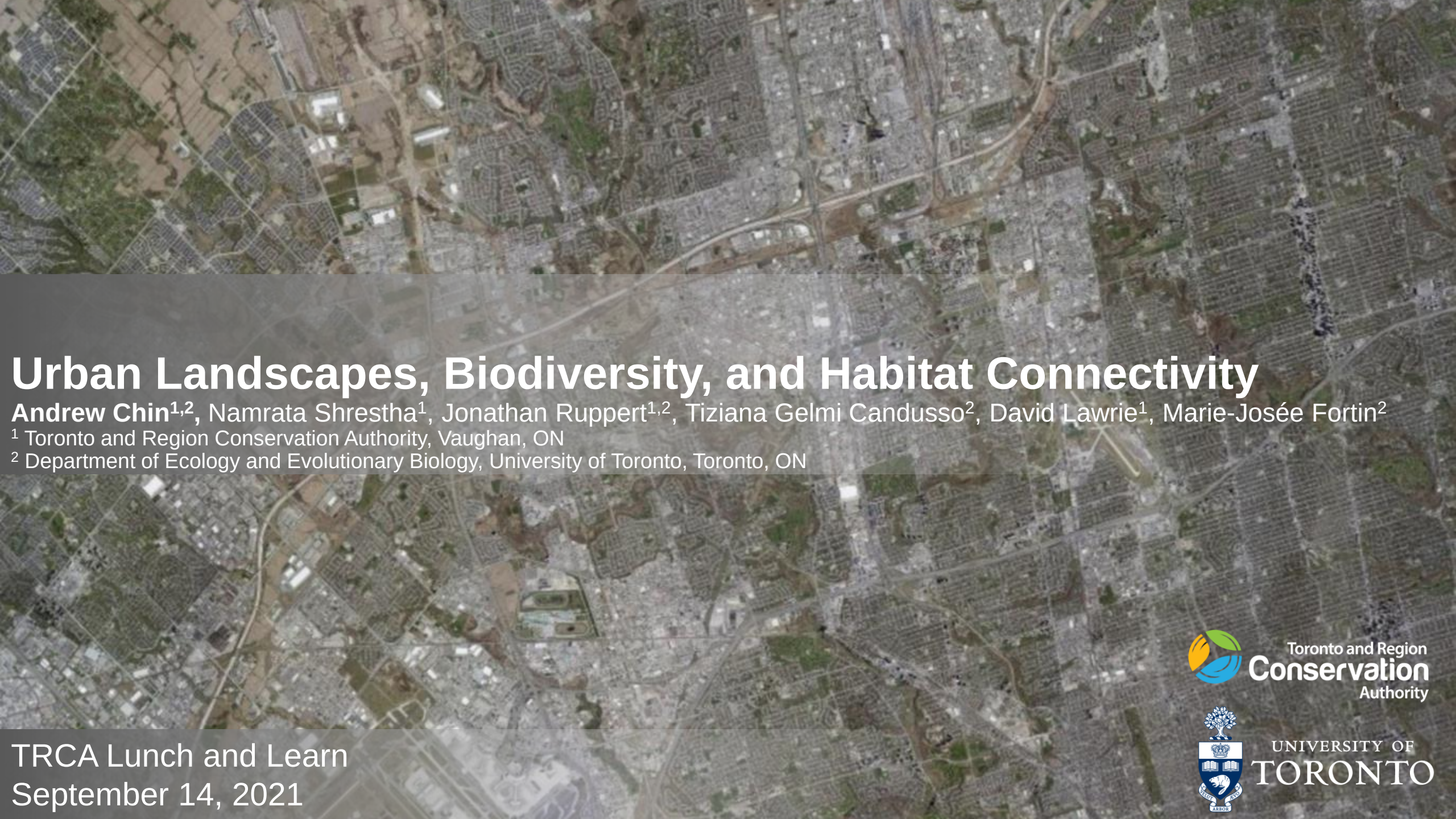
ECS Lunch and Learn

Supporting internal knowledge transfer within TRCA

September 14, 2021

Toronto and Region Conservation Authority



Urban Landscapes, Biodiversity, and Habitat Connectivity

Andrew Chin[1,2], Namrata Shrestha[1], Jonathan Ruppert[1,2], Tiziana Gelmi Candusso[2], David Lawrie[1], Marie-Josée Fortin[2]

[1] Toronto and Region Conservation Authority, Vaughan, ON

[2] Department of Ecology and Evolutionary Biology, University of Toronto, Toronto, ON

Toronto and Region Conservation Authority

UNIVERSITY OF TORONTO

TRCA Lunch and Learn

September 14, 2021

Habitat Connectivity

Maintaining landscape connectivity completing their life-history needs

- Access to habitat
- Long-term persistence in the landscape

Road Networks

Roads negatively affect wildlife populations

- Direct effect:
  - injury/mortality through road construction
  - wildlife-vehicle collisions
- Indirect effects:
  - modified behavior (road avoidance)
  - altered physical and chemical environments
  - spread of exotic species

Urban Ecosystems

- Landscape connectivity is critical in urban areas where the remaining habitat patches are small and highly fragmented

Objectives

1. Assess the regional connectivity priorities through a broad connectivity model
2. Regional connectivity priorities based on habitat patch types with amphibian movement guilds
3. Prioritization of ecopassage implementation based on watershed-level results

Objectives

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2. Regional connectivity priorities based on habitat patch types with amphibian movement guilds
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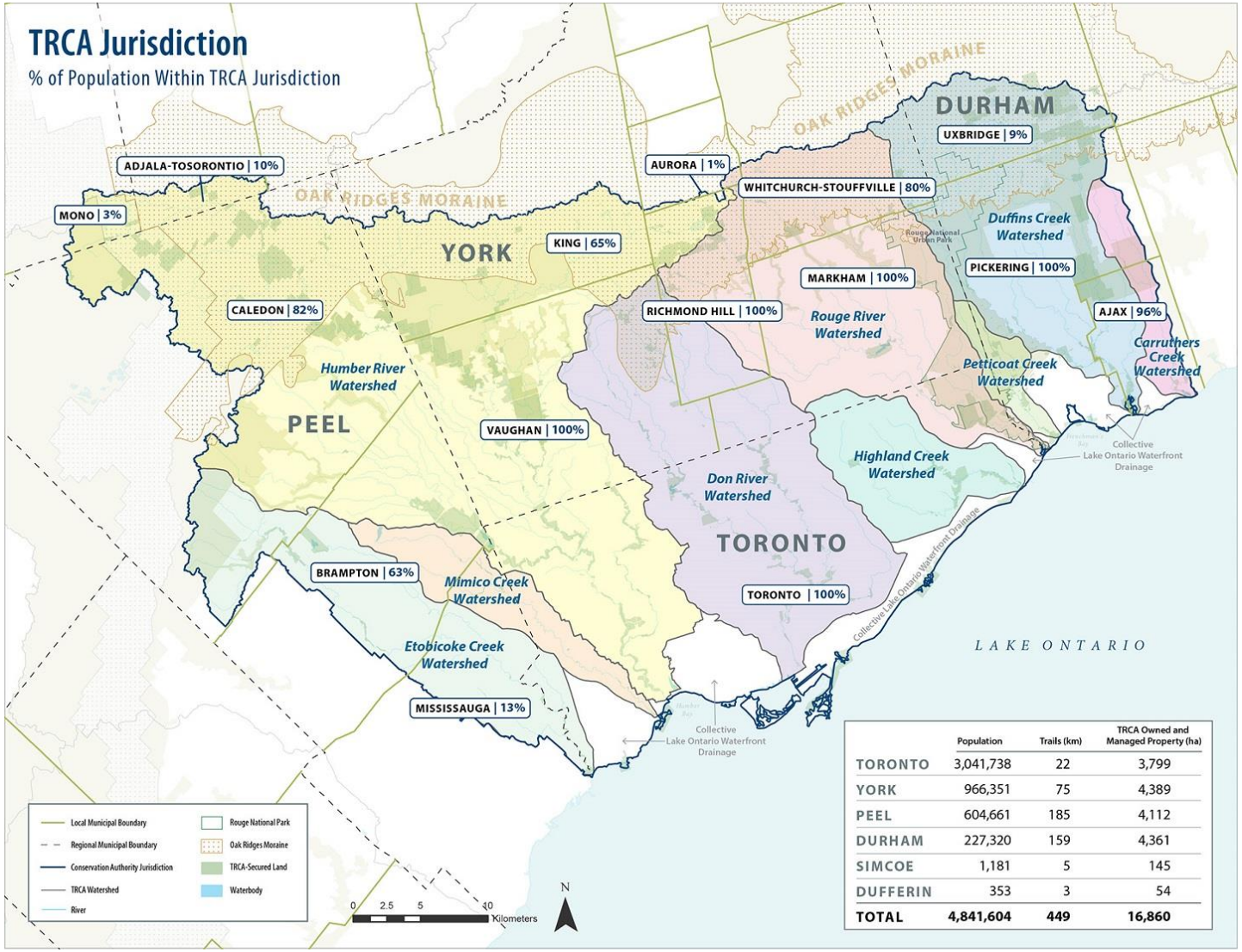
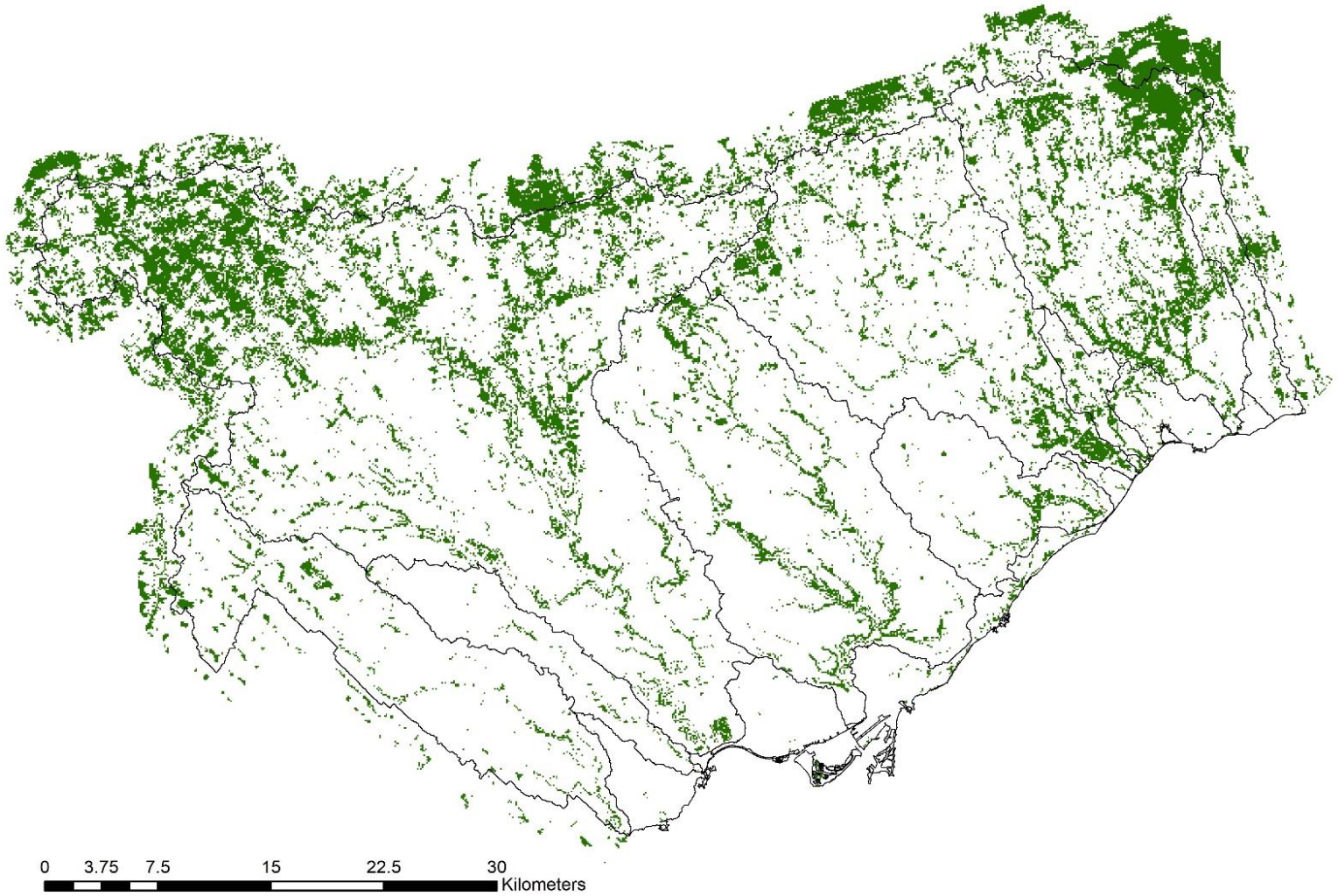
Study Region

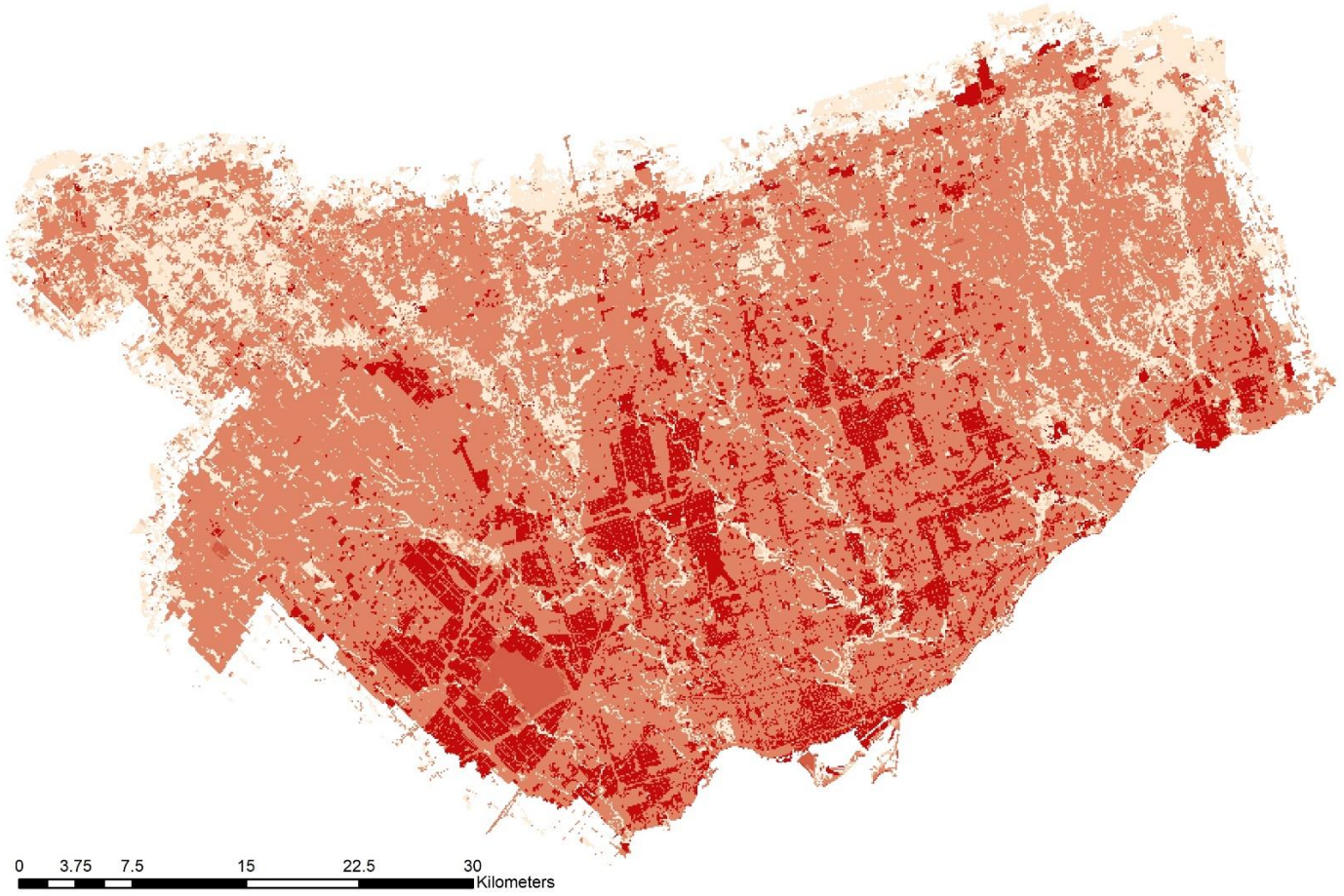


Habitat across the Landscape



Example:
Forest habitat patches

Impediment to Movement



Example:
Resistance layer for
forest-wetland dependent species

Resistance value

1	Low impediment
10	
20	
25	
30	
45	
100	High impediment

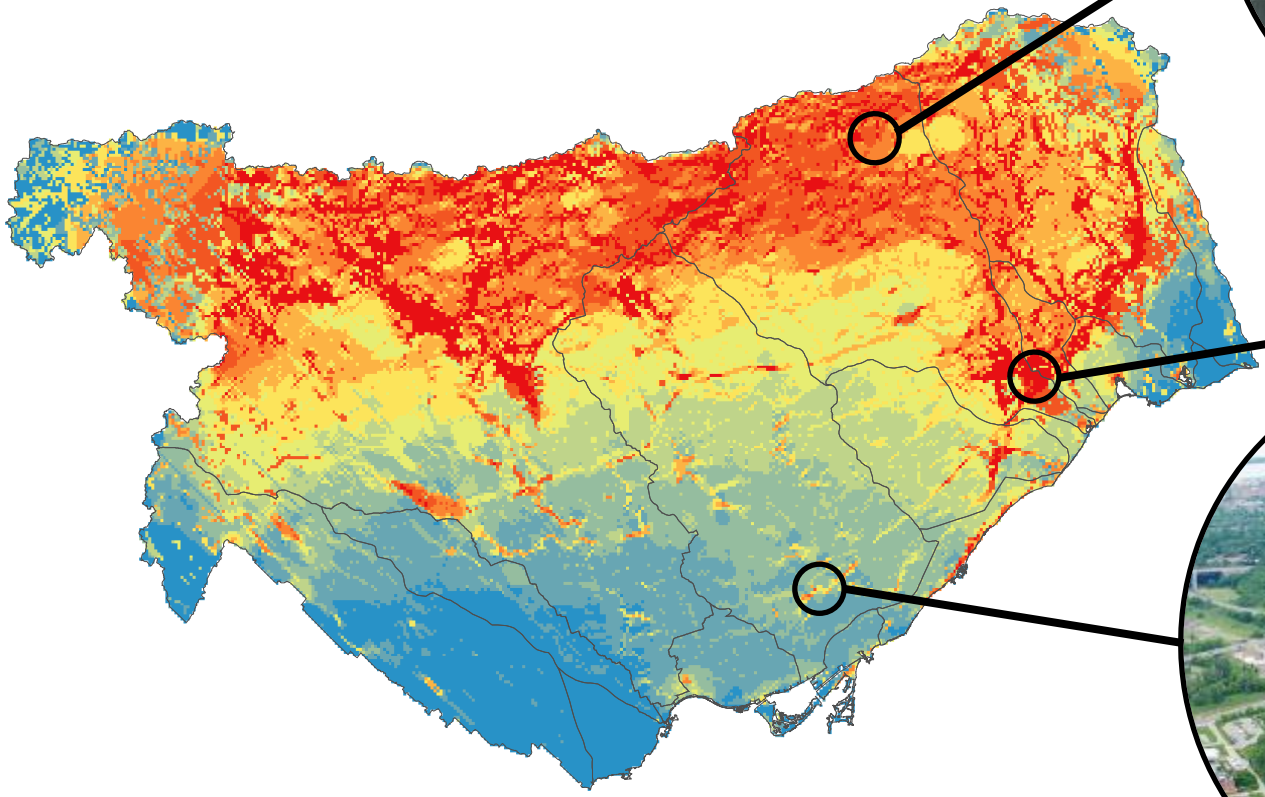
Method: Circuitscape

- Circuitscape (McRae et al. 2008) is a tool that identifies the locations that we cannot lose – the only pathways that if lost will compromise regional connectivity

- Identify regional corridors
- Identify regional movement guild-based corridors
  - Amphibians: wetland-wetland and forest-wetland connectivity

Habitat Patches (Nodes) + Resistance Layer = Circuitscape Output

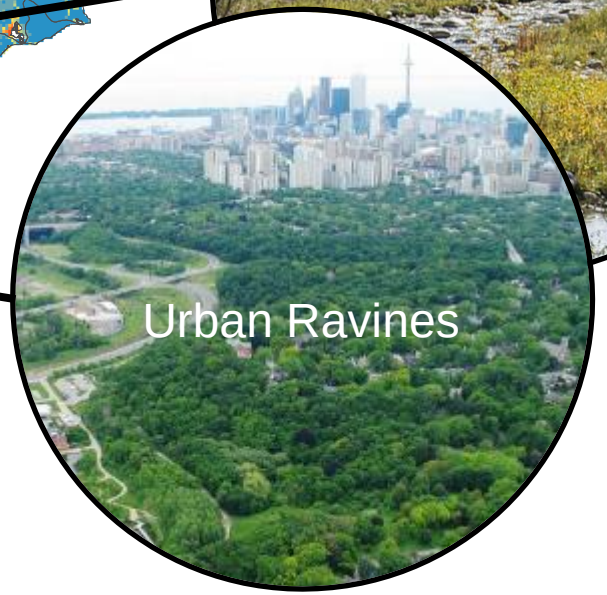
Regional Connectivity



Pinchpoint connectivity (quantile)

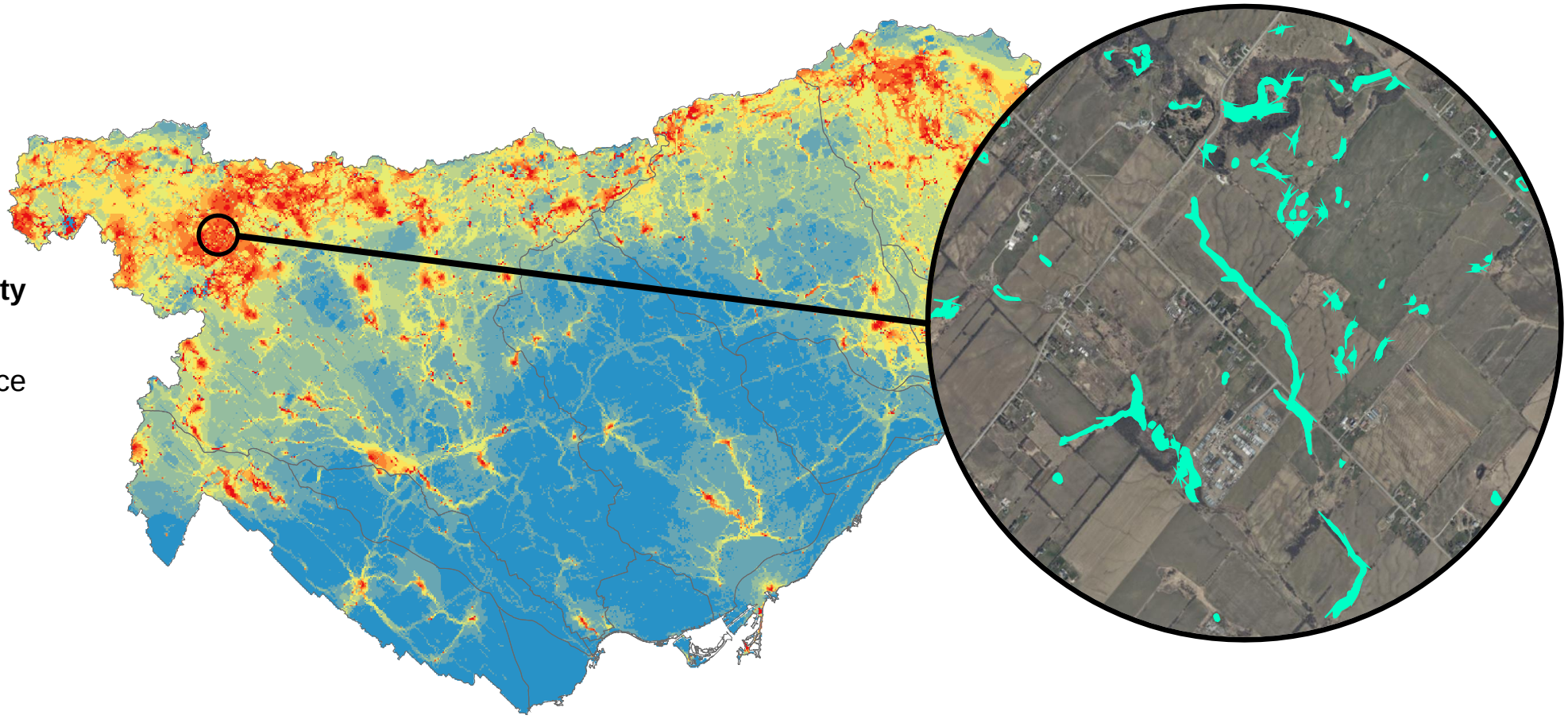
Low importance

High importance



Amphibian Habitat Connectivity: Wetland

Wetlands are dispersed and corridors are sparse

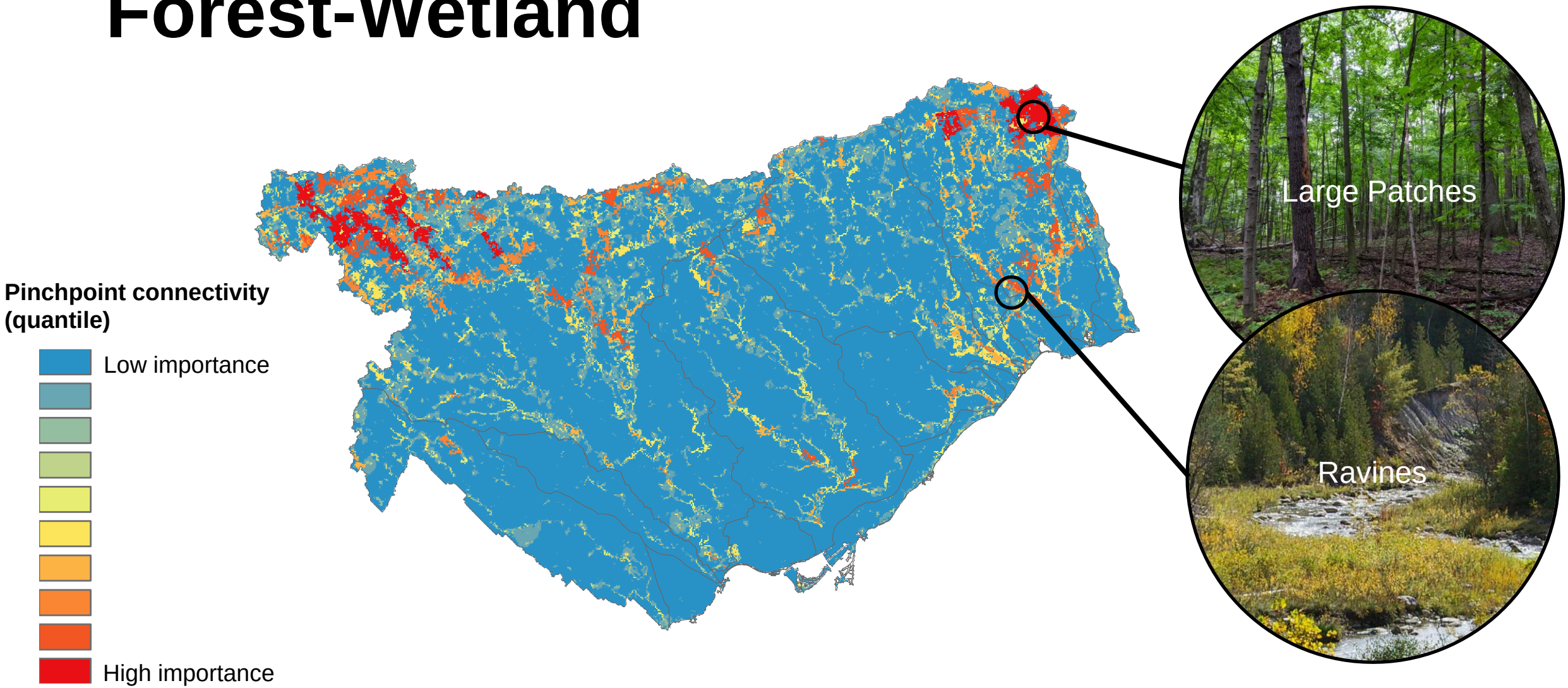


Pinchpoint connectivity (quantile)

Low importance

High importance

Amphibian Habitat Connectivity: Forest-Wetland

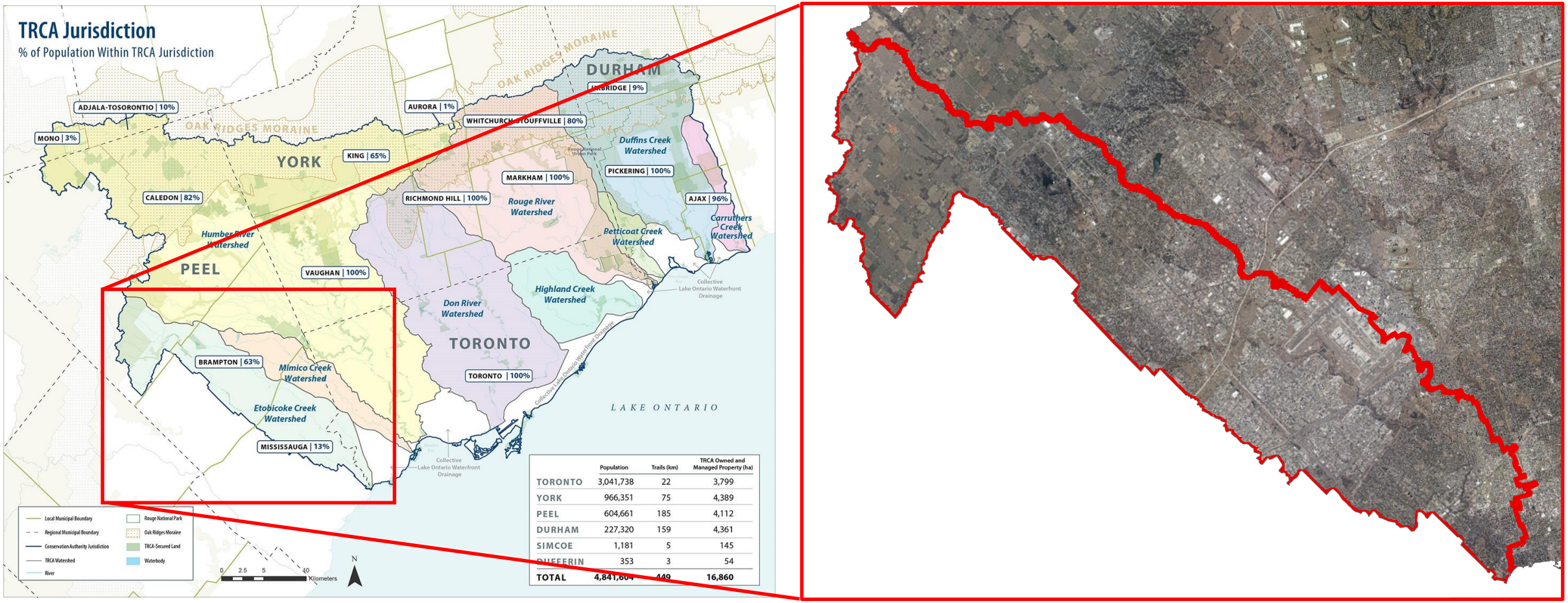


Objectives

1. Assess the regional connectivity priorities through a broad connectivity model
2. Regional connectivity priorities based on habitat patch types with broad avian and amphibian movement guilds
3. Prioritization of ecopassage implementation based on watershed-level results

Watershed-level Connectivity

Etobicoke Creek Watershed



Method: Linkage Mapper

Linkage Mapper (McRae and Kavanagh 2011)

- Identifies least-cost paths that provide the linkages between habitats
- Linkages are determined through cost-weighted distances

10-m resolution for resistance rasters representing movement guilds:

- Amphibian Wetland-Wetland
- Amphibian Forest-Wetland
- Mammals (Large Canines) Forest-Meadow

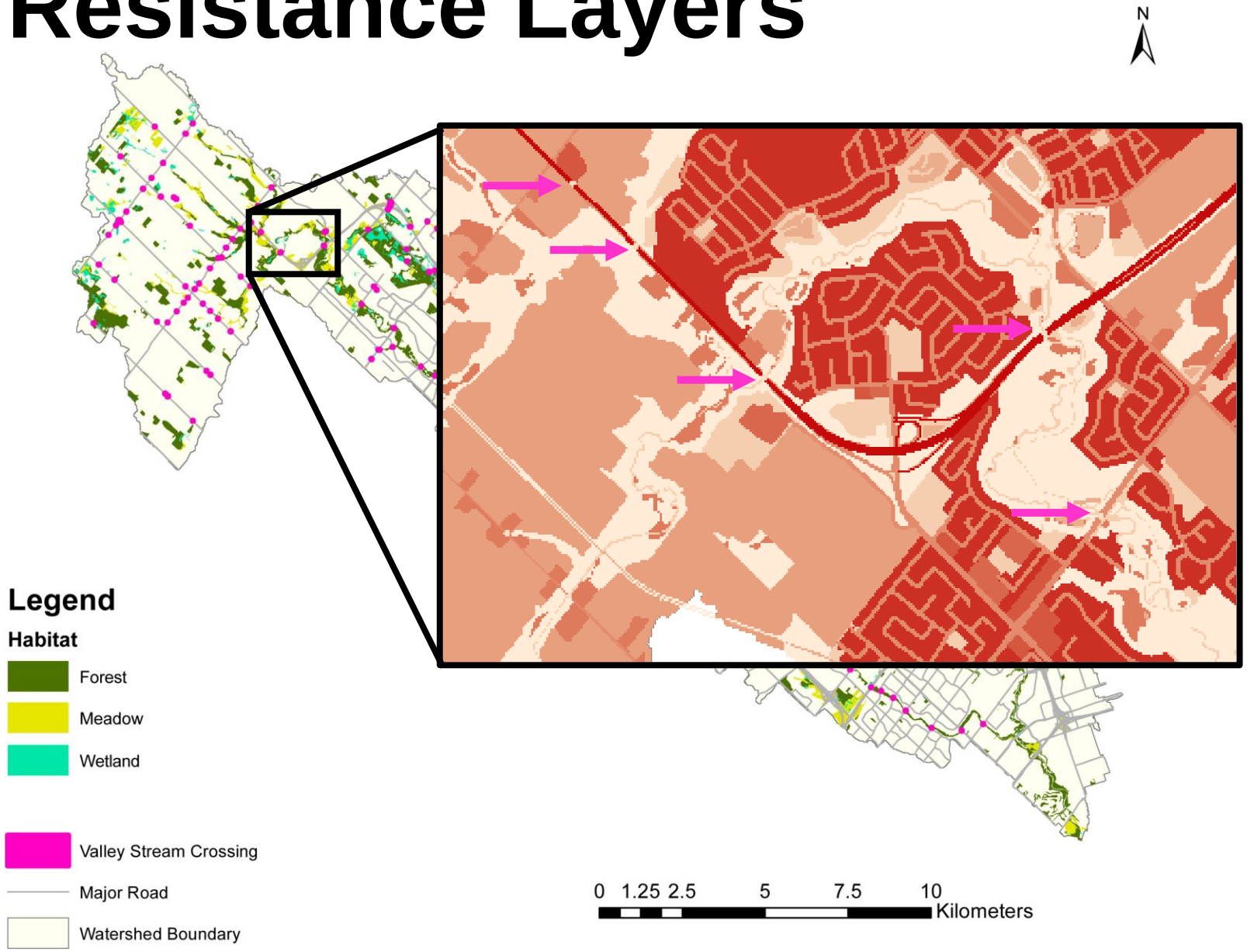
Habitat Patches (Nodes) + Resistance Layer

Method: Ecopassage Prioritization

1. Identify important linkages as least-cost paths for each movement guild using Linkage Mapper
2. Identify corridors as pinch points using Circuitscape
3. Least-cost paths with high pinch points (i.e. important corridors) crossing roads
4. Intersections with multiple movement guilds and high pinch point values become higher priority for ecopassage implementation or barrier improvement

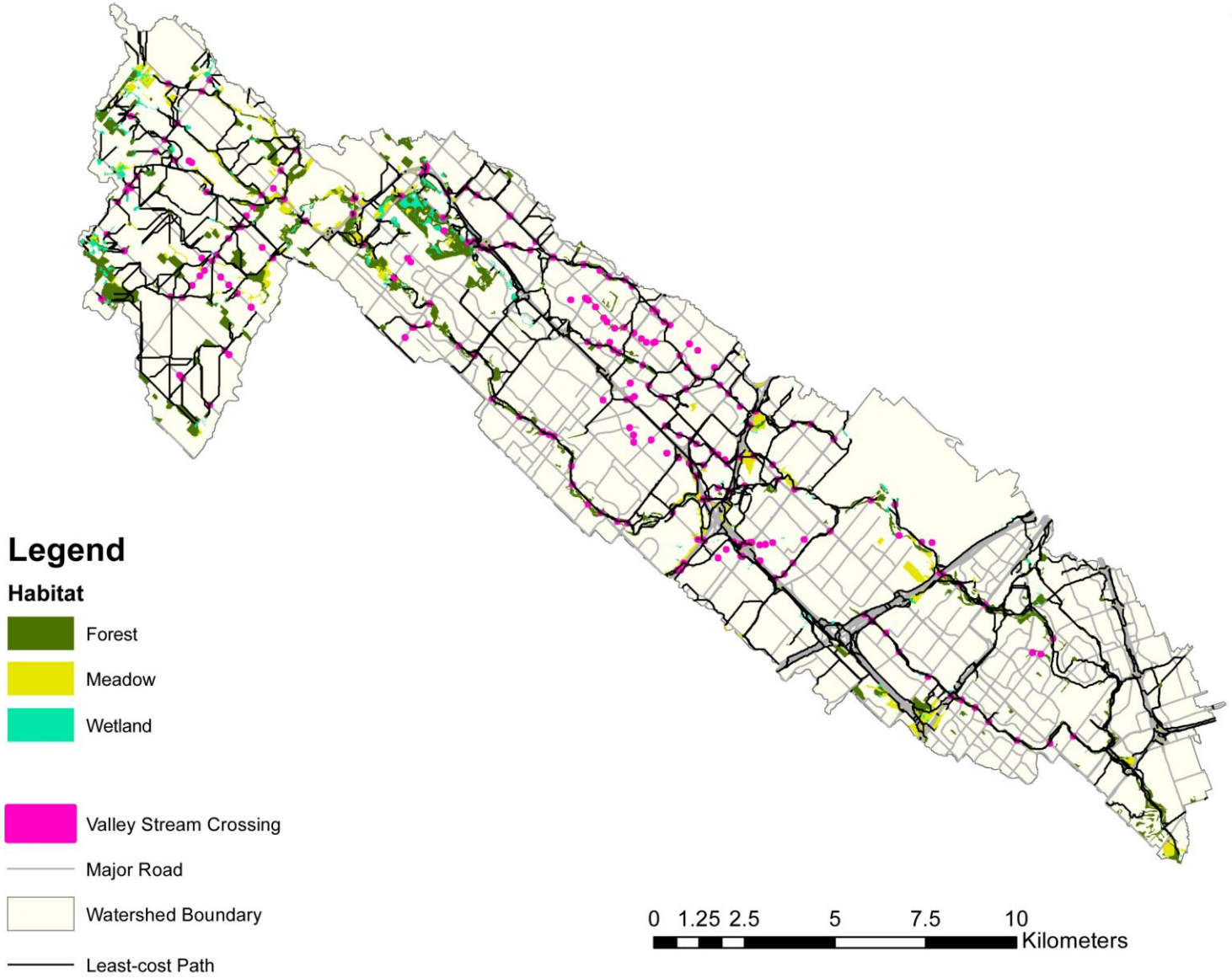
Valley Stream Crossings

Resistance Layers

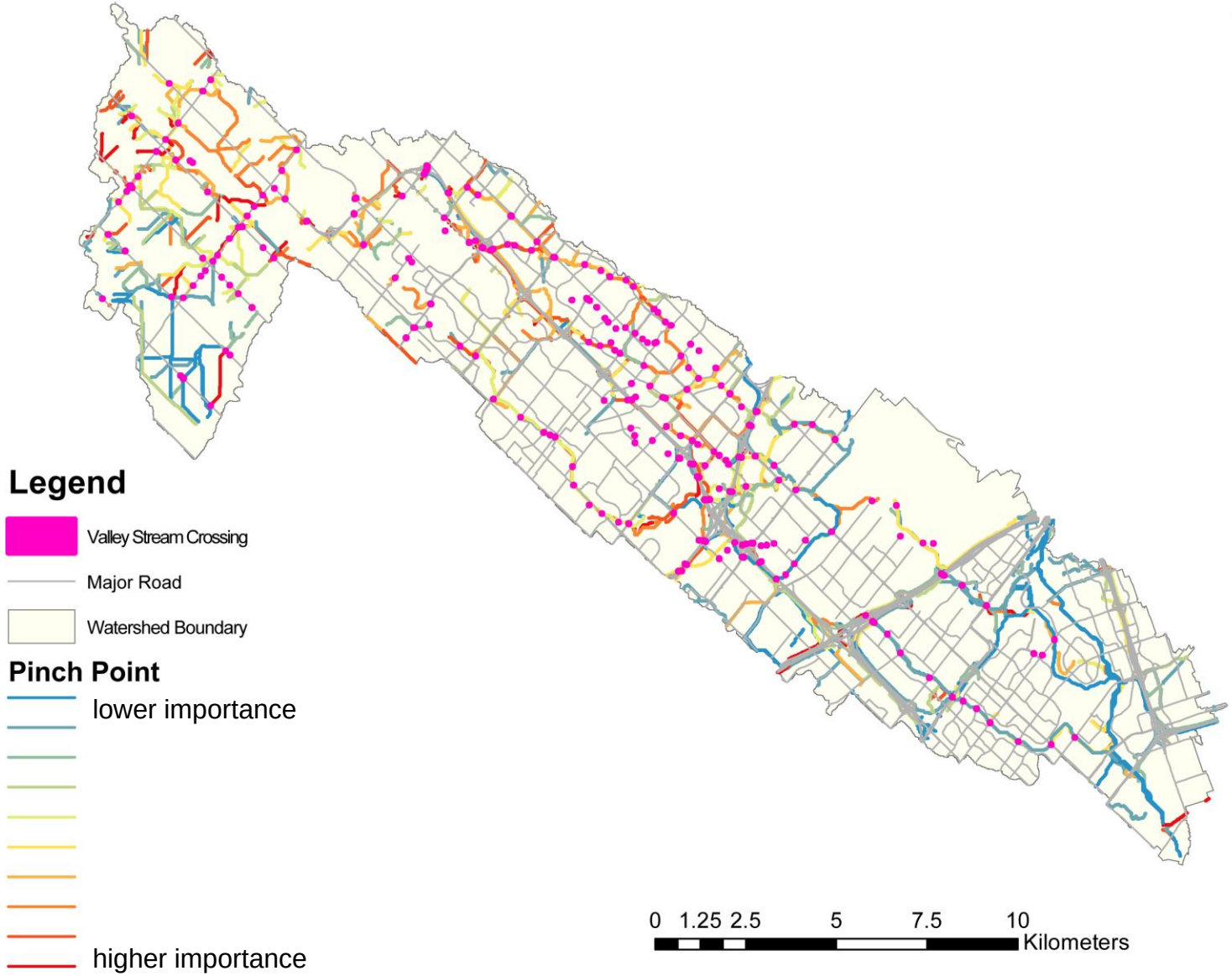


Reduced resistance at valley stream crossings

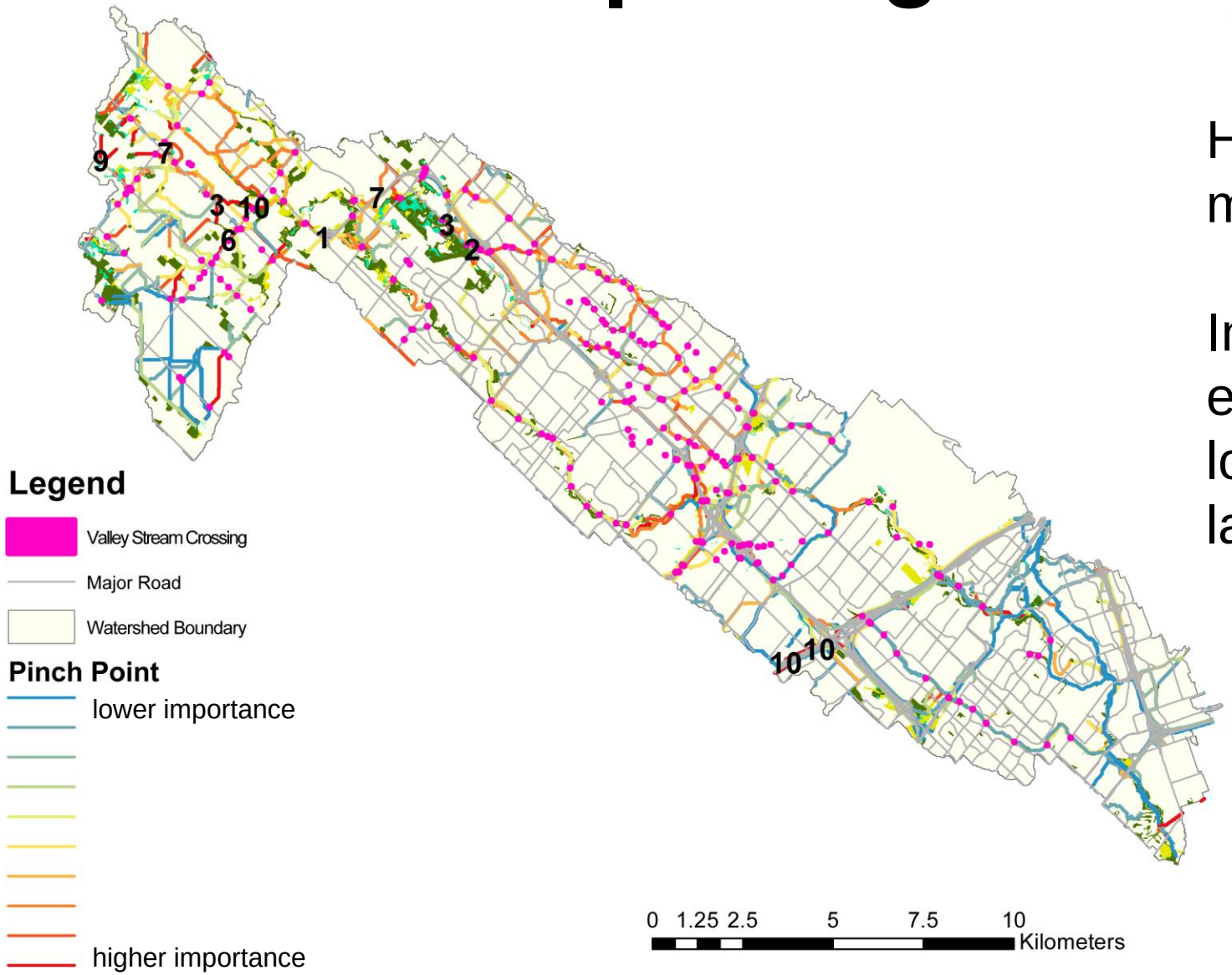
Results: Least-Cost Paths



Results: Pinch Points



Results: Ecopassage Prioritization



Highest priorities support multiple movement guilds

Implementing an ecopassage at these locations support overall landscape connectivity

Summary

- Regional connectivity maps help identify critical areas that should be maintained including future development
- Species movement guilds demonstrate that corridors could vary based on habitat needs and movement behaviour
- Informs ecopassage prioritization representing important movement corridors in the landscape

Thank You!

University of Toronto
Fortin Lab

TRCA
Paul Prior
Sue Hayes

Peel Region

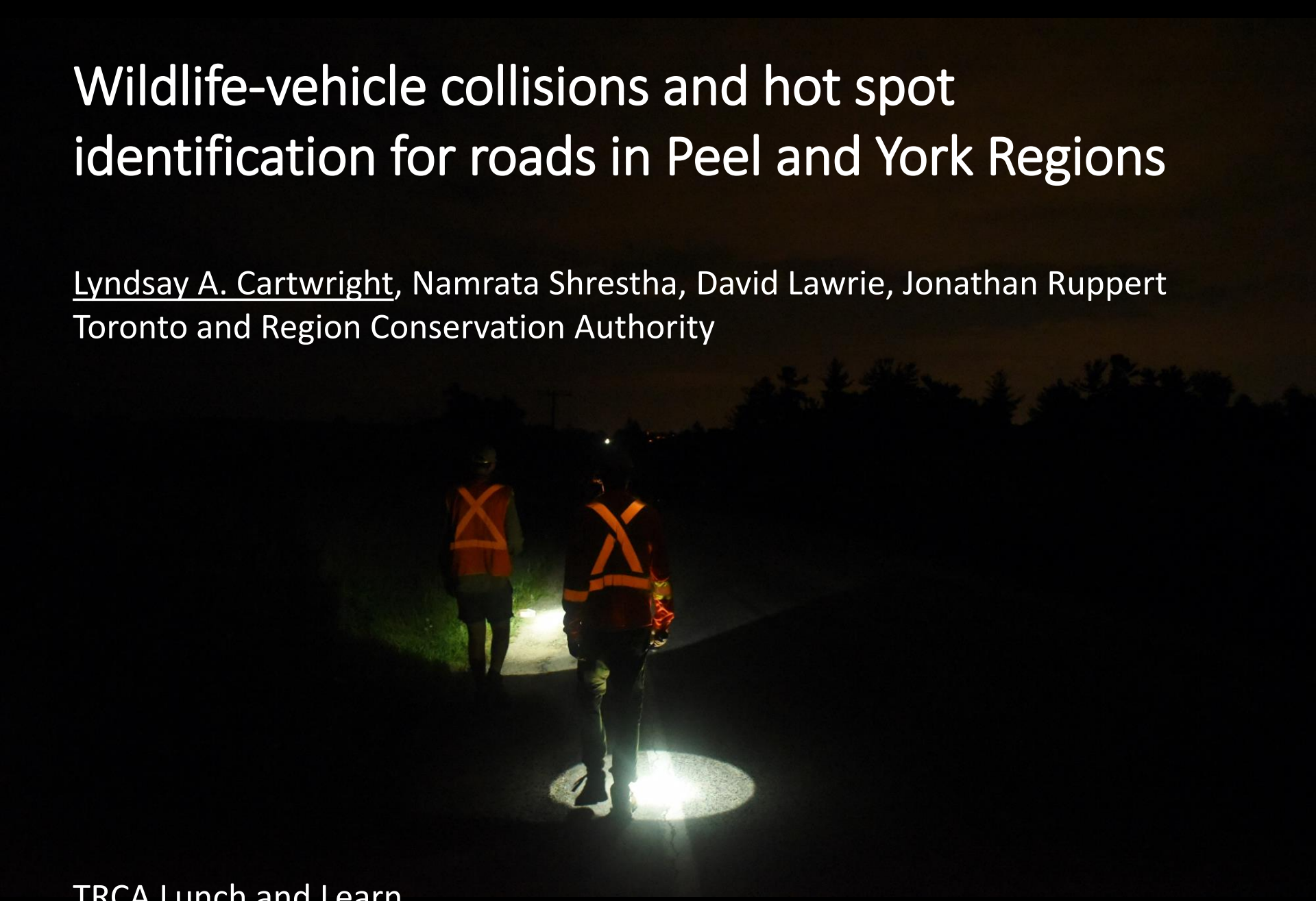
York Region

Mitacs

NSERC

Wildlife-vehicle collisions and hot spot identification for roads in Peel and York Regions

Lyndsay A. Cartwright, Namrata Shrestha, David Lawrie, Jonathan Ruppert
Toronto and Region Conservation Authority



TRCA Lunch and Learn
September 14, 2021

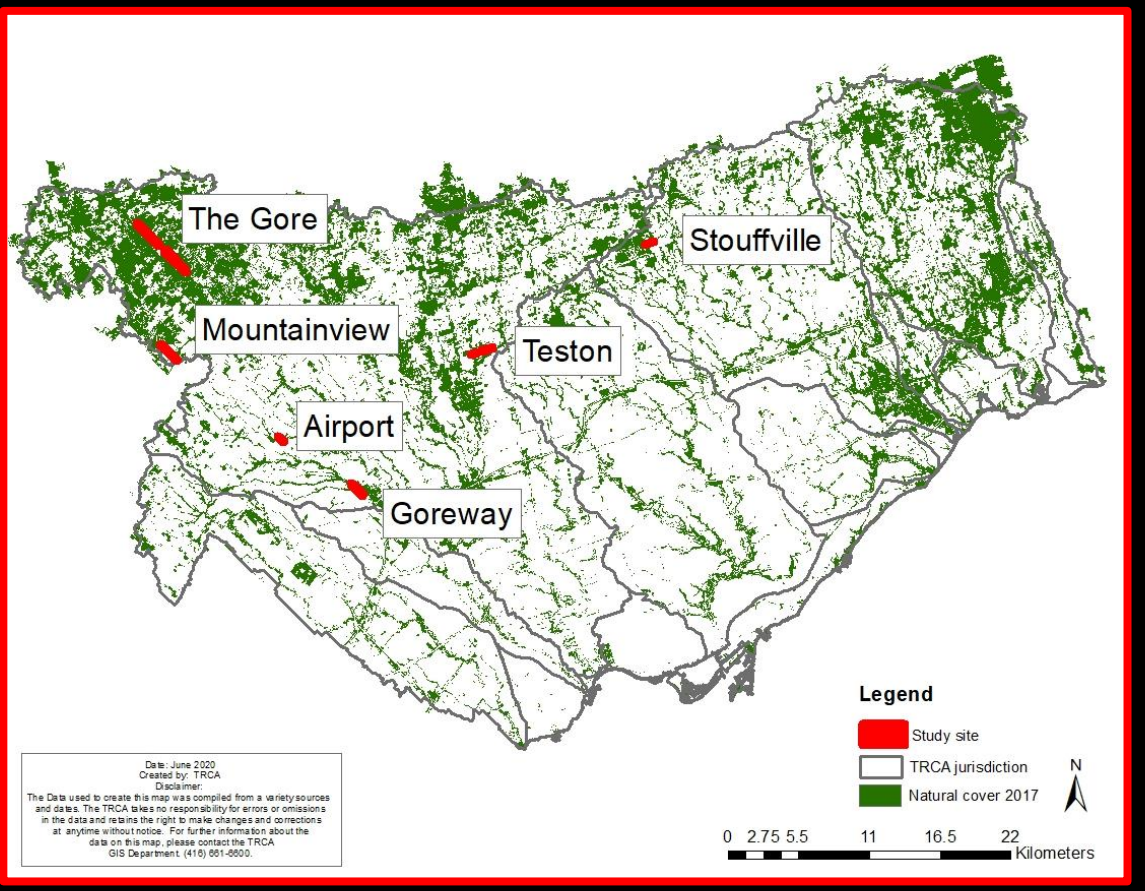
Purpose

- Broader goals

- Summarize wildlife-vehicle collision (WVC) data collected in 2018 and 2019 at six sites in the Greater Toronto Area.

- Number of WVCs
  - Composition by taxa group, species, L1-L3, species at risk
  - Seasonal patterns
- Hot spot assessments

Methods

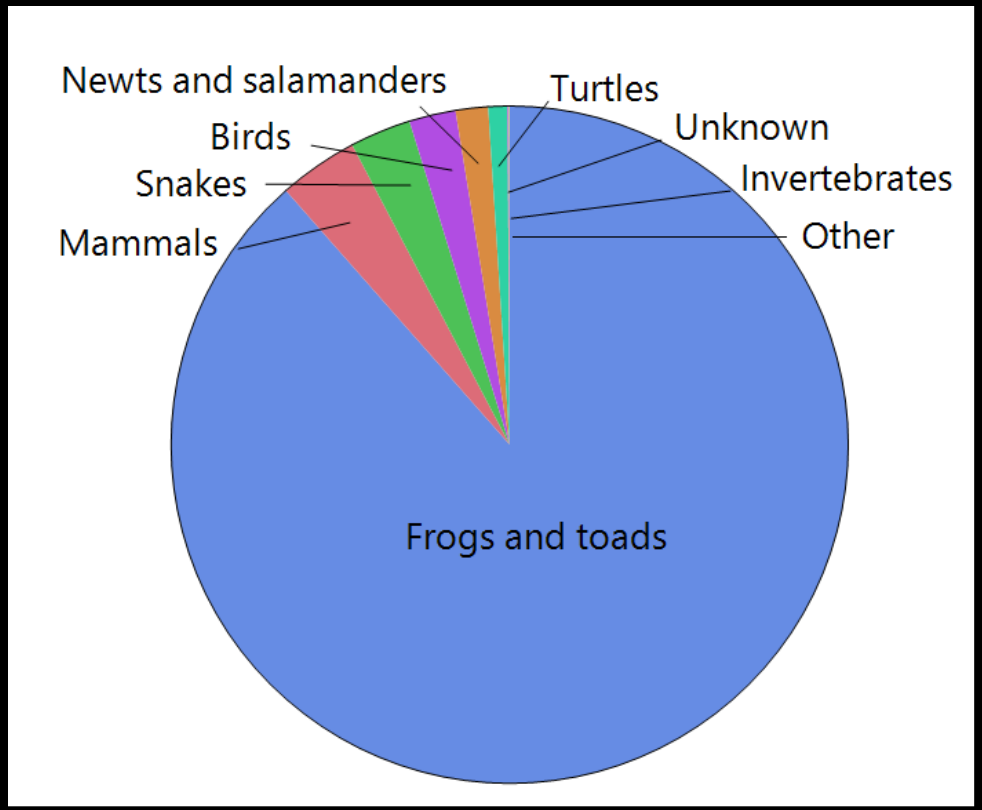


- April-November
- Day and night
- Identify/GPS

All sites combined - # WVCs by taxa

- Frogs and toads represented 89% of all WVCs

Taxa group	Total number of WVCs
Frogs and toads	7769
Mammals	334
Snakes	256
Birds	195
Newts and salamanders	136
Turtles	80
Unknown	5
Invertebrates	3
Other	1



All sites combined - # WVCs by species

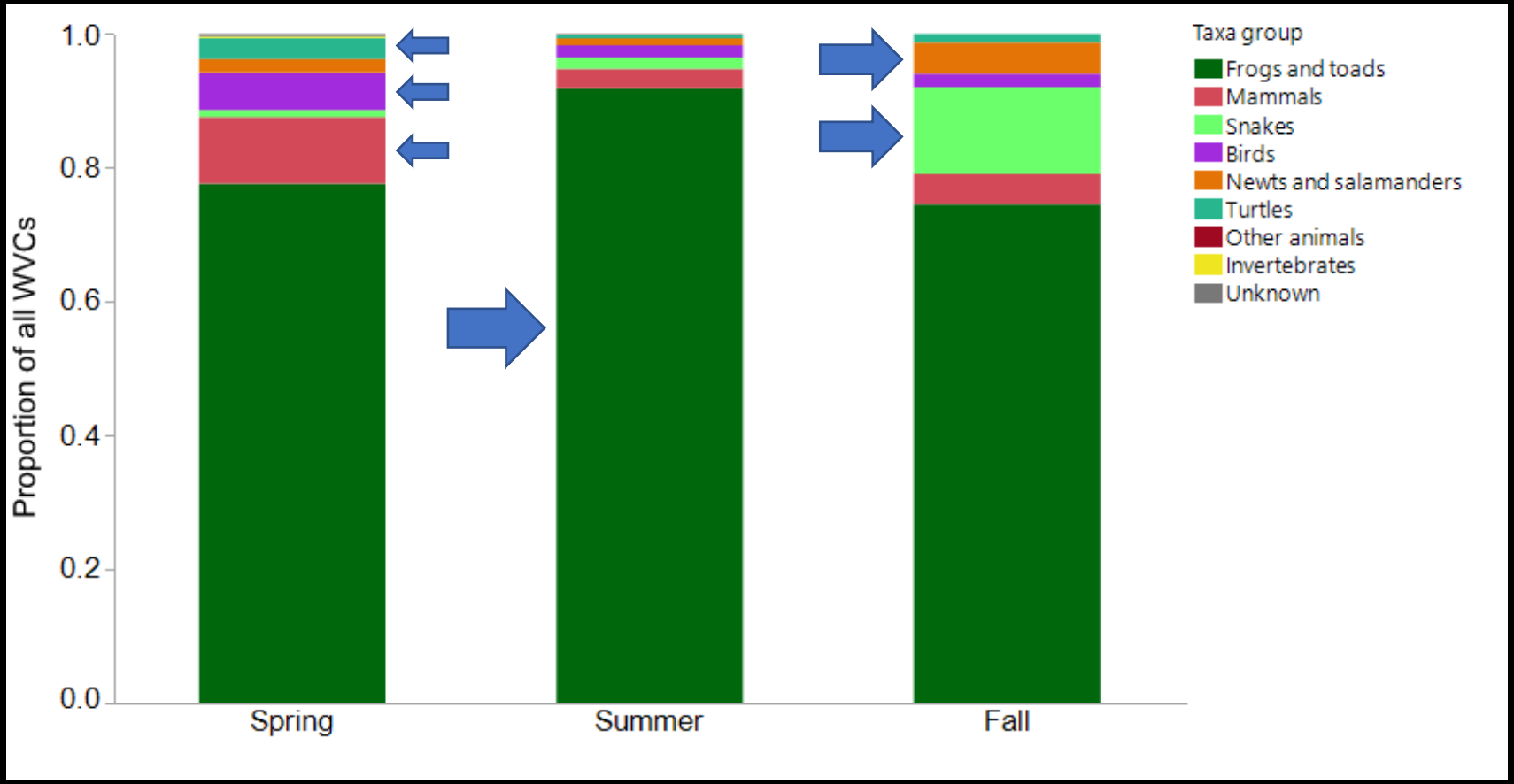
- 54% of all WVCs were species of regional concern

Common Snapping Turtle
(*Chelydra serpentina serpentina*)

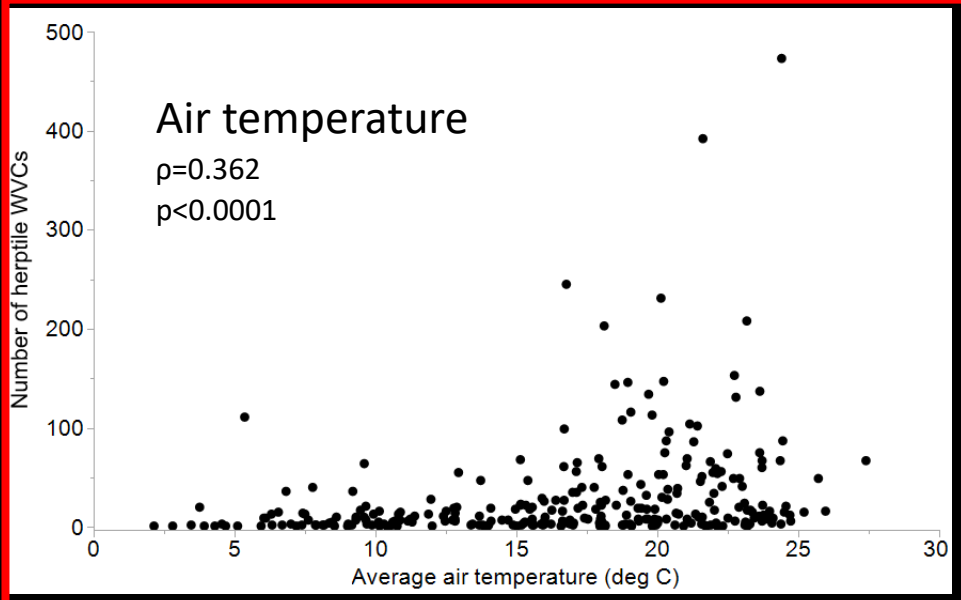
Species	L-rank	Total number of WVCs
Unknown		6075
American Toad	L4	588
Grey Treefrog	L2	338
Green Frog	L4	309
Northern Leopard Frog	L3	293
Spring Peeper	L2	176
Wood Frog	L2	173
Northern Red-bellied Snake	L3	132
Eastern Newt	L2	101
Eastern Gartersnake	L4	91
American Bullfrog	L2	56
Snapping Turtle (SAR)	L3	39
Midland Painted Turtle	L3	38
Jefferson Salamander (SAR)	L1	29
Grey Squirrel	L5	26
Raccoon	L5	25
Eastern Chipmunk	L4	24
Eastern Milksnake	L3	23
Pickerel Frog	L2	21
Eastern Cottontail	L4	20

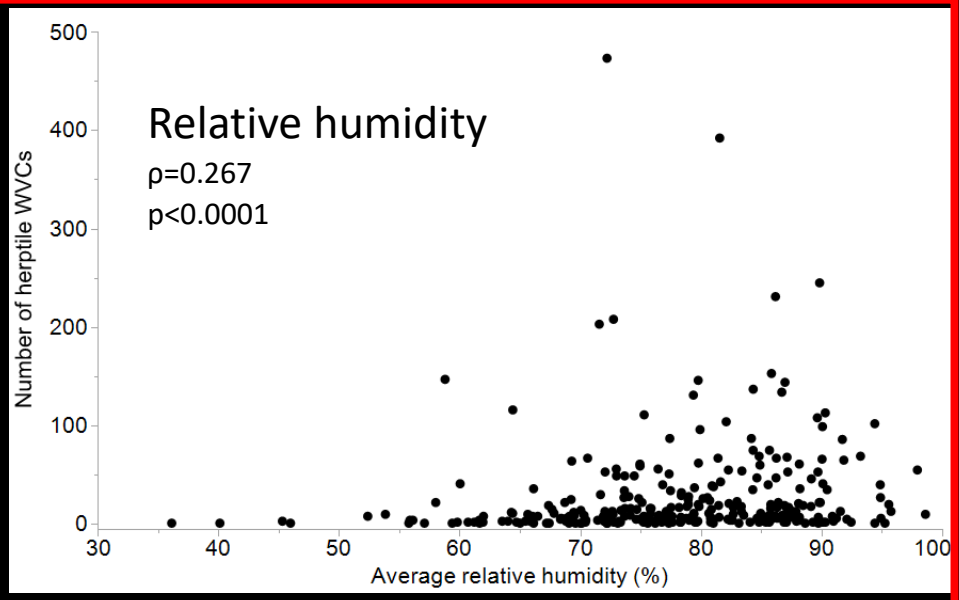
Plus 59 more species…

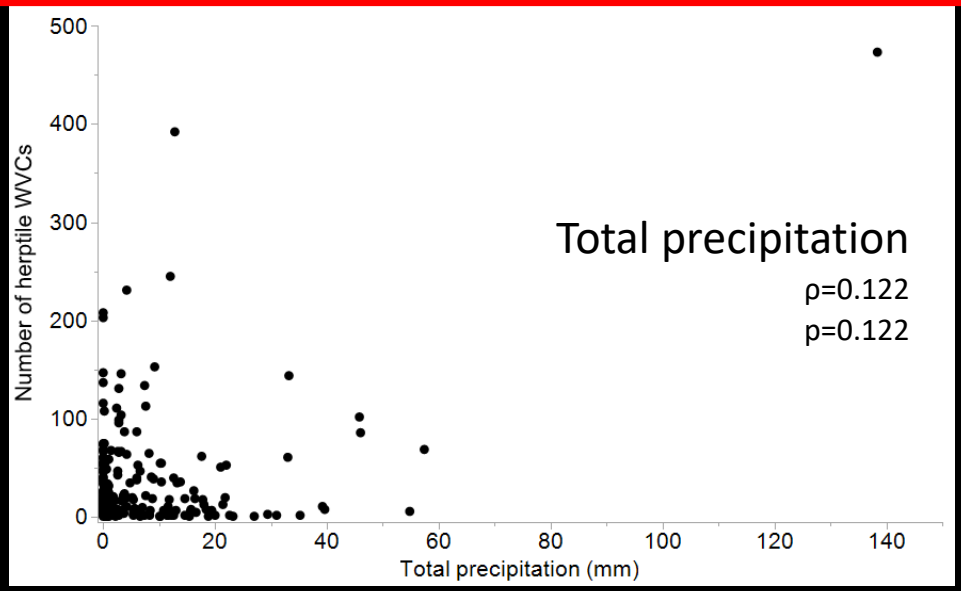
All sites combined – seasonal variation by taxa



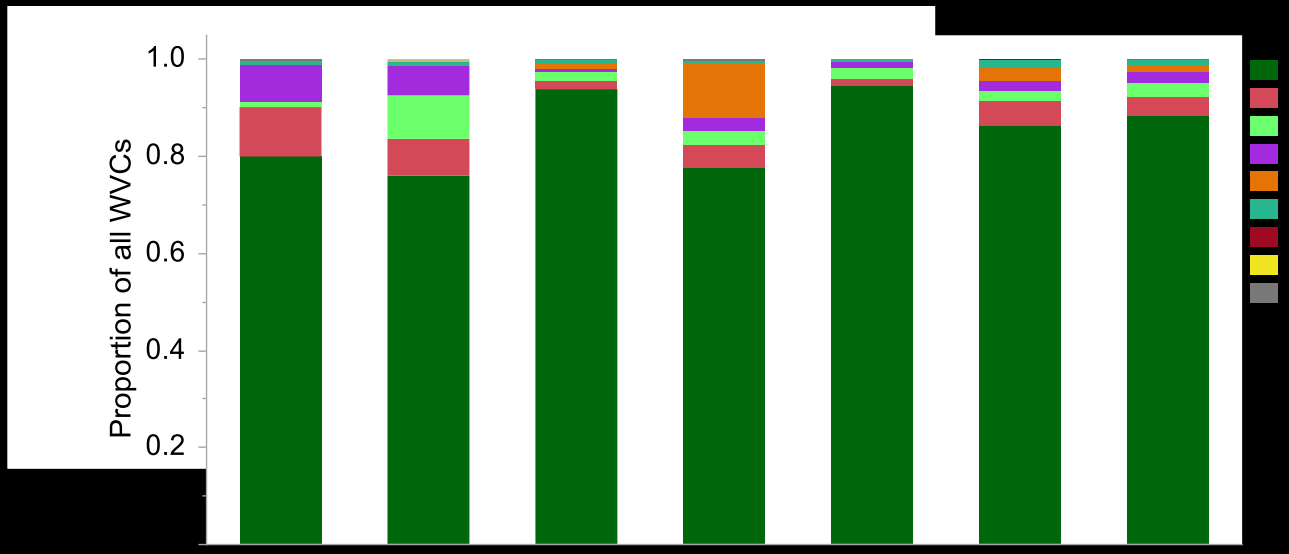
Weather and herptile WVCs







Comparing among sites – composition by taxa group



- Sites are different… mitigation

Comparing among sites

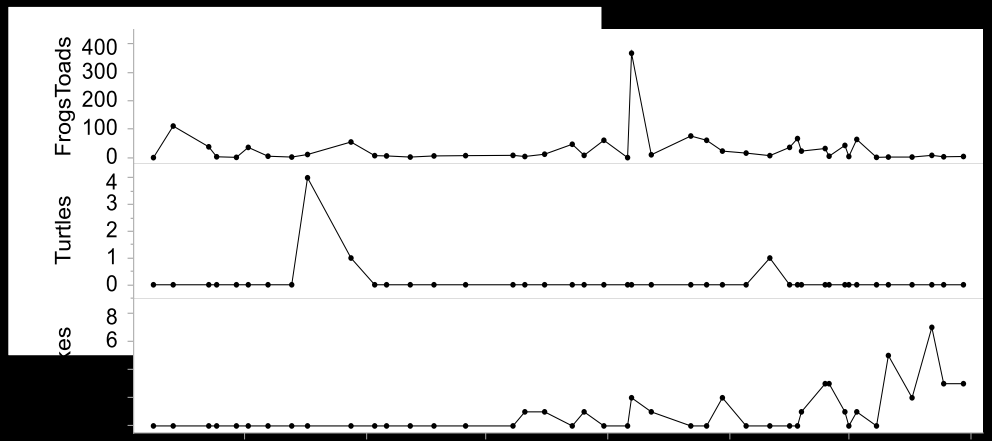
- Prioritization/ mitigation

Pickerel Frog
(*Lithobates palustris*)

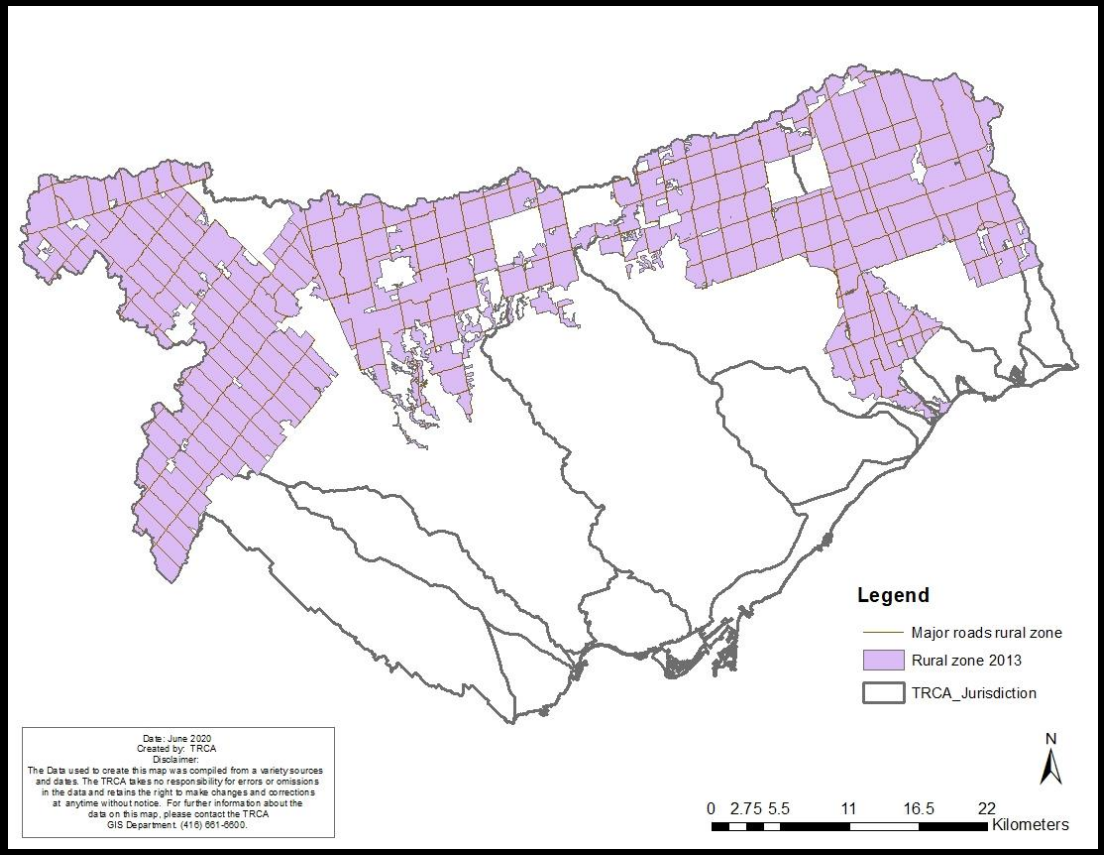
Species	L-rank	Airport	Goreway	Mountainview	Stouffville	Teston	The Gore	Total
Unknown		120	858	1748	186	1394	1769	6075
American Toad	L4	52	32	261	32	29	182	588
Grey Treefrog	***L2***	18		21	6	***132***	***161***	338
Green Frog	L4	17	17	158	8	29	80	309
Northern Leopard Frog	***L3***	***29***		***155***		***61***	***48***	293
Spring Peeper	***L2***			12	12	***138***	14	176
Wood Frog	***L2***	2	4	3	***37***	***22***	***105***	173
Northern Red-bellied Snake	***L3***		***79***	17	8	20	8	132
Eastern Newt	***L2***			***29***	6	1	***65***	101
Eastern Gartersnake	L4	3	14	27	1	14	32	91
American Bullfrog	***L2***			***56***				56
Snapping Turtle (SAR)	***L3***	2	2	8			***27***	39
Midland Painted Turtle	***L3***		6	6	1	6	***19***	38
Jefferson Salamander (SAR)	***L1***				***29***			29
Grey Squirrel	L5	3	6	2	1		14	26
Raccoon	L5		7	4	2	1	11	25
Eastern Chipmunk	L4			6		2	16	24
Eastern Milksnake	***L3***			4		9	***10***	23
Pickerel Frog	***L2***			1			***20***	21
Eastern Cottontail	L4	5	8	2			5	20
American Robin	L5		9		1	1	4	15
Porcupine	***L2***			1			***13***	14

Plus 57 more species…

Timing movements and mapping hot spots – e.g. Teston Road



We estimate that approximately **1.2 million** wildlife-vehicle collisions occur in one season (April-November) on major roads in the rural area of the jurisdiction.



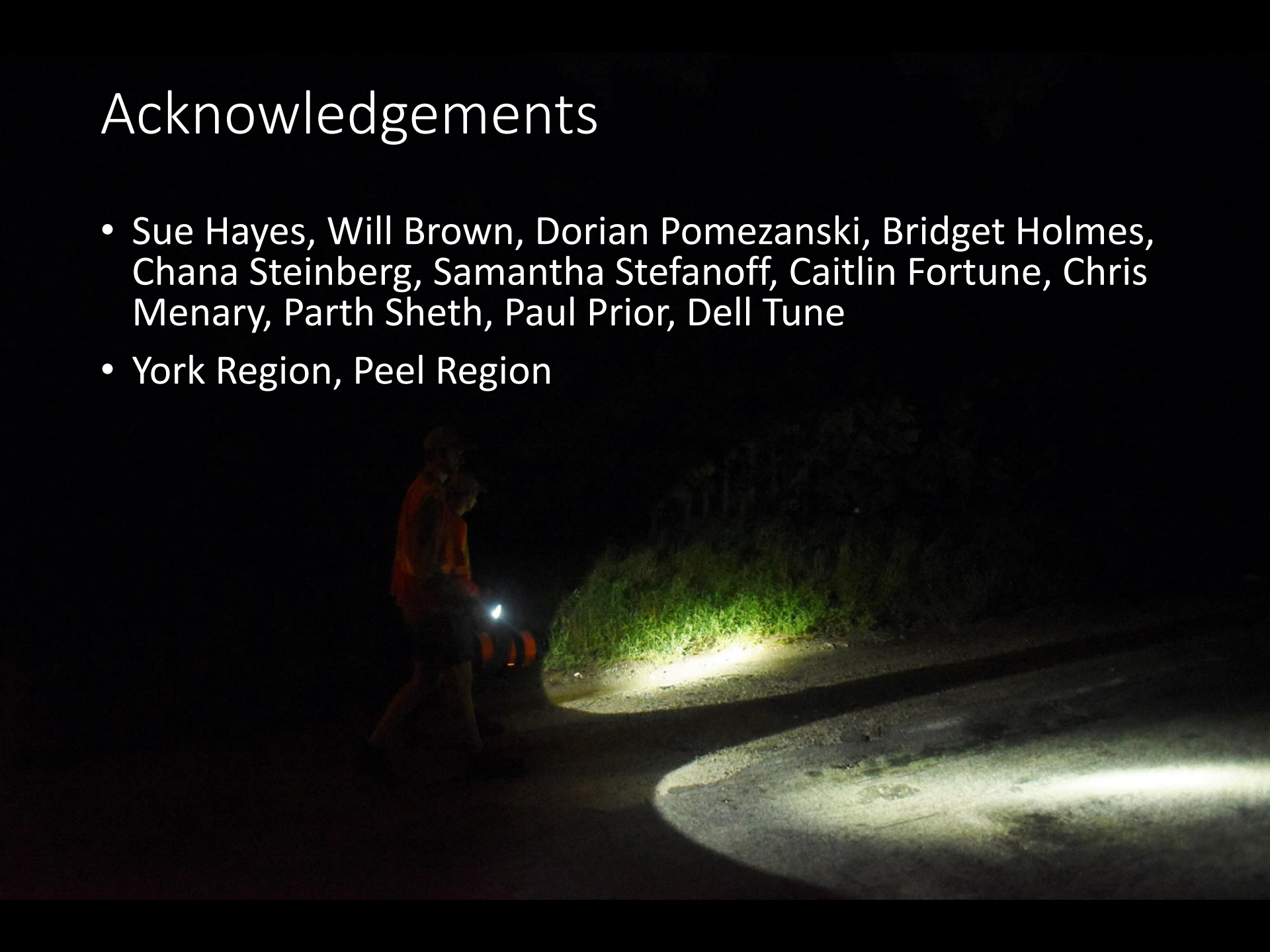
Conclusions

- WVCs are a major threat to wildlife population persistence

- The results of this project can be used to:
  - Guide where to install wildlife passages
  - What type of passage would have maximum benefit based on species
  - Restrict traffic
  - Raise awareness on the extent of the issue

Acknowledgements

- Sue Hayes, Will Brown, Dorian Pomezanski, Bridget Holmes, Chana Steinberg, Samantha Stefanoff, Caitlin Fortune, Chris Menary, Parth Sheth, Paul Prior, Dell Tune
- York Region, Peel Region



Making the Connection

The role of technology and habitat use in making good wildlife connectivity decisions.

Presented by: David Lawrie, Research Scientist

September 14, 2021

Toronto and Region Conservation Authority

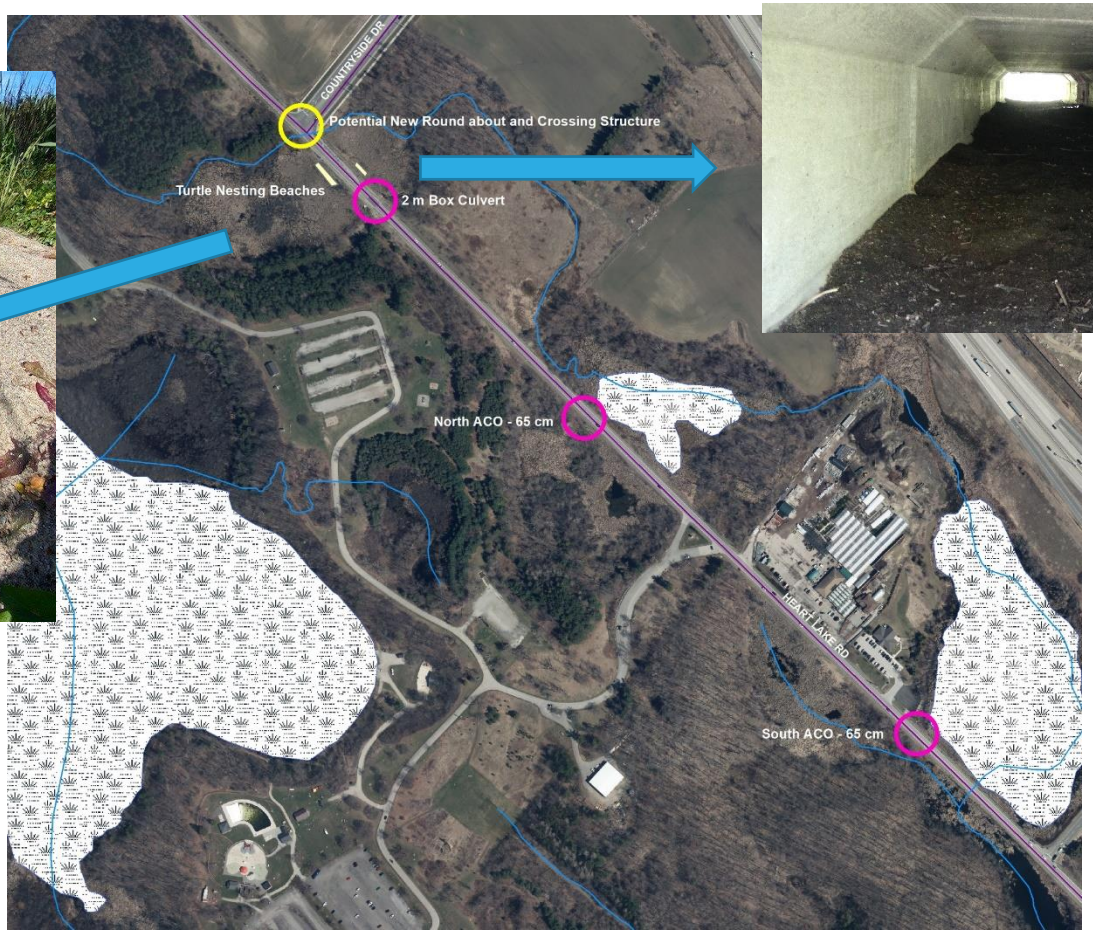
Heart Lake and Stouffville Road Study Areas

Heart Lake a long winding road to get here

Heart Lake Road

Heart Lake Road

A Snapshot of Mitigation



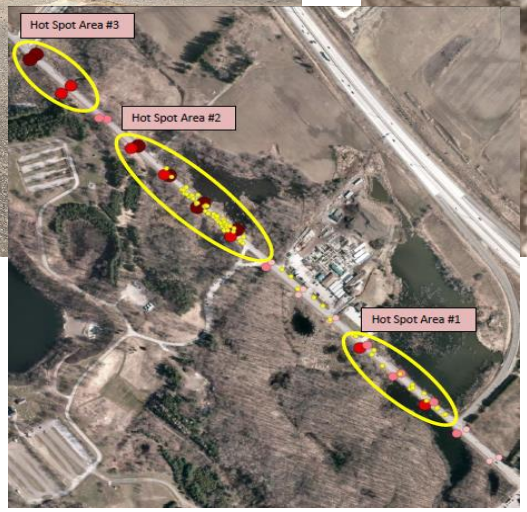
The 2m Box Culvert

Typical PIR Cameras vs HALT Laser Trigger

Camera Type	Bushnell Eastside Low Glow	Bushnell Liveview Laser Trigger	Bushnell Westside No Glow
Species Observed, L-Rank	Raccoon, L5	Raccoon, L5	Raccoon, L5
	Deer Mouse, L4	Deer Mouse, L4	Deer Mouse, L4
	Eastern Chipmunk, L4	Eastern Chipmunk, L4	Eastern Chipmunk, L4
	Eastern Cottontail, L4	Eastern Cottontail, L4	Eastern Cottontail, L4
	Grey Squirrel, L5	Grey Squirrel, L5	Grey Squirrel, L5
	Mink, L4	Mink, L4	Mink, L4
	Red Squirrel, L4	Red Squirrel, L4	Red Squirrel, L4
	Striped Skunk, L5	Striped Skunk, L5	Striped Skunk, L5
	Virginia opossum, L4	Virginia opossum, L4	Virginia opossum, L4
	Vole, L4	Vole, L4	Vole, L4
		Ermine, L3	
		American Toad, L4	
		Common Snapping Turtle, L3	
		Green Frog , L4	
		Milksnake, L3	
		Muskrat, L4	
		Northern Leopard Frog, L3	
		Shrew, L3	
Total of Species Captured	**10**	**18**	**10**
Total # of Detections	607	2274	794*

Considerations for Design & Implementation

City of Brampton Heart Lake Road ACO Wildlife Tunnel Installation – 2 Days

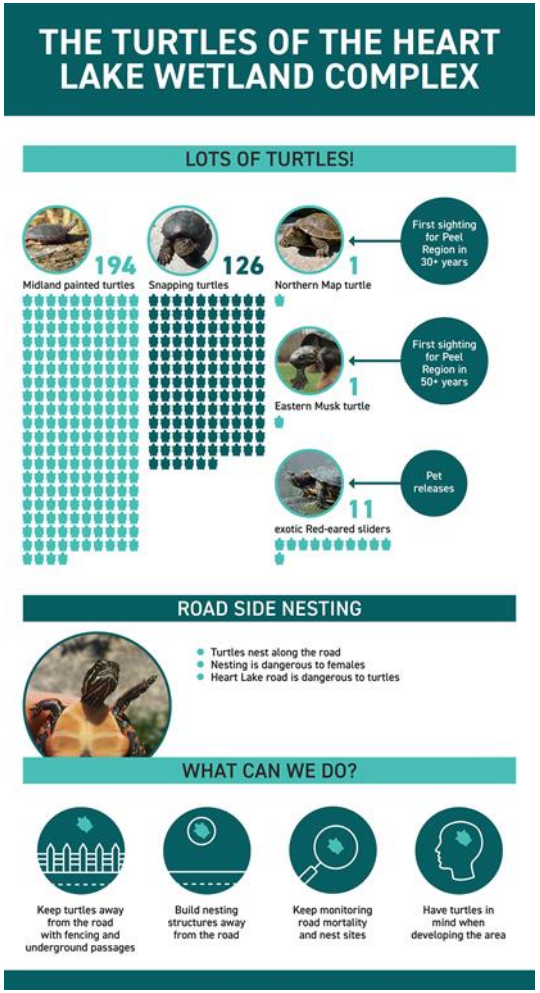


HALT Laser Trigger in ACO

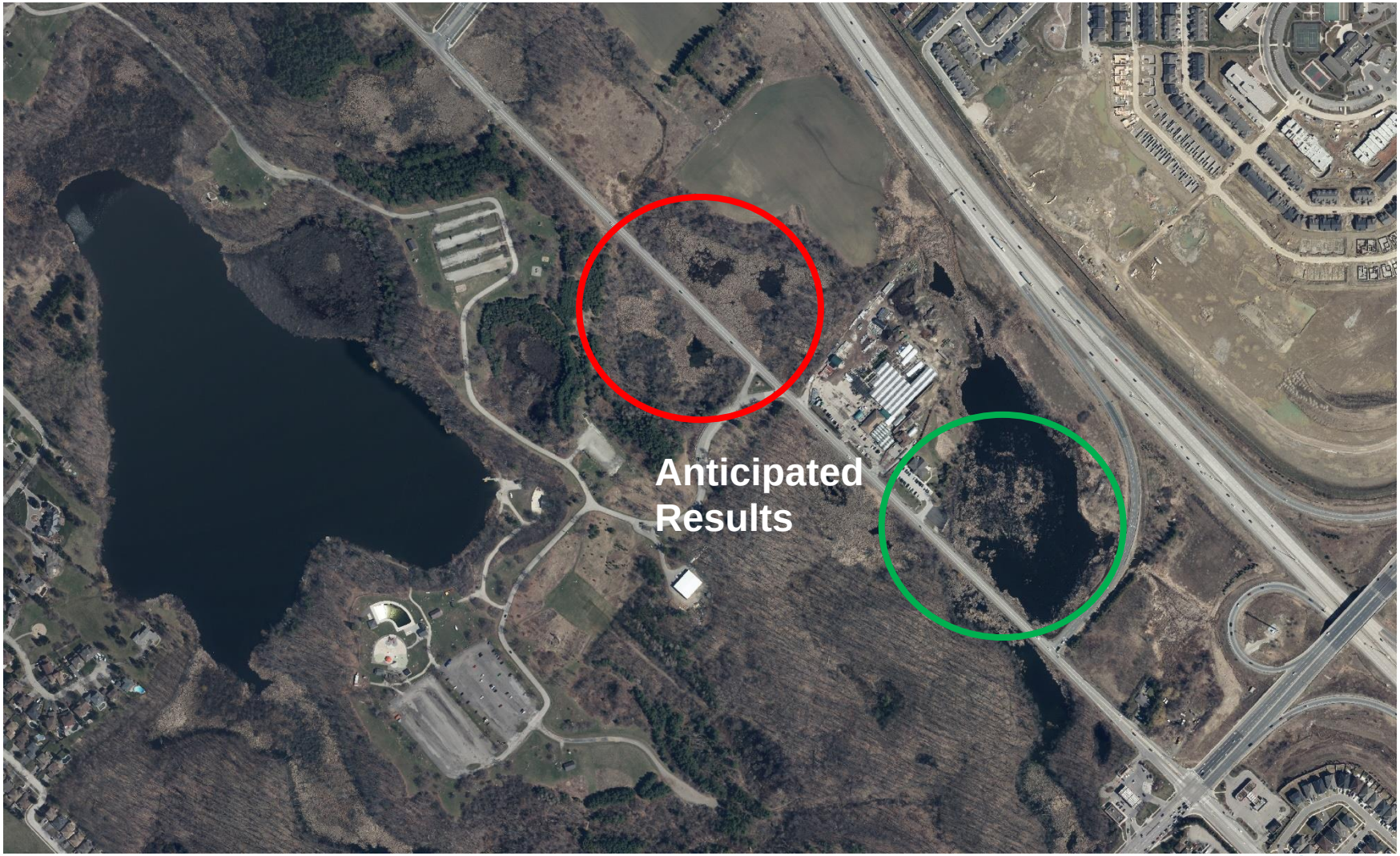
ACO Movement Year 1 Results

June 30th - November 16th				
Camera Type	**45cm (18") Halt Camera North Tunnel**		**45cm (18") Halt Camera South Tunnel**	
	Species	**L-Rank**	**Species**	**L-Rank**
Species Observed, L-Rank	American Toad	L4	American Toad	L4
	Deer Mouse	L4	Deer Mouse	L4
	Eastern Chipmunk	L4	Eastern Chipmunk	L4
	Eastern Cottontail	L4	Eastern Cottontail	L4
	Eastern Garter Snake	L4	not observed	•
	Ermine	L3	not observed	•
	Green Frog	L4	Green Frog	L4
	not observed	•	Grey Squirrel	L5
	not observed	•	Meadow Jumping Mouse	L3
	Milksnake	L3	not observed	•
	not observed	•	Mink	L4
	not observed	•	Muskrat	L4
	Northern Leopard Frog	L3	Northern Leopard Frog	L3
	not observed	•	Norway Rat	LX
	Raccoon	L5	Raccoon	L5
	Snapping Turle	L3	not observed	•
	Striped Skunk	L5	Striped Skunk	L5
	Virginia opossum	L4	Virginia opossum	L4
	Vole (sp. Undetermined)	L3	Vole (sp. Undetermined)	L3
	not observed	•	Wood Duck	L4
	Wood Frog	L2	not observed	•
Total of Species Captured	**15**		**16**	
Total # of Image Detections	**935**		**1690**	

Tracking Turtle Movement



Tracking Turtle Movement

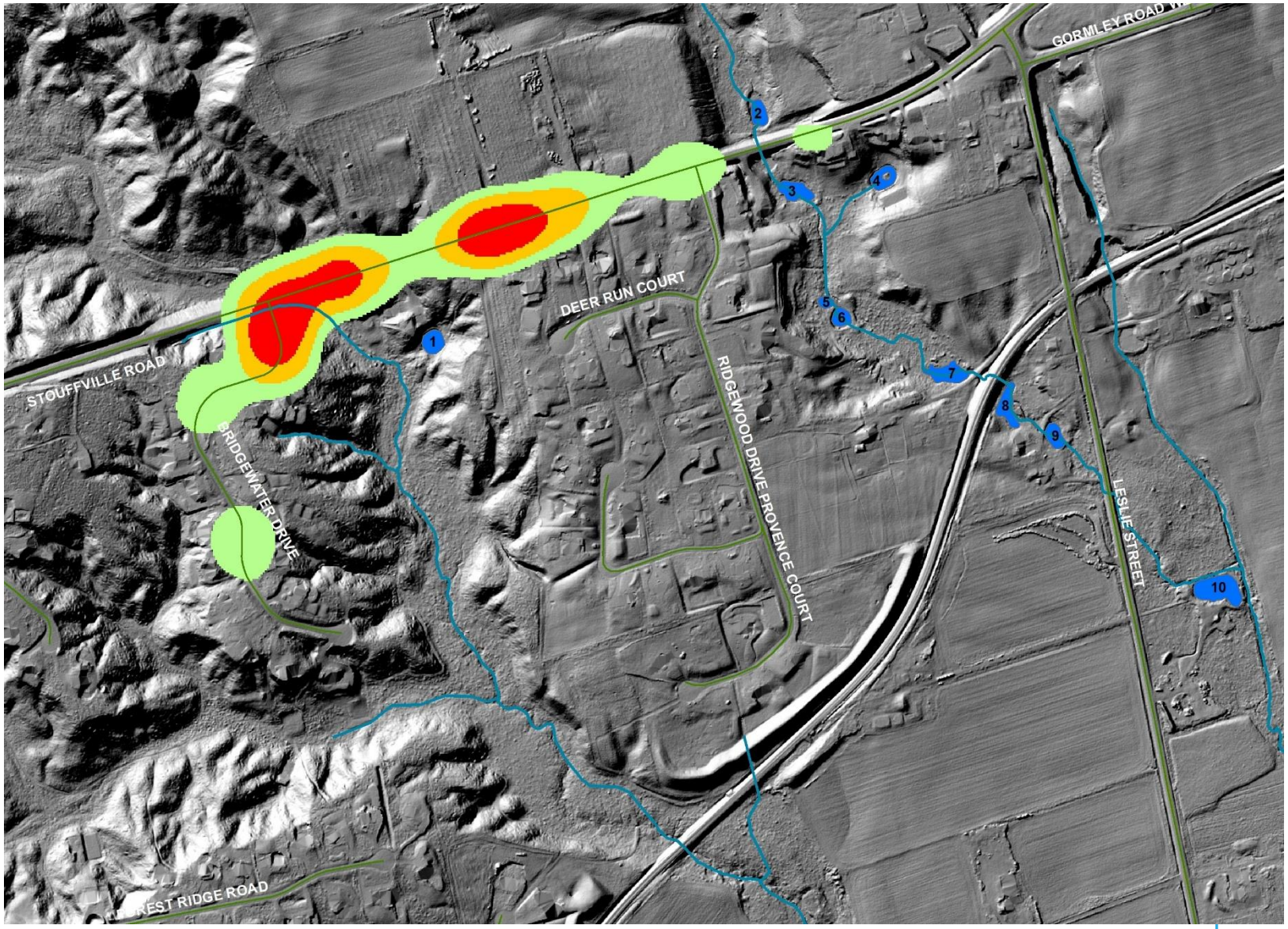


Stouffville Road

Stouffville Road

Total Road Ecology Faunal Records

Focal Movement Areas JESA



Understanding Timing of Movements

Stouffville Road

June 12 2020

June 3 2021

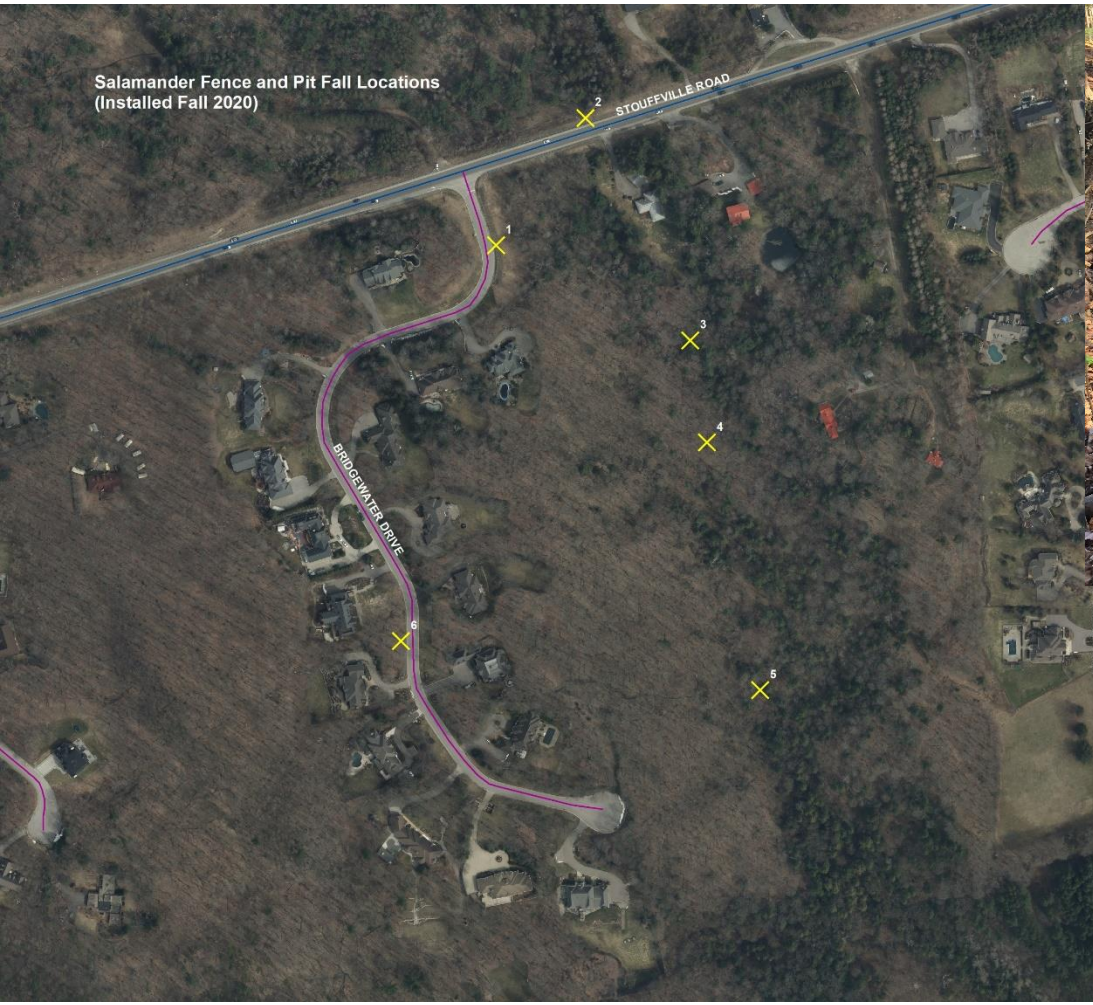
Stouffville Road

August 23 2020

August 30 2021

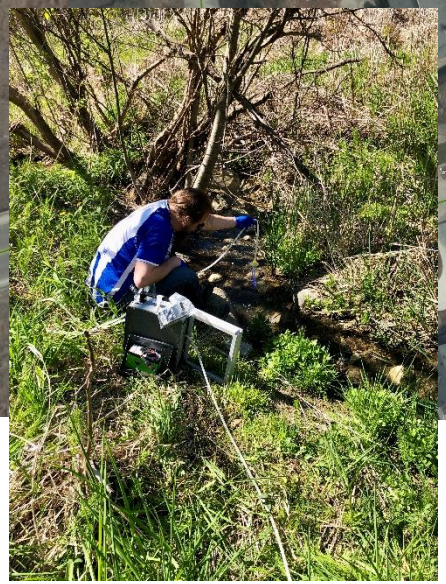
NRSI and UofG Partnership

Stouffville Road



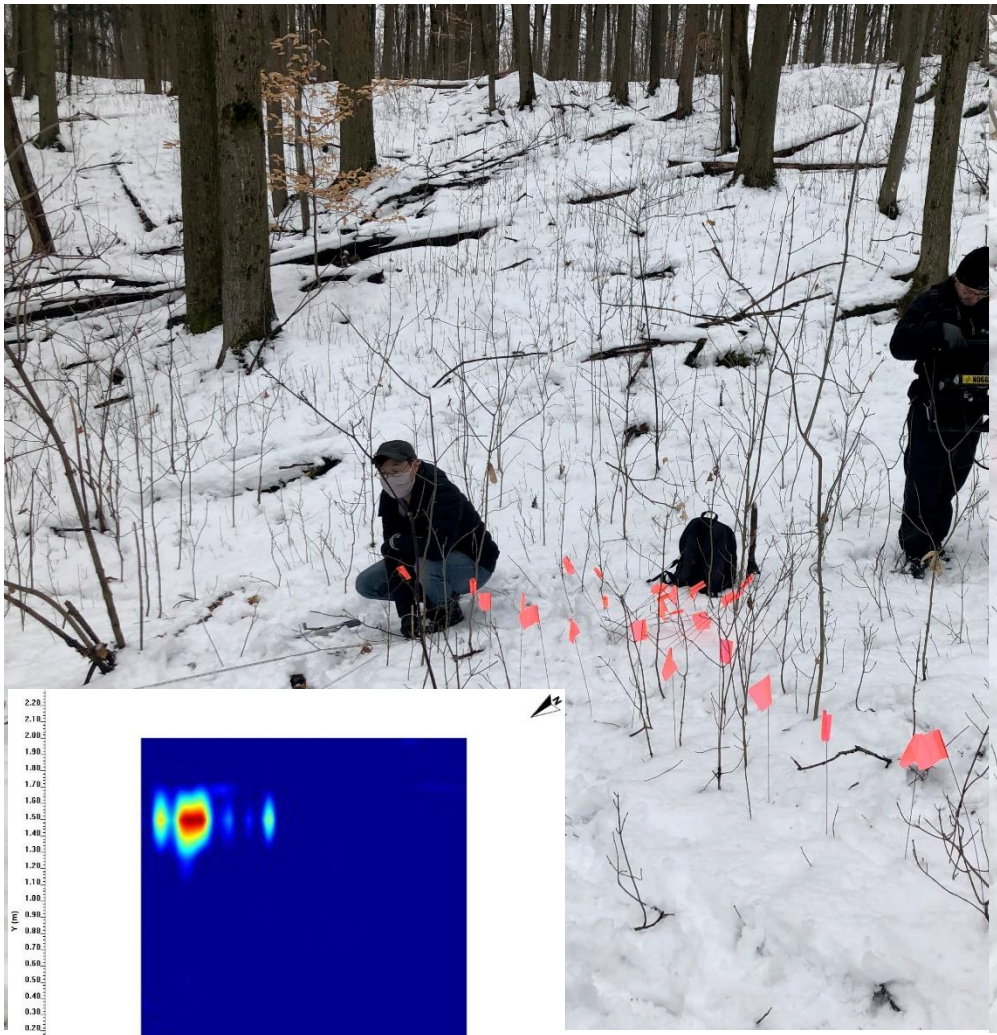
eDNA


Pond #2 - 1380 Stouffville Rd
eDNA Sampling Locations
2
B
A
C
STOUFFVILLE ROAD



GORMLEY ROAD EAST
Gormley Court Pond
eDNA Sampling Location
GORMLEY COURT
CA, CB, CC

Stouffville Road



Thanks to our Partners

York Region
Peel Region
NRSI Consulting
Guelph University – Norris Lab
Staff at TRCA
Ontario Species at Risk Stewardship Program

Toronto and Region Conservation Authority

Upcoming ECS Lunch and Learns!

Tuesday, October 26
11:00am-12:00pm

Carruthers Creek Watershed Plan

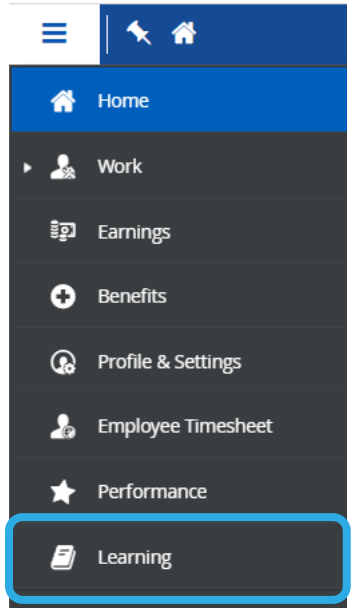
By Tony Morris

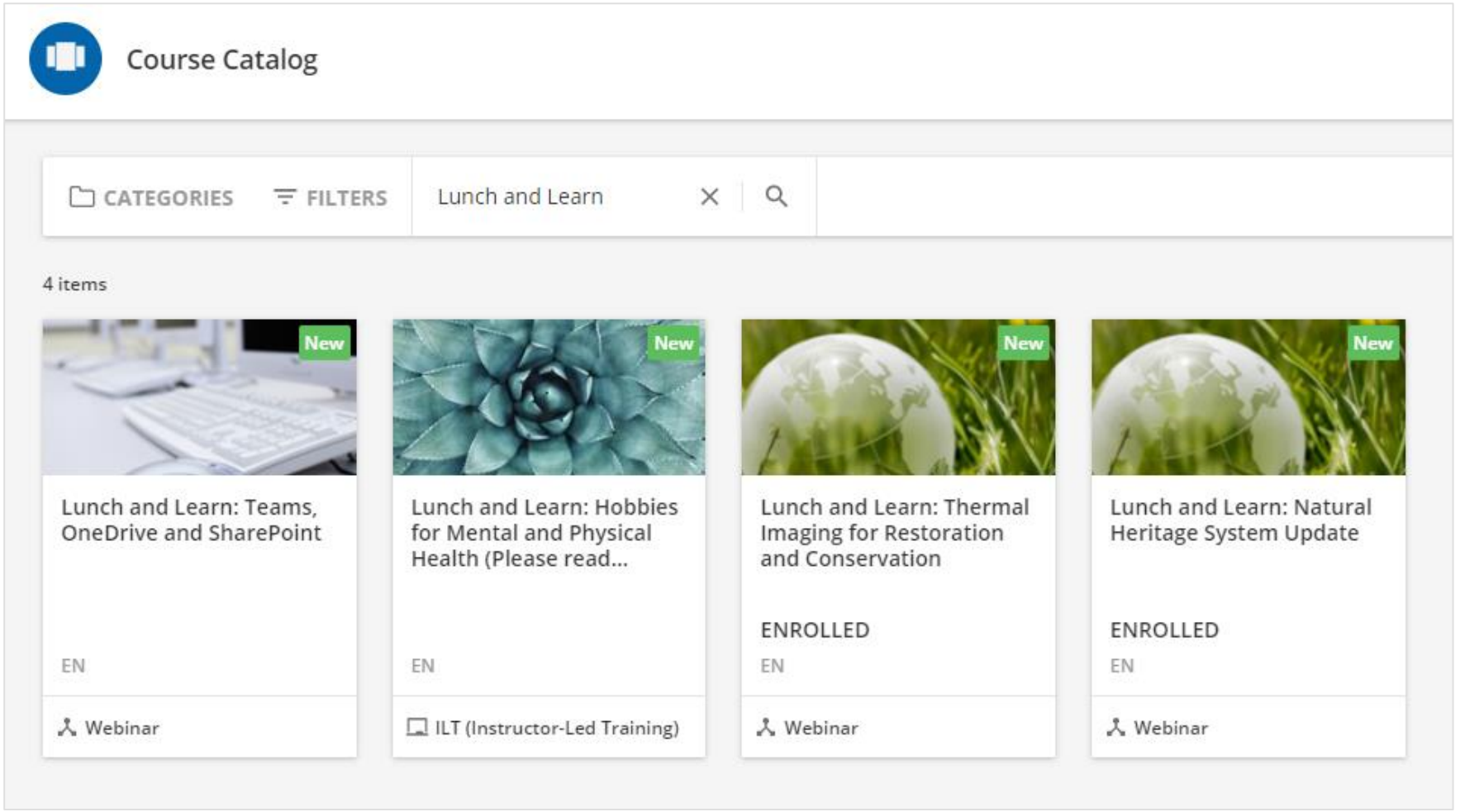
November - TBC

National Issues Report (2021): Water Resources

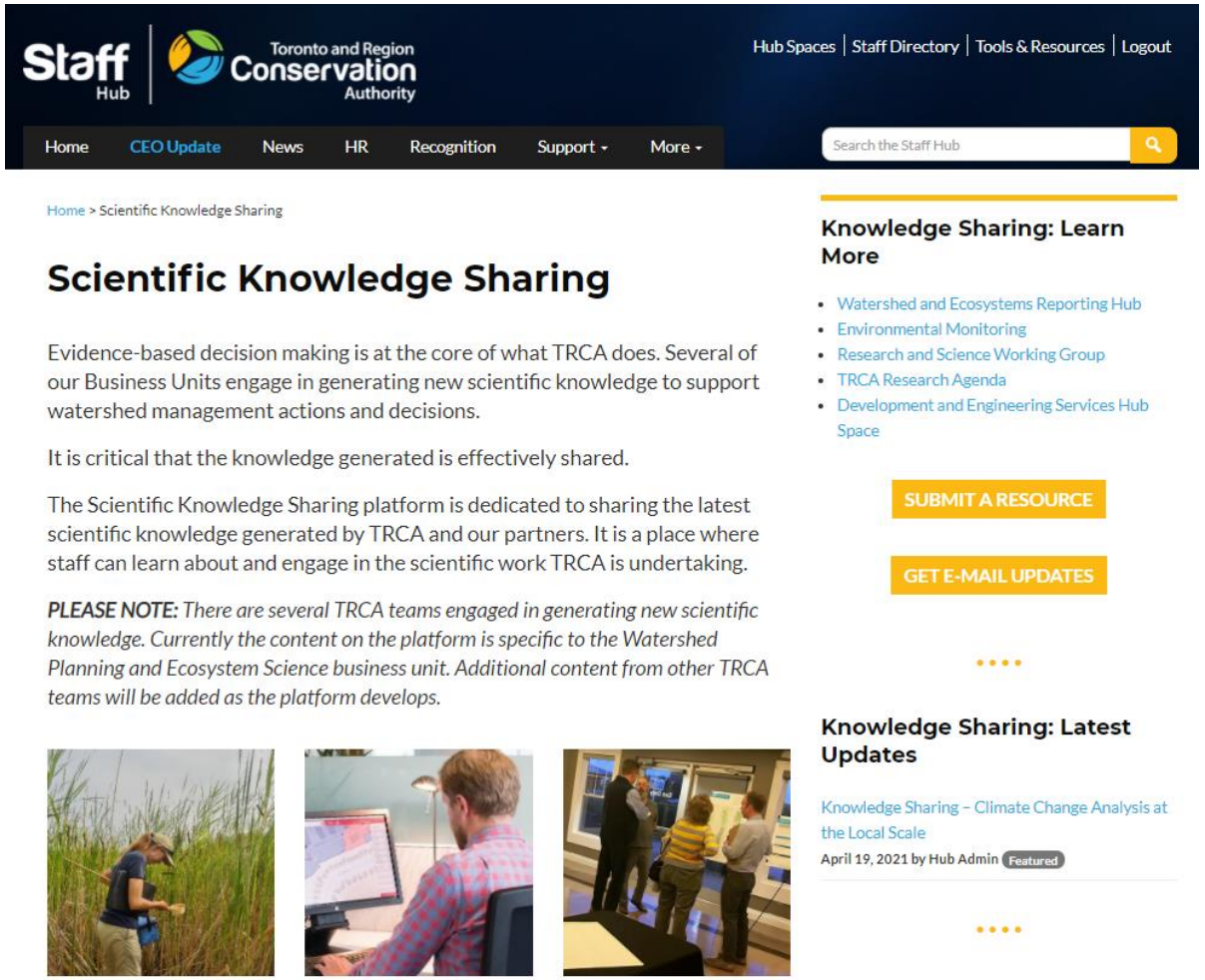
By Guest Speakers

Learning Management System





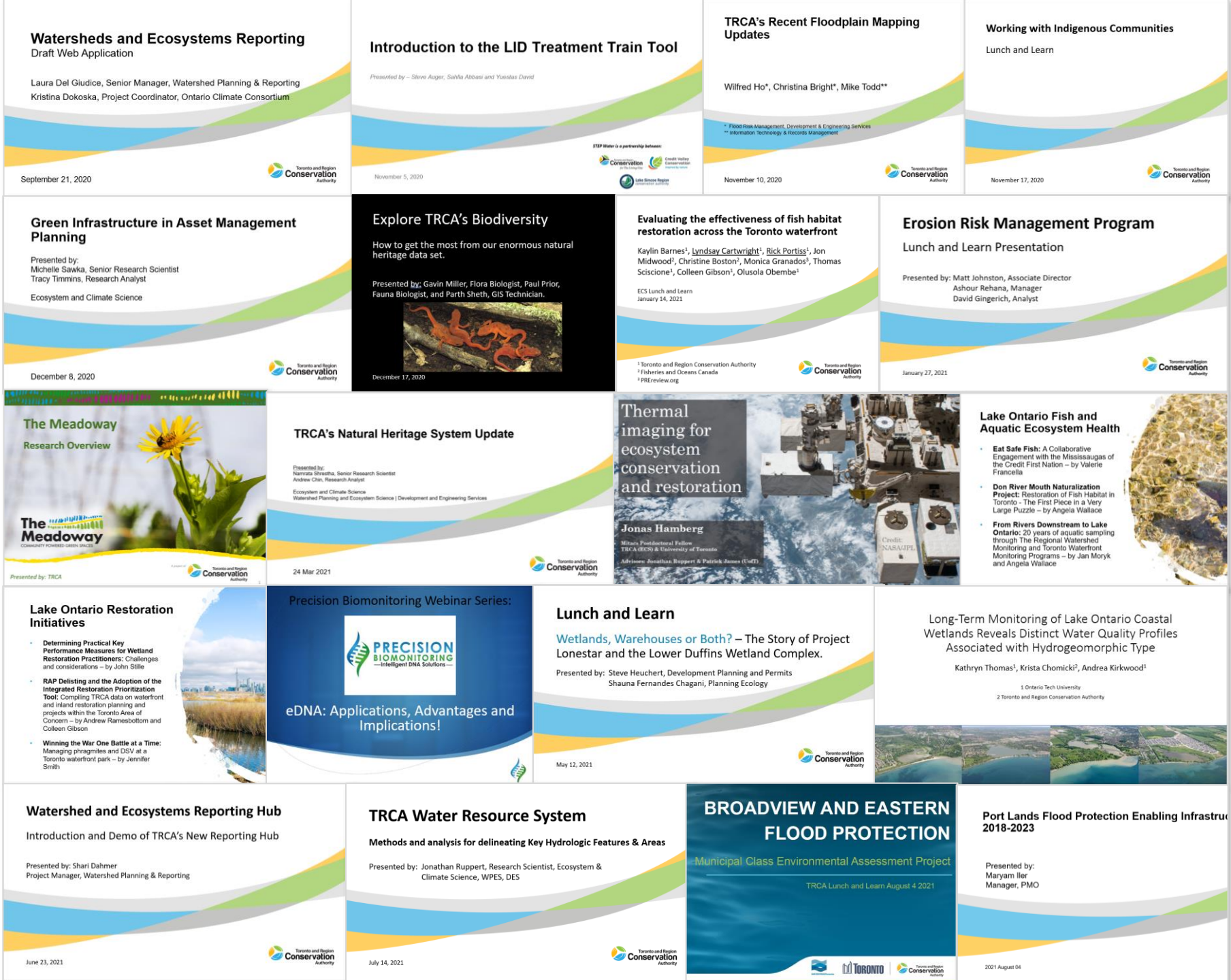
Scientific Knowledge Sharing Hub

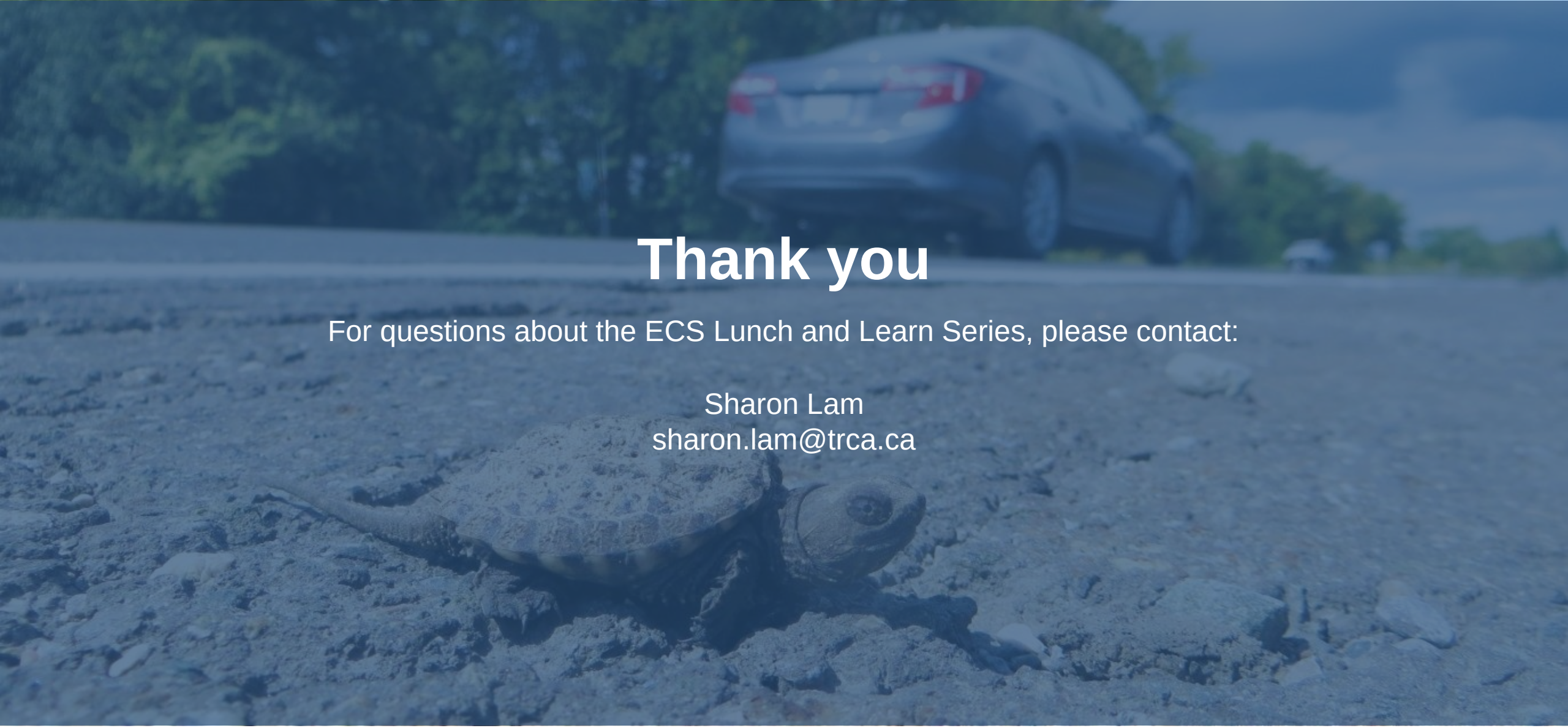


EXPLORE THE RESOURCE LIBRARY

- Newsletters +
- Open Data & Information +
- Plans and Strategies +
- Presentations to Partners +
- Reports and Technical Papers +
- Scientific Papers +
- Technical Protocols & Best Practices +
- Videos +
- Webinars and Lunch & Learns +

Past Recordings





Thank you

For questions about the ECS Lunch and Learn Series, please contact:

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Toronto and Region Conservation Authority