett Doust *(University of Windsor, Windsor, ON)*;
Brian McHattie *(Consultant to Environment Canada, Burlington, ON)*
Scott Staelgraeve *(Ducks Unlimited, Ann Arbor, MI)*; and
Gary Towns (*Michigan Department of Natural Resources, Livonia, MI*).

Major points emphasized by panelists included:

- there is a need to address how much habitat rehabilitation and enhancement is enough, (e.g., one could look at historical counts of species present and the ecological needs of an area— in forested areas breeding birds could be used as monitors to determine how much restoration is enough— birds need 30 % forest cover in order to breed successfully);

- priority must be placed on a landscape ecology perspective which would address, among other things, "patch" quality and connectivity;

- there is an urgent need to preserve critical remaining habitats like Humbug Marsh (Table 8) and to provide the rationale for protection because the current land use safeguards are being threatened by developers;

- organizations such as Ducks Unlimited have a long history of wetlands restoration and have considerable technical expertise and practical experience;

- the link between improved habitat and improved water quality must be recognized; and

- industries, which are major land-owners, have the potential to become partners on specific projects and make significant contributions to habitat rehabilitation and conservation.

Conference participants learned about a number of successful habitat rehabilitation and conservation projects in the Detroit River watershed (e.g., Ruwe Marsh, Stony Island, Belle Isle). Indeed, there have been many such projects that need to be celebrated. However, it was also noted that, despite such projects, habitats continue to be lost and degraded. For example, ERCA has reported a 96% loss of wetlands on the Canadian side of the Detroit River and a 97% loss of tree cover. It was also noted that 97% of the coastal wetlands on the U.S. side of the river have been lost to development (only 3% remains in Humbug Marsh).

Table 8. The ecological value of Humbug Marsh and surrounding waters as habitat for fish and wildlife (modified from Manny 1997).

CHARACTERISTIC	DESCRIPTIVE INFORMATION
Location of Humbug Marsh	• 188 ha (465 acres) coastal marsh in Gibraltar and Trenton, Michigan • located in lower Detroit River on U.S. mainland • last 3% of coastal wetlands on the U.S. mainland (97% have been lost to development)
Fishery	• waters surrounding Humbug Marsh recognized as a walleye fishing hot spot • over 10 million walleye enter the Detroit River each year to spawn • Humbug Marsh and surrounding waters are known nationally to bass fishers who hold tournaments in the lower Detroit River each year • juvenile lake sturgeon are now being caught in the lower Detroit River for the first time in decades • the lower Detroit River, including Humbug Marsh, is the most important spawning and nursery habitat in the entire Detroit River and much of western Lake Erie • 45 species of fish spawn in the area • yearlings and juveniles of 20 species of fish use the area as nursery habitat
Birds	• important duck hunting area for local sportsmen • lower Detroit River is important habitat for diving ducks (canvasbacks, redheads, buffleheads, and scaup) • area nominated by U.S. Fish and Wildlife Service as a focus area for enhancement and protection of fish and wildlife, especially waterfowl • feeding grounds for bald eagles • Marsh serves as stopping point in the annual migration of more than 17 species of raptors (e.g., vultures, eagles, hawks, falcons, kestrels) and 48 species of non-raptors (e.g., loons, Great Blue Herons, warblers, shore birds, hummingbirds, cranes, cattle egrets)

Participants emphasized that there should be no further loss of critical, existing habitats. Moreover, habitats should be rehabilitated or enhanced wherever possible. Critical questions raised included:

- How much habitat is enough?
- How much development is too much?
- Can limits be set based on ecological function?
- How has the invasion of exotics affected species diversity and habitat destruction?

Again, it was emphasized that there are no habitat management plans for the Detroit River. To move forward in a systematic fashion on habitat issues for the Detroit River and its watershed will require the following:

- establishing and maintaining habitat inventories;
- applying Environment Canada's "*A Draft Framework for Guiding Habitat Rehabilitation in Great Lakes Areas of Concern*" or a comparable methodology to establish habitat restoration guidelines and priorities;
- establishing local habitat indicators and targets;
- applying a landscape ecology approach;
- obtaining commitments from governments for monitoring (i.e., to quantify effectiveness and benefits); and
- establishing partnerships with industries and other organizations.

> "At this conference, we have seen and heard of great habitat restoration projects on both sides of the river, but little has been mentioned about protecting those few habitats left in this area. Peche Island and Humbug Marsh, natural jewels on both sides of the border, have to be kept in their natural state and in public ownership now!
>
> Both remind me of the huge, old maple tree in my backyard, rooted on the lot line between my yard and a neighbour's yard. When I need to relax on a hot, summer day, I do so, as does my neighbour, under that maple. I would do anything to protect that old maple tree.
>
> If that maple were to fall, yes I would plant more trees. But neither myself, nor my children, nor their children, would enjoy the same comfort and shade in our lifetimes under all the new trees as we do now under one old maple tree.
>
> Having worked for 25 years at Ford Motor Company you soon realize that getting it right the first time is far better than costly retrofitting later, with fewer results. Habitat restoration is very important, however, it is the act of retrofitting today's environment for that which was not preserved yesterday. Preservation should always come before restoration!"
>
> *Ken Cloutier, CAW Windsor Regional Environment Council*

Participants noted that both large habitat rehabilitation and conservation projects and small ones are important (e.g., small projects add up to big ecological results). Habitat rehabilitation

should be viewed as experimentation guided by hypotheses and clear objectives. The lessons learned from these "experiments" can then be applied elsewhere. Viewing habitat rehabilitation projects as experiments also fosters adaptive management.

It was noted that when projects are designed to include human use, citizens get first hand experience and reap benefits. This helps enhance learning and develop new "champions" for habitat rehabilitation and conservation. Further, partnerships are important for many of the same reasons (e.g., Canard Marsh, Turkey Island, Ford Motor Company - Sheldon Road Plant, Dean Construction projects).

PANEL DISCUSSION: COUPLING OF RESEARCH AND MANAGEMENT FOR HABITAT REHABILITATION AND CONSERVATION

The afternoon panel discussion was held to focus on the necessary coupling of research and management for habitat rehabilitation and conservation in the Detroit River and its watershed. The panel discussion was initiated with an introductory talk for which an abstract is presented below.

Scientific Challenges of Habitat Rehabilitation and Conservation

John E. Gannon, U.S. Geological Survey, Great Lakes Science Center

Stan Moberly, Past President of the American Fisheries Society, stated that "The greatest threat to fisheries resource security is...loss of habitat and, therefore, loss of our ability to produce fish...Habitat is the primary asset that produces the benefits we all seek; losing it seals the fate of our fisheries and bankrupts the fishery aspirations of future generations." These concerns formed the basis for the American Fisheries Society (1994) "Vision for North American Fisheries in the 21st Century." The Society's long-term goal is to restore 50% of lost or damaged habitats in North America. It is estimated that restoration of depleted fish populations and habitat productivity would produce 500,000 jobs and pump more than $3 billion (U.S.) into the economy. Even more jobs and economic benefits are involved when considering the restoration of wetland and terrestrial habitats.

Various programs exist in different agencies and institutions for protection of terrestrial, wetland, and aquatic habitat. These programs are terribly disjunct and would benefit from partnerships and improved communications among Federal, state, provincial, First Nations, local governments, and private stakeholders, such as land trust organizations. Nonetheless, there is much more effort currently being devoted to protection of relatively pristine and critical habitat than towards restoration of degraded habitat. Moreover, there is much more progress in terrestrial and wetlands habitat protection than in aquatic habitat protection.

Restoration means returning habitat to the healthy condition that existed prior to degradation. The field of restoration ecology is only a few decades old, evolving from research on restoration of native prairie vegetation. This movement has spread to other terrestrial habitats, wetlands, and most recently aquatic habitats (Natural Research Council 1992). Restoration ecology is so new that there are few theories and principles developed. Many current restoration-related studies involve inventory of existing habitat, identification of degrading problems, selection and implementation of remediation methods, and follow-up evaluation to determine if remedial goals were met. Other studies require identification and removal of degrading forces, with subsequent evaluation of the ability of habitat to self-organize and heal itself. In others, purposeful habitat manipulations are designed, implemented, and evaluated. The latter studies encompass the new field of ecological engineering (Mitsch and Jorgensen 1989), whereby principles of ecology and engineering are being applied to habitat restoration.

The Great Lakes research community has held several workshops in recent years to develop research needs and priorities for aquatic habitat restoration and coastal zone ecology. Historically, the Great Lakes coastal zone has largely been ignored because: 1) emphasis is placed on offshore water quality and offshore fisheries; 2) the coastal zone is so dynamic and difficult to sample quantitatively; and 3) a restoration ethic and reliable protocols appreciably have not been developed. These workshops have shown clearly that habitat research is not receiving sufficient attention and usually falls into the very wide crack between traditional water quality research and fisheries research. Furthermore, it is readily apparent that aquatic habitat restoration has focused mostly on pollution cleanup and management of soft sediments; whereas, there are great benefits to be gained in restoring hard-bottom substrates (e.g., rocky shoals, submerged bedrock outcrops, habitat associated with breakwaters and jetties, etc.) that support high biodiversity and spawning and nursery habitat functions (Gannon 1993).

From an institutional perspective, the Great Lakes research community receives much of its direction and prioritization from participating in the activities of the International Joint Commission (IJC) and the Great Lakes Fishery Commission (GLFC). Again, habitat issues usually fall into the very wide crack between traditional water quality and fishery institutions. IJC biennial meetings have focused mostly on toxic contaminants, while GLFC annual meetings largely concentrate on exotic species, particularly sea lamprey control. Yet, there is recent evidence that habitat is becoming the issue of common dialogue between the IJC and GLFC. For example, the impairment of beneficial uses in the Great Lakes Areas of Concern includes fish and wildlife habitat loss and degradation. The GLFC recently has recognized the importance of habitat protection and restoration to the successful restoration of fish species. Significantly, it was concluded at the State of the Lakes Ecosystem Conference (SOLEC '94) "...that habitat loss, exotic species and toxic substances should be given equal attention in working to restore the integrity of the basin's ecosystem" (U.S. Environmental Protection Agency 1995).

Not limited to specific Areas of Concern, is a parallel initiative in waterfront redevelopment. Much of the heavy industry on Great Lakes shorelines has shut down or downsized during the past two decades, leaving shoreline locations (known as "brownfields") available for new uses. Improvements in environmental quality in the Great Lakes has spurred interest in waterfront redevelopment for marinas, restaurants, and other water-oriented facilities. An important challenge is to "piggyback" on these terrestrially oriented projects and extend waterfront restoration into adjacent wetlands and aquatic habitats.

Meanwhile, fishery managers have been developing long-term fish community goals in the Great Lakes through the GLFC Lake Committees. The GLFC's Habitat Advisory Board is assisting the fishery managers by identifying habitat issues that may prevent fish community goals from being met. Curiously, it has been difficult for fishery managers to agree upon fish community goals for stocks of common concern in offshore waters. In contrast, there has been a melding of fishery and environmental goals in the bays, harbors, and connecting channels through the RAP process in Great Lakes Areas of Concern. Fish community goals and requirements for habitat protection and restoration have been developed in considerable detail for most of the Areas of Concern. These

plans often have broad agency and community support and provide guidance on habitat research and evaluation needs.

In most environmental issues, it is difficult to demonstrate immediate economic benefits, but this is not so with the habitat issue. There is much interest in habitat protection and restoration in the coastal zone because of the economic benefits anticipated from waterfront redevelopment, elimination of beneficial use impairments, and restoration of fish communities. Coastal zone areas are very important economically because they are most accessible to the greatest number of potential users, and this is where resource use conflicts are greatest. They are also the places where protection and restoration will have the greatest beneficial economic impact.

Panel Discussion

Following the introductory talk, panelists entered into an interactive discussion with the audience. Panelists included:

David Barton *(University of Waterloo, Waterloo, ON);*
John Gannon *(U.S. Geological Survey, Great Lakes Science Center, Ann Arbor, MI* - Moderator);
Orin Gelderloos *(University of Michigan-Dearborn, Dearborn, MI*);
Tony Hough *(Wayne State University, Detroit, MI);* and
Michael Jones *(Michigan State University, East Lansing, MI).*

Panelists made the following points:

- research and science play critical roles in the practice of habitat rehabilitation and conservation, but, in general, research/monitoring is underfunded compared to other aspects of habitat projects, and so it was recommended that a fraction of every engineering project should be devoted to research/monitoring;

- ecology and economy are interrelated and habitat rehabilitation and conservation have ethical and moral dimensions;

- the Detroit River is important as a link between Lake Erie and Lake St. Clair, and it has specific problems such as exotic species, and fragmentation of habitat;

- restoration is a long-term process and solutions should be kept simple and attainable;

- the goals of habitat restoration projects should be clearly stated - we should not be doing projects without an endpoint in mind;

- the capacity of some habitats for self-restoration should be accounted for;

- habitat restoration should be approached as research, where results are evaluated against hypotheses and clear objectives;

- successful rehabilitation techniques need to be communicated for adoption and adaptation elsewhere; and

- habitat management must be adaptive.

In general, it was recognized that, from a management perspective, the relative importance of habitat, compared to persistent toxic substances and exotic species, is increasing. Also, there is the three-dimensional aspect to habitat protection (e.g., the quality of the overlying water in aquatic habitats must not be ignored). Participants called for greater research and management attention to be placed on the nearshore environment and edge habitats. Most efforts are currently being targeted at soft sediments and much more work is needed on hard sediments.

From a management perspective, it was also recognized that soft engineering approaches need to be applied much more frequently and extensively. Even though it was noted that we have entered a new era of ecological engineering and restoration ecology, habitat continues to fall through the management cracks. Education will be a critical component.

There was agreement that there is a need to integrate management, research, and public participation/education. The adaptive management approach (i.e., assess, set priorities, and take action in an iterative fashion) was identified as the most appropriate, effective, and pragmatic course of action. However, this approach requires patience. For the adaptive management approach to succeed, research and monitoring must become more important to support science-based, decision-making and to validate management actions. Some habitat protection measures, such as land acquisition, can proceed without extensive research. Priorities identified by participants included:

- placing greater emphasis on understanding how ecosystems function;

- setting clear objectives and quantitative end points;

- treating management actions as experiments and practicing adaptive management; and

- quantifying project effectiveness (i.e., both ecological and economic benefits).

FINDINGS AND CONCLUSIONS

The Conference on "Rehabilitating and Conserving Detroit River Habitats" was a major success, attracting over 170 participants. Presentations describing successful habitat rehabilitation and conservation were well received. This conference not only highlighted Detroit River success stories, but it also allowed stakeholders to learn what steps are necessary to move forward on habitat rehabilitation and conservation projects, and of the need to recruit new "champions" to this field .

Major findings of the conference included:

- there is an urgent need to protect the few remaining natural areas along the Detroit River (e.g., islands and coastal wetland habitats such as Humbug Marsh and Peche Island; unique prairie habitats);

- management agencies must take the lead in using available guidance tools to set priorities for habitat rehabilitation and conservation (e.g., Environment Canada's "*A Draft Framework for Guiding Habitat Rehabilitation in Great Lakes Areas of Concern*") and move forward with habitat rehabilitation and conservation projects;

- individuals and organizations who have habitat expertise need to get involved prominently and early in the planning processes for waterfront development, shoreline modification, and similar projects;

- habitat rehabilitation and conservation projects should be recognized as important experiments from which we can learn - we must therefore explicitly link research/monitoring with planning and management of habitats; and

- greater emphasis must be placed on quantifying the economic, social, and ecological benefits of habitat rehabilitation and conservation projects.

Again, participants recognized the urgent need for "champions" — credible individuals or groups willing to propose, publicize, and implement specific habitat projects and conservation efforts. In addition, a high profile must be sustained for Detroit River habitat rehabilitation and conservation, and other environmental issues.

The Great Lakes Institute for Environmental Research, it's partners and conference co-sponsors all recognize the important role of transfer of scientific knowledge, and of the need to couple research with management and public issues. They pledge to convene similar conferences and public meetings in the future to promote and sustain open dialogue.

LITERATURE CITED

American Fisheries Society. 1994. Vision for North American Fisheries in the 21st Century. AFS, Bethesda, MD. 11 pp.

Environment Canada. 1997. A Draft Framework for Guiding Habitat Rehabilitation in Great Lakes Areas of Concern. Downsview, Ontario. 74 pp.

Gannon, J. E. 1993. Restoration ecology: Long-term evaluation as an essential feature of rehabilitation. Buffalo Environmental Law Journal. 1:267-277.

Goodyear, C.S., T.A. Edsall, D.M. Ormsby Dempsey, G.D. Moss, and P.E. Polanski. 1982. Atlas of the spawning and nursery areas of Great Lakes fishes. Volume eight: Detroit River. U.S. Fish and Wildlife Service, Washington, D.C. FWS/OBS-82/52. 33 pp.

Hector D., and L. Tulen. 1995. Ruwe marsh protection project - phase 1, p. 154-157. *In* J.R.M. Kelso and J.H. Hartig [editors]. Methods of modifying habitat to benefit the Great Lakes ecosystem. CISTI (Can. Inst. Sci. Tech. Inf..) Occas. Pap. No. 1: 294 pp.

Jones, B.D. 1997. Remedial Action Plan RAP Sheet: A Local Group's Solutions to the Protection of a Resource. International Joint Commission, Windsor, Ontario, March/April Focus, pp 20-21.

Larson, J.W. 1981. Essayons. A history of the Detroit District U.S. Army Corps of Engineers. U.S. Army Corps of Engineers, Detroit District. Detroit, MI. 215 pp.

Manny, B.A. 1997. Ecological value of Humbug Marsh and Surrounding Waters as Habitat for Fish and Wildlife: The Last Remnant Great Lakes Coastal Wetland in the Detroit River. Background document prepared for City of Trenton, Environmental Review Board.

Manny, B.A., T.A. Edsall, and E. Jaworski. 1988. The Detroit River, Michigan: An ecological profile. U.S. Fish and Wildlife Service Biology Report. 85(7.17). 86 pp.

Michigan Department of Natural Resources and Ontario Ministry of Environment. 1991. Stage I Remedial Action Plan for Detroit River Area of Concern. Lansing, Michigan and Sarnia, Ontario. 504 pp.

Milner, James W. 1873. Report on the fisheries of the Great Lakes; The results of inquiries prosecuted in 1871 and 1872. U.S. Commission of Fisheries. Annual Report. pp. 12-13.

Mitsch, W. J. and S. E. Jorgensen. 1989. Ecological Engineering, Wiley, NY.

National Research Council. 1992. Restoration of Aquatic Ecosystems: Science, Technology, and Public Policy. National Academy Press, Washington, D.C.

Oldham, M. 1983. Environmentally Significant Areas of the Essex Region. Essex Region Conservation Authority Publication. Essex, Ontario. 426 pp.

Ontario Ministry of Natural Resources. 1990. A Silvicultural Guide for the Tolerant Region Hardwoods Working Group in Ontario. Science and Technology Series, Vol. 7. Ontario Ministry of Natural Resources. Queen's Printer for Ontario. Toronto. 178 pp.

Ontario Ministry of Natural Resources. 1993. A Tree-marking Guide for the Tolerant Hardwoods Working Group in Ontario. Science and Technology Series, Vol. 87. Ontario Ministry of Natural Resources. Queen's Printer for Ontario. Toronto. 227 pp.

Ontario Ministry of Natural Resources. 1994 draft version. "Survey of Candidate Sites on the St. Clair and Detroit Rivers for Potential Habitat Rehabilitation/Enhancement".

Schloesser, D.W. and B.A. Manny. 1986. Distribution of submersed aquatic macrophytes in the St. Clair-Detroit River system. Journal of Freshwater Ecology 3:537-544.

Schloesser, D.W. & B.A. Manny. 1990. Decline of wild celery buds in the lower Detroit River, 1950-1985. Journal of Wildlife Management. 54:72-76.

The Nature Conservancy. 1994. The Conservation of Biological Diversity in the Great Lakes Ecosystem: Issues and Opportunities. The Nature Conservancy Great Lakes Program, 79 W. Monroe Street, Suite 1309, Chicago, IL 60603. 118 pp.

U.S. Environmental Protection Agency. 1995. U.S. Report to the International Joint Commission, Great Lakes Program Progress Report, Chicago, IL.

APPENDIX 1

CONFERENCE PROGRAM

REHABILITATING AND CONSERVING DETROIT RIVER HABITATS

MARCH 4, 1998

GREAT LAKES INSTITUTE FOR ENVIRONMENTAL RESEARCH
UNIVERSITY OF WINDSOR AND CITIZENS ENVIRONMENT ALLIANCE

CAW STUDENT CENTRE, AMBASSADOR ROOM, 2ND FLOOR
UNIVERSITY OF WINDSOR

9:00-9:10 a.m. **Welcome and Introductions**
Art Szabo, Acting Director, Great Lakes Institute for Environmental Research
William E. Jones, Vice-President, Academic, University of Windsor
Tom Behlen, Regional Office Director, International Joint Commission
Rick Coronado, Citizens Environment Alliance
John Hartig, International Joint Commission

9:10 a.m. **Morning Session** - *Moderator: John Hartig, International Joint Commission*

9:10-9:30 a.m. City of Detroit's Belle Isle Habitat Restoration Project
(Doug Denison, Johnson, Johnson & Roy, Inc.)

9:30-9:50 a.m. Identification of and Protection Mechanisms for Detroit River Habitats
(Stan Taylor, Essex Region Conservation Authority)

9:50-10:10 a.m. Conserving Critical Habitats in the Conservation Crescent
- The Stony Island Story
(Mary Ginnebaugh, Grosse Ile Nature and Land Conservancy)

10:10-10:30 a.m. **BREAK**

10:30-10:50 a.m. Ruwe Marsh Restoration Project
(Lisa Tulen, Citizens Environment Alliance)

10:50-12:00 p.m. **Panel Discussion on Habitat Needs and Priorities**
(Moderator: Lynda Corkum, University of Windsor)
Introductory Talk: Habitat Rehabilitation and Enhancement Strategy and Priorities for the Detroit River and Canadian Subwatersheds
(Dan Lebedyk, Essex Region Conservation Authority)

Panelists: *Brian McHattie, Consultant to Environment Canada*
Jon Lovett Doust, University of Windsor
Gary Towns, Michigan Department of Natural Resources
Scott Staelgraeve, Ducks Unlimited
Dan Ballnik, Ford Motor Company, Dearborn, Michigan
Brooks Dean, Dean Construction, Windsor, Ontario

12:00-1:00 p.m. **LUNCH**

1:00 p.m. **Afternoon Session** - *Moderator: David Dolan, International Joint Commission*

1:00-1:20 p.m. Ecological Restoration of Grassy Island and the Wyandotte National Wildlife Refuge
(Bruce Manny, U.S. Geological Survey - Great Lakes Science Center)

1:20-1:40 p.m. A Multi-partner Initiative to Wetland and Prairie Restoration in the St. Clair River Watershed (The MacDonald Park Restoration Project) with Application to the Detroit River
(Don Hector, Ontario Ministry of Natural Resources)

1:40-2:00 p.m. Wayne County Detroit Metropolitan Airport Crosswinds Marsh Wetland Mitigation Project
(Don Tilton, Tilton and Associates)

2:00-2:20 p.m. Habitat Rehabilitation and Enhancement Projects in the Detroit River and Tributary Watersheds
(Jim Hartman, Essex Region Conservation Authority)

2:20-2:40 p.m. BASF's Rehabilitation of Fighting Island
(Jack Lanigan, BASF Corporation)

2:40-3:00 p.m. **BREAK**

3:00-4:10 p.m. **Panel Discussion on Coupling of Research and Management for Habitat Rehabilitation and Conservation**
(Moderator: John Gannon, U.S. Geological Survey - Great Lakes Science Center)
Introductory Talk: Scientific Challenges of Habitat Rehabilitation and Conservation
(John Gannon, U.S. Geological Survey - Great Lakes Science Center)

Panelists: *Tony Hough, Wayne State University*
Orin Gelderloos, University of Michigan - Dearborn
Dave Barton, University of Waterloo
Michael Jones, Michigan State University

4:10-4:30 p.m. **Summary and Concluding Remarks**

APPENDIX 2

LIST OF CONFERENCE ATTENDEES

Ihsan Al-Aasm, University of Windsor, Windsor, ON
Melissa Ann Allen, St. Thomas of Villa Nova Secondary School, La Salle, ON
Wesley Andres, Windsor, ON
Jeff Assef, St. Clair Beach, ON
Dan Ballnik, Ford Motor Company, Dearborn, MI
Dave Barton, University of Waterloo, Waterloo, ON
Jesse Basden, St. Thomas of Villa Nova Secondary School, La Salle, ON
Steven Beaudoin, St. Thomas of Villa Nova Secondary School, La Salle, ON
Tom Behlen, International Joint Commission, Windsor, ON
Ralph Benoit, Windsor, ON
Ray Bergeron, Cable Arm Clam Shell
Andy Bezare, St. Thomas of Villa Nova Secondary School, La Salle, ON
Tony Bietola, City Hall, Windsor, ON
Barb Bjarneson, Windsor Env. Adv. Committee, Windsor, ON
Doug Bondy, International Joint Commission, Windsor, ON
Wade Bondy, Windsor, ON
Marlyn Booker, St. Thomas of Villa Nova Secondary School, La Salle, ON
Andy Bramburger, Amherstburg, ON
Mark Breederland, Michigan Sea Grant, Clinton Township, MI
Peggy Britt, Michigan Sea Grant, Ann Arbor, MI
Doug Brown, Environment Canada, CCIW, Burlington, ON
Tricia Burgess, Our Lady of Mt. Carmel High School, Wyandotte, MI
Peter Bzuik, West Windsor Treatment Plant, Windsor, ON
Jean Calmen Bratkovich, Detroit Free Press, Detroit, MI
Janeen Caissie, St. Thomas of Villa Nova Secondary School, La Salle, ON
Jenn Candusso, St. Thomas of Villa Nova Secondary School, La Salle, ON
Adriano Cassano, St. Thomas of Villa Nova Secondary School, La Salle, ON
Enrique Cerda, Our Lady of Mt. Carmel High School, Wyandotte, MI
Annette Chabot, St. Thomas of Villa Nova Secondary School, La Salle, ON
Margo Chase, University of Windsor, Windsor, ON
Zhong Xing Chen, Great Lakes Institute for Environmental Research, Windsor, MI
Jan Ciborowski, University of Windsor, Windsor, ON
Ken Cloutier, CAW Windsor Regional Environment Council, Windsor, ON
Lynda Corkum, University of Windsor, Windsor, ON
Rick Coronado, Citizens Environment Alliance, Windsor, ON
George Costaris, Canadian Consulate, Detroit, MI
Bill Craig, Holiday Nature Preserve Assoc., Livonia, MI
David Cree, Windsor Harbour Commission, Windsor, ON
Ryan Cunningham, Our Lady of Mt. Carmel High School, Wyandotte, MI
Mikael Dalimonie, Harrow, ON
Brooks Dean, Dean Construction, La Salle, ON
Doug Denison, Johnson, Johnson and Roy, Inc.,Ann Arbor, MI
David Dolan, International Joint Commission, Windsor, ON
Yves Dubuc, CBC (French), Windsor, ON
Don Dukelow, West Windsor Treatment Plant, Windsor, ON
Mandy Dunlap, Detroit, MI
Lisa Dutman, St. Thomas of Villa Nova Secondary School, La Salle, ON

Sheris Natasha Empey, St. Thomas of Villa Nova Secondary School, La Salle, ON
Rob Ferguson, Amherstburg, ON
Sharon Ferman, Michigan Dept. of Environmental Quality, Livonia, MI
Amy Finn, St. Thomas of Villa Nova Secondary School, La Salle, ON
Dean Fitzgerald, University of Windsor, ON
Ron Fodor
Vince Francescutti, Windsor, ON
John Gannon, Great Lakes Science Center, Ann Arbor, MI
Orin Gelderloos, University of Michigan-Dearborn, Dearborn, MI
Don A. Giffin, Dearborn, MI
Mary Ginnebaugh, Grosse Ile Nature and Land Conservancy, Grosse Ile, MI
Chris Giroux, Citizens Environment Alliance, Windsor, ON
Andrea Greenham, St. Thomas of Villa Nova Secondary School, La Salle, ON
Andrew Greenham, St. Thomas of Villa Nova Secondary School, La Salle, ON
Robert C. Haas, Michigan Dept. of Natural Resources, Mt. Clemens, MI
G. D. Haffner, University of Windsor, Windsor, ON
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Trisha Harris, Windsor, ON
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Harold Hayes, St. Thomas of Villa Nova Secondary School, La Salle, ON
Don Hector, Ontario Ministry of Natural Resources, Chatham, ON
Thomas Heidtke, Wayne State University, Detroit, MI
Tony Hough, Wayne State University, Detroit, MI
Bob Hunt, Wayne County Michigan Planning Dept. (2 ppl)
Karin Isley, St. Thomas of Villa Nova Secondary School, La Salle, ON
Janet Jakubiak, Plymouth, MI
Saad Y. Jasim, SJ Environmental Consultants (Windsor) Inc., Windsor, ON
Gary Johnson, Ministry of the Environment, Sarnia, ON
Bruce D. Jones, Grosse Ile Nature and Land Conservancy, Grosse Ile, MI
Michael L. Jones, Michigan State University, East Lansing, MI
W. E. Jones, University of Windsor, Windsor, ON
William Kalbfleisch, Windsor, ON
Louis Kanan, Our Lady of Mt. Carmel High School, Wyandotte, MI
Jamie Kendziuk, Sterling Heights, MI
Brian Knowles, Wildlife Habitat Council, Detroit, MI
Ralph Kummler, Wayne State University, Detroit, MI
Jeanie Laforge, University of Windsor, Windsor, ON
Jack Lanigan, BASF Corporation, Wyandotte, MI
Todd Leadley, University of Windsor, Windsor, ON
Dan Lebedyk, Essex Region Conservation Authority, Essex, ON
Colin Lesperance, St. Thomas of Villa Nova Secondary School, La Salle, ON
Shaun Litster, St. Thomas of Villa Nova Secondary School, La Salle, ON
June Liu-Vajko, City Hall, Windsor, ON
Jane Longmoore, Windsor, ON
Gary Longton, Detroit Edison, Detroit MI
Jon Lovett Doust, University of Windsor, Windsor, ON
Karl S. Luttrell, Science Diving & Environmental Company, Ann Arbor, MI
Misti MacDonald, St. Thomas of Villa Nova Secondary School, La Salle, ON
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Jennifer MacPherson, St. Thomas of Villa Nova Secondary School, La Salle, ON

Bruce Manny, Great Lakes Science Center, Ann Arbor, MI
Bill Marshall, Tek-Trans, Windsor, ON
Theresa Martin, Our Lady of Mt. Carmel High School, Wyandotte, MI
Carolyn Matkovich, University of Windsor, Windsor, ON
Mitch McGuire, St. Thomas of Villa Nova Secondary School, La Salle, ON
Jodi McLean, St. Thomas of Villa Nova Secondary School, La Salle, ON
William McLellan, St. Thomas of Villa Nova Secondary School, La Salle, ON
Kevin McGunagle, International Joint Commission, Windsor, ON
Brian McHattie, Consultant to Environment Canada, Burlington, ON
Heather McIntosh, Windsor University, Windsor, ON
Lorne Meloche, City Hall, Windsor, ON
Wayne Miller, Windsor Utilities Commission, Windsor, ON
Barry Mineau, Windsor Skin and Scuba Club, Essex, ON
James Montant, Wayne State University, Detroit, MI
Tom Murray, City Hall, Windsor, ON
Ian Naisbitt, Tecumseh, ON
Michael O'Brien, St. Clair Beach, ON
Mark Olender, U.S. EPA, Chicago, IL
Ryan O'Neil, St. Thomas of Villa Nova Secondary School, La Salle, ON
Wayne Ouellette, St. Thomas of Villa Nova Secondary School, La Salle, ON
Andy Paling, St. Thomas of Villa Nova Secondary School, La Salle, ON
Sandra Parker, International Joint Commission, Windsor, ON
Bill Parkus, SEMCOG, Detroit, MI
Andy Paul, University of Windsor, Windsor, ON
John Petz, Senator Spencer Abraham's Office, Southfield, MI
Dan Philips, St. Thomas of Villa Nova Secondary School, La Salle, ON
Micheline Picard, St. Thomas of Villa Nova Secondary School, La Salle, ON
Raong Phalavong, University of Windsor, Windsor, ON
Janet Planck, Environment Canada, CCIW, Burlington, ON
Jenn Purdie, St. Thomas of Villa Nova Secondary School, La Salle, ON
Joe Rathbun, ASCL Corporation, Livonia, MI
Stan Reitsma, University of Windsor, ON
Sarah Riesberry, University of Windsor, Windsor, ON
Julian Revin, Belle River, ON
George Rinke, Ford Motor Company, Dearborn, MI
Kelly Roberts, St. Thomas of Villa Nova Secondary School, La Salle, ON
Krista Michelle Robinson, St. Thomas of Villa Nova Secondary School, La Salle, ON
Lou Romano, West Windsor Treatment Plant, Windsor, ON
Mike Russo, Our Lady of Mt. Carmel High School, Wyandotte, MI
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Lynda Sanchez, Michigan Dept. of Environmental Quality, Lansing, MI
Alisha Sawicki, Our Lady of Mt. Carmel High School, Wyandotte, MI
Pat Schincariol, Citizens Environment Alliance, Windsor, ON
Doug Schmidt, Windsor Star, Leamington, ON
Antonio Secreti, St. Thomas of Villa Nova Secondary School, La Salle, ON
Henry Shanfield, Friends of Peche Island, Windsor, ON
Shawna Shaw, Our Lady of Mt. Carmel High School, Wyandotte, MI
Cynthia Silveri, Detroit Recreation Dept., Detroit, MI
Jack Smiley, Southeast Michigan Land Conservancy, Detroit, MI
Rob Spring, Citizens Environment Alliance, Windsor, ON

Barbara Stanton, Detroit Free Press, Detroit, MI
Steve Stewart, Michigan Sea Grant Extension, Clinton Township, MI
Scott Staelgraeve, Ducks Unlimited, Ann Arbor, MI
William Suntalski, Windsor, ON
Arthur Szabo, University of Windsor, Windsor, ON
Bruce Szczechowski, Our Lady of Mount Carmel High School, Wyandotte, MI
Leah Taraba, Windsor, ON
Stan Taylor, Essex Region Conservation Authority, Essex, ON
Donald L. Tilton, Tilton and Associates, Ann Arbor, MI
Doug Thiel, BASF Corporation, Windsor, ON
Al Timmins, St. Thomas of Villa Nova Secondary School, La Salle, ON
Maciej Tomczak, University of Windsor, Windsor, ON
Gary Towns, Michigan Dept. of Natural Resources, Livonia, MI
Mary Tracy, Wayne University, Detroit, MI
Lisa Tulen, Citizens Environment Alliance, Windsor, ON
Roberta Urbani, Detroit Edison, Detroit, MI
Sarah VanStone, University of Windsor, Windsor, ON
Gerry Waldron, Amherstburg, ON
Amy Wansa, Our Lady of Mt. Carmel High School, Wyandotte, MI
Larry Webb, City Hall, Windsor, ON
Jeff Whyte, University of Windsor, Windsor, ON
Lynsay Theresa Williamson, St. Thomas of Villa Nova Secondary School, La Salle, ON
Bruce Yinger

APPENDIX 3

CONFERENCE CO-SPONSORS

Canadian Auto Workers - Local 444

CAW TCA
Local 444

The CAW, is a major industrial and transportation union. The CAW is committed to helping develop transportation policies that are environmentally sound. Local union environmental committees and health and safety representatives are the CAW emissaries to the green community, province and country. We must work together at each stage on the four R's of the future: Reduce, Reuse, Recover, Recycle.

The Canadian Consulate General, Detroit Office

CANADA

Of the more than $1 billion a day of two-way trade between the United States and Canada, over 40% of this trade crosses the border in the Windsor/Detroit region. Canada's relationship with the United States is unique in its breadth and complexity. The volume of our commerce, the strength of our defense commitments, the density of our institutional linkages and our mutual regard for human values have led naturally to a friendly yet robust and dynamic relationship which is the envy of the world.

The Canadian Salt Company Limited

windsor
THE SALT OF THE EARTH

The Canadian Salt Company Limited has produced salt in Windsor since 1893. Its mandate is to provide leadership in the salt industry through people committed to excellence in meeting and exceeding its customers' expectations.

Citizens Environment Alliance of Southwestern Ontario

CITIZENS ENVIRONMENT ALLIANCE

The CEA is an educational environmental organization with supporters in Southwestern Ontario and Southeastern Michigan. CEA's mandate is to educate the public about environmental problems and solutions in the Great Lakes region of Southwestern Ontario.

The Corporation of the City of Windsor

Windsor is a vibrant and cosmopolitan community at the hub of North America. Windsor and environs combine a wealth of natural and created attractions with ease of access and excellence of facilities. The Mission of The City of Windsor, with the involvement of its citizens, is to deliver effective and responsive municipal services, and to mobilize innovative community partnerships.

Dean Construction Company Limited

Dean Construction Co. Ltd., established in 1926, is one of the foremost deep foundation and marine construction companies in the Great Lakes region. Heightened international concern over the poor quality of our Great Lakes has focused attention on the need to reduce pollution, contain or remove contaminated sediment and remediate our environment. Dean Construction has helped to protect and restore environmentally sensitive wetlands, fish habitats and recreational areas through the construction of sediment traps, fish ladders, artificial reefs, spawning areas, and beach sills.

Detroit Edison, A DTE Energy Company

DTE Energy Company provides energy and services to customers in North America. Its major subsidiary Detroit Edison turns energy into solutions for its 2 million electricity customers in 7,600 square miles of Southeastern Michigan. DTE Energy is involved in alternative energy development through solar and landfill gas recovery facilities.

Environment Canada -Environmental Protection Service

Environment Canada is a science-based government department whose business is helping Canadians live and prosper in an environment that is properly protected and conserved. Its goal is to help make sustainable development a reality in Canada and, by doing so, make Canada an example to the world.

Great Lakes Institute for Environmental Research

GREAT LAKES INSTITUTE
FOR ENVIRONMENTAL RESEARCH

The Great Lakes Institute for Environmental Research at the University of Windsor is dedicated to the restoration and protection of the Great Lakes ecosystem. It is committed to excellence in the research it conducts, the education it promotes and the training it provides. With excellence as their goal, the faculty and students associated with the Institute serve the immediate needs of the environmental community and anticipate the needs of future generations in the Great Lakes basin.

International Joint Commission

International Joint Commission
Commission mixte internationale

The International Joint Commission is an independent international organization established under the Boundary Waters Treaty of 1909. Its purpose is to help prevent disputes over use of waters shared by Canada and the United States and to provide advice on questions of mutual concern when requested by the two federal governments. The Great Lakes Regional Office in Windsor was established in 1972 to facilitate the implementation of the Great Lakes Water Quality Agreement.

Lafontaine, Cowie, Burratto & Associates Limited

LCBA.
CONSULTING ENGINEERS

Lafontaine, Cowie, Burratto & Associates Limited and its predecessor firms have practised engineering in Windsor and Southwestern Ontario for over 100 years. LCBA is committed to continuing the tradition of combining sound engineering experience with innovative technology to produce cost effective, environmentally responsible and functional designs

Michigan Sea Grant

Sea Grant
Michigan

Michigan Sea Grant, a cooperative program of the University of Michigan and Michigan State University, funds university research and conducts educational programs to help individuals, local communities, coastal businesses and state and local agencies develop Great Lakes resources and exercise good stewardship in their use.

Michigan State University

Michigan State University is committed to helping people improve their lives through an educational process that applies knowledge to critical needs, issues, and opportunities. The Fisheries & Wildlife Department provides the education, research and outreach needed by society for the conservation and rehabilitation of fisheries and wildlife resources.

The University of Windsor

The University of Windsor serves students and the community by providing an atmosphere fostering creativity, discovery, application, critical thinking, service, and communication. The university supports excellence in research and creative activity, including in areas of importance to its geographic region. The university strives to support the local community through interaction with business, labour, community groups and institutions, and to provide the international community with access to its educational resources.

Windsor and District Labour Council

The Windsor and District Labour Council represents more than 40,000 organized workers in the tricounty area including Windsor and Essex county. Standing committees of the Labour Council cover various social, political, health & safety, and environmental issues.

The Windsor Harbour Commission

The Windsor Harbour Commission is a Federal corporation established under the provisions of the Harbour Commissions Act, which is mandated to administer, develop and regulate the Port of Windsor.

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