

Ecological Corridor Overlay

Recommendations for Implementation in Rural Municipalities

**Ecological Corridor Overlay:
Recommendations for Implementation in
Rural Municipalities**

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Executive Summary

While there is strong science behind the need to maintain ecological connectivity, few tools exist to help municipalities balance the need for economic growth with the protection of ecological connectivity. Even in municipalities where ecological corridors have been delineated and recognized in policy, implementing their protection is difficult. We have explored the feasibility of an ecological corridor overlay to be used in rural municipal planning as one strategy to address this issue.

For this ecological corridor feasibility study, we reviewed existing overlays currently used in rural municipal planning and held a workshop with rural municipal planning staff to gather input on an ecological corridor overlay purpose as well as barriers and solutions to implementation. This document presents a general ecological corridor overlay purpose and the Wildlife Movement Tool to show how a proposed development may impact the ecological corridor. This would enable municipal planners to adapt this sample overlay policy should the opportunity arise to implement in their community.

We provide the following activities recommended for municipalities interested in protecting ecological connectivity and implementing an ecological corridor overlay:

- Delineate ecological corridors within the municipality.
- Promote awareness of the importance of ecological connectivity to build council, municipal staff, and community support.
- Recognize ecological connectivity in necessary municipal policy.
- Adopt an amendment to the Land Use Bylaw that describes the ecological corridor overlay.

Finally, we present a case study in the Municipality of Crowsnest Pass, which has delineated its ecological corridors and recognized wildlife linkages in their Municipal Development Plan. The case study highlights a conceptual development proposal that lands within the ecological corridor overlay, thus triggering the use of the Wildlife Movement Tool, results of which would be reviewed by municipal planning staff.

Introduction

Ecological connectivity is the unimpeded movement of plant and wildlife species and the flow of natural processes that sustain life on earth. It is a key strategy to protecting plant and wildlife species, maintaining viable ecosystems and wildlife populations, and promoting climate change adaptation. For instance, protecting wildlife movement allows the fulfillment biological processes (i.e., mating, dispersal, migration, gene flow), and provides the ability for wildlife to redistribute in response to disturbances and climate change (IUCN, 2020; Zeller, et al., 2018).

Ecological corridors, also referred to as wildlife corridors, are the primary tool to achieve ecological connectivity, and consist of a clearly defined geographical space that is governed and managed over the

long term, such as managing an ecological corridor to maintain or restore wildlife movement (IUCN, 2020).

There is strong science behind the need to maintain ecological connectivity for both wildlife and human well-being, however, it can be difficult for municipalities to implement even in areas where ecological corridors have been delineated. Guidance on how municipalities can encourage growth to occur in a way that can facilitate connectivity is needed.

This report discusses how an ecological corridor overlay district (EC overlay) can address this issue in rural municipalities. We provide sample language for an overlay, as well as the option of utilizing a tool, such as the Wildlife Movement Tool, to calculate the risks a proposed development would have on ecological connectivity. For this purpose, we demonstrate the use of the Wildlife Movement Tool in the Crowsnest Pass, as the Western Highway 3 Ecological Corridor has been delineated for this area, and the Wildlife Movement tool was developed using the delineated corridor map. This tool could be adapted for other rural municipalities with a delineated ecological corridor.

Overlay district in land use planning

An overlay district is a planning tool that creates a set of criteria and/or special information requirements that is applied to land use applications where the overlay exists. Every parcel of land is subject to a land use district (zoning) – an overlay district sits atop the base zoning, supplementing the rules of the underlying zoning. Overlays are typically used for specific geographic situations like flood plains and downtown areas. An EC overlay would be the boundary of the mapped ecological corridors.

Methodology

The EC overlay feasibility study for rural municipalities was completed by the Miistakis Institute and the Oldman River Regional Services Commission (ORRSC), with the intent that it could provide language and direction to rural municipalities should the opportunity to arise to implement. To complete this study, we reviewed overlay districts that are currently in use and engaged with representatives from rural municipalities during a workshop. The Wildlife Movement Tool (previously referred to as the Connectivity Risk Assessment tool) was developed as an educational tool for the Crowsnest Pass, under guidance from an advisory committee consisting of experts in the field of ecological connectivity and municipal and provincial planning. The tool is currently being expanded to Pincher Creek and is expandable to other areas with consultation.

Workshop with municipal representatives

Miistakis and ORRSC held a workshop to engage municipal planners in ecological connectivity and the overlay concept. The workshop gathered the input needed to create generic EC overlay language and build an understanding of the steps required for implementation. The workshop objectives were to:

- Workshop the concept of an EC overlay through discussing the purpose, special information requirements and approvals process;
- Identify barriers and solutions to implementation; and
- Discuss the case study concept for the Western Highway 3 Ecological Corridor.

High-level notes from the workshop, including a list of attendees and identified barriers and solutions, can be found in Appendix I.

Implementing an Ecological Corridor Overlay

The following sections outline key activities we recommend as a path to implementing an ecological corridor overlay (EC overlay), to help guide growth to occur in a way that maintains ecological connectivity in a municipality.

1. Delineate ecological corridors within the municipality.
2. Promote awareness of the importance of ecological connectivity to build council, municipal staff, and community support.
3. Recognize ecological connectivity in necessary municipal policy.
4. Adopt an amendment to the Land Use Bylaw that describes the ecological corridor overlay.

Activities 1-3 can occur simultaneously, however activity 1 and 2 will provide the information and opportunity for activity 3. They lay the basis for activity 4: implementing an ecological corridor overlay.

Delineate ecological corridors within the municipality

Ecological corridors, as described in the introduction, are the primary tool used to maintain connectivity: by identifying where ecological corridors exist, a municipality can then manage those areas with the purpose of conserving ecological connectivity. A municipality will want to outline the purpose of the ecological corridor to ensure its intended purpose is maintained. For example, an ecological corridor can be managed to ensure that human activity does not further impede target wildlife species from moving through it.

There are different ways to identify ecological corridors, in some cases wildlife movement pathways are documented, for example in Wyoming consistent mule deer migration routes have been mapped using GPS collar data (Aikens et al. 2017). These migration corridors can be managed as ecological corridors with the intended purpose of ensuring mule deer continue to migrate. Often, we lack specific movement pathways for species and modeling is used to identify potential ecological corridors. It is important to model potential movement for a diversity of target species that represent different spatial scales or habitat types. In areas of intense land use and fragmented natural habitat, a structural (species agnostic) model that focuses on naturalness may be the best way to document remaining opportunity areas for where ecological flow/processes can still occur.

Modeling typically requires two main components (Zeller, 2018), 1. a resistance to movement surface which is typically represented as an inverse function of habitat suitability, that has been estimated through empirical data (e.g., species occurrence data, or GPS collar data) and 2. identification of patches (core habitat) where movement needs to occur to and from. A common modeling approach is to use a connectivity algorithm, such as Circuitscape or cost-based distance to estimate the ability of an animal to move between core habitat on the landscape.

We recommend a collaborative approach to the modeling of ecological corridors that include municipal representatives and experts in the local ecology. If the purpose of ecological connectivity is focused on maintaining biodiversity, we suggest developing a species agnostic model, and modelling for a series of target species that represent species of concern, species that move large distances, and/or species that are of cultural importance to the community. Further, a collaborative approach can ensure the resulting mapped ecological corridors align with the community's plans and future growth.

Promote awareness of the importance of ecological connectivity

During a workshop exploring the feasibility of an EC overlay, participants identified several barriers to implementation. The strongest barrier to implementation was identified as the lack of public knowledge and support. Social support is necessary to facilitate municipal decision making and investment in maintaining ecological corridors. Community members, municipal staff and council must understand why it is important to maintain naturally connected systems and the role they play in not just healthy wildlife populations, but human well-being (through the maintenance of ecosystem services). Communication strategies include public forums, digital and print materials, and citizen science and volunteer programs. Partnering with environmental non-governmental organizations can play an integral role in promoting awareness and acceptance of protecting ecological connectivity.

Ecological corridors will fall on private land, which can make gaining support of landowners particularly challenging due to concern of restricting their land use. Communication with landowners and the broader community should focus not on restrictions, but rather on how development and growth can occur alongside healthy, connected natural systems. Any policy that places requirements on private land located within mapped ecological corridors, such as an EC overlay, should be clearly communicated and easily understood, along with flexible opportunities to comply with such policy, such as through implementing mitigation measures selected from a suite of suitable options.

Recognize ecological connectivity in municipal policy

We recognize that an EC overlay will only be implemented if ecological connectivity is recognized in higher level planning and policy documents within a municipality. Provincial legislation provides the direction local decision makers need to then create policy regarding ecological connectivity. For example, the Alberta Land Stewardship Act (ALSA) directs the preparation of regional plans and identifies objectives of the Government regarding land use, economics, and the environment. The South Saskatchewan Regional Plan (SSRP) speaks broadly to “connectivity of wildlife habitat” (page 57) which provides opportunity for municipalities to integrate policies around connectivity in their planning documents. As well, the Municipal Government Act (MGA) states in Part 1 Section 3 that the purpose of a municipality is to “foster the well-being of the environment,” whereas Part 17 is not specific as to how that is carried out.

From the direction of provincial legislation, municipalities should then integrate the ecological connectivity concept into the municipal planning process through the following:

- Municipal Development Plans (MDP):
 - MDPs encompasses the entire municipality and focuses on “big picture” concepts. MDPs influence lower order plans and direct policy and on the ground decisions regarding consideration and weighting given to rezoning of land. Municipalities can state the importance of ecological connectivity in their MDP, which can be generally for the maintenance of ecological processes, wildlife movement, or specify species of importance. The MDP should include a map of ecological corridors (if delineated) and their commitment to protecting and maintaining the corridors.
- Intermunicipal Development Plans (IDP)
 - IDPs include areas of land lying within the participating municipalities as they consider necessary and include the need to address environmental matters within the area, either generally or specifically. Municipalities can choose to

include ecological corridors in their IDPs (if delineated), and can outline their coordinated effort to protect or maintain the corridors.

- **Area Structure Plans (ASP):**

- If the importance of maintaining ecological connectivity is directed by the MDP (and IDPs if applicable), this can inform an ASP to consider the needs of an ecological corridor. ASPs will then provide the framework for subdivision in specific areas of the municipality, and describe the sequence of development including land uses, density of population, locations of major transportation routes, etc. Development proposals will follow what's laid out in the ASP, and it's at this point the EC overlay policy would trigger the use of the ecological corridor impact tool.

- **Land Use Bylaw:**

- The Land Use Bylaw is the implementation document that divides a municipality into land use districts (zones). It lists the permitted, discretionary, and prohibited uses and articulates the process for making decisions and issuing permits. The Land Use Bylaw provides guidelines for subdivision and development such as additional information requirements at the time of permit application, setbacks and no-go area, speciality zoning districts and overlays. A Land Use Bylaw amendment would implement the ecological corridor overlay, discussed below.

Adopt an Ecological Corridor Overlay

The following language for an EC overlay can be adjusted as necessary in an amendment to the land use bylaw.

Ecological Corridor Overlay Bylaw template:

1.1 Purpose

The purpose of the Ecological Corridor Overlay (EC Overlay) is to maintain ecological connectivity necessary for [as stated in the MDP, such as wildlife movement and/or ecological processes] while providing for economic growth in the [municipality].

1.2 Application

This Overlay applied to those lands within the ecological corridor boundaries as seen in Appendix X.

1.3 Development Regulations and Submission Requirements

For developments located within the EC Overlay, subsection 2 of this Bylaw shall apply. Submission of a [Wildlife Movement tool report, document describing corridor impacts, letter from environmental professional] shall be required.

1.4 Special Information Requirements

The [report, letter] shall conclude that the proposed development is designed such that the following conditions are met:

- The ecological corridor will not be reduced to less than 350m.

- Wildlife movement will not be restricted to areas of steep slope (>30 degree slope) within 1000m of the proposed development .
- Human presence will not be over 20 people per day at the site. (note: this is for the purpose of maintaining functional movement for grizzly bear and elk, and may need to be adjusted for a municipality's ecological connectivity goals)
- Wildlife attractants such as unsecured garbage and fruit trees will not be introduced to the site.
- The development will not reduce the priority ungulate or grizzly bear habitat indicated on the ecological corridor map within 1000m buffer.

If the development cannot meet the above conditions, they must indicate mitigations in subsection 2.2 that will be implemented.

1.5 Wildlife Movement Tool (should the municipality adopt the use of the tool)

The Development Officer may require the applicant to submit a report generated from the Wildlife Movement Tool to satisfy the Special Information Requirements. The Wildlife Movement Tool assesses the listed conditions in section 2 and generates a report. A report indicating a low risk to the ecological corridor will not negatively impact the ecological corridor and may proceed without further considerations. A report indicating a medium risk to the ecological corridor will require documentation of mitigations in subsection 2.2 that will be implemented. A report indicating a high risk to the ecological corridor will require an assessment if the development site or corridor boundary can be shifted as the corridor will no longer be functional should development proceed as-is.

1.6 Mitigations

The Development Office may impose any conditions necessary to mitigate adverse impacts to the ecological corridor. See [name of mitigation document] for a description of strategies available to mitigate impacts to the conditions in section 2.

Wildlife Movement Tool Example: SW Alberta Ecological Corridor

This section describes how a planning support tool can be used to inform development decisions that land within the mapped ecological corridor. In our case study, we show how the Wildlife Movement tool (formerly referred to as the Connectivity Risk Assessment tool), which was developed as an educational tool, would be used in a development application that falls within the EC overlay district. The purpose is to highlight how the tool could be used as a special information requirement in the overlay policy.

SW Alberta Ecological Corridor

The SW Alberta Ecological Corridor includes areas within the Municipal Districts of Crowsnest Pass and Pincher Creek. The ecological corridor for this area was developed through a multi-stakeholder engagement using existing science for the target species of elk, bighorn sheep, wolverine and grizzly bear (Miistakis Institute, 2016). The ecological corridor provides important ecological connections that link the protected areas to the north and south of Highway 3, however, ecological connectivity is threatened by the cumulative effects of fragmentation resulting from competing land uses of recreation, grouped of multi-lot subdivision, forestry, oil and gas, and associated infrastructure. As well, Highway 3,

a two-lane east-west highway with 6,000 - 9,000 vehicles a day, bisects both municipalities and presents a major challenge to maintaining ecological connectivity. The Wildlife Movement Tool was developed for the Western Highway 3 Ecological Corridor as an educational tool to show how development in the Crowsnest Pass can impede or allow for wildlife movement to continue in the ecological corridor.

Development scenario

To demonstrate how the EC Overlay may influence growth to occur in a way that protects the functionality of the ecological corridor, a hypothetical development was created to generate a report from the Wildlife Movement Tool.

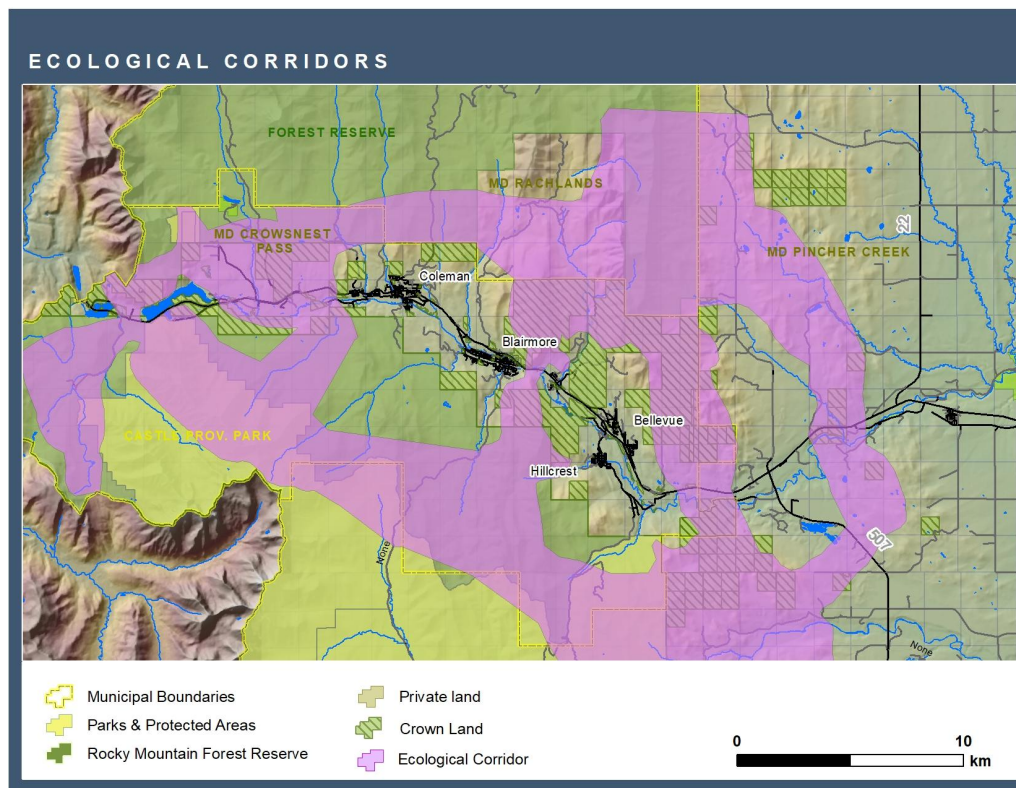


Figure 1: Western Highway 3 Ecological Corridor

The hypothetical development scenario is assuming a proposal for a 100 site campground located south of Highway 3, near Leitch Collieries Provincial Historic Site. The below image shows the footprint of the proposed campground drawn in the Wildlife Movement tool.

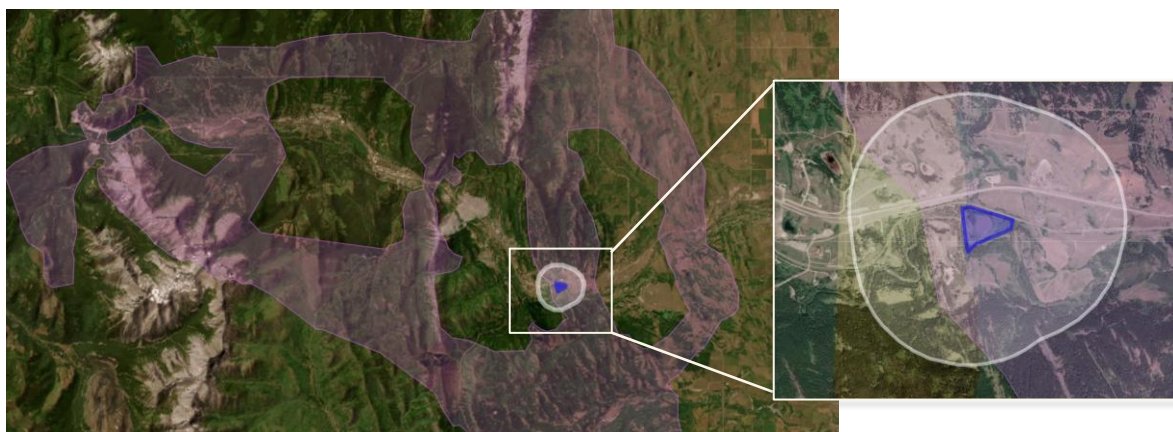


Figure 2: Location of development scenario and 1000m development buffer drawn in the Wildlife Movement tool map.

Wildlife Movement tool inputs

As the land in question lands within the EC Overlay boundary, the applicant is required to submit a report generated from the Wildlife Movement tool. The online tool (https://miistakis.shinyapps.io/cra_app/) first asks the proponent to draw the footprint of the campground, and automatically draws a 1000m buffer around the proposed development (Figure 2).

Once the development footprint is drawn, the applicant is asked three questions relating to the current conditions within the footprint (pre-development), and four questions relating to the future conditions (once campground is built). Answers are in drop-down format.

Current Condition - conditions prior to development

What is the average number of people per day within the development?

<12 people events per day

Is human presence predictable (activity occurs in regular intervals; non-predictable defined as not constant or not in regular intervals) within the development?

<20 people events per day and predictable or non-predictable

Are there currently unsecured human food sources (for example fruit trees, accessible garbage) within the development?

No

Future Condition - conditions after development

What will be the average number of people per day within the development?

>20 people events per day

Will human presence be predictable (activity occurs in regular intervals or not in regular intervals) within the development?

>20 human events per day and non-predictable

Will there be unsecured human food sources (for example fruit trees, accessible garbage) within the development?

Yes

How many additional landowners (private landowners, municipal owned, provincial crown land) occur outside of the ecological corridor within 1000 m of development? We use this to determine how difficult it would be to adjust the corridor boundary to accommodate a development inside corridor.

>2 landowners

SUBMIT

Figure 3: Wildlife Movement Tool form, to be completed by development officer or developer.

The following bullet points are the questions asked in the online tool, followed by explanation of the answers for our development example:

Current condition – conditions prior to development:

- Q:What is the average number of people per day within the development?
 - A: <12 people per day

- Explanation: as there is no development or infrastructure currently there)
- Q: Is human presence predictable (activity occurs in regular intervals; non-predictable defined as not constant or no in regular intervals) within the development?
 - A: <20 people per day and predictable or non-predictable
 - Explanation: due to the low number of people per day at the current site, it does not matter if their presence is predictable or unpredictable.
- Q: Are there currently unsecured human food sources (for example fruit trees, accessible garbage) within the development?
 - A: No
 - Explanation: as there is no development or infrastructure currently there, there are no unsecured human food sources.

Future condition – conditions after development:

- Q: What will the average number of people per day within the development?
 - A: >20 people per days
 - Explanation: a 100 site campground can add well over 20 people per day at the development.
- Q: Will human presence be predictable within the development?
 - A: Non-predictable
 - Explanation: the number of people at any given time, and their movements throughout the surrounding area will vary, so human presence will not be predictable.
- Q: Will there be unsecured human food sources within the development?
 - A: Yes
 - Explanation: People visiting the campground will likely bring unsecured human food sources and leave garbage.
- How many additional landowners (private landowners, municipal owned, provincial crown land) occur outside of the ecological corridor within 1000 m of development? We use this to determine how difficult it would be to adjust corridor boundary to accommodate a development inside corridor
 - A: >2

After the questions are answered, the applicant will press submit. Upon submission, the Wildlife Movement Tool calculates additional factors in the background, including:

- If the development will physically alter the ecological corridor's width and flatness;
- If the surrounding landscape can accommodate wildlife movement, allowing the potential to shift the corridor if needed; and
- Percent of the development buffer containing habitat of high value for grizzly bear and elk.

Wildlife Movement tool report

After submission, the Wildlife Movement Tool will generate an overall result of:

- Corridor compromised,
- Mitigation Recommended, or
- Low Impact

The report includes a summary table that lists how the current conditions (in absence of proposed development) may change if the development is approved as-is. Following the summary table (Figure 4), an explanation of each area considered by the tool is included. For areas that may be negatively

impacted by the development, mitigation strategies are listed in bullet points linked to the *Ecological Corridor Development Mitigation Guidelines* report, which provides suggested mitigation measures that can implemented to reduce the negative impact of the development on wildlife movement.

CURRENT CONDITION WITHIN 1,000 M BUFFER		FUTURE CONDITION SHOULD DEVELOPMENT OCCUR
MINIMUM WIDTH SUFFICIENT	➡	MINIMUM WIDTH SUFFICIENT
FLAT LAND SUFFICIENT	➡	FLAT LAND SUFFICIENT
LOW HUMAN DISTURBANCE	➡	LOW HUMAN DISTURBANCE
GOVERNANCE DIVERSITY	➡	GOVERNANCE DIVERSITY (COVER 2 ADDITIONAL LANDOWNERS IN BUFFER)
CORRIDOR PLASTICITY	➡	HIGH CORRIDOR PLASTICITY
HUMAN ACTIVITY LEVEL LOW	➡	HIGH HUMAN ACTIVITY
HUMAN PRESENCE LOW, PREDICTABILITY NOT AN ISSUE	➡	HUMAN PRESENCE OVER 20 PEOPLE PER DAY AND NOT PREDICTABLE
NO WILDLIFE ATTRACTANTS	➡	WILDLIFE ATTRACTANTS
UNGULATE HABITAT	➡	UNGULATE HABITAT NOT IMPACTED
GRIZZLY BEAR HABITAT	➡	GRIZZLY BEAR HABITAT NOT IMPACTED

Figure 4: Summary report table. Green areas indicate low impact, yellow areas indicate mitigation is recommended.

In this example scenario, the proposed campground development report results in “Mitigation Recommended” due to level of human activity, human predictability and wildlife attractants. The developer would need to incorporate mitigation strategies to ensure the campground does not impede wildlife movement in the ecological corridor. The other areas considered by the tool (i.e., minimum width of corridor) were determined to be low risk. See Appendix V for the full report generated from the Wildlife Movement tool. Areas that fall under “low impact” do not require mitigation measures.

There are just three scenarios in which a development would result in “Corridor Compromised”:

- Corridor’s minimum width would be 350m wide
- Combination of:
 - Corridor width would be between 350-1000m wide
 - >70% of the buffer is human disturbance
 - >20 human events per day in buffer
- Combination of:
 - Corridor width would be between 350-1000m wide
 - Less than 50% of neighboring lands support wildlife movement

Recommendations

The following outlines our recommendations for implementing an ecological corridor overlay with the goal of guiding growth and development to occur in a way that will continue to allow for wildlife movement:

- Delineate ecological corridors within the municipality(ies).
 - Include municipal staff and local experts when possible.
 - Consider a series of target species relevant to the area and a structural connectivity model to inform delineation of ecological corridors.
 - Include consideration of current ASP's and land-use zoning and where developments have been approved but not developed.
- Recognize ecological connectivity in municipal policy.
 - Recognize the importance of ecological connectivity in the Municipal Development Plan (MDP).
 - Include ecological corridor boundary map in the Municipal Development Plan (MDP).
 - Ideally this would be the corridor boundary that was delineated. However, if this may not be palatable to the community or council, as a start, a coarse map showing general movement areas without boundaries that may identify specific parcels. See Appendix IV for an example from the Crowsnest Pass MDP.
 - Align ecological corridor boundaries and goals in Intermunicipal Development Plans.
 - Include ecological corridor requirements into ASPs.
 - Adopt a Land Use Bylaw amendment to create an ecological corridor overlay.
- Promote awareness of the importance of ecological connectivity to build council, municipal staff, and community support.
 - Engage council, staff and community on the importance of ecological connectivity to their municipality and region.
 - Clarify that an ecological corridor overlay is not to preclude development, but to encourage growth in a way that aligns with community values.
 - Community values may already include the preservation of ecological connectivity, or may focus on other issues that align well, such as the preservation of agriculture and ranching, scenic views, recreation and cultural sites.
 - Clarify which land use types are acceptable (do not negatively impact wildlife movement) within an ecological corridor.
 - Highlight how complying with existing regulations, such as required riparian setbacks, align with investing in and maintaining ecological corridors.

- Adopt mitigation guidelines that developers would use to comply with the ecological overlay.
 - Mitigation guidelines will be developed with input from municipal planning and corridor experts to guide municipalities wishing to implement an ecological corridor overlay.

Key References

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Appendix I: Overlay Workshop

Workshop participants

An ecological corridor overlay feasibility workshop was held on December 8th, 2022 at the Ranchlands administrative building. The following individuals were in attendance:

- Laura Mckinnon, Development Assistant, Pincher Creek
- Julie McLean, Senior Planner, Foothills County
- Derrick Krizsan, Chief Administrative Officer, Willow Creek
- Cindy Chisholm, Manager of Planning & Development, Willow Creek
- Dominic Kazmierczak, Manager of Planning, Rocky View
- Devin LaFleche, Regional Planning Strategist, Rocky View
- Maria Didowski, Wildlife Biologist, Alberta Environment and Protected Areas
- Steve Harty, Senior Planner, ORRSC
- Diane Horvath, Senior Planner, ORRSC
- Gavin Scott, Senior Planner, ORRSC
- Ryan Dyck, Senior Planner, ORRSC
- Dana Duke, Executive Director, Miistakis
- Tracy Lee, Director of Conservation Research, Miistakis
- Nicole Kahal, Conservation Analyst, Miistakis

High-level notes from workshop

Where can we include ecological connectivity in municipal policy?:

- Ecological connectivity should be in the Municipal Development Plan (MDP), as this outlines how the municipality should develop.
 - An example is the Crowsnest Pass using a coarse depiction of where wildlife linages are located.
 - Wildlife linkage zones used a language that was more palatable, and actual boundaries were not shown – the coarse areas were more palatable as not related to parcels.
- Consider ecological connectivity in Intermunicipal development plans (IDP).
- An example of ecological connectivity applied to an Area Structure Plan: Burmis Lundbreck Corridor. 2012 update removed group country residential; the division council supported changing the zoning.
- Land use bylaws – regulatory level: no-go areas, setbacks, overlays.
- Highlight that ecological corridors often align with agricultural preservation goals as well – helps to sell to council.
- Ensure not trying to preclude development all together.
- Additional examples of overlays in use?

- Overlays are mostly used in urban areas
- High river regional airport – Foothills County

What policy is already in place at your municipality to support ecological connectivity?

- Natural systems overlay from the CRMB growth plan (non-regulatory)
 - Has floodway, flood fringe, habitat.
 - This is a GIS overlay, no policy yet developed around it.
- Foothills – dark sky bylaw
 - Difficult to implement
- Foothills – riparian setback nature model
 - Only implemented maybe twice. Imposed at discretion of council.
- MDP mention of ecological connectivity
 - Pincher Creek
 - Medicine Hat? (pronghorn?)
 - Crowsnest Pass
 - Ranchlands – developing new MDP, something that can potentially be added
 - Quarter section smallest that is allowed. 90-100 people in population
 - Ranchers here have a good understanding of ecology, usually run operations with respect to environment and wildlife.
 - Lots of restrictions on development and industry, and that’s the way the community wants it. But, population is slowly changing.
 - ASPs
 - Bragg Creek
 - Rocky View County
 - Moose, deer, habitat to show where species might be using in ASP. Can build on this to show partial passage through residential areas, that connect into larger corridors.
 - Considered in ASP because it was project team driven. Not considered in MDP.
 - MDP did have ecological consideration, but council took it out. But new MDP and council might consider.
 - 7 IDPs
 - There is an internal document – intermunicipal regional pathway study between RVC and Calgary. Dom can share with us
 - IDPs – usually about keeping values (agriculture), could be a way to introduce ecological connectivity into these as they are being updated
 - Joint ASP – urban/rural. Appended to IDP. Limitation
 - MGA – section 664 for environmental reserve
 - This may be where its missing. Potentially add ecological corridor into this.

Wildlife Movement tool (previously called Connectivity Risk Assessment tool) demo – how can we facilitate its use?:

- GOA – Landscape Analysis Tool (LAT) could use the EC layers as used by developers to consider impacts of developments.

- Land stewardship grant program – created an evaluation that put properties through for conservation funds– if you want to sell and land is of high value to conservation the GOA might also want to purchase it.
- Tax credit for maintaining the land for ecological connectivity.
- The tool addresses complexities and gives specific guidelines (as opposed to the floodway example, if it lies within, here are requirements).
- Mitigations:
 - Create a general list of mitigations that sits separately from the tool.
 - Could be beneficial to include specific mitigations for types of land use (gravel pit, residential) and outline as soft and hard mitigations.
 - Consider timing, seasonal, species-based needs, structures (lights, noise- decibel level, cover)
 - Technical, but doesn't need to get too specific – for example, recommend berm to create visual separation, not specific height (unless known)
 - Municipality would run the tool and approve mitigation plan, however noted most municipalities do not have an ecologist or specialist to help with complex decisions.

Notes on the draft generic purpose for the ecological corridor overlay:

- Need to define “high risk.”
- Council will see red flag over “intent to discourage development.”
- Most land uses are discretionary.
- This would exist in an addendum to a land use bylaw.
- The use of “shall” makes it seem regulatory.
- Last sentence may contradict purpose if you want the overlay to adjust what is allowed.
- Subdivisions aren't mentioned – overlays will have influence on policy for types of subdivisions.

General discussion:

- Be good to understand what density of housing can still support wildlife/corridor function?
- Some municipalities have a culture over the “right to” develop subdivisions, other don't and can deny applications.
- The concept is for it to be both regulation and legislation – right now its developed just as educational case study, currently exploring how to implement.
- Overlays don't necessarily stop development, they can be removed.
- Can it be applied provincially? As ecological protection often too inconvenient or difficult for municipalities to protect.
- Municipalities could bring the delineated corridor to the Calgary Metropolitan Board.
- Concern an EC Overlay is another tool urban areas use to squash rural development.
- An ecological corridor boundary could eventually sit in the CMRB natural systems database, but first work with municipalities as they have the greatest ability to create a corridor based on the space they have left.

Next steps:

- Participants agreed to review the ecological corridor overlay feasibility study.
- Document where each municipality is in terms of policy for ecological connectivity and opportunities/timing for policy framing in future.

- Explore set-back options already regulated to understand existing regulations that might support EC (riparian set-backs).
- Miistakis has received funding to pursue delineating the corridors with Municipality of Pincher Creek, Foothills County and Rocky View County.
- Municipal Land Use Suitability tool process shared with participants. Used with Crowsnest Pass to determine most feasible areas for development and with Pincher Creek for renewable energy. Currently going through process for renewable energy with Rocky View County.

The following describes potential barriers and solutions to implementing an ecological corridor overlay identified during the workshop.

Identified barriers

The following were identified as barriers:

- Lack of community/landowner support
- Lack of council support
- Lack of understanding how overlays impact landowners, and how it differs from base zoning
- Ecological corridor may not be delineated and widely agreed on
- Conflict or lack of alignment with other planning and policy documents
- No protections for the ecological corridor regionally
- Higher level policy needs to be in place before implementing

Identified solutions

The following were identified as solutions to the above barriers:

- Educated and promote awareness of ecological connectivity and the importance in maintaining
 - Messaging should be specific to the community
- Delineate corridors through a multi-stakeholder process to reach agreement and buy-in on the ecological corridors to invest in conserving.
- Socialize the ecological corridor concept
 - Demonstrate alignment with agricultural preservation values
 - Demonstrate alignment with recreational (e.g., green spaces and pathways) and cultural (e.g., scenic routes) values
 - Name corridors to create recognition

Appendix II: Examples of Existing Overlays

Crowsnest Pass' Historic Commercial Areas Overlay District (HCOD)

Under the Land Use Bylaw No. 868-2013

Purpose: To promote and protect the significance of historic commercial areas and areas immediately adjacent to historic commercial areas by ensuring development is designed and constructed in a manner that respects the sense of place evoked by these areas, reinforces the character of these areas and ensures a high quality of development.

Permitted Uses: Those uses listed as permitted and discretionary in the underlying land use district.

Discretionary Uses: Those uses listed as permitted and discretionary in the underlying land use district.

Application: The regulations in this District apply to the construction of any new building and signage and to any renovations, alterations, additions and/or reconstruction of an existing building on lands located within the District.

Every development permit application which meets the above criteria shall be referred to the Municipal Historic Resources Board for comment along with complete drawings to the satisfaction of the Development Officer and the Municipal Historic Resources Board. Complete drawings shall be to scale and shall consist of a site plan, full elevations drawings (including colours, materials etc.), floor plan, landscaping plan and a statement from the developer as to how the application satisfies the purpose statement of the District.

General Development Regulations:

Building setbacks, building height and parcel coverage shall be the same as in the underlying Land Use District. Where there appears a contrast between the regulations of the underlying Land Use District and the historical development patterns of adjacent buildings, the new development shall be expected to achieve a reasonable compromise between these two standards but shall have more regard for historical development patterns.

Development shall be of a style, design and quality that respects and compliments existing buildings in the historic commercial area. Development shall adhere to Section 3, "Main Street Buildings in the Crowsnest Pass", and to Section 4, "New Construction in the Historic District" of the Design Guidelines for the Crowsnest Pass Historic District document. Buildings shall utilize an established historical design theme or a design theme respectful of and complementary to existing buildings in the historic commercial area.

In addition to the provisions of the above paragraph, façade renovations, alterations, additions and/or reconstruction of existing buildings shall be expected to retain the integrity of a buildings character defining elements if any character defining elements are known to be present.

Residential Development Regulations:

R-1, Residential, areas within the District will be allowed to continue in use including new construction, additions and renovations. Redevelopment of R-1 parcels within the District shall adhere to Section 3, "Main Street Buildings in the Crowsnest Pass", and to Section 4, "New Construction in the Historic District" of the Design Guidelines for the Crowsnest Pass Historic District document. Redevelopments will be encouraged to utilize an established historical design

Foothills County's Flood Hazard Protection Overlay District

Foothills County's Land Use Bylaw 60/2014 created a new land use district to provide for the safe and efficient use of lands within the floodway and flood fringe of all the rivers, streams, creeks and waterways.

The overlay district exists over top of a property's existing land use and includes areas within provincially mapped floodways and flood fringe as well as areas believed to have been impacted by the flood event of 2013.

The intent of this district is to discourage new development on lands subject to flooding and achieve the long term goal of maintaining or decreasing the overall density of development on lands that may be subject to flooding.

In the Flood Hazard Protection Overlay, the permitted and discretionary uses listed in the land use district in which the site is located shall continue to apply if supported by engineering and technical studies and are able to meet all applicable development requirements.

Edmonton Zoning Bylaw 12800: Floodplain Protection Overlay

812 (FPO) Floodplain Protection Overlay

812.1 General Purpose

Bylaw 16733

July 6, 2015

The purpose of this Overlay is to provide for the safe and efficient use of lands which may be within the defined floodplains of the North Saskatchewan River and its tributaries within the City of Edmonton. The Overlay regulates building Height, the location and geodetic elevation of openings into buildings, the Use in portions of buildings, the design Grade of the Site, and Landscaping, to mitigate the potential negative effects of a flood event.

812.2 Application

This Overlay applies to those lands identified on the Appendices to this Overlay.

812.3 Development Regulations and Submission Requirements

For all developments situated within a Floodplain Protection Overlay, subsection 14.4 of this Bylaw shall apply.

Submission of a certificate from a Professional Engineer or Architect shall be required in accordance with the guidelines of the Floodplain Management Policies of the applicable plan, as follows:

- North Saskatchewan River Valley Area Redevelopment Plan;
- Cloverdale Area Redevelopment Plan;
- Rosedale Area Redevelopment Plan; and
- Riverdale Area Redevelopment Plan.

Eagle Mountain, Utah: Wildlife Corridor Overlay Zone

17.49.010 Purpose and objective.

This chapter allows for the creation of [wildlife corridor overlay zones](#) within Eagle Mountain City and creates regulations and protections from development which may adversely impact wildlife and their

habitat. This chapter does not change the underlying zoning, but establishes standards, requirements, and procedures for areas where an existing zone and the wildlife corridor overlay zone overlap.

This chapter provides support for and methods by which to preserve wildlife, wildlife habitats, and wildlife migration routes, especially the critical mule deer migration corridor, in and through Eagle Mountain City. This preservation of wildlife habitat and open space is a key strategy identified in the Eagle Mountain City “general plan parks, trails, and open space master plan,” and the “transportation master plan.” Wildlife corridor overlay zones provide a means to reduce the continuing wildlife habitat loss and fragmentation of wildlife habitat and migration routes for native and migrating species, while simultaneously accommodating appropriate improvements to these areas.

Wildlife corridors safeguard and connect wildlife habitats, allowing for movement, migration, foraging, breeding, dispersal of flora and fauna, and connectivity of their habitat. Fragmentation and habitat loss from development and other anthropogenic disturbances, such as roads, structures, excessive noise, and/or excessive movements, can alter daily movement patterns of wildlife, often leading to increased human-wildlife conflict. Preservation of these corridors, along with fencing and safe crossings, will also help to reduce human-wildlife conflict.

By supporting wildlife in the region, wildlife corridor overlay zones may also provide for recreational opportunities, open space preservation, potential tourism, and education for students and residents. [Ord. [O-18-2024](#) § 1 (Exh. A); Ord. [O-06-2021](#) § 2 (Exh. A)].

Teton County, Idaho: Natural Resource Overlay and Wildlife Habitat Analysis

The [Natural Resource Overlay \(NRO\) map](#) identifies the most important and sensitive natural resources, including priority wetland habitat, songbird/raptor breeding and wintering habitat, and big game migration corridors and seasonal range. The NRO map is referenced throughout Teton County’s land development code. Any land division, development, special use, and certain building permits within Teton County, Idaho on sites that are wholly or partially within or immediately adjacent to the NRO Map must prepare a [Wildlife Habitat Analysis \(WHA\)](#), an in-depth professional appraisal of wildlife and habitat. The broad purpose of a WHA are:

- A. Provide information that will help the Applicant, the Boards of Planning and Zoning and County Commissioners, the Building Department, citizens, and other reviewers and decision-makers recognize and assess the wildlife habitat features of the proposed development site;
- B. Help the Applicant design the development project in ways that avoid impacts to Indicator Species and Indicator Habitats;
- C. Help the Applicant avoid costly reworking of the project design later on in the planning process; and
- D. Streamline the environmental review.

The WHA policy details the steps and methodology in the land division or development application process, including engaging with a WHA Consultant from a County-maintained list of pre-qualified Consultants.

Blaine County, Idaho: Wildlife Overlay District

9-20-1: PURPOSE:

The Blaine County board of county commissioners finds that the county contains wildlife habitat and species of local, statewide, and national significance as documented by Idaho department of fish and

game (IDFG), the federal bureau of land management, United States fish and wildlife service and the United States forest service. It is the purpose of these regulations to preserve and enhance the diversity of wildlife habitat and species throughout the county for the economic, recreational, and environmental benefit of county residents and visitors. (Ord. 2006-19, 11-14-2006)

9-20-2: ESTABLISHMENT OF DISTRICT:

The wildlife overlay district (W) is hereby established and shall cover all lands within Blaine County. (Ord. 2008-17, 11-25-2008)

9-20-3: APPLICABILITY:

Any subdivision of land within Blaine County. (Ord. 2006-19, 11-14-2006)

The ordinance goes on to include a review procedure, which will determine the need for the applicant to prepare a “Conservation Plan” that includes a wildlife survey and habitat assessment and plan for implementation, maintenance and monitoring of mitigation measures.

Ventura County, California: Habitat Connectivity and Wildlife Corridors Overlay Zone and Critical Wildlife Passage Areas Overlay Zone

Section 8104-7.7 – Habitat Connectivity and Wildlife Corridors Overlay Zone

The general purpose of the Habitat Connectivity and Wildlife Corridors overlay zone are to preserve *functional connectivity* for wildlife and vegetation throughout the overlay zone by minimizing direct and indirect barriers, minimizing loss of vegetation and habitat fragmentation and minimizing impacts to those areas that are narrow, impacted or otherwise tenuous with respect to wildlife movement. The purposes include the following:

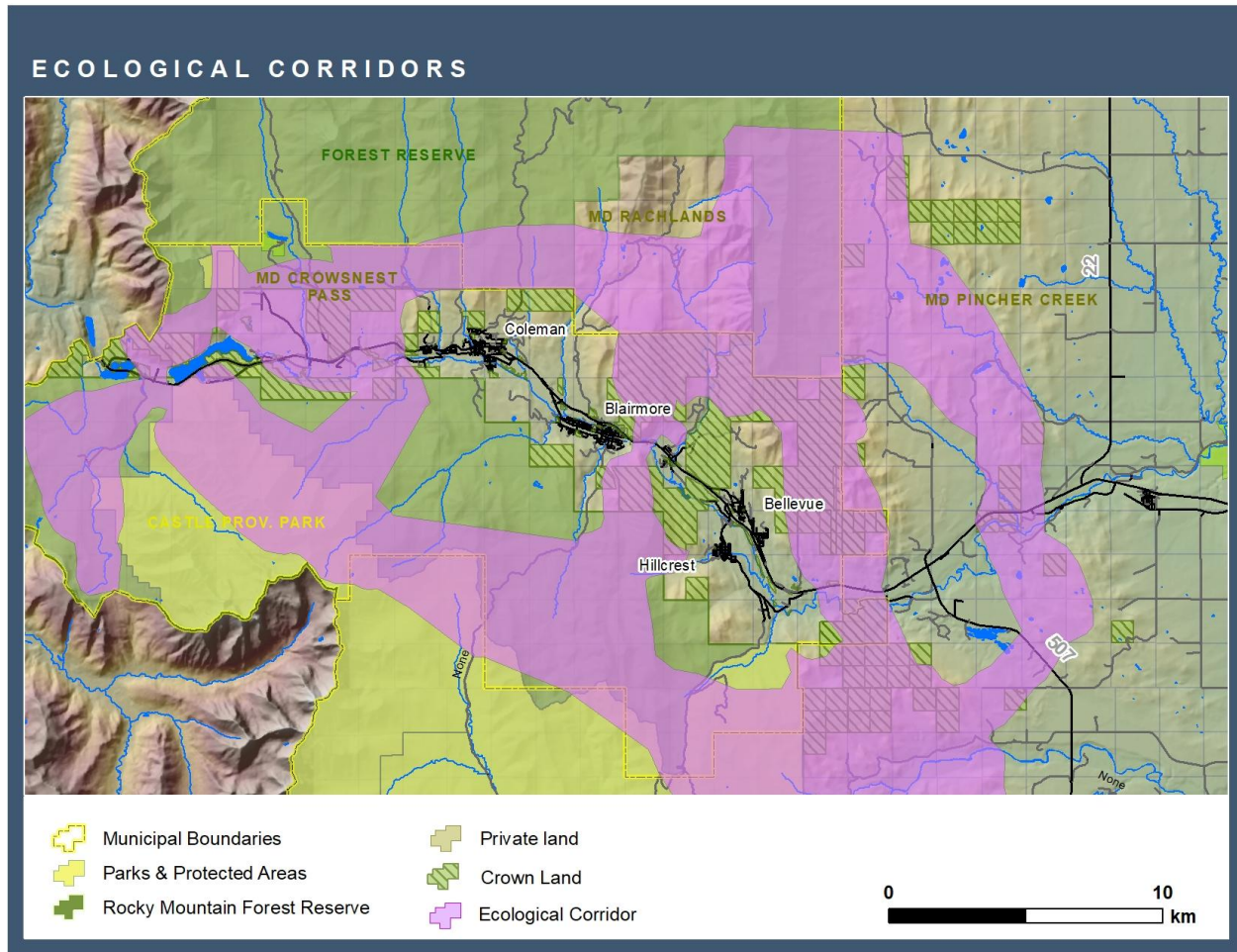
- A. Minimize indirect impacts to wildlife created by outdoor lighting, such as disorientation of nocturnal species and the disruption of mating, feeding, migrating and the predator-prey balance.
- B. Preserve the *functional connectivity* and habitat quality of *surface water features*, due to the vital role they play in providing refuge and resources for wildlife.
- C. Protect and enhance *wildlife crossing structures* to help facilitate safe wildlife passage.
- D. Minimize the introduction of *invasive plants*, which can increase fire risk, reduce water availability, accelerate erosion and flooding, and diminish biodiversity within an ecosystem.
- E. Minimize *wildlife impermeable fencing*, which can create barriers to food and water, shelter, and breeding access to unrelated members of the same species needed to maintain genetic diversity.

Section 8104-7.8 – Critical Wildlife Passage Areas Overlay Zone

There are three critical wildlife passage areas that are located entirely within the boundaries of the larger Habitat Connectivity and Wildlife Corridors Overlay zone. These areas are particularly critical for facilitating wildlife movement due to any of the following: (1) the existence of intact native habitat or other habitat with important beneficial values for wildlife; (2) proximity to water bodies or ridgelines; (3) proximity to critical roadway crossings; (4) likelihood of encroachment by future development which could easily disturb wildlife movement and plant dispersal; or (5) presence of non-urbanized or undeveloped lands within a geographic location that connects core habitats at a regional scale.

Development within these zones have restrictions and requirements on fencing, outdoor lighting, landscaping, vegetation removal, and/or setbacks from wildlife crossing structures.

Appendix III: SW Alberta Ecological Corridor Map



Appendix IV: Ecological Connectivity in Existing Municipal Policy

Municipality of Crowsnest Pass

The Municipality of Crowsnest Pass included wildlife linkage zones in their MDP. A course map depicting where important wildlife movement areas is included (see Figure 1 below). As well, the MDP includes key terms such as:

- Wildland-urban interface means the area where human developments meet or are intermingled with forest vegetation and its associated fuel, and
- Wildlife linkage zone means an area of seasonal habitat where animals can find food, shelter and security. Wildlife linkage zones maintain ecological connectivity adjacent to urban environments.

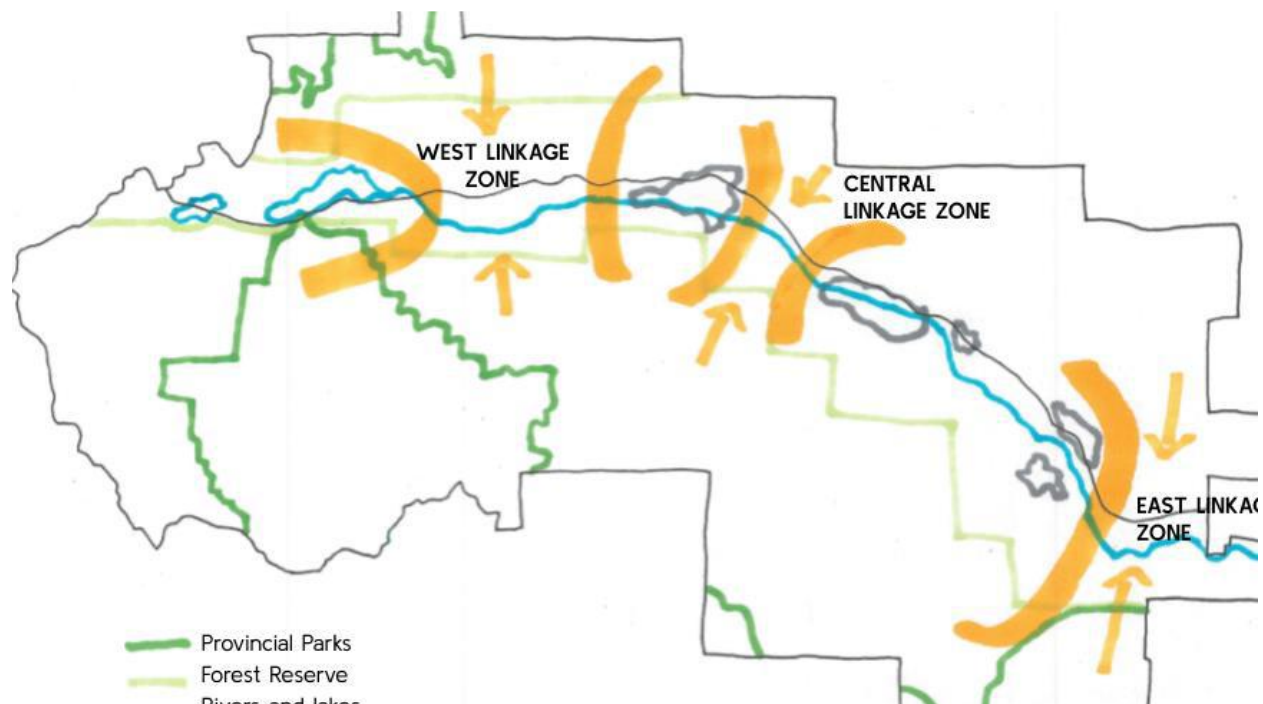


Figure 5: Figure 9 from Crowsnest Pass MDP.

Municipality of Pincher Creek

The Municipality of Pincher Creek adopted the Burmis Lundbreck Corridor Area Structure Plan (ASP) in 2012. The vision for the Burmis Lundbreck Corridor is as follows: “The Burmis Lundbreck Corridor area structure plan will strive to achieve an appropriate balance between community growth, a variety of lifestyles, and the natural features that promote visual, historical, cultural and environmental harmony.” The ASP includes an environmentally sensitive corridor in its land use map, and helps to ensure land use in the area aligns with maintaining ecological connectivity in the area. The area includes land that is privately conserved.

Appendix V: Case Study Wildlife Movement Tool Report

WILDLIFE MOVEMENT TOOL

REPORT OUTPUT

TOTAL SCORE:

MITIGATION RECOMMENDED

The following table summarizes how the areas important for ecological corridor function will change should the development occur.

Green indicates there will be a low or no impact to the ecological corridor, yellow indicates mitigation is required to maintain ecological corridor, and red indicates the ecological corridor will be compromised.

CURRENT CONDITION WITHIN 1,000 M BUFFER		FUTURE CONDITION SHOULD DEVELOPMENT OCCUR
MINIMUM WIDTH SUFFICIENT	→	MINIMUM WIDTH SUFFICIENT
FLAT LAND SUFFICIENT	→	FLAT LAND SUFFICIENT
LOW HUMAN DISTURBANCE	→	LOW HUMAN DISTURBANCE
GOVERNANCE DIVERSITY	→	GOVERNANCE DIVERSITY COVER 2 ADDITIONAL LANDOWNERS IN BUFFER
CORRIDOR PLASTICITY	→	HIGH CORRIDOR PLASTICITY
HUMAN ACTIVITY LEVEL LOW	→	HIGH HUMAN ACTIVITY
HUMAN PRESENCE LOW, PREDICTABILITY NOT AN ISSUE	→	HUMAN PRESENCE OVER 20 PEOPLE PER DAY AND NOT PREDICTABLE
NO WILDLIFE ATTRACTANTS	→	WILDLIFE ATTRACTANTS
UNGULATE HABITAT	→	UNGULATE HABITAT NOT IMPACTED
GRIZZLY BEAR HABITAT	→	GRIZZLY BEAR HABITAT NOT IMPACTED



MITIGATION RECOMMENDED

The following areas should be mitigated to continue to allow for wildlife movement. See the Ecological Corridor Development Mitigation Guidelines for details on the listed options.

HUMAN ACTIVITY

The average number of people per day within the new development will be

Over 20.

Details: Human activity level accounts for the number of people doing various activities on the landscape (e.g., working, hiking, biking, residential activity, grazing leases, fishing, etc.). Research indicates that under 12 human activity events per day is not likely to impede wildlife movement, 12-20 human activity events per day may impede wildlife movement, and greater than 20 human activity events per day will impede wildlife.

Mitigate:

- Reduce linear disturbances
 - Consider placement of linear infrastructure
 - Road fencing and wildlife crossings
 - Reduced road lighting
- Manage human activity
 - Signage and education
 - Garbage management
 - Recreational trail management
- Incorporate corridor-friendly infrastructure
 - Visual and noise barriers
 - Reduced artificial lighting
 - Wildlife friendly fencing
 - Vegetation and landscaping

HUMAN PREDICTABILITY

Human presence will be over an average of 20 people per day, and non-predictable.

Details: Human predictability is defined as constant or perfect periodicity (e.g., scheduled bus route); non-predictable human activity is defined as not constant or imperfect periodicity (e.g., hiking). Research indicates that wildlife movement can adapt best to predictable human presence. However, even when predictable, the high levels of human activity resulting from the proposed development result in mitigations recommended.

Mitigate:

- Reduce linear disturbances
 - Consider placement of linear infrastructure
 - Road fencing and wildlife crossings
 - Reduced road lighting
- Manage human activity
 - Signage and education
 - Garbage management
 - Recreational trail management
- Incorporate corridor-friendly infrastructure
 - Visual and noise barriers
 - Reduced artificial lighting
 - Wildlife friendly fencing
 - Vegetation and landscaping

WILDLIFE ATTRACTANTS

Wildlife attractants will be present within the new development footprint.

Details: Wildlife attractants include unsecured human food sources (fruit trees, bird feeders, garden, garbage, and compost) within the development buffer.

Mitigate:

- Garbage management

LOW IMPACT

The development will have a low impact to the following areas necessary for a functioning ecological corridor. Wildlife movement is likely to be maintained.

MINIMUM WIDTH

The minimum width of the ecological corridor will be:

Over 1,000m wide. Wildlife movement will continue.

Details: The ecological minimum width represents an area wide enough for wildlife to move through unimpeded. Research indicates 350m as the minimum width necessary to abate human influence and enable movement of large terrestrial mammals. A minimum width of over 1000m is optimal for maintaining wildlife movement long term.

Mitigate

- [Situating development close to the ecological corridor edge](#)
- [Shifting corridor boundary](#)
- [Offset losses](#)

FLATNESS

There will be sufficient area of flat land required for wildlife movement.

Details: Corridor flatness represents an area flat enough for wildlife to move through unimpeded. Research indicates that the slope of the corridor must be $< 25^\circ$ (average) to allow wildlife to move through unimpeded, as most wildlife species avoid steep slopes.

Mitigate:

- [Situating development close to the ecological corridor edge](#)
- [Shifting corridor boundary](#)
- [Offset losses](#)

HUMAN DISTURBANCE

The percent area of human disturbance within the development buffer will be

Under 50% disturbed

Details: Human disturbance results in replacement of the natural landscape to a built environment (roads, houses, mining sites) which can impede wildlife movement. Experts agreed that if the development buffer area would result in over 50% disturbed, it would impede wildlife movement.

Mitigate:

- Reduce linear disturbances
 - [Consider placement of linear infrastructure](#)
 - [Road fencing and wildlife crossings](#)
 - [Reduced road lighting](#)
- Manage human activity
 - [Signage and education](#)
 - [Garbage management](#)
 - [Recreational trail management](#)
- Incorporate corridor-friendly infrastructure
 - [Visual and noise barriers](#)
 - [Reduced artificial lighting](#)
 - [Wildlife friendly fencing](#)
 - [Vegetation and landscaping](#)

GOVERNANCE DIVERSITY

There are two additional landowners outside the ecological corridor, but within 1000m of the development footprint.

Details: Governance diversity represents the number of landowners with governance outside the ecological corridor. The fewer the number of landowners, the easier it will be to adjust the corridor boundary to accommodate wildlife movement given the proposed development's positioning on the landscape. This impact consideration is tied directly to corridor plasticity which determines if the area is conducive to wildlife movement. While this does not impact results from this tool, it is an important consideration.

CORRIDOR PLASTICITY

80-100% of neighbouring lands can support wildlife movement.

Details: Corridor plasticity is the ability to shift the corridor boundary should the development result in a high risk to width, human disturbance, or flatness. While this percentage does not impact results from this tool, it is an important consideration. Shifting corridor boundaries will be made more difficult the more landowners involved.

HIGH VALUE GRIZZLY BEAR HABITAT

The new development footprint and 1000m buffer does not land within high value habitat for grizzly bear.

Details: Grizzly bear is a focal species for the ecological corridor. The development could have a negative impact on carnivore use of the corridors if it removes a significant portion of high value grizzly bear habitat. If the new development buffer includes areas of high value habitat for grizzly bear, mitigation is recommended to ensure grizzly bear are still able to occur and move through the ecological corridor.

Mitigate:

- Situate development close to the ecological corridor edge
- Shift corridor boundary
- Offset losses
- Reduce linear disturbances
 - Consider placement of linear infrastructure
 - Road fencing and wildlife crossings
 - Reduced road lighting
- Manage human activity
 - Signage and education
 - Garbage management
 - Recreational trail management
- Incorporate corridor-friendly infrastructure
 - Visual and noise barriers
 - Reduced artificial lighting
 - Wildlife friendly fencing
 - Vegetation and landscaping

HIGH VALUE UNGULATE HABITAT

The new development footprint and 1000m buffer does not land within Elk summer and winter ranges.

Details: Elk is a focal species for the ecological corridors. If the 1000m buffer around the new development footprint lands within Elk summer and winter ranges, mitigation is recommended to ensure that Elk are still able to occur and move through the ecological corridor.

Mitigate:

- Situate development close to the ecological corridor edge
- Shift corridor boundary
- Offset losses
- Reduce linear disturbances
 - Consider placement of linear infrastructure
 - Road fencing and wildlife crossings
 - Reduced road lighting
- Manage human activity
 - Signage and education
 - Garbage management
 - Recreational trail management
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