The CoLAB Challenge

Safe Passages: An Integrated Design Approach

DRAFT

Principal Investigator: Nina-Marie Lister

Director, Ecological Design Lab @ Ryerson U

ECO/LOGICAL DESIGN LAB

Ryerson University

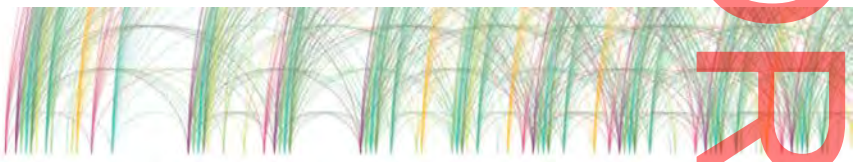
SSHRC Federal Research Partnership

Ryerson University
School of Urban & Regional Planning
Faculty of Community Services

Social Sciences and Humanities Research Council

ECO/LOGICAL DESIGN LAB

ARC



MONTANA STATE UNIVERSITY | Western Transportation Institute

Royal Roads UNIVERSITY

UNIVERSITY OF TORONTO
JOHN H. DANIELS FACULTY OF ARCHITECTURE, LANDSCAPE, AND DESIGN

McGill

Miistakis Institute

Yellowstone to Yukon Conservation Initiative

toronto ZOO

TORONTO

Toronto and Region Conservation for The Living City

THE CITY OF Edmonton

EVERGREEN

Partnership Focus

Landscape Connectivity

Green Infrastructure

Wildlife Crossing Infrastructure

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Partnership Focus

- Advancing urban **landscape connectivity** (resilient urban regions)
- Healthy, resilient cities provide connected healthy habitats for humans and wildlife
- Design for connectivity needs living, **green infrastructure** investments, solutions
- Connectivity means everyone has the freedom to roam, safe passage for all
- **Wildlife crossing infrastructure**, passages, connections at different scales, speeds

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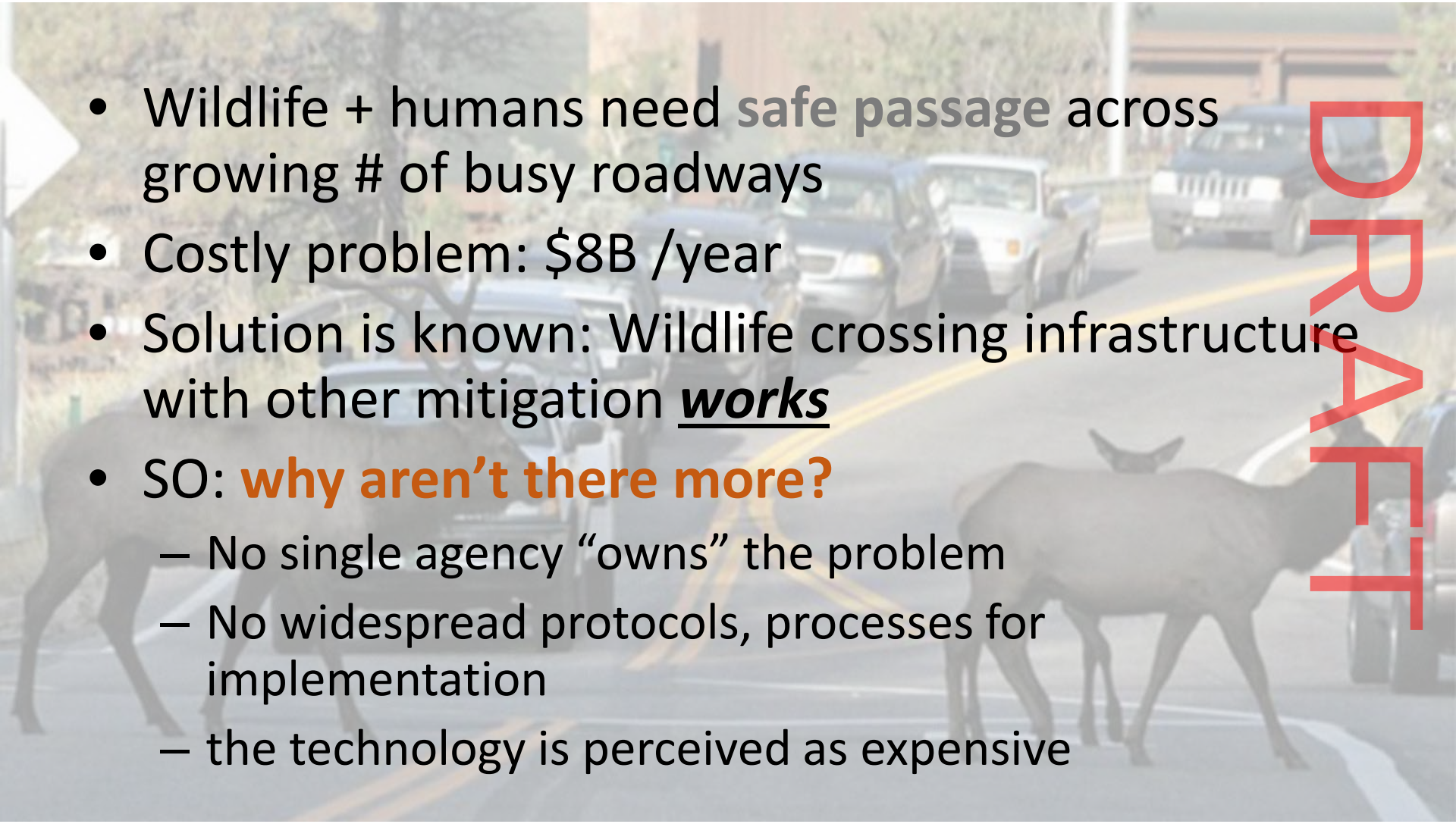
The Problem

WTI, 2009

The Problem

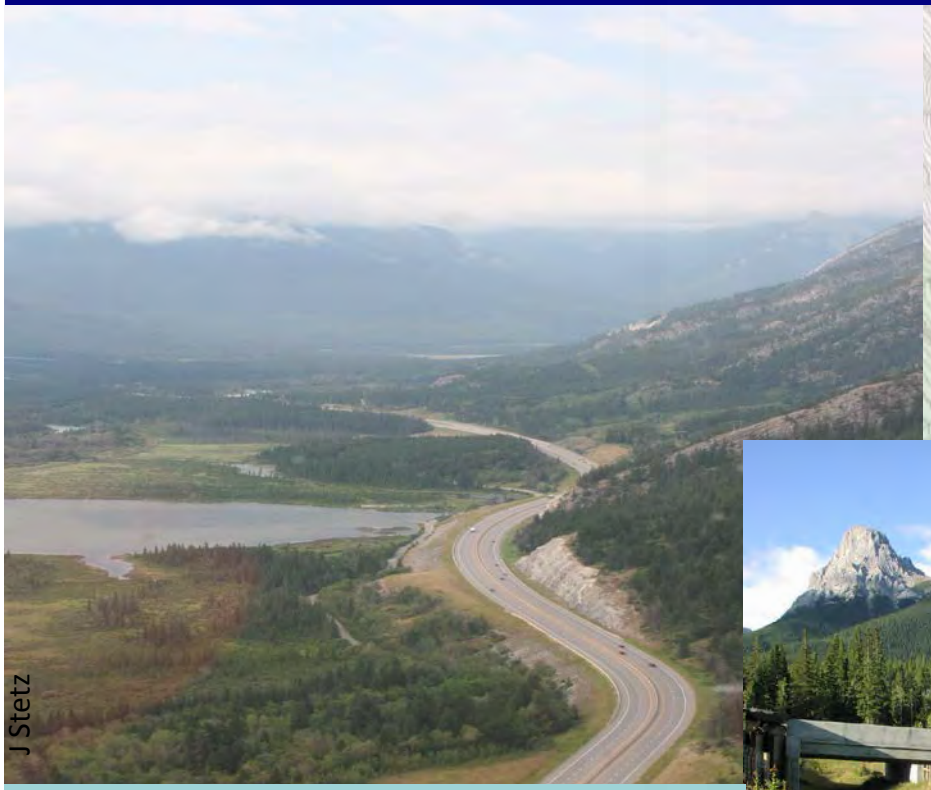


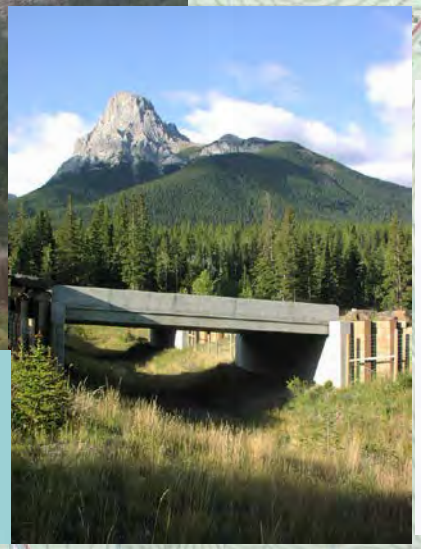
- Wildlife + humans need **safe passage** across growing # of busy roadways
- Costly problem: $8B /year
- Solution is known: Wildlife crossing infrastructure with other mitigation ***works***
- SO: **why aren't there more?**
  - No single agency "owns" the problem
  - No widespread protocols, processes for implementation
  - the technology is perceived as expensive

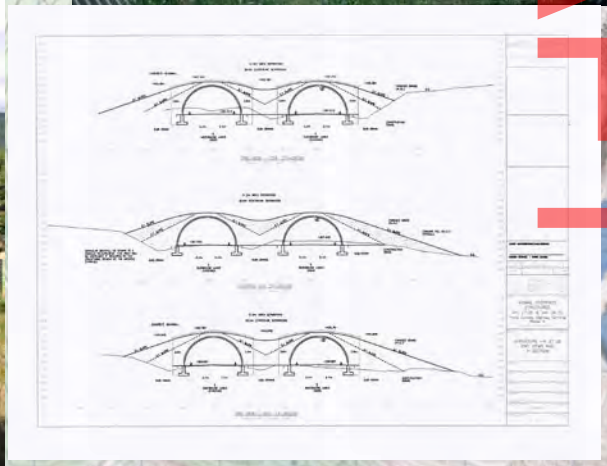
The Solution…

Wolverine Creek Overpass, Banff National Park T. Clevenger, 2005

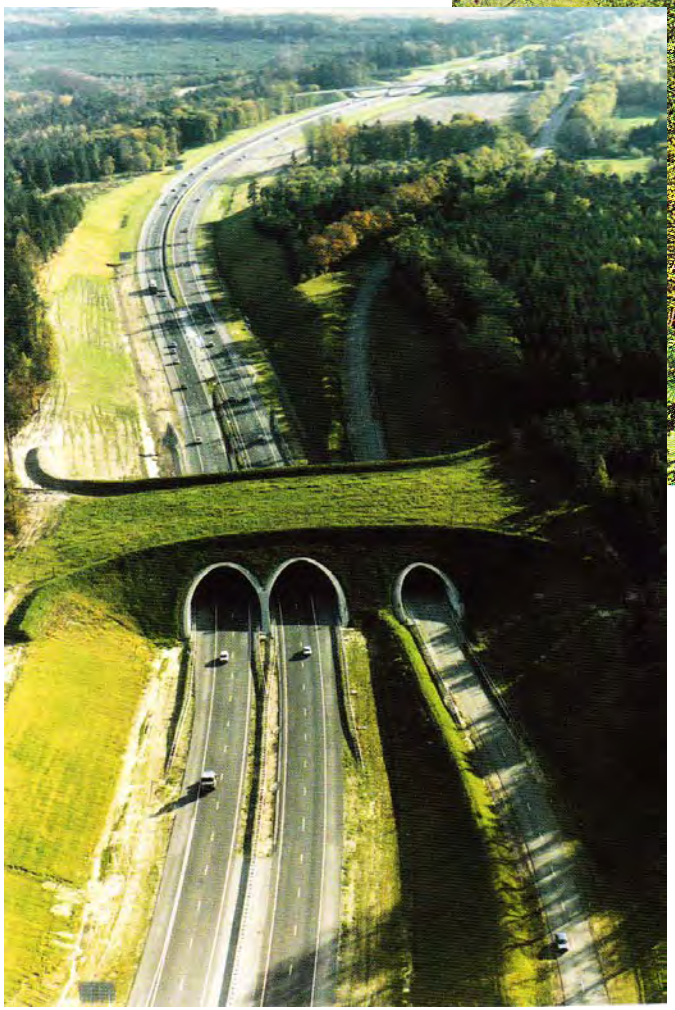
Wildlife crossing infrastructure
Design, costs and funding mechanisms







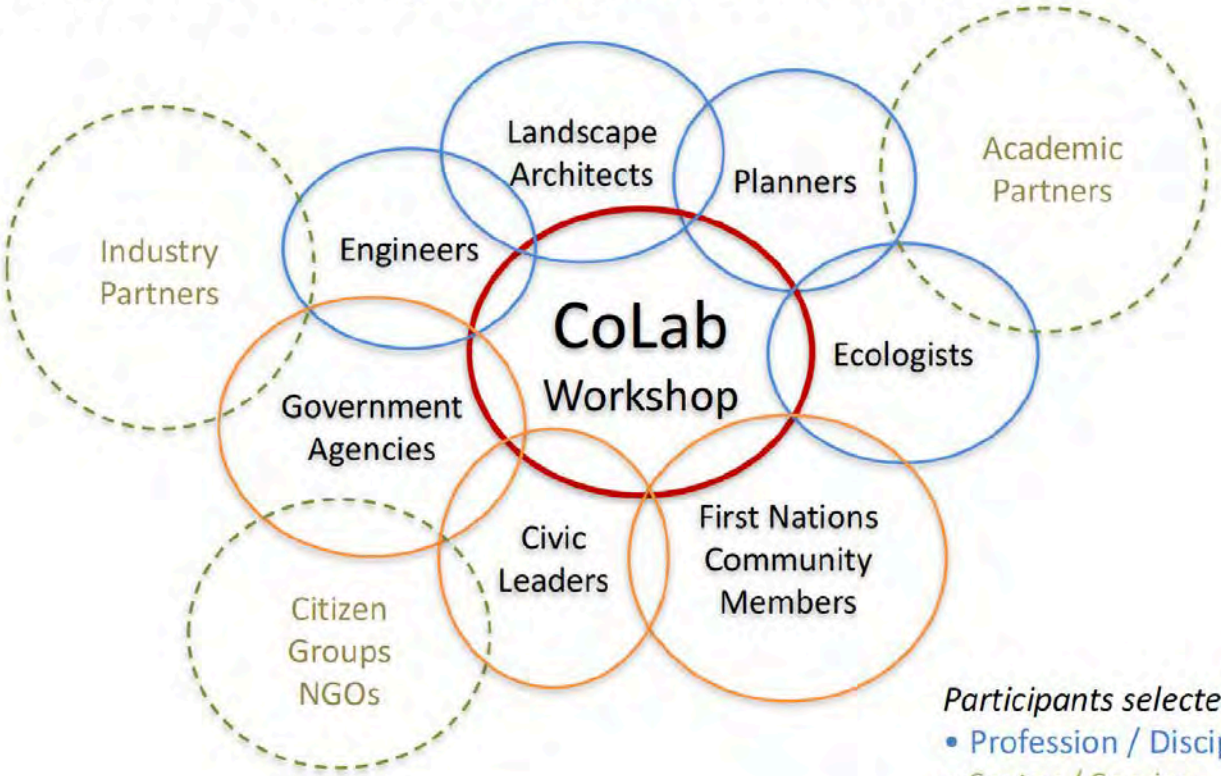
Dr. Tony Clevenger
Western Transportation Institute
Montana State University



Netherlands:
> 50 crossing structures

HOW?

Integrated Planning & Design **CoLaboratory**



Participants selected by

- Profession / Discipline
- Sector / Service
- Agency
- Community

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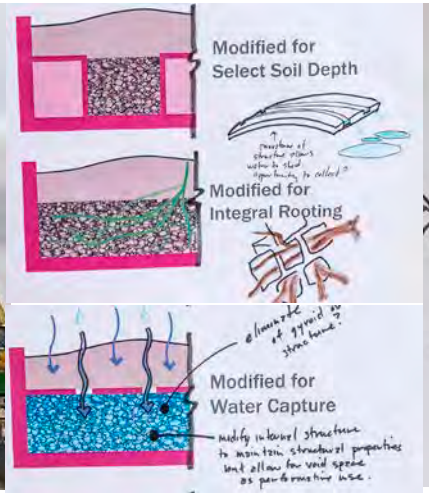
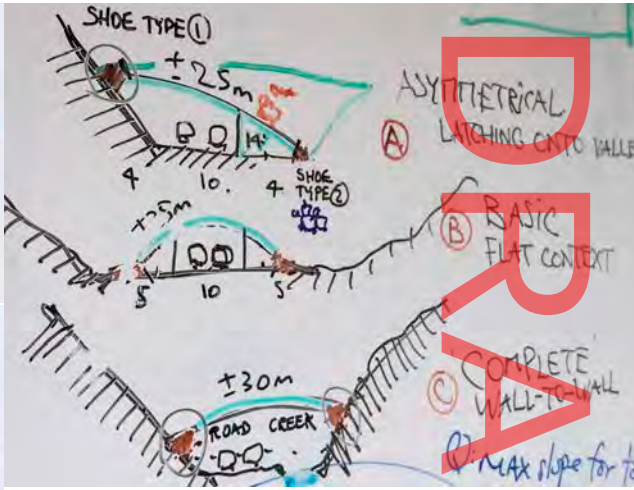
CoLaboratory: An intensive learning-by-doing exercise in which participants from across disciplines engage in a facilitated real-time design and planning challenge. CoLabs are researched-based, collaborative studio workshops in which participants come together to situate the research problem, animate the data, realize planning and design solutions, and link them to implementation strategies within both policy and site contexts.

ASSETS

- **Additional capacity** to expand background knowledge and scan of best/next practices
- **Application of academic research insights** from national scale research on urban landscape connectivity and green infrastructure
- Co-creation and **integration of knowledge** across sectors and fields of expertise
- **Pilot testing** of visualization and communication strategies

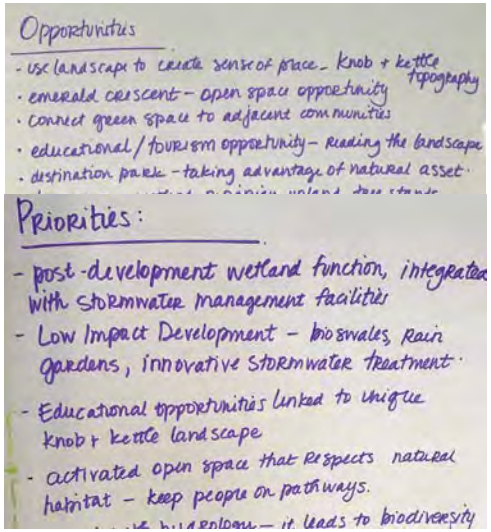
FOCUS AREAS





New Materials *May 2018, cohost: Western Transportation Institute, MSU*

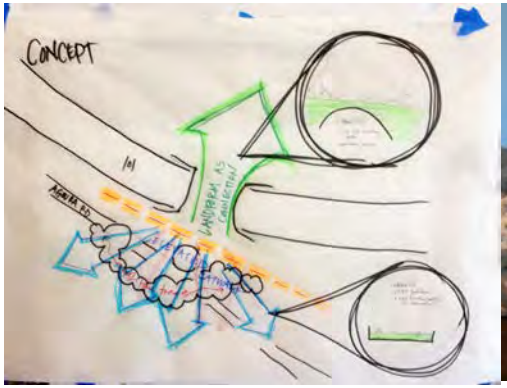
New materials (fiber reinforced polymers) to enhance ecological function and feasibility and to reduce maintenance needs in green infrastructure applications.

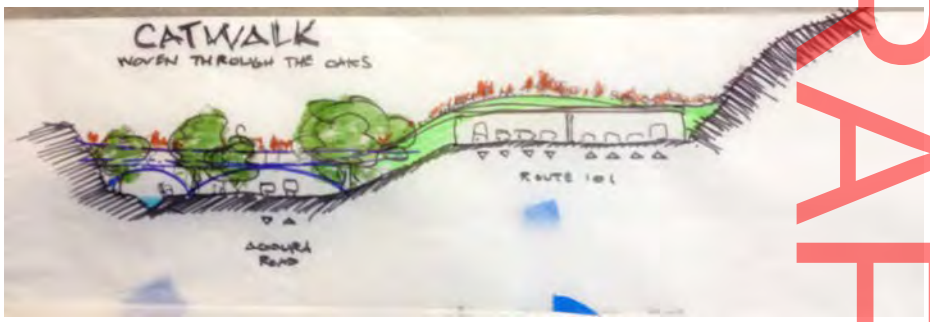


New Approaches: Process + Policy *Nov 2018, cohost: City of Edmonton*

Planning strategies for increased landscape connectivity and green infrastructure integration

December 2018, cohost: DIALOG, Calgary





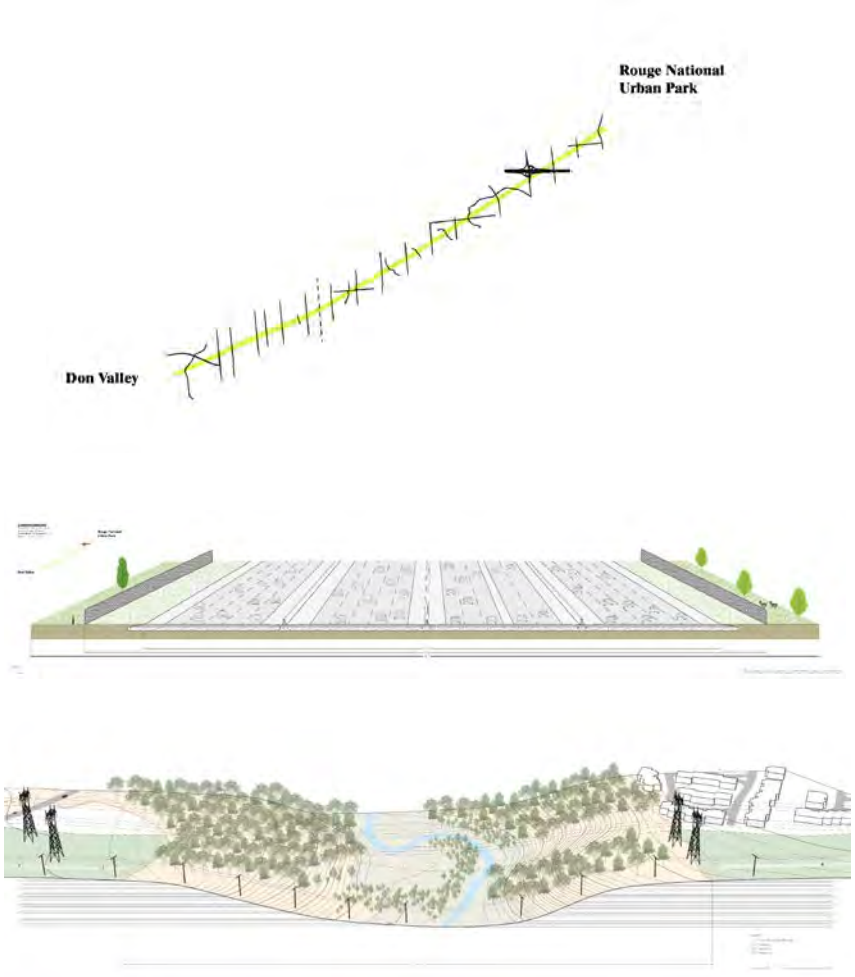
May 2019, guest: Liberty Canyon, Los Angeles

New Designs

Design innovations to enhance adaptability, modularity, landscape integration and implementation strategies.

Meadoway Interrupted:

29 Road crossings over 16km of linear park



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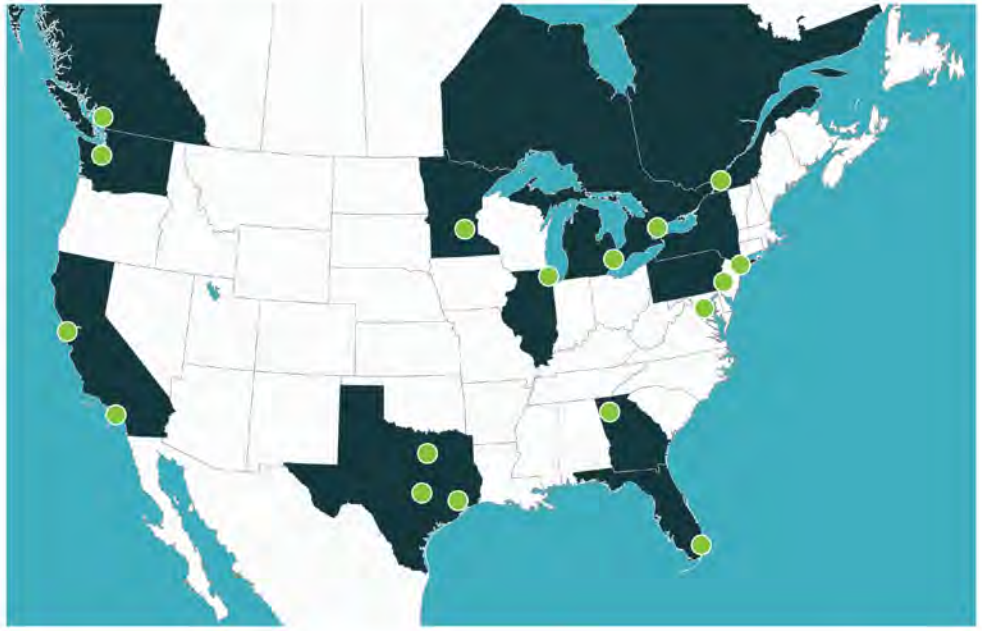
RESEARCH

PRECEDENT CASE STUDIES



NORTH AMERICA

The High Line	New York, NY
Rail Park	Philadelphia, PA
11th St Bridge Park	Washington, DC
Dequindre Cut	Detroit, MI
The Underline	Miami, FL
The Beltline	Atlanta, GA
The 606	Chicago, IL
The Midtown Greenway	Minneapolis, MN
Bayou Greenways	Houston, TX
Klyde Warren Park	Dallas, TX
Trinity River Park	Dallas, TX
Waller Creek	Austin, TX
River LA	Los Angeles, CA
Crissy Field	San Francisco, CA
Presidio Tunnel Tops	San Francisco, CA
Waterfront Seattle	Seattle, WA
Bonaventure Park	Montréal, QC
The Bentway	Toronto, ON
Arbutus Greenway	Vancouver, BC

EUROPE & ASIA

La Petite Ceinture	Paris, FR
Cheonggyecheon River	Seoul, KR

Maps not to scale

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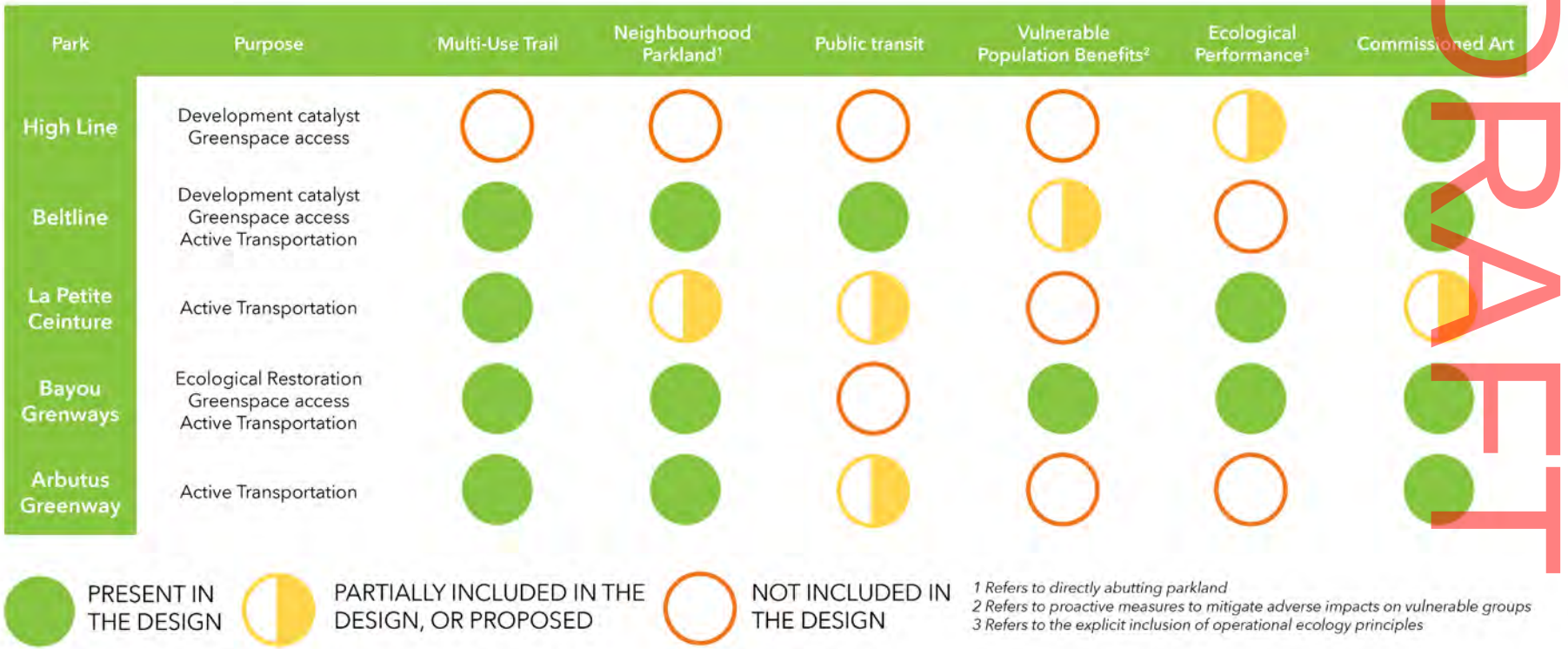
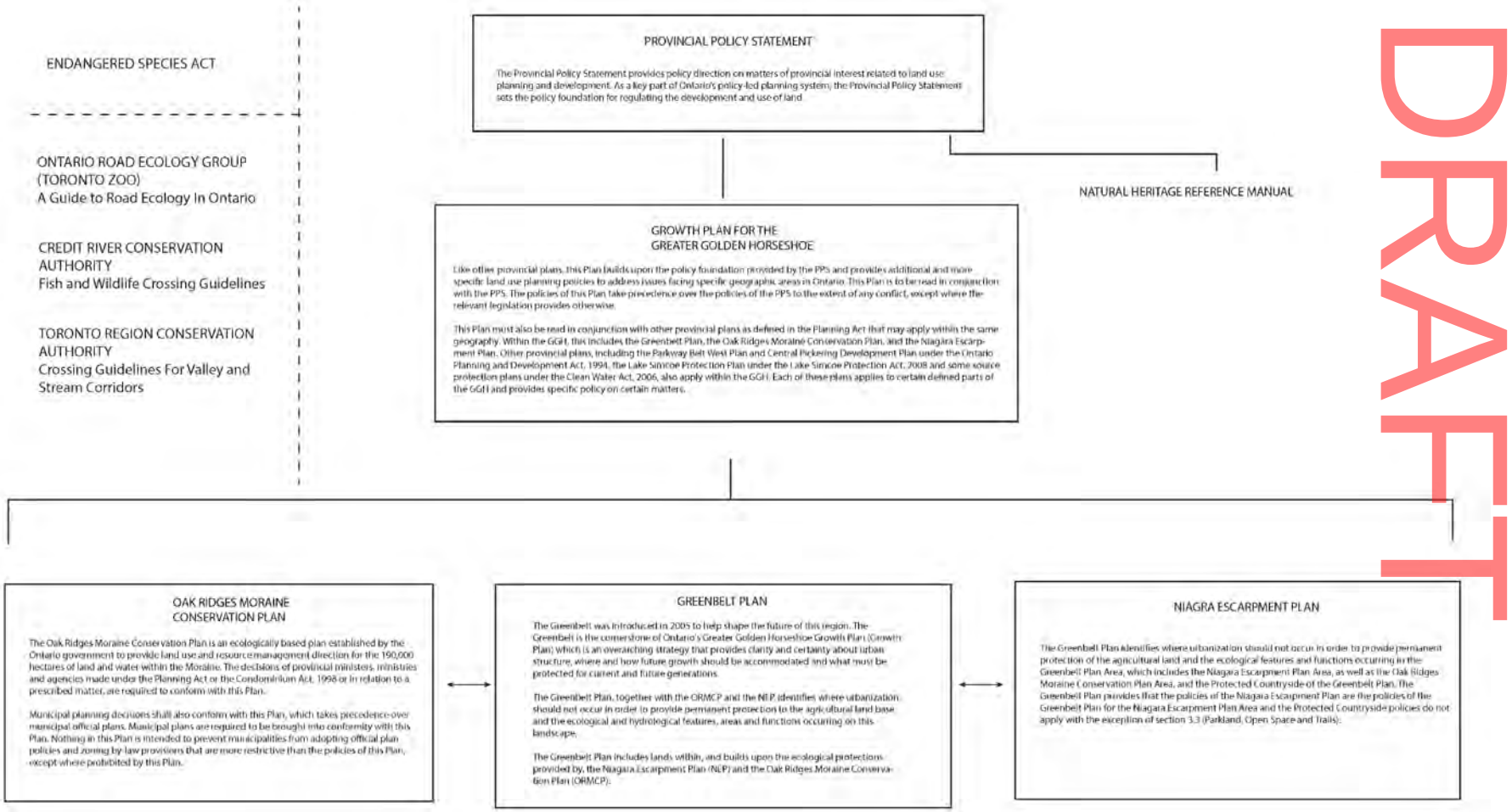
SELECT CASE STUDIES



POLICY VISUALISATION

What are the policies?



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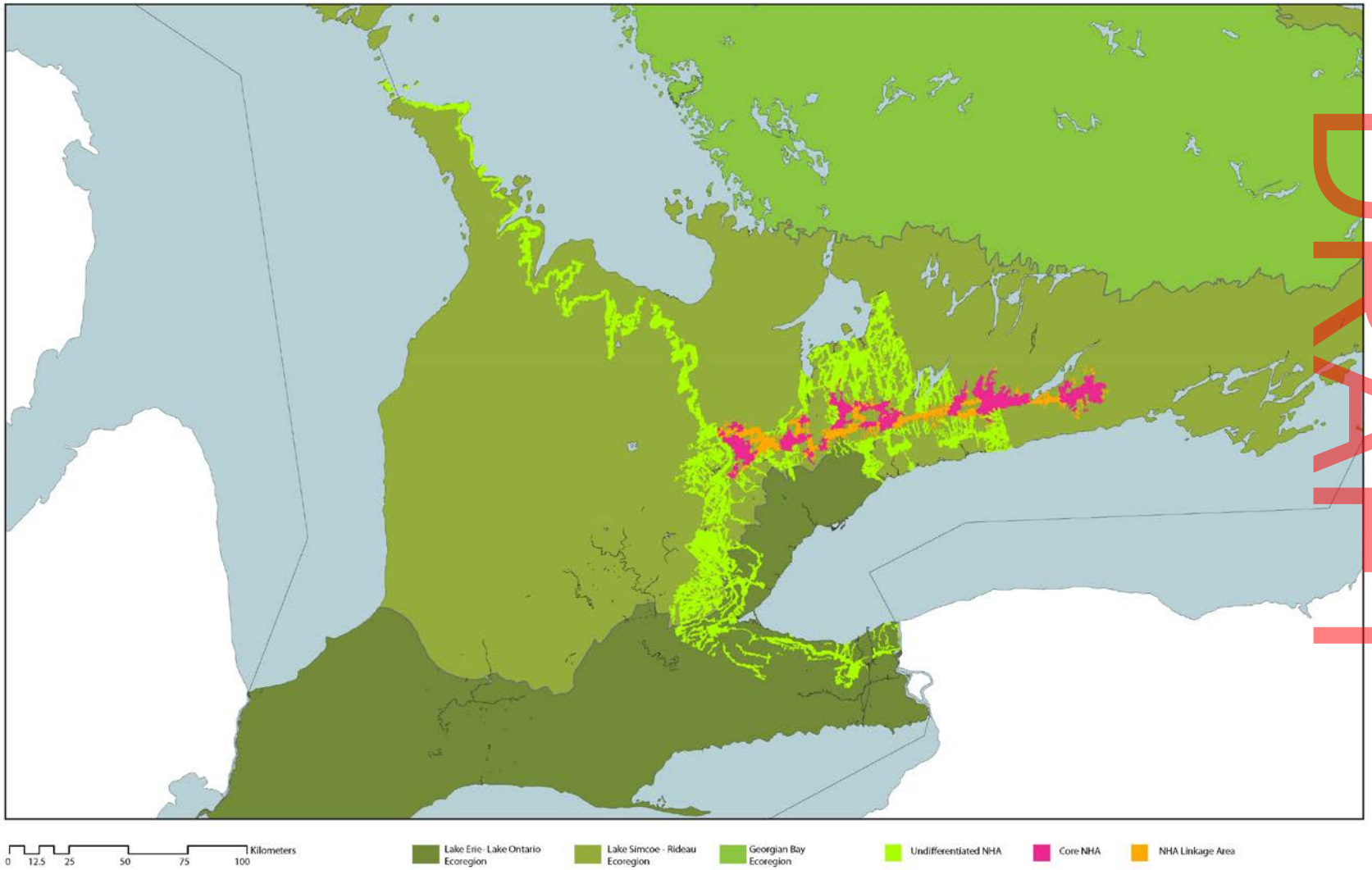
How do they meet the landscape?



Aaron Hernandez, 2018

What are the effects?

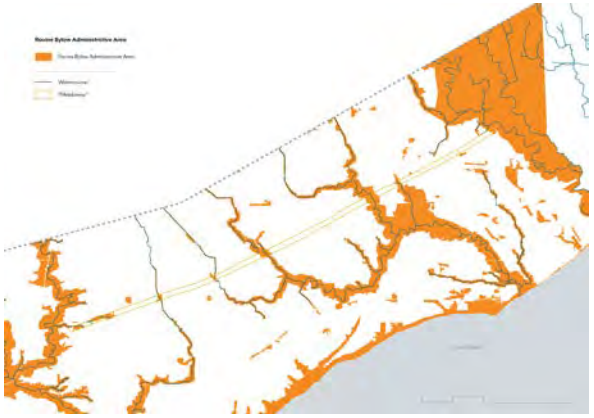
Aaron Hernandez, 2018

What are the systems?

City of Toronto Parks Planning Area

Habitat Type

Roads and Highways



City of Toronto Ravine Strategy Policy Area

Topography

Buildings

What questions do we need to ask?

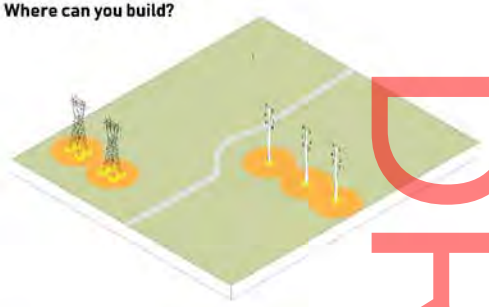
Where can water go?

- "Stormwater management (SWM) ponds placed under 115 kV and 230 kV transmission lines cannot exceed two-thirds of the corridor width."
- "SWM ponds under 500 kV transmission lines cannot exceed one-third of the corridor width."
- "SWM ponds must be designed to withstand the effects of 100-year storm conditions."

Where can cars go?

- "Roads crossing the ROW should be perpendicular to the hydro corridor. Curb cuts or access gates should be provided for Hydro One maintenance vehicles."
- "Parking facilities on 115 kV and 230 kV ROWs should be restricted to passenger vehicles only."
- "Parking facilities are not permitted under 500 kV ROWs."
- "Catch basins must be positioned within a paved roadway."

Where can you build?

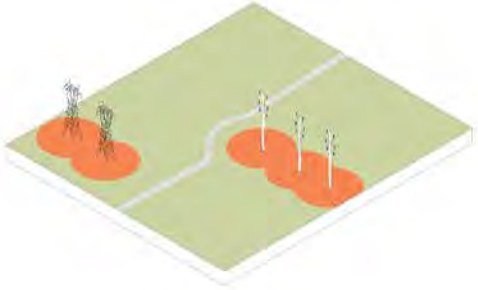


- 3m radius around tower footing must remain ungraded.
- No excavation using heavy machinery is permitted within 10m of tower footings.
- "Buildings or permanent structures are not permitted on ROW."
- "Consideration should be given to minimizing the use of conductive (metallic) materials where alternatives exist (e.g. fences)."

Where can you increase topography?

- "Grading changes must not impact vertical clearance requirements or result in standing water anywhere along corridor."
- "No fill material may be placed on the ROW without written approval from Hydro One."

Where does Hydro One need clear access?



- Hydro One requires a 15m clear working radius around transmission towers.

Where can you plant?

- "An area of 15 metres around transmission towers should be kept clear of shrubs to permit Hydro One access to towers."
- "Plantings which grow to a maturity height over 4 metres are not permitted on the ROW."
- "Hydro One encourages the planting of low growing plant species and works to selectively treat invasive and high canopy vegetation in support of this goal, where necessary."

- Shrubs permitted in right-of-way:

Gray Dogwood	Cornus alternifolia	Honeysuckle
Red Osier Dogwood	Elderberry	High Bush Cranberry Lonicera spp.
Alternate Leaf Dogwood	Sambucus Canadensis	Viburnum trilobum
Cornus racemosa	Forsythia	Mugo Pine
Cornus sericea	Forsythia ovata	Pinus mugo mugo

Sources:
1. "Secondary Land Uses on Hydro One Right-of-Ways." Hydro One. Accessed January 16, 2019. https://www.hydroone.com/business-services/secondary-land-use.
2. "Vegetation Management." Hydro One. Accessed January 16, 2019. https://www.hydroone.com/about/corporate-info/research/vegetation-management

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City of Edmonton's Ecological Network Approach: Supporting Wildlife Connectivity

Canadian Institute of Planners Conference, 2019
Suzanne Young
July 4, 2019

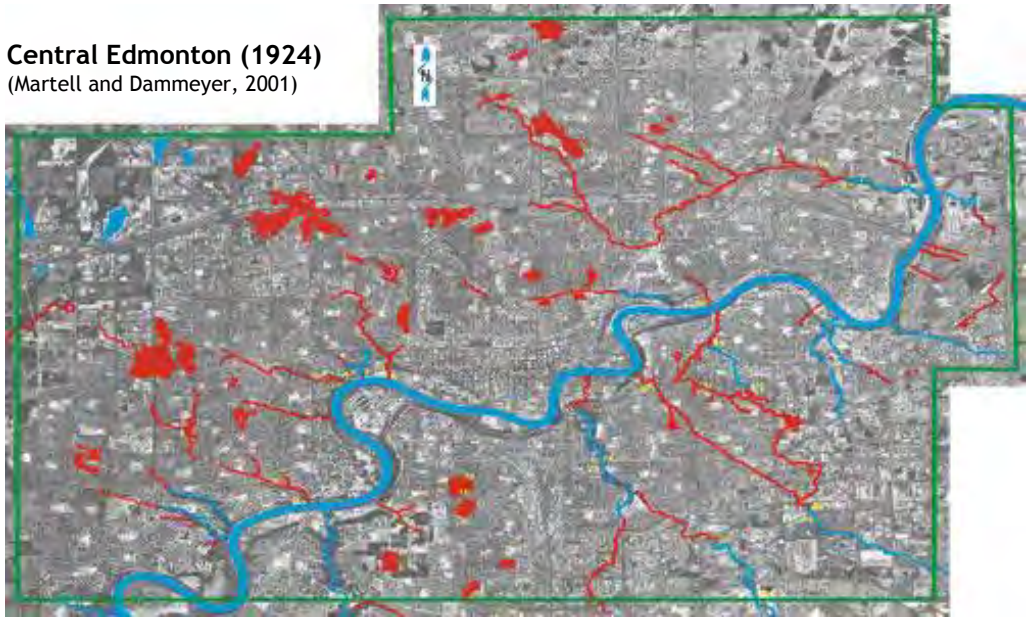
Edmonton

Moose, skunks, beavers, coyotes, OH MY

Threats to Urban Biodiversity

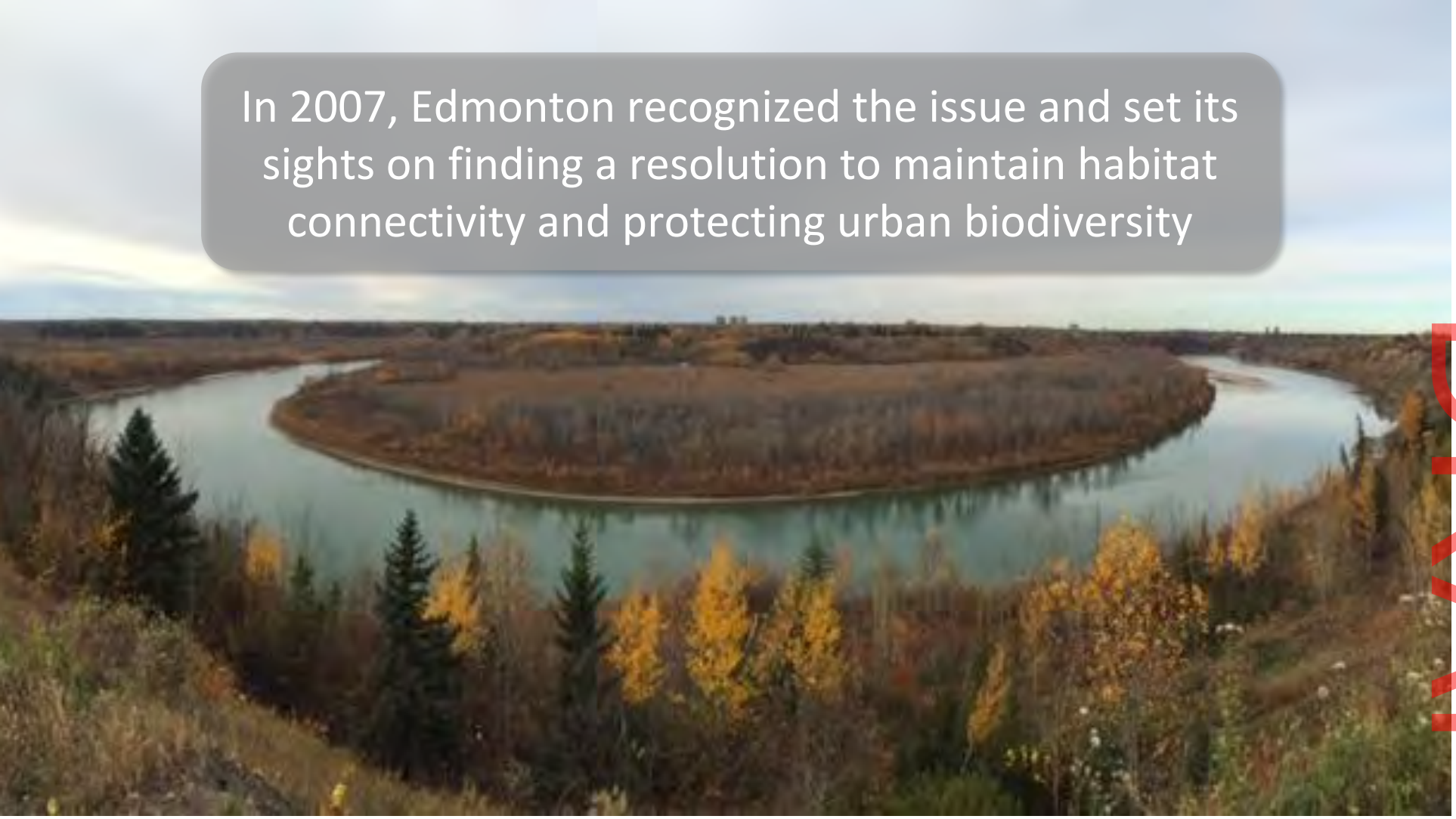
Habitat loss and fragmentation is the single largest threat to biodiversity conservation in an urban area

Central Edmonton (1924)
(Martell and Dammeyer, 2001)

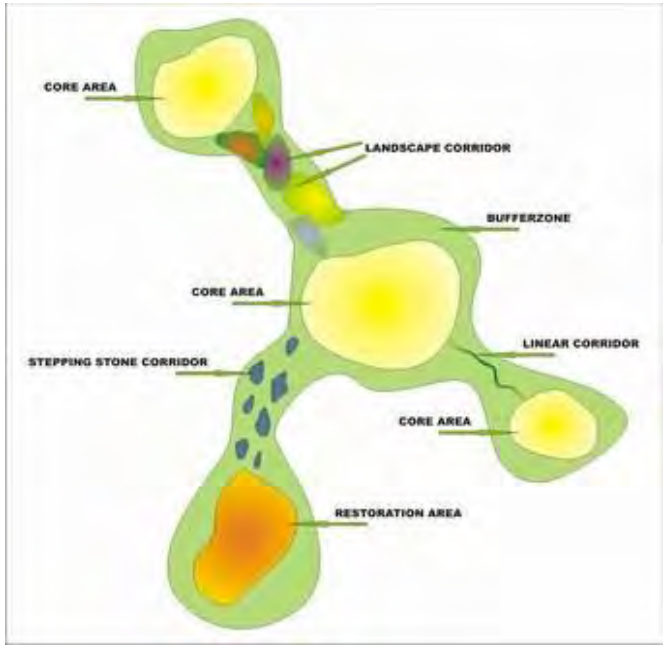


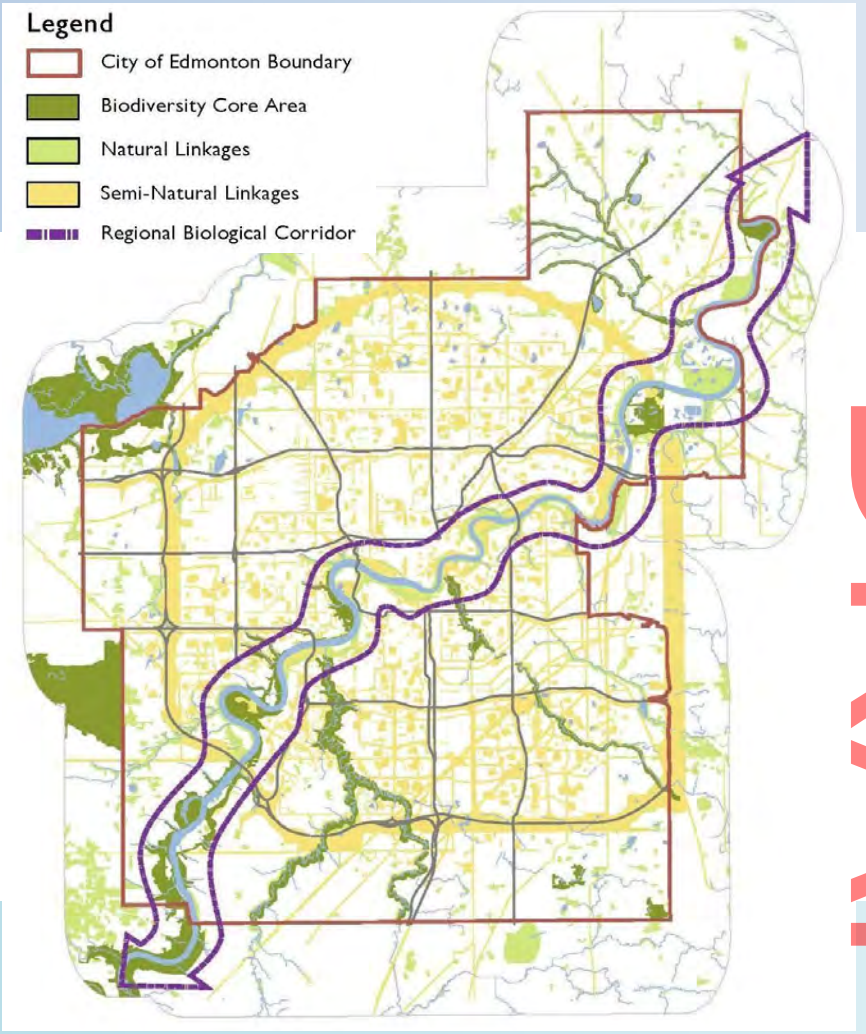
Lost wetlands and drainage courses

In 2007, Edmonton recognized the issue and set its sights on finding a resolution to maintain habitat connectivity and protecting urban biodiversity



Edmonton's Ecological Network Approach





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In 2010, Edmonton embedded its ecological network goal into its highest municipal planning document: Municipal Development Plan

"Edmonton protects, preserves, and enhances its natural environment by… maintaining a ***functional ecological network****"*

- 1 of only 9 strategic goals, The Way We Grow

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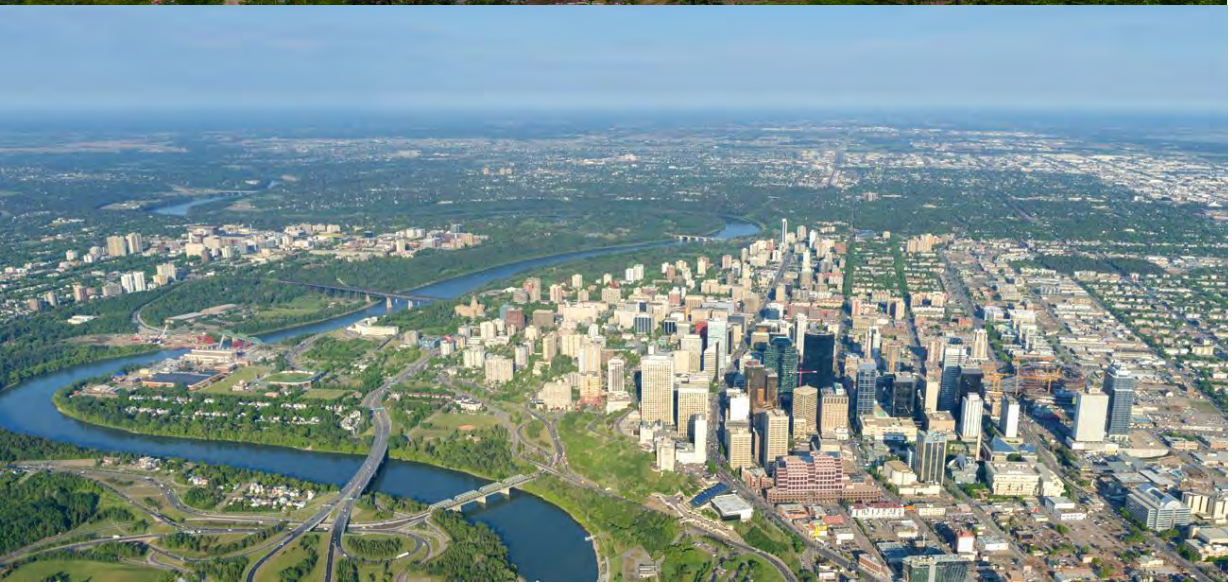
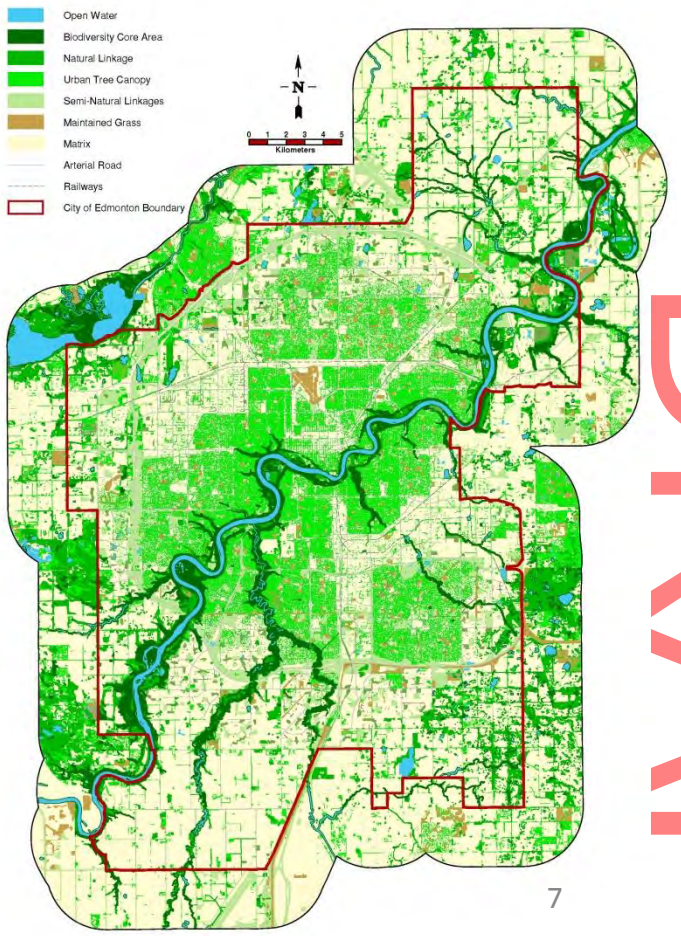


City of Edmonton
Ecological Network (2018)

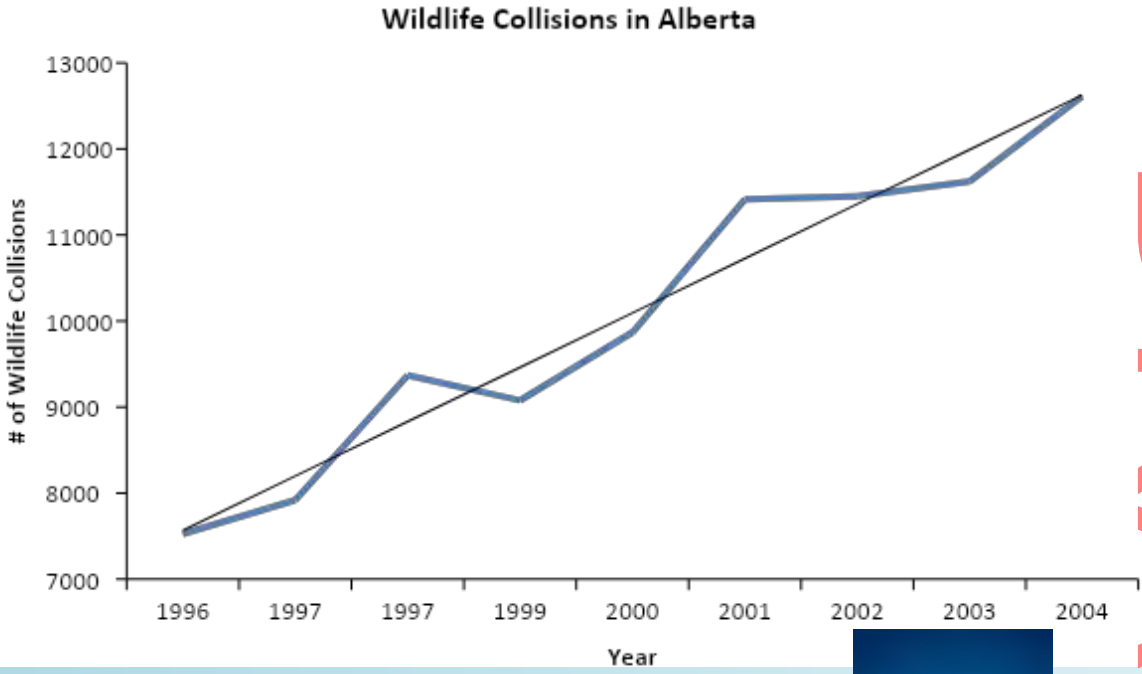


Barriers to the movement of wildlife are created as development constrains the ecological network.

Development creates barriers to movement – specifically Edmonton's transportation network

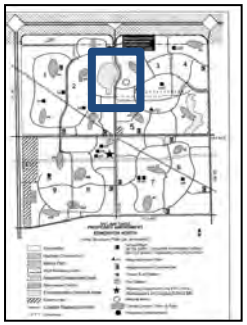
A Growing Alberta Trend

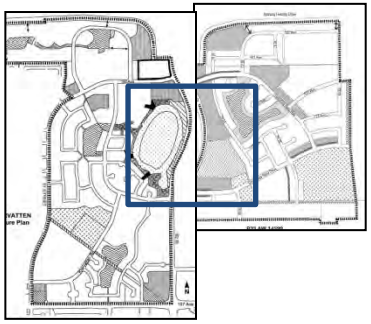
From 2011 to 2014 there were over 70,453 wildlife collisions in Alberta



2007

Planning for wildlife passages occurred at last stage of municipal planning process





Strategic Plans, Policies + Guidelines

Area Structure Plans

Neighbourhoood Structure Plans

Zoning + Subdivision + Servicing Agreements

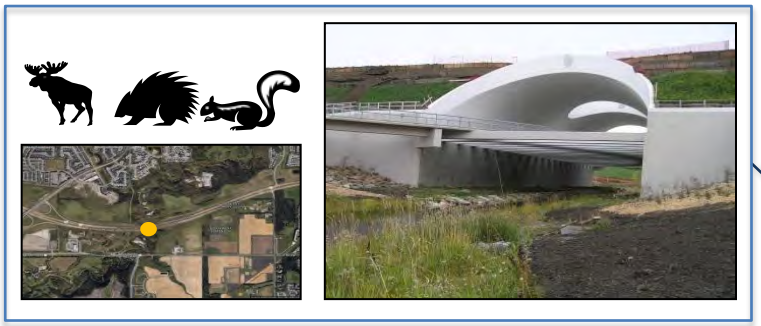
Development + Building Permits and Detailed Design

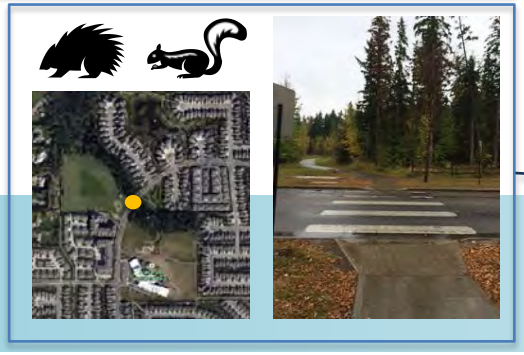
Edmonton

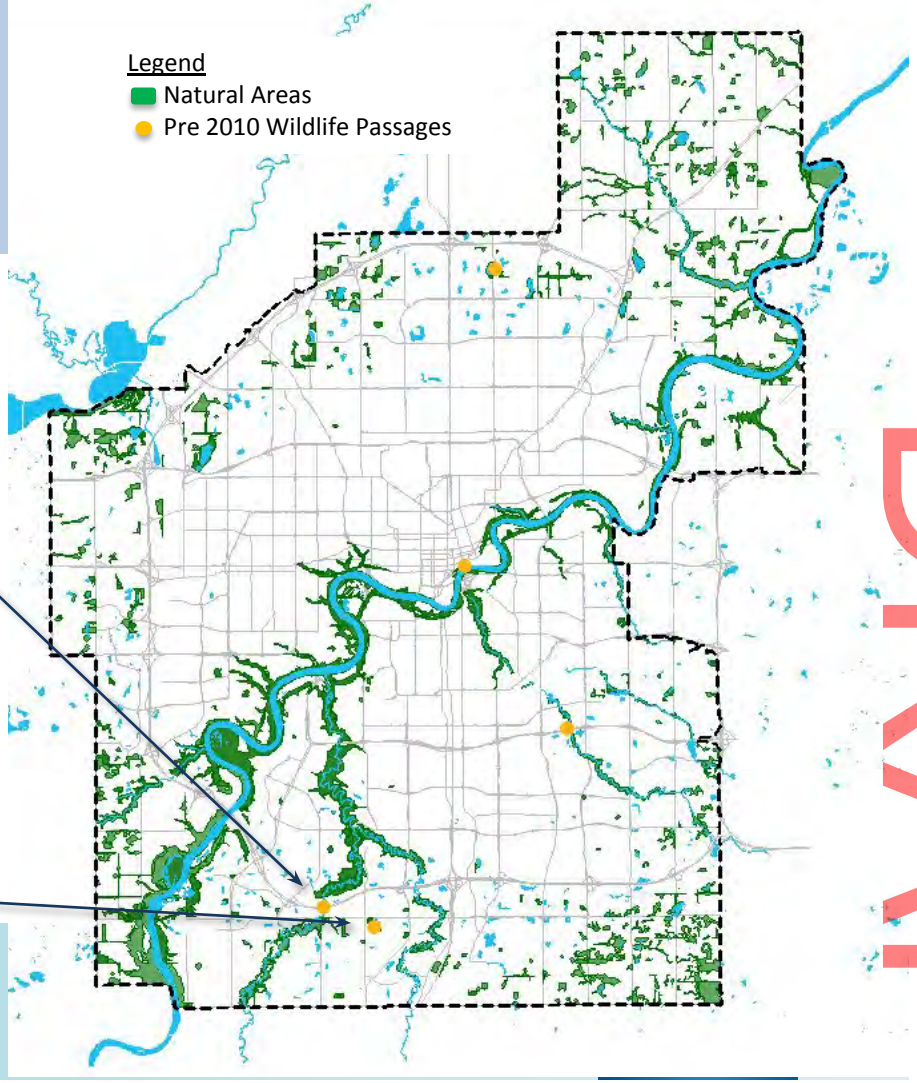
Pre-2010

Five passages constructed

Five dedicated wildlife passages constructed ranging from a large mammal underpass to a rolled curve







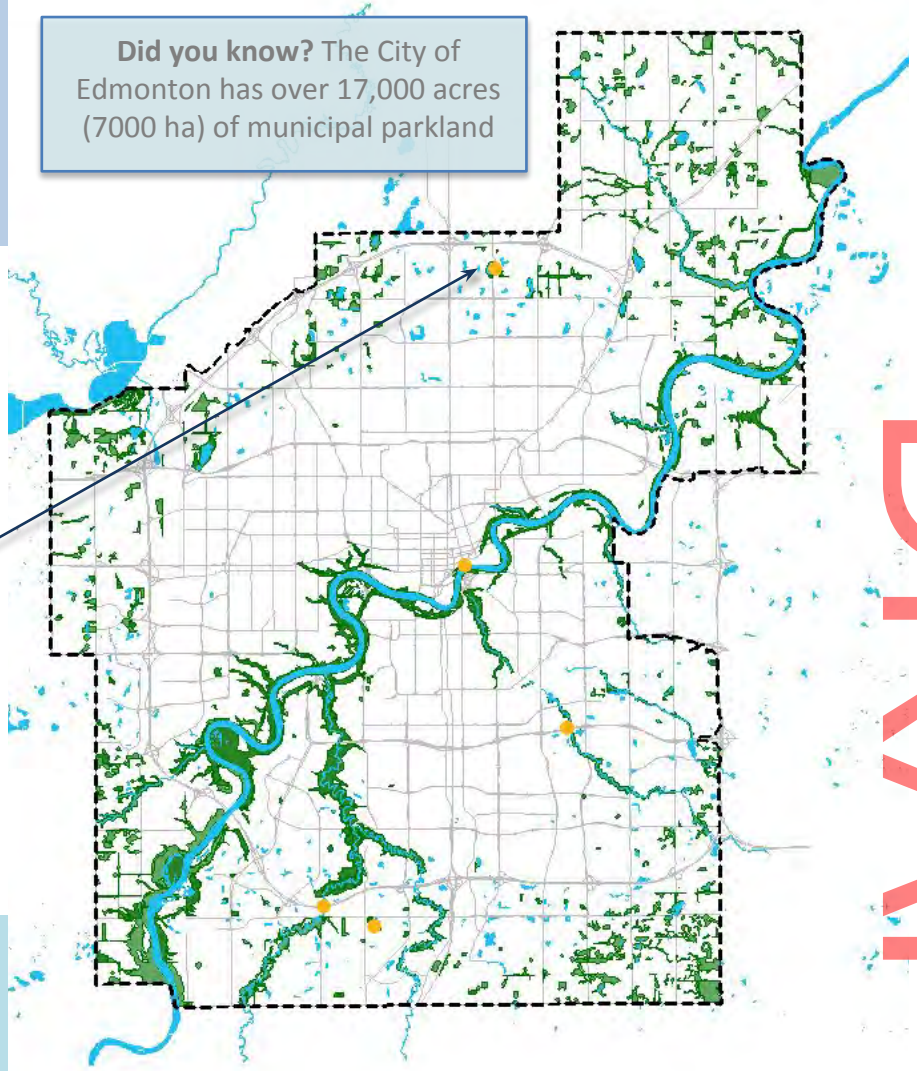
Our 1st purpose designed suburban wildlife passage

2007

First dedicated wildlife passage.

Designed for small mammals.

Did you know? The City of Edmonton has over 17,000 acres (7000 ha) of municipal parkland



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Edmonton

2010

Wildlife Passage Engineering Design Guidelines (WPEDG) created by engineers for engineers

Project Objectives:

1) Maintenance of biodiversity and regional ecological connectivity within a fragmented urban landscape
2) Create a manual that is "engineer friendly"

Outcomes:

1) To maintaining habitat connectivity and reduce genetic isolation among the city's wildlife populations, and
2) Reduce human/wildlife conflict

Edmonton

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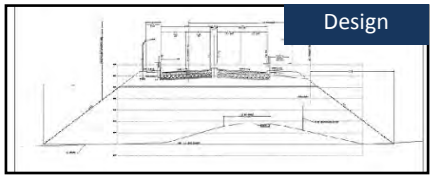
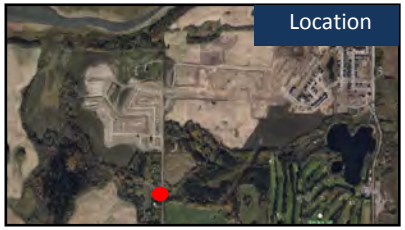
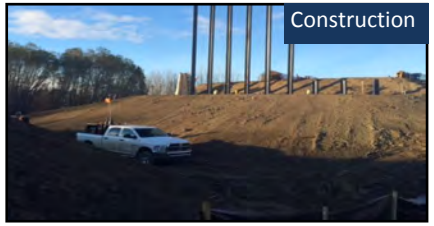
2010-2019

27 more wildlife passages

Hawks Pass: 1st bridge structure in a non-ravine environment

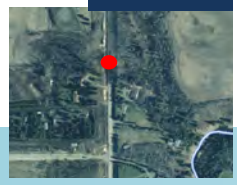


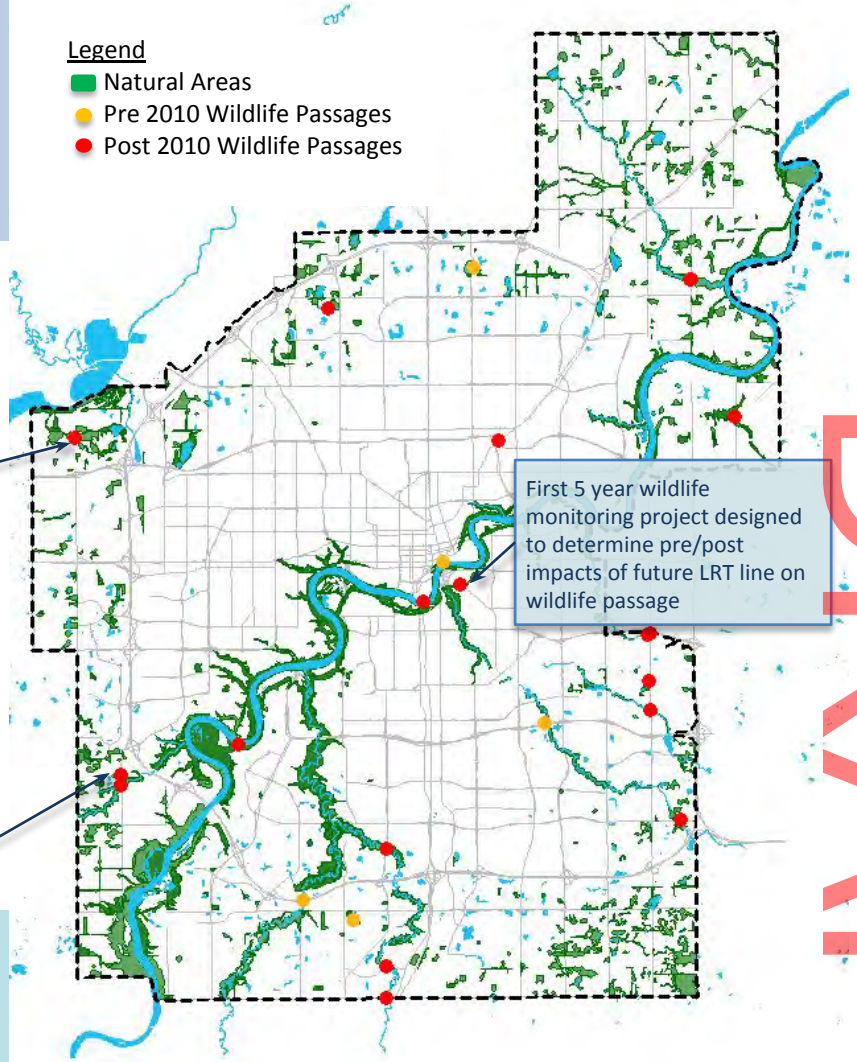




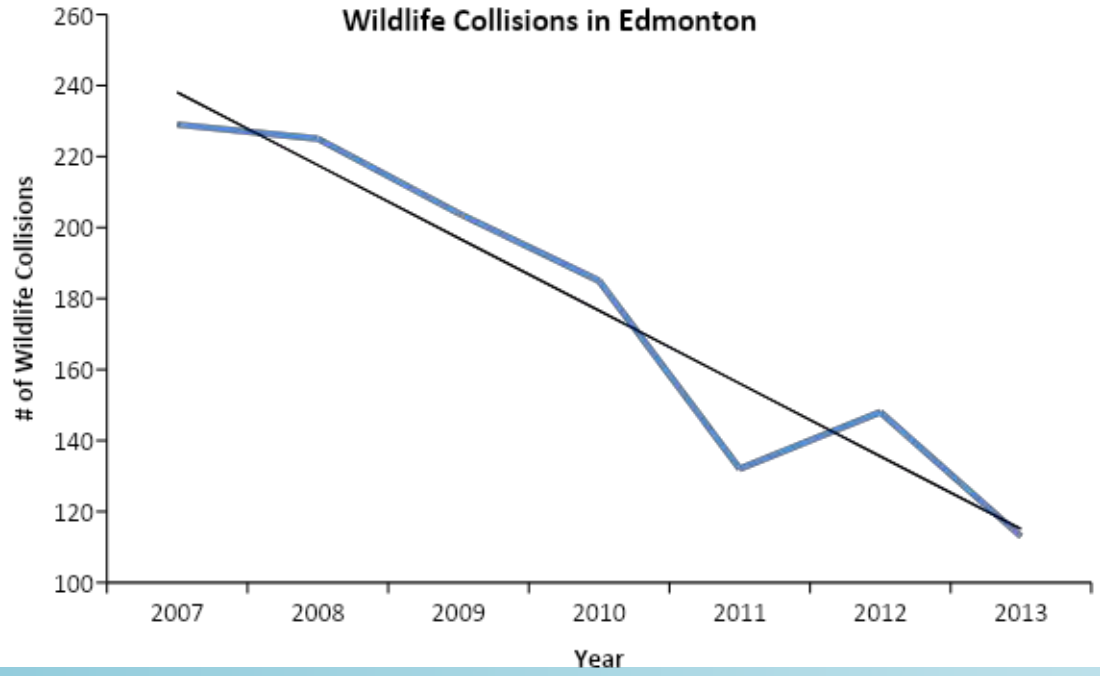
Dual culvert: to connect tributary with creek

Location





Positive Results



While the population of Edmonton **increased** by 160,000

The number of wildlife collisions **decreased** by 51%

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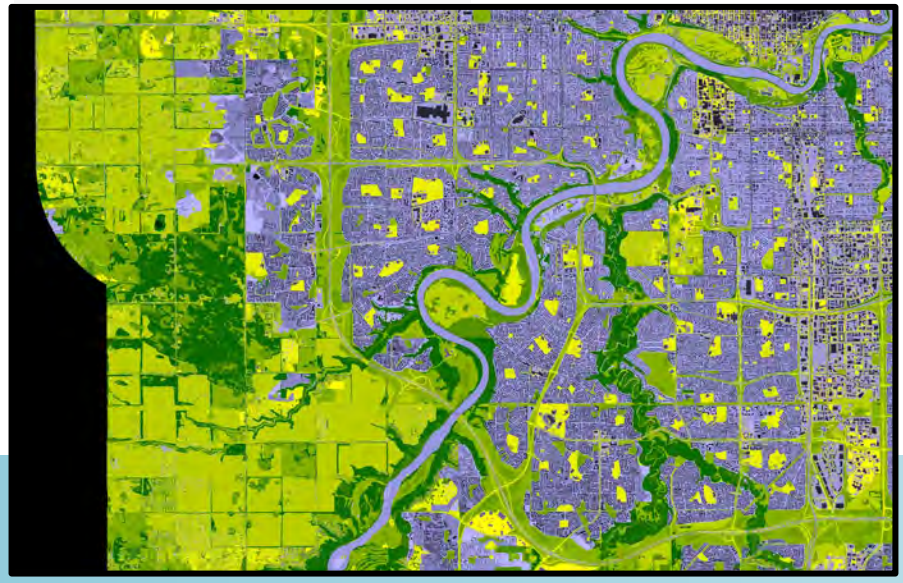
Advanced Wildlife Connectivity Modeling

E.g. A birds eye view: Chickadee Resistance Map



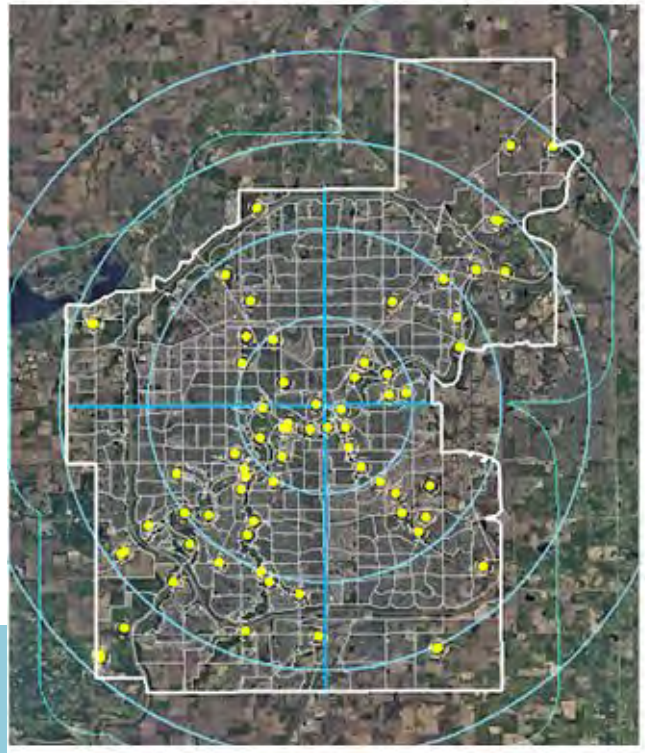
Step 1) Natural Asset mapping products were used in conjunction with electrical theory to create "resistance" maps for various wildlife found in Edmonton.

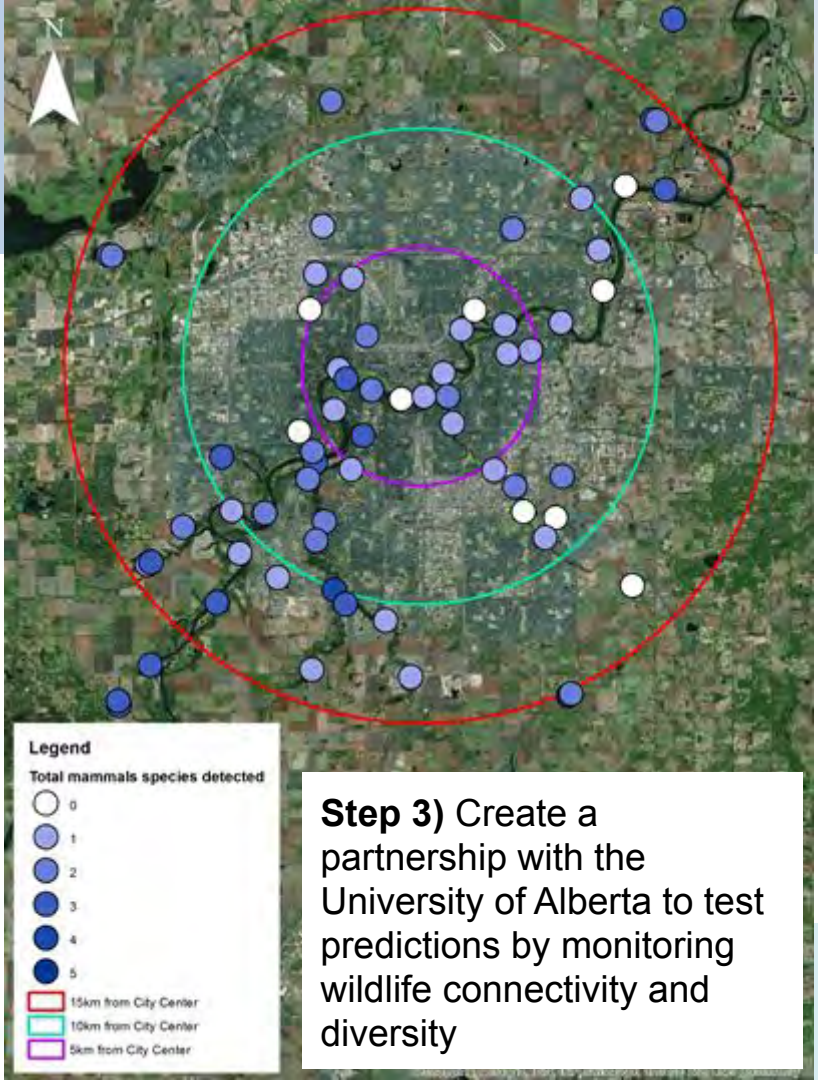
Dark green represents modelled areas of low resistance (i.e. areas that are very permeable) for critters that fly (e.g. songbirds, bats).

Purple areas indicate high resistance (or areas flying critters do not like to hang out in).

Step 2) Run a theoretical electrical charge through the system to produce ...

Advanced Wildlife Connectivity Modeling

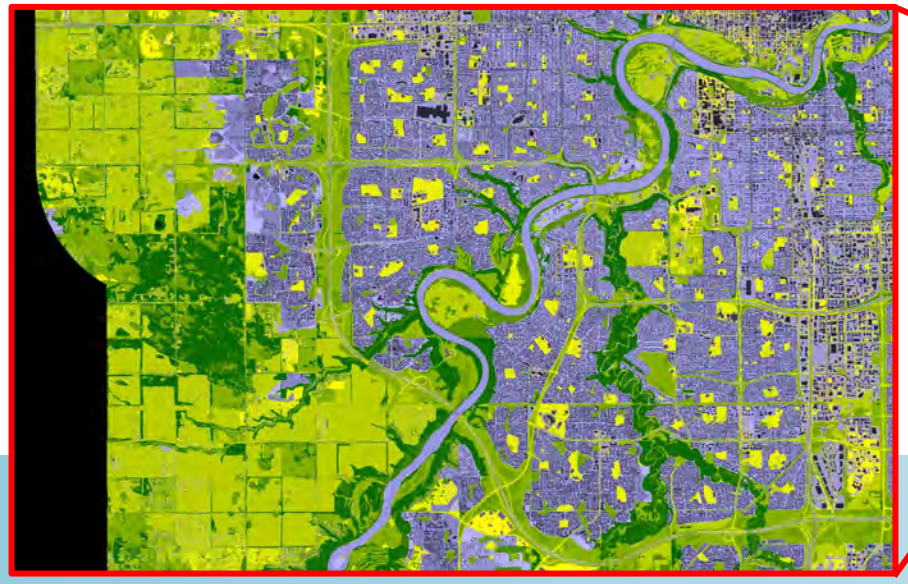


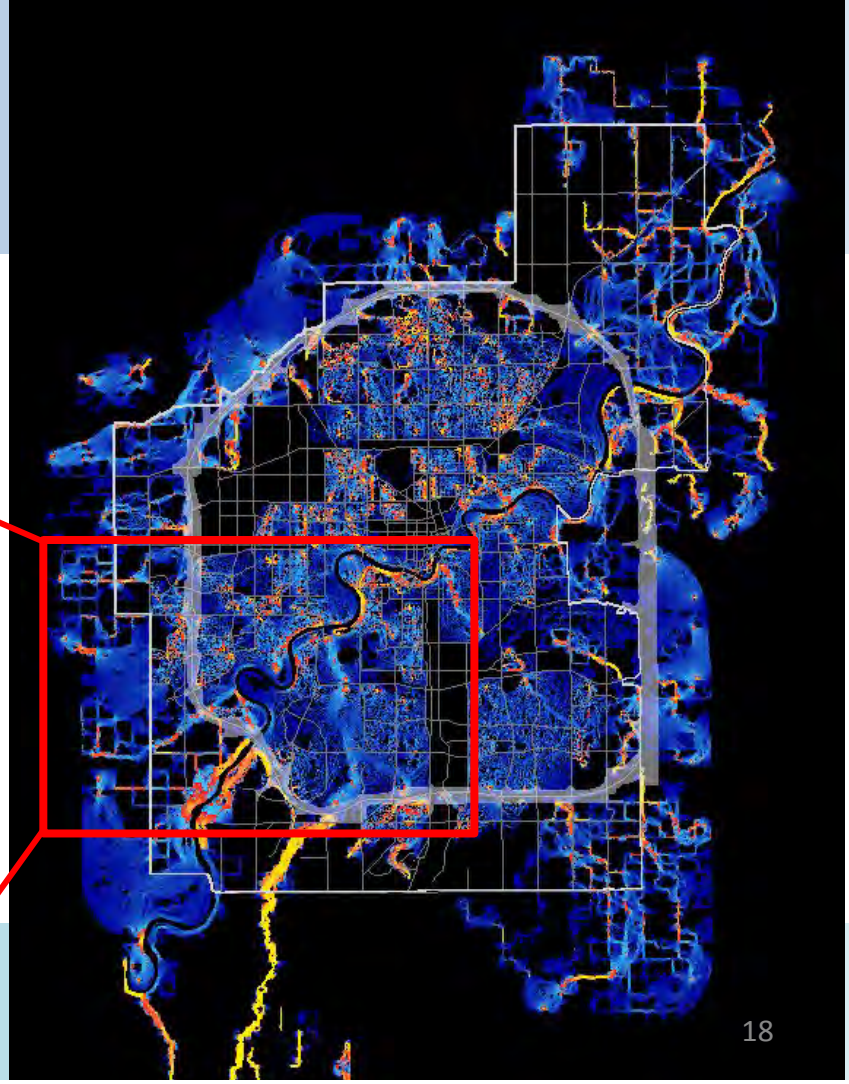


Step 3) Create a partnership with the University of Alberta to test predictions by monitoring wildlife connectivity and diversity

Advanced Wildlife Connectivity Modeling

… a voltage map that predicts where important wildlife corridors (yellow/orange) and pinch-points (red) may occur.





Thank You

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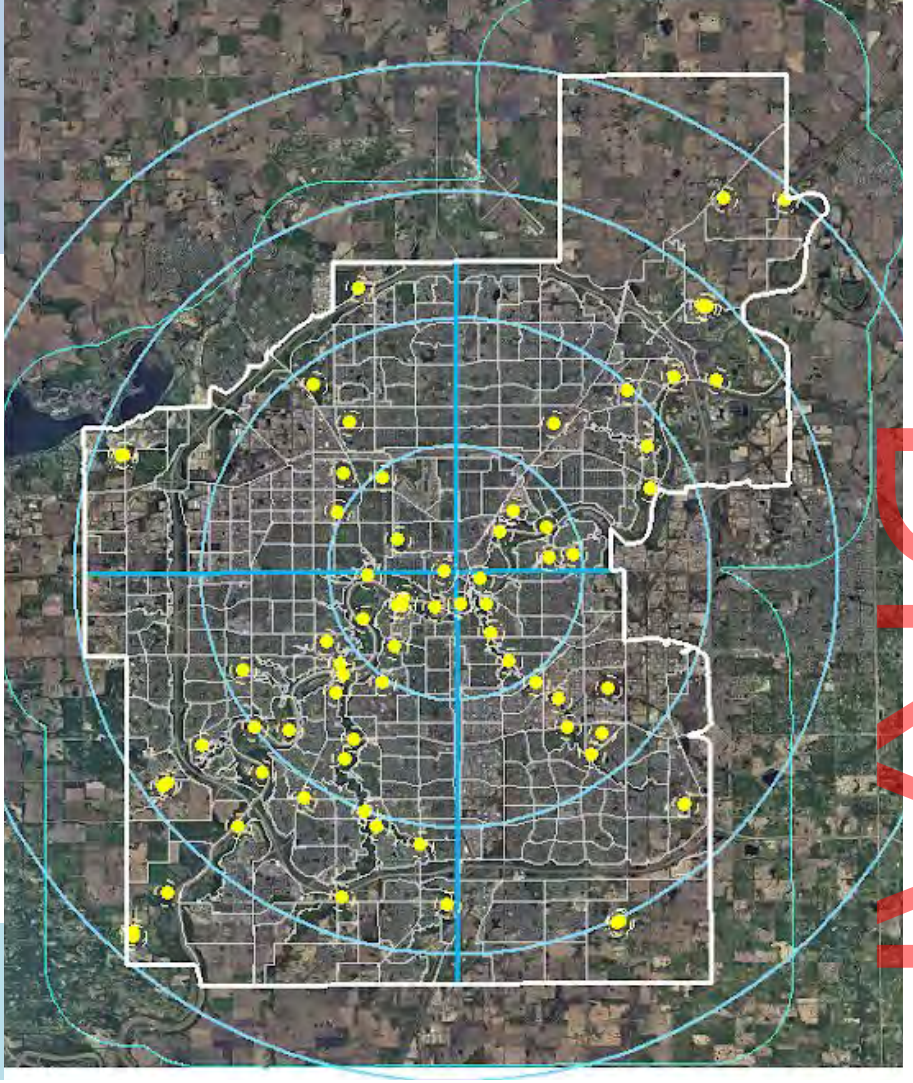
Sample Wildlife Photos

2018/19 Wildlife Monitoring Program: Monitoring sites

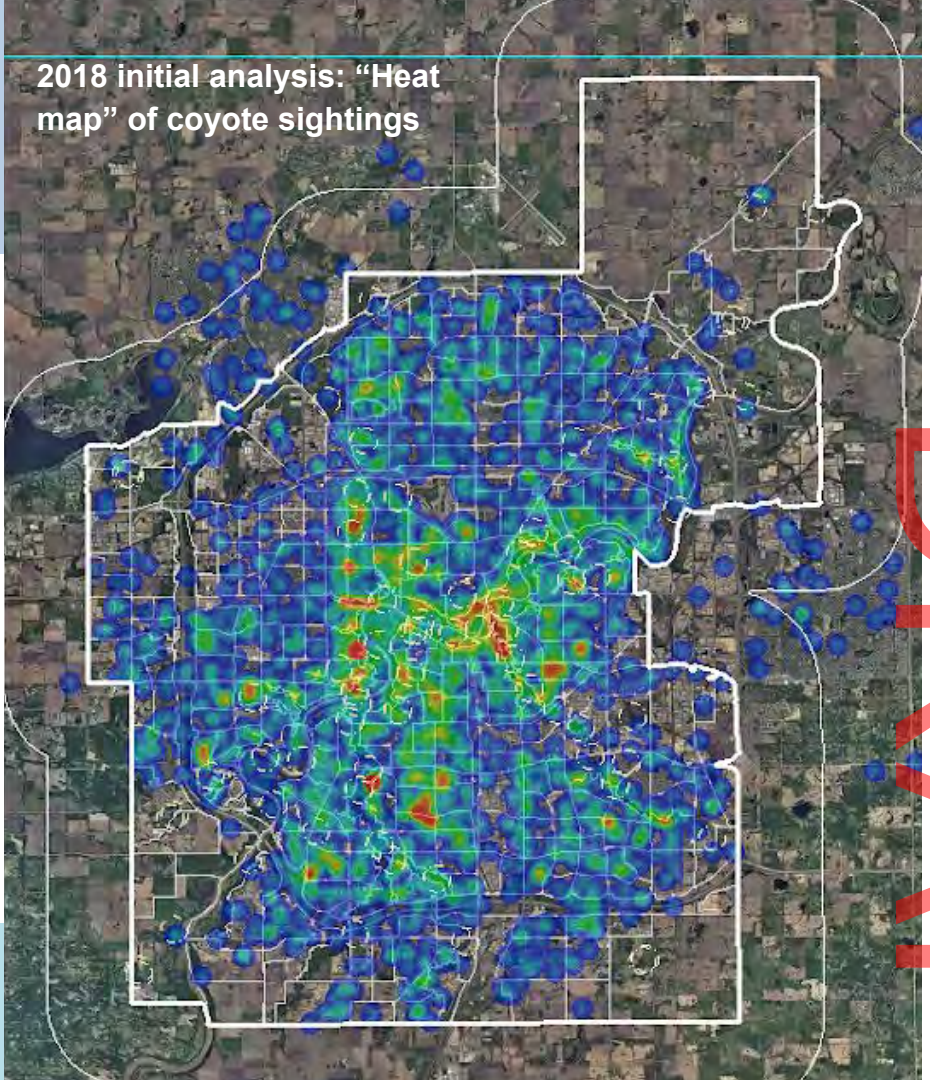
Study design:

- City is divided into four quadrants with 5km circular transects radiating from the City center (blue)
- Deployed wildlife cameras (yellow dots)
- Study design facilitates the research and information requirements of four project partners:
  - City of Edmonton
  - University of Alberta - Coyote project
  - Urban Wildlife Information Network
  - Alberta Biodiversity Monitoring Institute



2018/19 Wildlife Monitoring Program Objectives

- Monitor wildlife use through the City by deploying wildlife monitoring cameras to assess and collect information on:
  - What wildlife species are present in Edmonton
  - Habitat connectivity
  - Wildlife use of purpose built wildlife passage structures
  - Baseline data in select undisturbed habitat patches
- Validate the City's natural systems connectivity models by comparing them with existing wildlife movement data
- Use the results of this work to inform ecological network strategic planning
- Leverage this work to broaden the results and impact of this program by developing collaborative relationships with both internal and external partners



Systemic Barriers to Connectivity

Nick Stow (Ph.D., EP)
Senior Environmental Planner

CIP National Conference 2019

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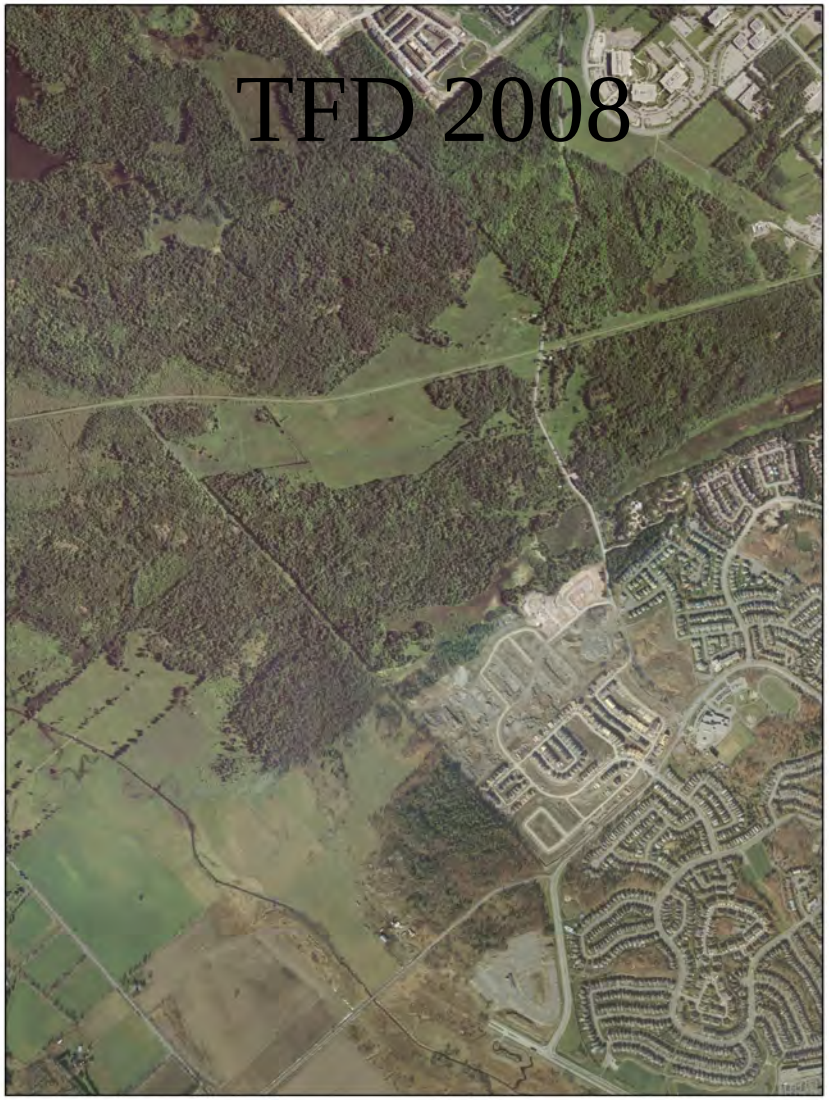
July 4, 2019



Wildlife Passages and Fencing

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Ottawa

Success

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Why Did TFD Succeed?

- Federal Funding (50% of road cost)
- Federal Environmental Assessment
- Strong political support

Barriers to New Projects

- Legacy Environmental Assessments
- Capital costs
- Operational considerations and costs
- Lack of legislative or regulatory trigger
- Organizational culture

Roger Stevens Drive

- Important rural linkage
- Core natural area (Marlborough Forest)
- High mortality (including species at risk)
- High cost
- Design issues
- No upgrades planned
- No regulatory trigger

Keys to Future Success

- Identify the need in the Environmental Assessment
- Get the cost into the preliminary budget
- Bring Operations Groups into the discussion early.
- Identify ownership and responsibility.

Sheila Boudreau

OALA, CSLA, RPP/OPPI, MCIP

Ontario Association of Landscape Architects

Ontario Professional Planners Institute

EOR

water

ecology

community

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2019 CIP NATIONAL CONFERENCE

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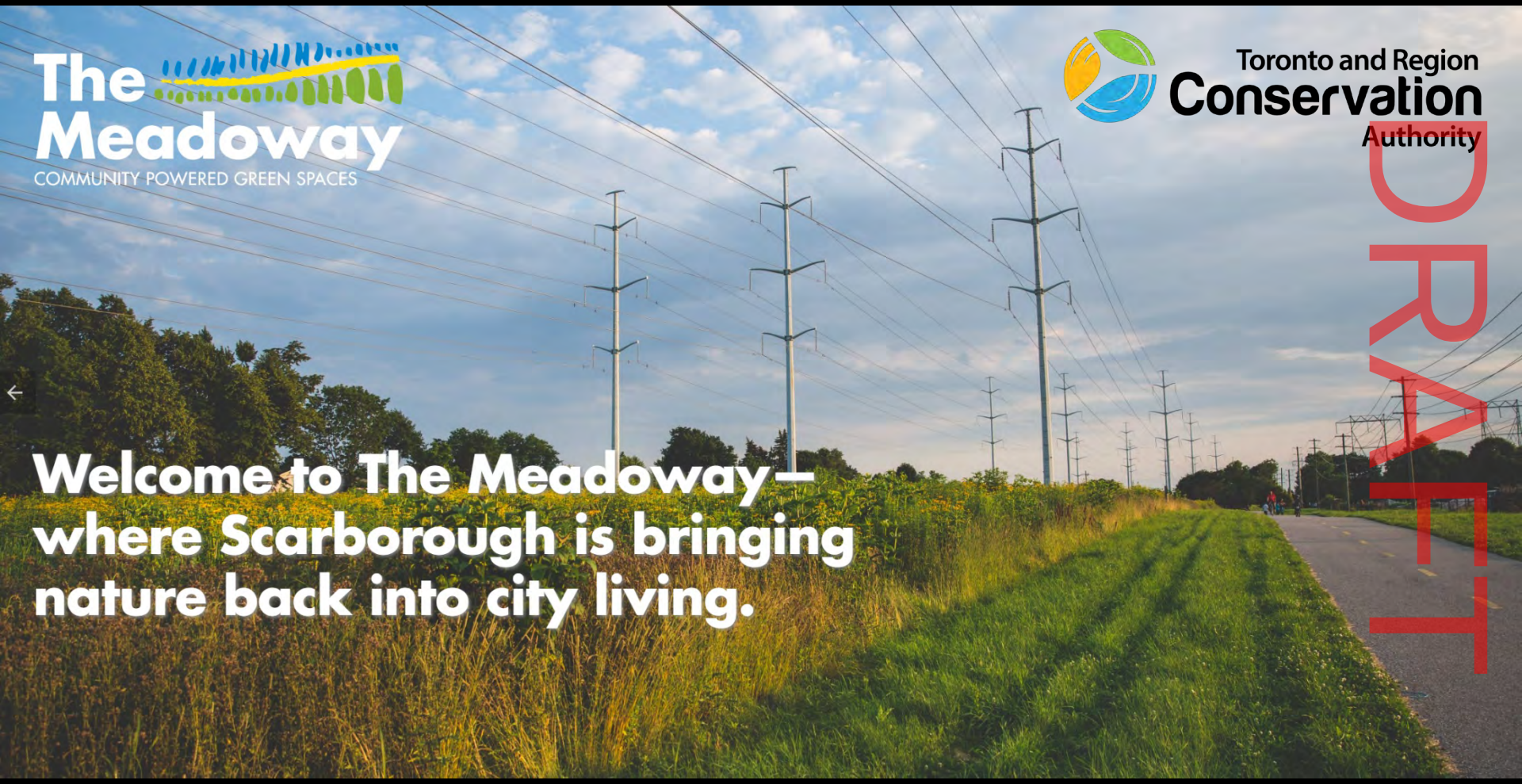
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Toronto and Region Conservation Authority
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Welcome to The Meadoway—where Scarborough is bringing nature back into city living.


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Visualization Toolkit

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Visualization Toolkit

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2 PERSPECTIVE- ACTIVE
NOT TO SCALE

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