

Agenda Including Addeds

Environmental and Ecological Planning Advisory Committee

The 10th Meeting of the Environmental and Ecological Planning Advisory Committee
September 19, 2019, 5:00 PM
Committee Rooms #1 and #2

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	Pages
1. Call to Order	
1.1 Disclosures of Pecuniary Interest	
2. Scheduled Items	
2.1 5:00 PM Adrienne Sones, Environmental Services Engineer - Kilally South, East Basin Environmental Assessment	
2.2 5:30 PM Linda McDougall, Ecologist and Travis Macbeth, Planner II - Draft Subject Lands Status Report - White Oak-Dingman Secondary Plan, Parsons Inc. 2019	
3. Consent	
3.1 9th Report of the Environmental and Ecological Planning Advisory Committee	2
3.2 Municipal Council resolution adopted at its meeting held on August 27, 2019, with respect to the 8th Report of the Environmental and Ecological Planning Advisory Committee	4
3.3 Environmentally Significant Areas Meeting Minutes - April and August, 2019	5
4. Sub-Committees and Working Groups	
4.1 Environmental Management Working Group Comments	10
5. Items for Discussion	
5.1 Restriction on Detonation of Fireworks in Environmentally Significant Areas	14
6. Adjournment	

Next Meeting Date: October 17, 2019

Environmental and Ecological Planning Advisory Committee

Report

The 9th Meeting of the Environmental and Ecological Planning Advisory Committee
August 15, 2019
Committee Rooms #1 and #2

Attendance PRESENT: S. Levin (Chair), I. Arturo, L. Banks, A. Bilson-Darko, A. Cleaver, R. Doyle, L. Grieves, S. Hall, J. Khan, B. Krichker, I. Mohamed, K. Moser, B. Samuels, S. Sivakumar, R. Trudeau and M. Wallace and H. Lysynski (Secretary)

ABSENT: E. Arellano, A. Boyer, R. Doyle, C. Dyck, S. Esan, P. Ferguson, S. Heuchan and I. Whiteside

ALSO PRESENT: G. Barrett, J. MacKay, L. McDougall and E. Williamson

The meeting was called to order at 5:00 PM

1. Call to Order

1.1 Disclosures of Pecuniary Interest

That it BE NOTED that M. Wallace disclosed a pecuniary interest in clauses 5.12 and 5.2 of this Report having to do with the Zoning By-law Amendment for the properties located at 800, 805 and 810 Chelton Road, by indicating that his employer has a business relationship with the applicant.

2. Scheduled Items

2.1 5:00 PM Emily Williamson, Ecologist – Environmental Management Guidelines update

That a Working Group BE ESTABLISHED consisting of S. Levin, I. Arturo, L. Banks, A. Cleaver, C. Dyck, J. Khan, B. Krichker, K. Moser and B. Samuels, to review and provide comments on the Environmental Management Guidelines; it being noted that the Environmental and Ecological Planning Advisory Committee heard the attached presentation from E. Williamson, Ecologist, with respect to this matter.

3. Consent

3.1 8th Report of the Environmental and Ecological Planning Advisory Committee

That it BE NOTED that the 8th Report of the Environmental and Ecological Planning Advisory Committee, from its meeting held on July 18, 2019, was received.

3.2 Municipal Council Resolution - 7th Report of the Environmental and Ecological Planning Advisory Committee

That it BE NOTED that the Municipal Council resolution adopted at its meeting held on July 30, 2019, with respect to the 7th Report of the Environmental and Ecological Planning Advisory Committee, was received.

4. Sub-Committees and Working Groups

None.

5. Items for Discussion

- 5.1 Notice of Planning Application - Zoning By-law Amendment - 800, 805 and 810 Chelton Road

That it BE NOTED that the Environmental and Ecological Planning Advisory Committee reviewed and received a Notice of Planning Application dated July 16, 2019, from L. Mottram, Senior Planner, with respect to the application by The Ironstone Building Company Inc., relating to the properties located at 800, 805 and 810 Chelton Road.

- 5.2 Scoped Environmental Impact Statement for the Chelton Road Development

That it BE NOTED that the Environmental and Ecological Planning Advisory Committee reviewed and received the Scoped Environmental Impact Statement relating to the properties located at 800, 805 and 810 Chelton Road.

- 5.3 Notice of Planning Application - Official Plan and Zoning By-law Amendments - 1-3 Bathurst Street and 269-281 Thames Street

That it BE NOTED that the Environmental and Ecological Planning Advisory Committee reviewed and received a Notice of Planning Application dated July 24, 2019, from C. Lowery Planner II, with respect to the application by 2497646 Ontario Ltd., relating to the properties located at 1-3 Bathurst Street and 269-281 Thames Street.

- 5.4 Notice of Study Completion - Clarke Road Improvements Municipal Class Environmental Assessment - Veterans Memorial Parkway extension to Fanshawe Park Road East

That it BE NOTED that the Environmental and Ecological Planning Advisory Committee reviewed and received a Notice of Study Completion relating to the Clarke Road Improvements Municipal Class Environmental Assessment for the Veterans Memorial Parkway extension to Fanshawe Park Road East.

6. Adjournment

The meeting adjourned at 6:18 PM.



P.O. Box 5035
300 Dufferin Avenue
London, ON
N6A 4L9

August 28, 2019

Chair and Members
Animal Welfare Advisory Committee

I hereby certify that the Municipal Council, at its meeting held on August 27, 2019 resolved:

That, the following actions be taken with respect to the 8th Report of the Environmental and Ecological Planning Advisory Committee, from its meeting held on August 8, 2019:

- a) the following actions be taken with respect to the 7th Report of the Environmental and Ecological Planning Advisory Committee from its meeting held on June 20, 2019:
 - i) the Report of the Environmental and Ecological Planning Advisory Committee from its meeting held on June 20, 2019 BE RECEIVED; and,
 - ii) the Animal Welfare Advisory Committee BE REQUESTED to review the most recent Draft "You, Your Dog and Environmentally Significant Areas" brochure and provide feedback to the Environmental and Ecological Planning Advisory Committee; and,
 - iii) the Animal Welfare Advisory Committee BE REQUESTED to provide an update to the Environmental and Ecological Planning Advisory Committee on the status of the distribution of the "Is Your Cat Safe Outdoors?" brochure; and,
- b) clauses 1.1 and 1.2, 3.2 to 3.5 inclusive, 5.1 and 5.2, BE RECEIVED for information. (2.1/14/PEC)

C. Saunders
City Clerk
/lm

cc. Chair and Members, Environmental and Ecological Planning Advisory Committee

ESA Management Committee Meeting
11 AM to 1 PM, Tuesday, April 30, 2019
UTRCA Boardroom

Membership

City - Linda McDougall, Gregg Barrett, Christine Jarvis
UTRCA - Alex Shivas, Cathy Quinlan, Christine Creighton
ESA Team - Dan Jones, Brandon Williamson, Cole Volkaert, Richard Brewer, Jacob Mehlenbacker, Owen Mueller (coop student)

1) Welcome and Introductions

- Introductions were made

2) ESA Team Operations Report

- a) **Power Point of Operations Activities** – review of Sept 2018 to Dec 2018, and Jan to April 2019 activities
- b) **Quarterly Report, Wages-to-date Summary** – reviewed

3) Environmentally Significant Areas (ESA) – Conservation Master Plans and General Updates

4a. Medway Valley Heritage Forest ESA

- Buckthorn management continues in north and Goutweed / Knotweed management and monitoring continues in south
- Phragmites management/monitoring continues in 2019
- Touch up and monitoring of 2018 invasive species work (noting all top and high restoration priorities addressed and most moderate and low are underway)
- Several encroachments under an enforcement process
- Friends of Medway Creek/City leading design for kiosk sign for Sunningdale Road West access point - funded by City.

4b. The Coves ESA

- City/Reforest London tree planting/restoration projects proposed for 2019/2020 for Briscoe Woods and west of Silver Creek ravine.
- City submitted a \$600k federal funding application for implementing stream channel restoration implementation as per CMP.
- Phragmites management/monitoring continues in 2019
- Touch up and monitoring of 2018 invasive species work

4c. Meadowlily Woods ESA

- Draft Conservation Master Plan by Natural Resource Solutions Inc.; James McKay leading process to address comments and revise report; Phase I public meeting held March 22nd 2019
- Phragmites management/monitoring continues in 2019
- Touch up and monitoring of 2018 invasive species work

4d. Westminster Ponds/Pond Mills ESA

- ESA Team continuing the adaptive management process in the Restoration Plan for the 4.0 ha buckthorn site behind tourism building.
- Boardwalk lifecycle replacements/AODA upgrades in 2019
- Phragmites management/monitoring continues in 2019

- Touch up and monitoring of 2018 invasive species work
- Several encroachments now under an enforcement process

4e. Sifton Bog ESA

- Touch up and monitoring of 2018 invasive species work

4f. Kains Woods ESA

- Kains Woods is a successful example of early detection rapid response for invasive species management.
- Touch up and monitoring of 2018 invasive species work

4g. Warbler Woods ESA

- Phragmites management/monitoring continues in 2019

4h. Kilally Meadows ESA

- DSV work continues north and south of river in 2019 including touch ups of previous work and Hypena biological control work with Silv-Econ.
- TVTA volunteer group buckthorn baggie project on north side continues, possible restoration planting in fall 2019 w ESA Team leading project.
- ESA Ecological Restoration Plan presented to the Adopt an ESA group will be finalized and posted to City website in May 2019.

4i. Lower Dingman ESA

- Touch up and monitoring of 2018 invasive species work

4j. Pottersburg Valley ESA

- Half hectare of Phragmites management in 2018, monitoring and management continues 2019
- ESA Team Ecological Restoration Plan for Oak Savannah area for 2019-2023 implementation.

4k. Kelly Stanton ESA

- Phragmites management/monitoring continues in 2019.

5) Other

a) Brochure Updates

- All nine brochures now updated (Coves, Kains, Kilally, Lower Dingman, Medway, Meadowlily, Sifton Bog, Warbler, Westminster)

b) Tree Risk Assessment Policy/Procedures Review/Update

- Includes update to backyard tree policy/procedure in discussions – Linda to tee up meeting

c) The Invasive Species Centre commends the City of London for the excellent work completed under its London Invasive Plant Management Strategy (see attached letter).

6) Next Meetings – July/Aug and Oct/Nov.



April 8, 2019

City of London, Long Range Planning and Sustainability Department
ATTN: Linda McDougall

Dear Ms. McDougall,

The Invasive Species Centre commends the City of London for the excellent work completed under its London Invasive Plant Management Strategy. Not only was London the first municipality in Ontario to create, approve and implement an invasive species strategy, but your implementation can now act as a model for other Ontario municipalities to follow. Beyond the tremendous ecological benefits of this strategy, London is enabling community-led engagement around invasive species control such as the notable buckthorn removal work undertaken at the Kilally Meadows Environmentally Significant Area.

The implementation of the strategy has been thoughtful and well-advised. Use of provincial standards for invasive species management as well as investing in biological control efforts such as those targeting purple loosestrife and dog-strangling vine are but two examples of a thoughtful approach to addressing established invasive species within your municipality.

City staff have also worked to develop partnerships with organizations such as the Invasive Species Centre to work collaboratively on invasive species issues facing London and other communities alike. Recent examples include partnering to deliver a workshop on oak wilt, and invasive disease threatening native oak trees. Staff from the City of London also recently participated in the Invasive Species Centre's municipal economic survey, which helps all Ontarians better understand just how costly invasive species are at the community level. With the average Ontario municipality spending \$3.06 per person, per year on invasive species control, London is making strides towards costs saving through prevention and action. The Invasive Species Centre looks forward to working with the City and the broader London community to help prevent and reduce the spread of invasive species.

Sincerely,

Tracey Cooke
Executive Director

ESA Management Committee Meeting
Tuesday, August 20th, 2019
UTRCA Boardroom

MINUTES

Membership

City - Linda McDougall, Emily Williamson, Jessica Wakefield
UTRCA - Alex Shivas, Cathy Quinlan, Christine Creighton
ESA Team - Dan Jones, Brandon Williamson, Richard Brewer, Jacob Mehlenbacker,
Kandyce Affleck, Anthony Ambrogio
Regrets - Christine Jarvis, Gregg Barrett, Cole Volkaert, James MacKay

1) Welcome and Introductions

2) ESA Team Operations Report

- a) **Power Point of Operations Activities – May to August 2019**
- b) **Quarterly Report, Wages-to-date Summary**

3) Environmentally Significant Areas (ESA) – Conservation Master Plans and General Updates

3a. Medway Valley Heritage Forest ESA

- Medway VHF ESA CMP Phase 2 process has resumed, first meeting tomorrow, E. Williamson project lead
- Buckthorn management continues in north and Goutweed / Knotweed management and monitoring continues in south
- Phragmites management/monitoring continues in 2019
- Touch up and monitoring of 2018 invasive species work (noting all top and high restoration priorities addressed and most moderate and low are underway)
- TAG solution for railing at Metamora Access is now installed
- TAG solution for Wychwood Access repair to be installed this fall, E. Williamson project lead
- Several encroachments under an enforcement process
- Friends of Medway Creek/City leading design for kiosk sign for Sunningdale Road West access point - funded by City

3b. The Coves ESA

- City/Reforest London tree planting/restoration projects proposed for 2019/2020 for Briscoe Woods and west of Silver Creek ravine
- Phragmites management/monitoring continues in 2019
- Invasive honeysuckle and bittersweet management East Pond
- Touch up and monitoring of 2018 invasive species work

3c. Meadowlily Woods ESA

- Draft Conservation Master Plan by Natural Resource Solutions Inc.; James McKay leading process to address comments and revise report
- TAG solution for Access 4 relocation to be installed this fall, L. McDougall project lead
- Phragmites management/monitoring continues in 2019
- Buckthorn management and touch up and monitoring of 2018 invasive species work

3d. Westminster Ponds/Pond Mills ESA

- ESA Team continuing the adaptive management process in the Restoration Plan for the 4.0 ha buckthorn site behind tourism building.
- Boardwalk lifecycle replacements/AODA upgrades in 2019
- Phragmites management/monitoring continues in 2019
- Several encroachments under an enforcement process
- Touch up and monitoring of 2018 invasive species work

3e. Sifton Bog ESA

- Touch up and monitoring of 2018 invasive species work

3f. Kains Woods ESA

- Kains Woods is a successful example of early detection rapid response for invasive species management.
- Trail closed barrier extended near Sifton's lands
- Touch up and monitoring of 2018 invasive species work

3g. Warbler Woods ESA

- Phragmites management/monitoring continues in 2019
- A few encroachments under an enforcement process

3h. Kilally Meadows ESA

- DSV work continues north and south of river in 2019 including touch ups of previous work and Hypena biological control work with Silv-Econ.
- TVTA volunteer group buckthorn baggie project on north side is wrapping up. Ian Bailey is the contact from TVTA for project.
- ESA Ecological Restoration Plan is now finalized and posted to City website.

3i. Lower Dingman ESA

- Touch up and monitoring of 2018 invasive species work

3j. Pottersburg Valley ESA

- Half hectare of Phragmites management in 2018, monitoring and management continues 2019
- ESA Team Ecological Restoration Plan for Oak Savanna area for 2019-2023 implementation
- Design of information kiosk and map underway by City, project leads J. Wakefield and L. McDougall

3k. Kelly Stanton ESA

- Phragmites management/monitoring continues in 2019

4) Other

a) Tree Risk Assessment Policy/Procedures Review/Update

- Process is underway, E. Williamson project lead

5) Next Meeting – Nov/Dec 2019

External Resource and First Nation Comments

Reviewer	Reviewer	Comment #	EMG	Page #	Type of Comment	Comment and Suggested Action
E.g. EEPAC	T. River	1	1.0	29-34	2	The EIS Checklist is not user friendly.
EEPAC	Working Group	1	ToR, 1.0	2	2	Objective currently includes "identify data gaps". Greater specificity is needed here. Data gaps with regards to what? What is the "data"?
EEPAC	Working Group	2	ToR, 2.0	2	2	Language switches between "policy" and "policies". Should be made consistent.
EEPAC	Working Group	3	ToR, 3.1	2	1	"where possible" This text should be removed. Current data and external sources should be updated absolutely.
EEPAC	Working Group	4	ToR 3.1	2	1	Background and reference documents included should explicitly list peer-reviewed scientific studies, particularly those conducted in Southern Ontario
EEPAC	Working Group	5	ToR 3.1	3	3	Add as reference document: Categorizing and Protecting Habitat under the Endangered Species Act, Feb 2012, Ontario
EEPAC	Working Group	6	ToR 3.1	3	3	Add as reference document: Forest Edge Management Plan Guidelines, Toronto and Region Conservation Authority, 2004
EEPAC	Working Group	7	ToR 3.1	3	3	Add as reference document: Conservation Halton Ecological Monitoring Protocols, version 1.0, February 2017
EEPAC	Working Group	8	ToR 3.1	3	3	Add as reference document: Ecological Buffer Guideline Review, Beacon Environmental for the Credit River Conservation Authority, Dec 2012
EEPAC	Working Group	9	Tor 3.1	3	1	Other secondary source literature should include information relevant to strategies for mitigation, restoration and monitoring (both compliance and effectiveness monitoring)
EEPAC	Working Group	10	ToR 3.1	4	3	Background and reference documents should include examples of similar guidelines from other Ontario municipalities and Conservation Authorities
EEPAC	Working Group	11	Tor 3.1	4	1	Insert text: "Additional references as may be provided by stakeholders throughout the process."
EEPAC	Working Group	12	Tor 3.2	4	1	Insert text: "For example, the CITY OF LONDON ESA EVALUATION CRITERIA APPLICATION GUIDELINES as they are part of the current Official Plan and the London Plan."
EEPAC	Working Group	13	ToR 3.2	5	4	First nations to be included in consultation should be explicitly named. Insert text: "Chippewas of the Thames First Nation, Munsee-Delaware Nation, Oneida Nation of the Thames, Other First Nations groups as applicable."
EEPAC	Working Group	14	ToR 3.2	4	4	This paragraph should be moved to Phase 1 (changing the timeline) because between now and the initial meeting is when comments on the 2007 documents will be received, not cutting off all stakeholders including EEPAC
EEPAC	Working Group	15	ToR 3.2	4	4	The consultant will be responsible for up to two meetings per external resource group or First Nation band during Phase 1 of the consultation process. The consultant will be responsible for meeting minutes <INSERT TEXT>
EEPAC	Working Group	16	ToR 3.1	4	1	Include conclusions and recommendations of past subwatershed studies by the City of London
EEPAC	Working Group	17	ToR 3.2	5	4	A second draft shall be prepared for external resource groups and First Nations review. All external resource groups and First Nations shall be invited to discuss areas of disagreement and attempt to resolve differences in a
EEPAC	Working Group	18	ToR 3.2	5	4	Proposed modified timeline: Comments on existing 2007 EMG → Draft 1 → Comments on Draft 1 → Draft 2 → Comments on Draft 2 → Final Draft Presentation to EEPAC. This timeline should be made clear in a
EEPAC	Working Group	19	ToR 3.3	5	4	Insert Text: "The consultant should update only those sections of the Guidelines that need to be updated. However, a recommendation may be that some or all of the Guidelines not be revised. The consultant shall
EEPAC	Working Group	20	ToR 3.3	5	4	New separate guideline for monitoring should be considered, reflecting pre- and post- construction period.
EEPAC	Working Group	21	ToR 5.0	6	4	Modified timeline for Phase 1: "April 16, 2020 – EEPAC presentation and circulation of the updated Draft EMGs for comment May 21, 2020 – Deadline to receive comments on the Draft EMGs from external resource groups
EEPAC	Working Group	22	ToR 5.0	6	4	Modified timeline for Phase 2: Begin external resource group consultation on the Draft EMGs <INSERT TEXT> "(minimum two sessions per group)"
EEPAC	Working Group	23			3	The working group recommends that a supplementary document be included as an appendix to the EMGs which lists secondary sources that are relevant to the revision of the EMGs. These sources include but are not limited
EEPAC	Working Group	24			1	The EMGs should be reviewed at minimum every 5 years. The frequency of this review should reflect changing conditions due to the effects of climate change (e.g. weather patterns, species shifts, species stress, greater
EEPAC	Working Group	25			4	The ToR should include provisions for EISs and other studies to make reference to climate change and/or make it a prominent factor when analyzing development projects or when creating Conservation Management Plans.
EEPAC	Working Group	26			3	The EMGs must take a landscape approach to area analyses. Ecosystems rarely stand alone and species frequently cross between areas. If the City is seeking to boost connectivity and work against fragmentation,
EEPAC	Berta Krichker	27	2.0		3	Data Collection Standards for the Ecological Inventory needs to be based on detailed evaluations of the subject areas/sites and its' existing conditions that will be undertaken in accordance with specific field
EEPAC	Berta Krichker	28	2.3		1	Assessment of Development Impact (direct and indirect impact) needs to be assessed by presenting of viable alternatives where the identified impact will be defined in specific details (potential evaluated short and long term
EEPAC	Berta Krichker	29	3.0		1	Guidelines Document for ESA Identification, Evaluation and Boundary Delineation will be required to include all applicable and viable information that in detailed will identified all ecological/environmental functions and featured
EEPAC	Berta Krichker	30	5.0		3	Guidelines for Determining Setbacks and Ecological Buffers shall include all applicable and viable information that in all required details will identified all ecological/environmental functions and featured of the subject ESA and

Source Type 1-peer reviewed science 2-municipal documents 3-provincial documents 4-Federal documents 5-NGO documents	Year Published	Specific to Southern Ontario? (Y/N)	Title	Summary or description (if applicable)	Link to access document (if applicable)	Comments
1	2011	Y	<i>Falk, K., Nol, E., & Burke, D. (2011). Weak effect of edges on avian nesting success in fragmented and forested landscapes in Ontario, Canada. Landscape Ecology, 26(2), 239-251. doi:10.1007/s10980-010-9543-5</i>	We studied the effects of anthropogenic edges on predation and parasitism of forest bird nests in an agriculturally fragmented landscape and a continuously forested landscape in Ontario, Canada. Nesting data were collected at 1937 nests across 10 species in the fragmented landscape from 2002–2008, and 464 nests across 4 species in the continuously forested landscape from 2006–2008. Brood parasitism only occurred in the fragmented landscape, and was positively related to the proportion of rural grassland and row crop habitats within 500-m of nests. Daily nest survival was negatively related to the density of roads within 500-m of nests in the fragmented landscape, but was not influenced by distance to anthropogenic edge in either landscape. Predation rates were higher in the fragmented landscape for Ovenbird and Rose-breasted Grosbeak nests, but did not differ between landscapes for Veery and American Redstart nests. Uniformly high predation in the fragmented landscape may be a result of (1) matrix predators that penetrate deep (>300 m) into the forest interior, or (2) the additive effect of forest-dependent and matrix-associated predators that results in high predation pressure in both edge and interior habitats. Further research focused on the identification of nest predators, their population dynamics, and habitat use is required to understand the underlying mechanisms leading to uniformly high nest predation in fragmented landscapes.		
1	2019	Y	<i>Miedema, L. J., Capmourteres, V., and Anand, M., 2019. Impact of land composition and configuration on the functional trait assembly of forest communities in southern Ontario. Ecosphere 10(3):e02633. 10.1002/ecs2.2633</i>	The conversion of natural lands to agricultural and urban areas is the leading cause of biodiversity loss worldwide, and an understanding of functional trait assembly pattern can help to mitigate the ecological implications of this loss. We use plant functional traits—characteristics of the plant that determine how they react to and interact with the surrounding ecosystem—to assess the impacts of landscape composition and configuration on plant community assembly patterns in the multiple-use Credit River watershed, Southern Ontario. We examine functional patterns in metacommunities to uncover how eight landscape variables (including both agricultural and urban uses) affect community assembly patterns and which traits explain these assembly patterns. We find that landscape variables result in significant trait divergence assembly patterns at two spatial scales (1 and 10 km), which means that these forest communities are more functionally diverse than would be expected by chance. Additionally, the optimal functional traits that maximize divergence in the community are dependent on landscape variables. We discuss three mechanisms—limiting similarity, niche availability, disturbance—that might be responsible for the trait divergence observed. First, we propose that limiting similarity could lead to trait divergence through niche differentiation and thus coexistence of more traits. Second, we argue that mosaic landscapes provide multiple and diverse habitats in which more species, likely with differing functional traits, can occur. Finally, we discuss how disturbances could prevent dominant species from competitively excluding others, thus favoring coexistence of functional traits.	The conversion of natural lands to agricultural and urban areas is the leading cause of biodiversity loss worldwide, and an understanding of functional trait assembly pattern can help to mitigate the ecological implications of this loss. We use plant functional traits—characteristics of the plant that determine how they react to and interact with the surrounding ecosystem—to assess the impacts of landscape composition and configuration on plant community assembly patterns in the multiple-use Credit River watershed, Southern Ontario. We examine functional patterns in metacommunities to uncover how eight landscape variables (including both agricultural and urban uses) affect community assembly patterns and which traits explain these assembly patterns. We find that landscape variables result in significant trait divergence assembly patterns at two spatial scales (1 and 10 km), which means that these forest communities are more functionally diverse than would be expected by chance. Additionally, the optimal functional traits that maximize divergence in the community are dependent on landscape variables. We discuss three mechanisms—limiting similarity, niche availability, disturbance—that might be responsible for the trait divergence observed. First, we propose that limiting similarity could lead to trait divergence through niche differentiation and thus coexistence of more traits. Second, we argue that mosaic landscapes provide multiple and diverse habitats in which more species, likely with differing functional traits, can occur. Finally, we discuss how disturbances could prevent dominant species from competitively excluding others, thus favoring coexistence of functional traits.	
1	2010	Y	<i>Jesse E. H. Patterson, Jay R. Malcolm "Landscape structure and local habitat characteristics as correlates of <i>Glaucomys sabrinus</i> and <i>Tamiasciurus hudsonicus</i> occurrence," <i>Journal of Mammalogy</i>, 91(3), 642-653, (16 June 2010)</i>	Understanding the effects of forest fragmentation on tree-dwelling sciurids is of particular interest given their arboreal habits and the extent of anthropogenic habitat fragmentation inflicted upon North American forest ecosystems over the past 2 centuries. In this study we investigate occurrences of northern flying squirrels (<i>Glaucomys sabrinus</i>) and red squirrels (<i>Tamiasciurus hudsonicus</i>) in forest fragments in southern Ontario, Canada, as a function of local habitat and landscape features. During the summer of 2006 we measured occurrence via live-trapping in 24 forest fragments ranging in size from 4 to 2,881 ha, each adjacent to or surrounded by active row-crop agriculture. In addition to patch area and measurements of local habitat features, we calculated 4 landscape metrics in variously sized circular landscape windows: number of patches, forest cover, mean proximity index, and distance to the nearest neighboring patches. Occurrence of <i>G. sabrinus</i> was positively correlated with patch area ($P = 0.016$) but not with other features, whereas occurrence of <i>T. hudsonicus</i> was positively associated with basal area of coniferous trees ($P = 0.047$) but not with other habitat or landscape features. Populations of <i>T. hudsonicus</i> did not show fragmentation effects, likely due to high vagility and high population growth potential. Northern flying squirrels were not found in patches < 29 ha in size and, as estimated from a receiver operating characteristic curve, the ideal minimum fragment size for patch occupancy was 48.25 ha. Our data support conclusions that diverse management schemes may be required to preserve relatively large contiguous tracts of forest for <i>G. sabrinus</i> and appropriate conifer structure for <i>T. hudsonicus</i> in a way that will facilitate the persistence of these 2 species in deciduous Great Lakes–St. Lawrence forest ecosystems.		
1	2008	Y	<i>Eigenbrod, F., Hecnar, S. J., & Fahrig, L. (2008). Accessible habitat: An improved measure of the effects of habitat loss and roads on wildlife populations. Landscape Ecology, 23(2), 159-168. doi:10.1007/s10980-007-9174-7</i>	Habitat loss is known to be the main cause of the current global decline in biodiversity, and roads are thought to affect the persistence of many species by restricting movement between habitat patches. However, measuring the effects of roads and habitat loss separately means that the configuration of habitat relative to roads is not considered. We present a new measure of the combined effects of roads and habitat amount: accessible habitat. We define accessible habitat as the amount of habitat that can be reached from a focal habitat patch without crossing a road, and make available a GIS tool to calculate accessible habitat. We hypothesize that accessible habitat will be the best predictor of the effects of habitat loss and roads for any species for which roads are a major barrier to movement. We conducted a case study of the utility of the accessible habitat concept using a data set of anuran species richness from 27 ponds near a motorway. We defined habitat as forest in this example. We found that accessible habitat was not only a better predictor of species richness than total habitat in the landscape or distance to the motorway, but also that by failing to consider accessible habitat we would have incorrectly concluded that there was no effect of habitat amount on species richness.		
1	2015	N	<i>Jarzyna, Marta A., et al. "Landscape Fragmentation Affects Responses of Avian Communities to Climate Change." <i>Global Change Biology</i> 21.8 (2015): 2942-53.</i>	Forecasting the consequences of climate change is contingent upon our understanding of the relationship between biodiversity patterns and climatic variability. While the impacts of climate change on individual species have been well-documented, there is a paucity of studies on climate-mediated changes in community dynamics. Our objectives were to investigate the relationship between temporal turnover in avian biodiversity and changes in climatic conditions and to assess the role of landscape fragmentation in affecting this relationship. We hypothesized that community turnover would be highest in regions experiencing the most pronounced changes in climate and that these patterns would be reduced in human-dominated landscapes. To test this hypothesis, we quantified temporal turnover in avian communities over a 20-year period using data from the New York State Breeding Atlases collected during 1980–1985 and 2000–2005. We applied Bayesian spatially varying intercept models to evaluate the relationship between temporal turnover and temporal trends in climatic conditions and landscape fragmentation. We found that models including interaction terms between climate change and landscape fragmentation were superior to models without the interaction terms, suggesting that the relationship between avian community turnover and changes in climatic conditions was affected by the level of landscape fragmentation. Specifically, we found weaker associations between temporal turnover and climatic change in regions with prevalent habitat fragmentation. We suggest that avian communities in fragmented landscapes are more robust to climate change than communities found in contiguous habitats because they are comprised of species with wider thermal niches and thus are less susceptible to shifts in climatic variability. We conclude that highly fragmented regions are likely to undergo less pronounced changes in composition and structure of faunal communities as a result of climate change, whereas those changes are likely to be greater in contiguous and unfragmented habitats.		
1	2007	Y	<i>Milne, Robert J., and Lorne P. Bennett. "Biodiversity and Ecological Value of Conservation Lands in Agricultural Landscapes of Southern Ontario, Canada." <i>Landscape Ecology</i> 22.5 (2007): 657-70.</i>	In eastern North America, large forest patches have been the primary target of biodiversity conservation. This conservation strategy ignores land units that combine to form the complex emergent rural landscapes typical of this region. In addition, many studies have focussed on one wildlife group at a single spatial scale. In this paper, studies of avian and anuran populations at regional and landscape scales have been integrated to assess the ecological value of agricultural mosaics in southern Ontario on the basis of the maintenance of faunal biodiversity. Field surveys of avian and anuran populations were conducted between 2001 and 2004 at the watershed and sub-watershed levels. The ecological values of land units were based on a combination of several components including species richness, species of conservation concern (rarity), abundance, and landscape parameters (patch size and connectivity). It was determined that habitats such as thicket swamps, coniferous plantations and cultural savannas can play an important role in the overall biodiversity and ecological value of the agricultural landscape. Thicket swamps at the edge of agricultural fields or roads provided excellent breeding habitat for anurans. Coniferous plantations and cultural savannas attracted many birds of conservation concern. In many cases, the land units that provided high ecological value for birds did not score well for frogs. Higher scores for avian and anuran populations were recorded along the Niagara Escarpment and other protected areas as expected. However, some private land areas scored high, some spatially connected to the protected areas and therefore providing an opportunity for private land owners to enter into a management arrangement with the local agencies.		

1	2003	Y	McLachlan, S. M., and D. R. Bazely. "Outcomes of Longterm Deciduous Forest Restoration in Southwestern Ontario, Canada." <i>Biological Conservation</i> 113.2 (2003): 159-69.	At present, forest cover in southwestern Ontario, Canada, remains at less than 5% due to intensive agricultural and urban land use. Although much of the extant forest is increasingly protected by legislation, remnants continue to be degraded by the spread of non-native plant species, overgrazing, and recreational use. Some parks in the region have adopted management programs aimed at mitigating this degradation. Over the last 35 years, cottages and roads at Point Pelée National Park have been removed and sites either passively restored (i.e. road or cottage eliminated and vegetation allowed to regenerate) or actively restored (i.e. road or cottage eliminated, exotic vegetation removed, and native species planted). In 1994 and 1995, we assessed the effectiveness of restoration by comparing the understorey plant communities in 28 restored sites with those in less disturbed reference sites. There was a significant increase (P<0.0001) in the similarity of understorey plant communities between restored and reference sites as time-since-restoration increased. Soil moisture, canopy cover, distance to continuous forest, and site-shape all significantly affected plant species composition. Former road sites recovered significantly (P<0.05) more rapidly than former cottage sites, and the former lawns of passively restored cottage sites were the slowest to recover. Five years following active restoration, non-native ruderal species continued to dominate restored sites. The observed recovery of understorey plant communities in restored sites is attributed to their proximity to natural vegetation, and its function as a seed source. In some sites, recovery is substantial and, assuming present trajectories of change are maintained, we predict that recovery could occur in many mesic sites within the next 20 years. Restoration activity facilitates forest recovery and would appear to have a valuable function in mitigating ongoing conflicts between conservation and human use in this region.		
1	2014	Y	Koen, Erin L., et al. "Landscape Connectivity for Wildlife: Development and Validation of Multispecies Linkage Maps." <i>Methods in Ecology and Evolution</i> 5.7 (2014): 626-33.	The ability to identify regions of high functional connectivity for multiple wildlife species is of conservation interest with respect to habitat management and corridor planning. We present a method that does not require independent, field-collected data, is insensitive to the placement of source and destination sites (nodes) for modeling connectivity, and does not require the selection of a focal species. In the first step of our approach, we created a cost surface that represented permeability of the landscape to movement for a suite of species. We randomly selected nodes around the perimeter of the buffered study area and used circuit theory to connect pairs of nodes. When the buffer was removed, the resulting current density map represented, for each grid cell, the probability of use by moving animals. We found that using nodes that were randomly located around the perimeter of the buffered study area was less biased by node placement than randomly selecting nodes within the study area. We also found that a buffer of $\geq 20\%$ of the study area width was sufficient to remove the effects of node placement on current density. We tested our method by creating a map of connectivity in the Algonquin to Adirondack region in eastern North America, and we validated the map with independently collected data. We found that amphibians and reptiles were more likely to cross roads in areas of high current density, and fishers (<i>Pekania pennanti</i>) used areas with high current density within their home ranges. Our approach provides an efficient and cost effective method of predicting areas with relatively high landscape connectivity for multiple species.		
1	2018	Y	Potential carbon loss associated with post-settlement wetland conversion in southern Ontario, Canada Carbon Balance and Management. 2018;13(1):1-12 DOI 10.1186/s13021-018-0094-4	Natural wetlands can mitigate ongoing increases in atmospheric carbon by storing any net balance of organic carbon (peat) between plant production (carbon uptake) and microbial decomposition (carbon release). Efforts are ongoing to quantify peat carbon stored in global wetlands, with considerable focus given to boreal/subarctic peatlands and tropical peat swamps. Many wetlands in temperate latitudes have been transformed to anthropogenic landscapes, making it difficult to investigate their natural/historic carbon balance. The remaining temperate swamps and marshes are often treated as mineral soil wetlands and assumed to not accumulate peat. Southern Ontario in the Laurentian Great Lakes drainage basin was formerly a wetland-rich region that has undergone significant land use change since European settlement. Results This study uses southern Ontario as a case study to assess the degree to which temperate regions could have stored substantial carbon if it had not been for widespread anthropogenic land cover change. Here, we reconstruct the full extent and distribution of natural wetlands using two wetland maps, one for pre-settlement conditions (prior to 1850 CE) and the other for modern-day patterns of land use (2011 CE). We found that the pre-settlement wetland cover decreased by about 56% with the loss most significant for marshes as only 11% of predicted pre-settlement marshland area remains today. We estimate that pre-settlement wetlands held up to ~ 3.3 Pg of carbon relative to ~ 1.3 Pg for present-day (total across all wetland classes). Conclusions By not considering the recent carbon loss of temperate wetlands, we may be underestimating the wetland carbon sink in the pre-industrial carbon cycle. Future work is needed to better track the conversion of natural wetlands globally and the associated carbon stock change.		
1	2018	Y	Tim P. Duval. Effect of residential development on stream phosphorus dynamics in headwater suburbanizing watersheds of southern Ontario, Canada. <i>Science of The Total Environment</i> . Volumes 637–638, 2018. Pages 1241–1251. ISSN 0048-9697. https://doi.org/10.1016/j.scitotenv.2018.04.437 .	Suburban landscapes are known to have degraded water quality relative to natural settings, including increased total phosphorus (TP) levels; however, the effect of subdivision construction activities on stream TP dynamics are less understood. This study measured TP and its constituents particulate, dissolved organic, and dissolved inorganic phosphorus (PP, DOP, and DIP, respectively) in two headwater streams of contrasting urbanization activity to examine whether the land-use conversion process itself contributed to TP concentrations and export. The nested watershed undergoing significant active residential community construction contained large areas of cleared former agricultural field and associated sediment mounds with elevated soil TP (~1000 mg kg ⁻¹), and twice as many stormwater management (SWM) ponds than the watershed with completed suburban communities. Daily stream sampling for six months revealed limited differences in TP between urbanized and urbanizing watersheds regardless of season or stream flow condition; however, the forms of TP varied significantly. The proportion of TP as DOP was consistently higher in the urbanizing stream relative to the urban stream, which was in line with significant decreases in DOP concentration as proportion of cleared former agricultural land decreased and density of SWM ponds increased. The DOP, and to a lesser extent DIP and PP, dynamics resulted in a 2.5x greater areal export of TP from a small watershed actively being suburbanized during the study period compared to the larger watershed with greater land urbanized 3–5 years ago. The results of this study suggest stream TP concentrations are relatively unresponsive to active versus established suburban cover, but the forms of TP can be quite different, and the period of home construction can increase phosphorus (P) delivery to and export through nearby streams. This information can aid land managers and urban planners update best management practices to mitigate the transfer of terrestrial P to the aquatic environment.		
1	2018	Y	Cropland patchiness strongest agricultural predictor of bird diversity for multiple guilds in landscapes of Ontario, Canada. Frei, B., Bennett, E.M. & Kerr, J.T. <i>Reg Environ Change</i> (2018) 18: 2105. https://doi.org/10.1007/s10113-018-1343-5	The potential for agricultural landscapes to support biodiversity may vary greatly based on agricultural land use. Current knowledge suggests that agricultural composition and intensity are dominant drivers of biodiversity in agricultural landscapes, with variable effects of agricultural configuration and landscape diversity. The aim of this study was to determine the relative effects of agricultural composition, intensity, configuration, and landscape diversity on the species diversity of six distinct bird guilds on the landscape scale in a large and complex landscape in Ontario, Canada. We found that agricultural configuration, specifically patchiness of croplands, and to a lesser degree forage lands, was the strongest predictor of bird diversity for three of the six bird guilds considered (forest, shrubland, and town). The effects of increased cropland patchiness were variable, with forest and shrubland bird diversity increasing from small to moderate patchiness, and town bird diversity declining from moderate to high patchiness. Grassland birds, a group of considerable conservation concern, increased near linearly with increased agricultural land cover in the landscape, highlighting the need to consider agricultural lands in conservation planning for this species group. Woodland bird diversity declined significantly with all increasing measures of agricultural intensity, including the proportion of high-intensity agriculture and larger patches of agricultural land. Wetland birds were unique from the other guilds, showing primarily a strong association between diversity of land cover types and guild-level bird diversity. Surprisingly, increased cover of agricultural lands, which we predicted to be a dominant driver of guild-level bird diversity declines due to habitat loss, had weak, non-significant effects relative to the other land use variable being tested, except for the positive association with grassland birds. Our findings suggest that a mix of management strategies should be employed to consider the varying effects of agricultural lands on different bird guilds, such as the inclusion of agricultural land in conservation strategies for grassland species and further managing the configuration of agricultural lands to enhance biodiversity of agricultural landscapes.		
3	2018	N	Vegetation Resources Inventory – British Columbia. Ground Sampling Procedures, 2018. Inventory Methods for Forest and Grassland Songbirds. Prepared by Ministry of Environment, Lands and Parks (BC) Resources Inventory Branch for the Terrestrial Ecosystems Task Force Resources Inventory Committee, March 16, 1999.			
	2010	Y	Area-Sensitivity by Forest Songbirds: theoretical and practical implications of scale dependency, Desrocher, Renaud, Hockachka, Cadman, <i>Ecography</i> 33:921-931, 2010	Songbird presence is often associated with the area of suitable habitat in the surrounding landscape. However, the size of landscape for which this association is maximized is generally unknown, likely to vary among species, and may affect our ability to incorporate songbirds in landscape management. We measured the occurrence and the persistence of forest songbirds in relation to the amount of habitat measured at several scales: local (100, 200 m radius), neighborhood (400, 800 m), landscape (1.6, 3.2, 6.4 km) and regional (12–24 km), based on data from Ontario's Forest Bird Monitoring Program (1987–2005). Songbird occurrence was obtained from point count sites distributed across southern Ontario and each revisited in multiple years (mean=5.8 yr). Presence of each species at a site was associated with forest habitat area measures that account for differences in preferred forest cover types among species. Area of coniferous, deciduous and mixed forest was derived from Landsat TM imagery. Thirty-two of the 35 species studied were area-sensitive, and area-sensitivity was apparent for 13–25 species at each spatial scale. For 24 species, the strength of area-sensitivity varied with scale, suggesting the importance of local, neighborhood, landscape and regional habitat for 3, 5, 5, and 11 species respectively. As a result, the list of the five most area-sensitive species varied depending on the scale at which habitat was described. We conclude that area-sensitivity can occur at a broader set of scales than generally assumed, and is most pronounced at the regional scale. We suggest that a broad set of scales should be examined before taking conservation decisions based on avian area-sensitivity.		
2	2007	Y	TERRESTRIAL NATURAL HERITAGE SYSTEM STRATEGY Toronto Region Conservation Authority, 2007.			https://trca.ca/conservation/greenspace-management/terrestrial-natural-heritage/
3	2011	Y	A land manager's guide to conserving habitat for forest birds in southern Ontario, Ministry of Natural Resources, 2011, 140 pp.			#VALUE!
5	2015	Y	Ontario Nature, 2015, The Ontario Reptile and Amphibian Atlas	Data source		https://ontarionature.org/programs/citizen-science/reptile-amphibian-atlas/
2	2014	Y	Middlesex County, 2014, Middlesex Natural Heritage System Study, 48 pp.	Data source		
4			Data collection - Aquatic Species at Risk Maps, DFO, http://www.dfo-mpo.gc.ca/species-especies/sara-lep/map-carte/index-eng.html .	Data collection		
4	2007		Recommended Protocols for Monitoring Impacts of Wind Turbines on Birds. April 2007 Environment Canada, Canadian Wildlife Service, 33 pp. (the protocols can be applied to any situation, not just wind turbines)	Data collection		http://publications.gc.ca/site/eng/458449/publication.html
	2012		Buffers – Beacon Environmental 2012 (Credit River CA)	Buffers		Beacon on buffers
3	2015		Appendix F: Guidelines for Ecological Buffer Areas, Environmental Planning Policies - April 2015, Catarauqui Region Conservation Authority	EIS		EcologicalBuffers Catarauqui Region CA

4	2006?		Table 5: Sensitivity of Fish and Fish Habitat from Practitioners Guide to the Risk Management FRAMEWORK FOR DFO HABITAT MANAGEMENT STAFF, version 1.	EIS	EIS Table 5 from DFO	
2	2017	Y	Guidelines for the Preparation of Environmental Impacts Studies, version 1, City of Guelph. Prepared with the assistance of Beacon Environmental. Last accessed August 21, 2019 (includes a clearer way of presenting impact assessments and divides monitoring into three different types. Also good appendices on Wildlife Survey Guidance	EIS	Guelph EIS Guidelines	
3	2014	Y	Toronto and Region CA Environmental Impact Statement Guidelines, Oct 2014, pp. 31. Includes data collection standards for the inventory of natural components for an EIS	data collection	TRCA EIS Guidelines	
2	2012		City of Ottawa, Environmental Impact Statement Guidelines, 2nd Edition April 2012, includes identifying cumulative impacts. Appendix 10 includes standard mitigation measures for various natural heritage features and functions. Appendix 6, Preliminary Environmental Data Collection Checklist seems, in part, easier to use than our current one.	EIS	#VALUE!	
3	2017	Y	EIS - Conservation Halton's Guidelines for Ecological Studies. August 2017. 6 pp. has nice table of studies, their timing as well as method and protocol.	EIS	#VALUE!	
3	2012	N	Categorizing and Protecting Habitat under the Endangered Species Act, Feb 2012, Ontario, https://www.ontario.ca/page/species-risk-guides-and-resources			
3	2004	Y	Forest Edge Management Plan Guidelines, Toronto and Region Conservation Authority, 2004 (this should be included in restoration where new edge is created)		http://trca.on.ca/dotAsset/40029.pdf	
3	2017	Y	Monitoring – Conservation Halton Ecological Monitoring Protocols, version 1.0, February 2017	monitoring	https://www.conservationhalton.ca/long-term-environmental-monitoring	
5	2005	N	The Atlas of the Breeding Birds of Ontario (2001-2005) and its predecessor and any updated version	Data source that should be used to determine how bird distributions have changed.		
5		Y	Nature London's Annual Christmas Bird Counts	Bird count data could be used for specific sites in London as a data source for changes in populations as there are data for specific sites that have been sampled each year for a number of years.	http://www.naturelondon.com/annual-bird-counts/	
5	2004	N	Ontario Benthos Biomonitoring Network (OBBN)	data collection protocol	https://desc.ca/programs/OBBN	
3	2017	N	Preparing environmental assessments. Government of Ontario		https://www.ontario.ca/page/preparing-environmental-assessments	
3	2015	Y	Ontario Ministry of Natural Resources and Forestry. Significant Wildlife Habitat Criteria Schedules for Ecoregion 7E.		https://docs.ontario.ca/documents/4776/schedule-7e-jan-2015-access-vers-final-s.pdf	
1	2012	N	Gray, P.A., D. Paleczny, T.J. Beechey, B. King, M. Wester, R.J. Davidson, S. Janetos, S.B. Felders, and R.G. Davis. 2012. Ontario's Natural Heritage Areas: Their Description and Relationship to the IUCN Protected Areas Classification System (A Provisional Assessment). Version 1.1. Queen's Printer for Ontario, Peterborough, Ontario, Canada. 356 pp.			
1	2016	Y	Kirchoff, D., McCarthy, D., Crandall, D. D., McDowell, L., & Whitelaw, G. 2016. A policy window opens: strategic environmental assessment in York Region, Ontario, Canada. In Progress in Environmental Assessment Policy, and Management Theory and Practice (pp. 27-48).			
1	2017	N	Chilima, J. S., Blakely, J. A., Noble, B. F., & Patrick, R. J. 2017. Institutional arrangements for assessing and managing cumulative effects on watersheds: Lessons from the Grand River watershed, Ontario, Canada. Canadian Water Resources Journal, 42(3), 223-236.			
1	2007	N	Nirupama, N., & Simonovic, S. P. 2007. Increase of flood risk due to urbanisation: a Canadian example. Natural Hazards, 40(1), 25.			
1	2018	N	Agrawal, N. (eds.), 2018. Natural Disasters and Risk Management in Canada. Advances in Natural and Technological Hazards Research, vol. 49. Springer, Dordrecht.			
1	2012	N	Gunson, K. E., Ireland, D., & Schueler, F. 2012. A tool to prioritize high-risk road mortality locations for wetland-forest herpetofauna in southern Ontario, Canada. Northwestern Journal of Zoology, 8(2), 409-413.			
1	2015	Y	Richmond, S., Jenkins, E., Couturier, A., & Cadman, M. 2015. Thresholds in forest bird richness in response to three types of forest cover in Ontario, Canada. Landscape Ecology, 30(7), 1273-1290.			
1	2017	N	Edge, C. B., Fortin, M. J., Jackson, D. A., Lawrie, D., Stanfield, L., & Shrestha, N. 2017. Habitat alteration and habitat fragmentation differentially affect beta diversity of stream fish communities. Landscape Ecology, 32(3), 647-662.			
5	2006	Y	The Southwestern Ontario Orthophotography Project (SWOOP)	Data set consists of multiple remotely sensed data products including 30 cm which was derived from digital aerial photography collected in the spring and summer of 2006 by First Base Solutions. SWOOP encompasses the following municipal tiers: Bruce County, Brant County, Elgin County, Essex County, Grey County, Haldimand County, Huron County, Lambton County, Middlesex County, Norfolk County, Oxford County, Perth County and Wellington County, Dufferin County (west), Municipality of Chatham-Kent. (Restricted access)		
4		N	GeoGratis	A portal provided by the Earth Science Sector (ESS) of Natural Resources Canada (NRCan).	http://geogratias.gc.ca/	
5		N	Scholars GeoPortal	An award-winning geospatial data discovery tool made possible by the Ontario Council of University Libraries and Government of Ontario (Restricted access)		
4		N	EarthExplorer	Provides basic information and on-line access to remotely-sensed data from the U.S. Geological Survey Earth Resources Observation and Science (EROS) Center archive.	http://earthexplorer.usgs.gov/	
1	2006	N	Effects of Habitat Disturbance from Residential Development on Breeding Bird Communities in Riparian Corridors, SUZANNE M. LUSSIER, Environmental Management Vol. 38, No. 3, pp. 504-521			
2	2010	Y	Beacon Environmental. 2010. Recommendations for Conducting Wetland Environmental Impact Studies (EIS) for Section 28 Regulations Permissions. Prepared for Conservation Ontario by Beacon Environmental in association with SCS Consulting Group and Blackport and Associates.			

Background research for proposal to review the City of London's parks and recreation area by-law with respect to fireworks in ESAs

Written by Brendon Samuels, EEPAC Member.

Thanks to Dr. Andrea Boyer and Leanne Grieves for contributing to the drafting of this document.

The City of London's fireworks by-law (40) includes the following restrictions on where fireworks may be detonated outdoors: "No person shall discharge any consumer fireworks in or on or into any park, highway, street, lane, square or other public place, unless under a display fireworks permit to do so issued by the Fire Chief." These restrictions make no mention of detonations from within or in close proximity to natural areas (such as ESAs). Although ESAs may be generally considered "public places" as already included in the by-law, more explicit wording is needed to deter individuals from detonating fireworks within or near ESAs. The city's by-law on fireworks was most recently amended in 2016. Being that the fireworks bylaw falls outside the work of the EEPAC, and further amendments to it would require input from many sources, it may be prudent for the committee to instead approach the issue of firework detonations in ESAs via the parks and recreation area by-law (41).

In its current form the city's parks by-law includes no references to fireworks, setting it apart from equivalent by-laws in other municipalities in Ontario which expressly prohibit the use of fireworks in parks. Under Part 5 of London's parks and recreation area by-law, section 5.4 lists prohibitions in ESAs including "(9) ... no person shall start or maintain a fire in an ESA or a natural park for any purpose except with the written authority of the Managing Director who may impose specific conditions which shall be adhered to." It seems reasonable that an additional restriction or prohibition could be made for the use of fireworks in ESAs. For the committee's review I have provided some relevant sources of information below about environmental effects of fireworks, including their impacts on humans and other animals, about alternatives to fireworks displays that may be of general interest, and about comparable by-laws in other municipalities.

There is a variety of anecdotal evidence to suggest that detonations of fireworks produce detrimental effects in both wild and domestic animals (1-5). Following the detonation of fireworks on holidays, animal care centres respond to a sharp increase in reported incidents of disturbed animals (6-8). Although there isn't much scientific research on the effects of fireworks specifically, loud anthropogenic noise is known to negatively impact behaviour of wild animals (9-10). For example, birds have been shown to react to fireworks by flying in darkness away from the source of the noise, risking collisions with structures like buildings (2, 11). There is also some evidence that incubating birds may abandon their nests upon exposure to fireworks (12). The negative effects of fireworks on wildlife have received considerable media attention in recent years (e.g., 13-16). In at least one recent case, a fireworks display was relocated to accommodate concerns about impacts on local wildlife (17).

Besides the welfare of animals, fireworks create a significant environmental stressor for many humans, including individuals with autism (18), as well as veterans and refugees who have experienced gun violence and live with post-traumatic stress disorder (19). Fireworks are a source of airborne pollutants and water contaminants including perchlorates and artificial dyes (20-22) and contain non-degradable plastics that may produce litter. Improper use of fireworks poses serious health risks to humans in the immediate vicinity, and detonation of fireworks in dry conditions may also increase the risk of fires (23). According to the Office of the Ontario Fire Marshal, fireworks caused 129 fires and almost \$2.5 million in damage in Ontario between 2009 and 2013. Fortunately, there are alternatives to fireworks that have been adopted elsewhere in light of these concerns. For example, the city of Banff, Alberta opted to replace its festive fireworks with quieter displays using lasers and music (24). There are also pyrotechnic technologies available that produce the same light effects as fireworks but with less acute noise.

By-laws concerning the use of fireworks are more rigorous in other provinces than in Ontario, particularly those vulnerable to forest fires. In Prince Edward Island (25), as well as several municipalities within Alberta including Banff, Canmore and Calgary (26-28), by-laws restrict the display, sale and possession of all fireworks to permit holders. Within the province of Ontario, by-laws concerning permitted venues and occasions for fireworks vary across municipalities. Several municipalities in Ontario have recently considered introducing tighter restrictions on the use of fireworks, including Huntsville (29), Dysart (30) and Brantford (30). The parks by-laws for many cities, including Toronto (32), Ottawa (33), Hamilton (34), Mississauga (35) and Windsor (36) expressly prohibit the use of fireworks in parks unless authorized by permit, whereas in London the use of display (not consumer) fireworks is restricted to permit-holders exclusively through the fireworks by-law. There are provisions in some by-laws that may restrict issuing of fireworks permits in light of environmental concerns. For example, the fireworks by-law of the city of Brampton authorizes the Fire Chief to apply absolute discretion to refuse a fireworks permit for a variety of reasons, including the proposed locale of the display and any environmental consideration (37). Fireworks are forbidden in all of Ontario's provincial parks (38). Internationally there are new laws emerging in places of ecological importance which entirely prohibit the use of fireworks out of consideration for their effects on wildlife (39).

In summary, the city of London already prohibits the detonation of fireworks in parks via the fireworks by-law, but there are insufficient protections in place to stop the detonation of fireworks in ESAs. The fireworks by-law distinguishes between consumer fireworks, which may be legally purchased and detonated by anyone over the age of 18 around the time of cultural celebrations, and display fireworks, which require a permit. The parks and recreation area bylaw includes no restrictions on detonations of fireworks in ESAs or in parks in general.

Note: Given that this matter has implications for animal welfare, it may be worthwhile to seek input from the animal welfare advisory committee for the city of London

Sources:

- (1) The Management of Horses during Fireworks in New Zealand <https://www.mdpi.com/2076-2615/6/3/20/htm>
 - (2) Illegal Fireworks Likely Cause of Massive Arkansas Blackbird Deaths. <https://www.audubon.org/news/illegal-fireworks-likely-cause-massive-arkansas-blackbird-deaths>
 - (3) Fireworks are no fun for pets. DOI: 10.1111/j.2045-0648.2012.00224.x or Veterinary Nursing Journal Vol27 pp387-390 <https://www.tandfonline.com/doi/abs/10.1111/j.2045-0648.2012.00224.x?src=recsys&journalCode=tvnj20>
 - (4) What the experts are saying about fireworks and animals. <https://www.all-creatures.org/oad/quot.html>
 - (5) Fireworks company calls Guelph geese incident 'unfortunate' <https://www.guelphmercury.com/news-story/2684059-fireworks-company-calls-guelph-geese-incident-unfortunate/>
 - (6) Loud Fireworks Affect Wildlife. https://www.westsoundwildlife.org/wildlife/Coexisting/CO_Fireworks.html
 - (7) Fireworks cause wildlife rehab centers to fill up. <https://www.krem.com/article/news/fireworks-cause-wildlife-rehab-centers-to-fill-up/293-452773054>
 - (8) Animal control and shelter already busy with animals running loose from fireworks. <https://www.kmvt.com/content/news/Animal-control-and-shelter-already-busy-with-animals-running-loose-from-fireworks-512148331.html>
 - (9) Evaluating anthropogenic noise impacts on animals in natural areas <https://pdfs.semanticscholar.org/daa1/bfefd87455d8e923496b188c2f6600b76306.pdf>
 - (10) Noise pollution and the environment. <https://www.science.org.au/curious/earth-environment/noise-pollution-and-environment>
 - (11) Birds flee en mass from New Year's Eve fireworks <https://academic.oup.com/beheco/article/22/6/1173/218852>. An accompanying media article summarizing findings: <https://www.forbes.com/sites/grrlscientist/2015/12/31/birds-flee-en-mass-from-new-years-eve-fireworks/#408a83187850>
 - (12) Seabird and marine mammal monitoring and response to a fireworks display at Gualala Point Island, Sonoma County, California, May to August 2007. http://webarchive.loc.gov/all/20090326140728/http://www.blm.gov/pgdata/etc/medialib/blm/ca/pdf/coastal_monument.Par.31821.File.dat/Master%20Seabird%20Monitoring%20Final%20Report_2008.pdf
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- (29) Huntsville, ON considering ban on fireworks: <https://www.muskokaregion.com/news-story/9491314-a-huntsville-community-discussion-environmental-ban-or-limit-on-fireworks/>
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