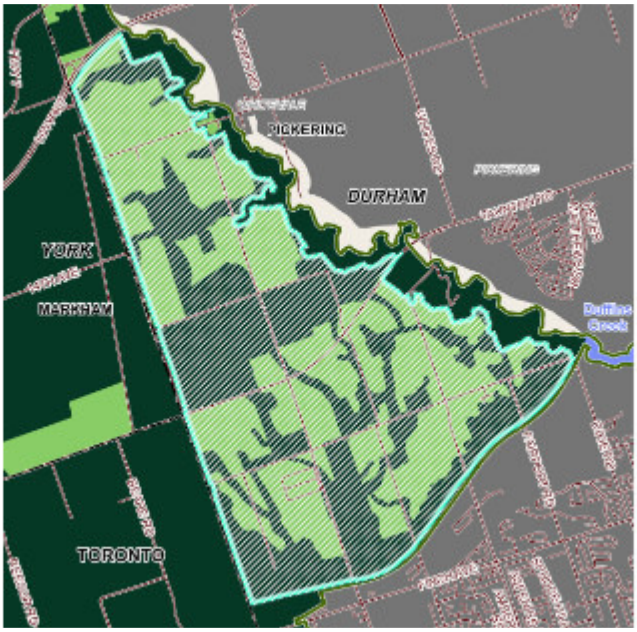
ecokare international

02-December-2022

Attention: Shelly Petrie, Program Director, Greenbelt Foundation

Re: Natural Heritage and Connectivity Evaluation of proposed removal of the Duffins Rouge Agricultural Preserve (Map 6) from the Greenbelt.



Background and expertise:

I, Kari Gunson, am a professional landscape ecologist and have twenty-five years of experience conducting peer-reviews in the field of landscape ecology, connectivity and road ecology studies that evaluate the impacts of roads and other developments on the natural environment. I have a BSc. Degree in Zoology and Ecology, an MSc. Degree in Geographic Information Science, and an MSc. Degree in Conservation Biology. My full CV is attached to this memo.

I have lived in Southern Ontario for the past 15 years where I have worked on relevant projects related to evaluating connectivity on a landscape scale with a primary focus on natural heritage and roads (see below) and impacts to Species at Risk. All of the

projects below entailed mapping and evaluating natural heritage features and systems, residential communities and roads, and assessing where connectivity could be maintained or restored within the context of existing and projected anthropogenic development and disturbance.

A brief list of selected relevant publications includes:

Wildlands League and **Eco-Kare International**. 2022. Road ecology and connectivity assessment in the Greater Rouge Ecosystem. Funded by the Greenbelt Foundation.

Eco-Kare International. 2022. Road mortality data collection and hotspot analysis in the northern areas of Rouge Urban National Park. 2022. Final report submitted to Parks Canada.

Dillon Consulting and **Eco-Kare International**. 2022. Pre-mitigation assessment and monitoring evaluation of mitigation measures on Princess Street and Creekside Valley Blvd. in response to new residential community development in a provincially significant wetland (Collins Creek Provincially Significant Wetland complex, City of Kingston, Ontario). August 2020 to December 2022.

Parsons and **Eco-Kare International**. 2014-2019. Highway 6, pre-mitigation assessment for Massasauga Rattlesnakes in the Bruce Peninsula, 2014-2019

Kari Gunson, expert ecology witness for the Prince Edward County Field Naturalists for a proposed windfarm development at Ostrander Point crown block. 2015-2017. Tribunal overturned the proposed development and Ostrander Point remains undisturbed and is proposed to be integrated in the South Shore protected area.

Dougan and Associates, Paradigm Transportation Solutions, Matrix Solutions, and **Eco-Kare International**. 2016. Balancing environmental protection and transportation in the Laurel Creek Environmental Sensitive Landscape: A case study. Final Report submitted to the Region of Waterloo. 349 pp.

Eco-Kare International. In draft**.** A municipal road ecology strategy for the Town of Oakville. Oakville, Ontario. 178 pp.

Eco-Kare International. 2015. Halton Region Species at Risk road mortality, hotspot mapping, and evaluation of wildlife crossing structure opportunities. Final report submitted to the Region of Halton with funding from the Ministry of Natural Resources and Forestry Habitat Stewardship Program, Oakville, Ontario. 49 pp.

Ministry of Transportation. 2015. MTO Wildlife Mitigation Program Analysis and Tools. Final report by **Eco-Kare International** submitted to the Ministry of Transportation, St. Catharines, Ontario. 188 pp.

Brief summary:

The Duffins-Rouge Agricultural Preserve has been proposed to be removed from the Greenbelt designation subjecting the preserve to the threat of urbanization. The nearly 4,700 acres of primary agricultural land is situated between the Duffins Creek watershed and Rouge Urban National Park and is an important corridor for movement of wildlife and water. The preserve also contains pristine natural habitat that provides refuge for many wildlife species. There occurs a treed swamp – deciduous forest – meadow complex in the middle of the preserve that is a key east-west 'stepping stone' for wildlife moving from between Duffins and Rouge Creek natural riparian systems. Furthermore, the existing agriculture use of the land in the surrounding mosaic is preferred to maintain the natural ecological and connectivity processes within and surrounding the preserve.

Therefore, it is of my expert opinion that wildlife diversity and habitat connectivity in the area will not only be severely negatively impacted by urbanization, but in some cases wildlife populations will actually be lost. This will also diminish neighbouring wildlife populations in surrounding areas because there will no longer be recruitment of individuals from the preserve and these populations will be increasingly isolated and unable to move to and between intact natural habitat.

Background review:

Ms. Gunson has been working in the Greater Rouge and Duffins Creek area for the past two years, evaluating impacts of roads on wildlife, prioritizing areas for protection to ensure habitat connectivity, and implementing non-lethal beaver management techniques to ensure and restore wetland and hydraulic processes along the west Duffins Creek drainage.

Below is a natural areas and hydrology map of the identified Duffins-Rouge Agricultural Preserve with subsequent review of key natural heritage features:

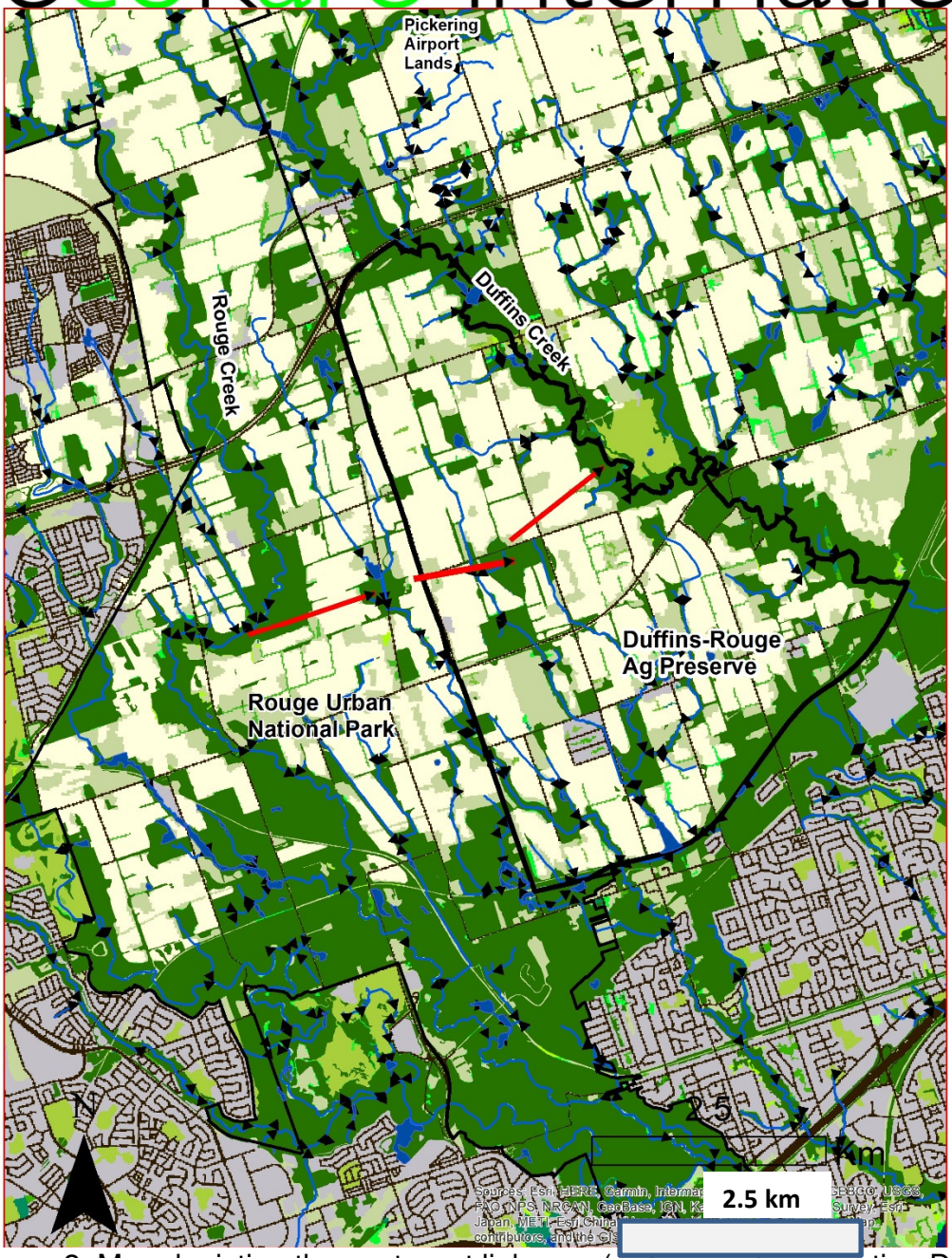


Figure 2. Map depicting the east west linkages (red arrows) connecting Duffins and Rouge Creek. The Duffins-Rouge Ag Preserve is a relatively permeable matrix of land use for both wildlife and water connectivity relative to the surrounding urban area southerly. There are several Species at Risk that have been observed in the Preserve. Underlying layers include existing natural cover as part of the natural heritage strategy (TRCA, 2022), the Southern Ontario Land Classification System Version 3 (MNRF, 2019) and Integrated hydrology network (MNRF, 2013).

- A review of the iNaturalist observations in the preserve demonstrate a diversity of wildlife species use the existing habitat. There were also several Species at Risk reptiles such as Blanding's Turtle, Snapping Turtle, and Eastern Milksnake observed in the preserve. There is a diverse assemblage of amphibian species that include Gray Treefrog, Wood Frogs, American Toads, Bullfrogs and Leopard Frogs. In addition, there are a wide diversity of wetland birds and Species at Risk birds that include Eastern Meadowlark, and Bobolink (Natural Heritage Information Centre, 2013 occurrence maps).
- A treed-wetland swamp occurs in the middle of the region that is a key 'stepping stone' of natural habitat for animals moving east to west between Duffins Creek and Rouge Creek riparian systems (Figure 2). Each red arrow in Figure 2 is approximately 1.5 km, an average movement distance for freshwater turtles, snakes, and some amphibians. All natural area patches even small ones are important and their value is dependent on the configuration of the natural areas in the landscape when providing refuge for vulnerable species (see report in Quebec, Rayfield et al. 2019).
- Approximately 1,300 acres of the nearly 4,700 acres or 28% is existing natural cover and is part of the TRCA's updated regional target natural heritage system (2022) that identifies important ecological areas for natural heritage features and functions.
- The existing road network is gravel low-volume roads, if land use changes to residential the road network will be upgraded and subsequently wildlife will be subject to increased negative effects of roads, that include fragmentation, and road mortality.
- Agricultural lands are often a component of the landscape matrix used by turtles and other wildlife species in Southern Ontario and in suburban landscapes (Caverhill et al. 2006). Agricultural land is less suitable than wetland-forest complex but much more desirable than anthropogenically disturbed land use to sustain wildlife populations.

References:

Caverhill, B., B. Johnson, J. Phillips, E. Nadeau, M. Kula, and R. Holmes. Blanding's Turtle (Emydoidea Blandingii) and Snapping Turtle (Chelydra Serpentina) Habitat Use and Movements in the Oakland Swamp Wetland Complex, Ontario, Canada, and Their Response to the Provincial Highway 24 Exclusion Fence and Aquatic Culvert Ecopassage from 2010-2011'. Toronto, ON: Report prepared by the Toronto Zoo, Adopt-A-Pond program, 2011.

Rayfield, B., G. Laroque, C. Daniel and A. Gonzalez. 2019. Une priorisation pour la conservation

des milieux naturels des basses-terres du Saint- Laurent en fonction de leur importance pour la connectivité écologique. Final report to the Quebec ministère de l'Environnement.

Toronto Region Conservation Authority. 2022. TRCA Updated Target Natural Heritage System: A Summary Report.

ecokare international

Appendix B Gunson CV

ecokare international

Kari E. Gunson, Principal Road Ecologist
644 Bethune Street, Peterborough, ON, K9H 4A3
kegunson@eco-kare.com • http://eco-kare.com
cell: 705-933-8430

Work History

2008-present	Principal, Eco-Kare International
2007-2008	Road Ecologist, Toronto Zoo
2006-2007	Teaching Assistant for Statistics and Geographic Information Systems courses
1999-2006	Parks Canada, Banff National Park, Road Ecology Research Associate

Education

2007	MSc.	Geospatial Technologies	State University of New York, Syracuse, New York
1998	MSc.	Conservation Biology	University of Cape Town, Cape Town, South Africa
1994	BSc.	Double major: Zoology and Ecology	University of Calgary, Calgary, Alberta

Corporate Profile

Eco-Kare has been in operation for thirteen years and was incorporated in 2009 in Toronto, Ontario and is now based out of Peterborough, Ontario. Its mandate is to translate the science of road and landscape ecology for engineers, planners, and decision-makers charged with implementing cost- effective mainstream solutions to reduce impacts of anthropogenic land use on ecological processes. Eco-Kare's principal, KariGunson, is in a good position to deliver this mandate, having worked for the past 25 consecutive years as a full-time applied landscape ecologist on road mitigation projects throughout North America. Ms. Gunson has established a global network of connections, and has amassed an in-house library of over 2,880 articles, peer-reviewed papers and technical papers catalogued in a digital library.

Ms. Gunson’s debut into landscape ecology began in 1999 where she worked as part of a research team to monitor the overpasses and underpasses and associated exclusion fencing in Banff National Park for mid-sized and large animals. In 2005, she moved east to Syracuse, New Yorkto complete an MSc. In Environmental Resource Engineering from the State University of NewYork. In 2007, Kari moved to Ontario to lead the formation of the Ontario Road Ecology Group at the Toronto Zoo. In 2009, she began Eco-Kare International - in response to an ever-increasing demand for effective road mitigation solutions especially for

Ontario's Species at Risk reptiles. She now works on a wide spectrum of road ecological needs from the planning, design,implementation and monitoring of wildlife-road mitigation (e.g., exclusion barrier, wildlife crossing structures and signage) for a variety of large and small animal species including black bears, moose, deer, snakes, turtles and amphibians.

Eco-Kare International was the lead firm employed to consistently monitor and evaluate the effectiveness of five phases of mitigation implementation over 175 km of highway 69/400 for the Ontario Ministry of Transportation (final results are currently being reviewed) for many of Ontario's Species at Risk turtles and snakes and large animals. These monitoring methods were adapted from lessons learned from previous monitoring led by Ms. Gunson in Banff National Park from 1999 to 2005 and has led to the largest known database of crossing structure use for reptiles in the world. As a result of this work, Eco-Kare has employed these methods for several agencies in Ontario including other large- and mid-sized consulting companies, Conservation Authorities and Universities.

In 2019, Kari was the lead author on a newly launched book -Wildlife on Roads- that also has a supplementary iNaturalist project for Ontarians to submit complete and accurate wildlife on road observations. Her founding firm, Eco-Kare International, published and distributed over 300 copies across the world at invited conferences and workshops including Europe, South Africa, Costa Rica, Mexico, United States, and Canada. Eco-Kare now has an on-line store available for purchase of the book. Other contributions to road ecology include six book chapters, 16 co-authored, peer-reviewed published articles and 3 guideline documents. Her most recent compiled review, completed in 2019, includes a compendium of drawings available on-line at the following link (https://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=4337).

Kari uses a landscape-connected approach in her work, specializing in the field of Geographic Information Science where she is able to assess and design mitigation strategies from a birds-eye view. Furthermore, having come from a landscaping and technical engineering background, Kari is in a good position to understand and implement practical and effective wildlife crossing structures and exclusion fencing on a site by site basis that meets several criteria such as budget, terrain, and selected target species. Kari is a passionate individual who has extensive experience working with transportation/environmental/land-use planners (municipal and provincial), engineers, landscape architects, ecologists, and computer scientists in all phases of road design, construction and maintenance.

Awards

- One of 3 finalists in the 2012 Peterborough Business Excellence Awards, Environmental Practices Award

- First runner-up for the 2012 Earth Day Canada Hometown Hero Small Business Award
- Part of multi-disciplinary team that earned 1 of 5 finalist positions in the ARC International Wildlife Overpass Design Competition, Vail, Colorado, 2010

Skills Development

Completed graduate-level courses in Digital Image Analysis, Geographic Information Systems, Systems Ecology, and Advanced Statistical Analysis

Advanced Computer Literacy

- Geographic Information Systems (GIS) Software: ArcView 10.4, with Spatial Analyst extension
- Computer Programming: Matlab 7.1
- Geographic Positioning Systems (GPS) software: Trimble, Pathfinder, Oziexplorer, BaseCamp
- Statistical Analysis Software: R, SAS, SPSS, Minitab, and Statistica
- Microsoft Office 2013: Word, Access, Powerpoint, and Excel

Affiliations

- Present Member of the Society of Conservation Biology
- Present Member of the Canadian Herpetological Society
- Present Member of the Transport Working Group (TWG), under the auspices of the IUCN's Connectivity Conservation Specialist Group (CCSG)
- Present Member and co-founder of the Ontario Road Ecology Group
- Member of the Australasian Network for Ecology and Transportation

Selected Project Experience

Pre-mitigation assessment on Princess Street (Collins Creek Provincially Significant Wetland Complex), City of Kingston, Ontario, August 2022.

Eco-Kare worked with Dillon Consulting to prepare a conceptual mitigation strategythat includes crossing structures, exclusion fencing and alternate nesting habitat for freshwater turtles along Princess Street that bisects the Collins Creek wetland complex. The strategy will also strive to mitigate impacts of a nearby residential development and boulevard that will bisect the northern portion of the wetland complex. The strategy is based on available

observations of freshwater turtles (road-kill, live crossings and nesting observations) as collected by the Society of Conservation Biology, McIntosh Perry, and Turtles Kingston over the past ten years. As part of the strategy the team is also conducting a hydraulic assessment that will integrate existing and proposed bridges and culverts with detailed drawings and cost estimates.

Road passages and barriers for small terrestrial wildlife-Summary and repository of design examples, National Co-operative Highway Research Program, Transportation Research Board, Washington, D.C., 2018-2019.

Ms. Gunson worked as a co-principal investigator alongside Dr. Marcel Huijser with the Western Transportation Institute to prepare a literature review and online survey to compile best management practices for wildlife mitigation for small mammals smaller than a coyote, reptiles, and amphibians in North America. The results are now organized for download on the Transportation Research Board NCHRP Project 25-25, Task 113 website (https://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=4337)

Highway 6, pre-mitigation assessment for Massasauga Rattlesnakes, 2014-2019.

Based on findings from monitoring work conducted as part of an MSc. thesis by T. Stinnissen, Eco-Kare was retained by Nature Conservancy to install 400 m of wildlife exclusion fencing and monitor snake use of an existing drainage culvert on Highway 6 in the Bruce Peninsula in 2014-2015. Following this work, Eco-Kare worked with Parsons Inc. to provide an assessment for road mitigation measures at the site for Massasauga Rattlesnakes for an upcoming road upgrade project (August 2020). These measures, that include upsizing existing drainage culverts, permanent wildlife exclusion fencing, terrestrial wildlife crossing structures, beaver exclusion from culverts, and mitigation at highway-driveway intersections, are all being included in a comprehensive mitigation strategy for turtles and snakes.

Highway 69 and Highway 11, Effectiveness monitoring of wildlife mitigation measures on Highway 69: Sudbury to Township of Severn, and on Highway 11 for both large and small animals, 2011-2020.

Eco-Kare has led this monitoring work over the past nine years to evaluate the effectiveness of multi-species crossing structures (1 overpass, 2 creek-bridge pathways, 1 large animal underpass, 3 reptile tunnels, and over 30 specialized drainage culverts), fencing, jump-outs, and one-way gate as part of five phases of road extension and improvement projects on Highway 69. The monitoring for reptiles is part of an overall benefit measure implemented for Species at Risk reptiles. The data collection involves using the most up-to-date digital infra-red camera monitoring technology, wildlife-vehicle collision data, and snow tracking methods to assess effectiveness of mitigation measures that will also inform placement and design of new mitigation measures on highways. Results are currently being summarized for final reporting requirements, and have previously been presented at two International conferences of Ecology and Transportation (2015 and 2017), at a regional roads and connectivity conference in Quebec City in October 2017 and in a peer-reviewed publication currently published with Le Naturaliste Canadien.

Longpoint Causeway Environmental Assessment, Schedule B, placement of 3 wildlife crossing structures (2011) and Schedule C, road widening project, 2017-2020.

Initially, Eco-Kare was retained to statistically analyze road mortality data to determine the placement (±10 m) of three crossing tunnels for amphibians and reptiles along 6 km of road using kernel density hotspot analyses in 2011. Eco-Kare contributed to design recommendations for new open-top tunnel designs, of which nine are currently integrated into the road project. Presently, Eco-Kare is working with Parsons environmental and engineering team to advise on inclusion of mitigation measures, specifically exclusion fencing, for reptiles for an upcoming road widening project and bridge replacement project within the detail design phase of planning.

U.S. Highway 93, Valentine National Wildlife Refuge, Evaluation of exclusion fencing and drainage culverts for use and reduction of road mortality by the Blanding's Turtle in Nebraska, 2016 – 2017.

The Valentine National Wildlife Refuge hosts the world's largest Blanding's Turtle population in the world. As such, the Nebraska Roads Department and the U.S Fish and Wildlife Service implemented wildlife exclusion fencing with drainage culverts along selected valleys of the

Sandhills of Nebraska. Eco-Kare was retained by Dr. Marcel Huijser of the Western Transportation Institute on an advisory capacity to implement a monitoring plan to assess effectiveness of the structures for Blanding's Turtles and to provide recommendations to implement adaptive management for these measures. Highlighted at the 2017 International Conference of Ecology and Transportation (ICOET) as a poster presentation.

Pre-mitigation exclusionary fencing, wildlife crossing structure mitigation plan, installation of 2.0 km of fencing, and subsequent post-monitoring plan for Kouchibouguac National Park, 2016-2017.

Worked with Parks Canada staff to provide expertise for placement, design and monitoring of six dedicated wildlife crossing structures and 3.2 km of exclusionary fencing into a highway and bike trail network in Kouchibouguac National Park. Eco-Kare was subsequently retained to install 2.0 km of ACO wildlife fencing, which is currently being monitored by an MSc student.

Hotspot prioritization of road mitigation along a road network for turtles and amphibians in the Regional Municipality of Peel, 2015-2016.

Worked with the Toronto Region Conservation Authority (CA), and Credit Valley CA to develop a road ecology strategy to prioritize where road mitigation most specifically for reptiles and amphibians is required. We used ten years of amphibian call data to model the amount of forest cover surrounding wetlands where amphibians occurred and used this information to map habitat. Road layers were then overlaid in a Geographic Information System to predict where amphibians would cross between wetland-forest habitat. The Regional Municipality of Peel was provided with a geospatial database to prioritize mitigation for implementation in road upgrade projects. The work was featured as a case study in the most recent text book of wildlife mitigation for small animals and methods developed have since been employed in other CA jurisdictions including Guelph, Halton Region and Raisin Region CA.

Laurel Creek Environmentally Sensitive Area, Region of Waterloo, 2014 and 2015

Eco-Kare was retained by Dougan and Associates to work with a team of hydrologists, engineers, and ecologists to provide Best Management Practices (BMP) for the existing and proposed road upgrade projects in the Laurel Creek Environmentally Sensitive Area, Waterloo, Ontario. This was a one-of-a-kind project that worked with decision-makers and the public to integrate concepts and practices to formulate a balanced approach for environmental protection during road planning, maintenance and construction phases of transportation

development. Eco-Kare performed a connectivity and hydraulic analysis using available data to prioritize key locations for wildlife mitigation in planned road projects.

Road Ecology Strategy for the Town of Oakville, Environmental Policy Office, Sept 2013 – Sept 2015

Retained by the Town of Oakville to develop a road ecology strategy for decision makers and practitioners to facilitate integration of road ecology concepts into existing and future municipal infrastructure development. This included reviewing and providing Best Management Practices (BMP) for reducing municipal road impacts on wildlife (road-kill and connectivity), vegetation (invasive and Right-of-Way management), and hydrology (connectivity and water quality). The best management practices is the first of its kind to be conducted for municipal planning, and may also be applied to other road types and jurisdictions. It is especially timely and applicable to North Oakville where new communities and supporting infrastructure such as roads are currently being planned within the official plans.

Evaluation of road-side awareness signs for turtles and snakes on provincial highways in Ontario for the Ministry of Transportation (MTO), 2012 – 2016.

Eco-Kare monitored six sites where Wildlife Habitat Awareness (WHA) signs were placed along highways in Ontario in a Before-After-Control-Impact study design. Three performance measures were used: 1) motorist surveys to determine whether motorist notice and respond to the WHA signs, 2) traffic speed studies to measure whether motorists slow down when driving past the signs, and 3) road mortality surveys to measure whether fewer animals die on the road at the signs. Based on our findings the MTO developed new policy recommendations for the installation of these signs in known hotspots along the highway network.

Best Management Guidelines for mitigation measures for the Ministry of Natural Resources, Species at Risk Branch, Jan 2014 – Dec 2014.

Lead consultant in development of taxa specific Best Management Practices (BMP) for road mitigation measures for Species at Risk amphibians and reptile species in Ontario. Guidelines are comprehensive and based on an extensive global literature review from conference proceedings and telephone and email surveys. BMP's entail planning for, and integration with existing and new road projects. In addition, other chapters include summarizing road impacts and monitoring techniques and study designs for evaluating effectiveness of mitigation measures.

Development of a province-wide wildlife mitigation strategy (WMS) for the Ministry of Transportation, Ontario, 2012 – 2016

Eco-Kare (Ms. Gunson) was the lead project manager and technical developer for two mitigation prioritization tools for the MTO. Each tool integrated available data, expertise and tools into a first generation framework that will define where road mitigation should be prioritized along Ontario's 19,000 km of highways for both large and small animals. Animals targeted include Species at Risk (SAR) turtles, snakes, small mammals, and birds that are protected under the Endangered Species Act (2007) as well as large animals, e.g. moose, deer, and black bears that pose a public safety risk. The large animal decision tool uses crash data to define where high risk wildlife-vehicle collision (WVC) hotspots occur. Supplementary to the spatial analysis, metrics such as the proportion of WVCs, crash severity, and vehicle risk were evaluated at defined hotspots. The small animal tool was primarily based on habitat models that predict where road mortality will occur for Species at Risk habitat specialists such as the Blanding's Turtle, Foxsnakes, and Massasauga Rattlesnake.

Highway 7 turtle road mortality and movement study, Ministry of Transportation, 2012-ongoing.

Eco-Kare worked with Laurentian University and Seburn Consulting to measure where road mortality hotspots occur for turtles on Highway 7 in 2012. Subsequently, the existing drainage culvert was upsized at the primary hotspot and Animex fence was installed for 500 m. Concurrently, a beaver exclusion, turtle passage trial is taking place in partnership with Queen's University and the Highway Infrastructure Innovation Funding Program with the Ministry of Transportation to manage water flow, beaver exclusion from damming the culvert that permits water flow and passage for turtles. This project was presented at the 2017 ICOET conference as an oral presentation as well as at the first inaugural BeaverCon conference in Baltimore, Maryland in March 2020.

Cyprus lake road, pre-mitigation assessment, Bruce Peninsula National Park, 2010.

Designed a mitigation strategy for Parks Canada that prioritized where and what type of mitigation was feasible for amphibians and reptiles along Cyprus Lake Road in Bruce Peninsula National Park. Wildlife awareness signage, a tunnel underpass and fencing were recommended. A tunnel and signs were placed in 2011, and in spring 2013, Eco-Kare also assisted the Park in designing and building a wildlife fence associated with the new wildlife crossing structure for snakes and turtles. Currently, new and improved fencing (Animex) and newly designed wildlife crossing structures for Massasauga Rattlesnakes have been installed along several roads in the park.

Banff wildlife crossings project-Parks Canada, Banff National Park, 1999-2005.

Supervised and contributed to collecting data to analyze the effectiveness of 22 underpass and 2 overpass structures and associated fencing on alleviating habitat fragmentation and mortality on local wildlife populations from 1999 to 2005. Research was used in an adaptive management approach to build new structures along the Trans-Canada Highway in the Lake Louise region. Eco-Kare is currently involved in the data analysis, writing and synthesis of manuscripts that has led to over ten peer-reviewed scientific papers since 1999. This project has been profiled on National Geographic and Discovery Channel as well as in over 20 peer-reviewed research articles.

Peer-reviewed Publications (please see https://eco-kare.com/publications-conferences/ for a complete list of publications)

Gunson, K.E., A.P. Clevenger, A.T. Ford. **2022.** A comparison of elk-vehicle collision patterns with demographic and abundance data in the Central Canadian Rocky Mountains. Conservation Society and Practice online https://doi.org/10.1111/csp2.12842

Gunson, K.E. 2019. A comparison of turtle and snake passage at drainage culverts along two major highways in North America. Le Canadien Naturaliste 143: 81-84.

Clevenger, A. P., M. Barrueto, K. E. Gunson, F. M. Caryl, and A. T. Ford. 2015. Context dependent effects on spatial variation in deer-vehicle collisions. Ecosphere. 6:art47. (Click here for a .pdf) .

Seburn, D. C., K. Gunson, and F. W. Schueler. 2014. Apparent widespread decline of the Boreal Chorus Frog (Pseudacris maculata) in eastern Ottawa. The Canadian Field-Naturalist 128:151–157.

Gunson, K. E., and F. W. Schueler. 2012. Effective placement of road mitigation using lessons learned from turtle crossing signs in Ontario. Ecological Restoration 30:329–334.

Langen, T. A., K. E. Gunson, C. A. Scheiner, and J. T. Boulerice. 2012. Road mortality in freshwater turtles: identifying causes of spatial patterns to optimize road planning and mitigation. Biodiversity and Conservation 21:3017–3034.

Gunson, K. E., D. Ireland, and F. Schueler. 2012. A tool to prioritize high-risk road mortality locations for wetland-forest herpetofauna in Southern Ontario, Canada. North-Western Journal of Zoology 8:409–413.

Seburn, D. C., and K.E. Gunson. 2011. Has the Western Chorus Frog (Pseudacris triseriata)

declined in Western Ottawa, Ontario? The Canadian Field-Naturalist 125:220–226.

Gunson, K. E., G. Mountrakis, and L. J. Quackenbush. 2011. Spatial wildlife-vehicle collision models: A review of current work and its application to transportation mitigation projects. Journal of Environmental Management 92:1074–1082.

Gunson, K. E., A. P. Clevenger, A. T. Ford, J. A. Bissonette, and A. Hardy. 2009. A comparison of data sets varying in spatial accuracy used to predict the occurrence of wildlife-vehicle collisions. Environmental management 44:268–277.

Mountrakis, G., and K.E. Gunson. 2009. Multi-scale spatiotemporal analyses of moose–vehicle collisions: a case study in northern Vermont. International Journal of Geographical Information Science 23:1389–1412.

Chruszcz, B., A. P. Clevenger, K. E. Gunson, and M. L. Gibeau. 2003. Relationships among grizzly bears, highways, and habitat in the Banff-Bow Valley, Alberta, Canada. Canadian Journal of Zoology 81:1378–1391.

Clevenger, A. P., B. Chruszcz, and K. E. Gunson. 2003. Spatial patterns and factors influencing small vertebrate fauna road-kill aggregations. Biological Conservation 109:15–26.

Clevenger, A. P., J. Wierzchowski, B. Chruszcz, and K. E. Gunson. 2002. GIS-generated, expert-based models for identifying wildlife habitat linkages and planning mitigation passages. Conservation Biology 16:503–514.

Clevenger, A. P., B. Chruszcz, and K. E. Gunson. 2001. Drainage culverts as habitat linkages and factors affecting passage by mammals. Journal of Applied Ecology 38:1340–1349.

Clevenger, A. P., M. Mcivor, D. McIvor, B. Chruszcz, and K. E. Gunson. 2001. Tiger salamander, Ambystoma tigrinum, movements and mortality on the Trans-Canada Highway in southwestern Alberta. Canadian Field-Naturalist 115:199–204.

Clevenger, A. P., B. Chruszcz, and K. E. Gunson. 2001. Highway mitigation fencing reduces wildlife-vehicle collisions. Wildlife Society Bulletin 29:646–653.

Book Compilations

Gunson, K. E. and F. W. S. Schueler. 2019. Wildlife on Roads-A Handbook. Edited and published by Eco-Kare International. 240 pages.

Gunson, K. E., and F. Z. Teixeira. 2015. Road-wildlife mitigation planning can be improved by identifying the patterns and processes associated with wildlife-vehicle collisions. Pages 101-110 in R. van der Ree, D. J. Smith, and C. Grilo, editors. Handbook of Road Ecology. John Wiley & Sons, Oxford.

Jackson, S. D., D. J. Smith, and **K. E. Gunson**. 2015. Sharing the road: Mitigating road impacts on small vertebrates. Pages 177 – 208 in K. M. Andrews, P. Nanjappa, and S. P. D. Riley, editors. Roads and Ecological Infrastructure: Concepts and Applications for Small Animals. Johns Hopkins University Press, Baltimore, MD.

Kintsch, J., **K. E. Gunson**, and T. A. Langen. 2015. Engaging the public through public education and citizen science. Pages 94 – 110 in K. M. Andrews, P. Nanjappa, and S. P. D. Riley, editors. Roads and Ecological Infrastructure: Concepts and Applications for Small Animals. Johns Hopkins University Press, Baltimore, MD.

Langen, T. A., **K. E. Gunson**, S. D. Jackson, D. J. Smith, and W. Ruediger. 2015. Planning to mitigate road effects on small animals. Pages 146 – 177 in K. M. Andrews, P. Nanjappa, and S. P. D. Riley, editors. Roads and Ecological Infrastructure: Concepts and Applications for Small Animals. Johns Hopkins University Press, Baltimore, MD.

Smith, D. J., **K. E. Gunson**, D. Marsh, and S. Tonjes. 2015. Monitoring and adaptive management of road impacts and mitigation. Pages 240 – 261 in K. M. Andrews, P. Nanjappa, and S. P. D. Riley, editors. Roads and Ecological Infrastructure: Concepts and Applications for Small Animals. Johns Hopkins University Press, Baltimore, MD.