

# SQUAMISH ENVIRONMENT SOCIETY'S WILDLIFE CONNECTIVITY PROJECT PART 1: SCOPING REPORT

April 3, 2023

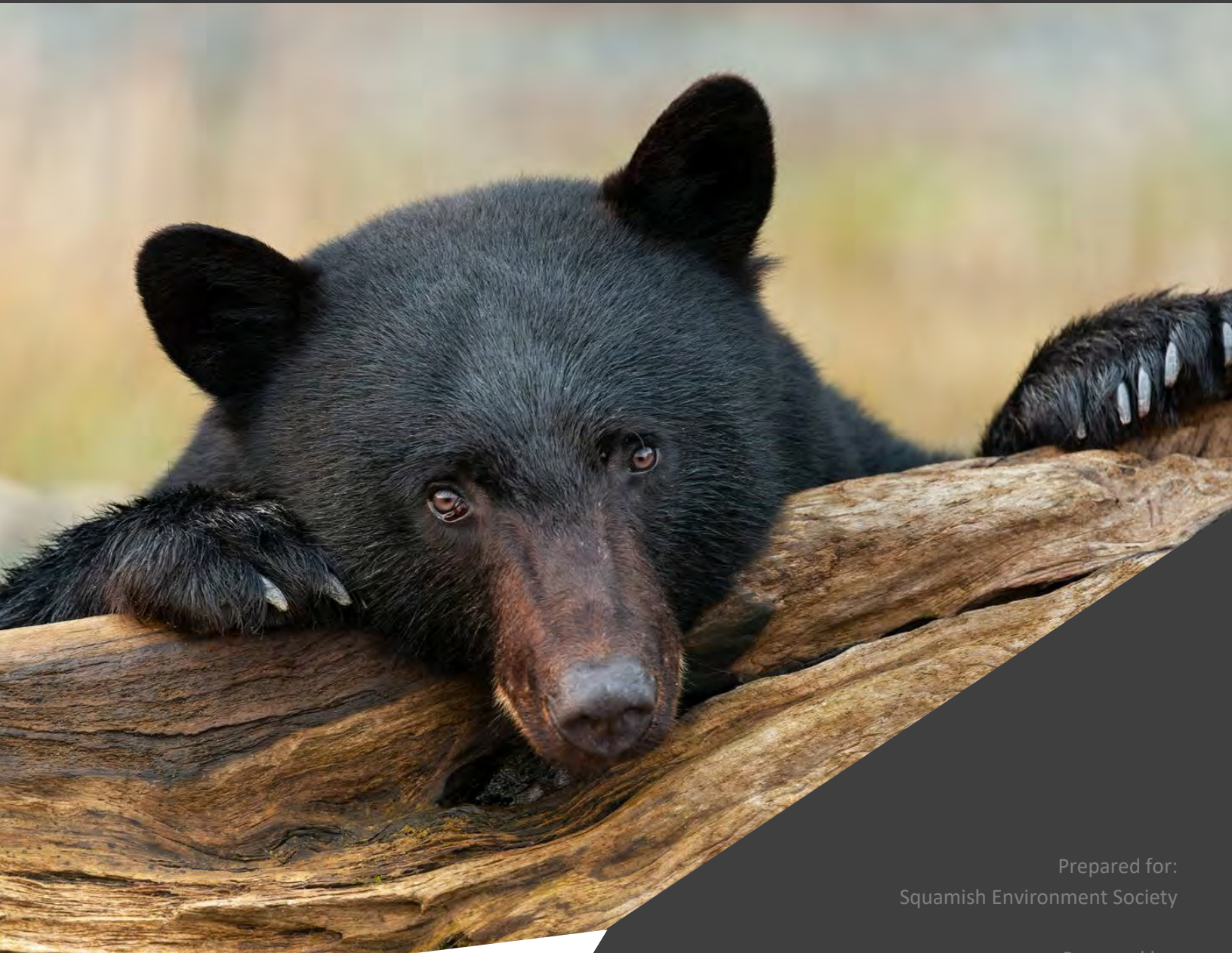


Photo: Connor Stefanison

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CRE Project #: 050-01-02



## PREFACE

In 2015 and 2016, the District of Squamish produced Environmentally Sensitive Area mapping (DOS 2023), and identified a need for wildlife corridor mapping (pers. comms. Caroline Ashekian, 2021) as well as a biodiversity conservation strategy (South Coast Conservation Program 2015). The need to protect wildlife corridors was integrated into the District's Official Community Plan (DOS 2017) and the Squamish-Lillooet Regional District Regional Growth Strategy (SLRD 2018).

In 2021, the Squamish Environment Society retained CoastRange Environmental Ltd. (CoastRange) to conduct a preliminary scoping study for identification of wildlife corridors. This study provided high-level insights into similar initiatives in and near British Columbia (BC), possible stakeholders, relevant policy tools and methodological options. This study resulted in a Preliminary Scoping Report and project plan dated October 5, 2021, and ultimately determined that identification and protection of wildlife corridors in and around Squamish is feasible and much needed.

In 2022, the Squamish Environment Society, in collaboration with the Howe Sound Biosphere Region Initiative Society, embarked on a more extensive Scoping Phase for the Wildlife Connectivity Project (the Project). During this phase, CoastRange worked closely with Murray Journeay, Researcher and Director with the Squamish Environment Society, to explore the aforementioned topics in greater depth, establish essential working relationships and better define the path forward. The Project received letters of support from 14 government and non-government organizations, and welcomed the Squamish Nation, District of Squamish, Squamish-Lillooet Regional District, University of British Columbia, Simon Fraser University and Capilano University as project partners and collaborators. The Scoping Phase resulted in two reports:

- Part 1: Scoping Report
- Part 2: Technical Report

This report (**Part 1: Scoping Report**) serves as a broad summary of salient findings from the Scoping Phase and is written for a non-technical audience (e.g., planners, land managers, citizen scientists, stakeholders, funders and potential partners). It introduces the current state of biodiversity and connectivity theory, and provides an overview of the Project, biodiversity conservation strategies, connectivity modelling, policy and regulatory tools. Examples from other initiatives in and around BC are provided throughout.

The companion report (**Part 2: Technical Report**) provides a deeper dive into modelling and assessment framework methodology and is written for a technical audience (e.g., data modellers, GIS technicians and those with an interest in spatial modelling).

Together, these reports include insights gleaned from a review of 29 similar initiatives in and around BC; a review of provincial, national and international technical guidance documents; and communications with subject experts. Valuable insights and direction were also gathered through various engagement activities, including one-on-ones, a Local Intergovernmental Meeting, an Information + Collaboration Workshop, a survey and an interactive mapping tool.

**Recommended citation:** K. Loudon and M. Journeay, 2023. Wildlife Connectivity Project, Part 1: Scoping Report; Squamish Environment Society, 21 p.

## ACKNOWLEDGEMENTS

Identifying and protecting areas important for wildlife connectivity can not be done in isolation. The Squamish Environment Society would like to thank all of you who continue to share and collaborate with this Project. Your contributions are invaluable.

The Focus Area for this Project lies within the traditional territory of the Sk̓wx̓wú7mesh Úxwumixw (Squamish Nation). We kindly thank the Sk̓wx̓wú7mesh Úxwumixw for their collaboration and partnership on this Project, and look forward to continuing to learn from the Nation as we work toward the common goal of better understanding, protecting and restoring long-standing and sacred ecosystem connections.

We would also like to thank the Howe Sound Biosphere Region Initiative Society which has given this Project a place within the larger biosphere initiative and continues to guide this Project forward. This Project would not have been possible without funding from the Howe Sound Biosphere Region Initiative Society, Environment and Climate Change Canada, Squamish Environment Society’s private donors, the Squamish-Lillooet Regional District, BC Nature and then BC Naturalists’ Foundation. We would also like to thank Meg Toom of Serratus Wildlife Services; Andrew Simon at the University of British Columbia; Katherine Andy and Chelsea Little at Simon Fraser University; Thomas Flower at Capilano University; Rachel Munger, Julie Aeyelts, Austin Chandler and Jonny Williams from Sk̓wx̓wú7mesh Úxwumixw; Sarah McJannet, Lesley Douglas and Dan Griffin from the District of Squamish; and Anna Koterniak from the Squamish-Lillooet Regional District for their continued contributions to this Project.

<p><b>Core Project Team</b></p>	 <p><b>Squamish Environment Society</b></p>	 <p><b>ÁTL'KA'TSEM HOWE SOUND BIOSPHERE REGION</b></p>	 <p><b>COASTRANGE ENVIRONMENTAL</b></p>			
<p><b>Funders</b></p>	<p>This project was undertaken with the financial support of: Ce projet a été réalisé avec l'appui financier de :</p> <div style="display: flex; justify-content: space-around;"> <div data-bbox="365 1407 812 1480">  <p>Environment and Climate Change Canada</p> </div> <div data-bbox="844 1407 1250 1480"> <p>Environnement et Changement climatique Canada</p> </div> </div> <div style="display: flex; justify-content: space-around; margin-top: 20px;"> <div data-bbox="365 1533 690 1680">  <p><b>Squamish Environment Society</b></p> </div> <div data-bbox="714 1533 966 1680">  <p><b>SQUAMISH - LILLOOET REGIONAL DISTRICT</b></p> </div> <div data-bbox="990 1533 1307 1680">  <p><b>BCnature</b> FEDERATION OF BC NATURALISTS</p> </div> <div data-bbox="1331 1501 1437 1680">  <p><b>BC NATURALISTS' FOUNDATION</b></p> </div> </div>					
<p><b>Collaborators</b></p>	 <p><b>Sk̓wx̓wú7mesh Úxwumixw</b> Squamish Nation</p>	 <p><b>SQUAMISH - LILLOOET REGIONAL DISTRICT</b></p>	 <p><b>SQUAMISH</b></p>	 <p><b>UBC</b></p>	 <p><b>SFU</b></p>	 <p><b>CAPILANO UNIVERSITY</b></p>



## EXECUTIVE SUMMARY

Southwestern BC, like many densely settled regions of the world, is experiencing increased threats of biodiversity loss caused by the pressures of urban growth and development. Protecting natural habitat and maintaining and restoring connectivity are essential steps toward slowing biodiversity loss, especially in the face of climate change and climate-driven species' range shifts. Governments around the world are acknowledging the importance of ecological connectivity.

Connected landscapes and wildlife corridors allow animals and plants to move between habitat core areas, which helps to maintain genetic diversity, provides access to required resources and refugia, allows for adaptation to changing environmental conditions, and ultimately supports species resilience thereby reducing the risk of local extinction. The protection of wildlife corridors not only supports wildlife, but also supports regional biodiversity that includes the variety of smaller animals, birds, amphibians, plants, fungi and micro-organisms that live in and depend upon the habitat within the corridor. The protection of corridors also protects the associated ecosystem services.

The proposed Focus Area for this Project includes the northern half of the At'l'ka7tsem/Howe Sound UNESCO Biosphere Region, including the District of Squamish and surrounding areas that are co-managed by the Squamish-Lillooet Regional District and the Skwxwú7mesh Úxwumixw (Squamish Nation). The Project is broken down into multiple phases. This report (Part 1: Scoping Report) and the companion report (Part 2: Technical Report) present salient findings from the Scoping Phase. The next phase of the Project includes two distinct but complementary components: (1) connectivity modelling (i.e., identifying and mapping areas important to wildlife connectivity) and (2) the development of a biodiversity conservation strategy. The subsequent phase includes working with local land managers to take actions that enhance biodiversity conservation in our region. Project phasing is described herein and a project plan is appended.

The Scoping Phase included a review of 29 similar initiatives in and around BC; a review of provincial, national and international technical guidance documents; and communications with local land managers and subject experts. Benchmark examples highlighted herein include the biodiversity conservation strategies developed for the Okanagan Region and the City of New Westminster, policy and regulatory tools developed by the City of Surrey, and the connectivity modelling work of TerrAdapt.org and the Washington Habitat Connectivity Working Group (and partners).

It is recommended that the Project be governed by a Biodiversity Conservation Collaborative composed of the core project team, Indigenous knowledge holders, a steering committee (including land management organizations), focus species expert groups, technical advisors, academic partners, other biodiversity knowledge holders, and collaborative initiatives. This proposed governance structure is described herein, and a summary of the engagement activities performed during the Scoping Phase is appended.

Various methodological options for connectivity modelling were explored including species-specific, non-species-specific, static and dynamic models; modelling options for habitat suitability and resistance; and the use of spatial analysis tools, such as Linkage Mapper, Circuitscape, Conefore, Zonation and TerrAdapt.

A preliminary model was developed to explore data availability and the feasibility, strengths and limitations of various approaches. After consultation with subject experts and local land managers, it is recommended to pursue a dynamic model that makes use of both species-specific and a landscape-based approaches. It is recommended that the model be informed by the Biodiversity Conservation Collaborative, specifically technical advisors, species experts, Indigenous knowledge holders and a steering committee. An iterative approach will be required in order to incorporate feedback from species experts, stakeholders and land managers. The dynamic modelling approach will allow for tracking of changes over time and adaptive land management practices. Details regarding modelling and assessment framework methods can be found in the companion report (Part 2: Technical Report).

Once developed, the model results, including maps of areas important to wildlife connectivity and other previous and concurrent studies, will help inform the development of a biodiversity conservation strategy. The biodiversity conservation strategy can be envisioned as a canoe that is powered through the water by multiple paddles, each paddle being a contribution from a project or initiative that improves our understanding of biodiversity conservation priorities. As proposed, the strategy will outline the actions and approaches needed to conserve and protect biodiversity within the Focus Area. A review of policy and regulatory tools that can be used to protect such areas is provided herein.

Under the collective guidance of the Biodiversity Conservation Collaborative, it is envisioned that the Project's deliverables will be aligned with the mandates and needs of land management organizations and, thus, can serve as decision support tools to guide land use management and conservation.

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# 1 INTRODUCTION + BACKGROUND

## 1.1 The State of Biodiversity and Connectivity

According to the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (2019), global extinction rates are at least tens to hundreds of times higher than over the past 10 million years, with as many as 1 million species facing extinction, many within decades, unless action is taken to address the underlying causes of biodiversity loss. Habitat loss, fragmentation and the impediment of wildlife movement are among the main underlying causes. Protecting natural habitat and maintaining and restoring connectivity are essential steps toward slowing biodiversity loss, especially in the face of climate change and climate-driven species’ range shifts. (Pither et al. 2021)

Southwestern BC, like many densely settled regions of the world, is experiencing increased threats of biodiversity loss caused by the pressures of urban growth and development. More than 25% of wildland habitat in the Átl’ka7tsem/Howe Sound UNESCO Biosphere Region has either been lost to permanent human settlement or disrupted by ongoing resource development activities and a supporting road infrastructure that is increasingly transforming the backcountry into a human-dominated landscape (Figure 1, Shackelford et al. 2018, BC Resource Stewardship Branch 2021). Based on a compilation of available observation data, the Átl’ka7tsem/Howe Sound UNESCO Biosphere Region provides habitat for 44 Red-listed and 122 Blue-listed terrestrial wildlife species, including 35 species which are protected under Canada's Species at Risk Act (AHSUBR 2021).

In the centre of the region is the District of Squamish. Squamish is experiencing rapid population growth, largely driven by people who are attracted to the area’s beautiful, natural outdoor spaces. Rapid development continues to fragment these landscapes, potentially making it difficult for wildlife to move through the region. Land managers, residents and experts in and around Squamish have expressed interest in protecting wildlife corridors. In order to protect these corridors, land use planners and managers need to be able to identify areas important for connectivity.

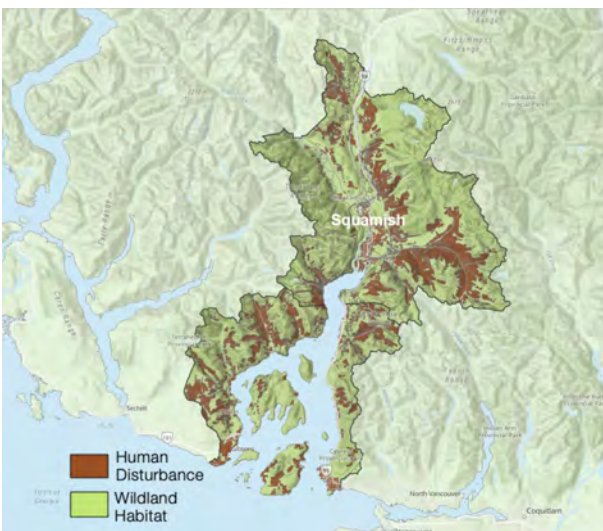


Figure 1. Map of the Átl’ka7tsem/Howe Sound UNESCO Biosphere Region showing areas of human development (25%) and remaining wildland habitat (75%; BC Resource Stewardship Branch 2021).

## 1.2 Global Commitment

Governments around the world are acknowledging the importance of ecological connectivity (Pither et al. 2021), and this Wildlife Connectivity Project (the Project) joins a growing suite of global, national, provincial and local initiatives that strive to protect landscape connectivity. The following initiatives exemplify how global targets can flow down into local action in the context of this Project:

- **COP15 30 by 2030:** In December 2022 at the United Nations Biodiversity Conference (COP15), representatives from 188 governments from around the world established a landmark agreement to protect 30 percent of Earth’s lands, oceans, coastal areas, and inland waters by 2030 (Convention on Biodiversity 2022).
- **Canada’s Conservation Targets + Investment:** In alignment with COP15’s 30 by 2030 agreement, Canada continues their commitment to conserve 25 per cent of lands, freshwater, and oceans by 2025, and 30 per cent by 2030. To support these goals, Canada has invested an additional \$2.3 billion over five years (2021 onwards) in Environment and Climate Change Canada’s Enhanced Nature Legacy Initiative (Government of Canada 2023). Of which, \$60.6 million is funding the National Program for Ecological Corridors (Parks Canada 2021) and \$11.3 million is funding biodiversity conservation efforts in nineteen UNESCO biosphere reserves across Canada (Government of Canada 2022a).
- **Átl’ka7tsem/Howe Sound UNESCO Biosphere Region:** In September 2021, the Átl’ka7tsem/Howe Sound Biosphere Region was designated as an official UNESCO Biosphere Reserve (HSBRIS 2021) and the Howe Sound Biosphere Region Initiative Society became responsible for managing it. In September 2022, \$926,000 of Enhanced Nature Legacy funds were allocated to the Átl’ka7tsem/Howe Sound UNESCO Biosphere Region (Government of Canada 2022b).
- **Wildlife Connectivity Project:** In April 2022, the Howe Sound Biosphere Region Initiative Society joined the Squamish Environment Society to work collaboratively on their Wildlife Connectivity Project. The Society recognized the Project’s potential to serve as a model for addressing habitat connectivity region-wide. A portion of the Biosphere’s Enhanced Nature Legacy funds were allocated to the Scoping Phase and earmarked as seed funding for future phases of the Project.

## 1.3 Connectivity Theory

### 1.3.1 What is a wildlife corridor, and why is it important?

A wildlife corridor, also known as an ecological corridor or habitat corridor, is a natural or artificial strip of habitat that connects two or more core habitat areas (Figure 2), allowing wildlife to move between them. It can be a larger landscape corridor, narrower linear corridor or stepping stone corridor (Figure 2), or any other type of landscape feature that provides suitable habitat and allows animals to move freely. Wildlife corridors are an area-based conservation approach designed to facilitate natural movement and are often established in areas where natural habitats have been fragmented by human activities.

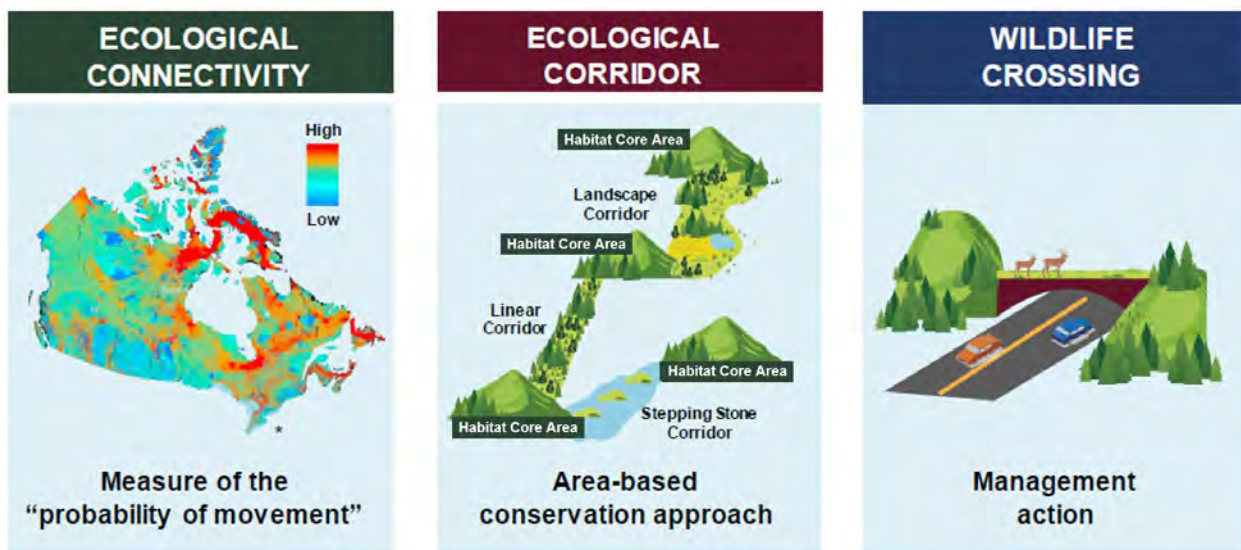


Figure 2. Relevant distinctions between ecological connectivity, ecological corridors and wildlife crossings (Parks Canada 2022).

Habitat core areas are intact ecosystems that provide essential resources for longer-term sustainability, such as access to food, water, shelter from weather and predation, and areas that support reproductive requirements. Allowing animals to move between habitat core area helps to maintain genetic diversity, provides access to required resources and refugia, allows for adaptation to changing environmental conditions, and ultimately supports species resilience and reduces the risk of local extinction. Corridors provide critical connections between fragmented and isolated habitats within the developed landscape and promote human-wildlife coexistence. Corridors also support a wide range of ecosystem services (see Section 1.3.4 below).

To fully understand what wildlife corridors are, it is important to understand how they differ from wildlife crossings and green infrastructure networks, as described below.

### 1.3.2 How do wildlife corridors and wildlife crossings differ?

A wildlife crossing is an example of a management action that can occur within a wildlife corridor or in other areas. It is a specific structure or feature that is designed to allow animals to cross roads or other human-made barriers safely. It can include tunnels, bridges, culverts, or other features that allow animals to cross without coming into contact with vehicles or other human-made structures. While both wildlife corridors and wildlife crossings are designed to facilitate safe wildlife movement, they differ in terms of their scale and purpose. Wildlife corridors are generally larger and more broadly focused.

### 1.3.3 How do wildlife corridors and green infrastructure networks differ?

Several neighbouring jurisdictions, including the City of Surrey, the City of New Westminster, Metro Vancouver and the City of Vancouver, have developed or are developing green infrastructure networks. Green infrastructure networks tend to be established in more urban communities in which habitat and connectivity for large mammals are limited. While wildlife corridors are focused on facilitating movement of wildlife, green infrastructure networks are focused on providing multiple benefits to humans and the environment. Green infrastructure networks are broader in scope and often involve social and economic benefits, as well as natural and built environments. This broader scope may include parks, greenways, swales, green roofs and areas that deliver a wide range of ecosystem services. Typically, areas that support wildlife are included in green infrastructure networks; however, not all areas within a green infrastructure network are capable of supporting wildlife.

### 1.3.4 How do wildlife corridors protect ecosystem services?

Ecosystem services are the benefits people obtain from ecosystems. Examples of these benefits include natural pollination of crops, natural cleansing of air and water, mitigation of climate change impacts and extreme weather, space for recreation, facilitating human mental and physical well-being, provision of food, the decomposition of wastes, and the storage and natural filtration of stormwater. These benefits are provided by large healthy ecosystems, such as natural forests and wetlands, and by smaller natural and semi-natural features, such as urban forests, swales and ditches, street trees and urban parks. Typically, areas that support wildlife also provide ecosystem services; however, not all areas that provide ecosystem services are capable of supporting wildlife. As such, the conservation of wildlife corridors also protects urban forests and ecosystem services.

### 1.3.5 Why Wildlife?

Squamish is surrounded by the natural environment, but the opportunities to protect areas important for wildlife connectivity, specifically that needed for medium to large-sized mammals, is declining in the face of rapid urban development. As such, this Project prioritizes the need to identify and protect wildlife habitat, as opposed to green infrastructure or ecosystem services. It is, however, anticipated that larger green infrastructure features and significant ecosystem services will be included within the areas that are identified as being important for wildlife connectivity.

## 2 PROJECT OVERVIEW

This section provides an overview of the Project, including the proposed goals, geographic scope, phases, project governance structure and engagement. Through consultation with key land managers and subject experts, it has become apparent that the Project must be collaborative and adaptive in order to succeed. As such, the information provided herein may evolve throughout the life of the Project.

The project plan is provided in Appendix 1. A summary of engagement activities performed during this Scoping Phase is provided in Appendix 2.

### 2.1 Purpose + Goals

The purpose of this Project is to help protect biodiversity within the northern portion of the Átl'ka7tsem/Howe Sound UNESCO Biosphere Region and to serve as a model for addressing habitat connectivity region-wide. As previously mentioned, habitat fragmentation and the impediment of wildlife movement are among the main underlying causes of declines in biodiversity (Pither et al. 2021). Protecting areas important to wildlife connectivity can indirectly protect the many other species, both plants and animals, that share the same habitats; and associated ecosystem services. The Project's deliverables, namely the identification of areas important to wildlife connectivity and the development of biodiversity conservation strategies, are intended to be used as support tools to inform the decisions and, where applicable, policies of local land management organizations.

Through strategic partnerships with local and regional governments, First Nations, Provincial and Federal Agencies and other organizations who share a mandate for biodiversity conservation, we aim to:

- Establish a base of evidence that increases awareness and understanding of threats to biodiversity, and that empowers local conservation planning in accordance with the UN Convention on Biological Diversity (COP 15), UN Sustainable Development Goals (SDG15 Targets\*), and UN Declaration on the Rights of Indigenous Peoples (UNDRIP).
- Identify the best available routes to maintain movement for wildlife and ecological processes through an integrated network of connectivity pathways that increase the prospects of habitat resilience for the broadest possible range of native species.
- Identify opportunities to protect, enhance and restore habitat connectivity, and incorporate existing protected areas and other effective area-based conservation measures.

\*UN Sustainable Development Goal 15 (SDG15) is to *protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss* (United Nations 2023). This goal includes twelve targets.

## 2.2 Geographic Scope

### 2.2.1 Focus Area

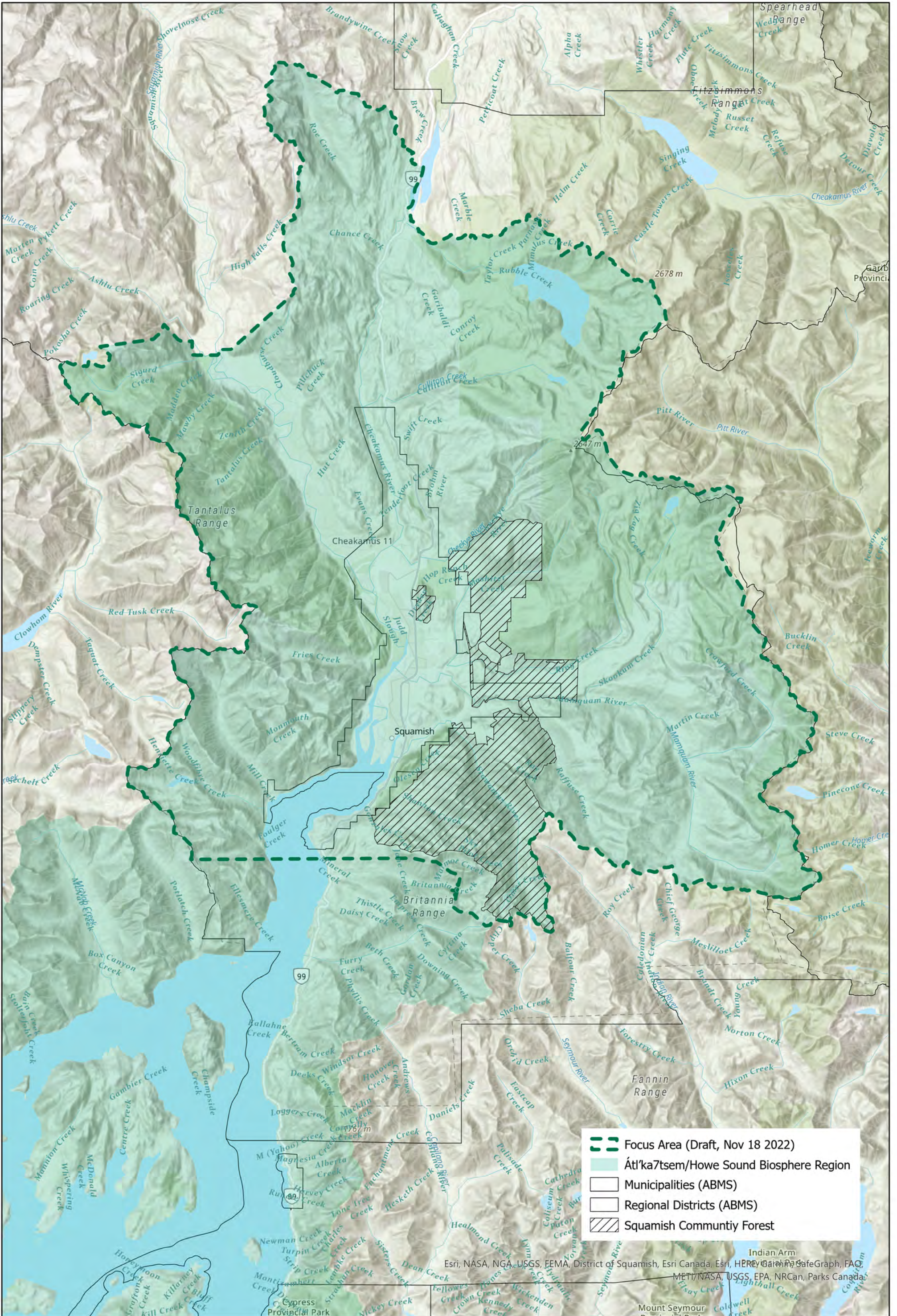
As illustrated in Figure 3, the Focus Area includes the northern half of the Atl'ka7tsem/Howe Sound UNESCO Biosphere Region, including the District of Squamish and surrounding areas that are co-managed by the Squamish-Lillooet Regional District and the Skwxwú7mesh Úxwumixw (Squamish Nation). The Focus Area spans south to Britannia, north to Daisy Lake, and to the height of land to the west and east.

This area was prioritized because while rapid urban growth and resource development continue to fragment this landscape and lead to habitat loss, it is not too late to protect and enhance connectivity. With approximately 75% of wildland habitat remaining within the Atl'ka7tsem/Howe Sound UNESCO Biosphere Region (Shackelford et al. 2018, BC Resource Stewardship Branch 2021), there remains significant opportunity to maintain and protect areas important to wildlife connectivity in order to mitigate biodiversity loss. The Focus Area is large enough to account for regional habitat connectivity. It connects major protected areas, such as Garibaldi Provincial Park, Tantalus Provincial Park and the Skwelwil'em Squamish Estuary Wildlife Management Area. It is small enough that it contains similar biogeoclimatic conditions, ecosystems and species.

### 2.2.2 Context Area

The preliminary model development that occurred during this Scoping Phase included a larger regional Context Area. The Context Area includes watersheds within the 'Sea-to-Sky' portion of the Squamish-Lillooet Regional District and neighbouring areas of the Skwxwú7mesh Úxwumixw, Sunshine Coast Regional District, Metro Vancouver and Gulf Islands. Including a larger area allows us to 'zoom-out' to see the broader context of regional wildlife habitat. It also provides a foundation for future projects that may wish to 'zoom-in' on other focus areas and benefit from the work being done for this Project. Datasets within the Context Area are limited to those that are available regionally or provincially, while the Focus Area (described above) may include additional datasets and features that are only relevant or available at the local level.







## 2.3 Project Phases

The Project is broken down into the following phases (Figure 4; Appendix 1). As previously mentioned, the Project must be collaborative and adaptive in order to succeed. As such, the information provided herein may evolve throughout the life of the Project.



Figure 4. Project phasing

## 2.4 Project Governance + Engagement Framework

### 2.4.1 Biodiversity Conservation Collaborative

It is recommended that the Project be governed by a Biodiversity Conservation Collaborative composed of the Core Project Team, a Steering Committee and a variety of groups and individuals that contribute to the direction of the Project (Figure 5).

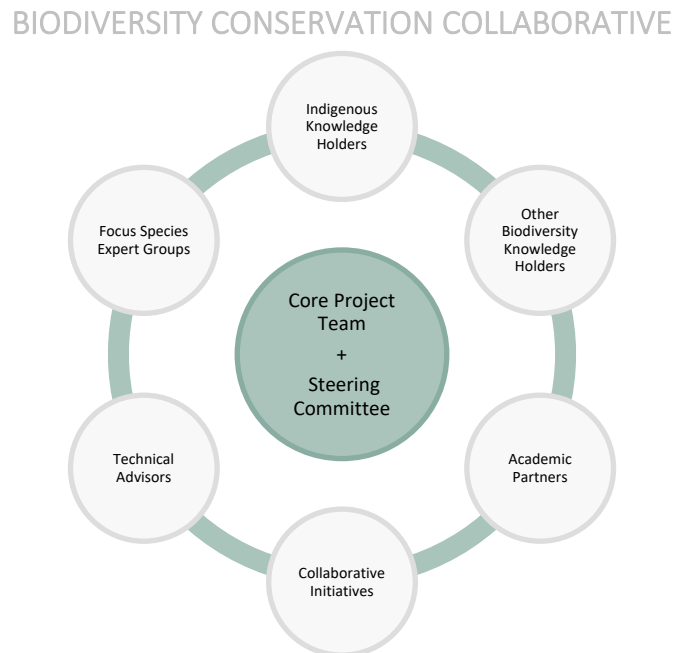


Figure 5. Biodiversity Conservation Collaborative diagram

### 2.4.2 Core Project Team

Currently, the Core Project Team is composed of key individuals from the Squamish Environment Society, the Howe Sound Biosphere Region Initiative Society and their consultants.

### 2.4.3 Steering Committee

The majority of similar initiatives throughout BC are governed by a committee. These committees assume many forms, including steering committees, advisory committees, working groups and technical committees. Given that this Project is led by a non-governmental organization (NGO), it is considered important to seek and incorporate direction and guidance from governments and organizations responsible for land management within the Focus Area. As such, establishing a Steering Committee was identified as an effective means to collaborate and advance shared interests, further strengthening the relationship between the Squamish Environment Society, Howe Sound Biosphere Region Initiative Society, District of Squamish, Squamish Lillooet Regional District, Sḵw̱x̱wú7mesh Úxwumixw, BC Parks, other provincial ministries, representatives from forestry, highways and agriculture, and other interested parties.

Once formed, the Committee will serve as a forum to provide advice to the core project team on the identification and management of wildlife corridors and development of a biodiversity conservation strategy. This may also include supplemental studies and assessments mutually agreed upon by the parties. Together, the parties will work to advance mutual interests and provide collective advice and recommendations. Under the collective guidance of the committee, it is envisioned that the Project's deliverables (i.e., connectivity modelling and the biodiversity conservation strategy) will be aligned with the mandates and needs of land management organizations and, thus, will serve as more effective decision support tools for the region.

More information about the proposed Steering Committee can be found in the [Steering Committee Overview factsheet](#). A Terms of Reference for the Committee has been drafted. It is recommended that the Committee be convened early in the next phase of this Project.

#### 2.4.4 Academic Partners + Collaborative Initiatives

Throughout this Scoping Phase, we encountered an abundance of opportunities to collaborate with new and existing initiatives. Below are a few examples. We continue to welcome opportunities for collaboration.

- **University of British Columbia (UBC):** Andrew Simon, PhD candidate with the O'Connor Lab at UBC, is working synergistically with this Project to map the distribution of species in relation to environmental stressors, to identify sites with potential for resilience, vulnerability, and connectivity across a changing landscape. The research includes synthesizing biodiversity data, modelling biodiversity and habitat suitability and systematic field validation. This work will ultimately be integrated into this Project's connectivity modelling.
- **Simon Fraser University (SFU):** Katherine Andy, Resource and Environmental Management Graduate Student at SFU, is working with Dr. Chelsea Little to study how wildlife move through various landscapes. The research uses 36 camera traps placed at 12 sites located along transects that span a gradient of developmental intensity (from the urban development within Squamish outwards to less developed wilderness areas) to survey mammal movement in riparian areas. This work will ultimately be integrated into this Project's connectivity modelling.
- **Capilano University:** Thomas Flower, PhD, Biology Instructor at Capilano University is working with students to develop opportunities to research corridor biodiversity and usage in the Átl'ka7tsem/Howe Sound UNESCO Biosphere Region. This work may include camera traps, transects and assessment of buffer habitat and habitat patches relating to species at risk. There is great potential for this work to be integrated into the Project's connectivity modelling.
- **Squamish Community Forest:** The Squamish Community Forest makes up approximately 10 % of the Focus Area and shares many objectives with the Project. It is formed through a partnership with the Skwxwú7mesh Úxwumixw and the District of Squamish, and has a governance structure tied to community values. Their management planning already incorporates area-based constraints, including Wildlife Habitat Areas, Ungulate Winter Ranges, Old Growth Management Areas and riparian areas, and there is a desire to allocate volume-based constraints, which can be

moved around on the landscape, to areas that offer the most valuable habitat or provide connectivity. There is also a shared desire to track change in the landscape over time. Collaboration between the Squamish Community Forest and this Project presents many opportunities for sharing of data, knowledge and technology.

- **Sḵw̓x̓wú7mesh Úxwumixw (Squamish Nation):** The Nation has a long-standing and sacred responsibility to the lands and waters of its territory. The Core Project Team is working with the Nation to develop options for Sḵw̓x̓wú7mesh Úxwumixw members and Indigenous knowledge holders to contribute knowledge to the Project.

### 2.4.5 Engagement

The level and scope of engagement done by similar initiatives in and around BC varies greatly. For example, the Southwestern Washington Habitat Connectivity Working Group hosts several working meetings per year that are open to everyone, whereas other initiatives have opted to complete the science portions of the Project (e.g., connectivity modelling) before external engagement, allowing subject experts to focus on pure science without the influence of competing priorities. In these cases, external engagement is scheduled for the policy development phase.

During the Scoping Phase of this Project, opportunities for engagement were focused on potential collaborators and contributors, although attendance and participation from all stakeholders and community members was and continues to be welcome. Engagement activities during this phase are summarized in Appendix 2. The results from the Information + Collaboration Workshop (February 16, 2023) and the online survey (February 22 to March 8, 2023) are summarised in separate reports.

The online survey asked respondents how they wish to engage with the Project moving forward. The most popular options were participating in surveys and workshops (39%), submitting data to iNaturalist (37%) and participating in collaborative ‘spin-off’ projects (29%). A total of 7 people expressed interest in joining a Focal Species Expert Group, 7 people were interested in joining a Steering Committee, and 4 people were interested in exploring funding opportunities for the Project.

Recommended engagement activities for future phases include:

- Websites and press releases
- Surveys and interactive mapping tools
- Workshops
- Promoting the use of iNaturalist
- Direct communications regarding collaborative ‘spin-off’ projects.
- Focal Species Expert Groups
- Steering Committee
- Working with the Sḵw̓x̓wú7mesh Úxwumixw to develop and distribute an Indigenous knowledge survey
- Council presentations (District of Squamish and Squamish-Lillooet Regional District)
- Continued communications with key stakeholder groups to better understand concerns and shared objectives.

## 3 BIODIVERSITY CONSERVATION STRATEGY

### 3.1 What is a biodiversity conservation strategy?

A biodiversity conservation strategy is a plan or framework that outlines the actions and approaches needed to conserve and protect biodiversity within a particular area or region. The main intent of a biodiversity conservation strategy is to identify and prioritize areas of high biodiversity value, and to develop targeted conservation actions. It typically includes a range of objectives, goals, and actions aimed at preserving species and ecosystems; maintaining genetic diversity; and addressing threats to biodiversity, such as habitat loss or climate change. Biodiversity conservation strategies are typically developed by governments, NGOs, or other stakeholders and may be based on scientific research and stakeholder consultation. The strategies can help to guide decision-making related to land use, resource management, and conservation, and are an important tool for protecting and conserving biodiversity.

### 3.2 What is biodiversity?

Biodiversity is the variety of life on Earth or within a particular area, including the diversity of species (plants, animals, fungi and micro-organisms), genetic variation within species, and diversity of ecosystems. It is the variability among living organisms which includes the diversity within species, between species, and among ecosystems. It can be measured as the number of species in an area and number of individuals of each species, and is often used as an indicator of ecosystem health and resilience. (Diamond Head Consulting 2022)

### 3.3 How do wildlife corridors protect biodiversity?

Wildlife corridors protect more than wildlife. They protect biodiversity in several ways. For example, corridors allow gene flow between areas, thereby diversifying genetics within populations. Corridors also provided habitat for a diversity of smaller animals, birds, amphibians, plants, fungi and micro-organisms. The focal species within wildlife connectivity studies are often umbrella species, meaning that the protection of habitat for that species indirectly protects the many other species that share the same habitats (the umbrella effect).

### 3.4 Why a biodiversity conservation strategy?

A biodiversity conservation strategy is an important planning and communication tool for the protection of wildlife corridors and biodiversity at large. It is a way to link the results of wildlife connectivity mapping to that of other biodiversity-related projects and work, and to present unified priorities and management action recommendations.

Development of a biodiversity conservation strategy for the Squamish area was recommended during a District of Squamish policy review (South Coast Conservation Program 2015). Since that time, the District of Squamish has developed fundamental datasets to support the assessment of biodiversity and wildlife



corridors, specifically the Environmentally Sensitive Area mapping produced in 2016 (DOS 2023). Wildlife connectivity mapping and work by others (e.g., the prioritization of conservation areas within the Squamish Community Forest and the Biodiversity Assessment being undertaken by Andrew Simon, PhD candidate at University of British Columbia) can build upon the aforementioned datasets to inform the biodiversity conservation strategy. It is recommended that the biodiversity conservation strategy undergo evaluation and revision cycles (e.g., every 5 years) to document changes in biodiversity, habitat, and community values over time, and help ensure that the management action recommendations are current. Revision cycles will also provide an opportunity to incorporate additional projects or initiatives that may be undertaken in the Focus Area. The biodiversity conservation strategy can be envisioned as a canoe (Figure 6) that is powered through the water by multiple paddles: each paddle being a contribution from a project or initiative that improves our understanding of biodiversity conservation priorities. The revision cycles can be seen as the islands that are visited along the way, where new paddlers join the canoe.



Figure 6. The conceptual biodiversity conservation strategy canoe

### 3.5 Examples

There are numerous communities and regions in BC that have a biodiversity conservation strategy or a similar type of strategy. Twelve such examples are listed below by publication date. Two benchmark examples of biodiversity conservation strategies are identified within the list (\*) and described below.

The contents within these strategies varies by community. For example, the *Sunshine Coast Biodiversity Strategy* (Ruby Lake Loon Society 2012) is an example of a relatively simple goal-based strategy, while the benchmark examples described below, including *A Biodiversity Conservation Strategy for the Okanagan Region* (OCCP and SOSCP 2014) and the *City of New Westminister Biodiversity and Natural Areas Strategy* (Diamond Head Consulting 2022) are much more extensive.

- |                               |                                                |
|-------------------------------|------------------------------------------------|
| 1. City of New Westminister*  | (Diamond Head Consulting 2022)                 |
| 2. Cascadia                   | (Cascadia Partnership Forum 2022)              |
| 3. Islands Trust Region       | (Islands Trust Conservancy 2018)               |
| 4. City of Vancouver          | (Vancouver Board of Parks and Recreation 2016) |
| 5. City of Richmond           | (City of Richmond 2015)                        |
| 6. City of Surrey             | (Diamond Head Consulting 2014)                 |
| 7. Okanagan Region*           | (OCCP and SOSCP 2014)                          |
| 8. South Okanagan-Similkameen | (SOSCP 2012)                                   |
| 9. Comox Valley               | (Juniper Environmental Services 2013)          |
| 10. City of Vernon            | (City of Vernon 2013)                          |
| 11. Sunshine Coast            | (Ruby Lake Loon Society 2012)                  |
| 12. Township of Langley       | (Township of Langley 2008)                     |

\*Identified as a benchmark example

#### 3.5.1 Okanagan Region

*A Biodiversity Conservation Strategy for the Okanagan Region* (OCCP and SOSCP 2014; Figure 7) is one of two sub-regional strategies developed for the Okanagan Valley. It was written by the Okanagan Collaborative and the South Okanagan Similkameen Conservation Programs, which jointly represent over 80 partners. This report and the overarching initiative serve as a strong benchmark for a sub-regional biodiversity conservation strategy.

As summarized by the Okanagan Collaborative Conservation Program (OCCP 2023), the strategy is an environmental policy framework that sets priorities for identifying, preserving and restoring important natural areas. The purpose of developing a regional strategy was to create a “big-picture” landscape view of the region that provides a framework for considering conservation options for entire ecosystems and watersheds that go beyond municipal or rural boundaries and include all land tenures.

The strategy identifies...

1. Why we should conserve and restore natural areas,
2. Which natural areas should be protected and restored,
3. Who can contribute,
4. How and when conservation and enhancement of these natural areas can be achieved, and the role of natural areas in protecting regional biodiversity.

The strategy contains...

1. Vision, goals and guiding principles,
2. Analysis of the status of biodiversity in the region,
3. Strategic directions and recommended actions for local and senior governments,
4. Summary of biodiversity key findings for each regional district,
5. List of existing tools and resources for biodiversity conservation, and a
6. List of federal and provincial legislation of significance to biodiversity management.

The strategy includes an analysis of the status of nature which resulted in a series of maps (decision support tool) that answer key questions, as listed below. The key findings from these analyses were summarized for each regional district.

1. Which ecosystems are the most important? (Conservation Rankings Map)
2. Where are the areas of greatest importance for biodiversity? (Relative Biodiversity Map)
3. How are habitats linked to allow wildlife movement? (Habitat Connectivity Map, Figure 8)
4. What is being managed to protect biodiversity and where are there gaps and opportunities? (Land Management Class Map)

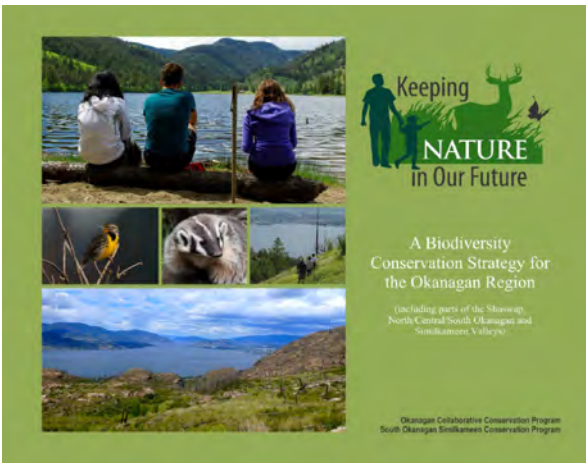


Figure 7. The cover of A Biodiversity Conservation Strategy for the Okanagan Region (OCCP and SOSCP 2014)

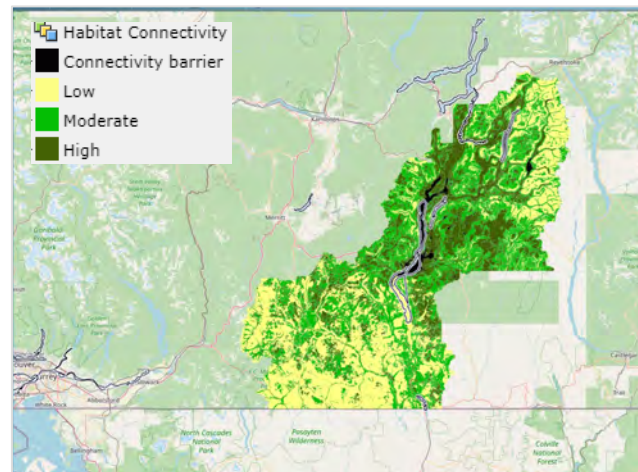


Figure 8. Habitat connectivity mapping for the Okanagan Region (Community Mapping Network 2023)

### 3.5.2 City of New Westminster

The City of New Westminster Biodiversity and Natural Areas Strategy (Diamond Head Consulting 2022; Figure 9) was led by the City and Diamond Head Consulting. The City’s green infrastructure network was developed as an integral part of the strategy. The strategy includes a map of the green infrastructure network (Figure 10), as well as an ecological inventory map and a biodiversity ranking map, and it details the methods used for biodiversity ranking.

The strategy analyses the state of natural areas and biodiversity in the City and provides a suite of recommended actions and guidelines that will help the City to prioritize protection, enhancement, and restoration of natural areas and support the species that live there. It was developed with input from staff from various departments of the City of New Westminster, local First Nations, and the broader community, and includes a summary of engagement. It provides recommendations for operations, planning, and policy that will protect, connect, and restore the existing natural area assets. A consolidation of the recommended actions noted within the strategy are provided in a table. (Diamond Head Consulting 2022)



Figure 9. The cover of the City of New Westminster Biodiversity and Natural Areas Strategy (Diamond Head Consulting 2022).

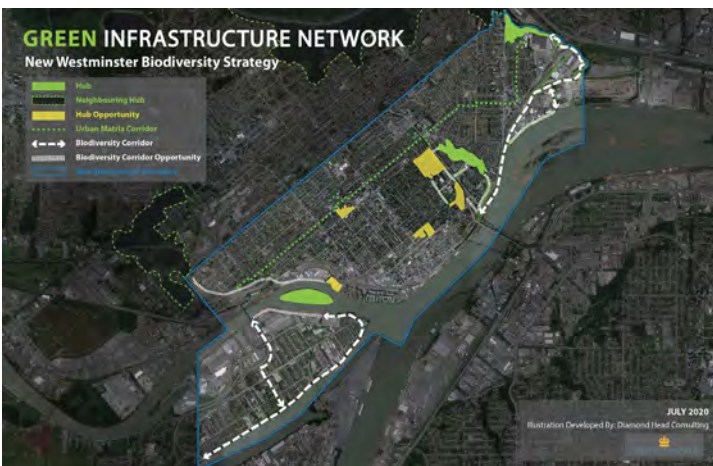


Figure 10. A map of the City of New Westminster’s Green Infrastructure Network (Diamond Head Consulting 2022).

## 4 CONNECTIVITY MODELLING

This section provides a high-level overview of methodological options, focal species selection criteria and examples of other modelling initiatives for the non-technical audience. The companion report (Part 2: Technical Report) provides a deeper dive into modelling and assessment framework methodology and is written for a technical audience (e.g., data modellers, GIS technicians and those with an interest in spatial modelling).

### 4.1 Methodological Options

Several communities in and around BC have identified or are identifying areas important to connectivity. The spatial scope of these projects ranges from local (e.g., within municipal boundaries) to regional (e.g., within regional districts, significant valleys or watersheds) to transboundary (e.g., spanning the US-Canada border). These initiatives use a variety of different methodologies, almost all of which make use of landscape or habitat modelling.

#### 4.1.1 ‘Species-specific’ vs ‘Non-species-specific’ Connectivity

The ‘species-specific’ (functional connectivity) approach to modelling connectivity looks at the ease with which individuals of a certain species or group of species (e.g., amphibians or carnivores) can move through the landscape based on what they need and how they respond to what they encounter. The modelling is then based on expert opinion or empirical data specific to that species, such as GPS locations, behaviour studies and/or genetic information. (Greenaway 2016)

The ‘non-species-specific’ (structural connectivity) approach is a ‘connected-landscape’ approach (a.k.a. multi-species approach, species generalist approach). The focus is on the naturalness of the landscape, where intactness (less human disturbance) is used as a proxy for the potential of species to move through the landscape. It does not consider the behavioural response of specific species to the landscape. This may be desirable if species-specific information is lacking and habitat loss and fragmentation are a major concern. (Greenaway 2016)

#### 4.1.2 Habitat Suitability and Resistance

Connectivity models often incorporate ‘habitat suitability’ and ‘resistance’. Areas of suitable habitat are identified (e.g., core habitat area or patches) and connectivity is measured based on ‘resistance’ or how easy or difficult it is for species to move between these areas. Resistance (a.k.a., landscape impedance) can increase in areas of human development (e.g., crossing roads and fences or avoiding humans, etc.) or due to natural barriers (e.g., rivers, cliffs, dense vegetation, etc.). (Greenaway 2016)

#### 4.1.3 Static vs Dynamic Modelling

Static models use available data to produce a snapshot of conditions at a particular point in time. In some cases, the available data may be several years old or may have been published at various times. This can



result in connectivity maps that may be outdated at the time of publication. These models may be costly or time-consuming to update. Regardless, static modelling practices are well established, may be more affordable, and can provide great insights into environmental conditions.

Dynamic models are designed to allow for regular updates as new data becomes available, such as regularly updated remote sensing data. These methods tend to be more ‘cutting edge’ and may have higher upfront costs. They do, however, allow for regular updates, tracking of and predicting change over time, and adaptive management: important features when dealing with rapidly changing landscapes.

#### 4.1.4 Spatial Analysis Tools

There are several spatial analysis tool options that can be used for wildlife connectivity mapping, depending on the specific needs and objectives of the project. The Conservation Corridor website (Conservation Corridor 2023) provides an extensive summary. Some commonly used software tools for this purpose include:

- **Gnarly Landscape Utilities:** Gnarly Landscape Utilities is an ArcGIS toolbox for connectivity modelling, which includes tools for creating resistance and habitat layers (i.e., Resistance and Habitat Calculator) and core area mapping (i.e., Core Mapper; Circuitscape 2023b). It was developed, in part, to support connectivity analyses by the Washington Wildlife Habitat Connectivity Working Group. It is used primarily for identifying habitat core areas based on available information about overall suitability and landscape features that may limit the movement of species across the landscape (e.g., roads, developed areas, etc.). Habitat core areas identified using the Gnarly landscapes are used as inputs to Linkage Mapper and Circuitscape (described below), which subsequently identify the interstitial network of connectivity pathways linking habitat core areas.
- **Linkage Mapper:** Linkage Mapper is a software tool that uses least-cost corridor analysis, circuit theory, and barrier analysis to map corridors, detect pinch-points and restoration opportunities within them, and identify important core areas and corridors (Circuitscape 2023). It supports regional wildlife habitat connectivity analyses, is comprised of open-source Python scripts that are shared in an ArcGIS toolbox, and consists of six tools: Linkage Pathways, Climate Linkage Mapper, Barrier Mapper, Pinchpoint Mapper, Centrality Mapper and Linkage Priority (Linkage Mapper 2023).
- **Circuitscape:** Circuitscape is a connectivity analysis software package which borrows algorithms from electronic circuit theory to predict patterns of movement, gene flow, and genetic differentiation among plant and animal populations in heterogeneous landscapes. Circuit theory complements least-cost path approaches because it considers effects of all possible pathways across a landscape simultaneously. (Circuitscape 2023a)
- **TerrAdapt:** TerrAdapt is a cloud-based platform that uses the remote sensing and artificial intelligence capabilities of Google Earth Engine to dynamically monitor landscape change, project



future risks and prioritize conservation actions. The platform uses data from as early as 1993 and produces forecasts to 2100. (TerrAdapt 2023a)

- **Conefor:** Conefor is a software package that allows quantifying the importance of habitat areas and links for the maintenance or improvement of connectivity, as well as evaluating the impacts on connectivity of habitat and landscape changes (Conefor 2023).
- **Zonation:** Zonation is a spatial conservation planning software that operates on spatial data about biodiversity features (species, habitats, ecosystem services), costs and threats to conduct data-rich, large-scale, high resolution spatial conservation prioritization (Finnish Environmental Institute 2023).
- **Marxan Connect:** Marxan Connect is an open-source, open-access Graphical User Interface (GUI) tool designed to assist conservation planners with the appropriate use of data on ecological connectivity in protected area network planning (Marxan Connect 2023).

These spatial analysis tools, and many others, can be used to map wildlife connectivity, identify important areas for conservation and connectivity, and inform conservation planning and decision-making.

## 4.2 Focal Species

Wildlife connectivity studies often start by modelling areas of importance for a few (less than 10) species. These species are referred to as 'focal species'. The draft selection criteria for choosing focal species are as follows:

- Focal species are to be terrestrial and/or riparian wildlife species (i.e., species that travel along the ground, as opposed to birds or fish).
- Ideally, focal species are umbrella species, meaning that the protection of habitat for that species indirectly protects the many other species that share the same habitats (the umbrella effect). These species should represent the connectivity needs of a broader assemblage of wildlife, as well as the major vegetation classes across the Focus Area.
- Ideally, focal species represent threats to wildlife connectivity and persistence expected in Focus Areas.
- Focal species can also be species at risk, or species of particular community or Indigenous value.
- Focal species should not be habitat generalists (i.e., should not be so adaptable that they occur regularly in a wide variety of habitat types and conditions).
- Ideally, the focal species cumulatively represent a wide variety of habitats within the study area.

- Focal species should be common enough in the Focus Area to potentially enable statistically significant studies.
- Ideally, there are local knowledge holders and species experts that are willing and available to share their knowledge of the chosen focal species.

Potential focal species for this Project are listed in Table 1. They include medium to large-sized mammals that occur throughout a variety of habitat types within the Focus Area. These species have been the subject of research and, as such, species experts may be available.

The aforementioned online survey asked respondents to help choose a focal species. Black Bear, Grizzly Bear, Cougar, Roosevelt Elk, Wolf, Mountain Goat and Bobcat received the highest rankings, followed by “other” (including Red Fox, amphibians, American Martin, Pacific Water Shrew, Western Toads, Coastal Tailed Frog and weasels), and then Black-tailed Deer, Wolverine, Coyote and Moose. The species in Table 1 are listed in this order.

Table 1. Potential focal species

Common Name	Scientific Name	Presence within Focus Area <sup>1</sup>	Status <sup>2</sup>
Black Bear	<i>Ursus americanus</i>	●	Yellow
Grizzly Bear	<i>Ursus arctos horribilis</i>	● (NW)	Blue 1-SC
Cougar	<i>Puma concolor</i>	●	Yellow
Roosevelt Elk	<i>Cervus canadensis roosevelti</i>	●	Blue
Wolf	<i>Canis lupus</i>	●	Yellow
Mountain Goat	<i>Oreamnos americanus</i>	●	Blue
Bobcat	<i>Lynx rufus</i>	●	Yellow
Black-tailed Deer	<i>Odocoileus hemionus columbianus</i>	●	Yellow
Wolverine	<i>Gulo gulo</i>	●	1-SC
Coyote	<i>Canis latrans</i>	●	Yellow
Moose	<i>Alces alces</i>	●	Yellow
Pacific Fisher	<i>Pekania pennanti</i>	●	No status
Other focal species candidates for consideration: Red Fox, amphibians, American Martin, Pacific Water Shrew, Western Toads, Coastal Tailed Frog, and weasels			

<sup>1</sup> Draft habitat usage based on consultation with select stakeholders. To be refined.

● Obligate or frequent habitat use; ● Common habitat use; ● Occasional or rare habitat use

<sup>2</sup> BC List: Red (at risk), Blue (special concern), Yellow (not at risk)

SARA: 1-SC (listed as Special Concern within Schedule 1 of Canada's *Species at Risk Act*)

## 4.3 Examples

Several local governments and NGOs in and around BC have mapped wildlife corridors as part of their planning and conservation efforts. Some examples are described in the following sections.

### 4.3.1 Yellowstone to Yukon Conservation Initiative

Founded in 1993, the Yellowstone to Yukon (Y2Y) conservation initiative represents one of the earliest examples of how the integration of large-landscape assessment and collaborative transboundary conservation efforts can be effective in enhancing the connectivity and adaptive capacity of wildland habitat within broad regions that are vulnerable to the impacts of both human disturbance and climate change (Chester 2015, Mattson et al. 2011). With a sustained focus on both biodiversity assessment and integrated land governance, the Y2Y initiative has been effective in expanding regional networks of protected areas and enhancing habitat connectivity for vulnerable species and related ecosystem processes across nearly 1.2 million square kilometers of terrestrial and freshwater habitat within the Rocky Mountain regions of Canada and neighbouring regions of the United States (Hebblewhite et al. 2022). Key to the success of these efforts has been the development of large-landscape assessment models that combine field-based observations of wildlife species and their spatial distribution with explanatory variables derived from regional land cover datasets to both identify and evaluate the effectiveness of regional wildlife habitat connectivity networks (Merrill 2005).

### 4.3.2 Cascades to Coast Landscape Collaborative

The Cascades to Coast Landscape Collaborative has worked in partnership with the Washington Wildlife Habitat Connectivity Working Group and Conservation Biology Institute to produce a series of analyses that (1) model habitat connectivity for five focal species (American Beaver, Cougar, Pacific Fisher, Mountain Beaver and Western Gray Squirrel), (2) model structural connectivity (i.e., naturalness connectivity) to describe landscape integrity, and (3) synthesize the habitat connectivity models to identify priority linkages in the region (Cascades to Coast Landscape Collaborative 2023). This work made use of the Centrality Mapper tool in Linkage Mapper, among other methods as detailed in the *Cascades to Coast Analysis* report (Washington Wildlife Habitat Connectivity Working Group 2022). Southwestern Washington Habitat Connectivity Working Group (a regional subset of the state-wide working group) and Conservation Northwest (a Seattle-based NGO) have done extensive species-specific connectivity modelling largely using Linkage Mapper, including the Centrality Mapper and PinchPoint Mapper tools, as well as Gnarly Landscape Utilities and Circuitscape (pers. comm. Brian Stewart, Conservation Northwest, October and November 2022).

### 4.3.3 Cascadia Partner Forum

The Cascadia Partner Forum represents a transboundary coalition of practitioners and researchers working together with natural resource management and conservation organizations to enhance the adaptive capacity of wildlife habitat in the southern Coast Range and surrounding lowland regions of southwest BC and Washington State. Insights gained through a long history of cross-border conservation efforts have

been incorporated into a collaborative ‘Blueprint for a Resilient Cascadia’ – a living document that identifies core strategies and assessment frameworks that will be needed to enhance the adaptive capacities of natural landscapes that are increasingly vulnerable to the combined effects of human disturbance and a warming climate (Cascadia Partner Forum 2022).

TerrAdapt Cascadia is a dynamic landscape modelling framework co-developed by TerrAdapt.org and the Cascadia Partner Forum to increase capabilities for analyzing rapidly changing patterns of wildland habitat within a broad bioregional context, and for identifying adaptive land management strategies that are effective in minimizing the impacts of biodiversity loss at both local and regional scales of land governance. As described above, TerrAdapt is a cloud-based platform that utilizes remote sensing and machine learning capabilities of Google’s Earth Engine to dynamically monitor historical patterns of land cover change and habitat connectivity over time (1990-2023), to project how these patterns are likely to change based on future climate and land use scenarios, and to help prioritize areas for conservation (TerrAdapt 2023b). The analytic platform supports the assessment of habitat integrity and evolving patterns of structural connectivity within broad terrestrial ecosystems, and more detailed patterns of functional connectivity that identify the ecological needs of representative focal species within the Cascadia region (e.g., grizzly bear, wolverine, Canada lynx, Pacific Fisher, and sage-grouse).

#### 4.3.4 Okanagan Collaborative Conservation Program

The Okanagan Collaborative Conservation Program worked with individuals from University of British Columbia (UBC and UBC-Okanagan) and McGill University to further define regional and sub-regional wildlife corridors using Circuitscape (Latimer and Peatt 2014), building upon the GIS mapping developed for *A Biodiversity Conservation Strategy for the Okanagan Region* (OCCP and SOSCP 2014).

#### 4.3.5 Metro Vancouver

The Metro Vancouver Regional District worked with a master’s student at UBC and Diamond Head Consulting to evaluate and model regional ecosystem connectivity for 8 focal species using Conefor and Zonation, as detailed in Metro Vancouver’s *Evaluation of Regional Ecosystem Connectivity* (Diamond Head Consulting 2021). They are now embarking on modelling a green infrastructure network (pers. comm. Josephine Clark, Metro Vancouver, January 12, 2023).

#### 4.3.6 City of Richmond

The City of Richmond modelled an ecological network including hubs, sites and corridors. Vegetation was used as the primary indicator of ecological value. As part of this exercise, they conducted a corridor analysis using a landscape impedance model, and a landscape permeability using Circuitscape, as detailed in *Richmond’s Ecological Network Management Strategy* (City of Richmond 2015).

#### 4.3.7 Other Examples

Similar connectivity modelling initiatives have been undertaken by the City of Surrey, City of New Westminster, Kootenay Connect (Columbia Valley), Kootenay Conservation Program (East and West

Kootenay), Town of Comox, and Township of Langley (specific neighbourhood plans). The City of Vancouver is currently initiating a project to identify a green infrastructure network.

## 5 POLICY + REGULATORY TOOLS

### 5.1 Local Government

#### 5.1.1 Policy + Regulatory Tool Options

This section was written with assistance from Lidstone & Company Barristers & Solicitors through their contributions to Appendix 3. In the context of this report, local government refers to the District of Squamish and the Squamish-Lillooet Regional District.

There are several policy and regulatory tools available to local governments that can be used to protect areas important to wildlife connectivity. These tools can be divided into ‘broad authorities’, including plans, strategies and services, and ‘discrete land use authorities’, as listed below. Of these, regional growth strategies, official community plans, development permit areas and zoning were short-listed as the most relevant and effective tools for protecting wildlife corridors, and development cost charges, density bonus zoning and community amenity contributions were short-listed as useful incentives to encourage the protection of wildlife corridors. Descriptions of local government jurisdictions and the most relevant local government tools is provided in Appendix 3.

#### **Broad Authorities:** Plans, Strategies and Services

- Official community plans, including neighbourhood and local area plans\*
- Regional growth strategies\*
- Sustainability strategies
- Biodiversity conservation strategies
- Regional and municipal park plans
- Greenways plans
- Transportation plans
- Conservation fund services
- Stormwater plans
- Watershed plans
- Sustainable community plans
- Liquid waste management plans
- Water management plans
- Community wildfire protection plans
- Habitat banking



### Discrete Land Use Authorities

- Zoning bylaws\*
  - Conservation zoning
  - Density bonus/amenity zoning\*
  - Community amenity contributions\*
- Development permit areas\*
- Development approval information areas
- Development approval procedures bylaw
- Subdivision and servicing bylaws
  - Approving officer public interest authority
- Tree protection bylaws
- Landscaping bylaws
- Soil deposit and removal bylaws
- Invasive species bylaws
- Development cost charges\*
- Community amenity contributions\*
- Section 219 covenants
- Bare land strata subdivisions to preserve larger remainder parcels for conservation
- Phased development agreements to enforce any development conditions, including potential community amenity contributions
- Highway dedication, reservation, or development as trails

\*Short-listed as key tools and important incentives for the protection of wildlife habitat and wildlife connectivity.

## 5.1.2 Examples

Based on a cursory review of 29 other initiatives in BC, the broad authority and need to identify and protect wildlife corridors are frequently set forth in official community plans and regional growth strategies. The identification of wildlife corridors and related management actions are often detailed within a biodiversity conservation strategy. Wildlife corridor models and biodiversity conservation strategies are then used to inform and strengthen relevant development permit area guidelines and inform the alignment of other policy and regulatory tools, plans and strategies. Natural Environment Development Permit Areas (DPAs) are one of the most effective and well utilized regulatory tools to protect wildlife corridors at the development stage. Some examples from other communities in BC are provided below:

### 5.1.2.1 District of Lake Country (DPA)

The District of Lake Country's Natural Environment DPA Guidelines (District of Lake Country 2018) seek to protect, among other features, an ecological connectivity corridor that connects Okanagan Mountain Provincial Park to Kalamalka Lake Provincial Park, and a number of smaller local ecological corridors identified in the Sensitive Ecosystems Inventory that, if conserved or restored, will contribute to maintaining ecosystem connectivity within the District of Lake Country. The main corridor is 16 km long and 1 km wide. The DPA guidelines are designed to keep the corridor free from structures, regulate fencing, require vegetation screening, require wildlife crossings and habitat offsetting, and require that a minimum width of the corridor be maintained.

#### **5.1.2.2 City of Kelowna (DPA)**

The City of Kelowna's Natural Environment DPA (City of Kelowna 2021) contains guidelines for protection of the Okanagan Ecosystem Connectivity Corridor which is 1 km wide (Figure 11). These guidelines require that connectivity be retained or reconnected through habitat restoration, and stipulate minimum widths for the corridor. They require vegetation buffers between the corridor and built environment, regulate fencing, and stipulate how development sites are to protect the corridor.

#### **5.1.2.3 Town of Comox (DPA)**

The Town of Comox's Development Permit Areas 11 (Wildlife Corridor; Town of Comox 2011, as amended) is designed to protect the natural environment, its ecosystems and biological diversity in relation to the resting and movement of deer. In accordance with these guidelines, no subdivision, alteration of land or fencing is to occur unless the applicant first obtains a development permit.

#### **5.1.2.4 City of Surrey**

The City of Surrey has been identified as a benchmark community with regards to policy development for the protection of their green infrastructure network (GIN; Figure 12). The city has updated their Official Community Plan and Sensitive Ecosystems DPA, and has aligned other bylaws, policies and land use planning tools to work synergistically to support their Biodiversity Conservation Strategy and protect and enhance their GIN. Some examples of Surrey's policy tools are as follows:

**Official Community Plan:** The City of Surrey's Official Community Plan (OCP; City of Surrey 2013, as amended) has an entire policy section dedicated to the GIN, which calls for (1) the development of plans, strategies and policies to protect, enhance and manage the GIN, (2) strategic land acquisition, (3) the employment of conservation tools (e.g., covenants eco-gifting programs, land trusts and incentives) to enhance protection of private lands, and (4) protection of urban forests. It states that municipal infrastructure projects need to align with the Biodiversity Conservation Strategy, which includes the GIN. The OCP supports the City's Urban Forest Management Strategy target of having canopy coverage of 30% across the entire city.

**Development Permit Area:** The City of Surrey's Development Permit Area 3 (Sensitive Ecosystems; City of Surrey 2013, as amended) triggers special reviews and requirements for development applications within 50 metres of the GIN. These guidelines speak to adjusting development plans to buffer around, accommodate and avoid disturbance of the GIN. They also speak to reconnection of fragmented ecosystems and environmental monitoring, and they detail submission requirements for Ecosystem Development Plans and Impact Mitigation Plans.

**Development Cost Charges:** The City of Surrey has implemented a Parkland Development Cost Charge (Bylaw No. 20560, 2022; City of Surrey 2022) which is intended to yield \$16.4 million/year for acquisition of GIN lands. The city identified a need to acquire approximately 1000 acres (405 ha) over a 50-year horizon, with land costs between \$29-32 million/ha. The funds derived from this Development Cost Charge can be used for land acquisition, but not for maintenance or monitoring of the acquired land assets.

**Existing Protections:** The City of Surrey utilizes existing regulatory mechanisms, such as the *Riparian Areas Protection Regulation*, *Water Sustainability Act*, *Park and Urban Dedication bylaws*, *Tree Protection Bylaw* and *Soil Conservation and Protection Bylaw* to assist with protection of the GIN.

**Alignment of Infrastructure and Land Use Plans:** The city also works inter-departmentally to align capital infrastructure plans and land use plans (e.g., *Neighbourhood Concept Plans*) with their *Biodiversity Conservation Strategy* (e.g., installing wildlife-friendly road mitigation in the GIN; pers. comm. Pamela Zevit and Stephen Godwin, May 2022)



Figure 11. Ecosystem Connectivity Corridor map extracted from the City of Kelowna Official Community Plan (City of Kelowna 2021)



Figure 12. Green Infrastructure Network map extracted from the City of Surrey’s Biodiversity Conservation Strategy (Diamond Head Consulting 2014)

### 5.1.3 Existing Local Government Tools

The District of Squamish Official Community Plan (Bylaw 2500, 2017; DOS 2017) and Development Permit Area 1 (DPA 1 – Environmental Protection; DOS 2017), and the SLRD Regional Growth Strategy (Bylaw No. 1562, 2018; SLRD 2018) contain numerous objectives, policies, guidelines and statements that clearly prioritize the establishment and protection of wildlife corridors, as detailed in Appendix 4. These policy tools lay a foundation for this Project. The work proposed by this Project, including connectivity modelling and development of a biodiversity conservation strategy, can be used to develop, strengthen and align development permit areas and other tools to better protect wildlife movement throughout our region.

## 5.2 Senior Government

In Canada and BC, there are several federal and provincial legislations that have significance to biodiversity and habitat conservation. These laws provide legal frameworks for the protection and conservation of biodiversity and habitats by regulating activities that may have an impact on them, such as development, resource extraction, and human activities that may cause harm to wildlife or their habitats. They also provide for the establishment of protected areas, the identification and listing of species at risk, and the development and implementation of recovery plans to conserve and protect species and their habitats.

### 5.2.1 Examples

Examples of relevant federal and provincial legislation are provided below and described in Appendix 5. Collaborative effort between ministries and levels of government is essential.

Relevant and ongoing provincial initiatives also include the establishment of ungulate winter ranges, wildlife habitat areas, wildlife management areas, old growth management areas, parks, conservancies, ecological reserves, riparian areas, motorized area restrictions and wildlands (pers. comm. Dave Southam, District Manager, Sea to Sky, FLNRORD, September 16, 2021). The Skwelwil'em Squamish Estuary Wildlife Management Area, which was established in 2007 and is centrally located within the Focus Area, is an example of a provincial initiative enabled under the *Wildlife Act*. Another example is the management of ungulate winter ranges within the provincial *Forest and Range Practices Act*.

Additional tools available to BC Parks include property acquisition adjacent to parks, and the deliverables from this Project may be used to inform responses to referrals which propose new land uses adjacent to parks.

#### Federal

- *Environmental Assessment Act*
- *Environmental Protection Act*
- *National Parks Act*
- *Wildlife Act*
- *Fisheries Act*
- *Migratory Birds Convention Act*
- *Species at Risk Act*

#### Provincial

- *Agricultural Land Commission Act*
- *Community Charter*
- *Ecological Reserve Act*
- *Environmental Assessment Act*
- *Environment and Land Use Act*
- *Fish Protection Act*
- *Forest Act*
- *Forest and Range Practices Act*
- *Land Act*
- *Local Government Act*
- *Park Act*
- *Protected Areas of British Columbia Act*
- *Riparian Areas Protection Regulation*
- *Water Sustainability Act*
- *Wildlife Act*

### 5.2.1.1 Kootenay Connect

Kootenay Connect is working to identify corridors in the Columbia Valley. Currently, they are primarily relying on provincial conservation tools to protect corridors, such as Wildlife Management Areas, Provincial Conservation Lands, Wildlife Habitat Areas, Wildlife Habitat Features, Ungulate Winter Range under the *Forest and Range Practices Act*, and crown lands with Notations of Interest. (pers. comm., Marcy Mahr, Kootenay Connect Manager, February 2023)

## 5.3 First Nations

Sḵw̓x̓wú7mesh Úxwumixw (Squamish Nation) holds Indigenous Rights & Title in lands and waters within its territory, which are recognized and affirmed under Section 35 of the Constitution Act, 1982, DRIPA within the Province of BC and in the United Nations Declarations on the Rights of Indigenous Peoples (UNDRIP; Sḵw̓x̓wú7mesh Úxwumixw 2023). This includes the Focus Area for this Project.

The Nation has a long-standing and sacred responsibility to the lands and waters of its territory. Sḵw̓x̓wú7mesh Úxwumixw has never signed a treaty with the Crown, or otherwise ceded its lands or rights. As such, the Sḵw̓x̓wú7mesh Úxwumixw Rights & Title department exists to protect, preserve and manage the Nation's rights and title interests, including all of its lands, resources and cultural heritage. (Sḵw̓x̓wú7mesh Úxwumixw 2023)

The Crown has a legal duty to consult the Nation in respect of proposed decisions that have the potential to adversely affect the Nation's rights and title interests. If a proposal is on Crown land, the Crown is legally obligated to consult the Nation. Companies and other non-government entities often undertake their own consultation processes. The Rights & Title Department receives a significant volume of referrals from government and industry regarding these proposed projects, initiatives and decisions on Sḵw̓x̓wú7mesh Úxwumixw territory. A technical team evaluates each referral and engages in consultation using the lenses of archeology, culture and the environment. The technical team provides recommendations and best management practices. If the proposal is on private land, there is no legal obligation for the proponent to oblige by the Nation's recommendations. (Sḵw̓x̓wú7mesh Úxwumixw 2023, pers. comm., Rachel Munger, March 7, 2023)

This Project aims to incorporate Sḵw̓x̓wú7mesh Úxwumixw values and, as such, the proposed connectivity modelling and biodiversity conservation strategy can ideally serve as a decision support tool to inform the Nation's referral process.

The designation of Indigenous Protected and Conserved Areas (IPCA's or Tribal Parks) is another potential tool that First Nations can use to direct the management of wildlife habitat and corridors to align with Indigenous values. IPCA's can take on many forms, but share three main elements. They are Indigenous-led, they represent a long-term commitment to conservation, and they elevate Indigenous rights and responsibilities (Indigenous Circle of Experts 2018). Wah'nah'juss Hilt'h'hooiss (Meares Island) in Clayoquot Sound was declared a Tribal Park in 1984 and remains one of the most well-known and long-standing examples in BC. The Okanagan Collaborative Conservation Program has noted IPCA's as a policy tool to support the protection of wildlife corridors in the Okanagan (pers. comm., Bryn White and Scott Boswell,



Okanagan Collaborative Conservation Program, February 2023). The Ashnola Corridor, as described below, is an example of a corridor being designated as an IPCA.

### 5.3.1 Examples

#### 5.3.1.1 Ashnola Corridor

In April 2022, the Syilx people of the Okanagan Nation and Similkameen Valley announced the designation of the n̓ʔaysnúlaʔx̓w, (Ashnola Corridor; Figure 13) as a new Indigenous Protected and Conserved Area. The Ashnola Corridor stretches from the headwaters of the Ashnola River, to Cathedral Lakes and Paul Creek (Revelstoke Review 2022), just west of Manning Park in southern BC. The purpose of the declaration is to care for the water, land and animals (Global News 2022).

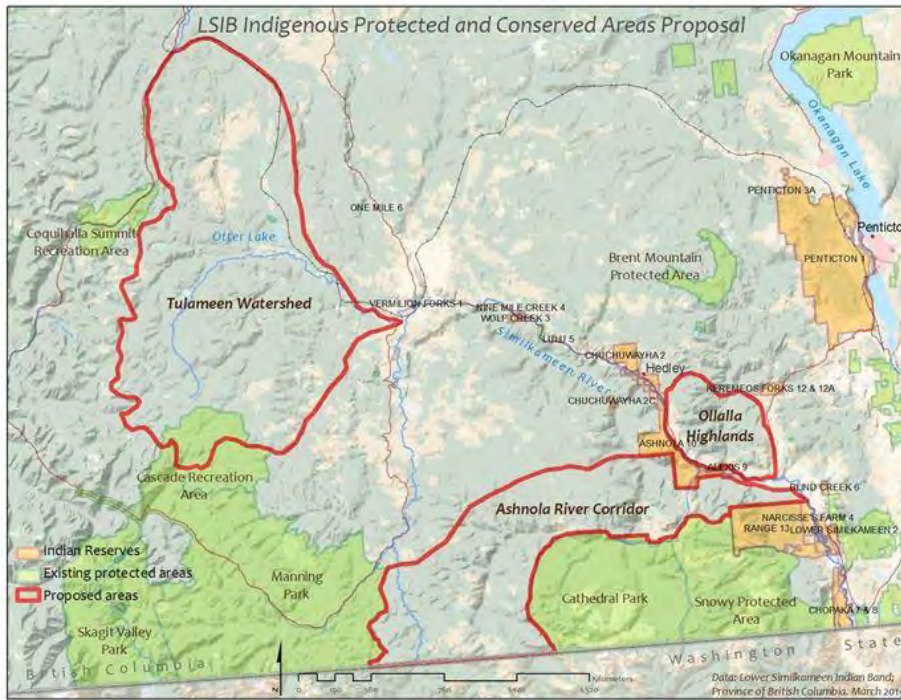


Figure 13. Map of the Ashnola Corridor (InfoNews 2022)

## 6 RECOMMENDATIONS

The recommendations below and proposed project plan (Appendix 1) reflect feedback provided by the Skwxwú7mesh Úxwumixw; local, provincial and federal governments; academic partners and collaborators; environmental NGOs; funding organizations; species experts; consulting firms and neighbouring connectivity initiatives. Based on this feedback, there is clear political and community support for increasing our understanding of wildlife connectivity, identifying wildlife corridors, and developing strategies to better protect biodiversity within the Focus Area. These priorities are also reflected within the SLRD Regional Growth Strategy and District of Squamish Official Community Plan. The following paragraphs summarize recommendations for the Project's next phases.

### General Recommendations:

- **Collaborative and Adaptive:** Through consultation with the aforementioned stakeholders, it has become apparent that the Project must be collaborative and adaptive in order to succeed. As such, the project plan is a living document and should be amended from time to time, allowing the Project to align with the needs and mandates of stakeholders and land managers.
- **Geographic Scope:** The proposed Focus Area includes the northern half of the Atl'ka7tsem/Howe Sound UNESCO Biosphere Region, including the District of Squamish and surrounding areas that are co-managed by the Squamish-Lillooet Regional District and the Skwxwú7mesh Úxwumixw, as shown in Figure 3. The Focus Area spans south to Britannia, north to Daisy Lake, and to the height of land to the west and east. The Focus Area can be refined, as needed, to integrate feedback from the online survey and other stakeholders.
- **Biodiversity Conservation Collaborative:** It is recommended that the Project, including connectivity modelling and development of a biodiversity conservation strategy, be governed by a Biodiversity Conservation Collaborative composed of the core project team, Indigenous knowledge holders, a steering committee, focus species expert groups, technical advisors, academic partners, other biodiversity knowledge holders, and collaborative initiatives.
- **Steering Committee:** It is recommended that a Steering Committee be convened early in the next phase of this Project. Ideally, the Committee will be composed of representatives from land management organizations, along with individuals from the core project team and subject experts. The Committee will serve as a forum to provide advice on the identification and management of wildlife corridors and development of a biodiversity conservation strategy.
- **Alignment with Land Management Organizations:** Under the collective guidance of the Biodiversity Conservation Collaborative, it is recommended that the Project's deliverables be aligned with the mandates and needs of land management organizations with the intent of developing effective decision support tools to guide land use, resource management, and conservation.

- **Project Name:** It is recommended that the Project be renamed to reflect the scope of both the wildlife connectivity modelling component and the broader biodiversity conservation strategy component. Exploring options for a Squamish language name can continue.
- **Indigenous Knowledge:** It is recommended that the core project team continue working with the Sk̓wx̓wú7mesh Úxwumixw to incorporate Indigenous knowledge and values into the Project. This may include development of an Indigenous knowledge survey and mapping tool that can be used to document insights provided by community members, with the assistance of Sk̓wx̓wú7mesh Úxwumixw staff.
- **Engagement:** It is recommended that the core project team continue with information sharing, collaboration with key stakeholders and, where appropriate, public engagement throughout the Project's lifespan. Recommended engagement activities are listed within Section 2.4.5 of this report. It is also recommended that the core project team continue to integrate feedback from the workshop, survey and mapping tool that were hosted during the Scoping Phase and, where appropriate, follow up with those who provided feedback and expressed interest in continuing their involvement with the Project.

#### Connectivity Modelling Recommendations:

- **Dynamic Modelling Capabilities:** It is recommended that a dynamic model be pursued. This may require more upfront time and costs, but will allow for regular updates, tracking of and, possibly, predicting change over time, and adaptive management: important features when dealing with rapidly changing landscapes.
- **Species-specific and Landscape Modelling:** It is recommended that the model include both species-specific and landscape modelling components.
- **Iterative Approach:** An iterative approach will be required in order to incorporate feedback from species experts, stakeholders and land managers.
- **Focal Species:** A list of potential focal species and draft selection criteria is provided herein. It is recommended that the focal species be terrestrial and/or riparian wildlife species (i.e., species that travel along the ground, as opposed to birds or fish). Focal species should be umbrella species, species at risk, or species of particular community or Indigenous value. It is recommended that focal species options be refined through consultation with species experts and technical advisors. In some cases, preliminary models may be required to determine suitability of focal species and data availability.

#### Biodiversity Conservation Strategy Recommendations:

- **The Canoe Analogy:** The biodiversity conservation strategy can be envisioned as a canoe that is powered through the water by multiple paddles: each paddle being a contribution from a project or initiative that improves our understanding of biodiversity conservation priorities.

- **Revision Cycles:** It is recommended that the biodiversity conservation strategy undergo evaluation and revision cycles (e.g., every 5 years) to document changes in biodiversity, habitat, and community values over time, incorporate the results from additional studies, and help ensure that the management action recommendations are current.
- **Content:** It is recommended that the biodiversity conservation strategy (1) integrate community values, (2) identify and prioritize areas of high biodiversity value, including but not limited to wildlife corridors, and (3) outline targeted conservation actions needed to protect biodiversity within the Focus Area, including but not limited to policy tools.
- **Benchmark Examples:** Two benchmark examples of biodiversity conservation strategies are provided herein, including A Biodiversity Conservation Strategy for the Okanagan Region (OCCP and SOSCP 2014) and the City of New Westminster Biodiversity and Natural Areas Strategy (Diamond Head Consulting 2022).

## 7 SIGNATURES

Please do not hesitate to contact the undersigned should you have any questions.

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## Appendix 1: Project Plan

# PROJECT PLAN



March 29, 2023 (draft)

Squamish Environment Society

**NOTE:** Through consultation with stakeholders, it has become apparent that the project must be collaborative and adaptive in order to succeed. As such, the project plan is a living document and should be amended from time to time, allowing the project to align with the needs and mandates of stakeholders and land managers.





	Preliminary Scoping 	Scoping 	Connectivity Modelling + Biodiversity Conservation Strategy	Conservation Tool Development	Ongoing Evaluation
<b>Timing</b>	Sept 2021	2022 – 2023	2023 – 2025	2025 – Onwards	2025 - Onwards
<b>Costs</b>	\$5,000	\$60,000	Approx. \$250,000	Approx. \$80,000	Ongoing
<b>Leadership, Collaboration + Engagement</b>	Identify key stakeholders and make initial contact.	Refine the stakeholder list, develop a project governance framework, and draft a Terms of Reference for the steering committee. Work with the Squamish Nation and local land managers to better understand shared objectives and identify opportunities for collaboration. Develop an online Engagement Portal. Host a survey, interactive mapping tool, virtual workshop, one-on-ones and direct communications with key land management organizations. Update websites and prepare press releases	Refine and buildout the Biodiversity Conservation Collaborative, including formation of the steering committee and focus species expert groups, as available. Continue working with the Squamish Nation to integrate Indigenous knowledge. Update and seek feedback from local land management organization, Councils, Boards and the community, and continue working to align the Project with their needs. Continue with website updates, press releases, surveys and workshops, as appropriate.	Support local governments, First Nations and other land management organizations with public engagement (e.g., IAP2) relating to the development of conservation tools to manage and protect areas important to wildlife connectivity and biodiversity, as appropriate.	Continue to share results (see below) with local governments, First Nations, other land management organizations and the public. Solicit and integrate their feedback. Continue to educate stakeholders and the community on the importance of protecting wildlife corridors and biodiversity.
<b>Wildlife Connectivity Modelling</b>	Cursory review similar initiatives in and around BC to identify methodological options for the identification of wildlife corridors. List and describe relevant existing data sources. Include preliminary considerations regarding geographic limits, target species, and methodological approach.	Detailed review of methodological options for connectivity modelling, including those used by other initiatives in and around BC. Identify and consult benchmark initiatives regarding methods and lessons learned. Refine the geographic scope. Identify possible focal species and draft focal species selection criteria. Develop a preliminary assessment framework that will provide a baseline for the model moving forward. Document lessons learned and make recommendations for connectivity model.	Identify focal species. Make any required revisions to the Focus Area. Develop the assessment framework. Gather required data. Integrate Indigenous knowledge. Model areas important to wildlife connectivity (e.g., habitat core areas, corridors and stepping stones). Use an iterative process to incorporate feedback and integrate existing visions for development and growth (e.g., growth management boundaries, densification areas, etc.). Integrate field verification, as appropriate.	Work with local governments, First Nations and other land management organizations to produce and revise maps to inform decisions and support the development of conservation tools.	Use the model to measure and predict changes over time, and inform adaptive land management. Develop and implement methods to monitor and measure success criteria.
<b>Biodiversity Conservation Strategy</b>	Cursory review municipal and senior government conservation tools, including but not limited to relevant policy and Biodiversity Conservation Strategies. Identify examples of conservation tools being used by similar initiatives in BC.	Detailed review of Biodiversity Conservation Strategies and conservation tools available in BC. Work with a lawyer to describe and shortlist the policy tools that are most applicable to the protection of wildlife corridors. Identify and consult benchmark communities that are using conservation tools to protect wildlife corridors or green infrastructure networks.	Develop a Biodiversity Conservation Strategy that (1) reflects community values, (2) identifies and prioritizes areas of high biodiversity value, including but not limited to wildlife corridors, and (3) outlines targeted conservation actions needed to protect biodiversity within the Focus Area. Work with local governments, First Nations and other land management organizations to develop recommendations for conservation tools that are best suited for the Focus Area.	Support local governments, First Nations and other land management organizations in the development and implementation of conservation tools, including but not limited to policy and regulatory tools.	Undergo evaluation and revision cycles of the Biodiversity Conservation Strategy to document changes in biodiversity, habitat and community values overtime, incorporate the results from additional studies, and ensure that the management action recommendations are current.
<b>Deliverables</b>	Preliminary Scoping Report Preliminary Project Plan	Part 1: Scoping Report Part 2: Technical Report Revised Project Plan	Biodiversity Conservation Strategy Maps of areas important to wildlife connectivity [To serve as decision support tools for land management and as a model for addressing habitat connectivity region-wide.]	Effective conservation tools developed by local land managers, with assistance from the core project team.	Model updates, revisions to the Biodiversity Conservation Strategy that reflect changes over time, public education and adaptive management.

## Appendix 2: Communications + Engagement Log

This appendix presents a summary of the communication and engagement activities implemented during the Scoping Phase (April 1, 2022 to March 31, 2023) of the Squamish Environment Society’s Wildlife Connectivity Project. Activities during this phase were focused on information sharing and seeking feedback on the overall project design, bringing people together to build momentum, and collaboration. Opportunities for engagement were focused on potential collaborators and contributors, although attendance and participation from all stakeholders and community members was and continues to be welcome.

The results from the Information + Collaboration Workshop (February 16, 2023) and the online survey (February 22 to March 8, 2023) are summarised in separate reports. Links to these reports are provided below.

Engagement and communications activities performed during the Scoping Phase are summarized as follows:

#### **Websites**

- ✓ Regular updates to the Squamish Environment Society’s project website
- ✓ Updates to the Howe Sound Biosphere Region Initiative Society’s website, as needed

#### **Factsheets**

- ✓ Developed a Project Overview (1-pager)
- ✓ Developed a Steering Committee (1-pager)

#### **Press Releases**

- ✓ Announced the project overview (July 2022) - BC Nature Magazine
- ✓ Announced project funding (Sept 2022) - The Squamish Reporter, North Shore News, Yahoo Finance and Impac5
- ✓ Announced the project kick-off (September 2022) - Squamish Chief
- ✓ Announced the engagement portal, including survey and mapping tool (Feb 2023) - Squamish Chief

#### **Stakeholder List + Governance Structure**

- ✓ Refined a list of over 150 key stakeholders
- ✓ Refined the Project’s governance structure

#### **Sḵwxwú7mesh Úxwumixw (Squamish Nation)**

- ✓ One-on-One (Nov 2022)
- ✓ Received a letter of support (Nov to Dec 2023)
- ✓ Ongoing communications and meetings (Nov 2022 to March 2023)
- ✓ Local Intergovernmental Meeting (Jan 2023)
- ✓ Information and Collaboration Workshop (Feb 2023)

- ✓ Worked together to develop a plan to incorporate Indigenous knowledge through a custom survey tool (March 2023)
- ✓ Worked together to develop a plan to generate a project name that reflects Sk̓wx̓wú7mesh Úxwumixw values (March 2023)

#### **Local Intergovernmental Meeting**

- ✓ Hosted a 2-hour meeting on January 26, 2023, attended by representatives from the Sk̓wx̓wú7mesh Úxwumixw, District of Squamish and Squamish-Lillooet Regional District, to discuss the project scope and framing, deliverables and outcomes, the focus area, modelling methodologies, governance structure, and engagement.

#### **Information + Collaboration Workshop**

- ✓ A 3-hour virtual workshop on February 16, 2023, attended by nearly 40 individuals representing First Nations, local and provincial governments, academic partners and collaborators, environmental NGOs, funding organizations, species experts, consulting firms and neighbouring connectivity initiatives. The workshop was facilitated and included (1) a project overview, (2) guest speakers from Conservation Northwest, Simon Fraser University and TerrAdapt.org, (3) interactive polls and breakout sessions, (4) a summary of ways to engage and collaborate with the Project, including an introduction to the engagement portal and mapping tool, (5) a recap of the workshop by witnesses. Over 150 stakeholders and key contacts were invited to participate. Video recordings from the workshop are hosted on the [Engagement Portal](#).
- ✓ A summary of the interactive poll results can be found [here](#).

#### **Engagement Portal**

- ✓ Developed an [Engagement Portal](#) using ArcGIS StoryMap to share opportunities to engage and collaborate with the Project. (Feb 2023)
- ✓ Invited approximately 150 stakeholders and key contacts to participate.

#### **Online Survey**

- ✓ Developed and hosted an online survey using ArcGIS Survey123 to encourage sharing of knowledge and values about wildlife habitat. Survey questions invited feedback on the focus area, focal species, shared objectives, use cases, concerns and how respondents would like to be involved with the Project moving forward. (Feb - Mar 2023)
- ✓ Invited approximately 150 stakeholders and key contacts to participate.
- ✓ A summary of the survey results can be found [here](#).

#### **Interactive Mapping Tool**

- ✓ Developed and hosted an interactive [mapping tool](#) to collect information about areas of importance or concern relating to wildlife habitat and connectivity in and around the Focus Area. (Feb 2023 – ongoing)
- ✓ Invited approximately 150 stakeholders and key contacts to participate.

### Steering Committee

- ✓ Drafted a Terms of Reference for the Steering Committee.
- ✓ Secured membership from five individuals across all three local and Indigenous governments.
- ✓ Solicited membership from seven other parties, including various provincial government departments, forestry and agriculture.
- ✓ Convening of the Steering Committee was deferred to the next phase of the Project, in favour of hosting the aforementioned Information + Collaboration Workshop.

### Connecting with other Initiatives in BC

- ✓ Researched and gained insights from 29 similar initiatives in and around BC.
- ✓ Established working relationships with neighbouring initiatives and technical advisors.
- ✓ Took the first steps towards creating a network, including an email list and [crowdsource shared document](#), through which key contributors to connectivity initiatives throughout BC can connect with each other and share information about their project. (Feb 2023 - ongoing)

### One-on-Ones + Direct Communications

- ✓ District of Squamish (Nov 2022 - ongoing)
- ✓ Squamish-Lillooet Regional District (Nov 2022 - ongoing)
- ✓ Sk̓wx̓wú7mesh Úxwumixw (Nov 2022 – ongoing)
- ✓ City of Surrey (Spring 2022 - ongoing)
- ✓ New Westminster (Jan 2023 - ongoing)
- ✓ District of Central Saanich (Jan 2023 – ongoing)
- ✓ Metro Vancouver (Jan 2023 - ongoing)
- ✓ Bowen Islanders (Dec 2022)
- ✓ Kate Andy, SFU (Dec 2022 - ongoing)
- ✓ Andrew Simons, UBC (Apr 2022 - ongoing)
- ✓ Tom Flower, CapU (Dec 2022 - ongoing)
- ✓ Southwestern Washington Habitat Connectivity Working Group and Conservation Northwest (Oct 2022 – ongoing)
- ✓ John Gallo, Conservation Biology Institute (Oct 2022 – ongoing)
- ✓ Greg Kehm, TerrAdapt.org (Dec 2022 – ongoing)
- ✓ Mara Kerry, Parks Canada’s Ecological Corridors Program (Feb 2023)
- ✓ Squamish Community Forest, Chartwell Resource Group Ltd. (Feb 2023 – ongoing)
- ✓ Lidstone & Company Barristers & Solicitors (Jan - Mar 2023)
- ✓ Connor Stefanison, Wildlife Expert (Dec 2022)
- ✓ Michelle McLellan, Grizzly Bear Expert (Jan – Feb 2023)
- ✓ Joe Scott, Grizzly Bear Expert (Jan 2023)
- ✓ Diamond Head Consulting Ltd. (Jan – Feb 2023)
- ✓ Monica Pearson, Ministry of Land, Water and Resource Stewardship (Feb 2023)
- ✓ Mike Badry, Ministry of Environment (Jan 2023)
- ✓ Simon Gravel, Ministry of Environment (Jan 2023)



- ✓ Nicola Bickerton, Ministry of Forests (Jan 2023)
- ✓ Kristina Lensky, Ministry of Forests (Feb 2023)
- ✓ Steve Rochetta, Ministry of Forests (Jan 2023)
- ✓ Alistair McCrone, Ministry of Forests (Jan 2023)
- ✓ Darryl Reynolds, Ministry of Forests (Jan 2023)
- ✓ Cliff Nietvelt, Ministry of Forests (Jan 2023)
- ✓ Leonard Sielecki, BC Ministry Transportation and Infrastructure (Jan 2023)
- ✓ Regan Kohlhardt, BC Parks (Jan 2023)
- ✓ Stephan Bernhard, BC Timber Sales (Jan 2023)
- ✓ Maxime Lepin, Community Forest, Squamish Forestry LP (Feb 2023)
- ✓ Jeffrey Weightman, Ministry of Agriculture & Food (Feb 2023)

## Appendix 3: Local Government Tools

# LIDSTONE & COMPANY

Barristers and Solicitors

## MEMORANDUM

**TO:** Squamish Environment Society  
**FROM:** Janae Enns & Don Lidstone, K.C.  
**DATE:** March 6, 2023  
**RE:** Local Government Tools for Wildlife Corridor Protection  
**FILE:** 20260-101

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## REQUESTED TASK

Lidstone & Company was retained by the Squamish Environment Society to review and summarize policy and regulatory tools that are available to local governments for the protection of wildlife habitat and wildlife corridors. This memo provides an overview of relevant local government jurisdictions and includes a list of relevant policy and regulatory tools. The most important and potentially effective tools have been short listed and described herein.

### I. LIST OF LOCAL GOVERNMENT AUTHORITIES

An overview of relevant policy and regulatory tools available to local governments is as follows:

#### **Broad Authorities: Plans, Strategies & Services**

- Official community plans (Part 14 Division 4 of the LGA)
  - Neighbourhood and local area plans
- Regional growth strategies (Part 13 of the LGA)
- Sustainability strategies
- Biodiversity conservation strategies
- Regional and municipal park plans
- Greenways plans
- Transportation plans
- Conservation fund services
- Stormwater plans

{00872425; 2 }Vancouver Office:  
#1300 - Sun Tower - 128 Pender Street West  
Vancouver, BC V6B 1R8

Calgary Office:  
Bow Valley Square 2, #3300 - 205 5th Avenue, SW  
Calgary, AB T2P 2V7

- Watershed plans
- Sustainable community plans
- Liquid waste management plans
- Water management plans
- Community wildfire protection plans
- Habitat banking

### **Discrete Land Use Authorities**

- Zoning bylaws (Part 14 Division 5 of the LGA)
  - Conservation zoning
  - Density bonus/amenity zoning
  - Community amenity contributions
- Development permit areas (section 488(1) of the LGA)
- Development approval information areas (section 484 of the LGA)
- Development approval procedures bylaw (section 460 of the LGA)
- Subdivision and servicing bylaws (section 506 of the LGA)
  - Approving officer public interest authority
- Tree protection bylaws (section 500 of the LGA & section 8(3)(c) of the *Community Charter*)
- Landscaping bylaws (section 527 of the LGA)
- Soil deposit and removal bylaws (section 327 of the LGA & section 8(3)(m) of the *Community Charter*)
- Invasive species bylaws (section 2(b)(iii) of the *Community Charter Spheres of Concurrent Jurisdiction - Environment and Wildlife Regulation*)
- Development cost charges (section 559(1) of the LGA)
- Community amenity contributions
- Section 219 covenants
- Bare land strata subdivisions to preserve larger remainder parcels for conservation
- Phased development agreements to enforce any development conditions, including potential community amenity contributions
- Highway dedication, reservation, or development as trails

### **Short List of Local Government Authorities**

The following authorities have been short-listed as key tools for the protection of wildlife habitat and wildlife connectivity:

1. Regional Growth Strategy
2. Official Community Plan
3. Development Permit Areas
4. Zoning

The following authorities have been short-listed as important incentives to encourage the protection of wildlife habitat and connectivity:

5. Density Bonus Zoning
6. Community Amenity Contributions
7. Development Cost Charges

## **II. LOCAL GOVERNMENT JURISDICTION OVERVIEW**

As a starting point, municipalities are afforded general jurisdiction under the *Community Charter* to pass bylaws for the protection of the natural environment. However, this jurisdiction is an area of concurrent jurisdiction with the Province. The concurrent jurisdiction recognizes the significant interest in provincially regulating the natural environment and constrains a municipality's ability to regulate in the area. In order for a municipality to pass a bylaw that has an underlying purpose of regulating the natural environment, the bylaw must be authorized under provincial regulation or approved by the Province. Currently, provincial regulation authorizes municipalities to autonomously regulate in some matters relating to waterways, the sale of wild flowers, pesticides, invasive species, dangerous wildlife and plastic waste reduction. Regional districts have a limited scope of regulatory authority and are not empowered to adopt bylaws of concurrent authority in relation to the natural environment.

Despite these constraints, local governments are afforded a wide range of distinct planning and regulatory tools to support environmental objectives. These can range from including high-level policies in Official Community Plans and Regional Growth Strategies, to imposing site-specific development requirements to preserve sensitive ecosystems and wildlife corridors. Some tools stem directly from local government's statutory authority to establish services and regulate land use. Others stem from local government's discretion in approving land use applications and developments within its jurisdiction. The discrete tools described below can be leveraged to protect wildlife habitat and connectivity without engaging the need for provincial authorizations required under the municipal concurrent natural environment jurisdiction.



## **1. Regional Growth Strategy**

A regional district board may adopt a regional growth strategy (“RGS”) under section 429 of the LGA, for the purpose of guiding decisions on growth, change and development within the regional district. A RGS is a long-term collaborative strategy that addresses regional matters over at least a 20-year period. A RGS should work towards protecting environmentally sensitive areas and must include proposed actions in relation to parks and natural areas.<sup>1</sup> Typically, a RGS applies to the entire regional district, including member municipalities and electoral areas. Accordingly, once a RGS is adopted, it becomes binding on the regional district and affected municipalities. All regional district bylaws and services undertaken must be consistent with the RGS.<sup>2</sup>

The initiation of a RGS can also act as a catalyst for environmental consultations with key land managers. The development of a RGS must provide opportunities for early and ongoing consultation with residents; affected local governments; first nations; boards of education, greater boards and improvement district boards; and the provincial and federal governments.<sup>3</sup> The consultations can provide a valuable opportunity to identify shared environmental goals and locate existing wildlife habitats, as supported by ecosystem mapping. A RGS should incorporate environmental objectives and specific action items to support wildlife protection and connectivity at a regional scale. Once adopted, a RGS can commit the regional district and affected municipalities to implement priority actions in support of habitat connectivity.

## **2. Official Community Plans**

Section 472 of the LGA authorizes municipalities and regional districts to adopt an Official Community Plan (“OCP”). An OCP is a visionary set of high-level objectives and policies to guide local government land use decisions and community development. An OCP must also work towards achieving the purposes and goals contained within an adopted RGS.<sup>4</sup> Apart from a RGS, OCPs are the key policy document of any local government, as all bylaws and works undertaken by a local government must be consistent with the OCP.<sup>5</sup> As OCPs set out the overarching vision for the entire community, OCPs may include local area plans or neighbourhood plans that address how subsets of the community will achieve the broad vision, while considering the specific needs of the neighbourhood.

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<sup>1</sup> Section 429(2)(c)(iv) of the LGA.

<sup>2</sup> Section 445(1) of the LGA.

<sup>3</sup> Section 434 of the LGA.

<sup>4</sup> An OCP must include a regional context statement that specifically identifies the relationship between the OCP and the RGS and how the OCP is to be made consistent with the RGS: section 447 of the LGA.

<sup>5</sup> Section 478 of the LGA.

An OCP must include statements and map designations for land use restrictions on lands that are environmentally sensitive.<sup>6</sup> An OCP may also include policies relating to the preservation, protection, restoration and enhancement of the natural environment, its ecosystems and biological diversity.<sup>7</sup> Local governments can designate connectivity corridors and critical habitat areas as environmentally sensitive and restrict development in these areas. OCPs can also incorporate overarching policies to support environmental protection and wildlife connectivity. Such policies may include:

- support for future mapping and research to identify critical habitats and priority corridors;
- maintaining, acquiring, or creating natural corridors of trails, parks and greenways for habitat systems and human activity where appropriate;
- enhancing ecological links between existing natural areas to increase connections between isolated habitats;
- clustering and condensing new development away from environmentally sensitive areas and to reduce sprawled development;
- encouraging greener development and building practices;
- designating development permit areas for the protection of the natural environment;
- promoting environmental stewardship and conservation; and
- encouraging wildlife bridges or tunnels for passing over or through existing human linear developments.

Accordingly, the OCP is one of the starting points to incorporate localized policies to prioritize environmental protection and connectivity.

### **3. Development Permit Areas**

Under section 488(1)(a) of the LGA, an OCP may designate development permit areas (“DPAs”) for the protection of the natural environment, its ecosystems and biological diversity. Natural environment DPAs are one of the most effective regulatory tools to protect wildlife habitat at the development stage. If lands are designated as a natural environment DPA, then the land cannot be subdivided, subject to building construction, or altered without the landowner first obtaining a development permit (“DP”).<sup>8</sup> However, any natural environment DPA designation must be in relation to identifiable geographic features, not significant tracts of land.

An OCP must specify the special conditions or objectives that justify the DPA designation. The OCP must also prescribe guidelines that a local government will apply when deciding whether to grant a DP. Notably, local governments can only issue a DP in accordance with the applicable guidelines.<sup>9</sup> In deciding whether to grant or refuse issuance of a development permit, the local government must apply the

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<sup>6</sup> Section 473(1)(d) of the LGA.

<sup>7</sup> Section 474(1)(d) of the LGA.

<sup>8</sup> Section 489(c) of the LGA.

<sup>9</sup> Section 490(2) of the LGA.

guidelines and cannot act on the basis of extraneous concerns outside the guidelines.<sup>10</sup>

For land within a natural environment DPA, a DP may:

- (a) specify areas of land to remain free from development, except in accordance with any conditions contained in the permit;
- (b) require specified natural features or areas to be preserved, protected, restored or enhanced in accordance with the permit;
- (c) require natural water courses to be dedicated;
- (d) require works to be constructed to preserve, protect, restore or enhance natural water courses or other specified natural features of the environment; and
- (e) require protection measures, including vegetation planting or retention for fish habitat, drainage and erosion control.<sup>11</sup>

The applicable DPA guidelines must be worded carefully to ensure the requirements are sufficient to protect and enhance wildlife habitats. The DPA designation should be supported by ecosystem mapping and apply to all areas identified as existing or anticipated wildlife corridors. Once incorporated into the bylaw, DPAs provide site specific development conditions that can be tailored to wildlife corridor objectives. The guidelines should specifically restrict development in sensitive ecosystems and impose requirements to enhance wildlife connectivity as a condition of development approval. DPs are a regulatory requirement. If an owner fails to comply with a requirement to obtain a DP, or fails to comply with any of the conditions contained within a DP, the local government can pursue bylaw enforcement measures to effect compliance.

#### **4. Zoning**

Section 479 of the LGA gives local governments broad powers to regulate a number of matters through a zoning bylaw. Namely, a zoning bylaw may divide areas into zones, establish the boundaries of the zones and regulate land use, buildings and density within a zone. Zoning bylaws are intended to reduce nuisances between property owners by strategically clustering and maximizing land use by zoning areas for the highest and best use. Local government zoning authority is one of the more proactive regulatory tools available to support wildlife corridors and habitat connectivity. Zoning can identify areas for conservation that include sensitive habitats and desired corridors.

Zoning regulations can restrict development in environmentally sensitive areas by:

- limiting permitted uses;
- prescribing appropriate setbacks from sensitive ecosystems and desired corridors;
- controlling surface and rainwater runoff, by limiting impermeable surfaces and prescribing standards for surface runoff disposal;
- decreasing the permitted density or intensity of land use;

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<sup>10</sup> *0742848 B.C. Ltd. v. Squamish (District)*, 2011 BCSC 747.

<sup>11</sup> Section 491(1) of the LGA.

- creating larger lot sizes to preserve more of the natural environment; and
- directing intensive development in more suitable areas.

## 5. Density Bonus Zoning

Local governments can also incorporate a density bonus scheme in its zoning bylaw to forward habitat preservation and wildlife connectivity goals. The density bonus scheme is set out in section 482 of the LGA. It allows for a zoning bylaw to establish different density rules for a zone and establish conditions that would entitle an owner to a higher density. The conditions can relate to the conservation or provision of amenities. “Amenities” has a broad scope and can include the preservation or enhancement of wildlife habitats, including connectivity corridors. The density bonus authority provides flexibility for local governments to construct the scheme in support of habitat preservation. For example, it can specify conditions to restrict development in environmentally sensitive areas through the provision of restrictive covenants, or it can require works to enhance and support wildlife corridors.

The baseline density and provision of amenities that would entitle a property owner to higher density must be set out in the zoning bylaw. All property owners within a zone must know what conditions may be imposed to allow for the increased density. If the specified conditions are met, then the owner is entitled to the density bonus.

The zoning authority is a matter within municipal councils and regional district board’s discretion and such authority cannot be fettered or constrained. A zoning bylaw can be continually revisited and revised to enhance environmental protections subject to following the prescribed statutory procedures and satisfying procedural fairness requirements.<sup>12</sup>

## 6. Community Amenity Contributions

Wildlife habitat protection and connectivity goals can also be achieved through community amenity contribution (“CAC”) negotiations with land use applicants. It has become a common practice amongst local governments to negotiate and secure voluntary amenities as part of the rezoning process. There is no express legislative authority for local governments to require CACs as a condition for rezoning approval. However, the practice of securing CACs is generally considered part of the discretionary nature in a local government’s power to adopt rezoning applications. Courts have upheld CAC requirements where a developer *volunteers* the amenity in relation to a zoning application. The local government can then consider the provision of an amenity in determining whether the application is ultimately in the public interest.<sup>13</sup>

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<sup>12</sup> A zoning bylaw can be set aside on grounds of breach of procedural fairness for not affording persons affected by the bylaw an opportunity to be heard, even when the zoning bylaw is consistent with the OCP: see *Rocky Point Metalcraft Ltd. v. Cowichan Valley Regional District*, [2012 BCSC 756](#) at paras 109-110.

<sup>13</sup> *Island View Beach Estates Corp v Central Saanich* [1999] BCJ No 1762 (BCSC).

Local governments can develop a CAC policy that provides a consistent framework to guide negotiations with developers and rezoning applicants. CAC guiding policies can incorporate habitat preservation and connectivity goals to support future negotiations with land use applicants and CAC acquisitions. CACs can also be validly imposed as a condition of amenity zoning or a phased development agreement.

## **7. Development Cost Charges**

Development cost charges (“DCCs”) are another authority that can be exercised in support of habitat protection and wildlife corridors. Under section 559(1) of the LGA, a local government can adopt a DCC bylaw and impose DCCs on every person who obtains subdivision approval or obtains a building permit authorizing construction. DCCs may be imposed to assist a local government in paying capital costs of providing and improving park land.<sup>14</sup> Such capital costs specifically include costs of acquiring or reclaiming land as park land. An owner can satisfy all or part of a DCC park acquisition charge by transferring part of the lands to the local government for park purposes.

Section 563(2) of the LGA authorizes a local government to waive or reduce a DCC for developments that are designed to result in a low environmental impact. Local governments can prescribe DCC waiver or reductions for eligible developments that support wildlife connectivity efforts. The DCC waiver or reduction bylaw must establish what constitutes an eligible development, the amount or rates of charge reductions, and may establish the requirements and conditions that must be met to obtain the waiver or reduction.<sup>15</sup> Additionally, all DCC bylaws or amendments require approval by the Inspector of Municipalities.

## **8. Section 219 Covenants**

Restrictive covenants are often an appropriate tool available to local governments to regulate and restrict development near sensitive ecosystems. Section 219 of the *Land Title Act* authorizes a local government to register a covenant on title of a property that imposes a positive or negative obligation on a property owner in respect of:

- the use of land;
- the use of a building;
- subdivision;
- sale or separate transfer of designated parcels of land; or
- that land or a specified amenity be protected, preserved, conserved, maintained, enhanced, restored or kept in its natural or existing state in accordance with the covenant.

The phrase “in respect of” is very broad and can encompass a wide range of provisions, so long as they are in some way functionally connected to the matters contemplated above. Section 219 covenants are frequently granted to local governments as part of the development process for conservation purposes. A

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<sup>14</sup> Section 559(2)(b) of the LGA.

<sup>15</sup> Section 563(3) of the LGA.



requirement for a section 219 covenant for developments in environmentally sensitive areas can be specified in OCPs, including DPA guidelines, and zoning bylaws. Local governments sometimes have express legislative authority to require a section 219 covenant.<sup>16</sup> In other situations, there may not be express authority to require a section 219 covenant, however, local governments can often request one as part of its discretionary development approval processes. Ultimately, a section 219 covenant is a voluntary agreement between the local government and a property owner, which terms can be tailored to the development and site characteristics to achieve environmental objectives. Often covenants are granted in favour of a local government and a conservation authority, to ensure the covenant is not discharged by a future local government on immediate parochial grounds.

## 9. Conservation Fund Services

Several local governments have established a form of conservation service where they dedicate and direct funds to supporting environmental initiatives. The *Community Charter* provides municipal councils with broad authority to create services and impose fees to cover the costs of providing those services by bylaw. Section 8 of the *Community Charter* provides a municipality may provide any service that the council considers necessary or desirable, and may do this directly or through another public authority or another person or organization. Section 194 provides council may, by bylaw, impose a fee payable in respect of all or part of a municipal service. Regional districts can also establish a conservation service; however, the process is a bit more complicated. Analogous authorities are provided to regional districts under s. 332 and 397 of the LGA, where regional districts can establish necessary services for all or part of the region and impose fees for services. However, before the regional district service bylaw takes effect, it must receive approval from the provincial Inspector of Municipalities and must receive approval from the electors in the participating service area in accordance with section 342 of the LGA.

For example, the Regional District of Central Kootenay established the [Local Conservation Fund Service](#) after eligible voters opted to create the service.

## 10. Landscaping Bylaw

Section 527(1) of the LGA grants local governments authority to adopt a landscaping bylaw to regulate landscaping for preserving, protecting, restoring and enhancing the natural environment. A landscaping bylaw can set different requirements, standards and regulations for different zones, different uses within a zone and different locations within a zone.<sup>17</sup>

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<sup>16</sup> For example, a section 219 covenant can be required under section 56(5) of the *Community Charter* prior to issuing a building permit for lands that are likely to be subject to flooding, mud flows, debris flows, debris torrents, erosion, land slip, rockfalls, subsidence or avalanche.

<sup>17</sup> Section 527(1) of the LGA.

A landscaping bylaw can tailor its requirements to specific development activities. It can also supplement natural environment DPA guidelines to prescribe more comprehensive landscaping requirements to support wildlife corridors. However, if substantial landscaping guidelines are provided for in applicable DPAs, a standalone landscaping bylaw could be redundant.

## **11. Tree Protection Bylaw**

Tree bylaws are another regulatory tool that can be leveraged for nature conservation efforts. Section 8(3)(c) of the *Community Charter* grants municipalities jurisdiction to adopt tree bylaws that regulate, prohibit and impose requirements with respect to tree cutting. Many municipalities have adopted tree protection bylaws that require property owners to apply for a tree cutting permit in accordance with the conditions specified in the bylaw. Often tree bylaws will require owners to engage a qualified professional and plant replacement trees as a condition of the permit. In contrast, regional districts are not afforded broad tree regulation powers and can only regulate tree cutting in areas subject to natural hazards.<sup>18</sup> Regional district tree protection powers are limited. Approving officers can impose conditions in preliminary layout approval or preliminary layout review processes and in the public interest.

## **12. Subdivision and Servicing Bylaw**

Section 506 of the LGA provides authority for a local government to adopt a bylaw to regulate and require the provision of works and services as a condition of subdivision approval. A subdivision and servicing bylaw can prescribe the standards for highways, sidewalks and boulevards within a proposed subdivision. It can also require a subdivision applicant to provide a drainage system that meets the standards established in the bylaw. An approving officer has no discretion to approve an application for subdivision if it does not comply with all the applicable land use and subdivision bylaws.<sup>19</sup> An approving officer is also granted jurisdiction to refuse a subdivision application if it is against the public interest, which can engage environmental considerations.

Local governments can consider adopting subdivision regulations to establish more stringent requirements to further support habitat connectivity and preservation. For example, rainwater management designs can be incorporated as drainage standards set out as servicing standards in the bylaw. Any servicing requirements must be established by bylaw to provide developers with clear standards of any works or services that may be required. Alternatively, works and services that extend beyond what is currently established by bylaw, can be negotiated voluntarily for consideration of discretionary land use approvals.

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<sup>18</sup> Section 500 of the LGA.

<sup>19</sup> Section 87(b) of the *Land Title Act*; *Seaview Land Estates v South*, 1981 CanLII 439 (BCCA).

### **13. Park Dedication**

Parkland dedications offers an additional level of protection to ensure the continued protection of wildlife habitat and corridors. Under s. 30 of the *Community Charter*, a municipality or regional district can reserve or dedicate government owned property as a park by a bylaw adopted by an affirmative vote of at least 2/3 of elected officials. Once a park dedication bylaw is adopted, all works that may affect the property must be consistent with the purpose for which the property was reserved or dedicated. Local governments may wish to dedicate acquired areas as park for purposes of wildlife connectivity to ensure all future works go towards achieving this purpose.

### **14. Limit on Compensation (Side Bar)**

Generally, landowners are not entitled to compensation for a loss experienced from the exercise of local government's land use powers. Section 458(1) of the LGA specifically provides that compensation is not payable to any person for any reduction in land, or for any loss, resulting from the adoption of an OCP, zoning bylaw, issuance of a land use permit, and land use bylaws adopted under Division 13 of the LGA, which include runoff control requirements, landscaping and flood plain requirements, amongst others. Courts have consistently upheld this provision and recognized that it insulates local governments from liability for the impact of rezoning bylaws, including those which have the effect of downzoning properties.

The immunity afforded under s. 458(1) has limits. The limit on compensation does not apply to bylaws that restrict land solely to public use, which can also amount to a constructive taking.<sup>20</sup> Also, local governments must always exercise its authority in a reasonable manner and base its decisions on proper motives in the public interest. There are also nuances to this general immunity, where property owners may seek equitable remedies if the local government is receiving some form of benefit from its decision to downzone.

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<sup>20</sup> Section 458(2) of the LGA; *Annapolis Group Inc. v Halifax Regional Municipality*, 2022 SCC 36.

## Appendix 4: Existing DOS + SLRD Tools

This appendix provides a summary of existing policy and regulatory tools held by the District of Squamish and Squamish-Lillooet Regional District that have relevance to wildlife corridors.

## **DISTRICT OF SQUAMISH**

The District of Squamish Official Community Plan (Bylaw 2500, 2017; DOS 2017) and Development Permit Area 1 (DPA 1 – Environmental Protection; DOS 2017) contain numerous objectives, policies and guidelines that clearly prioritize the establishment and protection of wildlife corridors and demonstrate the importance of this topic to staff, council and residents. (Table 1).

Currently, under DPA 1, wildlife corridors are identified on a project-by-project basis as part of a Site Bio-inventory report which is required for land development projects or, less commonly, sub area plans that are proposed within DPA 1. Habitat connectivity is inherently a larger-scale issue which makes it challenging to identify corridors on a project-by-project basis, resulting in a lack of protection.

The District of Squamish also has a Growth Management Boundary and associated policies in which wildlife corridors could be integrated, and several zoning classifications that support conservation initiatives (Table 2).

The District does not yet have a Biodiversity Conservation Strategy (BCS), although development of one was recommended in a municipal policy review conducted for the District (South Coast Conservation Program 2015).

These tools, specifically the Growth Management Boundary and DPA 1, could be strengthened to support protection of wildlife corridors. For example, DPA 1 could be strengthened by including a map of wildlife corridors, ranking these areas as *high* Environmentally Sensitive Areas, and developing prescriptive guidelines that define allowed land uses and mitigation measures in and around corridors. These additions could be integrated into DPA 1 as an amendment (at any time) or as part of an OCP rewrite which occurs once every 5 to 10 years, as needed. The last OCP rewrites were in 2009 and 2017.

The connectivity modelling proposed within this Project, once developed, can ideally be used as a decision support tool to inform Site Bio-inventories and the assessment of wildlife corridors by Qualified Environmental Professionals at the project level.



Table 1. Relevant objectives, policies and guidelines within the District of Squamish Official Community Plan and Development Permit Area 1.

<b>PART 3: OBJECTIVES &amp; POLICIES</b>	
<b>Section 9: Sub Area Planning</b>	
Policy 9.4(d)(vii)	Sub area plans are to include an inventory of environmentally sensitive areas and wildlife habitats, and identification of significant, contiguous areas for protection and restoration, based on an environmental impact assessment of proposed future development.
<b>Section 10: Natural Environment</b>	
Objective 10.1(b)	Preserve watershed health and ecosystem network connectivity through integrated watershed management.
Policy 10.2(b)	Protect areas with significant ecological and habitat values, including sensitive ecosystems and important wildlife corridors.
Objective 10.3(b)	Minimize habitat loss and fragmentation of environmentally sensitive areas.
Objective 10.3(c)	Rehabilitate and enhance previously degraded or fragmented natural areas.
Policy 10.4(f)	Wherever possible, link sensitive areas such as aquatic habitats to parks, greenways, or other natural areas to strengthen the natural areas network.
Policy 10.6(c)	For land use planning and development of future sub area plans and Future Residential Neighbourhoods (Schedule B), environmental assessments must consider the context of larger habitat systems as part of the District’s natural areas network. Area planning and impact assessments should identify strategies for protecting environmentally sensitive areas, their living resources and the connections between them.
Objective 10.13(a)	Establish, maintain, and enhance natural habitat connectivity and greenway corridors for wildlife movement.
Policy 10.14 (a)	Work with all levels of government, First Nations and the community to define and establish wildlife habitats and corridors.
Policy 10.14 (b)	Protect wildlife habitats and corridors during land use planning and development, and pursue opportunities to restore fragmented ecosystems and reconnect isolated species or populations.
Policy 10.14 (d)	Undertake necessary companion updates to the Wildlife Attractant Bylaw, zoning, building, solid waste, and other municipal bylaws to reflect best management practices for preventing human-wildlife conflicts.
<b>PART 5: DEVELOPMENT PERMIT AREAS</b>	
<b>Section 34: Development Permit Area 1 (Environmental Protection)</b>	
<b>Section 34.3: Objectives and Justification</b>	
Section 34.3(a)(iv)	Support the movement of various species by connecting ecosystems through undisturbed open space corridors;
<b>Section 34.5: General Guidelines</b>	
Section 34.5(a)	Applications for development (unless exempted under DPA1) shall be accompanied by a Site Bio-Inventory prepared by a QEP. The Bio-Inventory shall be carried out in accordance with the District’s approved terms of reference (TOR) to establish the suitability of the land for development and specify protection measures and any required mitigation, compensation, restoration or enhancement measures.
<b>Section 34.6: Terrestrial Guidelines</b>	
Section 34.6(e)	Maintain connectivity and linkages with adjacent sensitive ecosystems and other habitat areas through the use of corridors and greenways to minimize fragmentation.
Section 34.6(f)	Design wildlife crossings wherever protected wildlife corridors are interrupted by roadways, as determined by the environmental assessment.

Table 2. District of Squamish zoning classifications that support conservation initiatives.

DISTRICT OF SQUAMISH ZONING BYLAW (No. 2200, 2011; consolidated October 2022)	
CD-58	Comprehensive Development Zone 58 (CD-58) is intended to accommodate educational and habitat conservation uses and the promotion of environmental stewardship activities within the rural portion of the municipality.
P-4	Ecological Reserve (P-4) is intended to protect and enhance land and water areas with high ecological value and to provide limited public access and use.
CD-83	Comprehensive Development Zone 83 (CD-83) is designated as an environmentally sensitive area.
P-3	Park, Recreation, and Institutional Use (P-3) is intended to accommodate the use of public land to serve the educational, park and recreational needs of the District.
P-6	Groundwater Protection (P-6) is intended for the long term protection of the community water system.

## SQUAMISH-LILLOOET REGIONAL DISTRICT

The SLRD Regional Growth Strategy (Bylaw No. 1562, 2018; SLRD 2018) lists wildlife habitat fragmentation as a concern to the region’s residents. The bylaw states that natural ecosystem functioning will be protected by “*promoting connectivity through landscape level planning and maintaining and creating wildlife corridors*”. The bylaw includes a strategic direction, agreed upon by the SLRD and member municipalities, to “*support the creation (and management) of an inter-connected network of regional green spaces / corridors to serve as recreation and wildlife corridors, growth boundaries and wildfire interface areas*”.

The SLRD Planning and Development Services Department is responsible for the Official Community Plan bylaws for Electoral Areas A, B, C and D (Figure A). The Focus Area for this Project is situated within Electoral Area D. As detailed within the District of Squamish section above, maps of wildlife corridors and associated guidelines could be integrated into the SLRD’s OCPs. The current OCP for Electoral Area D (surrounding the District of Squamish) was enacted in 2013.



Figure A. Map of the Squamish-Lillooet Regional District, showing municipalities and SLRD Electoral Areas A, B, C and D.

The Electoral Area D Zoning Bylaw includes two zoning classifications that may align with conservation initiatives (Table 3). Additional zones could be developed.

Table 3. SLRD Electoral Area D zoning classifications that may align with conservation initiatives.

<b>DISTRICT OF SQUAMISH ZONING BYLAW (No. 2200, 2011; consolidated October 2022)</b>	
PS1	Park Space 1 (PS1) is intended to provide for the location and development of parks and open spaces and accessory facilities for park uses within Electoral Area D.
CWP	Community Watershed Protection Zone (CWP) is intended to recognize the Community Watershed Protection designation in the Electoral Area D Official Community Plan Bylaw No. 1135-2013 as created under the BC Forest and Ranges Practices Act.

## Appendix 5: Senior Government Legislation

This appendix contains excerpts, with minor amendments, from A Biodiversity Conservation Strategy for the Okanagan Region (OCCP and SOSCP 2014)

In Canada and BC, there are several federal and provincial legislations that have significance to biodiversity and habitat conservation, as described below.

## **FEDERAL LEGISLATION**

**Canadian Environmental Assessment Act** - provides a legislated requirement to review environmental impacts of major projects. Environmental assessments focus on potential adverse environment effects within federal jurisdiction including: fish and fish habitat, other aquatic species, migratory birds, federal lands, effects that cross provincial or international boundaries, effects that impact on Aboriginal peoples such as their use of lands and resources for traditional purposes, and changes to the environment directly linked to federal decisions about a project. Environmental assessments consider various factors including cumulative effects, mitigation and comments from the public.

**Canadian Environmental Protection Act** - an amalgam of several acts concerning environmental standards, protection and penalties for violation. It deals primarily with regulation of pollution.

**Canada National Parks Act** - maintains and restores the ecological integrity of Canada's national parks.

**Canada Wildlife Act** - allows for the designation of National Wildlife Areas (lands set aside for conservation purposes), and directs federal government wildlife research and education activities.

**Fisheries Act** – recently revised to focus on protection for the productivity of recreational, commercial and Aboriginal fisheries.

**Migratory Birds Convention Act** - regulates the hunting and use of migratory birds, as well as disturbance to bird nests, eggs, and shelters.

**Species at Risk Act** - seeks to prevent wildlife species in Canada from disappearing; to provide for the recovery of wildlife species that are extirpated, endangered or threatened by human activity; and to manage to avoid wildlife species of special concern from becoming endangered or threatened.

## PROVINCIAL LEGISLATION

**Agricultural Land Commission Act** - sets the legislative framework for the establishment and administration of the Provincial agricultural land reserve program. Establishes the Provincial Agricultural Land Commission and gives it the mandate to: preserve agricultural land; encourage farming on agricultural land in collaboration with other communities of interest; and encourages local governments, First Nations, the government and its agents to accommodate farm use of agricultural land and uses compatible with agriculture in their plans, bylaws and policies.

Agricultural interests are generally well protected under the provincial Agricultural Land Commission Act (ALCA). Within the Agricultural Land Reserve (ALR), agricultural uses take precedence over other values, including ecological values. Furthermore, the Farm Practices Protection (Right To Farm) Act gives preferential treatment to carry out farming practices in the ALR. In most cases, the Agriculture Land Commission does not support or approve conservation covenants on ALR land, even if the landowner is willing, if it is perceived to limit future agricultural uses. Although there is some federal and provincial legislation in place to protect ecological values on agricultural land, implementation, compliance and enforcement mechanisms are relatively ineffective.

At the local government level, land use bylaws must be consistent with the ALCA and its regulations. This limits local government jurisdiction over farmland. For example, environmentally sensitive development permit areas do not have the same capacity to influence land use on ALR lands as they do elsewhere.

**Community Charter** - provides all municipalities with a framework for their core areas of authority, including broad powers; taxation; financial management; procedures; and bylaw enforcement.

**Ecological Reserve Act** - the purpose of this Act is to reserve Crown land for ecological purposes, including; areas suitable for natural environment scientific research and educational purposes; representative examples of natural ecosystems; areas of ecosystems that have been modified by human beings and offer an opportunity to study the recovery of the natural ecosystem; areas that include rare or endangered native plants and animals in their natural habitat; and areas that contain unique and rare examples of botanical, zoological or geological phenomena.

**Environmental Assessment Act** - similar to the CEAA, triggered by major provincial projects. BC and Canada work together to minimize duplication of assessments and harmonize efforts where possible.

**Environment and Land Use Act** - a broad piece of legislation which empowers a Land Use Committee of Cabinet to ensure that all aspects of the preservation and maintenance of the natural environment are fully considered in the administration of land use and resource development. Orders can be made respecting the environment or land use. Protected area designations under the Environment and Land Use Act are by order in council and management direction for protected areas is provided by any special conditions included in the establishing order in council and specified provisions of the Park Act and Park, Conservancy and Recreation Area Regulation as identified in the order in council.



**Fish Protection Act** - includes a number of important provisions that prohibit dams, designate sensitive streams and limit Water Act approvals and licenses on sensitive streams, allow development of legally binding recovery plans for sensitive streams, and allow the province to require local governments take actions to protect fish habitat.

**Forest Act** – one of two main pieces of legislation that govern logging on BC’s publicly owned forest lands (the other being the Forest and Range Practices Act). Primary focus is determining the rate of logging, granting tenure rights to Crown (public) timber and rules for administration of tenures, designating forest land for administrative purposes, and establishing rules for logging business.

**Forest and Range Practices Act** - regulates the practice requirements for the logging and ranching industries. Incorporates both planning requirements and on-the-ground practices requirements.

**Land Act** - main legislation governing the disposition of provincial Crown (i.e., public) land in BC. Crown land is any land owned by the province, including land that is covered by water, such as the foreshore and the beds of lakes, rivers and streams.

**Local Government Act** - delegates extensive powers to regulate private land use activities to local governments. Local governments may adopt Regional Growth Strategies and Official Community Plans, tools that direct urban development.

**Park Act** – main legislation governing protected areas in BC. It provides for the designation and administration of provincial parks, recreation areas, and nature conservancy areas.

**Protected Areas of British Columbia Act** - establishes class A parks, ecological reserves and conservancies whose management and development are constrained by the Park Act.

**Riparian Areas Protection Regulation** - A tool under the Fish Protection Act that requires local governments to approve land use activities affecting riparian areas only after an environmental assessment is done, during the development approvals process. Developers must retain a Qualified Environmental Professional (QEP) to assess the potential for impacts to riparian areas, with a focus on fish and fish habitat. The federal Fisheries Act would cover in-stream activities.

**Water Sustainability Act** - regulates water use, requiring licenses to access surface waters. As critical limits on the ability of watersheds to meet water demands are reached, this act must be used to negotiate the allocation of those limited water flows.

**Wildlife Act** - Allows for the creation of Wildlife Management Areas (WMAs), such as the Skwelwil'em Squamish Estuary Wildlife Management Area. WMAs are designated for the protection of wildlife habitat while allowing certain types of human activities, on lands held by the provincial government directly or through lease. WMAs are considered a tool to protect wildlife when other protection measures are considered too restrictive on the existing land uses (e.g., forestry, grazing, recreation, agriculture) in the area. At this time, the Wildlife Act provides almost no protection of habitat for species. Although there is enabling legislation to act on Species at Risk, little has been done with it.