

IMPACT REPORT

SAFE PASSAGES

*Towards an integrated planning approach for
landscape connectivity*





In addition to in-kind and partner funding support, the Safe Passages Project was funded by two federal research grants from the Social Science and Humanities Research Council of Canada: A Partnership Development Grant and a Partnership Engage Grant.

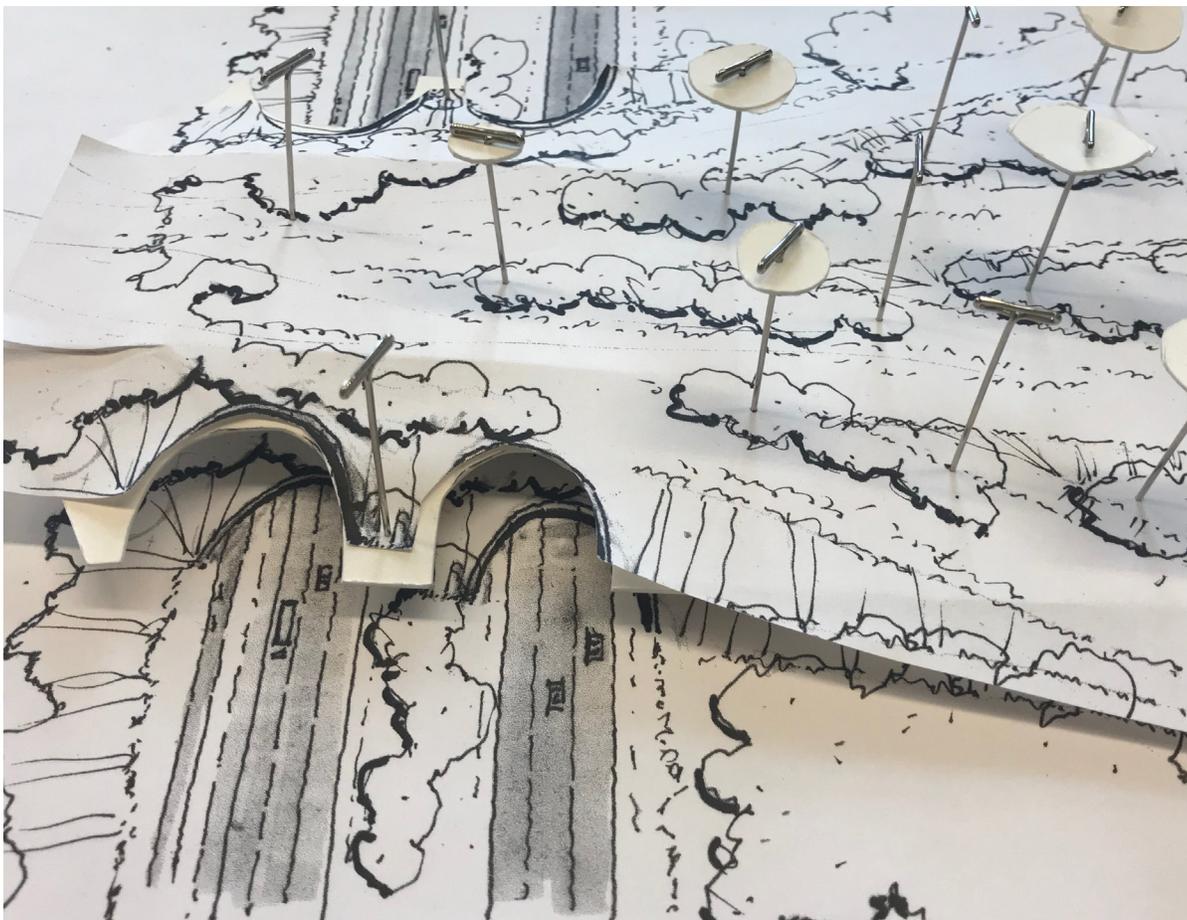
Principal investigator: Nina-Marie Lister

CITATION: Ecological Design Lab. (2026). *Safe Passages Impact Report: Towards an integrated planning approach for landscape connectivity* (Careri, S., Ed.). Ecological Design Lab at Toronto Metropolitan University. <https://doi.org/10.5281/zenodo.18867203>

PROJECT DESCRIPTION

As roads, highways, and urban expansion continue to sever critical ecological networks, a greater number of wildlife populations will become isolated. Evidence-based policies, innovative transdisciplinary research and design solutions, as well as public support are needed to protect wildlife mobility, to maintain healthy ecosystems and genetic diversity.

The Safe Passages Project advances research for the sustainable planning, design, and implementation of wildlife crossing infrastructure for improved landscape connectivity. The project goal is to (re)connect fragmented habitats and landscapes for the safe passage of both humans and wildlife through an integrated planning and design framework, supported by science-driven policy. Through this goal, the project translates landscape connectivity issues to the municipal scale, and aims to improve our relationships with wildlife across urbanizing landscapes by championing, demonstrating and implementing human-wildlife coexistence strategies. By redefining how we coexist with urban wildlife, the Safe Passages project advances socio-ecological resilience - in research and in built form through (e.g.) sharing data in connectivity planning infrastructure, by engaging interdisciplinary practitioners across planning, architecture, engineering, landscape design and ecology, and by transforming roads from barriers to bridges to overcome human-wildlife conflict.



Calgary CoLab - Wildlife overpass model

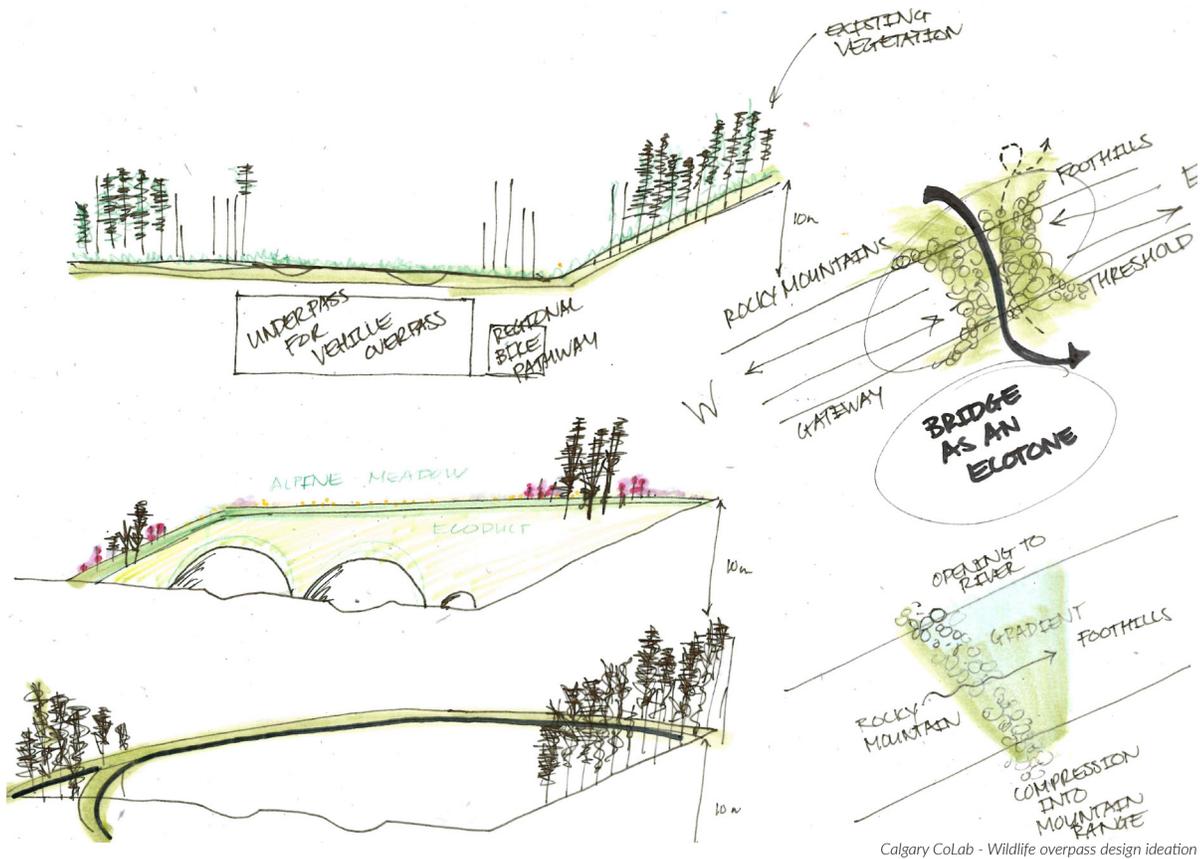
THE SAFE PASSAGES COLABS

Effective conservation requires habitat protection **and** connection through policy **and** infrastructure. But maintaining, restoring and enhancing landscape connectivity is an interdisciplinary socio-ecological challenge that is not currently in the mandate of any single agency. Although the policy and infrastructural design solutions to reducing habitat fragmentation exist and are known to work, the Safe Passages Project addresses an urgent need for a coordinated, integrated approach to planning and design for widespread sustainable implementation of these infrastructures and the policies that support them.

Since launching in 2015, through the Safe Passages project the EDL has fostered the Safe Passages Partnership - a research network of academics, practitioners, and partner organizations across Canada and the U.S. investigating the challenges and opportunities from institutional silos to diverse regulatory frameworks and a growing constituency of experts. The partnership network works to strengthen and enhance collaborations between the relevant agencies, levels of government, and organizations concerning landscape connectivity practices. These include community leaders in urban and landscape planning and conservation working alongside professional planners, landscape architects, ecologists, and sustainability and policy experts to generate material results for public exhibition, policy stimulus, civic dialogue – and ultimately to design, build and deliver constructed infrastructural solutions that provide “safe passage” for all.



Montana CoLab - Working session Site B Bozeman Pass



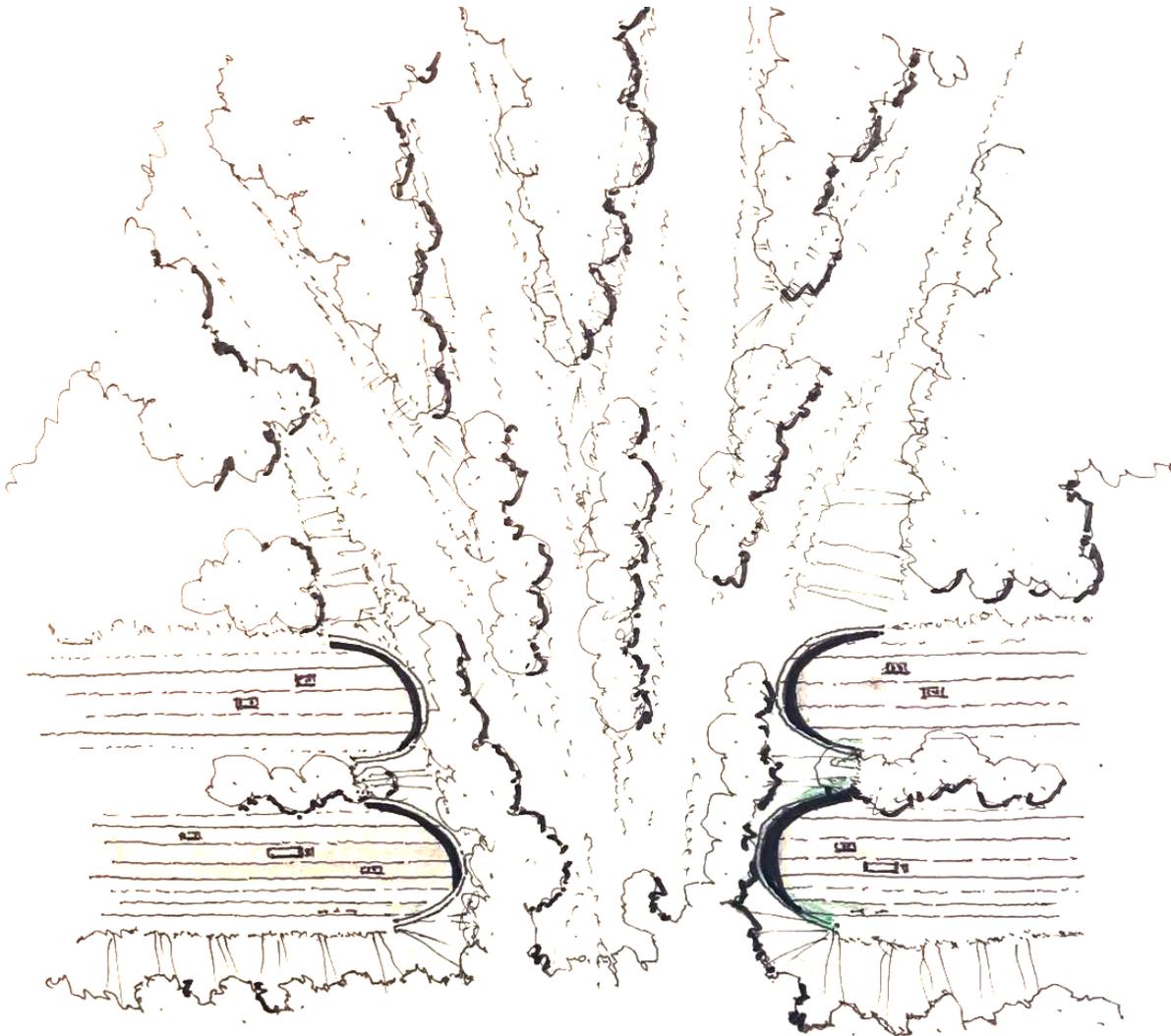
Calgary CoLab - Wildlife overpass design ideation

EDL delivers co-creative methods of knowledge production through a CoLaboratory (CoLab) praxis approach, developing nature-based solutions for biodiversity recovery and climate resilience. The CoLab method invites experts from different disciplines to contribute to an intensive multi-day workshop to develop shared visions and practical place-based design strategies built on best-available science and current data. In this context, this method presents an opportunity for designers, planners, and allied professionals, along with key project stakeholders to seek collaborative solutions to landscape connectivity challenges, as well as wildlife crossing infrastructure implementation barriers.

Through the CoLab model, the Safe Passages Project adopts a unique experiential learning and action approach for practitioners to engage in a diversity of collaborative strategies for advanced research innovation. In assessing barriers and opportunities for contested landscapes between humans and wildlife, the outcomes of this project continue to generate place-based co-created design and advocacy solutions across Canada and the U.S.

A total of six CoLabs were undertaken (2018-2022) as part of this project. Each pursued unique objectives to identify and overcome landscape connectivity obstacles at specific geographic locations, with findings summarized in the following reports:

- [Montana CoLab \(2018\): Exploring Fibre-Reinforced Plastic Bridges for Wildlife;](#)
- [Edmonton CoLab \(2018\): Towards Integrated Green Infrastructure Design;](#)
- [Calgary CoLab \(2018\): Design Innovation for Wildlife Crossing Infrastructure at the Trans-Canada Highway;](#)
- [Toronto CoLab \(2019\): A Way Forward for a Complex Multi-Use Trail - the Meadoway;](#)
- [Liberty Canyon CoLab \(2019\): Building a Bridge to the Future Highway 101 Wildlife Overpass;](#) and
- [Beyond Safe Passage Banff CoLab \(2022\): Visualizing Connectivity](#) (representing the final phase of the Safe Passage CoLab sessions)



Calgary CoLab - Wildlife overpass design sketch exploration



CoLab site visit to one of six wildlife overpasses located along the Trans Canada Highway in Banff, Alberta

ACHIEVEMENTS AND IMPACTS

Design impacts:

The Safe Passages Project advances an integrated approach for the sustainable planning, design, and implementation of wildlife crossing infrastructure and improved landscape connectivity. Through the Safe Passages Partnership, five municipalities (Toronto ON, Calgary AB, Edmonton AB, Bozeman, MT and Los Angeles CA) have advanced solutions for the safe passage of humans and wildlife, reaching predominantly urban populations through innovative planning and design for purpose-designed and built wildlife crossing infrastructures including overpasses, underpasses and at-grade corridors.

In this way, the Safe Passages Project has been integral to the development and uptake of an integrated policy and built design practice for wildlife crossing infrastructure over roads in Canada and the U.S. Since the launch of the project, the Safe Passages Partnership team of partner organizations, academic and professional designers, planners and landscape architects, ecologists and transportation engineers, have contributed to the successful planning, design and implementation of three new wildlife crossing overpasses: two in Canada (the Peterlougheed Wildlife Overpass (formerly the Bow Valley Crossing) in Alberta and the Highway 3 crossing in southeastern BC) and one in the US, the Wallis Annenberg Wildlife Crossing, set to be world's largest crossing spanning 10 lanes over the Pacific 101 Highway in Los Angeles, California.

Further information on each CoLab can be found in the **CoLab Overview** section of this report.



Wallis Annenberg Wildlife Crossing rendering, Agoura Hills, (under construction fall 2025) over the 101 Freeway in California (Rock Design Associates with NWF, 2024)

Impacts on practice:

The Safe Passages CoLab sessions served as incubators for experiential knowledge exchange and co-creative design strategies to overcome traditional and professional disciplinary obstacles. In addition to interdisciplinary knowledge generation, the Safe Passages CoLabs created opportunities for professionals across related design and planning fields to share expertise, learn about and engage with diverse landscape connectivity practices and integrated planning and land management strategies. By engaging in open dialogue during the CoLab sessions, professionals were able to reinforce commitments to stewardship, share experiences and practices, and co-create connectivity solutions (for policy and design) with other practitioners – an outcome that persists and influences a network of practice, long after the CoLab concludes.



Beyond Safe Passage CoLab - Indigenous elder blessing and introductory remarks

In advancing human-wildlife relationships with the land, the Safe Passages Project emphasizes and includes traditional knowledge systems (or Indigenous ways of knowing as well as Indigenous-led advocacy for coexistence). The materials produced from this research include the role of storytelling and communication in connectivity planning beyond approaches that rely exclusively on Western science. For example, in identifying ecological corridors with cultural significance, including diverse data sources and methods, and engaging diverse knowledge systems for planting and habitat design, a holistic systems-based approach emerged. This approach is essential to developing an integrated framework for planning and design for landscape connectivity.

The Safe Passages Project bridges the gaps between research and practice in connectivity planning. A key part of this is achieved by empowering practitioners with the knowledge to advance interdisciplinary design research and to co-create solutions which likely would not exist otherwise within distinct professional silos. In this way, practice shifts away from reliance on individual expertise, and towards collaborative solutions – an approach that is more effective in addressing complex and urgent challenges. These research insights and applied learning have since been integrated into planning curricula, studio-based design pedagogy, and professional practice across the partnership network. In September 2025, the Ontario Professional Planners Institute recognized the Safe Passages Project for its contributions to research and professional practice, awarding the lab with the [2025 OPPI PlanON Innovative Research Award](#).



Banff CoLab - Outdoor learning session and exploratory walk

Publication outputs:

Translating these findings into academic articles and public-facing resources synthesizes the complex information developed, and makes it accessible and actionable for practitioners, all the while contributing meaningfully to advancements in research in relevant planning and design fields. In combination, these outputs demonstrate how the planning and design practice in the future can respond to “wicked” design connectivity problems, while also working to address the entangled challenges of climate change and biodiversity loss.



Montana CoLab - Process work investigating opportunities for connectivity

As a critical outcome of this work, the project findings have been published in six academic scientific journal articles to date (with a seventh manuscript in preparation) and three peer-reviewed book chapters.

Scientific Journal Articles (7):

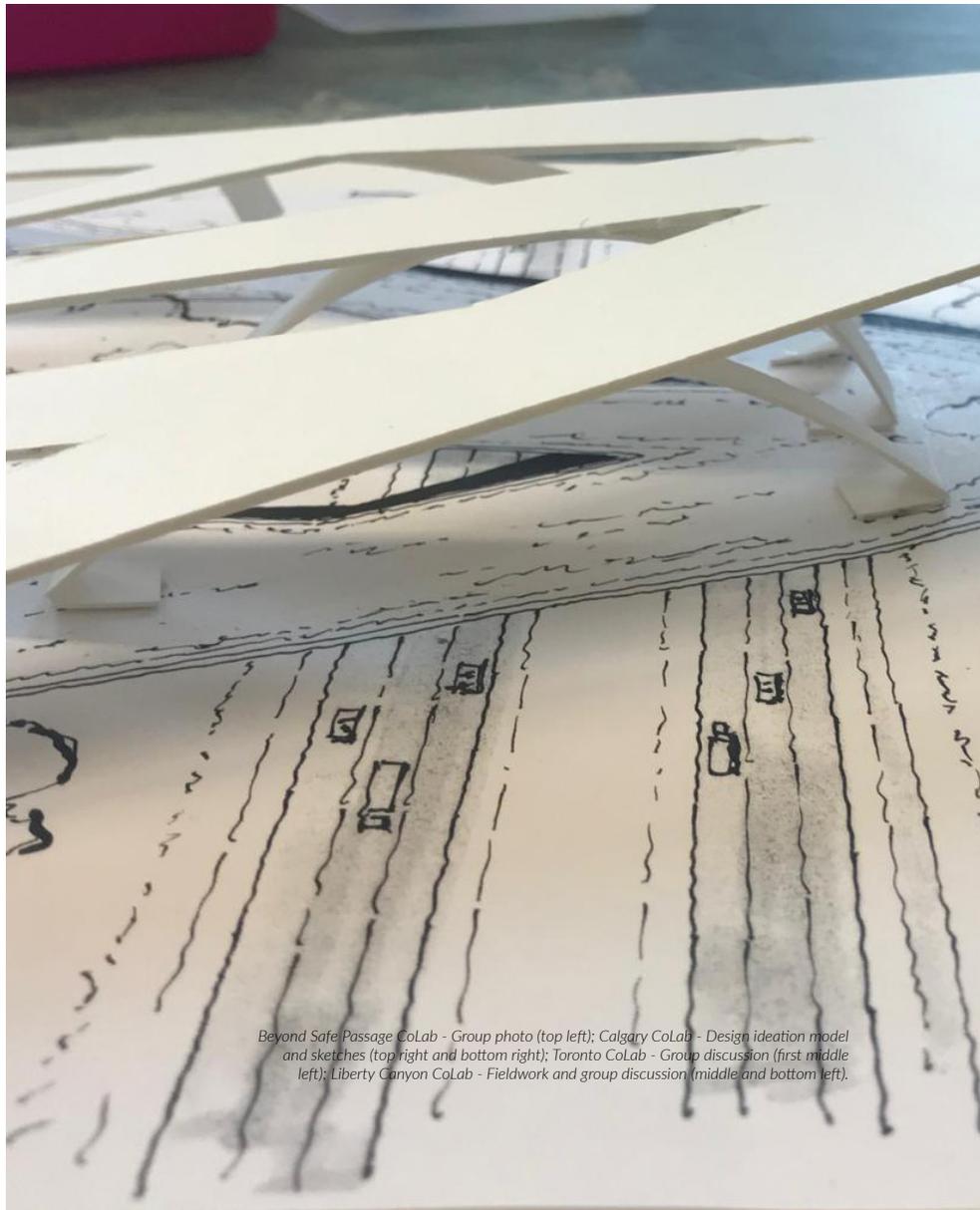
- Luka, N., Lister, N.-M., Careri, S. (*manuscript in preparation*). Charrettes and Colabs as Design Praxis: Operationalizing Sustainability Through Transdisciplinary Co-Creation.
- Newell, R., Lister, N.-M, Brocki, M. Cerbu, A., Dale, A., Careri, S. (2025). Dimensions of integration for landscape connectivity planning: A framework for understanding challenges and opportunities. *Ecology and Society*. 30(2), 7. <https://doi.org/10.5751/ES-16136-300237>;

- Newell, R., Lister, N.-M, Dale, A., & Careri, S. (2025). Wildlife crossing database platform: A transdisciplinary approach to developing a tool for landscape connectivity planning and public engagement. *Wildlife Society Bulletin (2011)*, 49(2). <https://doi.org/10.1002/wsb.1593>;
- Callahan, R., Lister-Stevens, N.-M, Brocki, M., Blake, V., & Lister, N.-M. (2024). Assessing the Potential for Legal Liability to Create Incentives for Agencies to Reduce Wildlife-Vehicle Collisions in Canada and the United States. *Journal of International Wildlife Law and Policy*, 27(1), 7–21. <https://doi.org/10.1080/13880292.2024.2396229>;
- Newell, R., Dale, A., & Lister, N.-M. (2022). An integrated climate-biodiversity framework to improve planning and policy: an application to wildlife crossings and landscape connectivity. *Ecology and Society*, 27(1), 23-. <https://doi.org/10.5751/ES-12999-270123>.; And
- Bell, M., Fick, D., Ament, R., & Lister, N.-M. (2020). The Use of Fiber-Reinforced Polymers in Wildlife Crossing Infrastructure. *Sustainability*, 12(4), 1557. <https://doi.org/10.3390/su12041557>.
- Lister, N.-M., Brocki, M. & Ament, R. (2015). Integrated adaptive design for wildlife movement under climate change. *Frontiers in Ecology and Environment*, 13(9): 493–502, <https://doi.org/10.1890/150080>.

Book Chapters (peer reviewed, 3):

- Luka, N., Aird, B. & Lister, N.-M. (2022). Complimenting Citizen Engagement with Innovative Forms of Professional Coproduction: A Case for Transdisciplinary Charettes. Chapter 7 in Kong, H. and T. Monforte (Eds.) *Sustainability, Citizen Participation, and City Governance: Multidisciplinary Perspectives*. University of Toronto Press, pp 163-193.
- McCartney, S., Lister, N.-M. & Herskovits, J. (2022). Codesign, Collaboration and Systems Change: Reflections on Innovative Cross-Cultural and Interdisciplinary Practice Centred on Action in Landscapes of Conflict. In McCartney, S., Solano, S., Vangjeli, S. and Zander, H. (Eds) *A Landscape Approach: From Local Communities to Territorial Systems*. pp 249-262. ORO Editions.
- Boudreau, S., Gransauil, G., Lister, N.-M, & Pritchard, G. (2022). Preparing students for interdisciplinary work: green infrastructure curricula at Ryerson University, Toronto, Ontario, Canada. Chapter 10 in Vacca, J. R. (ed) *Smart Cities Policies and Financing*. Elsevier, pp 135-153. <https://www.sciencedirect.com/science/article/pii/B9780128191309000401?via%3Dihub>

SAFE PASSAGES COLABS OVERVIEW



Beyond Safe Passage CoLab - Group photo (top left); Calgary CoLab - Design ideation model and sketches (top right and bottom right); Toronto CoLab - Group discussion (first middle left); Liberty Canyon CoLab - Fieldwork and group discussion (middle and bottom left).

Yellowstone to Yukon Conservation Initiative

CoLaboratory Focus Areas



Hwy 1, Canmore/Bow Valley, Alberta



Hwy 3, Elk Valley, British Columbia



Hwy 93, Flathead Reservation, Montana



Hwy 90, Bearmouth, Montana



Beyond Safe Passage CoLab (CoLab prep) - Context map

- Legend**
- Focus Highway
 - Highway
 - Protected Areas
 - Urban Areas

- Project Status**
- Outreach
 - Research
 - Agreement
 - Implementation
 - Monitoring





Beyond Safe Passage CoLab - Fly-through story board

BEYOND SAFE PASSAGE: BUILDING BRIDGES FOR LANDSCAPE CONNECTIVITY - VISUALIZING CONNECTIVITY COLAB

May, 2022

Context:

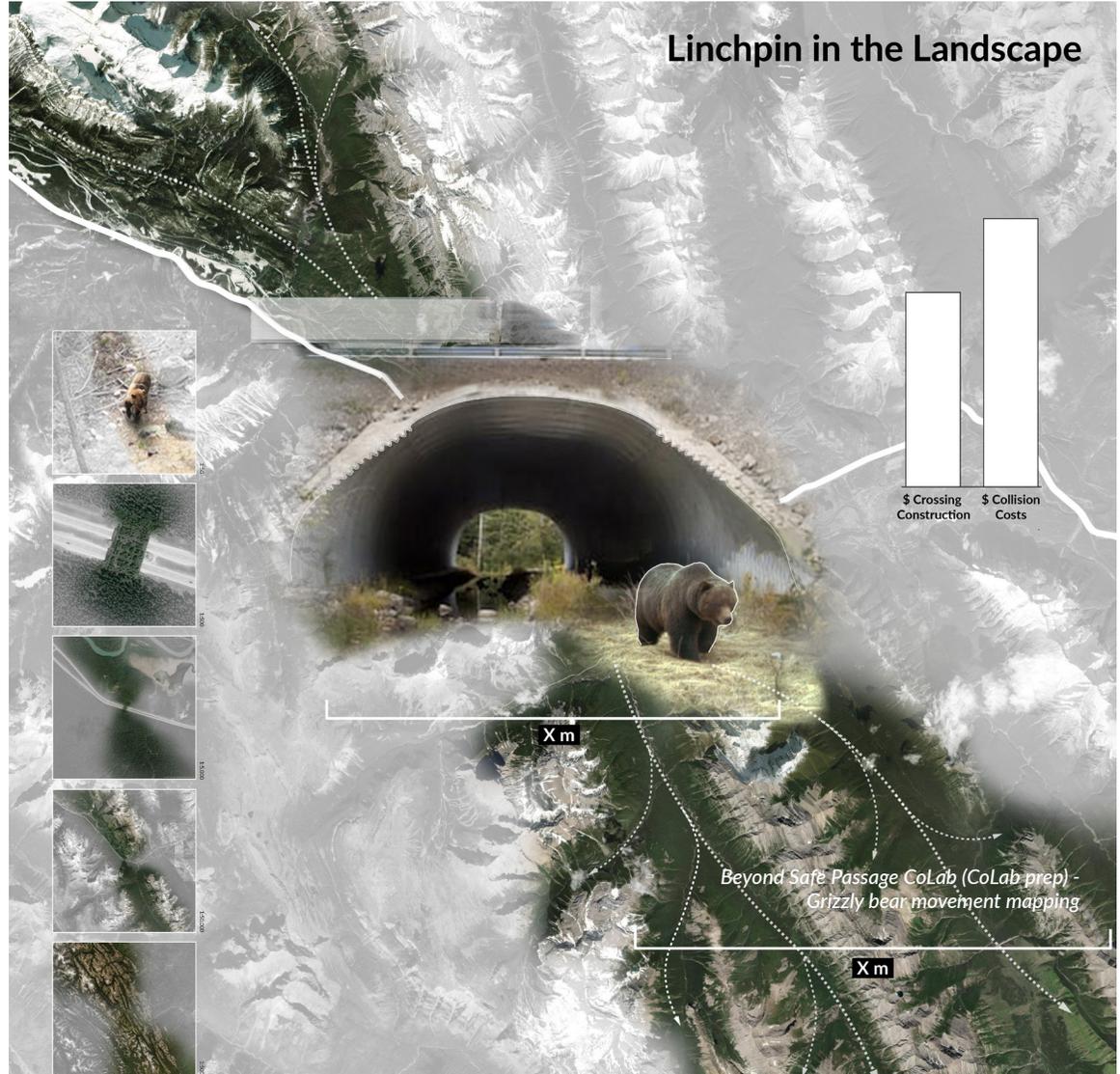
Engaging new allies and audiences in reconnecting landscapes and habitats for wildlife, people and ecosystems is essential to short-term wins and long-term success. From planning to design to governance, new materials, new methods and new ways of thinking are needed to bridge gaps, crossroads and reconnect habitats. This begins with a compelling story that takes us from science to design to implementation and action. The Beyond Safe Passage CoLab engages a new partner organization to the Safe Passages Partnership – the intercontinental large landscape partnership, [Yellowstone to Yukon Initiative \(Y2Y\)](#). Together with Y2Y, this CoLab served as an additional design workshop focused on the Banff-Canmore region to [advance an integrated approach to help foster solutions for the safe passage](#) of humans and wildlife in the Bow River Valley. CoLab participants were divided into three working groups, each focusing on strategic locations that amplify cross-border partnership and coordination on safe wildlife passage, and position the Safe Passages partners as global leaders in this work to decision-makers using case studies and stories from Highways 1, 3, 93 and I-90.

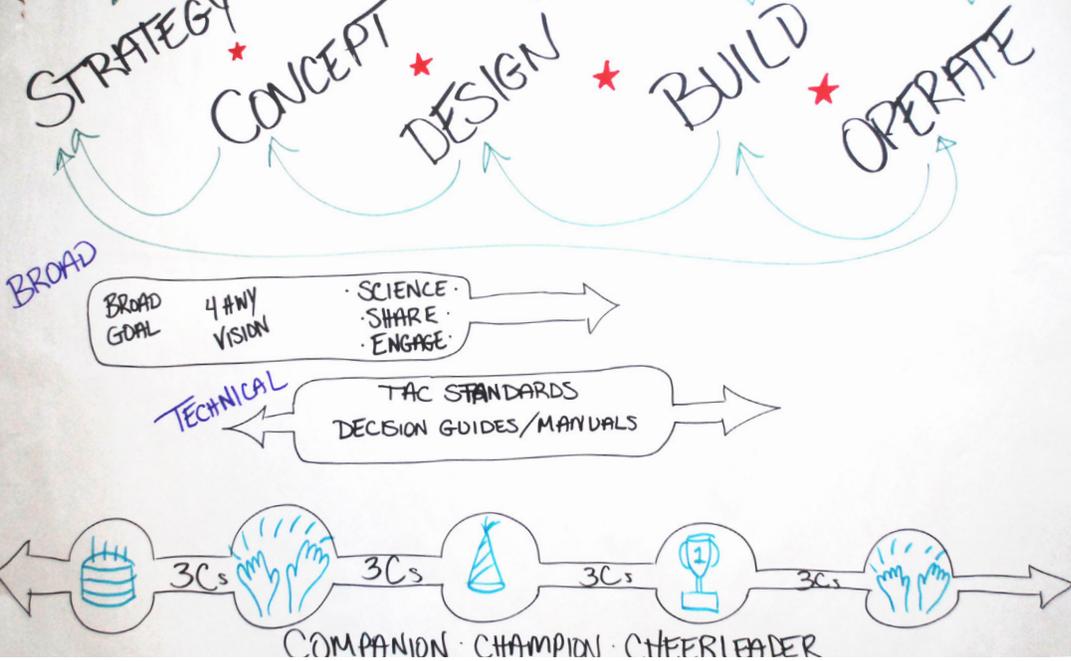
Objective:

How do we tell effective, engaging, and compelling stories of connectivity? During the Beyond Safe Passage CoLab, participants were asked to brainstorm, blue sky, dive in, and test their communication design ideas in several scenarios! The objective of the Beyond Safe Passage CoLab was to develop communications materials to support federal investments in the implementation of large-scale green infrastructure projects. Such documentation can be used to highlight wildlife infrastructure as critical for connecting protected areas and advancing global conservation commitments and the realization of biodiversity recovery goals. Importantly, it can also engage a wider public audience and help to build excitement, educational opportunities and social learning into the project, from concept to completion.

**Grizzly Bear 11072874:
46 Crossing Attempts
Nov 2020 - May 2021**

- - - - - Movements Nov-Dec 2020
- - - - - Movements Apr-May 2021
- Locations <500m from Hwy





Beyond Safe Passage CoLab — Concept sketches, collaborative discussions, and project presentations



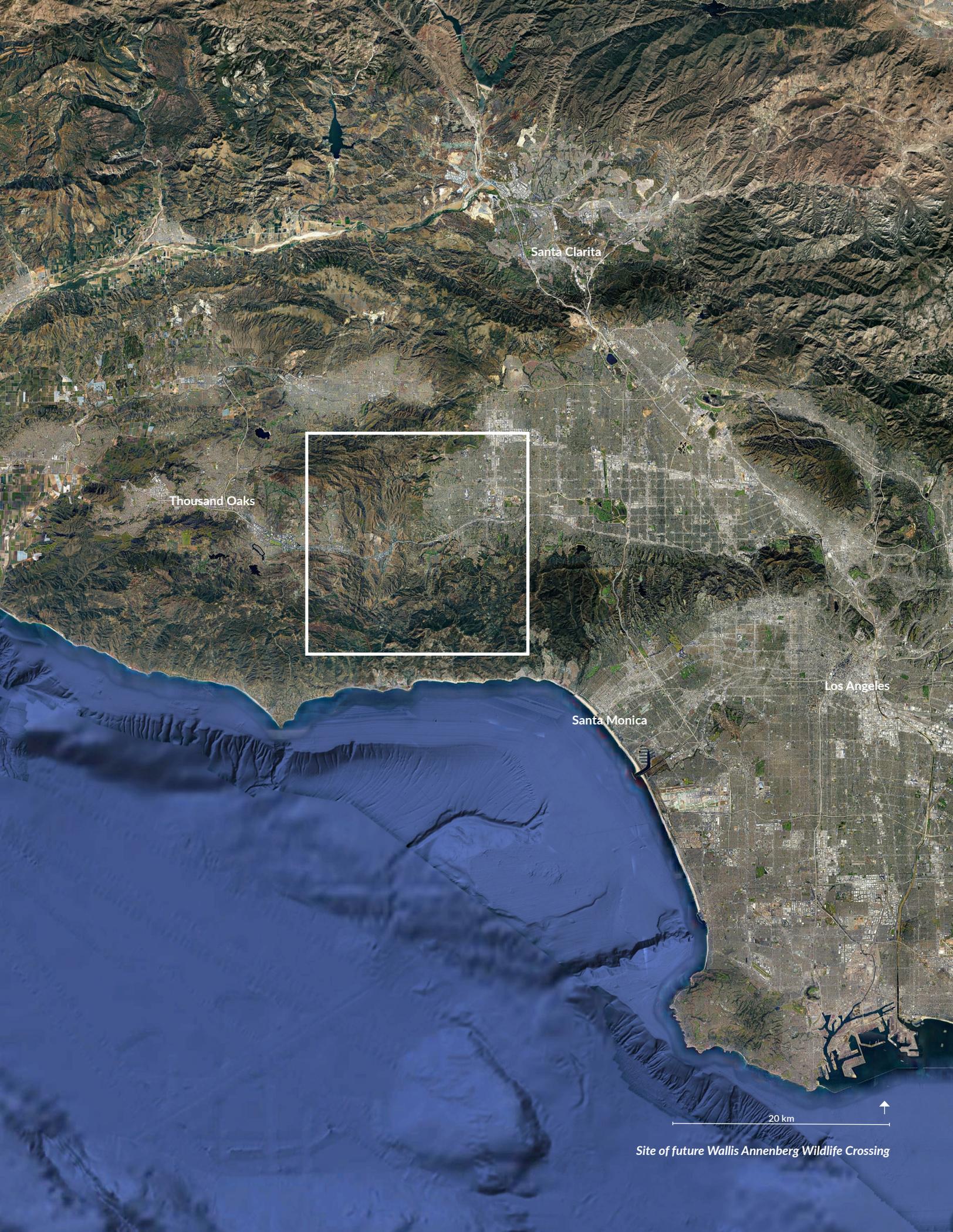
Beyond Safe Passage CoLab - Highway 1 working group final presentation

Partners:

[ARC Solutions](#), [Yellowstone to Yukon \(Y2Y\)](#), [Harvard Graduate School of Design](#), [Miistakis Institute](#), [Montana State University - Western Transportation Institute](#), [Parks Canada](#), [Puente Strategies](#), [Nature Conservancy of Canada \(NCC\)](#), [Wildsight](#)

Key Outcomes & Current Status:

Each team developed materials for building a stronger case for wildlife crossing infrastructure, creating visual materials and media and to convey compelling stories to government decision-makers. While each group had a different priority geography, overarching themes to emerge from these discussions included: leading with shared values and common ground, considering different ways of knowing, increasing visibility and access to nature, engaging with diverse publics and stakeholders, the importance of Indigenous leadership and relationship building, as well as overarching strategies for crafting narrative.



Santa Clarita

Thousand Oaks



Los Angeles

Santa Monica

20 km



Site of future Wallis Annenberg Wildlife Crossing



Wallis Annenberg Wildlife Crossing - Illustrative site plan rendering (Rock Design Associates with NWF, 2024)

LIBERTY CANYON COLAB: BUILDING A BRIDGE TO THE FUTURE HIGHWAY 101 WILDLIFE OVERPASS

May, 2019

Context:

Located northwest of Los Angeles, California, the [Wallis Annenberg Wildlife Crossing \(WAWC\)](#) at Liberty Canyon will be not only the first overpass crossing in California spanning across 10 lanes of the Pacific 101 Highway (U.S. Route 101), but will be the largest in the world, representing an unprecedented milestone for urban wildlife conservation. EDL, as a key partner of ARC Solutions, was invited by Beth Pratt (the Regional Executive Director of the [National Wildlife Federation](#)) to lead a professional CoLab workshop to provide technical advice and planning support, for the development of (then known as) the Highway 101 Wildlife Crossing Project at Liberty Canyon. This high profile and large-scale project will inspire future work in reconnecting landscapes and green infrastructure for the safe passage of humans and wildlife, for generations to come.

Objective:

The objective of the Liberty Canyon CoLab was to review, respond to, and provide guidance on the design and plans for the Liberty Canyon crossing developed by [Caltrans](#) during the Phase 2 and Project Approval & Environmental Document (PAED) phase, while identifying opportunities to improve, innovate, and reduce costs where appropriate. CoLab participants were divided into four working groups to collaboratively approach recommendations which pertain to the design of the structure, including the physical site approach, the landscape surface, and the sub-and-superstructure elements of the crossing. This CoLab engaged both the technical / material aspects of ecological design, as well as Indigenous partnerships and community relationship building strategies for the project.



Liberty Canyon CoLab – Group documentation centered on P-22, participant fieldwork, and early site rendered model



Wallis Annenberg Wildlife Crossing - 101 Freeway perspective rendering (Rock Design Associates with NWF, 2024)



Wallis Annenberg Wildlife Crossing - Illustrative site rendering (Rock Design Associates with NWF, 2024)



Liberty Canyon CoLab - Final presentations

Partners:

[ARC Solutions](#), Liberty Canyon Project partners ([National Wildlife Federation](#), [CalTrans](#), [National Park Service](#), [Santa Monica Mountain Conservancy](#), [City of Agoura Hills](#))

Key Outcomes & Current Status:

As of February 2026, the WAWC is in its final construction phase and is [expected to be completed in late 2026](#). EDL and the Liberty Canyon CoLab partners continue to provide external peer-review and technical advice throughout the design and construction process to ensure that considerations for successful design are integrated in the project design and program. This includes, but is not limited to, design feedback and insight generated from the CoLab pertaining to:

- The design of the landscape surface to facilitate the effective movement of focal wildlife species;
- Overall superstructure loads and opportunities to streamline substructure design;
- Disturbance-mitigation measures to minimize traffic-related noise, light, vibration and visual impacts on the overpass
- Design opportunities for enhanced landscape and ecological performance; and
- Integration of place-making design elements that highlight the ecological and social significance of the structure.



FINCH-KENNEDY STATION

METROLINX RER STATION: LAWRENCE-KENNEDY SMART TRACK

LAWRENCE AVE

AGINCOURT

DORSET PARK

DON VALLEY VILLAGE

MARYVALE

YORK HEIGHTS

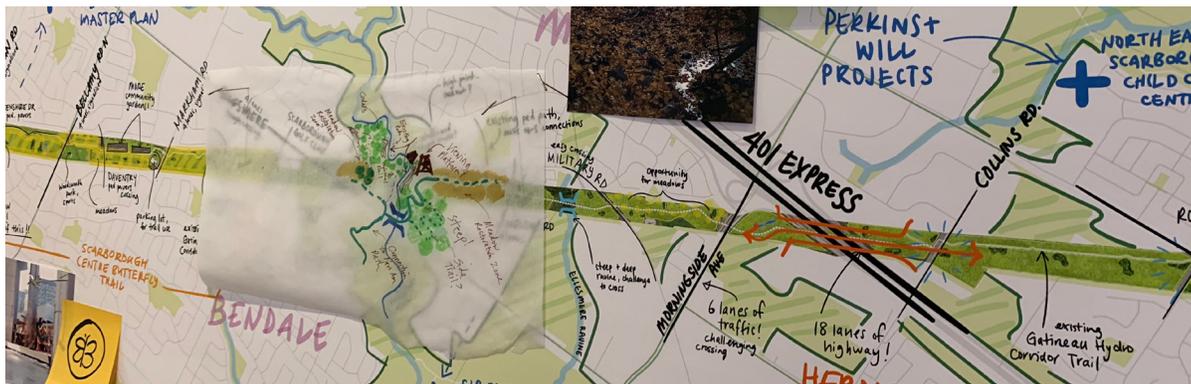
DON MILLS CROSSING

PERKINS + WILL PROJECTS

PROJECT WAY / GATEWAY

EGLENTON

OWNERS REP. EGLINTON CROSS TOWN LRT



Toronto CoLab - Site analysis documenting linear crossings and opportunities for connectivity

TORONTO COLAB: A WAY FORWARD FOR A COMPLEX MULTI-USE TRAIL - THE MEADOWAY

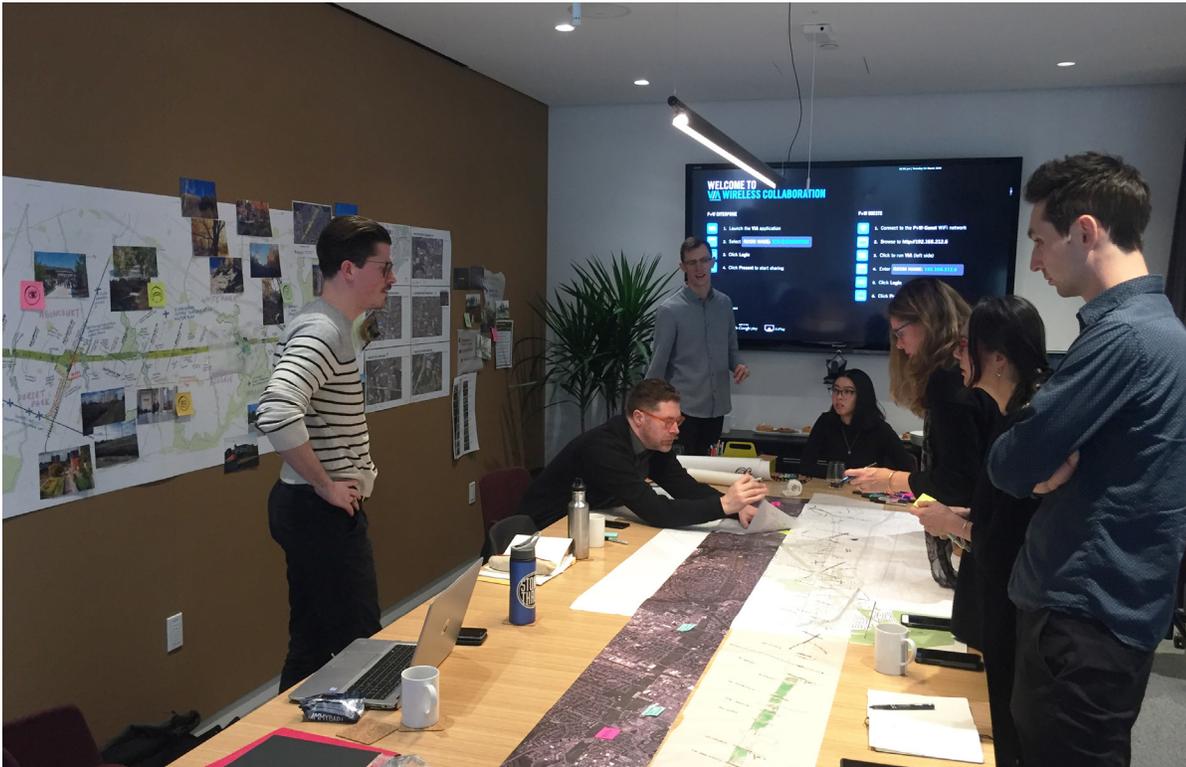
April, 2019

Context:

[The Meadowway](#) will see the transformation of 16 kilometers of underutilized greenspace between [Rouge National Urban Park](#) and downtown Toronto, into a more cohesive and revitalized active transportation network and community gathering place. Envisioned to provide a green, active, east-west link in the city, the Meadowway builds upon existing infrastructure and lessons learned from previous successful revitalization projects. Though the Meadowway represents just 10% of hydrological corridor lands across the Toronto region, it acts as a starting point to establish a connected greenspace network across 4,200 acres in the region. EDL was invited by the [Toronto and Region Conservation Authority \(TRCA\)](#) to lead an interprofessional CoLab workshop to review and respond to the design and Request for Proposals developed to date for the Meadowway greenspace corridor.

Objective:

The objective of the Meadowway CoLab was to discuss, review and inform guiding principles and design directions for the project overall and with specific reference to the development of the Visualization Toolkit. Participants were divided into three working groups, and discussed existing studies, the Request for Proposals and the engagement principles framed through a series of guided questions.



Meadoway CoLab - Working session

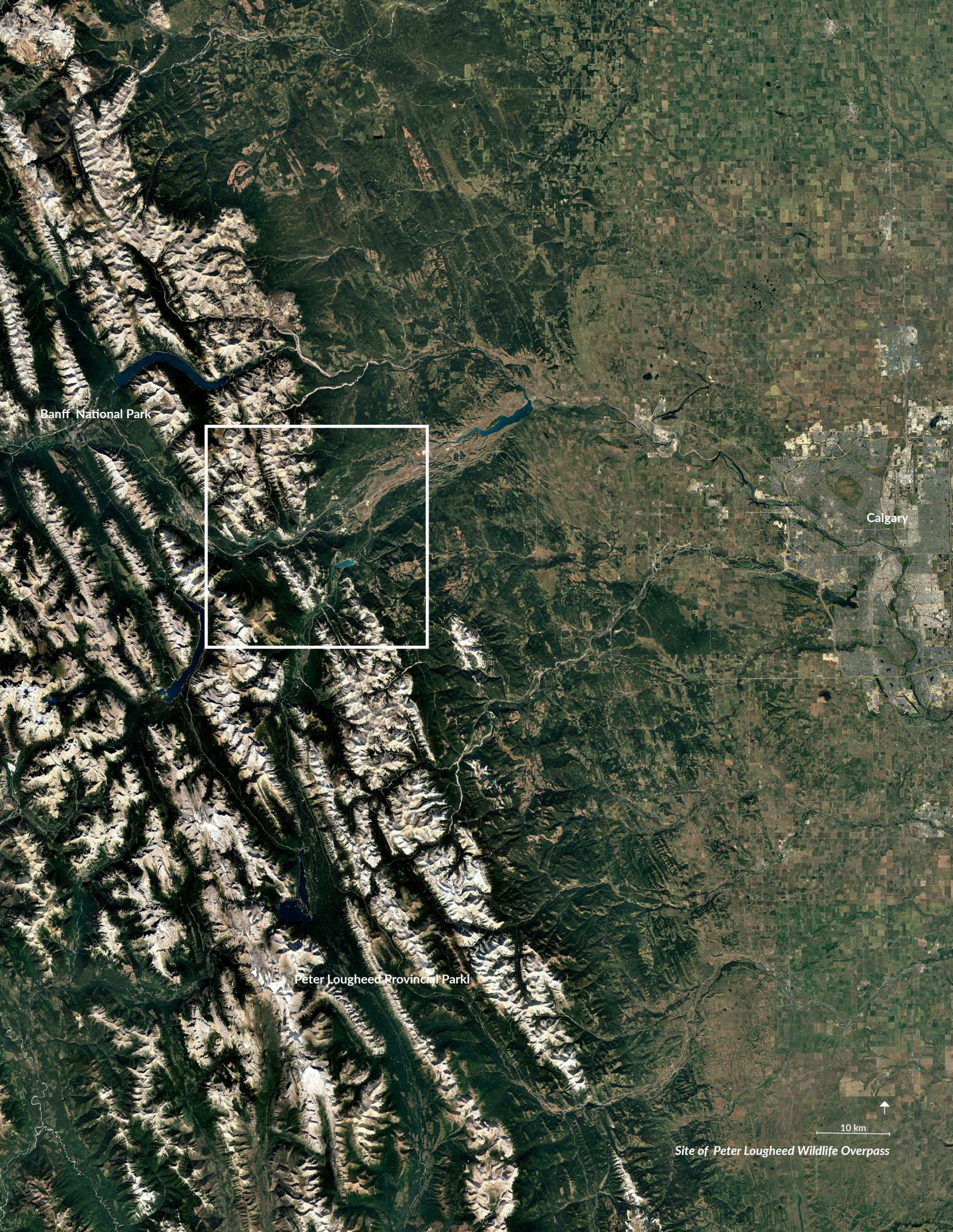
Partners:

[Toronto and Region Conservation Authority](#), [Perkins&Will](#), [Weston Foundation](#)

Key Outcomes & Current Status:

As of October 2025, the Meadoway is in its second phase of construction (2023-2025) and is partially completed. The first phase (2018-2022) restored over 80 hectares of meadow and saw the establishment of newly connected parks, trails and ravines systems, as well as new public realm and community infrastructure. While several segments are expected to be completed over the next year, full build-out is expected to go beyond 2026-2027 (or possibly later), with future phases (Phases 3-5) currently unfunded or in the funding / planning stage.

Using an [integrated approach](#), the Meadoway CoLab presented the TRCA with considerations pertaining to two main themes: uses and landscape typologies, and reconnecting landscapes. By engaging in the CoLab process, the project team gained a deeper understanding on how the Meadoway will exemplify design excellence, engineering innovation, and overall quality and effectiveness of greenspace revitalization. Most significantly, the insights generated through the Toronto Meadoway CoLab directly informed the creation of the [Meadoway Visualization Toolkit](#) - a key component used to guide the development and direction of the project.



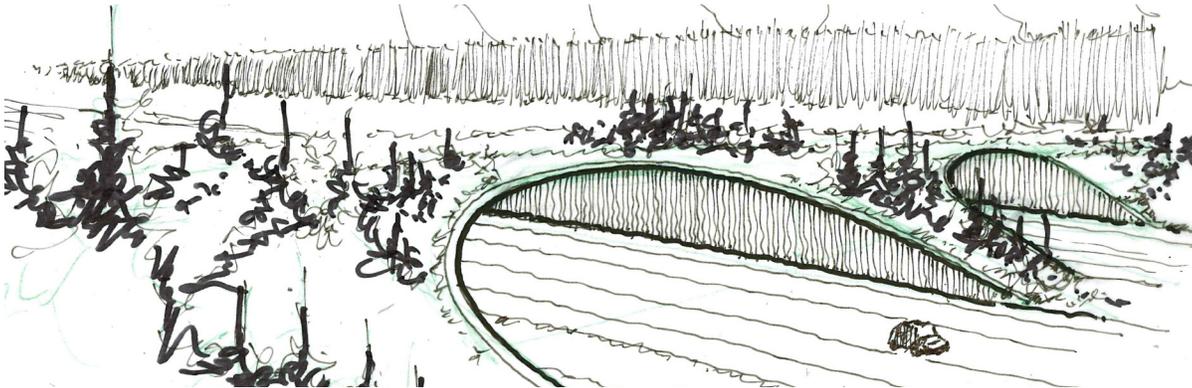
Banff National Park

Calgary

Peter Lougheed Provincial Park

10 km

Site of Peter Lougheed Wildlife Overpass



Calgary CoLab - Wildlife overpass early design concept sketch

CALGARY COLAB: DESIGN INNOVATION FOR WILDLIFE CROSSING INFRASTRUCTURE AT THE TRANS-CANADA HIGHWAY

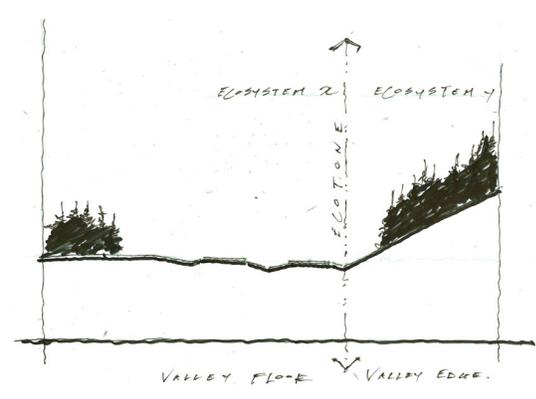
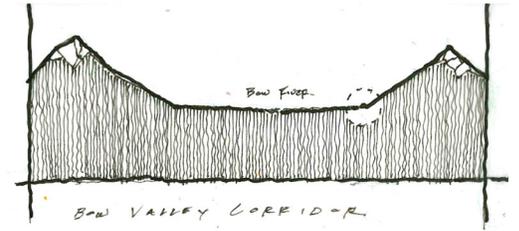
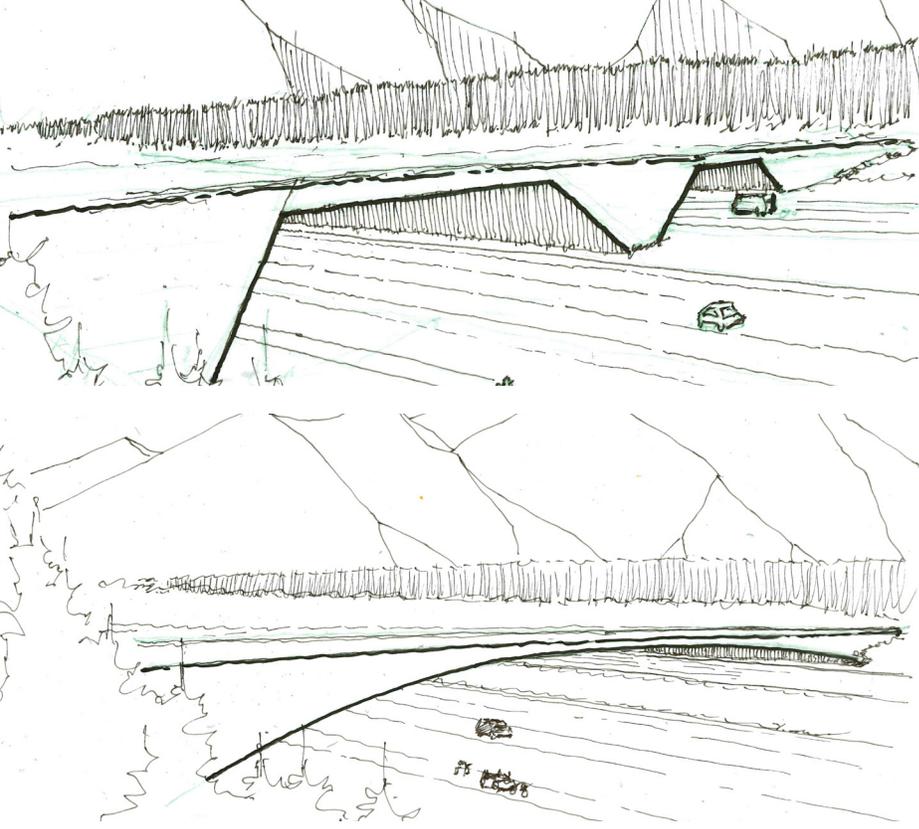
December, 2018

Context:

The [Peter Lougheed Wildlife Overpass](#) is located along one of the busiest stretches of the TransCanada Highway, east of Banff National Park in Alberta's Bow River Valley, and represents the country's [first large-scale vegetated wildlife overpass built outside a national park](#). The TransCanada Highway is a key access point to the mountain parks of the Canadian Rockies, providing connections to Calgary, various local communities, and the Stoney Indian Reserve. This area is rich in wildlife, including both large and small mammals, consequently making this section of the highway a hotspot for wildlife vehicle collisions. EDL, along with ARC Solutions, was invited by Jill Robertson and Antonio Gomez-Palacio (DIALOG), to lead an inter-professional CoLab with the purpose to develop design recommendations for (then known as) the TransCanada Highway (TCH) Wildlife Crossing Project. Given the [high rate of wildlife-vehicle collisions in this area](#), DIALOG was first engaged by Alberta Transportation and Economic Corridors to design the new overpass structure for mitigation.

Objective:

The stated objective of the Calgary CoLab was to guide and inform the design of a wildlife overpass structure that will be appropriate to span four, six or eight lane highway cross sections, and consider an adjacent multi-use trail. CoLab participants were divided into two teams and were encouraged to investigate a number of design considerations, including, but not limited to: constructability, structural stability, life cycle and long term durability, procurement strategies, aesthetics and design impact, ecological connectivity, and landscape integration with the surrounding environment.



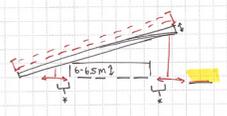
WATER
FORCES ON THE LAND

Project: CALGARY COLAB Project #: _____
 Description: DAY 2 Date: 14/12/2018
 Designed: _____ Checked: _____ Page: _____

DIALOG

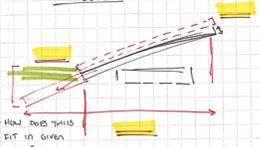
LANDING POINTS

VARIABLES
 * HOW EXPANSION?
 * LANDING POINTS,
 HOW FAR SPAN?



CANTILEVER

* DEPTH OF FILL OVER
 THE SPAN
 * WHAT ARE THE SOIL
 PROFILES (REL. VEGETATION)
 COVER -> PARTICLES SIZES
 * SNOW LOADING



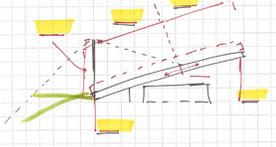
* HOW DEEP A
 CANTILEVER WEIGHT?
 * RELATIONSHIP HEIGHT-TO-SPAN
 HOW DOES _____ LIMIT THE
 SPAN + THICKNESS OF SLAB/SOIL PROFILE?
 -> LANDING POINTS
 -> DEPTH OF CANTILEVER ELEMENT WEIGHT
 -> POINT OF CONTACT w/ COLUMN SUPPORT
 ->

Project: CALGARY COLAB Project #: _____
 Description: DAY 2 Date: 14/12/2018
 Designed: _____ Checked: _____ Page: _____

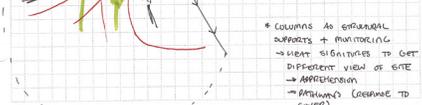
DIALOG

SUPPORT COLUMN

* OBSERVATION
 POINTS FOR
 CANTILEVER

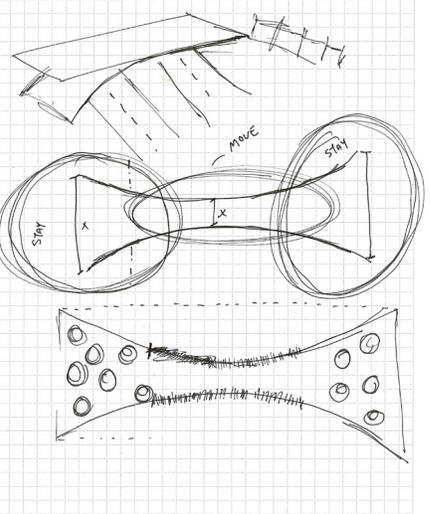


* COLUMNS AS ENVIRONMENTAL
 SUPPORTS + MONITORING
 -> HEAT SIGNATURES TO GET
 DIFFERENT VIEW OF SITE
 -> APPREHENSION
 -> PATTERNS (CONCRETE TO
 COVER)



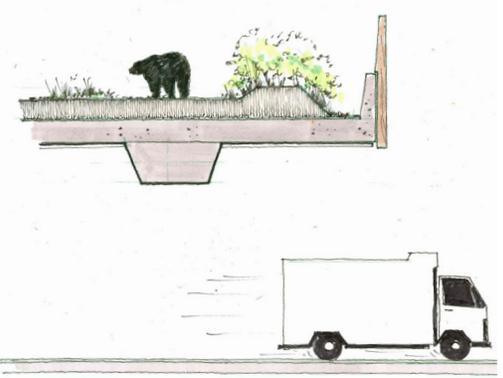
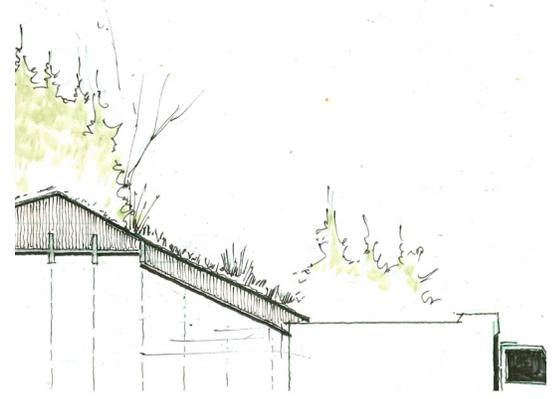
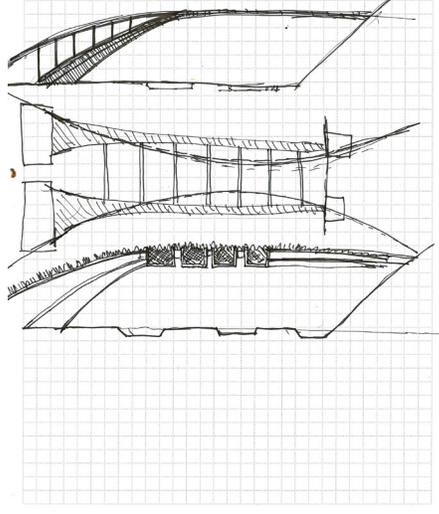
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SECTION
 Calgary CoLab - Wildlife overpass design ideation and sketch process work



The Trans Canada Highway Wildlife Crossing Project as part of the Calgary CoLab opened officially as the Peter Lougheed Wildlife Overpass in 2025 (DIALOG)



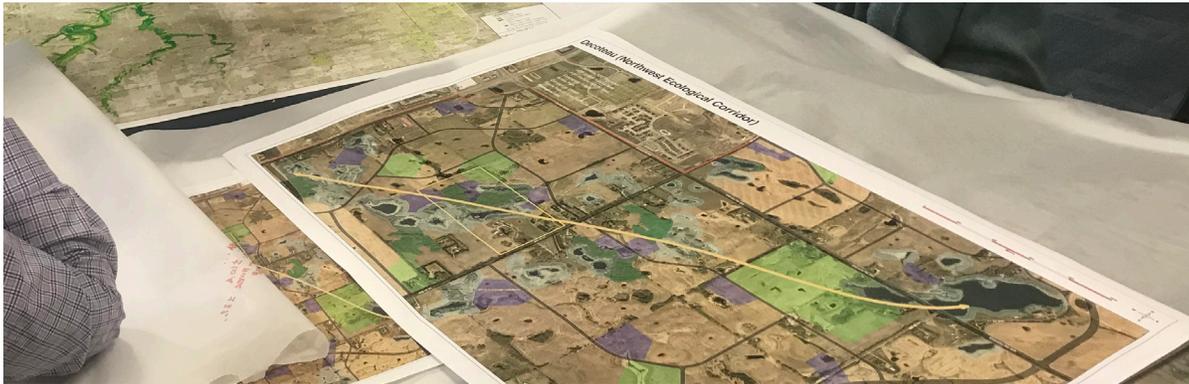
Calgary CoLab - Roundtable discussions and work in progress

Partners:

[DIALOG](#), [ARC Solutions](#), [Yellowstone to Yukon \(Y2Y\)](#), [Mistakis Institute](#), [Alberta Transportation and Economic Corridors](#)

Key Outcomes & Current Status:

The Peter Lougheed Wildlife Overpass Project officially completed construction and opened in July 2025. The CoLab helped to inform the project directly, presenting a series of recommendations for the design, communication, procurement, and overall process of the final wildlife crossing infrastructure. By directly extending the Banff wildlife corridor system eastward, the crossing was purposely-designed to allow wildlife to safely cross the TransCanada Highway, and has become a [global model for restoring ecological connectivity](#). Early project outcome documentation has already recorded a [80% reduction in wildlife-vehicle collisions since construction was completed](#). This high profile and large-scale project has set a precedent for future work in reconnecting landscapes and green infrastructure for the safe passage of both humans and wildlife across the country, and is part of ongoing and expanding efforts in Alberta to reduce wildlife-vehicle collisions and improve connectivity for wildlife in BowRiver Valley region.



Edmonton CoLab - Site base maps

EDMONTON COLAB: TOWARDS INTEGRATED GREEN INFRASTRUCTURE DESIGN

September, 2018

Context:

Riverview and Decoteau are developing neighbourhoods located in the southwest of Edmonton, approximately 30km from the city's downtown core. These areas represent key urbanizing landscapes with particular opportunities to enhance ecological connectivity and integration within the city's larger green network, while also addressing population growth and pressures for large-scale development in coming decades. EDL was invited by Grant Pearsell (at the time, Director of Urban Analysis at the City of Edmonton) to facilitate an interdepartmental and community stakeholder CoLab to review and respond to the planning and design for Riverview and Decoteau to identify key ecological corridors and networks, policy frameworks, and approaches to streetscape community development.

Objective:

The objective of the Edmonton CoLab was to explore and develop a suite of landscape design approaches that facilitate the planning and implementation of ecological connectivity enhancements within Edmonton's urban matrix and ecological network. CoLab participants were organized into two working groups, each tasked with developing a design concept intended to enhance ecological connectivity and function at their assigned site.



Edmonton CoLab - Roundtable discussion

Partners:

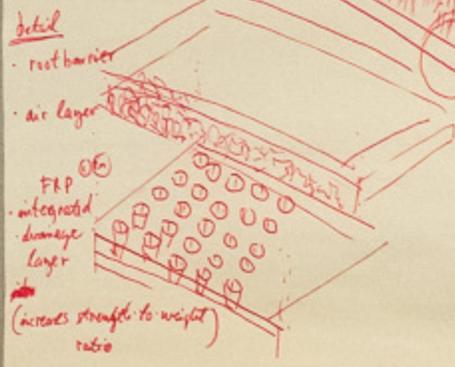
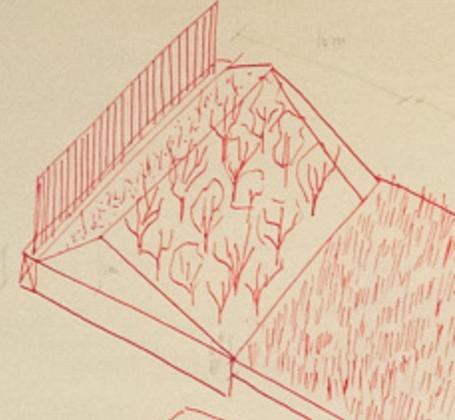
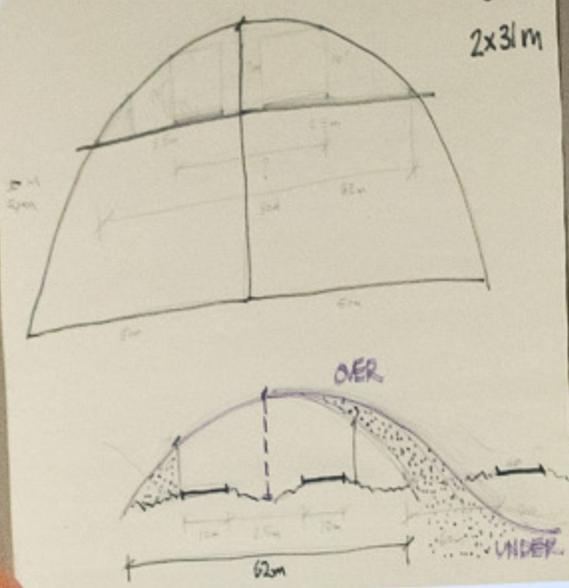
[City of Edmonton](#), [B&A Planning Group](#), [Sierra Club Canada](#)

Key Outcomes & Current Status:

During the first phase of the CoLab, particular attention was paid to landscape and streetscape design elements, ecological connectivity and biodiversity, and at-grade solutions such as ecological greenways and corridors, as well as wildlife movement, and green and blue infrastructure. The outcome of the first phase was an overall spatial design concept. These concepts were supported by a series of recommended policy objectives developed during the second phase of the CoLab. By engaging in the CoLab process, the city of Edmonton was able to exchange insights with practitioners and identify common emerging approaches and strategies in municipal planning and design research to advance resilient city building for Edmonton.

FRP ARCH (DOOR)

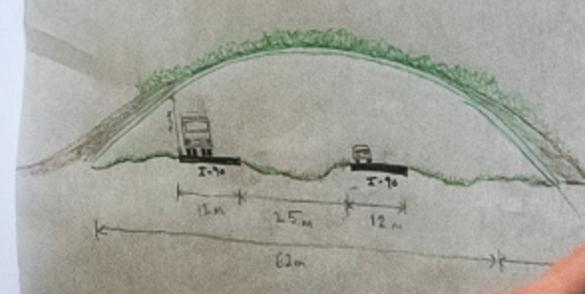
SPAN
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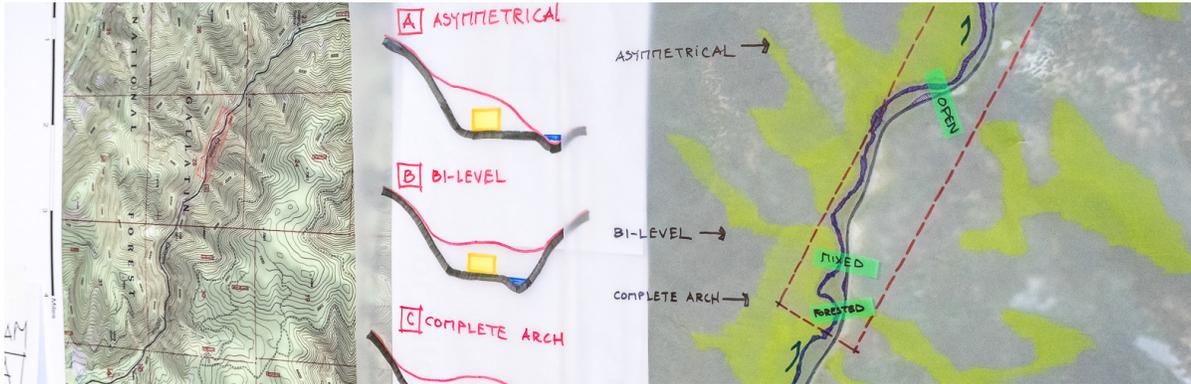
Topographic Map for Site B



FRP ARCH SECTION



OPTION 2: "THE MAST"



Montana CoLab - Site analysis and design process work

MONTANA COLAB: EXPLORING FIBRE-REINFORCED PLASTIC BRIDGES FOR WILDLIFE

April, 2018

Context:

Well-designed wildlife crossing structures have proven effective in reducing wildlife mortality, increasing motorist safety, and maintaining connectivity across roadways. However, as a result of their high cost, implementation of crossing infrastructure, particularly for wildlife overpasses, has been less common compared to other mitigation solutions. Fiber-reinforced polymer (FRP) bridges are a new material option and may present a less expensive solution with a more adaptable design that could allow transportation planners and engineers to construct numerous FRP wildlife crossings for the cost of a single concrete overpass. A composite material of structural fibers set in a mold of thermoset resin, FRP structures can be up to three-times lighter than concrete and steel bridges and exhibit a range of qualities that lend them to next-generation bridge construction. EDL, as a key partner of ARC Solutions, was invited by the Western Transportation Institute and Montana State University, to lead an integrated inter-professional workshop to explore new materials, design and building solutions for 2 sites: Hyalite Canyon Road and the Bozeman Pass in Montana, U.S. Both locations present opportunities in Montana for planned and future wildlife crossings.

Objective:

The objective of the Montana CoLab was to develop creative technical solutions using new material technologies to produce a wildlife overpass structure that utilizes novel materials to guide the development of a structure that is feasible and adaptable. CoLab participants were divided into two working groups, and were asked to identify design opportunities and explore methods for incorporating FRP bridges into wildlife crossing infrastructure designs in North America, and evaluate and articulate the political and administrative processes that will facilitate the adoption of plastic bridge designs by federal, state, and local transportation agencies.



Montana CoLab - Working session Site A Hyalite Canyon

Partners:

[ARC Solutions](#), [Montana State University - Western Transportation Institute](#)

Key Outcomes & Current Status:

By engaging in the CoLab process, insights revealed strong evidence that supports the use of FRP materials that are capable of outperforming conventional bridge construction materials in regard to structural performance, maintenance, and cost. The ongoing design and research collaborations as a result of the CoLab can directly produce improved and better integrated planning, design, construction and procurement processes for novel materials, which in turn will assist in the large-scale deployment of wildlife crossing infrastructure. The outcomes of Montana CoLab illustrate how adapting FRP bridges and structures into effective wildlife crossings can contribute to the long-term goals of improving motorist and passenger safety, wildlife conservation, and cost efficiency.

The Montana CoLab led to further research by team members, published in a peer-reviewed scientific journal article: Bell, M., Fick, D., Ament, R., & Lister, N.-M. (2020). The Use of Fiber-Reinforced Polymers in Wildlife Crossing Infrastructure. *Sustainability*, 12(4), 1557. <https://doi.org/10.3390/su12041557>.



Liberty Canyon CoLab - Participant site visit to learn about the P-22 mountain lion

CASE STUDY: Liberty Canyon CoLab - Wallis Annenberg Wildlife Crossing



Wallis Annenberg Wildlife Crossing concept design rendering (Rock Design Associates with NWF, 2024)

Located northwest of Los Angeles, the [Wallis Annenberg Wildlife Crossing \(WAWC\)](#) will be the first overpass wildlife crossing in California spanning across 10 lanes of the Pacific 101 Highway (U.S. Route 101). In 2019, EDL, as a key partner of [ARC Solutions](#), was invited by Beth Pratt (the Regional Executive Director of the [National Wildlife Federation \(NWF\)](#)) to lead a professional CoLab to provide technical advice and planning support for the design and plans prepared by [Caltrans](#) for (then known as) the Highway 101 Wildlife Crossing Project at Liberty Canyon, to identify opportunities to improve, innovate, and reduce costs where appropriate.



Wallis Annenberg Wildlife Crossing - Illustrative project rendering from adjacent foothills (Rock Design Associates with NWF, 2024)

The landscape of the Santa Monica Mountains has long been fragmented by urban development, which has led to habitat reduction and genetic isolation, especially for the mountain lion population. The visionary [WAWC](#) symbolizes a shift toward coexisting with wildlife and nature in urban areas, leading with a design that blends structural engineering, landscape design and native species cultivation and planting to recover biodiversity, integrate with the surrounding habitat and reconnect the fragmented ecosystem. Currently in the last phase of construction, the crossing was directly informed by insights generated through the [Liberty Canyon CoLab](#). Set to be the world's largest wildlife crossing overpass when completed (in 2026), the WAWC will reconnect the landscape of California's Santa Monica Mountains.

The EDL (in support of the State of California and as a partner of ARC Solutions) continues to serve on the technical advisory team to the NWF for this project. Members of the EDL and ARC continue this work as board members with the new \$500M California Reconnected: Wildlife Crossing Fund, whose mission it is to reconnect wildlife habitat across California. As an outcome of the Safe Passages Project, these contributions are notable as the WAWC represents an unprecedented milestone for urban wildlife conservation, design innovation, and landscape connectivity. This high profile and large-scale project will inspire the future of landscape connectivity practices in planning and green infrastructure for the safe passage of humans and wildlife. As such, it further underscores the reach of a decade of research generated through the Safe Passages Project, which extends beyond provincial, and even national boundaries.



Top view surrounding Wallis Annenberg Wildlife Crossing, Agoura Hills, California (under construction fall 2024)

Reflecting on the Liberty Canyon CoLab - Discussion with Beth Pratt:

Leading up to LA's [2025 Urban Wildlife Week](#) and the 10th anniversary of the annual [P-22](#) Day Festival, EDL (Lab Manager Sabrina Careri) sat down with Beth Pratt to reflect on the impact of the Liberty Canyon CoLab in shaping the success of the WAWC, to better capture its influence as a tool and method for fostering the co-creation of knowledge and transdisciplinary design collaborations six years later.

Q: What is the story of the WAWC? Looking back, how did the CoLab process influence the overall trajectory of the project?

As described by Beth, the story of the WAWC is one of connection – between people, wildlife, and landscape. Unlike wildlife crossing infrastructure projects that are traditionally developed for conveyance, the WAWC is “not just a don't-kill the animal crossing” or about merely “providing a path across the road;” but it is about reconnecting the ecosystem that has been severed by human development. For Beth, the WAWC is “a climate resiliency project... It is about designing to address genetic isolation of both plants and animals... It is about learning to see the landscape differently and how it serves wildlife – this is the lasting impact of the CoLab.”

Beth's background is in biology and business, and her role in the project centered on leading all aspects of the campaign for the needed public support and funding, supported by her expertise in communication and marketing. In describing the CoLab's pivotal influence on the development of the WAWC, Beth emphasized its role in revealing the true value of an integrated design approach. During the very early stages in the project's development, she explained, “wildlife crossing infrastructure was really more thought of as a bridge for conveyance.” For her, engaging in the CoLab revealed the level of integration that is needed for the successful delivery of wildlife crossing infrastructure stating, “it is not just about engineering. It has to have an integration of the biological components that we tend to think of as separate.” The CoLab process, she says, “pushed everyone out of their comfort level,” and revealed how structural considerations can be influenced

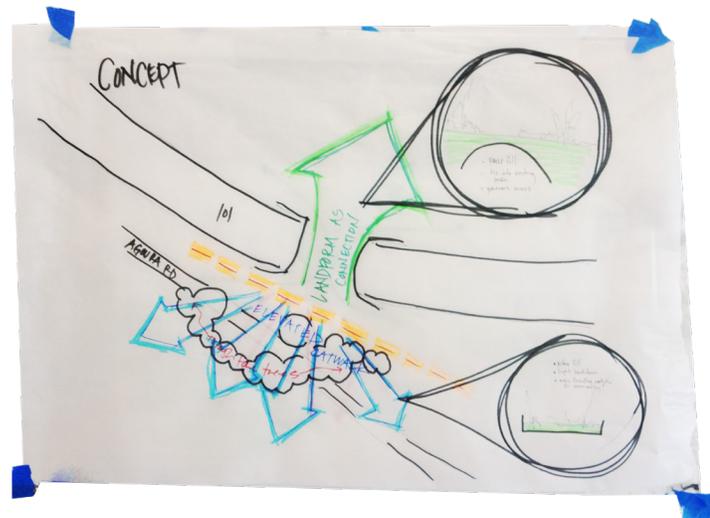
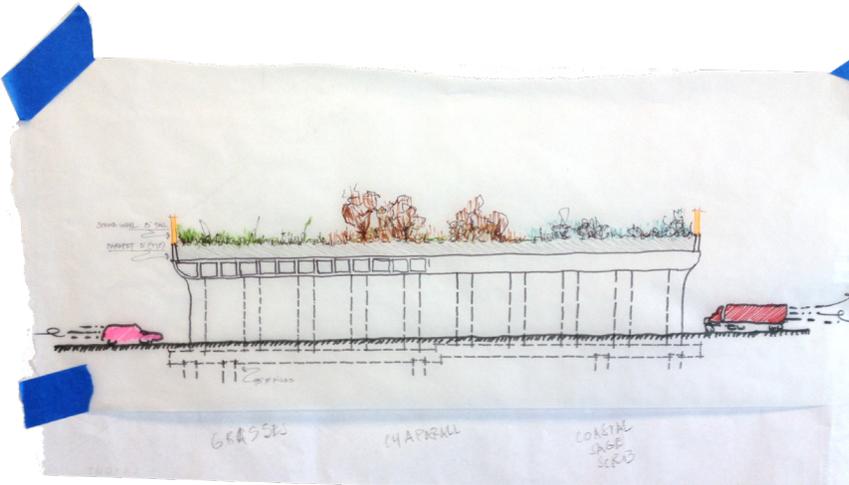
to create what she describes as “*more than a system of conveyance but a totality of biological functioning.*” Indeed, ARC and EDL have studied, documented the need, and advocated for integrated design: we know that success means that wildlife actively use a crossing structure, which is how wildlife-vehicle collisions are reduced. Therefore, to be successful, an effective wildlife crossing must effectively integrate the structure and the landscape; they must be planned and designed together.

“*Being able to see how the different disciplines work together, where in a normal process, this would be separate... was the real aha moment.*” While Caltrans staff have extensive expertise in bridge construction, particularly in structural engineering, Beth recognized that the project needed the integration of ecology or landscape components, questioning, “*how do we get a team to design all the elements collaboratively with Caltrans to bring biological expertise in the project?*” Ultimately, engaging in the CoLab process, she revealed, was the answer. By fostering “*relationship building... [and] having them work together and brainstorm in one room*” she explains, the CoLab allowed for a new type of “*side-by-side understanding*” to occur, where the interdisciplinary collaboration helped to develop a shared vision, as an example, illustrated through “*engineers understanding why [ecologists and] biologists needed it a certain way*” and vice versa.



EDL Director Nina-Marie Lister with lead designer Robert Rock touring the top of Wallis Annenberg Wildlife Crossing, Agoura Hills, California (under construction fall 2024)

The CoLab outputs have directly influenced the design of the crossing structure by shifting the project from focusing solely on the movement of large animals to a focus on designing a fully functional ecological surface, a landscape that integrates with the surrounding habitat. This way of thinking informed structural decisions for the WAWC in a way that she explains, “*would never have happened*” otherwise. For example, the incorporation of appropriate microbial spores as recommended by a mycologist during the CoLab. By allowing for the discovery of “*different ways of approaching the WAWC*,” the CoLab created a model that centers on a “*collaborative, not competitive, approach to design*” she adds. One of the most significant outcomes of the CoLab was the introduction of Robert Rock ([Rock Design Associates](#)), the lead designer of the project, a member of the ARC partnership.



The Chumash Rainbow Bridge Creation Story

“An incredible way to connect us all to something bigger”

One moment during the CoLab that particularly stands out for Beth was the involvement of Indigenous tribal elder and traditional storyteller, Alan Salazar. During the CoLab, Salazar shared the creation story of the Chumash Peoples: this is the story of the Rainbow Bridge that once connected the Channel Islands to the Santa Monica Mountains. As a symbol of the future of his community, he expressed that he sees it embodied in the WAWC. His story resonated with and inspired the team at the CoLab, even prompting one of the engineers to ask about the possibility of incorporating rainbow colored concrete into the design. For Beth, this was an emotional and moving moment that reflected the spirit of connection of the WAWC and collaboration made possible by the CoLab.

Q: Can you share the mission and longer-term ambition of the Wildlife Crossing Fund (WCF), and how it builds on the success of the WAWC?

Many lessons were learned over the course of the WAWC project development, but one of the most significant were those surrounding the funding that is needed to implement more wildlife crossing infrastructure. *“That is where you look [to] see how the WAWC was possible,”* Beth says. The long-term goal of this work, Beth describes, is *“that the state and local and federal budgets will incorporate wildlife crossing infrastructure, but we are not there yet, and wildlife does not have time to wait till that happens, so it is imperative to leverage private philanthropy to advance these projects”* - this is one of the primary reasons why the WCF was formed. *“Not every project has a P22,”* she says, referring to the mountain lion that captured the hearts of LA’s citizens and ignited the #SaveLACougars campaign, *“so it helps with the questioning of how we get big investment.”* In short, the WCF is about *“taking the championship team that was assembled through the process of designing and implementing the WAWC... [this is a team] that is able to design [the crossing technically and deliver it]. This team can communicate funding, and deploy it where needed, and [therefore] make this design process more accessible.”*



Top view of Wallis Annenberg Wildlife Crossing, Agoura Hills, California (under construction fall 2024)

Q: Are there lessons from the CoLab process that you think could be applied to future Wildlife Crossing Fund projects?

“The CoLab process itself should be employed as early and often as possible.” For the WAWC, the CoLab session occurred as the environmental documentation process (known as the environmental permitting) was at the 30% complete mark in the design phases. At the time, Beth looked at the major partners involved (including the NWF, the National Park service, Caltrans, and the Santa Monica Mountains Conservancy) and recognized the need for outside expertise, technical advice and engagement. Having been involved in previous CoLabs and seeing the success of this model for previous projects, she then invited Nina-Marie Lister (Ecological Design Lab) and Jeremy Guth (ARC Solutions) to facilitate a design workshop for the crossing at Liberty Canyon. Upon reflecting on the considerable influence of the CoLab for the success of the WAWC during this interview, she adds *“if I were to do it all again, I would engage in the CoLab process right from the beginning.”* At the point in the design process for the WAWC when the CoLab occurred, two major studies had already occurred (the Feasibility Study and the Environmental Study). *“That’s two years of planning and design that could have used the integration much sooner”* she adds, stating that for future projects *“the process itself should be at point zero.”* CoLab research aligns with and supports this finding, i.e. that early intervention and pre-planning are necessary for optimal integrated design and cost-effective delivery, and in particular, for necessary adaptations in the procurement process were specific technical expertise and casting are required for wildlife crossing structures (see e.g. Newell, R., Lister, N.-M, Brocki, M. Cerbu, A., Dale, A., Careri, S. (2025)).



Liberty Canyon CoLab - Process design work and discussions



Liberty Canyon CoLab - Participants engaged in field work

Q: What are your personal reflections or lasting impressions of the CoLab process?

“Learning by doing,” Beth says. Recognizing that the CoLab created an opportunity to have an advanced – and importantly, integrated and interdisciplinary – level of professional expertise in one room, Beth explained how this directly benefited the project. From this integrated and advanced expertise, Beth noted that, it created an ongoing and involved network of professionals that are able to provide insights and recreate the process for future projects. Beth also pointed out that the Colab process advanced communications of the project by serving as an educational tool that demonstrates accountability and credibility to funders stating, *“when you're raising private and public money, you have to show that you're doing your due diligence, and definitely being able to show donors and government agencies that you did this [referring to the CoLab] is a pretty important asset to be able to offer.”*

Beth also spoke of the stronger integration and consideration of both ecology **AND** design that occurred, which paved the way for a more habitat-focused design for climate resilience and overall ecosystem connectivity, being a direct benefit of the CoLab, *“would we have a crossing without the CoLab? Probably, but I bet it would look really different... it would look more structural... more industrial”* (with the implication being that it might have been less ecologically effective or functional). While noting that the CoLab did not necessarily make the project possible, Beth emphasized that it significantly shaped it with an integrated planning approach and ecological effectiveness, adding that the sound walls and lighting considerations are two examples that without the CoLab, she says, *“likely would not have been have factored in.”* In addition to its scale and ambition, Beth also noted that the WAWC stands out for location, and how the CoLab was critical to making the crossing a fully functional ecosystem in an urban setting, stating, *“nobody's tried to do this in such an urban area... [without the CoLab] they would have followed other models of crossings”* and neglected integral contextual habitat features.

Finally, Beth described the CoLab as being **transformative**. She attributes the success of the WAWC to the entire team, while giving special recognition to the involvement of ARC Solutions and EDL's Director, Nina-Marie for advancing the approach of the WAWC and the team's understanding of ecological design. By engaging in the CoLab, she adds, the "championship team" that was created, shifted their thinking on the crossing by aligning it with current climate realities - a contribution which she calls "visionary thinking" and directly attributes to input of the EDL and Nina-Marie. She says, "upon reflecting on how I was 14 years ago starting on this, and what I thought wildlife crossings were, to what I now am convinced they need to be, that's really the CoLab and Nina-Marie's kind of visionary thinking on ecological design."



Liberty Canyon CoLab - EDL Director Nina-Marie Lister alongside Jeremy Guth (ARC Solutions) speaking on the CoLab process



Breaking ground for the construction of the WAWC Earth Day 2022



CoLab participants learning about P-22, the celebrated Los Angeles mountain lion



Field vests project completed by fourth-grade students for the 10th Anniversary P-22 Day Festival

· · · ECO/
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