Kootenay Connect: Riparian Wildlife Corridors for Climate Change

Year 1 Annual Report

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4/30/2020

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Trans-Border Grizzly Bear Project

Project # COL-F20-W-3043

ACKNOWLEDGEMENTS

We are grateful for financial support from the Fish & Wildlife Compensation Program, Wilburforce Foundation, Liz Claiborne & Art Ortenberg Foundation, Columbia Basin Trust, Habitat Conservation Trust Foundation, Environment and Climate Change Canada, Nature Conservancy of Canada, and the Nature Trust of BC.

Contributors to the concept of Kootenay Connect include key individuals such as Greg Utzig of Kutenai Nature Investigations; Marlene Machmer of Pandion Ecological Research; Chris Bosman of the Nature Trust of BC; Richard Klafki, Nancy Newhouse, and Adrian Leslie of Nature Conservancy of Canada; Juliet Craig of Kootenay Conservation Program; Marc-Andre Beaucher of Creston Valley Wildlife Management Area; Dave White of Canal Flats Wilderness Club; and Rick Hoar and Dr. Suzanne Bayley of Columbia Wetlands Stewardship Partners, among others.

A preliminary list of organizational partners includes:

- BC Ministry FLNRORD, Ecosystem Section
- Canal Flats Wilderness Club
- Columbia Wetlands Stewardship Partners
- Creston Valley Wildlife Management Authority
- East Kootenay Wildlife Association
- Kootenay Conservation Program
- Lake Windermere District Rod & Gun Club
- Nature Conservancy of Canada
- Slocan Lake Stewardship Society
- The Nature Trust of BC
- Trans-border Grizzly Bear Project
- Wildlife Conservation Society of Canada

This report was prepared partially for FWCP project # COL-F20-W-3043

Recommended citation:
Proctor, M. F. and M. Mahr. 2020. Kootenay Connect: Riparian Wildlife Corridors for Climate Change, Year 1 Annual Report. Kootenay Conservation Program, Nelson, BC.

Cover photo: Columbia Wetlands at Luxor Linkage (Credit: Richard Klafki).

CONTENTS

FIGURES

TABLES

DEFINITION OF ACRONYMS

ALR	Agricultural Land Reserve
BBC	Bonanza Biodiversity Corridor
BMP	Best Management Practices
CBT	Columbia Basin Trust
CVWMA	Creston Valley Wildlife Management Area
CW	Columbia Wetlands
CWSP	Columbia Wetlands Stewardship Partners
EKWA	East Kootenay Wildlife Association
ESA	Environmentally Sensitive Area
ESCLWMA	East Side Columbia Lake Wildlife Management Area
FWCP	Fish & Wildlife Compensation Program
GIS	Geographic Information System
KCP	Kootenay Conservation Program
MFLNRORD or FLNRORD	Ministry of Forests, Lands, Natural Resource Operations and Rural Development
NCC	Nature Conservancy of Canada
NGO	Non-governmental Organization
NTBC	The Nature Trust of British Columbia
OCP	Official Community Plan
SLSS	Slocan Lake Stewardship Society
SWAMP	Slocan Wetlands Assessment & Monitoring Project
TBGBP	Trans-border Grizzly Bear Project
WC	Wycliffe Corridor
WHA	Wildlife Habitat Area
WHF	Wildlife Habitat Feature
WMA	Wildlife Management Area

EXECUTIVE SUMMARY

Riparian and wetland systems are biodiversity hotspots and climate refugia that also act as wildlife linkages across human-settled valleys. In the Kootenay region of BC, protecting riparian-wetland complexes is also the best opportunity for re-establishing fragmented grizzly bear populations and potentially other wildlife species. A new initiative called Kootenay Connect integrates large carnivore (grizzly bears), ungulate, and other wildlife species occurrence data with large riparian-wetland complexes mapped in Geographic Information Systems (GIS) to identify critical habitats and connectivity corridors at a regional scale.

The goals of Kootenay Connect are:

- To blend science and community-based approaches to large landscape conservation by identifying connectivity areas throughout the East and West Kootenays focused on wildlife corridors, biodiversity hotspots, and climate change refugia.
- To integrate climate modelling to identify the highest priority areas in which to retain landscape connectivity as habitats shift over time.
- To assess conservation threats, and opportunities for addressing them, through strategies that will enhance the ability of ecological networks to connect different landscape elements and elevational gradients for all species.

The paradigm that underpins Kootenay Connect is that landscape linkages focusing on low-elevation large riparian-wetland complexes are essential for conserving biodiversity, movement corridors, and ecological functions in BC's Kootenay region.

This report updates (and replaces) our preliminary report (Proctor & Mahr 2019) with the results of Kootenay Connect's first year of activities. The preliminary report provided background, justification, and anticipated large-scale conservation benefits of initiating Kootenay Connect to assess and call attention to ecological connectivity throughout the Kootenay region. Briefly, this initiative evolved from a decade of work by the Trans-border Grizzly Bear Project (TBGBP) that identified grizzly bear fragmentation patterns (Proctor et al. 2012) and potential corridors across the region's human-settled valleys of southeastern BC (Proctor et al. 2015); and detailed how a decade of targeted connectivity management resulted in enhanced grizzly bear connectivity across the Creston Valley that also protected strategic endangered northern leopard frog breeding habitats (Proctor et al. 2018).

This body of work highlighting the Creston Valley Frog Bear corridor became the springboard and proof of concept for Kootenay Connect to investigate the role of riparian-wetland complexes throughout the Kootenay region to provide at a regional scale for multiple species at risk, sensitive habitats, movement corridors, and ecological functions – both currently and with climate disruption.

The lessons learned from the Creston Valley Frog Bear example: Science research can help confirm the most important locations for conservation measures across landscapes, inform specific actions, and monitor their effectiveness. Using this knowledge, it is possible to develop conservation objectives that are compelling and lead to successful integration of multiple jurisdictions as different interests and mandates do their part to achieve a common vision for conservation.

Kootenay Connect builds on the growing capacity of conservation collaboratives that are emerging across the Kootenay region. A key objective of Kootenay Connect is to develop new (or strengthen existing) landscape-scale partnerships comprised of diverse stakeholders with a common interest in developing place-based solutions for local landscapes. We are working with the Kootenay Conservation Program, a network of 80+ partners, and other key stakeholders within 12 corridors to develop a mosaic of conservation activities, strategies, and solutions that include private and public lands in order to improve management across wildlife corridors and landscape connectivity areas throughout the East and West Kootenays.

As regional funders such as the Fish & Wildlife Compensation Program (FWCP) and Columbia Basin Trust (CBT) direct more support to landscape-level conservation and restoration, and federal and global initiatives encourage increasing protected areas and connectivity areas, the time is ripe for Kootenay Connect to help identify where conservation values are highest, capacity is strongest, and collaborative efforts are valued. Thus, there are many ongoing conservation opportunities and initiatives that are complementary to the purposes of Kootenay Connect within which we can contribute an integrated high-level perspective to stitch together habitats and ecosystems that ecologically depend upon each other as an integrated whole.

Kootenay Connect is being developed between 2019 and 2022. Our project focused on Four Focal Corridors in Year 1 (2019–2020): Creston Valley, Bonanza Biodiversity Corridor, Columbia Wetlands north of Radium, and Wycliffe Wildlife Corridor. In subsequent years (2020–2023) we will address other regional corridors in the Kootenay region.

The following activities were pursued in our first year:

1. **Mapping**. To help us eventually map carnivore/wildlife/SAR/riparian/climate change corridors to be considered for enhanced protection and connectivity management, we developed an extensive GIS database covering 14 themes: 1) riparian and wetlands habitats; 2) grizzly bear habitat and connectivity models; 3) wolverine habitat models; 4) American badger habitat models; 5) seasonal elk habitat use and movement routes; 6) mountain goat and bighorn sheep habitat data; 7) ungulate winter range; 8) all available

SAR spatial data including a thorough species at risk review in the Columbia Wetlands; 9) ecological and geophysical GIS layers; 10) regional ecological climate-response modelling; 11) high conservation value forest delineations used by the timber industry; 12) human-related land use layers; 13) jurisdictional land use designations, private and public protected lands, land ownership; and 14) information gathered from several regional wildlife and habitat experts.

2. **Integrated GIS layers.** We integrated the above GIS layers to identify specific conservation targets and strategies that included a climate adaptation perspective provided by a regional climate change model and relevant biologically-based mapping layers (e.g., northern leopard frog breeding ponds and migration routes, western painted turtle breeding habitats, great blue heron rookeries, relevant species at risk information, ungulate winter range, etc.) with land ownership patterns to help identify threats and conservation opportunities.
3. **Identified private land conservation opportunities**. We analyzed private lands within riparian-wetland complexes within the Four Focal Corridors for their potential conservation by the Nature Conservancy Canada or the Nature Trust of BC.
4. In collaboration with Kutenai Nature Investigations, we carried out a climate adaptation assessment of the Creston Valley and Bonanza Corridor areas that will act as an overarching framework for conservation action planning.
5. **Produced detailed GIS maps for each of Four Focal Corridors.** We have mapped the Creston Valley, Bonanza Biodiversity Corridor, Columbia Wetlands, and Wycliffe Wildlife Corridor with the above attributes to inform our conservation planning.
6. **Worked with champions in Four Focal Corridors.** We organized workshops in the Four Focal Corridors to consult with local stewardship groups, First Nations, local, regional, and provincial land managers, and other regional experts to review mapping and identified corridor-specific threats and conservation opportunities available in the public and private sectors. These Four Focal Corridors serve as test cases to develop a framework and methodologies for approaching our overall workup of each of the 12 anticipated corridors. The proof of concept we developed will then be applied to subsequent corridors in Years 2 and 3.
7. **Analyzed case studies.** We worked in the Four Focal Corridors developing a framework for identifying, prioritizing, and implementing conservation actions.
8. **Compiled existing resources.** We researched and packaged resources for each of the Four Focal Corridors.
9. **Reported out to partners and funders.** The results of these activities are presented in this report entitled, *Kootenay Connect: Riparian Wildlife Corridors for Climate Change – Year 1 Annual Report.* Considerable effort was invested in this report, as it showcases the initiative and is our blueprint for future conservation efforts across the region. We

developed a matrix of Kootenay Connect corridor-specific needs, efforts, and conservation tools to identify our approach to new corridors in Years 2 and 3.

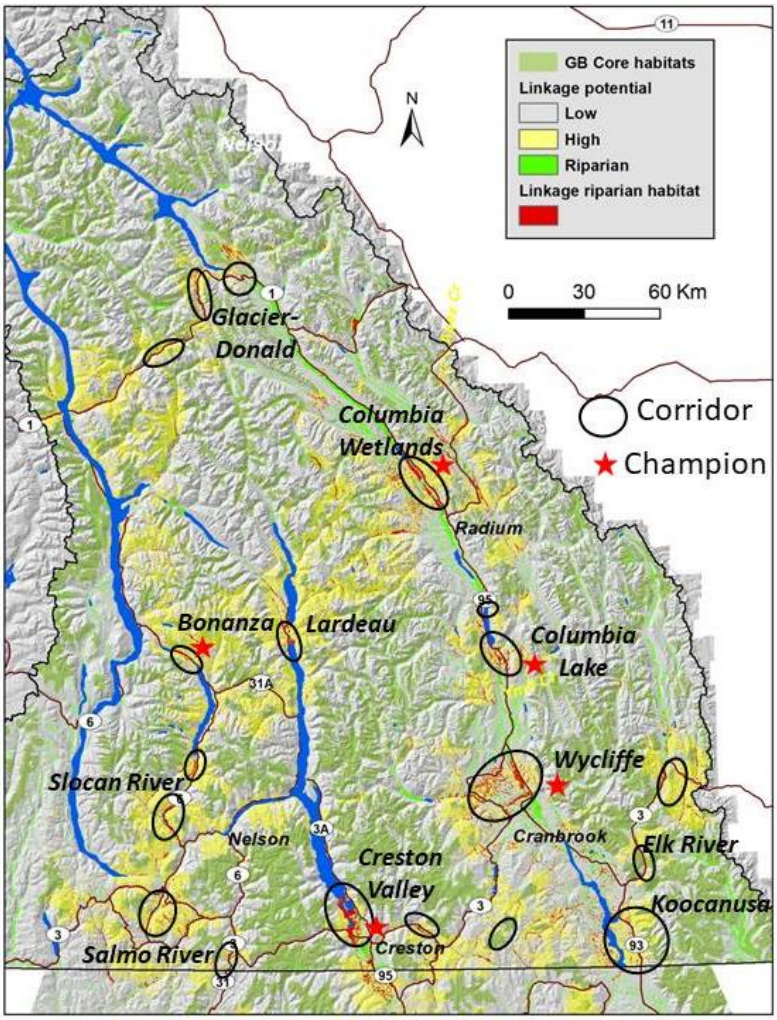
We found consistent and similar conservation values, threats across the Four Focal Areas and therefore similar priority actions and recommendations. Specific tools and who might address these activities are detailed in Table 1 in the Recommendations section.

We recommend:

- improved biodiversity and SAR inventories
- identification of critical habitats and biodiversity hotspots for protection
- integrated riparian-wetland-upland connectivity areas be specified and protected that include species whose inter-seasonal life cycles span the riparian-upland interface (e.g., western toads)
- that invasive species be managed and monitored
- more effective management of recreational pressures on SAR and connectivity habitats
- that access management be initiated in areas adjacent to these corridors
- the above actions be considered on both public and private lands
- private land stewardship be encouraged, and/or strategic lands be purchased directly or placed under conservation easement through private land trusts
- that all conservation strategies be developed through a climate change adaptation lens
- that specific climate resilience actions be undertaken (e.g., fire management to avoid catastrophic fires, intra-wetland-hydrologic connectivity be enhanced)
- that Kootenay Connect, its partners, and government pursue official designation and establishment of Wildlife/Ecological Corridor status for these area

Our project is a deliberate synthesis of FWCP's Action Plan focal ecosystems, habitats and species encapsulated by priority actions in Upland &Dryland, Wetlands & Riparian Areas, and Rivers & Riparian Areas Action Plans. Our project is designed to maintain and re-establish landscape-level connectivity through our human-settled valleys through rich biodiverse wetland-riparian complexes and in the process overlaps with many identified FWCP Priority Actions encompassing research, land securement, habitat-based actions and monitoring detailed below. Kootenay Connect works to sew together upland habitats with wetland-riparian habitats for the benefit of several recovery species and species of interest and their habitats.

In Years 2 and 3, we will apply the Kootenay Connect concept in other areas of the Kootenays by working closely with stewardship groups, First Nations, and local and provincial land managers to implement corridor-specific conservation strategies. This may include, but not be limited to, strategic private land acquisitions; conservation easements and farm stewardship plans; enhancements to Wildlife Management Areas; and proposals to expand Wildlife Management Areas and BC's protected areas system; assist Regional Districts with scientific rationale for development permitting and zoning regulations; inform riparian-wetland restoration; support landowner education and assistance for stewardship to help improve private land management; and contribute our results to fundraising efforts to benefit landscape-level conservation. We intend that this Kootenay Connect annual report will provide a framework and tools for scaling up local conservation efforts to provide solutions for large-scale conservation.



Kootenay Connect's target corridors with local champions identified (star). In corridors currently without clear champions, Kootenay Connect will work with KCP's partners, land trusts, and local and provincial and federal government (e.g., Canadian Wildlife Service, Parks Canada), and First Nations to identify potential collaborators.

OVERVIEW

This report updates (and replaces) our preliminary report (Proctor & Mahr 2019) with the results of Kootenay Connect's first year of activities. In our preliminary report we provided background, justification, and anticipated large-scale conservation benefits of initiating Kootenay Connect to assess and call attention to ecological connectivity throughout the Kootenay region. The premise behind Kootenay Connect is that landscape linkages focusing on large riparian-wetland complexes are essential for conserving biodiversity, movement corridors, and ecological functions over time in BC's Kootenay region. Given this, the goals of Kootenay Connect are:

- To blend science and community-based approaches to large landscape conservation by identifying connectivity areas throughout the East and West Kootenays focused on wildlife corridors, biodiversity hotspots, and climate change refugia.
- To integrate climate modelling to identify the highest priority areas in which to retain landscape connectivity as habitats shift over time.
- To assess conservation threats, and opportunities for addressing them, through strategies that will enhance the ability of ecological networks to connect different landscape elements and elevational gradients, for all species.

Kootenay Connect and FWCP Action Plans and Priority Actions

Our project is a deliberate synthesis of the Fish & Wildlife Compensation Program's (FWCP) Action Plan focal ecosystems, habitats and species encapsulated by priority actions in Upland & Dryland, Wetlands & Riparian Areas, and Rivers & Riparian Areas Action Plans. Our project is designed to maintain and re-establish landscape-level connectivity through our human-settled valleys through rich biodiverse wetland-riparian complexes and in the process overlaps with many identified FWCP Priority Actions encompassing research, land securement, habitat-based actions and monitoring detailed below. Kootenay Connect works to sew together upland habitats with wetland-riparian habitats for the benefit of several recovery species and species of interest and their habitats.

Kootenay Connect overlaps well with many of the global priority actions applicable to all focal areas identified in the FWCP Wetland & Riparian Areas Action Plan detailed below. The area-specific actions also have good overlap with Kootenay Connects goals and objectives, but are not detailed here (see Results Year 1 Progress below)

FWCP's Upland & Dryland Action Plan

Kootenay Connect aligns well with the priorities of FWCP's Upland & Dryland Action Plan.

Under Land Securement there are several relevant Priority Actions including:

- Protect connectivity corridors for carnivores and ungulates in the Creston Valley – Kootenay Connect is extending to other important and essential connectivity corridors throughout our larger Creston Valley focal area. ;
- Secure important connectivity habitat for carnivores and ungulates in the Elk Valley and Columbia Valley.
- Identify opportunities to secure priority upland/dryland habitats in the Columbia Basin – Kootenay Connect is
  working directly with the Nature Conservancy Canada and the Nature Trust of BC to facilitate achieving this goal.
- Contribute to land acquisition opportunities as they arise adjacent to conservation properties & WMAs for recovery of focal species and the habitats they depend upon now and into the future.
- Protect upland grassland and open forests in the Columbia Valley – Kootenay Connect is encouraging grassland restoration in the Colymnbia Valley as well as the Wycliffe Corridor. Habitat based actions:
- Continue with wildlife tree recruitment (primarily for Lewis's Woodpecker), grassland and open forest ecosystem restoration activities in the East Kootenay – Kootenay Connect's support of projects in the Wycliffe Focal Area also includes restoration of Williamson's sapsucker habitat.

Wetlands & Riparian Areas Action Plan

Kootenay Connect aligns well with the priorities of FWCP's Wetlands & Riparian Action Plan

Under Research and Information Acquisition:

- Map the abundance and distribution of riparian habitats by focal area–through Kootenay Connect, detailed wetland mapping is occurring in the Bonanza Corridor and Columbia Wetlands areas.
- Review available species' inventories in order to identify changes, trends and information gaps.

Under Habitat-based actions:

- Restore and create wetland and habitat area habitat – this is being done in Kootenay Connect's Bonanza and Creston Valley Focal Areas)
- Explore options to collaborate with partners, in order to conserve and enhance wetland and riparian areas.

Under Land securement:

- Identify threats to habitat connectivity and support opportunities for land securement to permanently protect and steward values for wetland and riparian areas.

Under Monitoring and Evaluation:

- Compile, assess, and document effectiveness of completed wetland and riparian restoration project.

Identify threats to habitat connectivity and support opportunities, including but not limited to land securement, in order to secure and steward lands with high conservation values for wetland and riparian areas. Increased available wetland and riparian habitat and community involvement in stewardship activities. Increased available wetland and riparian habitat and community involvement in stewardship activities. Work with regional organizations to conserve and enhance riparian areas in and adjacent to communities within this focal area. P2

Species of Interest Action Plans

Recovery Species mentioned in the FWCP's Action Plans are also priorities for Kootenay Connect. Thus far, Kootenay Connect is targeting 20 species at risk federally protected by the Species at Risk Act (SARA) such as, northern leopard frog, western painted turtle, western screech owl, Lewis's woodpecker, great blue heron, northern myotis, American badger, and grizzly bear. Kootenay Connects is designed to benefit 36 species of special interest such as, bull trout,. Kokanee, flammulated owls, sandhill cranes, osprey, mountain goats, and American beaver.

This report is organized into several parts, Background and Results.

BACKGROUND

1. Part I explores the intellectual and conservation rationale for the concept of Kootenay Connect.
2. Part II discusses the successful components of the Creston Valley's Frog Bear Natural Area and considers how the Creston Valley 'proof of concept' is being applied to other potential landscapes in the region that have high biodiversity within wildlife movement corridors.
3. Part III highlights global and regional initiatives that illustrate how Kootenay Connect aligns with strategies and goals operating in a larger context, and how this initiative can help the Kootenay region contribute to these broader conservation initiatives.
4. Part IV identifies potential conservation tools, such as protections, laws, policies, regulations, and management plans that could be applied to conservation and management of wildlife corridors and areas of high biodiversity within a variety of jurisdictions, both public and private.

RESULTS

5. Part V provides results of our Year 1 activities in Four Focal Corridors, introduces additional focal areas to be approached in Year 2, and proposes a framework for identifying, prioritizing, and implementing conservation actions.
6. Part VI – TO UPDATE identifies next steps beyond this report to effectively deliver Kootenay Connect.

BACKGROUND

PART I. WHY KOOTENAY CONNECT?

The impetus for developing the new initiative of "Kootenay Connect" is based on ecological principles, with downstream social, political, and economic implications. The Trans-border Grizzly Bear Project (TBGBP) has identified corridors for grizzly bears across most human-settled valleys with major highways across the Kootenay region (Proctor et al. 2015) in response to evidence of extensive population-level fragmentation (Proctor et al. 2012). Based on this research and corridor identification (Proctor et al. 2015), the TBGBP focused connectivity management on the Creston Valley and over a decade or more, successfully re-established connectivity between the South Selkirk and South Purcell mountains in that area (Proctor et al. 2018). The main linkage area was the northern end of the Creston Valley that is dominated by the Creston Valley Wildlife Management Area (CVWMA), a large world-class riparian-wetland complex that is also a regional biodiversity hotspot[1] (Fig. 1). That special area was given the moniker the "Frog Bear Natural Area" to highlight the fact that the endangered northern leopard frog is also staging a comeback in shallow open water wetlands exactly where grizzly bears are traversing the valley.

Soon after, and with this frog-bear species overlap in mind, it became clear that many of the predicted grizzly bear connectivity areas in Proctor et al. (2015) also clearly overlapped with valley-bottom riparian-wetland areas throughout the Kootenay region. These findings have led us to consider other important regional linkage areas and develop a large landscape approach through Kootenay Connect. This initiative is designed to build on conservation success in the Creston Valley to establish and enhance connectivity areas that provide benefits at a regional scale for multiple species at risk, sensitive habitats, movement corridors, and ecological functions, and apply them across several landscapes within the Kootenays.

[1] https://www.crestonwildlife.ca/wetlands/biodiversity

Figure 1 illustrates the diversity of land ownership that may necessitate a mosaic of conservation strategies respective of private and public landownership. The Trans-border Grizzly Bear Project has been working with a network of organizations to apply a mosaic of conservation strategies within the Creston Valley for over a decade, which has resulted in the re-establishment of inter-mountain connectivity of grizzly bears (Proctor et al. 2018) and expanded the conservation utility of the Creston Wildlife Management Area in an east–west dimension to foster wildlife connectivity.

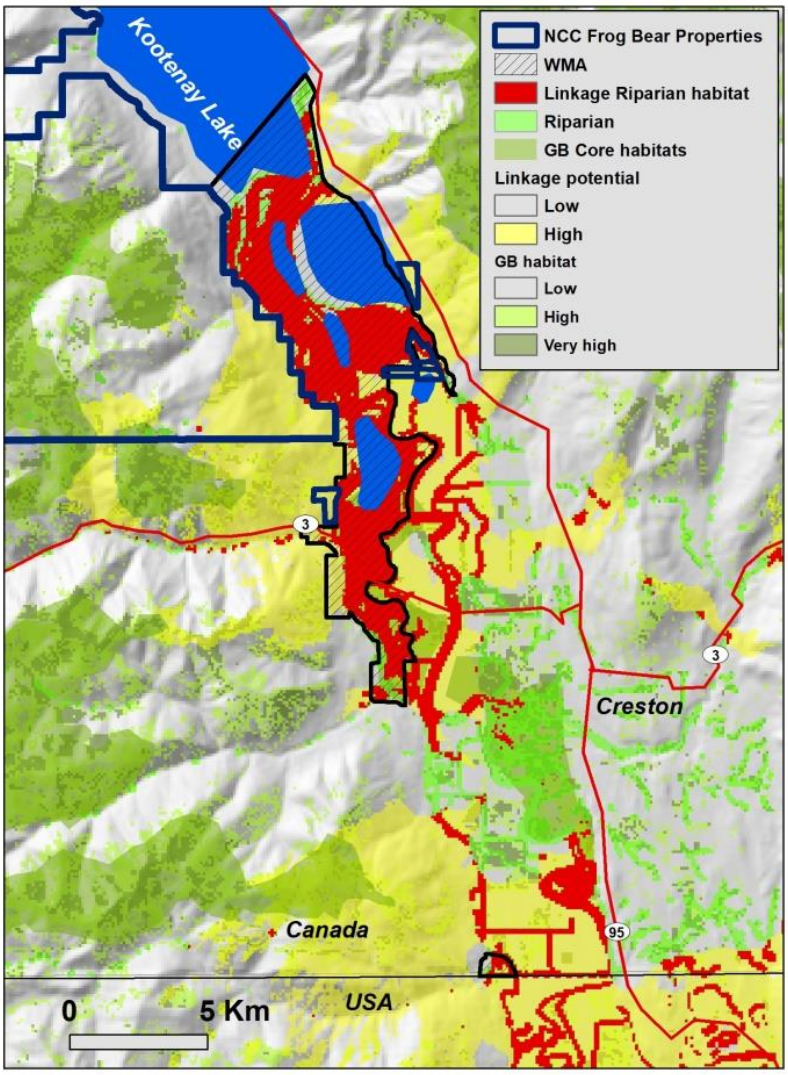


Figure 1. Close-up of the overlap of riparian-wetland habitats and grizzly bears linkages (red) in the Creston Valley that reveals the mosaic of land ownership (provincial, Creston Valley Wildlife Management Area, and private land conservation properties owned by Nature Conservancy of Canada).

SCIENCE RATIONALE

We know that riparian-wetland areas often have higher species richness and abundance than adjacent upland habitats (Klein et al. 2009, Kinley & Newhouse 1997, Hauer et al. 2016) as well as different suites of species (Sabo et al. 2005). These areas also provide many ecosystem services and facilitate ecological processes including species migration along their lengths and across their widths as connections to important upland habitats (Naiman et al. 1993, Klein et al. 2009, Hauer et al. 2016). Several ecological processes spill over from riparian-wetland areas into adjacent lands to capture seasonal habitat requirements of species that rely on riparian habitats for some portion of their annual needs (Semlitsch and Bodie 2003, Hauer et al. 2016), particularly for amphibians (Todd et al. 2009, Cushman 2005, Bull 2006) as is the case for the Creston Valley northern leopard frog population mentioned above[2] and the region's grizzly bears (Proctor et al. 2012, 2015). It has also been suggested that to effectively manage for biological diversity (including ecological processes or ecological diversity) a landscape perspective is required (Naiman et al. 1993) that integrates adjacent upland habitats and often adjacent agricultural lands (Harvey et al. 2008).

The paradigm that underpins Kootenay Connect is that landscape linkages focusing on low-elevation large riparian-wetland complexes are essential for conserving biodiversity, movement corridors, and ecological functions in BC's Kootenay region.

Considering the entire landscape, grizzly bears are a useful umbrella species in our region because they have large home ranges and use almost all habitat types throughout a year. Thus to maintain regional healthy grizzly populations, it is necessary to maintain a wide variety of habitats in reasonably natural condition and with connectivity areas linking mountain ranges. Both suitable habitats and connectivity need to occur across a large-scale grizzly bear metapopulation but this is fragmented in the Kootenay region (Proctor et al. 2012, Hauer et al. 2016). Coupling this scientific rationale with the fact that grizzly bears are iconic and can be used politically to generate conservation action (and funds) is exactly what occurred in the Frog Bear Natural Area of the Creston Valley (Proctor et al. 2018) in which a diversity of partners leveraged grizzly bear conservation to establish an east–west wildlife corridor across the north end of the Creston Valley.

[2] https://www.natureconservancy.ca/en/where-we-work/british-columbia/featured-projects/west-kootenay/frog-bear-conservation-corridor.html

One example of connectivity management is the partial protection of key private land that dominates the valley bottom. Key forest and agricultural lands were purchased by the Nature Conservancy of Canada to enhance and expand the conservation benefits of the CVWMA in an east–west direction (Fig. 2). When you add together the benefits to wildlife provided by protected Crown land (CVWMA), land trust conservation properties, and conservation practices adopted by adjacent private farm and ranch landowners, collaborative actions have measurably improved grizzly bear connectivity between the South Selkirk and South Purcell mountains (Proctor et al. 2018) while also helping to secure a critical breeding area for endangered northern leopard frogs.

Figure 2. Graphic developed by the Nature Conservancy of Canada for public communications illustrating the landscape view of the Frog Bear Conservation Corridor.

Thinking how best to advance Kootenay Connect beyond grizzly bears, we have expanded this concept of landscape connectivity management by identifying other important places where diverse partners might work together to protect areas of high biological diversity and establish recognized wildlife corridors across the Kootenays (Hilty and Merenlender 2004, Todd et al. 2009). Since nature does not recognize private and public land ownership, we envision these biodiversity and wildlife corridors to be some combination of land ownership types with a mosaic of potential management and conservation actions that are relevant to the jurisdictional landscape across the Kootenays (Gallo et al. 2009, Miller and Hobbs 2002, Miller

et al. 2003). We consider existing provincial and local laws, regulations, and management strategies in both the private and government sectors to accomplish our conservation goals, such as strategic land acquisitions and conservation easements, enhancements to Wildlife Management Areas, expanding Wildlife Management Areas, additions to BC's protected areas system, Regional District development permitting and zoning regulations, riparian-wetland restoration, targeted education and landowner assistance for stewardship to improve private land management, fundraising for specific actions, and more. (See Part IV and Appendix D for more information on conservation tools.)

CLIMATE CHANGE REFUGIA

Climate change is having a major impact on global and local biodiversity (Bellard et al. 2012, Stein et al. 2013), resulting in shifts in species ranges (Chen et al. 2011), and a possible dramatic increase in the extinction rate (Pimm 2008). Stressors from climate change likely exacerbate impacts on natural systems from habitat loss and degradation (Brook et al. 2008, Segan et al. 2016). The necessity for habitat refugia in a changing climate is strong and well-documented (Seavy et al. 2009, Keppel and Wardell-Johnson 2012, Morelli et al. 2016). Identifying, recognizing, and managing components of landscapes to function as "climate refugia" can allow nature to slowly adapt to the expected but unpredictable shifting conditions that will allow existing flora to hold on longer and provide wildlife with a safe haven while adjusting to a changing environment. Refugia have been defined by many and we favour definitions that include properties that promote species and ecological community persistence, sustain long-term population viability, ecological services (Sweeney et al. 2004), and ecological and evolutionary processes (Klein et al. 2009, Keppel et al. 2012, Reside et al. 2014).

Refugia are often associated with habitats of higher biodiversity, in species number, richness (different types), and ecological processes (Keppel and Wardell-Johnson 2012, Keppel et al. 2012). Riparian-wetland complexes have the ability to act as climate refugia in many places around the world (Sabo et al. 2005, Lees and Peres 2008, Reside et al. 2014, Selwood et al. 2015, Morelli et al. 2016, Nimmo et al. 2016) and for a large portion of ecosystems in the Kootenays (Kinley & Newhouse 1997, Hauer et al. 2016). We are not suggesting that riparian-wetland habitats represent the entire suite of climate change refugia for the Kootenay region, however we reason they are likely one critically important component of a refugia system in a region that is expected to get hotter and drier (Holt et al. 2012). There is good evidence from other parts of the world that riparian habitats have the potential to be climate refugia (Croonquist and Brooks 1991, Maeve et al. 1991, Sweeney et al. 2004, Lees and Peres 2008, Klein et al. 2009, Reside et al. 2014, Selwood et al. 2015) and are therefore a relevant management objective for climate adaptation in the Kootenays.

Given that climate change is upon us, is projected to intensify in the coming decades, and will have profound impacts on our region's ecosystems, one of our best strategies to ensure nature's resilience is to manage landscapes to ensure connectivity for the full spectrum of species and processes in order to facilitate adaptation to changing and shifting habitats (Cross et al. 2012, Holt et al. 2012, Utzig and Holt 2015b, Ayram et al. 2016). Protecting riparian-wetland areas is considered good insurance for sustaining refugia of current biodiversity. In addition, our preliminary research suggests they are also important areas for landscape-level wildlife connectivity, along and across riparian corridors which link mountain ranges in our region where extensive hydrological developments (dams) have transformed many of our valley bottoms (Columbia River, Arrow Lakes, Duncan and Koocanusa reservoirs) eliminating many terrestrial and riparian habitats and fundamentally altering inter-mountain connectivity (Utzig and Schmidt 2011). The pattern of dams and large reservoirs have created a series of terrestrial pinch-points of connectivity at the north and south ends of reservoirs exacerbating a similar pattern that was already extensive with our natural valley-bottom lakes (Kootenay, Slocan, Windermere, Columbia). These hydrologic systems have steered human settlement into the terrestrial portions of valley bottoms that further fragment habitat connectivity within and across valleys, and place development pressure on the remaining (un-flooded) riparian-wetland habitats (Utzig and Holt 2015a).

The Kootenay region's remaining valley bottoms are therefore especially important both as potential climate refugia and arenas for connectivity. Therefore, we integrated climate adaptation modelling by local landscape ecologist G. Utzig (unpublished data) into our assessment of important corridors for Kootenay Connect. Utzig's climate modelling results help validate our proposed corridor sites and complement our corridor selections where appropriate. There is no better time than the present to develop comprehensive conservation strategies to protect and improve management in some of the most important valley-bottom habitats.

THE TIME IS RIPE FOR KOOTENAY CONNECT

Kootenay Connect is a project whose time has come. It is in line with, and takes inspiration from, the IUCN World Commission on Protected Areas' (WCPA) recent guiding document on ecological corridors (Hilty et al. 2020). It is a culmination of science and stewardship efforts throughout the Kootenay region over the past decade and will tie together many priority actions that have been identified for this region. There is growing interest in participating in connectivity conservation from a broad range of organizations, as demonstrated at the Kootenay Conservation Program's Fall Gatherings 2017–2019, and KCP-sponsored Conservation Action Forums held in both the East and West Kootenays.

In conjunction with the scientific rationale described above, the timing of Kootenay Connect allows this initiative to build upon the growing capacity of conservation collaboratives that are emerging across the Kootenays. For example, new conservation collaboratives are being created with leadership from the KCP to form a network of "Conservation Neighbourhoods" (Fig. 3). These new collaborations are forming around a specific landscape or geography, such as a watershed, a valley, or a wildlife corridor; they require cross-boundary collaboration from multiple partners and stakeholders; and they are essential to addressing the mosaic of land ownership and management objectives inherent in landscape-scale conservation.

An objective of Kootenay Connect is to develop new, or strengthen existing, landscape-scale partnerships comprised of diverse stakeholders with a common interest in developing place-based solutions for local landscapes.

What unites these diverse stakeholders within KCP's Conservation Neighbourhoods is their shared commitment to a place and desire to address overarching, large-scale problems such as habitat fragmentation, declining biodiversity, invasive species, recreational pressure, fire fuel management, and climate change. Participants acknowledge that resolution of these long-term, systems-level problems will require leveraging a diversity of resources, developing collective goals, and providing planning and actions that transcend organizational, land ownership, political, and jurisdictional boundaries.

In Part V, the priorities actions resulting from KCP-sponsored Conservation Action Forums in the Conservation Neighbourhoods of Creston Valley, Slocan Lake Watershed, and Upper Columbia Valley will be summarized in terms of their contributions to Kootenay Connect. Common within all of these areas are these eight conservation priorities:

1. Conserve populations of species of concern
2. Protect existing high-quality habitats
3. Enhance landscape connectivity and corridors
4. Enhance and restore degraded ecosystems
5. Advance climate change resilience
6. Prevent and control invasive species
7. Reduce human-wildlife conflict and recreational pressure
8. Address cumulative effects

This type of collaborative approach to identifying and addressing landscape-scale issues is exactly what's needed for Kootenay Connect to succeed. Working with KCP and its diverse partnerships, we will engage key stakeholders with interests in private and public lands within each landscape corridor in order to develop a mosaic of conservation activities, strategies, and solutions that will inform how Kootenay Connects' science will result in conservation on the ground.

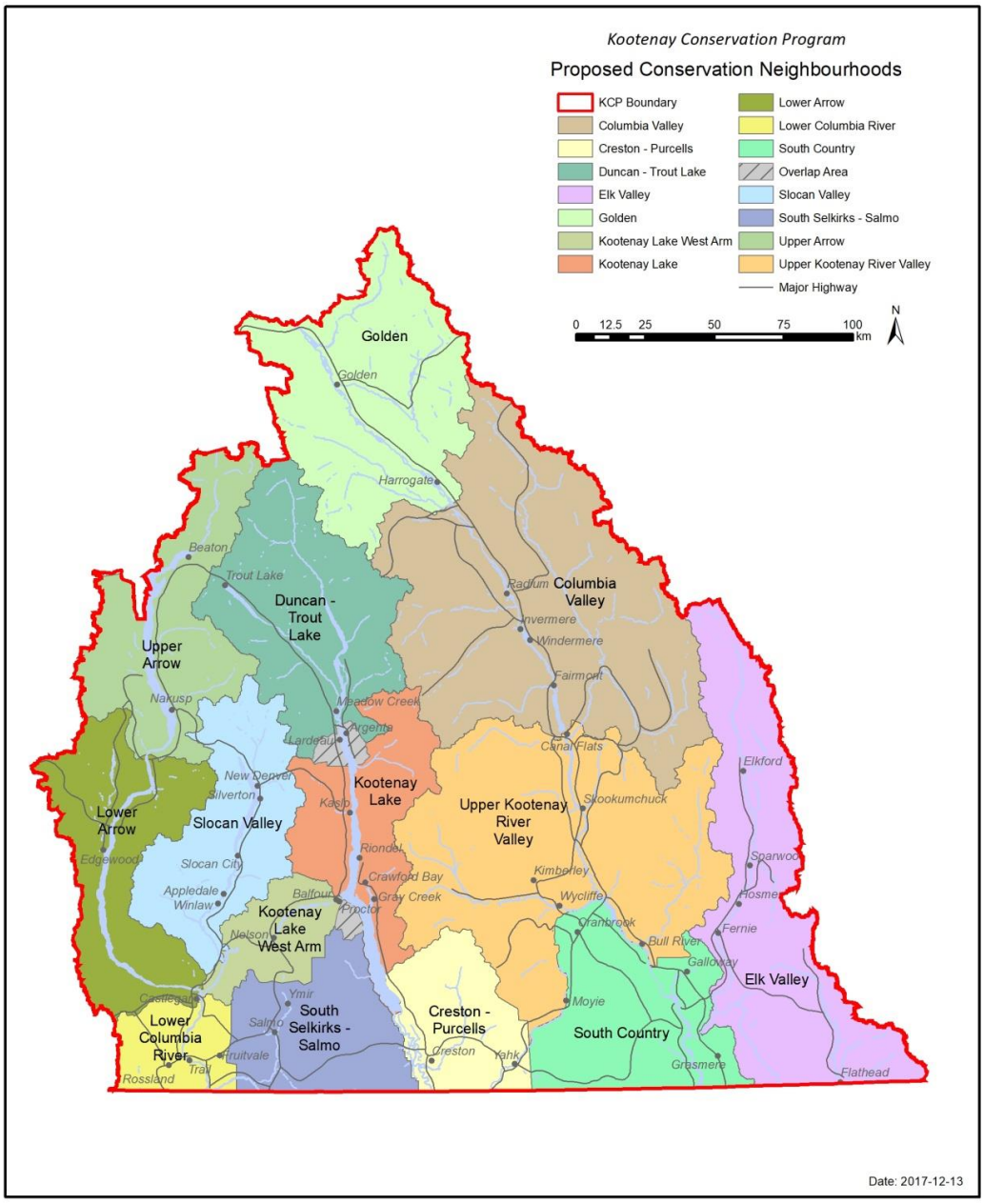


Figure 3. Map of the Kootenay Conservation Program's proposed 14 Conservation Planning Neighbourhoods in the East and West Kootenays.

In Figure 3, the Slocan Lake Watershed, Columbia Valley, Lower Columbia River, Elk Valley and Creston Valley are neighbourhoods where landscape-scale Conservation Action Forums have occurred and collaboratives are underway. In Fall of 2020, Kootenay Connect will team up with KCP and Wildsight-Golden to deliver a Conservation Action Forum in the Golden area.

PROJECT DESCRIPTION

The goal of Kootenay Connect is to identify, assess and initiate establishment of regionally recognized wildlife connectivity areas across the human-settled valleys within the East and West Kootenays. Recent analyses suggest that there is significant overlap between grizzly bear connectivity areas and riparian-wetland complexes in most of our major valleys. These riparian-wetland complexes are also excellent biodiversity hotspots and potential refugia from the impacts of climate change (Capon et al. 2013, Davies 2010).

Kootenay Connect is being developed over three years (2019–2022). In Year 1 (2019/20), we integrated grizzly bear connectivity mapping with riparian-wetland complexes, climate change adaptation modelling, and expert opinion to form the basis for identifying 12 of the most important connectivity areas across the Kootenays (Fig. 4). Also in Year 1, we focused on four connectivity areas to identify conservation targets, ecological threats, and conservation opportunities, as well as local champions who are already working to develop initial conservation management frameworks. These areas are case studies to research local, regional, and provincial resource agencies and stewardship groups (e.g., partners of the Kootenay Conservation Program) to develop a mosaic of strategies that will encompass both private and public lands. (See Part V for more information on developing and applying case studies.)

This Year 1 report updates our preliminary report (Proctor & Mahr 2019) and highlights the results of scientific analysis, mapping, and local engagement we have accomplished to advance connectivity conservation in the four focal connectivity areas. In Years 2 and 3, we will expand on our approach from Year 1, plus take our lessons learned, and collaborate with KCP to form local corridor initiatives in the other eight corridors where they do not yet exist. (See Part VI for more information on next steps.)

We know from the enthusiastic response to the workshop, “Kootenay Connect: A Collaborative Approach to Corridors” (October 2018), diverse stakeholders throughout the region are primed to see project-level information rolled up into a larger landscape context. All agree the time has come for addressing the landscape holistically by incorporating habitat complexes, multiple species, movement corridors, and ecological functioning to inform on-the-ground conservation action.

There is considerable expertise within the Kootenay region for us to tap into. We are confident in our approach based on the success of five Conservation Action Forums co-hosted by KCP in the Slocan Lake Watershed (February 2017), Columbia Valley (December 2017), Lower Columbia-Trail area (December 2018), Elk Valley (May 2019), and Creston Valley (January 2020), in which a variety of individuals and organizations have been contributing to Kootenay

Connect[3]. In Part V, we illustrate how Kootenay Connect has leveraged these Conservation Action Forums into more opportunities for connectivity conservation and management.

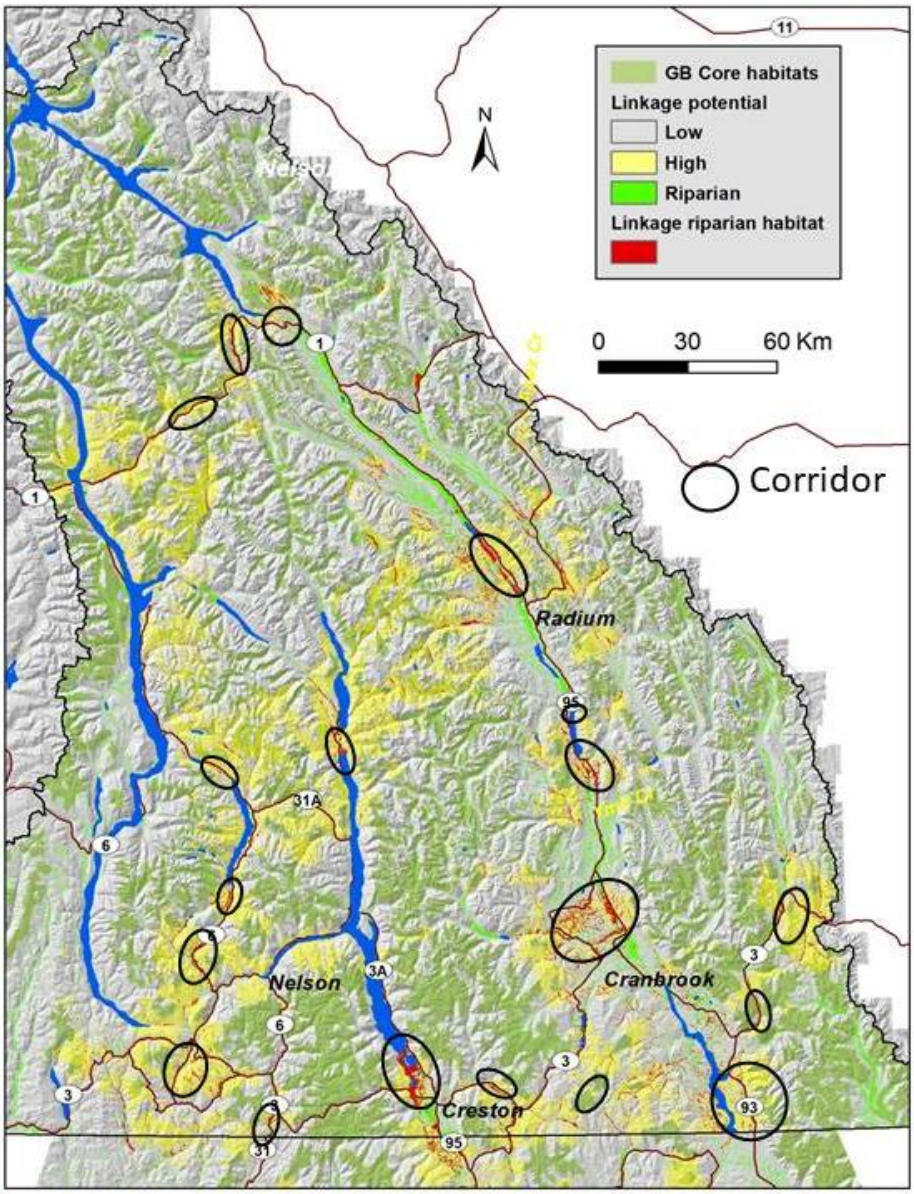


Figure 4. Map of the Kootenay region that illustrates the overlap between predicted grizzly bear linkages and riparian habitat that are potential focal corridors for Kootenay Connect.

In Figure 4, overlap areas (red) between predicted grizzly bear linkages (yellow) and riparian (lime green) habitat. Red areas with ovals are preliminary riparian-wetland biodiversity hotspot corridors that are candidates for conservation within Kootenay Connect.

[3] Find all of KCP's Conservation Action Forum reports at: https://kootenayconservation.ca/conservation-action-forums/

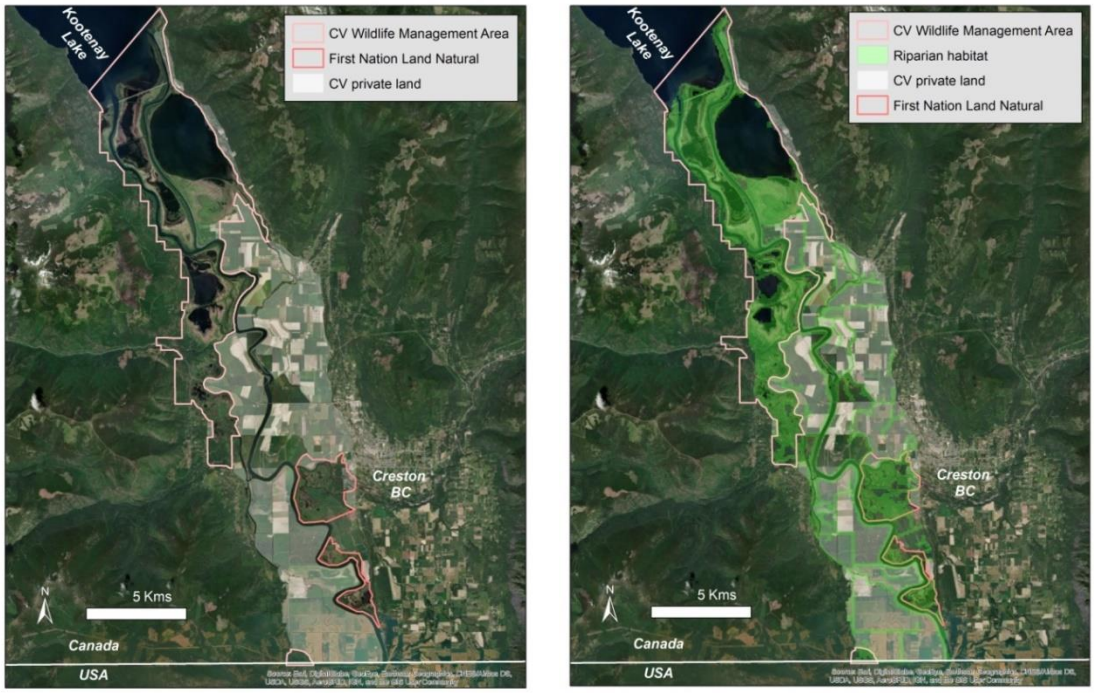
PART II. CRESTON VALLEY CASE STUDY

In 2005, TBGBP researchers radio-collared an adult male grizzly bear in the South Purcell Mountains, high in the Kidd Creek watershed east of the town of Creston. The next April, this bear frequented the Creston Valley off a ridge at the north end of the valley, just south of Duck Lake. Each evening he would cross Highway 3A, the Kootenay River, and much of the Creston Valley to reach good spring habitat in the Creston Valley Wildlife Management Area (CVWMA), and returned to the mountains during daylight. He was using a very well-used wildlife trail and using a remote camera TBGBP documented that the trail was also being used by most other large mammal species in the area, sharing time between the rich productive valley-bottom habitat and the adjacent upland habitats. This male bear's movements inspired TBGBP to include the Creston Valley and the 7,000-hectare (17,000-acre) CVWMA – originally established in 1968 for wildlife and waterfowl conservation and flood control – as integral to the transboundary grizzly bear research program.

Fast-forward and a decade later, TBGBP had ample evidence that the riparian-wetland habitats of the CVWMA (which covers 41% of the valley-bottom flats between Kootenay Lake and the US border, Fig. 5) were both important seasonal and connectivity habitats for grizzly bears from the South Selkirk and Purcell mountains (Proctor et al. 2015), and were part of a regional solution to reconnect a metapopulation of grizzly bears that had been extensively fragmented (Proctor et al. 2012). Not only did TBGBP's connectivity habitat modelling suggest the Creston Valley with its extensive riparian-wetland habitat would be important for re-establishing movements between mountain ranges, the bears were validating their predictions. The TBGBP therefore chose the Creston Valley to focus connectivity management efforts in what amounted to an experimental question: *Could we reconnect the decades-long isolated South Selkirk grizzly bear population to the larger healthier population in the South Purcell Mountains?*

The management activities in the Creston Valley by TBGBP (between 2005 and 2017) were centred on grizzly bear connectivity with the idea that grizzlies might be a useful umbrella species. Therefore, one of our primary activities has been to focus on expanding the conservation utility of the CVWMA as the centrepiece for east–west inter-mountain connectivity. Although the north–south ecosystem and species connectivity is equally important in this trans-border region, particularly in terms of climate change, the TBGBP had to act immediately on conserving this cross-valley linkage area at the south end of Kootenay Lake as the best opportunity to maintain resilient grizzly bear populations in the area into the future. And as we now know, north–south and east–west habitat connectivity are required for

promoting biological resilience under climate change in the transboundary Creston Valley region.



a) b)

Figure 5. a) The Creston Valley matrix of private lands and farms and the Creston Valley Wildlife Management Area and b) same landscape with the extensive riparian-wetland habitats indicated in lighter green.

With data and maps of actual and predicted grizzly bear movement in hand, in 2009 TBGBP started working with the Nature Conservancy of Canada (NCC) and Yellowstone to Yukon Conservation Initiative to purchase strategic land in fee simple and establish conservation covenants with willing landowners that would enhance ecological connectivity in the east–west dimension across the human-settled valley bottom. Because some of the properties that were purchased were being used for agriculture and were included in BC's Agricultural Land Reserve (ALR), TBGBP and NCC acquired a variance from the BC Agricultural Land Commission to place restrictions on agricultural activities to be "wildlife friendly." Currently, these purchased lands are managed for wildlife connectivity and northern leopard frog conservation.

To further local practices in coexistence, TBGBP worked with local farmers and ranchers to integrate wildlife-friendly activities and use electric fencing to secure wildlife attractants. The primary goal of this on-the-ground management effort was to reduce human-wildlife conflict which then ultimately results in improved human safety, decreased property damage (of crops,

livestock, fences, etc.), and increased tolerance by humans. After a decade of management, TBGBP documented an increase in inter-mountain movement and breeding of grizzly bears across the valley in the "Frog Bear Conservation Corridor" (Proctor et al. 2018) (Fig. 2).

This overall conservation management effort is a work in progress, as there is still more to be done with respect to private land conservation and documenting the benefit to other important wetland and riparian species. For example, TBGBP is initiating a student project to assess the dispersal and connectivity of threatened western toads in relation to the CVWMA and upland habitats. Another ongoing project is establishing a safe and ecologically sound dead livestock composting facility that will improve valley-bottom water quality and reduce a wildlife attractant. This effort integrates the needs of local farmers and ranchers with regional, provincial, and federal governments.

The lesson learned from the Creston Valley Frog Bear example: Science research can help confirm the most important locations for conservation measures across landscapes, inform specific actions, and monitor their effectiveness. Using this knowledge, it is possible to develop conservation objectives that are compelling and lead to successful integration of multiple jurisdictions as different interests and mandates do their part to achieve a common vision for conservation.

In the case of the Creston Valley connectivity area, TBGBP and partners integrated provincial, regional and municipal governments, private landowners, conservation organizations, and research scientists to facilitate improved landscape-level connectivity and enhanced conservation utility of the CVWMA. This result has not only reconnected an isolated grizzly population and increased protection for an endangered amphibian's breeding area, it has led to an increased local culture of conservation as residents fence fruit orchards and manage bear attractants in an effort to coexist with grizzly bears and avoid driving their vehicles on dike roads adjacent to northern leopard frog breeding ponds.

PART III. COMPLEMENTARY INITIATIVES

There are many ongoing conservation opportunities and initiatives globally (Hilty et al. 2020), nationally, provincially, and regionally that are complementary to the purposes of Kootenay Connect and within which Kootenay Connect can contribute conservation outcomes that will result in more protected land strategically located across the Kootenays (Appendix A). Over the next few years, we anticipate Kootenay Connect will contribute to reaching some of the various goals and targets of these complementary initiatives. For example, global initiatives include the

United Nations Convention on Biodiversity Aichi Biodiversity Target 11[4] and designation of Key Biodiversity Areas[5]. Nationally, the 2020 Biodiversity Goals and Targets for Canada[6] has led to the recent Target 1 Challenge Fund of the Canada Nature Fund. The Provincial Wildlife Management Plan 2020 and proposed provincial BC Species at Risk legislation are two opportunities that will guide provincial priorities in the coming years. Regionally, the Fish & Wildlife Compensation Program (FWCP)-Columbia Region Action Plans, the Columbia Basin Trust's new Ecosystem Enhancement Program, and the Conservation Neighbourhoods approach developed by the Kootenay Conservation Program all work towards some portion of Kootenay Connect's overall goal of conserving connectivity areas with high biodiversity.

CANADA NATURE FUND'S SUPPORT FOR KOOTENAY CONNECT PRIORITY PLACES

As stated above, in 2018 we knew the timing to launch Kootenay Connect couldn't be better. While finalizing our preliminary report in early 2019, we saw the announcement of Environment and Climate Change Canada's (ECCC) Canada Nature Fund program to support local priority places throughout Canada. We began dialoguing with KCP and several organizations working in the Four Focal Corridors we proposed to work in during Year 1. Kootenay Connect provided a good fit for the purpose of the ECCC's Community-Nominated Priority Places program in which multiple partners take action together at the community level to protect and recover species at risk in order to complement ongoing species at risk conservation in priority places already identified by federal, provincial, and territorial governments.

What resulted was over 20 partners in the East and West Kootenays proposing over 50 subprojects over four years to improve habitats for species at risk. The alignment between partners and projects that Kootenay Connect quickly generated proved successful in that we were one of 15 projects selected nationally and one of two projects selected in British Columbia to receive a Community-Nominated Priority Places grant valued at $2 million over four years. Currently, on-the-ground conservation and management actions focusing on species at risk will help Canada achieve its Target 1 goal of protecting 17% of Canada high-priority terrestrial systems among other conservation goals mentioned above.

[4] https://www.cbd.int/sp/targets/rationale/target-11/
[5] http://www.keybiodiversityareas.org/what-are-kbas
[6] https://biodivcanada.chm-cbd.net/2020-biodiversity-goals-and-targets-canada

The schematic below (Fig. 6) shows how Kootenay Connect Community-Nominated Priority Places[7] fit into the larger concept of Kootenay Connect that we are reporting on here. Kootenay Connect provides an umbrella for both FWCP- and ECCC-funded projects. Whereas Kootenay Connect "Original" currently funded by the FWCP is a three-year regional initiative that provides a science and mapping foundation for collaborative conservation planning and implementation across 12 areas, Kootenay Connect "Priority Places" is a four-year program focusing on the four corridors that were identify in Year 1 of the FWCP project. Although in this first year of both projects there is overlap in purpose and geography, in future years Kootenay Connect Original will focus on other corridors in the Kootenay region beyond those four that will continue to be funded by ECCC's Canada Nature Fund.

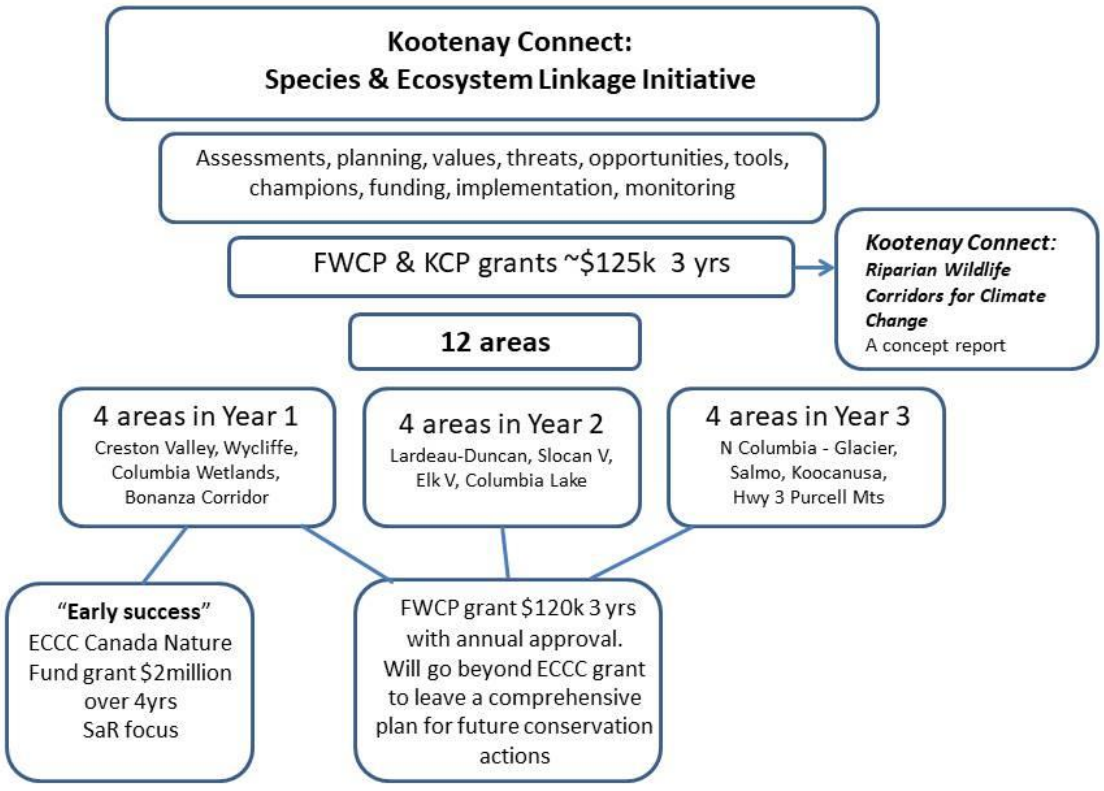


Figure 6. Diagram of how Kootenay Connect provides an umbrella for both FWCP-funded and Environment and Climate Change Canada Community-Nominated Priority Places-funded projects.

[7] https://kootenayconservation.ca/kootenay-connect/

PART IV. POTENTIAL CONSERVATION TOOLS

Once high-priority regions on the landscape are identified to increase conservation protection and actions, it is important to know what measures or tools are available in the conservation toolbox that can apply to multiple jurisdictions and a mosaic of land ownerships. To increase our collective knowledge of appropriate tools (e.g., land designations, legislation, regulations and policies), we have put together the *Land Use Designations, Laws, and Policies to Protect Biodiversity Toolbox* (Tables 2 and 3 in Appendix D) that applies to federal, provincial, and local levels of government and private land. This matrix is a work in progress, and will be expanded and improved as Kootenay Connect and local stakeholders begin assessing how best to designate new lands for conservation, and influence government management plans and practices that protect species at risk and habitat connectivity into the future. We envision working with KCP to develop a *Multi-jurisdictional Conservation Connectivity Toolbox* to guide the application of tools based on location-appropriate conditions.

PART V. APPLICATION ACROSS THE KOOTENAY REGION

The Kootenay region has seen substantial conservation effort around our regional wetland complexes, but with minimal emphasis on connectivity with adjacent upland habitats. There are considerable protected areas across the upper Columbia Basin which were created with minimal emphasis on connecting Wildlife Management Areas and Provincial and National Parks, and prior to 'connectivity' becoming a focus of landscape-level conservation. With over a decade of connectivity research under our belts, locally and across the globe, we now know that linking habitats is essential to realizing ecological integrity and supporting nature's ability to adapt to climate change.

The Kootenay Connect initiative is designed to focus on – and add the connectivity dimension to – the existing base of conservation lands and efforts across the Kootenays. Importantly, Kootenay Connect will stitch together upland habitats with riparian-wetland habitats for the benefit of other species of interest (Olson et al. 2007). We endeavour to integrate each realm into a composite effort that bridges jurisdictional, protection, and management priorities and results in connecting suites of species and ecological processes that require multiple habitat types currently and into the foreseeable future under climate change.

It is our intention to work with and expand upon existing riparian and wetland-based conservation initiatives that are underway across the Kootenays. We are working closely with conservation leaders such as Columbia Wetland Stewardship Partners, Slocan Lake Stewardship Society, Creston Valley Wildlife Management Area, Nature Conservancy of Canada, Nature

Trust of BC, and many others, to connect habitats in multiple dimensions, i.e., north–south within mountain ranges and along valley bottoms, east–west between mountain ranges, and elevationally between valley-bottom and upland habitats.

Our vision for Kootenay Connect is to add the landscape-scale connectivity dimension to conserving biodiversity; integrate conservation and management efforts across ecosystems to promote climate change resilience; and help kick-start connectivity conservation collaboratives where they are not yet occurring.

Over the course of Kootenay Connect's work, we envision using a selection of tools from a multi-jurisdictional toolbox, integrating all levels of government, and private land conservation and stewardship activities to reach common conservation goals. Where relevant, we would integrate and expand on existing complementary initiatives (discussed above and in Appendix C); and utilize various tools that we have begun to outline in the *Land Use Designations, Laws, and Policies to Protect Biodiversity Toolbox* (Appendix D).

For example, it may be appropriate to apply for an expansion of existing (or creation of new) Wildlife Management Areas on public lands that are important riparian-wetland habitats; or directly purchase in fee simple (or place under conservation covenant) through a land trust private lands that are adjacent to an important riparian area as connectivity habitat to adjacent upland habitats; or embark on wetland restoration on private lands to reclaim degraded habitat; or help develop guidelines for wildlife corridors and connectivity in Development Permit Areas designated by Regional Districts. We envision that such specific activities will be undertaken in cooperation with local stewardship groups and land managers and planners that already know their landscapes well.

The most promising areas for conservation action and where we focused our effort in Year 1, are the following four connectivity areas where local champions are already working collaboratively to advance conservation at a landscape scale: Creston Valley Corridor, Bonanza Biodiversity Corridor in the north Slocan Valley, Columbia Wetlands Corridor north of Radium, and Wycliffe Wildlife Corridor between Cranbrook and Kimberley – all are discussed in detail below.

RESULTS: YEAR 1 PROGRESS ON FOUR KOOTENAY CONNECT CORRIDORS

Between September 2019 and March 2020, we held Kootenay Connect workshops in each of our Four Focal Corridors: Wycliffe Wildlife Corridor (Cranbrook, September 2019), Columbia Wetlands Corridor (Radium Hot Springs, November 2019), Creston Valley Corridor (Creston, January 2020), and Bonanza Biodiversity Corridor (March 2020) (Fig. 7). Participants included local species at risk biologists and recovery team members, independent and government biologists, conservation groups and land trusts, municipal and regional planners, elected officials, First Nations, and agricultural producers.

Kootenay Connect Workshop for the Bonanza Biodiversity Corridor co-sponsored by the Slocan Lake Stewardship Society including independent and government biologists and other experts, local conservation groups, land trusts, regional district staff, and First Nations with the purpose of identifying important conservation values and threats to the BBC, as well as opportunities for collaborative conservation. March 6, 2020, Silverton, BC. (Photo: M. Proctor)

The purpose of these workshops was to discuss the ecological values, threats and opportunities for enhancing conservation of habitat connectivity; employ a climate change lens to identify potential impacts on existing habitat cores and connectivity; and begin to explore new connectivity needs for climate-induced shifts in species ranges. The ultimate goal of each workshop was to develop specific conservation strategies for each area and encourage collaboration for local stewardship and management.

A series of Tables 2–7 in Appendix A summarizes focal corridor-specific ecological values including species of interest, important habitats and habitat features, important ecological processes and the ecological threats each area faces. These data are summarized from our extensive data gathering from local experts at workshops, in consultations with regional researchers, GIS database development of biological, ecological, and human-influence layers, described above. As our Four Focal Areas are centred on important low-elevation, wetland-riparian areas there is significant similarity in the natural values across the four corridors.

Conservation targets were defined as species at risk and of cultural importance, important habitat types, wildlife habitat features, special landscape elements, and ecological processes that are targets for protective action. The values represent the biological diversity and unique habitats of each focal area which sustain its ecological integrity and healthy functioning. Although listed independently, conservation targets are interconnected and may nest under each other hierarchically. For example, habitat features may be embedded in particular habitat types or may be the result of certain ecological processes.

Threats were defined as negative impacts which may significantly stress or impair conservation values and directly impact species viability, habitat quality, or ecological functioning. These impacts are activities or processes that are causing or may cause the destruction, degradation, and/or impairment of one or more of the identified conservation values. Many, and likely all, of the conservation targets will face combined stresses. Cumulative impacts are difficult to quantify and even more difficult to predict. Therefore, a precautionary approach to management and further development will be important in order to minimize the non-climate stressors on conservation values.

Given that a changing climate adds a new dimension of impacts, workshop participants agreed that applying a climate change lens is essential to designing conservation actions that consider an unprecedented range of ecological conditions that have no reliable historical basis. Actions must account for changing temperature and precipitation which will disrupt habitats, move home ranges, bring diseases, and change hydrologic patterns. Thus, Kootenay Connect's message underscores that we must respond to existing impacts on habitat connectivity while also anticipating a range of impacts brought by a changing climate.

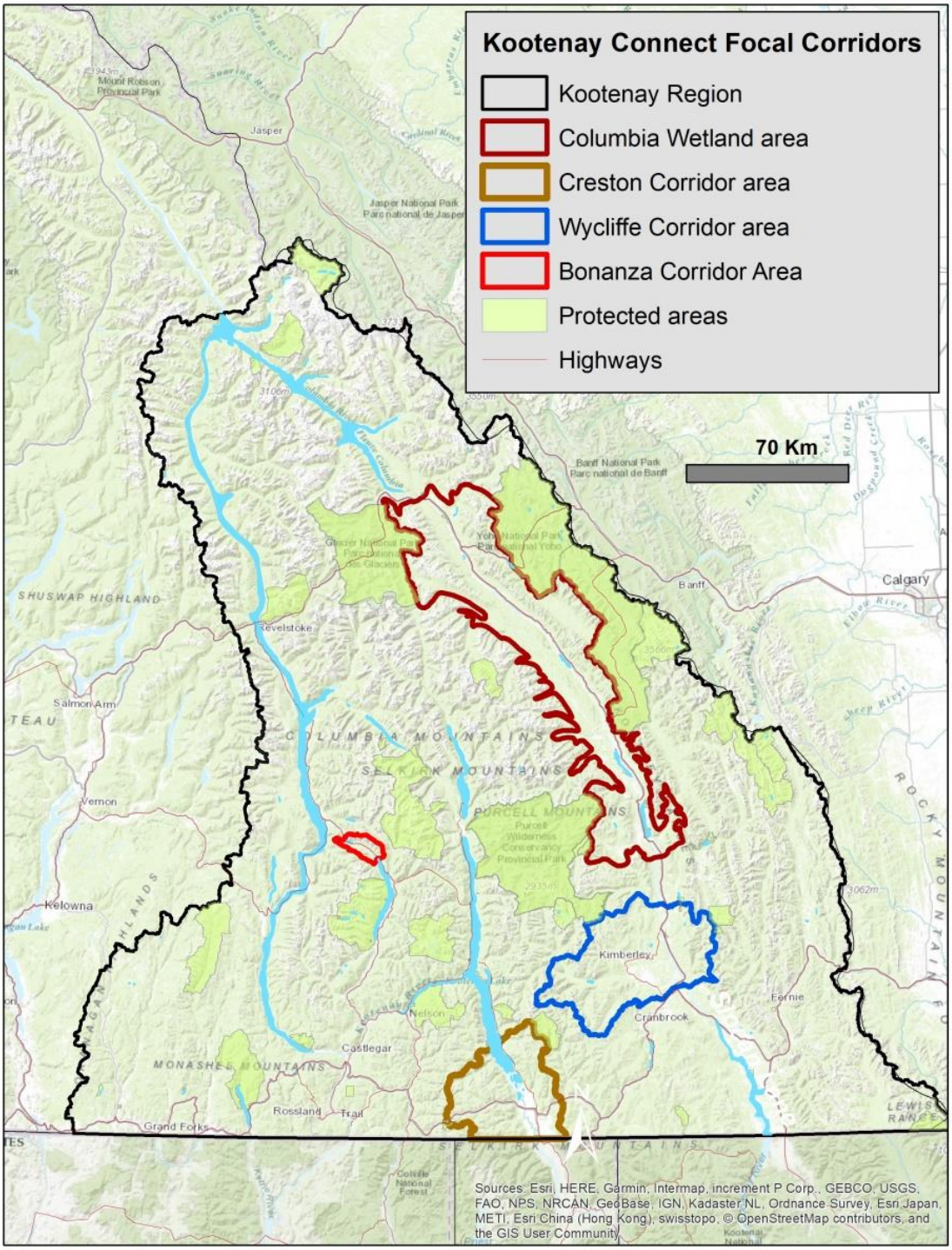


Figure 7. Four Focal Corridors across the Kootenay region within Kootenay Connect Year 1 efforts encompassing 10,000 km^2.

1. CRESTON VALLEY (PHASE 2):

Geographic Description

The Creston Valley connects a portion of the South Selkirk and South Purcell mountains and holds the Creston Valley Wildlife Management Area (CVWMA) which covers ~41% of the valley bottom. Details are also provided above in the Creston Valley Case Study. The CVWMA has 19 SARA listed species, 34 Committee on the Status of Endangered Wildlife in Canada (COSEWIC) listed species and 43 BC listed species (Tables 1 and 2), including the federally-listed endangered northern leopard frog (Fig. 8) and the grizzly bear (Fig. 9) listed as Special Concern.

Creston Valley Wildlife Management Area and northern leopard frog. (Photo: CVWMA)

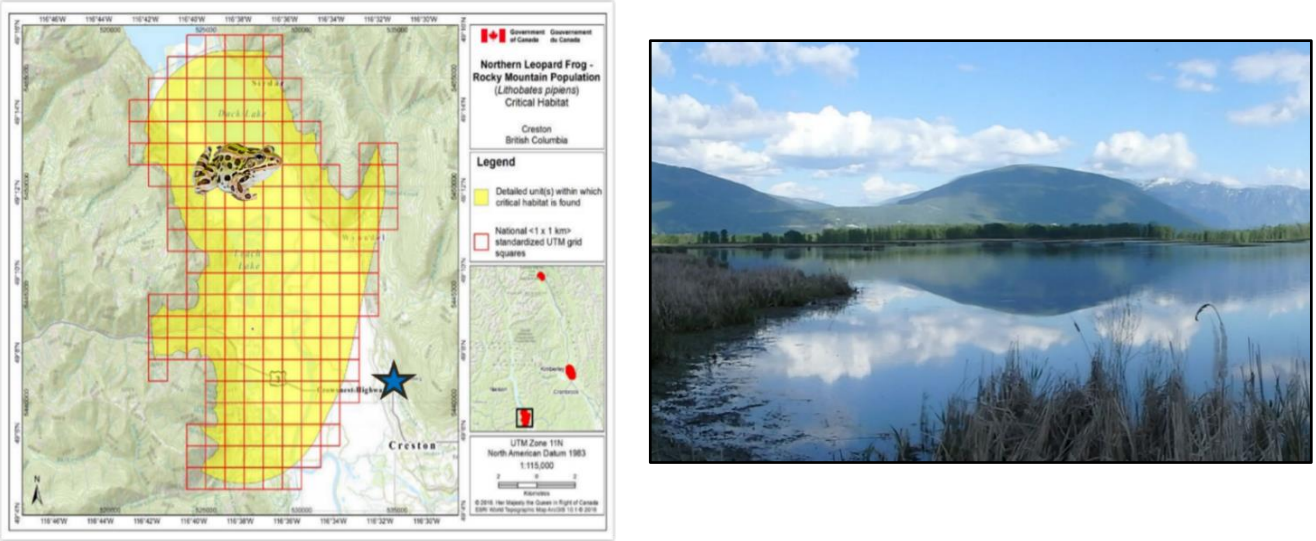


Figure 8. Map of northern leopard frog critical habitat and breeding pond, Creston Valley. (Map and Photo: NLF Recovery Team.)

Leading Connectivity Conservation Groups

Groups engaged in conserving and managing biodiversity and habitat connectivity in the Creston Valley include: Trans-border Grizzly Bear Project, Creston Valley Wildlife Management Area, Nature Conservancy of Canada, Lower Kutenai Band, Farmland Advantage, Northern Leopard Frog Recovery Team, FLNRORD, Kootenay Conservation Program, Wildsight-Creston, and Yellowstone to Yukon Conservation Initiative. The centrepiece of the Creston Valley Corridor is the Creston Valley Wildlife Management Area, and considerable connectivity efforts to link the riparian-wetland valley bottom to adjacent upland habitats have already been accomplished (as discussed above in Part II, Creston Valley Case Study). The Nature Conservancy of Canada (with fundraising help from the Yellowstone to Yukon Conservation Initiative) has already purchased several strategic lands for grizzly bears and northern leopard frogs that also benefit other SAR.

Through the Creston Conservation Action Forum discussed below, we identified there is more work to be done to ensure both inter-mountain connectivity across this valley and longitudinal connectivity north to south for seasonal migrants and south to north for species with shifting ranges due to climate change (Fig. 10). In what we're calling "Phase 2" for conservation in Creston Valley, all partners are motivated to continue collaborating on conservation land purchases and projects contributing to Kootenay Connect.

Creston Valley Conservation Action Forum & Kootenay Connect Workshop

In January 2020, we held a Conservation Action Forum in conjunction with KCP and the Creston Valley Wildlife Management Area (CVWMA) focusing on the Creston Valley. Twenty-seven participants including species at risk experts and recovery team members, independent and government biologists, conservationists, land trusts, municipal and regional planners, First Nations, and agricultural producers collectively identified ecological threats, conservation opportunities, and collaborative strategies for the valley. We briefly report on the results here. For more details, refer to *Creston Valley Conservation Action Forum Summary Report*[8].

The Creston Valley Conservation Action Forum provided participants with an innovative way to approach conservation by working in the context of a local "Conservation Neighbourhood" to identify common priorities and objectives for on-the-ground conservation and stewardship activities. The Forum also provided an important opportunity for further integrating private lands into the conservation and management of connected habitat in the Creston Valley by engaging Farmland Advantage, Creston Beef Growers Association, Yaqan Nu?kiy (Lower Kootenay Band), CVWMA, and Regional District of Central Kootenay.

During this Forum, scientific recommendations led to identifying *conservation targets* (including species at risk Tables 2 and 3; habitat types Table 4; habitat features Table 5; ecological process Table 6); and *ecological threats* (Table 7) in Appendix A. This group process of identifying important biological and ecological elements and forces within the Creston Valley provided a robust foundation for setting common conservation priorities.

Of the many recommendations, five of these became priorities that were developed into action plans that proposed positive solutions and activities to address biodiversity, high-quality habitat, floodplains, and landscape connectivity and resilience through the lens of climate change in the transboundary Kootenay/Kootenai River ecosystem.

The five priority action plans were developed for the Creston Valley:

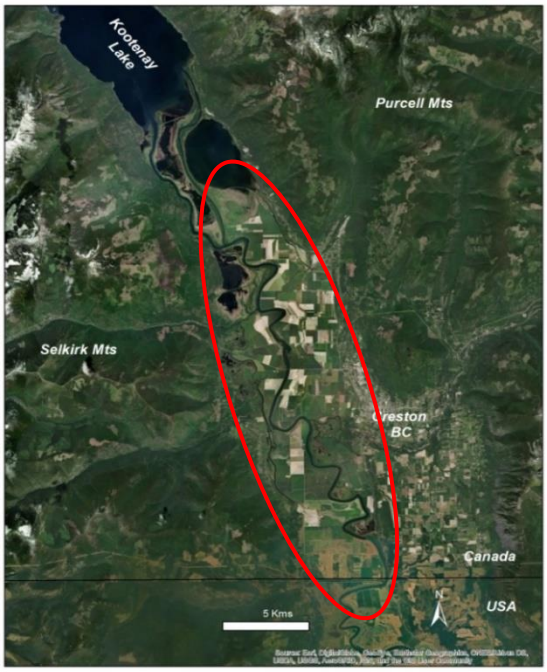
1. Develop a Landscape-scale Ecosystem-based Inventory of Biodiversity
2. Enhance Landscape Connectivity and Corridors Through a Climate Change Lens
3. Expand Stewardship Opportunities to Protect High-quality Habitats

[8] https://kootenayconservation.ca/wp-content/uploads/Creston-Valley-CAF-Summary-Report_FINAL-27Feb2020.pdf.

4. Restore Floodplain Connectivity of the Kootenay/Kootenai River System
5. Perform Fire-maintained Ecosystem Restoration

Of particular interest to Kootenay Connect in the Creston Valley were priorities that incorporated both connectivity conservation and climate adaptation strategies. Key priorities for action identified for Creston were:

1. To apply fire management activities to reduce intensity, frequency, and extent on ecosystems in areas north and south of the main Creston Valley in the immediately adjacent lower mountain slopes (Fig. 10).
2. To protect the north–south climate corridor connecting with Idaho on the west side of the Kootenay River Valley and continuing up to Kootenay Lake on the east side of the Valley. This north–south connectivity would be bridged by the east–west connectivity established across the northern portion of the valley just south of Duck Lake (Fig. 10).
3. To restore inter-wetland and river floodplain connectivity to enhance the water storage function of the wetlands and floodplains through the dry summer months.
4. Identify and protect tributaries that have the potential to deliver cold water throughout the summer through their high-elevation reach and snow melt potential.
5. To identify and protect wet, cool old-growth patches throughout the area as fire-resistant patches that may act as climate refugia.



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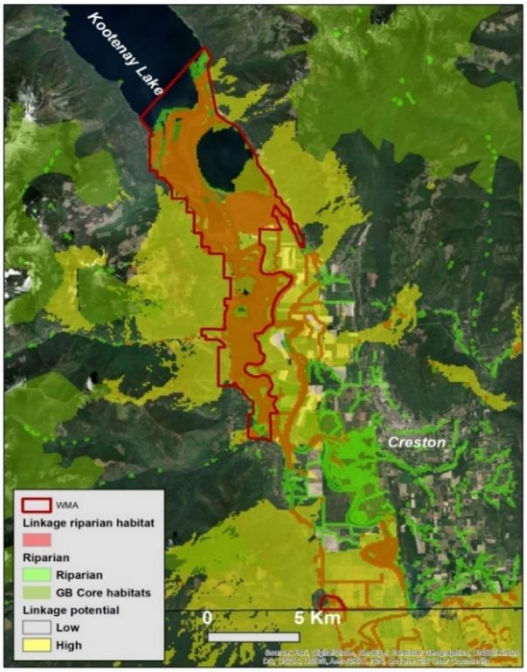

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Figure 9. a) Google Earth image of the Creston Valley Corridor (red oval) connecting the Purcell and Selkirk mountains along BC Highway 3A north of Creston, BC; and b) the same area with grizzly bear core (green) and linkage (yellow) habitats overlaid with riparian habitats (orange) in the valley bottom.

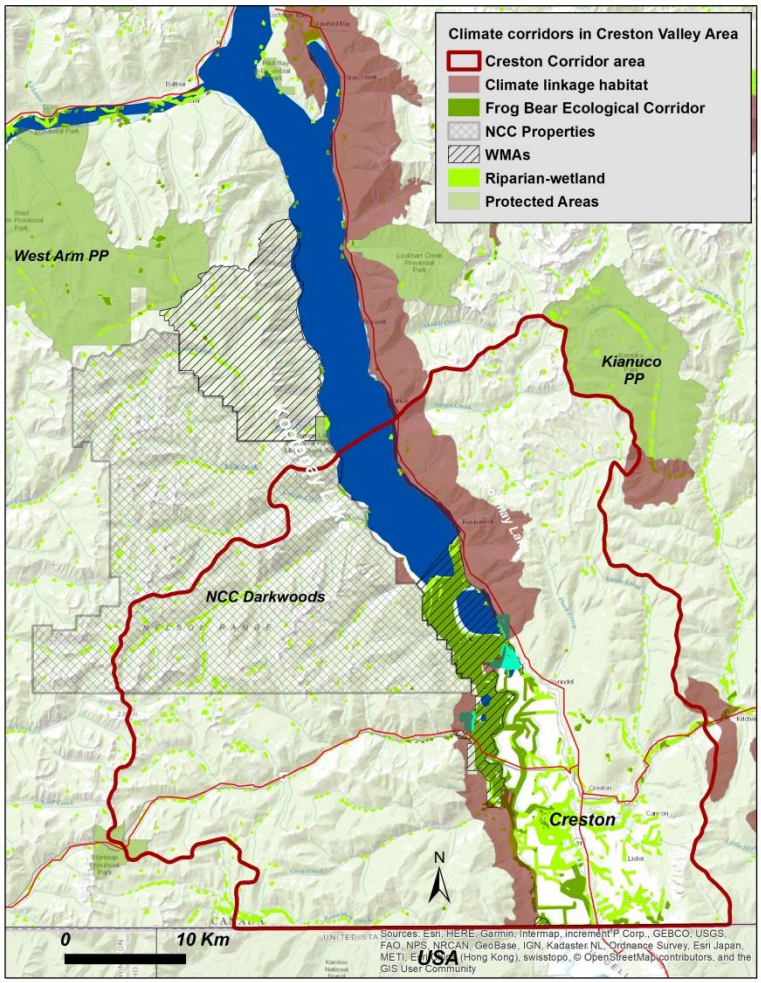


Figure 10. Proposed "climate corridor" (brown) north and south of Creston Valley (Utzig 2020) connected by the Frog Bear Ecological Corridor (dark green) that runs east–west across the Creston Valley just south of Duck Lake.

Kootenay Connect Priority Places Projects

As mentioned in Part III above, Creston was also part of the Kootenay Connect Priority Places project funded by Environment and Climate Change Canada's Canada Nature Fund. The lead partner in this corridor is the Creston Valley Wildlife Management Area. Here we report preliminary results from that project since they overlap with this first year of Kootenay Connect funded by FWCP.

To begin working on Priority 3 of the Creston CAF, work was initiated to restore inter-wetland and river floodplain connectivity where feasible to enhance the water storage function of the wetlands and floodplains through the dry summer months.

Within the abbreviated funding Year 1 (September 2019–March 2020) of Kootenay Connect Priority Places, there were several shovel-ready subprojects led by CVWMA at the Duck Lake Nesting Area, Six Mile Slough, and Corn Creek Marsh that benefited northern leopard frog and western painted turtle. A subproject in the Creston Valley Duck Lake area worked to remove encroaching emergent vegetation to increase intra-wetland hydrologic connectivity – in other words, increased shallow open water breeding habitat and re-established the flow of water between components of the Duck Lake wetland complex that were being choked out by vegetation (Fig. 11). The restoration activities targeting northern leopard frog will also benefit other species including western toad, Columbia spotted frog, long-toed salamander, Pacific chorus frog, western painted turtle; and secondarily, short-eared owl, red-necked phalarope, rusty blackbird, barn swallow, and long-billed curlew.

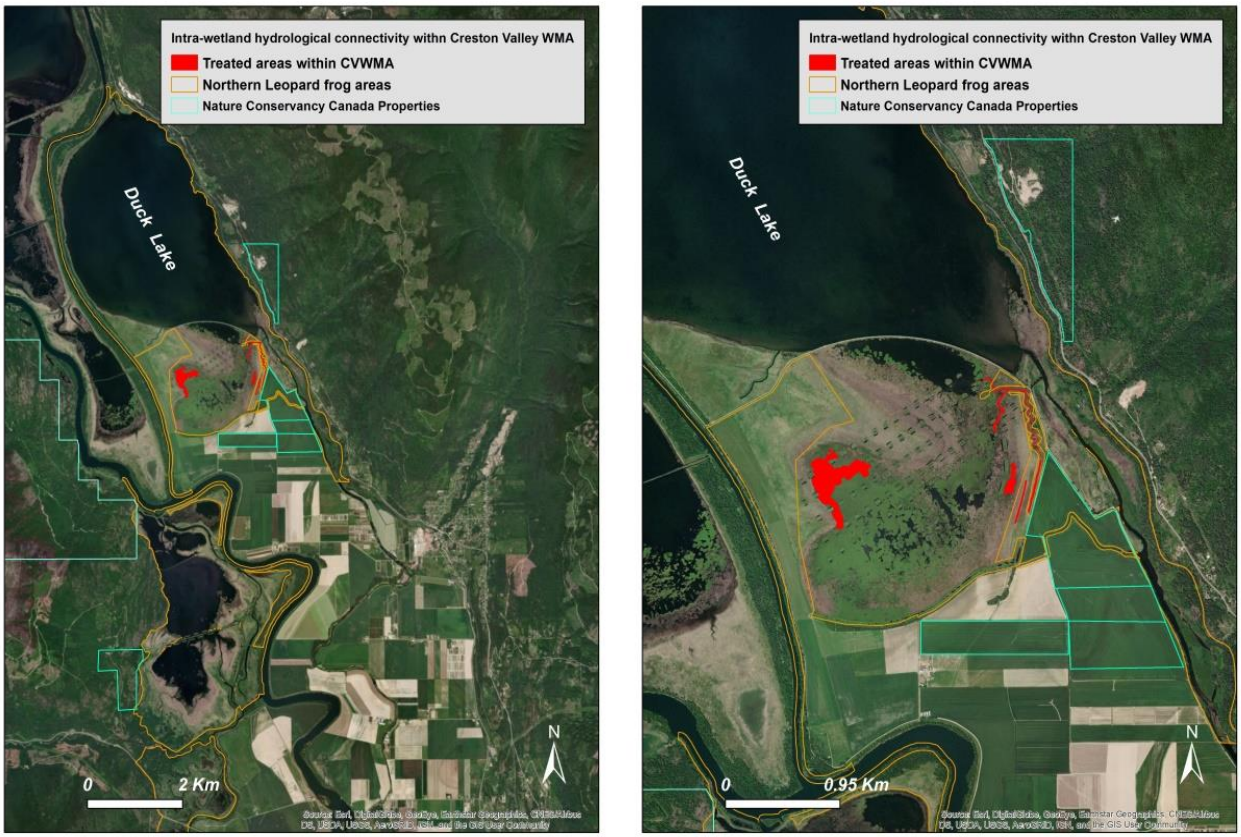


Figure 11. Intra-wetland hydrologic connectivity work supported by Kootenay Connect Priority Place's ECCC funding to the Creston Valley Management Area to improve northern leopard frog foraging, breeding, and overwintering habitat, and connectivity routes between seasonally important habitats.

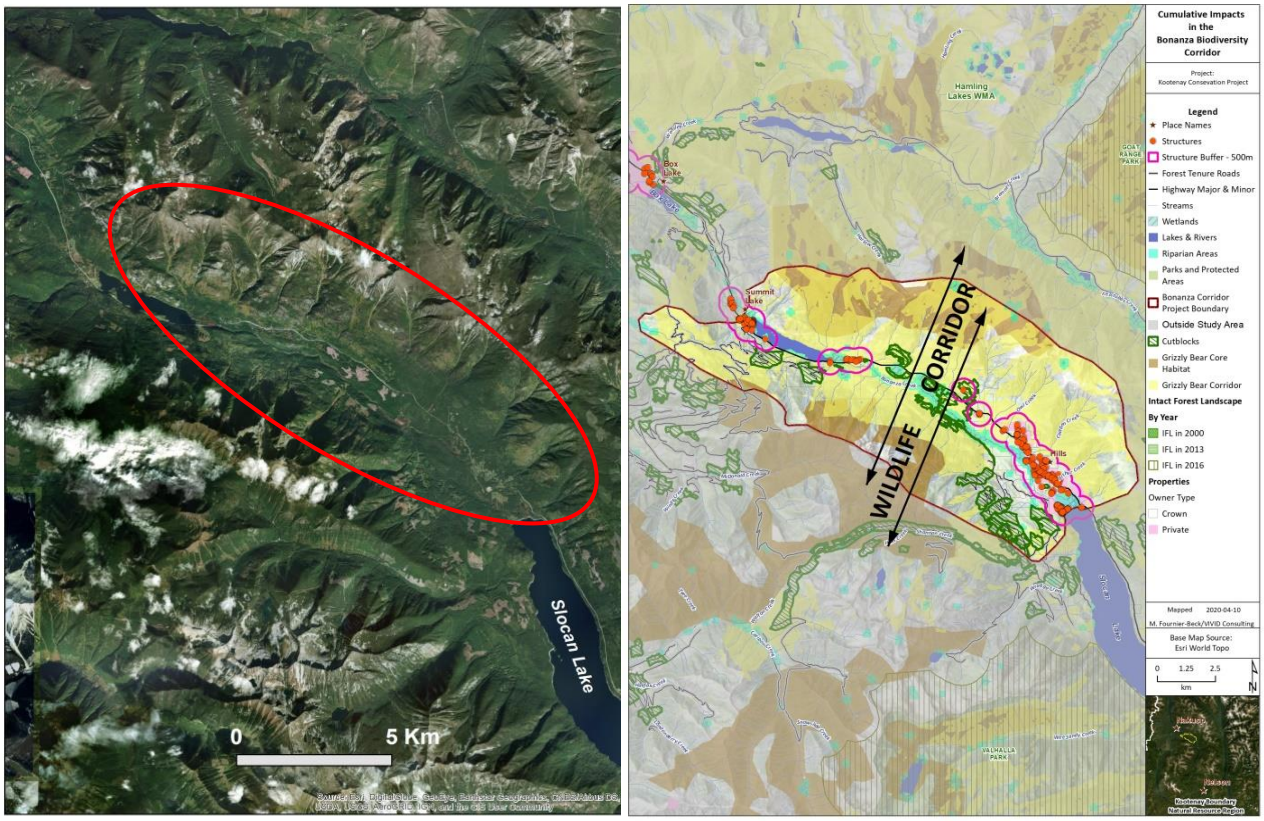
Future subprojects in Years 2–4 in the Creston Valley include: water control improvements at Duck Lake: continuation of northern leopard frog habitat enhancement within their seasonal movement corridor linking breeding, foraging, and overwintering habitats; restoration of connectivity lands in the northern portion of the valley suitable for cross-valley larger mammal connectivity; development of a buffer strip of aquatic, woodland, and open upland habitats along the south side of the Duck Lake Nesting Area; and northern leopard frog population recovery work in conjunction with the provincial NLF Recovery Team.

Looking west across the Creston Valley Wildlife Management Area just south of Duck Lake to the South Selkirk mountains. (Photo: M. Proctor)

2. BONANZA BIODIVERSITY CORRIDOR (BBC)

Geographic Description

This 140 km^2 corridor located between Slocan and Summit lakes extends ~14 km along Highway 6 (Fig. 12). The BBC has great potential to be a significant wildlife and ecological corridor linking Valhalla and Goat Range Provincial Parks in the Valhalla and Central Selkirk mountains, respectively (Fig. 12). A recent expert review of species at risk in the larger Slocan Watershed found 47 species of vertebrates, invertebrates, reptiles, amphibians, and vascular and non-vascular plants species (Durand and Mackenzie 2017) – a portion of which is highly likely to rely on the valley-bottom riparian habitats within the Bonanza Biodiversity Corridor (Schott 2013).



a) b)

Figure 12. a) Google Earth image of the BBC (red oval) extending along BC Highway 6 between Slocan and Summit lakes connecting the Valhalla and Central Selkirk mountain ranges; and b) same area with grizzly bear core (tan) and linkage (yellow) habitats as identified by the Trans-border Grizzly Bear Project (Proctor et al. 2015), overlaid with cumulative impacts relative to preliminary upland wildlife corridors.

These upland corridors will be updated with cumulative SAR and other species data collected in Year 2.

Leading Connectivity Conservation Groups

Groups engaged in conserving and managing biodiversity and habitat connectivity in the Bonanza Biodiversity Corridor include: Slocan Lake Stewardship Society (SLSS), Slocan Wetlands Assessment & Monitoring Project (SWAMP), Summit Lake Western Toad Project, Valhalla Foundation for Ecology, Valhalla Wilderness Society, and Okanagan Nation Alliance.

SLSS is a non-profit advocacy organization that is dedicated to retaining the ecological integrity of the Slocan Lake Watershed through applied scientific research and education. At the 2017 Conservation Action Forum co-hosted by SLSS and KCP (attended by provincial, regional and local government, scientists, land planners, and local water stewards), the Bonanza Biodiversity Corridor was recognized as a unique ecosystem in need of conservation (Mahr 2017a and b). The BBC was also identified as a grizzly bear corridor (Proctor et al. 2015), and recently a radio-collared bear used this area to move across the valley between the two mountain ranges. A high-level assessment of the BBC's conservation values and habitat connectivity areas was conducted by KCP (Mahr 2018b). In addition, SWAMP has surveyed, classified and mapped wetlands throughout the BBC and their report on species at risk identified many unique native flora and fauna not found elsewhere in the Columbia Basin.

The Valhalla Foundation for Ecology's acquisition of a 14-hectare (35-acre) portion of Bonanza Marsh, referred to as Snk'mip Nature Preserve, provides a conservation anchor at the southern end of the BBC at the head of Slocan Lake. VFE is currently restoring hydrologic connectivity to reclaim areas impacted by human disturbance, and enhance the diversity of wetland types surrounding the core of shallow open water. At the northern end of the corridor is Summit Lake, which has possibly BC's largest breeding hotspot for the endangered western toad.

Looking south from Hunter Siding Wetland to Slocan Lake in the Bonanza Biodiversity Corridor. (Photo: Ryan Durand)

Kootenay Connect – Bonanza Biodiversity Corridor Workshop

In February 2017, SLSS and KCP co-hosted a Conservation Action Forum that used a Conservation Neighbourhood approach and provided the model for subsequent KCP-led forums. Scientists, conservationists, land trusts, local government, provincial government resource managers and planners, GIS analysts, and recreationists collectively identified ecological threats, conservation opportunities, and collaborative strategies for the Slocan Lake Watershed (Mahr 2017b). We briefly report on the results here. For more details, refer to the Slocan Lake Watershed Priority Conservation Actions Summary report[9].

After declaring the area between Summit and Slocan lakes the "Bonanza Biodiversity Corridor," scientific recommendations led to identifying *conservation targets* (including species Tables 2 and 3, habitat types Table 4, habitat features Table 5, and ecological process Table 6); and *ecological threats* (Table 7) in Appendix A.

[9] https://kootenayconservation.ca/wp-content/uploads/Slocan-Lake-Watershed-Forum-14Mar2017.pdf

In March 2020, Kootenay Connect held a workshop for the Bonanza Biodiversity Corridor (BBC). Twenty-six participants included local species at risk experts and recovery team members, independent and government biologists, conservation land trusts, regional planners, conservation organizations (e.g., Slocan Lake Stewardship Society, Yellowstone to Yukon Conservation Initiative), First Nations (Okanagan Nation Alliance, Sinixt Nation), and industry, focused on the BCC. Our goal was to continue the work started with the Conservation Action Forum discussed above.

During this workshop participants reviewed the target species, habitat types and features, and ecological processes generated at the 2017 Slocan Lake Watershed Conservation Action Forum (above), as well as identified additional ecological threats, conservation opportunities, and collaborative strategies. The workshop highlighted current projects that are addressing priorities identified in 2017, such as the Bonanza Wetland Enhancement Project which is enhancing and restoring valley-bottom wetlands, and mapping and ground-truthing habitat types and old growth to enhance habitat connectivity along elevation gradients. This project is part of Kootenay Connect Priority Places discussed below.

For this workshop focused on the BBC, we did something different than we did in our Columbia Wetlands and Wycliffe Corridor workshops (described below). We engaged climate change modeller and landscape ecologist Greg Utzig of Kutenai Nature Investigations to pilot a process for meaningfully incorporating climate change impacts into assessments of habitat connectivity. Employing a climate change lens to the BBC allowed us to explore new connectivity needs for climate-induced shifts in species ranges in the area and the key role of the distribution of water in determining existing and future cool, wet climate refugia (Utzig and Holt 2015b).

Climate adaptation recommendations being incorporated into Kootenay Connect

- Identify cool, wet old-growth refugia and protect using a buffer around important old-growth patches that lived through past fires
- Identify wetlands that are fed by drainages on the east side of Highway 6 that provide cold water through hot, dry summer conditions
- Restore intra-wetland connectivity to hold water longer
- Build in wetland redundancy – protect more than multiple areas of similar wetland and riparian habitat types
- Don’t focus restoration objectives based on current or past conditions – consider future climate change impacts, i.e., restoration activities must help bridge between different climate conditions.

Priority Conservation Actions for the Bonanza Biodiversity Corridor

- Fire suppression preparation to help resist catastrophic fire – encourage Fire Smart practices around private land in the corridor
- Control area around important old-growth patches that lived through past fires

- Explore OGMA protection system in the valley and upgrade for accuracy
- Instigate baseline data collection for water monitoring
- Increase public awareness of the ecological significance of the BBC through use of signage and other activities; and use this as an opportunity to encourage public participation
- Notify KCP of potential private conservation properties in the area
- Explore options for using Development Permit Areas in Ecologically Sensitive Areas on private lands and work with RDCK
- Establishing a citizen science road watch (App) to monitor roadkill and identify mortality hotspots for potential management

Kootenay Connect Priority Places Project

As mentioned in Part III above, the Bonanza Corridor is part of the Kootenay Connect Priority Places project funded by Environment and Climate Change Canada's Canada Nature Fund. The lead organization in this corridor is the Slocan Lake Stewardship Society. Projects funded by the ECCC were a direct result of Kootenay Connect's priority actions previously identified in the Slocan Lake Forum. Here we report preliminary results from that project since they overlap with this first year of Kootenay Connect funded by FWCP.

Within the abbreviated funding Year 1 (September 2019–March 2020) of Kootenay Connect Priority Places, the Bonanza Biodiversity Corridor activities included three primary subprojects: assessment and planning for wetland restoration at three sites along the rail trail bisecting the valley bottom (Summit Lake, Upper Bonanza, Hunter Siding) researching the role of beavers, and mapping habitat types using lidar and TEM that would include identification of remaining old growth within the Bonanza Corridor (Fig. 13). In future years, activities will include wetland restoration at the three sites that reconnects wetlands and the Bonanza Creek floodplain; actions that work with beavers to improve wetland functionality; species at risk inventory; and habitat and old-growth mapping and ground-truthing to inform conservation recommendations.

Kootenay Connect's contribution is a series of new GIS spatial layers and maps developed for the corridor that include layers for human disturbance, ecological attributes, topographic, geophysical, species at risk observation points, species-specific habitat use models, species-specific connectivity models, habitat types (e.g., wetland, riparian, etc.), ownership and land use designation, private conservation lands and more. (A list of spatial coverage across all Four Focal Corridors is found in Appendix D.) These layers are kept as a Kootenay Connect GIS database for use by teams working within each focal corridor, conservation and research planning and decision-making, knowledge gap analyses, and more.

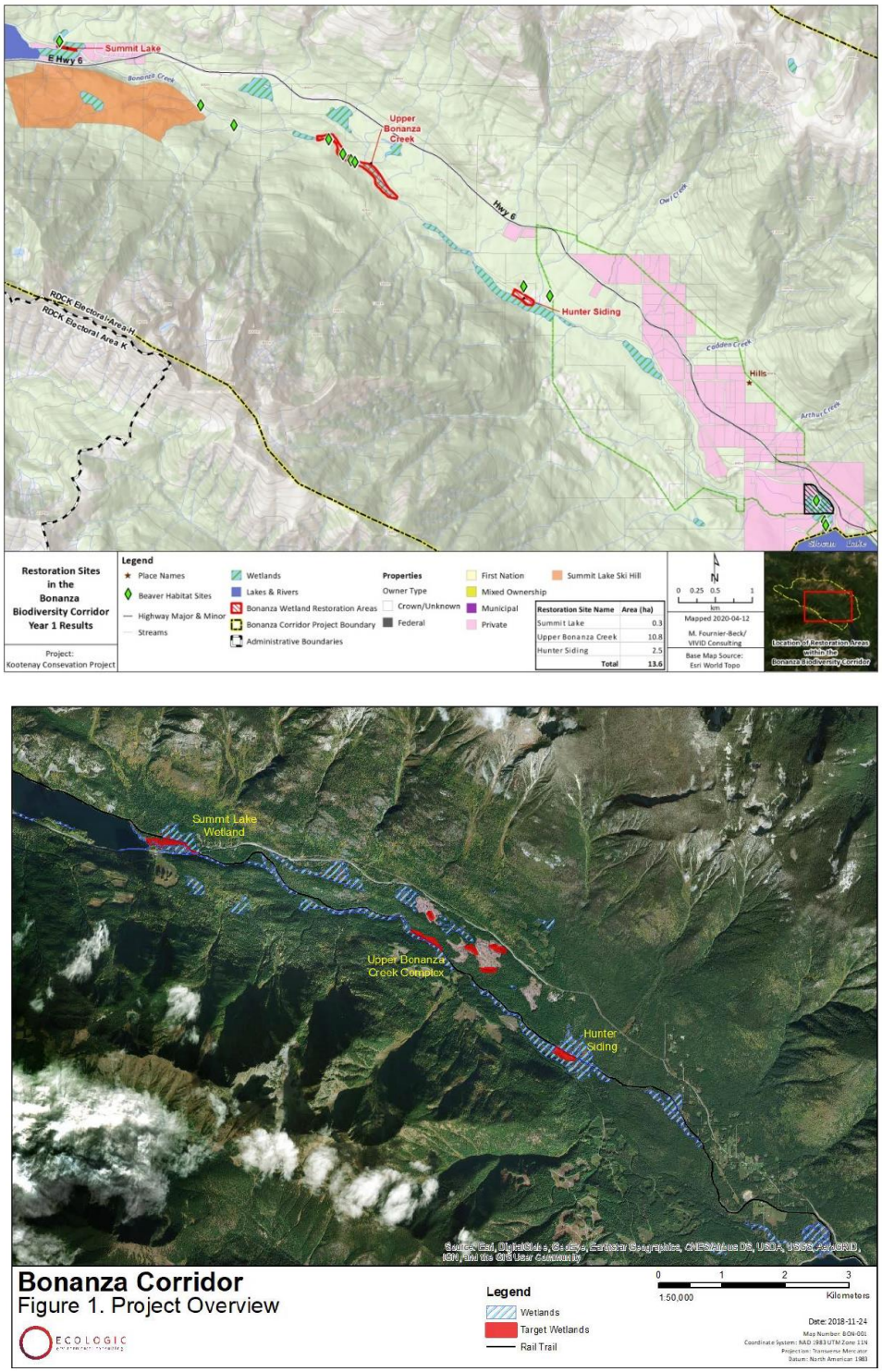
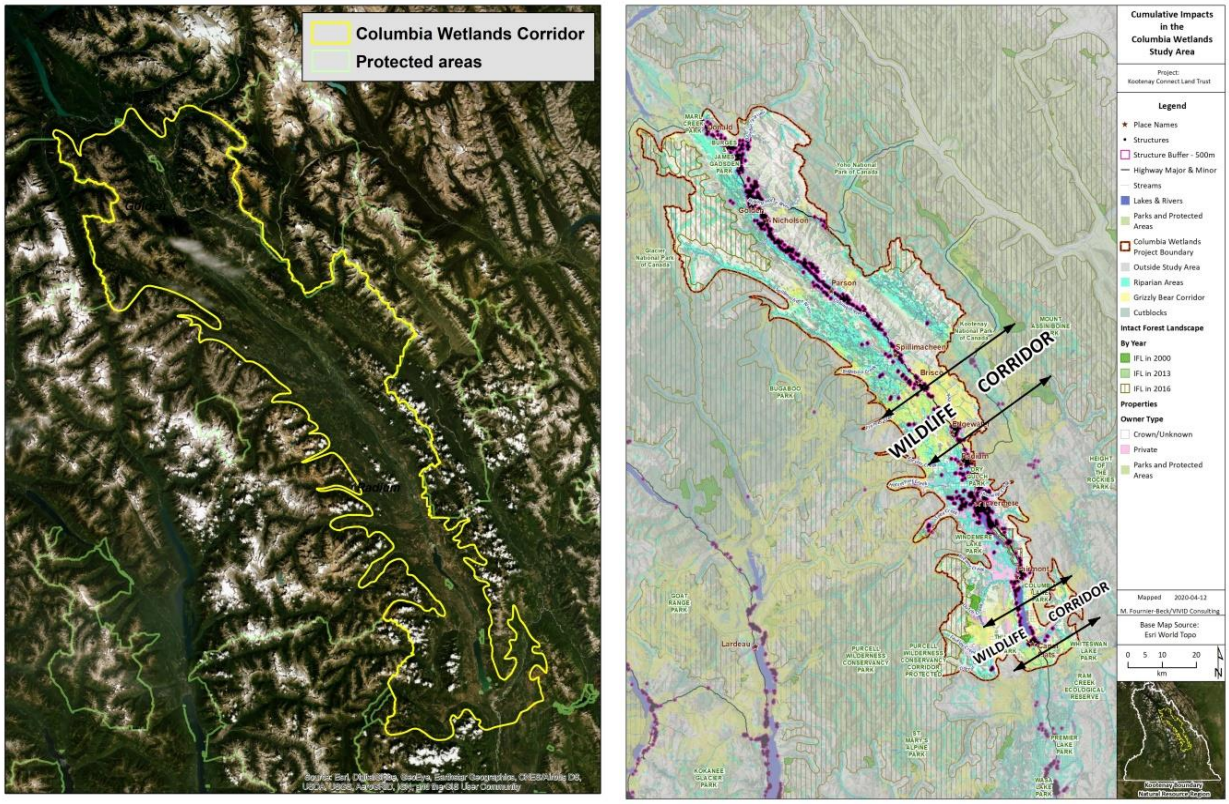


Figure 13. Wetland restoration work in three wetland sites (Summit Lake, Upper Bonanza Cr., and Hunter Siding) and beaver activity survey supported by Kootenay Connect Priority Place's ECCC funding performed by EcoLogic Consultants for the Slocan Lake Stewardship Society in the Bonanza Biodiversity Corridor.

3. COLUMBIA WETLANDS NORTH OF RADIUM HOT SPRINGS

Geographic Description

The 180-km long Columbia Wetlands within the Rocky Mountain Trench extends from Donald at the north end to Canal Flats in the south (Fig. 14). It is one of the largest intact wetland complexes in Canada, and an international Ramsar Site recognized by the United Nations. Much of the Columbia Wetlands is encompassed within the Columbia Wetlands Wildlife Management Area with a mix of private and federal lands managed as National Wildlife Areas. This wetland separates the Rocky and Purcell mountains across much of the northern portion of the valley from the US border up through Golden, BC.



a) b)

Figure 14. a) Google Earth image of the Columbia Wetlands north–south along the Rocky Mountain Trench (red oval) and with east–west corridors connecting the Purcell and Rocky mountains along BC Highway 95 north of Radium, BC; and b) the same area with grizzly bear core (tan) and linkage (yellow) habitats as identified by the Trans-border Grizzly Bear Project (Proctor et al. 2015), overlaid with cumulative impacts relative to preliminary upland wildlife corridors.

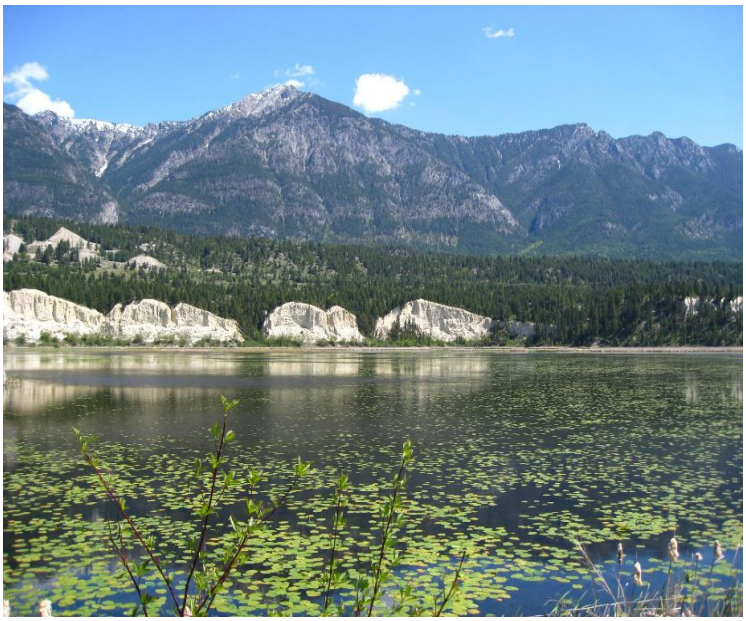
These upland corridors in Figure 14 will be updated with cumulative SAR and other species data collected in Year 2.

Leading Connectivity Conservation Groups

Most groups engaged in conserving and managing biodiversity and habitat connectivity in the Columbia Wetlands as partners of the Columbia Wetlands Stewardship Partners (CWSP). This non-profit partnership includes over 30 organizations dedicated to working with all levels of government, community groups, and the public to implement a shared stewardship model for the management of the upper Columbia River and adjacent Columbia Wetlands. The partnership includes a variety of environmental, agricultural, hunting and fishing organizations, various levels of federal and provincial government, local communities, First Nations, and business representatives from tourism and forestry sectors.

Kootenay Connect Workshop – Columbia Wetlands Corridor Workshop

In December 2017, KCP and CWSP co-hosted a Conservation Action Forum (Mahr 2018a). Scientists, conservationists, land trusts, local elected officials, provincial government resource managers and planners, rod and gun clubs, keepers of Indigenous knowledge, and agriculturalists collectively identified ecological threats, conservation opportunities, and collaborative strategies for the Columbia Wetlands. We briefly report on the results here. For more details, refer to *Columbia Valley Priority Conservation Actions Summary Report*[10]. Scientific recommendations led to identifying *conservation targets* (including species Tables 2 and 3, habitat types Table 4, habitat features Table 5, and ecological process Table 6); and *ecological threats* (Table 7) in Appendix A.



Shallow open water wetland surrounded by clay banks in the Columbia Wetlands. (Photo: M. Mahr)

[10] https://kootenayconservation.ca/wp-content/uploads/Columbia-Valley-Conservation-Action-Forum-Summary-Report-FINAL_20Dec2017.pdf

In November 2019, we held a Kootenay Connect – Columbia Wetlands Corridor workshop of 16 participants including independent and government biologists, conservation land trusts, Regional District of East Kootenay (RDEK) planners, conservation organizations (e.g., CWSP, Living Lakes Canada, Wildsight), First Nations (Ktunaxa, Shuswap Band), and elected officials interested in conserving the Columbia Wetlands.

During this workshop participants reviewed the target species, habitat types and features, and ecological processes generated at the 2017 Columbia Wetlands Conservation Action Forum (above), as well as species at risk added to the list by Kootenay Connect. Participants also identified additional ecological threats, conservation opportunities, and collaborative strategies that went beyond those identified at the 2017 Forum.

The workshop focused on how older habitat suitability models developed for ungulates could be updated; the benefits of creating an "opportunities map" for Nature Conservancy of Canada and Nature Trust of BC for identifying all private lands with wetlands that occur outside the CWWMA and that stand out as potentially important for conservation; and how Kootenay Connect can provide scientific rationale for corridor identification and designation of Ecologically Sensitive Areas within corridors for the new Steamboat Jubilee Mountain Official Community Plan (OCP) is being developed over the next 1–2 years.

Priority Conservation Actions for the Columbia Wetlands Corridor

- Protect hydrological inflow in the Columbia River and Wetlands by expanding monitoring and implementing adaptive measures to reduce impacts from climate change on hydrologic processes that influence functionality and could impact the area's fish, wildlife, and overall biodiversity.
- Implement a regional conservation plan to facilitate species and habitat shifts necessary for resilient ecosystems to adapt to climate change including connectivity for species and ecosystems.
- Floodplain management
    - Identify flood plain hazard zones – to be zoned as no development
    - Management that slows water flow through the wetland, complexity and interconnected waterways within the wetland
    - Identify drainages with more permanent and colder sources of water
    - Identify and protect old-growth hotspots as potential climate refugia
    - Identify biodiversity hotspots – climate refugia
- Contribute Trans-border Grizzly Bear Project habitat use and Kootenay Connect's science and maps to access management planning that is being initiated by FLNRORD

for the Columbia Valley Recreation Access Management Plan (CVRAMP) – help identify "no go" zones for recreationists

- Support the RDEK planning office and elected officials willing to integrate science-based information in private land permitting in sensitive areas. They indicated the following as potential avenues of cooperation with Kootenay Connect:
  - Use of Development Permit Areas (DPA) relative to Ecological Sensitive Areas (ESAs) – Kootenay Connect can help define ESAs (high, medium, low) that would be managed through their existing permitting process
  - There is a need for accurate scientific rationale
  - Steamboat Jubilee Mountain Official Community Plan (OCP) is being updated over the next 1–2 years – Kootenay Connect can provide details for corridor identification
  - Scientific rationale for ESAs includes sensitive habitats for species at risk, wetlands, riparian, wildlife corridors, etc. as well as important wetland-upland interface areas
  - Identify for protection private and public lands adjacent to wetlands outside the CWWMA and CW Natural Areas
  - Identify and map important floodplain areas, alluvial fans, and hazard areas for management planning
- Identify potential Wildlife Habitat Areas for important habitats for American badger, Lewis's woodpecker, and great blue heron – these species may be less controversial since protections may not impact forestry.

Kootenay Connect Priority Places Project

As mentioned in Part III above, the Columbia Wetlands Corridor is part of the Kootenay Connect Priority Places project funded by Environment and Climate Change Canada's Canada Nature Fund. The lead organization in this corridor is the Columbia Wetlands Stewardship Partners. Here we report preliminary results from that project since they overlap with this first year of Kootenay Connect funded by FWCP.

Within the abbreviated funding Year 1 (September 2019–March 2020) of Kootenay Connect Priority Places, the Columbia Wetlands Corridor activities included three primary subprojects:

delineation of an ecological boundary for the Columbia Wetlands and adjacent uplands; using lidar and TEM to map specific habitat types within the extensive wetlands complex to facilitate future conservation planning; and identification of species at risk that rely upon the Columbia Wetland's habitats. This species at risk inventory involved extensive literature and database searches, resulting in the identification of 65 species at risk and 21 ecological communities at risk found to occur in the Columbia Wetlands (Darvill 2020). GIS maps and recommendations

for filling data gaps and conservation actions will be integrated within Kootenay Connect during Year 2.

Future subprojects in Years 2–4 in the Columbia Wetlands include: species at risk inventories to fill identified knowledge gaps and to inform the identification of critical habitats and mapping of biodiversity hotspots for future management and/or protections between Canal Flats and Golden not already protected. Implementation strategies include inclusion in Wildlife Habitat Areas or Features, and expansion of the CW Wildlife Management Area where appropriate, private land stewardship initiatives, including restoration or protection (e.g., Farmland Advantage), informing the RDEK conservation planning and development permitting process, protecting private land adjacent to important wetland and riparian habitats by the Nature Conservancy Canada and the Nature Trust of BC; hydrologic mapping of important wetland communities in relation to climate change water delivery and function; a northern long-eared bat survey and restoration of old growth where appropriate to accommodate these bats; monitoring and mitigations of beaver in cottonwood stands; and hydrologic mapping of important wetland communities in relation to climate change impacts to water delivery and levels in order to retain water in selected wetlands that are vulnerable to climate change.

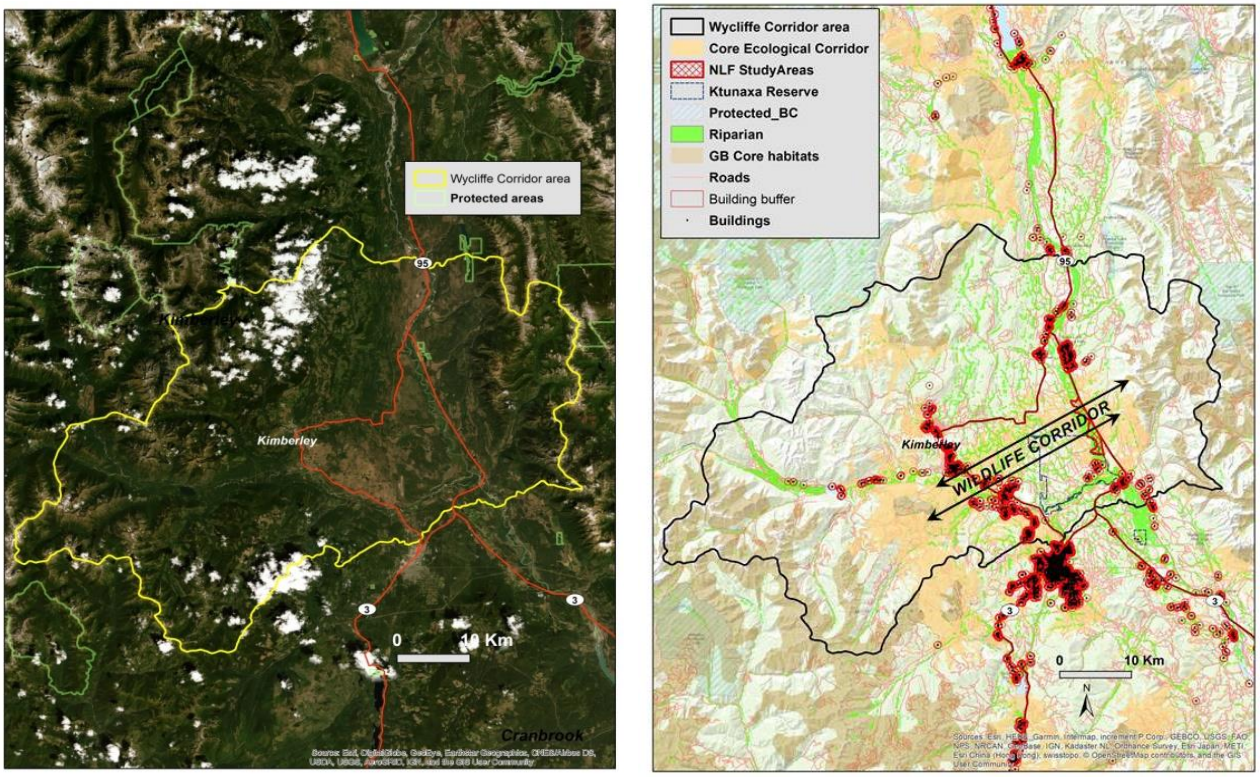
4. WYCLIFFE WILDLIFE CORRIDOR

Geographic Description

This grassland-open forest corridor with scattered wetlands and riparian areas is located between Kimberley and Cranbrook, BC (Fig. 15). The Wycliffe Corridor includes Luke Creek Wildlife Corridor and Pine Butte Ranch Conservation Area, in addition to Teck Cominco lands and working ranches. Currently there are private conservation lands owned and managed by the Nature Conservancy of Canada, Nature Trust of BC and FLNRORD that form the Wycliffe Conservation Complex. The Wycliffe Corridor is part of the Ponderosa Pine biogeoclimatic zone that supports a mosaic of plant communities with biological richness and rarity, as well as significant populations of rare and endangered species. This ecosystem requires periodic low-intensity fires to maintain its structure and fire suppression in the recent past has necessitated restoration (Murphy 2016). The montane grassland component of the corridor provides some different habitat associations than the other riparian-wetland corridors within the Kootenay Connect Focal Areas; however, there are scattered riparian areas on smaller creeks as well as the St. Mary's River that support songbirds, reptiles, and amphibians. Wycliffe is well-known for its important winter range for deer and elk and important open forest habitat for Lewis's woodpecker, Williamson's sapsucker, and several federally and provincially listed plant species.

Leading Connectivity Conservation Groups

Groups engaged in conserving and managing biodiversity and habitat connectivity in the Wycliffe Corridor include: Rocky Mountain Trench Natural Resources Society, Rocky Mountain Trench Ecosystem Restoration program, Nature Conservancy of Canada, the Nature Trust of BC, ʔaq̓am, FLNRORD and FWCP. Over the last decade, the Wycliffe Corridor has received substantial conservation attention, including grassland enhancement and restoration in addition to private land purchases to protect conservation values unique to the Rocky Mountain Trench ecosystem.



a) b)

Figure 15. a) Google Earth image of the Wycliffe grasslands-riparian corridor between Cranbrook and Kimberley, BC separating the Rocky and Purcell mountains, and b) the same area with grizzly bear core (tan), linkage (beige), riparian (green) habitats as identified by the Trans-border Grizzly Bear Project (Proctor et al. 2015), overlaid with cumulative impacts relative to preliminary upland wildlife corridors.

These upland corridors will be updated with cumulative SAR and other species data collected in Year 2.

Wycliffe Corridor. (Photo R. Klafki)

The Wycliffe Wildlife Corridor is located in KCP's Upper Kootenay River Valley Conservation Neighbourhood. KCP has not yet hosted a Conservation Action Forum in this region, thus Kootenay Connect's workshop initiated an important discussion of conservation priorities.

In September 2019, we held a Kootenay Connect – Wycliffe Wildlife Corridor workshop of 12 participants including independent and government biologists, conservation land trusts, RDEK regional planners, conservation organizations (e.g., Rocky Mountain Trench Natural Resources Society, Kootenay Community Bat Project, Nature Conservancy of Canada, the Nature Trust of BC), and First Nations (Ktunaxa - ʔaq̓am) to assess conservation challenges, opportunities, and strategies in the Wycliffe Wildlife Corridor.

During this workshop participants reviewed the target species, habitat types and features, and ecological processes generated specifically for Wycliffe, as well as species at risk and habitats added to the list by Kootenay Connect. Participants also modified the list of ecological threats that were generated for the Upper Columbia Valley at their 2017 Conservation Action Forum. Their recommendations led to identifying *conservation targets* (including species Tables 2 and 3, habitat types Table 4, habitat features Table 5, and ecological process Table 6); and *ecological threats* (Table 7) in Appendix A.

The workshop began by discussing where to draw an ecological boundary for what has been generally referred to as the Wycliffe Wildlife Corridor. Cumulative human impacts (Fig. 17), distribution of American badger, grassland habitat types, and ungulate migration linking the St. Mary's drainage at the west to the open grassland complex informed delineation of this ecosystem.

Wycliffe Corridor has a large percentage of private lands which take on a prominent role in terms of conservation planning. A key result of this workshop was the group's interest in increasing private land conservation and stewardship through various identified options. The group explored tools such as direct purchase and conservation easements in cooperation with Nature Conservancy Canada and Nature Trust of BC to build on their success in the Wycliffe Corridor; as well as REDK regulatory processes that could provide additional protections.

To help advance this collective interest in increasing private land conservation, we conducted an analysis that enabled us to identify where priority private lands for conservation occur in the Wycliffe Corridor. Phase 1 of this effort led to identifying and mapping all private lands within 500 m of riparian-wetland habitats. We then selected properties that either overlapped with riparian and wetland habitats, or were located within our proposed upland wildlife corridors, or had both attributes. In Phase 2 during Kootenay Connect's Year 2, we will take a closer look at the selected properties with respect to overlap of SARs, critical habitats, human disturbances, and potential resilience to climate change.

This workshop helped refine Kootenay Connect's objectives with already existing planning processes within the Regional District of East Kootenay (RDEK). RDEK planners require integrating reliable scientific data about natural values with the potential to be excessively compromised within the private lands in that area. They identify Ecological Sensitive Areas (ESAs) and manage them with Development Permit Areas (DPAs) to be consistent with natural values articulated in Official Community Plans (OCPs) where they have been instituted. We recognized this as a legitimate arena to integrate our work in identifying critical habitats and connectivity corridors with private land management and have forged a working relationship with RDEK planners.

Lastly, the Wycliffe Corridor presents an important opportunity to encourage voluntary stewardship practices to improve habitat and reduce human-wildlife conflict on private land. Local groups, such as Farmland Advantage, and initiatives such as KCP's Stewardship Solutions offer expertise and financial support.

Specific Priority Conservation Actions for the Wycliffe Wildlife Corridor

- Integrate science-based criteria for Ecological Sensitive Areas and identify them for incorporation in RDEK private lands Development Permit Area program and for potential inclusion within Official Community Plans to address private land within regional connectivity areas. This would include exploring compensatory tools for conservation zoning for willing landowners.
- Provide science-based information for FLNRORD access management planning in the area, particularly grizzly bear habitat use and huckleberry patch models from the Trans-border Grizzly Bear Project.

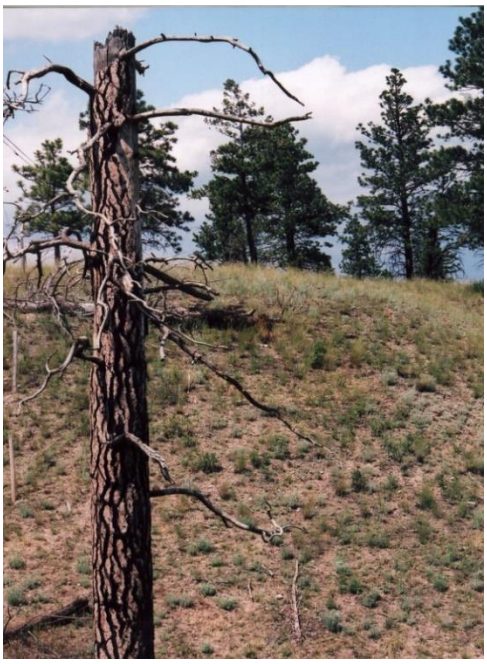
- Incorporate livestock exclusion, but wildlife-friendly fencing for sensitive wetlands. This would include assessing the impact and possible solutions for ungulate exclusionary fencing that people are erecting which may be inhibiting wildlife movements.
- Provide data and maps to support private land acquisition opportunities through the Nature Conservancy of Canada and the Nature Trust of BC.
- Identify areas for the provincial government to designate WMAs or WHAs (e.g., for Lewis's woodpecker or flammulated owl).
- Private land conservation and stewardship opportunities, including working with the RDEK on mechanisms to implement private land conservation e.g., cutting of wildlife trees that impact Lewis's woodpecker.
- Reach out to absentee landowners, including CP Rail to engage them in conservation activities on their unused lands in the corridor.
- Cooperation between NCC, NTBC, FLNRORD and Ktunaxa Nation on conservation priorities that span land ownership.
- Fire management to reduce potential for catastrophic fires also relies upon cooperation between NCC, NTBC, FLNRORD and Ktunaxa Nation.

Kootenay Connect Priority Places Project

As mentioned in Part III above, the Wycliffe Corridor is part of the Kootenay Connect Priority Places project funded by Environment and Climate Change Canada's Canada Nature Fund. The lead organizations in this corridor are the Nature Conservancy of Canada and the Nature Trust of BC. Here we report preliminary results from that project since they overlap with this first year of Kootenay Connect funded by FWCP.

Within the abbreviated funding Year 1 (September 2019–March 2020) of Kootenay Connect Priority Places, the Wildlife Corridor activities included two primary subprojects: field surveys to prioritize areas and inform prescriptions in management plans for improving habitat for Lewis's woodpecker and Williamson's sapsucker (Fig. 16). We also did an analysis to identify and preliminarily prioritize potential private conservation lands for possible purchase through land trusts (NCC and NTBC) and extensive GIS database building of natural values (species and habitats), cumulative impact mapping (Fig. 17), and development of layers to further integrate Kootenay Connect's corridor results into the RDEK planning processes for Ecological Sensitive Areas for Development Permit Areas.

In future years, activities in Years 2–4 will include grassland restoration activities, habitat enhancement such as forest thinning for Williamson's sapsucker, Lewis's woodpecker, and American badger, fencing to exclude livestock from sensitive grasslands and wetlands, and invasive species management.



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b)

Lewis's woodpecker-worthy snag in Wycliffe Corridor and b) a Lewis's woodpecker perched on a snag in Wycliffe Corridor. (Photos: R. Klafki)

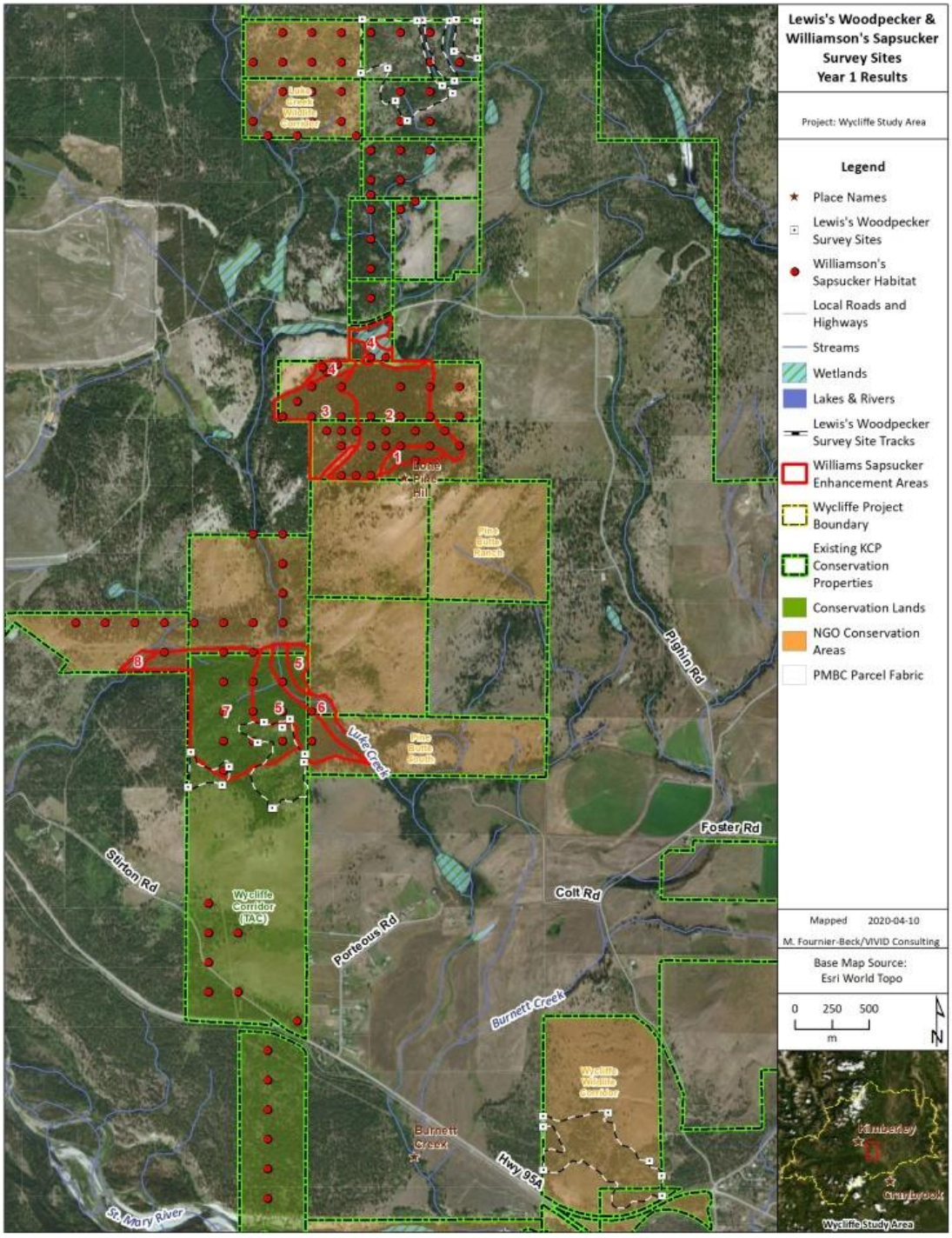

Figure 16. Williamson's sapsucker and Lewis's woodpecker survey work carried out with Kootenay Connect's ECCC funds by the Nature Conservancy Canada and the Nature Trust of BC in the Wycliffe Corridor in 2019–2020.

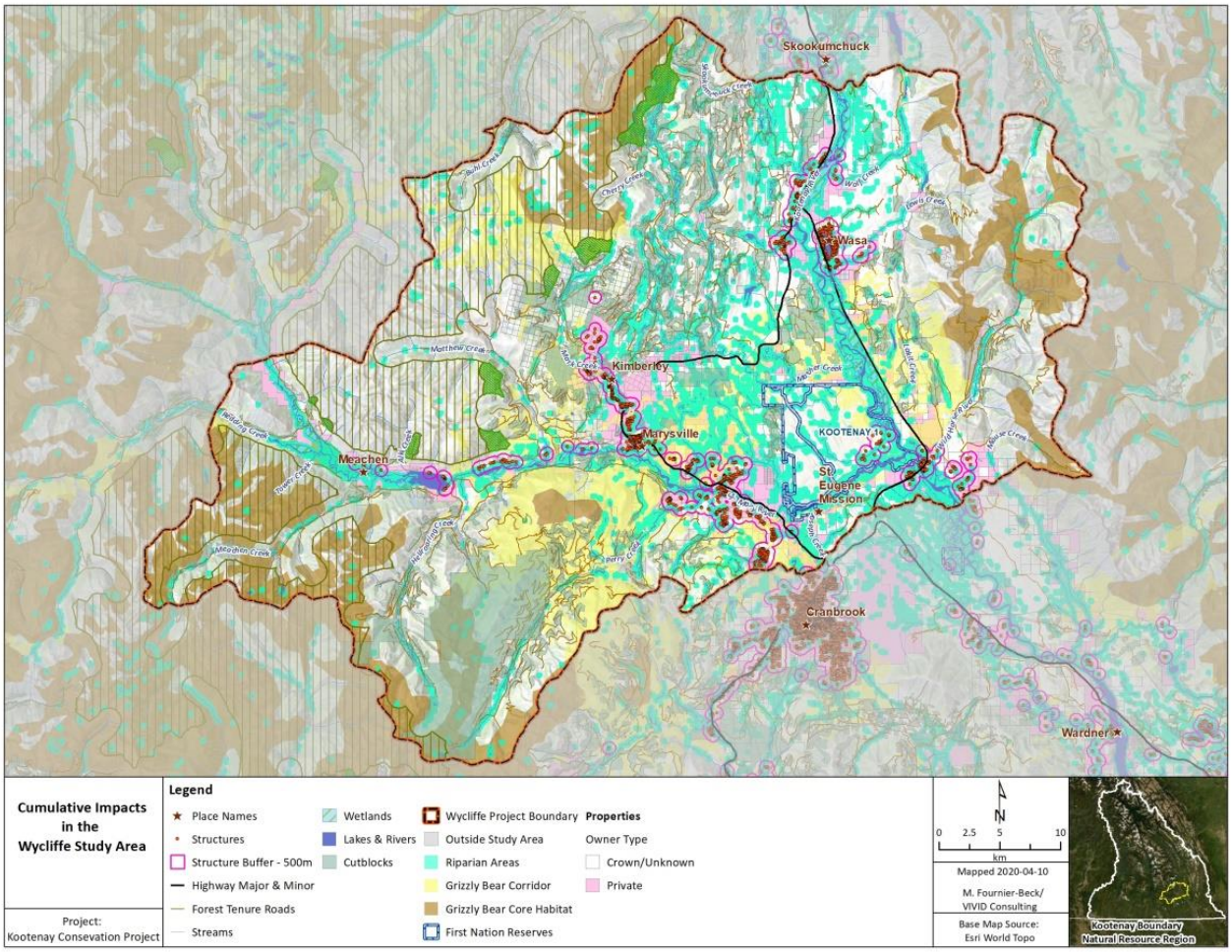

Figure 17. Cumulative impacts in the Wycliffe Corridor.

RECOMMENDATIONS

We found consistent and similar conservation values and threats across the Four Focal Areas and therefore similar priority actions and recommendations. Specific tools and who might address these activities are detailed below in Table 1. We recommend:

- improved biodiversity and SAR inventories
- identification of critical habitats and biodiversity hotspots for protection
- integrated riparian-wetland-upland connectivity areas be specified and protected that include species whose inter-seasonal life cycles span the riparian-upland interface
- that invasive species be managed and monitored
- more effective management of recreational pressures on SAR and connectivity habitats
- that access management be initiated in areas adjacent to these corridors
- the above actions be considered on both public and private lands
- private land stewardship be encouraged, and/or strategic lands be purchased directly or placed under conservation easement through private land trusts
- that all conservation strategies be developed through a climate change adaptation lens
- that specific climate resilience actions be undertaken (e.g., fire management to avoid catastrophic fires, intra-wetland-hydrologic connectivity be enhanced)
- that Kootenay Connect, its partners, and government pursue designation and establishment of Wildlife/Ecological Corridor status for some areas

Our last recommendation, to begin a process of formal designation of Wildlife/Ecological Corridors with the provincial and regional governments, is critical to maintaining the biological and ecological resilience of the Kootenay region. The inter-jurisdictional nature of connectivity ecology requires that any such Corridor designation include private and public lands. We realize that provincial and regional authority over private lands is limited, however, we are optimistic because we have received such a positive response from regional planners, particularly in the East Kootenay. We are encouraged by the potential for managing sensitive or critical habitats on private lands through Ecological Sensitive Areas within Development Permit Areas, and that inclusion of private property may be within the scope of an inter-jurisdictional Wildlife/Ecological Corridor designation. These Regional District tools already exist, and the work that Kootenay Connect is doing results in the type of information they require within that planning and regulatory process. Recommendations for activities on public lands within these corridors can be discussed with provincial government. We therefore recommend a dialogue begin with the provincial government, Regional Districts, and Kootenay Connect to pursue this type of designation.

Table 1. Summary of recommended priority actions for Kootenay Connect (Year 1) Four Focal Corridors.

These priority actions were synthesized after extensive consultation with local biologists (independent and government), local stewardship groups, conservation organizations, Regional District planners, and First Nations.

Conservation value	Priority action	Tool	Who
Biodiversity & SAR inventory	SAR critical habitat mapping to protect	Biological assessment	KC
	ID biodiversity hotspots	Biological assessment	KC
	Private land - develop farm/ranch biodiversity plans		Farmland Advantage
	Private land purchase of conservation lands	Assessment	NCC, BCNT, KC
Identify and protect high-quality habitats	Work with RDECK/RDCK to use Development Permit Areas to protect Ecological Sensitive Areas	Regional District development permit regulations and Official Community Plans	RDEK, RDCK, KC
	Provincial lands, ID restore or protect high-quality habitats	WMA expansion, WHA WHF designations	FLNRORD, KC
	Federal lands, ID restore or protect high-quality habitats	Migratory Bird Sanctuaries, Key Biodiversity Areas	CWS, KC
Propose designation for Ecological Corridor status	Articulate the ecological & CC case and lobby BC gov through municipal, regional & fed govs.		SSLS & KC

Conservation value	Priority action	Tool	Who
Access management planning in upland corridors	Assess, and develop plans for access management & lobby BC gov to participate	Work and develop plans with recreational groups, and BC gov	TBGBP, KC, BC gov
Manage & monitor invasive species to protect sensitive areas			
Manage for climate change	Manage for reduced fire severity on lower slopes in climate corridor	Fire interface planning	Prov of BC
	Develop a Climate Change Adaptation Strategy	Consultant analysis (e.g., Holt & Utzig)	SSLS & KC
	ID & protect wet, cool old-growth patches	Habitat mapping / WHA designation	
Climate change - intra-wetland hydrologic connectivity	Restore hydro connectivity	Channel dredging, culvert placement	CVWMA
Reduce recreational pressure	Assess important habitats with recreational pressure	Work with recreational groups, regional & provincial governments	Local stewardship groups, KC, RDEK, RECK, BC gov

CV is Creston Valley
CW is Columbia Wetlands
WC is Wycliffe
BN is Bonanza

YEAR 2 OF KOOTENAY CONNECT

As Kootenay Connect gains momentum and begins achieving results, we plan to expand our riparian-wetland corridor focus to potential new areas. In Year 2, we will consider including these Four Focal Areas: Columbia Lake Wetlands, Lardeau-Duncan Flats, Elk Valley Corridor, and the Slocan River Valley.

1. Columbia Lake Wetlands. The East Side Columbia Lake Wildlife Management Area (ESCLWMA) is an extensive ~69 km^2 area near Canal Flats that encompasses habitat on the east side of the lake and wraps around the south end to include an important riparian-wetland area. The 290-hectare Columbia Lake Provincial Park extends the ESCLWMA along the north lakeshore and connects to another small WMA that encompasses a riparian-wetland complex at the north end of Columbia Lake. These complexes constitute a potential wildlife corridor between the Rocky and Purcell mountains near the southern end of the Columbia Wetlands. Both the north and south wetland complexes were identified as grizzly bear corridors (Proctor et al. 2015). At the south end, the important river crossroads (the headwaters of the Kootenay River passes south within 1 km of the headwaters of the Columbia River system flowing north) is an important opportunity to establish landscape connectivity between the Rocky and Purcell mountains. Also, there is considerable east–west corridor potential up to 5 km south of Columbia Lake.

***Lead stewardship groups*:** East Kootenay Wildlife Association (EKWA) and Canal Flats Wilderness Club are primarily hunting and fishing organizations with a strong conservation ethic that recognizes the economic, recreational, and ecological importance of healthy wildlife populations. EKWA is concerned because this area has been experiencing increased development pressure which is threatening to eliminate options for habitat connectivity at the north and south ends of Columbia Lake. EKWA has expressed interest in working with Kootenay Connect on expanding conservation management to facilitate cross-valley connectivity.

2. Lardeau-Duncan Flats, between Kootenay and Duncan lakes. The Lardeau Flats are a riparian-wetland complex at the north end of Kootenay Lake that is a pinch point between Kootenay and Duncan lakes (Fig. 10). This area is downstream of the Duncan Dam, contains the Duncan and Lardeau rivers, and is being managed to enhance black cottonwood riparian habitats for wildlife and biodiversity through mimicking historic water regimes (BC Hydro 2017). This area has received considerable conservation attention in the form of private land conservation, including wetland restoration work. Previous wildlife surveys (reviewed in BC Hydro 2017) document red-listed western grebe; and blue-listed western painted turtle, great blue heron, bobolink, caribou, and grizzly bear (Herbison 1996, 1999). Herbison (1996) also

suggested this riparian-wetland area is important for species that also use upland habitats. Ecologically significant conservation lands are owned and managed by the Nature Trust of BC and BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development.

***Lead stewardship groups*:** The Nature Trust of BC, BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development, Wildlife Habitats for Tomorrow, Friends of the Lardeau, and local professional biologists.

3. Elk Valley Corridor. There are several riparian areas paralleling the Elk River and Highway 3 between Elko and the Alberta border. These areas have been identified as good wildlife corridors, and there has been initial effort to manage them as such. The Kootenay Conservation Program will be hosting a Conservation Neighbourhood workshop in the area in May 2019 and more specific actions and collaborators will be identified at that time.

***Potential Lead stewardship group(s)*:** Sparwood Fish and Wildlife Association, Elkford Rod and Gun Club, Wildsight-Elk Valley Branch, Elk River Alliance, Nature Conservancy of Canada, the Nature Trust of BC.

4. Slocan River Valley south of Slocan Lake to Highway 3A. In the Slocan Valley south of Slocan Lake along the mainstem of the Slocan and Little Slocan rivers there are extensive riparian areas with associated wetland complexes that are potential areas for exploring Kootenay Connect. In a recent review of species at risk in the larger Slocan Watershed, 47 species were identified that included vertebrates, invertebrates, reptiles, amphibians, and vascular and non-vascular plant species (Durand and Mackenzie 2017) some portions of which are highly likely to rely on the valley-bottom riparian habitats.

***Stewardship groups*:** Slocan River Stewardship Society (SRSS), Slocan Wetlands Assessment & Monitoring Project (SWAMP), the Nature Trust of BC, and local professional biologists.

PART VI. WHAT'S NEXT FOR KOOTENAY CONNECT?

NEXT STEPS FOR YEAR 2 (2020–2021)

The following steps will assist with moving the Kootenay Connect initiative forward in Year 2.

1. **Mapping**. Finalize ecological mapping of carnivore/wildlife/riparian/climate change corridors to be considered for enhanced protection and connectivity management. Integrate the grizzly bear connectivity model, the regional ecological climate-response modelling by Kutenai Nature Investigations, Provincial Ministry of Environment and Climate Change Strategy's conservation planning modelling, and information gathered from several regional wildlife and riparian experts.
2. **Integrate GIS layers.** Integrate our accumulated natural, geophysical and human GIS layers with our regional climate change adaptation modelling and land ownership patterns to identify specific sites that need protection or restoration, whether on public or private lands.
3. **Work with champions in Focal Corridors to facilitate on-the-ground conservation activities, with the ECCC grant already secured.** Repeat Year 1's activities in the next four corridors during year 2: Columbia Lake, Lardeau, Slocan, and Elk Valley riparian-wetland complexes.
4. **Report out to partners and funders.** The results of these activities are presented in this report. Considerable effort has been invested in this report, as it showcases the initiative and is our blueprint for future conservation efforts across the region. It presents a matrix of Kootenay Connect corridor-specific needs, efforts and conservation tools to identify our approach to new corridors in Years 2 and 3.
5. **Kootenay Connect Summit.** To be co-hosted and organized with the Kootenay Conservation Program in Spring of 2021.
6. **Apply Kootenay Connect concept in other areas of the Kootenays**. In Years 2 and 3, we will work with stewardship groups, First Nations, and local and provincial land managers to implement the corridor-specific conservation strategies decided upon in Year 1. This may include, but not be limited to, fundraising for specific actions, strategic land or conservation easement purchasing, Wildlife Management Area enhancements, riparian-wetland restoration, private land management initiatives and more. The Kootenay Connect report will provide a framework and tools for scaling up local conservation efforts to provide solutions for landscape conservation.

POTENTIAL PARTNERS

This project engages many partners within a large network of independent and government biologists, stewardship groups, land trusts, First Nations, Regional District planners, and provincial land managers. Since KCP and TBGBP sponsored a workshop dedicated to the topic of Kootenay Connect in October 2018 (denoted *), our list of collaborators has grown substantially.

A preliminary list of potential partners of Kootenay Connect:

- BC Ministry FLNRORD, Habitat and Ecosystem Section*
- Canal Flats Wilderness Club*
- Columbia Wetlands Stewardship Partners*
- Creston Valley Wildlife Management Authority*
- East Kootenay Wildlife Association*
- Ecological Consulting
- Elkford Rod and Gun Club
- Goldeneye Ecological Services
- Kootenay Conservation Program*
- Kutenai Nature Investigations*
- Ktunaxa Nation Council
- Lake Windermere District Rod & Gun Club*
- Nature Conservancy of Canada*
- Okanagan Nation Alliance
- Pandion Ecological Research*
- Regional District of Central Kootenay
- Regional District of East Kootenay
- Sinixt Nation
- Slocan Lake Stewardship Society
- Slocan River Streamkeepers
- Slocan Wetlands Assessment & Monitoring Project
- Sparwood Fish and Wildlife Association
- The Nature Trust of BC*
- Trans-border Grizzly Bear Project*
- Valhalla Foundation for Ecology and Social Justice
- Wildlife Conservation Society of Canada
- Wildsight (Regional and Branches: Golden, Invermere, Elk Valley, Creston)
- Yellowstone to Yukon Conservation Initiative

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APPENDIX A. SUMMARY TABLES OF CONSERVATION TARGETS & THREATS IN FOUR FOCAL CORRIDORS

Table 2. Summary of Species at Risk across Kootenay Connect (Year 1) Four Focal Corridors.

These data were summarized from Table 3, which was itemized after extensive consultation with local SAR biologists (independent and government), local stewardship groups, conservation organizations, First Nations and literature reviews.

Focal area	SARA listed			COSEWIC	BC listed		
	Endangered	Threatened	Special Concern	Listed	Red	Blue	Yellow
Creston Valley	3	5	11	34	9	17	6
Columbia Wetlands	5	7	7	20	8	19	9
Wycliffe Corridor	6	6	4	43	8	14	5
Bonanza	1	5	7	15	2	13	4

Table 3. Species at Risk plus Ecologically and Culturally Important Species across Kootenay Connect (Year 1) Four Focal Corridors.

This is the result of extensive consultation with local SAR biologists (independent and government), local stewardship groups, conservation organizations, First Nations, and literature reviews.

SAR and Culturally Important	Focal Corridors				Conservation Status			
Species	**Creston**	**Columbia Wetlands**	**Wycliffe**	**Bonanza**	**SARA listed**	**COSEWIC**	**BC**	**Importance**
Jumping Slug	1					Special Concern	Blue	
Native bees		1	1					Cultural
Western Bumblebee				1			Blue	
Rocky Mountain Ridged Mussel	1		1		Special Concern	Endangered	Red	
Coeur d'Alene Oregonian Snail	1			1	Special Concern	Special Concern	Yellow	
Coeur d'Alene Salamander	1			1		Special Concern		
Northern Leopard Frog	1	1	1		Endangered	Endangered	Red	
Western Toad	1	1		1	Special Concern	Special Concern	Yellow	
Western Painted Turtle	1	1			Special Concern	Special Concern	Blue	
Western Skink	1			1	Special Concern	Special Concern	Blue	
Bull Trout	1	1	1	1			Blue	
Burbot	1	1	1				Red	
Dace		1	1				Yellow	
Kokanee	1	1	1	1				Cultural
Sculpin		1	1					
Westslope Cutthroat Trout	1	1	1	1	Special Concern	Special Concern	Blue	
White Sturgeon Columbia R		1	1		Endangered	Non-active	Red	
White Sturgeon Kootenay R	1				Endangered	Non-active		
American Avocet	1	1					Blue	
American Bittern	1	1	1				Blue	

American White Pelican	1						Red	
	Focal Corridors				Conservation Status			
Species	**Creston**	**Columbia Wetlands**	**Wycliffe**	**Bonanza**	**SARA listed**	**COSEWIC**	**BC**	**Importance**
Bank Swallow	1	1	1	1	Threatened	Threatened	Blue	
Barn Swallow	1	1	1	1	Threatened	Threatened	Blue	
Black Swift				1		Endangered	Blue	
Bobolink	1	1	1		Threatened	Threatened	Blue	
Clark's Nutcracker		1					Yellow	Cultural
Common Nighthawk	1	1	1	1	Threatened	Special Concern	Yellow	
Double-crested Cormorant	1						Yellow	
Eared Grebe		1					Yellow	
Flammulated Owl		1	1			Vulnerable	Blue	
Forester's Tern	1		1				Red	
Great Blue Heron	1	1	1	1			Blue	
Horned Grebe		1				Special Concern	Yellow	
Lewis's Woodpecker	Occas.	1	1		Threatened	Threatened	Blue	
Long-billed Curlew	1	1	1		Special Concern	Special Concern	Blue	
Olive-sided Flycatcher	Uncom.			1	Threatened	Special Concern	Blue	
Osprey				1				
Peregrine Falcon *anatum* ssp	1	1			Special Concern		Red	
Pied-billed Grebe		1						Cultural
Sandhill Crane	1	1	1				Yellow	
Sharp-tailed Grouse					Extirpated			Cultural
Short-eared Owl	1	1			Special Concern	Special Concern	Blue	
Western Grebe	1	1		1	Special Concern	Special Concern	Red	
Western Screech Owl	1	1			Threatened	Threatened	Blue	
Williamson's Sapsucker			1		Endangered	Endangered	Red	
Yellow-breasted Chat	Occas.				Endangered	Endangered	Red	

American Badger	Uncom.	1	1		Endangered	Endangered	Red	Indicator
	Focal Corridors				Conservation Status			
Species	**Creston**	**Columbia Wetlands**	**Wycliffe**	**Bonanza**	**SARA listed**	**COSEWIC**	**BC**	**Importance**
American Beaver	1	1	1	1				Keystone
Big Brown Bat		1	1					Cultural
Fringed Myotis	1						Blue	
Grizzly Bear	1	1	1	1	Special Concern	Special Concern	Blue	indicator
Little Brown Myotis	1	1	1	1	Endangered	Endangered	Yellow	
Moose		1	1					Cultural
Mountain Caribou		1	1	1	Threatened	Endangered	Red	
Mountain Goat		1	1	1			Blue	
Mule Deer		1	1					Cultural
Muskrat		1						Cultural
Northern Myotis		1	1		Endangered	Endangered	Blue	
Northern Pocket Gopher	1	1					Red	
Porcupine		1	1					Cultural
Red-tailed Chipmunk	1						Red	
Rocky Mountain Bighorn Sheep		1	1					Cultural
Rocky Mountain Elk	1	1	1	1				Cultural
Silver-haired Bat		1	1				Yellow	
Townsend's Long-eared Bat	1	1	1				Blue	
Wolf		1	1	1				Cultural
Wolverine		1		1	Special Concern	Special Concern	Blue	
Yuma Myotis		1	1					Cultural
Antelope Bitterbrush			1					
Mountain Moonwort				1			Blue	

	Focal Corridors				Conservation Status			
Species	**Creston**	**Columbia Wetlands**	**Wycliffe**	**Bonanza**	**SARA listed**	**COSEWIC**	**BC**	**Importance**
Traditional plants (e.g., bitterroot, balsamroot, highbush cranberry, saskatoon, soapberry, wapato)		1	1	1				Cultural
Limber Pine		1						Cultural
Ponderosa Pine			1					Cultural
Whitebark Pine	1	1	1	1				Cultural

Table 4. Important habitat types across Kootenay Connect (Year 1) Four Focal Corridors.

These habitats were identified through extensive consultation with local SAR biologists (independent and government), local stewardship groups, conservation organizations, First Nations, and literature reviews. A '1' in the columns indicates that these habitats are important and of high conservation value and therefore deserving attention within the indicated focal area.

Important habitats	Creston	Columbia Wetlands	Wycliffe	Bonanza
Alluvial fans / creek mouths	1	1	1	1
Alpine & high-elevation grasslands		1		
Grassland-open forest	1	1	1	
Ground-surface water interface	1	1	1	1
Interconnected floodplain, wetlands, shallow water	1	1		1
Lake foreshore	1	1	1	1
Low-elevation old-growth Douglas fir, ponderosa pine	1	1	1	
Old-growth cedar-hemlock				1
Mature aspen		1	1	
Mature riparian cottonwood & spruce forests	1	1	1	1
Mid elevation grasslands	1	1		
Ponds & lakes	1	1	1	1
Riparian areas	1	1	1	1
Rivers & streams	1	1	1	1
Shallow open water	1	1		1
Wetlands	1	1	1	1

Table 5. Important wildlife habitat features across Kootenay Connect (Year 1) Four Focal Corridors.

These wildlife features were identified through extensive consultation with local SAR biologists (independent and government), local stewardship groups, conservation organizations, First Nations, and literature reviews. A '1' in the columns indicates that these features are important, of high conservation value, and therefore deserving attention within the indicated focal area.

Wildlife Habitat Features[11]	Creston	Columbia Wetlands	Wycliffe	Bonanza
Abandoned buildings	1	1		1
Bat hibernacula	1	1	1	1
Burrows & denning areas	1	1	1	1
Calcareous rocks & soils	1	1	1	1
Climax grasslands	1	1	1	
Fish feeding & rearing areas	1	1	1	1
Fish spawning beds	1	1	1	1
Huckleberry patches	1	1	1	1
Mainstem spawning habitat	1	1	1	1
Migratory stopover sites	1	1	1	1
Mineral licks	1	1	1	1
Nesting & roosting sites	1	1	1	1
Perched non-draining ponds		1		
Rock caves	1	1	1	1
Rocky outcrops	1	1	1	1
Steep-sided slope clay banks		1	1	
Ungulate winter range		1	1	
Wildlife corridors	1	1	1	1
Wildlife trees	1	1	1	1

[11] Kootenay Connect list is adapted from the Boundary Wildlife Habitat Features Order (2018), Ministry of Environment & Climate Change Strategy, Forest & Range Practices Act.pdf

Table 6. Key ecological processes across Kootenay Connect (Year 1) Four Focal Corridors.

These ecological processes were identified through extensive consultation with local SAR biologists (independent and government), local stewardship groups, conservation organizations, First Nations, and literature reviews. A '1' in the columns indicates that these ecological processes are important, of high conservation value, and therefore deserving attention within the indicated focal area.

Ecological processes	Creston	Columbia Wetlands	Wycliffe	Bonanza
Beaver wetland creation		1		1
Breeding & nesting	1	1	1	
Carbon storage	1	1		1
Fish overwintering	1		1	1
Fish spawning & rearing	1	1	1	1
Geomorphic processes (e.g., erosion, sedimentation, levees, large woody debris, gravel)	1	1	1	1
Hydrologic functions (e.g., filtering, recharge, flood control, storage)	1	1	1	1
Natural fire regime	1		1	1
Natural plant succession		1		
Nutrient cycling & dynamics	1	1	1	1
Pollination	1			1
Predator-prey dynamics	1	1	1	1
Stand-maintaining (or low-intensity) fires		1		
Wildlife movement & migration	1	1	1	1

Table 7. Ecological threats across Kootenay Connect (Year 1) Four Focal Corridors.

These ecological threats were identified through extensive consultation with local SAR biologists (independent and government), local stewardship groups, landowners, conservation organizations, First Nations, and literature reviews. A '1' in the columns indicates that these threats are present, of concern, and therefore deserving study and/or management actions to mitigate or alleviate within the indicated focal area.

Bold red indicates a significant threat. **Bold black** indicates an important threat. Plain text indicates a presence of threat.

Threat category	Threat	Creston	Columbia wetlands	Wycliffe	Bonanza
Direct loss or impairment of habitat / species	agricultural expansion and/or intensification	**1**	**1**	**1**	1
	conifer encroachment on native grassland	1	**1**	**1**	
	declining water quality	1	**1**	1	**1**
	exclusionary fencing to wildlife		1	**1**	
	extensive logging and road building	**1**	1	**1**	**1**
	extreme fire and fire suppression	**1**	1	**1**	**1**
	harvest and/or falling of wildlife trees	**1**	**1**	**1**	1
	herbicide/pesticide run-off	1	**1**		1
	human-wildlife conflicts	**1**	1	1	**1**
	loss of instream complexity (e.g., large woody debris, gravel, and sediment)	**1**	**1**		**1**
	loss of old structures for bats and barn swallows	**1**			**1**
	loss of river-wetland-floodplain hydrologic connectivity	**1**	1		**1**
	mine closures (providing bat hibernacula)		1	1	
	natural system modification (e.g., water diversion, diking, railway bed)	**1**	**1**	1	**1**
	over-grazing or poor range management	**1**	**1**	**1**	
	residential development/urban sprawl	1	**1**	**1**	1
	stream bank erosion and sedimentation	**1**	1	1	**1**
	timing of harvest interfering with nesting & fledging	**1**			1
	transportation corridors and hydro lines	1	1	1	**1**
	Baciliius thuringensis subspecies israelensis (BTI) for mosquito control	1	**1**		
	wildlife collisions on transportation corridors	**1**	**1**	**1**	**1**

	woody vegetation encroachment into wetlands	1			
Invasive species	**Threat**	**Creston**	**Columbia wetlands**	**Wycliffe**	**Bonanza**
	American bullfrog	1	1	1	**1**
	chronic wasting disease (CWD)	1			1
	chytrid fungus	**1**	**1**	1	**1**
	non-native fish	1	1		1
	West Nile virus (ticks)				
	whirling disease	1			1
	white pine blister rust	1	1	1	1
	zebra and quagga mussels	1	1	1	1
Recreational pressure	dogs off leash	1			
	increased access to backcountry and high alpine areas	1	**1**	1	1
	increased human activity in the wetlands	1	1		1
	increased trail and off-trail usage (e.g., multi-use and non-motorized use)	1	1	1	1
	increased trail building (authorized and unauthorized)	1		**1**	**1**
	catastrophic fire	1	1	1	1
	changes in nutrient inputs caused by floods and droughts	**1**			1
Uncertainty of climate change	forest pest spread (e.g., mountain pine beetle and other insects)	1	1	1	**1**
	hydrological changes (causing floods or extreme drought)	1	1	1	1
	increased stream temperature	**1**			1
	irrigation depleting water resource during drought	1			1
	loss of snowpack/loss of cold-water creeks	**1**	1	**1**	1
	mudslides/landslides		1	1	**1**
	vegetation changes/habitat shifting	**1**	**1**	1	**1**
	water impoundments and other water storage may affect hydrology	1	**1**		1
	wildlife disease spread	1	1	1	1
Cumulative effects	impacts from multiple threats	1	1	1	1

APPENDIX B. GIS LAYERS & DATABASES FOR KOOTENAY CONNECT

Table 8. List of GIS layers and databases that underpin analyses and conservation planning.

Data layer type	GIS layers	Source
Species of interest	Grizzly bear habitat model[1]	TBGBP
	Grizzly bear core habitat model [1]	TBGBP
	Grizzly bear corridor model[1]	TBGBP
	Wolverine density	BC Gov
	Marmot habitat	BC Gov
	Badger habitat model	Nancy Newhouse
	Ungulate winter range[2]	BC Gov
	Caribou habitat areas	BC Gov
	Big horn sheep data	BC Gov
	Mountain goat	BC Gov
	Species at risk & of concern observations[3]	BC Gov
	Northern leopard frog breeding areas	R Darvill
	Columbia Wetland bird layers	R Darvill
Biological	Bird survey data	R Darvill
	Biodiversity hotspots (CW)	R Darvill
	Swan data	BC Gov
	Osprey nests	M Machmer
	Heron nests	M Machmer
	Old-growth management areas	BC Gov
	Riparian/wetland areas	TBGBP[1]
	Fine-scale habitat-type layers (CW & Bonanza)	R Durrand
	Lidar	BC Gov
	Ortho Photos	BC Gov
	NC BEC units	BC Gov
Human influence	Forestry roads	BC Gov
	Road density	TBGBP[1]
	Highways	GIS data online
	Human settlement	TBGBP[1]
	RDEK Land use designation areas	RDEK

Layer type	GIS layers	Source
Land ownership & management	First Nations lands	Ian Adams
	Private lands	BC Gov
	Cadastral data	EK/WK Regional Districts
	Regional District planning layers	EK/WK Regional Districts
	Protected areas – public	GIS data online
	Protected areas – land trusts	NCC
	Wildlife Management Areas	BC Gov
	Wildlife Habitat Areas	BC Gov
	Canfor High Value Conservation Areas	Canfor
	Greg Utzig Conservation Planning Areas	G Utzig
	Agricultural Land Reserve lands	BC Gov
Data gaps	Habitat models for most species	
	Connectivity models for most species	
	Hydrology models	
	Suitability maps	Ian Adams
	Columbia Shuswap RD Area A	
	Movement data for wolves, wolverine & badgers	

[1] Trans-border Grizzly Bear Project

[2] Moose, elk, whitetail, mule deer, bighorn sheep, mtn goat, caribou

[3] Bald eagle, flammulated owl, gb heron, osprey, Lewis's woodpecker, w screech owl, Williamson's sapsucker

[3] Cougar, elk, moose, mule deer, n goshawk, NLF, painted turtle, western toad, wt deer

[3] Fisher, Great Basin spadefoot toad, long-billed curlew, n goshawk, marten

APPENDIX C: COMPLEMENTARY INITIATIVES

Table 9. Global, national, provincial and regional initiatives complementary to the purposes of Kootenay Connect.

Initiatives	Purpose	Goal / Objective	Implications
Global Initiatives			
United Nations Strategic Plan for Biodiversity for 2011–2020 and Aichi Biodiversity Targets	Set global targets for conservation under the Convention on Biological Diversity.	Strategic Goal C: *To improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity.*	This goal includes a specific target for spatial conservation, **Aichi Target 11** which states: *By 2020, at least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well-connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes.* https://www.cbd.int/sp/targets/rationale/target-11/
Key Biodiversity Areas Prepared by the Joint Task Force on Biodiversity and Protected Areas led by the IUCN Species Survival Commission and IUCN World Commission on Protected Areas in association with the IUCN Global Species Programme	Provide a global standard for the identification of sites that contribute significantly to the global persistence of biodiversity in terrestrial, inland water and marine environments.	*Support the strategic expansion of protected area networks by governments and civil society.*	KBAs can help achieve the Aichi Biodiversity Targets (in particular Target 11, above), as established by the Convention on Biological Diversity; serve to inform the description or identification of sites under international conventions (such as Ecologically and Biologically Significant Areas described under the Convention on Biological Diversity, wetlands of international importance designated under the Ramsar Convention, and natural World Heritage Sites); inform private sector policies, environmental standards, and certification programs; support conservation planning and priority-setting at national and regional levels; and provide local and Indigenous communities with new opportunities and benefits. http://www.keybiodiversityareas.org/home

Continental Initiatives	Purpose	Goal / Objective	Implications
Great Northern Landscape Conservation Cooperative	Landscape Conservation Cooperatives are voluntary public-private partnerships composed of states, tribes, federal agencies, NGOs, universities, international jurisdictions, and others working together to address landscape- and seascape-scale conservation issues. LCCs work together to identify commonalities among our efforts and build consensus to enact a regional approach to landscape conservation. They work across boundaries and jurisdictions, and share data, science, and capacity to achieve common goals.	The network of cooperatives: • Develops and provides integrated science-based information about the implications of climate change and other stressors for the sustainability of natural and cultural resources; • Develops shared, landscape-level conservation objectives and inform conservation strategies that are based on a shared scientific understanding about the landscape, including the implications of current and future environmental stressors; • Facilitates exchange of applied science in the implementation of conservation strategies and products developed by the Cooperative or partners; • Monitors and evaluates the effectiveness of LCC conservation strategies in meeting shared objectives; • Develops appropriate linkages that connect LCCs to ensure an effective network.	GNLCC is one of a network of 22 LCCs that is changing how to think about, plan, and act upon collaborative conservation issues in a way that goes beyond boundaries to help the places and the natural and cultural resources our communities depend on thrive for generations to come. LCC collaborative partnerships are non-regulatory, adaptive, grounded in science. LCCs leverage resources, share scientific expertise, fill needed science gaps, identify best practices, and prevent duplication of efforts through coordinated conservation planning and design to effect long-term change. https://lccnetwork.org/lcc/great-northern

Continental Initiatives cont.	Purpose	Goal / Objective	Implications
Yellowstone to Yukon Conservation Initiative	The Yellowstone to Yukon Conservation Initiative (Y2Y) is a joint Canada-US not-for-profit organization that connects and protects habitat from Yellowstone to Yukon so people and nature can thrive.	Y2Y addresses conservation issues at a continental scale in order to create a web of life-sustaining wildlife habitats linked by movement corridors that extend 2,000 miles (3,200 km) from Yellowstone National Park to the Yukon Territory. Y2Y seeks to reverse fragmentation and to protect and connect habitat in order for wildlife and people to coexist and thrive. Such a protected and connected network creates the best opportunity for wild species to move and adapt to a changing climate.	Yellowstone to Yukon conservation vision took hold 1993, and currently approximately 300 partner groups have joined forces to connect and protect this landscape. Since Y2Y's inception, protected areas have increased from 11 to 21 percent within the Yellowstone to Yukon region, while better management practices have improved conservation across an additional 30% of lands to help ensure functional wildlife corridors that connect protected areas and allow wildlife to roam. https://y2y.net/

National Initiatives	Purpose	Goal / Objective	Implications
2020 Biodiversity Goals and Targets for Canada	Set new medium-term goals and targets developed by federal, provincial and territorial governments to achieve long-term biodiversity outcomes.	**Strategic Goal A:** *By 2020, Canada's lands and waters are planned and managed using an ecosystem approach to support biodiversity conservation outcomes at local, regional, and national scales.* **Target 1 Conservation Networks:** *By 2020, at least 17 percent of terrestrial areas and inland water, and 10 percent of coastal and marine areas, are conserved through networks of protected areas and other effective area-based conservation measures.*	These goals and targets describe results to be achieved through the collective efforts of a diversity of players both public and private whose actions and decisions have an impact on biodiversity. Target 1 for Canada is especially relevant to Kootenay Connect and is linked with the global Aichi Target 11 (discussed above). Canada is expected to prepare National Reports featuring successful case studies to the Convention on Biological Diversity. https://biodivcanada.chm-cbd.net/2020-biodiversity-goals-and-targets-canada#target_1
Target 1 Challenge Fund of the Canada Nature Fund Administered by Environment and Climate Change Canada	Federal government funding available to acquire critical habitats and landscapes in order to increase Canada's protected areas network.		The Challenge component of the Canada Nature Fund will provide up to $175 million over 4 years to establish new protected and conserved areas. In December 2018, the Target 1 Challenge Fund launched an Expression of Interest phase with the first cohort of successful projects to be notified in May 2019. The duration of the Canada Nature Fund is until March 31, 2023. https://www.canada.ca/en/environment-climate-change/news/2018/06/canada-nature-fund-special-ministerial-representative-and-national-advisory-committee.html
		Protected areas, IPCAs, and OECMs For activities supported by the Target 1 Challenge, examples of new protected areas could include: • Provincial and territorial government protected areas focused on nature conservation that may be established under designations such as Provincial and Territorial Parks, Wilderness Parks, Wildlife Refuges, Ecological Reserves, Nature Reserves, Biological Reserves, Biodiversity Reserves, Natural Areas, Wilderness Areas, Habitat Protection Areas, Wildlife Management Areas, Conservancies, and Special Management Areas. • In addition to government-owned and managed areas, the Target 1 Challenge may also support collaboratively managed and non-government protected areas including Indigenous Protected and Conserved Areas (IPCA), privately owned conservation lands, areas protected and conserved through Indigenous land claim agreements and traditional use planning areas among others. • The Indigenous Circle of Experts (ICE) recommended the concept of IPCAs, which is a spectrum of protected and conserved area approaches led by Indigenous peoples in Canada (including Protected	

		Area, OECMs, and other types of conservation). For more information on IPCA's please refer to the ICE report "We Rise Together." • IPCAs: from the Indigenous Circle of Experts, Indigenous Protected and Conserved Areas (IPCAs) are lands and waters where Indigenous people have a leadership role in protecting and conserving cultures and ecosystems through Indigenous laws, governance, and knowledge systems. • Other effective area-based conservation measures (OECMs): areas that are not recognized as a protected area, and may not have the conservation of biodiversity as the primary goal, yet are geographically defined and managed over the long term in ways that result in the effective and enduring protection of biodiversity.	
Federal Species at Risk Act (SARA)	Designed to meet one of Canada's key commitments under the International Convention on Biological Diversity.	The goal of SARA is to protect endangered or threatened organisms and their habitats. It also manages species which are not yet threatened, but whose existence or habitat is in jeopardy.	The Species at Risk Act designates the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), an independent committee of wildlife experts and scientists, to identify threatened species and assess their conservation status, i.e., federally recognized as special concern, threatened, endangered, extirpated, and extinct in Canada under Schedule I of SARA. COSEWIC reports are influential toward the addition of species to the List of Wildlife SAR (Schedule 1) by the Minister of the Environment. SARA describes Critical Habitat as the habitat that is necessary for the survival or recovery of a listed wildlife species, and that is identified as the species' critical habitat in a recovery strategy or in an action plan for the species. Many projects now require screening for critical habitat as part of the impact assessment process. Implementation of SARA depends upon the willingness of the federal government to enforce. https://laws-lois.justice.gc.ca/eng/acts/s-15.3/ https://www.canada.ca/en/environment-climate-change/services/environmental-enforcement/acts-regulations/about-species-at-risk-act.html

Provincial Initiatives	Purpose	Goal / Objective	Implications
Provincial Wildlife Management Plan 2020 (draft) BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development	A broad vision and new strategy for wildlife management and habitat conservation for BC in 2020.	Address some of the challenges currently facing wildlife management and habitat conservation in BC.	Address challenges includes enhancing existing collaboration on wildlife management and habitat conservation with Indigenous peoples; increasing involvement of NGO conservation organizations and a broad range of wildlife and habitat stakeholders; identifying measures that need to be taken to proactively manage wildlife and habitat and prevent wildlife from becoming species at risk; addressing habitat loss, alteration, and fragmentation due to human activity; determining the most effective ways to proactively adapt to the impacts of climate change on wildlife and habitats; acquiring better information on wildlife and habitats to inform management and conservation outcomes and decision-making to achieve robust compliance and enforcement; encouraging prevention and mitigation of human-wildlife conflicts and addressing the underlying causes; providing stable and increasing funding dedicated to wildlife management, habitat conservation, and compliance and enforcement. https://engage.gov.bc.ca/wildlifeandhabitat/

Regional Initiatives	Purpose	Goal / Objective	Implications
Fish & Wildlife Compensation Program Action Plans	The FWCP is a partnership between BC Hydro, the Province of B.C., Fisheries and Oceans Canada, First Nations and Public Stakeholders to conserve and enhance fish and wildlife in watersheds impacted by existing BC Hydro dams.	FWCP's three strategic objectives: 1. Maintain or improve the status of species or ecosystems of concern, and the integrity and productivity of ecosystems and habitats. 2. Maintain or improve opportunities for sustainable use, including harvesting and other uses. Harvesting includes First Nations, recreational, sport, and commercial harvests. Other uses may include cultural, medicinal, or non-consumptive uses. 3. Build and maintain relationships with stakeholders and aboriginal communities to support BC Hydro's social responsibility policy and the Province's shared stewardship objective.	FWCP's Columbia Region Action Plans (revised in 2019) identify priority actions needed to accomplish FWCP objectives for the restoration, conservation, and enhancement of fish and wildlife and their habitats at the basin or watershed-level. The Action Plans guide FWCP investments in projects, track progress toward implementation, set annual priorities and guide decision-making in setting out and approving the Annual Operating Plan. • Reservoirs & Large Lakes Action Plan • Small Lakes Action Plan • Rivers & Riparian Areas Action Plan • Upland & Dryland Action Plan • Wetlands & Riparian Areas Action Plan Kootenay Connect is a synthesis of the focal ecosystems, habitats, and species identified in priority actions within Upland & Dryland and Wetlands & Riparian Areas Action Plans.
Columbia Basin Trust Ecosystems Enhancement Program	Over the course of five years, the Trust's Ecosystem Enhancement Program aims to identify and support one to three projects in each subregion, focusing on two subregions during each year of the program.	The goal is to help maintain and improve ecological health and native biodiversity in a variety of ecosystems, such as wetlands, fish habitat, forests, and grasslands. To maintain and improve ecological health and native biodiversity by supporting large-scale ecosystem enhancement, restoration and conservation projects in the Basin.	Supported projects will focus on enhancement, restoration and conservation by seeking input from community groups, First Nations representatives, and government experts. With a budget of $10 million spread over five years, the Trust focuses on two subregions each year and identifies project opportunities to implement on-the-ground actions to support ecological health at a landscape level. Targeted landscapes include: Year 1 targets Southern Rocky Mountain Trench and Kootenay Lake subregions; Year 2 targets Columbia Valley and Arrow/Slocan subregions; Year 3 targets Lower Columbia and Elk Valley subregions; Year 4 targets North Columbia and Upper Columbia subregions; Year 5 will review additional project opportunities across the Basin. https://ourtrust.org/grants-and-programs-directory/ecosystem-enhancement-program/
Kootenay Conservation Program - Conservation Neighbourhoods	Identify focal areas for both private land securement and stewardship activities within subregions to demonstrate how private land securement and stewardship at the local scale fits into the larger picture of conservation in the Kootenay region.	Identify and strategically support 14 Conservation Neighbourhoods in which groups of partners and stakeholders work together in local landscapes such as watersheds, valleys, and wildlife corridors to develop shared conservation priorities through collaborative action planning and joint stewardship projects to benefit at-risk species, important habitats, hydrologic functions, and connectivity areas.	To date, five Conservation Neighbourhoods have active partnerships working on common conservation priorities: the Slocan Lake Watershed, Upper Columbia Valley, Lower Columbia, Elk Valley, and Creston Valley. http://kootenayconservation.ca/conservation-neighbourhoods/

APPENDIX D: LAND USE DESIGNATIONS, LAWS, AND POLICIES TO PROTECT BIODIVERSITY TOOLBOX

The following Tables 10 and 11 constitute a conservation toolbox of protections, laws, policies, regulations, and management plans that can be applied to conservation and management of biodiversity areas and wildlife corridors by a variety of jurisdictions.

Table 10. Land Use Designation Tools to Protect Biodiversity[12]

Designation	Legislation (Lead Agency)	Applies to:	Federal Land	Provincial Land	Reg. Distr. / Municipal	Private Land	Implemented by:	Effectiveness	Limitations	Who May Be Impacted?
Federal										
Migratory Bird Sanctuaries	Migratory Birds Convention Act (Canadian Wildlife Service, Environment Canada)	Any land in Canada	√	√	√	√	Federal Cabinet	Established in 1917 (updated in 1994). Contains regulations to protect migratory birds, their eggs, and their nests from hunting, trafficking, and possession. Applied extensively in northern Canada. In southern Canada applied more on private lands. Potentially useful designation to protect wetlands where there are nationally significant migratory bird populations.	Primary focus is hunting regulations; poor to no protection for habitat other than nests while active; would not protect wetlands outside of nationally significant migratory bird habitat.	Depends on whether regulations apply only in sanctuaries, or in any areas frequented by migratory birds.

[12] Sources: *A Wetland Action Plan for British Columbia (2010); Legislation for Species at Risk* https://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/species-ecosystems-at-risk/legislation

Designation	Legislation (Lead Agency)	Applies to:	Federal Land	Provincial Land	Reg. Distr. / Municipal	Private Land	Implemented by:	Effectiveness	Limitations	Who May Be Impacted?
Federal cont.										
National Wildlife Areas (NWAs)	Canada Wildlife Act (Canadian Wildlife Service, Environment and Climate Change Canada)	Land under the administration of the Minister of Environment and Climate Change	√				Federal Minister of Environment and Climate Change	Flexible, open-ended designations for areas required for wildlife conservation; good enforcement provisions for NWAs; less difficult to establish and more flexible than National Park designations.	Regulations do not have habitat focus, but prohibit many activities that harm habitat; there is not strong protection for NWAs from outside activity; requirement for federal administration of land requires provincial cooperation (purchase, donation or transfer).	Depends on areas designated NWA.
National Parks	Canada National Parks Act (Parks Canada)	Lands owned by Canada, or agreed to by Province	√				Federal Cabinet	Generally strong protection for species and habitat in national parks, but broad exceptions available; good ecological integrity requirements.	Primary purpose is not protection of biodiversity and habitat – would be of ancillary benefit; low penalty for environmental damage; long process to designate National Parks in legislation.	Potentially the Province and licencees if commercially productive land is removed from the land base.
Indigenous Protected Conserved Areas	Pathway to Canada Target 1 Initiative (Environment and Climate Change Canada)	Lands and waters where Indigenous governments have the primary authority in protecting and conserving culture heritage and ecosystems.	√	√			Federal Minister of Environment and Climate Change	Important new Indigenous-led conservation tool to increase habitat protection on a landscape scale relying on Indigenous laws, governance, and knowledge systems. Secures traditional lands that are critical for the exercise of Treaty and Aboriginal Rights.	IPCAs, like Tribal Parks, conserve traditional lands for traditional activities such as hunting, fishing, and the gathering of medicinal plants crucial to maintaining Indigenous cultural and spiritual identity and connection to the land, while ensuring the stewardship of sensitive ecosystems.	Potentially the Province and licencees if commercially productive land is removed from the land base.

Designation	Legislation (Lead Agency)	Applies to:	Federal Land	Provincial Land	Reg. Distr. / Municipal	Private Land	Implemented by:	Effectiveness	Limitations	Who May Be Impacted?
Provincial										
Wildlife Management Areas (WMA) **Critical Wildlife Areas (CWA)** **Wildlife Sanctuaries**	Wildlife Act (Ministry of Environment & Climate Change Strategy)	Land under the administration of the Minister responsible for the Wildlife Act (e.g., Provincial Crown land, or private land leased to Minister)		√		√	Minister with Cabinet's approval	WMAs provide reasonably strong protection, enforceability, and flexibility due to regional manager's authority over all activities in a WMA; strong degree of decision-making by agency responsible for wildlife habitat; example is Columbia Wetlands WMA.	Requires formal act of designation in order for wetlands and other habitat to be protected; requires high-level (Cabinet) consent for Minister's designation decision; may be difficult for agency to acquire administration of land as prerequisite for WMA designation; cannot regulate all activity impacting habitat.	Expanding WMA designations could affect licenced users of the Crown land gaining WMA status; however, some uses could be accommodated depending on the impact.
Provincial Parks	Park Act (Ministry of Environment & Climate Change Strategy)	Provincial Crown land		√			Legislature or Cabinet	Park Act is the strongest protected area designation because many require Act of Legislature to change boundaries. Park, Conservancy and Recreation Area Regulation addresses management and protection of park resources which includes species at risk.	Park Act has strong recreation focus; requires high-level approval to designate; may not be suitable for habitats that require active interventions; not well-suited to designations of small, specific habitat, such as wetlands.	None.

Designation	Legislation (Lead Agency)	Applies to:	Federal Land	Provincial Land	Reg. Distr. /Municipal	Private Land	Implemented by:	Effectiveness	Limitations	Who May Be Impacted?
Provincial cont.										
Ecological Reserves	Ecological Reserves Act (Ministry of Environment & Climate Change Strategy)	Provincial Crown land		√			Cabinet (some require the Legislature to modify boundaries)	Strong legislation for protection of ecosystems; takes priority over all other legislation. Ecological Reserves are created for many reasons, including protection of at-risk species or their habitat. They are established by inclusion to the schedules of the Protected Areas of British Columbia Act or by order-in-council under the Ecological Reserves Act. The Park, Conservancy and Recreation Area Regulation under the Park Act applies to ecological reserves as if they were parks. The Ecological Reserve Regulations address additional restrictions in ecological reserves to ensure protection of the resources in an ecological reserve.	Science-based research and education focus; good for many lands, but not for those that require active management. No provisions in associated regulations target species at risk or their habitat.	None.

Designation	Legislation (Lead Agency)	Applies to:	Federal Land	Provincial Land	Reg. Distr. / Municipal	Private Land	Implemented by:	Effectiveness	Limitations	Who May Be Impacted?
Provincial cont.										
Ad Hoc designations	Environment and Land Use Act	All land in BC		√	√	√	Cabinet	Good, flexible legislation that can be tailor-made to special circumstances, where other tools are a poor fit; prevails over other legislation.	Protection and enforcement depend on the order-in-council (OIC) that is passed by Cabinet in a given situation. Past enforcement problems were addressed under **s.6** of the Park Act (might not fit every situation).	Depends on the Cabinet OIC – potentially anyone.
Wildlife Habitat Areas (WHAs)	Forest and Range Practices Act (Government Actions, Forest Planning and Practices, Range and Woodlots Regulations)	Crown forest land, range land, and private land in a Tree Farm Licence area, Community Forest Area, or Wildlife Management Area		√		√	Minister of Environment (delegated to Deputy Minister of Environment)	The purpose of WHAs is to conserve those habitats considered most limiting to a given Identified Wildlife element. WHAs are mapped areas that are necessary to meet the habitat requirements of an Identified Wildlife element; designate critical habitats in which activities are managed to limit their impact on the Identified Wildlife element for which the area was established. WHAs can be put into WMAs.	WHAs only apply to identified wildlife; depends on strength of general wildlife measure for the identified wildlife; not very flexible; implementation is highly constrained by occurrences of species and land use impacts.	Would mostly affect forest or range licensees carrying out forest or range practices.

Designation	Legislation (Lead Agency)	Applies to:	Federal Land	Provincial Land	Reg. Distr. / Municipal	Private Land	Implemented by:	Effectiveness	Limitations	Who May Be Impacted?
Provincial cont.										
Wildlife Habitat Features (WHFs)	Forest and Range Practices Act (Government Actions, Forest Planning and Practices, Range and Woodlots Regulations)	Crown forest land, range land, and private land in a Tree Farm Licence area, Community Forest Area, or Wildlife Management Area		√		√	Minister of Environment (delegated to Deputy Minister of Environment)	WHFs may provide additional protection to WMAs or WHAs, e.g., for ecosystem elements used by wildlife to meet one or more of their important habitat requirements. WHFs are a possibility where the MoE Deputy Minister could identify specific localized features to protect a species at risk. Practices requirement for a WHF, once established, is "must not damage or render ineffective."	WHFs are generally small areas, spatially defined, and probably of limited use in conserving large areas of habitat. Examples include a significant mineral lick or wallow, a nest used by a bird, bat hibernaculum, or a burrow or den used by a mammal.	Would mostly affect forest or range licensees carrying out forest or range practices.
Reserves, notations, and transfers	Land Act ss.15, 16, 17	Crown Land Reserves can be referred to as wildlife habitat management areas, natural environment areas, recreation conservation management areas.		√			Ministry of Forests and Range - Integrated Land Management Bureau (ILMB)	Effective in withdrawing Crown land from disposition; could be important tool in implementing a provincial policy in which important Crown lands for wildlife are not sold.	Not necessarily effective in protecting habitat from land use practices, because there are no enforceable measures to protect habitat per se; seen more as an interim designation to preserve conservation opportunity until more appropriate designation is made.	Potentially interested purchasers of Crown land.

Designation	Legislation (Lead Agency)	Applies to:	Federal Land	Provincial Land	Reg. Distr. / Municipal	Private Land	Implemented by:	Effectiveness	Limitations	Who May Be Impacted?
Local Government										
Environmentally Sensitive Areas (ESAs)	Local Government Act	Potentially any land in a municipality or Regional District jurisdiction			√	√	Municipal councils and Regional District boards	Local governments have the capacity to declare important habitat as ESAs in official community plans and regional growth strategies, and to restrict use of these areas, such as wetlands, through zoning bylaws, development permit areas, etc.	Enabling only with no provincial direction, policy or model to guide local governments; potential for wide discrepancy in results.	Owners of properties with important habitat, such as wetlands, deciduous riparian forest, and old-growth conifer forest.
Development Permit Areas (DPAs) **Environmental DPAs**	Local Government Act	Private and public land within a municipality			√	√	Municipal councils and Regional District boards	Attempts to control the form and character of development so as to preserve, protect, restore or enhance natural values. DPAs provide an implementation option, for example, for the Riparian Areas Regulation (RAR).	Depends on local government willingness to designate DPAs, and quality of requirements in each development permit.	Local governments; property owners.

Table 11. Legislation and Regulation of Land & Water Uses and Activities That Affect Biodiversity.[13]

Legislation (Lead Agency)	Mechanism / Activity	Federal Land	Provincial Land	Reg. Distr. / Municipal	Private Land	Tools	Effectiveness	Limitations	Who Is Impacted?
Federal									
Species at Risk Act (SARA) (Ministry of Environment)	Prevent wildlife species in Canada from disappearing; provide for the recovery of wildlife species that are extirpated (no longer exist in the wild in Canada), endangered, or threatened as a result of human activity; and manage species of special concern to prevent them from becoming endangered or threatened.	√	√			SARA includes species at risk listing and reporting processes through COSEWIC. SARA helps protect Critical Habitat – the habitat necessary for the survival or recovery of a listed wildlife species (Schedule 1), and that is identified as the species' critical habitat in a recovery strategy or in an action plan for the species. Many projects now require screening for critical habitat as part of the impact assessment process.	Depends on the federal government's willingness to implement and enforce. Many species listed under SARA have continued to decline after SARA was enacted in 2002. COSEWIC process provides scientific evidence but listing decisions for many vulnerable species are delayed. In some cases, protections are withheld for certain species because of economic interests. SARA does have a "safety net" clause that would force the provinces to protect SARA listed species, but it has never been used.	The legislation itself may not be the problem but how it's being implemented by the federal government is not stopping populations from declining or helping species recovery; focuses on individual species rather than ecosystems; developing recovery strategies can be challenging and time-consuming which delays protection.	Commercial and industrial interests on the land and in freshwater and marine environments where vulnerable species live or where harvesting occurs.

[13] Sources: *A Wetland Action Plan for British Columbia (2010); Legislation for Species at Risk* https://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/species-ecosystems-at-risk/legislation

Legislation (Lead Agency)	Mechanism / Activity	Federal Land	Provincial Land	Reg. Distr. / Municipal	Private Land	Tools	Effectiveness	Limitations	Who Is Impacted?
Federal cont.									
Canadian Environmental Assessment Act – Bill 38 (Canadian Environmental Assessment Agency)	Coordinated impact assessment of proposed major development in BC where federal government has authority	√	√	√?	√?	Certain types of proposed projects must undergo environmental impact assessment and obtain an EA certificate in order to proceed.	The Reviewable Projects Regulation defines the types and sizes of projects that are automatically subject to EAA process. The Minister has power to designate a project as reviewable even though it is not included in Reviewable Projects Regulation. Casts a broad net over many of the potential ways that the federal government can affect species and habitat; the primary means of implementing the Federal Policy on Wetland Conservation.	Act's application is discretionary; increased threshold for review; no guaranteed participation for communities, First Nations, local governments, or the public; government may decide that economic interests prevail over environmental protection.	Major project proponents.
Fisheries Act (Fisheries & Oceans Canada)	Prohibitions on activities that cause harmful alteration, disruption or destruction to fish habitat and/or cause deposit of deleterious (polluting) substances in any Canadian freshwater and marine fisheries waters.	√	√	√	√	Habitat Protection and Pollution Prevention Provisions of the Act outline obligations (of owners, operators, developers and project proponents) and enforcement.	Strong federal laws that may help protect fish habitat and can apply to conserving wetlands and riparian areas associated with fish habitat; enforcement provides deterrent, and creative sentencing may require remediation.	Reactive and rarely applied.	Industrial and commercial interests.

Legislation (Lead Agency)	Mechanism / Activity	Federal Land	Provincial Land	Reg. Distr. / Municipal	Private Land	Tools	Effectiveness	Limitations	Who Is Impacted?
Federal cont.									
International Boundary Waters Treaty Act (International Joint Commission - Canada Ministry of Foreign Affairs)	Protection of international boundary waters	√					Act created in 1909 with a focus on the Great Lakes. Boundary waters are bodies of fresh water that the US-Canada border flows through. Addresses conflicts and rights arising between the two countries over the use of waters that cross the borders of the two countries, in particular pollution and dams or other structures.	Doesn't include transboundary rivers, although the treaty has provisions related to such rivers, e.g., dams.	
Canadian Environmental Protection Act (Environment Canada)	Regulation of toxic wastes & substances	√	√	√	√		Provides indirect benefits to land and water by regulating release of toxic substances, pollutants, and wastes into the environment.		

Legislation (Lead Agency)	Mechanism / Activity	Federal Land	Provincial Land	Reg. Distr. / Municipal	Private Land	Tools	Effectiveness	Limitations	Who Is Impacted?
Provincial									
Provincial BC Species at Risk legislation (proposed) (Ministry of Environment and Climate Change Strategy)	Provincial species at risk legislation to take actions to protect and recover species at risk, and prevent new species from becoming at risk.		√	√	√		In 2017, provincial government mandated the enactment of an endangered species law that is under development. In the absence of a single piece of legislation, current provincial and federal laws collectively govern how at-risk populations and habitats in BC are managed and who is responsible for them.	Yet to be determined.	Agriculture, mining forestry, hydroelectric dams, and other industrial and commercial activities under provincial jurisdiction.
Forest and Range Practices Act (FRPA)	Forest practices (including forestry, range, some oil & gas activities) on Crown forest and range land, and some private land within tenures.		√			Allows designation of Wildlife Habitat Areas and Wildlife Habitat Features. Riparian classification includes management area, management reserve zone and management zones with varying restrictions and buffers with well-developed discretionary management guidelines.	Effective because protects habitat features important to wildlife for breeding, spawning, nesting, hibernating, etc. It also requires classification of all wetlands with associated restrictions and buffers on wetlands as small as 0.25 ha in specific biogeoclimatic zones. Also provides restrictions and buffers for smaller wetlands within 60 m of each other with a combined size of 5 ha or larger.	Restrictions and buffers do not apply to all small wetlands some of which may have high habitat values. Restrictions and buffers are discretionary and only apply in the absence of an approved Forest Stewardship Plan that does not include a result or strategy to meet the objective for water, fish, wildlife, and biodiversity set out in the Forest Planning and Practices Regulation.	Forest and range tenure holders.

Legislation (Lead Agency)	Mechanism / Activity	Federal Land	Provincial Land	Reg. Distr. / Municipal	Private Land	Tools	Effectiveness	Limitations	Who Is Impacted?
Provincial cont.									
Private Managed Forest Land Act and Regulations	Managed Forest Land Class is a BC Assessment property classification established to encourage private landowners in BC to manage their lands for long-term forest production in accordance with the Private Managed Forest Land Act and associated regulations.				√	A regulatory approach that requires forest owners to protect key public environmental values such as water quality and fish habitat, soils conservation, critical wildlife habitat, and reforestation.	Regulations specify management requirements for timber harvesting, silviculture, and road-related activities. The Managed Forest Council ensures compliance and makes determinations which may be followed by other steps including: Reconsideration of Council Decision, and Appeal to the Forest Appeals Commission. Offers little in regard to enforceable regulation to protect habitat.	A voluntary tax exemption program that has limited protection. Anyone who intends to cut trees on lands covered by FRPA is required to have a cutting licence and must comply with FRPA and associated regulations, or in the case of the oil and gas industry requires a master licence to cut and the provision of the Forest Practices Code applies.	Owners of private forest reserve land.

Legislation (Lead Agency)	Mechanism / Activity	Federal Land	Provincial Land	Reg. Distr. / Municipal	Private Land	Tools	Effectiveness	Limitations	Who Is Impacted?
Provincial cont.									
Wildlife Act (Ministry of Environment and Climate Change Strategy)	Regulation of hunting Access Management Areas		√	√	√	Protects all vertebrate species from direct harm, except as allowed by regulation (e.g., hunting or trapping). Protections can be enabled for endangered or threatened species and their habitats can be protected as Critical Wildlife Habitats in Wildlife Management Areas. Ministry of Environment manages access through two sections of the Wildlife Act. Wildlife Act provides FLNRORD with the ability to manage access within sensitive areas or areas of high fish and wildlife habitat value.	Limited ability to help species through hunting regulations, **s.9** (beaver dams) and **s.34** protection for birds, eggs, and some nests; ability to designate threatened and endangered species, and provide for critical wildlife areas within Wildlife Management Areas. **S.108** allows MoE to place restrictions on the use of motorized vehicles for the purpose of hunting or fishing. This section is useful for the protection of populations from over-harvest. **S.109** allows MoE to place restrictions on the use of all motorized vehicles within a specified area for the purpose of wildlife management including the protection of fish and/or wildlife habitat and ecosystems. This restriction applies to all motorized use.	Focus on "take" regulation is a limiting means of managing wildlife; habitat provisions are limited, usually requiring formal designation, but available; threatened & endangered provisions under-utilized. Limited reporting and enforcement of violations.	Depends on approach taken. Presently, affects mainly hunters, some farmers, and motorized recreationists.

Legislation (Lead Agency)	**Mechanism / Activity**	**Federal Land**	**Provincial Land**	**Reg. Distr. / Municipal**	**Private Land**	**Tools**	**Effectiveness**	**Limitations**	**Who Is Impacted?**
Provincial cont.									

Fish Protection Act (Ministry of Environment & Climate Change Strategy)	Protection of fish & fish habitat		√	√	√	Currently in force are sections dealing with designation of sensitive streams, recovery plans, and no new dams on specified rivers.	Sections not yet in force provide for: issuance of stream flow protection licences; orders for temporary reduction in water use in case of drought; identify fish & habitat considerations in water management plans; authorize reduction of water rights in accordance with water management plans. **Sec. 9** in force for orders for temporary reduction in water use in case of drought to protect threatened fish populations.	Not yet in force: **s.5** - fish and fish habitat considerations in licencing decisions; **s.8** - streamflow protection licences; **s.10** - fish and fish habitat considerations in water management plans; **s.11** - reduction of water rights in accordance with plan; Transitional pending Water Act applications **s.36**	Local governments, landowners, water licence applicants & holders, developers, industry.

Legislation (Lead Agency)	Mechanism / Activity	Federal Land	Provincial Land	Reg. Distr. / Municipal	Private Land	Tools	Effectiveness	Limitations	Who Is Impacted?
Provincial cont.									
Fish Protection Act - Section 12 (Ministry of Environment & Climate Change Strategy) (Local Government)	Riparian Areas Regulation and Sensitive Stream Designation. Focuses on four major objectives: ensuring sufficient water for fish; protecting and restoring fish habitat; improved riparian protection and enhancement; and stronger local government powers in environmental planning.		√	√	√	Provides legislative authority for water managers to consider impacts on fish and fish habitat before approving new licences, amendments to licences, or issuing approvals for work in or near streams.	Directives will help fish-associated habitat, especially if they are critical to maintaining mean annual discharge (MAD) and base-flow requirements under a recovery plan; wetlands expressly addressed in regulations; provides provincial guidance for local governments; regulations incorporate no net loss approach; restricts licencing under Water Act; Sensitive Stream designation allows for recovery plans that may help protect associated habitat. Some local governments have failed to implement as required by the Regulation.	Fish-stream focused; limited ability to address agricultural impacts to riparian areas and wetlands; local governments must establish streamside protection and enhancement areas within 5 years of the Regulation being proclaimed. Only applies to urbanized areas of the province.	Local governments, landowners, some water licence applicants, developers, industry.

Legislation (Lead Agency)	Mechanism / Activity	Federal Land	Provincial Land	Reg. Distr. / Municipal	Private Land	Tools	Effectiveness	Limitations	Who Is Impacted?
Provincial cont.									
Land Act	Integrated Land Management Bureau (ILMB) Ministry of Environment for habitat acquired under **s.106**		√			Governs the sale and granting of rights to use Crown land.	Has provisions that could help conserve habitat by: • withdrawing wetlands from disposition, • requiring reservations and conservation covenants on Crown land sold; requiring environmental assessment on Crown land before sale, • regulating activity in designated areas, • enforcing against trespass on Crown lands, • allowing for land exchanges (e.g., Crown land for important private land), • allowing any ministry to acquire and manage land.	When it comes to the extraction of natural resources, the Province normally retains ownership of the land, and grants resource extraction rights through other legislation.	

Legislation (Lead Agency)	Mechanism / Activity	Federal Land	Provincial Land	Reg. Distr. / Municipal	Private Land	Tools	Effectiveness	Limitations	Who Is Impacted?
Provincial cont.									
Land Title Act (LTA)	Land Title Office (LTO); Agricultural Land Commission; Approving Officers under LTA (e.g., local government, Islands Trust, Ministry of Transportation officials)			√	√	Allows registration of **s.219** conservation covenants on land title; specifies terms for subdivision approval	Good tool for protecting habitat values through encumbrances (rather than outright ownership) on titles that survive ownership changes; allows approving officers discretion to refuse or impose conditions on subdivision of land.	LTO policy requires approval of Agricultural Land Commission for ALR land (but not for FLR). This raises issues about weakness of ALC Act regarding wetlands values. Enforcement is problematic; cost issues (e.g., survey for LTO, affordability for NGOs); discretion re subdivision approvals is adequate.	Property owners, and conservation agencies seeking to negotiate and register conservation covenants.
Protection of Crown lands **(BC Ministry of Environment and Climate Change Strategy)**	Orders-in-council		√	√	√	Orders-in-council can be made respecting the environment or land use.	Government has used this provision to establish 81 protected areas. Environment and Land Use Committee of Cabinet has broad powers 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.	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 and Recreation Area Regulation as identified in the order-in-council.	N/A

Legislation (Lead Agency)	Mechanism / Activity	Federal Land	Provincial Land	Reg. Distr. / Municipal	Private Land	Tools	Effectiveness	Limitations	Who Is Impacted?
Provincial cont.									
Water Protection Act (Ministry of Environment and Climate Change Strategy)	Prohibitions on bulk water removal		√	√	√		Confirms provincial ownership of Crown surface water and groundwater. Province has right to ensure its protection and sustainable use. Prohibits bulk water removal from BC, and diversion of water between major watersheds within BC.		Water licence applicants, developers.
Water Act (Ministry of Environment & Climate Change Strategy)	Ministry of Environment - Water Stewardship Division		√	√	√	Water Use Planning; Water Use Plans (WUPs)	WUPs define daily operating parameters applied at all BC Hydro hydroelectric facilities; recognize multiple water use objectives; and balance competing uses, such as domestic water supply, fish and wildlife, recreation, heritage, and electrical power needs. Once a WUP is accepted by the Comptroller of Water Rights, operational changes, monitoring studies, and physical works outlined in the plan are implemented through orders under the Water Act.		BC Hydro, other water stakeholders.

Legislation (Lead Agency)	Mechanism / Activity	Federal Land	Provincial Land	Reg. Distr. / Municipal	Private Land	Tools	Effectiveness	Limitations	Who Is Impacted?
Provincial cont.									
Water Act **Groundwater Protection Regulation** (Ministry of Environment & Climate Change Strategy)	Land and Water BC Inc. (for dispositions) Ministry of Environment - groundwater technical standards and water management planning		√	√	√	Issuance of water licences Groundwater protection	Water Act requires provincial approval for diverting or storing water, or changes in and about a stream (definition includes wetlands to some extent). Groundwater regulations (Part 5 of Water Act) protect wells/aquifers from contamination and thus afford some protection for wetlands that are groundwater-fed. Part 4 of Water Act provides for legally binding water management plans tailored to address local issues.	Wetland conservation issues are not effectively addressed in Water Act; important wetlands may be harmed by licence approvals. Groundwater consumption is not regulated which could result in wetlands connected to groundwater going dry. Definition of stream is limited in that it may not be interpreted to include all wetlands.	Water Licence applicants/holders. With respect to groundwater, well owners, drillers, and pump installers are impacted. Consultants may also be impacted in that they may be required to make alternate specifications for well installations.
Drainage, Ditch and Dike Act (Part 1 of Act repealed by Bill 8, 2002) **Dike Maintenance Act**	Dike construction and maintenance		√	√	√	None – but **s.63** requires compliance with Water Act.	Establishes authority for activities that can impact wetlands, but does not impose accountability for wetlands impacts.	May have considerable impact on wetlands, yet does not address wetlands at all. Most diking is historic; new diking is undertaken by local government or Ministry of Transportation.	Local governments, Ministry of Transportation.

Legislation (Lead Agency)	Mechanism / Activity	Federal Land	Provincial Land	Reg. Distr. / Municipal	Private Land	Tools	Effectiveness	Limitations	Who Is Impacted?
Provincial cont.									
Agriculture Land Commission Act **Agricultural Land Reserve Use, Subdivision and Procedure Regulation**	Agricultural land practices			√	√	Regulates use of agricultural land, soil removal and fill in ALR. Brownfield Removal Strategy	Variable. Allows for ecological reserves and wildlife habitat uses of agricultural land if surface is not subject to substantial works; very limited allowance for considering environmental values (**ss. 43.1, 44**), but always subordinate to farm use.	Strong priority given to agriculture; no consideration of environmental impacts such as loss of wetlands for most decisions; assumes agricultural land is more scarce than wetlands; could impede ability to implement mitigation measures.	Private landowners in Agricultural Land Reserve (ALR).
Weed Control Act	Invasive species		√	√	√	The BC Weed Control Act imposes a duty on all land occupiers to control designated noxious plants.	Works for designated species that have an impact on agriculture.	Designated species list may not reflect invasive species that are impacting non-agricultural lands.	Crown land and private landowners.

Legislation	Lead Agency	Federal Land	Provincial Land	Reg. Distr. / Municipal	Private Land	Relevance	Effectiveness	Limitations	Who Is Impacted?
Provincial cont.									
Local Government Act (LGA) **Community Charter (CC)**	Local governments Ministry of Community and Rural Development			√	√	Zoning and bylaw actions affect land use	In addition to Environmentally Sensitive Areas (ESAs) and Development Permit Areas (DPAs) designations, local governments have delegated authority to identify land use zones and pass bylaws affecting land use that could impact wetlands, for both public and private land. This can have both a positive and negative effect on wetlands. Wetland areas prone to flooding can be protected by bylaw (**s.910 LGA**). Forested wetlands could be protected from tree cutting by bylaw (**s.50 CC**).	Recognizes that a purpose of local government is to foster the "current and future economic, social, and environmental well-being of a community." Does not provide a definition of "environment," and protection of wetland environments, wetland habitats, and wetland species including species at risk is discretionary rather than mandated ("may" instead of "must"). Local governments are constrained by some provincial legislation, e.g., Farm Practices Protection (Right to Farm) Act, in their desire to protect wetlands as the highest use for a property.	Local governments, landowners, and constituents.

Legislation	Lead Agency	Federal Land	Provincial Land	Reg. Distr. / Municipal	Private Land	Relevance	Effectiveness	Limitations	Who Is Impacted?
Provincial cont.									
Official Community Plans (OCPs) - Bylaw						Official Community Plans support a sustainable community, and serve to preserve and enhance the local economy, and the health and well-being of its residents and property owners as well as the natural environment. OCPs must encourage environmental stewardship for land, water, and air.	OCPs are enacted as bylaws with an overarching goal to support healthy, clean, and sustainable communities by ensuring that environmental integrity and diversity are maintained in land use decisions. Broad environmental goals can include: protecting the natural environment; ensuring development does not adversely harm or detract from identified wildlife corridors and areas with high wildlife and fisheries habitat value; protecting the quantity and quality of water resources and waterways; ensuring development is managed along with the physical nature and natural limitations of the land base.	Refers to resource and land use based on forestry, mining, and commercial, residential, and recreation development and activities relative to sustainability. Strong OCPs can have resource objectives such as protecting the local forest land base and large areas of un-fragmented forest habitat for its aesthetic and recreational value and importance to natural ecological functioning; and protecting riparian zones, sensitive ecosystems, watersheds, and biodiversity.	Private landowners, developers, industrial and commercial interests.