Conservation Halton Board Meeting/Annual General Meeting

Conservation Halton
2596 Britannia Road, Burlington ON L7P OG3
Apr 20, 2023 1:00 PM - 4:00 PM EDT

Table of Contents

March 23 Conservation Halton Board Meeting Minutes

Conservation Halton
Mar 23, 2023, at 1:00 PM EDT
@ Zoom: ttps://us02web.zoom.us/j/89780562435?pwd=aHNvTlNNengrc2dSazlyZHBtZUN0Zz09

1. Roll Call

Sameera Ali
Rob Burton
Kristina Tesser Derksen
Cathy Duddeck (Vice Chair)
Jane Fogal
Chantal Garneau
Dave Gittings
Sammy Ijaz
Gordon Krantz
Sue McFadden
Rory Nisan
Gerry Smallegange (Chair)
Shawna Stolte
Alvin Tedjo
Marianne Meed Ward

Absent with regrets:
Allan Elgar
Steve Gilmour
Cameron Kroetsch
Alex Wilson
Maureen Wilson

Staff Present:
Kim Barrett, Associate Director, Science & Partnerships
Hassaan Basit, President & CEO
Garner Beckett, Executive Director Foundation
Adriana Birza, Senior Advisor, Office of the President & CEO
Leah Bortolotti, Director, Marketing & Communications
Niamh Buckley, Admin Assistant, Office of the President & CEO
Andrea Dunn, Coordinator, Monitoring Ecology
Glenn Farmer, Manager, Flood Forecasting & Operations
Laura Head, Regulations Officer, Planning & Regulations
Assad Hoosein, Sr Manager, Parks Development & Capital Projects
Matt Howatt, Manager, Environmental Planning
Craig Machan, Director, Parks & Operations
Kellie McCormack, Director, Planning & Regulations
Marnie Piggot, Director, Finance
Plezzie Ramirez, Director, Human Resources
Mark Vytvytskyy, Chief Operating Officer
Barb Veale, Sen. Director, Watershed Strategies & Climate Change

The Chair called the meeting to order at 1:03 p.m. and advised that the agenda would be amended *to include Correspondence to the Board under Item No. 9. Other Business and would be addressed prior to moving in camera.*

2. Disclosure of Pecuniary Interest

There were **no disclosures of pecuniary interest.**

3. Acceptance of the AMENDED Agenda

CHB 03 01 Moved by: Cathy Duddeck
Seconded by: Kristina Tesser Derksen

THAT the agenda ***be accepted as distributed.***

Carried

4. CEO Verbal Update

The Board will engage in a strategy session after the business part of the meeting to discuss the implications of the changes introduced by Bill 23. The focus of this session will be on identifying opportunities while supporting the Ministry of Environment, Conservation and Parks (MECP).

The CEO shared an update on what is happening at CH:

Customer' Service/ Parks revenue: WOW Camps opened registration to the public for the summer season and were sold out within 24 hours. WOW will add additional spots to meet demand.

Glen Eden has attracted more than 310,000 visitors during the ski season. To cater to the high demand, the season has been extended to March 26.

Maple Syrup at Mountsberg has welcomed 14,000 guests to date. 440 trees have been tapped collecting a substantial 7400 litres of sap and transforming it into 156 litres of syrup.

Financial Update: Recent Grant and Funding Approvals: **$100k+ Grants secured in 2023:**

Infrastructure:

1. Kelso Beach Building Accessible Renovation - $100k
2. Glen Eden Elevator and Entryway Accessible Renovation - $100k

Other:

1. Wetlands Conservation Partner Program - $386k
2. EcoPark System - Cootes to Escarpment - $985k

Total secured in 2023 (to date): $1,571,800

LID Project Update:

- Construction is due to be completed by the end of May 2023 (West side – May 9, East side
  – May 26)
- Planting will begin mid-May 2023.

CEO Office: Board members were invited to participate in a poll to confirm their availability for an upcoming board tour in May. As of now, the results show that May 9 is the preferred date. Additional information about the tour will be provided as the date draws closer.

5. Presentations:

5.1 Developer Contribution Reserve Projects Update – Mark Vytvytskyy, Chief Operating Officer (Item 6.3)

5.2 Emergency Preparedness: Flood Forecasting/Flood Hazard Mapping & Regulations - Glenn Farmer, Manager, Flood Forecasting & Operations, Matt Howatt, Manager, Policy & Special Initiatives Planning & Regulations

5.3 Watershed Report Card presentation - Kim Barrett, Associate Director, Science & Partnerships (Item 6.4)

6. Consent Items

6.1 Approval of February 16 Conservation Halton Board DRAFT Meeting Minutes

6.2 Approval of February 16 Conservation Halton Board Inaugural DRAFT Meeting Minutes

6.3 Developer Contribution Reserve Projects
(CHB 03 23 01)

6.4 Conservation Halton Watershed Report Card 2023
(CHB 03 23 02)

6.5 Electricity Grid Improvements
(CHBD 03 23 03)

6.6 Bill 109 Implementation Update
(CHB 03 23 04)

6.7 Parks Canada funding for Cootes to Escarpment EcoPark System
(CHB 03 23 05)

6.8 Conservation Halton's East Burlington Creeks Flood Hazard Mapping Study (CH File No. ADM 041 & ADM 356)
(CHB 03 23 06)

6.9 Status of Conservation Halton's Land Use Planning Policy Review & Update (CH File No. AADM-50/ADM 365) and Spill Flood Hazard Policy Review & Update (CH File No. AADM-29/ADM 343) (CHB 03 23 07)

The consent items **were adopted.**

7. Action Items

7.1 Conservation Halton Board of Directors 2023 - 2027 Committees Membership (CHB 03 23 08)

CHB 03 02 Moved by: Cathy Duddeck
Seconded by: Kristina Tesser Derksen

THAT the Conservation Halton Board **approves of the 2023 - 2027 CH Board Committees membership effective March 23, 2023.**

Carried

7.2 Proposed construction of a two-storey addition within 15 metres of the erosion hazard (valley) associated with Sixteen Mile Creek, 400 Trafalgar Road, Town of Oakville CH File No. A/22/O/90; RAPP-5280 (CHB 03 23 09)

CHB 03 03 Moved by: Gordon Krantz
Seconded by: Marianne Meed Ward

THAT the Conservation Halton **approves the issuance of a permit for the construction of a two- storey addition within 15 metres of the erosion hazard (valley) associated with Sixteen Mile Creek, 400 Trafalgar Road, Town of Oakville (CH File No. A/22/O/90; RAPP-5280)**

And

THAT the Conservation Halton Board **receives the staff report entitled "Proposed construction of a two-storey addition within 15 metres of the erosion hazard (valley) associated with Sixteen Mile Creek, 400 Trafalgar Road, Town of Oakville (CH File No. A/22/O/90; RAPP-5280)"**

Carried

7.3 Proposed reconstruction of a two-storey dwelling within 7.5 metres of the floodplain associated with McCraney Creek, 540 Patricia Drive, Town of Oakville CH File No. A/22/O/106; RAPP-1076
(CHB 03 23 10)

CHB 03 04 Moved by: Chantal Garneau
Seconded by: Jane Fogal

THAT the Conservation Halton Board **approves the issuance of a permit for the reconstruction of a two-storey dwelling within 7.5 metres of the floodplain associated with McCraney Creek, 540 Patricia Drive, Town of Oakville (CH File No. A/22/O/106; RAPP-1076)**

And

THAT the Conservation Halton Board **receives the staff report entitled "Proposed reconstruction of a two-storey dwelling within 7.5 metres of the floodplain associated with McCraney Creek, 540 Patricia Drive, Town of Oakville (CH File No. A/22/O/106; RAPP-1076)".**

Carried

7.4 Proposed construction of a pool and associated decking/retaining wall within a valley associated with a tributary of Bronte Creek, 5268 Cedar Springs Road, City of Burlington CH File No. A/22/B/74; RAPP-393 (CHB 03 23 11)

CHB 03 05 Moved by: David Gittings
Seconded by: Sammy Ijaz

THAT the Conservation Halton Board **approves the issuance of a permit for the construction of pool and associated decking/retaining wall within a valley associated with a Tributary of Bronte Creek, 5268 Cedar Springs, City of Burlington (CH File No. A/22/B/74; RAPP-393);**

And

THAT the Conservation Halton Board **receives the staff report entitled "Proposed construction of a pool and associated decking/retaining wall within a valley associated with a Tributary of Bronte Creek, 5268 Cedar Springs, City of Burlington (CH File No. A/22/B/74; RAPP-393)".**

Carried

7.5 Reconstruction of a two-storey barn, including conversion of the second storey to seasonal dwelling units within the valley associated with Sixteen Mile Creek, 9268 Fifth Line, Town of Halton Hills CH File No. RAPP-8878
(CHB 03 23 12)

CHB 03 06 Moved by: Gordon Krantz
Seconded by: Sammy Ijaz

THAT the Conservation Halton Board **approves the issuance of a permit for the reconstruction of a two-storey barn, including conversion of the second storey to seasonal dwelling units within the valley associated with Sixteen Mile Creek, 9268 Fifth Line, Town of Halton Hills (CH File No. RAPP-8878);**

And

THAT the Conservation Halton Board **receives the staff report entitled "Reconstruction of a two- storey barn, including conversion of the second storey to seasonal dwelling units within the valley associated with Sixteen Mile Creek, 9268 Fifth Line, Town of Halton Hills (CH File No. RAPP-8878)."**

Carried

7.6 Scoped Subwatershed Study, Northeast Corner Steeles Avenue & Eighth Line, Town of Halton Hills, CH File No.: MPR 750

CHB 03 07 Moved by: Rory Nisan
Seconded by: Sue McFadden

THAT the Conservation Halton Board **endorses the Scoped Subwatershed Study, Northeast Corner Steeles Avenue & Eighth Line in Halton Hills, specifically the management recommendations that relate to areas regulated by Conservation Halton.**

And

THAT the Conservation Halton Board **receives for information the staff report entitled "Scoped Watershed Study, Northeast Corner Steeles Avenue & Eighth Line, Town of Halton Hills".**

Carried

7.7 2022 Year-End Budget Variance Report - Operating (CHB 03 23 14)

CHB 03 08 Moved by: Cathy Duddeck
Seconded by: Dave Gittings

THAT the Conservation Halton (CH) Board **approves the allocation of the 2022 operating surplus of $3,643,396 to the following Reserves and allocated surplus:**

- **$3,165,799 to the Conservation Areas Capital Reserve;**
- **$30,000 to the Stewardship and Restoration Reserve;**
- **$245,614 to the Building Reserve;**
- **$23,000 to the Vehicle and Equipment Reserve;**
- **$178,983 for the adjustment to surplus (deficit) funds for a prior year carry forward amount;**

And

THAT the Conservation Halton Board **approves a transfer of $46,550 to the Debt Financing Charges for the 2022 budget amount in excess of actual 2022 debt financing charges;**

And

THAT the Conservation Halton Board **approves further adjustments to the 2022 operating surplus if required in the 2022 audited financial statements to the Stabilization Reserves, which will be noted in the staff report when the financial statements are presented;**

And

THAT the Conservation Halton Board **approves transfers in 2023 from reserves for up to the following amounts:**

- **$300,000 from the WMSS Stabilization Reserve for potential increased legal expenses and Bill 23 impacts**
- **$30,000 from the Stewardship and Restoration Reserve for anticipated increased Outreach program staffing costs**
- **$23,000 from the Vehicle and Equipment Reserve for the purchase in 2023 of a utility vehicle included in the 2022 budget**

And

THAT the Conservation Halton Board **receives for information the report entitled "2022 Year-End Budget Variance Report".**

Carried

7.8 2022 Year-End Capital Projects Update
(CHB 03 23 15)

CHB 03 09 Moved by: Shawna Stolte
Seconded by: Alvin Tedjo

THAT the Conservation Halton Board **approve the closing of capital projects noted in the Capital Project Summary Financial Appendix.**

And

THAT the Conservation Halton Board **receives for information the staff report entitled "2022 Year-End Capital Projects Update".**

Carried

7.9 2022 Investments and Investment Revenue
(CHB 03 23 16)

CHB 03 10 Moved by: Kristine Tesser Derksen
Seconded by: Gordon Krantz

THAT the Conservation Halton Board **approves the allocation of investment revenue of $726,220 to operating funds and to reserves as noted in the report;**

And

THAT the Conservation Halton Board **receives for information the staff report entitled "2022 Investments and Investment Revenue".**

Carried

8. Other Business

8.1 Correspondence to the Board was shared.

9 In Camera

CHB 03 11 Moved by: Kristina Tesser Derksen
Seconded by: Gordon Krantz

THAT the Conservation Halton Board **move In Camera.**

Carried

CHB 03 12 Moved by: Kristina Tesser Derksen
Seconded by: Gordon Krantz

THAT the Conservation Halton Board **reconvene in public forum.**

Carried

10 Adjournment

CHB 03 13 Moved by: Marianne Meed Ward

THAT the Conservation Halton Board meeting **be adjourned at 2:24 p.m.**

Carried

Signed by: Hassaan Basit, President & CEO

Date: April 20, 2023

Finance & Audit Meeting Committee Meeting Minutes

Conservation Halton
Apr 4, 2023, at 11:00 AM EDT
@ Zoom meeting:
https://us02web.zoom.us/j/87047217026?pwd=Z3dad2I5S3IGM1dHVlZGdXc5L0hWdz09

1. Roll Call

Members Present: Sameera Ali
Rob Burton
Cathy Duddeck
Chantal Garneau
Gerry Smallegange
Alvin Tedjo

Guests present: Stacey Stahlmann, KPMG, Partner Administration
Sarah Clayton, KPMG Manager Audit Services

Staff Present: Hassaan Basit, President & CEO
Adriana Birza, Senior Advisor, Office of the President & CEO
Niamh Buckley, Administrative Assistant, Office of the President & CEO
Marnie Piggot, Director, Finance
Justin Wei, Senior Manager, Finance

2. Disclosure of Pecuniary Interest

There were **no disclosures of pecuniary interest.**

3. Approval of Agenda

FA 01 01 Moved by: Rob Burton
Seconded by: Chantal Garneau

THAT the Finance & Audit Committee agenda **be approved as distributed.**

Carried

4. Action Items

4.1 Election of Officers 2023

The CEO assumed the role of chair for the elections process.

The CEO called for a motion that Adriana Birza and Marnie Piggot be appointed as scrutineers in the event of an election and that all ballots be destroyed by the scrutineers afterwards.

FA 01 02 Moved by: Gerry Smallegange
Seconded by: Cathy Duddeck

THAT Adriana Birza and Marnie Piggot **be appointed as scrutineers in the event of an election and that all ballots be destroyed by the scrutineers afterwards.**

Carried

4.1.1 Election of Chair

The CEO called for nominations for the position of Chair, Finance & Audit Committee 2023-2027.

It was Moved by Cathy Duddeck that Rob Burton be nominated for the position of Chair, Finance & Audit Committee 2023-2027.

For a second time, the CEO called for nominations for the position of Chair, Finance & Audit Committee 2023 – 2027. There were none.

For the third time, The CEO called for nominations for the position of Chair, Finance & Audit Committee 2023-2027. There were none.

The CEO called for a motion to close nominations for the position of Chair, Finance & Audit Committee 2023-2027.

It was moved by Cathy Duddeck that nominations be closed for the position of Chair, Finance & Audit Committee 2023-2027.

Carried

The CEO asked Rob Burton if he would allow his name to stand for Chair, Finance & Audit Committee for 2023–2027

Rob Burton confirmed he would allow his name to stand.

The CEO declared Rob Burton by acclamation as Chair, Finance & Audit Committee 2023-2027.

The CEO congratulated Rob Burton.

4.1.2 Election of Vice Chair

The CEO call for nominations for the position of Vice Chair, Finance & Audit Committee 2023 - 2027.

It was Moved by Cathy Duddeck that Sameera Ali be nominated for the position of Vice Chair. Finance & Audit Committee 2023-2027.

For a second time the CEO asked if there were nominations for the position of Vice Chair, Finance & Audit Committee 2023-2027. There were none.

For the third time, the CEO asked if there were nominations for the position of Vice Chair, Finance & Audit Committee 2023-2027. There were none.

The CEO called for a motion to close nominations for the position of Vice Chair, Finance & Audit Committee 2023-2027.

It was Moved by Cathy Duddeck that nominations be close for the position of Vice Chair, Finance & Audit Committee for 2023–2027.

The CEO asked Sameera Ali if she would allow her name to stand for Vice Chair, Finance & Audit Committee 2023-2027.

Sameera Ali confirmed she would allow her name to stand.

The CEO congratulated Sameera Ali.

4.2 Approval of DRAFT Audited Financial Statements for 2022
(FA 01 23 01)

FA 01 02 Moved by: Cathy Duddeck
Seconded by: Sameera Ali

THAT the Finance & Audit Committee **recommends to the Conservation Halton Board that the audited financial statements for the year ended December 31, 2022, be approved as presented.**

Carried

4.3 Appointment of Auditor for 2023
(FA 01 23 02)

FA 01 03 Moved by: Alvin Tedjo
Seconded by: Gerry Smallegange

THAT the Finance & Audit Committee **recommends to the Conservation Halton Board the reappointment of KPMG LLP as auditor for Conservation Halton for the 2023 fiscal year.**

Carried

5. Other Business

There was **no other business.**

6. Adjournment

FA 01 04 Moved by: Gerry Smallegange

THAT the Finance & Audit Committee meeting **be adjourned at 11:27 a.m.**

Carried

Signed by: Hassaan Basit, President & CEO/Secretary-Treasurer

Date: April 20, 2023

Conservation Halton Board – April 20, 2023

RESOLUTIONS

Finance and Audit Committee Meeting - April 4, 2023

FA 01 01

Recommendation

THAT the Finance & Audit Committee **recommends to the Conservation Halton Board that the audited financial statements for the year ended December 31, 2022, be approved as presented.**

FA 01 02

Recommendation

THAT the Finance & Audit Committee **recommends to the Conservation Halton Board the reappointment of KPMG LLP as auditor for Conservation Halton for the 2023 fiscal year.**

Governance & Risk Committee Meeting Minutes

Halton Region Source Protection Authority
Apr 11, 2023, at 11:00 AM EDT
@ Zoom:
https://us02web.zoom.us/j/82540995026?pwd=d0JBOVpZZlRibzZlejRQVXpyVUNJdz09

1. Roll Call

Members present:	Kristina Tesser Derksen Cathy Duddeck Jane Fogal Gordon Krantz Rory Nisan
Members absent with regrets:	Shawna Stolte Gerry Smallegange
Staff present:	Hassaan Basit, President & CEO Niamh Buckley, Administrative Assistant, Office of the President & CEO Katherine Hale, Administrative Coordinator, HR & Operations Mark Vytvytskyy, Chief Operating Officer

The Chair called the meeting to order at 11:01 a.m.

2. Disclosure of Pecuniary interest

There were no **disclosures of pecuniary interest.**

3. Acceptance of Agenda

GC 01 01 Moved by: Rory Nisan
Seconded by: Jane Fogal

THAT the agenda **be approved as distributed**

Carried

4. Election of Officers

4.1 Election of Chair

The CEO assumed the position of Chair for the election process.

The CEO called for nominations for the position of Chair of the Governance & Risk Committee 2023–2027.

It was MOVED by Cathy Duddeck that Rory Nisan be nominated for the position of Chair of the Governance & Risk Committee 2023 – 2027.

For a second time, the CEO called for nominations for the position of Chair of the Governance & Risk Committee 2023-2027.

There were no nominations.

For a third time, the CEO called for nominations for the position of Vice Chair of the Governance & Risk Committee 2023-2027.

There were no nominations.

The CEO called for a motion to close nominations for the election of Chair of the Governance & Risk Committee 2023-2027.

It was MOVED by Cathy Duddeck that nominations for the position of Chair be closed.

Carried

The CEO asked Rory Nisan if he would allow his name stand for the position of Chair of the Governance & Risk Committee 2023-2027.

Rory Nisan confirmed he would allow his name to stand.

4.2 Election of Vice Chair

The CEO called for nominations for the position of Vice Chair of the Governance & Risk Committee 2023–2027.

It was MOVED by Cathy Duddeck that Kristina Tesser Derksen be nominated for the position of Vice Chair of the Governance & Risk Committee 2023–2027.

For a second time, the CEO called for nominations for the position of Vice Chair of the Governance & Risk Committee 2023-2027.

There were no nominations.

For a third time, the CEO called for nominations for the position of Vice Chair of the Governance & Risk Committee 2323-2027.

There were no nominations.

The CEO called for a motion to close nominations for the election of Vice Chair for the Governance & Risk Committee 2023-2027.

It was MOVED by Cathy Duddeck that nominations for the position of Vice Chair be closed.

Carried

The CEO asked Kristina if she would allow her name to stand for the position of Vice Chair of the Governance & Risk Committee 2023-2027.

Kristina confirmed she would allow her name to stand.

5. Action Items

5.1 Conservation Halton Purchasing Policy Revision (GC 01 23 01)

GC 01 02 Moved by: Gordon Krantz
Seconded by: Cathy Duddeck

THAT the Governance & Risk Committee **recommends to the Conservation Halton Board the approval of the Conservation Halton Purchasing Policy changes to the reporting requirements and approval authority;**

And

THAT the Governance & Risk Committee **recommends to the Conservation Halton Board that the Purchasing Policy changes in the staff report entitled "Purchasing Policy – Revision to Reporting Requirements & Approval Authority" be reflected under Appendix 5: President & CEO/Secretary-Treasurer Management Authority Limits Policy of the Halton Region Conservation Authority General Membership By-Law 2018-01 (rev. Nov. 17, 2022).**

Carried

6. In Camera

GC 01 03 Moved by: Jane Fogal
Seconded by: Gordon Krantz

THAT the Governance & Risk Committee **move In Camera.**

GC 01 04 Moved by: Cathy Duddeck
Seconded by: Kristina Tesser Derksen

THAT the Governance & Risk Committee **reconvene in public forum;**

And

THAT the Conservation Halton Governance & Risk Committee **receives for information the staff report that summarizes the identification and assessment of Conservation Halton's top enterprise risks, and the update of the corporate risk program initiatives.**

Carried

7. Other Business

There was **no other business.**

8. Adjournment

GC 01 05 **Moved by: Jane Fogal**

THAT the Conservation Halton Governance & Risk Committee meeting **be adjourned at 11:53 a.m.**

Signed by: Hassaan Basit, President & CEO/Secretary-Treasurer

Date: April 20, 2023

Conservation Halton Board – April 20, 2023

RESOLUTIONS

Governance & Risk Committee Meeting - April 11, 2023

GC 01 01

Recommendation

THAT the Governance & Risk Committee **recommends to the Conservation Halton Board the approval of the Conservation Halton Purchasing Policy changes to the reporting requirements and approval authority;**

And

THAT the Governance & Risk Committee **recommends to the Conservation Halton Board that the Purchasing Policy changes in the staff report entitled "Purchasing Policy – Revision to Reporting Requirements & Approval Authority" be reflected under Appendix 5: President & CEO/Secretary-Treasurer Management Authority Limits Policy of the Halton Region Conservation Authority General Membership By-Law 2018-01 (rev. Nov. 17, 2022)**.

REPORT TO: **Conservation Halton Board**

REPORT NO: # CHBD 04 23 01

FROM: Plezzie Ramirez, Director, Human Resources

DATE: April 20, 2023

SUBJECT: **Health & Safety Update (Q4 2022 – Q1 2023)**

Recommendation

THAT the Conservation Halton Board **receives for information the occupational health and safety update for the period of October 1, 2022, to March 31, 2023.**

Report

The attached summary provides an overview of Conservation Halton's (CH's) health and safety performance from Q4 2022 – Q1 2023. The number of incidents is tracked and categorized depending on severity, which is determined by whether there was lost time and the number of lost days. The frequency or number of incidents and whether the incidents were reportable to WSIB is also tracked (Figure 2). Additional indicators tracked by CH are summarized below. A review and analysis of the data helps senior leadership to identify the types of proactive prevention programs, including the types of training, that should be implemented and prioritized.

The number of reportable WSIB claims, lost time injuries, and lost days for this period are lower in comparison to the same period reported in April 2022. Most claims came from the Glen Eden Ski and Snowboard Centre, with most injuries resulting from slips or falls on ice and snow which is typical during the winter season.

For this reporting period you will note in the chart labelled 'Years of Service' (Figure 6) that 27% of injuries involved employees with less than one year of service. This number has decreased from 47% reported in April 2022 and is trending in the right direction. This is a result of improved compliance tracking of health and safety training through a new health and safety management system that was brought in last year to try and reduce injuries among the 1 year or less cohort.

The number of lost time injuries and days lost were lower than the same period for the year prior. This was due to the nature of the injuries and recovery periods required. All lost time claims were actively managed for early and safe return to work, with modified duties offered whenever possible.

Prevention initiatives established since the last health and safety report have been completed and are on track:

- The new health and safety management system implemented in 2022 has streamlined and improved our current health and safety program, and has introduced improved measuring, tracking, and quantifying compliance across the organization.
- The Contractor Safety Program training was completed in November 2022.

- An inventory of existing AED devices has been completed and new devices will be purchased to replace devices nearing expiry.
- De-escalation training has been completed for key departments in the organization that are at a higher risk to encounter a difficult or unsafe situation with a member of the public.

Impact on Strategic Priorities

This report supports the Momentum priority of Organizational Sustainability

Financial Impact

There is no financial impact to this report.

Signed & respectfully submitted:

Plezzie Ramirez
Director, Human Resources

Approved for circulation:

Hassaan Basit
President & CEO/Secretary-Treasurer

FOR QUESTIONS ON CONTENT: Plezzie Ramirez, Director, Human Resources
pramirez@hrca.on.ca, (905) 336-1158 Ext. 2252

Figure 1

WSIB INJURY STATISTICS
October 2022 – March 2023

Location	Oct 2022-Mar 2023	Oct 2021-Mar 2022	Oct 2020-Mar 2021	Oct 2019-Mar 2020	Oct 2018-Mar 2019
Admin Office	0	0	1	0	0
Glen Eden	11	14	1	11	11
Kelso	0	0	0	0	0
Mountsberg	1	0	1	0	0
Crawford Lake	1	0	0	1	1
Hilton Falls	0	0	0	0	0
Rat-MN	0	0	0	0	0
Workshop	0	0	0	1	1
Off-site/ Field	2	3	2	1	1
	15	17	5	14	14

Figure 2

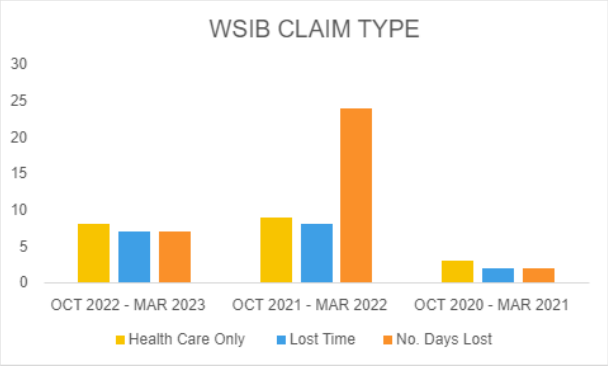


Figure 3

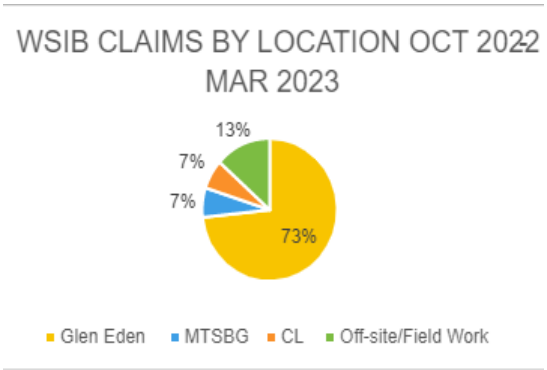


Figure 4

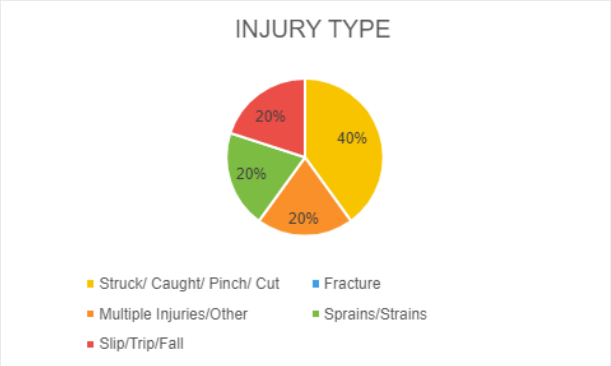


Figure 5

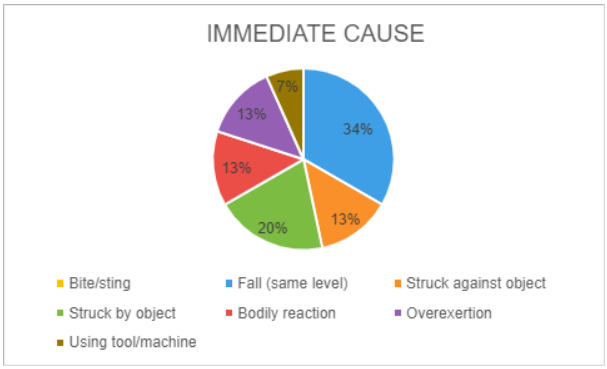


Figure 6

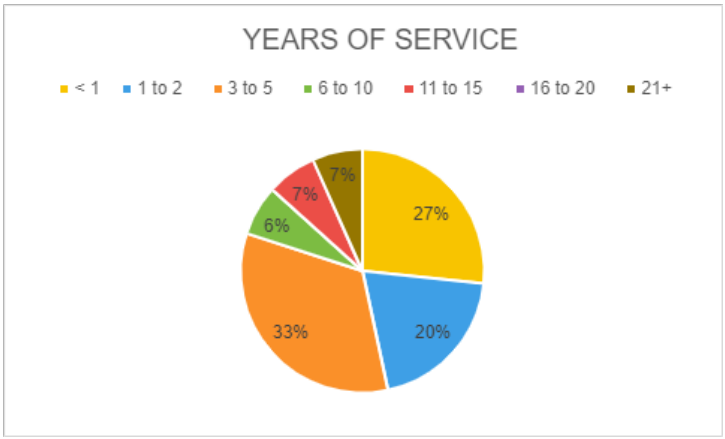
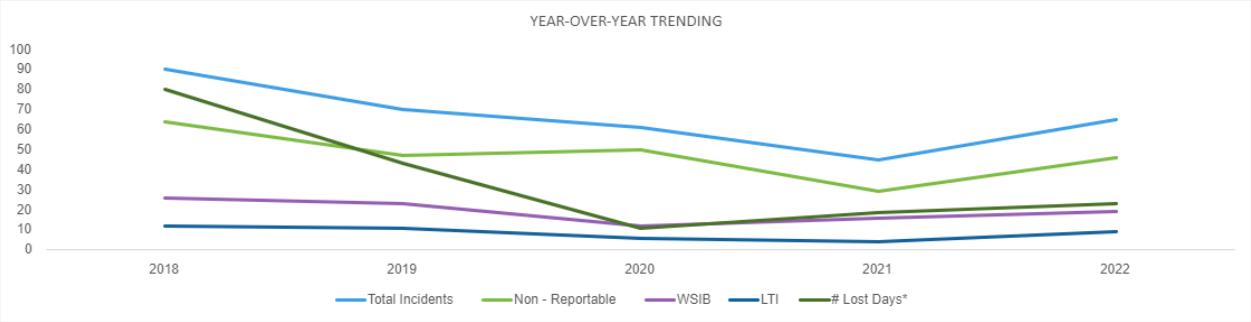


Figure 7



Conservation Halton

April 2023

REPORT TO: **Conservation Halton Board**

REPORT NO: # CHB 04 23 02

FROM: Barbara J. Veale, Senior Director, Watershed Strategies & Climate Change

DATE: April 20, 2023

SUBJECT: **Using Smartphone-GPS Data to Quantify Human Activity in Green Spaces**

Recommendation

THAT the Conservation Halton Board **receives for information the paper 'Using Smartphone-GPS Data to Quantify Human Activity in Green Spaces.'**

Report

Conservation Halton (CH) parks provide diverse habitats for plants, birds, mammals, fish, amphibians, insects, reptiles, and other species that collectively comprise ecosystems. These species and lands, in turn, provide critical ecosystem services including flood attenuation and carbon storage. Perhaps the best-known ecosystem service CH parks provide is recreation, with over 1 million visitors welcomed annually.

There is a critical and ongoing need to ensure that ecosystems within CH parks remain healthy and resilient to withstand threats such as climate change and invasive species and continue to support people and nature. As the watershed population continues to increase, the need for access to quality outdoor recreational opportunities and pressure on our ecosystems will continue to rise.

ParkPass data provides a record of how many people visit our parks, but it does not provide insights on where they go when they enter the park. Some elements and areas of CH parks are more sensitive than others to human disturbance, and thus it was considered beneficial to improve our knowledge of how visitors are using the space in our parks. To do so, CH worked with a research team from the University of Toronto. An innovative study to better understand visitation within CH parks using anonymized GPS data from visitors' cell phones was undertaken. Ecological Land Classification data collected by CH was used to study whether visitors spent more or less time in areas with certain types of vegetation. ParkPass data was shared with the research team to cross-reference against the data collected from cell phone signals. Staff provided ongoing input to the study and assisted with the writing and editing of a scientific paper that was published in the journal PLoS Computational Biology in December 2022 attached (Appendix B). Significant findings of the study include:

- There is a strong correlation between study estimates of mobile device activity and ParkPass visitation rates based on reservation data,
- Users spend most of their time on trails, and
- Visitors have an affinity for vegetation communities commonly associated with the edge of the Niagara Escarpment (e.g., lookout points).

Future applications of this work could include:
- Comparing intensity of activity from visitation data to on-the-ground monitoring data of trail conditions to pro-actively identify areas that may become problematic in future, as opposed to waiting until issues manifest, and
- Overlaying visitation data on areas of CH parks known to have sensitive features so that visitors to high-traffic areas can be directed to less sensitive areas.

The journal selected the paper to have a press release within its scientific network, and an article was featured on the web site "ScienceDaily" on December 15, 2022:
Harnessing smartphones to track how people use green spaces: Anonymized GPS data could aid efforts to balance recreation and conservation in urban areas -- ScienceDaily-
(https://www.sciencedaily.com/releases/2022/12/221215161541.htm)

The study will also be featured by the University of Toronto's School of Cities in an upcoming public facing policy document, including an interview with Kim Barrett (Conservation Halton) and lead author Alessandro Filazzola (University of Toronto).

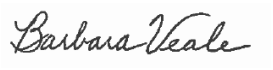
Impact on Strategic Priorities

This report supports the Momentum priorities of Science, Conservation and Restoration, and Nature and Parks.

Financial Impact

There is no financial impact to this report.

Signed & respectfully submitted:



Barbara J. Veale
Senior Director, Watershed Strategies & Climate Change

Approved for circulation:

Hassaan Basit
President & CEO/Secretary-Treasurer

FOR QUESTIONS ON CONTENT: Kim Barrett, Associate Director, Science & Partnerships
kbarrett@hrca.on.ca

PLOS COMPUTATIONAL BIOLOGY

RESEARCH ARTICLE

Using smartphone-GPS data to quantify human activity in green spaces

Alessandro Filazzola[1,2]*, Garland Xie[1,3], Kimberly Barrett[4], Andrea Dunn[4], Marc T. J. Johnson[1,5], James Scott MacIvor[1,2,3]

1 Centre for Urban Environments, University of Toronto Mississauga, Mississauga, Ontario, Canada, **2** Apex Resource Management Solutions, Ottawa, Ontario, Canada, **3** Department of Biological Sciences, University of Toronto Scarborough, Toronto, Ontario, Canada, **4** Conservation Halton, Burlington, Ontario, Canada, **5** Department of Biology, University of Toronto Mississauga, Mississauga, Ontario, Canada

* alex.filazzola@utoronto.ca

Citation: Filazzola A, Xie G, Barrett K, Dunn A, Johnson MTJ, MacIvor JS (2022) Using smartphone-GPS data to quantify human activity in green spaces. PLoS Comput Biol 18(12): e1010725. https://doi.org/10.1371/journal.pcbi.1010725

Editor: Ricardo Martinez-Garcia, International Center for Theoretical Physics - South American Institute for Fundamental Research, BRAZIL

Received: April 12, 2022

Accepted: November 10, 2022

Published: December 15, 2022

Peer Review History: PLOS recognizes the benefits of transparency in the peer review process; therefore, we enable the publication of all of the content of peer review and author responses alongside final, published articles. The editorial history of this article is available here: https://doi.org/10.1371/journal.pcbi.1010725

Data Availability Statement: All analyses were conducted in R version 4.1.2. All scripts and source codes are available on a public repository

Abstract

Cities are growing in density and coverage globally, increasing the value of green spaces for human health and well-being. Understanding the interactions between people and green spaces is also critical for biological conservation and sustainable development. However, quantifying green space use is particularly challenging. We used an activity index of anonymized GPS data from smart devices provided by Mapbox (www.mapbox.com) to characterize human activity in green spaces in the Greater Toronto Area, Canada. The goals of our study were to describe i) a methodological example of how anonymized GPS data could be used for human-nature research and ii) associations between park features and human activity. We describe some of the challenges and solutions with using this activity index, especially in the context of green spaces and biodiversity monitoring. We found the activity index was strongly correlated with visitation records (i.e., park reservations) and that these data are useful to identify high or low-usage areas within green spaces. Parks with a more extensive trail network typically experienced higher visitation rates and a substantial proportion of activity remained on trails. We identified certain land covers that were more frequently associated with human presence, such as rock formations, and find a relationship between human activity and tree composition. Our study demonstrates that anonymized GPS data from smart devices are a powerful tool for spatially quantifying human activity in green spaces. These could help to minimize trade-offs in the management of green spaces for human use and biological conservation will continue to be a significant challenge over the coming decades because of accelerating urbanization coupled with population growth. Importantly, we include a series of recommendations when using activity indexes for managing green spaces that can assist with biomonitoring and supporting sustainable human use.

Author summary

In urban areas, green spaces represent important places for recreation, preservation of biodiversity, and delivery of ecosystem services, such as managing stormwater and

that can be found at https://github.com/afilazzola/CUERecreationEcology. Data for the characteristics and summarized activity values for each green space tested are also publicly available https://doi.org/10.6084/m9.figshare.21304767.v1.

Funding: This research was funded by a Post-Doctoral Fellowship awarded to AF by the Center for Urban Environments and School of Cities at the University of Toronto, Canada. GX was funded by an Ontario Graduate Scholarship, a Center for Environmental Research in the Anthropocene Graduate Fellowship, and NSERC CREATE funding (# 401276521) awarded to JSM. The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

Competing interests: The authors have declared that no competing interests exist.

reducing extreme heat. How people use green spaces and their impact on urban biodiversity is not well understood, particularly because it is difficult to monitor human activity. We used anonymized GPS data from smart devices to quantify green space use in Southern Ontario. We found a strong correlation between our estimates of mobile device activity and green space visitation rates determined from reservation data. We also found that users often spent most of their time on trails and that there were correlations between human activity and tree composition. We provide one of the first analyses exploring how people use urban green spaces using GPS data and the potential link to urban biodiversity.

Introduction

Cities are rapidly expanding, creating new challenges for managing green spaces. More than half of the global population currently lives in cities and that number is projected to increase to almost 90% by the end of the century [1,2]. As cities increase in size and area, green spaces including remnant natural areas, protected reserves, and urban parks, face growing stressors from human activity. Direct human use of green spaces can negatively impact urban wildlife including trampling, litter, the introduction of non-native species, and pollution [3–6]. However, both managed and unmanaged green spaces are important for city residents as a place for exercise, recreation, socialization, and supporting mental well-being [7–10]. This need has been amplified during the COVID-19 pandemic as people have increasingly sought out green spaces when indoor areas were closed or with increased risk of infection [11–13]. Thus, managing green spaces is a delicate balancing act between utility for people and the conservation of biodiversity.

One of the main limitations in effectively managing green spaces is the uncertainty around how and when people use these areas. Some managed parks use a reservation-based system with controlled points of entry, whereas other green spaces have multiple unrestricted access points. Trails are created to facilitate human movement and reduce disturbance to biodiversity, but visitors will still venture off-trail or erode new paths of easily navigable terrain [14]. Determining areas of high disturbance (i.e., high traffic), potential off-trail use, and overlap with sensitive species, can all be achieved through understanding human activity in green spaces. However, capturing human activity at a resolution fine enough for management, such as less than 100 x 100 m, is challenging. Typical methods for quantifying human activity include record-keeping visitors at entrance points, video monitoring, or *post-hoc* assessment of visitor impacts, such as campsite use [15–17]. Unfortunately, these data often neglect any spatial component of what visitors do outside of control points. Visually tracking visitors as they move within green spaces can be both cost-prohibitive and potentially intrusive. Using social media can be effective to track actions and activity from geotags of publicly shared images, posts, or tweets [18,19], but these data can be biased towards individual behaviours and be biased towards intentional points of interest [20]. With the widespread adoption of mobile smartphones and other smart devices, using anonymized GPS data can be an effective tool in determining patterns in the use of green spaces.

Connecting biodiversity observations to smart device activity data can pose a unique set of challenges beyond validating human activity patterns. Any correlation between species and human activity could occur because of multiple pathways including i) the species is relatively resilient to human disturbance and thus persists when others cannot, ii) the species or species' habitat is attractive to visitors, iii) the property coincidentally is dominated by this species and is very accessible (e.g., walking distance to residential areas), or iv) any combination of these

three factors. Teasing apart which of these pathways is relevant can be challenging because correlations between human activity and biodiversity may be because of aesthetic appeal or accessibility. While GPS data from smart devices have broad spatial and temporal coverage across a region, biodiversity data is often restricted to long-term monitoring plots that are static in location or multiple experimental sites that are short-term [21]. Biodiversity data are also rarely collected daily or cover a broad spatial area, presenting a challenge when trying to connect these two disparate types of data (e.g., evaluating the effects of human activity on biodiversity). Additionally, biodiversity surveys are often conducted away from areas with high human activity (e.g., trails, playgrounds, picnic areas) in more naturalized areas, reducing the chance that any overlapping human activity would be recorded. Using community science (e.g., iNaturalist, e-bird, Bumble Bee Watch) can be an effective tool for obtaining surveys with broad spatial and temporal coverage of green spaces [22,23], but these types of data are inherently correlated with smartphone use because of the mobile applications they require. A preliminary exploration of biodiversity and GPS data from smart devices would include examining the relative use of land cover types in green spaces to determine if certain areas, particularly where there is sensitive habitat, receive disproportionate levels of human activity.

Management of urban green spaces can be complex trying to balance different property types, land covers, and public uses. We partnered with Conservation Halton (www.conservationhalton.ca), a local conservation authority within the Conservation Ontario (www.conservationontario.ca) network responsible for natural areas, protected reserves, and urban parks in the regional municipality of Halton. Conservation Halton is responsible for managing a watershed that spans 1000 km^2 of land containing different ecosystems, including forests (106 hectares; 7.5% coverage), riparian vegetation (7 km in total length; 14.5% coverage), and grasslands (130 hectares; 10.9% coverage) [24]. To improve ecosystem service delivery, Conservation Halton is working to increase natural land coverage above a particular threshold but must also balance naturalization with the provisioning of recreational opportunities [24]. Maintaining this balance is challenging since there are over 1.2 million visitors annually to the Conservation Areas due to their proximity to large urban centers (e.g., Hamilton, Milton, Mississauga, and Oakville) [25] with many of these municipalities being the fastest-growing cities in Canada [26]. Common social features of this landscape are recreational activities such as hiking, dog walking, cross-country skiing, and picnicking. Management of the 53 diverse properties within Conservation Halton's jurisdiction represents some of the common challenges associated with land managers responsible for urban green spaces.

GPS data from smart devices can be a powerful tool in managing green spaces, but methods are needed that can properly quantify patterns of human activity. The purpose of our study was to describe how an activity index of anonymized GPS data from smart devices could be used for human-nature research, particularly looking at the associations between park features and human activity. GPS data from smartphones has been used previously to estimate trail use, green space access, and outdoor recreation patterns [13,27,28], but many studies rely on volunteer participants representing a fraction of green space users. Using Mapbox Movement (www.mapbox.com/movement-data) we obtained an anonymized activity index representing human density aggregated to 100 x 100 m grid cells and two-hour windows. In the following study, we developed methods for the synthesis, management, and analysis of anonymized GPS data from smart devices in Conservation Halton green spaces by answering the following three questions:

1. How does the anonymized activity index (comprising both activity density and activity coverage) compare to traditional measures of human activity in urban green spaces, such as reservation data or trail density?

2. What are the challenges associated with using the activity index to infer human presence in green spaces, particularly for land managers?
3. Can the activity index be used to correlate patterns of human activity to landscape features and tree composition?

Results

Patterns of human activity

The adjusted activity density was found to accurately capture human visitation within green spaces. All green spaces had at least one grid cell with activity values above the threshold used to anonymize the data. Green spaces had on average 40.6% (SE ± 3.3%) of the total area with detectable GPS-location data (Table 1). Reserve areas had the lowest percentage of activity coverage (Table 1) as would be expected for lands where access is limited. For the green spaces where reservations were required, we found a strong positive relationship between the total number of reservations and the adjusted activity density ($F_{1,8} = 10.7$, $p = 0.011$, $R^2 = 0.63$; Fig 1). The relationship between the number of reservations and (adjusted) activity density was mediated by day-of-week ($F_{1,8} = 6.95$, $p = 0.029$), where on average, reservations across green spaces was 2.5% higher on weekends despite the weekend representing fewer days. This pattern suggests that for the same number of reservations, people often spend more time at these green spaces on the weekend relative to weekdays.

Unique metrics of human activity

The activity index can provide greater spatial and temporal resolution for human activity relative to tracking visitation patterns through park entrances. Many green spaces had hot spots of activity values on trails, whereas adjacent areas (*i.e.*, 'off trail') had substantially lower activity values. For example, two green spaces (Hilton Falls and Kelso Conservation Areas) had high activity patterns within their trail network (Fig 2), and on average, parks with higher trail densities were found to have higher amounts of activity density ($F_{1,16} = 8.60$, $p = 0.0097$, $R^2 = 0.35$; Fig 3A). Similarly, green spaces with high densities of trails also correlated with more area of activity coverage, *i.e.*, areas of the green space containing any human activity ($F_{1,9} = 6.57$, $p = 0.035$, $R^2 = 0.36$; Fig 3B). The percent of activity on-trail was significantly correlated with activity coverage ($F_{1,9} = 18.0$, $p = 0.002$, $R^2 = 0.63$; Fig 3C), suggesting increased green space use typically occurs on trails.

Activity patterns and the environment

Activity density varied considerably by the land cover classes described by Conservation Halton (ELC-CC, Ecological Land Classifications Community Classes). Forest and cultural land

Table 1. General characteristics of the green spaces within Conservation Halton's jurisdiction including land type, whether properties are actively managed, number of properties, and average property size. Activity coverage represents the percentage of an area within the green space that has any human activity determined from the Mapbox data. A list of all green spaces and characteristics can be found in S2 Table.

Land Type	Managed	Properties	Property Size (km^2)	Activity coverage (%)
Conservation Area	Managed Land	7	3.68	59.8
Conservation Area	Non-Managed Land	8	0.88	48.4
Natural Area	Non-Managed Land	16	0.5	44.5
Other	Non-Managed Land	9	0.1	34.3
Reserve Area	Non-Managed Land	13	0.24	26.3

https://doi.org/10.1371/journal.pcbi.1010725.t001

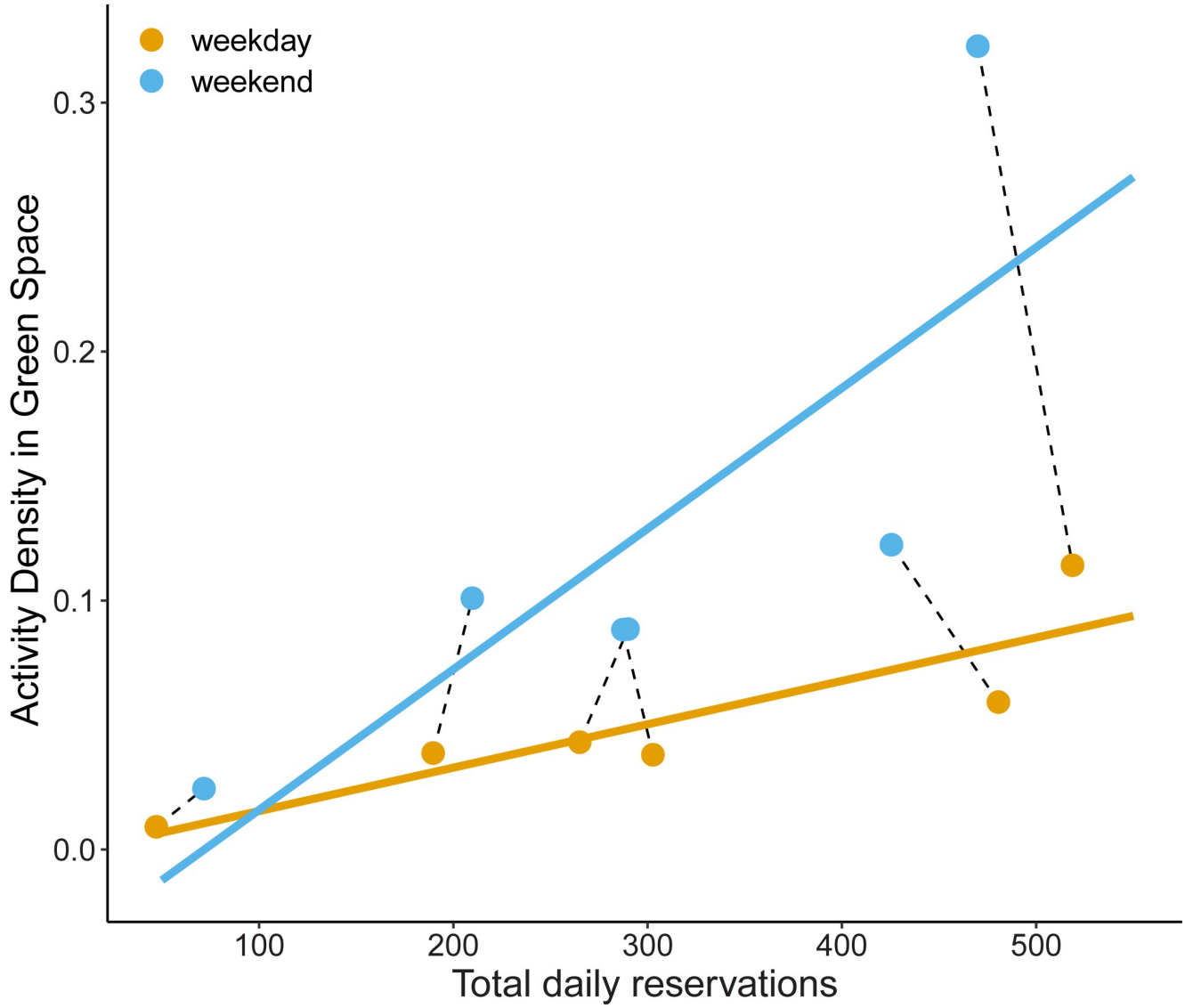


Fig 1. The total daily reservations for Conservation Halton green spaces that had reservation-only entrances were strongly positively associated with activity density (mean effect ± SE = 0.00017 ± 0.00013). On average, activity density was much higher on weekends compared to weekdays (mean effect ± SE = 0.00039 ± 0.0002). Dashed lines connect the same green space for weekends and weekdays. Reservation and activity density represent the totals within each conservation authority property between June and August 2020.

https://doi.org/10.1371/journal.pcbi.1010725.g001

classes were associated with the highest proportion of grid cells with human activity, followed by talus and cliff (Fig 4A). However, relative to the abundance of the land classes in each property, rock formations, including talus, cliff, crevice and cave, and bluff, were disproportionately visited (~ 75%) relative to other land types (Fig 4B). By contrast, forests and cultural land classes had a lower proportion of activity density relative (<50%) to their abundance among green spaces.

We found that our measures of human activity were significantly correlated to patterns of tree composition across the sixteen green space properties ($F_{15} = 2.74$, $p = 0.001$; Fig 5), explaining 25% of the variation in species composition. Although few species were uniquely identified to correlate with human activity, there were some correlations observed. Yellow birch (Betulaceae: *Betula alleghaniensis*) and black ash (Oleaceae: *Fraxinus nigra*) were both

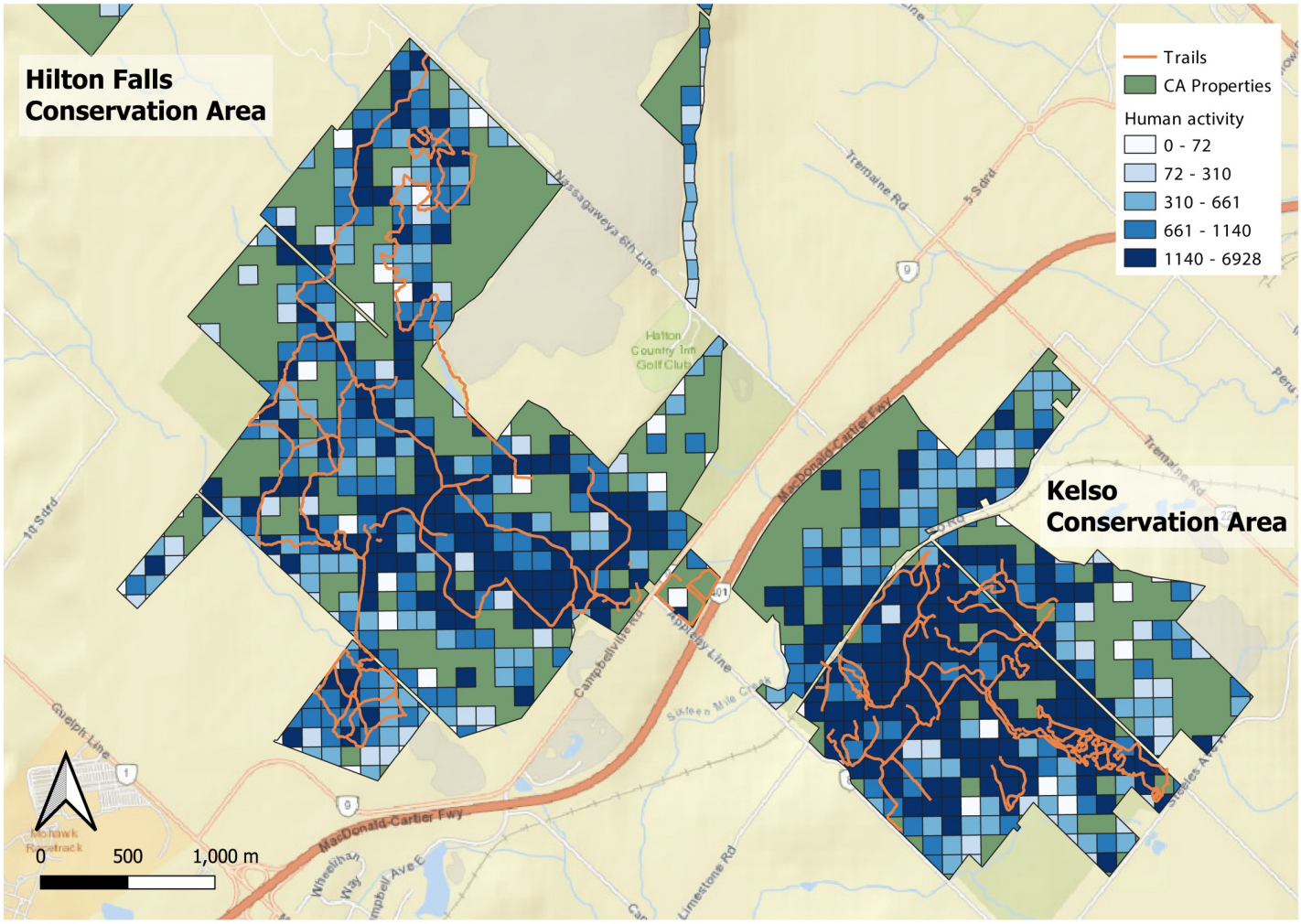


Fig 2. A representation of anonymized activity density in two Conservation Halton green spaces, Hilton Falls and Kelso Conservation Areas. Each blue grid-cell represents a 100 x 100 m pixel of activity density with darker colours representing higher densities of human activity. Values represent the maximum activity density value observed across all hourly timeframes for the three-month time-series. Orange lines within property boundaries are official trails managed within the green space. Green areas within property boundaries have activity levels too low to be available in the Mapbox dataset, potentially representing refugia in the park where human activity is negligible. Alternately, some of these low-activity areas are small water bodies or inaccessible areas because of terrain. Maps were created using Open Street Maps (https://www.openstreetmap.org/).

https://doi.org/10.1371/journal.pcbi.1010725.g002

positively correlated with activity density and proportion of weekend activity (Fig 5). Some species appear to be negatively associated with activity density including bitternut hickory (Juglandaceae: *Carya cordiformis*), ironwood (Betulaceae: *Ostrya virginiana*), and American elm (Ulmaceae: *Ulmus americana*). However, these three species are also relatively uncommon compared to the other tree species examined.

Discussion

Our study represents one of the first that examines relationships between human activity and green space using anonymized GPS data from smart devices. We found a significant

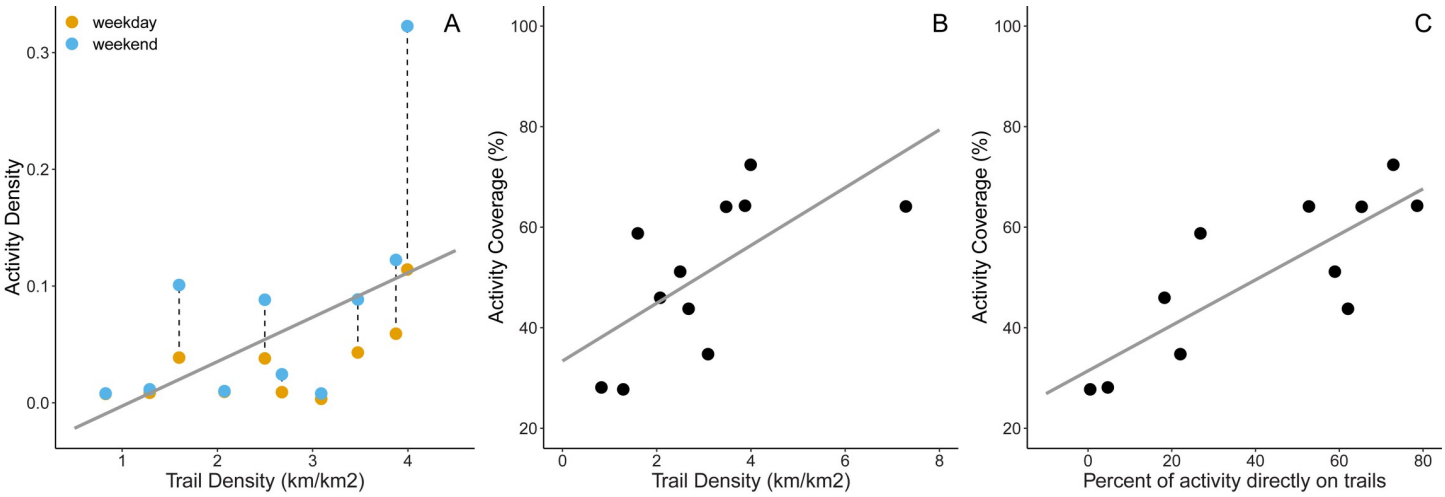


Fig 3. Patterns of trail use with activity density and coverage. Green spaces with higher trail densities were found to have significantly higher activity patterns (mean effect ± SE = 0.021 ± 0.018; Panel A). Dashed lines connect the same green space for weekends and weekdays. There was also a positive relationship between the area of activity density with trail densities (mean effect ± SE = 0.057 ± 0.022; Panel B), where a higher proportion of trails result in more coverage of the green space with human activity. The percentage of activity on trails (*i.e.*, on-trail vs. off-trail use) was positively correlated with activity coverage (mean effect ± SE = 1.47 ± 0.35; Panel C).

https://doi.org/10.1371/journal.pcbi.1010725.g003

correlation between the number of visitors (based on reservation data) and activity density (R^2 = 0.63; Fig 1), demonstrating that smart device activity effectively captures human activity in green spaces. However, it is important to note that pre-processing is required to reflect the activity more accurately in green spaces. Both activity density and coverage proved effective at capturing human activity patterns in green spaces including patterns of trail and land cover classes (Figs 3 and 4). For land managers looking to balance human use with biological conservation in green spaces, we illustrate that these data are both powerful and accessible for pinpointing hot spots of human activity, prospective ecological refugia (i.e., where human activity is low), and encroachment of activity on restricted areas. This information can be used to *a priori* plan biomonitoring to capture impacts along a gradient of human activity level.

Description of observed patterns and interpretation

Activity patterns varied considerably, but predictably among green spaces. Off-trail use is a significant problem in conserving biodiversity, causing disturbance, trampling, and introduction of non-native species [6,29,30]. In the green spaces evaluated, we found that most visitors appear to remain within the designated use areas, with the highest activity observed along trails (Figs 2 and 3) or in recreational spaces (e.g., picnicking areas) (Fig 4). Still, the activity outside of designated use areas persisted across green spaces with the percent of activity on-trails dropping below 5% of total activity (e.g., Kilbride). Some of these green spaces have unofficial trails that are managed by non-profits or local communities. For example, the Bruce Trail Conservancy manages a 904 km trail that intersects some of these green spaces but that is independent of Conservation Halton (www.brucetrail.org/). Future land managers interested in relating trail networks to human activity may need to aggregate trail locations from multiple data sources, such as AllTrails (www.alltrails.com/) or TrailForks (www.trailforks.com/). The activity data used here can also guide managers to areas of frequent or abundant human presence but where no trails exist, to determine where off-trail incursions are most common. For green spaces in Conservation Halton, the highest activity of off-trail use appeared near the entrances or in areas between adjacent trails (e.g., Fig 2). These perceived negative impacts to green spaces could be flipped to a positive if human behaviour (*i.e.*, where people go off-trail the

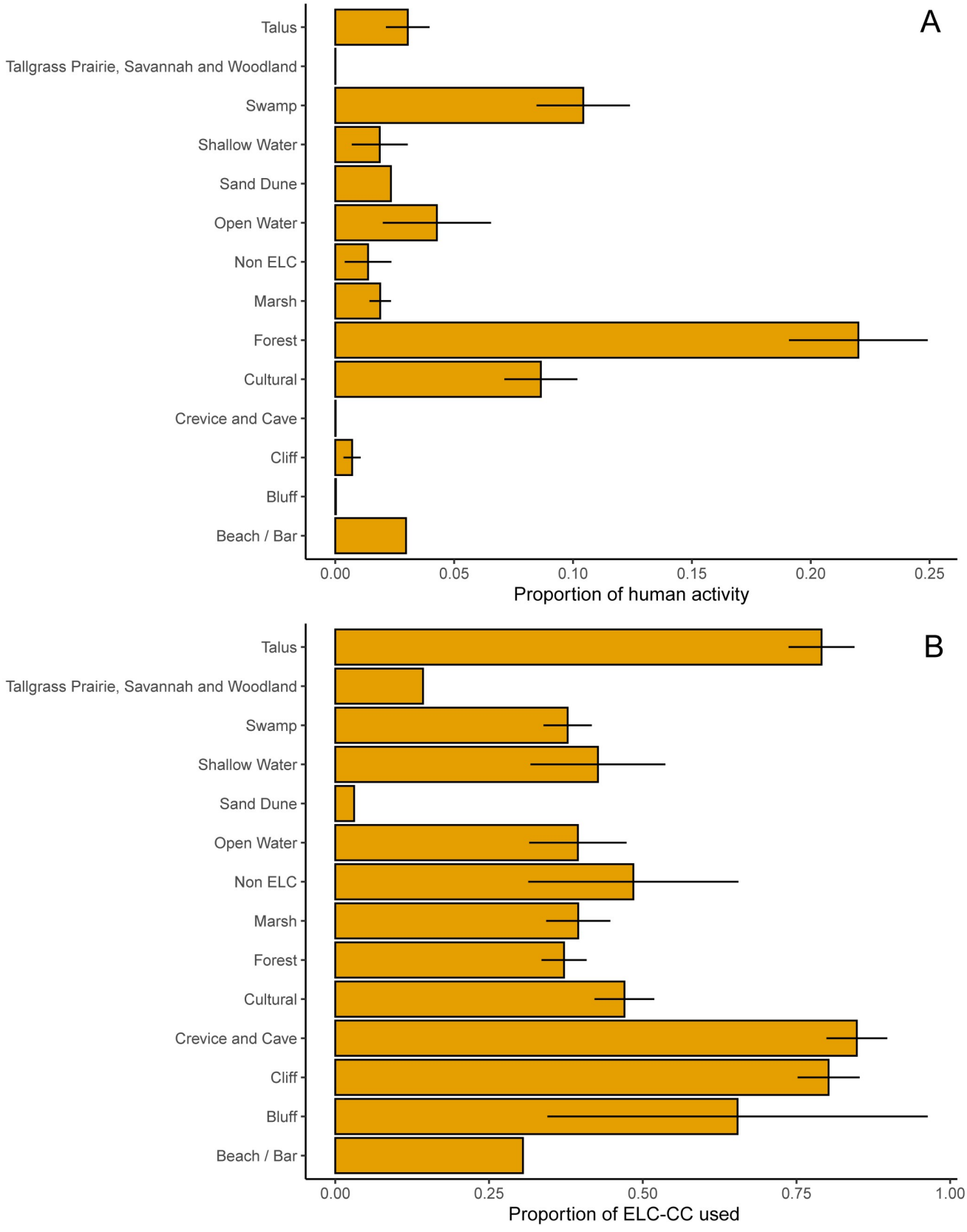

A
Talus
Tallgrass Prairie, Savannah and Woodland
Swamp
Shallow Water
Sand Dune
Open Water
Non ELC
Marsh
Forest
Cultural
Crevice and Cave
Cliff
Bluff
Beach / Bar
0.00
0.05
0.10
0.15
0.20
0.25
Proportion of human activity
B
Talus
Tallgrass Prairie, Savannah and Woodland
Swamp
Shallow Water
Sand Dune
Open Water
Non ELC
Marsh
Forest
Cultural
Crevice and Cave
Cliff
Bluff
Beach / Bar
0.00
0.25
0.50
0.75
1.00
Proportion of ELC-CC used

Fig 4. Patterns of human activity in each of the Ecological Land Classifications Community Classes (ELC-CC) for Conservation Halton green spaces. We calculated the proportion of human activity by using any grid cell that had activity throughout the 3-month timeframe relative to the land cover of that grid cell. *The proportion of human activity* by ELC-CC represents the percent of human activity within the property separated by each ELC-CC (Panel A). *The proportion of ELC-CC used* represents the percent of human activity in that ELC-CC relative to the total coverage of that class within the property (Panel B).

https://doi.org/10.1371/journal.pcbi.1010725.g004

most) is useful for guiding future trails and accessibility. However, biodiversity in these areas will be more susceptible to disturbance and if off-trail activity occurs in sensitive habitats, this human activity could be monitored and modified. Additionally, while trails are typically managed to mitigate impacts to the landscape, many are still constructed in ecologically sensitive areas [e.g., 31]. Thus, high activity on trails are not enough information alone to determine effective management.

Limitations of location data

Anonymized GPS data from smart devices is a powerful tool with broad spatial and temporal resolution, but there are biases and considerations for its use (Table 2). The challenges we encountered when estimating human activity can be generalized into social, technical, and data issues (Table 2). Although mobile device use has expanded rapidly across the globe [32], there remain large differences among regions and demographics [e.g., 33,34]. In areas where mobile device adoption is high, smart device locations may more accurately reflect human activity relative to other location-based data (*e.g.*, social media, geotagged photos, *iNaturalist*). Our study took place in Canada where LTE mobile networks cover 99% of the population [35] and 80% of Canadians report having a mobile data plan for personal use (www150.statcan.gc.ca). However, even within countries, there are differences in mobile device use between rural, suburban, and urban communities. In the United States, rural Americans have consistently fewer mobile devices relative to residents of urban or suburban areas [36]. In Canada, 81% living within a city metropolitan area (CMA) had mobile data plans compared to 73% in non-CMA areas (www150.statcan.gc.ca). The devices and the software applications used will also be prone to biases (Table 2). There can be variations in quantifying activity caused by different accuracies among devices, operating systems, software, and location [37]. For instance, smart devices can vary between 5–10 meters in GPS positioning based on hardware [27,38]. The choice of a software application by the device user can also determine activity patterns. For example, a person using a ride-sharing application is more likely to have location services turned on, whereas a person in a green space may not have any application open. As green spaces are often viewed as a place to "disconnect" or be engaged in activities that discourage mobile device use (e.g., swimming, jogging), activity patterns may be less accurate than when compared to roads. These biases are important when considering the expansion of the applicability of human activity data to other demographics or regions (Table 2).

Some of the biases associated with using smart device data to infer human activity have been identified in previous studies, but there are specific considerations concerning green spaces. For example, the activity index was anonymized by aggregating activity patterns to coarse resolutions to prevent harassment, crime, or injustice [39–41]. This method facilitates anonymity and prevents tracking individual behaviours, activity by demographics, or the fine-scale resolution of activity patterns (e.g., < 100 m). However, most green spaces found in urban areas are small, so discerning activity within the green space relative to nearby cities within these aggregated areas can be difficult. This becomes particularly problematic on green space boundaries that are delineated by private residential properties or high-traffic roads. Smart device data are rarely separated by mode of transportation (*e.g.*, pedestrian, cyclist, motorist) and thus differentiating between cars driving along the boundaries and hikers within

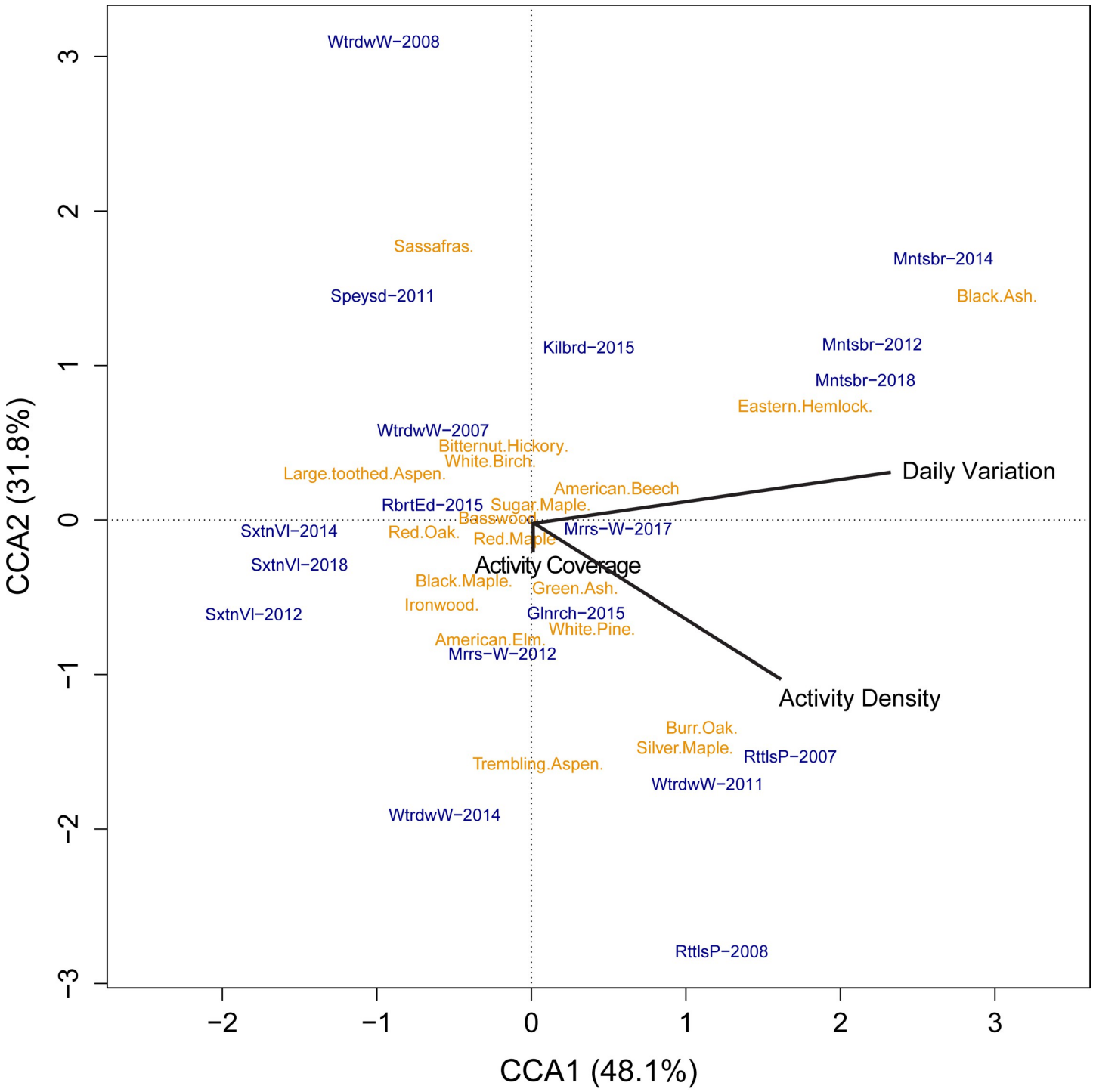


Fig 5. Correlations between human activity and tree composition in green spaces ($F_{1,15} = 2.74$, $p = 0.001$). The partially constrained correspondence analysis (pCCA) explained 79% of the variation in tree species among green spaces with an adjusted $R^2 = 0.17$. Names in orange represent the abbreviated common names of tree species found at each site (blue). Black represents the constrained predictors of activity density, proportion of weekend activity, and activity coverage (percent coverage of green space). Year was included as a conditioning matrix to partial out any interannual variability.

https://doi.org/10.1371/journal.pcbi.1010725.g005

Table 2. Considerations for future users of anonymized location data for estimating human activity.

Issue	Key Studies	Challenge	Details	Examples
Social	[39–42]	Privacy	Data should not be too specific because it can infringe on people's privacy or be used for nefarious purposes.	Data are anonymized and aggregated to a coarse spatial resolution.
		Ownership differences	The number of mobile devices differs among the demographics of people.	More affluent communities will likely possess more devices and thus have higher activity patterns.
		Safety	The use of devices may vary depending on location or security.	Out of safety concerns, individuals may avoid using their devices.
		Behaviour of individual	Use of the device may vary depending on the activity of individual	When exercising someone may not use their device.
		Behaviour on phone	Location tracking services may vary depending on application use on a smart device.	Ride-sharing applications will more frequently report location relative to a messaging application.
		Land type	Certain land types are inherently more likely to have higher activity.	Roads are vectors for transportation and thus will typically have high activity relative to other areas.
Technical	[27,37,38]	Accuracy	Not all devices or networks equally estimate the location of a device.	Older cell phones may have a larger radius of location accuracy.
		Coverage	Some areas have limited or no coverage of a cellular network because of geographic barriers or the placement of towers.	Rural green spaces may have low coverage because of topography preventing coverage and infrequent towers.
		Noise	To minimize privacy concerns, activity data are often masked below a certain threshold or have a random amount of activity added.	Areas with low human activity will have no values reported.
		Time	Over time, the number or usage of devices can increase.	Devices with location services were less common 10 years ago than today.
Data	[43,44]	Training	Requires expertise in spatial analysis and high-performance computing.	Activity data are often vectored tiles based on spatial extents.
		Cost	Data are not publicly available and require purchase from companies.	Activity data is costly even when purchased as snapshots based on certain timeframes or areas.
		Management	The size and type of data often require high-performance computing resources.	Regional datasets often exceed the storage and memory capabilities of personal computers.

https://doi.org/10.1371/journal.pcbi.1010725.t002

the adjacent green space can be difficult at coarse scales. Similarly, determining the behaviour of individuals can require some assumptions (Table 2). One can infer activity at a beach or picnic area could represent swimming and socializing respectively, but neither is definitive nor requires knowledge of how land cover matches the activity type. Another common challenge with anonymized activity data is thresholding to remove activity patterns below a certain level to prevent tracking select individuals on private properties. Green spaces often have relatively less activity compared to adjacent paved city spaces (e.g., roads, buildings), causing some areas to report no activity when activity is low. One approach to resolving the above challenges is to examine every green space case-by-case to validate activity patterns. However, for municipal land managers responsible for many properties, this approach is laborious and subjective. Our approach of removing grid-cells based on high overnight activity is reproducible and systematic but can lower the number of available grid cells for analysis.

Human activity and the environment

Certain land cover types had higher activity relative to others. Forests were the most visited land cover, but also represented the largest area of the green spaces, particularly surrounding the trail network (Fig 4). Cliff and rock formations were visited disproportionately high relative to their cover, likely because these areas have scenic points of interest (e.g., lookouts, waterfalls) and a developed trail network. Typically, these land cover types would also be attractive for rock climbing activities (i.e., bouldering, rappelling, climbing), but these activities were prohibited during the 2020 season because of the pandemic. Rock formations are

consistently popular attractions in green spaces [e.g., 45], but can pose a hazard both to human health from climbing accidents and to local biodiversity from trampling [46,47]. Many green space visitors seek quiet, uncongested areas [48,49], and overcrowding may drive negative experiences among users, which decreases support for conservation [50]. Yet, some areas in green spaces will inherently be more sensitive than others. Knowledge about preferred land cover types can inform land managers to either prioritize conservation potential in areas with low human activity (e.g., swamps, marshes, or grasslands) or implement measures (e.g., fencing) to mitigate impacts to high-activity areas.

Associating human activity with patterns of biodiversity is inherently challenging. We demonstrated preliminary evidence that human activity interpreted from smart devices is related to patterns of tree composition in green spaces (Fig 5). However, it is important to note we are not implying causation or mechanistic relationships and instead are providing a heuristic of the potential for activity data to be related to green space management. For instance, we saw a negative relationship between human activity and ironwood, *Ostrya virginiana* (Betulaceae), but this species is more commonly found in swamps or high-moisture areas [51], within which we saw markedly lower human activity. Conversely, yellow birch, *Betula alleghaniensis* (Betulaceae), has a visually appealing bark and thus may attract greater human activity. Additionally, trails are often designed to direct people to certain habitat types because of accessibility, ease of construction, or ease for visitors to travel. Eastern hemlock, *Tsuga canadensis* (Pinaceae), is relatively tolerant to disturbance compared to other species, and thus may be more likely associated with higher intensity of human activity [52]. There may also be indirect factors driving the observed relationships, such as high white-tailed deer densities (*Odocoileus virginianus*), which have a significant effect on tree composition in Southern Ontario [53,54] but may also be appealing to visitors. Other types of biodiversity data may be useful for disentangling some of these patterns. We used long-term monitoring data of trees that is relatively robust to survey biases but is restricted to select survey locations and certain years. Community science databases (*e.g.*, *iNaturalist*, *eBird*) would have larger spatial and temporal coverage allowing for greater overlap with the activity data, although most will be inherently correlated to activity data since they have smartphone applications. Relating patterns of biodiversity to smart device activity is thus a promising opportunity that requires careful consideration of data sources and experimental design.

Implications

The prospects of anonymized GPS data from smart devices for managers of green spaces and more broadly, to balance human impacts with the engagement of the environment, is exciting. We show it surpasses information available from counting visitors at the entrance by including human activity hot spots and cold spots, off-trail movement, and human behaviour. This information is crucial to support the connection of visitors to important park features that deepen care or appreciation of the environment. Land managers can also improve the accessibility of the green space and develop more parsimonious trail routes that mitigate off-trail activity. Anonymized activity data is also helpful for quantifying visitation rates and patterns in ungated or unstaffed green spaces with no reservation system or tracking mechanism in place. With an improved understanding of human activity across green spaces, biomonitoring inventories can be coordinated in ways that capture biodiversity information across gradients of human activity levels. This could be critical to disentangle local disturbance and modification to community composition, loss of sensitive species, and management of at-risk species. Since human activity in green spaces is correlated with invasive species propagules [3], biomonitoring inventories designed to include sites along human activity gradients may be critical to

proactively manage invasive species and mitigate economic costs associated with eliminating established species. Location data from smart devices may thus provide a stronger proxy of human activity, and consequently propagule pressure, relative to landscape analyses such as distance to roads.

The activity data collected by Mapbox is recorded hourly and so continuous monitoring of green spaces for changes in human behaviour is possible. With the COVID-19 pandemic, many local parks have seen a significant increase in the number of people visiting, and with this comes a wider range of behaviours [11,12]. For instance, Conservation Halton saw an increase in visitors to approximately 1.2 million visitors over 10 months in 2020 (many green spaces were closed in April and May because of the pandemic) relative to only 1.1 million visitors in 2019 for all twelve months. Knowledge of when green spaces are visited and wherein the park visitation is highest will permit refinement of both biomonitoring, management, and engagement to more effectively (and economically) link the needs of humans to access nature and recreation opportunities while also conserving biodiversity in green spaces.

Data and methods

Mapbox movement data

We obtained anonymized GPS data from smart devices from Mapbox for the Greater Toronto Region (43.23˚ N– 44.35˚ N, 78.83˚ W—80.26˚ W) which includes the Regional Municipality of Halton and its surrounding areas. Mapbox is a private company that specializes in location data with products for application development. The data they provide is referred to as an "activity index" representing a density of smart devices within a 100 x 100 m grid-cell. The methods Mapbox uses to create the activity index can be broken down into four steps: 1) Collection, 2) Calibration, 3) Anonymization, and 4) Normalization. The collection includes location data from any smart device that uses the Mapbox software development kit (SDK). Location data can come from the GPS within the device, cell tower triangulation, or router indexation if the device connects to a wireless network. The collection pipeline aggregates repeated location information from a device into five-minute intervals within a grid-cell, but discards the start and end of a trip to assist in anonymity. Therefore, a high activity index within a grid-cell can be both from a high density of smart devices or continuous movement of the same smart devices. The calibration pipeline adjusts for fluctuations in the volume of telemetry data during collection. Because the location data comes from thousands of smart device applications, each with their use patterns, the team at Mapbox needs to apply adjustments to ensure the data reflect real-world conditions. The calibration steps are extensive and a discussion of the methods involved can be found here (https://www.mapbox.com/blog/calibrating-mapbox-movement).

Devices are aggregated to these grid-cells for anonymity by preventing the tracking of individuals or identifying human patterns within private areas. To further anonymize the activity index, Mapbox removes activity levels below a threshold and adds an unspecified amount of noise to prevent re-identification [e.g., 41,55]. The applied threshold and added noise are generated using a machine-learning algorithm developed by Mapbox. Lastly, Mapbox normalizes the activity index within a given country (i.e., Canada) and scaled each time interval to a baseline of the mean activity patterns for January of the respective year. The activity index is thus unitless without any real-world equivalent, such as the density of people, number of smart devices, or time spent in an area. Mapbox recommends that the activity index be only used for relative comparisons in human activity rather than any analysis of a specific data point or grid-cell. Additionally, for the above reasons, Mapbox emphasizes that comparisons made over short time scales (e.g., within a year) and similar regions (e.g., within the same country) will be

more relatable than those across larger time-periods and other regions. For more details on how Mapbox calculates its proprietary activity index, see their online guide (https://docs.mapbox.com/data/movement/guides/).

The activity index was provided by Mapbox in 100 x 100 m grid-cells across Halton Region for June, July, and August 2020 (S2 Table). Each grid cell has a monthly average value for 2-hour time windows throughout a complete 24-hour day. Monthly averages are also separated into weekdays (Monday-Friday) and weekends (Saturday and Sunday). We found the intersection of each grid cell with the green spaces managed by Conservation Halton through an iterative loop (function *st_intersection*; package *sf*). Grid cells that were found to intersect on Conservation Halton properties often ended up masked to an area smaller than the full 100 x 100 m grid-cell (see Fig 2).

A significant challenge with using the smart device activity for green spaces was the accidental inclusion of activity outside of the green space. Roads and highways were especially challenging when adjacent to property boundaries, causing high activity patterns that are likely not reflective of the activity within the property. Removing grid cells individually based on proximity to roads is labourious, requires spatial information about roads, and can be subjective. For a more systematic approach, we identified any grid cell with human activity between 12–6 am. Many of the green spaces are closed to access overnight and the remaining properties likely experience substantially lower traffic compared to daytime hours. Additionally, mobile device use is typically lower during these hours [56]. The activity in these areas between 12–6 am is therefore likely below the threshold identified by Mapbox for human activity. Conversely, roads and adjacent commercial operations remain active during overnight hours. Therefore, we excluded any grid cell with activity during these select hours to remove activity outside of the green spaces from being reported. We validated this approach by examining the association of the activity index and roads in all green spaces. As expected, roads and especially busy highways had the most night-time activity, whereas the interior of green spaces was almost exclusively without any activity. See S1 Appendix for a discussion of this exclusion based on high night-time activity.

Green space data

As a case study for using anonymized GPS data from smart devices with green spaces, we selected 53 green spaces managed by Conservation Halton in Ontario, Canada. As part of the Conservation Ontario (https://conservationontario.ca) network of conservation authorities, Conservation Halton is a conservation authority empowered by the provincial government to manage green spaces for biological conservation, the preservation of ecosystem services, and human recreation. The 53 green spaces encompass a range of management types including conservation areas used for recreation and conservation, natural areas where human visitation is not facilitated (i.e., no parking lots or trails), reserve areas where human activity is limited (e.g., fencing), and other areas that include stormwater diversion channels and urban parks (Tables 2 and S2). While there were 53 separate green spaces, not all had data available for our analyses. For our subsequent analyses, five sites had reservation data, eleven had official trail networks, eleven had tree diversity measures, and all had land classification information.

During the summer of 2020, visitation to seven of the green spaces managed as conservation areas was controlled through reservations because of the Covid-19 pandemic. Individuals with reservations were allowed to visit the green space between 9 am and 6 pm for a maximum of 2 hours. These seven green spaces are among the most popular within Conservation Halton with features including waterbodies, rock formations, look-outs, and well-developed trail networks. We obtained the reservation data for visitors that attended these seven properties for

June, July, and August 2020. Each reservation included the number of individuals, the time of check-in, and the park visited. Additionally, we obtained information about the property boundaries, Ecological Land Classification, and officially managed trail network from Conservation Halton's open data portal (www.conservationhalton.ca/mapping-and-data). The Ecological Land Classification categorizes land formations and vegetation communities to assist in the characterization of the landscape [57]. Through ground surveys, lands are grouped into different classifications such as marsh, forest, dune, and swamp.

To test the relationship between human activity and local landscape features we compared land cover and tree composition in different green spaces. Land cover was obtained from an Ecological Land Classification that was conducted by Conservation Halton. Ecological Land Classification uses a systematic approach to convert high-resolution aerial imagery into digitized spatial polygons assigned a Community Class [57,58]. Examples of the Ecological Land Classification Community Classes (ELC-CC) include forest, cultural (e.g., recreational areas), talus (i.e., scree), and open water. Tree surveys were conducted at eleven unique sites in Conservation Halton's watershed jurisdiction between 2006 and 2019. Terrestrial vegetation monitoring protocols established by the Ecological Monitoring and Assessment Network were followed [59]. Within permanent sample plots, each tree with a diameter at breast height (dbh) of 10 cm or greater was individually tagged and basal area was calculated over subsequent visits. Between 10–20 permanent plots were set up in each of the eleven sites and we averaged across all plots to estimate the mean basal area per species in each green space and survey year. Although the activity data was acquired for 2020, the composition of tree species at these sites remains relatively constant between years. To confirm composition did not change significantly between years, we conducted a constrained correspondence analysis with year as a predictor and found it did not significantly affect tree species ($F_{1,26} = 1.26$, $p = 0.23$).

Data analysis

We used two metrics of human activity based on the Mapbox activity index: activity density and activity coverage. Activity density (Eq 1) was calculated by taking the grid-cells determined to not have high overnight activity and multiplying the activity value by the area of the grid-cell. When the green space polygons intersected with the Mapbox polygons, many were reduced to areas that were only a fraction of the full size, but the activity index for that grid cell represents the entire grid-cell. Therefore, we multiplied by the area to scale the activity based on the area occupied. To quantify activity density for an entire green space, we used the sum, rather than median or mean, because the number of grid cells varies over time due to the thresholding of activity that is applied to anonymize the data (i.e., no grid cells have zero values, they are simply absent). Thus, we divided the sum of adjusted activity across all grid-cells within the green space and across all three months by the area of that green space. Since the provided Mapbox index represents a normalized proportion, our adjusted metric of activity density relates to the proportion of smart device activity in a grid-cell and a given 2-hour window. The activity index is thus weighted both by the number of devices and the duration the devices spent in the grid-cell of interest.

We also calculated activity coverage for every property (Eq 2). If any grid-cell had an activity index value for any of the time-periods within our dataset, that grid-cell was treated as having human activity. We totaled the area identified with human activity and divided it by the total area of the property to determine the percent area (Eq 2). The remaining percentage of the total area represents the proportion of green space where human activity is non-detectable and therefore infrequent, if not completely absent. The inverse of this value would be the percent area of the property where human activity is at a non-detectable level throughout the

timeframe.

$$Activity\ Density_{greenspace} = \frac{\sum Activity \times Area_{polygon}}{Area_{greenspace}} \quad \text{Eq 1}$$

$$Activity\ Coverage_{greenspace} = \frac{\sum Area_{polygon}}{Area_{greenspace}} \quad \text{Eq 2}$$

To compare activity density and coverage to traditional estimates of visitation and to validate the estimated activity patterns through our adjusted metric, we examined the five Conservation Halton green spaces that had reservation-only access. We summarized the total number of visitors on weekends and weekdays for June, July, and August 2020, with the sum adjusted activity data and fit a linear model. The number of visitors and day-of-week were fitted as interacting predictors.

We compared the density of trails among all green space properties with official trails (16 in total) to activity density and coverage using linear models. We identified any grid cell from the activity data that intersected with the trail network (function *st_intersection*; package *sf*) and summed the area of activity on trails divided by area with human activity. The resulting percentage represents the amount of human activity that is spent on trails. To determine if greater visitation to a green space relates to activity on trails, we fit a linear model comparing the percentage of human activity on trails to the percent of human activity in the property.

Next, we determined how human activity intersected with the Ecological Land Classification Community Class (ELC-CC). The proportion of human activity was determined by dividing the activity coverage in each ELC-CC by the total area of activity coverage. The proportion of ELC-CC used was established by dividing the area of activity coverage in each ELC-CC by the total area of that ELC-CC in the respective green space.

Lastly, we tested if activity density or coverage had any relationship with biodiversity patterns in these green spaces. We compared the basal area of tree species collected as part of a long-term monitoring project at the 11 sites using a partially constrained correspondence analysis (pCCA). We fit the activity density (averaged across weekdays and weekends), activity coverage, and the proportion of weekend activity (i.e., weekend activity divided by weekday activity) as predictors. Year was fit as a conditioning matrix to partial out any interannual differences in tree composition. However, many of these trees were long-lived individuals without substantial differences in species over years. We conducted a permutation test of pCCA (function *anova.cca*, package *vegan*) to determine model significance and percent of variation explained [60].

All analyses were conducted in *R* version 4.1.2 [61]. All scripts and source codes are available on a public repository that can be found at https://github.com/afilazzola/CUERecreationEcology. Data for the characteristics and summarized activity values for each green space tested are also publicly available [62] https://doi.org/10.6084/m9.figshare.21304767.v1.

Supporting information

S1 Appendix. Examples of excluding road activity.
(DOCX)

S1 Table. Sample Mapbox Movement dataset.
(DOCX)

S2 Table. Characteristics of Conservation Halton green spaces.
(DOCX)

Acknowledgments

We thank Mapbox for providing the anonymized GPS data of smart devices.

Author Contributions

Conceptualization: Alessandro Filazzola, Kimberly Barrett, Andrea Dunn, Marc T. J. Johnson, James Scott MacIvor.

Data curation: Alessandro Filazzola, Garland Xie, Kimberly Barrett, Andrea Dunn.

Formal analysis: Alessandro Filazzola, Garland Xie.

Funding acquisition: Marc T. J. Johnson, James Scott MacIvor.

Investigation: Alessandro Filazzola, Garland Xie, James Scott MacIvor.

Methodology: Alessandro Filazzola, Garland Xie, James Scott MacIvor.

Project administration: Alessandro Filazzola, Marc T. J. Johnson, James Scott MacIvor.

Resources: Alessandro Filazzola, Kimberly Barrett, Andrea Dunn.

Software: Alessandro Filazzola.

Supervision: Alessandro Filazzola, Marc T. J. Johnson, James Scott MacIvor.

Validation: Alessandro Filazzola.

Visualization: Alessandro Filazzola, Garland Xie.

Writing – original draft: Alessandro Filazzola.

Writing – review & editing: Alessandro Filazzola, Garland Xie, Kimberly Barrett, Andrea Dunn, Marc T. J. Johnson, James Scott MacIvor.

References

1. Riahi K, van Vuuren DP, Kriegler E, Edmonds J, O'Neill BC, Fujimori S, et al. The Shared Socioeconomic Pathways and their energy, land use, and greenhouse gas emissions implications: An overview. Glob Environ Chang. 2017; 42: 153–168. https://doi.org/10.1016/j.gloenvcha.2016.05.009
2. Nations U. Transforming our world: the 2030 Agenda for Sustainable Development. 2015.
3. Cadotte MW, Yasui SLE, Livingstone S, MacIvor JS. Are urban systems beneficial, detrimental, or indifferent for biological invasion? Biol Invasions. 2017; 19: 3489–3503. https://doi.org/10.1007/s10530-017-1586-y
4. Shochat E, Lerman SB, Anderies JM, Warren PS, Faeth SH, Nilon CH. Invasion, Competition, and Biodiversity Loss in Urban Ecosystems. Bioscience. 2010; 60: 199–208. https://doi.org/10.1525/bio.2010.60.3.6
5. McDonnell MJ, Pickett STA, Groffman P, Bohlen P, Pouyat R V, Zipperer WC, et al. Ecosystem Processes Along an Urban-to-Rural Gradient BT—Urban Ecology: An International Perspective on the Interaction Between Humans and Nature. In: Marzluff JM, Shulenberger E, Endlicher W, Alberti M, Bradley G, Ryan C, et al., editors. Boston, MA: Springer US; 2008. pp. 299–313. https://doi.org/10.1007/978-0-387-73412-5_18
6. Mason S, Newsome D, Moore S, Admiraal R. Recreational trampling negatively impacts vegetation structure of an Australian biodiversity hotspot. Biodivers Conserv. 2015; 24: 2685–2707. https://doi.org/10.1007/s10531-015-0957-x
7. Jim CY, Chen WY. Recreation–amenity use and contingent valuation of urban greenspaces in Guangzhou, China. Landsc Urban Plan. 2006; 75: 81–96. https://doi.org/10.1016/j.landurbplan.2004.08.008

8. Grzyb T, Kulczyk S, Derek M, Woźniak E. Using social media to assess recreation across urban green spaces in times of abrupt change. Ecosyst Serv. 2021; 49: 101297. https://doi.org/10.1016/j.ecoser.2021.101297

9. Nutsford D, Pearson AL, Kingham S. An ecological study investigating the association between access to urban green space and mental health. Public Health. 2013; 127: 1005–1011. https://doi.org/10.1016/j.puhe.2013.08.016 PMID: 24262442

10. Lee ACK, Maheswaran R. The health benefits of urban green spaces: a review of the evidence. J Public Health (Bangkok). 2011; 33: 212–222. https://doi.org/10.1093/pubmed/fdq068 PMID: 20833671

11. Rice WL, Mateer TJ, Reigner N, Newman P, Lawhon B, Taff BD. Changes in recreational behaviors of outdoor enthusiasts during the COVID-19 pandemic: analysis across urban and rural communities. J Urban Ecol. 2020; 6: juaa020. https://doi.org/10.1093/jue/juaa020

12. Volenec ZM, Abraham JO, Becker AD, Dobson AP. Public parks and the pandemic: How park usage has been affected by COVID-19 policies. PLoS One. 2021; 16: e0251799. Available: https://doi.org/10.1371/journal.pone.0251799 PMID: 34010353

13. Venter ZS, Barton DN, Gundersen V, Figari H, Nowell M. Urban nature in a time of crisis: Recreational use of green space increases during the COVID-19 outbreak in Oslo, Norway. Environ Res Lett. 2020; 15: 104075.

14. Lynn NA, Brown RD. Effects of recreational use impacts on hiking experiences in natural areas. Landsc Urban Plan. 2003; 64: 77–87. https://doi.org/10.1016/S0169-2046(02)00202-5

15. Marion JL. A Review and Synthesis of Recreation Ecology Research Supporting Carrying Capacity and Visitor Use Management Decisionmaking. J For. 2016; 114: 339–351. https://doi.org/10.5849/jof.15-062

16. D'Antonio A, Monz C, Newman P, Lawson S, Taff D. Enhancing the utility of visitor impact assessment in parks and protected areas: A combined social–ecological approach. J Environ Manage. 2013; 124: 72–81. https://doi.org/10.1016/j.jenvman.2013.03.036 PMID: 23624424

17. Ward P, McKenzie TL, Cohen D, Evenson KR, Golinelli D, Hillier A, et al. Physical activity surveillance in parks using direct observation. Prev Chronic Dis. 2014; 11: 130147. https://doi.org/10.5888/pcd11.130147 PMID: 24384304

18. Tenkanen H, Di Minin E, Heikinheimo V, Hausmann A, Herbst M, Kajala L, et al. Instagram, Flickr, or Twitter: Assessing the usability of social media data for visitor monitoring in protected areas. Sci Rep. 2017; 7: 17615. https://doi.org/10.1038/s41598-017-18007-4 PMID: 29242619

19. Donahue ML, Keeler BL, Wood SA, Fisher DM, Hamstead ZA, McPhearson T. Using social media to understand drivers of urban park visitation in the Twin Cities, MN. Landsc Urban Plan. 2018; 175: 1–10. https://doi.org/10.1016/j.landurbplan.2018.02.006

20. Wilkins EJ, Wood SA, Smith JW. Uses and Limitations of Social Media to Inform Visitor Use Management in Parks and Protected Areas: A Systematic Review. Environ Manage. 2021; 67: 120–132. https://doi.org/10.1007/s00267-020-01373-7 PMID: 33063153

21. Filazzola A, Cahill JF Jr. Replication in field ecology: Identifying challenges and proposing solutions. Methods Ecol Evol. 2021; 12: 1780–1792. https://doi.org/10.1111/2041-210X.13657

22. Jimenez MF, Pejchar L, Reed SE. Tradeoffs of using place-based community science for urban biodiversity monitoring. Conserv Sci Pract. 2021; 3: e338.

23. Callaghan CT, Ozeroff I, Hitchcock C, Chandler M. Capitalizing on opportunistic citizen science data to monitor urban biodiversity: A multi-taxa framework. Biol Conserv. 2020; 251: 108753. https://doi.org/10.1016/j.biocon.2020.108753

24. ConservationHalton. Strategic Forest Management Plan. Conservtion Halton. 2020. Available: https://www.conservationhalton.ca/wp-content/uploads/2022/07/SFMP-Full-Plan-2020_Final_Oct.9.2020.pdf

25. ConservationHalton. Conservation Halton's Annual Report. 2021. Available: https://www.conservationhalton.ca/about-us/annual-reports/

26. StatisticsCanada. Census subdivision of Milton, T—Ontario. In: Focus on Geography Series, 2011 Census [Internet]. 2011. Available: https://www12.statcan.gc.ca/census-recensement/2011/as-sa/fogs-spg/Facts-csd-eng.cfm?LANG=Eng&GK=CSD&GC=3524009

27. Korpilo S, Virtanen T, Lehvävirta S. Smartphone GPS tracking—Inexpensive and efficient data collection on recreational movement. Landsc Urban Plan. 2017; 157: 608–617.

28. Ladle A, Galpern P, Doyle-Baker P. Measuring the use of green space with urban resource selection functions: An application using smartphone GPS locations. Landsc Urban Plan. 2018; 179: 107–115.

29. Nepal SK, Way P. Comparison of vegetation conditions along two backcountry trails in Mount Robson Provincial Park, British Columbia (Canada). J Environ Manage. 2007; 82: 240–249. https://doi.org/10.1016/j.jenvman.2005.12.016 PMID: 16580125

30. Barros A, Aschero V, Mazzolari A, Cavieres LA, Pickering CM. Going off trails: How dispersed visitor use affects alpine vegetation. J Environ Manage. 2020; 267: 110546. https://doi.org/10.1016/j.jenvman.2020.110546 PMID: 32421663

31. Tomczyk AM. A GIS assessment and modelling of environmental sensitivity of recreational trails: The case of Gorce National Park, Poland. Appl Geogr. 2011; 31: 339–351. https://doi.org/10.1016/j.apgeog.2010.07.006

32. Obile W. Ericsson mobility report. Nov. 2016.

33. van Biljon J, Kotzé P. Modelling the Factors That Influence Mobile Phone Adoption. Proceedings of the 2007 Annual Research Conference of the South African Institute of Computer Scientists and Information Technologists on IT Research in Developing Countries. New York, NY, USA: Association for Computing Machinery; 2007. pp. 152–161. https://doi.org/10.1145/1292491.1292509

34. Baishya K, Samalia HV. Factors Influencing Smartphone Adoption: A Study in the Indian Bottom of the Pyramid Context. Glob Bus Rev. 2019; 21: 1387–1405. https://doi.org/10.1177/0972150919856961

35. CRTR CR and TC. Communications Monitoring Report. Ottawa, Canada; 2018. Available: https://crtc.gc.ca/pubs/cmr2018-en.pdf

36. Vogels EA. Some digital divides persist between rural, urban and suburban America. Pew Res Center, August. 2021;19.

37. Lin K, Kansal A, Lymberopoulos D, Zhao F. Energy-accuracy aware localization for mobile devices. Proceedings of 8th International Conference on Mobile Systems, Applications, and Services (MobiSys' 10). 2010.

38. Hess B, Farahani AZ, Tschirschnitz F, von Reischach F. Evaluation of Fine-Granular GPS Tracking on Smartphones. Proceedings of the First ACM SIGSPATIAL International Workshop on Mobile Geographic Information Systems. New York, NY, USA: Association for Computing Machinery; 2012. pp. 33–40. https://doi.org/10.1145/2442810.2442817

39. de Montjoye Y-A, Hidalgo CA, Verleysen M, Blondel VD. Unique in the Crowd: The privacy bounds of human mobility. Sci Rep. 2013; 3: 1376. https://doi.org/10.1038/srep01376 PMID: 23524645

40. UnitedNations. Mapping the risk-utility landscape: mobile data for sustainable development and humanitarian action. Glob Pulse Proj Ser no18. 2015.

41. Zook M, Barocas S, boyd danah, Crawford K, Keller E, Gangadharan SP, et al. Ten simple rules for responsible big data research. PLOS Comput Biol. 2017; 13: e1005399. Available: https://doi.org/10.1371/journal.pcbi.1005399 PMID: 28358831

42. Moro E, Calacci D, Dong X, Pentland A. Mobility patterns are associated with experienced income segregation in large US cities. Nat Commun. 2021; 12: 4633. https://doi.org/10.1038/s41467-021-24899-8 PMID: 34330916

43. Boyd D, Crawford K. Critical questions for big data: Provocations for a cultural, technological, and scholarly phenomenon. Information, Commun \& Soc. 2012; 15: 662–679.

44. Brdar S, Novović O, Grujić N, González—Vélez H, Truicua C-O, Benkner S, et al. Big data processing, analysis and applications in mobile cellular networks. High-Performance Modelling and Simulation for Big Data Applications. Springer, Cham; 2019. pp. 163–185.

45. Sinclair M, Mayer M, Woltering M, Ghermandi A. Using social media to estimate visitor provenance and patterns of recreation in Germany's national parks. J Environ Manage. 2020; 263: 110418. https://doi.org/10.1016/j.jenvman.2020.110418 PMID: 32883482

46. Newsome D, Dowling R, Leung Y-F. The nature and management of geotourism: A case study of two established iconic geotourism destinations. Tour Manag Perspect. 2012; 2–3: 19–27. https://doi.org/10.1016/j.tmp.2011.12.009

47. Gstaettner AM, Kobryn HT, Rodger K, Phillips M, Lee D. Monitoring visitor injury in protected areas—analysis of incident reporting in two Western Australian parks. J Outdoor Recreat Tour. 2019; 25: 143–157. https://doi.org/10.1016/j.jort.2018.04.002

48. Home R, Hunziker M, Bauer N. Psychosocial outcomes as motivations for visiting nearby urban green spaces. Leis Sci. 2012; 34: 350–365.

49. Frick J, Degenhardt B, Buchecker M, others. Predicting local residents' use of nearby outdoor recreation areas through quality perceptions and recreational expectations. For Snow Landsc Res. 2007; 81: 31–41.

50. Rossi SD, Byrne JA, Pickering CM, Reser J. 'Seeing red' in national parks: How visitors' values affect perceptions and park experiences. Geoforum. 2015; 66: 41–52. https://doi.org/10.1016/j.geoforum.2015.09.009

51. Metzger FT. Ostrya virginiana (Mill.) K. Koch: eastern hophornbeam. RM Burn B H Honkala, Tech Coord Silvics North Am USDA For Serv Washington, DC, USA. 1990; 490–496.

52. Frelich LE, Lorimer CG. Natural disturbance regimes in hemlock-hardwood forests of the upper Great Lakes region. Ecol Monogr. 1991; 61: 145–164.

53. Tanentzap AJ, Bazely DR, Koh S, Timciska M, Haggith EG, Carleton TJ, et al. Seeing the forest for the deer: Do reductions in deer-disturbance lead to forest recovery? Biol Conserv. 2011; 144: 376–382. https://doi.org/10.1016/j.biocon.2010.09.015

54. Filazzola A, Tanentzap AJ, Bazely DR. Estimating the impacts of browsers on forest understories using a modified index of community composition. For Ecol Manage. 2014; 313: 10–16.

55. Thompson SA, Warzel C. Twelve million phones, one dataset, zero privacy. New York, NY, USA: New York Times; 2019.

56. Monsivais D, Ghosh A, Bhattacharya K, Dunbar RIM, Kaski K. Tracking urban human activity from mobile phone calling patterns. PLOS Comput Biol. 2017; 13: e1005824. Available: https://doi.org/10.1371/journal.pcbi.1005824 PMID: 29161270

57. Lee HT, W.D. B, Riley J, Bowles J, Puddister M, Uhlig P, et al. Ecological Land Classification for Southern Ontario: First approximation and its application. Ontario Minist Nat Resour. 1998; SCSS Field Guide FG-02.

58. Crins WJ, Gray PA, P.W.C. U. The Ecosystems of Ontario, Part 1: Ecozones and Ecoregions. Peterborough, Canada: Ontario Ministry of Natural Resources; 2007.

59. Roberts-Pichette P, Gillespie LJ. Terrestrial vegetation biodiversity monitoring protocols. Ecological Monitoring Coordinating Office, Canada Centre for Inland Waters; 1999.

60. Legendre P, Oksanen J, ter Braak CJF. Testing the significance of canonical axes in redundancy analysis. Methods Ecol Evol. 2011; 2: 269–277. https://doi.org/10.1111/j.2041-210X.2010.00078.x

61. R Core Team. R: A language and environment for statistical computing. R Found Stat Comput Vienna, Austria. 2019; URL https://www.R-project.org/.

62. Filazzola A, Xie G, Dunn A, Barrett K, Johnson MTJ, MacIvor JS. Patterns of human activity in green spaces managed by Conservation Halton using anonymized locations of smart devices. figshare. 2022.

Conservation Halton

April 2023

REPORT TO: **Conservation Halton Board**

REPORT NO: # CHB 04 23 03

FROM: Craig Machan, Director, Parks and Operations

DATE: April 20, 2023

SUBJECT: **HKD Exclusive Vendor (Sole Source)**

Recommendation

THAT the Conservation Halton Board **approves the purchase of $144,691 plus HST for snowmaking equipment from HKD Snowmakers;**

And

THAT the Conservation Halton Board **approves HKD Snowmakers as the exclusive vendor for Glen Eden snowmaking equipment.**

Report

The impacts of climate change have made it imperative for Glen Eden to have a modern and efficient snowmaking system to continue its operations. Over the past few seasons, the snowmaking department has undertaken significant improvements to both the infrastructure and the system itself. This has enabled staff to produce high-quality snow at higher temperatures and increases the overall efficiency of the snowmaking process.

In 2021, staff invested in digital snowmaking solutions and purchased twenty (20) new snow guns from HKD Snowmakers. The HKD products have been utilized both on the ski hill and in the pumphouse, resulting in optimized system usage and improved user experience. In 2022, eleven (11) additional guns and hoses were purchased to replace outdated equipment, further enhancing the uniformity and efficiency of the system.

To further enhance the uniformity and user-friendliness of our snowmaking system, we strongly recommend replacing remaining outdated equipment with high-efficiency products from HKD Snowmakers. This upgrade will enable Glen Eden to continue improving the efficiency and innovation of its snow production, while ensuring that equipment across the hill is standardized and easy to operate. By investing in a modern snowmaking system, Glen Eden can maintain its operations and provide excellent ski experiences to customers, all while minimizing the resort's impact on the environment."

Impact on Strategic Priorities

This report supports the Momentum priority of Nature and Parks:

- Implement new tools to enhance customer experience and streamline internal operations.

Financial Impact

Given the significant contribution of HKD equipment to Glen Eden's snowmaking infrastructure, CH staff recommends sourcing products from this company. However, if the quality of HKD's products declines, the pricing becomes unreasonable, or if their products are no longer available, the staff will follow the established procurement process to identify and source suitable alternatives.

In line with our commitment to maintaining the highest quality equipment, we are requesting a total of $144,691 plus HST in 2023 for HKD to provide ten (10) snowmaking tower guns, consisting of two (2) 2-foot sled guns, three (3) 10-foot Tower Guns, three (3) 20-foot tower guns, and two (2) 30-foot tower guns. Additionally, we are requesting two (2) sled-mounted fan guns and thirty-four (34) snowmaking hoses in a variety of sizes.

We believe that this investment will enable Glen Eden to continue improving the efficiency and effectiveness of our snowmaking operations, while ensuring that we remain environmentally sustainable.

Signed & respectfully submitted:

Craig Machan
Director, Parks & Operations

Approved for circulation:

Hassaan Basit
President & CEO/Secretary-Treasurer

FOR QUESTIONS ON CONTENT: Justin Silva, Senior Manager, Operations, jsilva@hrca.on.ca

EPORT TO: **Conservation Halton Board**

REPORT NO: # CHB 04 23 04

FROM: Kellie McCormack, Director, Planning & Regulations

DATE: April 20, 2023

SUBJECT: **Proposed re-development of 3540-3548 Commerce Court, City of Burlington**

Recommendation

THAT the Conservation Halton Board **approves the issuance of a permit for the construction of two structural columns and a portion of a wall associated with a residential building within 7.5 metres of the flood hazard associated with Tuck Creek, 3540–3548 Commerce Court, City of Burlington.**

And

THAT the Conservation Halton Board **receives for information the Staff report entitled "Proposed re-development of 3540-3548 Commerce Court, City of Burlington".**

Executive Summary

An applicant is proposing to construct a six-storey residential building at 3540-3548 Commerce Court in the City of Burlington. Although most of the works will be located outside of Conservation Halton's (CH) regulated area, a permit is required for two structural columns and a portion of the building's wall within CH's 7.5 metre regulatory allowance. A permit is also required for a parking lot and grading works which will involve a minor floodplain alteration; however, these works meet CH's regulatory policies.

The applicant previously submitted a Site Plan Application to the City of Burlington in 2019 to construct a multi-use building on 3548 Commerce Court. Based on the information available at that time, the subject property was not identified as regulated by CH. In 2020, the City completed the Tuck Creek Environmental Assessment (EA) which revealed that the flood hazard associated with Tuck Creek in this area is larger than previously understood. Based on EA findings and the text of *Ontario Regulation 162/06*, any areas within Tuck Creek watershed that meet those described in the regulation, are considered regulated by CH. That same year, the applicant also purchased the neighbouring property (3540 Commerce Court) and reached out to CH to discuss a redesign of both 3548 and 3540 Commerce Court. CH advised that the recently completed EA identified that 3548 Commerce Court contains a flood hazard, and that the property is regulated by CH. The applicant and their agent worked with CH staff to re-design the proposed residential building so that it would be located outside of the flood hazard.

The two structural columns and a portion of the building wall will be located approximately 3 metres from the limit of the flood hazard at its closest point. The structural columns and wall do not meet CH's Board approved policy which states no new development is permitted within 7.5 metres of the floodplain, except where provided for by policy. Staff can only issue permits that meet Board-

approved policies. Staff recommends approval of the proposed works as the applicant has demonstrated that the applicable regulatory test (i.e., the control of flooding) can be met, and safe access and egress to and within the site will be maintained.

Report

Background/Proposal

The subject property is located at 3540-3548 Commerce Court in the City of Burlington (Appendix C: Figure 1). The property is adjacent to Tuck Creek and contains a portion of the flooding hazard associated with that watercourse. Conservation Halton (CH) regulates 7.5 metres from the flooding hazard associated with Tuck Creek.

CH received a permit application for the construction of a six-storey residential building and associated on grade parking (Appendix C: Figure 2). Although most of the works will be located outside of CH's regulated area, a permit is required for two structural columns and a portion of the building's wall, which are located within CH's 7.5 metre regulatory allowance. A permit is also required for a parking lot and grading works which will involve a minor floodplain alteration; however, these works meet CH's regulatory policies. No basement or underground parking are proposed.

The applicant previously submitted a Site Plan Application to the City of Burlington in 2019 to construct a multi-use building on 3548 Commerce Court, Burlington. Based on the information available at that time, the subject property was not identified as regulated by CH and staff did not object to the approval of the Site Plan Application.

In 2020, the City completed the Tuck Creek Environmental Assessment (EA) which revealed that the flood hazard associated with Tuck Creek is larger than previously understood. This EA study is considered the best available information for understanding the magnitude and extent of the hazard in this area, for assessing potential risk to life and property, identifying areas requiring further analysis, and for decision making when development is contemplated in hazardous areas.

Based on the EA findings, and the text of *Ontario Regulation 162/06*, any areas within Tuck Creek watershed that meet those described in the regulation, are considered regulated by CH. This includes the flooding and erosion hazards associated with Tuck Creek, as well as an associated 7.5 metre regulatory allowance.

In 2020, the applicant purchased the neighbouring property (3540 Commerce Court) and reached out to CH to discuss a redesign of both 3548 and 3540 Commerce Court. CH advised that, based on the recently completed EA, 3548 Commerce Court contained a flood hazard, and the property is regulated by CH. The applicant and their agent worked with CH staff to re-design the proposed residential building so that it is located outside of the flood hazard, as well as outside of the associated 7.5 metre regulatory allowance, to the extent possible. Only a small portion of the building (i.e., two structural columns and a portion of a wall associated with the proposed building) are within CH's regulatory allowance, which is approximately 3 metres from the limit of the flood hazard at its closest point (Appendix D: Figure 2).

CH Policy Review

CH has regulatory policies that allow for re-development of existing uses and some limited new development within CH's regulatory allowances. For example, CH Policy 2.27.1 permits reconstructions or additions, Policy 2.27.2.1 permits non-habitable accessory structures on already developed lots, and Policy 2.27.2.3 allows non-structural works (grading). However, given that a portion of the site is currently vacant, the works are considered new development not redevelopment of existing uses, these policies cannot be met. CH's regulatory policies do not currently contemplate new residential development within 7.5 metres of the flood hazard.

The regulatory policy that would then apply to this situation is Policy 2.27.2.4: *Minor Valley Systems – Development within 7.5 metres of Flood Plain* which states:

> **2.27.2.4** Except as provided for in Policies 2.27.2.1 – 2.27.2.3, no new development is permitted within 7.5 metres of the flood plain.

The intent of Policy 2.27.2.4 is to limit development within CH regulated lands. The intent is also to provide for an access allowance to ensure there is a large enough safety zone for people and vehicles to enter and exit an area during an emergency (e.g., flood hazard).

The applicant worked with CH staff to improve the original design so that the proposed residential building will be located entirely outside of the flood hazard and CH's regulated area, with the exception of two structural columns and portion of a wall associated with the residential building, which will be located approximately 3 metres from the limit of the flood hazard at its closest point. A parking lot is also proposed within CH's regulated area; however, those works meet CH Policy 2.24.4 (Parking Lots). Safe access to and within the site will be maintained. The grading works to facilitate a minor floodplain alteration meet CH Policy 2.19.2.

Strict adherence to CH's minor valley systems regulatory policies would limit development of the subject property. CH staff can only issue permits that meet CH's Board-approved regulatory policies and policy exceptions require Board approval.

<u>Recommendation</u>

The applicant has demonstrated through the information submitted that the applicable regulatory test (i.e., the control of flooding) can be met. They have confirmed that:

a) Redevelopment of the site is unlikely to affect the control of flooding or to create a condition or circumstance that, in the event of a natural hazard, might jeopardize the health or safety of persons or result in damage or destruction of property;

b) The proposed residential building will be located entirely outside of CH's regulated area, with the exception of two structural columns and portion of the building wall, which will maintain a minimum 3 metre setback from the limit of the flood hazard at its closest point;

c) The proposed works will maintain safe access and egress to and within the site (i.e., proposed works will not impede access).

In light of the above, staff recommends that the CH Board approve the construction of columns and a portion of a wall associated with a proposed residential building within 7.5 metres of the flooding hazard associated with Tuck Creek, 3540-3548 Commerce Court, Burlington.

Impact on Strategic Priorities

This report supports the Momentum priority of Natural Hazards and Water.

Financial Impact

There is no financial impact resulting from this proposal.

Signed & respectfully submitted:

Kellie McCormack
Director, Planning & Regulations

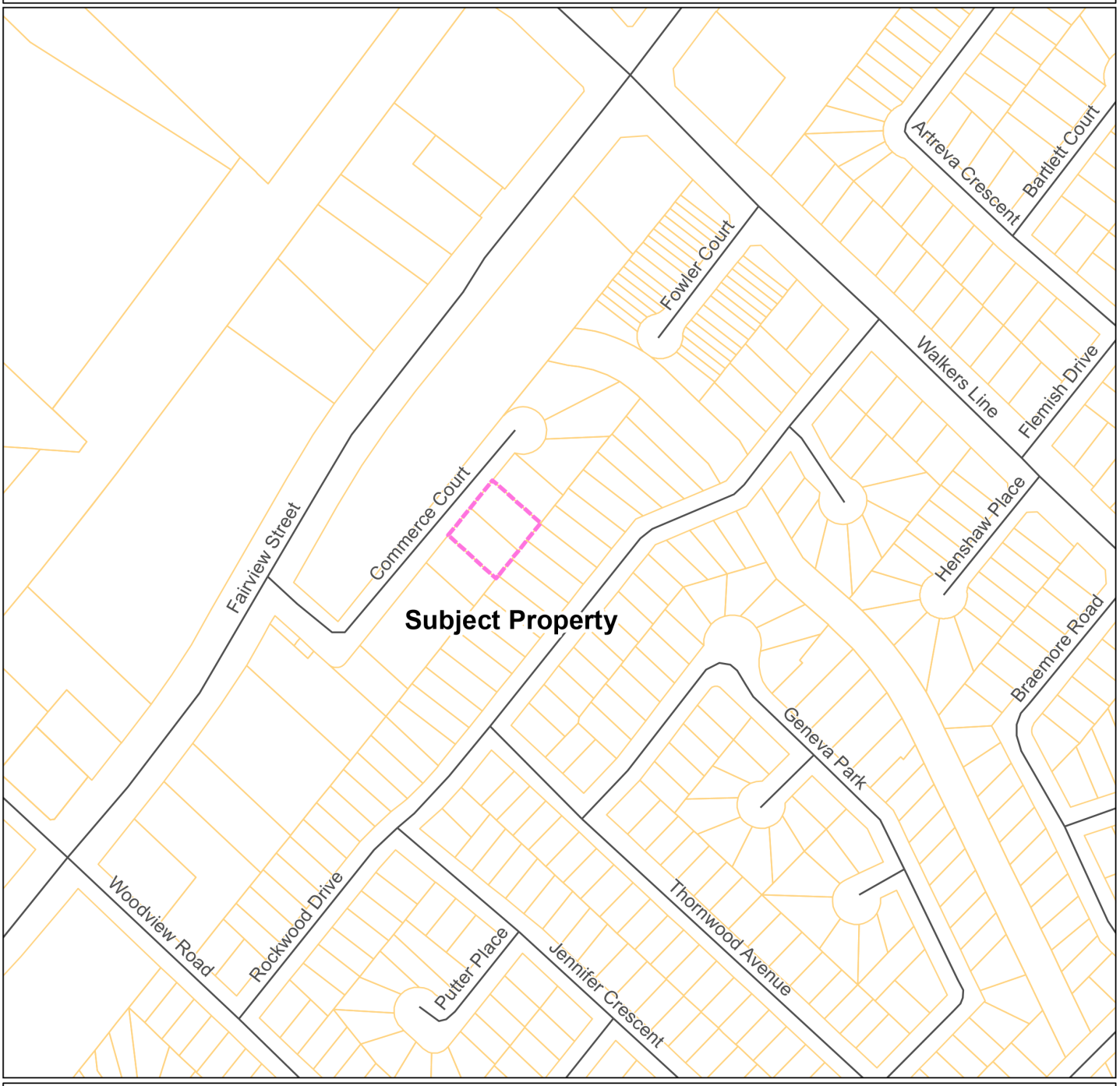
Approved for circulation:

Hassaan Basit
President & CEO/Secretary-Treasurer

FOR QUESTIONS ON CONTENT: Ola Panczyk, Environmental Planner
opanczyk@hrca.on.ca

Appendix C

Figure 1: Key Map of 3540 and 3548 Commerce Court, Burlington



Legend

Subject Property:
3540-3548 Commerce Court, Burlington

Transportation Network

Parcels

0 25 50 100 150 Metres

Appendix D

Conservation Halton

Figure 2: Proposed works within CH's 7.5 metre regulatory allowance

Legend

- Floodplain
- 7.5 metre regulatory allowance
- Structural columns
- Building wall

Map not to scale

Conservation Halton

April 2023

REPORT TO: **Conservation Halton Board**

REPORT NO: # CHB 04 23 05

FROM: Kellie McCormack, Director, Planning & Regulations

DATE: April 20, 2023

SUBJECT: **iConnect North – Proposed Development of 522 Highway 6 and 30 and 50 Horseshoe Crescent, City of Hamilton**

Recommendation

THAT the Conservation Halton Board **approves site-specific permit requirements to allow for the proposed access road and associated wetland replication;**

And

THAT the Conservation Halton Board **directs to staff issue a permit for the proposed access road and associated wetland replication, if staff are satisfied that all requirements are met;**

And

THAT the Conservation Halton Board **receives for information the Staff report entitled "iConnect North – Proposed Development of 522 Highway 6 and 30 and 50 Horseshoe Crescent, City of Hamilton".**

Executive Summary

A Draft Plan of Subdivision, Official Plan Amendment, and Zoning Bylaw Amendment was submitted for lands, referred to as iConnect North, at the northeast corner of Highway 5 and Highway 6 in the City of Hamilton. The proposed development consists of residential uses and associated infrastructure, including a legal access road. The access road was identified in an Environmental Assessment (EA), prepared by the Ministry of Transportation (MTO), related to proposed improvements to the Highway 6 and Dundas Street (Highway 5) intersection. The legal access road is necessary public infrastructure to ensure properties along Dundas Street (Highway 5) will continue to have access after the future interchange works are completed; however, it will bisect and significantly alter a wetland. The EA demonstrates the need for the access road and the applicant has demonstrated that the function of the wetland will be replicated and net gain achieved. Staff is satisfied that the information submitted provides sufficient justification for the proposed wetland replication; however, wetland replications are not currently contemplated within CH's policy framework. CH staff recommends the CH Board approve the site-specific permit requirements that, if met, would allow staff to issue a permit for the proposed access road and associated wetland replication. CH staff can only issue permits that meet CH's Board-approved regulatory policies, any policy exception requires CH Board approval.

Report

Background/Proposal

Subject Property

The subject lands, referred to as 'iConnect North', are bounded by Highway 6 to the west, Dundas Street East to the south, Parkside Drive to the north, and Clappison Avenue to the east (Appendix E: Figure 1). The subject lands are on a watershed divide, such that a portion of the site's drainage flows north towards Borer's Creek in Hamilton Conservation Authority's (HCA) jurisdiction, and the balance of the drainage flows south towards Grindstone Creek in Conservation Halton's (CH) jurisdiction.

The iConnect North lands contain a wetland (0.9 hectares in size) that is regulated by CH under *Ontario Regulation 162/06*. CH regulates a distance of 30 metres from wetlands less than 2 hectares.

Previous Studies and Applications

An Environmental Assessment (EA) was prepared in 2003 by the Ministry of Transportation (MTO), which identified proposed improvements to the Highway 6 and Dundas Street (Highway 5) intersection, as well as two potential access road locations. The proposed road is necessary, as it is to provide an alternate route for properties that are expected to lose their existing access along Dundas Street once the Dundas Street and Highway 6 intersection is reconfigured.

In 2006, a Draft Plan of Subdivision (referred to as the 'Flamborough Power Centre; File No. 25T-200404) was approved for these lands for "big-box" commercial uses. At that time, the approved draft plan conditions included the following condition, as requested by MTO:

> *Condition 67 – that legal road access shall be provided from the internal subdivision road (Street B) through Block 5 to the abutting lands to the south, to the satisfaction of the Ministry of Transportation, should the lands to the south remain in separate ownership at the time of registration of the plan of subdivision.*

Since the time of the EA and the 2006 Draft Plan Approval, a regulated wetland less than 2 ha in size was identified on the subject site. The proposed legal access road will bisect the wetland.

Current Development Applications

In 2019, a Draft Plan of Subdivision (25T-2019005), Official Plan Amendment (UHOPA-19-012), and Zoning Bylaw Amendment (ZAC-19-044) was submitted to the City of Hamilton for the subject lands. These applications would allow for a broader range of land uses and building forms than the originally approved Draft Plan of Subdivision and are proposed to create a more complete community, referred to as the iConnect Community.

The proposed development for the iConnect North Community consists of residential uses and associated infrastructure, as well as the legal access road discussed above. The City of Hamilton has confirmed with the MTO that this access road is still required to ensure properties retain access after the construction of the Highway 5/6 interchange.

The above-referenced applications were appealed to the Ontario Lands Tribunal (OLT) in early 2022 for lack of decision by the City of Hamilton. CH sought party status to ensure that CH's regulatory responsibilities are considered.

Proposed Wetland Replication

At the time of the EA and original Draft Plan of Subdivision, no wetlands were identified on the subject site. In 2019, as part of the current development applications, CH identified a regulated wetland on the subject lands. The wetland is not considered Provincially Significant and is approximately 0.9 hectares in size.

The proposed legal access road will bisect the wetland. It is not feasible to retain the wetland in-situ, as its form and function will be significantly impacted. CH staff worked with the applicant to identify how the wetland's function may be replicated within the watershed subcatchment and to ensure that it was not entirely lost from the landscape.

The applicant submitted the following in support of the proposed wetland replication:

- A wetland restoration strategy that justifies the wetland replication and demonstrates that the function will be replicated and net gain achieved;
- A general concept and guiding principles for the wetland restoration, including a commitment that the replicated wetland will be connected to existing natural features and with improved habitat function and diversity (details to be confirmed at detailed design); and
- A confirmed site for wetland restoration within the same watershed subcatchment.

CH Policy

CH has regulatory policies that allow for the crossing of a wetland if required for public infrastructure purposes. CH Policy 2.48 allows public infrastructure to cross hazardous lands, valleylands, wetlands or shorelines, where need is demonstrated and there is no reasonable alternative. Wetlands may be crossed provided it is supported by an Environmental Assessment or equivalent comprehensive study. However, the proposed scenario is not contemplated within CH's current policy framework, as the proposed legal access road will significantly alter the wetland, necessitating offsite replication, rather than a simple crossing over the wetland. Since CH staff only has delegated authority to issue permissions for works that meet CH's Board-approved regulatory policies, Board approval is required for any policy exception. The applicant is seeking an exception to CH's regulatory policies to enable CH staff to issue a permit for the proposed development, after the OPA, ZBLA and Plan of Subdivision are approved.

Analysis

The EA prepared by the MTO has demonstrated the need for a legal access road which bisects a wetland and that there is no reasonable alternative. Based on a review of the information submitted, staff is satisfied that the applicant has provided comprehensive justification for the proposed wetland replication and has also demonstrated that the wetland post-development scenario will be replicated with improved overall function compared to the existing wetland condition. Detailed designs to support the wetland replication will be provided through future *Planning Act* and CH Permit Applications. In addition to CH's general permit requirements, the recommended site-specific permit-requirements are:

1. A wetland water balance assessment confirming the detailed design approach and wetland types to be replicated for review and comment to the satisfaction of CH; and,
2. Detailed design of the wetland, including a landscape plan for the proposed wetland vegetation seed mix/plantings.

In addition, the applicant has demonstrated that the applicable regulatory tests (i.e., conservation of land and control of flooding) can be met. They have confirmed that:

a) redevelopment of the site is unlikely to affect the control of flooding or to create a condition or circumstance that, in the event of a Regulatory storm, might jeopardize the health or safety of persons or result in damage or destruction of property; and,
b) the function of the wetland will be replicated and net gain achieved, and the replicated wetland will be located in the same watershed subcatchment.

Conclusion/Recommendation

The proposed scenario is not contemplated within CH's current policy framework; however, the EA prepared by the MTO demonstrates the need for the access road, and the applicant has demonstrated that the function of the wetland will be replicated and net gain achieved. Staff is satisfied that the information submitted provides comprehensive justification for the proposed wetland replication. CH staff recommends the CH Board approve the site-specific permit requirements that, if met, would allow staff to issue a permit for the proposed access road and associated wetland replication.

Impact on Strategic Priorities

This report supports the Momentum priority of Natural Hazards and Water

Financial Impact

There is no financial impact resulting from this proposal.

Signed & respectfully submitted:

Kellie McCormack
Director, Planning & Regulations

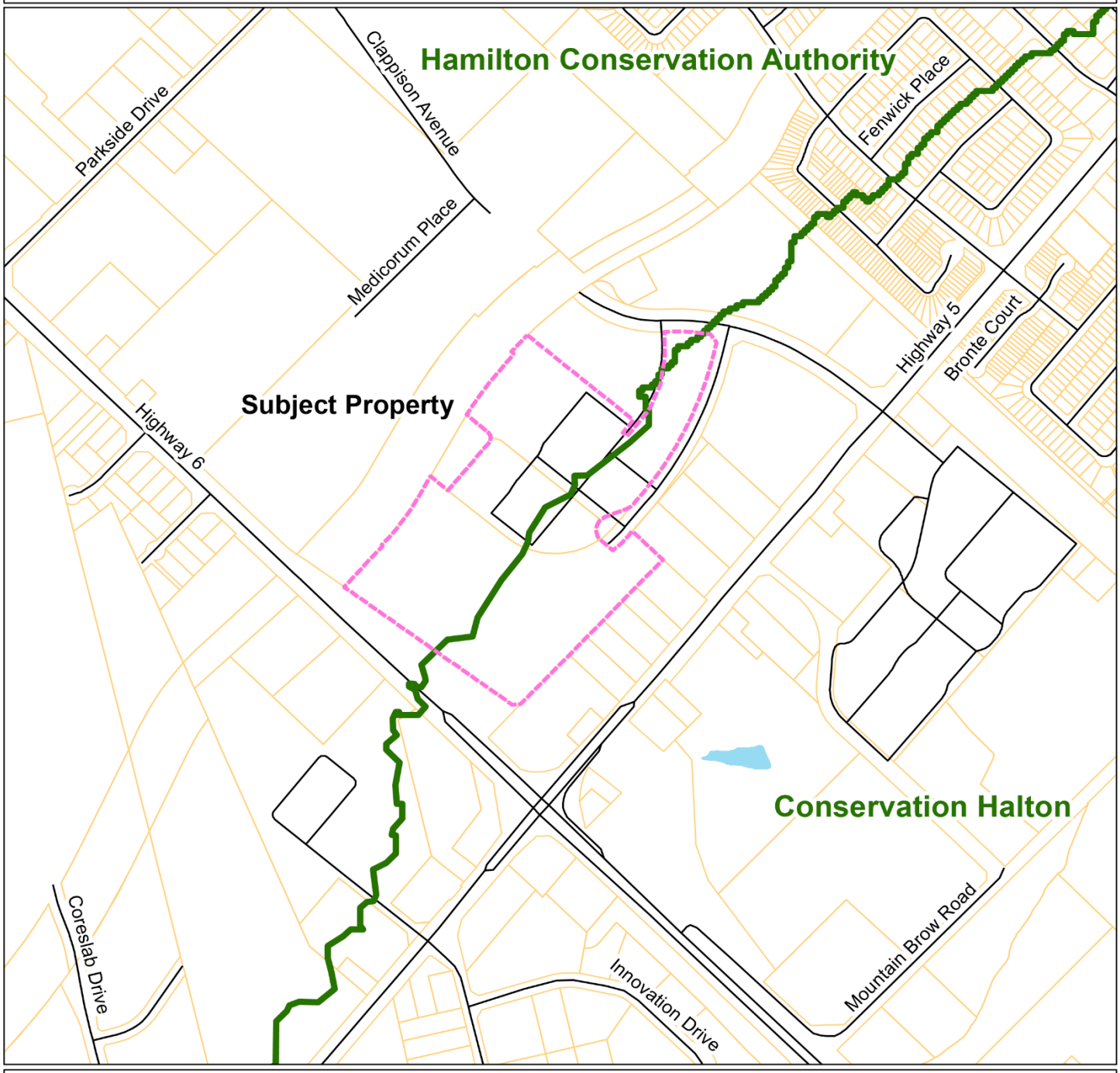
Approved for circulation:

Hassaan Basit
President & CEO/Secretary-Treasurer

FOR QUESTIONS ON CONTENT: Ola Panczyk, Environmental Planner
opanczyk@hrca.on.ca

Appendix E

Figure 1: Key Map of 522 Highway 6, 30 and 50 Horseshoe Crescent, Hamilton



Legend

- Subject Property: 522 Highway 6, 30 and 50 Horseshoe Crescent, Hamilton
- Transportation Network
- Parcels
- Jurisdictional Boundary

0 75 150 300 450 Metres

Conservation Halton

April 2023

REPORT TO: **Conservation Halton Board**

REPORT NO: # CHBD 04 23 06

FROM: Garner Beckett, Executive Director, Foundation

DATE: April 20, 2023

SUBJECT: **Reappointment of Conservation Halton Foundation Board Members**

Recommendation

THAT the Conservation Halton Board **approves the reappointment of the following Members to the Conservation Halton Foundation Board of Directors for a two-year term:**

- **Mr. Don Ford**
- **Ms. Suzanne Bevan**
- **Mr. George Caines**
- **Mr. Galen Naidoo Harris**
- **Ms. Catherine Mulvale**
- **Mr. Bryden Tait**
- **Mr. Jim Sweetlove**
- **Mr. Ed Wells**
- **Ms. Jane Wilcox**

Report

At the Conservation Halton Foundation (Foundation) Board Meeting/Annual General Meeting on April 5, 2023, members voted to reappoint the members listed above for a two-year term until April 2025.

The individuals named have demonstrated a commitment to the values and long-term strategic objectives of both Conservation Halton and the Conservation Halton Foundation.

All the individuals listed have confirmed that they will let their names stand for reappointment.

In accordance with the Foundation's By-Law, member renewal must also be approved by the Conservation Halton Board.

Impact on Strategic Goals

This report supports the Momentum strategic theme of Striving for service excellence and efficiency

Financial Impact

There is no financial impact.

Conservation Halton

April
2023

Signed & respectfully submitted:

Garner Beckett
Executive Director, Foundation

Approved for circulation:

Hassaan Basit
President & CEO/Secretary-Treasurer

FOR QUESTION ON CONTENT:

Garner Beckett, Executive Director, Foundation
gbeckett@hrca.on.ca; 905 336 1158 x 2256