Essex Region Conservation Authority

Board of Directors — Meeting Agenda

Meeting Date:	Thursday, February 15, 2024
Time:	6:00 pm
Location and Details:	Council Chambers, County of Essex Civic Centre 360 Fairview Avenue West, Essex, ON

12. Reports for Information

C. **Environmental Registry Reports**
None

D. **Correspondence**

13. Committee of the Whole

A. **Confidential Matters related to Property and Personnel**

B. **Reconvene in Open Session**

14. New Business

15. Other Business

A. **Next Meeting**

The next meeting of the ERCA Board of Directors will be held April 11, 2024, starting at 6:00 p.m. at the Essex Civic Centre.

16. Adjournment

Essex Region Conservation Authority
sustaining the place for life

Tim Byrne, CAO/Secretary-Treasurer

Upcoming Events

- April 11, 2024
- May 8, 2024 – At the Call of the Chair
- June 20, 2024
- September 12, 2024
- October 10, 2024 – At the Call of the Chair
- November 14, 2024
- December 12 , 2024

Essex Region Conservation Authority

Board of Directors Annual General Meeting — Meeting Minutes

Meeting Date: Thursday, January 18, 2024

Time: 6:00 pm

Location and Details: Council Chambers, Essex Civic Centre

Attendance

Members Present:	Jim Morrison (Chair)	Larry Verbeke
	Sue Desjarlais (Vice-Chair)	Dayne Malloch
	Molly Allaire	Joe Bachetti
	Thomas Neufeld	Tania Jobin
	Katie McGuire-Blais	Angelo Marignani
	Michael Akpata	Mark McKenzie
	Anthony Abraham	Kieran McKenzie
Absent:	Jason Matyi	
Regrets:	Peter Courtney	Tracey Bailey
	Kim DeYong	Ryan McNamara

Staff Present

Tim Byrne, CAO/Secretary-Treasurer
Nicole Kupnicki, Corporate Services, Human Resources Manager/EA
Shelley McMullen, CFO/Director Corporate Services
Kevin Money, Director Conservation Services
Danielle Stuebing, Director Community and Outreach Services
James Bryant, Director Watershed Management Services
Katheryn Arthur, Restoration Biologist
Tom Dufour, GIS Technician
Dan Lebedyk, Biologist/Ecologist
Nancy Roy, Accounting Associate
Kris Ives, Curator/Education Coordinator
Katheryn Schryburt, Interpreter
Laura Neufeld, Community Outreach Coordinator
Aaron Zimmer, Multimedia Specialist
Lisa Limarzi, Administrative Associate, Corporate Services
Jacqueline Serran, DRCC Remedial Action Plan Coordinator
Katie Stammler, Water Quality Scientist/Project Manager SWP

Guests

MP Chris Lewis
MPP Trevor Jones
Mayor Dennis Rogers, Town of Kingsville
Councillor Rodney Hammond, Town of Essex
Mayor Gary McNamara, Town of Tecumseh

Councillor James Dorner, Town of Tecumseh
Brian Hillman, Director Development Services, Town of Tecumseh
Heather Grondin, Chief Relations Officer, WDBA
Grant Hilbers, Chief Capital Officer, WDBA
Marnie Pouget, Chief of Staff- Office of Chris Lewis, MP Essex
Dr. John & Pat Hartig
Ben Marginson and family
Ross Margerison
Laura Vermeer
Darlene Marshall
Tim McCarthy
Kim Verbeek
Claire Wales, President, Essex Region Conservation Foundation
Eric Naylor, Director, Essex Region Conservation Foundation
Clayton Armstrong and Susan Iatonna
Don McArthur, County of Essex
Henry Denotter, Essex Soil and Crop Improvement Association
Daniela Koppeser, Curriculum Consultant, WECDSB
John DeMarco
Donna Tuckwell
Gordon Orr
Amber Baker
Cory Trowbridge, Wildlife Preservation Canada
Melissa Coulbeck, Landscape Effects
Nash Matais, Occulus
Ashley Hooley, Hot Topic
Tamara Stomp, Kingsville
Lizanne Lebdyk
Danella Koppeger, WECDSB
John Demarco
Gordon Orr, TWEPI
Henrik Hoyer
Corrine Chiasson

1. Call to Order

Good evening and welcome to the January 18, 2024 meeting of the ERCA Board of Directors. I will call the meeting to order and confirm members in attendance.

We have regrets this evening from:

- Councillor Peter Courtney, Amherstburg
- Deputy Mayor, Kim DeYong, Kingsville
- Mayor Tracey Bailey, Lakeshore
- Councillor Ryan McNamara, Lakeshore

2. Land Acknowledgement

I'd like to begin by acknowledging that this land is the traditional territory of the Three Fires Confederacy of First Nations, comprised of the Ojibway, the Odawa, and the Potawatomi Peoples.

We value the significant historical and contemporary contributions of local and regional First Nations and all of the Original Peoples of Turtle Island - North America who have been living and working on the land from time immemorial.

3. Comments from the Outgoing Chair

I would like to recognize our elected officials, in particular Mayor Gary McNamara, Mayor Dennis Rogers, esteemed members of Council and their Senior Administrative teams, members of the Essex Region Conservation Foundation, ERCA staff members and all who have joined us this evening.

There are several dignitaries who bring greetings tonight, and I'd like to first welcome former Board Member, MPP Trevor Jones from the riding of Chatham/Kent/Leamington.

<comments from MPP Trevor Jones>

Thank you, MPP Jones. I would like to welcome another former Board Member, Chris Lewis, MP for the riding of Essex who has a few words to say. Welcome, MP Lewis.

<comments from MP Chris Lewis>

Thanks, Chris. We continue to thank you for your support. Chief Mary Duckworth of the Caldwell First Nation was hoping to attend this evening but has run into some unfortunate weather as she travels back to the region and had to send her regrets this evening along with congratulations to award winners.

Before vacating the Chair, I wish to express what a privilege it has been to serve with you all on this Board, especially in our 50th Year of Conservation. We will have the opportunity to reflect on some of our many accomplishments later this evening with our annual report video, but there are a few notable highlights that I will take with me from this past year.

I was extremely proud to have had the opportunity to celebrate the grand opening of the new Windsor-Essex Community Foundation Community Entrance, which provides another access point to our beloved Greenway trail system.

It was a great honour to welcome the many partners with whom we have worked over five decades of conservation to our 50th Anniversary celebration in July. As well, I was incredibly thankful to our senior leadership team, CAO Tim Byrne and CFO Shelley McMullen, for their leadership in negotiating the cost-apportionment agreements with each member municipality.

To the members of the Board, I thank each of you for your dedication, commitment, and support. One of the most important elements of this Board is our relationships – with each other, with all levels of government, volunteers, organizations and many others. I am pleased that we had the opportunity to strengthen our relationships and carry on our important watershed management work to ensure the sustainability of the communities we serve, and I look forward to continuing to work with you all for years to come.

4. Declarations of Pecuniary Interest

There were no declarations of pecuniary interest.

5. Approval of Agenda

Resolution 01/24 Moved by Joe Bachetti
Seconded by Angelo Marignani
THAT the agenda for the January 18, 2024 meeting of the ERCA Board of Directors be approved. **Carried**

6. Adoption of Minutes

A. ERCA Board of Directors

Resolution 02/24 Moved by Michael Akpata
Seconded by Sue Desjarlais
THAT the minutes for the December 14, 2023 meeting of the ERCA Board of Directors be approved as distributed. **Carried**

B. ERCA Executive Committee

Resolution 03/24 Moved by Larry Verbeke
Seconded by Anthony Abraham
THAT the minutes for the December 14, 2023 and December 22, 2023, meetings of the ERCA Executive Committee be approved as distributed. **Carried**

7. Business Arising from the Previous Minutes

8. Election of Chair and Vice Chair

A. Appointment of Interim Chair (CAO for purposes of Election)

Resolution 04/24 Moved by Sue Desjarlais
Seconded by Mark McKenzie
THAT the CAO/Secretary-Treasurer of the Essex Region Conservation Authority (ERCA) be authorized to act as Chair for the 2024 election of Chair of the Essex Region Conservation Authority. **Carried**

B. Interim Chair Comments

I would like to thank our Chair, Vice Chair and all members of the Board for your ongoing support over the past year as we worked to implement the changes to the Conservation Authorities Act and proceed with the deliverables under ERCA's Transition Plan. ERCA is finalizing agreements with member municipalities for the implementation of non-mandatory Category 3 services. I would like to thank members of Municipal Administration for their time and efforts to assist with this process and will continue to look forward to working with them in a collegial fashion implementing all facets of the municipal agreements.

On to the elections.... I will begin by reminding members and the audience that our elections are conducted in accordance with Administrative Procedures By-Law and the Conservation Authorities Act.

C. Appointment of Scrutineers

Resolution 05/24 Moved by Katie McGuire-Blais
Seconded by Tania Jobin
THAT Claire Wales and Gordon Orr be appointed to act as scrutineers for the 2024 election of Chair and Vice-Chair of the Essex Region Conservation Authority, if needed.
Carried

D. Election of Chair

Resolution 06/24 Moved by Angelo Marignani
Seconded by Thomas Neufeld
THAT nominations for the position of Chair be closed. **Carried**

Resolution 07/24 THAT Councillor Jim Morrison is the Chair of the Essex Region Conservation Authority for the next year. **Acclaimed.**

E. Election of Vice Chair

Resolution 08/24 Moved by Larry Verbeke
Seconded by Dayne Malloch
THAT nominations for the position of Vice Chair be closed. **Carried**

Resolution 09/24 THAT Councillor Sue Desjarlais is the Vice Chair of the Essex Region Conservation Authority for the next year. **Acclaimed**

9. Remarks from Incoming Chair

Thank you for your confidence in electing (acclaiming) me as Chair, and congratulations to Sue Desjarlais on their election as Vice Chair. We look forward to serving in the Windsor-Essex-Pelee Island community in these roles. I am particularly honoured to serve in this capacity during ERCA's 51st year.

The following items are standard business practice of the Authority and that Auditor, Financial Institutions, Solicitor and Insurance Company receive endorsement through resolution by the Board.

10. Actions

A. Appointment of ERCA Auditor, Financial Institutions, Solicitor, and Insurance Company for 2024

i. Auditor

Resolution 10/24 Moved by Larry Verbeke
Seconded by Anthony Abraham
THAT the firm of Hicks, MacPherson, Iatonna and Driedger LLP be appointed as the Authority's Auditor for 2024. **Carried**

ii. Financial Institution

Resolution 11/24 Moved by Katie McGuire-Blais
Seconded by Joe Bachetti
THAT the CIBC and the Windsor Family Credit Union be appointed as the ERCA financial institutions and utilized for banking, including borrowing and short-term investments, for 2024. **Carried**

iii. Solicitors

Resolution 12/24 Moved by Angelo Marignani
Seconded by Mark McKenzie
THAT the firms of Shibley Righton, LLP, M. Gordner Law Professional Corporation, and McTague Law Firm be appointed the ERCA Solicitors for 2024. **Carried**

iv. Insurance Company

Resolution 13/24 Moved by Kieran McKenzie
Seconded by Tania Jobin
THAT ERCA continues to participate in the Conservation Ontario Group Insurance program for its insurance coverage for 2024. **Carried**

B. Approval for ERCA Borrowing Resolution

Resolution 14/24 Moved by Molly Alliare
Seconded by Sue Desjarlais
WHERAS it is necessary for the Essex Region Conservation Authority (hereinafter called the "Authority") to borrow the sum of up to 1,500,000 dollars required for its purposes until payment to the Authority by participating municipalities, designated as such under the Conservation Authorities Act, R.S.O. 1990, Chapter C.27, and grant payments received from senior levels of government.

Be It Therefore Resolved:

THAT the Authority borrow, at the lowest effective interest rate, from any one of its appointed financial institutions or participating municipalities, a sum not to exceed in the aggregate 1,500,000 dollars at any one time necessary for its purposes by way of loans, advances, overdrafts, or promissory note, or notes of the Authority until payment to the Authority of any grants and of sums to be paid to the Authority by participating municipalities.

11. Reports for Approval

None

12. Reports for Information

A. Environmental Registry Reports

None

B. Correspondence

i. Letter from MNRF regarding Minister's direction for conservation authorities regarding fee changes associated with planning, development and permitting fees dated December 13, 2023

i. Letter from MNRF regarding Extension to meet requirements under O.Reg. 687/21 Transition Plan and Agreements dated December 13, 2023

ii. Letter from Ministry Tourism, Culture and Sport regarding the Community Museum Operating Grant for 2023-2024 dated December 20, 2023

Resolution 15/24 Moved by Molly Alliare
Seconded by Tania Jobin
THAT correspondence be received for Member's information. **Carried**

13. 2023 Essex Region Conservation Authority Annual Report

Resolution 16/24 Moved by Larry Verbeke
Seconded by Anthony Abraham
THAT the 2023 Annual Report be received for Member's information. **Carried**

14. ERCA Staff Awards

The accomplishments we celebrate here tonight would not have been possible without the small, hardworking team of staff who implement them. We are so fortunate to have staff who, over many years, continue to contribute to the sustainability of the region. These people are among the most dedicated staff members I have had the pleasure of working with.

We have undertaken the practice of recognizing special milestones, and planting a tree to signify years of service to the region. I would ask Tim Byrne to introduce the staff members we celebrate this year.

Kate Arthur – 20 Years

Two decades ago, Kate came to ERCA with a great deal of enthusiasm which has never diminished. Her job as ERCA's Restoration Biologist is a great match for her creativity as she develops restoration projects, plans and creates prairie restoration sites and designs productive wetlands that provide new homes for wildlife, and improve water quality.

Kate's dedication to improving biodiversity in our region is as outstanding as her ability to overcome adversity in the field. Kate takes on new tasks and challenges with enthusiasm and is able to find the humor even in horrible weather conditions, equipment breakdowns and more of the regular challenges encountered in the field. She is never deterred.

Kate's hard work, charismatic personality and customer service excellence has helped create hundreds of acres of tree planting projects, new prairie habitat for pollinators and over 100 acres of new wetlands. Our region's biodiversity has improved because of Kate's efforts, and we thank her for her continued hard work at ERCA!

Tom Dufour – 20 years

For 20 years, Tom Dufour has served as ERCA's Geomatics Technician. He manages all services related to GIS such as cartography, spatial analysis, aerial photography and web mapping, to name just a few.

Tom has moved ERCA forward in its adoption and use of new Geomatics Technologies that have supported countless projects. He helped develop the Detroit River Shoreline Assessment project and created mapping to highlight years of restoration success as well as target future restoration opportunities. His work was also critical in generating updated habitat layers and linking climate vulnerable species at risk to future restoration sites in collaboration with Point Pelee National Park.

His work continues to provide the necessary mapping and processes related to flood and the wetland restoration projects, Source Water Protection, our Conservation Areas Lands Inventory and associated Strategy, and so many more initiatives. An innovative project that Tom developed was Digital Elevation Modelling, which continues to allow us to digitally target the best locations for soil control BMPs to improve water quality. The DEM also enables Watershed Management Services to review development files with an understanding of the surrounding topography. Most recently, Tom's work in supporting the evaluation of the impacts caused by the flood in August 2023 was crucial to support the municipalities in obtaining Disaster Recovery Assistance Funding from the Province.

Tom, thank you for 20 years of service.

Bill Tate – 15 years

Bill Tate has dedicated the past 15 years as ERCA's Superintendent of Field Operations. He began his career here at ERCA as part of our survey crew before leaving us for a short while to obtain his certification in and gain experience as a Civil Engineering Technologist. When we had an opening in our team to lead our field staff and operations, we knew immediately that Bill was the ideal candidate for the job. Bill possesses extensive knowledge of construction, carpentry and automotive skills. He is a creative problem-solver who is constantly considering inventive ways to help improve our Conservation Areas.

Bill is flexible with his schedule to accommodate his coworkers' needs and respond to whatever mother nature throws his way! His staff, Director and co-workers agree that Bill has an enthusiasm, work ethic and positive attitude not matched by many.

Bill and his small team have the unique challenge of taking care of over 4000 acres of land, public facilities at our conservation areas, almost 100 kms of trails, our fleet of vehicles, new construction projects and much, much more. Bill is always up to the challenge of his job with a smile on his face and lots of laughter. While Bill was not able to join us this evening, we are certainly fortunate to have him as part of the ERCA team.

Dan Lebedyk – 33 Years of Service

I would also like to recognize an individual who has dedicated the past 33 years to ERCA. While he will be honoured at a retirement celebration later this month, it is fitting to also recognize his countless contributions to our region here tonight.

Since his employment with the Essex Region Conservation Authority (ERCA) began in 1990, Dan Lebedyk has fulfilled a variety of roles with the Authority. He first served as an Interpreter, has served as a surveyor and draftsperson, to his current position as ERCA's Biologist/Ecologist, a role that he has held since 1993.

Dan has been a remarkable resource to and for the Conservation Authority. He has provided guidance and advice to every municipality within our region to ensure natural heritage features are protected as development is undertaken. He is a sought-after spokesperson and expert on matters related to the biology of this region, has represented the Windsor-Essex region provincially and federally, and has served on numerous local and provincial committees and task forces.

Dan was appointed as a provincial offences officer by the conservation Authority in 1995. In 2003, he was appointed as a **Special Constable** by the Ontario Minister of Public Safety and Security exercising the powers of the Solicitor General, for the purpose of enforcing regulations pursuant to Section 29 of the *Conservation Authorities Act*. He has also been certified by the Province as a Low Complexity Prescribed Burn Boss, qualified to plan and lead low complexity Prescribed Burns for ecosystem management including the supervision of Ignition and Suppression Crews.

Dan is highly intuitive, and able to adapt effectively to changing situations. He is an accomplished orator, and effective communicator. He has appeared at the Ontario Municipal Board and is recognized as an expert in his field.

An accomplished researcher, Dan has authored and contributed to dozens of research studies and publications. He was a major contributor to the evolution of the Herb Gray Parkway. From the onset of the project, the Province of Ontario requested that Dan be available full time as a resource to the Province on endangered species placement and natural heritage matters to ensure this massive project proceeded in an environmentally sensitive manner.

In addition to Dan's skills and credentials as described above, Dan also was instrumental in assisting the Authority with acquiring, installing and making fully operational anything and everything associated with the conversion to computerization in the late 80's and early 90's.

For nearly three and a half decades, Dan Lebedyk has dedicated his career to protecting the environment of the Windsor-Essex-Pelee Island region. His contributions have left a lasting legacy towards the environmental sustainability of our region, and he has helped to mentor younger biologists to continue fighting this good fight.

Dan, we thank you for your incredible contributions not only to this organization, but to this region as a whole, and wish you every good thing in your retirement.

15. ERCA Conservation Awards Presentation

Taking the time to honour those organizations and individuals who have made significant contributions to protecting and improving our region's environment is one of the most exciting elements of each year's annual meeting.

Conservation Awards have been presented annually since 1992, and once again, we are delighted to recognize those who have made a difference in enriching our region.

At this time, I'd like to invite Danielle Breault Stuebing, our Director of Communications & Outreach to assist in announcing this year's Award recipients, and Vice Chair Sue Desjarlais to join me in presenting these awards.

Conservation Farm Award – Clayton Armstrong and Susan Iatonna

We begin tonight with the Conservation Farm Award, which is jointly presented by ERCA and the Essex Soil and Crop Improvement Association to the farming operation which best displays conservation minded farming practices. The farms are graded on tillage practices, crop rotation, chemical use and storage, knowledge of fertility programs, Best Management Practices and overall farm maintenance.

Clayton Armstrong and Susan Iatonna have established many conservation practices on their fields over the years. Their farming practices include minimum and no-till cropping; precision soil sampling; variable rate fertilizer application; water and sediment control structures and rock chutes to reduce soil erosion. They also use buffer strips along water courses to help improve water quality in their region.

Clayton and Susan, together with Clayton's father in years past, have planted hundreds of white cedar trees in windbreaks on many of their farms in the Deerbrook area. They have added solar panels in an effort to become net zero energy users. Clayton and Susan have participated in the Canada-Ontario Environmental Farm Plan program, and ERCA's Clean Water ~ Green spaces program to implement many Best Management Practices to become good stewards of the land for the next generations, and it is our honour to recognize them with the Conservation Farm Award.

John R. Park Homestead Award – Darlene Marshall

The John R. Park Homestead Award recognizes an individual or group for preservation and promotion of human and natural history in the Essex Region, and we are pleased to honour Darlene Marshall with this award.

Darlene is a proud Anishinaabe woman and member of Caldwell First Nation, Turtle Clan. Darlene has been an outstanding educator with the Windsor-Essex Catholic District School Board for nearly 30 years. She has been an elementary classroom teacher, an ESL Teacher supporting multilingual students, and for the past 7 years, has served as the Indigenous Education Lead. Darlene is the first hold this significant role in her board.

Darlene leads programming and supports educators with infusing Indigenous histories, cultures and perspectives across the curriculum with authentic resources and learning opportunities. She is a passionate advocate for Indigenous education, building strong relationships with educators, families, and community to support the achievement and well-being of a growing number of self-identified Indigenous students. Darlene also teaches courses in Indigenous Education to future educators.

Darlene is active in inspiring others to examine their own programs and in challenging them to tell a more full history of our region. Darlene leads by example and is very generous in sharing her time, knowledge, and resources to help non-Indigenous partners on their journey to reconciliation. Darlene is dedicated to working with local community and organizations, like ERCA, to indigenize programming, to include "two-eyed ways of seeing", and to recognize the rich local Indigenous history, traditions, and continued contributions.

Chi-miigwech to Darlene Marshall for her contributions to the preservation and promotion of human and natural history in the Essex Region, and we are so honoured to present her with the John R. Park Homestead Conservation Award.

Youth Award - Ben Margerison

For many years, Leamington District Secondary School student Ben Margerison has been an outstanding advocate for environmental sustainability throughout Essex County, and we are pleased to present him with the Youth Conservation Award.

From a very young age, Ben demonstrated an intense curiosity for the natural world and he regularly participated in young naturalist programs. This innate interest evolved into a commitment to protecting our local ecosystems and when he started high school, Ben immediately joined the EcoTeam so he could work within a group of like-minded young environmentalists.

Ben has been the most dedicated member of the LDSS EcoTeam for the past four years - he can always be depended on to take the lead in maintaining the school's pollinator gardens, for recruiting volunteers for ERCA's tree planting events and for developing and delivering environmental awareness campaigns to better inform his fellow students about environmental issues like climate change and biodiversity loss.

Last year, Ben worked with a few classmates to raise awareness about the environmental impacts of textile waste and the campaign culminated in a clothing drive and fashion show featuring only second hand clothing. Next year, Ben intends to pursue a university program in Marine Biology - a perfect fit for someone who cares so deeply about protecting our planet. We wish him every success with his future pursuits, and are honoured to recognize him with this award.

Environmental Achievement – Dr. John Hartig

Dr. John Hartig is currently a Visiting Scholar at the Great Lakes Institute for Environmental Research at the University of Windsor. His multi-disciplinary research focuses on cleanup of the most polluted areas of Great Lakes. John also serves as the chair of the Community Foundation for Southeast Michigan's Great Lakes Way Advisory Committee and is on the Board of Directors of the Detroit Riverfront Conservancy. Dr. Hartig is this year’s recipient of the Conservation Award for Environmental Achievement.

In 1997, President Bill Clinton named the Detroit River as one of 14 American Heritage Rivers, a designation that would bring millions of dollars for cleanup and restoration. John Hartig was appointed Detroit River Navigator, and was integral in aiding ERCA in obtaining the Canadian Heritage Rivers designation in a concurrent process. Following that, for 14 years he served as Refuge Manager for the Detroit River International Wildlife Refuge. John has received numerous awards for his work, including a 2022 Michigan Notable Leader in Sustainability from Carin's Detroit Business, a 2018 Honor Award for Meritorious Service from U.S. Department of Interior, the 2017 Community Peacemaker Award from Wayne State University’s Center for Peace and Conflict Studies, and the 2015 Conservationist of the Year Award from the John Muir Association.

He has authored or co-authored over 100 publications on the environment, and has published seven books. His most recent book titled *Waterfront Porch* won a 2020 Next Generation Indie Book Award in the “nature/environment” category. He also writes a monthly blog titled Great Lakes Moment for Detroit Public Television's Great Lakes Now.

He is currently writing a report on how Conservation Authorities in Canada and Watershed Councils in the United States are on the cutting edge of implementing the ecosystem approach to resource management.

Dr. John Hartig has dedicated his career to advocating for the Great Lakes and inspiring others to get involved, and we are honoured to present him with the Conservation Award for Environmental Achievement.

Environmental Achievement – Windsor-Detroit Bridge Authority

Created in 2012, Windsor-Detroit Bridge Authority, known as the WDBA, is a not-for-profit Canadian Crown corporation. While wholly owned by the Government of Canada, it is structured like a private company and operates independently from government. We are honoured to recognize the WDBA's significant contributions with the Award for Environmental Achievement.

The WDBA oversees construction, operation and maintenance of the Gordie Howe International Bridge through a public-private partnership. Since the inception of this partnership, the Gordie Howe International Bridge project has been committed to the principles of sustainable infrastructure – striving to be socially, environmentally and economically responsible, contribute to a cleaner environment and protect communities on both sides of the border from the impacts of climate change.

Its efforts are widely recognized and in November, the Gordie Howe International Bridge project team was honoured with the inaugural National Environmental, Social and Governance Award from the Canadian Council for Public-Private Partnerships. Some of the environmental highlights for which it was recognized include:

- the integration of energy-efficient LED lighting
- buildings designed to meet LEED v4 Silver ratings
- installation of a peregrine falcon box on the bridge to facilitate nesting
- the relocation of over 2,600 SAR plants and 2,000 seeds from native prairie species from the site
- incorporation of green roofs on select buildings
- employing green infrastructure and stormwater management design principles; and
- establishing significant buffers around the ports of entry to maximize the distance between operations and adjacent receptors.

The WDBA has also been recognized with a Brownie Award for its dedication to the rehabilitation of brownfield sites. The Gordie Howe International Bridge strategically acquired brownfield lands for its Canadian Port of Entry and bridge site; extensively remediated them and undertook innovative approaches to obtain capital financing for economic and ecological restoration.

Another key feature of the Gordie Howe International Bridge its Community Benefits Plan which supports opportunities that can advance economic, social or environmental conditions for the local communities.

There are many accomplishments that have been achieved thanks to this program, including the Triple Tree Impact projects undertaken in partnership with ERCA to plant hundreds of trees in Sandwich. In addition, the Malden Park Observation Area has been opened, content has been developed for the Windsor-Detroit Cross-River Tour in partnership with the University of Windsor and University of Michigan, as well as greenspace conservation and Jesuit pear reclamation.

It's also exciting that the WDBA has committed to a pedestrian and cycling-crossing, and is investigating additional cycling infrastructure investments in Southwest Detroit and along Sandwich Street in Windsor to further help reduce carbon footprints while supporting cross-border tourism efforts.

The legacy of these countless investments and dedication toward sustainability will be felt in the community for generations to come, and we are pleased to add to the Windsor Detroit Bridge Authority many accolades with this Award for Environmental Achievement.

Dennis Chase Staff Award – Nancy Roy

The Dennis Chase Staff Award honours longtime staff member Dennis Chase and recognizes those who demonstrate the traits that Dennis upheld: dedication, commitment, conscientiousness, kindness to colleagues, enthusiasm, pride in a job well done, and good humour.

Nancy Roy is ERCA's Accounting Associate, and while she's been with ERCA for less than two years, she has quickly become the team cheerleader. She's the first to congratulate, support and praise whenever a co-worker has made an achievement. She goes out of her way to engage customers, clients and new employees and makes them feel welcome and cared for.

Nancy always shows up with a smile and a heart full of gratitude and respect. She is able to diffuse difficult situations with aplomb and a quick wit and she is a delightful presence in the workplace. She approaches everyone she meets with a positive, warm and welcoming demeanour. Her naturally upbeat perspective ensures that every individual interacting with her feels genuinely heard and that their needs will be well taken care of. Her enthusiasm is contagious, and she doesn't hesitate to say "YES" whenever someone needs help or she is asked to participate in new things.

While Nancy has had several jobs throughout her career, with ERCA, she has identified that she has found her calling. She takes pride in her Health & Safety Committee duties and loves getting out to inspect our various conservation areas. Nancy is able to put everyone she interacts with at ease with her approachable demeanor and quick sense of humour.

Here's what some of her colleagues had to say:

"If you're ever having a bad day – go talk to Nancy and you will immediately feel better. Her beautiful smile, positive attitude and her ability to find a way to give you a sincere compliment are unfailing. If you need help with anything, Nancy is always there to lend a hand. And, despite her small frame – she can do some pretty heavy lifting!"

Nancy embodies the Maya Angelou quote that "People will forget what you said, people will forget what you did, but people will never forget how you made them feel". Nancy has the rare ability to make us all feel better for our interactions with her.

For these reasons and more, we are pleased to present her with the Dennis Chase Staff Award.

Congratulations to all, and thank you for your incredible contributions to sustainability in our region.

16. Other Business

A. Next Meeting

The next meeting of the ERCA Board of Directors will be held on February 15, 2024 starting at 6:00 p.m. in Council Chambers, Essex Civic Centre.

17. Adjournment

Resolution 17/24 Moved by Molly Alliare
Seconded by Katie McGuire-Blais

THAT the 2024 Annual General Meeting of the Essex Region Conservation Authority Board of Directors be adjourned. **Carried**

Jim Morrison, Chair

Tim Byrne, CAO/Secretary-Treasurer

Essex Region Conservation Authority

Board of Directors BD 01/24

From: Shelley McMullen, CFO/Director of Finance & Corporate Services

Date: Tuesday, January 30, 2024

Subject: ERCA 2024 Budget Approval and Municipal Cost Apportionment

Compliance Action: *Conservation Authorities Act, R.S.O. 1990, c. C.27*
O. Reg. 686/21 Mandatory Programs and Services
O. Reg. 687/21 Transition Plans and Agreements for Programs and Services
O. Reg. 402/22 Budget and Apportionment

Recommendation 1: THAT the 2024 Draft Budget totalling $8,888,090, be approved as the 2024 Final Budget, in accordance with *Ontario Regulation 402/22* and Bylaw A-1: Administrative Procedures, and further,

THAT the Board of Directors approve the total municipal cost apportionment of $3,288,350, including $2,971,088 (+2.6%, $75,965), representing the reduced operating and capital costs, directly attributable to the Category 1 mandatory programs and services, and $317,262, (-63.7%,-$555,850), representing the reduced operating and capital costs, attributable to the unanimously supported non-mandatory Category 3 programs and services; and further,

THAT the vote to approve Recommendation 1, by the Board of Directions, be carried by a weighted majority and recorded, satisfying Sections 16 and 23 of O. Regulation 402/22.

Recommendation 2: THAT the Board of Directors accept the discretionary and recommended municipal contributions, to a new and separate land acquisition and protection fund, from the Town of Essex in the amount of $24,321, and the Township of Pelee in the amount of $1,378, in accordance with respective signed Cost Apportioning Agreements and Resolution or Bylaw of Council.

Background:

On December 14, 2023, ERCA Administration presented ERCA's Draft 2024 Budget, Discussion & Analysis, to the Board of Directors, for review and recommendation regarding a proposed decrease of **$479,885 (-12.7%) in the total cost apportionment.** With the support of the Board of Directors, the draft budget, totalling **$$8,888,090** was distributed to member municipalities, and notice was given that a recorded and weighted vote, regarding the levy of **$3,288,350**, would proceed at the February 15, 2024, meeting of the Board of Directors, in accordance with *Ontario Regulation 402/22*.

While the draft budget was provided to member municipalities on December 15, 2023, for the purposes of consultation, as mandated in the Budget and Apportionment Regulation *(O. Reg 402/22),* the Authority did not receive any feedback regarding the draft budget directly. However, as discussions were actively taking place with municipal administrations and combined with the appearances of the leadership team at respective Councils, regarding the Cost Apportioning Agreements, potential concerns regarding budget increases were likely allayed at that time. Even prior to the reduction in the cost apportionment for the non-mandatory Category 3 programs, the global increase to cost apportionment/levy was proposed to be less than 3%.

Due to the absence of any changes to the budget, as no feedback was received, the budget as attached **(Appendix A)** is the final budget, to be approved by the Board of Directors. While the Regulation *(O. Reg 402/22)* provides for the ability of the final budget to be approved by a majority vote, it can be carried by a weighted majority, if that is required by the Authority's bylaws, which is the case (Bylaw A-1: Administrative Procedures). The Authority has historically approved the final budget and the cost apportionment (levy) in one consolidated vote, recorded and carried by the weighted majority.

Appendix B, from the budget discussion document (attached), sets out the allocation of Municipal Levies for 2024, based on the modified current value assessment and includes the cost apportionment for both Category 1 and Category 3 programs, services and capital projects. The recommended land acquisition contribution is also highlighted in Appendix B, with Council-approved contributions, shown in bold. To date, land acquisition funding has been confirmed by both the Town of Essex and the Township of Pelee.

Appendix D (Funding Sources by Service Delivery Area), has also been attached for quick reference, as it presents a high level overview of 2024 programs and services, including projected expenses and expected funding sources.

As the Authority has not received confirmation of municipal Council resolutions, from all member municipalities, regarding the Category 3 Cost Apportionment Agreement, the 'notice to pay' pertaining to that portion of the cost apportionment will be delayed, for some municipalities until the signed agreements are received, with the council resolution. 'The Authority received an extension until March 31, 2024, of the January 1, 2024 deadline, for the completion of the Transition Plan, which included the negotiation and signing of Cost Apportioning Agreements.

Approved By:

Tim Byrne
CAO/Secretary Treasurer

Attachments:

- Appendix A - 2024 Draft Detailed and Summary Budgets for Mandatory and Non-Mandatory Programs, Services & Capital Projects
- Appendix B - 2024 Draft Municipal Levies
- Appendix D – 2024 Funding Sources by Service Delivery Area

Appendix A: 2024 Draft Detailed and Summary Budgets for Mandatory and Non-Mandatory Programs & Services

Essex Region Conservation Authority
sustaining the place for life

DRAFT DETAILED & SUMMARY BUDGETS FOR MANDATORY AND NON-MANDATORY PROGRAMS & SERVICES

	2023 BUDGET	2023 PROJECTION	2024 DRAFT BUDGET
WATERSHED MANAGEMENT SERVICES			
CATEGORY 1 MANDATORY SERVICES - RISKS OF NATURAL HAZARDS			
DEVELOPMENT SERVICES			
MANDATORY/GENERAL LEVY	413,800	393,800	**540,750**
SELF-GENERATED FEES	519,000	545,000	**576,000**
	932,800	938,800	**1,116,750**
WAGES	691,500	662,100	**856,000**
CONSULTING	-	-	**-**
SUPPLIES/OFFICE/JANITORIAL	30,700	24,950	**29,250**
VEHICLE/TRAVEL/EQUIP'T USAGE	26,600	18,500	**18,500**
CORP SUPPORT/SHARED SVCS	120,000	113,000	**143,000**
RENT/INS/TAXES/UTILITIES	58,000	64,000	**64,000**
DUES/MEMBERSHIPS	1,000	1,000	**1,000**
AUDIT AND LEGAL	5,000	25,000	**5,000**
SMALL MISC	-	-	**-**
	932,800	908,550	**1,116,750**
PLANNING RELATED TO HAZARDS			
MANDATORY/GENERAL LEVY	164,850	111,716	**26,650**
SELF GENERATED FEES	80,000	127,800	**130,000**
	244,850	239,516	**156,650**
WAGES	200,200	143,000	**118,500**
SUPPLIES/OFFICE/JANITORIAL	1,550	1,650	**2,150**
VEHICLE/TRAVEL/EQUIP'T USAGE	1,500	500	**500**
CORP SUPPORT/SHARED SVCS	26,600	24,000	**20,500**
RENT/INS/TAXES/UTILITIES	15,000	15,000	**15,000**
	244,850	184,150	**156,650**
FLOOD /EROSION PROGRAM (S.39 PROV $)			
MANDATORY/GENERAL LEVY	106,663	125,140	**106,083**
PROVINCIAL GRANTS	104,417	104,417	**104,417**
	211,080	229,557	**210,500**
WAGES	128,900	122,100	**111,000**
CONSULTING/INFO'N/DATA SVCS	35,500	45,000	**50,000**
SUPPLIES/OFFICE/JANITORIAL	5,180	4,980	**4,000**
VEHICLE/TRAVEL/EQUIP'T USAGE	7,000	6,000	**6,000**
CORP SUPPORT/SHARED SVCS	26,500	26,500	**30,500**
RENT/INS/TAXES/UTILITIES	8,000	9,000	**9,000**
CAP MAINT/LOW VALUE ASSETS	-	16,000	**-**
	211,080	229,580	**210,500**
OTHER WMS TERM PROJECTS			
MANDATORY/GENERAL LEVY	48,500	100,134	**152,500**
OTHER GRANTS/USER FEES/RECOVERIES	46,000	-	**30,000**
TRANSFERS (TO)/FROM DEFERRED REVENUES	24,500	(24,000)	**42,000**
	119,000	76,134	**224,500**
DIRECT WAGES	52,000	16,134	**60,000**
CONSULTING/OUTSIDE ENGINEERING	58,000	58,000	**155,000**
TRAVEL/VEHICLE/ADMINISTRATION/OVERHEAD	9,000	2,000	**9,500**
	119,000	76,134	**224,500**

	2023 BUDGET	2023 PROJECTION	2024 DRAFT BUDGET
SUMMARY - CATEGORY 1 WMS MANDATORY SERVICES, RISKS OF NATURAL HAZARDS			
MANDATORY/GENERAL LEVY	**733,813**	**730,790**	**825,983**
PROVINCIAL GRANTS	**104,417**	**104,417**	**104,417**
SELF-GENERATED FEES	**599,000**	**672,800**	**706,000**
TRANSFER TO/FROM DEF REVENUES	**24,500**	**(24,000)**	**42,000**
TRANSFER TO/FROM RESERVES	**46,000**	**-**	**30,000**
	1,507,730	**1,484,007**	**1,708,400**
WAGES & BENEFITS	**1,072,600**	**943,334**	**1,145,500**
SUPPLIES/SERVICES/OTHER	**218,930**	**265,080**	**334,900**
INTERNAL RECOVERIES FOR SHARED SVCS/FLEET	**216,200**	**190,000**	**228,000**
	1,507,730	**1,398,414**	**1,708,400**
SURPLUS/(DEFICIT)	**-**	**85,593**	**-**
MUNICIPAL WATER & EROSION CONTROL PROJECTS (50% PROV $)			
MUNICIPAL	-	9,773	**-**
	-	9,773	**-**
WAGES	-	462	**-**
CONSULTING/OUTSIDE ENGINEERING	-	6,764	**-**
TRAVEL/VEHICLE/ADMINISTRATION/OVERHEAD	-	2,547	**-**
	-	9,773	**-**
OTHER MUNICIPAL TERM STUDIES/PROJECTS			
MUNICIPAL	(163,200)	(53,695)	**-**
PROVINCIAL GRANTS	182,000	182,000	**-**
TRANSFERS (TO)/FROM DEFERRED REVENUES	35,250	-	**30,000**
	54,050	128,305	**30,000**
WAGES	47,050	19,055	**25,500**
CONSULTING/OUTSIDE ENGINEERING	-	108,000	**-**
TRAVEL/VEHICLE/ADMINISTRATION/OVERHEAD	7,000	3,250	**4,500**
	54,050	130,305	**30,000**
SUMMARY CATEGORY 1 MANDATORY SERVICES -WECI PROJECTS AND MUNICIPAL SPECIAL STUDIES			
MUNICIPAL	**(163,200)**	**(43,922)**	-
PROVINCIAL GRANTS	**182,000**	**182,000**	-
TRANSFER TO/FROM DEF REVENUES	**35,250**	**-**	30,000
	54,050	**138,078**	30,000
WAGES & BENEFITS	**47,050**	**19,517**	25,500
CONSTRUCTION/ENGINEERING/SUPPLIES	**-**	**116,311**	-
INTERNAL RECOVERIES FOR SHARED SVCS/FLEET	**7,000**	**4,250**	4,500
	54,050	**140,078**	30,000
SURPLUS/(DEFICIT)	**-**	**(2,000)**	-

CONSERVATION SERVICES

	2023 BUDGET	2023 PROJECTION	2024 DRAFT BUDGET
CATEGORY 1 MANDATORY SERVICES - CONSERVATION LANDS MANAGEMENT			
GENERAL PROGRAM OPERATIONS, MANAGEMENT PLANS & LAND STRATEGIES			
MANDATORY/GENERAL LEVY	204,715	234,945	**195,400**
MUNICIPAL	-	-	**-**
FEDERAL GRANTS	92,000	92,000	**8,000**
SELF-GENERATED FEES	-	-	**-**
	296,715	326,945	**203,400**
WAGES	256,300	243,220	**169,540**
ENGINEERING/CONSULTING	-	36,000	**-**
SUPPLIES/OFFICE/JANITORIAL	5,515	7,260	**950**
VEHICLE/TRAVEL/EQUIP'T USAGE	3,500	3,900	**910**
CORP SUPPORT/SHARED SVCS	31,400	35,810	**32,000**
	296,715	326,190	**203,400**

	2023 BUDGET	2023 PROJECTION	2024 DRAFT BUDGET
CONSERVATION AREAS/GREEWAYS/OWNED PROPERTIES MAINTENANCE			
MANDATORY/GENERAL LEVY	775,110	775,110	**954,255**
FEDERAL GRANTS	-	2,000	**-**
FOUNDATION & OTHER GRANTS	-	22,500	**15,500**
SELF-GENERATED USER FEES	81,800	85,997	**94,000**
TRANSFERS (TO)/FROM DEFERRED REVENUES	-	-	**8,500**
TRANSFERS TO/FROM RESERVES	20,000	15,000	**(10,000)**
	876,910	900,607	**1,062,255**
WAGES	371,500	397,872	**493,822**
CONSTRUCTION	-	18,500	**10,000**
ENGINEERING/CONSULTING	17,000	26,500	**10,000**
SUPPLIES/OFFICE/JANITORIAL	58,110	62,629	**58,742**
VEHICLE/TRAVEL/EQUIP'T USAGE	90,000	118,440	**108,999**
PLANT MAT/LANDOWNER GRANTS	5,500	3,366	**15,000**
CORP SUPPORT/SHARED SVCS	107,600	96,033	**139,442**
RENT/INS/TAXES/UTILITIES	155,700	182,128	**177,901**
AUDIT AND LEGAL	-	1,980	**15,000**
CAP MAINT/LOW VALUE ASSETS	68,000	14,532	**29,349**
SMALL MISC	3,500	4,208	**4,000**
	876,910	926,188	**1,062,255**
CAPITAL OR MAJOR MAINTENANCE/IMPROVEMENT PROJECTS-Mandatory			
MANDATORY/GENERAL LEVY	-	-	**10,000**
PROVINCIAL GRANTS	-	104,000	**400,000**
FEDERAL GRANTS	550,000	95,000	**80,000**
FOUNDATION & OTHER GRANTS	-	-	**-**
TRANSFERS TO/FROM DEFERRED REVENUES	123,700	3,700	**202,000**
TRANSFERS TO/FROM RESERVES	397,500	394,750	**563,000**
	1,071,200	597,450	**1,255,000**
WAGES	14,250	10,250	**13,000**
CONSTRUCTION	907,000	418,000	**1,025,000**
ENGINEERING/CONSULTING/SUB CONTRACTING	93,000	133,000	**61,000**
CONSTRUCTION SUPPLIES	9,200	4,200	**10,000**
VEHICLE/TRAVEL/EQUIP'T USAGE	2,000	-	**2,000**
PLANT MAT/LANDOWNER GRANTS	5,000	-	**5,000**
CORP SUPPORT/SHARED SVCS	16,750	10,000	**19,000**
CAP MAINT/LOW VALUE ASSETS	22,000	22,000	**118,000**
	1,071,200	597,450	**1,255,000**
TREE PLANTING AND RESTORATION -ERCA LANDS			
MANDATORY/GENERAL LEVY	113,100	82,870	**89,700**
PROVINCIAL GRANTS	30,000	30,000	**-**
FEDERAL GRANTS	-	11,775	**-**
FOUNDATION & OTHER GRANTS	5,000	4,700	**-**
SELF GENERATED FEES	10,000	18,750	**-**
	158,100	148,095	**89,700**
WAGES	72,500	51,000	**33,000**
CONSTRUCTION	40,000	40,000	**-**
ENGINEERING/CONSULTING/SUB CONTRACTING	-	17,000	**2,000**
SUPPLIES/OFFICE/JANITORIAL	4,250	7,100	**6,850**
VEHICLE/TRAVEL/EQUIP'T USAGE	12,850	4,350	**4,350**
PLANT MAT/LANDOWNER GRANTS	11,500	12,500	**30,500**
CORP SUPPORT/SHARED SVCS	17,000	12,000	**13,000**
	158,100	143,950	**89,700**

	2023 BUDGET	2023 PROJECTION	2024 DRAFT BUDGET
FLEET & FIELD EQUIPMENT			
MANDATORY/GENERAL LEVY	-	-	**23,200**
RECOVERIES/CHARGEBACKS	199,700	216,058	**209,200**
TRANSFERS TO/FROM RESERVES	153,000	98,000	**-**
	352,700	314,058	**232,400**
MAINTENANCE/REPAIRS	65,900	65,900	**62,000**
FUEL	57,500	57,500	**57,500**
LICENCES/MISC/SMALL TOOLS	19,300	20,900	**20,900**
AMORTIZATION	89,000	103,000	**103,000**
	231,700	247,300	**243,400**
SUMMARY CATEGORY 1 MANDATORY SERVICES -LAND MGMT, (OWNED) CA OPERATIONS, MAINTENANCE & CAPITAL			
MANDATORY/GENERAL LEVY	**1,092,925**	**1,092,925**	**1,272,555**
MUNICIPAL	**-**	**-**	**-**
PROVINCIAL GRANTS	**30,000**	**134,000**	**400,000**
FEDERAL GRANTS	**642,000**	**200,775**	**88,000**
FOUNDATION & OTHER GRANTS	**5,000**	**27,200**	**15,500**
SELF-GENERATED FEES	**291,500**	**320,805**	**303,200**
TRANSFER TO/FROM DEF REVENUES	**123,700**	**3,700**	**210,500**
TRANSFER TO/FROM RESERVES	**570,500**	**507,750**	**553,000**
	2,755,625	**2,287,155**	**2,842,755**
WAGES & BENEFITS	**725,450**	**713,242**	**716,362**
CONSTRUCTION/ENGINEERING/SUPPLIES	**1,644,025**	**1,261,693**	**1,829,451**
INTERNAL RECOVERIES FOR SHARED SVCS/FLEET	**265,150**	**266,143**	**307,942**
	2,634,625	**2,241,078**	**2,853,755**
SURPLUS/(DEFICIT)	**121,000**	**46,077**	**(11,000)**
CATEGORY 3 NON MANDATORY SERVICES - ONGOING ERCA CORE CONSERVATION-RELATED PROGRAMS			
LAND SECUREMENT			
NON-MANDATORY LEVY	40,000	40,000	**-**
TRANSFERS (TO)/FROM LAND ACQ FUND	-	17,500	**57,500**
	40,000	57,500	**57,500**
WAGES	5,000	2,500	**2,500**
PROPERTY	-	-	**-**
LEGAL, SURVEYING,CONSULTNG	30,000	50,000	**50,000**
CORP SUPPORT/SHARED SVCS	5,000	5,000	**5,000**
	40,000	57,500	**57,500**
RESTORATION/TREE PLANTING PROGRAM - NON ERCA PROPERTIES			
NON-MANDATORY LEVY	75,000	75,000	**75,000**
PROVINCIAL GRANTS	150,000	50,000	**50,000**
FEDERAL GRANTS	40,000	160,000	**160,000**
FOUNDATION & OTHER GRANTS	-	64,000	**-**
SELF-GENERATED FEES	225,000	202,000	**205,000**
IN-KIND	10,000	15,000	**10,000**
TRANSFERS (TO)/FROM DEFERRED REVENUES	107,000	57,800	**29,700**
	607,000	623,800	**529,700**
WAGES	207,400	207,400	**160,500**
CONSTRUCTION	40,000	40,000	**-**
ENGINEERING/CONSULTING/SUB-CONTRACTING	-	-	**-**
SUPPLIES/OFFICE/JANITORIAL	18,200	14,200	**18,200**
VEHICLE/TRAVEL/EQUIP'T USAGE	41,400	58,600	**49,000**
PLANT MAT/LANDOWNER GRANTS	215,500	214,500	**207,500**
CORP SUPPORT/SHARED SVCS	65,000	65,000	**75,000**
RENT/INS/TAXES/UTILITIES	9,000	9,000	**9,000**
IN KIND SVCS SUPPLIES	10,000	15,000	**10,000**
CAP MAINT/LOW VALUE ASSETS	500	500	**500**
	607,000	624,200	**529,700**

	2023 BUDGET	2023 PROJECTION	2024 DRAFT BUDGET
HOLIDAY BEACH (OPERATED UNDER MGMT AGREEMENT)			
NON-MANDATORY LEVY	-	-	**-**
SELF GENERATED	352,600	373,700	**399,000**
TRANSFERS TO/FROM RESERVES	-	5,500	**(13,000)**
	352,600	381,200	**386,000**
WAGES	161,000	197,896	**188,700**
ENGINEERING/CONSULTING/SUB CONTRACTING	8,500	14,000	**3,500**
SUPPLIES/OFFICE/JANITORIAL	61,600	62,000	**64,800**
VEHICLE/TRAVEL/EQUIP'T USAGE	19,000	22,000	**25,500**
CORP SUPPORT/SHARED SVCS	35,500	35,500	**40,500**
RENT/INS/TAXES/UTILITIES	44,000	40,000	**45,000**
MAJOR MAINT/ROADS/VEGETATION	20,500	8,350	**17,500**
	352,600	380,246	**386,000**

SUMMARY CATEGORY 3 NON MANDATORY SERVICES - ERCA ONGOING CORE CONSERVATION & HERITAGE PROGRAMS			
NON-MANDATORY LEVY	**115,000**	**115,000**	**75,000**
PROVINCIAL GRANTS	**150,000**	**50,000**	**50,000**
FEDERAL GRANTS	**40,000**	**162,000**	**160,000**
FOUNDATION & OTHER GRANTS	**-**	**64,000**	**-**
SELF-GENERATED FEES	**577,600**	**575,700**	**604,000**
IN-KIND	**10,000**	**15,000**	**10,000**
TRANSFER TO/FROM DEF REVENUES	**107,000**	**75,300**	**87,200**
TRANSFER TO/FROM RESERVES	**-**	**5,500**	**(13,000)**
	999,600	**1,062,500**	**973,200**
WAGES & BENEFITS	**373,400**	**407,796**	**351,700**
OTHER OPERATING/SITE SUPPLIES/PROF SERVICES	**478,200**	**500,650**	**453,000**
INTERNAL RECOVERIES FOR SHARED SVCS/FLEET	**148,000**	**153,500**	**168,500**
	999,600	**1,061,946**	**973,200**
SURPLUS/(DEFICIT)	**-**	**554**	**-**

CATEGORY 3 NON MANDATORY SERVICES - FEE FOR SERVICE TERM-LIMITED PROJECTS/CONTRACTS			
FEE FOR SERVICE RESTORATION PROJECTS & HABITAT STUDIES			
MUNICIPAL	-	-	**-**
PROVINCIAL GRANTS	24,000	24,000	**-**
FEDERAL GRANTS	75,000	75,000	**-**
FOUNDATION & OTHER GRANTS	68,000	68,000	**68,000**
TRANSFERS (TO)/FROM DEFERRED REVENUES	(5,000)	(5,000)	**-**
	162,000	162,000	**68,000**
WAGES	9,000	9,000	**8,000**
CONSTRUCTION	70,000	70,000	**33,000**
ENGINEERING/CONSULTING/SUB-CONTRACTING	57,000	57,000	**7,000**
SUPPLIES/OFFICE/JANITORIAL	2,000	2,000	**2,000**
VEHICLE/TRAVEL/EQUIP'T USAGE	500	500	**500**
PLANT MAT/LANDOWNER GRANTS	15,000	15,000	**14,000**
CORP SUPPORT/SHARED SVCS	8,500	8,500	**3,500**
RENT/INS/TAXES/UTILITIES	-	-	**-**
	162,000	162,000	**68,000**
FEE FOR SERVICE PROPERTY MAINTENANCE/MANAGEMENT			
SELF-GENERATED FEES	12,000	13,500	**31,200**
	12,000	13,500	**31,200**
WAGES	6,600	6,600	**12,500**
VEHICLE/TRAVEL/EQUIP'T USAGE	2,700	2,700	**5,800**
CORP SUPPORT/SHARED SVCS	2,300	2,000	**4,700**
RENT/INS/TAXES/UTILITIES	400	400	**6,400**
SMALL MISC	-	1,800	**1,800**
	12,000	13,500	**31,200**

	2023 BUDGET	2023 PROJECTION	2024 DRAFT BUDGET
SUMMARY CATEGORY 3 NON MANDATORY SERVICES - FEE FOR SERVICE CONTRACTS/TERM LIMITED PROJECTS			
MUNICIPAL	-	-	-
PROVINCIAL GRANTS	24,000	24,000	-
FEDERAL GRANTS	75,000	75,000	-
FOUNDATION & OTHER GRANTS	68,000	68,000	68,000
SELF-GENERATED FEES	12,000	13,500	31,200
TRANSFER TO/FROM DEF REVENUES	(5,000)	(5,000)	-
	174,000	175,500	99,200
WAGES & BENEFITS	15,600	15,600	20,500
CONSTRUCTION/SUPPLIES/OTHER	144,400	146,200	64,200
INTERNAL RECOVERIES FOR SHARED SVCS/FLEET	14,000	13,700	14,500
	174,000	175,500	99,200
SURPLUS/(DEFICIT)	-	-	-

WATERSHED RESEARCH

	2023 BUDGET	2023 PROJECTION	2024 DRAFT BUDGET
CATEGORY 1 MANDATORY SERVICE - DRINKING WATER SOURCE PROTECTION AND PROV SURFACE/GROUND WATER MONITORING			
MANDATORY/GENERAL LEVY	21,285	21,285	**18,350**
PROVINCIAL GRANTS	96,900	96,900	**114,400**
TRANSFERS (TO)/FROM DEFERRED REVENUES	-	8,000	**-**
	118,185	126,185	**132,750**
WAGES	94,300	98,150	**105,848**
SUPPLIES/OFFICE/JANITORIAL	785	500	**700**
VEHICLE/TRAVEL/EQUIP'T USAGE	1,500	4,000	**4,000**
CORP SUPPORT/SHARED SVCS	13,500	14,550	**14,102**
RENT/INS/TAXES/UTILITIES	3,500	3,500	**3,500**
CAP MAINT/LOW VALUE ASSETS	-	760	**-**
TOTAL EXPENSES	118,185	126,060	**132,750**
PER DIEMS/MISC	4,600	4,600	**4,600**
	118,185	126,060	**132,750**
CATEGORY 2 MUNICIPAL SERVICES - RISK MANAGEMENT SERVICES (PART IV CWA, 2006)			
MUNICIPAL	17,100	14,600	**14,600**
	17,100	14,600	**14,600**
WAGES	11,600	9,100	**9,100**
SUPPLIES/OFFICE/JANITORIAL	500	500	**500**
VEHICLE/TRAVEL/EQUIP'T USAGE	1,500	1,500	**1,500**
CORP SUPPORT/SHARED SVCS	1,500	1,500	**1,500**
RENT/INS/TAXES/UTILITIES	2,000	2,000	**2,000**
	17,100	14,600	**14,600**
CATEGORY 3 NON MANDATORY SERVICE - ONGOING ERCA CORE WATER QUALITY/RESEARCH PROGRAM			
WATERSHED WATER QUALITY PROGRAM			
NON-MANDATORY LEVY	-	-	**25,000**
TRANSFERS (TO)/FROM DEFERRED REVENUES	35,200	40,000	**43,955**
	35,200	40,000	**68,955**
WAGES	16,500	18,650	**30,995**
CONSULTING/SUB CONTRACTING	5,500	12,000	**13,000**
SUPPLIES/OFFICE/JANITORIAL	1,700	2,750	**2,400**
VEHICLE/TRAVEL/EQUIP'T USAGE	4,000	8,100	**8,060**
CORP SUPPORT/SHARED SVCS	4,500	-	**10,000**
RENT/INS/TAXES/UTILITIES	2,500	2,500	**2,000**
TECHNICAL EQUIPMENT	500	-	**2,500**
	35,200	44,000	**68,955**

	2023 BUDGET	2023 PROJECTION	2024 DRAFT BUDGET
DEMONSTRATION/CROP RESEARCH FARM			
NON-MANDATORY LEVY	-	-	-
PROVINCIAL GRANTS	30,000	30,000	-
SELF-GENERATED	23,000	9,800	-
	53,000	39,800	-
WAGES	32,500	35,744	-
SUPPLIES/OFFICE/JANITORIAL	4,250	3,200	-
VEHICLE/TRAVEL/EQUIP'T USAGE	4,000	4,000	-
CORP SUPPORT/SHARED SVCS	6,000	5,556	-
RENT/INS/TAXES/UTILITIES	750	1,000	-
DUES/MEMBERSHIPS	500	-	-
	53,000	49,500	-
LANDOWNER STEWARDSHIP PROGRAM			
NON-MANDATORY LEVY	73,000	73,000	-
IN-KIND	20,000	3,500	-
	93,000	76,500	-
WAGES	38,000	54,000	-
SUPPLIES/OFFICE/JANITORIAL	-	300	-
VEHICLE/TRAVEL/EQUIP'T USAGE	-	2,400	-
PLANT MAT/LANDOWNER GRANTS	30,000	12,000	-
CORP SUPPORT/SHARED SVCS	4,000	5,000	-
RENT/INS/TAXES/UTILITIES	1,000	1,000	-
IN KIND SVCS SUPPLIES	20,000	3,500	-
	93,000	78,200	-
SUMMARY CATEGORY 3 NON MANDATORY SERVICES - ERCA ONGOING WATER QUALITY/ RESEARCH PROGRAMS			
NON-MANDATORY LEVY	**73,000**	**73,000**	**25,000**
PROVINCIAL GRANTS	**30,000**	**30,000**	**-**
SELF-GENERATED	**23,000**	**9,800**	**-**
IN-KIND	**20,000**	**3,500**	**-**
TRANSFER TO/FROM DEF REVENUES	**35,200**	**40,000**	**43,955**
	181,200	**156,300**	**68,955**
WAGES & BENEFITS	**87,000**	**108,394**	**30,995**
SUPPLIES/TECH SERVICES/EQUIP'T	**71,700**	**38,350**	**19,960**
INTERNAL RECOVERIES FOR SHARED SVCS/FLEET	**22,500**	**24,956**	**18,000**
	181,200	**171,700**	**68,955**
SURPLUS/(DEFICIT)	**-**	**(15,400)**	**-**
CATEGORY 3 NON MANDATORY SERVICES - TERM LIMITED GRANT-FUNDED/FEE-FOR-SERVICE PROJECTS/STUDIES			
DETROIT RIVER CANADIAN CLEANUP			
PROVINCIAL GRANTS	73,500	73,500	**90,000**
FEDERAL GRANTS	70,000	70,000	**75,000**
TRANSFERS (TO)/FROM DEFERRED REVENUES	25,800	32,800	**15,500**
	169,300	176,300	**180,500**
WAGES	131,200	138,200	**137,500**
ENGINEERING/CONSULTING	-	-	**-**
SUPPLIES/OFFICE/JANITORIAL	4,400	4,400	**2,600**
VEHICLE/TRAVEL/EQUIP'T USAGE	300	300	**1,000**
PLANT MAT/LANDOWNER GRANTS	10,000	10,000	**10,000**
CORP SUPPORT/SHARED SVCS	21,000	21,000	**27,000**
RENT/INS/TAXES/UTILITIES	2,400	2,400	**2,400**
CAP MAINT/LOW VALUE ASSETS	-	-	**-**
	169,300	176,300	**180,500**
OTHER WATER QUALITY STUDIES (FED$ & PROV$)			
PROVINCIAL GRANTS	23,484	24,889	-
FEDERAL GRANTS	145,000	145,000	-
OTHER	(10,000)	(10,000)	-
IN-KIND	-	462	-
TRANSFERS (TO)/FROM DEFERRED REVENUES	55,800	50,439	-
	214,284	210,790	-

	2023 BUDGET	2023 PROJECTION	2024 DRAFT BUDGET
WAGES	72,784	65,996	**-**
CONSULTING/SUB CONTRACTING	46,800	48,241	**-**
SUPPLIES/OFFICE/JANITORIAL	8,000	5,211	**-**
VEHICLE/TRAVEL/EQUIP'T USAGE	4,200	847	**-**
PLANT MAT/LANDOWNER GRANTS	70,000	70,822	**-**
CORP SUPPORT/SHARED SVCS	12,500	14,418	**-**
IN KIND SVCS SUPPLIES	-	462	**-**
TECHNICAL EQUIPMENT	-	4,793	**-**
	214,284	210,790	**-**
OTHER WATER QUALITY FEE FOR SERVICE (SAMPLING/DATA/ANALYSIS)			
FEDERAL GRANTS	42,975	43,670	**27,100**
SELF-GENERATED	-	-	**-**
TRANSFERS (TO)/FROM DEFERRED REVENUES	-	1,500	**-**
	42,975	45,170	**27,100**
WAGES	31,900	32,959	**19,500**
CONSULTING/SUB CONTRACTING	500	1,900	**-**
SUPPLIES/OFFICE/JANITORIAL	1,500	1,500	**1,500**
VEHICLE/TRAVEL/EQUIP'T USAGE	2,675	3,093	**2,600**
CORP SUPPORT/SHARED SVCS	5,700	5,218	**3,000**
RENT/INS/TAXES/UTILITIES	700	500	**500**
	42,975	45,170	**27,100**
SUMMARY CATEGORY 3 NON MANDATORY SERVICES - TERM LIMITED GRANT-FUNDED/FEE-FOR-SERVICE PROJECTS/STUDIES			
PROVINCIAL GRANTS	**96,984**	**98,389**	**90,000**
FEDERAL GRANTS	**257,975**	**258,670**	**102,100**
SELF-GENERATED	**(10,000)**	**(10,000)**	**-**
IN-KIND	**-**	**462**	**-**
TRANSFER TO/FROM DEF REVENUES	**81,600**	**84,739**	**15,500**
	426,559	**432,260**	**207,600**
WAGES & BENEFITS	**235,884**	**237,155**	**157,000**
SUBSIDIES/MATERIALS/TECH SVCS/EQUIP'T	**144,400**	**150,411**	**17,600**
INTERNAL RECOVERIES FOR SHARED SVCS/FLEET	**46,275**	**44,694**	**33,000**
	426,559	**432,260**	**207,600**
SURPLUS/(DEFICIT)	**-**	**-**	**-**

COMMUNITY SERVICES

	2023 BUDGET	2023 PROJECTION	2024 DRAFT BUDGET
GENERAL SERVICES			
CORPORATE COMMUNICATIONS			
MANDATORY/GENERAL LEVY	181,600	184,623	**200,900**
FOUNDATION & OTHER GRANTS	5,000	(13,000)	**5,000**
TRANSFERS (TO)/FROM DEFERRED REVENUES	15,000	15,000	**-**
	201,600	186,623	**205,900**
WAGES	178,500	162,500	**188,000**
CONSULTING	10,000	10,000	**5,000**
SUPPLIES/OFFICE/JANITORIAL	12,400	12,400	**12,200**
VEHICLE/TRAVEL/EQUIP'T USAGE	250	250	**250**
CAP MAINT/LOW VALUE ASSETS	450	450	**450**
	201,600	185,600	**205,900**
CATEGORY 3 NON MANDATORY SERVICES - ONGOING ERCA STAKEHOLDER ENGAGEMENT, OUTREACH & EDUCATION			
OUTDOOR & CONSERVATION EDUCATION			
NON-MANDATORY LEVY	-	-	**-**
FOUNDATION & OTHER GRANTS	40,000	44,500	**45,000**
SELF-GENERATED	24,000	17,000	**25,000**
TRANSFERS (TO)/FROM DEFERRED REVENUES	-	10,000	**30,330**
	64,000	71,500	**100,330**

	2023 BUDGET	2023 PROJECTION	2024 DRAFT BUDGET
WAGES	51,350	57,000	**73,500**
SUPPLIES/OFFICE/JANITORIAL	1,970	1,970	**2,750**
VEHICLE/TRAVEL/EQUIP'T USAGE	1,080	2,480	**2,480**
CORP SUPPORT/SHARED SVCS	8,000	8,000	**13,000**
RENT/INS/TAXES/UTILITIES	1,600	1,600	**1,600**
CAP MAINT/LOW VALUE ASSETS	-	-	**7,000**
	64,000	71,050	**100,330**
OUTREACH & ENGAGEMENT			
NON-MANDATORY LEVY	34,150	34,150	**57,150**
FOUNDATION & OTHER GRANTS	10,000	21,300	**24,000**
TRANSFERS (TO)/FROM DEFERRED REVENUES	20,000	20,000	**-**
	64,150	75,450	**81,150**
WAGES	35,100	48,700	**44,500**
SUPPLIES/OFFICE/JANITORIAL	3,350	4,163	**3,000**
VEHICLE/TRAVEL/EQUIP'T USAGE	4,200	3,200	**4,000**
PARTNER GRANTS/PLANT MATERIAL	9,000	9,000	**15,000**
CORP SUPPORT/SHARED SVCS	10,000	10,000	**12,000**
RENT/INS/TAXES/UTILITIES	2,000	2,400	**2,400**
CAP MAINT/LOW VALUE ASSETS	500	500	**250**
	64,150	77,963	**81,150**
JOHN R PARK HOMESTEAD MUSEUM OPERATIONS AND EDUCATIONAL PROGRAMMING			
MANDATORY/GENERAL LEVY	-	-	**-**
CW~GS LEVY	150,962	150,962	**160,112**
PROVINCIAL GRANTS	23,688	23,688	**23,688**
FEDERAL GRANTS	6,000	14,000	**9,000**
FOUNDATION & OTHER GRANTS	26,500	24,750	**28,750**
SELF-GENERATED FEES	109,000	118,300	**134,000**
TRANSFERS (TO)/FROM RESERVES	(15,000)	(15,000)	**(15,000)**
	301,150	316,700	**340,550**
WAGES	189,000	190,550	**223,000**
SUPPLIES/OFFICE/JANITORIAL	43,850	52,950	**50,750**
VEHICLE/TRAVEL/EQUIP'T USAGE	3,300	700	**1,450**
CORP SUPPORT/SHARED SVCS	25,000	30,000	**30,250**
RENT/INS/TAXES/UTILITIES	38,500	38,500	**34,200**
CAP MAINT/LOW VALUE ASSETS	1,000	600	**600**
	301,150	314,100	**340,550**
SUMMARY CATEGORY 3 NON MANDATORY SERVICES - COMMUNITY OUTREACH,EDUCATION & JRPH MUSEUM OPERATIONS			
MANDATORY/GENERAL LEVY	**-**	**-**	**-**
NON-MANDATORY LEVY	**185,112**	**185,112**	**217,262**
PROVINCIAL GRANTS	**23,688**	**23,688**	**23,688**
FEDERAL GRANTS	**6,000**	**14,000**	**9,000**
FOUNDATION & OTHER GRANTS	**76,500**	**84,750**	**93,750**
SELF-GENERATED FEES	**133,000**	**141,100**	**163,000**
TRANSFER TO/FROM DEF REVENUES	**20,000**	**30,000**	**30,330**
TRANSFER TO/FROM RESERVES	**(15,000)**	**(15,000)**	**(15,000)**
	429,300	**463,650**	**522,030**
WAGES & BENEFITS	**275,450**	**296,250**	**341,000**
OTHER OPERATING/SITE SUPPLIES/PROF SERVICES	**105,850**	**113,063**	**118,980**
INTERNAL RECOVERIES FOR SHARED SVCS/FLEET	**48,000**	**53,800**	**62,050**
	429,300	**463,113**	**522,030**
SURPLUS/(DEFICIT)	**-**	**537**	**-**
CATEGORY 3 NON MANDATORY SERVICES - FUNDRAISING/COMMUNITY EVENTS & GRANT FUNDED TERM PROJECTS			
FEDERAL GRANTS	329,000	329,476	**-**
FOUNDATION & OTHER GRANTS	30,000	49,000	**-**
SELF-GENERATED	-	18,000	**-**
TRANSFERS (TO)/FROM DEFERRED REVENUES	(20,000)	(24,000)	**24,000**
	339,000	372,476	**24,000**
WAGES	60,450	75,666	**9,000**
TREES/SUPPLIES	278,550	298,903	**15,000**
	339,000	374,569	**24,000**

	2023 BUDGET	2023 PROJECTION	2024 DRAFT BUDGET

CORPORATE SERVICES (GNERAL SERVICES)

GENERAL SERVICES- CORPORATE & SUPPORT FUNCTIONS			
ADMINISTRATION, GOVERNANCE, RISK,COMPLIANCE,HR,FINANCE & IM/IT			
MANDATORY/GENERAL LEVY	540,500	540,500	**433,300**
RECOVERIES/CHARGEBACKS	596,400	590,000	**661,000**
INTEREST & INVESTMENT INCOME	105,000	255,000	**210,000**
OTHER	-	1,500	**1,400**
TRANSFERS (TO)/FROM DEFERRED REVENUES	-	(25,000)	**-**
TRANSFERS (TO)/FROM RESERVES	-	(50,000)	**(44,000)**
	1,241,900	1,312,000	**1,261,700**
WAGES	865,000	848,000	**900,500**
MEMBER EXPENSES/CO DUES	55,500	60,500	**58,500**
AUDIT/LEGAL/CONSULTING	54,000	29,000	**30,000**
SUPPLIES/EQUIPT/NETWORK	93,400	97,300	**112,700**
OCCUPANCY/PHONE	150,000	148,000	**138,500**
TRAVEL & BD/STAFF MEETINGS	2,000	4,500	**5,500**
RETIREE BENEFITS	22,000	20,000	**16,000**
	1,241,900	1,207,300	**1,261,700**

CORPORATE SPECIAL PROJECTS (RECORDS/IS/IT)			
MANDATORY/GENERAL LEVY	-	-	**20,000**
TRANSFERS FROM DEF REVENUES	-	-	**25,000**
TRANSFERS FROM RESERVES	-	-	**45,000**
	-	-	**90,000**
WAGES	-	-	**10,000**
CONSULTING/OTHER	-	-	**80,000**
	-	-	**90,000**

RESERVES- MANDATORY PROGRAMS			
MANDATORY/GENERAL LEVY	325,000	325,000	**200,000**
TRANSFER TO/FROM RESERVES	(325,000)	(325,000)	**(200,000)**
	-	-	**-**

SUMMARY CORPORATE SERVICES			
MANDATORY/GENERAL LEVY	**865,500**	**865,500**	**653,300**
RECOVERIES/CHARGEBACKS	**596,400**	**590,000**	**661,000**
INTEREST	**105,000**	**255,000**	**210,000**
OTHER	**-**	**1,500**	**1,400**
TRANSFER TO/FROM DEF REVENUES	**-**	**(25,000)**	**25,000**
TRANSFER TO/FROM RESERVES	**(325,000)**	**(375,000)**	**(199,000)**
	1,241,900	**1,312,000**	**1,351,700**
WAGES & BENEFITS	**865,000**	**848,000**	**910,500**
OTHER OPERATING/SUPPLIES/PROF SERVICES	**376,900**	**359,300**	**441,200**
	1,241,900	**1,207,300**	**1,351,700**
SURPLUS/(DEFICIT)	**-**	**104,700**	**-**

NON MANDATORY SERVICES- ESSEX REGION CONSERVATION GOVERNANCE & FINANCE SUPPORTS			
FOUNDATION SUPPORT GRANT	55,000	55,000	**55,000**
ERCF-RELATED WAGE SUPPORTS	55,000	55,000	**55,000**
NET FINANCIAL SUPPORT OF/(PROVIDED BY) ERCF	-	-	**-**

RESERVES- NON-MANDATORY PROGRAMS			
NON-MANDATORY LEVY	500,000	500,000	**-**
TRANSFER TO/FROM RESERVES	(500,000)	(500,000)	**-**
	-	-	**-**

	2023 BUDGET	2023 PROJECTION	2024 DRAFT BUDGET
BUDGET SUMMARY OF PROGRAMS & SERVICES BY CATEGORY			
General Services (Administration, Finance, Human Resources, IT, & Communications)			
Municipal Levies/Cost Apportionment	722,100	725,123	**654,200**
Self-generated/Other grants	110,000	243,500	**216,400**
Shared and corporate services recoveries	596,400	590,000	**661,000**
Deferred Revenue Transfers	15,000	(10,000)	**25,000**
Reserve transfers	-	(50,000)	**1,000**
Total revenues - general/administrative programs & services	**1,443,500**	1,498,623	**1,557,600**
Wages & benefits	1,065,500	1,030,500	**1,114,500**
Office supplies & expenses - other ERCA programs	15,400	17,400	**19,900**
Occupancy, taxes & utilities	151,000	148,500	**139,500**
Equipment, software/hardware & website	73,050	71,950	**79,750**
Technical & sub-contracted services/consulting	35,000	13,000	**89,000**
Insurance	9,000	9,000	**9,000**
Audit & Legal	29,000	29,000	**29,000**
Dues & memberships	43,800	44,300	**43,800**
Travel, training & professional development	4,750	8,250	**13,750**
Board ,committee & meeting expenses	16,000	19,000	**17,500**
Bank, credit card charges and interest	1,000	2,000	**1,900**
Total operational expenses -general/administrative	1,443,500	1,392,900	**1,557,600**
Total Surplus/(Deficit)-General/Administrative Programs & Services	**-**	**105,723**	**-**
Category 1 Mandatory Programs & Services associated with Risks of Hazards, Lands & DWSP			
Total municipal cost apportionment associated with mandatory programs & services	2,173,023	2,170,000	**2,306,888**
Municipal special project	(163,200)	(43,922)	**-**
Other Government $	505,317	519,092	**226,817**
Self-generated/Other grants	695,800	804,747	**815,500**
Shared services recoveries - Non-Mandatory Programs	73,700	75,258	**78,200**
Deferred Revenue Transfers	59,750	(16,000)	**80,500**
Reserve transfers	(106,000)	(212,000)	**(180,000)**
Total revenues associated with mandatory programs & services	**3,238,390**	3,297,175	**3,327,905**
Operational Expenses associated with mandatory services			
Wages & benefits	1,925,150	1,763,993	**1,980,210**
Construction	40,000	58,500	**10,000**
Plant material	17,000	15,866	**45,500**
Site & operational supplies/services - Conservation Areas	60,550	94,709	**51,911**
Office supplies & expenses - other ERCA programs	10,465	13,577	**10,000**
Occupancy, taxes, utilities & waste removal	150,010	170,291	**166,321**
Maintenance, repairs & security-sites	70,750	18,485	**36,994**
Maintenance, repairs & supplies-fleet/equipment	119,400	121,000	**121,000**
Equipment, software/hardware & website	18,365	26,410	**14,620**
Technical & sub-contracted services/consulting	97,000	259,264	**210,500**
Insurance	129,700	137,767	**137,967**
Audit & Legal	5,000	26,980	**20,000**
Dues & memberships	1,500	1,750	**1,500**
Travel, training & professional development	6,500	11,005	**6,198**
Board ,committee & meeting expenses	4,600	4,600	**4,600**
Bank, credit card charges and interest	13,800	12,040	**12,040**
Fleet/Equipment replacement	210,000	185,000	**92,000**
Allocated corporate recoveries	358,600	328,143	**406,544**
Total operational expenses -mandatory programs	**3,238,390**	**3,249,380**	**3,327,905**
Operating surplus/(Deficit) - mandatory programs/services	**-**	**47,795**	**-**
Capital projects associated with Category 1 Programs & Services			
Total municipal cost apportionment associated with capital projects/infrastructure	-	-	**10,000**
Transfers from Infrastructure Reserve	397,500	394,750	**563,000**
Grants from ERCF/Other funders	656,700	185,700	**682,000**
Total revenues associated with capital projects/infrastructure	**1,054,200**	**580,450**	**1,255,000**
Construction/engineering-ERCA capital projects (transferred to TCA at y/e)	1,040,700	570,950	**1,242,000**
Wages	13,500	9,500	**13,000**
Capitalized Infrastructure replacement			
Total ERCA infrastructure investment	**1,054,200**	**580,450**	**1,255,000**
Surplus/(Deficit) - Capital Projects	-	-	-

	2023 BUDGET	2023 PROJECTION	2024 DRAFT BUDGET
Category 3 Non-Mandatory Programs & Services			
On-going recurring core watershed programs & services			
Municipal cost apportionment	873,112	873,112	**317,262**
Other Government $	249,688	279,688	**242,688**
Self-generated/Other grants	895,100	948,850	**925,750**
Deferred Revenue Transfers	162,200	145,300	**161,485**
Reserve Transfers	(515,000)	(509,500)	**(28,000)**
Total revenues-ongoing non-mandatory programs & services	**1,665,100**	**1,737,450**	**1,619,185**
Expenses associated with ERCA ongoing non-mandatory programs & services			
Wages & benefits	791,350	867,940	**778,695**
Construction& consulting engineering	65,000	85,000	**45,000**
Plants, removals and landowner subsidies	254,500	235,500	**222,500**
Supplies	96,807	101,870	**100,450**
Maintenance, repairs & security	32,200	34,800	**28,150**
Occupancy, taxes, utilities & waste removal	75,053	68,003	**65,400**
Equipment, software/hardware & website	16,400	12,450	**37,800**
Lab, data, technical & sub-contracted services	19,000	26,000	**16,500**
Insurance	42,350	43,800	**41,300**
Audit & legal	5,000	5,000	**5,000**
Dues & memberships	4,650	4,150	**4,150**
Travel, training & professional development	2,590	2,690	**2,390**
Board ,committee & meeting expenses	-	300	**300**
Bank, credit card charges and interest	11,700	13,500	**13,000**
In-kind supplies & services	30,000	18,500	**10,000**
Land acquisition & acquisition assistance	-	-	**-**
Land acquisition	-	-	**-**
Shared services allocations	218,500	232,256	**248,550**
Other misc. supplies	-	-	**-**
	1,665,100	**1,751,759**	**1,619,185**
svcs	**-**	**(14,309)**	**-**
Category 3 Non-Mandatory Programs & Services			
Term-limited projects with special grants and fixed terms			
Municipal Special Project/Fee For Service	-	-	**-**
Other Government $	782,959	785,535	**192,100**
Self-generated/Other grants	100,000	138,962	**99,200**
Deferred Revenue Transfer	56,600	55,739	**39,500**
Total Revenues associated with term limited 3rd-party funded projects & services	**939,559**	**980,236**	**330,800**
Expenses associated with term limited 3rd-party funded projects & services			
Wages & benefits	311,934	328,420	**186,500**
Construction& consulting engineering	330,300	299,480	**40,000**
Plants, removals and landowner subsidies	99,500	97,322	**34,000**
Program supplies-	45,500	77,954	**5,000**
Occupancy, taxes, utilities & waste removal	600	600	**5,000**
Equipment, software/hardware & website	58,400	86,028	**1,800**
Lab, data, technical & sub-contracted services	14,800	17,075	**1,800**
Insurance, audit & legal	3,500	3,300	**4,300**
Travel, training & professional development	500	182	**900**
Bank, credit card charges and interest	-	-	**-**
In-kind supplies & services	-	462	**-**
Shared services allocations	74,525	71,505	**51,500**
Other supplies	-	-	**-**
	939,559	**982,329**	**330,800**
Surplus/(Deficit) assoc. with term limited 3rd party funded projects & services	**-**	**(2,093)**	**-**
Capital projects associated with Category 3 Non-Mandatory Programs & Services			
Transfers from Infrastructure Reserve	179,000	316,000	**370,000**
Grants from ERCF/Other funders	159,500	159,500	**-**
Total revenues - Cat 3 capital projects/infrastructure	**338,500**	**475,500**	**370,000**
Construction/engineering-ERCA capital projects (transferred to TCA at y/e)	327,750	464,750	**357,500**
Wages	10,750	10,750	**12,500**
Capitalized Infrastructure replacement			
Total expenses- Cat 3 capital projects/infrastructure	***338,500***	***475,500***	**370,000**
Surplus/(Deficit) - Cat 3 capital projects	-	-	-

	2023 BUDGET	2023 PROJECTION	2024 DRAFT BUDGET
Category 2 Programs & Services (provided on behalf of one or more municipalities through agreement)			
Municipal special project	17,100	14,600	**14,600**
Total operating revenues - municipal programs & services	**17,100**	14,600	**14,600**
Wages & benefits	11,600	9,100	**9,100**
Office supplies & expenses	500	500	**500**
Equipment, software/hardware & website	-	-	**-**
Insurance	2,000	2,000	**2,000**
Travel, training & professional development	1,500	1,500	**1,500**
Shared/corporate services	1,500	1,500	**1,500**
Other	-	-	**-**
total expenses	17,100	14,600	**14,600**
Total operating expenses -municipal programs & services	17,100	14,600	**14,600**
Total Surplus/(Deficit)-Cat 2 Municipal Programs/Services	**-**	**-**	**-**
Cost Apportionment for Mandatory Programs	**2,895,123**	**2,895,123**	**2,971,088**
Cost Apportionment for Non-Mandatory Programs	**873,112**	**873,112**	**317,262**
Total Municipal Cost Apportionment	**3,768,235**	**3,768,235**	**3,288,350**

CONSOLIDATED STATEMENT OF FINANCIAL ACTIVITIES-ALL CATEGORIES

	2023 BUDGET	2023 PROJECTION	2024 DRAFT BUDGET
Mandatory cost apportionment	$ 2,895,123	$ 2,895,123	**$ 2,971,088**
Non-mandatory cost apportionment	873,112	873,112	**317,262**
Total Municipal Levy	**3,768,235**	**3,768,235**	**3,288,350**
Water & erosion control infrastructure and special projects	(163,200)	(43,922)	-
Risk management services	17,100	14,600	**14,600**
	3,622,135	**3,738,913**	**3,302,950**
Provincial			
Section 39 Flood/Erosion Program	104,417	104,417	**104,417**
Drinking Water Source Protection	96,900	96,900	**114,400**
Other (CMOG, SEO etc)	536,672	542,077	**563,688**
	737,989	**743,394**	**782,505**
Federal	**1,372,975**	**1,062,921**	**359,100**
Total Government Transfer Payments & Fees-For-Services	**5,733,099**	**5,545,228**	**4,444,555**
Other revenues			
Permit and applicant fees - mandatory services	599,000	672,800	**706,000**
Admissions, program fees & other services	744,300	752,347	**799,600**
Leases & property rentals	83,100	84,000	**94,000**
Donations and other grants			
General	51,500	126,500	**15,000**
Essex Region Conservation Foundation grants	218,000	256,450	**222,250**
In-kind contributions	30,000	18,962	**10,000**
Interest income	105,000	255,000	**210,000**
Total other revenues	**1,830,900**	**2,166,059**	**2,056,850**
Transfers from/(to) deferred revenues	506,750	268,239	**508,485**
Interdepartmental recoveries	796,100	806,058	**870,200**
TOTAL REVENUES	**$ 8,866,849**	**$ 8,785,584**	**$ 7,880,090**
EXPENSES BY CLASSIFICATION			
Wages & benefits	4,129,784	4,020,204	**4,094,505**
Construction-municipal projects	58,000	172,764	**155,000**
Construction-special grant projects	357,800	321,993	**42,000**
Construction-ERCA capital projects	1,328,300	1,090,800	**1,491,000**
Plant material, removals and landowner subsidies-special grant projects	352,000	334,822	**262,000**
Plant material, removals and landowner subsidies - ERCA operations	24,000	13,866	**45,000**
Program supplies- special grant projects	48,485	54,162	**41,850**
Site & operational supplies - Conservation Areas	133,450	137,209	**136,761**
Office supplies & expenses - other ERCA operations	63,487	99,339	**34,150**
Occupancy, taxes, utilities & waste removal	375,663	386,894	**375,221**
Maintenance, repairs & security-sites	103,950	53,785	**66,144**
Maintenance, repairs & supplies-fleet/equipment	119,400	121,000	**121,000**
Equipment, software/hardware & website - special grant projects	59,900	87,538	**5,300**

	2023 BUDGET	2023 PROJECTION	2024 DRAFT BUDGET
Equipment, software/hardware & website - ERCA operations	107,515	110,500	**223,670**
Lab, data, technical & sub-contracted services - special grant	57,800	77,141	**13,000**
Lab, data, technical & sub-contracted services - ERCA operations	74,500	96,478	**68,800**
Insurance	186,550	195,867	**194,567**
Audit, legal & consulting services	84,000	92,923	**143,000**
Dues & memberships	49,950	50,200	**49,450**
Travel, training & professional development	14,340	22,127	**23,238**
Board ,committee & meeting expenses	20,600	23,900	**22,400**
Bank, credit card charges and interest	26,500	27,540	**26,940**
In-kind supplies & services	30,000	18,962	**10,000**
Land acquisition & acquisition assistance	-	-	**-**
Amortization	375,500	389,500	**393,500**
Internal recoveries included in revenues	806,375	792,704	**869,094**
TOTAL EXPENSES	$ 8,987,849	$ 8,792,218	**$ 8,907,590**

Total Revenues	8,866,849	8,785,584	**7,880,090**
Total Expenses	8,987,849	8,792,218	**8,907,590**
SURPLUS/(DEFICIT) (ACCRUAL BASIS)	**(121,000)**	**(6,634)**	**(1,027,500)**
ADD/SUBTRACT: NON CASH ITEMS			
Donation of land to ERCA	-	-	**-**
Gain/loss on asset disposal	-	-	**-**
Amortization	375,500	389,500	**393,500**
Transfers from Reserves (Per Schedule)	-	-	**-**
DEDUCT: CAPITAL ITEMS			
Land acquisition	-	-	**-**
Purchased fleet/equipment	(210,000)	(185,000)	**(92,000)**
Infrastructure additions	-	-	**-**
(DECREASE)/INCREASE IN NET SURPLUS (prior to reserve transfers)	**44,500**	**197,866**	**(726,000)**
TRANSFER (TO)/FROM RESERVES (Per Schedule)	**(44,500)**	**(60,750)**	**726,000**
INCREASE/(DECREASE) IN UNRESTRICTED ACCUMULATED OPERATING FUND SURPLUS	**$ -**	**$ 137,116**	**$ -**

Appendix B - 2024 Draft Municipal Levies

MUNICIPAL COST APPORTIONMENT – Categories 1 (Mandatory) & Category 3 (Non-Mandatory)

MUNICIPALITY	CVA %	CVA %	Cat 1 Mandatory	General	Cat 1 Mandatory Apportion ment % Chg	Cat 3 Non-Mandatory*	CW~GS LEVY	Cat 3 Non-Mandatory Apportion ment % Chg	Total	Apportionment		
	2024	2023	2024	2023	$ Chg	2024	2023	% CHG	2024	2023	2024-2023	% CHG
			DRAFT	APPROVED		DRAFT	APPROVED		DRAFT	APPROVED		
			$2,971,088	$2,895,123	2.6%	$317,262	$873,112	-63.7%	$3,288,350	$3,768,235	(479,885)	-12.7%
TOWN OF AMHERSTBURG	6.14%	6.07%	**$ 182,495**	$ 175,773	**$ 6,722**	$ 19,487	$ 53,010	**$ (33,522)**	$ 201,982	$ 228,783	$ (26,800)	**-11.7%**
TOWN OF ESSEX	4.86%	4.86%	**144,517**	140,591	**3,926**	$ 15,432	42,400	**(26,968)**	159,949	182,991	(23,042)	**-12.6%**
TOWN OF KINGSVILLE	6.57%	6.44%	**195,230**	186,474	**8,756**	$ 20,847	56,237	**(35,390)**	216,078	242,711	(26,634)	**-11.0%**
MUNICIPALITY OF LAKESHORE	9.88%	9.77%	**293,519**	282,974	**10,546**	$ 31,343	85,339	**(53,996)**	324,862	368,313	(43,451)	**-11.8%**
TOWN OF LASALLE	9.04%	9.03%	**268,552**	261,314	**7,238**	$ 28,677	78,807	**(50,130)**	297,229	340,121	(42,892)	**-12.6%**
MUNICIPALITY OF LEAMINGTON	6.34%	6.21%	**188,358**	179,796	**8,561**	$ 20,113	54,223	**(34,110)**	208,471	234,019	(25,548)	**-10.9%**
TOWNSHIP OF PELEE	0.28%	0.27%	**8,187**	7,910	**277**	$ 874	2,385	**(1,511)**	9,061	10,295	(1,234)	**-12.0%**
TOWN OF TECUMSEH	8.16%	8.22%	**242,555**	238,054	**4,502**	$ 25,901	71,792	**(45,891)**	268,456	309,846	(41,390)	**-13.4%**
CITY OF WINDSOR	48.73%	49.13%	**1,447,675**	1,422,238	**25,437**	$ 154,587	428,919	**(274,332)**	1,602,262	1,851,156	(248,895)	**-13.4%**
TOTALS	**100%**	**100%**	**$ 2,971,088**	**$ 2,895,123**	**$ 75,965**	**$ 317,262**	**$ 873,112**	**$ (555,850)**	**$3,288,350**	**$ 3,768,235**	**$ (479,885)**	**-12.7%**

The Authority must have municipal cost apportioning agreements in place by March 31, 2024, including a Resolution of respective Councils, to cost apportion for the Category 3 non-mandatory programs and services.

Appendix D: 2024 Funding Sources by Service Delivery Program Area

Essex Region Conservation Authority — sustaining the place for life

2024	
CVA in the watershed	47,167,643,995
Population in the watershed	317,761

2024 FUNDING SOURCES BY SERVICE DELIVERY AREA

Dept/Category of Program	Program Sub-Unit	Budgeted Expenses/Transfers	Mandatory Levy	Non-Mandatory Levy	Municipal Special	Provincial Transfer Payments	Other Provincial	Federal	Fees/NGO Grants/ Def Rev	(To)/From Reserves	Total	Levy %	Levy Per Household ($300k)
Watershed Management Programs & Services													
Cat 1 -Risks of Natural Hazards	Development Services	$ 1,116,750	$ 540,750	$ -	$ -	$ -	$ -	$ -	$ 576,000	$ -	$ 1,116,750	48%	$ 3.44
Cat 1 -Risks of Natural Hazards	Planning- Hazards	156,650	26,650	-	-	-	-	-	130,000	-	156,650	17%	$ 0.17
Cat 1 -Risks of Natural Hazards	Flood Forecasting & Warning	210,500	106,083	-	-	104,417	-	-	-	-	210,500	50%	$ 0.67
Cat 1 -Risks of Natural Hazards	Watershed Resources Management Strategies/Policies	224,500	152,500	-	-	-	-	-	42,000	30,000	224,500	68%	$ 0.97
Cat 1 -Risks of Natural Hazards	Special Projects (municipal/other)	30,000	-	-	-	-	-	-	30,000	-	30,000	0%	$ -
Watershed Management Summary		1,738,400	825,983	-	-	104,417	-	-	778,000	30,000	1,738,400	48%	$ 5.25
Conservation Programs & Services													
Cat 1 - Conservation of Lands	Conservation Areas Infrastructure Projects	1,255,000	10,000	-	-	-	400,000	80,000	202,000	563,000	1,255,000	1%	$ 0.06
Cat 1 - Conservation of Lands	Conservation Areas & Infrastructure Maintenance	1,062,255	954,255	-	-	-	-	-	108,000	-	1,062,255	90%	$ 6.07
Cat 1 - Conservation of Lands	Transfer to AMP/Infrastructure Reserve - Cons Areas/Greenways	210,000	200,000	-	-	-	-	-	10,000	-	210,000	95%	$ 1.27
Cat 1 - Conservation of Lands	Cons Areas Management Plans, Land Strategies and Operations Oversight	203,400	195,400	-	-	-	-	8,000	-	-	203,400	96%	$ 1.24
Cat 1 - Conservation of Lands	Tree Planting & Restoration - Conservation Areas	89,700	89,700	-	-	-	-	-	-	-	89,700	100%	$ 0.57
Cat 1 - Conservation of Lands	Fleet/Equipment	232,400	23,200	-	-	-	-	-	209,200	-	232,400	10%	$ 0.15
Cat 3-Non Mandatory Services	Land Acquisition (Property surveys-CASO)/Legal)	57,500	-	-	-	-	-	-	57,500	-	57,500	0%	$ -
Cat 3-Non Mandatory Services	Treeplanting/Restoration- Non ERCA Properties	529,700	-	75,000	-	-	50,000	160,000	244,700	-	529,700	14%	$ 0.48
Cat 3-Non Mandatory Services	Holiday Beach Management	386,000	-	-	-	-	-	-	386,000	-	386,000	0%	$ -
Cat 3-Non Mandatory Services	HBCA Emergency Repairs Reserve	13,000							13,000		13,000	0%	$ -
Cat 3 -Fee for Service/ Contracts	Term Restoration Projects (Municipal/Other)	68,000	-	-	-	-	-	-	68,000	-	68,000	0%	$ -
Cat 3 -Fee for Service/ Contracts	Fee For Service Property Maintenance	31,200	-	-	-	-	-	-	31,200	-	31,200	0%	$ -
Conservation/Lands Summary		4,138,155	1,472,555	75,000	-	-	450,000	248,000	1,329,600	563,000	4,138,155	37%	$ 9.84
Water Quality Programs & Services													
Cat 1 - Drinking Water Source Protection	Mandatory Drinking Water Source Protection (SPA)	114,400	-	-	-	114,400	-	-	-	-	114,400	0%	$ -
Cat 1-Provincial Ground and Source Water Monitoring	Mandatory Provincial Ground and Surface Water Monitoring PGM	18,350	18,350	-	-	-	-	-	-	-	18,350	100%	$ 0.12
Cat 2 Municipal Services	Risk Management Services	14,600	-	-	14,600	-	-	-	-	-	14,600	0%	$ -
Cat 3 -Non Mandatory Services	ERCA Water Quality Program/Site Monitoring	68,955	-	25,000	-	-	-	-	43,955	-	68,955	36%	$ 0.16
Cat 3 -Non Mandatory Services	Agricultural Stewardship/Extension Services	-	-	-	-	-	-	-	-	-	-	0%	$ -
Cat 3- Special/Term Projects	Detroit River CDN Coalition	180,500	-	-	-	-	90,000	75,000	15,500	-	180,500	0%	$ -
Cat 3- Special/Term Projects	Fee for Service WQ Monitoring/Sampling	27,100	-	-	-	-	-	27,100	-	-	27,100	0%	$ -
Watershed Research Summary		423,905	18,350	25,000	14,600	114,400	90,000	102,100	59,455	-	423,905	10%	$ 0.28
Community Outreach/Heritage Programs & Services													
General Programs - Mandatory	Corporate Communications	205,900	200,900	-	-	-	-	-	5,000	-	205,900	98%	$ 1.28

Appendix D: 2024 Funding Sources by Service Delivery Program Area (continued)

2024 FUNDING SOURCES BY SERVICE DELIVERY AREA													
Dept/Category of Program	Program Sub-Unit	Budgeted Expenses/Transfers	Mandatory Levy	Non-Mandatory Levy	Municipal Special	Provincial Transfer Payments	Other Provincial	Federal	Fees/NGO Grants/ Def Rev	(To)/From Reserves	Total	Levy %	Levy Per Household ($300k)
Cat 3 -Non Mandatory Services	John R Park Homestead-Museum Operations/Ed'n Program	340,550	-	145,112	-	-	23,688	9,000	162,750	-	**340,550**	**43%**	$ 0.92
Cat 3 -Non Mandatory Services	Transfer to John R Park Homestead Preservation Reserve Fund	15,000	-	15,000	-	-	-	-	-	-	**15,000**	**100%**	$ 0.10
Cat 3 -Non Mandatory Services	John R Park Homestead-Museum/Heritage Bldgs Repairs	370,000			-	-	-	-	-	370,000	**370,000**	**0%**	$ -
Cat 3 -Non Mandatory Services	Outreach & Partnerships	81,150	-	57,150	-	-	-	-	24,000	-	**81,150**	**70%**	$ 0.36
Cat 3 -Non Mandatory Services	Outdoor & Conservation Education	100,330	-	-	-	-	-	-	100,330	-	**100,330**	**0%**	$ -
Cat 3 -Non Mandatory Projects	Grant -funded Projects/Events	24,000	-	-	-	-	-	-	24,000	-	**24,000**	**0%**	$ -
Community Outreach Summary		**1,136,930**	**200,900**	**217,262**	**-**	**-**	**23,688**	**9,000**	**316,080**	**370,000**	**1,136,930**	**37%**	**$ 2.66**
General & Corporate Services													
Mandatory	**Corporate Services**	**1,261,700**	**433,300**	**-**	**-**	**-**	**-**	**-**	**828,400**	**-**	**1,261,700**	**34%**	**$ 2.76**
Mandatory	**Interest Transfer to AMP/Infrastructure Reserve**	**44,000**		**-**	**-**	**-**	**-**	**-**	**44,000**		**44,000**	**0%**	**$ -**
Mandatory	**Corporate Special Projects**	**90,000**	**20,000**	**-**	**-**	**-**	**-**	**-**	**25,000**	**45,000**	**90,000**	**22%**	**$ 0.13**
Non Mandatory Services	**Essex Region Conservation Foundation (grant-funded) Supports**	55,000	-	-	-	-	-	-	55,000	-	55,000	**0%**	$ -
General & Corporate Services Summary		**1,450,700**	**453,300**	**-**	**-**	**-**	**-**	**-**	**952,400**	**45,000**	**1,450,700**	**31%**	**2.88**
		$ 8,888,090	$ 2,971,088	$ 317,262	$ 14,600	$ 218,817	$ 563,688	$ 359,100	$ 3,435,535	$ 1,008,000	$ 8,888,090	37%	$ 20.91
Mandatory Services (BOLDED)		$ 6,525,505	$ 2,971,088	$ -	$ -	$ 218,817	$ 400,000	$ 88,000	$ 2,209,600	$ 638,000	$ 6,391,505	46%	$ 18.90
Non Mandatory Services		$ 2,362,585	$ -	$ 317,262	$ 14,600	$ -	$ 163,688	$ 271,100	$ 1,225,935	$ 370,000	$ 2,496,585	13%	$ 2.02

Essex Region Conservation Authority

Board of Directors BD02/24

From: Jenny Gharib, HMCA Restoration and Adaptation Strategy Coordinator
Kevin Money, Director of Conservation Services

Date: Tuesday, January 30, 2024

Subject: **Hillman Marsh Climate Adaptation and Restoration Plan**

Compliance Action: *Conservation Authorities Act, R.S.O. 1990, c. C.27*
O. Reg. 686/21: Mandatory Programs and Services

Recommendation: **THAT BD02/24 Hillman Marsh Climate Adaptation and Restoration Plan be approved; and further,**

THAT ERCA continue to collaborate with Caldwell First Nation and other partners to implement the Hillman Marsh Conservation Area Climate Adaptation and Restoration Plan.

Summary

- Hillman Marsh is highly susceptible to coastal erosion and wetland loss due to such factors as negative sediment supply, variability in ice cover, extreme water level fluctuations, and increased frequency and intensity of storm events. These factors have resulted in the loss of the barrier beach, the loss aquatic vegetation, and increased vulnerability of sensitive marsh habitat.
- ERCA has worked with a multi-sector Steering Committee including the general public over the last 1.5 years to develop a Restoration Plan and explore various Restoration Concepts. A final concept was endorsed by the steering committee and vetted through public engagement processes.
- ERCA is applying for further funding from Environment and Climate Change Canada to begin numerical and physical modelling, and eventually will proceed with the implementation of the restoration plan, including required construction.

Discussion

In the Great Lakes, wetlands are facing a systemic threat due to the multiple and repeated stresses from land-based activities and the compounding impacts of climate change. In response to these climatic and non-climatic stressors, barrier-protected wetlands have experienced accelerated erosion, overwash, and breaching leading to the removal or burial of vegetation, damage to infrastructure, and the loss of valuable habitat, species, and general ecosystem decline.

The Hillman Marsh Conservation Area, located in Leamington, Ontario, is a barrier-protected coastal wetland that exists on a historically eroding shoreline. Erosion was accelerated with the construction of the Wheatley harbour in the early 1900's, and the attached jetty and breakwater later that century that resulted in significant impacts on the movement of sediment in the littoral cell. To protect shoreline development and homes from erosion and flooding, the shoreline was hardened, cutting off the natural supply of sediment that nourished and maintained the barrier beach, and likely accelerated nearshore downcutting of the lakebed. The barrier beach historically sheltered the marsh from lake waves and allowed wetland vegetation to thrive, however, in 2017, a sudden rise in water levels and increase in wave exposure resulted in significant barrier beach erosion. Record high lake levels and storms, and near record low ice cover in the following years resulted in the rapid expansion of a breach to a record of 500 metres, leaving Hillman Marsh exposed to the forces of Lake Erie. Over time, what is left of the barrier is rapidly eroding, resulting in the loss of more marsh habitat, submerged aquatic vegetation, and endangered and rare species. Ice-free winters and higher lake levels due to climate change are expected to exacerbate these challenges to the overall resilience of the marsh and barrier beach.

The current process and ultimately, the generated restoration plan aims to restore and enhance the Hillman Marsh barrier beach and wetland plant community to withstand future climate change extremes, provide safe habitat for native species, and safeguard surrounding homes and businesses.

With the implementation of this restoration project, a measurable increase in habitat quality, water quality, and biodiversity can be expected with the successful implementation of this project. The variety of habitats, supporting hundreds of rare and endangered birds, fish, and other wetland organisms will be restored, and native species will be able to thrive. Economic damages could be mitigated with a barrier to act as a buffer between the lake and the marsh, protecting hundreds of homes and businesses that currently reside below lake level.

Data collection, analysis, and literature review have guided the process of preparing three potential restoration concepts. These concepts include an artificial barrier made of a rock core and topped with sand, habitat islands, fish refugia, and extensive revegetation of both the beach and the marsh. The three concepts vary mainly by the difference in barrier size, with Concept A being high-crested and not allowing for overwash and sediment deposition along the backbarrier, and Concept B and C having a low crested barrier that does allow for overwash, making the barrier more dynamic.

Based on the opinion of experts on our Core Team and Steering Committee, and with consultation with the general public, ERCA recommends the project moving forward with Concept A as the preferred approach. The high crested barrier protects the marsh more effectively than the low crested barrier, providing the greatest opportunities for habitat restoration and vegetation re-establishment both on the barrier and in the back shore. Concept A is more robust and therefore more resilient against wave action, storm events, erosional forces, and the potential for future climate change extremes.

Following discussions with various experts, ERCA acknowledges that a low crested barrier presents a more dynamic system that could be better suited for wildlife and provide the beneficial processes and structure for a healthy wetland. However, concerns remain that Hillman Marsh may not be able to withstand the impact of a dynamic system without significant risk, given Hillman Marsh's current exposed state. In the subsequent phase of this project, numerical and physical modelling will be conducted by consultants to test the limits of a structure that has variable crest elevations and if areas of both high and low crested barrier beach can be accommodated without compromising the wetland, then this option could provide for a more biologically diverse project and will be recommended for development and construction.

Caldwell First Nation has been part of the Steering Committee since its inception. As the only additional landowner in the marsh, Caldwell First Nation have been fully consulted with but at this time, is withholding opinions and wishes to continue participation with the consultive process and dialogue with Caldwell leadership. Administration has committed to continuing full consultation with Caldwell First Nation in anticipation of securing full funding for this project.

Approved By:

Tim Byrne
CAO/Secretary Treasurer

Attachments:

- Hillman Marsh Conservation Area Restoration Plan

HILLMAN MARSH CONSERVATION AREA

RESTORATION PLAN

PREPARED BY

ESSEX REGION CONSERVATION AUTHORITY

PREPARED FOR

ENVIRONMENT AND CLIMATE CHANGE CANADA

Acknowledgments

Report prepared by:

- Jenny Gharib (ERCA)
- Kevin Money (ERCA)
- Peter Zuzek (Zuzek Inc.)
- Seth Logan (SJL Engineering)
- Greg Mayne (ECCC)
- Richard Kavanagh (ECCC)

Funding support provided by Environment and Climate Change Canada.

Essex Region Conservation Authority
sustaining the place for life

Environment and Climate Change Canada
Environnement et Changement climatique Canada

Cover photo: Wayne King (Leamington Shoreline Association)

Copies of this report may be obtained from:

Essex Region Conservation Authority
360 Fairview Ave. W., Suite 311
Essex ON N8M 1Y6

Recommended Citation:

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Executive Summary

In the Great Lakes, wetlands are facing a systemic threat due to the multiple and repeated stresses from land-based activities and the compounding impacts of climate change. In response to these climatic and non-climatic stressors, barrier-protected wetlands experience accelerated erosion, overwash, and breaching leading to the removal or burial of vegetation, damage to infrastructure, and the loss of valuable habitat, species, and ecosystem services.

The Hillman Marsh Conservation Area, located in Leamington, Ontario, is a barrier-protected coastal wetland that exists on a historically eroding shoreline. Erosion was accelerated with the construction of the Wheatley harbour in the early 1900's, and the attached jetty and breakwater later that century that resulted in significant impacts on the movement of sediment in the littoral cell. To protect shoreline development and homes from erosion and flooding, the shoreline was hardened, cutting off the natural supply of sediment that nourished and maintained the barrier beach, and likely accelerated nearshore downcutting of the lakebed. The barrier beach historically sheltered the marsh from lake waves and allowed wetland vegetation to thrive, however, in 2017, a sudden rise in water levels and increase in wave exposure resulted in significant barrier beach erosion. Record high lake levels and storms, and near record low ice cover in the following years resulted in the rapid expansion of a breach to a record of 500 metres, leaving Hillman Marsh exposed to the forces of Lake Erie. Over time, what is left of the barrier is rapidly eroding, resulting in the loss of more marsh habitat, aquatic vegetation, and endangered and rare species. Ice-free winters and higher lake levels due to climate change are expected to exacerbate these challenges to the overall resilience of the marsh and barrier beach.

Hillman Marsh contains spawning, nesting, and feeding habitat for a diverse number of species, including many species at risk. Most notably, populations of Common Hop Tree and Scarlet Ammannia, which were originally located on the barrier beach, have been completely lost due to the extensive erosion that occurred in 2017. Other rare, threatened, or endangered species that nest along the shoreline or in the marsh include the American Lotus, King Rail, Large Yellow Pond-lily, Least Bittern, Prothonotary Warbler, Swamp Rose-mallow, and several turtle species including Northern Map, Snapping, Spiny Softshell, Midland Painted, and Blanding's Turtle. Its diverse range of species and habitats, and continuously changing conditions provides a plethora of opportunities for environmental education and scientific research. Hillman Marsh is situated on the traditional territory of Caldwell First Nation and is a location of traditional use and knowledge. It has been a community staple in Essex-County for many decades hosting summer camps, nature tours, bird watching, educational field trips, and hunting events. There are vast amounts nature-based opportunities that benefit human health and give a source of identity, spiritual fulfillment, and cultural connection to the Great Lakes.

This restoration plan aims to restore and enhance the Hillman Marsh barrier beach and wetland plant community to withstand future climate change extremes, provide optimal habitat for native species, and safeguard surrounding homes and businesses. Data collection, analysis, and literature review have guided the process of preparing three potential restoration concepts. These concepts include an artificial barrier made of a rock core and topped with sand, habitat islands, fish refugia, and extensive revegetation of both the beach and the marsh. The three concepts vary mainly by the difference in barrier size, with Concept A being high-crested and not allowing for overwash and sediment deposition along the backbarrier, and Concept B and C having a low crested barrier that does allow for overwash, making the barrier more dynamic. Based on the opinion of experts on our Core Team and Steering Committee, and the opinion of the majority of the general public, ERCA recommends this project moves forward with Concept A as the preferred approach. The high crested barrier protects the marsh more effectively than the low crested barrier, providing the greatest opportunities for habitat restoration and vegetation re-establishment both on the barrier and behind it. Concept A is more robust and therefore more resilient against wave action, storm events, erosional forces, and future climate change extremes. Through in-depth discussions with various experts, ERCA recognizes that a low crested barrier presents a more dynamic system that will be better suited for wildlife and provides the fundamental services and structure for a healthy wetland. However, concerns remain that Hillman Marsh may not be able to handle this dynamic system, without failing, given its current state. Moving forward, numerical and physical modelling will be conducted by engineers to test the possibility of a structure that has variable crest elevations. If areas of both high and low crested barrier beach can be accommodated without compromising the wetland, then it will provide for a more biologically diverse outcome and will be pursued.

Caldwell First Nation has been part of the steering committee since its inception, but as the only other landowners in the marsh, staff would prefer to not commit to any preferred option, but instead to continue ongoing consultation with their leadership and community regarding their opinions. Administration has committed to continuing to work and communicate with and seek feedback from Caldwell First Nation if funding for this project is approved and it can move forward.

An increase in habitat quality, water quality, and biodiversity can be expected with the successful implementation of this project. The variety of habitats, which support hundreds of rare and endangered birds, fish, and other wetland organisms will be restored, and native species will be able to thrive. Economic damages will be avoided with a barrier to act as a buffer between the lake and the marsh, protecting hundreds of homes and businesses that currently reside below lake level.

Hillman Marsh Conservation Area Restoration Plan

1.0 Introduction

Great Lakes coastal wetlands provide indispensable benefits to the freshwater ecosystem, people, and the economy. Coastal wetlands absorb and cycle nutrients, accumulate sediments, and trap pollutants, subsequently improving water quality, mitigating erosion, and sequestering carbon. They provide crucial habitat for a wide range of species, many of which are endangered or threatened. In the Great Lakes, these wetlands are facing a systemic threat due to the multiple and repeated stresses from land-based activities and the compounding impacts of climate change. In response to these climatic and non-climatic stressors, barrier-protected wetlands experience accelerated erosion, overwash, and breaching leading to the removal or burial of vegetation, damage to infrastructure, and the loss of valuable habitat, species, and ecosystem services.

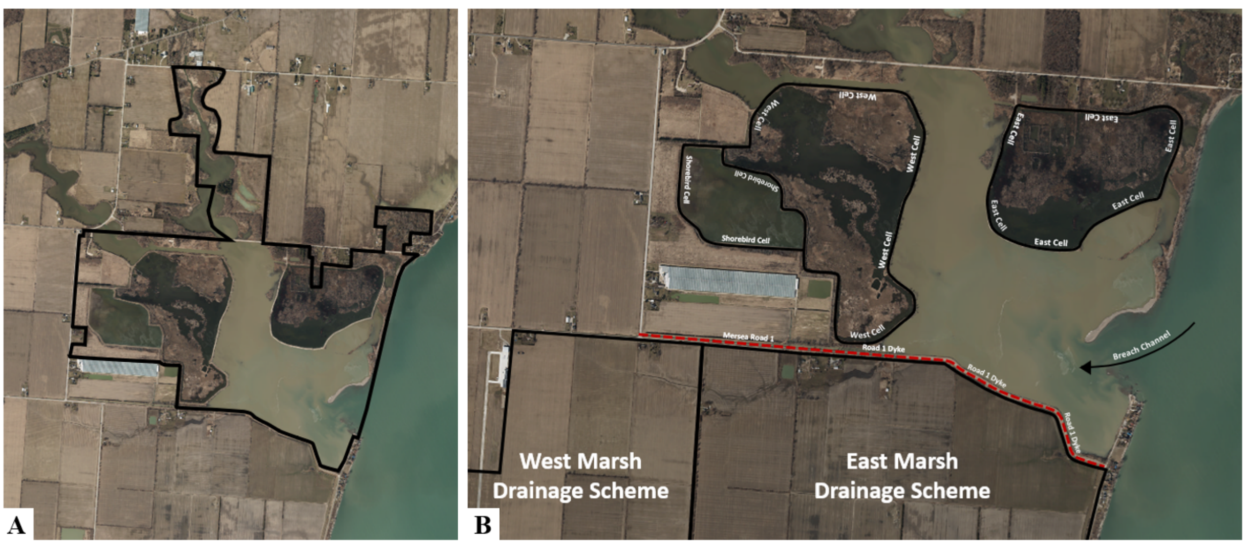


Figure 1: (A) Map of the extent of HMCA (covers 980 acres). (B) Map that depicts location of the West, East, and Shorebird Cells, the Road 1 dyke, and the East and West Marsh Drainage Schemes.

The Hillman Marsh Conservation Area (HMCA) is located in Leamington, Ontario, on the eastern shore of the Point Pelee Peninsula (a low-lying glacial sediment shoreline), and covers 980 acres (Fig. 1A, 3). It is a part of the Carolinian Canada region, preserving rare and endangered species (Baird, 2007). HMCA is a part of the Hillman Creek watershed that drains into Lake Erie, and falls under the jurisdiction of the Essex Region Conservation Authority. Hillman Marsh is a historically eroding shoreline however this erosion was accelerated with the construction of the Wheatley harbour in the early 1900's and the attached jetty and breakwater later that century. This development resulted in significant impacts on the movement of sediment in the littoral cell and in many cases created new sub-cells with little to no sediment bypassing. To protect shoreline development and homes from erosion and flooding, the shoreline was armoured, cutting off the natural supply of sediment that nourished and maintained the barrier beach, and this likely accelerated nearshore downcutting of the lakebed (Fig. 2; Zuzek Inc., 2021).

Figure 2: Shore parallel armour stone structures along Pulley Road.

The sudden rise in water levels and increase in wave exposure in 2017 resulted in significant barrier beach erosion. Record high lake levels and storms in the following years resulted in the rapid expansion of a breach to a record of 500 metres (Fig. 3B), leaving Hillman Marsh exposed to the forces of Lake Erie and exposing the Road 1 dyke to direct wave attack (Zuzek Inc., 2021). Due to a combination of factors in the updrift portion of the littoral cell including the breakwater and jetties at Wheatley Harbour, extensive shoreline armouring, and a deep nearshore due to ongoing lakebed downcutting, the Hillman barrier beach is being starved of the sediment that it needs to naturally recover from breaching events. Over time, what is left of the barrier is rapidly eroding, resulting in the loss of more marsh habitat, submerged aquatic vegetation, and endangered and rare species. Ice-free winters and higher lake levels due to climate change are expected to exacerbate these challenges to the overall resilience of the marsh and barrier beach.

This project highlights a need for the restoration and climate adaptation of the Hillman Marsh Conservation Area, as well as the need for the Essex Region Conservation Authority to address its core mandate related to managing the risk of natural hazards. Restoring the barrier beach and marsh will provide substantial co-benefits to the region, including restoring the ecological services offered by the wetland, and mitigating the risk of catastrophic flooding due to a breach in the Road 1 dyke.

2.0 Project Background

HMCA is classified as a(n):

- Environmentally Significant Area: remnant forests, wetlands, and prairies that have survived extensive land clearance (ERCA, 1983);
- Provincially Significant Wetland: areas identified by the province as being most valuable (MNRF, 2021);
- Area of Natural and Scientific Interest: areas containing natural landscapes or features identified as having life science or earth science values related to natural heritage, protection, scientific study, or education (MNRF, 2021).

Hillman Marsh is an extensive, shallow marsh interspersed with channels and areas of open water (Fig. 4). Agricultural fields surround the marsh on most sides, with Lake Erie bordering the east side. In 1989, dykes were constructed creating two wetland cells in the marsh that allow for water level control carried out by a pumping station (Fig. 1B). Drawdowns are completed every 10-15 years, removing most of the water from the cell, exposing the mudflats and allowing for seeds to germinate. In the past, this has resulted in a 30-48% increase in vegetation cover (Lebedyk, 2008). The original marsh that formed at the confluence of the Lebo and Hillman Creeks was historically sheltered from Lake Erie by the Hillman Marsh barrier beach, a 1.5 km long eastern facing barrier beach. The sheltering from lake waves allowed wetland vegetation to thrive, however, in 2017, a storm-induced breach removed the buffer between the marsh and Lake Erie.

Figure 3: Hillman Marsh is located on the Point Pelee Peninsula, extending south of the shore of Essex-County. (A) The Wheatley Harbour and attached jetty have trapped or removed 525,000 m³ of sediment from the downdrift shoreline. directly affecting (B) the Hillman Marsh Barrier Beach, a 1.5 km long, eastern-facing shoreline.

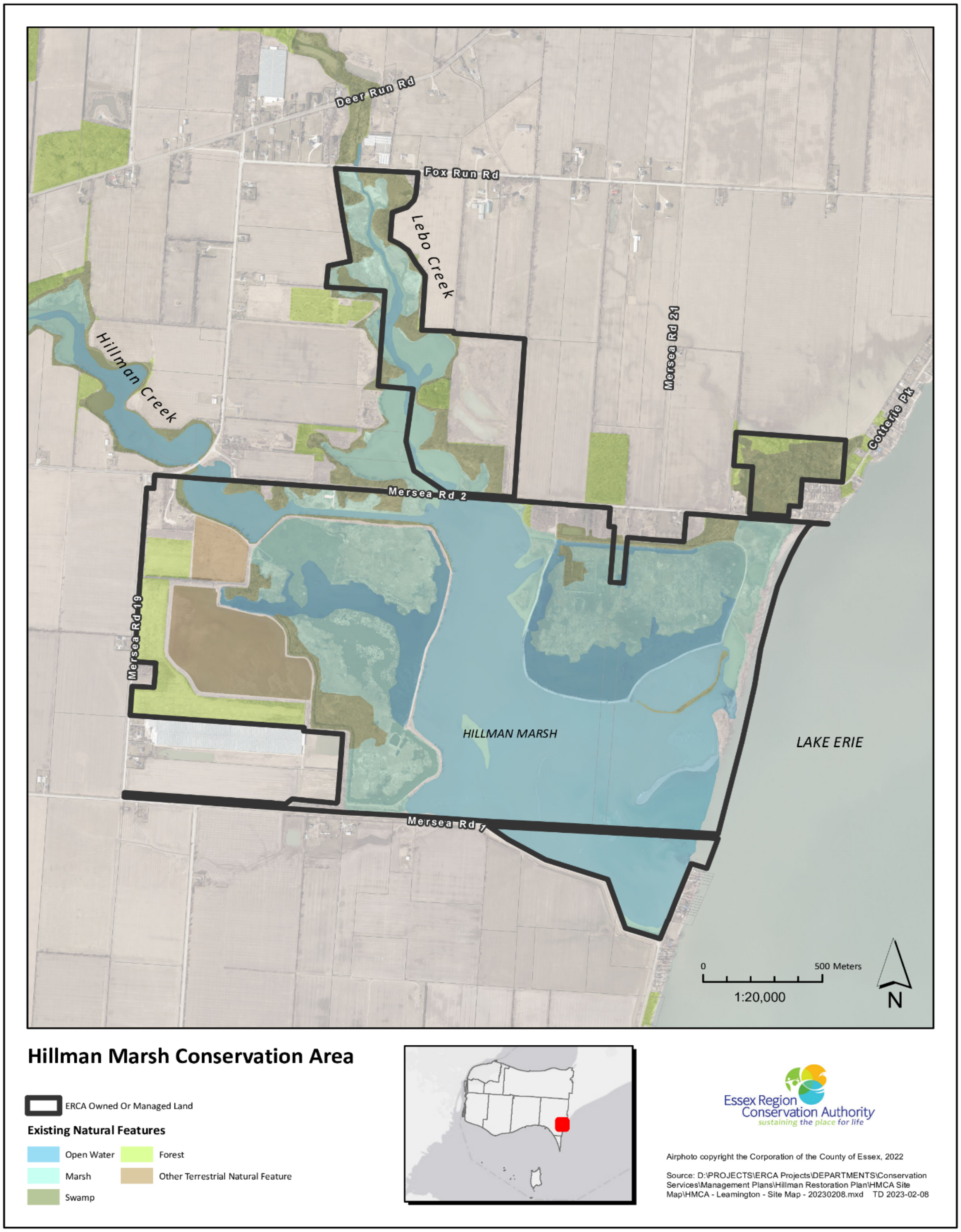


Figure 4: Map of the Hillman Marsh Conservation Area, showcasing existing natural features including open water, marsh, swamp, forest, and other terrestrial natural features. ERCA owned or managed land outlined in black. Developed by Tom Dufour, ERCA, 2023.

3.0 Hillman Marsh Evolution in a Changing Climate

Recent and projected future evolution of the Hillman Marsh barrier beach and wetlands in a changing climate are discussed in Section 3.0.

3.1 Influence of Sediment Supply, Erosion, Water Levels, and Ice Cover

Adequate sediment supply is essential in maintaining the resilience of Great Lakes barrier beaches, coastal wetlands, and shorelines against wave activity and storm events (Gharib et al., 2023; Liu et al., 2021). Sediment supply directly influences barrier sand volume, subsequently controlling barrier inertia, which determines how quickly a barrier beach can be respond to external forces, such as storm events (Cooper et al., 2018).

The natural delivery of longshore sediment transport to the Hillman Marsh barrier beach has been negatively impacted by the Wheatley Harbour jetty since its construction in 1951 (Baird, 2007). The Wheatley Harbour (built in early 1900's), attached jetty (1951), and offshore breakwater (1978) have collectively trapped or removed 525,000 m^3 of sediment (Fig. 3A), but since ~2010, Small Craft Harbours and the Wheatley Harbour Authority have been mechanically bypassing dredged sediment from the navigation channel at Wheatley and placing it at the north end of the barrier beach (Zuzek Inc., 2018). Waterfront development between Wheatley Harbour and Hillman Marsh, as well as communities in East Beach and Marentette Beach, began in the 1920's when there was a lack of understanding of hazards, but has continued despite an eroding shoreline, flooding, and sediment supply concerns (Baird, 2007). While hardening at the southern spit slowed the erosion of East Beach Road, the lake bottom continues to experience significant downcutting along the stretch of shoreline from Wheatley to Point Pelee National Park. A 2019 survey found that the north end of the Hillman Marsh barrier beach nearshore area roughly 200 m offshore was 2 m deeper compared to the conditions from the 1964 survey (Fig. 5, Line 19). Similarly, approximately 2.5 km south of the site along East Beach, the entire nearshore area was more than 1 m deeper in 2019 compared to 1964 out to depths of 5 m below Chart Datum (Fig. 5, Line 21).

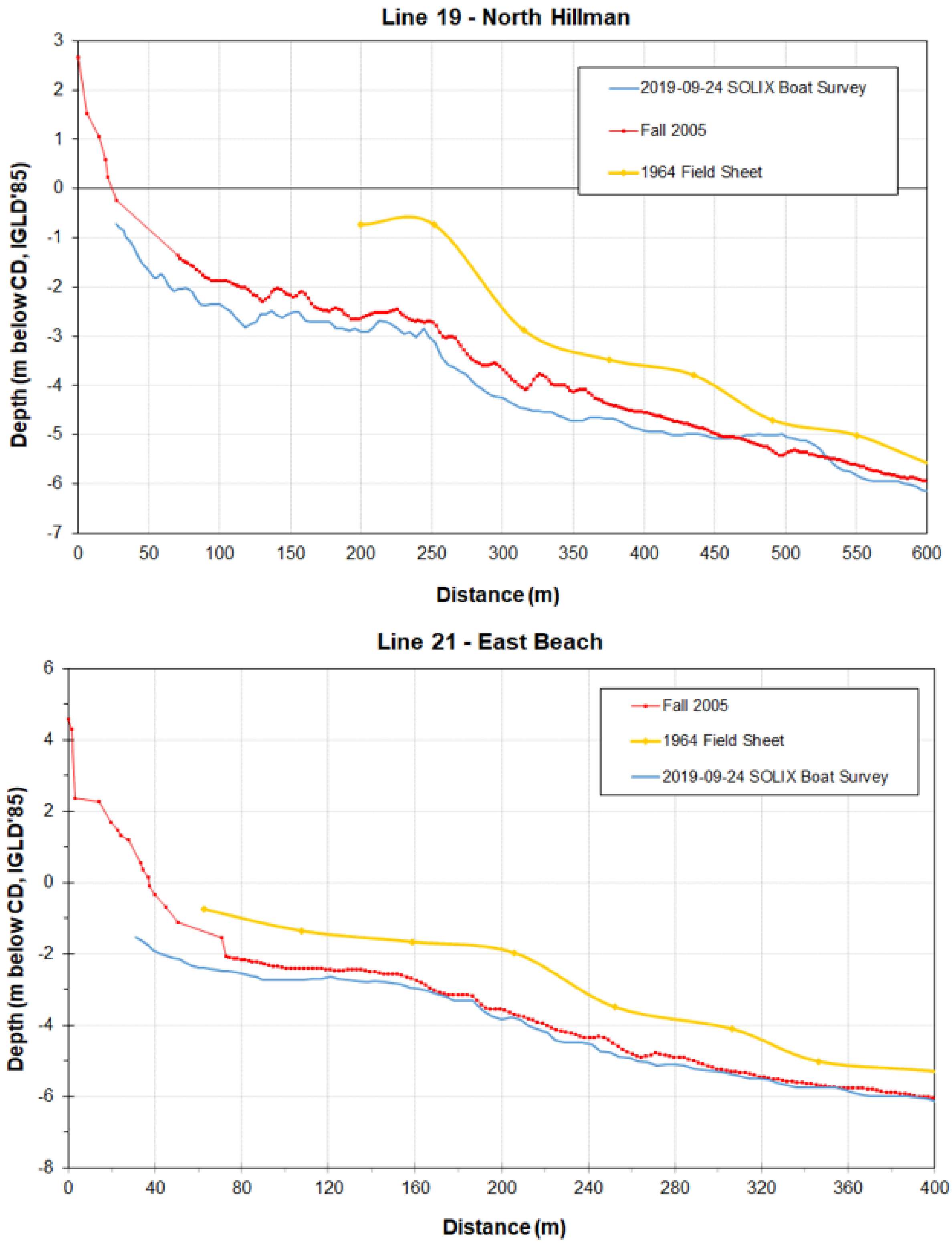


Figure 5: Bathymetric survey results show extreme lakebed downcutting at the Hillman Marsh barrier beach and East Beach (Zuzek Inc., 2021). "Depth below CD" refers to the depth below Chart Datum (173.5 m).

Great Lakes coastal habitats, and in particular coastal wetlands, are highly sensitive to fluctuations in water levels. Water level variability can occur on hourly, seasonal, and interannual scales, with hourly variations having the potential to cause the most damage, reaching up to 2 m at the eastern and western ends of Lake Erie during severe storm events (Quinn, 2002; Danard et al., 2003). Storm surge, an abnormal, sudden rise of water level associated with a strong wind event, causes the most destruction as it results in flooding and erosion of large sections of the coastline (Danard et al., 2003). Recent years have shown record high water levels (Fig. 6; GLERL, 2022b), making barrier beaches more susceptible to breaching (Kraus, 2003).

In 2013, a channel was excavated through the Hillman Marsh barrier beach to lower water levels in the marsh. This opening remained stable until 2016, when rising water levels initiated its rapid expansion. Rising water levels resulted in peak shoreline retreat at 5.46 m/y between 2016 and 2020 (Fig. 9; Gharib et al., 2021). This breach removed the protective barrier between the marsh and Lake Erie, negatively impacting marsh vegetation, and directly impacting and compromising both the controlled wetland cells and the Road 1 dyke, which protects more than 2,000 hectares of farmland and residential land located below lake level (Baird, 2007). The wetland cell dykes were upgraded in 2021 with materials that can withstand future high water level projections, but the Road 1 dyke was never designed to withstand even current lake waves.

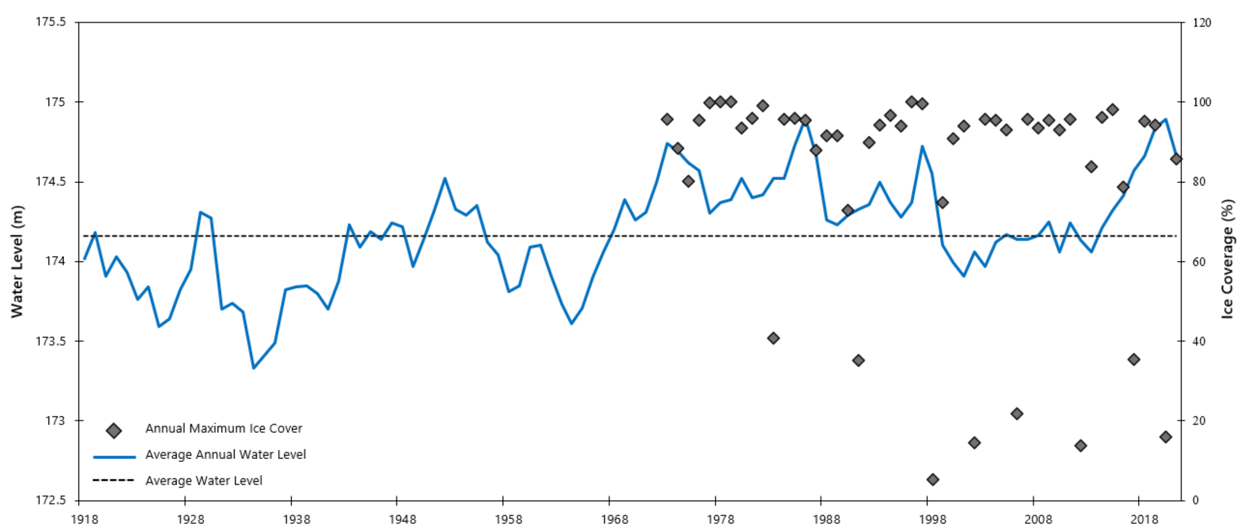


Figure 6: Average annual water levels (1918 – 2021) and long-term average water level (174.16 m) for Lake Erie were obtained from US Army Corps of Engineers. Annual Maximum Ice Cover (AMIC) from 1973 to 2021 was obtained from NOAA's Great Lakes Environmental Research Laboratory (GLERL).

Due to the shallow bathymetry of Lake Erie's west basin (average depth of 8 m; Assel, 2004), ice develops quickly around Hillman Marsh, protecting the beach and marsh from winter storm-driven waves and sediment loss (BaMasoud and Byrne, 2012). However, rising temperatures and milder winters will reduce the amount of protective ice cover. Most notably, the winter of 2019/2020 had a near record low Annual Maximum Ice Cover (AMIC) of 15.9%, which had not been observed in almost a decade (Fig. 6; GLERL, 2022). Due to the collective factors of inadequate sediment supply, an eroding lake bottom, rising water levels, warming temperatures, and climate driven extreme storm events, Hillman Beach has decreased in both elevation and width, to such a degree that 3,000-year-old chunks of underlying peat are being exposed in the breach channel and dislodged (Zuzek Inc., 2021; Fig. 7).

Figure 7: Decrease in width and elevation of the barrier beach has resulted in 3000-year-old chunks of peat to be exposed and dislodged. Photos taken (A) November 2nd, 2022 and (B) December 30th, 2022. Photos courtesy of Wayne King.

In summary, Hillman Marsh was once protected by a healthy but eroding barrier beach. Following decades of sediment deficit from the littoral system and erosion impacts due to the complete armouring of the adjacent shoreline, the barrier beach has crossed a tipping point (Fig. 8). The breach channel is so deep today, and the natural supply of sediment is so small, that natural deposition from longshore sediment transport will likely not repair the breach, as it has repaired smaller breaches in the past. Therefore, the Hillman Marsh has evolved from a barrier protected riverine wetland to an open coast wetland, which features significant exposure to lake waves and storm surge, and thermal influences from Lake Erie.

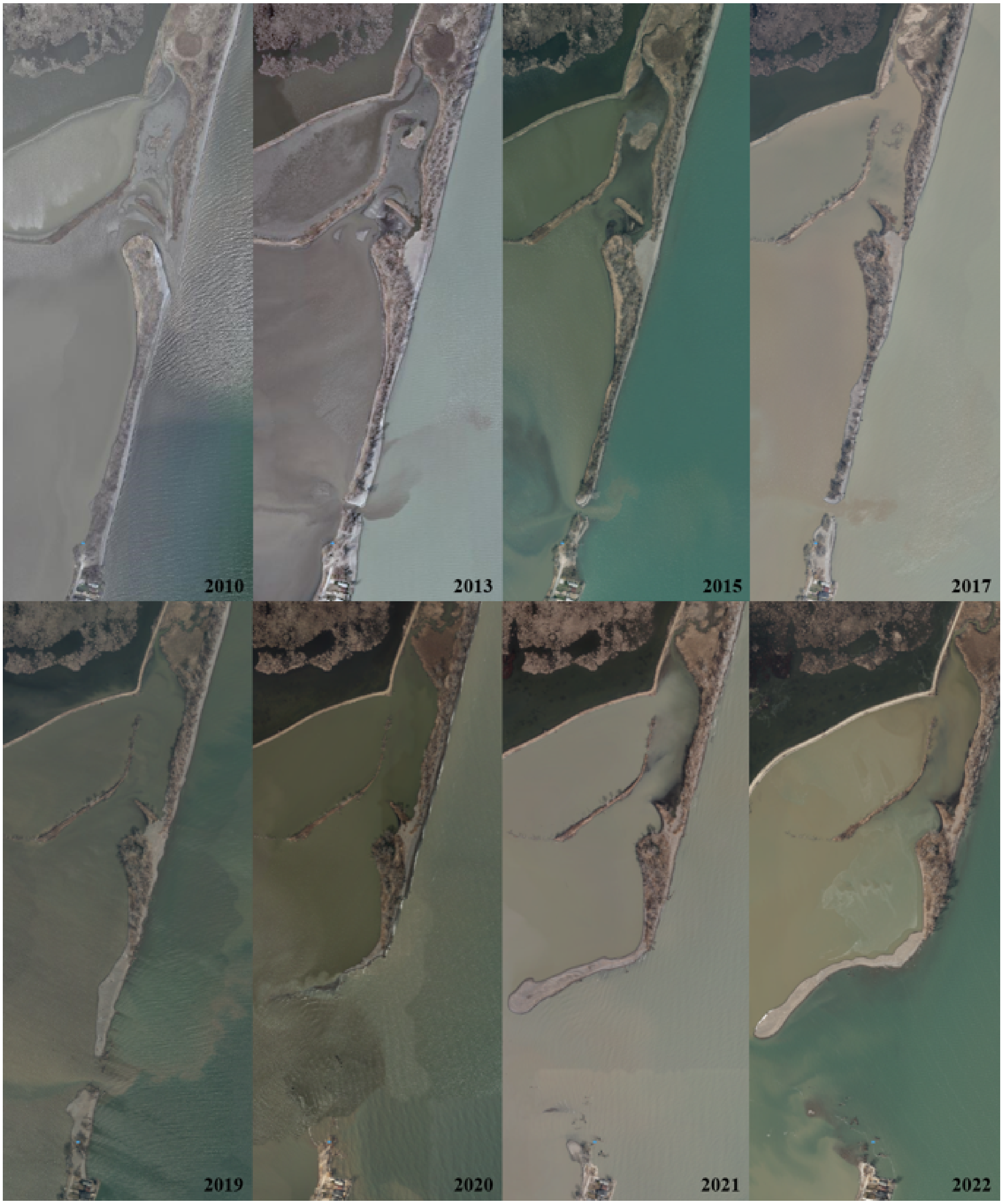


Figure 8: Hillman barrier beach from 2010 to 2022, photos retrieved from Essex Geocortex Database. Barrier is narrowing and retreating, and vegetation cover continues to diminish.

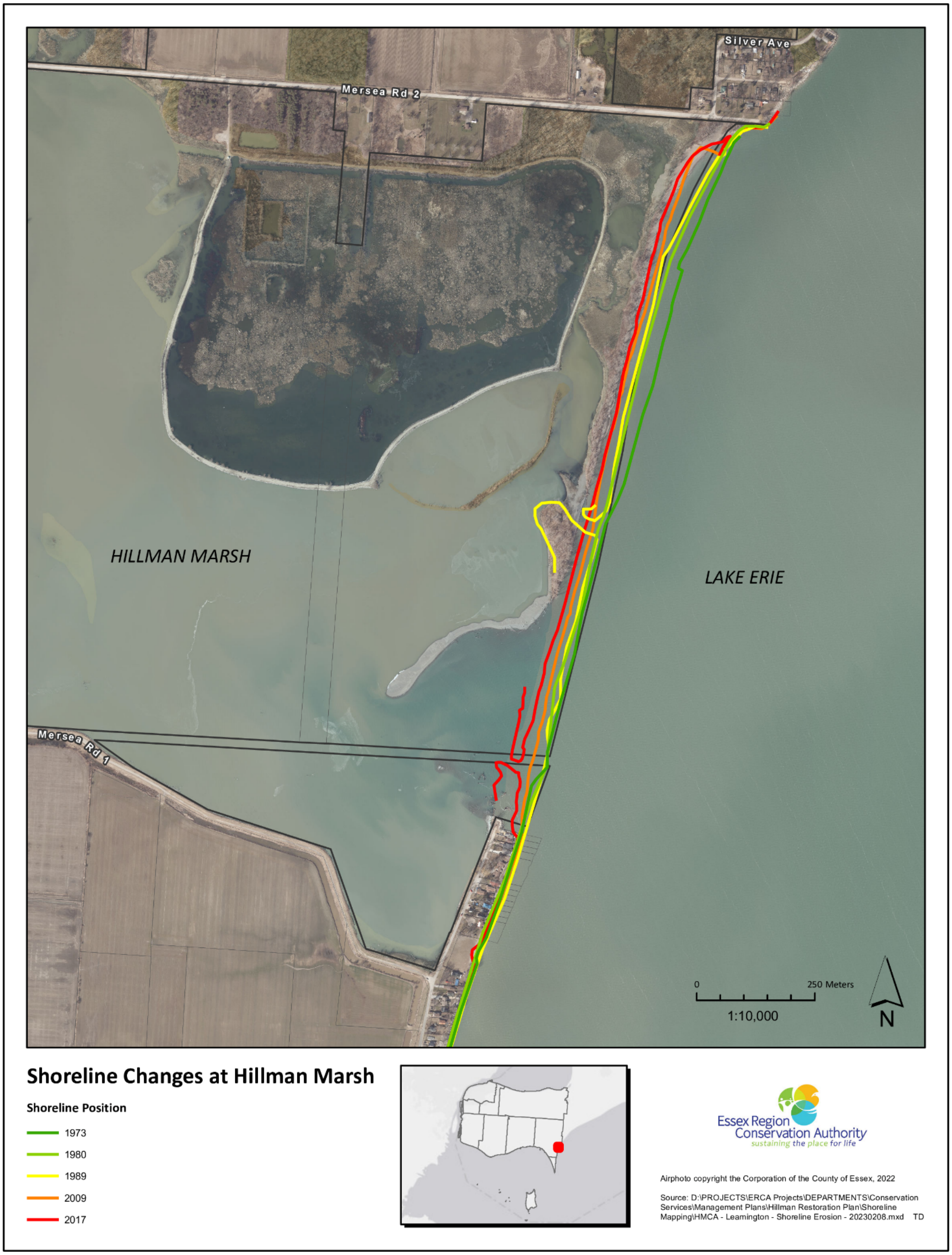


Figure 9: Map of Hillman Marsh barrier beach (2022) with previous shorelines digitized to visualize shoreline retreat since 1973. Map developed by Tom Dufour, ERCA, and shoreline digitized by Jenny Gharib, ERCA.

3.2 Loss of Marsh Habitat

Vegetative cover acts as a stabilization feature for barrier beaches. Buried root structures can increase soil cohesion, essentially anchoring down sediment, and exposed vegetation and root systems can provide resistance and wave energy dissipation. A plant community can also add organic matter directly to the soil, increasing clay content and trapping finer sediments. These processes reduce erosion over the long term (Feagin et al., 2015). Revegetation of the Hillman Marsh barrier beach occurred during a period of stable and near average lake levels (2000 to 2013); however, water levels began to rise and submerged vegetation leading to erosion of the barrier. Considerable vegetation loss began on the southern spit in 2017, and by 2019 the majority is lost, and barren land starts to expand to the northern spit. In present day, sparse vegetation remains, but as the breach continues to widen, much of the woody vegetation is being dislodged, and can be seen sitting on the lakebed where the barrier once was (Fig. 10).

Figure 10: Dislodged and submerged vegetation along eroding shoreline in original barrier location. A) View from the southern spit looking north, B) aerial view between both spits. Photos taken March, 2021.

As the Hillman Marsh barrier beach retreats landwards, more of the marsh habitat will be lost. A decrease in the wetland area will result in a decrease in native biodiversity – as certain species that require large patches of habitat will lose the foundation of their existence (Rodrigo, 2021). The creation of the four drainage schemes between 1900-1950 resulted in the conversion of approximately 2,000 hectares of wetland habitat to agricultural land south of Hillman Marsh (Baird, 2007). Since then, significant breaching and erosion of the barrier beach, and shoreline development, hardening, and other forms of alteration have resulted in natural habitat loss. At present, Essex County has only 8.5% of its natural cover remaining (ERCA, 2022), and these remains are fragmented, resulting in small habitat patches that are more vulnerable to predators and invasive species, and less viable for wildlife populations including species at risk (Baird, 2007).

3.3 Declining Habitat Quality

Agricultural activities in the Hillman Creek watershed result in an increase in total phosphorus, organic nitrogen and TKN, and E. coli in Hillman and Lebo Creek (ERCA, 2022b). Excess nutrients in tributaries can result in harmful algal blooms, making water toxic for humans and wildlife. These algal blooms have increased in size and severity in recent years throughout the western basin of Lake Erie due to a prevalent agricultural industry, a large population, and warming surface waters as a result of climate change (ECCC, 2018). A common method of evaluating wetland health is through the Index of Biological Integrity (IBI). IBI is a method of evaluating the variety of organisms and their response to human disturbance, with higher scores representing healthier wetlands. Most recent data from the Coastal Wetland Monitoring Program (2021) gives Hillman Marsh a Vegetation IBI score of 2.4 out of 5, meaning it is moderately degraded, an Amphibian IEC (Index of Ecological Condition, analogous with IBI) score of 7.2 out of 10 or mildly impacted, a Bird IEC of 5.4 out of 10 or moderately degraded, and a Fish IBI score of 1 out of 5, meaning it is degraded for fish and fish habitat.

The Island Biogeography Theory suggests that when an area of habitat becomes isolated from the surrounding matrix of similar habitat, over time these isolated species may become locally extinct, either due to stochastic events, habitat change, inbreeding depression, resource scarcity, or predation, resulting in a decline in species richness (MacArthur and Wilson, 1967; Losos and Ricklefs, 2010). Based on this theory, ephemeral breaches are a necessary and beneficial event that can restore the ecological integrity of a marsh, but this also assumes adequate sediment supply and proper conditions to allow for the natural recovery of a barrier beach. Long-term and sustained breach events at the Hillman Marsh can directly impact the physical and chemical composition of marsh habitat through sediment accumulation, concentration of pollutants, higher temperatures, and low dissolved oxygen (Surette, 2006). These new conditions may favour more tolerant or invasive species, and indirectly result in species migration, change in composition, and subsequently introduce predators, more competition, and ultimately the extirpation of native species. This can lead to long-term changes in the composition of fish assemblages (Surette, 2006), and may explain the low fish IBI at the Hillman Marsh.

4.0 What's at Stake? The Significance of Hillman Marsh

4.1 Ecological Significance

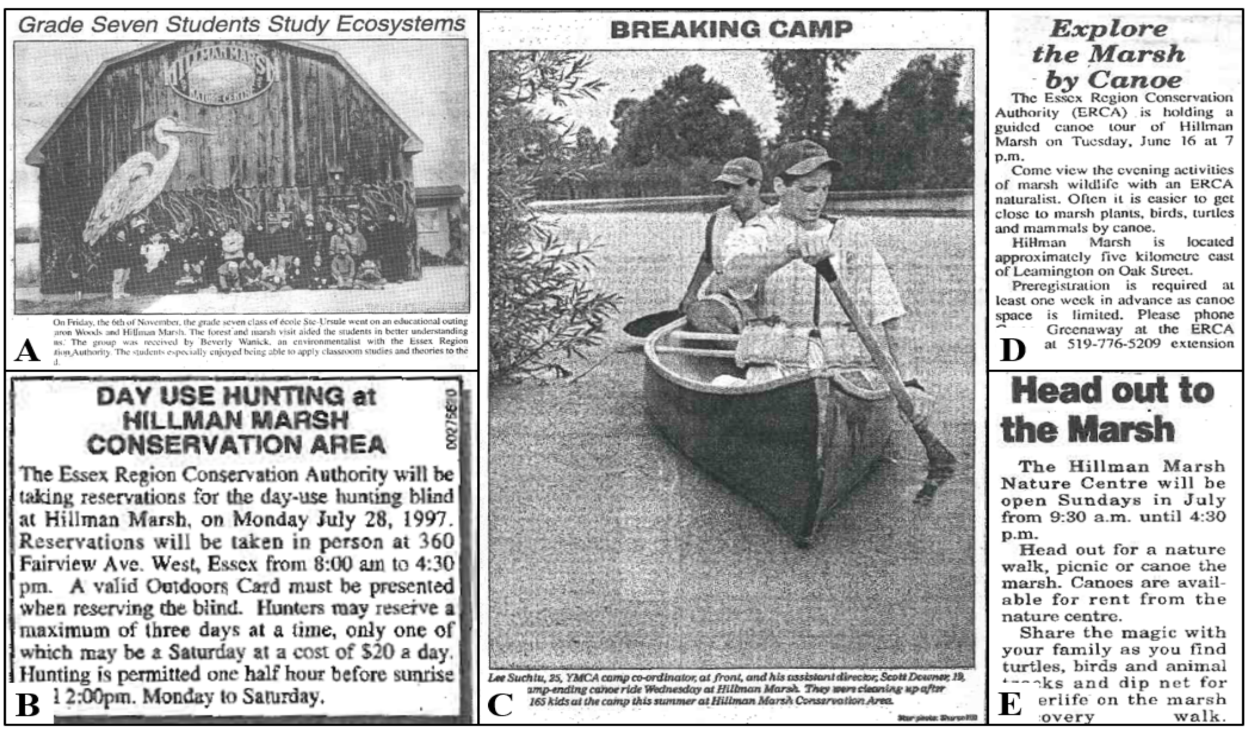
Hillman Marsh contains spawning, nesting, and feeding habitat for a diverse number of species, including many species at risk. According to data from the Natural Heritage Information Centre (NHIC), 13% of provincially tracked species at Hillman Marsh are classified as "special concern" and may become threatened, 20% are "threatened" and likely to become endangered, 29% are "endangered" and facing imminent extinction or extirpation, and 7% are "extirpated" meaning they are locally extinct (MNRF, 2021). Most notably, populations of Common Hop Tree and Scarlet Ammannia, which were originally located on the barrier beach, have been completely lost due to the extensive erosion that has occurred at Hillman Marsh. Other rare, threatened, or endangered species that nest along the shoreline or in the marsh include the American Lotus, King Rail, Large Yellow Pond-lily, Least Bittern, Prothonotary Warbler, Swamp Rose-mallow, and several turtle species including Northern Map, Snapping, Spiny Softshell, Midland Painted, and Blanding's Turtle (MNRF, 2021).

Marsh management is undertaken in two controlled wetland cells at Hillman Marsh in order to maintain a degree of wetland interspersion of approximately 50% (a 50/50 ratio of water to emergent, submergent, and floating wetland vegetation). When necessary, occasional drawdowns (typically every 10-15 years) are conducted in the early spring to trigger seed germination within the marsh mud substrate and re-initiate the marsh successional cycle. It is widely accepted that this water management tactic has shown positive relationships with occupancy and relative abundance of water birds (e.g., Least Bittern, Purple Gallinule, Dabbling Ducks, and many species of shorebirds), as well as provide substrate and litter for invertebrate populations (Fredrickson and Reid, 1988; Alexander and Hepp, 2014; Bradshaw et al., 2020). As a result of this active wetland management, species that are seldom seen in Ontario are frequently seen in the controlled wetland cells at Hillman Marsh. The revegetation efforts of this project aim to achieve a 50% interspersion rate in the open marsh, which is currently 90.2% open water.

4.2 Social Significance

Hillman Marsh is situated on the traditional territory of Caldwell First Nation and is a location of traditional use and knowledge. It's diverse range of species and habitats, and continuously changing conditions provides a plethora of opportunities for environmental education and scientific research. There are vast amounts nature-based opportunities that benefit human health and give a source of identity, spiritual fulfillment, and cultural connection to the Great Lakes.

The Hillman Marsh Conservation Area has been a community staple in Essex-County for many decades. Over the years, Hillman Marsh has hosted summer camps, nature tours, bird watching, educational field trips, and hunting events (Fig. 11). With natural resilience to lake level fluctuations, the marsh was able to function through periods of rising and falling lake levels. However, for those that live along the eroding and flood prone shoreline in the proximity of the Hillman Marsh, periods of high-water levels and intense storm events can cause extensive property damage and limit emergency ingress and egress on local roads (refer to specific events and impacts shown in Fig. 12). The Mersea Road 1 dyke at the southern boundary of the marsh is now the only line of defense between Lake Erie and hundreds of homes and agricultural businesses situated on lands below lake level. This dyke was not designed to withstand direct wave attack from Lake Erie and repairs have been designed (Dillon, 2013) but to this point not implemented. Re-establishing the Hillman barrier beach can create multiple co-benefits, such as sheltering the marsh from intense waves to facilitate habitat restoration, while also reducing the risk of a devasting dyke breach that would flood more than 2,000 hectares of land situated below lake level (Zuzek Inc. 2021).



Grade Seven Students Study Ecosystems

On Friday, the 6th of November, the grade seven class of école Ste-Ursule went on an educational outing aron Woods and Hillman Marsh. The forest and marsh visit aided the students in better understanding ns. The group was received by Beverly Wanick, an environmentalist with the Essex Region tion Authority. The students especially enjoyed being able to apply classroom studies and theories to the d.

A

DAY USE HUNTING at HILLMAN MARSH CONSERVATION AREA

The Essex Region Conservation Authority will be taking reservations for the day-use hunting blind at Hillman Marsh, on Monday July 28, 1997. Reservations will be taken in person at 360 Fairview Ave. West, Essex from 8:00 am to 4:30 pm. A valid Outdoors Card must be presented when reserving the blind. Hunters may reserve a maximum of three days at a time, only one of which may be a Saturday at a cost of $20 a day. Hunting is permitted one half hour before sunrise 12:00pm. Monday to Saturday.

B

BREAKING CAMP

Lee Suchiu, 25, YMCA camp co-ordinator, at front, and his assistant director, Scott Downer, 19, amp-ending canoe ride Wednesday at Hillman Marsh. They were cleaning up after 165 kids at the camp this summer at Hillman Marsh Conservation Area.

C

Explore the Marsh by Canoe

The Essex Region Conservation Authority (ERCA) is holding a guided canoe tour of Hillman Marsh on Tuesday, June 16 at 7 p.m.

Come view the evening activities of marsh wildlife with an ERCA naturalist. Often it is easier to get close to marsh plants, birds, turtles and mammals by canoe.

Hillman Marsh is located approximately five kilometre east of Leamington on Oak Street.

Preregistration is required at least one week in advance as canoe space is limited. Please phone Greenaway at the ERCA at 519-776-5209 extension

D

Head out to the Marsh

The Hillman Marsh Nature Centre will be open Sundays in July from 9:30 a.m. until 4:30 p.m.

Head out for a nature walk, picnic or canoe the marsh. Canoes are available for rent from the nature centre.

Share the magic with your family as you find turtles, birds and animal ks and dip net for erlife on the marsh overy walk.

E

Figure 11: Historical newspaper articles showcasing Hillman Marsh's role in the local community. (A) "Grade Seven Students Study Ecosystems" Essex Free Press, November 18, 1998. (B) "Daily Use Hunting at Hillman Marsh Conservation Area" Windsor Star, July 26, 1997. (C) "Breaking Camp" Windsor Star, August 29, 1996. (D) "Explore the Marsh by Canoe" Essex Free Press, June 10, 1998. (E) "Head out to the Marsh" Tilbury Times, June 24, 1998.

WEATHER

Windsor Star Sat Mar 15/97

Flood waters damage dozens of home

By Doug Schmidt
Star County Reporter
MERSEA TOWNSHIP

A flood watch remains in effect in Essex County until this afternoon for shoreline areas and other low-lying areas, the Essex Region Conservation Authority said Friday.

After strong easterly winds brought flooding Thursday night to dozens of low-lying Lake Erie properties on the eastern shoreline area of Mersea Township, the winds changed Friday to equally strong westerlies and local flood watchers had to switch their focus.

A combination of high lake levels and runoff from heavy rains resulted in a series of extensions to the initial flood watch issued Thursday. As of Friday afternoon, the west sides of Pelee Township, Mersea, Rochester and Tilbury North were all on flood watch.

Much of damage experienced late Thursday and early Friday occurred in ... age area between Point Pelee ... eatley, where dozens of homes ... to a half-metre of floodwater as unseasonably high and rough waters crashed over Lake Erie breakwalls.

John Bridgeman had to park his car outside the Elmdale neighborhood and then use a boat to ferry supplies to his home on a completely flooded street. Drivers who dared the local roads, particularly Lakeshore Drive/Cotterie Park, had to correctly guess where the asphalt was to avoid ending up in the abutting flooded fields.

Bridgeman angrily blamed much of his neighborhood's flood woes on work done to adjacent Hillman Marsh by ERCA, which he claimed prevented inland runoff from escaping to the lake. His son Dan said it was probably the worst flooding in nine years.

Ken Schmidt, the general manager and flood response co-ordinator of the conservation authority, said the high lake levels and the strong easterlies were to blame, as well as the low elevations of the victims' homes.

"Those homes should be flood-proofed ... they were built too low," said Schmidt of the worst-hit homes along the lakeshore.

Lakeshore homes along Marentette Park, which lies to the east of Point Pelee National Park, were still being pounded by waves Friday morning as the winds began to shift. Flocks of seagulls swooped down on front yards, scooping up beached fish thrown there by the powerful waves crashing against seawall barriers.

Laurene Waghorn, another Elmdale resident, also had to wade through water to get to her home. But the structure itself, unlike the others in the neighborhood, remained high and dry.

She said the house was flooded two weeks after her family moved in from London six years ago, and a decision was made to invest in a new foundation and footings to elevate it above the flood level.

Surveying the damage to her neighborhood, Waghorn said there's not a lot else that can be done to prevent the naturally low-lying area from occasional floods.

"Not unless you stop the wind ... if you get the east winds, this is what happens."

A

MAR 20 1997 — Wheatley Journal

Living along the lake can be a "love – hate relationship"

Low-lying shoreline areas south of the village in Mersea Township flooded Thursday night.

Winds 30 km gusting to 50 to 70 km spilled Lake Erie into the Coterie Park and Elmdale subdivisions.

The high winds coupled with run-off from heavy rainfall left dozens of homes sitting in flood water up to a half metre deep.

Lakeshore Drive and Coterie Park Road were under water as were abutting lawns and fields.

Homes further down the shoreline toward Point Pelee Park were bashed by water and spray with the strong easterly winds churning up the high water levels in Lake Erie.

Hillman Conservation Area canoe launch could have been at the roadside sign last week. The swollen ... flooded the parking lot and other lowland areas along the roadside that skirts the marsh and connects to ... le Subdivision.
... cene from the entrance to Julien Street at Elmdale illustrates the extent of the flooding in the area.

B

Marsh neighbours fear flood

Property owners near Hillman Marsh are claiming dikes pose a flooding threat, but ERCA says not so

Story and photo
by Rob Hornberger
Star Staff Reporter

A group of Mersea Township residents says man-made changes to a marsh owned by the Essex Region Conservation Authority (ERCA) have increased the flood threat to their homes.

Bill Braun, a spokesman for 15 East Beach Road homeowners, said dikes built to control water levels in portions of Hillman Marsh are restricting the dispersal of water flowing into the wetland from Lake Erie.

He said the dikes act like dams and could cause water levels in the open part of the 380 hectare marsh to rise to dangerous levels this fall.

"A lot of people are apprehensive about going away for the winter. They're worried about leaving and their property being damaged," he said.

East Beach residents living along the thin strip of land between Lake Erie ... an Marsh have spend thou... he dollars on breakwalls to ... ir homes from high lake lev... But the sides of their homes facing the marsh are virtually unprotected.

To protect his home from possible flooding, Braun has recently purchased four pumps and a generator. He also has a stockpile of sandbags to ring his home.

ERCA executive director Ken Schmidt said the authority and its partner, Ducks Unlimited, made extensive use of engineering studies in the late 1980s before the dikes were built, to insure they didn't add to the flood threat.

Maximize plant growth

The enclosed "cells" created by the dikes allow the authority to control water levels in 40 per cent of the marsh through the use of pumps.

By controlling water levels inside the cells, the authority is able to create conditions which maximize plant growth for nesting ducks and other wildlife.

Schmidt said the two major sources of Hillman Marsh flooding are heavy rainfall and high lake levels. He said the absence of major flooding during the 1989 storm which swamped much of southern Essex County proved the engineering studies are "very sound."

Braun said he would like to see a two-foot high berm built on the north side of the roadway.

He has also suggested to the authority that removable concrete structures be placed near the entrance of the channel to slow the flow of lake water coming into the marsh.

Stan Taylor, ERCA's water management specialist, said the type of flooding feared by Braun and his 14 neighbours is a "one-in-one hundred year" possibility.

He said a unique set of circumstances -- high water combined with strong winds blowing from the northeast for at least six hours — is needed for an "extreme event" to occur.

Lake Erie is approaching record water levels, but Taylor said the gale-force winds from the northeast necessary to cause flooding are still a rarity.

He said lake levels determine the water level of the marsh — whether all of it is open to the lake or just a portion. Because of the huge amounts of lake water capable of entering the marsh through the channel, placing concrete structures near the channel would have no affect reducing the flood threat, Taylor said.

If a one-in-one-hundred year storm occurred, only "six to eight inches" of water would cover the road, he said. Taylor said in such a scenario just as much water would be coming over the breakwalls as from the marsh.

Braun said water has spilled over onto the road three times this year. Schmidt said there was some minor flooding at an ERCA parking lot, but said the water come directly from the lake — not the marsh.

Improvements being made

Mario Musso, a Kitchener real estate broker who owns a home along East Beach Road, also known as Hillman Road, said the authority should be a good neighbour and erect a 750-foot marsh-side berm. He said he will sue if there is any flood damage to his home.

"I don't feel it's my responsibility to protect somebody else's property to protect my own. If there is any damage, I'll sue," he said.

Schmidt said it is the policy of the authority to prevent alterations to the physical landscape that can increase the likelihood of flooding.

"(At Hillman Marsh) ... the philosophy of no adverse impact has been upheld."

Ducks Unlimited is currently making $350,000 in improvements to the berms protecting the cells.

C

Flood victims have 'had it'

STORY AND PHOTO BY RON PRESTON
STAR COUNTY REPORTER
WHEATLEY

Cheryl and Bill Baltzer are fed up with Lake Erie.

For the third time in a year, their two-bedroom home in Elmdale subdivision has flooded, with up to 13 cm of water.

The northeast winds gusted up to 45 km/h on the weekend, whipping waves on the eastern shoreline of Mersea Township.

"We were fortunate the winds didn't reach the forecast intensities," said Tim Byrne, senior water management technician with the Essex Region Conservation Authority. Winds had been forecast for up to gale force, 80 km/h. "I'm not trying to minimize the problem (for those whose property flooded) but it's no worse than what we've seen in the recent past."

The "splash effect" of high winds driving the waves on to the beaches and hitting vertical breakwalls throws the water on to shoreline properties. Some roads in the Pulley, Elmdale, East Beach and Marentette Beach subdivisions were under up to 15 cm of water Saturday. The main road in Point Pelee National Park was flooded from the visitors' centre to the tip.

"If we were renting, we'd be out of here," said Bill Baltzer, "but we pay a mortgage, so we're stuck."

The couple aren't happy with the Shoreline Protection Program that would see them borrow up to $20,000 to raise their 50-year-old winterized cottage. The Baltzers said they received quotes of up to $32,000 for the job, an amount they simply can't afford.

They believe ERCA should provide grants to home... ut Byrne said there are no such govern... ams available.

... the conservation authority pushed to continue this program to help those living in floodplain near the shoreline, most of which were built prior to planning regulations. Houses built today must meet strict requirements to prevent similar problems.

Byrne said the mild winter and heavy rainfall have resulted in very high water levels throughout the Great Lakes Basin. Projections by the conservation authority said lake levels this summer could exceed record highs set in 1986.

A resident of East Beach Road said he's disappointed the conservation authority hasn't done more to protect residents in the Hillman Marsh area.

Bill Braun said ERCA recently spent thousands of dollars improving wildlife habitat, but didn't bother to build a berm between the marsh and East Beach Road.

Bill Baltzer, of Elmdale subdivision in Wheatley, stands at the flooded intersection near his home Saturday. Northeast winds flooded many residences in Mersea Township.

SEE ALSO WINTER'S PARTING SHOT / C10

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Figure 12: Historical newspaper articles showcasing long history of shoreline homeowners and lake-induced flooding and damage. (A) "Flood waters damage dozens of homes" Windsor Star, March 15, 1997. (B) "Living along the lake can be a love-hate relationship" Wheatley Journal, March 19, 1997. (C) "Marsh neighbours fear flood" Windsor Star, September, 1997. (D) Flood victims have had it" Windsor Star, March 23, 1998.

4.3 Economic Significance and Avoided Damages

Hillman Marsh is vital to the local economy as it is a focal point for outdoor recreation including hiking, canoeing, nature viewing, and hunting. Hunting revenue is roughly $10,000 annually, and entrance fees generate roughly $8,000 annually. Other indirect economic impacts for the surrounding area and local businesses include food and accommodation spending during the spring bird watching season, and spin-off tourism and recreation from the proximity to Point Pelee National Park.

As noted previously, the barrier beach once protected the surrounding land from Lake Erie waves and flooding, but since breaching, the Road 1 dyke has become the only barrier between Lake Erie and hundreds of homes and businesses, and Point Pelee National Park. A recently completed flood vulnerability study for Southeast Leamington determined that a breach of the Road 1 dyke would flood more than 300 structures and could result in $50 million in building and content damages for the agricultural lands below lake level. The potential economic damages exceed $100 million when higher lake levels due to climate change were considered (Zuzek Inc., 2021; the extent of flooding under both scenarios is shown in Fig 13 and 14).

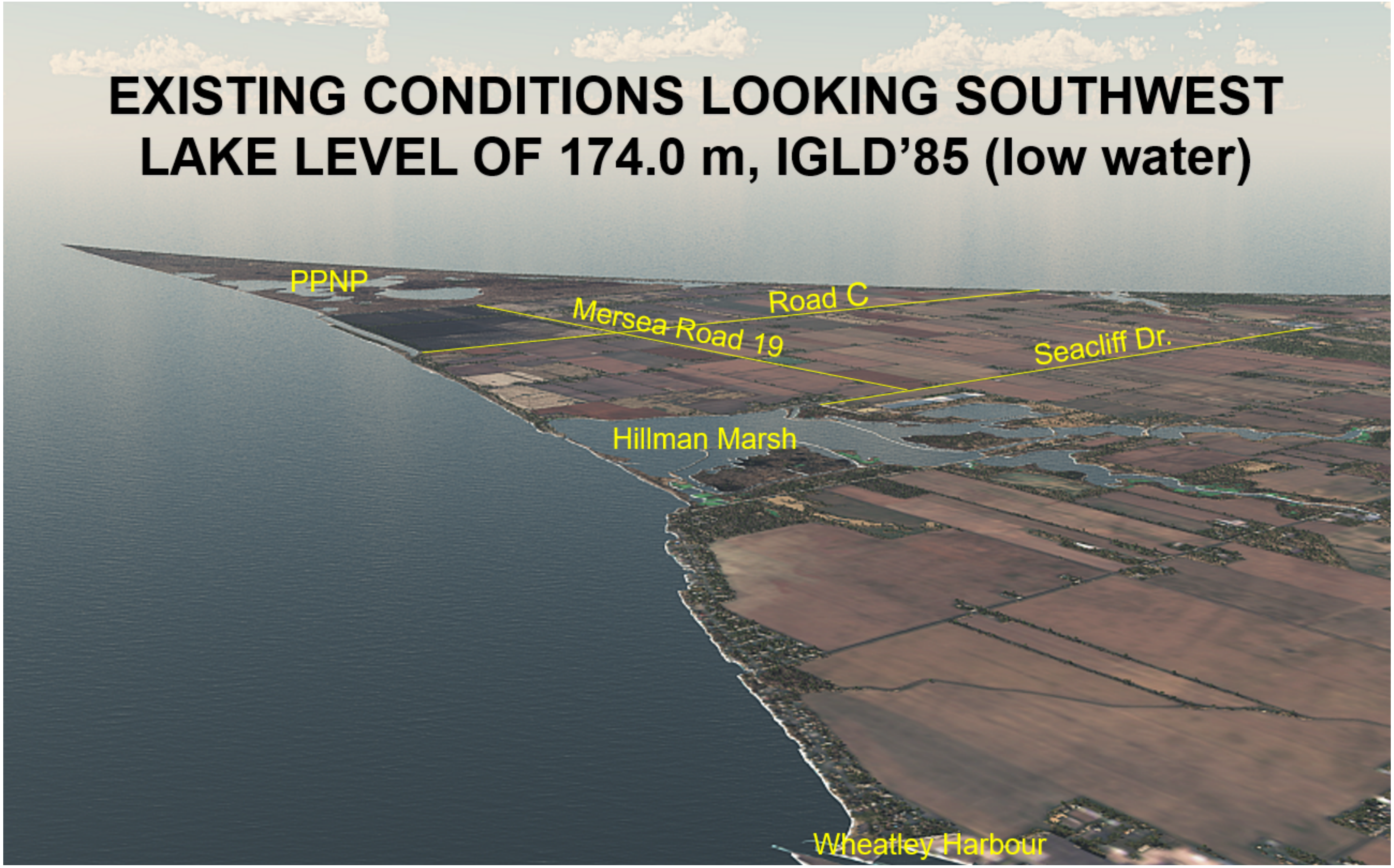

Figure 13: Existing conditions on the Point Pelee Foreland, looking southwest, with lake levels at 174.0m (IGLD'85).

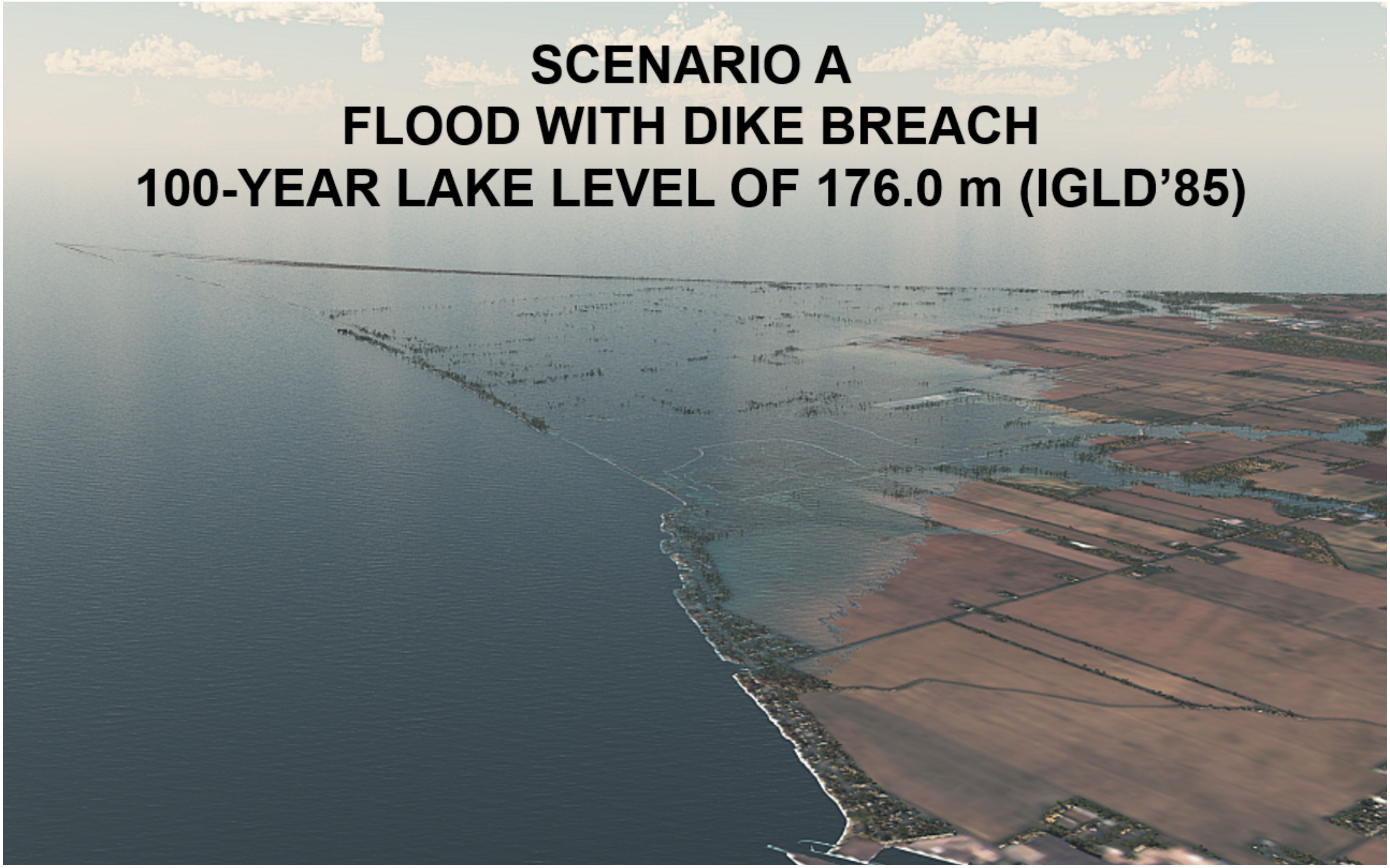

Figure 14: Simulated scenario of a Road 1 dyke breach for the 100-year lake level of 176.0m (IGLD'85).

5.0 Threats and Consequences of Climate Change

5.1 Climate Change Trends and Projections

A recent study by Environment and Climate Change Canada (2022) classified coastal wetlands in the Essex County region as "highly vulnerable" to climate change. Climate model results show wetter (7 to 15% increase in annual precipitation) and warmer (2.4–5.0°C increase in annual mean temperature) future conditions in the Great Lakes area. Results from a hydrological model show a projected decrease in snowpack (29–58%), and increase in evapotranspiration, especially during summer months (up to 0.4 mm/day) (Shrestha et al., 2022). Under the highest greenhouse gas emissions scenario, the model predicts extreme water level changes close to a metre above historical record highs toward the end of the century (ECCC, 2022). Although projected future average water levels may be higher or lower and not an exact prediction, the range of variability of water levels are expected to expand with more extreme highs and lows in the future (Theuerkauf and Braun, 2021; Seglenieks and Temgoua, 2022). These projected climate change trends pose a significant threat to Hillman Marsh's structure, function, and productivity and will lead to increased runoff, flooding, shoreline erosion, loss of biodiversity, and an increase in invasive species.

Environment and Climate Change Canada (2022) developed climate projections with two forcing scenarios called Representation Concentration Pathways (RCP). The first scenario, RCP 4.5, represents an intermediate future greenhouse gas concentration trajectory where emissions peak around 2040 and then begin to decline, projecting warming of 2.5°C above pre-industrial levels by 2100. The second scenario, RCP 8.5, represents an increasing emissions trajectory, one in which no actions are taken to reduce emissions, projecting warming of 5°C above pre-industrial levels by 2100.

5.1.1 Air Temperatures

The Great Lakes Basin has seen an increase in temperature of 0.7°C between 1985 and 2016. The range between minimum and maximum temperatures has decreased as minimum temperatures have increased. Warming air temperatures result in warmer winters, earlier spring warming, extreme heat, heavier precipitation, and less ice cover. In Lake Erie specifically, under RCP 4.5, annual land air temperatures could increase by 2.5°C by mid-century, and 3°C by the end of the century. Under RCP 8.5, annual land air temperatures could increase by 3.1°C by mid-century, and 4.8°C by the end of the century (Fig. 15; ECCC, 2022). Less ice cover is predicted to decrease substantially with warmer temperatures. Under RCP 8.5, average ice cover during the winter and spring could decrease by 19% and the average length of the ice season may decrease by 66 days in Lake Erie by the end of the century, compared to 1981-1999 (ECCC, 2022b).

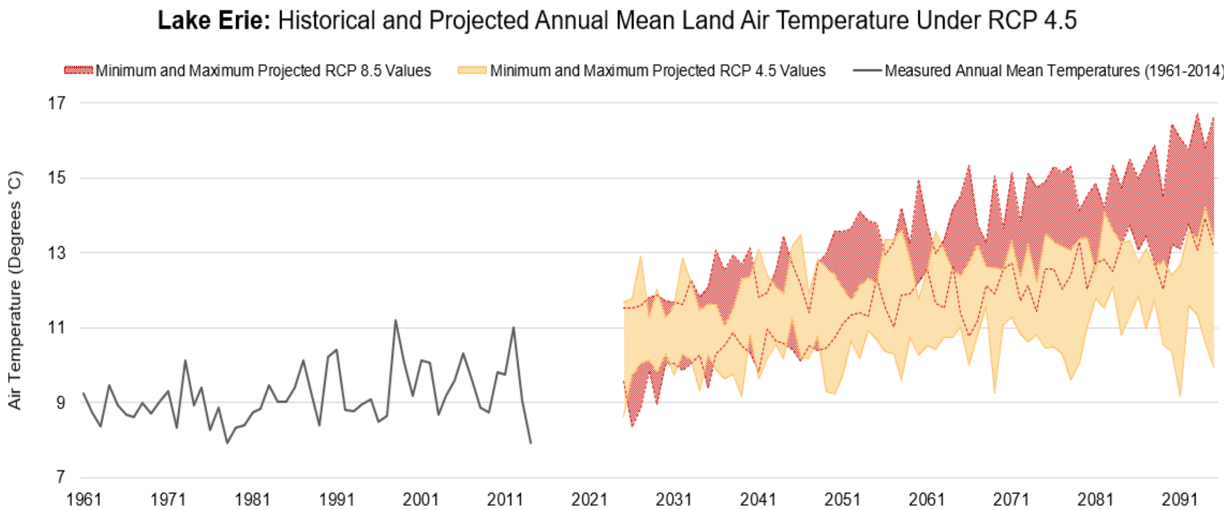

Figure 15: Historical and projected land air temperatures for Lake Erie under both RCP 4.5 and RCP 8.5. Projected for 2025-2095 (ECCC, 2022).

A recent climate change investigation by Zuzek Inc. (2021) investigated the impacts of an ice-free Lake Erie on winter wave energy exposure by comparing the amount of historical wave energy from 2000 to 2013 to an ice-free scenario for the same temporal period. The increase in winter wave energy reaching the shoreline of the Pelee Peninsula ranged from 80 to 120% (Fig. 16).

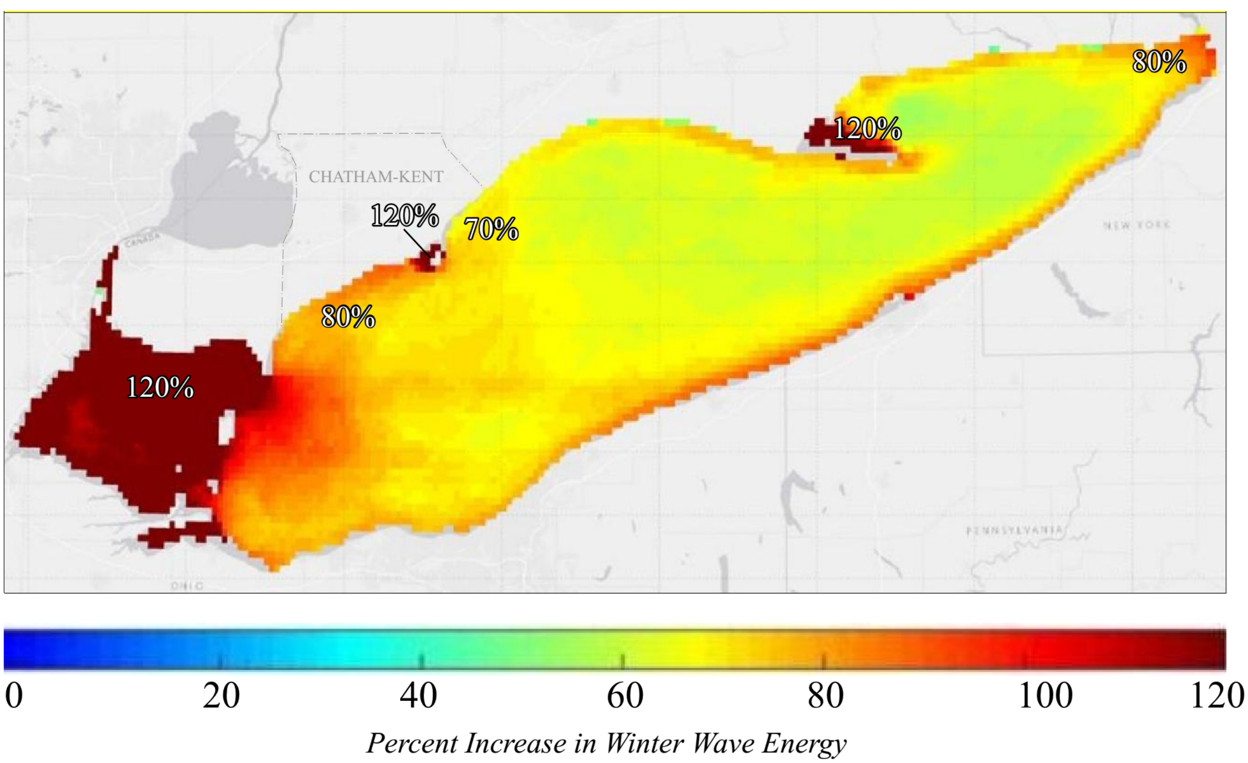

Figure 16: Percent increase in winter wave energy on Lake Erie for an ice-free scenario (Zuzek Inc., 2021).

5.1.2 Precipitation

With warmer winters, the Great Lakes region will experience less snowfall and more precipitation will fall as rain. The average annual total over-lake precipitation (1961-2000) for Lake Erie has been 909 mm. Under RCP 4.5, annual over-lake precipitation for Lake Erie could increase by 9% by end of century. Under RCP 8.5, annual over-lake precipitation for Lake Erie could increase by 18% by end of century (Fig 17; ECCC, 2022). These projections indicate a shift in the seasonality of precipitation with more precipitation falling in winter, spring, and fall, and potentially experiencing drier conditions in the summer (Dehghan, 2019).

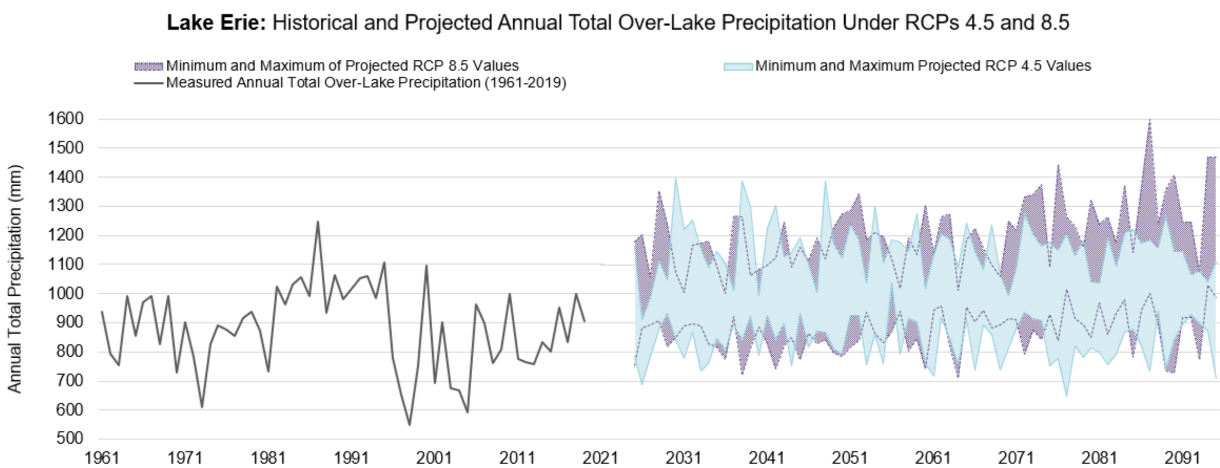

Figure 17: Historical and projected over-lake precipitation for Lake Erie under both RCP 4.5 and RCP 8.5. Projected for 2025-2095 (ECCC, 2022).

5.1.3 Lake Levels

Static lake levels (non-storm conditions) have fluctuated by as much as two metres over the last 100-years on Lake Erie, and lake-levels are projected to increase in variability, resulting in more extreme highs and lows (Theuerkauf and Braun, 2021). Under RCP 4.5, average annual lake-levels for Lake Erie are expected to rise by 0.3 m by the end of the century. Under RCP 8.5, average annual lake-levels are expected to increase by 0.5 m by the end of the century (Fig. 18; ECCC, 2022). In addition to higher average lake level conditions, the extreme high levels associated with wet periods such as 2019 are expected to be on the order of 0.4 to 0.5 m higher with 2.0°C to 2.5°C of global warming (Seglenieks and Temgoua, 2022). Higher average lake levels and higher extreme water levels during wet periods will increase the exposure of infrastructure, transportation, natural environment, and recreation facilities to natural hazards such as erosion and flooding.

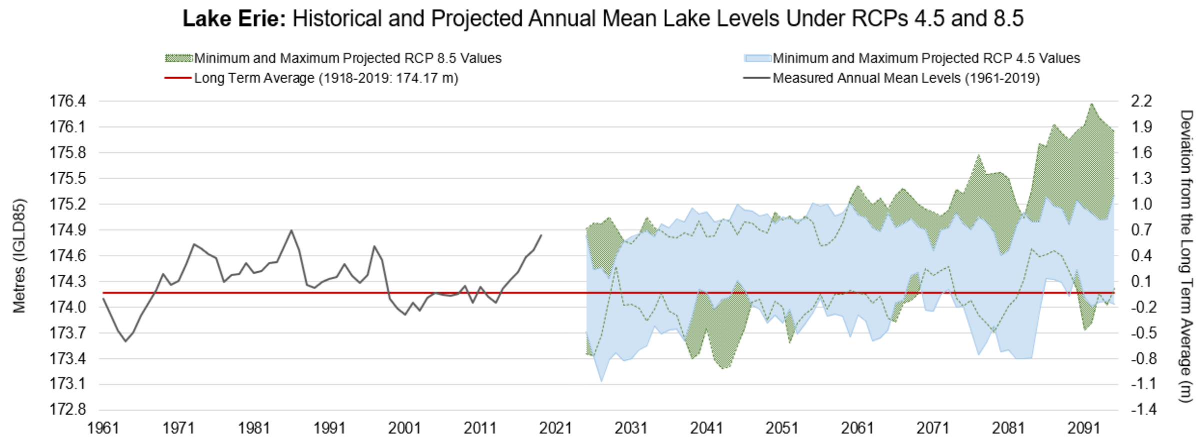

Figure 18: Historical and projected lake levels for Lake Erie under both RCP 4.5 and RCP 8.5. Projected for 2025-2095 (ECCC, 2022).

5.2 Climate Change Threats and Impacts

5.2.1 Changes in Hydrologic Regime and Water Quality

In general, water level regimes define wetland processes, soil moisture conditions, vegetation dominance, and maintain shoreline marshes. Water level changes need to be gradual to optimize wetland function and structure. A rapid rise in water levels can result in a loss of wetland habitat in areas where shorelines do not have the accommodation space to retreat and transition landwards. Wetland vegetation that is unable to germinate under high lake levels can rapidly grow in exposed mudflats during low water levels, however long periods of low lake levels, combined with increased temperatures, can lead to wetland drying and stranding, in turn altering species found within a wetland, and a decline in biodiversity and ecosystem services (ECCC, 2022).

The increased frequency and intensity of storm events can lead to increased sediment and nutrient runoff, which will result in water quality impairments such as high turbidity, eutrophication, and algal blooms. Excess sediments will lead to the burial of plant communities, a decrease in light penetration and photosynthesis, and a lack of oxygen (ERCA, 2022b).

5.2.2 Altered Coastal Processes

Warming air and water temperatures have already reduced winter ice cover across the Great Lakes (Fig. 6). Winter ice is imperative in protecting shorelines from extreme storms and waves that can lead to overwash and inland migration of barrier systems. The absence of ice will also leave shoreline properties vulnerable to more winter flooding and erosion and also cause damage to existing shoreline structures. This may lead to more or upgraded protection structures, which will contribute to further disruptions of natural erosion processes, sediment supply, transport, and deposition in beach environments. Moreover, with a rise in water levels and increased storm events, these coastal structures can become breached and damaged, reducing their protective function for coastal infrastructure (Fig. 19). The increased exposure to coastal storms is a pressing issue at HMCA, as the Road 1 dyke is vulnerable to failure, which could lead to extensive in inland flooding due to the low-lying nature of the agricultural lands in the drainage schemes (Zuzek Inc., 2021).

Figure 19: Failed seawall and home damage along Marentette Beach (south of HMCA) following the April 2018 ice storm.

5.2.3 Loss of Wetland Biodiversity

A vulnerability assessment of the Great Lakes showed that 62% of assessed species are vulnerable to climate change, with water dependent species being most at risk (Brinker et al., 2018). Climate change projections are in exceedance of several thresholds that can result in loss of or variability in species productivity, recruitment, abundance and overall composition. As a result of higher water levels, floating and submerged plants are less likely to persist, reducing fish and wildlife habitat. Severe storms and high lake levels result in nest abandonment for birds that nest on or near the water surface. Lower water levels, coupled with warm water temperatures and excess nutrients and sediments, provide conditions for algae growth and prominence of invasive phragmites and cattail. Lower water levels can result in the revegetation of marshes from the native seed bank but over the long-term can result in the loss of winter underwater habitat, and the loss of spawning access and submerged aquatic vegetation for fish. Exceedance of optimal temperature ranges and thresholds can result in possible phenology mismatches (affecting migration patterns and other ecological functions), loss of native species, introduction of new temperature tolerant species, and the emergence of pests and disease (ECCC, 2022).

6.0 Identifying Restoration Actions

This plan will propose recommended actions to reduce climate change risks to the Hillman Marsh and surrounding community, and enhance coastal wetland resilience for long-term health, function, and the provision of wetland goods and services. The Plan aims to address the need to conserve and manage lands owned by the Conservation Authority that are subject to flooding, erosion, and associated hazards, while simultaneously protecting people and property surrounding the marsh from this natural hazard. When implemented, the project will restore, enhance, and increase the resilience of the barrier-beach, along with the diversity and extent of the native wetland plant community in the marsh.

6.1 Project Partners

This Restoration Plan was developed with the help of the Steering Committee that provided feedback on the proposed restoration concepts, advised on relevant research, identified gaps and possible sources of information, and identified opportunities for First Nation engagement. The Steering Committee was comprised of the individuals from the following institutions:

- Caldwell First Nation
- Ducks Unlimited
- Environment and Climate Change Canada
- Fisheries and Oceans Canada
- Leamington Shoreline Association
- Ministry of Natural Resources and Forestry
- Ministry of the Environment, Conservation and Parks
- Municipality of Leamington
- Parks Canada, Point Pelee National Park
- SJL Engineering
- University of Windsor
- University of Waterloo
- Zuzek Inc.

The Essex Region Conservation Authority (ERCA) is receiving financial support from Environment and Climate Change Canada (ECCC) to coordinate the above committee and providing research and support for the project. The Ministry of the Environment, Conservation and Parks is providing ERCA with financial support to complete the first phase of the project (reconstruction of the south headland at East Beach Road and pilot barrier beach section) in 2023/2024.

6.2 Project Goals

Hillman Marsh and barrier beach ecosystem has passed its tipping point and it is very unlikely the breach in the beach will recover naturally. An adaptive transformational approach can restore this wetland using hybrid approaches of traditional engineering structures and nature-based solutions. With this context, there are three main goals for this project:

1. Employ a transformational adaptation approach to restore and enhance the Hillman Marsh barrier beach feature to withstand climate change extremes, protect the wetland ecosystem, and safeguard homes and businesses.
2. Restore the wetland plant community within the approximate 115 hectares of open water behind the barrier feature to enhance wetland structure, function, diversity, and resilience to climate change impacts using historical records and expert opinion.
3. Make the restored and enhanced Hillman Marsh ecosystem accessible to all of society and future generations to enjoy.

6.3 Project Objectives

This project is broken up into four phases to successfully achieve the aforementioned goals.

Phase 1:

- By March 2024, implement upgrades to the south headland at East Beach Road and construct a 40 m test section of the proposed artificial barrier, anchored on the west side of East Beach Road at the south end of Hillman Marsh, to mitigate ongoing erosion and anchor the future phases of work.

Phase 2:

- By March 2024, and in consultation with the Steering Committee, develop a high-level adaptation and restoration plan for a 1,500 metre barrier beach feature and for 115 hectares of a diverse and functional wetland plant community.

Phase 3:

- When funding is available, complete the necessary technical studies to optimize the location, dimensions, composition, and methods of construction for a new coastal barrier beach and outlet structure, as well as the structure and functional composition of the wetland plant community.

Phase 4:

- When funding for construction is secured, implement the concept developed and designed in Phases 2 and 3 to resist climate change impacts and provide community co-benefits by protecting the wetland ecosystem and the Road 1 dyke from a breach and flooding of surrounding homes, farms, and businesses.
- When the barrier beach construction is complete and funding for the ecological restoration is secured, restore 115 hectares of open water marsh by enhancing the structural and topographical heterogeneity, increase the number of functional wetland plant communities, and the increase the diversity of plant species as a key building block for enhanced wetland resilience to a changing climate.

6.4 Project Outputs

The main outputs of this Restoration Plan are:

- A report that summarizes historical and current information on Hillman Marsh, including shoreline development, barrier breaching, water quality, vegetation, and wildlife;
- A community outreach strategy to involve appropriate rightsholders, stakeholders, and the local community and provide opportunities for participation and feedback;
- Restoration concepts for a reconstructed barrier beach with nature-based and engineered components, and new wetland vegetation zones;
- A consensus-based restoration and adaptation strategy with recommended actions, approximate timelines, and a preliminary opinion of costs.

6.5 Anticipated Outcomes

As a result of the collaborative efforts with the project rights holders and stakeholders, it is expected that this project will:

- Improve understanding of the factors responsible for the degradation of a barrier beach and former protected coastal wetlands and the limiting factors for restoration;
- Restore and enhance the resilience of the barrier beach to future high-water levels, ice-free winters, and storm events;
- Restore habitats and ecosystems previously lost in the marsh;
- Create an example of barrier beach and wetland restoration in Canada and a template to follow for other threatened and degraded barrier beaches;
- Create multiple community co-benefits such as wetland restoration, expanded recreational use of the marsh, and disaster risk reduction for the properties and farms located south of the marsh on lands below lake level;

- Improve public awareness of the climatic and non-climatic threats on the Great Lakes, and engage and empower future investment in the restoration of Hillman Marsh.

6.6 Restoration Targets

This restoration project will affect approximately 115 hectares of open marsh. An ELC classification completed by ERCA in 2019 classified that the open marsh area was 90.2% open water, and only 9.8% floating and emergent vegetation. Although submerged vegetation was not formally included in this classification, observational evidence confirmed that there is minimal left in the marsh. This data approximates the extent of present-day vegetation communities, but since then some of these features have been lost, including a prominent cattail island, and it is likely that the marsh is more than 90.2% open water. A main target in this project's restoration efforts is to achieve an interspersion rate of 50% (a 50/50 ratio of water to submergent, emergent, and floating wetland vegetation).

7.0 Restoring the Hillman Barrier Beach and Wetland

7.1 Ongoing Design and Restoration Considerations

This restoration plan report has been informed by a series of completed and ongoing technical studies described in the following sections.

7.1.1 Land Use Change in the Hillman and Lebo Watersheds

The land use in the Hillman and Lebo Creek watersheds, which drain into Hillman Marsh, was qualitatively evaluated in 1968 and 2022 (Fig. 20). Though there does not appear to be any substantial increase in residential development and the majority of the lands feature agricultural land uses in both years, there is a large increase in greenhouses in the 2022 aerial photograph, as highlighted by the yellow rectangles in Figure 20. In 2019, the floor area of greenhouses in Essex County was 1,120 hectares, and it is predicted to grow to 1,360 hectares by 2041 (ERCA, 2022b). The greenhouses are comprised primarily of vegetables and fruit (96%), flowers and potted plants (3%), and greenhouse cannabis (1%) (ERCA, 2022b).

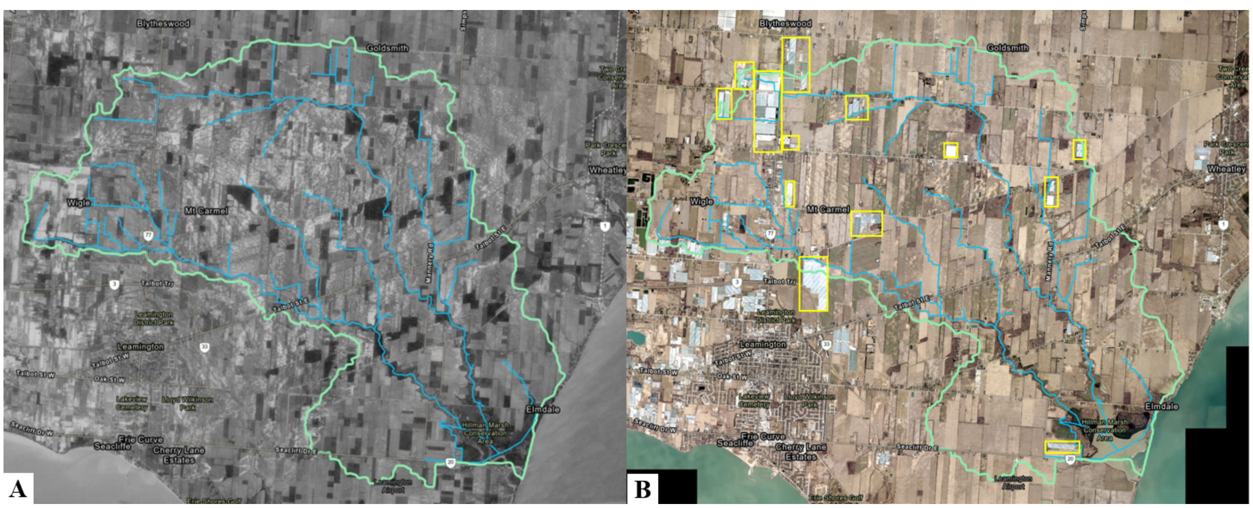

Figure 20: Comparison of land use in the Hillman and Lebo Creek Watersheds in (A) 1968 and (B) 2022. The main difference is the increase in greenhouse (yellow rectangles).

7.1.2 Water Quality in the Hillman Marsh

Turbidity, which makes water appear cloudy or muddy, is caused by the presence of suspended and dissolved matter (USGS, 2005) and is measured by the degree to which light is scattered by particles in a liquid (USGS, 2022). Typically, suspended particles are the dominant influence on light attenuation in natural waters, negatively impacting water clarity and reducing the penetration of light required for photosynthesis (Davies-Colley and Smith, 2001). This limited light penetration also affects fish predator prey interactions and impacts foraging and reproductive habitats (Carter et al., 2022). Excess suspended particles can absorb heat, increase water temperature, and decrease dissolved oxygen content (Schroeder, 2003). Pollutants are often bound to fine particles that cause turbidity, and in some cases, these may be toxic metals or nutrients that can enhance eutrophic conditions (Carter et al., 2022). Therefore, if water is too turbid, it loses the ability to support a wide variety of aquatic plants and animals.

A water quality monitoring instrument (YSI 600OMS V2 Optical Monitoring Sonde; Fig. 21A) was deployed at Hillman Marsh in July 2023 to collect continuous measurements of temperature and turbidity at an interval of 15 minutes. The sensor was placed in a sheltered area of the marsh, roughly 80 m offshore (Fig. 21B), to get an accurate understanding of turbidity levels in the area that would be the main focus in revegetation efforts further along in the project. Discrete measurements were taken of pH, dissolved oxygen, specific conductivity, and ambient conductivity roughly every 3 weeks using a YSI ProDSS Multiparameter Digital Meter (Table 1). Water samples were collected and sent to a laboratory for measurements of total suspended solids (TSS). The sensor was retrieved in late October 2023, with a total of 111 full days and 2 partial days of data.

Figure 21: (A) Set up of deployed turbidity sensor. (B) Location of turbidity sensor in the Marsh.

Table 1: Discrete measurements of temperature, dissolved oxygen (DO), specific conductivity, ambient conductivity, and pH taken every ~3 weeks at location of turbidity sensor. Water samples grabbed and sent to Caduceon Environmental Laboratories for TSS measurements.

Date	Time	Temp (°C)	DO (mg/L)	Specific Conductivity (μs/cm)	Ambient Conductivity (μs/cm2)	pH	TSS (mg/L)
07-07-2023	12:17 PM	23.5	9.3	284.5	276.4	9.3	
07-28-2023	11:13 AM	16.6	4.82	287.8	243.6	7.4	19
08-16-2023	10:18 AM	20.8	7.85	294.5	270	8.2	40
06-08-2023	11:05 AM	20.4	8.11	270.1	246.2	8.0	43
09-29-2023	10:40 AM	18	8.5	291.1	251.7	7.9	64
10-27-2023	10:26 AM	16.2	11.39	352.1	292.8	9.2	27

Preliminary results show the median turbidity for the Summer 2023 season as 24.2 NTU with frequent spikes ranging between 68.65 NTU and 205.15 NTU (Fig. 22). These peaks in turbidity often lined up with periods of precipitation that result in increased sediment and nutrient loads from non-point source agricultural runoff (Table 2; Carter et al., 2022). Most notably, 18.1 mm of precipitation on October 14, 2023, that yielded a median turbidity of 205.15 NTU. Although the exact cause for spiked turbidity in the absence of precipitation cannot be confirmed, studies suggest increased turbidity can be a result of algae growth (USGS, 2018), wave action (Paul et al., 1982), or resuspension from carp and other bottom-feeding fish (Weber and Brown, 2009). Turbidity standards set out by the Provincial Water Quality Objectives (PWQO) state that turbidity should not change by more than 10% above the natural levels for the protection of aquatic life (MECP, 2021). Although this dataset is only one season and is not enough to make final conclusions, turbidity often spiked above this 10% threshold this season. Monitoring of Hillman Marsh water quality should continue to grow a large enough data set to do proper statistical analysis.

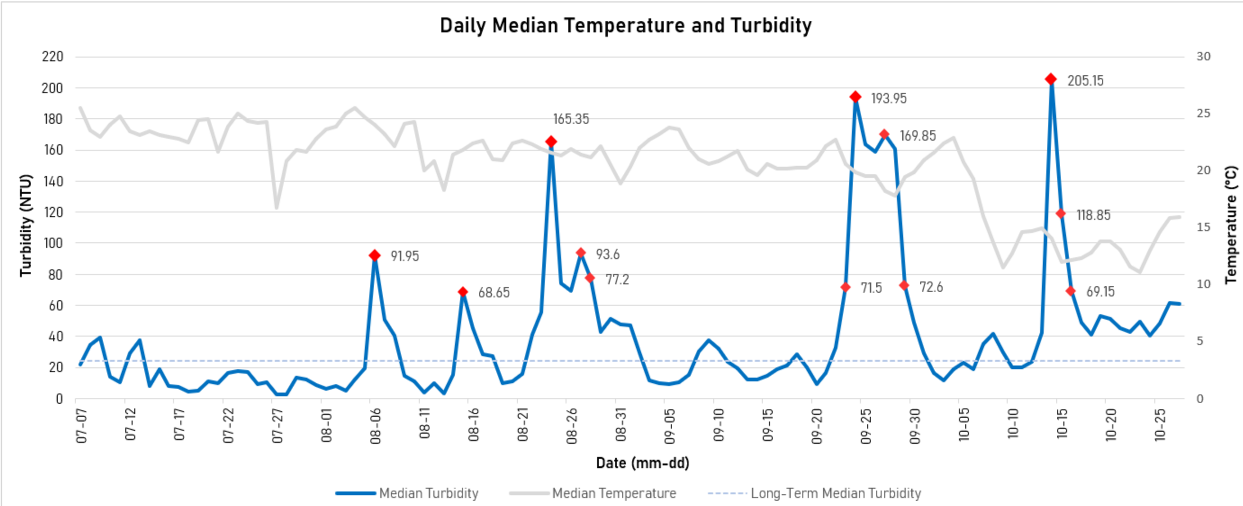

Figure 22: Daily median temperature and turbidity from July 7, 2023, to October 27, 2023. Peaks in turbidity marked in red, often lining up with precipitation events.

Table 2: Total rainfall (mm), average wind speed (km/h), and average wave height (m) on days with high median turbidity. Colour blocks represent consecutive days of high turbidity.

Date	Median Turbidity (NTU)	Total Rainfall (mm)	Avg Wind Speed (km/h)	Avg Wave Height (m)
08-06-2023	91.95	14.5	23.6	0.7
08-15-2023	68.65	13.7	18.9	0.5
08-24-2023	165.4	16	14.4	0.4
08-25-2023	73.9	0	14.9	0.3
08-26-2023	69.1	0.7	12.4	0.2
08-27-2023	93.6	0	14.9	0.4
08-28-2023	77.2	0	7.3	0.2
09-24-2023	194.0	0	19.3	M
09-25-2023	163.6	0.2	20.8	0.6
09-26-2023	159.1	0.3	23.4	0.7
09-27-2023	169.9	0.3	24.1	0.8
09-28-2023	160.9	7.3	20.9	0.7
10-14-2023	205.2	18.1	31.1	1.3
10-15-2023	118.9	0.2	24.6	0.7
10-16-2023	69.2	0.6	20.0	0.4
10-26-2023	61.4	1.1	23.9	0.6
10-27-2023	61.0	0.5	24.5	0.6

Since breaching of the protective barrier beach, wave agitation may have resulted in sediment stirrup in Hillman Marsh, and the subsequent increased turbidity levels resulted in the loss of submerged aquatic vegetation. Although emergent and floating vegetation can grow in turbid waters (floating vegetation has resurfaced this summer; Fig. 23), clear water is needed early in the growing season for new seedlings to establish (Austin et al., 2017). Once the barrier beach is restored, there will be a buffer between the marsh and the harsh conditions of Lake Erie, which should result in less sediment stirrup - allowing for the successful reestablishment of aquatic vegetation. Additionally, an increase in aquatic vegetation will help reduce future turbidity levels caused by bottom-feeding fish by trapping sediment (McNair and Chow-Fraser, 2003). Re-establishing aquatic vegetation will also help attenuate waves, regulate nutrients, and absorb CO_2 (Austin et al., 2017).

Figure 23: Floating aquatic vegetation in Hillman Marsh re-establishing this summer (June 2023).

7.1.3 Barrier Erosion and Downcutting in the Breach Channel

A bathymetric survey of the Hillman Marsh and Lake Erie shoreline was completed on May 26, 2023, and compared to data collected in 2007 and 2020 (Fig. 24). The most dramatic example of lakebed downcutting at Hillman Marsh is in the breach channel, which starts in the East Marsh Drainage Scheme, goes over the Road 1 dyke, through the marsh and over the former barrier beach (Profile B). The depths in the breach channel are up to 2 m deeper in 2023 as compared to 2007 (500 to 700 m on the x-axis), when the barrier beach was still in place.

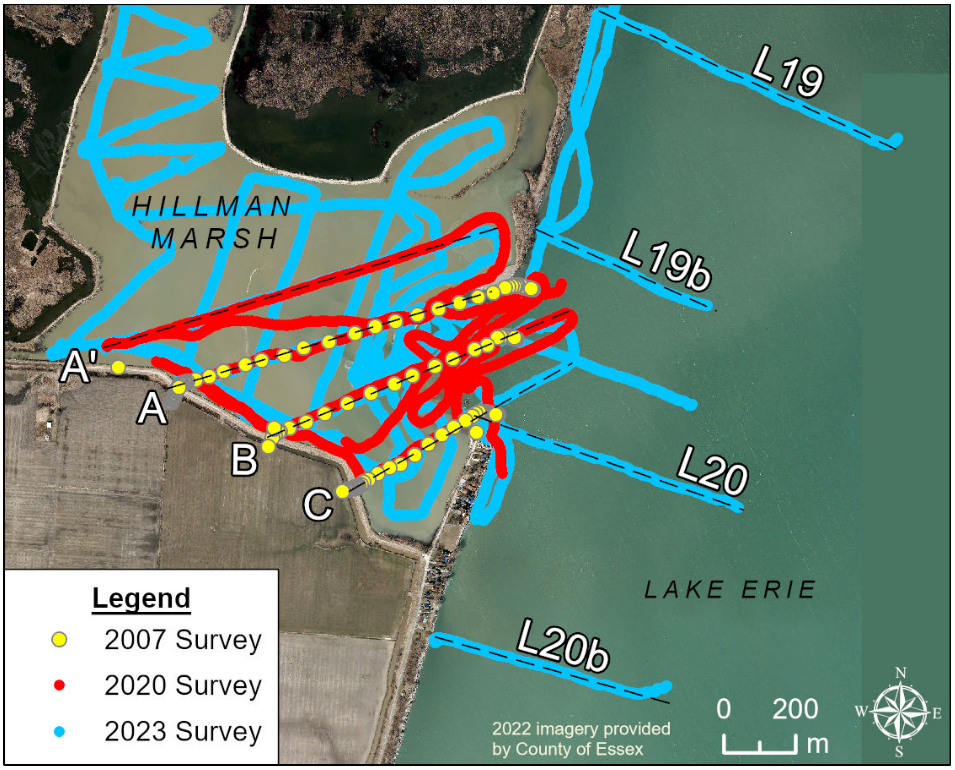

Figure 24: Tracklines of bathymetric surveys done in 2007, 2020, and 2023.

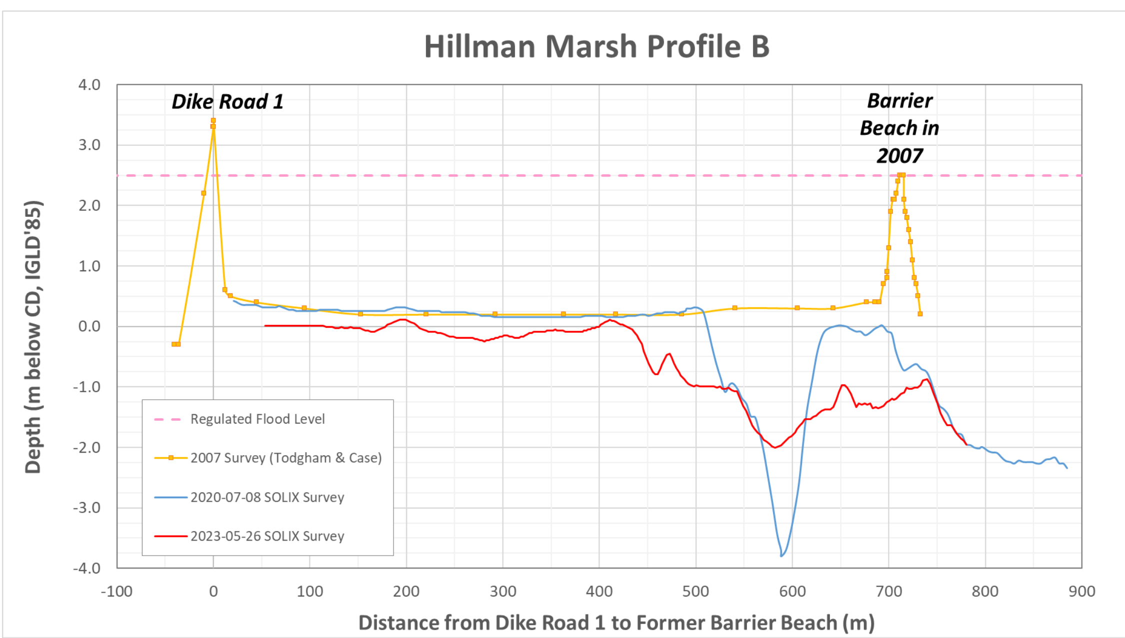

Figure 25: 2007 to 2023 Comparison of Marsh and Barrier Depths at Profile B in Figure 24.

7.1.4 Potential Role of Cumulative Stressors

Dramatic changes in the wetland plant communities at the Hillman Marsh occurred between the late 1960s and early 1970s (Fig. 26). The potential role of cumulative stressors was investigated based on published literature and other data sources. The greenhouse industry expansion in the Hillman and Lebo watersheds was already discussed and did not correspond to the period of vegetation die-off from the late 1960s to early 1970s. However, a 1988 (ERCA) water quality report comparing the Hillman Creek to Ruscom River and Big Creek that drain north is Essex County into Lake St. Clair found that the Hillman Creek featured the highest sediment and phosphorus concentrations, presumably from field crops.

Following rapid expansion of the greenhouse industry in the Leamington area in the late 1990s and early 2000s, monitoring by the Ministry of the Environment (2012) determined Sturgeon Creek and the Lebo Drain were the most polluted waterways in the province of Ontario with respect to phosphorus and nitrate, two key ingredients in fertilizer. Subsequently, in 2015 the Leamington and Kingsville tributaries were identified as a priority watershed for action in the Great Lakes Water Quality Agreement. In 2022, ERCA reported on a detailed 10-year monitoring program of local tributaries in Kingsville and Leamington, with a focus on greenhouse and non-greenhouse systems. Following extensive water quality monitoring, the study showed the greenhouse industry was directly responsible for elevated phosphorus and nitrate concentrations in local tributaries draining to Lake Erie. In agricultural dominated watersheds, phosphorus concentrations ranged from 0.12 to 0.3 mg/L but increased to 2.9 to 6.0 mg/L for the Kingsville and Leamington tributaries (~20 times higher). The measured phosphorus concentrations were 100 to 200 times higher than the Provincial Water Quality Objective of 0.03 mg/L, which is the benchmark for nuisance algal growth in streams (ERCA, 2022b).

A prolonged period of record setting lake levels in the early 1970s is one potential stressor that contributed to the wetland vegetation die-off and loss as a result of rapid drowning (Fig. 6). In 1973, the summer peak levels had established a new record high lake level, that was subsequently exceeded in 1986, 1998, and 2019.

Chemical pollution in Lake Erie is another potential contributor to the vegetation die-off. For example, mercury contamination from the St. Clair and Detroit Rivers resulted in the closure of the walleye fishery from 1970 to 1973 (Nepszy et al, 1991). More recently, the return of high phosphorus loads to Lake Erie has resulted in the return of toxic algal blooms in the Western and Central Basin of Lake Erie. Satellite derived concentrations of Chlorophyl, a measure of bloom intensity, routinely see Lake Erie local concentrations above the threshold of 3.6 ug/L for the central basin (Zuzek Inc., 2018b). A satellite derived cyanobacteria index (NOAA) also routinely tracks concentrations greater than 1 ug/L, which is a threshold established by the World Health Organization, along the east coast of the Pelee Peninsula (Zuzek Inc., 2018b).

Continued water quality monitoring in the Hillman watershed, which ultimately drains through the planned restoration, should continue. Remediation efforts to reduce nutrient losses from closed-loop operations in the Greenhouses is also required.

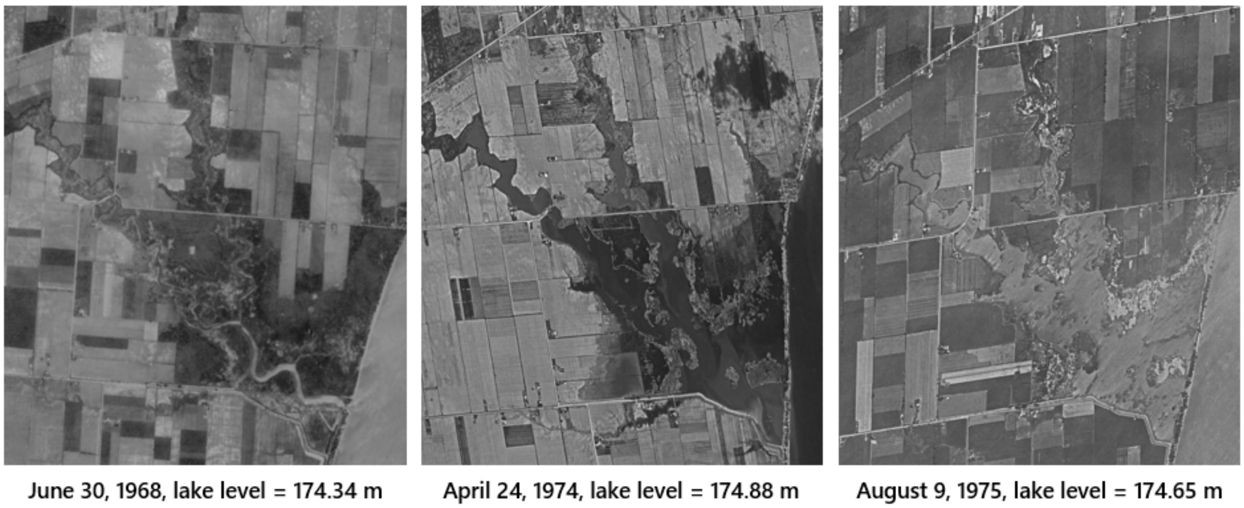

Figure 26: Dramatic changes in the wetland plant communities at Hillman Marsh between the late 1960s and early 1970s.

7.2 Concept Sketches for Barrier Beach and Wetland Restoration

Based on knowledge gained from this restoration study, three restoration concept sketches were developed for Hillman Marsh by Zuzek Inc. and SJL Engineering that focus on re-aligning the barrier beach further inland. They are described in the following report sections.

7.2.1 Concept A – High Crested Barrier

In Concept A, the barrier beach location is fixed further inland with a rock core and armoured outlet channel that is fixed in place (Fig. 27). The rock core (E & G) for the barrier beach is covered with sufficient sand to minimize wave overtopping events and restored with appropriate native vegetation (Fig. 28). Submerged rock shoals (H) reduce incident wave energy and help to stabilize the toe of the beach. A new feeder beach for the Wheatley Harbour dredged sediment is located on the back side of the north barrier beach and a construction road is used to haul sand for a new pocket beach (F).

Habitat islands and training structures (J) are used in the marsh to direct the Hillman and Lebo Creeks flow towards the fixed outlet structure. Potholes are excavated in the sheltered marsh to create fish refugia during periods of low lake levels or storm surges that can drain the marsh. The excavated sediment is used to raise the grades against the

Road 1 dyke. Swamp and marsh restoration will be undertaken once the barrier beach is reconstructed and sheltered waters are returned.

7.2.2 Concept B – Low Crested Barrier

Concept B (Fig. 29) features the same elements of Concept A with one major difference: the crest elevation of the restored barrier beach (G) is lower than Concept A to facilitate wave overtopping events (Fig. 30). This type of natural disturbance makes the system more dynamic and natural but will result in overwash deposits (K) and more wave energy in the marsh. The increased wave energy will limit the spatial extent of the marsh and swamp restoration compared on Concept A. This would be a less expensive option as compared to Concept A.

7.2.3 Concept C – Meandering Channel and Large Pocket Beach

Concept C features many of the same elements as Concept A and B, with the exception of the fixed outlet channel (Fig. 31). It is located further lakeward and centred on the existing breach channel, making use of existing bathymetry. Discharge from the watershed is directed towards the outlet by a series of habitat islands that create meandering channel. By extending the fixed outlet further lakeward in Concept C, a large pocket beach is constructed north of the outlet (F).

The elements of these concepts will be refined in the future with the completion of more technical studies, including additional field data collection to characterize the geotechnical properties of the soils, numerical modelling of waves and currents, and optimization of the barrier beach layout and outlet structure.

7.2.4 No Action Approach

The fourth option is to take a “No Action” approach, leaving Hillman Marsh to continue on its current trajectory. If this approach is taken, various environmental and economic consequences can be anticipated. Environmentally, the barrier beach will continue to erode and retreat landwards, and the breach will remain open, prolonging wave agitation in the marsh. Hillman Marsh will continue to see a decline in habitat quality, water quality, and biodiversity. There will be an increase in the risk of invasive species as they will be more tolerant to these harsh conditions compared to native species. Economically, significant damage is expected without a barrier to act as a buffer between the lake and the marsh. Incoming waves will directly impact the Road 1 Dyke, which can lead to a structural breach, as this dyke was not built to withstand the conditions of Lake Erie. A dyke breach would flood more than 300 structures and could result in $50-100 million in building and content damages for the agricultural lands below lake level.

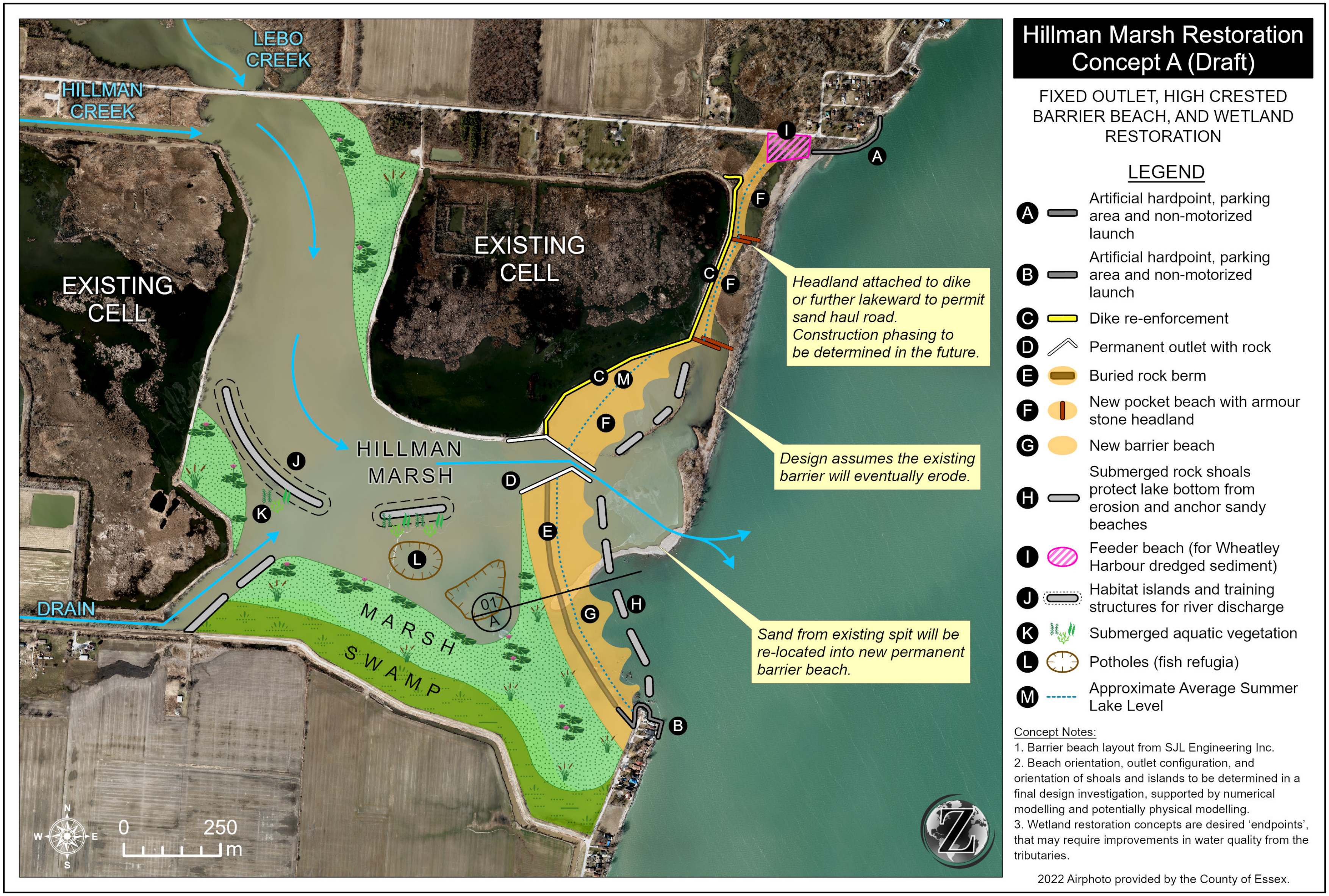

Figure 27: Concept A – High crested barrier.

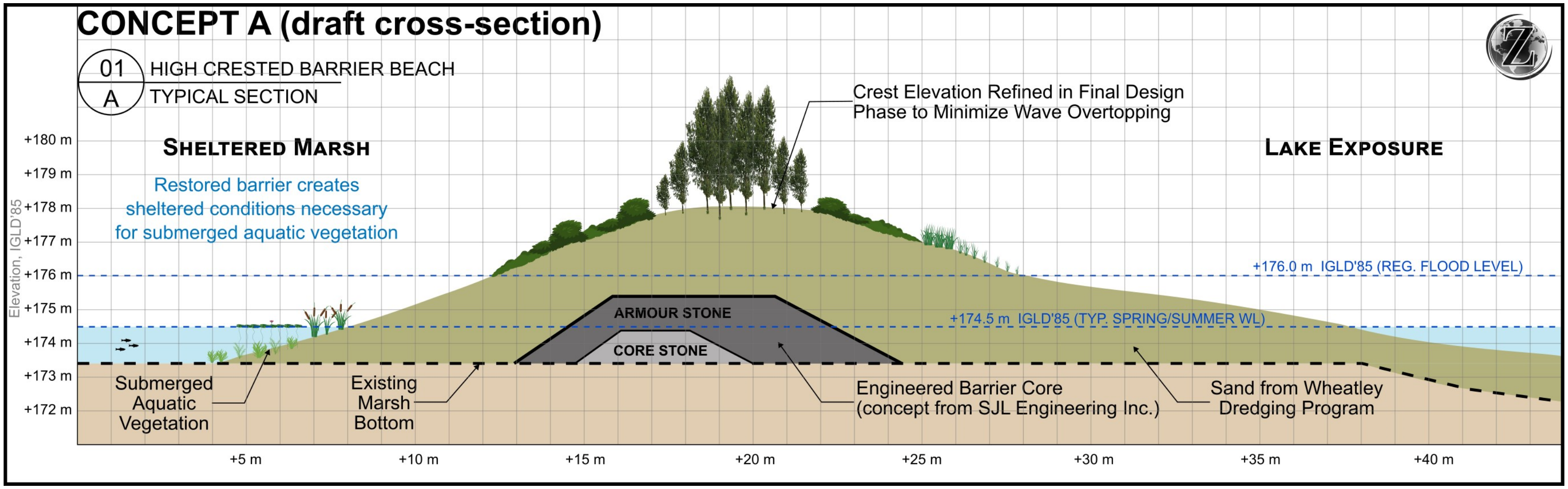

Figure 28: Concept A - High crested barrier cross-section.

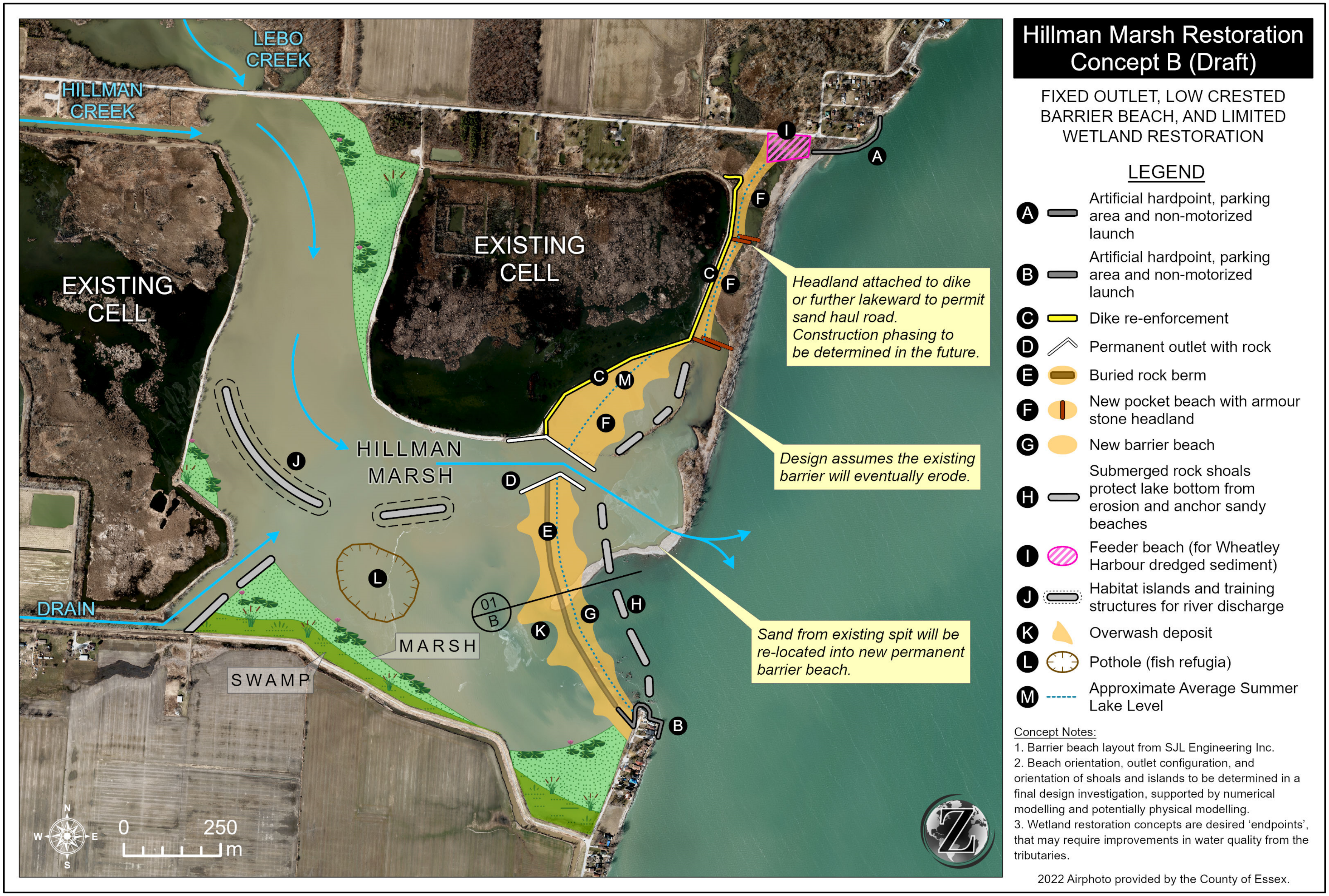

Figure 29: Concept B – Low crested barrier.

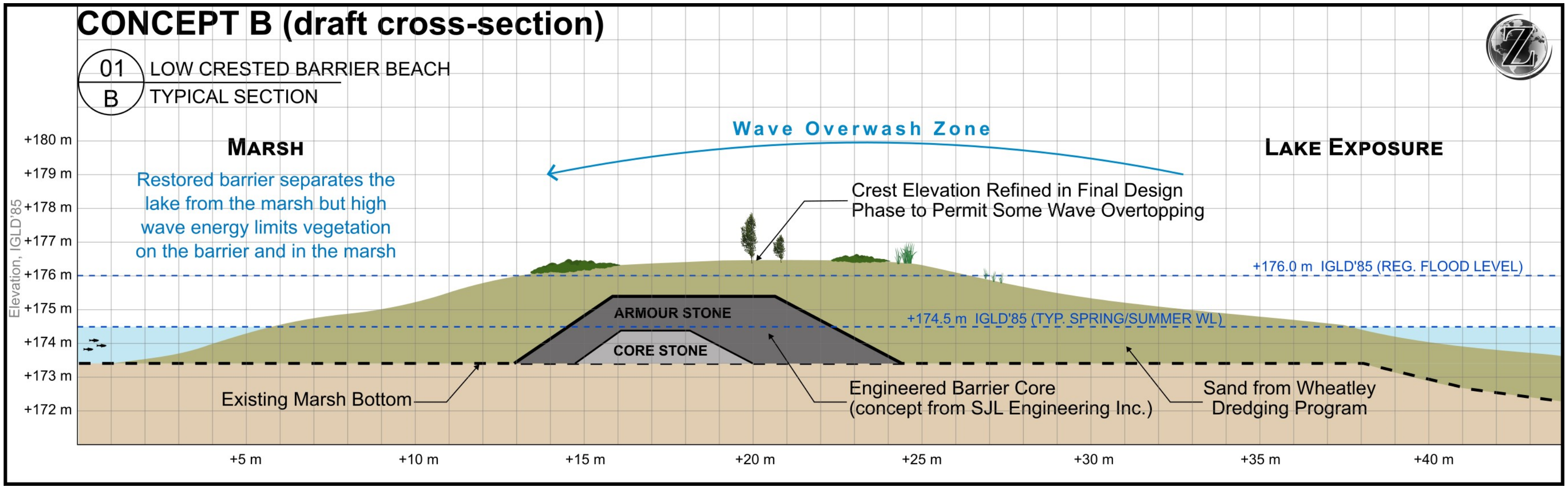

Figure 30: Concept B/C – Low crested barrier cross section.

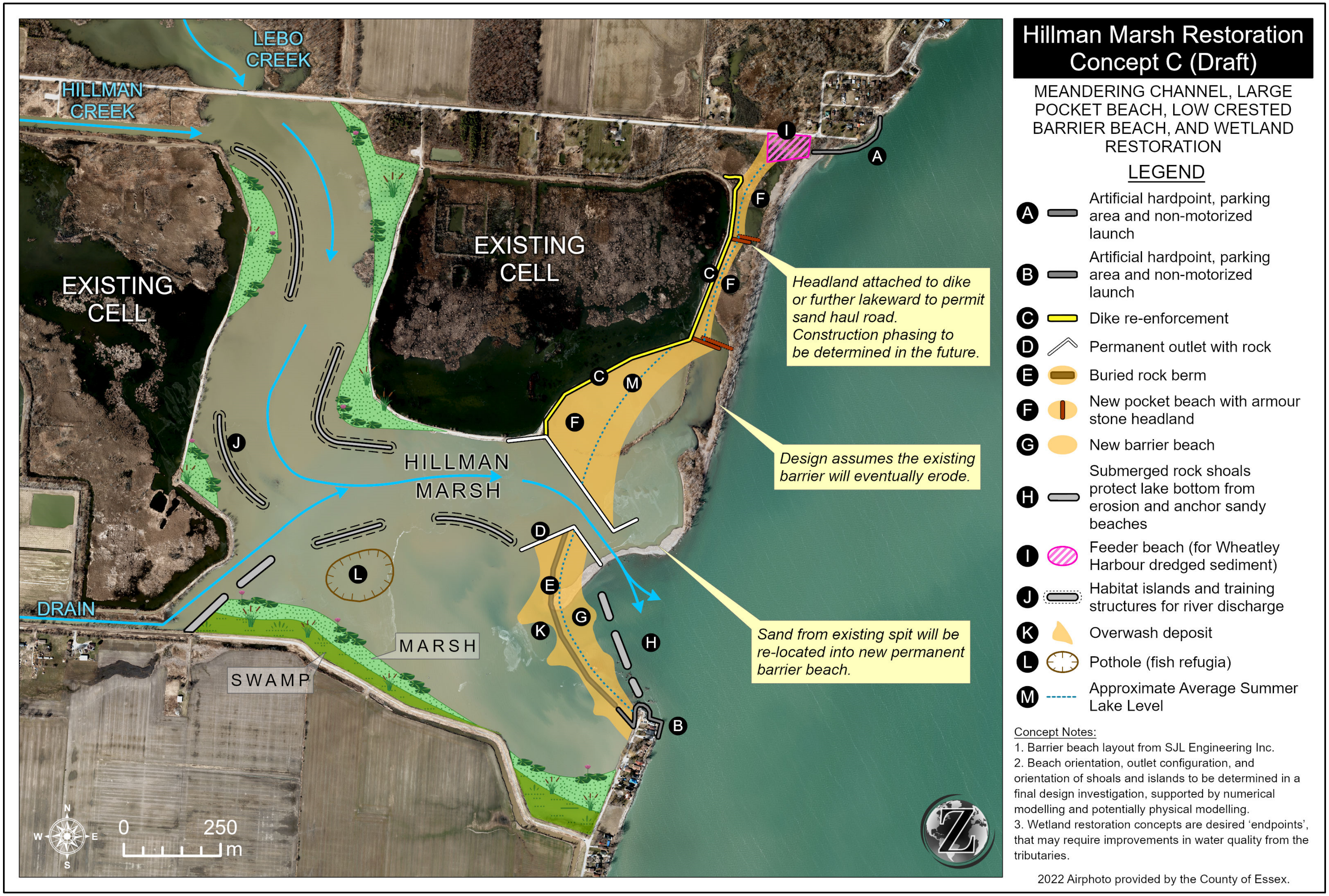

Figure 31: Concept C – Meandering channel and large pocket beach.

7.3 Preferred Option

Based on the opinion of experts on our Core Team and Steering Committee, and the opinion of the majority of the general public, ERCA recommends this project moves forward with Concept A as the preferred approach. The high crested barrier protects the marsh and provides the greatest opportunities for habitat restoration and vegetation re-establishment both on the barrier and behind it. Concept A is more robust and therefore more resilient against wave action, storm events, erosional forces, and future climate change extremes. Through in-depth discussions with various experts, ERCA recognizes that a low crested barrier presents a more dynamic system that will be better suited for wildlife and provides the fundamental services and structure for a healthy wetland. However, concerns remain that Hillman Marsh may not be able to handle this dynamic system, without failing, given its current state. Moving forward, numerical and physical modelling will be conducted by engineers to test the possibility of a structure that has variable crest elevations. If areas of both high and low crested barrier beach can be accommodated without compromising the wetland, then it will provide for a more biologically diverse outcome and will be pursued.

Caldwell First Nation has been part of the steering committee since its inception, but as the only other landowners in the marsh, staff would prefer to not commit to any preferred option, but instead to continue ongoing consultation with their leadership and community regarding their opinions. Administration has committed to continuing to work and communicate with and seek feedback from Caldwell First Nation if funding for this project is approved and it can move forward.

7.4 Phase 1 - East Beach Road South Headland and Pilot Restoration

Funding was received from the Ministry of the Environment, Conservation and Parks (MECP) to initiate work on the broader barrier beach and wetland restoration plan, referred to hereafter as Phase 1. The focus of the Phase 1 work was to implement upgrades to the south headland at the north end of East Beach Road, and to construct a test section of the artificial barrier with pilot wetland restoration efforts in its lee (Fig. 32). Phase 1 work is denoted "B" in the concepts shown above in Figures 27, 29, and 31. The stability of the south headland was determined to be a high priority component of all three concepts given that the north end of East Beach Road continues to erode both beneath and behind the existing stone erosion protection structure that was placed by the municipality in the fall of 2020.

The proposed Phase 1 work is set to go to construction tender in 2024, with implementation to occur shortly thereafter. The initial test section of artificial barrier will be monitored post-construction for settlement and performance in terms of its stability under wave loading and ability to dissipate wave energy entering the south portion of the marsh. The pilot restoration works in lee of the test section will be led by ERCA and will feature both sand and organic infill that will be graded to achieve several vegetation zones. The zones will be planted with a variety of emergent marsh species native to the region. Monitoring of all components of the Phase 1 works will be carried out in parallel with the technical work required to advance the concepts presented for the broader Hillman Marsh Barrier Beach and Wetland Restoration project (Phase 2).

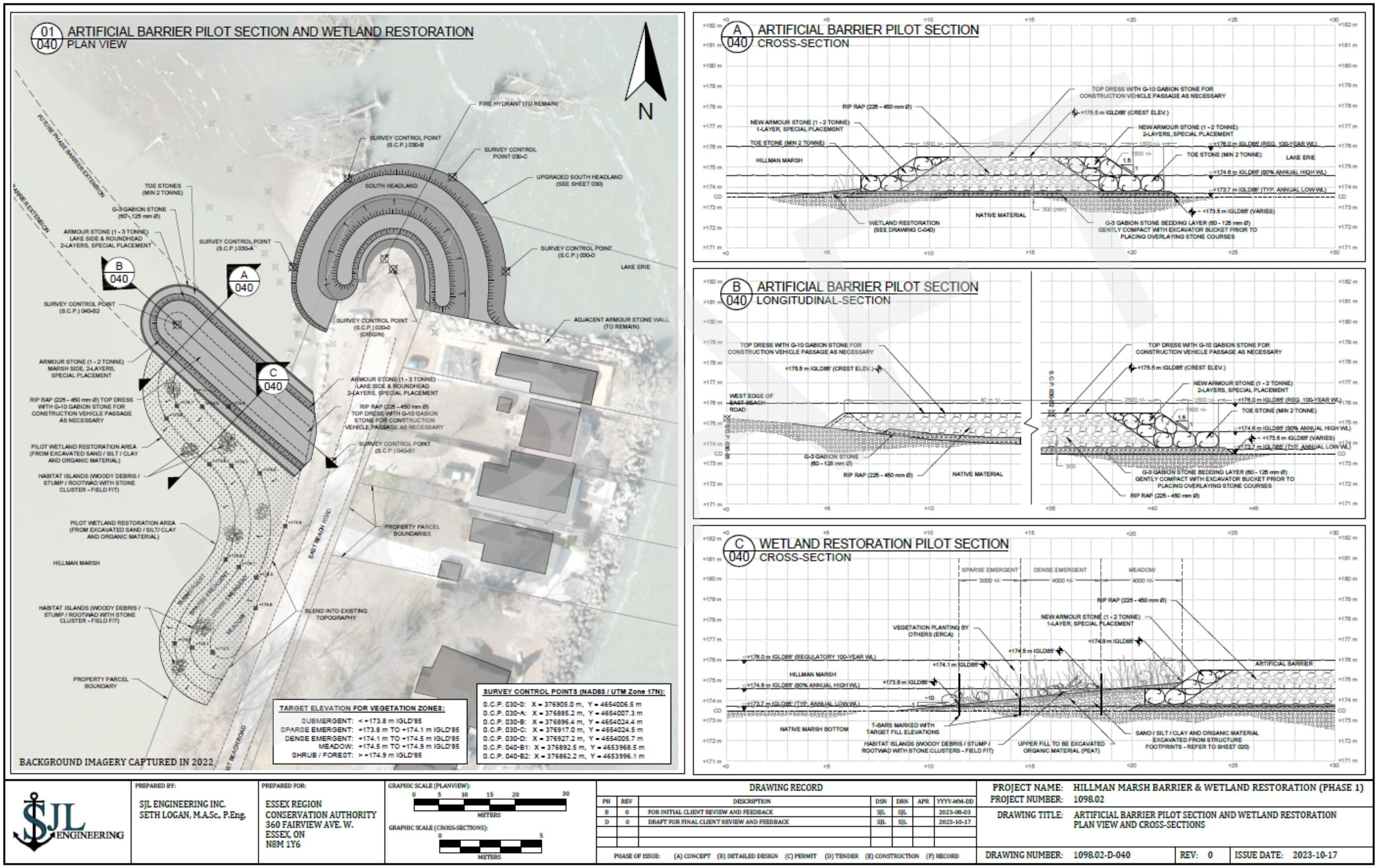

Figure 32: Map of the south headland upgrade, the pilot section for the artificial barrier, and the pilot wetland restoration.

8.0 Next Steps for Design and Project Implementation

The strategies and concepts presented in Section 7.0 will require a great deal of scientific and technical engineering work before a single concept can be selected, advanced, and ultimately designed to a level at which it can be tendered and constructed. The work required to advance the project to implementation has been divided into two additional phases of work, which are summarized in the sections that follow and in Table 3.

8.1 Phase 2 – Technical Work to Support Detailed Design

Phase 2 would begin with the acquisition of additional field data necessary to execute the technical tasks required for the assessment of concepts and detailed design of the overall barrier beach and wetland restoration plan. Following the field work, design conditions for the project would be developed both in terms of coastal and geotechnical considerations, and ecological restoration targets would be identified. A series of technical tasks would follow including detailed numerical and physical modelling of hydrodynamics, waves, and sediment transport to support the selection, advancement, and optimization of the overall concept to be carried forward to detailed engineering design. Finally, wetland restoration and beach nourishment plans would be developed to accompany the detailed engineering design work. Tasks expected to be included in Phase 2 are listed as follows:

- Field work and data acquisition;
- Evaluation of ecological baseline conditions and restoration targets;
- Development of design conditions and advanced concepts;
- Numerical modelling of nearshore and marsh hydrodynamics, waves, and sediment transport;
- Physical modelling of coastal processes and their interaction with the proposed works to facilitate layout and cross-section optimization for the various project components;
- Detailed engineering design and Class C cost estimating;
- Development of wetland restoration plan assuming a restored barrier;
- Development of beach nourishment plan;
- Assessment of construction feasibility and construction phasing.

8.2 Phase 3 – Final Design, Approvals and Preparation of Tender Documents

In Phase 3, the selected concept subjected to detailed engineering design will be finalized and drafted in construction ready drawings. All other components of a construction tender will be prepared including construction specifications and cost estimates. A long-term monitoring and adaptive management plan will be developed for the implemented project, and all necessary permits and agency approvals will be sought such that the project can advance to the implementation stage (to be Phase 4). Anticipated tasks included in Phase 3 are listed as follows:

- Final engineering design;
- Production of construction-ready engineering drawings;
- Development of long-term monitoring and adaptive management plan;
- Preparation of tender documents and technical specifications;
- Securing of permits and other agency approvals required for project implementation and project tendering.

8.3 Phase 4 – Tender and Construction

In Phase 4, the project will be tendered for construction and the barrier beach restoration will be carried out by a suitable contractor(s), with wetland restoration works to follow once sheltered waters return to the Hillman Marsh. All wetland restoration work will be led by ERCA.

8.4 Phase 5 – Monitoring and Adaptive Management

In the final project Phase, ongoing monitoring of all project elements including wetland survival and beach stability will be carried out, within the scope of the adaptive management plan developed in Phase 3. Monitoring of the barrier beach and wetland restoration should continue indefinitely to learn from the project, modify management approaches as required, and continue to build resilience to coastal storms and climate change.

Table 3: Operational plan breakdown by year, phase, scope, and budget.

Year	2022 –2024	2023-2024	2024-2025	2025-2026	2026-2027	2027+
Phase	**PHASE 1a: Engagement and Restoration Concept Development**	**PHASE 1b: Interim Improvements to South Hardpoint**	**PHASE 2: Technical Work to Support Final Design**	**PHASE 3: Final Design and Approvals**	**PHASE 4: Tender and Construction**	**PHASE 5: Adaptive Management**
Scope	1) Establish Steering Committee for the Hillman Marsh Conservation Area Restoration Plan (hereafter referred to as the Restoration Plan). 2) Development of high-level Restoration Plan concepts. 3) First Nations, community and stakeholder engagement and consultation. 4) Environmental and ecological monitoring and baseline assessment for restoration. 5) Physical data collection including bathymetric and topographic surveying. 6) Develop Technical Terms of Reference for restoration plan. 7) Develop funding strategy for Phase 2 technical work to support detailed design of Restoration Plan, Phase 3 final design and approvals, and Phase 4 tender and construction.	1) Coastal and geotechnical engineering for the design of upgrades to the south hardpoint and root section of artificial barrier beach. 2) Design of initial pilot restoration works in lee of East Beach Road South Hardpoint (southeast corner of marsh). 3) Project permitting and approvals from DFO, MNRF, ERCA, and the Municipality (as required). 4) Construction tendering. 5) Construction of Phase1b works during the in-water work window (Jul 15 - Sep 15). 6) Monitoring of interim south hardpoint upgrades and root section of artificial barrier beach for settlement, and monitoring of pilot restoration works.	1) Project communications 2) Additional field work and data collection as needed. 3) Numerical modelling of waves, hydrodynamics, and sediment transport. Integrate watershed flows and lake forcing. Optimize design through numerical modelling to minimize wave agitation in the marsh, develop design wave conditions for infrastructure and vegetation survival, assess necessary outlet width, configuration, and alignment, and to provide stability to newly created beach cells and artificial barrier. 4) Further optimize design through physical modelling of critical design components, including elevation, alignment, and cross-section of artificial barrier, north and south headlands, outlet geometry, and offshore rock shoals/artificial reefs. 5) Assess available water depths, substrate, exposure, and circulation throughout marsh to support development of wetland restoration plan. 6) Review potential sources of sediment for barrier restoration and develop beach nourishment plan. 7) Assess construction feasibility. 8) Seek funding for Phase 3 final design, Phase 4 tender/construction, and Phase 5 adaptive management and long-term monitoring.	1) Project communications (continued) 2) Complete detailed design of project elements including: a) North and south hardpoints; b) Artificial barrier beach / buried rock berm; c) Permanent Outlet; d) East dyke reinforcement with armour stone headlands and new pocket beach; e) Submerged rock shoals; f) Habitat islands and training structures for river discharge; g) Submergent and emergent aquatic vegetation; h) Pothole creation and sediment placement against Road 1 dyke; 3) Develop construction-ready drawing set, restoration plan, and specifications; 4) Material volumes and cost estimate 5) Develop adaptive management plan; 6) Secure permits and approvals from all relevant agencies including ERCA, MNRF, DFO, Municipality.	1) Tender packages will be prepared to secure quotations for the various phases of construction and restoration. 2) Secure contractors and commence construction with appropriate oversight. 3) Once heavy/civil construction is complete, marsh restoration can commence. This would be a multi-year effort.	1) Implement adaptative management plan during construction. 2) Ongoing monitoring of all project components.
Budget Estimate	$0.25 million (funded)	$0.5 million (funded)	$0.5 - $1.0 million	$0.5 - $1.0 million	Unknown (> $10 million)	$0.5 million/ 5 years

9.0 Community Engagement

In Fall 2023, ERCA conducted a series of public consultation and community engagement efforts to promote awareness of the Hillman Marsh Conservation Area Restoration Plan, with a goal to engage, inform and seek feedback from neighbouring landowners and the broader community. These efforts began through the launch of a project website, which provided an overview of HMCA's historical context, challenges, and threats, as well as the project's objectives, collaborative partners, and available resources. This website introduced a community feedback form that provided the opportunity for project feedback while also gathering information such as the users' municipality of residence (Fig. 33), user group identification (Fig. 34), and the frequency of their visits to Hillman Marsh (Fig. 35).

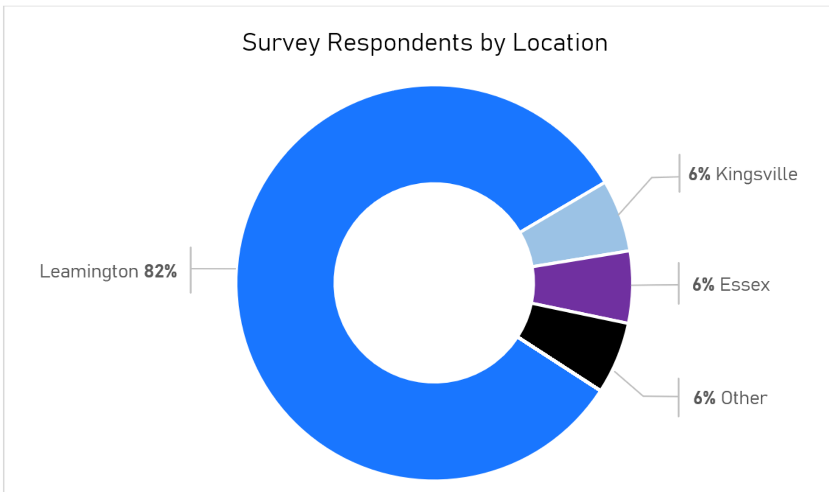

Figure 33: Survey responses for municipality of residence.

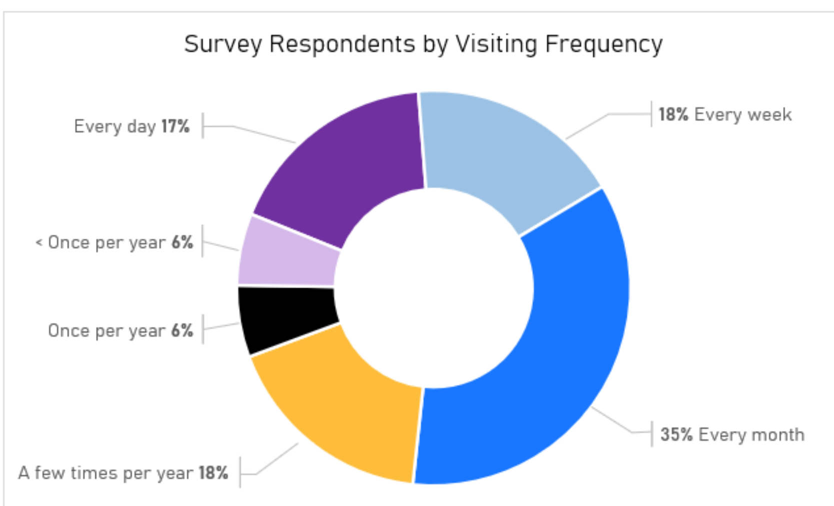

Figure 34: Survey responses for visiting frequency.

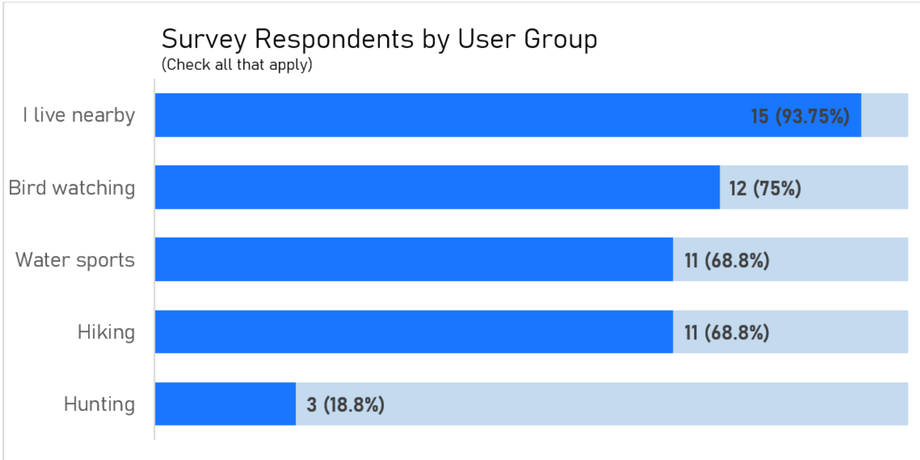

Figure 35: Survey responses for user groups.

The main source of engagement with the community occurred during public consultation meetings, which drew approximately 60 participants. Two evening sessions were conducted on October 3rd and 10th at the Nature Fresh Farms Recreation Centre and were open to the public. The local community was informed of the events three weeks prior through targeted mailing (flyers sent to 3000 homes, farms, and businesses within a 5 km radius of Hillman Marsh), social media (posted 5 times on ERCA's Instagram, Twitter, and Facebook accounts leading up to the event), a press release (sent out to 55 different media outlets, newspapers, and journalists), ERCA's website, and through an advertisement in the main lobby of the Nature Fresh Farms Recreation Centre. Various newspapers and news stations picked up the story and advertised it as well (Fig. 36). Interviews were conducted with AM 800, CBC News, and CTV News, and Windsor News Today, Yahoo!, and Penticton Herald published articles based on the information available on ERCA's website, these are available in the references list. The meetings featured informative posters and a presentation outlining the proposed restoration concepts that had been previously developed. Attendees were encouraged to ask questions, provide feedback, or express any concerns. These concerns will be thoroughly reviewed and considered in the decision-making process. A full list of community feedback can be found in the Appendix.

Wanted: public input on how to spend $10M on Hillman Marsh in Leamington

Hillman Marsh area. (Source: Wayne King)

Michelle Maluske
CTV Windsor News Reporter
Follow | Contact

Public input is wanted on how to spend $10 million on Hillman Marsh in Leamington.

The Essex Region Conservation Authority (ERCA) needs to fix the wetland, not only to preserve its biodiversity, but also to protect the municipal dyke.

Plan to restore Hillman Marsh under development

BY MAUREEN REVAIT

SEPTEMBER 24, 2023 - 6:00AM

The Essex Region Conservation Authority is developing a plan to restore the Hillman Marsh Conservation Area.

As part of the planning process, it wants to hear from residents and stakeholders.

The authority is concerned about erosion causing the beach and marsh to disappear.

It says the loss of the beach could compromise surrounding homes, farms, and businesses.

The public is invited to hear more about the effort to save the marsh and provide input at two public meetings. The open-house meetings will be held October 3 and October 10 from 6 p.m. to 8 p.m. at the Nature Fresh Farms Recreation Centre in Leamington.

Figure 36: Examples of advertisements for the public consultation meetings.

10.0 Conclusion

Hillman Marsh exists on a shoreline that has been eroding for centuries, even prior to the European Settlement. Coastal infrastructure at Wheatley Harbour was constructed without a sufficient understanding of its impacts on coastal processes, and shoreline armouring was subsequently constructed to protect development from coastal erosion and flooding. Although armouring provided residential protection, it has negatively impacted the natural supply of sediment that nourished and maintained the downdrift shoreline, including the Hillman Marsh barrier beach.

Over time, this limited sediment supply has resulted in a narrow, low-lying barrier beach that is highly susceptible to breaching and overwash processes. In 2017, harsh lake conditions resulted in significant erosion and the initiation of a storm-induced breach. Record high lake levels and storms, coupled with near record low ice cover in the following years resulted in the rapid expansion of the breach to almost 500 metres, leaving Hillman Marsh exposed to the forces of Lake Erie and highly vulnerable to current and future climate change impacts. Due to the limited availability of sediment, the barrier beach has not been able to naturally recover, even as water levels have dropped. This lack of recovery leads to further erosion and barrier retreat, subjecting the sensitive and vulnerable ecosystems in the marsh to altered water quality, disturbed habitat, and the intense conditions of Lake Erie. Without the barrier beach as a buffer, flooding threatens hundreds of surrounding homes, businesses, and farms that are all below lake level.

With the research and data presented in this report, ERCA advises moving forward with Concept A for the restoration of Hillman Marsh. Numerical and physical modelling will be conducted by engineers to test the possibility of a structure that has variable crest elevations. If areas of both high and low crested barrier beach can be accommodated without compromising the wetland, then it will provide for a more biologically diverse project and will be pursued. It is recommended that data collection continues on water quality and bathymetry to strengthen the existing datasets and allow for confident and accurate interpretation and decision making. A long-term monitoring plan will be developed to allow for continuous assessment of project outcomes and impacts, and for tracking of key performance indicators and goals. An adaptive management plan will complement this, by providing a framework for incorporating new techniques or adjustments based on new data, unforeseen changes, and stakeholder and community feedback. Upon approval from the Board of Directors, further funding will be sought to begin numerical and physical modelling, and eventually commence construction.

References

Alexander, B., & Hepp, G. (2014). Estimating Effects of Habitat Characteristics on Abundances of Three Species of Secretive Marsh Birds in Central Florida. *Waterbirds, 37*(3), 274-285.

AM800. (2023). *Hillman Marsh Public Meeting*. Retrieved from iHeartRadio: https://www.iheartradio.ca/am800/audio/hillman-marsh-public-meeting-1.20275945

Assel, R. (2004). *Lake Erie Ice Cover Climatology - Basin Averaged Ice Cover: Winters 1898-2002*.

Austin, A. N., Hansen, J. P., Donadi, S., & Eklöf, J. S. (2017). Relationships between aquatic vegetation and water turbidity: A field survey across seasons and spatial scales. *PLoS ONE, 12*(8).

Baird. (2007). *Sustainable Management Strategy for Southeast Leamington: Phase 2 Report. Prepared for the Essex Region Conservation Authority.*

BaMasoud, A., & Byrne, M. (2012). The impact of ice cover on shoreline recession: A case study from Western Point Pelee, Canada. *Geomorphology, 173*, 141-148.

Bradshaw, T., Blake-Bradshaw, A., Fournier, A., Lancaster, J., O'Connell, J., Jacques, C., . . . Hagy, H. (2020). Marsh bird occupancy of wetlands managed for waterfowl in the Midwestern USA. *PLoS One*.

Brinker, S. R., Garvey, M., & Jones, C. D. (2018). *Climate change vulnerability assessment of species in the Ontario Great Lakes Basin*. Ministry of Natural Resources and Forestry, Science and Research Branch.

Carter, G. S., Kowalski, K. P., & Eggleston, M. R. (2022). Turbidity and Estimated Phosphorus Retention in a Reconnected Lake Erie Coastal Wetland. *Water, 14*, 1853-1865.

CBC News. (2023). *Immediate action needed to save Essex County wetland, says ERCA*. Retrieved from CBC: https://www.cbc.ca/player/play/2270453827999

Cooper, J., Green, A., & Loureiro, C. (2018). Geological constraints on mesoscale coastal barrier behaviour. *Global and Planetary Change, 168*, 15-34.

CTV News. (2023). *Wanted: public input on how to spend $10M on Hillman Marsh in Leamington*. Retrieved from CTV News: https://windsor.ctvnews.ca/wanted-public-input-on-how-to-spend-10m-on-hillman-marsh-in-leamington-1.6595870

Danard, M., Munro, A., & Murty, T. (2003). Storm surge hazard in Canada. *Natural Hazards, 28*, 407-431.

Davies-Colley, R. J., & Smith, D. G. (2001). Turbidity, Suspended Sediment, and Water Clarity: A Review. *Journal of the American Water Resources Association, 37*(5), 1085-1101.

Dehghan, A. (2019). *Projections of key climate variables for use in wetlands vulnerability assessment. Environment and Climate Change Canada.*

Dillon. (2013). *East Marsh Dyke Repairs (East Marsh Drainage Scheme). Prepared for the Municipality of Leamington and the Essex Region Conservation Authority.*

Environment and Climate Change Canada. (2018). *Canada-Ontario Lake Erie Action Plan.*

Environment and Climate Change Canada. (2022). *Adapting to Climate Change: Solutions to Enhance Great Lakes Coatal Wetland Resilience.*

Environment and Climate Change Canada. (2022b). *Climate Change in the Great Lakes Basin: Summary of Trends and Impacts.*

Essex Region Conservation Authority. (1983). *Environmentally Significant Areas of the Essex Region.*

Essex Region Conservation Authority. (1988). *Ruscom River, Big Creek, and Hillman Creek Water Quality Study: Verification of the Lands Directorate Sediment Yield Model.*

Essex Region Conservation Authority. (2022). *ERCA 2022 Annual Report.*

Essex Region Conservation Authority. (2022b). *Essex Region Phosphorus Management Plan.*

Essex Region Conservation Authority. (2022c). *Public Consultation Meeting for the Hillman Marsh Conservation Area Restoration Plan*. Retrieved from Essex Region Conservation: https://essexregionconservation.ca/resources/news/public-consultation-meeting-for-the-hillman-marsh-conservation-area-restoration-plan/

Feagin, R., Figlus, J., Sigren, J., Martinez, M., Silva, R., Smith, W., . . . Carter, G. (2015). Going with the flow or against the grain? The promise of vegetation for protecting beaches, dunes, and barrier islands from erosion. *Frontiers in Ecology and the Environment, 25*(2), 203-210.

Fredrickson, L., & Reid, F. (1988). Preliminary Considerations for Manipulating Vegetation. *Fish and Wildlife Leaflet, 13*(4).

Gharib, J., Smith, A., & Houser, C. (2021). Barrier beaches and breaches: Historical changes on the Point Pelee Foreland. *Journal of Great Lakes Research, 47*(6), 1554-1564.

Gharib, J., Smith, A., Houser, C., & Martínez Jiménez, M. (2023). Barrier breach recovery in a lacustrine environment: Role of sediment supply and shoreline development. *Journal of Great Lakes Research, 9*(44).

Great Lakes Environmental Research Laboratory. (2022). *Great Lakes Water Level Observations*. Retrieved from https://www.glerl.noaa.gov/data/wlevels/#observations

Great Lakes Environmental Research Laboratory. (2022b). *Great Lakes Annual Maximum Ice Cover.* Retrieved from www.glerl.noaa.gov/data/ice/glicd/lakes_AMIC.pdf

Kraus, N. (2003). Analytical model of incipient breaching of coastal barriers. *Coastal Engineering Journal, 45*(4), 511-531.

Lebedyk, D. (2008). Ecosystem Management [Powerpoint Presentation]. Essex Region Conservation Authority.

Liu, Z., Fagherazzi, S., & Cui, B. (2021). Success of coastal wetlands restoration is driven by sediment availability. *Communications Earth and Environment, 2*(44).

Losos, J., & Ricklefs, R. (2010). *The Theory of Island Biogeography Revisited.* Princeton, NJ: Princeton University Press.

MacArthur, R., & Wilson, E. (1967). *The Theory of Island Biogeography*. Princeton, NJ: Princeton University Press.

McNair, S. A., & Chow-Fraser, P. (2003). Change in biomass of benthic and planktonic algae along a disturbance gradient for 24 Great Lakes coastal wetlands. *The Canadian Journal of Fisheries and Aquatic Sciences, 60*, 676-689.

Ministry of Natural Resources and Forestry. (2021). *Make a Map: Natural Heritage Areas, Provincially Tracked Species.* Retrieved from https://www.lioapplications.lrc.gov.on.ca/Natural_Heritage/index.html?viewer=Natural_Heritage.Natural_Heritage&locale=en-CA

Ministry of the Environment. (2012). *Greenhouse Wastewater Monitoring Project (2010 and 2011).*

Ministry of the Environment, Conservation and Parks. (2021). *Water management: policies, guidelines, provincial water quality objectives*. Retrieved from Ontario: https://www.ontario.ca/page/water-management-policies-guidelines-provincial-water-quality-objectives

Nepszy, S., Davies, D., Einhouse, E., Hatch, R., Isbell, G., MacLennan, D., & Muth, K. (1991). Walleye in Lake Erie and Lake St. Clair. *Great Lakes Fishery Commission, 91*(1).

Paul, J. F., Kasprzyk, R., & Lick, W. (1982). Turbidity in the Western Basin of Lake Erie. *Journal of Geophysical Research, 87*(c8), 5779-5784.

Penticton Herald. (2023). *Hillman Marsh Faces Erosion Crisis: Urgent Restoration Effort Launched*. Retrieved from Penticton Herald: https://www.pentictonherald.ca/spare_news/article_a2a9c73c-0544-5d05-9c34-54460b9e0195.html

Quinn, F. (2002). Secular changes in Grea Lakes water level seasonal cycles. *Journal of Great Lakes Research, 28*(3), 451-465.

Rodrigo, M. (2021). Wetlands Restoration with Hydrophytes: A Review. *Plants, 10*, 1035.

Schroeder, E. D. (2003). Water Resources. In *Encyclopedia of Physical Science and Technology* (pp. 721-751).

Seglenieks, F., & Temgoua, A. (2022). Future water levels of the Great Lakes under 1.5°C to 3°C warmer climates. *Journal of Great Lakes Research, 48*, 865-876.

Shrestha, N. K., Seglenieks, F., Temgoua, A. G., & Dehghan, A. (2022). The Impacts of Climate Change on Land Hydroclimatology of the Laurentian Great Lakes Basin. *Frontiers in Water, 4*.

Surette, H. (2006). Processes influencing temporal variation in fish species composition in Point Pelee National Park.

Theuerkauf, E., & Braun, K. (2021). Rapid water level rise drives unprecedented coastal habitat loss along the Great Lakes of North America. *Journal of Great Lakes Research, 47*(4), 945-954.

United States Geological Survey. (2005). 6.7 Turbidity. In C. W. Anderson, *Field Measurements.*

United States Geological Survey. (2018). *Turbidity and Water*. Retrieved from https://www.usgs.gov/special-topics/water-science-school/science/turbidity-and-water

United States Geological Survey. (2022). *Turbidity - Units of Measurement*. Retrieved from USGS: https://or.water.usgs.gov/grapher/fnu.html#:~:text=For%20example%2C%20a%20Formazin%20Nephelometric,measured%20with%20a%20white%20light

Weber, M. J., & Brown, M. L. (2009). Effects of Common Carp on Aquatic Ecosystems 80 Years after "Carp as a Dominant": Ecological Insights for Fisheries Management. *Reviews in Fisheries Science, 17*(4), 524-537.

Windsor News Today. (2023). *Plan to restore Hillman Marsh under development*. Retrieved from Windsor News Today: https://windsornewstoday.ca/windsor/news/2023/09/24/plan-to-restore-hillman-marsh-under-development

Yahoo! (2023). *Hillman Marsh Faces Erosion Crisis: Urgent Restoration Effort Launched*. Retrieved from Yahoo! Life: https://ca.style.yahoo.com/hillman-marsh-faces-erosion-crisis-034209739.html?guccounter=1&guce_referrer=aHR0cHM6Ly93d3cuZ29vZ2xlLmNvbS8&guce_referrer_sig=AQAAACt8YPTllXw12TxdVlkeSTbyCNXM8iEtqqAwURS2NU229R2UH_3hUlMybSr0Dplu8N5iggjJNzysewvG2zC5SlE9w9dludo9z

Zuzek Inc. (2018). *Synopsis of Point Pelee National Park Erosion and Mitigation Options. Prepared for Parks Canada Agency.*

Zuzek Inc. (2018b). *Southeast Leamington Hazard Identification and Risk Assessment (HIRA). Prepared for the Municipality of Leamington.*

Zuzek Inc. (2021). *Southeast Leamington Graduated Risk Floodplain Mapping Project. Prepared for the Municipality of Leamington.*

Appendices

Appendix A: Logic Model

Table 4: Logic model for first goal of Restoration Plan.

Goal #1	
Employ a transformational adaptation approach to restore and enhance the Hillman Marsh barrier beach feature to withstand climate change extremes, protect the wetland ecosystem, and safeguard homes and businesses, while permitting natural sedimentation in the restored beach processes, and limited wave overtopping during high lake levels.	
Recommended Actions	• Facilitate meetings with Steering Committee to share expertise on coastal geomorphology, coastal management, wetland ecology, and ecosystem restoration. • Complete literature review of previous management and restoration plans to assess successes, failures, and lessons learned. • Contract a coastal engineer to provide restoration and adaptation recommendations and technical guidance. • Secure necessary permits and approvals. • Collect historical data (meteorological data, wave data, aerial imagery, shoreline retreat) and complete new data collection (topo-bathymetric surveys, water quality monitoring). • Begin improvements to south headland, including anchor that will eventually support the artificial barrier. • Use numerical modelling of waves, hydrodynamics, sediment transport, flows, and lake levels to inform climate change adaptation and structural design. • Use physical modelling to replicate design and nearshore conditions, to optimize and finalize the design of the artificial barrier. • Review potential sources of sediment for barrier restoration and develop beach nourishment plan.

Recommended Outputs	• A written restoration plan that includes:
	  o Details and background information on Hillman Marsh
	  o Historical and current trends
	  o Current viability/condition
	  o Problem formulation
	  o Goals, objectives, actions and targets
	  o Potential constraints for adaptation options
	  o Vision of desired state and success in collaboration with the steering committee
	  o A technical design of a protective barrier beach feature.
	• Reconstructed and improved design for south headland at E Beach Rd.

	• Reconstructed artificial barrier beach with an effective sand nourishment plan that can withstand future lake levels and storm events.
Short-term Outcome	• Increased understanding and awareness of current and desired state of the Hillman Marsh Conservation Area by local community and Great Lakes community. • Barrier and vegetation loss at HMCA is addressed by federal, provincial, and municipal government. • Preferred option is brought forward to the board of directors for approval.
Mid-term Outcome	• Federal, provincial, and municipal governments provide resources to develop plans and commence construction on South Headland repairs and artificial barrier structure. • Efficient sand nourishment plan is developed and is put in place. • Artificial barrier is constructed.
Long-term Outcome	• Artificial barrier beach is revegetated and can withstand climate change impacts. • Post-implementation and long-term monitoring commence. • Design is optimized based on any noticed discrepancies.

Table 5: Logic model for second goal of Restoration Plan.

Goal #2	
Restore the wetland plant community within the approximate 115 hectares of open water behind the barrier feature to enhance wetland structure, function, diversity, and resilience to climate change impacts using historical records and expert opinion.	
Recommended Actions	• Facilitate meetings with Steering Committee to share expertise on coastal geomorphology, coastal management, wetland ecology, and ecosystem restoration. • Complete literature review of previous management and restoration plans to assess successes, failures, and lessons learned. • Contract a coastal engineer to provide restoration and adaptation recommendations and technical guidance. • Secure necessary permits and approvals. • Collect historical data (meteorological data, wave data, aerial imagery, shoreline retreat) and complete new data collection (topo-bathymetric surveys, water quality monitoring). • Draft and finalize wetland restoration concepts with input from the Steering Committee, Rights Holders, and Stakeholders (planting of vegetation, habitat islands, fish refugia). • Monitor, evaluate, and share project outcome, lessons learned, and next steps. • Alter bathymetry of marsh to create vegetation zones to optimize types of vegetation planted. • Optimize and finalize the planting strategy using appropriate species and physical conditions (bottom profile, substrate, circulation) and features (rock shoals, islands, channels, and potholes).

Recommended Outputs	• A written restoration plan that includes:
	  o Details and background information on Hillman Marsh
	  o Historical and current trends
	  o Current viability/condition
	  o Problem formulation
	  o Goals, objectives, actions and targets
	  o Potential constraints for adaptation options
	  o Vision of desired state and success in collaboration with the steering committee
	• A wetland restoration plan for the marsh including patterns and zones for revegetation.
	• A restored wetland plant community that is resilient to climatic disturbances and shocks.

Short-term Outcome	• Increased understanding and awareness of current state of the wetland by local community and Great Lakes community.

	• State of wetland is addressed by federal, provincial, and municipal government. • Preferred option is brought forward to the board of directors.
Mid-term Outcome	• Federal, provincial, and municipal governments provide resources to develop plans and commence wetland restoration. • Restoration efforts begin after artificial barrier is constructed and marsh is secluded from Lake Erie influence. • Vegetation plugs are planted and successfully protected from carp disturbance.
Long-term Outcome	• Marsh supports a diverse range of species and submerged aquatic vegetation is re-established. • The marsh is more resilient to future climate change impacts. • Post-implementation and long-term monitoring commence. • Design is optimized based on any noticed discrepancies.

Table 6: Logic model for third goal of Restoration Plan.

Goal #3	
Make the restored and enhanced Hillman Marsh ecosystem accessible to all of society and future generations to enjoy.	
Recommended Actions	• Hold public information/consultation sessions. • Develop community engagement strategy with goals, tactics and timelines. • Design and construct a new parking lot. • Design and construct a kayak launch.
Recommended Outputs	• Written community engagement strategy with objectives, targets, timelines, and anticipated outcomes. • Reconstruction of barrier beach that includes a parking lot, kayak launch, and other amenities.
Short-term Outcome	• Local community is aware that plan is being developed to restore and enhance Hillman Marsh and increase property protection. • Local community has the opportunity to attend information sessions and provide feedback both in person and through an online survey on ERCA's website.
Mid-term Outcome	• Construction and enhancement of South Headland makes E Beach Road safer and more stable, allowing for the construction of a parking lot and other amenities.
Long-term Outcome	• Completed barrier feature allows for community access to the beach and marsh. • Restored barrier beach and marsh allows for revegetation and repopulation of various species, allowing the community to enjoy nature and bird watching.

Appendix B: Public Consultation Results

Table 7: All comments and questions from public consultation meetings and feedback forms.

<table>
<tr><th colspan="2">Public Consultation Results</th></tr>
<tr><th colspan="2">Session 1: Tuesday, October 3, 2023</th></tr>
<tr><td>Questions</td><td>Can barrier be built up if low crested option is chosen but doesn’t work out?
What is the size of the outlet?
Why is the barrier curved not straight?
Why can’t jetties just be placed along the shore?</td></tr>
<tr><td>Comments</td><td>Wheatley Harbour jetty should be deconstructed, change public launch site.
Perhaps there is an opportunity to take material from the marsh for barrier building.
Permanent outlet:
Concern towards lake influence on marsh.
Consider a water tunnel under the beach instead of above water.
How can we ensure the channel doesn’t get plugged up with sediment.
North end of the beach should be hardened sooner – instead of being included in the later parts of the project.
Past trough digging may have resulted in the magnitude of this breach.
Parking lot should be reinstated.</td></tr>
<tr><th colspan="2">Session 2: Tuesday, October 10, 2023</th></tr>
<tr><td>Questions</td><td>If Wheatley’s sediment trapping issue is fixed, where will we get our sand? How do we know we’ll have enough sand?
Is this project using municipal tax dollars?
What stops waves from continuing to erode this artificial barrier?
What slope is being used for the pilot section of the beach?
How much erosion have we seen on road 1 dyke?
Are we paying attention to the impacts/benefits this will have on surrounding shorelines?</td></tr>
<tr><td>Comments</td><td>A lot of the construction projects have a lot of soil that they need to get rid of, maybe the rock core could be topped with some soil as well as sand. May be more stable this way.
Permanent outlet:
Outlet for drainage is a good idea, marsh could be prone to flooding otherwise.</td></tr>
</table>

	◦ The outlet should be moved further south on the barrier, if we leave it where it is now, southerly winds will bring waves through and it can result in more wave agitation. ◦ Outlet should follow natural water flow, where breach is now. • Sand from Leamington Harbour can potentially be used for sand nourishment in the future.
Written/Online Feedback Form Comments	
Would you like to say anything about your connection to Hillman Marsh?	• I grew up on Concession 1 Farm from early 1960's (by present day airport) and have seen many concerning changes in Hillman Marsh. • I have been coming to Hillman Marsh for 20+ years. • It is a special place and needs human intervention or we are going to lose it. • It is a wonderful place to enjoy outdoor activities, watch birds, and go for bike rides. • It would be a great loss not to protect it for future generations. We often enjoy going with our two little girls for canoeing, biking, and swimming. They have known this place since they were born, and enjoy coming back here every time. • I live in Chatham-Kent but Leamington area has been a home and place of work for me for over half of my 71 years - including a couple years on Pulley Rd. It does deeply concern me that so much heritage has been lost and hope for many more projects such as this.
Do you have any comments or feedback regarding this project?	• Definitely worth the effort and money to save this valuable habitat. Hopefully it will be restored quickly as the weather won't wait and is relentless. Looking forward to visiting more. • Excellent presentation. Need to take action now. • Concept A first choice. Then B or C. • First Nation consultation needed. • The will seems to be there to make this restoration project happen. I hope that the money is there to do so. Best of luck! • Back in ~2008, ERCA issued a report indicating that the main reason for sand depletion along Hillman Marsh and Point Pelee coastline, was due to Wheatley Harbour. As indicated, the extended groin at Wheatley Harbour blocks much of the sand migrating down from the eastern coastline. I agree with this report since I have seen on many occasions whereby the east side of the harbour is being dredged for sand build-up. I would have expected the proposed restoration project to specifically

	address this problem, which is a primary root cause of the sand barrier beach being depleted and thus breached. • I observed in the past significant blue/green algae present in Hillman Marsh. This algae is due to herbicide run-off from the local farms that originates upstream at Hillman and Lebo creeks. Prior to the barrier beach being breached, the marsh habitat suffered greatly from these chemicals. Now, with the influx of clean Lake Erie water, the marsh habitat has been greatly improved as can be seen with the greater diversity of fish and bird species. If the barrier beach is restored as planned, then one would expect the blue/green algae to immediately return. This too must be addressed in the project. • This extremely important wetland has been neglected for many years. Hopefully, this is a lesson on the importance of maintenance and the on-going cost of doing so, versus delaying action until it is too late, when the cost to rectify is much higher. • I am encouraged that a Steering Committee is finally being assembled to address this fragile ecosystem. • Everyone needs to come together, and Government Agencies need to commit to funding to complete this effort and show what can be done, so other areas in Canada and the world can follow suit. We have a chance to create a huge success here in Leamington and become an example of what is possible. • I prefer Concept A. It is not clear in the proposal what material would be used to build the barrier beach above the barrier rock berm. Several people I have spoke to indicated they heard at the meeting that it would be built entirely out of sand. If that is the case, it would be a good practice to cover the buried rock berm with clay soil then top it off with sand. That would provide a better soil composition for healthy vegetation regrowth. • I would hope any repairs or updates encompasses the health of the whole shoreline to replenish sand to protect not only the Conservation Area, but Point Pelee National Park and the shoreline that connects both. Moving the sand dredged from Wheatley Harbour to Hillman enables the sand to move along it's natural course and seems to be making a big difference. • I have a cottage at Marentette Beach, and we've often kayaked to the marsh. I hope that this project is successful. • Very happy to hear about this project.

Appendix C: Risk Assessment

This section presents the results of an Environmental Risk Assessment conducted to evaluate potential hazards involved with the construction phases of this project. Likelihood and severity were ranked for each factor, and a final risk rating was assigned from low, low-medium, medium, medium-high, and high.

		Severity				
		Negligible	**Minor**	**Moderate**	**Significant**	**Severe**
Likelihood	**Very Likely**	Low Med	Medium	Med High	High	High
	Likely	Low	Low Med	Medium	Med High	High
	Possible	Low	Low Med	Medium	Med High	Med High
	Unlikely	Low	Low Med	Low Med	Medium	Med High
	Very Unlikely	Low	Low	Low Med	Medium	Medium

Figure 37: Scoring chart for each risk based on likelihood and severity of the event.

Table 8: Results of Environmental Risk Assessment for project construction.

Risk	Mitigation	Likelihood	Severity	Risk Rating
Water pollution due to chemical/oil spill or unclean equipment entering the marsh.	- In-water works to be kept to a minimum. - Refueling will take place at a sufficient distance from the waters edge. - Contractor is responsible for cleaning all equipment of oil, grease, and fuel. - Spills of deleterious substances into waterways and on land will be immediately contained and cleaned up by the contractor in accordance with Provincial regulatory requirements	Unlikely	Significant	Medium Risk
Air pollution from construction (smog, dust, emission of fumes).	- Contractor to control emissions and abide by local authorities' emission requirements.	Very Likely	Minor	Medium Risk
Noise pollution for nearby residents from machinery and moving of materials.	- Contractor will abide by local noise by-laws (51-18) for duration of the works. - Work between 7:00am and 9:00pm, excluding Sundays and Holidays in which the window is 11:00am to 4:00pm.	Very likely	Negligible	Low-Medium Risk
Unintentional introduction of invasive species from equipment.	- Contractor responsible for inspection and cleaning of all machinery and equipment prior to arrival. - Contractor to ensure that no clods of dirt are visible after wash down, and that radiators, grills, and the interiors of vehicles are free of accumulations of seed, soil, mud, and plant materials parts including seeds, roots, flowers, fruit, and or stems.	Unlikely	Moderate	Low-Medium Risk
Unintentional death of fish, or harmful alternation, disruption, or destruction of fish habitat.	- Contractor to work in DFO's prescribed timing window for in-water work to protect fish, including their eggs, juveniles, spawning adults, and/or the organisms upon which they feed. - Minimal in-water work will take place.	Very Unlikely	Significant	Medium Risk

Disturbance or destruction of wildlife and wildlife habitat.	- Disturbance or destruction of wildlife to be avoided where possible. - Proper mitigation measures to ensure area is cleared.	Very Likely	Severe	High Risk
Disturbance or destruction of vegetation.	- Disturbance or destruction of vegetation to be avoided where possible. - Appropriate measures taken to restore vegetated areas to their pre-construction state.	Very Likely	Severe	High Risk
Improper use, handling, storage and/or disposal of waste and hazardous materials.	- Contractor to comply with WHMIS. - Contractor to dispose of all waste materials in a legal manner at a site approved by all local approving authorities and the Engineer.	Very Unlikely	Minor	Low Risk
Damage to residential, municipal, or ERCA owned property.	- No equipment, construction materials, excavated materials or waste shall be left on site after completion of the works unless directed by Owner. - Contractor is required to utilize one of the two specified haul routes.	Very Unlikely	Negligible	Low Risk
Land degradation/ disturbance that would make soil susceptible to erosion.	- Contractor to monitor the weather several days in advance to ensure that works are conducted during favourable weather conditions, avoiding high flow/currents, wet, windy, and rainy periods that may increase risk of erosion, sedimentation, or heightened turbidity.	Very Likely	Moderate	Medium-High Risk
Water quality impairments as a result of increased turbidity and suspended sediment.	- Contractor to monitor the weather several days in advance to ensure that works are conducted during favourable weather conditions. - Sediment curtain to be installed to limit turbidity in areas of wetland revegetation. - Adjustment of operations to produce lower turbidity levels (waiting for more favourable conditions or undertake additional mitigation measures).	Unlikely	Minor	Low-Medium Risk

Essex Region Conservation Authority

Board of Directors BD03/24

From: Jacqueline Serran, DRCC Remedial Action Plan Coordinator
Kevin Money, Director of Conservation Services

Date: Monday, February 5, 2024

Subject: **Biological Success of the Peche Island Erosion Mitigation and Habitat Restoration Project**

Strategic Action: 7.1 Expand and connect core habitat parcels to ensure species resiliency.

11.1 Continue to bring regional planners/ engineers together on matters of sustainability and finding innovative, regional solutions.

Recommendation: THAT Report BD03/24 be received for Members' information

Summary

- ERCA partnered with the City of Windsor to construct 9 sheltering islands at Peche Island in the Detroit River to reduce erosion and create fish habitat.
- Biological monitoring of the created calm water habitat was conducted by the Department of Fisheries and Oceans Canada in late summer 2021 and 2023.
- Submerged aquatic vegetation cover increased from 10% pre-construction to 59.49% in 2021 and 52.0% in 2023 in the calm water area likely due to decreased wave action. Decreased wave action and the establishment of aquatic vegetation are measurable mitigative processes indicating decreased rates of erosion, although that is not the focus of this study.
- In 2021, 34 fish species were captured (4 species at risk), including 19 native species that were not captured in previous surveys. In 2023, 31 fish species were captured (3 species at risk), of which, 3 are native species not previously caught in the 2021 survey or other previous surveys. Fish from all life stages were caught (i.e., juveniles and adults).
- Overall, the newly constructed sheltering islands have positively affected fish by improving habitat suitability around Peche Island for fish species.

Discussion

Peche Island is a 79-acre island located in the upper Detroit River near Lake St. Clair. The island is owned by the City of Windsor and is a municipal park that is accessible by boat. The island and surrounding waters have high biodiversity, including 22 species of rare native plants (235 plant species documented in total), 2 rare reptile species, critical habitat for species at risk, freshwater clams and mussels, and numerous birds (including bald eagles) that utilize the island for multiple life stages. The island has been designated an environmentally sensitive area and the marsh on the island is a provincially significant wetland.

Peche Island has been eroding at a rapid pace due to strong river currents and heavy wave action due to climate change and significant Great Lakes freighter traffic. The erosion of the island has caused large volumes of soil to erode into the river and it is estimated that Peche Island has decreased in area by 17 acres from 1931 to 2015. To mitigate the erosion, ERCA partnered with the City of Windsor to construct 9 sheltering islands to the north of the island and a 600 m revetment on the northeast side of the island. The primary purpose is for erosion control, where the sheltering islands also provide enhancement of fish habitat. The sheltering islands were designed to reduce wave action, thereby allowing submerged aquatic vegetation (SAV) to establish. The submerged aquatic vegetation provides food sources and cover for fish to use during their various life stages. The Peche Island project was completed in 2022 at an approximate cost of $4.5 million dollars. Funding was secured through multiple partnerships including the City of Windsor, ERCA, Environment and Climate Change Canada, Ontario Ministry of Natural Resources and Forestry, and others.

Post Construction Monitoring

Post construction monitoring was conducted in the calm water area created behind the sheltering islands to determine fish habitat improvements as a result of the project. Post construction monitoring was conducted in 2021 (on a portion of the calm water area) and 2023 (on the entire calm water area). The post construction monitoring consisted of measuring submerged aquatic vegetation, vegetation height, water quality, and fish community sampling.

Submerged Aquatic Vegetation Cover and Water Quality

Submerged aquatic vegetation (SAV) cover was sampled in the calm water area to determine whether an increase submerged aquatic vegetation was observed. Pre-construction, the average submerged aquatic vegetation cover in the area was 10%. In 2021, the average percent SAV cover was 59.49%, with an average plant height of 0.19 m. In 2023, the average percent SAV cover of 52.0%, with an average plant height of 0.17m. In both years, SAV was found throughout the project site, but it was highest along the northeast corner behind the sheltering islands. It is expected that over time vegetation in the areas behind the sheltering islands will increase due to an identified accumulation of fine sediments behind the islands that could be a sign of relief from exposure and river currents. Though fine sediments have accumulated over time behind the sheltering islands, the sheltering islands have not impacted water quality parameters including water clarity, turbidity, and temperature.

Fish community

In 2021, 34 fish species (n = 3,347 fish) were caught, four of which were Species at Risk (SAR): Northern Madtom, Channel Darter [*Percina copelandi*], Pugnose Shiner [*Notropis anogenus*], and Grass Pickerel [*Esox americanus vermiculatus*]. Thirteen species of potential juveniles were also found using the calm water area. Of the 34 species recorded in 2021, there were 19 native species that were not captured in the previous surveys. In 2023, 31 fish species were caught (n = 2,352 fish). Channel Darter was the only SAR species captured. Juvenile and adult life stages were caught for 12 species. Comparing the two monitoring years, a total of 4 species were caught in 2023 that were not caught in 2021, and 3 of these species were not identified in the previous surveys.

Erosion Protection and Mitigation

The 600 meter section of Peche Island most susceptible to erosion from prevailing Detroit River currents, storm events and wake from lake freighters has been fortified to halt the erosion that has taken place. The large rock reefs installed offshore not only provide significant habitat value, but also perform an important wave energy and dissipation roll that will reduce the rate and extent of erosion on the Amercian side of the island. Previously the wave energy present prevented the establishment and growth of SAV. Once the rock reefs were installed, the robust establishment of SAV behind the rock reefs is a clear indication that the wave energy along this side of the island has dissipated.

Conclusion

Vegetation cover is dense behind the constructed sheltering islands, though low lying and similar to previous surveys. There was an increase in species richness, as more fish species were caught in surveys than in previous surveys. Four species at risk and 19 newly captured adult native species with some in the juvenile stage were recorded in 2021. Similarly, there was one species at risk and 16 newly captured adult native species with many in the juvenile life stage in 2023. Given the increase in species richness and number of fish caught, the newly constructed sheltering islands suggest positive improvements with little-to-no negative impact on the fish and fish habitat around Peche Island.

Approved By:

Tim Byrne
CAO/Secretary Treasurer

Attachments:

- Draft Peche Island Biotic Monitoring Report for Phase 1, Years 1 and 3 and Phase 2, Year 1 Post-Construction

Peche Island Biotic Monitoring Report for Phase 1, Years 1 and 3 and Phase 2, Year 1 Post-Construction

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2024

Canadian Technical Report of
Fisheries and Aquatic Sciences

Fisheries and Oceans Canada Pêches et Océans Canada

Canada

Canadian Technical Report of
Fisheries and Aquatic Sciences

2024

Peche Island Biotic Monitoring Report for Phase 1, Years 1 and 3 and Phase 2, Year 1 Post-Construction

by

Jesse Gardner Costa, Stephanie L. Smodis, David T. Reddick, Stephen M. Murphy, Janet J. Jardine, Gillian K. Martin, Celeste Remillard, Erin N. Budgell, and Susan E. Doka

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ABSTRACT

Gardner Costa, J., Smodis, S.L., Reddick, D.T., Murphy, S.M., Jardine, J.J., Martin, G.K., Remillard, C., Budgell, E.N., and Doka, S.E. 2022. Peche Island Biotic Monitoring Report for Phase 1, Years 1 and 3 and Phase 2, Year 1 Post-Construction, 2024. Fisheries and Oceans Canada, 52p.

In partnership with the Detroit River Remedial Action Plan, Fisheries and Oceans Canada (DFO) Great Lakes Laboratory for Fisheries and Aquatic Sciences has been tasked with biological monitoring for the Peche Island erosion mitigation project. Peche Island's fish habitat was sampled using hydroacoustics and the fish community assessed using electrofishing, seine netting, and minnow trapping gear. These data were then used to evaluate the success criteria provided in the *Fisheries Act* and *Species at Risk Act* project authorization (PATH No.: 19-HCAA-00130; DFO, Fisheries and Fish Habitat Protection Program). All biological criteria have been met and exceeded. Low lying submerged aquatic vegetation cover was determined to be dense in the northeast corner behind the constructed berms, similar to previous surveys. During Phase 1, Year 1 post-construction monitoring in 2021, there was a total of 34 species caught, with 15 more species caught than in the pre-construction surveys (i.e., 19 species caught during pre-construction), including four Species at Risk. Nineteen native species not-previously-captured were detected. During Phase 1, Year 3 and Phase 2, Year 1 post-construction monitoring in 2023, there were a total of 31 species caught, with 12 more species caught than in pre-construction surveys, including one Species at Risk. Sixteen native species not-previously-captured were detected. Adult and juvenile life stages were recorded during both monitoring years, and the greatest number of juveniles were caught in 2023 (n = 244 juveniles). Newly captured species included both warmwater and coolwater temperature guild species, as determined by DFO's own habitat evaluation fish lists. Given the increase in species richness and number of fish caught, the newly constructed berms have little-to-no negative impact on the fish and fish habitat around Peche Island, with data suggesting positive improvements.

INTRODUCTION

This report serves as part of the compliance component of the authorization (PATH No.:19-HCAA-00130; Fisheries and Fish Habitat Protection Program, Fisheries and Ocean Canada) of the Peche Island shoreline erosion mitigation project. After years of erosion, likely exacerbated by a combination of commercial navigation uses and man-made channel deepening, approximately 6.9 hectares of Peche Island's area has been lost since 1931 (Serran et al. 2020). Peche Island provides important habitat for both fish and wildlife at the mouth of the Detroit River. Several partners (City of Windsor; Essex Region Conservation Authority; Detroit River Canadian Cleanup; Swim, Drink, Fish; Environment and Climate Change Canada [ECCC]; and Ontario Ministry of Northern Development, Mines, Natural Resources and Forestry [OMNDMNRF]) have undertaken the *Peche Island Fish Habitat and Erosion Mitigation Project* to protect the remaining habitat.

A revetment on the northeast shore and 9 off-shore sheltering islands on the north side of the island have been created to protect from further erosion and to provide fish habitat behind protected areas, promoting the establishment of submerged aquatic vegetation (SAV). The north side of the project was completed in two phases: 5.5 islands were constructed for Phase 1, and the remaining islands were constructed the following year for Phase 2. Detailed descriptions of the project are provided in Serran et al. (2020). Submerged aquatic vegetation provides habitat for fish species at all life stages, refuge for predators, habitat for prey items, and can serve as a food source for some fish species (Gilinsky 1984). Sites with SAV have been shown to have greater fish abundance than sites without (Chick and McIvor 1994; Randall et al. 1996).

Construction of Phase 1 was completed in 2020 and Phase 2 was completed in 2022. As part of the post-construction monitoring requirements for authorization, Fisheries and Oceans Canada, Great Lakes Laboratory for Fisheries and Aquatic Sciences (DFO) have sampled the fish and fish habitat of Peche Island for the Year 1 and 3 authorization post-construction monitoring requirements of Phase 1 (conducted in 2021 and 2023, respectively), and for the Year 1 post-construction monitoring of Phase 2 (conducted in 2023). This monitoring was funded by the Great Lakes Action Plan. Specifically, the proponent outlined success criteria regarding reduced wave action, macrophyte presence, and the presence of fish species and life stages (Table 1, adapted from Serran et al. 2020).

This report includes corrections to results presented in the Phase 1, Year 1 post-construction monitoring report (Gardner Costa et al. 2022; see Table A1 in the Appendix for more details), but the conclusions reported remain the same. Fish and fish habitat monitoring data are summarized in this report to evaluate the project success criteria and satisfy the Phase 1, Years 1 and 3 and Phase 2, Year 1 requirements of section 5.1.1.4 and 5.1.1.5 in the *Fisheries Act* authorization. For simplicity, the Phase 1, Year 1 post-construction monitoring may be referred to as 2021 sampling, and the Phase 1, Year 3 and Phase 2, Year 3 monitoring may be referred to as 2023 sampling.

METHODS

STUDY SITE

Peche Island contains 32 hectares of municipal park positioned at the mouth of the Detroit River, near Lake St. Clair (Figure 1). The island is owned and managed by the City of Windsor and is only accessible by watercraft. Peche Island has high biodiversity, much like the Windsor-Essex watershed and connecting channel it belongs to. The island itself is home to 235 plant species, 2 rare reptile species, numerous bird species, and provides critical habitat for aquatic Species at Risk (SAR), such as the Northern Madtom (*Noturus stigmosus*), Channel Darter (*Percina copelandi*), and various freshwater mollusks (Serran et al. 2020). The marsh on the island is a provincially significant wetland and the entire island is designated as an environmentally sensitive area. At the time of sampling for Phase 1, Year 1 monitoring (August 27, 2021) there were only 4 islands constructed, and daily mean water level was 175.7 m (IGLD85, station 11965 [Belle River]). For Phase 1, Year 3 and Phase 2, Year 1 monitoring (August 31, 2023), daily mean water level was 175.5 m. Water levels remained at the same level during both sampling weeks.

AQUATIC VEGETATION SAMPLING

Peche Island SAV was sampled using standardized methods used by DFO (Gardner Costa et al. 2018), using hydroacoustics and validation point-sampling along transects. Hydroacoustic data were collected to provide coverage of the whole project site. Hydroacoustic sampling used a BioSonics MX habitat system with a 205 kHz, 8˚ single-beam transducer (Seattle, Wash., U.S.A.). Percent (%) SAV cover, two-dimensional density of SAV along a transect, and plant height (m) were measured. The field crew laid out a five parallel transects at the project site along east-west lines approximately 50 m apart. Once completed, a north-south zig-zag design was surveyed to complete a grid pattern (Figure 2).

Point sampling of SAV occurred along each transect haphazardly to provide validation points for the hydroacoustics and substrate bottom-typing (Figure 2, Tables 2 and 3). These data were collected concurrently with the hydroacoustic survey. Presence and percent SAV cover (sparse [<25% SAV cover], moderate [25–75% SAV cover], dense [>75% SAV cover]) were visually estimated and recorded in relation to the hydroacoustic ping number, as well as longitude and latitude. Substrate type was classified visually according to the Wentworth scale of classification (following Bain and Stevenson 1999) and percent composition of each validation site was estimated. Clay, silt, and sand were generally classified as “fines” because of the inability to accurately assess the composition in the field. Due to reduced water clarity in 2021, point samples were captured using a GoPro camera mounted to a 1-m telescopic pole. Once the pole end touched bottom, it was rotated 360 degrees to record percent SAV cover and substrate type, which provided a uniform approach to the assessment. Crew members later reviewed the video to validate the substrate and plant information at each point.

HYDROACOUSTIC ANALYSIS

The hydroacoustic data were analyzed using BioSonics Visual Habitat software, version 2.0.29744 (BioSonics 2015) to determine bottom depth, percent SAV cover, and SAV height. Default software parameters were used with the exception of -38 dB for the rising edge threshold for bottom detection, a plant detection length criterion of >15 cm and maximum plant depth of 10 m (although based on past surveys we had no expectation of vegetation beyond 6 m). This height threshold is part of our standard operating procedure to distinguish vegetation from soft sediments, as well as to reduce potential acoustic interference in measurements at the sediment interface. Following the interpretation of the hydroacoustic data, results were summarized (mean ± standard deviation [SD], quartiles) for water depth (m), percent SAV cover, and SAV height (m).

All outputs were scrutinized and manually adjusted to address issues such as incorrect delineation of bottom depths because of dense SAV cover. Point sampling undertaken with the GoPro during the survey was used to verify SAV presence along transects. GoPro footage was only captured in 2021. Boxplots illustrating the median, 25th and 75th quartiles of both percent SAV cover and SAV height by depth range (1-m increments) were created using the echosounding data. SAV point data were plotted in ArcGIS to allow for a spatial assessment of SAV height and cover.

WATER QUALITY SAMPLING

Water chemistry attributes were measured using a YSI EXO3 multi-parameter sonde (YSI, Yellow Springs, Ohio, U.S.A.) at each SAV point-sample location and minnow trapping site, and at the center point of each seine net haul. Measured parameters included: depth (m), water temperature (°C), conductivity (µS/cm), turbidity (NTU), dissolved oxygen (mg/L), and pH.

Three data loggers were also used to continuously monitor dissolved oxygen and temperature (HOBO U26; Onset) at locations around the island in 2021 and 2023: one upstream outside of the construction zone (head of the island); one inside the embayment created by berm construction (backwater area); and one logger in the interior of the Peche Island wetland complex to the south (inner island) (Figure 2). Prior to deployment, dissolved oxygen and temperature loggers (DOT loggers) were calibrated and both the dissolved oxygen and temperature functions were performance checked to ensure accuracy of the loggers. All loggers were programmed to record every 15 minutes from the date of deployment until retrieval. Protocols for deployment, retrieval, and calibration are found in Larocque et al. (2020). Logger data was plotted for the entire duration that each logger was deployed. Dissolved oxygen was plotted with two thresholds: 3 mg/L which indicates anoxic conditions and 5 mg/L which is the lower optimum limit for fishes (Brown et al. 2009; Bowlby et al. 2019). Fish may survive dissolved oxygen levels that fall between the two thresholds for a short period of time depending on the species' sensitivity.

FISH COMMUNITY SAMPLING

Electrofishing

On August 27, 2021 and August 31, 2023, 10 transects were sampled using a boat electrofisher (Figure 1, Tables 2 and 3). Transect electrofishing was carried out using a Smith-Root SR20E electrofishing boat (length = 6.1 m, beam = 1.9 m). A 16-hp gas motor powered a 7.5-kW generator to produce the electric current. Electrical output was at approximately 6 to 8 amperes (A) at 170 volts DC in 2021, and approximately 17 to 20 A at 217 ± 11 volts DC in 2023. The electrode configuration consisted of two anodes, each with a terminal six-wire umbrella array, which extended out from the bow at an approximately 25° angle, with the aluminum boat acting as the cathode. We followed the protocol from Brousseau et al. (2005) for boat electrofishing in nearshore areas of the Great Lakes. Electrofishing commenced one hour after sunset and continued until all transects were completed. Once netted, the fish were held in an aerated live-well with two holding tanks and processed before sampling the next transect.

We electrofished interior wetland locations along the head of the island and locations within the permit area. These sites were selected to overlap with previously sampled regions to add to those data sets. All transects were traversed in a downstream orientation to account for the river current. As per the protocol, SAV was visually assessed for each 100-m transect. Mean percent SAV cover was assigned to one of four categories: none (0%), sparse (1% to 19%), moderate (20% to 70%), or dense (>70%).

Minnow traps

We used Gee minnow traps (Model G-40 manufactured N.Y., U.S.A.) constructed of 6.4-mm (1/4") square, galvanized wire mesh and are 42-cm (16") long, 19-cm (7.5") wide, and have a 22-mm (7/8") entrance hole. The bait for these traps was replaced at each deployment and consisted of one slice of common white bread, and one, 7-mm thick slice of old cheddar cheese. Traps were tied in a gang of three traps per location to one common weight, with one common float. Ten locations were trapped per 24-hour period, to exceed the 1,500-hour minimum in the permit requirements (Figure 1, Tables 2 and 3). Habitat features such as percent SAV cover and substrate percent composition were assessed visually using an AquaVue Aqua Scope-II underwater viewer, within an approximately 1-m radius around the center of the trap.

Seine nets

Water depth and current prevented the crew from wading at the sites identified in the permit requirements, however, the pre-identified locations were shifted to proximate locations along the shoreline of Peche Island that could be sampled safely. Due to site limitations and safety concerns, transects were oriented parallel to shore as opposed to perpendicular, changing the plan outlined in

Serran et al. (2020) because of depth constraints (Figure 1, Tables 2 and 3). Start and end points were chosen so the seine could be hauled onto shore with minimal obstruction, while still covering an adequate netting area. Transects were planned for a length of 50 m, with three sites to be sampled per day in 2021, totalling six seine hauls between August 15th and 16th. In 2023, a total of five seine nets were hauled on August 30th due to time constraints. The seine net used was a 15.2-m (50') bag seine, with 6.4-mm (1/4") white, delta knotless netting wings and a 1.8-m (6') square bag of 3.2-mm (1/8") white, delta knotless netting. One water quality measurement using a YSI EXO3 multi-parameter sonde was recorded at the mid-point of each haul. A visual assessment of vegetation (percent SAV cover) and sediment composition (percent composition) were recorded in 2021.

Fish processing

Fish captured using electrofishing, minnow traps, and seine nets were held in aerated bins and identified to species. Fork lengths were recorded; fish that had a rounded caudal fin were measured at total length (±1 mm). Fish captured using boat electrofishing were also weighed (wet mass, g). Digital balances were used to weigh fish up to 6,000 g to the nearest 1 g. Fish that were greater than 6,000 g or that were too long to fit on a digital balance (e.g., Northern Pike; *Esox lucius*) were placed in a mesh sling (of predetermined weight) and weighed with a digital hanging scale (with a capacity of 12,500 grams) to the nearest 100 grams. Fish were weighed and measured individually up to a maximum of 20 fish per species at each net haul, trap site, or electrofishing transect. When catches of a particular species exceeded 20 fish, the remaining fish were counted and batch-weighed for electrofishing transects, but were not batch-weighed for seining and minnow trapping. All fish were released after processing; large specimens and SAR fish were assessed and released first. Following the project's SAR permit requirements, captured Northern Madtom, a federally and provincially listed SAR, were relocated away from the in-water construction to the tail end of the island (42.34687, -82.93959) where there was some SAV present to provide cover.

Although we did not specifically target different life stages, we estimated the status of fish as either juveniles or non-juveniles, given their size-at-catch to address some authorization requirements. Excluding non-native and small bodied fishes, such as Round Goby [*Neogobius melanostomus*] and many cyprinids, we determined a cutoff of <60 mm for other fishes would be appropriate to provide a general size filter between non-juvenile (60+ mm) and juvenile (<60 mm) fishes. This is in line with the Mandrak et al. (2022) species-dependent guideline of 40 to 100 mm total length when collecting species vouchers for identification. They do not explicitly state that this range of fish lengths separates juveniles from adults but that at this size fish develop distinctive characteristics and thus the need for vouchers is greater to identify species with hard-to-detect features that are usually more obvious as adults.

RESULTS

PERCENT SAV COVER AND PLANT HEIGHT

2021 Sampling (Phase 1, Year 1)

More than 9.1 km (linear total of survey lines) of acoustic data were collected within the project area. Overall, the site had an average depth of 1.88 ± 0.36 m (depth range was 1.07–2.66 m), average percent SAV cover of 59.49 ± 29.13%, and average plant height of 0.19 ± 0.10 m, although the recorded height may be impacted by current at that specific location. SAV was found throughout the project site but the density was highest (>75% SAV cover) in the northeast corner and to a lower degree in the northwest corner, proximate to the newly constructed berms (Figure 2A). For all sites, sand and fine sediments were the dominant substrate types with occasional traces of gravel.

Plants colonized both depth ranges (1–2 m and 2–3 m) sampled and they had similar percent SAV cover (median of 60% SAV cover for both ranges) (Figure 3A). The mean percent SAV cover was higher in the 1- to 2-m depth range (mean ± SD of 61.50 ± 28.52%) compared with the 2 to 3 m range (56.14 ± 29.84%). Percent SAV cover had the high variability across all sites with a standard deviation of 29.13%. Plant height was generally low lying, but the tallest plant height detected was at one of the deepest depths sampled (i.e., plant height of 1.19 m at a depth of 2.56 m); however, most vegetation at any depth was less than 0.2 m in height (Figure 4A). Plant heights in the 2- to 3-m depth range (median of 0.16 m, and mean ± SD of 0.19 ± 0.11 m) were comparable to the 1- to 2-m range (median of 0.15 m, and mean ± SD of 0.19 ± 0.10 m). Field crew validation using GoPro footage indicated local currents affected plant height measurements. Video showed that the currents within the survey bent the plants over so they were not upright, and therefore our plant height estimates may be lower in these locations than the actual heights.

2023 Sampling (Phase 1, Year 3 and Phase 2, Year 1)

Similar to the 2021 survey, more than 6.8 km (linear total of survey lines) of acoustic data were collected within the project area. The site had an average depth of 1.45 ± 0.28 m (depth range was 0.87–2.07 m), average percent SAV cover of 52.0 ± 34.86 %, and average plant height of 0.17 ± 0.07 m. SAV was found throughout the project site, but it was highest (>75% SAV cover) along the northeast corner behind the berms (Figure 2B). Sand and fine sediments (silt and clay) were the dominant substrates across all sites, with some gravel recorded in a few sites. Cobble and rubble were recorded at one site where no SAV was present.

Plants colonized all depth ranges sampled, to varying degrees. The greatest percent SAV cover was recorded in the <1-m range (median of 70% SAV cover, and mean ± SD of 58.89 ± 36.76 %) (Figure 3B). There was high variability of percent SAV cover across all sites with a standard deviation of 34.86%. Overall, plants were consistently low-lying throughout the entire project site with most vegetation under 0.2 m in height (Figure 4B). The highest plant height recorded was 0.45 m in the 1 to 2 m depth range. Plant heights in the 1 to 2 m depth range (0.14 m, and 0.17 ± 0.07 m) were comparable to the 2 to 3 m range (median of 0.15 m, and mean ± SD of 0.14 ± 0.02 m). Plant heights were lowest in the <1-m depth range (median of 0.12 m, and mean ± SD of 0.12 ± 0.02 m).

WATER QUALITY

2021 Sampling (Phase 1, Year 1)

Water quality parameters were consistent at all sampling points, with little variation for each parameter on the days sampled (Table 4). There were no differences in water quality parameters between the sampling points in and outside of the construction zone. The northern shore of Peche Island can be described as low turbidity (1.3 ± 0.6 NTU), low conductivity (221.8 ± 4.1 μs/cm), slightly basic (8.5 ± 0.1 pH), and well oxygenated (8.7 ± 0.3 mg/L, mean temperature 23.0 ± 1.4 ^{o}C). Average depth of water quality measurement points was 1.5 ± 0.4 m. The field crew did note localized higher turbidity associated with areas of higher wave action and that the northern shore was influenced by river current. However, these spacial differences in turbidity were not reflected in the collected YSI data, likely because data collection was not continous and did not capture higher turbidity events.

Logger data of dissolved oxygen (mg/L) and water temperature were similar between sites behind and infront of the constructed islands (i.e., backwater area and the head of island) (Figures 2 and 5). Dissolved oxygen was consistently above 5 mg/L from late August to November. Dissolved oxygen remained steady throughout this period with an average of 8.96 ± 1.01 mg/L in the backwater area and 9.70 ± 1.17 mg/L in the head of the islands. Temperature steadily decreased further into the fall season, reaching a high of over 25 ^{o}C. Throughout late August to November, the average temperature was 17.04 ± 5.43 ^{o}C in the backwater area and 17.03 ± 5.41 ^{o}C in the head of the islands. In the inner island, dissolved oxygen reached below 3 mg/L in early September and late October (Figure 5). Average dissolved oxygen was 7.77 ± 1.99 mg/L and temperature was 16.46 ± 6.18 ^{o}C in the inner island.

2023 Sampling (Phase 1, Year 3 and Phase 2, Year 1)

Similar to 2021, water quality parameters were consistent among sampling points. There was little variation for each parameter on the days sampled (Table 5). One exception is that dissolved oxygen at site Peche Inner 3 had a single recording of 3.84 mg/L that was considerably lower compared with other sites, reaching as high as 10.68 mg/L. Average water quality parameters in the northern shore of Peche Island were comparable to 2021 values, with low turbidity (1.1 ± 0.4 NTU), low conductivity (215.1 ± 7.8 μs/cm), slightly basic (8.5 ± 0.2 pH), well oxygenated (9.5 ± 1.1 mg/L, and mean temperature 20.7 ± 0.6 ^{o}C). Water temperatures were cooler overall in 2023 than in 2021. Visual assessments from field crew members reported that there was less turbidity in 2023 compared with 2021. Average depth of water quality measurement points was 1.4 ± 0.3 m.

Logger data in the backwater area and at the head of the island showed that dissolved oxygen (mg/L) and water temperature were similar between the backwater area and the head of the island (Figures 2 and 5). Dissolved oxygen was consistently above 5 mg/L from late August to September. Dissolved oxygen was steady throughout the month of deployment, with averages of 8.49 ± 0.51 mg/L in the backwater area and 8.49 ± 0.34 mg/L at the head of the islands. The average temperature was 21.10 ± 1.73 ^{o}C and 22.13 ± 1.72 ^{o}C throughout the duration of deployment for each logger in the backwater area and head of the island, respectively. In the inner island, dissolved oxygen fell below 3 mg/L following a temperature increase to 25 ^{o}C in early September (Figure 5). Dissolved oxygen was variable later in the month and reached below 3 mg/L on a few days. The average dissolved oxygen was 7.50 ± 1.74 mg/L and the average temperature was 22.17 ± 1.75 °C.

FISH COMMUNITY

2021 Sampling (Phase 1, Year 1)

Using three gear types, 34 fish species (*n* = 3,347 fish) were caught and identifed to the species level. Specifically, electrofishing captured 257 fish (10 transects), minnow traps held 574 fish (30 traps, 2,103 trap hours), and seines netted 2,516 fish (6 × 50-m net hauls). Four SAR were captured: Northern Madtom, Channel Darter [*Percina copelandi*], Pugnose Shiner [*Notropis anogenus*], and Grass Pickerel [*Esox americanus vermiculatus*] (Figure 6, Table 6). Twenty of the 34 species caught belong to the warmwater temperature guild (58.8 %), 14 to the coolwater guild (41.2 %), and none from the coldwater guild (temperature guilds described in Abdel-Fattah et al. 2021, https://habitatassessment.ca/). There were 1,795 fish (53.6%) caught that belong to the warmwater temperature guild, and 1,552 fish (46.4 %) to the coolwater temperature guild.

Using a simple cutoff of 60 mm for adult (60+ mm) and juvenile (<60 mm) fishes, we identified the presence of potential juvenile lifestages (*n* = 84 fish) at our sampling sites (Table 8). Potential juveniles included Largemouth Bass [*Micropterus salmoides*], Smallmouth Bass [*Micropterus dolomieu*], and Channel Catfish [*Ictalurus punctatus*], among others, for a total of 13 different species with immature life stages present on-site in August 2021. Junveile and adult life stages were caught for all 13 species.

2023 Sampling (Phase 1, Year 3 and Phase 2, Year 1)

There were fewer fishes caught in 2023 compared with 2021, with 31 fish species caught (*n* = 2,352 fish). There were 2,324 fish identifed to the species level, and 8 fish identified to the genus level, including 6 *Lepomis sp.* and 2 *Notropis sp*. Among the three gear types used, electrofishing captured 776 fish (10 transects and one extra, non-standardized electrofishing transect), minnow traps held 326 fish (30 traps, 2,116 trap hours), and seines netted 1,250 fish (5 × 50-m net hauls). The non-standardized electrofishing transect caught three species: Bowfin (*Amia calva*), Channel Catfish and Northern Pike. One seine net site (15-S3) was not sampled due to time constraints. Channel Darter was the only SAR species captured among all gear types (Figure 6, Table 7). Eighteen of the 31 species belong to the warmwater temperature guild (58.1%), 13 to the coolwater guild (41.9%), and none from the coldwater guild (temperature guilds described in Abdel-Fattah et al. 2021, https://habitatassessment.ca/). Of the 2,324 fish identifed to the species level, 1,440 fish (62.0%) belong to the warmwater temperature guild, and 884 fish (38.0%) to the coolwater temperature guild.

Following the same cutoff as Phase 1, Year 1 monitoring, 60 mm was used to identify adult (60+ mm) and juvenile (<60 mm) fishes. A total of 242 juveniles were identified, from 13 native species (Table 9). There were 6 juveniles that were only identified to the genus level (i.e., *Lepomis sp.*). Junveile and adult life stages were caught for 12 species. The greatest number of juveniles identified were Bluegill (*Lepomis macrochirus*, n = 53), followed by Bluntnose Minnow (*Pimephales notatus*, n = 39), and Largemouth Bass (*Micropterus salmoides*, n = 33). Brook Silverside [*Labidesthes sicculus*], Alewife [*Alosa pseudoharengus*], Round Goby, Tubenose Goby [*Proterorhinus marmoratus*], and White Perch [*Morone americana*] were excluded from the juvenile total.

DISCUSSION

The objective of this report was to provide post-construction monitoring data and evaluate that data against the success criteria for the Peche Island erosion mitigation (habitat improvement) project to satisfy the conditions of the DFO *Fisheries Act* authorization. Half of the proposed berms were constructed in 2020 for Phase 1, with the remainder of the project completed in 2022 for Phase 2. There were some corrections to the fish community results for the Phase 1, Year 1 report (Gardner Costa et al. 2021), but they did not change the overall findings for meeting the success critieria (Appendix A). The following section discusses Phase 1, Years 1 and 3 post-construction monitoring, as well as Phase 2, Year 1 post-construction monitoring. The criteria listed in Table 1 related to biological monitoring define the success criteria around fish species caught and their lifestages, and percent SAV cover in the protected area behind the constructed berms (success criteria 2–4).

Criteria 2: *percent coverage of macrophytes has increased from an average of 10% to an average of 15% or greater in the entire backwater area.*

In 2021, Phase 1,Year 1 post-construction monitoring had a mean percent SAV cover of 59.49 ± 29.13%. In the 2023 post-construction monitoring for Phase 1, Year 3 and Phase 2, Year 1, mean percent SAV cover was 52.0 ± 34.86%, and therefore well above the success target. Of note, percent SAV cover was variable across the project site for both years. Vegetation had established in patches within the site in both years (Figure 2) but was low lying, likely due to current, particularly in 2021 (Figure 4; Koch 2001). Figure 2 shows the densest vegetation in both years was located along the northeastern shore of the island, behind the berms that were constructed, suggesting some relief from exposure to the main channel (Keddy 1983). There was dense vegetation in the northwestern area of the project in 2021, but this area was not sampled in 2023. The survey length was 2.3 km shorter in 2023, and key differences include no transects in the far northernwestern area and only one zig-zag transect in

2023 (Figure 2). This is likely why the percent SAV cover detected by hydroacoustics was lower in 2023, as visual observations of low-lying SAV were comparable between 2021 and 2023 sampling. Variation in SAV coverage is normal among years, especially given water level fluctuations (Chow-Fraser 2005). It is also possible that the lower water levels in 2023 could have increased the potential for ice scouring events in the winter.

The monitoring criteria in Serran et al. (2020) proposed comparing SAV estimates to a 2015 survey by OMNDMNRF (2015). That survey only sampled four sites and only one in proximity to the constructed berms (site 2). Each site consisted of three rake tosses and a visual estimate of percent SAV cover. Site 2 had an estimated 36.0% SAV cover, compared with an average of 59.49% for the whole construction area in our 2021 survey and 52.0% in our 2023 survey. It is difficult to compare pre- and post-construction conditions with a single point that was visually estimated versus percent SAV cover measured for the whole construction area using hydroacoustics. Hydroacoustics sample more consistently than visual estimates and allow for the collection of larger datasets more quickly.

Over time, we expect vegetation in the areas behind the berms to increase. We identified an accumulation of fine sediments behind the berms that could be a sign of relief from exposure and river currents. Given the homogeneity of water quality parameters across all sampling points and DOT loggers, the berms appear to have not impacted water quality (e.g., water clarity, turbidity, and temperature). In both years, dissolved oxygen and temperature were very similar between the backwater area and head of islands (Figure 5). Since dissolved oxygen was consistantly above 5 mg/L, the lower optimum threshold for fish suitability was surpassed and it provides better conditions for SAV growth (Brown et al. 2009). Dissolved oxygen tended to be lower and temperature tended to be slightly higher in the inner island compared with the other DOT logger locations. The only location that experienced dissolved oxygen levels below 3 mg/L was in the inner island. Dissolved oxygen levels below 3 mg/L are anoxic and are not suitable for fish survival (Bowlby et al. 2016). Since dissolved oxygen levels in the backwater area remained high, the construction of the berms did not negatively impact dissolved oxygen. Nonetheless, the suitable water quality parameters in the backwater area support the establishment of denser SAV as planned.

Criteria 3: *if fish sampling (e.g., minnow traps, seine netting) within the backwater area reveals two (2) new native species of cool or warmwater fish are utilizing the backwater area. Note: new native species are considered those that were not found in the project area in the 2017 sampling conducted near peche island [midwood et al. 2020]. Warm and coolwater native fish such as bowfin, pumpkinseed, and golden shiner have been found to the south of peche island in the 2017 sampling and could potentially use the new backwater area as habitat.*

Pre-construction fish community data were collected by partner agencies and were summarized in Serran et al. (2020) as part of the project authorization. Data referenced two reports: one drafted by OMNDMNRF (2015), and the other published by Midwood et al. (2020). Both used similar electrofishing protocols; however, the OMNDMNRF study took place during daylight hours, which is known to capture less diversity than nighttime sampling (Dumont and Deniss 1997; Pierce et al. 2001). Within the project site of Peche Island, 4 species were caught by OMNDMNRF (2015) and 19 species by DFO (2017) for a total of 155 fish. Comparatively, 26 species (257 fish total) were electrofished by DFO in August 2021 for Phase 1, Year 1 monitoring. In addition, we used multiple gear types as required by permit, with a final tally of 34 species and 3,347 fish; however, 28% (936 fish) of the total catch were Round Goby, predominantly captured in minnow traps and seine nets, not by electrofishing. Of the 34 species recorded in 2021, there were 19 native species that were not captured in the previous surveys. These 19 native species included a mix of both coolwater and warmwater fishes (Table 6), therefore more than fulfilling the Criteria 3 success metric for Phase 1, Year 1 monitoring in 2021.

In August 2023, 28 species (776 fish total) were electrofished by DFO. Using multiple gear types, there was a total of 31 species and 2,352 fish. Similar to the sampling in 2021, 26% (620 fish) of the total catch were Round Goby mainly from minnow traps and seine nets. Sixteen out of the 31 species were native (including coolwater and warmwater fishes) and were not captured in previous surveys summarized in Serran et al. (2020) (Table 7). Comparing the two monitoring years, a total of 4 species were caught in 2023 that were not caught in 2021, and 3 of these species were not caught in the previous surveys. The Criteria 3 success metric was exceeded during the 2023 monitoring of Phase 1, Year 3 and Phase 2, Year 1 post-construction.

Criteria 4: *presence of at least two life stages for two native species in the backwater area (e.g., young-of-year, juvenile or adult).*

Although we did not specifically target different lifestages in our general community sampling, we used length–weight relationships of several species to determine whether juveniles were present or not, based on their length at capture (Scott and Crossman 1973). Midwood et al. (2020) did not report life stages but OMNDMNRF (2015) did; however, they did not detail how they determined if species were juveniles, young-of-year, or adults. Using adult length averages from Scott and Crossman (1973), a cutoff of <60 mm, and conservatively removing small-bodied fishes from our life stage estimates, we are confident in the count of 13 species of juvenile fishes (n = 84 juveniles) captured during the Phase 1, Year 1 post-construction monitoring. All 13 species are native, and we captured both adult and juveniles of these species. During the Phase 1, Year 3 and Phase 2, Year 1 post-construction monitoring, there were 13 native species of juvenile fishes (n = 242 juveniles) captured. There were some juvenile fishes (n = 8 juveniles) that were only identified to the genus level, including 6 *Lepomis sp.* and 2 *Notropis sp.* Of the 13 native species of juveniles, 12 species were also captured in the adult life stage. This evaluation exceeds Criteria 4's success metric for Phase 1, Years 1 and 3, and Phase 2, Year 1 post-construction monitoring.

Despite the exceedance of all success criteria metrics in both sampling years, there are a few concerns that need to be addressed. Fewer fish were caught overall in the 2023 monitoring compared with the 2021 monitoring. The sampling gear type that caught the greatest number of fish overall were seine nets. Phase 2 had one less seine net than Phase 1 (5/6 sites netted in 2023), which partly contributes to the lower number of fishes caught in during the second phase. There are other possible reasons why fewer fishes were caught. Mean water temperature from YSI point-samples was cooler in 2023 (20.7 ± 0.6 ^{o}C) than 2021 (23.0 ± 1.4 ^{o}C), which may affect fish distributions, activity, and other physiological processes (Wismer and Christie 1987). There were 4 new species caught in the 2023 sampling that were not caught in 2021. Of the 4 species, 3 were coolwater fishes, including Alewife, Northern Pike, and Shorthead Redhorse (*Moxostoma macrolepidotum*). However, out of the total number of fish caught, there was a lower percentage of coolwater fishes in Phase 2 (38.0%) compared with Phase 1 (46.4%). Although fish are grouped into temperature guilds (Abdel-Fattah et al. 2021), fish may tolerate a wide range of temperatures that fall beyond their guild assignment (Wismer and Christie 1987).

There are likely other drivers that contributed to the lower fish catches in 2023. Offshore wind conditions were higher in 2021 and may have forced fish to seek shelter behind the islands from the wave action. Water levels were higher in 2021 than in 2023, therefore, fish that prefer deep water may be further offshore and not captured in our 2023 monitoring. There was higher turbidity in 2021 (e.g., that may provide some relief to fish from visual predators) that was not captured by the YSI data but was noted by the field crew. Limitations to the sampling design and use of each gear type must also be considered. The sampling design only captures fish at fine temporal and spatial scales, which means that not all fish in the area will be caught. There is a bias for boat electrofishing towards large-bodied fishes, whereas minnow traps and seine nets tend to catch small-bodied fishes. A holistic view of the site conditions and water quality parameters must be considered when comparing fish catches from different years. Even though the overall catch was lower in 2023, there was a greater number of native juvenile fishes caught in 2023 (n = 244 juveniles) compared with 2021 (n = 84 juveniles). This may indicate that adults are increasingly using the backwater area for spawning and rearing of their young.

There were two Northern Madtoms caught using minnow traps in 2021, however, there were no individuals caught in 2023. Northern Madtoms were caught further from the shore in 2021 (i.e., the only SAR species caught in seine nets in both 2021 and 2023 were Channel Darters). It is not surprising that boat electrofishing did not catch any Northern Madtoms, since this sampling gear type does not catch small-bodied fishes well. Fish salvages were ongoing during the construction of the project, and involved the use of minnow traps to relocate fish, including SAR, approximately 500 m downstream of the construction area. There were 42 Northern Madtoms relocated in 2020 and 18 Northern Madtoms in 2021 and 2022 (J. Serran, Essex Region Consevation Authority, Essex, Ontario, personal communication, 2024). It is possible that the minnow traps used for the fish salvage contributed to the lack of Northern Madtoms caught in our monitoring.

CONCLUSION

In the first and second round (Phase 1) and first round (Phase 2) of biological monitoring for the Peche Island erosion mitigation project, the fish habitat and community success criteria have all been exceeded. Vegetation cover is dense behind the constructed berms, though low lying and similar to previous surveys. There was an increase in species richness, as more fish species were caught in our surveys than in previous surveys. Four species at risk and 19 newly-captured adult native species with some in their juvenile stage were recorded in 2021 for Phase 1, Year 1 post-construction monitoring. Similarly, there was one species at risk and 16 newly-captured adult native species with many in their juvenile life stage in 2023 for Phase 1, Year 3 and Phase 2, Year 1 post-construction monitoring. Newly captured species included both warmwater and coolwater temperature guilds. Based on the success critiera, the newly constructed berms have postively affected the fish by improving habitat suitability around Peche Island for these species.

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REFERENCES

Abdel-Fattah, S., C.K., Minns, A.M., Doherty, J.J., Jardine, and S.E., Doka. 2021. Science and Foundations of the Habitat Ecosystem Assessment Tool (HEAT). DFO Can. Sci. Advis. Sec. Res. Doc. 2019/060. iv + 35 p.

Bain, M.B., and N.J., Stevenson, editors. 1999. Aquatic habitat assessment: Common methods. American Fisheries Society, Bethesda, Maryland.

BioSonics 2016. Visual Habitat User Guide. Seattle, WA.

Bowlby, J.N., V.P., Hiriart-Baer, E.A., Blukacz-Richards, R.R., Yerubandi, S.E., Doka, T.L. Long, and K.M., O'Connor. 2016. Evaluation of the Remedial Action Plan goal for dissolved oxygen in Hamilton Harbour: A goal based on habitat requirements for Cisco. Aquatic Ecosystem Health & Management. 19(2): 134-140. doi: 10.1080/14634988.2015.1106844.

Brousseau, C.M., R.G., Randall, and M.G., Clark. 2005. Protocol for boat electrofishing in near shore areas of the lower Great Lakes: transect and point survey methods for collecting fish and habitat data, 1988 to 2002. Can. Manu. Report Fish. Aquat. Sci. 2702.

Brown, T.G., B., Runciman, M.J., Bradford, and S., Pollard. 2009. A biological synopsis of yellow perch (*Perca flavescens*). Can. Manuscr. Rep. Fish. Aquat. Sci. 2883: v + 28 p.

Chick, J. H., and C.C., McIvor. 1994. Patterns in the abundance and composition of fishes among beds of different macrophytes - viewing a littoral-zone as a landscape. Can. J. Fish. Aquat. Sci. 51(12): 2873-2882. doi:10.1139/f94-286.

Chow-Fraser, P. 2005. Ecosystem response to changes in water level of Lake Ontario marshes: lessons from the restoration of Cootes Paradise Marsh. Hydrobriologia. 539: 189-204.

Dumont, S.C., and J.A., Dennis. 1997. Comparison of day and night electrofishing in Texas reservoirs. North American Journal of Fisheries Management. 17: 939-946.

Gardner Costa, J., K.E., Leisti, J.D., Midwood, and S.E., Doka. 2018. Submerged aquatic vegetation survey in the Bay of Quinte, 2015. Can. Tech. Rep. Fish. Aquat. Sci. 42 p.

Gilinsky, E. 1984. The role of fish predation and spatial heterogeneity in determining benthic community structure. Ecology. 65(2): 455-468. doi:10.2307/1941408.

Keddy, P.A. 1983. Shoreline vegetation in Axe Lake, Ontario: effects of exposure on zonation patterns. Ecology 64(2):331-344. doi: 10.2307/1937080Landis, J.R., and Koch, G.G. 1977. The Measurement of Observer Agreement for Categorical Data. Biometrics 33: 159. doi: 10.2307/2529310.

Koch, E.W. 2001. Beyond light: physical, geological, and geochemical parameters as possible submersed aquatic vegetation habitat requirements. Estuaries. 24(1): 1–17.

Larocque, S.M., R.W.K., Tang, and S.E., Doka. 2020. Water temperature and dissolved oxygen monitoring in Areas of Concern in the St. Clair-Detroit River System. Can. Tech. Rep. Fish. Aquat. Sci. 3380: xiv + 120 p.

Mandrak, N.E., L.D., Bouvier, J.E., Colm, E.C., Enders, D., Watkinson, E., Holm, T.J., Morris, and A.R., Drake. 2022. Voucher collection guidance for freshwater fishes in DFO's Ontario and Prairie, and Arctic regions. Can. Man. Rep. Fish. Aquat. Sci. 3235: iv + 30 p.

Midwood, J.D., E., Budgell, and D., Reddick. 2020. Application of a fish IBI to coastal wetlands in the St. Clair and Detroit River Areas of Concern. Can. Tech. Rep. Fish. Aquat. Sci. 3400: vi + 23 p.

OMNDMNRF. 2015. Detroit River Rehabilitation Site Survey. 2015. Draft report given permission to use by Richard Drouin, Ontario Ministry of Northern Development, Mines, Natural Resources, and Forestry, Lake Erie Management Unit, personal communication, 25 June 2021. 38p.

Pierce, C.L., A.M., Corcoron, A.N., Gronbach, S., Hsia, B.J., Mullarkey, and A.J., Schwartzhoff. 2001. Influence of diel period on electrofishing and beach seining assessments of littoral fish assemblages. North American Journal of Fisheries Management 21: 918-926.

Randall, R. G., C.K., Minns, V.W., Cairns, and J.E., Moore. 1996. The relationship between an index of fish production and submerged macrophytes and other habitat features at three littoral areas in the Great Lakes. Can. J. Fish. Aquat. Sci. 53(S1): 35-44. doi:10.1139/f95-271.

Serran, J., D., Klodnicki, D., Lebedyk, A., White, and K., Money. 2020. Offset Plan for Fisheries Act Section35(2)(b) Authorization DFO File No.19-HCAA-00130 Peche Island Erosion Mitigation Project. Essex Region Conservation Authority. 45p.

Scott, W.B., and E.J., Crossman. 1973. Freshwater fishes of Canada. Bull. Fish. Res. Board Can. 184: xi+1-966.

Wismer, D., and A., Christie. 1987. Temperature relationships of Great Lake fishes: a data compilation. Great Lakes Fishery Commission Special Publication. 87(3). 165p.

TABLES

Table 1. Summary of monitoring and success criteria as reported in Tables 12 and 15 in Serran et. al (2020), including a summary of our results for Phase 1, Year 1 post-construction monitoring in 2021, and Phase 1, Year 3 and Phase 2, Year 1 post-construction monitoring in 2023. Adapted from Serran et. al (2020).

Attribute	Monitoring Criteria	Success Criteria	Phase 1, Year 1 Success Evaluation	Phase 1, Year 3 and Phase 2, Year 1 Success Evaluation
Reduced wave action in new backwater area	Wave action pre and post construction will be compared.	Wave action shows a visible decrease in the backwater area during a high wind event in comparison to pre-construction photos.	Not applicable to this report.	
Improved macrophyte presence	% cover of macrophytes will be calculated and compared to pre construction.	Percent coverage of macrophytes has increased from an average of 10% to an average of 15% or greater in the entire new backwater area.	**Target met:** Mean % SAV cover was 59.49 ± 29.13. % SAV was variable across the project site but Figure 2A shows the densest vegetation in the northeastern shore of the island, behind the constructed berms.	**Target met:** Mean % SAV cover was of 52.0 ± 34.86. There was variability in % SAV across the project site (Figure 2B) with the densest vegetation in the northeastern shore of the island, behind the constructed berms.
Habitat utilization by cool and warmwater fish in new backwater area	Presence of new native cool and warmwater fish in backwater area during summer.	If fish sampling (e.g., minnow traps, seine netting) within the backwater area reveal two (2) new native species of cool or warmwater fish are utilizing the new backwater area. Note: new native species are considered those that were not found in the project area in the 2017 sampling conducted around Peche Island. Warm and coolwater native fish such as bowfin, pumpkinseed, and golden shiner have been	**Target met:** Thirty-four (34) species were captured (19 species total in Peche North, 6 in Peche Head, and 20 in Peche Inner). There were fifteen (15) more species were captured than in previous surveys. Four (4) species at risk (SAR) were also captured. Of the 34 captured, 19 new native species not previously recorded by past surveys were captured in 2021, including a mix of cool and warmwater species.	**Target met:** Thirty-one (31) species were captured (22 species total in Peche North, 10 in Peche Head, and 18 in Peche Inner). There were twelve (12) more species were captured than in previous surveys. One (1) SAR species was captured. Of the 31 species, 16 new native species not previously recorded by past surveys (excluding the 2021 monitoring) were captured in 2023, including a mix of cool and warmwater species. Four (4) of these species were not captured in the 2021 monitoring of Phase 1, Year

		found to the south of Peche Island in the 2017 sampling and could potentially use the new backwater area as habitat.		1, and three (3) were not captured in the 2021 monitoring or previous surveys.
Early fish life stage use of backwater area	Presence of multiple life stage fish in backwater area.	Presence of at least two life stages for two native species in the backwater area (e.g., young-of-year, juvenile or adult).	**Target met:** Thirteen (13) native species were caught in both their juvenile and adult life stages (84 individual fish total); all other species were likely in adult stage.	**Target met:** Thirteen (13) native juvenile species were caught, and twelve (12) were caught in juvenile and adult life stages (244 individual juvenile fish total); all other species were likely in adult stage.
Stability and suitability of structures	A comparison of the constructed habitat (i.e., the sheltering islands) to the approved plan will be made to confirm that the area of constructed habitat is as specified in the plan. Observations will be made once per monitoring year (years 1, and 3 post construction), to confirm that constructed features are in place and functional. Stability of the features and general condition will be assessed by mapping and photo documenting the habitat features once per monitoring year (years 1 and 3 post)	As-built survey demonstrates that sheltering islands are constructed as per the approved plans. The survey will include bathymetry to demonstrate the designed water depths have been achieved. As built conditions and water levels will be used to confirm the habitat area commitment is met or exceeded. Subsequent stability assessments will ensure constructed habitat features (rock structures) remain in place and that offset features are stable and not eroding (≥80% of features are considered stable).	Not applicable to this report.	

Table 2. Locations of all sampling points for fish and habitat sampling in 2021. Blanks indicate no data was collected depending on specific sampling types.

Sample Type	Site Code	Start Latitude	Start Longitude	End Latitude	End Longitude	Set Date	Check Date	Set Time	Check Time	Total Fishing Time
E-fishing	Peche Head 1	42.34628	-82.9207	42.34711	-82.92131	27/08/2021		0:30		
E-fishing	Peche Head 2	42.34715	-82.92136	42.3478	-82.92223	27/08/2021		0:40		
E-fishing	Peche Head 3	42.34852	-82.92326	42.34886	-82.92443	27/08/2021		0:52		
E-fishing	Peche Inner 4	42.34593	-82.93007	42.34565	-82.92894	26/08/2021		23:50		
E-fishing	Peche Inner 3	42.34546	-82.92437	42.34594	-82.92537	26/08/2021		23:10		
E-fishing	Peche Inner 2	42.34527	-82.92397	42.34475	-82.92298	26/08/2021		21:58		
E-fishing	Peche Inner 1	42.34553	-82.92528	42.34531	-82.92404	26/08/2021		21:50		
E-fishing	Peche North 3	42.34736	-82.92965	42.3472	-82.93085	27/08/2021		1:26		
E-fishing	Peche North 2	42.34794	-82.92738	42.34745	-82.92847	27/08/2021		1:35		
E-fishing	Peche North 1	42.34874	-82.92621	42.34861	-82.92716	27/08/2021		1:43		
Minnow Trap	13-T1	42.34884	-82.92646			9/13/2021	9/14/2021	15:05	12:44	21:39
Minnow Trap	13-T2	42.34832	-82.92632			9/13/2021	9/14/2021	15:15	12:50	21:35
Minnow Trap	13-T3	42.34869	-82.927478			9/13/2021	9/14/2021	15:20	13:10	21:50
Minnow Trap	13-T4	42.34801	-82.92782			9/13/2021	9/14/2021	15:25	13:35	22:10
Minnow Trap	13-T5	42.34879	-82.92821			9/13/2021	9/14/2021	15:30	14:20	22:50
Minnow Trap	13-T6	42.34786	-82.92815			9/13/2021	9/14/2021	15:35	15:34	23:59
Minnow Trap	13-T7	42.34812	-82.92883			9/13/2021	9/14/2021	15:40	15:48	23:52
Minnow Trap	13-T8	42.34875	-82.92913			9/13/2021	9/14/2021	15:45	15:55	23:50
Minnow Trap	13-T9	42.34831	-82.92929			9/13/2021	9/14/2021	15:50	16:05	23:45
Minnow Trap	13-T10	42.34760	-82.92949			9/13/2021	9/14/2021	16:00	16:15	23:45
Minnow Trap	14-T1	42.34818	-82.92699			9/14/2021	9/15/2021	14:50	15:24	0:34
Minnow Trap	14-T2	42.34846	-82.92682			9/14/2021	9/15/2021	14:55	15:30	0:35
Minnow Trap	14-T3	42.34781	-82.92726			9/14/2021	9/15/2021	15:00	15:41	0:41
Minnow Trap	14-T4	42.34832	-82.92783			9/14/2021	9/15/2021	15:05	15:45	0:40
Minnow Trap	14-T5	42.34753	-82.92892			9/14/2021	9/15/2021	15:10	15:50	0:40
Minnow Trap	14-T6	42.34720	-82.93045			9/14/2021	9/15/2021	16:02	16:05	0:03

Minnow Trap	14-T7	42.34805	-82.93067	9/14/2021	9/15/2021	16:07	16:20	0:13
Minnow Trap	14-T8	42.34827	-82.93192	9/14/2021	9/15/2021	16:11	16:28	0:17
Minnow Trap	14-T9	42.34774	-82.93204	9/14/2021	9/15/2021	16:15	16:33	0:18
Minnow Trap	14-T10	42.34687	-82.93156	9/14/2021	9/15/2021	16:20	16:36	0:16
Minnow Trap	15-T1	42.34764	-82.93004	9/15/2021	9/16/2021	15:54	14:21	22:27
Minnow Trap	15-T2	42.34848	-82.93008	9/15/2021	9/16/2021	15:56	14:36	22:40
Minnow Trap	15-T3	42.34771	-82.93140	9/15/2021	9/16/2021	15:58	14:46	22:48
Minnow Trap	15-T4	42.34729	-82.93205	9/15/2021	9/16/2021	16:02	14:52	22:50
Minnow Trap	15-T5	42.34715	-82.93253	9/15/2021	9/16/2021	16:04	14:58	22:54
Minnow Trap	15-T6	42.34714	-82.93304	9/15/2021	9/16/2021	16:27	15:06	22:39
Minnow Trap	15-T7	42.34708	-82.93386	9/15/2021	9/16/2021	16:35	15:20	22:45
Minnow Trap	15-T8	42.34861	-82.93431	9/15/2021	9/16/2021	16:52	15:31	22:39
Minnow Trap	15-T9	42.34856	-82.93292	9/15/2021	9/16/2021	16:54	15:42	22:48
Minnow Trap	15-T10	42.34784	-82.93288	9/15/2021	9/16/2021	16:56	15:56	23:00
Seine Net	15-S1	42.34865	-82.92575	9/15/2021			13:30	
Seine Net	15-S2	42.34785	-82.92667	9/15/2021			11:00	
Seine Net	15-S3	42.34772	-82.92741	9/15/2021			12:00	
Seine Net	16-S1	42.34736	-82.92846	9/16/2021			17:24	
Seine Net	16-S2	42.34706	-82.93124	9/16/2021			17:26	
Seine Net	16-S3	42.34696	-82.93336	9/16/2021			18:30	
DOT Logger 10327720	Peche Inside Islands	42.34801	-82.92738					
DOT Logger 10348234	Peche Head of Island	42.34908	-82.92614					
DOT Logger 10582214	Peche Island Inner	42.34414	-82.92331					
SAV Point Sample	Point 1	42.34882	-82.92600	9/17/2021				
SAV Point Sample	Point 2	42.34849	-82.92641	9/17/2021				
SAV Point Sample	Point 3	42.34822	-82.92722	9/17/2021				
SAV Point Sample	Point 4	42.34870	-82.92838	9/17/2021				
SAV Point Sample	Point 5	42.34887	-82.92970	9/17/2021				
SAV Point Sample	Point 6	42.34813	-82.93108	9/17/2021				

SAV Point Sample	Point 7	42.34730	-82.93244	9/17/2021
SAV Point Sample	Point 8	42.34762	-82.93370	9/17/2021
SAV Point Sample	Point 9	42.34802	-82.93568	9/17/2021
SAV Point Sample	Point 10	42.34853	-82.93778	9/17/2021

** DOT = dissolved oxygen – temperature*
** SAV = submerged aquatic vegetation*

Table 3. Locations of all sampling points for fish and habitat sampling in 2023. Blanks indicate no data was collected depending on specific sampling types.

Sample Type	Site Code	Start Latitude	Start Longitude	End Latitude	End Longitude	Set Date	Check Date	Set Time	Check Time	Total Fishing Time
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E-fishing	Peche Head 2	42.34715	-89.92136	42.34780	-82.92223	30/08/2023		23:16		
E-fishing	Peche Head 3	42.34852	-82.92326	42.34886	-82.92443	30/08/2023		23:25		
E-fishing	Peche Inner 1	42.34553	-89.92528	42.34531	-82.92404	31/08/2023		0:19		
E-fishing	Peche Inner 2	42.34527	-89.92397	42.34475	-82.92298	31/08/2023		-		
E-fishing	Peche Inner 3	42.34546	-82.92437	42.34594	-82.92537	31/08/2023		1:03		
E-fishing	Peche Inner 4	42.34593	-82.93007	42.34565	-82.92894	29/08/2023		21:06		
E-fishing	Peche Inside Rocks (Extra)	42.34876	-82.92858	42.34872	-82.92596	30/08/2023		10:43		
E-fishing	Peche North 1	42.34874	-82.92621	42.34861	-82.92716	30/08/2023		21:36		
E-fishing	Peche North 2	42.34794	-82.92738	43.34745	82.92847	30/08/2023		21:45		
E-fishing	Peche North 3	42.34736	-82.92965	42.34720	-82.93085	30/08/2023		22:20		
Minnow Trap	13-T1	42.34884	-82.92646			18/09/2023	19/09/2023	15:13	15:10	23:57
Minnow Trap	13-T2	42.34832	-82.92632			18/09/2023	19/09/2023	15:21	15:30	0:09
Minnow Trap	13-T3	42.34869	-82.92747			18/09/2023	19/09/2023	15:32	16:14	0:42
Minnow Trap	13-T4	42.34801	-82.92782			18/09/2023	19/09/2023	15:49	15:49	0:00
Minnow Trap	13-T5	42.34879	-82.92821			18/09/2023	19/09/2023	15:57	-	-
Minnow Trap	13-T6	42.34785	-82.92813			18/09/2023	19/09/2023	15:38	16:00	0:22
Minnow Trap	13-T7	42.34811	-82.92886			18/09/2023	19/09/2023	16:08	17:14	1:06

Minnow Trap	13-T8	42.34875	-82.92913	18/09/2023	19/09/2023	16:17	16:52		0:35
Minnow Trap	13-T9	42.34830	-82.92933	18/09/2023	19/09/2023	16:12	17:21		1:09
Minnow Trap	13-T10	42.34760	-82.92949	18/09/2023	19/09/2023	16:22	17:30		1:08
Minnow Trap	14-T1	42.34820	-82.92699	19/09/2023	20/09/2023	17:10	17:10		0:00
Minnow Trap	14-T2	42.34846	-82.92682	19/09/2023	20/09/2023	15:32	16:50		1:18
Minnow Trap	14-T3	42.34781	-82.92726	19/09/2023	20/09/2023	15:45	17:00		1:15
Minnow Trap	14-T4	42.34832	-82.92783	19/09/2023	20/09/2023	16:09	5:05		12:56
Minnow Trap	14-T5	42.34753	-82.92892	19/09/2023	20/09/2023	16:40	17:23		0:43
Minnow Trap	14-T6	42.34720	-82.92300	19/09/2023	20/09/2023	17:00	17:23		0:23
Minnow Trap	14-T7	42.34805	-82.93067	19/09/2023	20/09/2023	16:46	17:30		0:44
Minnow Trap	14-T8	42.34827	-82.93192	19/09/2023	20/09/2023	17:38	17:37		23:59
Minnow Trap	14-T9	42.34774	-82.93204	19/09/2023	20/09/2023	17:41	17:41		0:00
Minnow Trap	14-T10	42.34687	-82.93156	19/09/2023	20/09/2023	17:46	17:47		0:01
Minnow Trap	15-T1	42.34764	-82.93004	20/09/2023	21/09/2023	17:00	15:55		22:55
Minnow Trap	15-T2	42.34848	-82.93008	20/09/2023	21/09/2023	18:00	16:00		22:00
Minnow Trap	15-T3	42.34771	-82.93148	20/09/2023	21/09/2023	18:04	16:03		21:59
Minnow Trap	15-T4	42.34729	-82.93205	20/09/2023	21/09/2023	18:09	16:07		21:58
Minnow Trap	15-T5	42.34715	-82.93253	20/09/2023	21/09/2023	18:12	18:13		0:01
Minnow Trap	15-T6	42.34714	-82.93304	20/09/2023	21/09/2023	18:16	16:16		22:00
Minnow Trap	15-T7	42.34708	-82.93386	20/09/2023	21/09/2023	18:20	16:19		21:59
Minnow Trap	15-T8	42.34861	-82.93431	20/09/2023	21/09/2023	18:26	16:23		21:57
Minnow Trap	15-T9	42.34856	-82.93292	20/09/2023	21/09/2023	18:30	16:27		21:57
Minnow Trap	15-T10	43.34784	-82.93288	20/09/2023	21/09/2023	23:34	15:34		16:00
Seine Net	15-S1	42.34865	-82.92575	8/30/2023				**	
Seine Net	15-S2	42.34785	-82.92667	8/30/2023				**	
Seine Net	16-S1	42.34736	-82.92846	8/30/2023				**	
Seine Net	16-S2	42.34706	-82.93124	8/30/2023				**	
Seine Net	16-S3	42.34696	-82.93336	8/30/2023				**	
DOT Logger 684544	Peche Inside Islands	42.34801	-82.92738	29/08/2023	21/09/2023				

DOT Logger 540345	Peche Head of Island	42.34908	-82.92614			29/08/2023	21/09/2023
DOT Logger 813879	Peche Island Inner	42.34409	-82.92321			29/08/2023	21/09/2023
SAV Point Sample	Point 1	42.34797	-82.93291			9/19/2023	
SAV Point Sample	Point 2	42.34828	-82.92694			9/19/2023	
SAV Point Sample	Point 3	42.34713	-82.93597			9/19/2023	
SAV Point Sample	Point 4	42.34713	-82.93330			9/19/2023	
SAV Point Sample	Point 5	42.3480	-82.92676			9/19/2023	
SAV Point Sample	Point 6	42.34867	-82.92650			9/19/2023	
E-fishing	Peche Head 1	42.34628	-82.92070	42.34711	-82.92131	30/08/2023	
E-fishing	Peche Head 2	42.34715	-89.92136	42.34780	-82.92223	30/08/2023	
E-fishing	Peche Head 3	42.34852	-82.92326	42.34886	-82.92443	30/08/2023	
E-fishing	Peche Inner 1	42.34553	-89.92528	42.34531	-82.92404	31/08/2023	

** DOT = dissolved oxygen – temperature*

** SAV = submerged aquatic vegetation*

** No data reported is denoted by "-"*

*** Seine netting was completed between 13:00 to 17:00, starting upstream. Exact times are unavailable*

Table 4. Water quality collected at every sampling site for Peche Island in 2021. Blanks indicate data were not collected, N/A indicates data were collected but missing due to equipment failure. Mean and standard deviation are included at the bottom for each parameter.

Sample Type	Site Code	Depth (m)	Temperature (ºC)	DO (mg/L)	Conductivity (µs/cm)	pH	NTU	SAV % Cover
E-fishing	Peche Head 1		25.81	8.78	212.00	8.57	1.07	
E-fishing	Peche Head 2		25.76	8.68	216.00	8.55	1.12	
E-fishing	Peche Head 3		N/A	N/A	N/A	N/A	N/A	
E-fishing	Peche Inner 4		29.10	8.77	233.20	8.31	1.62	
E-fishing	Peche Inner 3		27.73	8.80	213.80	8.30	1.68	
E-fishing	Peche Inner 2		26.30	9.16	211.60	8.50	1.60	
E-fishing	Peche Inner 1		27.19	9.44	209.00	8.62	2.05	
E-fishing	Peche North 3		25.46	8.92	216.60	8.56	0.90	
E-fishing	Peche North 2		25.60	8.06	212.10	8.57	0.84	
E-fishing	Peche North 1		25.76	8.10	220.10	8.61	1.01	
Minnow Trap	13-T1	1.48	21.59	8.58	223.80	8.40	1.48	
Minnow Trap	13-T2	0.96	21.59	8.60	223.70	8.41	4.08	
Minnow Trap	13-T3	1.30	21.59	8.60	223.80	8.40	1.55	
Minnow Trap	13-T4	1.68	21.59	8.61	223.60	8.14	1.61	
Minnow Trap	13-T5	1.68	21.59	8.65	223.80	8.43	1.24	
Minnow Trap	13-T6	1.22	21.62	8.59	223.80	8.42	1.30	
Minnow Trap	13-T7	1.52	21.62	8.63	223.70	8.41	1.38	
Minnow Trap	13-T8	1.86	21.60	8.66	223.80	8.43	1.22	
Minnow Trap	13-T9	1.75	21.61	8.62	223.80	8.43	1.30	
Minnow Trap	13-T10	1.23	21.60	8.67	223.80	8.48	1.50	
Minnow Trap	14-T1	1.20	22.27	8.63	224.90	8.34	0.98	
Minnow Trap	14-T2	1.50	22.34	8.70	224.70	8.36	0.99	
Minnow Trap	14-T3	1.03	22.25	8.65	224.90	8.35	1.10	
Minnow Trap	14-T4	1.60	22.19	8.57	225.00	8.35	0.91	
Minnow Trap	14-T5	1.30	22.32	8.70	224.90	8.35	1.68	
Minnow Trap	14-T6	1.11	22.75	8.83	224.90	8.57	1.30	
Minnow Trap	14-T7	1.30	22.29	8.74	225.40	8.40	0.92	
Minnow Trap	14-T8	2.01	22.28	8.69	225.00	8.36	0.94	
Minnow Trap	14-T9	2.21	22.31	8.62	224.80	8.39	0.96	
Minnow Trap	14-T10	1.00	22.93	8.66	224.40	8.45	1.54	
Minnow Trap	15-T1	1.40	22.21	8.89	223.30	8.94	1.14	
Minnow Trap	15-T2	1.90	22.15	8.81	223.40	8.43	1.06	

Minnow Trap	15-T3	1.80	22.21	8.84	223.30	8.45	1.03	
Minnow Trap	15-T4	1.45	22.28	8.82	223.20	8.45	1.16	
Minnow Trap	15-T5	1.20	22.27	8.66	223.20	8.47	1.14	
Minnow Trap	15-T6	1.47	22.34	9.06	223.20	8.48	1.19	
Minnow Trap	15-T7	1.30	22.39	9.11	223.30	8.49	1.17	
Minnow Trap	15-T8	2.25	22.08	8.17	223.70	8.42	1.07	
Minnow Trap	15-T9	2.18	22.09	8.69	223.60	8.43	1.14	
Minnow Trap	15-T10	1.65	22.11	8.84	219.70	8.46	1.02	
Seine Net	15-S1	1.30	22.48	8.97	223.50	8.50	1.31	5
Seine Net	15-S2	1.20	21.92	8.76	223.80	8.48	1.13	70
Seine Net	15-S3	1.30	22.17	8.74	223.60	8.49	1.14	75
Seine Net	16-S1	1.30	22.67	8.58	223.70	8.60	2.81	5
Seine Net	16-S2	1.30	22.53	9.09	223.40	8.54	3.23	0
Seine Net	16-S3	1.30	22.36	9.04	223.30	8.52	2.29	5
DOT Logger 10327720	Peche Inside Islands	1.40	25.28	8.84	212.10		0.76	
DOT Logger 10348234	Peche Head of Island	1.40	25.28	8.84	212.10		0.76	
DOT Logger 10582214	Peche Island Inner	1.60	26.89	9.96	204.40	8.66	2.51	
SAV Point Sample	Point 1							2
SAV Point Sample	Point 2							95
SAV Point Sample	Point 3							95
SAV Point Sample	Point 4							100
SAV Point Sample	Point 5							70
SAV Point Sample	Point 6							50
SAV Point Sample	Point 7							30
SAV Point Sample	Point 8							15
SAV Point Sample	Point 9							0
SAV Point Sample	Point 10							0
Mean		**1.5**	**23.0**	**8.7**	**221.8**	**8.5**	**1.3**	
Standard Deviation		**0.4**	**1.4**	**0.3**	**4.1**	**0.1**	**0.6**	

** DOT = dissolved oxygen – temperature*
** SAV = submerged aquatic vegetation*

Table 5. Water quality collected at every sampling site for Peche Island in 2023. Blanks indicate data were not collected, N/A indicates data were collected but missing due to equipment failure. Mean and standard deviation are included at the bottom for each parameter.

Sample Type	Site Code	Depth (m)	Temperature (ºC)	DO (mg/L)	Conductivity (µs/cm)	pH	NTU	SAV % Cover
E-fishing	Peche Head 1		20.74	8.7	216	8.73	0.69	
E-fishing	Peche Head 2		20.74	8.75	216	8.74	0.67	
E-fishing	Peche Head 3		20.76	8.66	217	8.71	0.81	
E-fishing	Peche Inner 1		20.13	8.26	216	8.52	0.73	
E-fishing	Peche Inner 2		19.96	7.41	219	8.47	0.14	
E-fishing	Peche Inner 3		19.29	3.84	238	7.57	0.25	
E-fishing	Peche Inner 4		23.68	10.06	214	9.05	0.78	
E-fishing	Peche Inside Rocks (Extra)							
E-fishing	Peche North 1		20.88	8.72	215	8.79	0.55	
E-fishing	Peche North 2		20.88	8.76	215	8.75	0.73	
E-fishing	Peche North 3		20.71	8.71	215	8.78	0.58	
Minnow Trap	13-T1	1.23	20.8	10.68	217	8.51	0.99	
Minnow Trap	13-T2	0.76	20.7	10.36	218.8	8.42	1.21	
Minnow Trap	13-T3	1.53	20.4	10.11	219.6	8.46	1.11	
Minnow Trap	13-T4	1.00	20.5	10.02	219.5	8.42	1.27	
Minnow Trap	13-T5	1.68	20.3	9.74	220	8.35	1.32	
Minnow Trap	13-T6	1.10	20.5	10.06	219.5	8.41	1.52	
Minnow Trap	13-T7	1.38	20.3	9.81	219.6	8.36	1.13	
Minnow Trap	13-T8	1.64	20.6	10.1	219.8	8.36	1.1	
Minnow Trap	13-T9	1.77	20.3	9.87	219.9	8.37	1.18	
Minnow Trap	13-T10	1.06	20.4	10.16	219.2	8.41	1.25	
Minnow Trap	14-T1	1.47	20.3	9.77	219.7	8.36	1.08	
Minnow Trap	14-T2	1.20	20.7	10.35	218.3	8.42	0.95	
Minnow Trap	14-T3	0.65	20.9	10.31	219.2	8.47	1.02	
Minnow Trap	14-T4	1.33	20.40	9.84	219.90	8.39	1.09	
Minnow Trap	14-T5	0.96	20.5	10.11	219.4	8.4	1.21	
Minnow Trap	14-T6	1.64	20.3	9.88	209.9	8.37	1.17	
Minnow Trap	14-T7	1.47	20.3	9.79	219.9	8.37	1.13	
Minnow Trap	14-T8	1.64	20.3	9.88	220.1	8.36	1.2	
Minnow Trap	14-T9	1.62	20.30	9.92	219.90	8.37	1.24	
Minnow Trap	14-T10	1.09	20.7	10.2	219	8.47	1.71	
Minnow Trap	15-T1	1.27	20.6	9.99	200.7	8.4	1.33	

Minnow Trap	15-T2	1.71	20.4	9.92	200.6	8.4	1.34	
Minnow Trap	15-T3	1.56	20.6	9.96	200.4	8.35	1.45	
Minnow Trap	15-T4	1.43	20.62	10.1	200.4	8.35	1.4	
Minnow Trap	15-T5	1.15	20.71	10.22	219	8.42	1.46	
Minnow Trap	15-T6	1.46	20.74	10.1	201	8.42	1.68	
Minnow Trap	15-T7	1.28	20.89	10.21	198.2	8.34	1.82	
Minnow Trap	15-T8	2.20	20.42	9.82	200.8	8.37	1.25	
Minnow Trap	15-T9	2.01	20.43	9.86	200.2	8.36	1.2	
Minnow Trap	15-T10	1.77	20.53	10.02	219.5	8.4	1.47	
Seine Net	15-S1		21.16	9.91	213	8.47	1.8	
Seine Net	15-S2		21.17	9.93	217	8.51	1.45	
Seine Net	16-S1		21.26	9.99	212	8.53	1.6	
Seine Net	16-S2		20.79	9.07	215	8.81	1.1	
Seine Net	16-S3		21.25	9.95	212.2	8.58	1.22	
DOT Logger 684544	Peche Inside Islands		21.26	6.96	223.7	8.07	0.8	
DOT Logger 540345	Peche Head of Island		21.66	8.96	214.9	8.83	0.6	
DOT Logger 813879	Peche Island Inner		21.29	8.94	215	8.81	0.63	
SAV Point Sample	Point 1							0
SAV Point Sample	Point 2							20
SAV Point Sample	Point 3							0
SAV Point Sample	Point 4							0
SAV Point Sample	Point 5							50
SAV Point Sample	Point 6							100
Mean		**1.4**	**20.7**	**9.5**	**215.1**	**8.5**	**1.1**	
Standard Deviation		**0.3**	**0.6**	**1.1**	**7.8**	**0.2**	**0.4**	

* *DOT = dissolved oxygen - temperature*
* *SAV = submerged aquatic vegetation*

Table 6. Summary of all fish species caught by all gear types in 2021, including mean ± standard deviation (SD) length and weight, and their associated guild (Abdel-Fattah et al. 2021, https://habitatassessment.ca/). Species in **bold** were not previously recorded in the other locally referenced studies. Total fish caught by each gear type were: electrofishing (*n* = 257), minnow trap (*n* = 591), and seine net (*n* = 2516). All fish species are native, except Round Goby and Tubenose Goby.

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Table 7. Summary of all fish species caught by all gear types in 2023, including mean ± standard deviation (SD) length and weight, and their associated guild (Abdel-Fattah et al. 2021, https://habitatassessment.ca/). Species in **bold** were not previously recorded in the other locally referenced studies. Total fish caught by each gear type were: electrofishing (*n* = 773), minnow trap (*n* = 326), and seine net (*n* = 1250). All fish species are native, except Alewife, Round Goby, Tubenose Goby and White Perch. All fish species caught in 2021 were included in the table below and blanks indicate that the species was not caught in 2023. Species with an asterisk (*) were only caught in 2023. Species with a double asterisk (**) were caught in a non-standardized transect (*n* = 1 fish).

			All Gear Types				
Common Name	**Scientific Name**	**Temperature Guild**	**# of fish**	**Mean Length (mm)**	**SD**	**Mean Weight (g)**	**SD**
Alewife*	*Alosa pseudoharengus*	Cool	2	46.0	1.4		
Banded Killifish	*Fundulus diaphanus*	Cool					
Bluegill	*Lepomis macrochirus*	Warm	117	62.4	33.1	18.1	33.4
Bluntnose Minnow	*Pimephales notatus*	Warm	77	55.1	8.3	6.0	2.0
Bowfin**	*Amia calva*	Warm	1	630			
Brook Silverside	*Labidesthes sicculus*	Warm	742	54.2	6.2	1.0	
Brown Bullhead	*Ameiurus nebulosus*	Warm	3	247.3	25.3	209.0	50.6
Channel Catfish**	*Ictalurus punctatus*	Warm	1	634			
Channel Darter	*Percina copelandi*	Warm	1	46.0		1.0	
Common Shiner	*Luxilus cornutus*	Cool					
Emerald Shiner	*Notropis atherinoides*	Cool	104	69.0	5.3	3.5	1.0
Freshwater Drum	*Aplodinotus grunniens*	Warm	3	500.7	68.5	1279.7	291.1
Gizzard Shad	*Dorosoma cepedianum*	Warm	54	153.7	116.6	189.4	362.8
Golden Shiner	*Notemigonus crysoleucas*	Cool	20	66.0	5.7	4.2	1.8
Grass Pickerel	*Esox americanus vermiculatus*	Warm					
Hornyhead Chub	*Nocomis biguttatus*	Warm					
Largemouth Bass	*Micropterus salmoides*	Warm	91	82.9	78.0	45.9	179.7
Logperch	*Percina caprodes*	Cool	46	77.2	12.3	4.9	6.6
Longnose Gar	*Lepisosteus osseus*	Cool	1	361.0		63.0	
Mimic Shiner	*Notropis volucellus*	Warm	36	53.3	6.9	1.0	0.0
Northern Hog Sucker	*Hypentelium nigricans*	Warm	4	291.8	59.6	338.0	

Northern Madtom	*Noturus stigmosus*	Warm					
Northern Pike*,**	*Esox lucius*	Cool	2	363.5	122.3	139.0	
Pugnose Shiner	*Notropis anogenus*	Cool					
Pumpkinseed	*Lepomis gibbosus*	Warm	89	67.8	24.2	13.1	21.6
Rock Bass	*Ambloplites rupestris*	Warm	18	67.3	45.1	59.6	27.6
Round Goby	*Neogobius melanostomus*	Cool	620	67.4	18.4	6.3	5.1
Shorthead Redhorse*	*Moxostoma macrolepidotum*	Cool	2	169.0	12.7	59.5	7.8
Silver Redhorse	*Moxostoma anisurum*	Cool					
Smallmouth Bass	*Micropterus dolomieu*	Warm	199	107.6	77.2	128.9	338.7
Spotfin Shiner	*Cyprinella spiloptera*	Warm	1	67.0			
Spottail Shiner	*Notropis hudsonius*	Cool	7	56.1	14.0	1.0	
Tubenose Goby	*Proterorhinus marmoratus*	Cool	30	42.8	8.4		
Walleye	*Sander vitreus*	Cool	1	383.0		613.0	
White Perch*	*Morone americana*	Warm	2	77.5	10.6	7.0	5.7
White Sucker	*Catostomus commersonii*	Cool	8	90.1	10.7	9.4	3.5
Yellow Bullhead	*Ameiurus natalis*	Warm	1	293.0		374.0	
Yellow Perch	*Perca flavescens*	Cool	41	111.3	43.6	33.9	40.4
	Lepomis sp.		6	44.7	8.2	1.0	0.0
	Notropis sp.		2	25.5	4.9		
Grand Total			**2352**				

Table 8. Raw catch data (total = 84) of juvenile fish species caught in 2021 by all gear types, their length and weight, the associated gear type, and site of catch.

Gear Type	Site Code	Species	Length (mm)	Weight (g)	Trap ID
E-fishing	Peche Inner 4	Bluegill	34	1	
E-fishing	Peche Inner 4	Bluegill	40	1	
E-fishing	Peche Inner 4	Bluegill	42	3	
E-fishing	Peche Inner 4	Bluegill	48	2	
E-fishing	Peche Inner 3	Bluegill	49	3	
E-fishing	Peche Inner 3	Bluegill	54	6	
E-fishing	Peche Head 2	Emerald Shiner	28		
E-fishing	Peche Inner 3	Golden Shiner	56	4	
E-fishing	Peche Inner 3	Largemouth Bass	50	4	
E-fishing	Peche Inner 3	Largemouth Bass	53	3	
E-fishing	Peche Inner 4	Largemouth Bass	55	4	
E-fishing	Peche Inner 1	Largemouth Bass	57	3	
E-fishing	Peche Inner 2	Largemouth Bass	60	1	
E-fishing	Peche Inner 2	Largemouth Bass	60	4	
E-fishing	Peche Inner 3	Pugnose Shiner	38	1	
E-fishing	Peche Inner 1	Pumpkinseed	43	3	
E-fishing	Peche Inner 1	Pumpkinseed	44	3	
E-fishing	Peche Inner 2	Pumpkinseed	46	4	
E-fishing	Peche Inner 2	Pumpkinseed	49	2	
E-fishing	Peche Inner 3	Pumpkinseed	50	3	
E-fishing	Peche Inner 3	Pumpkinseed	51	6	
E-fishing	Peche Inner 2	Pumpkinseed	52	3	
E-fishing	Peche Inner 3	Pumpkinseed	53	2	
E-fishing	Peche Inner 3	Pumpkinseed	54	6	
E-fishing	Peche Inner 1	Pumpkinseed	55	3	
E-fishing	Peche Inner 2	Pumpkinseed	58	3	
E-fishing	Peche Inner 2	Pumpkinseed	59	4	
Minnow Trap	14-T1	Mimic Shiner	50		B
Minnow Trap	14-T1	Mimic Shiner	51		B
Minnow Trap	13-T6	Mimic Shiner	52		B
Minnow Trap	14-T4	Mimic Shiner	52		B
Minnow Trap	14-T9	Mimic Shiner	52		A
Minnow Trap	14-T9	Mimic Shiner	54		B
Minnow Trap	14-T7	Mimic Shiner	59		C
Minnow Trap	14-T7	Smallmouth Bass	56		C
Minnow Trap	14-T2	Spottail Shiner	44		A
Minnow Trap	13-T3	Spottail Shiner	54		C
Seine Net	16-S1	Banded Killifish	38		
Seine Net	16-S1	Bluntnose Minnow	41		

Seine Net	16-S1	Bluntnose Minnow	48
Seine Net	16-S1	Bluntnose Minnow	54
Seine Net	16-S1	Bluntnose Minnow	55
Seine Net	15-S1	Channel Catfish	41
Seine Net	15-S3	Channel Darter	46
Seine Net	16-S2	Channel Darter	48
Seine Net	16-S2	Channel Darter	49
Seine Net	16-S1	Emerald Shiner	27
Seine Net	16-S2	Emerald Shiner	41
Seine Net	16-S2	Emerald Shiner	41
Seine Net	16-S2	Emerald Shiner	42
Seine Net	16-S2	Emerald Shiner	43
Seine Net	15-S2	Emerald Shiner	48
Seine Net	16-S2	Emerald Shiner	51
Seine Net	16-S2	Emerald Shiner	55
Seine Net	16-S2	Emerald Shiner	57
Seine Net	16-S1	Emerald Shiner	58
Seine Net	16-S2	Logperch	59
Seine Net	15-S3	Logperch	60
Seine Net	16-S1	Logperch	60
Seine Net	15-S2	Mimic Shiner	42
Seine Net	15-S2	Mimic Shiner	43
Seine Net	15-S1	Mimic Shiner	45
Seine Net	16-S2	Mimic Shiner	45
Seine Net	15-S1	Mimic Shiner	46
Seine Net	15-S1	Mimic Shiner	48
Seine Net	16-S2	Mimic Shiner	48
Seine Net	16-S2	Mimic Shiner	49
Seine Net	16-S2	Mimic Shiner	50
Seine Net	16-S2	Mimic Shiner	51
Seine Net	16-S1	Mimic Shiner	52
Seine Net	16-S2	Mimic Shiner	52
Seine Net	16-S2	Mimic Shiner	52
Seine Net	16-S2	Mimic Shiner	56
Seine Net	16-S2	Mimic Shiner	58
Seine Net	15-S1	Smallmouth Bass	60
Seine Net	16-S1	Spottail Shiner	48
Seine Net	16-S1	Spottail Shiner	51
Seine Net	16-S1	Spottail Shiner	53
Seine Net	16-S1	Spottail Shiner	54
Seine Net	16-S1	Spottail Shiner	55
Seine Net	15-S3	Spottail Shiner	57
Seine Net	16-S1	Spottail Shiner	57

Seine Net	15-S3	Spottail Shiner	60
Seine Net	16-S2	Spottail Shiner	60

Table 9. Raw catch data (total = 244) of juvenile fish species caught in 2023 by all gear types, their length and weight, the associated gear type, and site of catch.

Gear Type	Site Code	Species	Length (mm)	Weight (g)	Trap ID
E-fishing	Peche North 2	Largemouth Bass	58	9	
E-fishing	Peche North 2	Smallmouth Bass	54		
E-fishing	Peche North 2	Mimic Shiner	51	1	
E-fishing	Peche North 2	Mimic Shiner	50	1	
E-fishing	Peche North 2	Mimic Shiner	52	1	
E-fishing	Peche North 2	Mimic Shiner	49	1	
E-fishing	Peche North 2	Mimic Shiner	49		
E-fishing	Peche North 2	Mimic Shiner	57	1	
E-fishing	Peche North 2	Mimic Shiner	48		
E-fishing	Peche North 2	Mimic Shiner	54	1	
E-fishing	Peche North 2	Mimic Shiner	50		
E-fishing	Peche North 2	Mimic Shiner	52		
E-fishing	Peche North 2	Mimic Shiner	45		
E-fishing	Peche North 2	Mimic Shiner	50		
E-fishing	Peche North 1	Spottail Shiner	52	1	
E-fishing	Peche North 1	Mimic Shiner	53	1	
E-fishing	Peche North 3	Smallmouth Bass	57	3	
E-fishing	Peche North 3	Channel Darter	46	1	
E-fishing	Peche Head 2	Mimic Shiner	51		
E-fishing	Peche Head 3	Smallmouth Bass	55	4	
E-fishing	Peche Head 3	Logperch	52	1	
E-fishing	Peche Head 3	Mimic Shiner	54		
E-fishing	Peche Inner 1	Bluegill	33	1	
E-fishing	Peche Inner 1	Bluntnose Minnow	59		
E-fishing	Peche Inner 1	Bluntnose Minnow	55		
E-fishing	Peche Inner 1	Bluntnose Minnow	55		
E-fishing	Peche Inner 1	Largemouth Bass	55	1	
E-fishing	Peche Inner 1	Bluntnose Minnow	57		
E-fishing	Peche Inner 1	Bluntnose Minnow	46		
E-fishing	Peche Inner 1	Bluntnose Minnow	59		
E-fishing	Peche Inner 1	Bluntnose Minnow	45		
E-fishing	Peche Inner 1	Largemouth Bass	59		
E-fishing	Peche Inner 1	Bluntnose Minnow	54		
E-fishing	Peche Inner 1	Bluntnose Minnow	54		
E-fishing	Peche Inner 1	Bluntnose Minnow	57		
E-fishing	Peche Inner 1	Bluntnose Minnow	52		
E-fishing	Peche Inner 1	Bluegill	49	2	
E-fishing	Peche Inner 1	Bluegill	35	1	
E-fishing	Peche Inner 1	Bluegill	43	1	

E-fishing	Peche Inner 1	Bluegill	49	3
E-fishing	Peche Inner 1	Bluegill	53	2
E-fishing	Peche Inner 1	Bluegill	55	3
E-fishing	Peche Inner 1	Bluegill	40	1
E-fishing	Peche Inner 1	Bluegill	54	3
E-fishing	Peche Inner 1	Bluegill	48	1
E-fishing	Peche Inner 1	Bluegill	34	
E-fishing	Peche Inner 1	Bluegill	39	
E-fishing	Peche Inner 1	Bluegill	45	
E-fishing	Peche Inner 1	Bluegill	46	
E-fishing	Peche Inner 1	Bluegill	51	
E-fishing	Peche Inner 1	Bluegill	52	
E-fishing	Peche Inner 1	Bluegill	44	
E-fishing	Peche Inner 1	Bluntnose Minnow	56	
E-fishing	Peche Inner 1	Bluntnose Minnow	52	
E-fishing	Peche Inner 1	Bluntnose Minnow	51	
E-fishing	Peche Inner 1	Bluntnose Minnow	44	
E-fishing	Peche Inner 1	Bluntnose Minnow	54	
E-fishing	Peche Inner 1	Bluntnose Minnow	51	
E-fishing	Peche Inner 1	Largemouth Bass	55	3
E-fishing	Peche Inner 1	Pumpkinseed	56	
E-fishing	Peche Inner 1	Pumpkinseed	57	
E-fishing	Peche Inner 1	Pumpkinseed	53	3
E-fishing	Peche Inner 1	Pumpkinseed	51	
E-fishing	Peche Inner 1	Pumpkinseed	45	
E-fishing	Peche Inner 1	Pumpkinseed	54	3
E-fishing	Peche Inner 1	Pumpkinseed	59	3
E-fishing	Peche Inner 1	Pumpkinseed	54	
E-fishing	Peche Inner 1	Pumpkinseed	57	4
E-fishing	Peche Inner 1	Pumpkinseed	55	
E-fishing	Peche Inner 1	Pumpkinseed	53	
E-fishing	Peche Inner 1	Pumpkinseed	55	4
E-fishing	Peche Inner 1	Logperch	56	1
E-fishing	Peche Inner 1	Largemouth Bass	59	12
E-fishing	Peche Inner 1	Largemouth Bass	52	1
E-fishing	Peche Inner 1	Largemouth Bass	55	3
E-fishing	Peche Inner 1	Largemouth Bass	55	
E-fishing	Peche Inner 1	Largemouth Bass	55	
E-fishing	Peche Inner 1	Largemouth Bass	50	2
E-fishing	Peche Inner 1	Largemouth Bass	54	
E-fishing	Peche Inner 1	Largemouth Bass	59	2
E-fishing	Peche Inner 1	Largemouth Bass	55	

E-fishing	Peche Head 1	Bluntnose Minnow	43	
E-fishing	Peche Head 1	Pumpkinseed	59	3
E-fishing	Peche Head 1	Bluntnose Minnow	50	
E-fishing	Peche Inner 3	Largemouth Bass	56	3
E-fishing	Peche Inner 3	Golden Shiner	57	3
E-fishing	Peche Inner 3	Bluntnose Minnow	45	
E-fishing	Peche Inner 3	Largemouth Bass	56	
E-fishing	Peche Inner 3	Largemouth Bass	56	
E-fishing	Peche Inner 3	Largemouth Bass	57	4
E-fishing	Peche Inner 3	Largemouth Bass	52	3
E-fishing	Peche Inner 3	Bluegill	41	
E-fishing	Peche Inner 3	Largemouth Bass	52	
E-fishing	Peche Inner 3	Bluegill	38	
E-fishing	Peche Inner 3	Bluegill	47	
E-fishing	Peche Inner 3	Pumpkinseed	52	
E-fishing	Peche Inner 3	Bluegill	48	
E-fishing	Peche Inner 3	Bluegill	38	
E-fishing	Peche Inner 3	Largemouth Bass	57	
E-fishing	Peche Inner 3	Bluegill	46	
E-fishing	Peche Inner 3	Largemouth Bass	55	3
E-fishing	Peche Inner 3	Bluegill	37	
E-fishing	Peche Inner 3	Bluegill	28	
E-fishing	Peche Inner 3	Bluegill	44	
E-fishing	Peche Inner 3	Pumpkinseed	50	
E-fishing	Peche Inner 3	Bluegill	46	
E-fishing	Peche Inner 3	Bluegill	42	
E-fishing	Peche Inner 3	Bluegill	44	
E-fishing	Peche Inner 3	Bluegill	33	
E-fishing	Peche Inner 3	Bluegill	33	
E-fishing	Peche Inner 3	Bluegill	57	
E-fishing	Peche Inner 2	Bluntnose Minnow	55	
E-fishing	Peche Inner 2	Bluntnose Minnow	59	
E-fishing	Peche Inner 2	Bluntnose Minnow	58	
E-fishing	Peche Inner 2	Bluntnose Minnow	55	
E-fishing	Peche Inner 2	Bluntnose Minnow	53	
E-fishing	Peche Inner 2	Bluntnose Minnow	56	
E-fishing	Peche Inner 2	Bluntnose Minnow	54	
E-fishing	Peche Inner 2	Bluntnose Minnow	57	
E-fishing	Peche Inner 2	Bluntnose Minnow	45	
E-fishing	Peche Inner 2	Bluntnose Minnow	47	
E-fishing	Peche Inner 2	Bluntnose Minnow	54	
E-fishing	Peche Inner 2	Bluntnose Minnow	46	

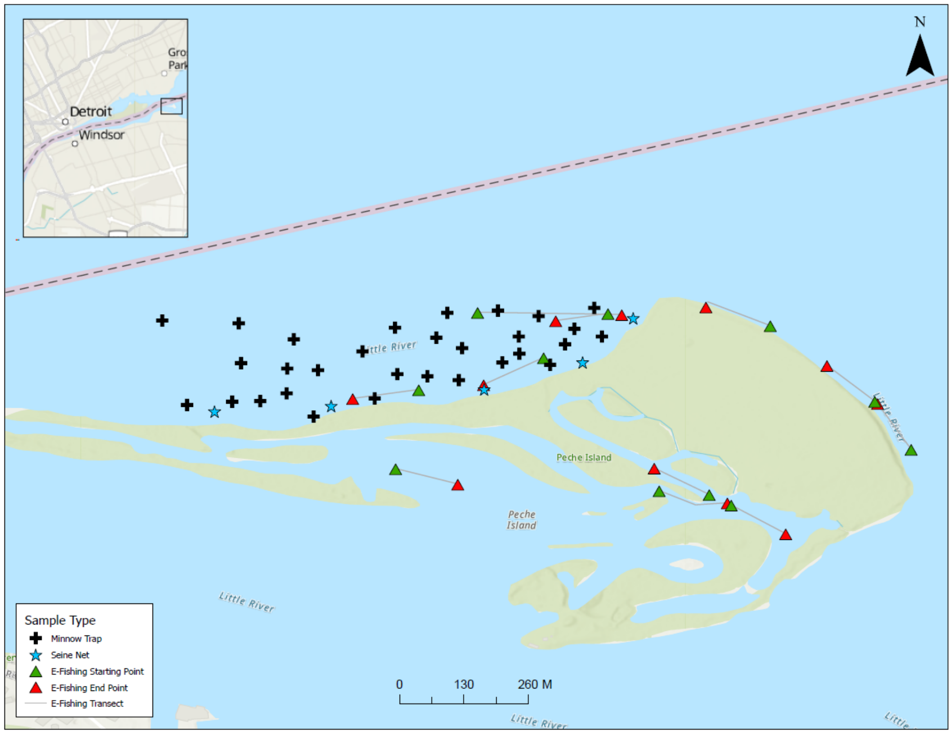
E-fishing	Peche Inner 2	Bluntnose Minnow	56	
E-fishing	Peche Inner 2	Bluntnose Minnow	44	
E-fishing	Peche Inner 2	Bluntnose Minnow	49	
E-fishing	Peche Inner 2	Bluntnose Minnow	55	
E-fishing	Peche Inner 2	Bluntnose Minnow	56	
E-fishing	Peche Inner 2	Bluntnose Minnow	55	
E-fishing	Peche Inner 2	Bluntnose Minnow	51	
E-fishing	Peche Inner 2	Largemouth Bass	58	4
E-fishing	Peche Inner 2	Largemouth Bass	50	4
E-fishing	Peche Inner 2	Largemouth Bass	55	4
E-fishing	Peche Inner 2	Largemouth Bass	57	4
E-fishing	Peche Inner 2	Largemouth Bass	53	4
E-fishing	Peche Inner 2	Largemouth Bass	54	4
E-fishing	Peche Inner 2	Largemouth Bass	44	3
E-fishing	Peche Inner 2	Largemouth Bass	55	4
E-fishing	Peche Inner 2	Largemouth Bass	57	4
E-fishing	Peche Inner 2	Largemouth Bass	53	4
E-fishing	Peche Inner 2	Largemouth Bass	55	4
E-fishing	Peche Inner 2	Golden Shiner	56	
E-fishing	Peche Inner 2	Golden Shiner	57	
E-fishing	Peche Inner 2	Bluegill	35	2
E-fishing	Peche Inner 2	Bluegill	42	3
E-fishing	Peche Inner 2	Bluegill	41	3
E-fishing	Peche Inner 2	Bluegill	44	3
E-fishing	Peche Inner 2	Bluegill	46	3
E-fishing	Peche Inner 2	Bluegill	39	2
E-fishing	Peche Inner 2	Bluegill	40	2
E-fishing	Peche Inner 2	Bluegill	42	2
E-fishing	Peche Inner 2	Bluegill	48	3
E-fishing	Peche Inner 2	Bluegill	46	3
E-fishing	Peche Inner 2	Bluegill	44	3
E-fishing	Peche Inner 2	Bluegill	43	3
E-fishing	Peche Inner 2	Bluegill	40	3
E-fishing	Peche Inner 2	Bluegill	45	3
E-fishing	Peche Inner 2	Bluegill	35	2
E-fishing	Peche Inner 2	Bluegill	45	3
E-fishing	Peche Inner 2	Bluegill	35	2
E-fishing	Peche Inner 2	Pumpkinseed	46	3
E-fishing	Peche Inner 2	Largemouth Bass	47	3
E-fishing	Peche Inner 2	Pumpkinseed	57	5
E-fishing	Peche Inner 2	Pumpkinseed	50	2
E-fishing	Peche Inner 2	Pumpkinseed	54	3

E-fishing	Peche Inner 2	Pumpkinseed	57	4	
E-fishing	Peche Inner 2	Pumpkinseed	55	2	
E-fishing	Peche Inner 2	Pumpkinseed	45	2	
E-fishing	Peche Inner 2	Pumpkinseed	52	3	
E-fishing	Peche Inner 2	Pumpkinseed	47	2	
E-fishing	Peche Inner 2	Pumpkinseed	50	3	
E-fishing	Peche Inner 2	Pumpkinseed	38	2	
E-fishing	Peche Inner 2	Pumpkinseed	56	3	
E-fishing	Peche Inner 2	Pumpkinseed	55	3	
E-fishing	Peche Inner 2	Pumpkinseed	55	4	
E-fishing	Peche Inner 2	Pumpkinseed	52	3	
E-fishing	Peche Inner 2	Pumpkinseed	57	4	
E-fishing	Peche Inner 4	Pumpkinseed	59	5	
E-fishing	Peche Inner 4	*Lepomis sp.*	31		
E-fishing	Peche Inner 4	Bluegill	51		
E-fishing	Peche Inner 4	Bluegill	44		
E-fishing	Peche Inner 4	Bluegill	50	3	
E-fishing	Peche Inner 4	*Lepomis sp.*	43		
E-fishing	Peche Inner 4	*Lepomis sp.*	52	1	
E-fishing	Peche Inner 4	*Lepomis sp.*	45		
E-fishing	Peche Inner 4	*Lepomis sp.*	43		
E-fishing	Peche Inner 4	*Lepomis sp.*	54	1	
Minnow Trap	14-T9	Mimic Shiner	55		A
Minnow Trap	14-T10	Mimic Shiner	51		A
Minnow Trap	14-T10	Mimic Shiner	55		A
Minnow Trap	14-T10	Mimic Shiner	51		B
Minnow Trap	14-T4	Rock Bass	45		B
Minnow Trap	14-T3	Mimic Shiner	59		A
Minnow Trap	14-T3	Rock Bass	31		B
Minnow Trap	14-T7	Mimic Shiner	56		C
Minnow Trap	14-T7	Mimic Shiner	45		C
Minnow Trap	13-T8	Rock Bass	47		B
Minnow Trap	13-T10	Mimic Shiner	51		B
Minnow Trap	13-T5	Rock Bass	32		A
Minnow Trap	13-T5	Rock Bass	39		C
Minnow Trap	13-T3	Rock Bass	43		A
Minnow Trap	13-T3	Rock Bass	41		B
Minnow Trap	13-T3	Rock Bass	29		C
Minnow Trap	13-T6	Rock Bass	51		A
Minnow Trap	13-T6	Mimic Shiner	55		C
Minnow Trap	13-T1	Bluegill	48		B
Minnow Trap	13-T1	Rock Bass	39		B

Minnow Trap	13-T1	Rock Bass	46	C
Minnow Trap	15-T10	Mimic Shiner	45	C
Minnow Trap	15-T8	Yellow Perch	59	A
Minnow Trap	15-T6	Rock Bass	42	C
Minnow Trap	15-T4	Mimic Shiner	55	A
Minnow Trap	15-T2	Rock Bass	51	C
Seine Net	15-S1	Alewife	47	
Seine Net	15-S1	Mimic Shiner	47	
Seine Net	15-S2	Spottail Shiner	57	
Seine Net	15-S2	Smallmouth Bass	47	
Seine Net	15-S2	Smallmouth Bass	56	
Seine Net	15-S2	Smallmouth Bass	42	
Seine Net	15-S2	Smallmouth Bass	55	
Seine Net	15-S2	Mimic Shiner	54	
Seine Net	15-S2	Spottail Shiner	57	
Seine Net	16-S1	Mimic Shiner	37	
Seine Net	16-S1	Alewife	45	
Seine Net	16-S1	Yellow Perch	54	
Seine Net	16-S1	Smallmouth Bass	55	
Seine Net	16-S1	Emerald Shiner	57	
Seine Net	16-S1	Notropis sp	29	
Seine Net	16-S2	Smallmouth Bass	58	
Seine Net	16-S2	Smallmouth Bass	50	
Seine Net	16-S2	Smallmouth Bass	52	
Seine Net	16-S2	Smallmouth Bass	58	
Seine Net	16-S2	Smallmouth Bass	58	
Seine Net	16-S2	Mimic Shiner	55	
Seine Net	16-S2	Yellow Perch	59	
Seine Net	16-S2	Yellow Perch	57	
Seine Net	16-S2	Yellow Perch	53	
Seine Net	16-S3	Smallmouth Bass	49	
Seine Net	16-S3	Smallmouth Bass	57	
Seine Net	16-S3	Mimic Shiner	56	
Seine Net	16-S3	Emerald Shiner	57	
Seine Net	16-S3	Spottail Shiner	35	
Seine Net	16-S3	Spottail Shiner	49	
Seine Net	16-S3	*Notropis sp.*	22	

FIGURES

(A) 2021 Monitoring



(B) 2023 Monitoring

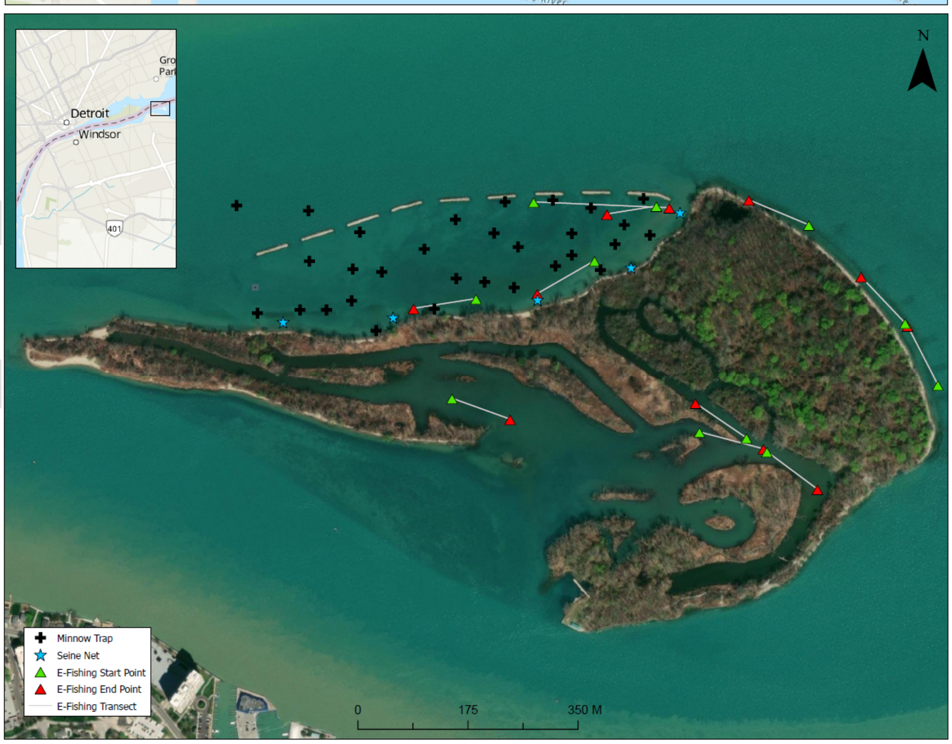


Figure 1. Map of Peche Island sampling sites in the Detroit River, classified by fish sampling gear, for (A) 2021, and (B) 2023.

(A) 2021 Monitoring

(B) 2023 Monitoring

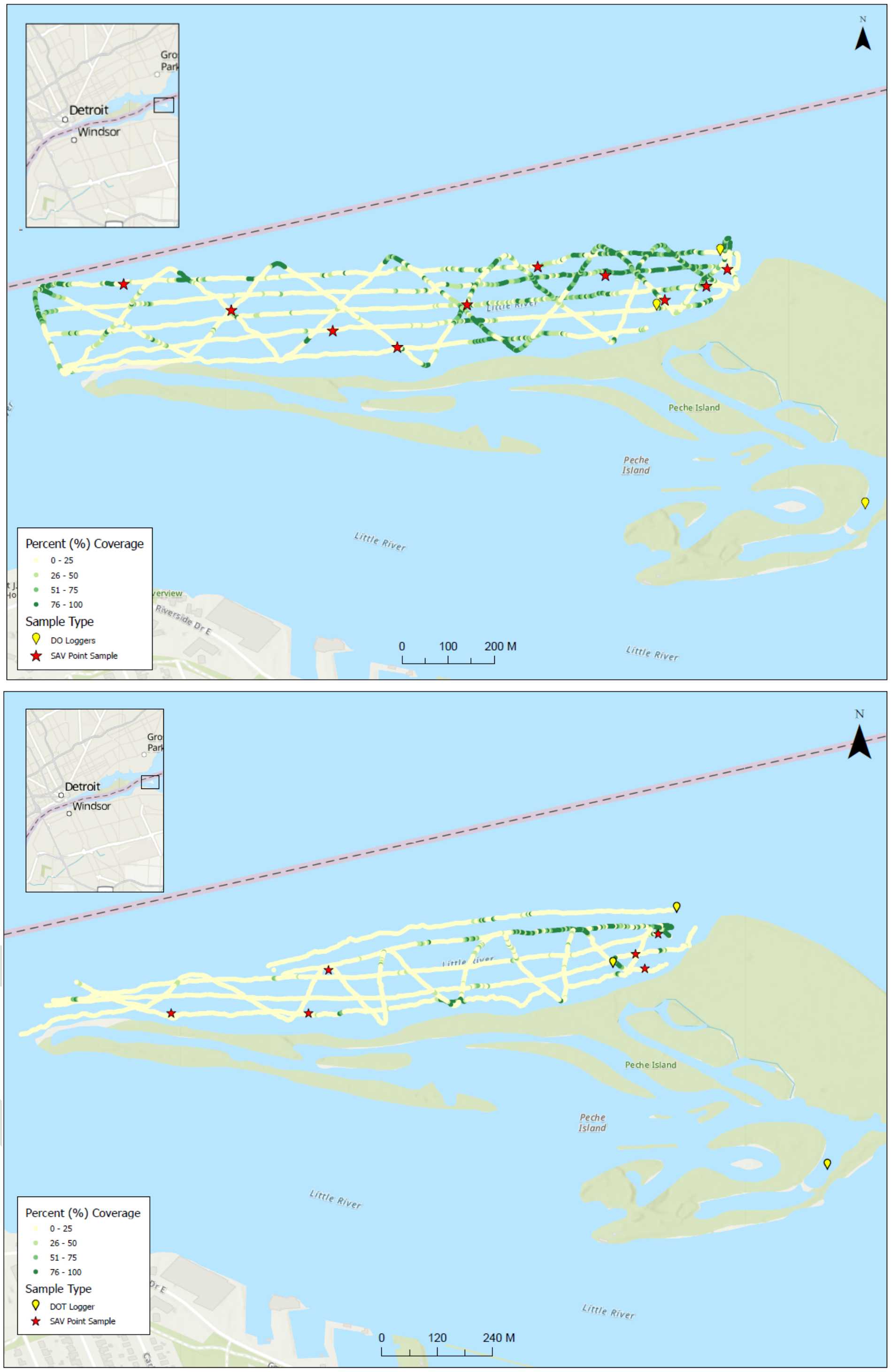
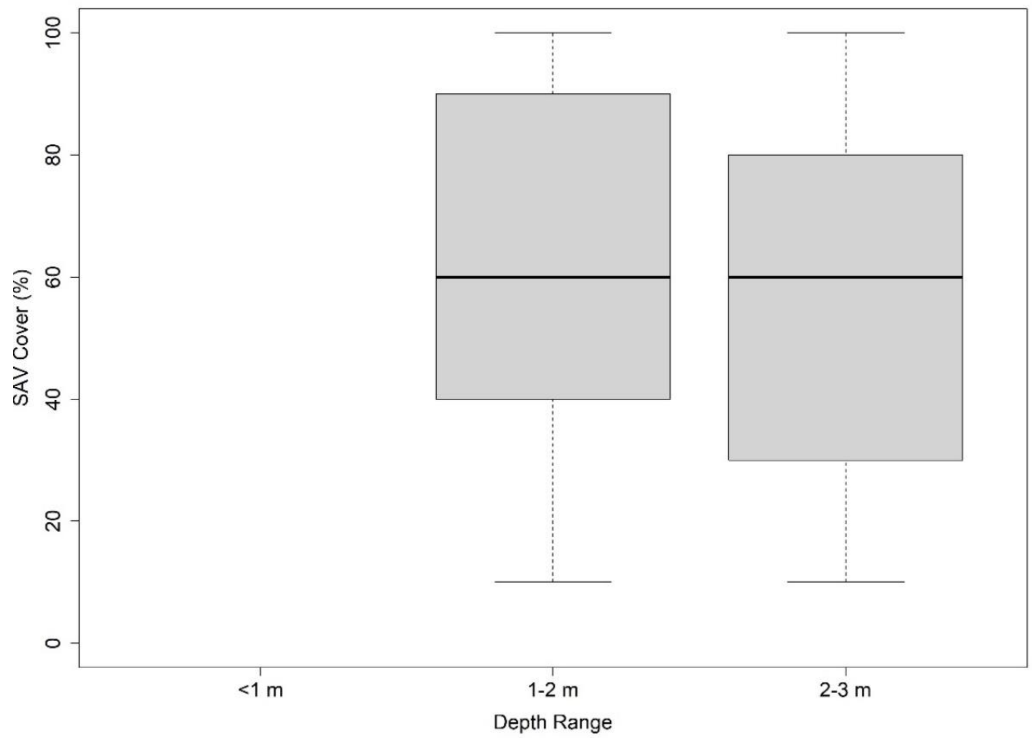
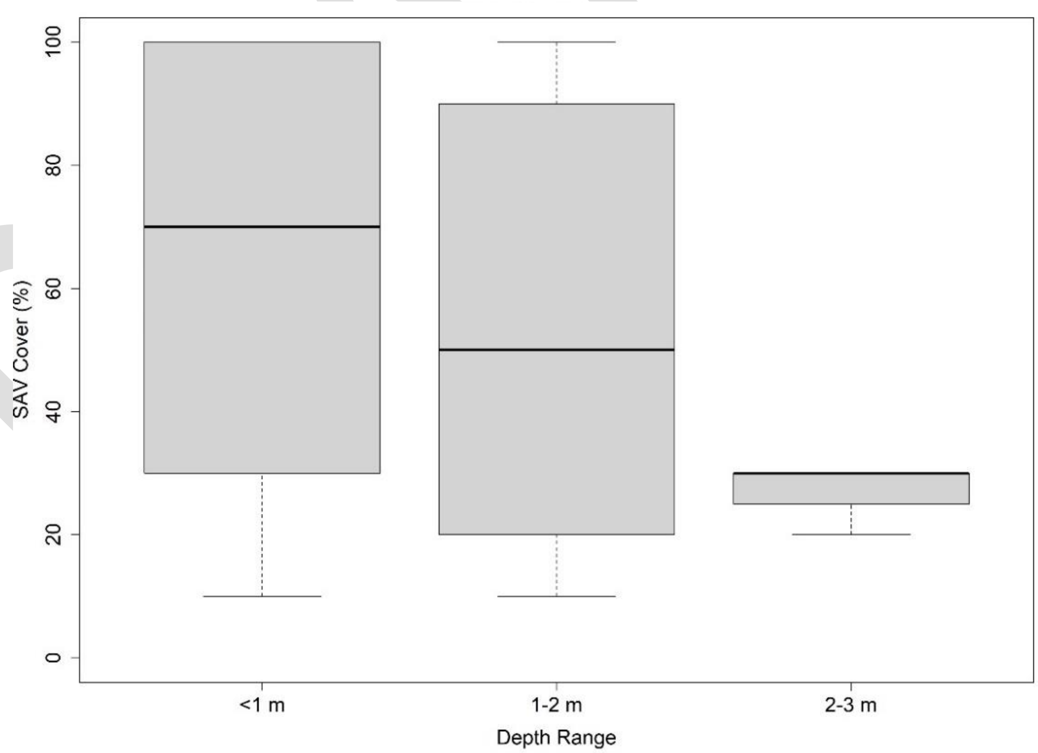


Figure 2. Percent submerged aquatic vegetation (% SAV) cover and density determined by the analysis of acoustic data from the Peche Island SAV survey for (A) Phase 1, Year 1 post-construction monitoring in 2021, and (B) Phase 1, Year 3 and Phase 2, Year 1 post-construction monitoring in 2023. Point samples are visual inspections to provide verification data for the acoustics. Location of the dissolved oxygen – temperature (DOT) loggers are included. Sampling did not occur in the <1 m range in 2021.

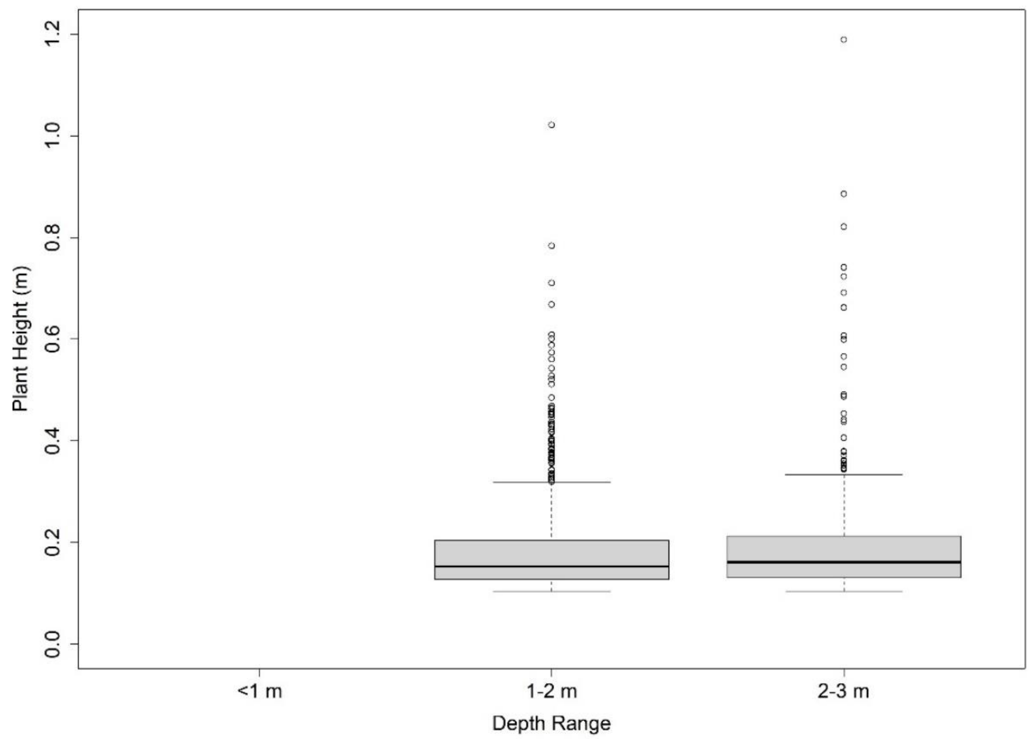


(A) 2021 Monitoring

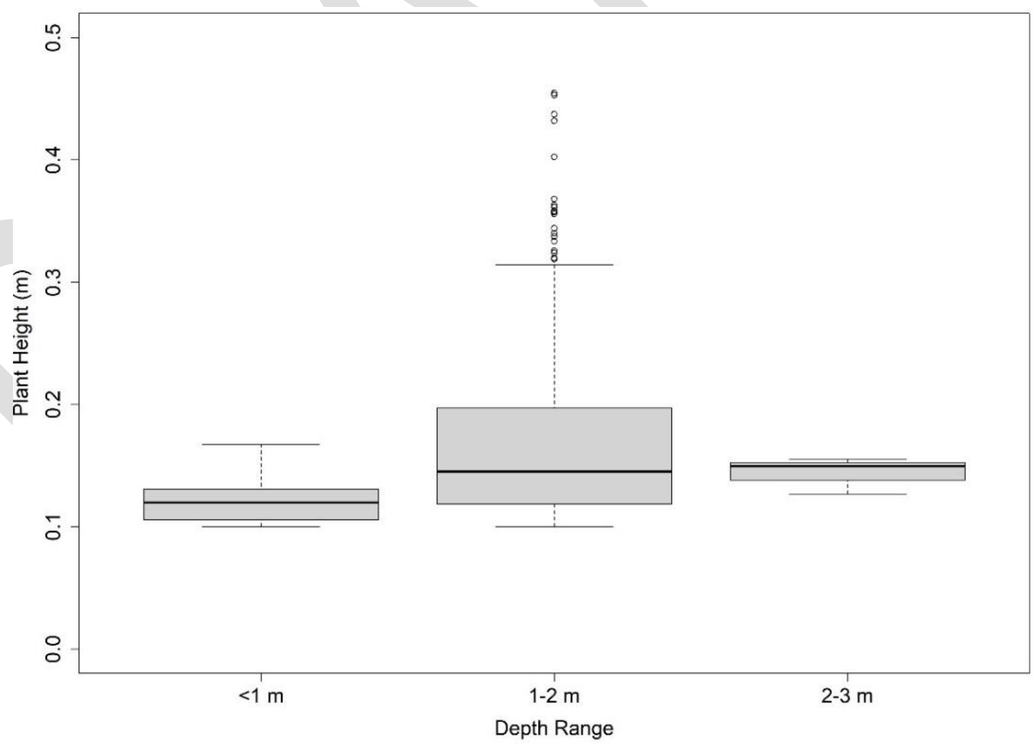


(B) 2023 Monitoring

Figure 3. Boxplots by depth range of percent SAV cover for the Peche Island erosion mitigation project based on the acoustic analysis of (A) the August 2021 monitoring data, and (B) the August 2023 monitoring data.



(A) 2021 Monitoring



(B) 2023 Monitoring

Figure 4. Boxplots by depth range of SAV plant height (m) determined for the Peche Island erosion mitigation project based on the acoustic analysis of (A) the August 2021 monitoring data, with no sampling in the <1 m range, and (B) the August 2023 monitoring data.

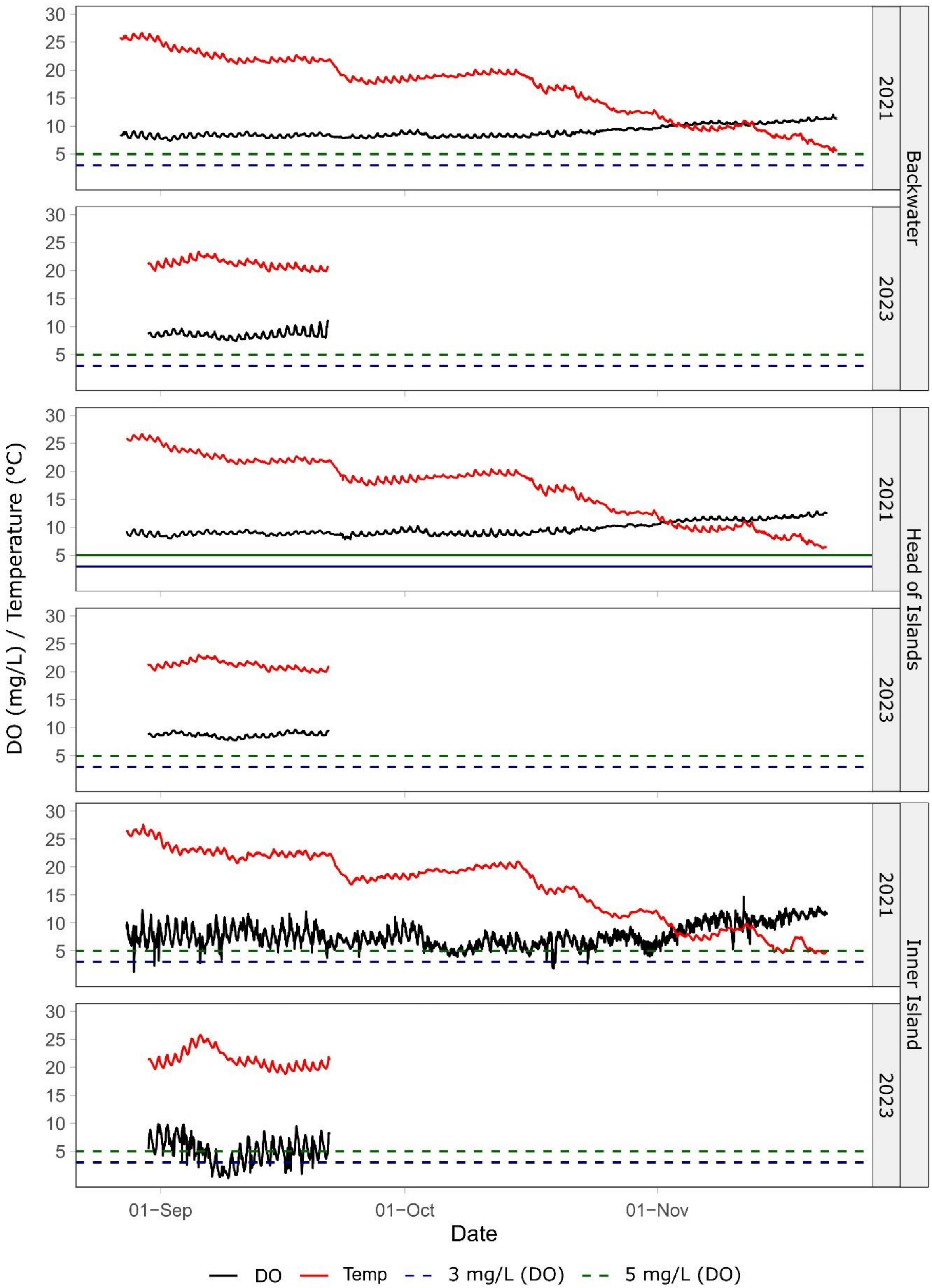


Figure 5. Dissolved oxygen (DO) and temperature (°C) recorded from HOBO U26 loggers deployed in the backwater area behind the islands, the head of the islands, and in the inner island wetland complex. Data for 2021 and 2023 are displayed for each location.

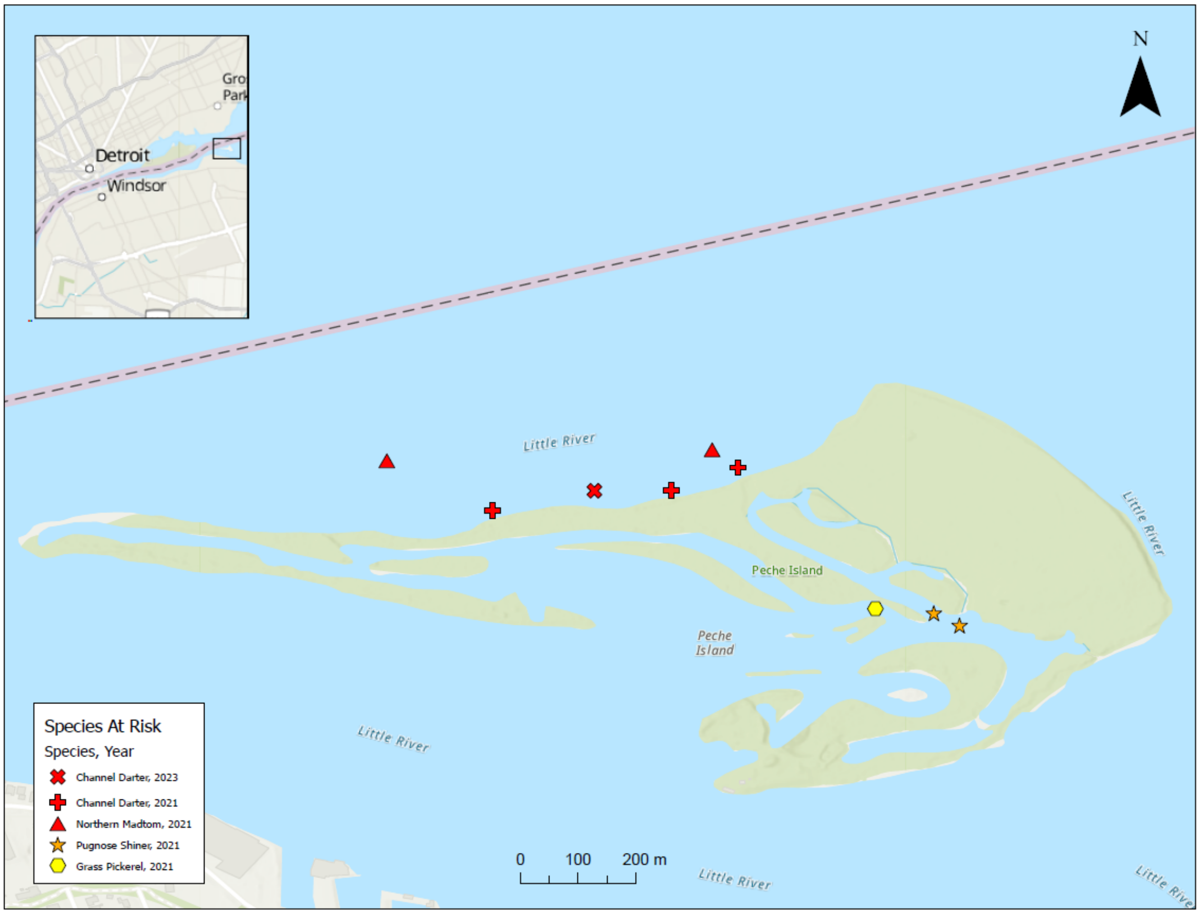


Figure 6. Map of the Species at Risk (SAR) captured at Peche island in 2021 and 2023. Colour of each symbol represents the SAR classification (Red = Endangered, Orange = Threatened, Yellow = Special Concern).

APPENDIX

Table A10. Corrections made to the Peche Island Phase 1, Year 1 post-construction monitoring report (Gardner Costa et al. 2021).

Description	Previous Number(s) Reported	Corrected Number(s)	Reasoning
Total number of fish caught	*n* = 3,364 fish	*n* = 3,347 fish	Number misreported
Total number of fish captured using minnow traps	*n* = 591 fish	*n* = 574 fish	Number misreported
Total number of minnow traps and trap hours	*n* = 36 traps and *n* = 2,158 trap hours	*n* = 30 traps and *n* = 2,103 trap hours	Numbers misreported
Number of new native species not previously recorded by past surveys	*n* =20 new native species	*n* = 19 new native species	Number misreported
Hydroacoustic data was re-analyzed	Percent SAV cover was 83.0 ± 26.85 %, but it was misreported as 49.31 ± 45.70 %	Percent SAV cover is 59.49 ± 29.13 %	Previous analysis overestimated percent SAV cover. Cut-off for SAV was more conservative in the new analysis. New figures were created

Essex Region Conservation Authority

Board of Directors BD04/24

From: James Bryant, Director, Watershed Management Services

Date: Thursday, February 1, 2024

Subject: **Watershed Management Services Activities Report for December 2023 & January 2024**

Strategic Action: Strategic Action Plan # 12.3 Enhance communication of ERCA's Watershed Management Services.

Recommendation:	THAT the review of Regulations and Planning Applications, as presented in Report BD04/24 be received for Members' information

Discussion

This report is provided to the Board as a summary of staff activity related to the Conservation Authority's *Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulation* (ONT 158/06, made pursuant to Section 28 of the Conservation Authorities Act). It is a summary of staff activity related to the review of municipal planning applications in accordance with the *Planning Act, Environment Assessment Act, Canadian Environmental Assessment Act*. This report summarizes the month of December 2023 & January 2024.

Total Regulations and Planning Activity – December 2023 & January 2024

Application	Count	Type
Clearance	17	
Condominium Pre-consultation Comments	1	Pre-submission Liaison
Condominium Request for Conditions	1	Condominium Condition Review
Consent/Variance/Zoning/OPA/SPC/OP	1	
Consent/Variance/Zoning/OPA/SPC/OP	28	Consent
Consent/Variance/Zoning/OPA/SPC/OP	20	Minor Variance
Consent/Variance/Zoning/OPA/SPC/OP	4	Official Plan Amendment
Consent/Variance/Zoning/OPA/SPC/OP	2	Pre-submission Liaison
Consent/Variance/Zoning/OPA/SPC/OP	10	Site Plan Control
Consent/Variance/Zoning/OPA/SPC/OP	1	Windsor Standing Committee
Consent/Variance/Zoning/OPA/SPC/OP	10	Zoning By-Law Amendment
EIA Review	1	
Environmental Assessment	4	
Lawyers Request	20	
Miscellaneous Developments	122	
Municipal Drainage Engineer	5	
Municipal Drainage SCR	17	
Notice of Violation	2	
Permit	103	
Pre-consultation	1	Pre-consultation draft plan of subdivision
Pre-consultation	10	Pre-submission Liaison
Pre-consultation	1	Site Plan Control
Subdivision Clearance of Conditions	2	SUB/ClearanceCondition
Subdivision Request for Conditions	1	SUB/Req. Conditions (CTY)

Activity Summary – Amherstburg – December 2023 & January 2024

Application	Count	Type
Clearance	1	
Consent/Variance/Zoning/OPA/SPC/OP	7	Consent
Consent/Variance/Zoning/OPA/SPC/OP	3	Minor Variance
Consent/Variance/Zoning/OPA/SPC/OP	1	Official Plan Amendment
Consent/Variance/Zoning/OPA/SPC/OP	4	Site Plan Control
Consent/Variance/Zoning/OPA/SPC/OP	4	Zoning By-Law Amendment
Lawyers Request	3	
Miscellaneous Developments	22	
Notice of Violation	1	
Permit	13	
Subdivision Clearance of Conditions	1	SUB/ClearanceCondition

Activity Summary – Essex – December 2023 & January 2024

Application	Count	Type
Clearance	4	
Consent/Variance/Zoning/OPA/SPC/OP	8	Consent
Consent/Variance/Zoning/OPA/SPC/OP	7	Minor Variance
Consent/Variance/Zoning/OPA/SPC/OP	1	Official Plan Amendment
Consent/Variance/Zoning/OPA/SPC/OP	1	Zoning By-Law Amendment
Lawyers Request	3	
Miscellaneous Developments	19	
Municipal Drainage Engineer	1	
Permit	8	

Activity Summary – Kingsville – December 2023 & January 2024

Application	Count	Type
Clearance	6	
Lawyers Request	4	
Miscellaneous Developments	20	
Permit	11	
Subdivision Request for Conditions	1	SUB/Req. Conditions (CTY)

Activity Summary – Lakeshore – December 2023 & January 2024

Application	Count	Type
Consent/Variance/Zoning/OPA/SPC/OP	1	Consent
Consent/Variance/Zoning/OPA/SPC/OP	2	Minor Variance
Consent/Variance/Zoning/OPA/SPC/OP	1	Official Plan Amendment
Consent/Variance/Zoning/OPA/SPC/OP	2	Site Plan Control
Consent/Variance/Zoning/OPA/SPC/OP	2	Zoning By-Law Amendment
Lawyers Request	6	
Miscellaneous Developments	22	
Municipal Drainage SCR	4	
Permit	22	
Pre-consultation	1	Pre-consultation draft plan of subdivision

Activity Summary – LaSalle – December 2023 & January 2024

Application	Count	Type
Condominium Request for Conditions	1	Condominium Condition Review
Environmental Assessment	1	
Lawyers Request	1	
Miscellaneous Developments	3	
Permit	3	

Application	Count	Type
Subdivision Clearance of Conditions	1	SUB/ClearanceCondition

Activity Summary – Leamington – December 2023 & January 2024

Application	Count	Type
Clearance	2	
Condominium Pre-consultation Comments	1	Pre-submission Liaison
Consent/Variance/Zoning/OPA/SPC/OP	11	Consent
Consent/Variance/Zoning/OPA/SPC/OP	1	Minor Variance
Consent/Variance/Zoning/OPA/SPC/OP	2	Pre-submission Liaison
Consent/Variance/Zoning/OPA/SPC/OP	1	Site Plan Control
Consent/Variance/Zoning/OPA/SPC/OP	3	Zoning By-Law Amendment
EIA Review	1	
Lawyers Request	1	
Miscellaneous Developments	20	
Municipal Drainage Engineer	2	
Municipal Drainage SCR	11	
Permit	9	
Pre-consultation	7	Pre-submission Liaison
Pre-consultation	1	Site Plan Control

Activity Summary – Pelee – December 2023 & January 2024

Application	Count	Type
Miscellaneous Developments	3	

Activity Summary – Tecumseh – December 2023 & January 2024

Application	Count	Type
Clearance	1	
Consent/Variance/Zoning/OPA/SPC/OP	1	Consent
Consent/Variance/Zoning/OPA/SPC/OP	7	Minor Variance
Consent/Variance/Zoning/OPA/SPC/OP	3	Site Plan Control
Environmental Assessment	1	
Miscellaneous Developments	4	
Municipal Drainage Engineer	1	
Permit	14	

Activity Summary – Windsor – December 2023 & January 2024

Application	Count	Type
Clearance	3	
Consent/Variance/Zoning/OPA/SPC/OP	1	
Consent/Variance/Zoning/OPA/SPC/OP	1	Windsor Standing Committee
Environmental Assessment	1	
Lawyers Request	2	
Miscellaneous Developments	9	
Municipal Drainage Engineer	1	
Municipal Drainage SCR	2	
Notice of Violation	1	
Permit	23	
Pre-consultation	3	Pre-submission Liaison

Approved By:

Tim Byrne, CAO/Secretary Treasurer

From: ESAReg (MECP)
To: ESAReg (MECP)
Subject: **Amendments to the Species at Risk in Ontario List regulation made under the Endangered Species Act, 2007**
Date: January 31, 2024 4:31:03 PM

Ministry of the Environment, Conservation and Parks

Ministère de l'Environnement, de la Protection de la nature et des Parcs

Ontario

Hello,

Ontario is committed to conserving the province's rich biodiversity by protecting and recovering species at risk and their habitats.

I am writing to share information regarding changes to the Species at Risk in Ontario (SARO) List regulation (Ontario Regulation 230/08) made under the *Endangered Species Act, 2007* (ESA). On January 29, 2024, the SARO List was amended to reflect new species at risk classifications set out in the 2022 Annual Report of the Committee on the Status of Species at Risk in Ontario (COSSARO). The amendments made to the SARO List are required by the ESA.

Background

COSSARO is an independent committee established under the ESA that is responsible for assessing and classifying species at risk in the province based on established criteria. In accordance with the ESA, COSSARO submits an annual report to the Minister of the Environment, Conservation and Parks (minister) that sets out the classification of each species that COSSARO has classified since its last annual report. The SARO List must be amended to reflect the new species classifications set out in COSSARO's report within twelve months of its receipt.

On January 31, 2023, the minister received COSSARO's 2022 Annual Report, which included information about the 18 species assessments it completed in 2022. In response to the determinations set out in COSSARO's report, the necessary amendments to the SARO List regulation were made on January 29, 2024. See the appendix for a summary of the amendments.

Updates to the SARO List

In accordance with the provisions of the ESA, the species that have been added to or reclassified on the SARO List as endangered or threatened species receive the species and habitat protections set out in sections 9(1) and 10(1) of the act, respectively. The species that have been reclassified as special concern or removed from the SARO List no longer receive protections under the ESA.

Changes made to a species' common or scientific name do not impact the species' classification on the SARO List or the protections afforded to the species under the ESA.

An information bulletin has been posted to the Environmental Registry of Ontario (notice number 019-8189) to advise the public of the changes made to the SARO List.

COSSARO's 2022 Annual Report to the minister is available at https://www.ontario.ca/page/2022-annual-report-committee-status-species-risk-ontario-cossaro.

COSSARO's species assessment reports and further information about the committee are available on its website at www.cossaroagency.ca.

If you wish to obtain additional information related to the regulatory changes described above, or have additional questions related to this process, please contact Jennifer Morton at jennifer.morton@ontario.ca.

Thank you for your interest in Ontario's species at risk.

Sincerely,

Christie Curley
A/Director, Species at Risk Branch
Ministry of the Environment, Conservation and Parks

APPENDIX

Below is a summary of the amendments made to the SARO List on January 29, 2024.

1. Species added to the SARO List

Reference	Common Name	Scientific Name	Species Grouping	Classification
1.	Dukes' Skipper	*Euphyes dukesi*	Insects	Special Concern
2.	Eastern Sand Darter (Southwestern Ontario population)[1]	*Ammocrypta pellucida*	Fishes	Threatened
3.	Eastern Sand Darter (West Lake population)[1]	*Ammocrypta pellucida*	Fishes	Endangered
4.	Northern Oak Hairstreak	*Satyrium favonius ontario*	Insects	Threatened
5.	Pumpkin Ash	*Fraxinus profunda*	Vascular Plants	Endangered

6.	Skillet Clubtail	*Gomphurus ventricosus*	Insects	Threatened

2. Species reclassified on the SARO List

Reference	Common Name	Scientific Name	Previous Classification	New Classification
1.	American Ginseng	*Panax quinquefolius*	Endangered	Threatened
2.	Cougar	*Puma concolor*	Endangered	Special Concern
3.	Eastern False Rue-anemone	*Enemion biternatum*	Threatened	Special Concern
4.	Eastern Foxsnake (Carolinian population)	*Pantherophis vulpinus*[2]	Endangered	Threatened

3. Species removed from the SARO List

Reference	Common Name	Scientific Name	Previous Classification	New status determined by COSSARO (2022)
1.	Bald Eagle	*Haliaeetus leucocephalus*	Special Concern	Not at Risk

4. Species renamed on the SARO List

Reference	Previous Common Name	New Common Name (changes in bold)	Previous Scientific Name	New Scientific Name (changes in bold)
1.	Eastern Foxsnake (Carolinian population)	n/a	*Pantherophis gloydi*	*Pantherophis* ***~~gloydi~~ vulpinus***
2.	Eastern Foxsnake (Georgian Bay population)	Eastern Foxsnake (**~~Georgian Bay~~ Great Lakes / St. Lawrence** population)	*Pantherophis gloydi*	*Pantherophis* ***~~gloydi~~ vulpinus***

3.	Greater Prairie-Chicken	n/a	*Tympanuchus cupido*	*Tympanuchus cupido* ***pinnatus***
4.	Mountain Lion or Cougar	~~**Mountain Lion or**~~ Cougar	*Puma concolor*	n/a

[1] Previously Eastern Sand Darter was listed on the SARO List as a single population that was classified as endangered. COSSARO has determined that the species has two distinct populations in Ontario and has classified both populations as at risk.

[2] Previously the SARO List identified the scientific name of the species as *Pantherophis gloydi* but COSSARO has determined that the name should be *Pantherophis vulpinus*.