Appendix 1 List of workshop participants

Name	Organization	Group
Alan Peatt	Okanagan Nation Alliance	1
Alyson Skinner	Okanagan Similkameen Stewardship Society	2
David Trotter	BC Ministry of Agriculture	2
Eliana Wardle	UBCO Centre for Culture and Technology	Observer
Gael Russell	BCWF Peachland Sportsman's Association	3
Heidi Simkins	District of Peachland	1
Jayden Riley	Westbank First Nations	3
Jeanette Angel	UBCO Centre for Culture and Technology	Observer
Keith Pinkoski	Regional District North Okanagan	5
Kirk Safford	BC Parks	3
Kurt Zander	Central Okanagan Land Trust (COLT)	2
Laura Hooker	UBCO/COLT	3
Leanna Warman	The Nature Trust of British Columbia	4
Les Gyug	RDCO Environmental Advisory Commission	4
Lorne Davis	Geostream Environmental Consulting	3
Lucy Reiss	Environment Canada	4
Mary Ann Olson-Russello	Ecoscape Environmental	5
Murray Kopp	Regional District of Central Okanagan	Partial attendance
Murray Wilson	Tolko	3
Orville Dyer	BC Ministry of FLNRO – Ecosystems Branch	4
Paul Dupuis	District of Lake Country	4
R.L. Simpson	BC Wildlife Federation, Southern Interior Land Trust	3
Rob Dinwoodie	BC Ministry of FLNRO Forests and Range	1
Scott Boswell	OCCP	5
Tanis Gieselman	SeedsCo Community Conservation/OCCP	1
Wayne Darlington	RDCO Parks Services	2
Organizing Committee		
Lael Parrott	UBCO	1 (Chair)
Tory Stevens	Ministry of Environment/BC Parks	2 (Chair)
Margaret Bakelaar	RDCO	3 (Chair)
Rachel Holt	Veridian Ecological Consulting	4 (Chair)
Gregory Kehm	Gregory Kehm Associates	5 (Chair)
Carol Luttmer	OCCP	Observer
Gisele Rehe	RDCO / OCCP	Observer
Corrie Allen	UBCO	Observer
Rachel Field	UBCO	Observer
Katey Sasges	UBCO	Observer
Alison Peatt	Bearfoot Resources Ltd.	Observer
Susan Latimer	SDL Environmental	Observer

Appendix 2 Slides from workshop presentations

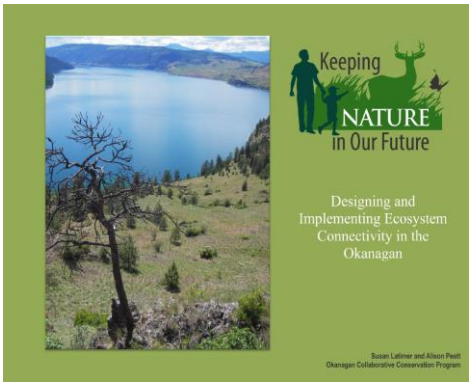
How do we plan for connectivity?

Alison Peatt, RPBio

Bearfoot Resources Ltd.

Simplifying Connectivity

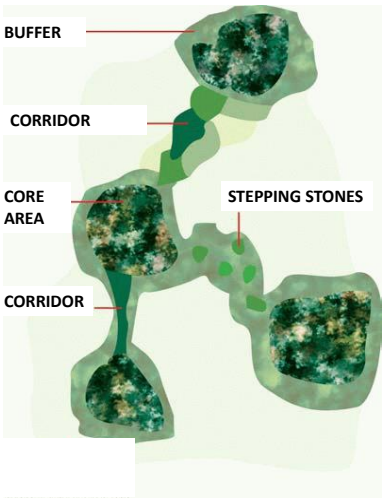
- Understanding what Connectivity is
- Planning and Designing Connectivity
- Why connectivity matters
- Selecting Location(s)



http://a100.gov.bc.ca/appsdata/acat/documents/r42389/Part3DesigningandImplementingEcosystemConnectivit_1405351562655_5351338661.pdf

What is Connectivity?

Connectivity is physical and functional links between ecosystems



How do we plan and design for Connectivity?

- What makes a good patch or corridor?
- How much habitat is enough?
- How to create a connectivity plan-
  - Planning stages/planning process
  - Local government tools
  - Examples
- Other resources
  - Glossary of terms
  - References
  - Appendices

Think globally; Act locally

Connectivity exists on multiple scales;

There are a variety of opportunities for action.

People help to set the priorities.

Why is it important to maintain ecological connectivity?

Dr. Lael Parrott
Director, UBC Okanagan Institute for Biodiversity, Resilience, and Ecosystem Services (BRAES)
Director, Complex Environmental Systems Laboratory
Associate Professor, Sustainability | Earth & Environmental Sciences, Geography and Biology
The University of British Columbia, Okanagan Campus
http://complexity.ok.ubc.ca

Why is it important to maintain ecological connectivity?

- An ecologically connected landscape supports biodiversity and ecosystem services (such as water filtration, air purification, waste recycling, pollination, recreation, aesthetic beauty) which are essential to our own health and well-being
- Connected ecosystems are more resilient and will be better able to adapt to increasing climate variability and mitigate the effects of extreme weather events

Why is it important to maintain ecological connectivity *in the Okanagan*?

- Loss of habitat, and fragmentation of existing habitats, is the single most important cause of biodiversity decline around the world, and here in the Okanagan
- The Okanagan represents only 0.8% of BC's land area, yet it contains over **30%** of the endangered species in the province and **46%** of the species of concern

Why is it important to maintain ecological connectivity *in the Okanagan*?

- The Okanagan is the northern extent of the American Great Basin Desert
- The region will be an important haven for species migrating northward as climate warms
- Topography, large lakes and human land use limit opportunities for species movement through the valley

Why is it important to maintain ecological connectivity *in the Okanagan*?

- Increasing levels of fragmentation may significantly affect biodiversity, human well-being, quality of life and livelihoods
- Restoration of habitats is exceedingly costly and more difficult to do than conservation; pro-actively planning for connectivity should be a priority in land use planning

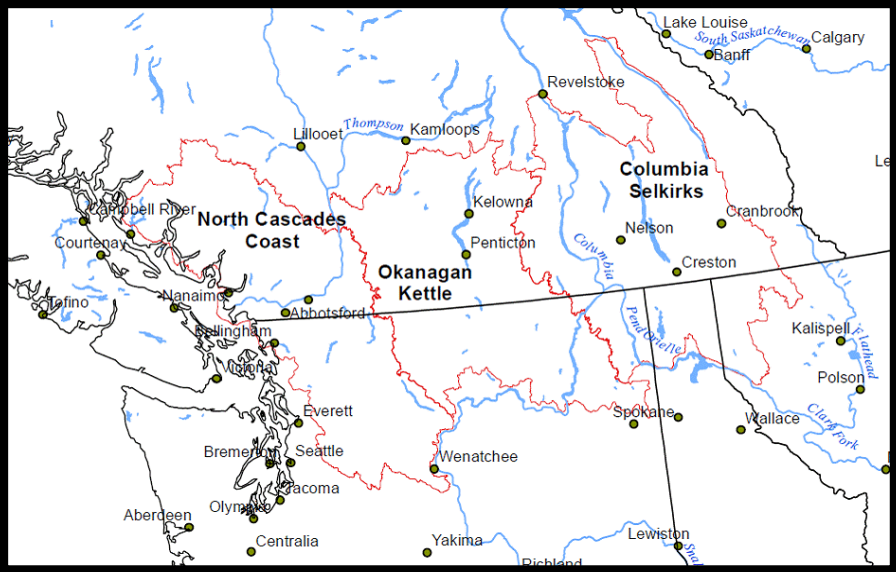
Looking at our landscape from multiple scales…

- BC-Washington Transboundary analyses (next)
- Regional-scale analyses

Habitat Connectivity across borders

GNLCC Funded Project

- Washington-BC Habitat Connectivity Transboundary Collaborative Team:
  - Conservation NorthWest
  - Dept. Fish and Wildlife
  - Department of Transportation
  - Ministry of Environment
  - University of Washington
  - US Forest Service
  - Supported by team of independent contractors



Goals

- Connectivity analysis for region. Two scales
  - Regional context, including cross-border analysis
  - Local context analysis
- Looking for areas of high value that present:
  - Current Opportunities
  - Current Barriers
  - Risks (current opportunities with threats)
- *Ultimately – inform decisions to …. maintain or improve wildlife connectivity through this region*

Basic Approach

- Use existing models and data where feasible
- Focus on low elevation – through 3 lenses
  - Species – grassland / shrub steppe habitat use
  - Species – montane movements through low elevation
  - Landscape integrity

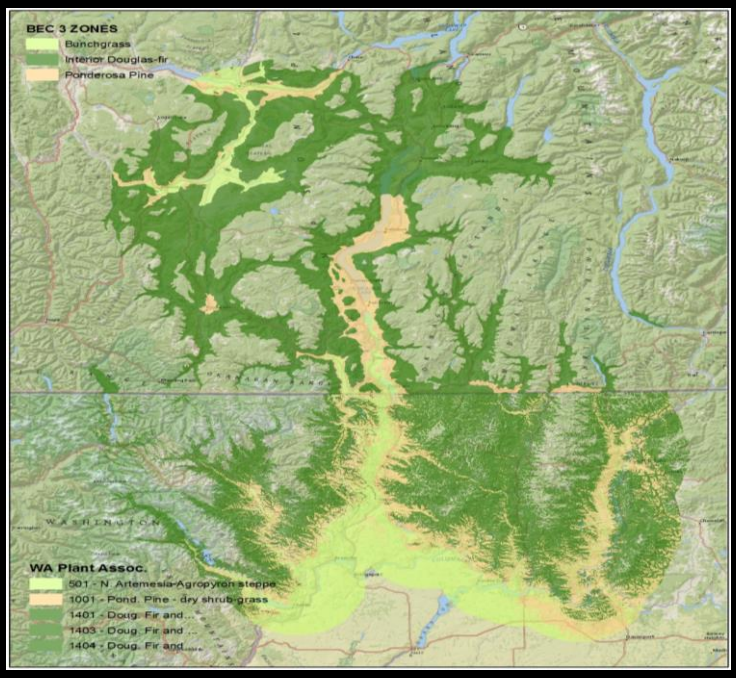
Guilds

Shrub-steppe / Grassland

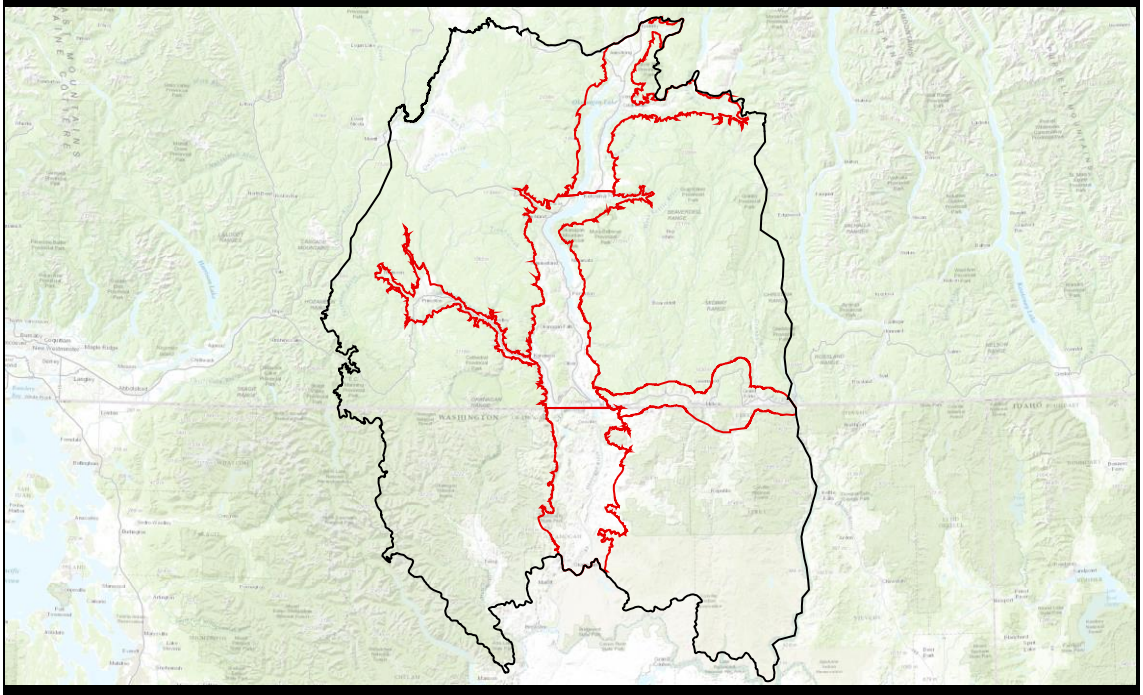
Montane

Landscape Integrity

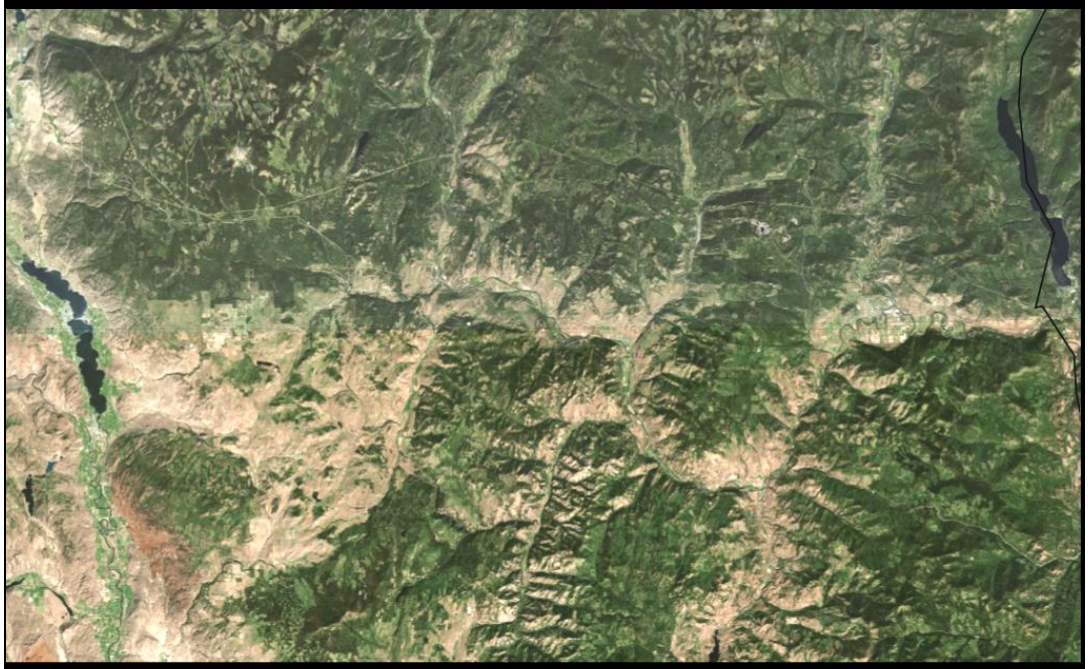
Upgraded for cross border, and with relevant species info as available



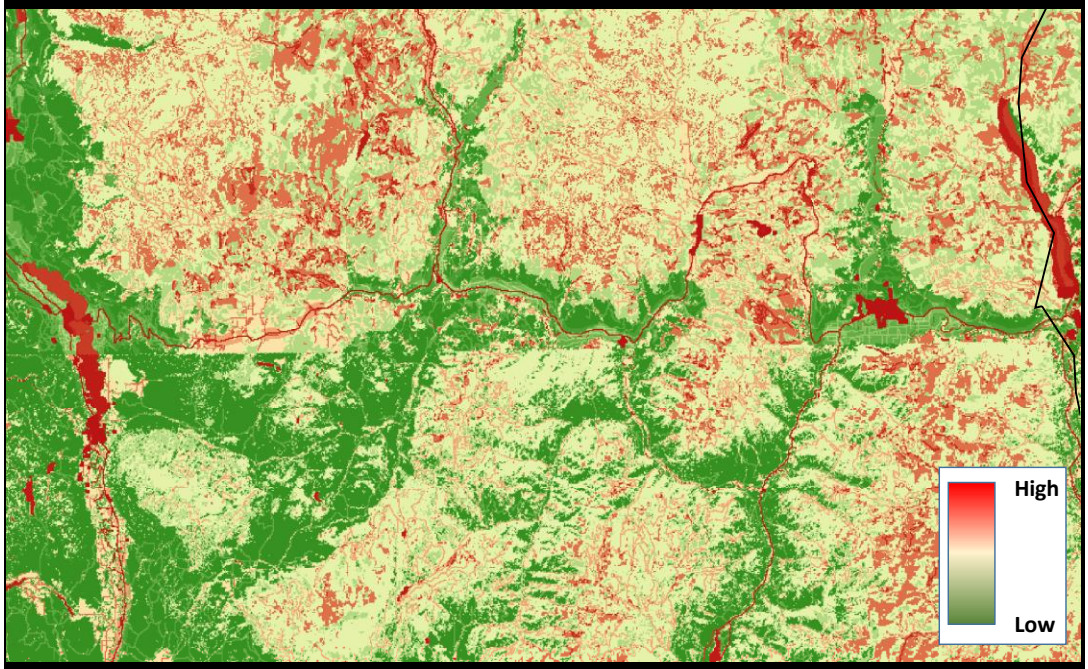
Fracture Zones



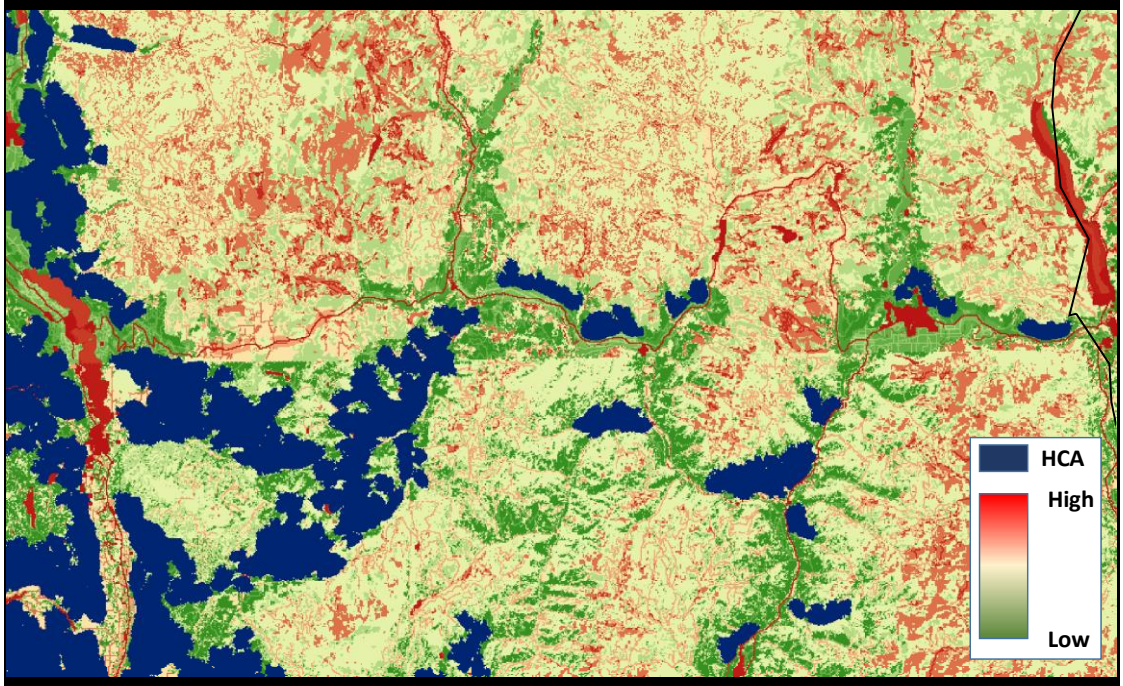
Products



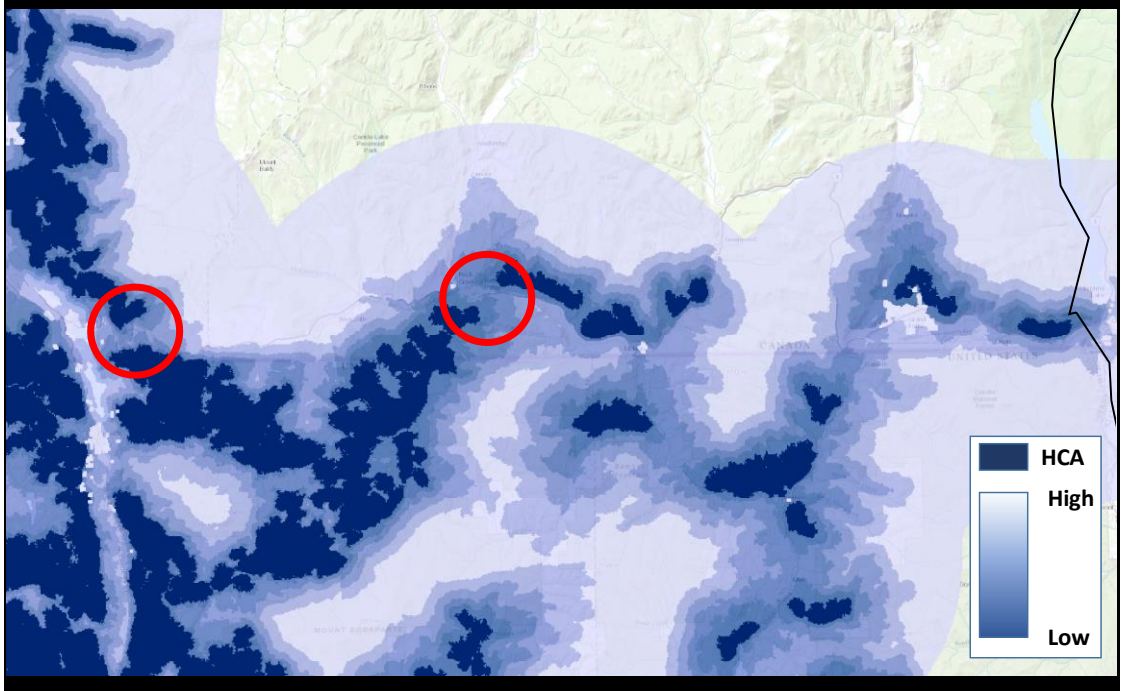
Products – resistance models



Products – cores or Habitat Concentration Areas (HCAs)



Products - cost-weighted distance models

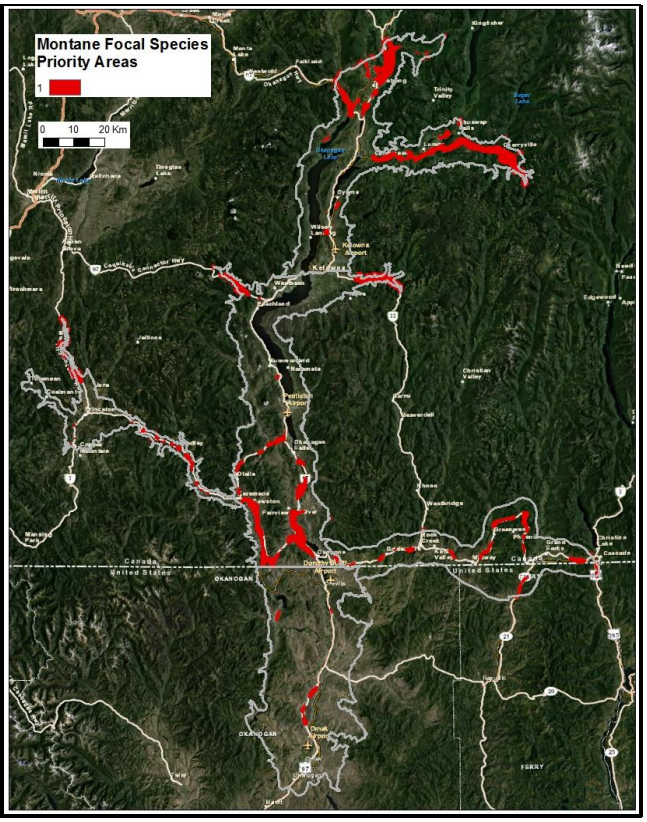


Models help identify areas for operational-scale analysis and planning that are essential to regional-scale connectivity

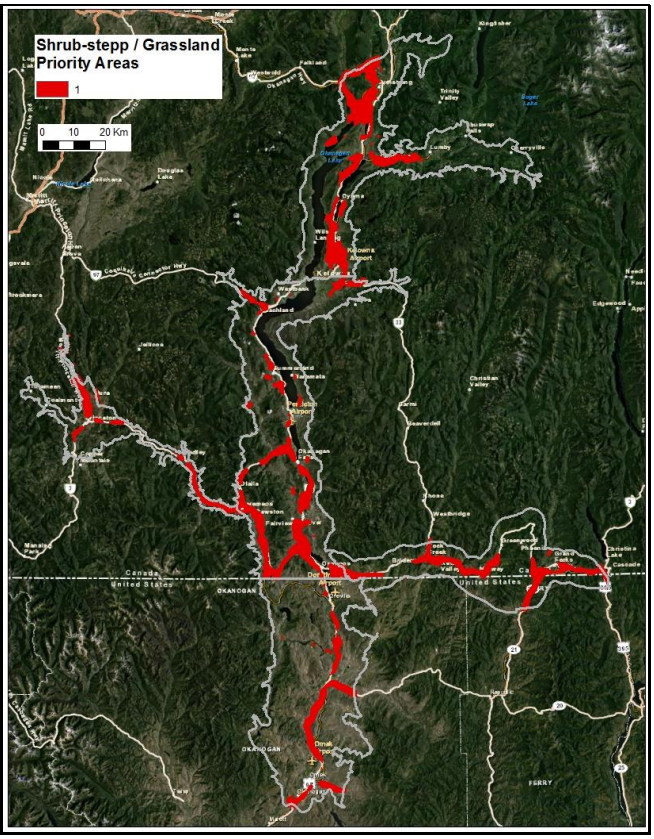
Products

- 3 types of maps for each of 5 subregions
  - Useful for area-specific or guild-specific investigation
- Compiled into a single product that focuses on areas of highest risk within the whole study area
  - Areas in low elevation
  - Closer to major roads

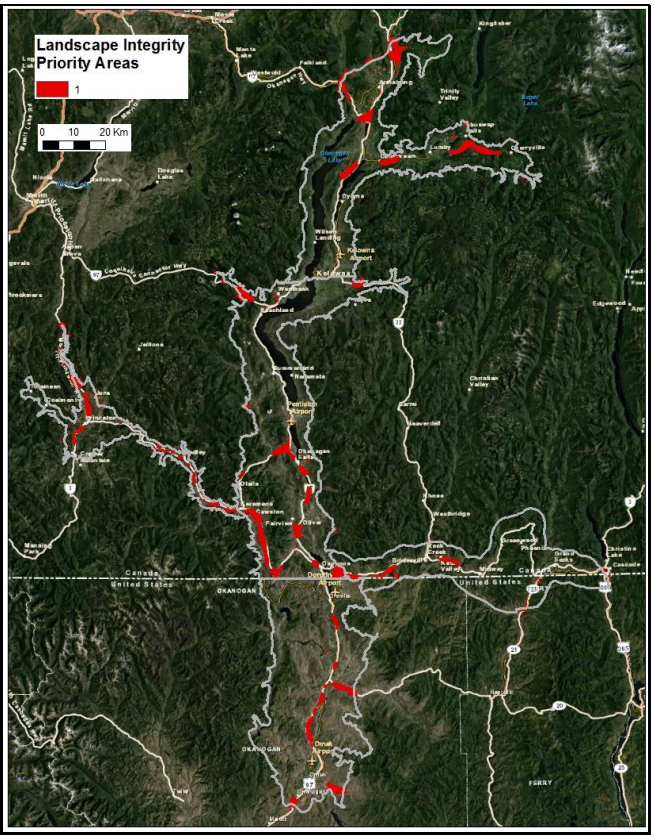
Linkage priorities for Montane / generalist Focal Species



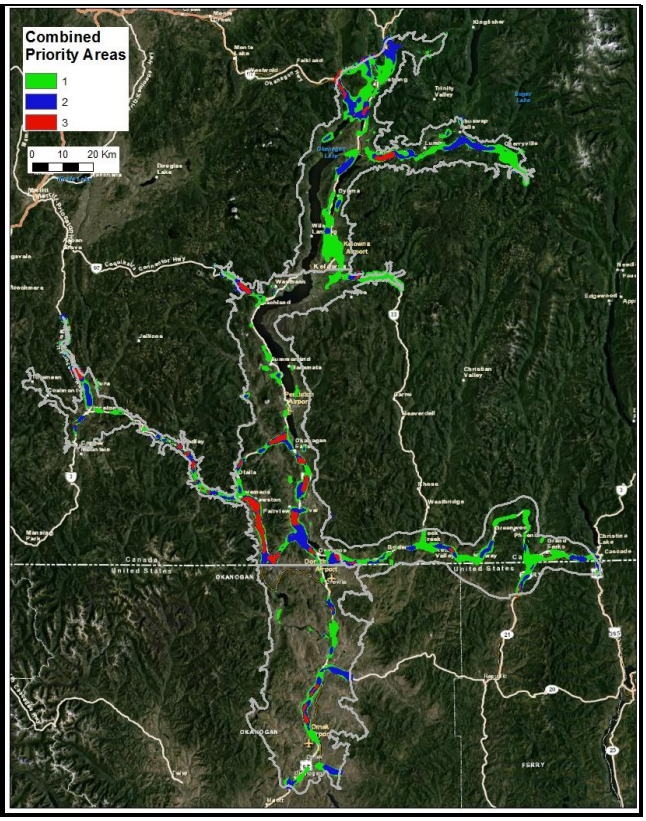
Linkage priorities for Shrub-steppe / Grassland



Linkage priorities for Landscape Integrity



Combined linkage priority areas (sum of the three previous layers)



Feedback?

- Comments on the maps themselves.
  - Working draft maps .. Not field tested
  - Are there ways in which this information could be presented which would make it more useful to you?
  - Do you think this regional scale is useful within your organisation ?

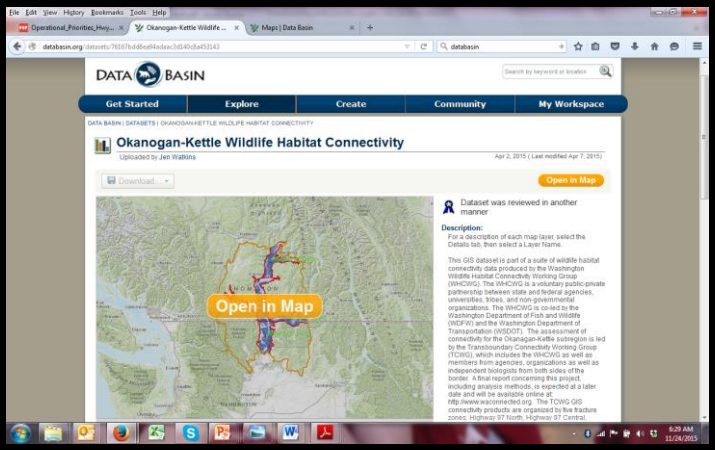
Climate Change?

Thank you!

- GNLCC Funded
- Supported by input from a range of partners
- Many hands make light work:
  - Jen Watkins, Andrew Shirk, Peter Singleton, Greg Kehm, Leslie Robb, Tory Stevens, Rachel Holt, Meade Krosby, Brian Cosentino, Brian Hall, Joanne Schuett-Hames, Karl Halupka, Bill Gaines.
- Additional thanks to:
  - Bryn White, Susan Latimer, Lael Parrott, Margaret Bakelaar, Orville Dyer, Dick Cannings, John Pierce,

Products are freely available:

- www.databasin.org



Maintaining ecological connectivity in the Okanagan: Description of regional analyses

Dr. Lael Parrott
Director, UBC Okanagan Institute for Biodiversity, Resilience, and Ecosystem Services (BRAES)
Director, Complex Environmental Systems Laboratory
Associate Professor, Sustainability | Earth & Environmental Sciences, Geography and Biology
The University of British Columbia, Okanagan Campus
http://complexity.ok.ubc.ca

Partnership:

Key organisations: *UBC Okanagan, Regional District of the Central Okanagan (RDCO), Okanagan Collaborative Conservation Program (OCCP) & South Okanagan Similkameen Conservation Program (SOSCP)*

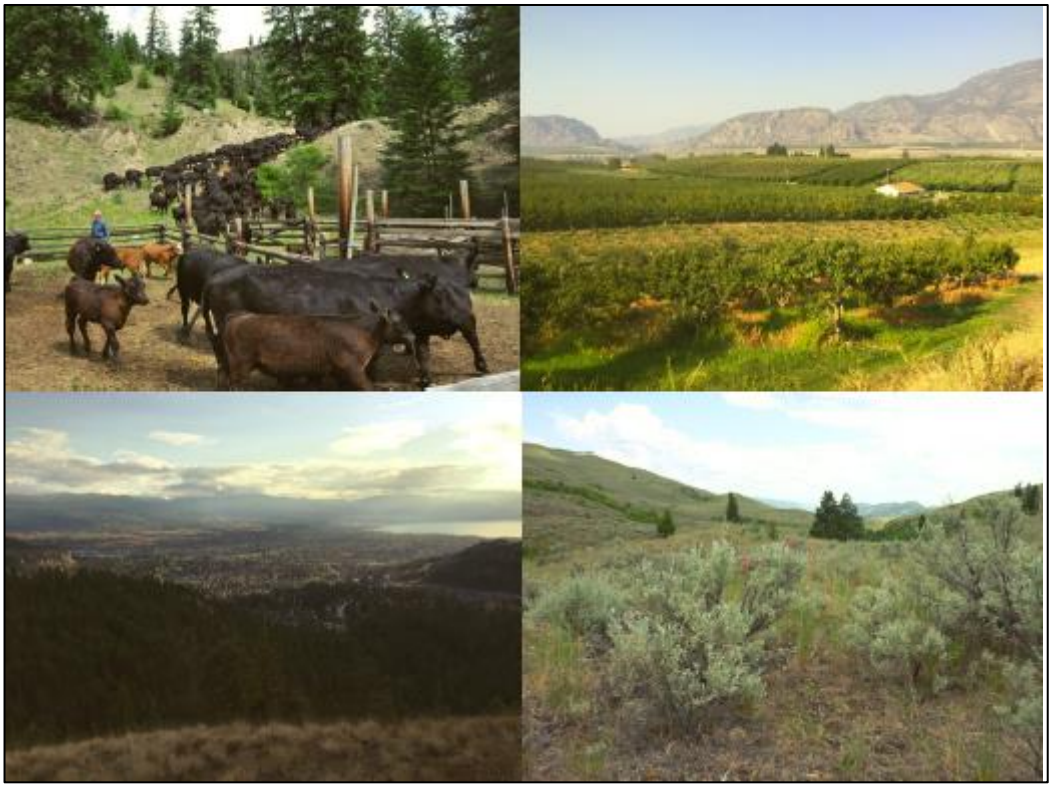
Research team:

Lael Parrott, Associate professor, UBC
Jeffrey Cardille, Associate Professor, McGill Univ.

Katey Kyle, PhD student, UBC - mapping corridors
Corrie Allen, MSc student, UBC - focal species
Rachel Field, PhD student, UBC - ecosystem services
Valerie Huyot, BSc student, McGill
Charles-André Bouchard, BSc student, McGill
Maryssa Soroke, BSc honour's, UBC (completed)

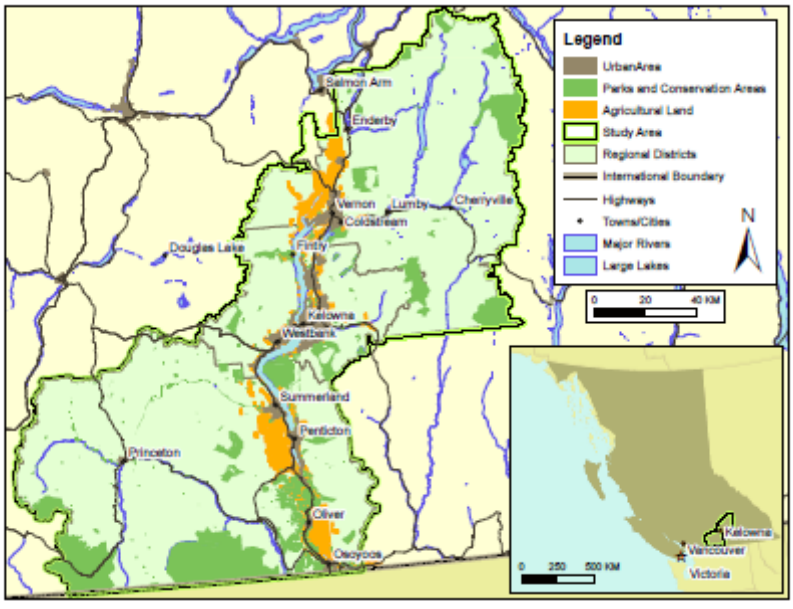
Our Vision

- *An ecologically functional and resilient Okanagan landscape that:*
  - supports and sustains biodiversity and ecosystem services
  - maintains habitat connectivity throughout the valley and with Washington State
  - supports human quality of life, by providing access to clean air and water and other ecosystem services
  - sustains resource-dependent livelihoods, including agriculture, forestry and tourism

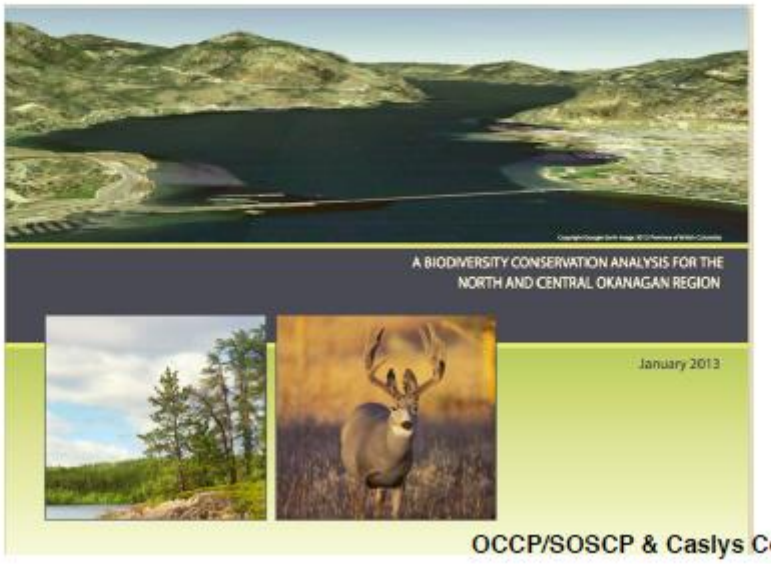


Study Area

(North, Central and South Okanagan Regional Districts, British Columbia, Canada)



Building on the Okanagan Biodiversity Conservation Strategy

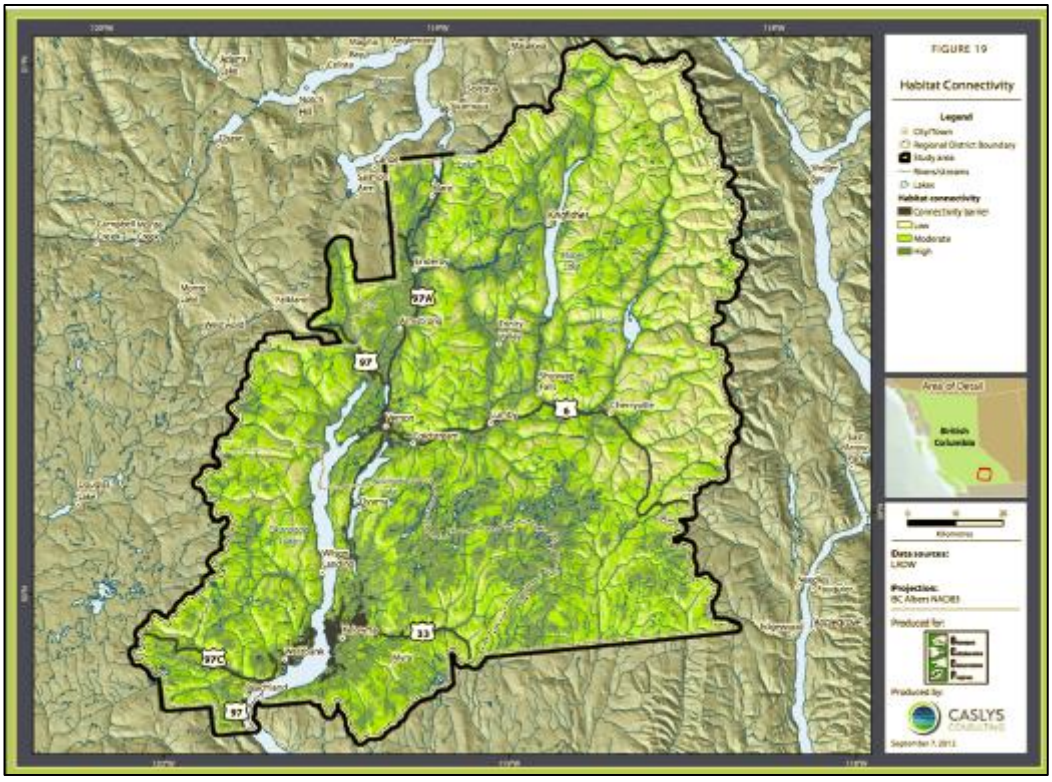


OCCP/SOSCP & Caslys Consulting

Building on the Okanagan Biodiversity Conservation Strategy

Figure 2. Biodiversity Conservation Analysis Overview

OCCP/SOSCP & Caslys Consulting



Identifying regional corridors: Methods

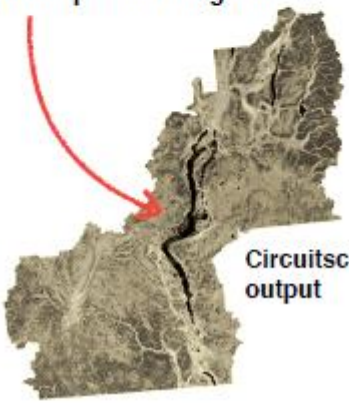
A spatial modelling tool called "Circuitscape" was used to find the most likely movement corridors for a generic animal moving through the landscape, based on assumptions about habitat connectivity made in the Biodiversity Conservation Strategy

Identifying regional corridors: Methods

BCS Habitat Connectivity Map

Resistance to movement raster map

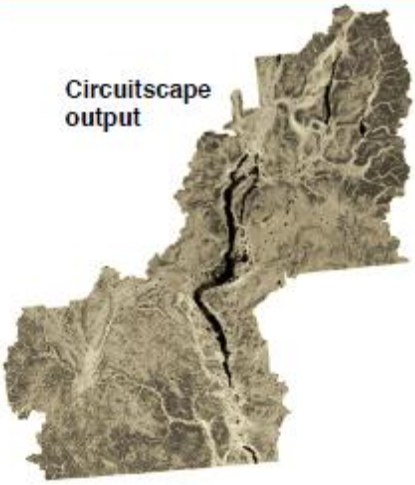
Circuitscape modelling tool

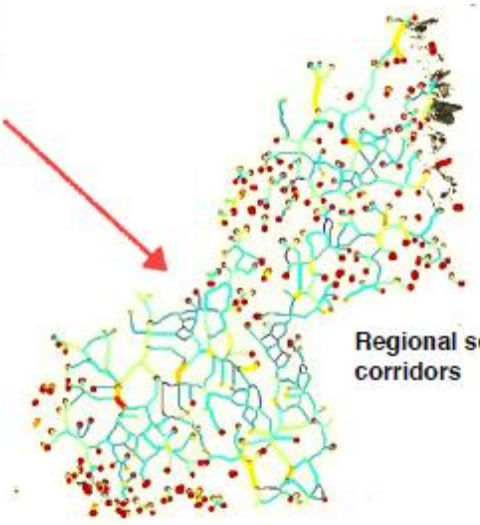


Circuitscape output

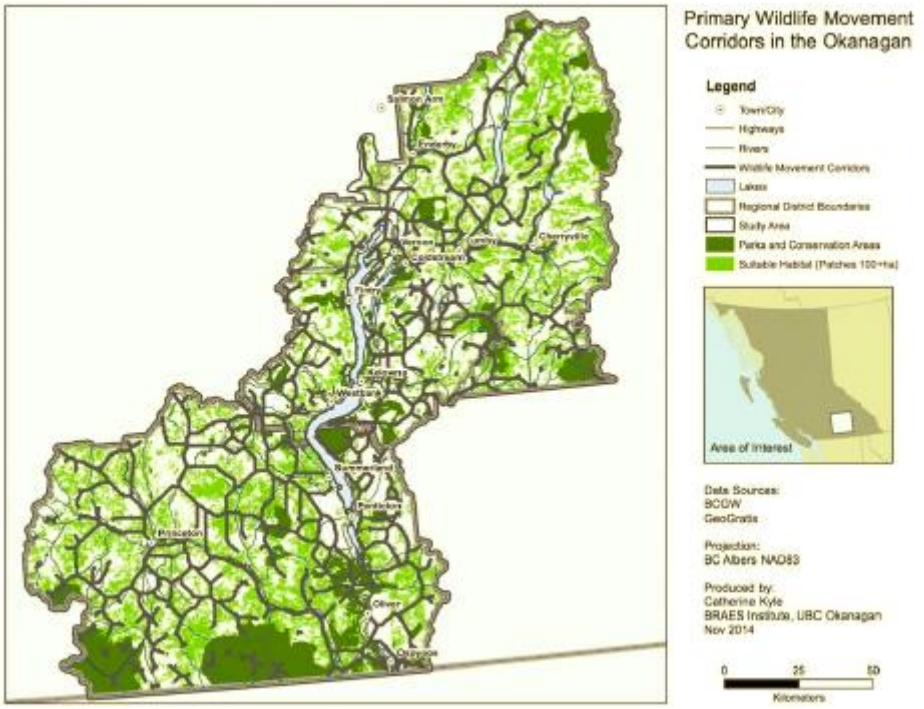
Identifying regional corridors: Methods

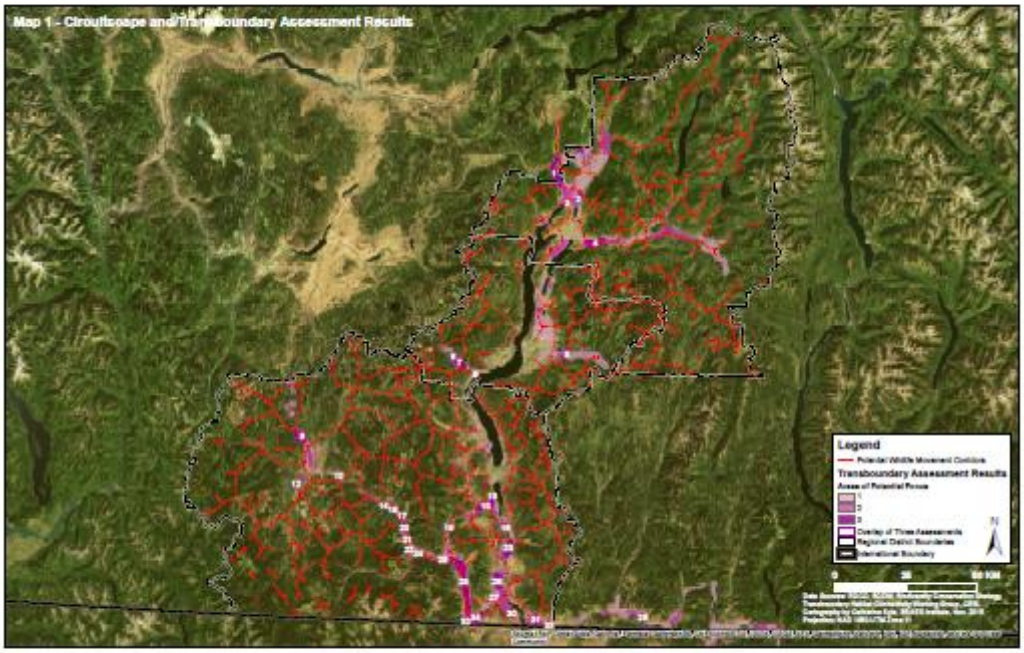
Circuitscape output

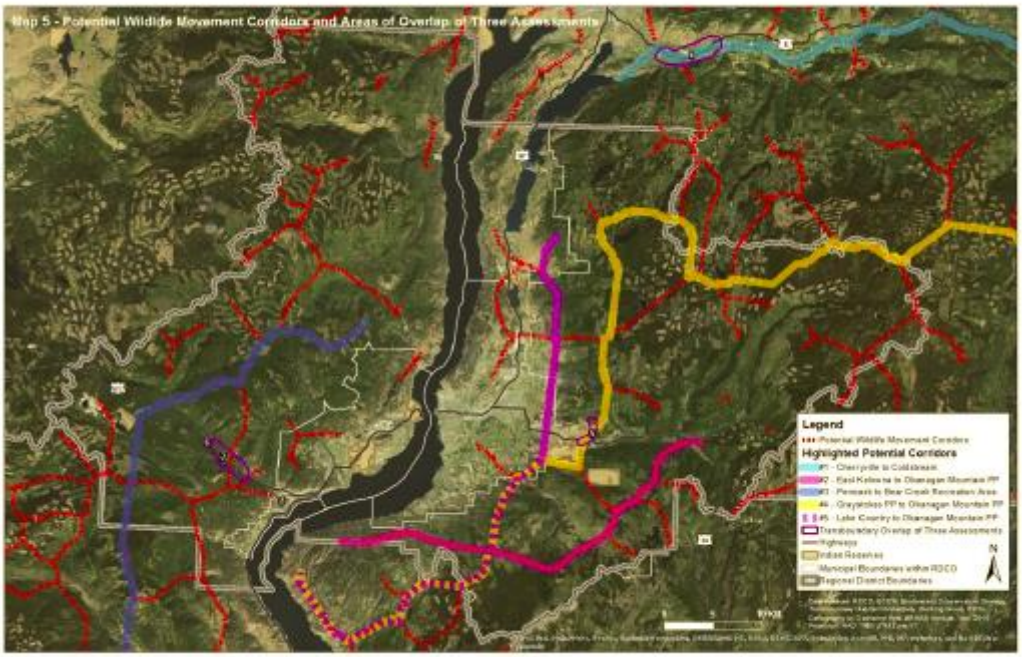




Regional scale corridors


Primary Wildlife Movement Corridors in the Okanagan
Legend
Town/City
Highways
Rivers
Wildlife Movement Corridors
Lakes
Regional District Boundaries
Study Area
Parks and Conservation Areas
Suitable Habitat (Patches 100+ha)
Area of Interest
Data Sources:
BCGW
GeoGratis
Projection:
BC Albers NAD83
Produced by:
Catherine Kyle
BRAES Institute, UBC Okanagan
Nov 2014
0
25
50
Kilometers


Map 1 - Circuitscape and Transboundary Assessment Results
Legend
Transboundary Assessment Results



Maintaining connectivity

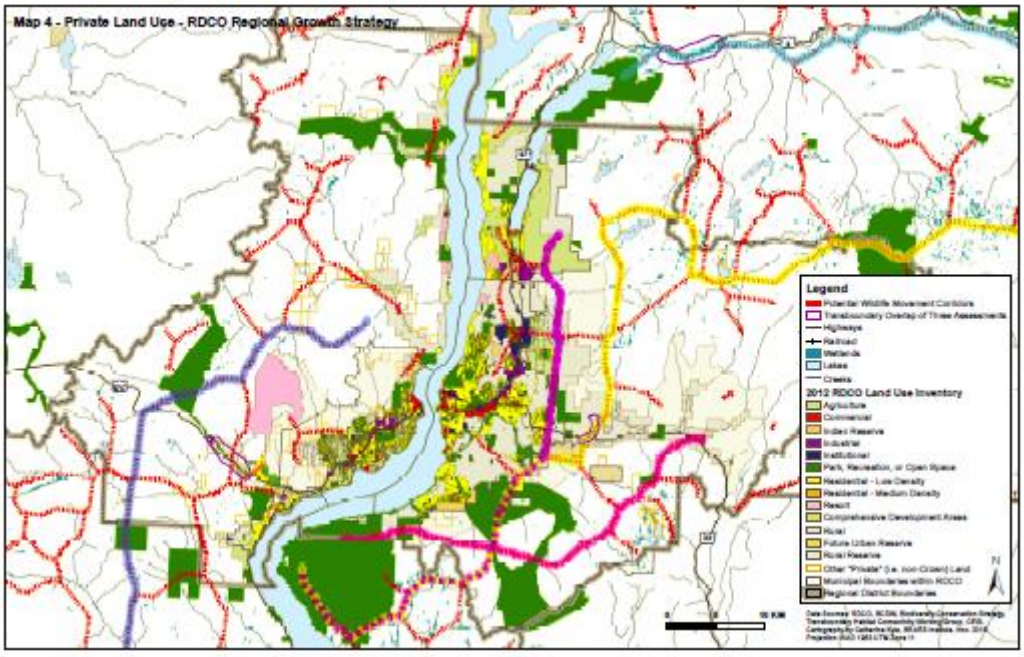
Things to think about

- The highlighted corridors emerged from what the best spatial data tells us about the landscape
- The location of these corridors should be used a guide to connectivity planning
- The landscape has different gradients of habitat quality and permeability to species movement

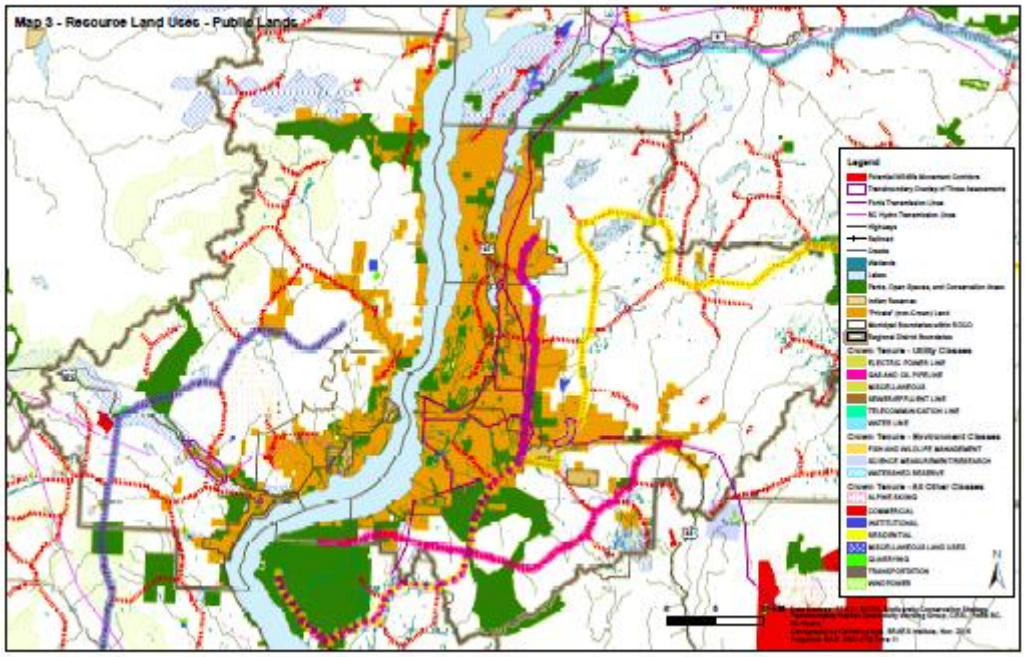
Maintaining connectivity
Things to think about

- Our objective should be to conserve sufficient areas of high quality natural habitat to support biodiversity and ecosystem function, and maintain connectivity between these using a range of approaches compatible with existing land use

Example: Present and future land use on private lands



Example: Leases and tenures on public resource lands



Maintaining connectivity

Things to think about

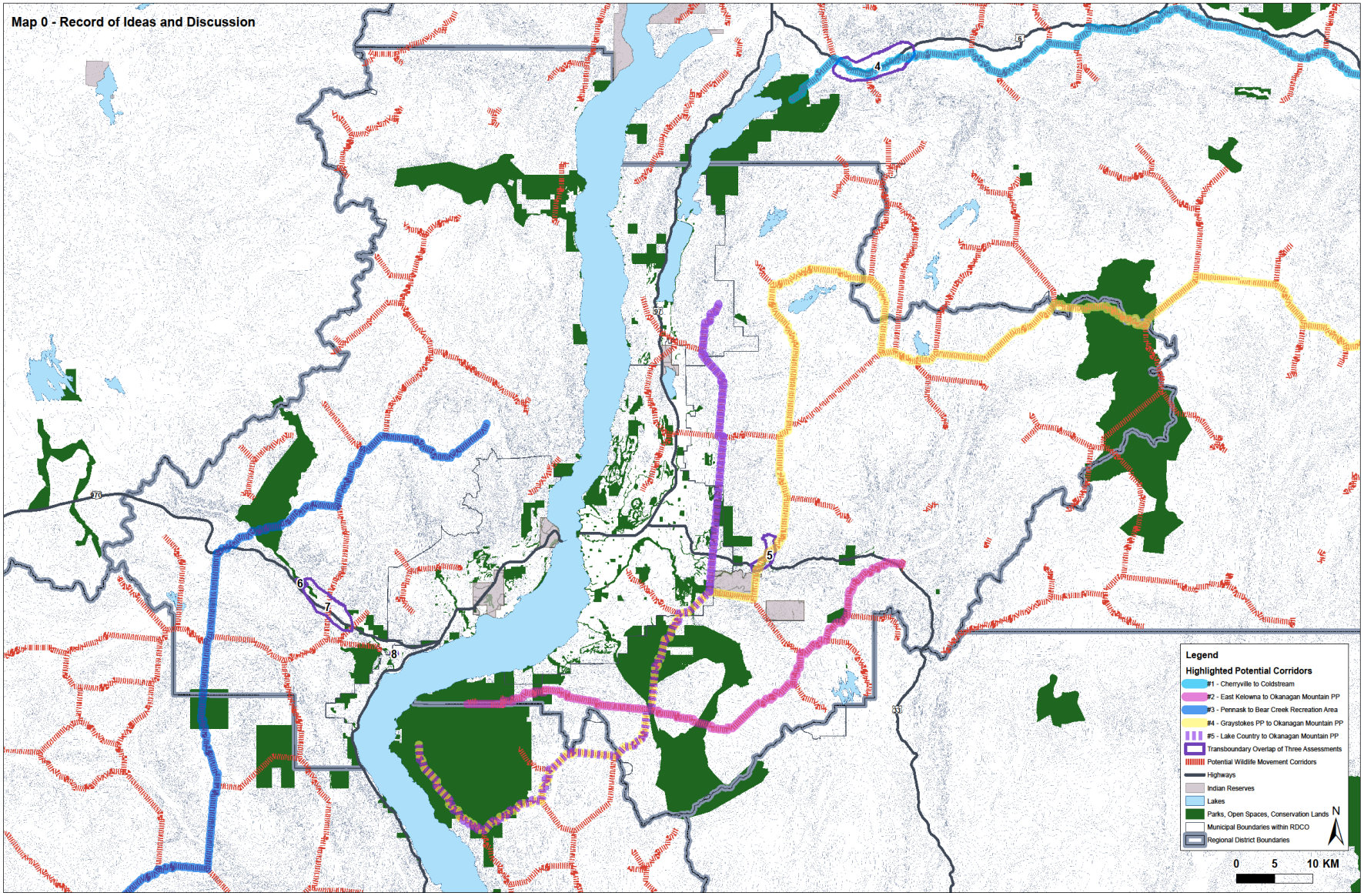
- While the most obvious **land cover** change has occurred in the valley bottom, human **land use** dominates the landscape and shapes our ecosystems
- The maps show the multiple overlapping tenures and uses that are linked to human livelihoods - corridor planning needs to take all of these tenures into consideration

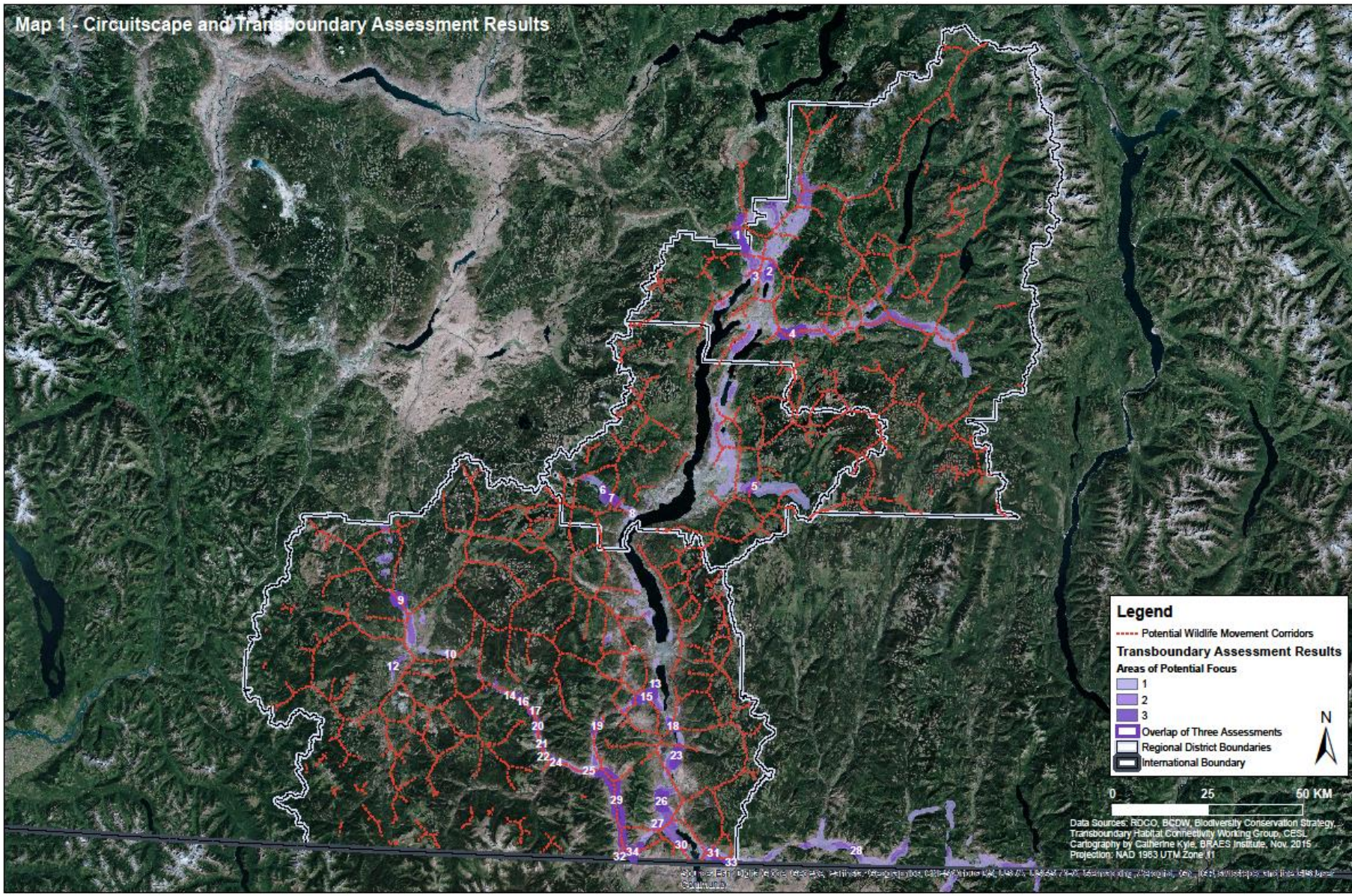
Conclusion

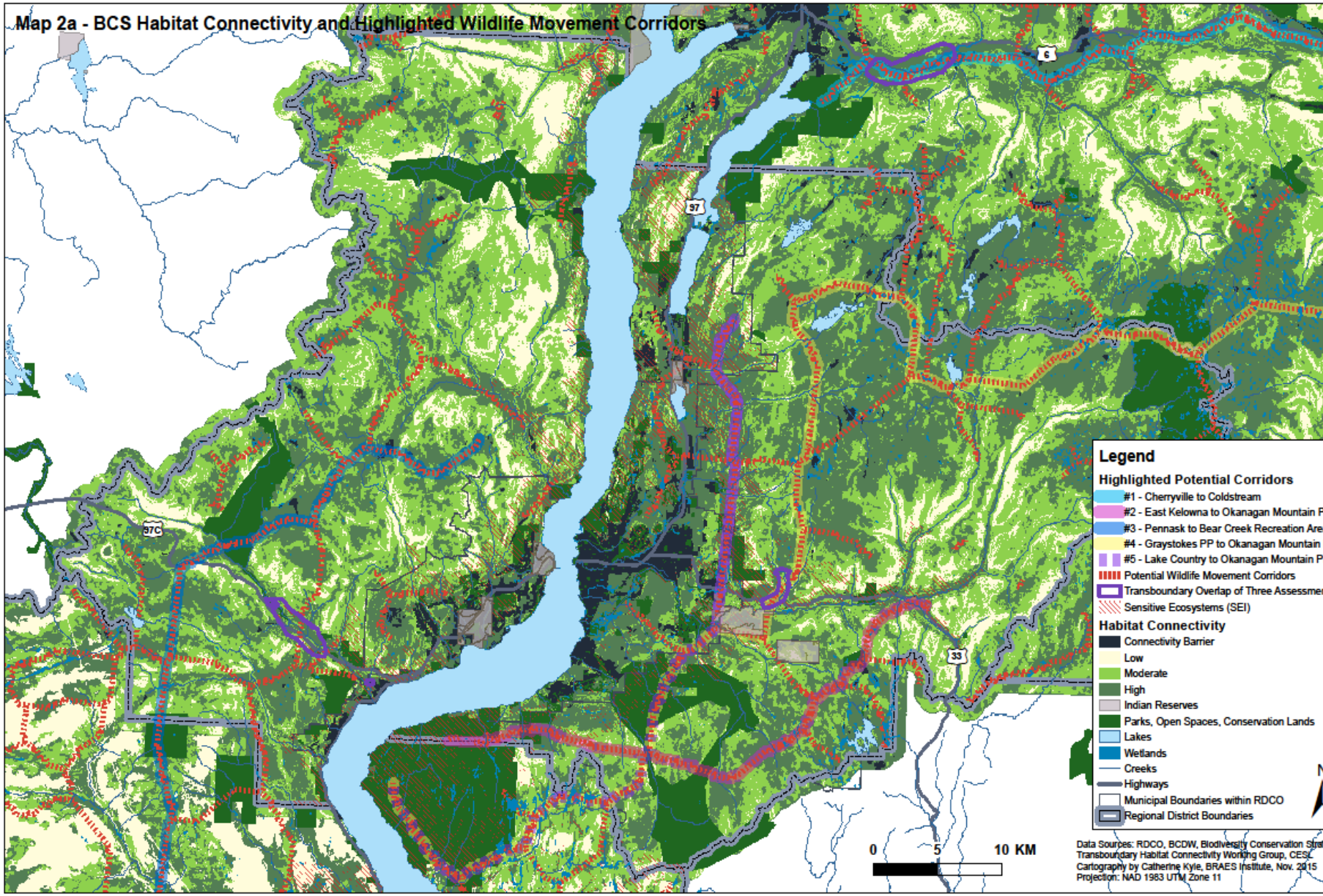
- This workshop is the first step in the planning process for maintaining ecological connectivity in the central Okanagan
- The approach should be applicable to the other regional districts
- We have a unique opportunity in the Okanagan to set an example of how, through collaboration, we can create an ecologically connected, and resilient, multifunctional landscape

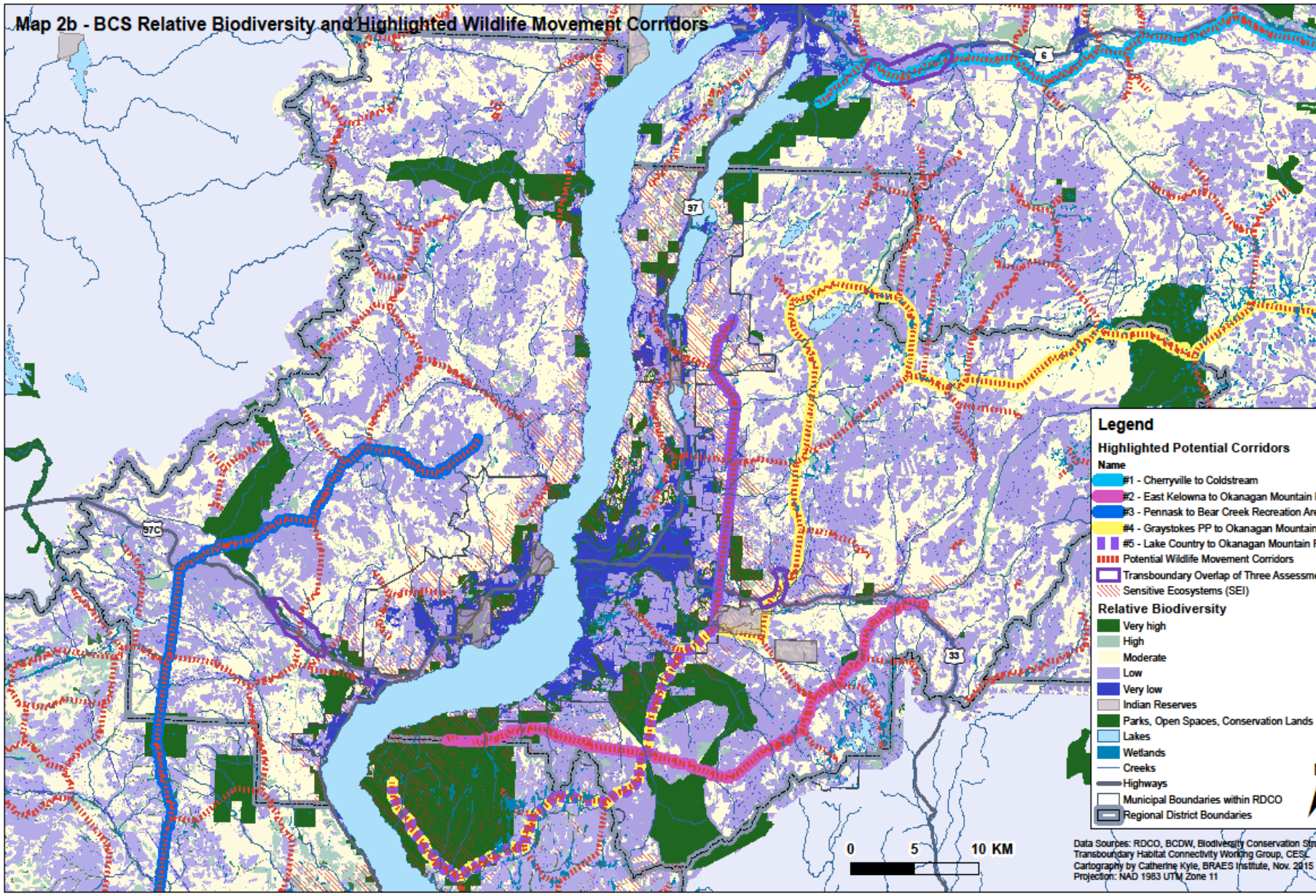
Kelowna, November 2015

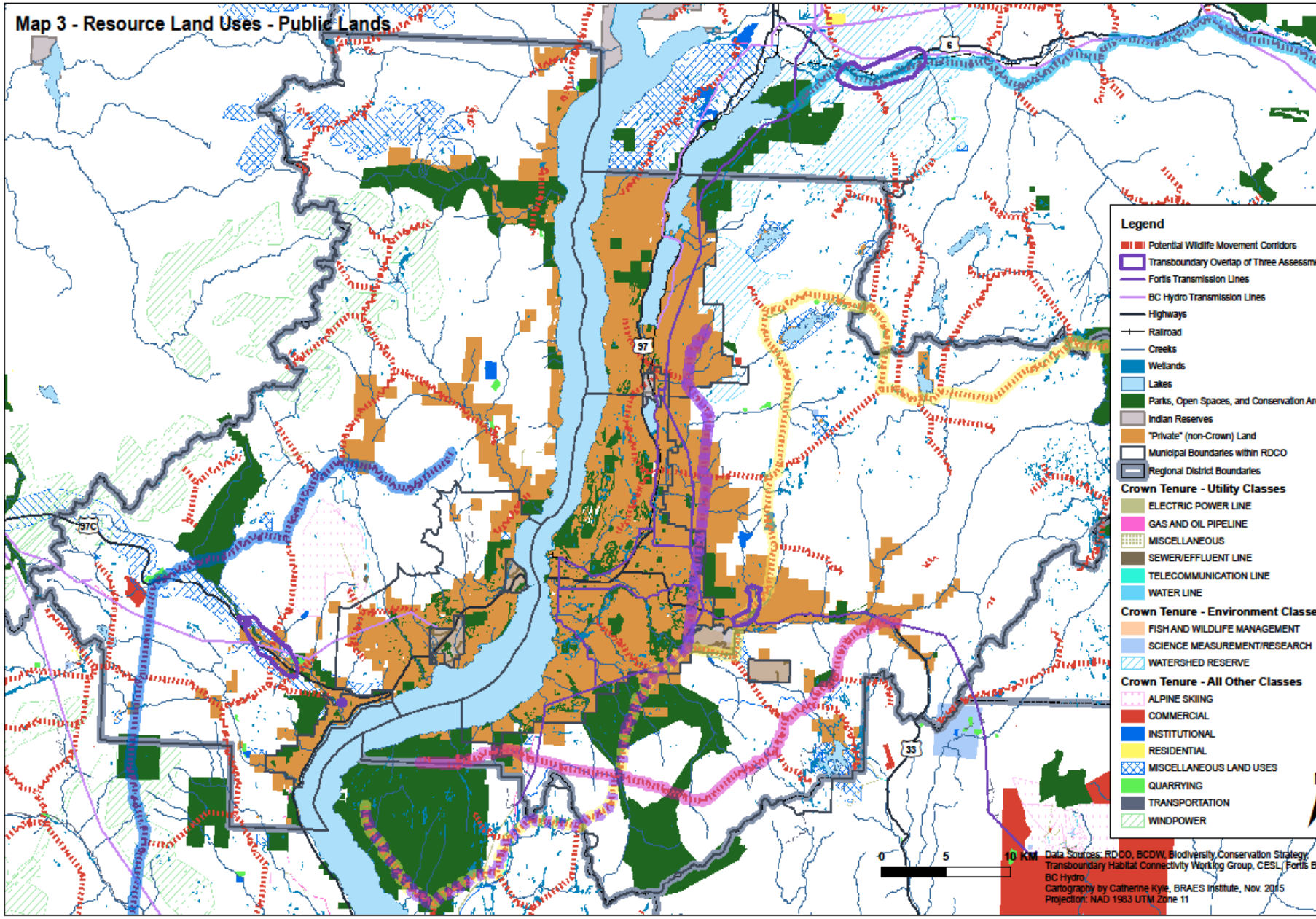
Appendix 3 Workshop resource maps and metadata

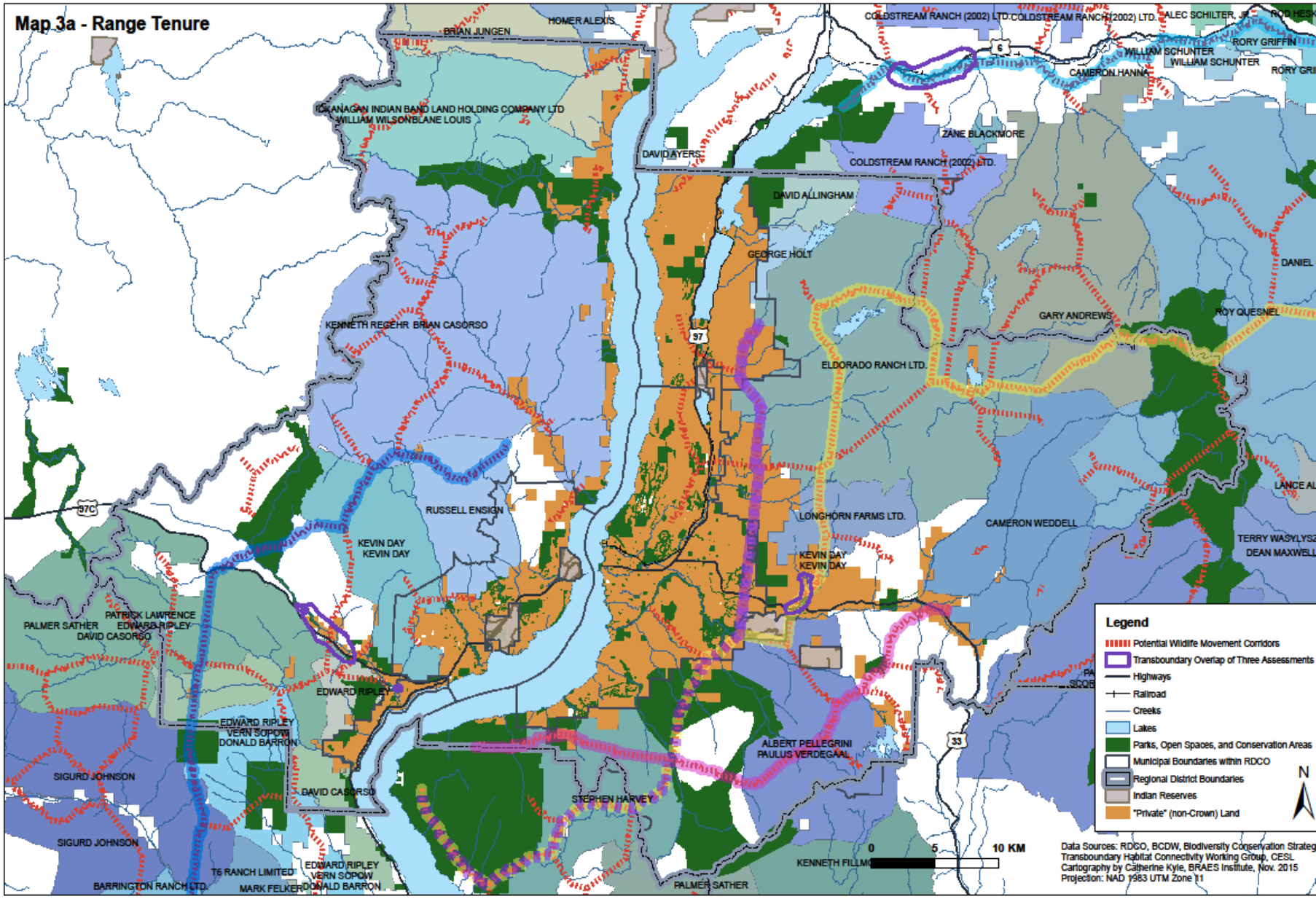


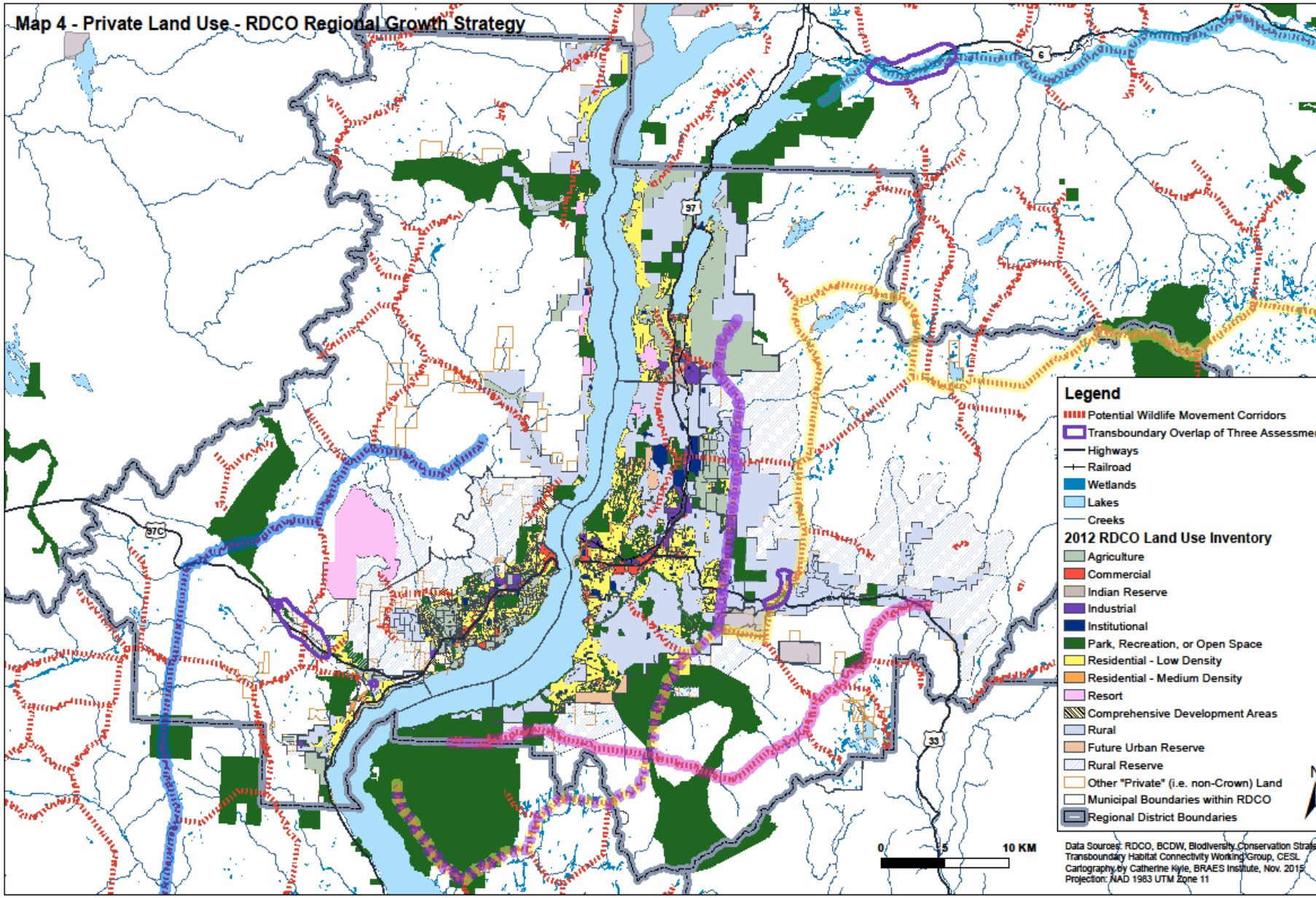

Map 1 - Circuitscape and Transboundary Assessment Results
Legend
Potential Wildlife Movement Corridors
Transboundary Assessment Results
Areas of Potential Focus
1
2
3
Overlap of Three Assessments
Regional District Boundaries
International Boundary
N
0
25
50 KM
Data Sources: RDCO, BCDW, Biodiversity Conservation Strategy, Transboundary Habitat Connectivity Working Group, CESL
Cartography by Catherine Kyle, BRAES Institute, Nov. 2015
Projection: NAD 1983 UTM Zone 11

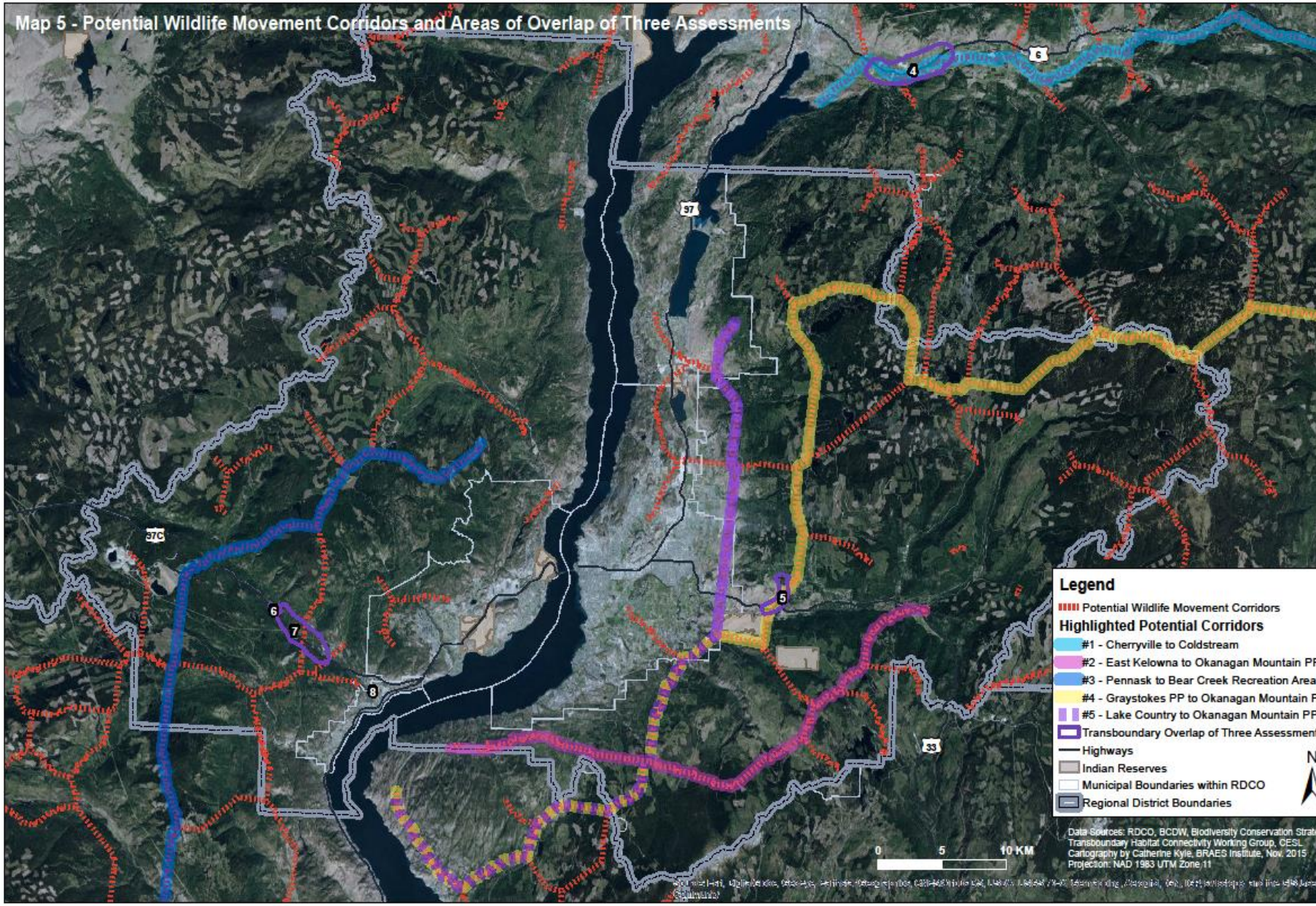

Map 2a - BCS Habitat Connectivity and Highlighted Wildlife Movement Corridors
6
97
97C
33
Legend
Highlighted Potential Corridors
#1 - Cherryville to Coldstream
#2 - East Kelowna to Okanagan Mountain P
#3 - Pennask to Bear Creek Recreation Are
#4 - Graystokes PP to Okanagan Mountain
#5 - Lake Country to Okanagan Mountain P
Potential Wildlife Movement Corridors
Transboundary Overlap of Three Assessme
Sensitive Ecosystems (SEI)
Habitat Connectivity
Connectivity Barrier
Low
Moderate
High
Indian Reserves
Parks, Open Spaces, Conservation Lands
Lakes
Wetlands
Creeks
Highways
Municipal Boundaries within RDCO
Regional District Boundaries
0
5
10 KM
Data Sources: RDCO, BCDW, Biodiversity Conservation Stra
Transboundary Habitat Connectivity Working Group, CESL
Cartography by Catherine Kyle, BRAES Institute, Nov. 2015
Projection: NAD 1983 UTM Zone 11

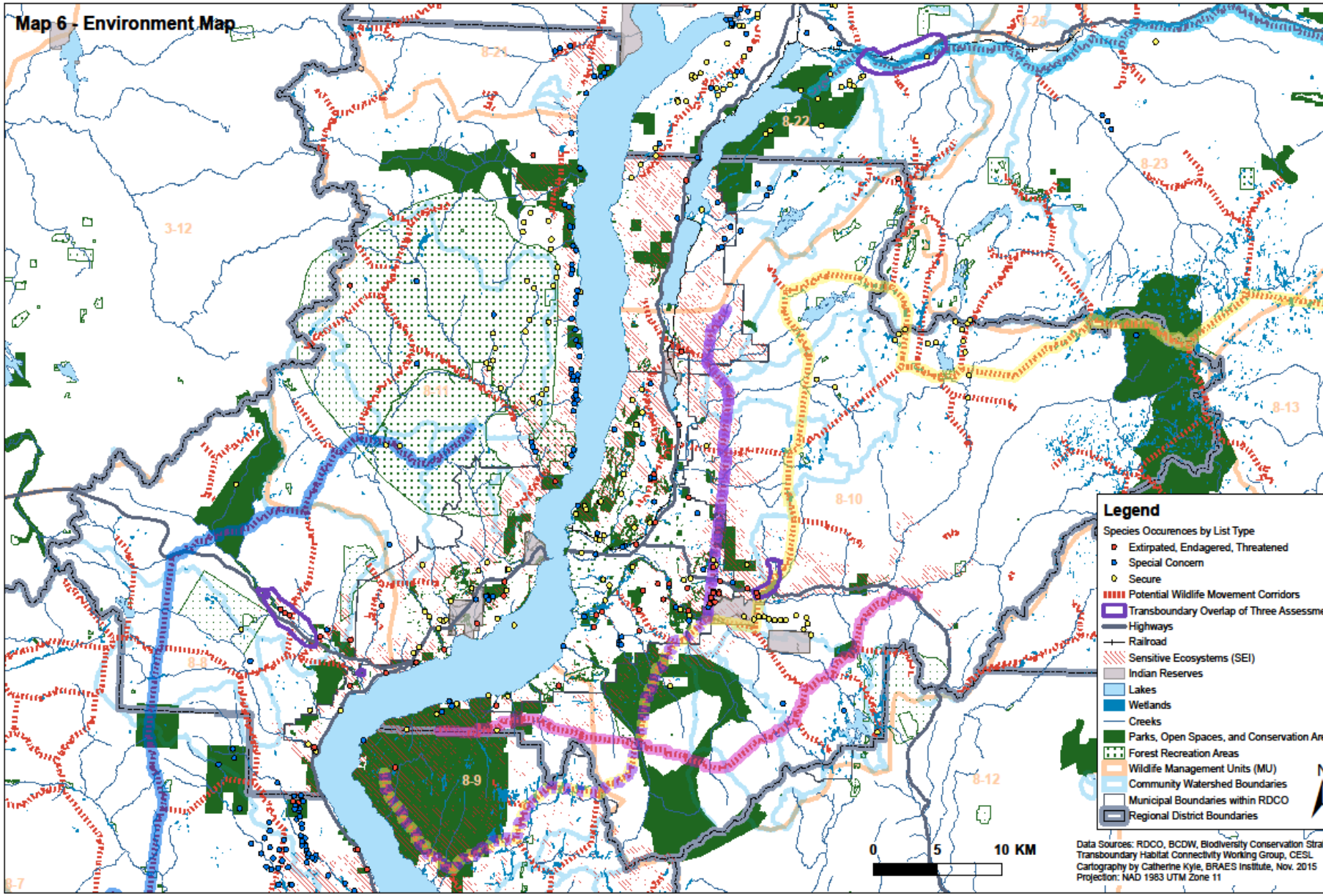

Map 2b - BCS Relative Biodiversity and Highlighted Wildlife Movement Corridors
6
97
97C
33
Legend
Highlighted Potential Corridors
Name
#1 - Cherryville to Coldstream
#2 - East Kelowna to Okanagan Mountain
#3 - Pennask to Bear Creek Recreation Are
#4 - Graystokes PP to Okanagan Mountain
#5 - Lake Country to Okanagan Mountain
Potential Wildlife Movement Corridors
Transboundary Overlap of Three Assessm
Sensitive Ecosystems (SEI)
Relative Biodiversity
Very high
High
Moderate
Low
Very low
Indian Reserves
Parks, Open Spaces, Conservation Lands
Lakes
Wetlands
Creeks
Highways
Municipal Boundaries within RDCO
Regional District Boundaries
0
5
10 KM
Data Sources: RDCO, BCDW, Biodiversity Conservation Str
Transboundary Habitat Connectivity Working Group, CESI
Cartography by Catherine Kyle, BRAES Institute, Nov. 2015
Projection: NAD 1983 UTM Zone 11


Map 3 - Resource Land Uses - Public Lands
Legend
Potential Wildlife Movement Corridors
Transboundary Overlap of Three Assessm
Fortis Transmission Lines
BC Hydro Transmission Lines
Highways
Railroad
Creeks
Wetlands
Lakes
Parks, Open Spaces, and Conservation Ar
Indian Reserves
"Private" (non-Crown) Land
Municipal Boundaries within RDCO
Regional District Boundaries
Crown Tenure - Utility Classes
ELECTRIC POWER LINE
GAS AND OIL PIPELINE
MISCELLANEOUS
SEWER/EFFLUENT LINE
TELECOMMUNICATION LINE
WATER LINE
Crown Tenure - Environment Classe
FISH AND WILDLIFE MANAGEMENT
SCIENCE MEASUREMENT/RESEARCH
WATERSHED RESERVE
Crown Tenure - All Other Classes
ALPINE SKIING
COMMERCIAL
INSTITUTIONAL
RESIDENTIAL
MISCELLANEOUS LAND USES
QUARRYING
TRANSPORTATION
WINDPOWER
97
97C
33
6
0
5
10 KM
Data Sources: RDCO, BCDW, Biodiversity Conservation Strategy,
Transboundary Habitat Connectivity Working Group, CESL, Fortis B
BC Hydro
Cartography by Catherine Kyle, BRAES Institute, Nov. 2015
Projection: NAD 1983 UTM Zone 11


Map 3a - Range Tenure
BRIAN JUNGEN
HOMER ALEXIS
COLDSTREAM RANCH (2002) LTD.
ALEC SCHILTER, JR.
RORY GRIFFIN
WILLIAM SCHUNTER
CAMERON HANNA
OKANAGAN INDIAN BAND LAND HOLDING COMPANY LTD
WILLIAM WILSONBLANE LOUIS
ZANE BLACKMORE
DAVID AYERS
COLDSTREAM RANCH (2002) LTD.
DAVID ALLINGHAM
GEORGE HOLT
DANIEL
ROY QUESNEL
GARY ANDREWS
KENNETH REGEHR
BRIAN CASORSO
97
ELDORADO RANCH LTD.
97C
RUSSELL ENSIGN
KEVIN DAY
KEVIN DAY
LONGHORN FARMS LTD.
CAMERON WEDDELL
TERRY WASYLYSZ
DEAN MAXWELL
PATRICK LAWRENCE
PALMER SATHER
EDWARD RIPLEY
DAVID CASORSO
EDWARD RIPLEY
EDWARD RIPLEY
VERN SOPOW
DONALD BARRON
ALBERT PELLEGRINI
PAULUS VERDEGAAL
33
SIGURD JOHNSON
DAVID CASORSO
STEPHEN HARVEY
SIGURD JOHNSON
T6 RANCH LIMITED
EDWARD RIPLEY
VERN SOPOW
DONALD BARRON
MARK FELKER
BARRINGTON RANCH LTD.
PALMER SATHER
KENNETH FILLM
0
5
10 KM
Legend
Potential Wildlife Movement Corridors
Transboundary Overlap of Three Assessments
Highways
Railroad
Creeks
Lakes
Parks, Open Spaces, and Conservation Areas
Municipal Boundaries within RDCO
Regional District Boundaries
Indian Reserves
"Private" (non-Crown) Land
N
Data Sources: RDCO, BCDW, Biodiversity Conservation Strateg
Transboundary Habitat Connectivity Working Group, CESL
Cartography by Catherine Kyle, BRAES Institute, Nov. 2015
Projection: NAD 1983 UTM Zone 11


Map 4 - Private Land Use - RDCO Regional Growth Strategy
Legend
Potential Wildlife Movement Corridors
Transboundary Overlap of Three Assessme
Highways
Railroad
Wetlands
Lakes
Creeks
2012 RDCO Land Use Inventory
Agriculture
Commercial
Indian Reserve
Industrial
Institutional
Park, Recreation, or Open Space
Residential - Low Density
Residential - Medium Density
Resort
Comprehensive Development Areas
Rural
Future Urban Reserve
Rural Reserve
Other "Private" (i.e. non-Crown) Land
Municipal Boundaries within RDCO
Regional District Boundaries
0
5
10 KM
Data Sources: RDCO, BCDW, Biodiversity Conservation Strat
Transboundary Habitat Connectivity Working Group, CESL
Cartography by Catherine Kyle, BRAES Institute, Nov. 2015
Projection: NAD 1983 UTM Zone 11
97
97C
33
6


Map 5 - Potential Wildlife Movement Corridors and Areas of Overlap of Three Assessments
4
6
97
97C
6
7
8
5
33
Legend
Potential Wildlife Movement Corridors
Highlighted Potential Corridors
#1 - Cherryville to Coldstream
#2 - East Kelowna to Okanagan Mountain PP
#3 - Pennask to Bear Creek Recreation Area
#4 - Graystokes PP to Okanagan Mountain P
#5 - Lake Country to Okanagan Mountain PP
Transboundary Overlap of Three Assessment
Highways
Indian Reserves
Municipal Boundaries within RDCO
Regional District Boundaries
0 5 10 KM
Data Sources: RDCO, BCDW, Biodiversity Conservation Strat
Transboundary Habitat Connectivity Working Group, CESL
Cartography by Catherine Kyle, BRAES Institute, Nov. 2015
Projection: NAD 1983 UTM Zone 11


Map 6 - Environment Map
8-7
8-22
8-23
3-12
8-11
8-13
8-10
8-9
8-12
Legend
Species Occurences by List Type
Extirpated, Endagered, Threatened
Special Concern
Secure
Potential Wildlife Movement Corridors
Transboundary Overlap of Three Assessme
Highways
Railroad
Sensitive Ecosystems (SEI)
Indian Reserves
Lakes
Wetlands
Creeks
Parks, Open Spaces, and Conservation Ar
Forest Recreation Areas
Wildlife Management Units (MU)
Community Watershed Boundaries
Municipal Boundaries within RDCO
Regional District Boundaries
0
5
10 KM
Data Sources: RDCO, BCDW, Biodiversity Conservation Stra
Transboundary Habitat Connectivity Working Group, CESL
Cartography by Catherine Kyle, BRAES Institute, Nov. 2015
Projection: NAD 1983 UTM Zone 11

Map 1 – Regional Perspective

This map (Figure 2) provides general landscape context for the study area. It shows the boundaries of the regional districts of North (RDNO), Central (RDCO) and South Okanagan-Similkameen (RDOS). Potential wildlife movement corridors through the Okanagan are shown in red. These regional corridors were established through modeling carried out by the Complex Environmental Systems Lab at UBC Okanagan, and the Cardille Lab at McGill University. These regional analyses are based on the habitat connectivity analysis produced as part of the Biodiversity Conservation Strategy for the Okanagan. Results of connectivity analyses carried out by the TCWG are shown in purple (Figure 2). From the map, we see considerable overlap in major movement corridors identified by the Regional and Transboundary analyses.

Explanation of regional connectivity analysis (red dashed lines)

The corridors shown in red are the output of a modelling exercise that built on the data from the Biodiversity Conservation Strategy (BCS) Habitat Connectivity maps created for the North, Central and South Okanagan[1]. In these Habitat Connectivity maps, a "connectivity" value is assigned to each parcel of land in the entire study area (RDOS, RDCO, RDNO) based on a number of assumptions regarding the ability of a generic species to traverse it (for example, low elevation areas and areas with proximity to water are assumed to have high connectivity; high elevation, rugged, steep slopes may have lower connectivity; high quality patches of natural vegetation contribute to connectivity and urban areas are connectivity barriers). Parcels are then classified into the categories: barrier, low, moderate or high connectivity depending on their connectivity value. The BCS Habitat Connectivity maps thus depict the relative ease with which species can move through different parts of the landscape, without identifying habitat corridors per se. These maps were built based on extensive expert consultation and all available provincial and regional environmental datasets (e.g., Sensitive Ecosystems Inventory (SEI), Terrestrial Ecosystem Modelling (TEM), Vegetation Resource Inventory (VRI), Agricultural Land use inventory (ALUI), resource roads, topography, rivers and streams, etc.). A detailed description of the methods used to construct the BCS Habitat Connectivity map is available in the BCS analysis reports[3,4]. The BCS Habitat Connectivity layer is shown in shades of green on Map 2a.

To establish the corridors shown on Map 1, the unclassified values on the BCS Habitat Connectivity map were used to establish resistances to wildlife movement on the landscape. The Circuitscape program[1] was then applied to the resistances to identify how wildlife might "flow" through the landscape, using the analogy of electricity seeking to find a path of least resistance through a medium. In this kind of modelling, animals can move anywhere on the landscape, following routes of least resistance to

[1] http://www.circuitscape.org

traverse the landscape. They are not restricted to finding routes from pre-defined origins and destinations. The output of Circuitscape was then analyzed to identify the most commonly used routes that the program found through the study area, shown as a network of corridors on Map 1. These corridors represent the most likely routes for species movement, based on the topography and land cover in the Okanagan and on the assumptions about wildlife movement made in the BCS.

Explanation of transboundary connectivity analysis (purple areas)

The transboundary analyses involved 3 different assessments, referred to here as: montane, shrub-steppe and landscape integrity. The montane and shrub steppe assessments were produced using American land cover datasets, as part of a statewide analysis for Washington that included parts of southern British Columbia. The Landscape Integrity assessment updated the statewide land cover layer with data from the BC Agricultural Land Use inventory (ALUI) and recent satellite imagery. For each assessment, habitat concentration areas (HCA) were identified in the valley bottoms. HCA are large natural habitat areas suitable for montane or shrub steppe species, or relatively intact natural areas in the case of the landscape integrity assessment. Resistance layers were then created for each of the three assessments, based on land cover data, topography, roads etc., and assumptions about animal movement through the landscape. Next, cost weighted distances between HCAs on the landscape were calculated for each of the three assessments to identify the most likely movement corridors between HCAs. Detailed information and data layers for the Washington statewide analyses (montane and shrub-steppe models) are available from http://www.waconnected.org

The purple areas on Map 1 show regions identified by one, two or all three of the transboundary assessments as being key corridors between HCA. The TCWG has labeled places where the three assessments overlap as being areas of potential focus. These are indicated with numbers on Map 1, and are shown on all subsequent maps in purple outlines.

Data sources (Map 1): Regional district boundaries were obtained from the BC Geographic Warehouse (BCGW), the international boundary (2011) was obtained from Statistics Canada, the world imagery basemap (2015) was obtained from ESRI Digital Globe / Map Service, and the potential wildlife movement corridors (2014) were obtained from analyses conducted by the Complex Environmental Systems Lab at UBCO and the Cardille Lab at McGill University. Transboundary Assessment Results were obtained from the TCWG.

Map 2a – BCS Habitat Connectivity and Highlighted Wildlife Movement Corridors

This map shows potential wildlife movement corridors for the RDCO and immediately adjacent areas within the RDNO and RDOS. Five focal corridors have been highlighted as potential candidates for on-the-ground case studies: (1) Cherryville to Coldstream; (2) East Kelowna to Okanagan Mountain Provincial Park (PP); (3) Pennask to Bear Creek Recreation Area; (4) Graystokes PP to Okanagan Mountain PP; (5) Lake Country to Okanagan Mountain PP. These candidates have been selected based on the weighted results of regional analysis (see Map 1 description for details) tracing likely paths from 1 with the purpose of providing a starting point for workshop discussion on potential corridor locations for case study. Corridors are overlaid on BCS habitat connectivity mapping results (i.e., low, moderate, and high connectivity; connectivity barrier). Other land use, sensitive ecosystems inventory (SEI), and aquatic features relevant to landscape connectivity are also identified. Sensitive ecosystems are those that are rare and fragile, and may include (but are not limited to): older forests, woodlands, coastal bluffs, herbaceous and sparsely vegetated ecosystems, grasslands, riparian ecosystems, and wetlands.

Data sources: The Transboundary Overlap of Three Assessments (2015) was obtained from the BC-WA TCG. The potential wildlife movement corridors (2014) were obtained from analyses conducted by the Complex Environmental Systems Lab at UBC and the Cardille Lab at McGill University; and the highlighted corridors (2015) were obtained from Complex Environmental Systems Lab at UBC. Habitat connectivity data was obtained from the BCS. Indian reserves, lakes, (named) creeks, sensitive ecosystems outside the RDCO (2011-14), highways, regional district boundaries, conservation lands, and provincial parks were obtained from BCGW. Sensitive ecosystem data within the RDCO (December 2012), municipal boundaries within the RDCO, and all park areas in the RDCO were obtained from the RDCO.

Wetlands (2014) were obtained from the RDCO and Ecoscape Environmental Consultants Ltd. Further details on wetlands mapping data are outlined in the Okanagan Wetlands Strategy[2] report, and it was based on: "[compiling and refining] existing Okanagan wetland mapping, inventory, classification, and other information into a single GIS database. The GIS data sources used are summarized below:

- City of Kelowna Wetlands Inventory Mapping (WIM; 2009);
- BC Freshwater Atlas (2014);
- Ministry of Environment Wetland Inventory Project (2009);
- Alkali-Saltgrass Herbaceous Vegetation Community Assessment (2011);

[2] Ecoscape Environmental Consultants Ltd. 2014. Okanagan Wetlands Strategy: Phase 1 – Outreach, Data Collection, Prioritization, and Mapping. Okanagan Basin Water Board Report, 43 pp. http://www.obwb.ca/newsite/wp-content/uploads/13-1159-Wetlands-Strategy-Report-FINAL-MAY-2014.pdf

- SEI/TEM for the study area;
- Sensitive Habitat Inventory and Mapping (SHIM; BX Creek, NORD, Vaseux Creek and Oliver, Prairie Creek, Winfield Creek, various dates);
- Foreshore Inventory Mapping (FIM; Kalamalka, Wood, Mabel, Mara, Okanagan, Osoyoos, various dates);
- Lower Shuswap River Inventory and Mapping (2010);
- Ducks Unlimited (DU) data (various sources).

Other, non-mapping or GIS sources of data that were integrated into the database by adding columns or data fields include:

- Wetlands of concern identified by members of the public or other stakeholders.

Map 2b - BCS Relative Biodiversity and Highlighted Wildlife Movement Corridors

This map is identical to Map 2a, except that potential wildlife movement corridors are overlaid on BCS relative biodiversity (i.e., very high, high, moderate, low, very low) mapping results (rather than BCS habitat connectivity).

The BCS relative biodiversity map is based on a model designed to identify the areas of greatest ecological and biodiversity significance. The result is a decision support tool that identifies biodiversity 'hotspots' at a regional scale in the study area. The relative biodiversity model considers the following parameters:

- Conservation ranking – Polygons with higher conservation rankings receive higher scores. The majority of the score came from the conservation ranking.
- Wetlands – Due to the importance of wetland habitats in this region, wetlands receive a higher score.
- Antelope brush – antelope brush habitat receives a higher score
- Potential riparian habitat – Potential riparian habitat areas receive a higher score
- Habitat patch size (i.e., whether the area falls within a habitat reservoir or refuge) – Larger habitat patches receive higher scores.
- Distance to roads – Habitat areas in close proximity to roads receive slightly lower scores.

The specific scores assigned to each of the parameters and their associated classes are documented in Table 9 [of the BCS]. The total score for each cell was summed and the assigned numeric values indicate relative biodiversity values – the higher the numeric value the higher the relative biodiversity."[3]

[3] Okanagan Collaborative Conservation Program (OCCP) and South Okanagan Similkameen Conservation Program (SOSCP). 2014. Keeping Nature in Our Future: A Biodiversity Conservation Strategy for the Okanagan Region. OCCP Report, 95pp.

Data sources: Relative biodiversity data was obtained from the BCS. All other data sources are outlined under the Map 2a summary above.

Map 3 – Resource Land Uses – Public Lands

This map outlines potential wildlife movement corridors along with utility, environment and other resource land uses (with visible coverage) in the RDCO and immediately adjacent areas within the RDNO and RDOS. Other land use and aquatic features relevant to landscape connectivity are also identified.

Data sources: Wetlands (2014) were obtained from the RDCO and Ecoscape Environmental Consultants Ltd. Private (non-Crown) lands (2013), municipal boundaries within the RDCO, and all park areas in the RDCO were obtained from the RDCO. BC Hydro transmission lines (2011) were obtained from BC Hydro. Fortis transmission lines were obtained from Fortis. All other data sources are outlined under the Map 2a summary above.

Map 3a - Range Tenure

This map displays range tenures (i.e., grazing and hay cutting licences and permits) administered by the BC Ministry of Forests and Range in the RDCO and immediately adjacent areas within the RDNO and RDOS. It also outlines potential wildlife movement corridors and other land use and aquatic features relevant to landscape connectivity.

A range tenure is an area of Crown rangeland where a *Range Act* tenure applies. Tenure holders access a defined amount of forage through grazing (measured in Animal Unit Months) or hay (tonnage). Range tenures apply only to Crown Land. In some cases, digital boundaries may overlap private land but these lands are not part of the grazing area (per the legal description); however, grazing may overlap waterbodies during drawdown (also described legally in the tenure documents and where applicable, the Range Use Plan). Livestock may graze islands and large bodies of water may act as Natural Range Barriers.

Data sources: All data sources are outlined under the Map 2a summary above.

Map 4 - Private Land Use - RDCO Regional Growth Strategy

This map shows all current and future land uses within the RDCO. It also outlines potential wildlife movement corridors and other land use and aquatic features relevant to landscape connectivity within the RDCO and immediately adjacent areas within the RDNO and RDOS.

Data sources: All data sources are outlined under the Map 2a summary above.

Map 5 - Potential Wildlife Movement Corridors and Areas of Overlap of Three Assessments

This map shows potential wildlife movement corridors for the RDCO and immediately adjacent areas within the RDNO and RDOS, based on regional modelling results (see Map 1 description for details). It also shows the overlap of three assessment areas identified by the Transboundary analyses. For reference and relevance to connectivity, highways, RDCO municipalities, and Indian reserves are also shown.

Data sources: The world imagery basemap (2015) was obtained from ESRI Digital Globe / Map Service. All other data sources are outlined under the Map 2a summary above.

Map 6 - Environment Map

This map identifies species occurrences (surveys and incidental) by COSEWIC status (i.e., extirpated, endangered, threatened, special concern, secure) within the RDCO and immediately adjacent areas within the RDNO and RDOS. It also outlines potential wildlife movement corridors and other land use, sensitive ecosystems (SEI), and aquatic features relevant to landscape connectivity. Note that Forest Recreation Areas are separated from parks as their coverage, use and management may differ.

Data sources: Species occurrence data (since 2000) were obtained from the BCGW (incidental) and the BC Wildlife Species Inventory (surveys and incidental). Note that the main data source for this includes incidental observations extending back to the 1800's; however, observations prior to 2000 were not included on this map. All other data sources are outlined under the Map 2a summary above.

Appendix 4 Workshop participant motivation for protecting ecosystem connectivity

Group tallies of reported motivations for protecting ecosystem connectivity from workshop participants. Note that some groups checked responses only once, while other groups reported multiple checks per response type.

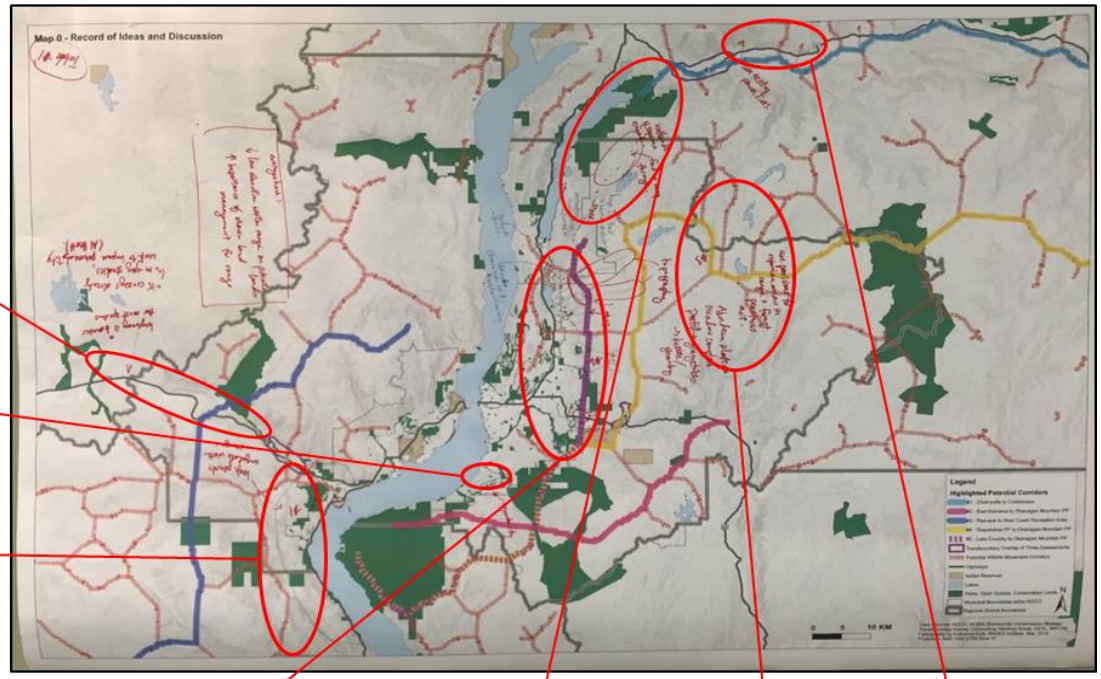
Why is protecting ecosystem connectivity important to you?

Motivation	Grp. 1	Grp. 2	Grp. 3	Grp. 4	Grp. 5	Totals
Resilience, capacity	1	3		2		6
Inform planning decisions	1		2	1	1	5
Biodiversity, conservation		1	1	2		4
Protection of species at risk			1	1	1	3
Future generations			2		1	3
Climate change				2		2
Provision of ecosystem services		1				1
Recreation, human enjoyment					1	1
Wildlife passage within region	1					1
Connectivity from the U.S. and up to the Okanagan and beyond	1					1
Other: highways, improving connectivity across highways; issues about the connector	1					1

Appendix 5 Corridor input from workshop breakout groups

Group 1

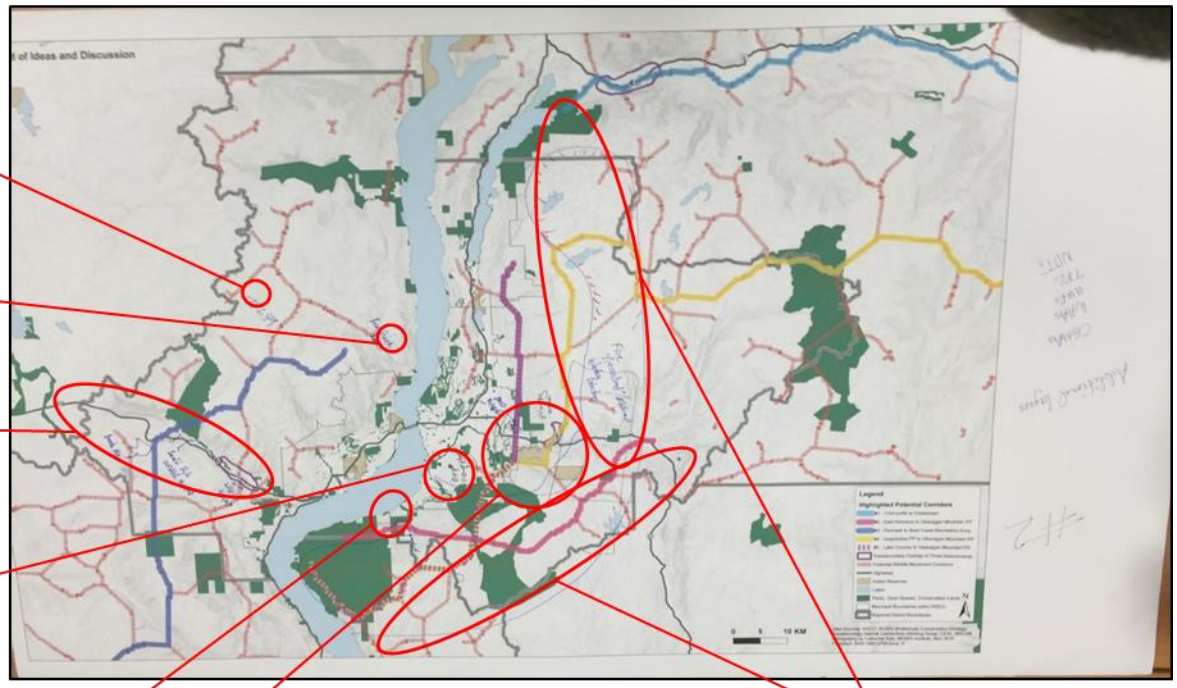
- Highway is a barrier for most species
  - Al Peatt: North – South crossing already; ongoing studies; work to improve permeability
- Opportunity
- High priority ungulate winter range
  - Agricultural Land Reserve (ALR)



- Use existing powerlines
- Hwy 33 crossing
- Stepping stones (@ parks)
- Steep; topography (suggested alt. route)
  - Eldorado Ranch – Beaver Lake Rd (up) maintain ranching
- Orchards and fences
- Wetlands; N. Oyama Creek
- Find a way through; creek
- High Rim Trail; human disturbance
- Recreation incompatible with wildlife
- Use provisions for riparian areas in Range and Forest Practices Act
- Aberdeen Plateau meadow complex; Postill (to) Greystokes (to) Kettle/Granby

Group 2

- Tree Farm Licence (TFL) 49



- Bear Creek RM2 (Recreation Management Area?)

- Brenda Mine
- Banff style wildlife overpass
- Wildlife overpass (2nd location)

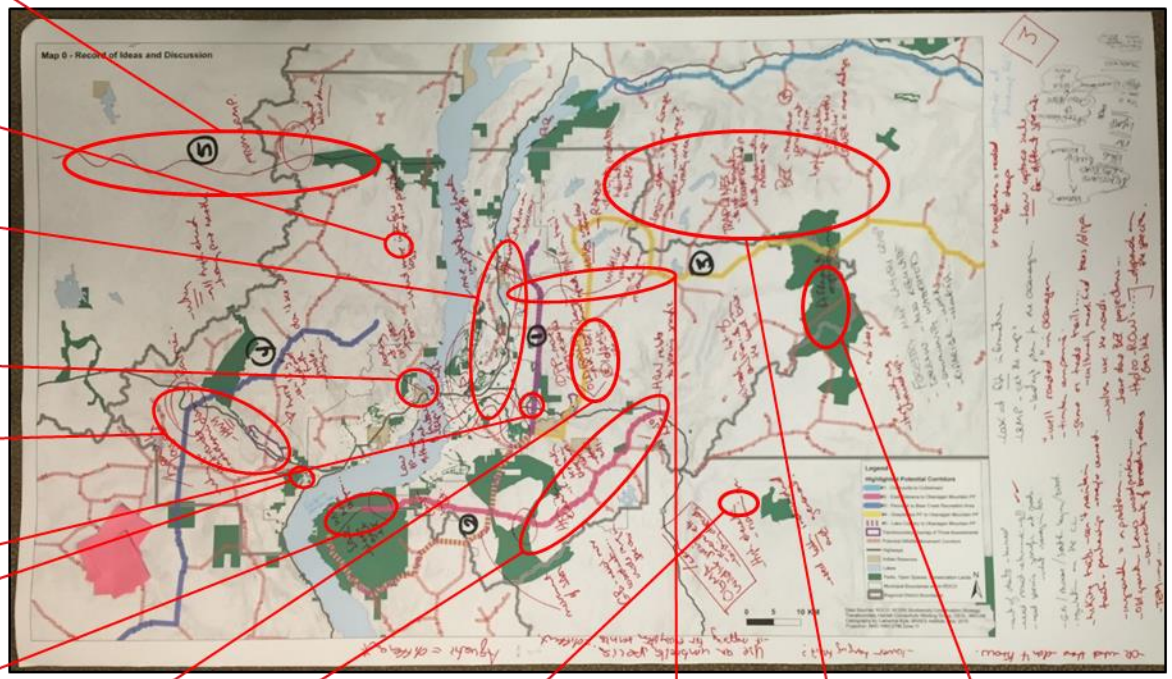
- Suggested Environmental Farm Plan (EFP) - group plan

- Fire prescribed/natural
- Interface protection

- Gravel pit (suggested alternate route)

- Priority area
- Black Mountain Irrigation District (BMID) reservoirs

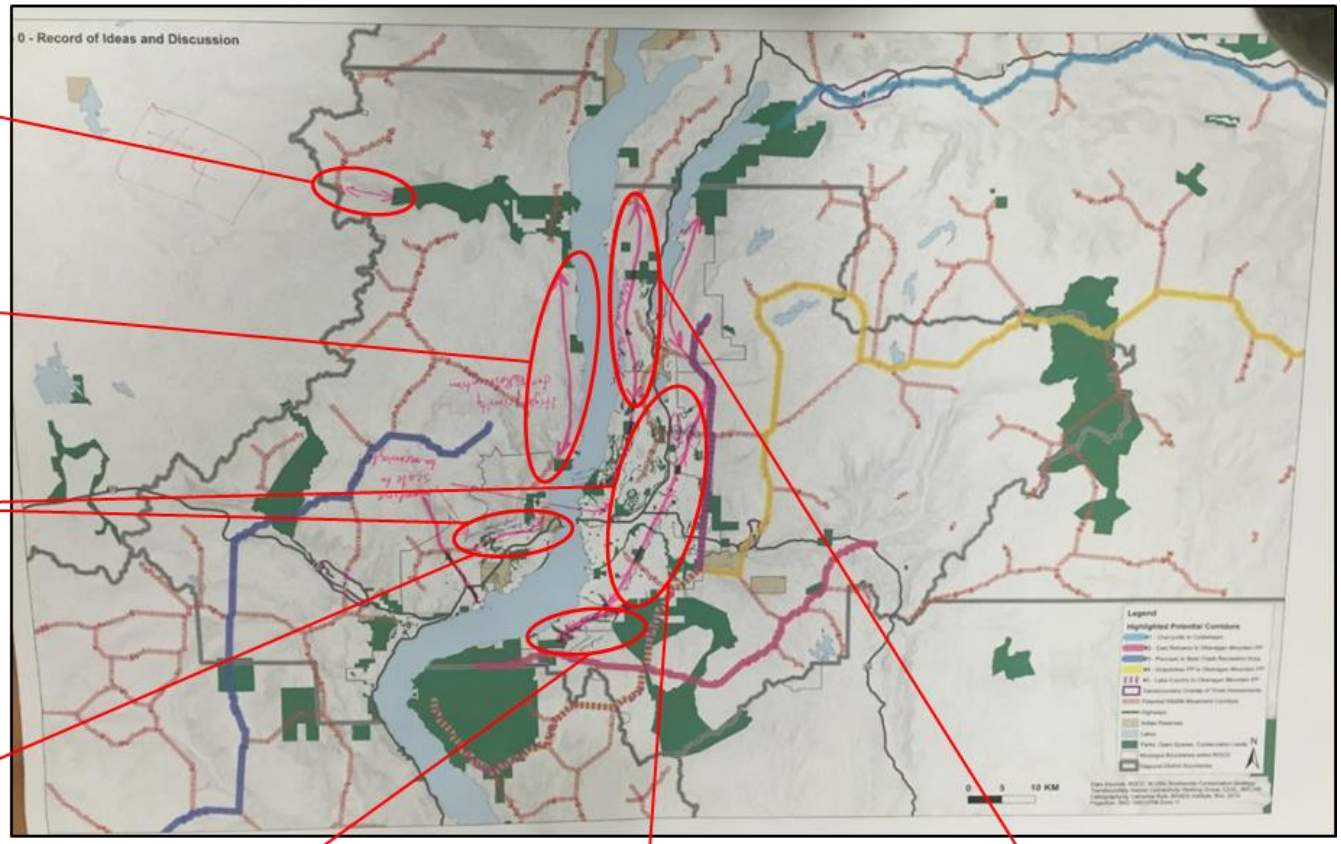
Group 3



- From Land and Resource Management Plan (LRMP) (suggested corridor) - wind blow down
- Want more interface logging for fire protection
- Gaps; Low Ponderosa Pine (PP) – (refine)? different set of factors would rank high; more important lower elevation; Species At Risk increase; beavers…
- Looking at corridors; trail
- Heavily Logged
- Barrier; highway
- Herd – can't go back and forth; mule deer don't see it – walking on
- Highway crossing
- Fish barrier; abandoned dam
- Wild Horse Canyon; Species at Risk (SAR) sheep, goat, elk, cougar, bobcat
- High Rim Trail
- Wildlife corridor – can do more research
- Different management regime – no steep
- movement of SAR
  - High elevation – if no rocky terrain the sheep won't use, deer will
  - Grizzly bears (GB) need more (coordination)?, wide range in species
  - Not so here - how relate to species specific
- High elevation riparian
- Already lots of constraints on the land base
- Start with ones chewed up
- Old Growth Management Area (OGMA) – wildlife species – removed etc. – existing…
- Traplines – to get information BC Wildlife Federation can help; observations; moose ap

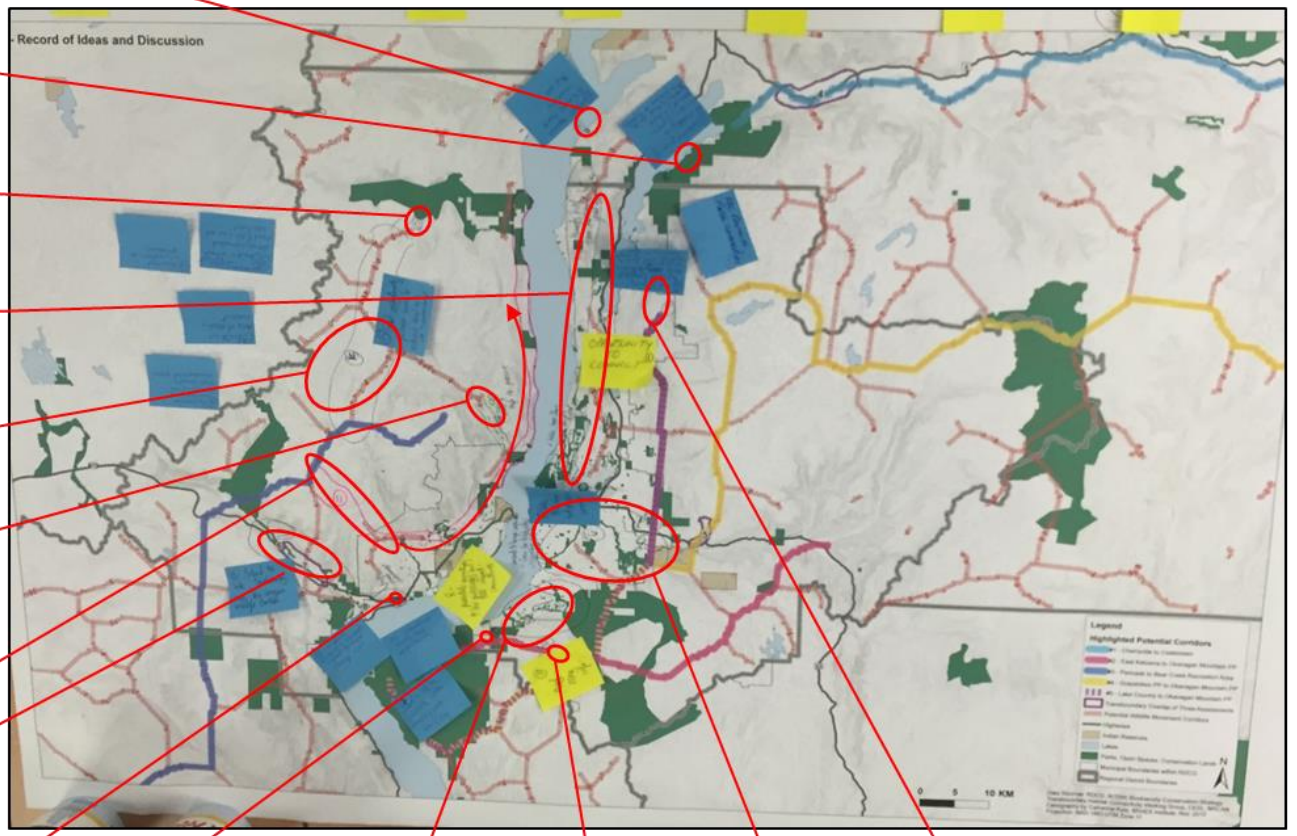
Group 4

- Connect East - West corridor
- High priority for Ecological Restoration
- More fine scale to be meaningful
- Low elevation undeveloped rural



- Defacto existing corridor; Natural corridor
- Natural corridor
- Low elevation route
- Airport (suggested alternate route)

Group 5



- RDNO acquired 2.3 acres here recently ($2.3 M)
- Lakeshore priority for including in corridor (people pressure) and have opportunity here to go from lakeshore to high elevation
- Potential connection to parkland
- Opportunity to connect; High threats level from development, but great opportunity; lakes, topo flow, ponds, birds
- Good opportunity, perhaps easier to achieve based on use and ownership
- High use road and high recreation pressure
- Foreshore corridor = important in areas with less density development pressure
- Extend to lake; Transboundary area; key canyon, wildlife corridor
- Wildlife culverts with inadequate fencing; tricky road crossings
- Wildlife preserve and recreation = great possible linkage area
- Possible opportunity; Increased dev. Pressures but still important connectivity
- Potential Fortis line opportunity
- Need more info
- Why this area is not modelled as a corridor?
  - Connects to larger corridors
  - Low to high elev.
  - Riparian corridor
- Kalamalka Provincial Park connection

Participant feedback about core and critical habitat

- Wildlife access to water is very important.
  - Desire to capture lakeshore protection, as well as the corridors identified (Pennask to Bear Creek).
- Low elevation particularly important in addition to the high elevation routes
  - Modified by fire.
  - Low elevation/Ponderosa pine has more unique species.
- High priority to protect and support trails between large parks.
- Wildlife passage:
  - Large ungulates, movement between winter and summer ranges; herd management; ruggedness is needed for sheep
  - Grizzly (getting them back and allowing them to travel through the region)
  - Old growth for Lewis' Woodpecker; connecting of breeding areas
- Use an umbrella species, if mapping for ecosystem services is difficult.

Participant feedback about opportunities and mechanisms for protection

- Use existing network of parks, recreational trails, utility right of ways, managed lands like riparian and old growth management areas.
  - Piggy back on riparian protection; inoperable areas on lakeshore.
  - Use provisions for riparian areas in the Forest Practices Act (currently in progress) to protect small streams through riparian buffers; this could be used for creating connectivity through the forest management lands, community watersheds, stock fish
  - Could use the closed Forest Service Roads; wolves use these roads.
  - Corridor where are unconstructed road Right Of Way (ROW).
  - Hydro ROW's, gas lines. Use depends on the species.
  - Build on existing investments: Kettle Valley Railway, High Rim Trail.
  - Mission Creek, connect to the yellow corridor.
  - May be that connectivity is driven by recreation and pressure from people for trails. See options to link with biodiversity/ conservation.
  - Trade trails, culturally modified trees/digs, traditional use of land.
  - Vernon to Kelowna: deactivated railroad line, multi-use corridors.
- If we focus on informing planning, we can get everything else (recreation, human enjoyment, and the protection of species at risk).
  - Development pressure is intensifying, need to plan ahead.
  - Bylaws for widening riparian protection, % of developments to greenspace and native plantings
- Protection of species at risk - we have this as an umbrella; we have unique location in Canada; high priority/responsibility. This links strongly biodiversity to other motivations listed.

- Where are there parcels of land for sale?
- Forest fire interface zones are becoming a hot topic, and these could double as corridors around residential areas.
- Rangeland managers see cattle grazing as a way to provide fuel management in the forest understory, so cows + corridors + interface zones makes a nice land management combination.
    - FLNRO Deputy Minister could create policies to keep ranching on land. This would protect livelihoods and is a land use more compatible with connectivity than other forms of development.
    - Increased importance of crown land management for range.
- Many golf courses are on ALR land; the Ministry of Agriculture could require that connectivity be required through golf courses.
- Draft group Environmental Farm Plan for an area rather than individual farms each doing their own.
- Overlay all land use values, create an opportunities map.

Participant feedback about challenges

- Long term focus; wants this to last over time; let land and process give you the framework; make the choices with view to resilience.
    - Hiking trails - can't maintain trails.
    - Management a huge difficulty.
- There is a critical need to deal with the economics of land values since many land uses on private property that are compatible with corridors (e.g., some forms of agriculture, ranching, woodlots), but are faced with great economic incentives to sell the land for development.
    - Ranching and some forms of agriculture can be compatible with wildlife movement. Stop the conversion of ranching land to wineries.
    - Wolves and deer, range disrupts the predator habitat buffet.
- Is there a cost to industries by making a corridor mandatory?
    - Incentives taxation policy
- Low elevation is more of a challenge to protect, mostly private land.
- High elevation areas already have a lot of constraints on the land base
    - Heavy pine beetle.
- Climate change impacts on connectivity and species range shifts.
- Noise and light pollution considerations.
- Logging, deer have more forage, cougars have a wide range? Rocky crests.
- 500 - 200 m width cannot happen on Crown Land, regulations?
- Lake Country to Okanagan Mountain Provincial Park has the most pressure.

Participant feedback about gaps

- Why; all high elevation; Montane-spruce not rare.

    - Old growth, risk climate change, fire…regrowth.
- Interested in much finer scale detail.
    - Utility corridors etc. that as a default would not be built upon.
    - More local-scale area by mid-Vernon creek to Kelowna.
- What is the goal: focal species, most pressure, ecosystem services, low-hanging fruit?
- West side, concern about the loss of previously existing connections down to the lake (e.g., around Peachland; good quality winter ungulate range that has been developed) and connections across the Okanagan connector for ungulates. Urgent to restore some of these connections.
    - Decreased low elevation winter range on private lands.
    - Pennask to Bear Creek Restoration Area; connect gap to Bear Creek.
    - 1960's land inventory (Peachland – 1a rank).
- Need to separate out by biogeoclimatic zones (BEC): montane/high elevation %, IDF %, PP% (where people live). Immediate crisis in each zone? Priority primarily based on areas that are the most messed up.
- Different corridors may need to be addressed for different priorities.
    - i.e., species specific, aquatic ecosystem is different.
- Need east-west corridors in addition to north-south corridors
    - Fintry to Douglas Lake not identified
- Need to share information, especially to policy makers regarding especially private land to build on policies already in place.
- Are modelled corridors actually serving their purpose? Should we focus on action instead of research?

Participant feedback about arriers

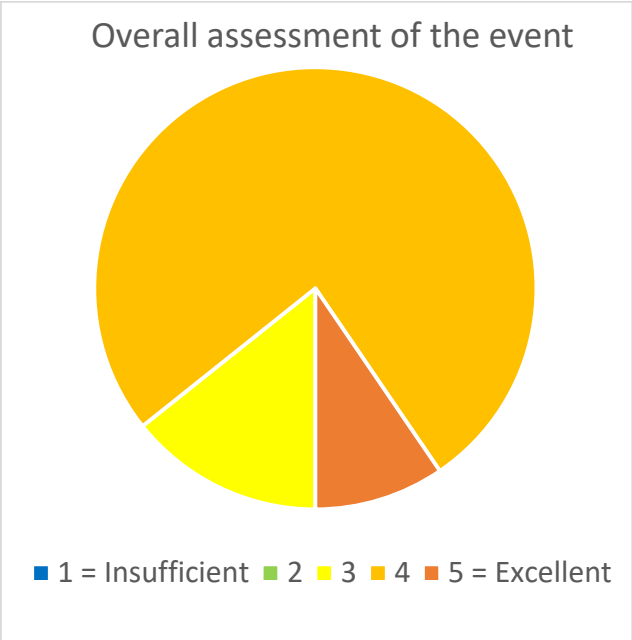
- Highway crossings (routes 97, 33, and 6) need enhancement of permeability.
    - We are "well roaded" in the Okanagan
    - Need species specific management at roads - what do we manage for? Grizzly bear/moose/Species At Risk/birds…
- Utility right of ways can also be barriers.
- Private land ownership, docks, steep terrain, off-road use of focus areas.
- Fencing of orchards, wineries: unfenced corridors could be left between blocks; need agricultural incentives to do this.
    - Plant hedgerows of native shrubs around orchards as alternative browse and physical barrier.
- See edge between development and forest.

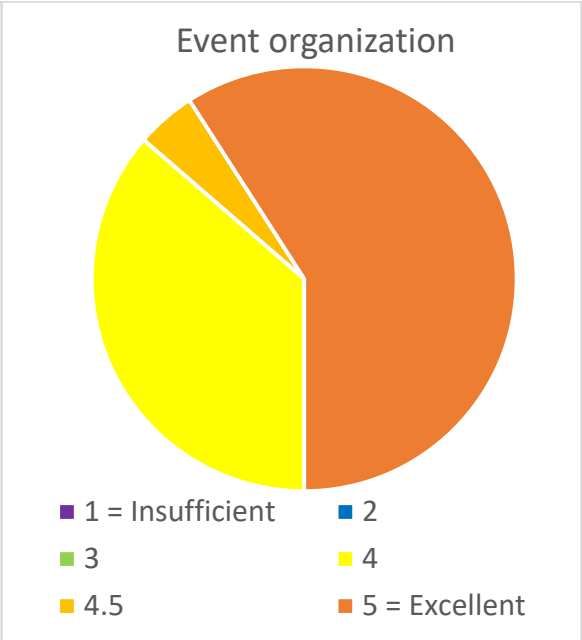
Participant feedback about additional data to incorporate

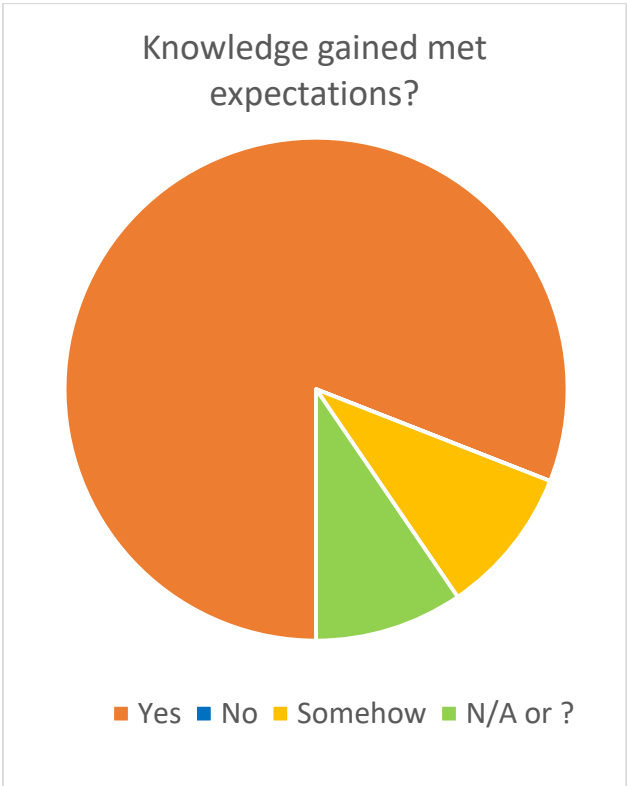
- Old Growth Management Areas (OMGAs)
- Ungulate Winter Ranges (UWRs)

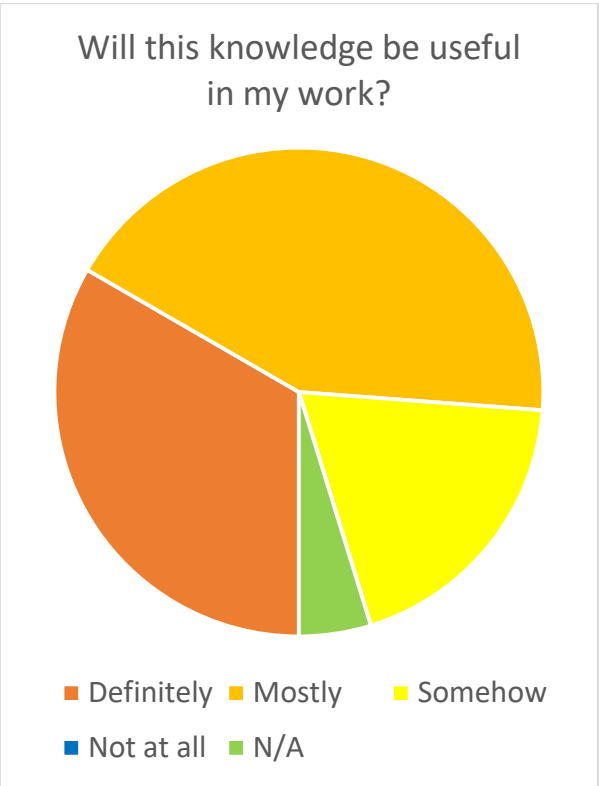
- Tree Farm Licences (TFLs)
- Wildlife Habitat Areas (WHAs)
- Natural Disturbance Types (NDTs).
- Forestry map layers for Land and Resource Management Plan (LRMP).
- Roads database, closed Forest Service Roads.
- Look at fish information: i.e., Foreshore Inventory Mapping (FIM), Sensitive Habitat Inventory and Mapping (SHIM).
- Conservation Data Centre mapped occurrences of rare species.
- Biogeoclimatic zones, climate projections, areas of high cumulative effects.
- Grasslands Conservation Council mapping, community watersheds, utility corridors, MOTI unconstructed rights-of-way.

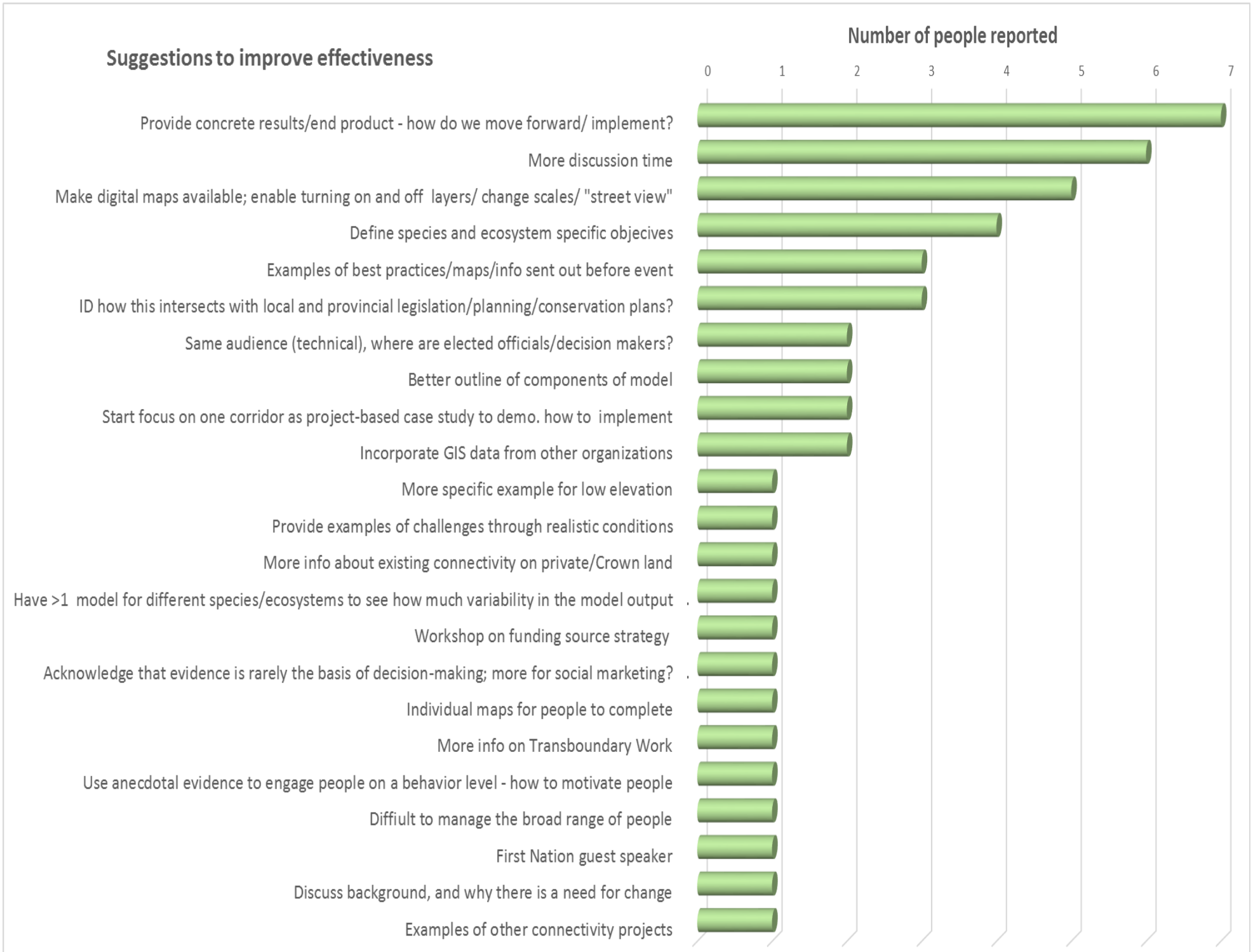
Appendix 6 Final workshop assessment data










Suggestions to improve effectiveness
Number of people reported
0
1
2
3
4
5
6
7
Provide concrete results/end product - how do we move forward/ implement?
More discussion time
Make digital maps available; enable turning on and off layers/ change scales/ "street view"
Define species and ecosystem specific objecives
Examples of best practices/maps/info sent out before event
ID how this intersects with local and provincial legislation/planning/conservation plans?
Same audience (technical), where are elected officials/decision makers?
Better outline of components of model
Start focus on one corridor as project-based case study to demo. how to implement
Incorporate GIS data from other organizations
More specific example for low elevation
Provide examples of challenges through realistic conditions
More info about existing connectivity on private/Crown land
Have >1 model for different species/ecosystems to see how much variability in the model output
Workshop on funding source strategy
Acknowledge that evidence is rarely the basis of decision-making; more for social marketing?
Individual maps for people to complete
More info on Transboundary Work
Use anecdotal evidence to engage people on a behavior level - how to motivate people
Diffiult to manage the broad range of people
First Nation guest speaker
Discuss background, and why there is a need for change
Examples of other connectivity projects

Comments and Suggestions (including specific activities or initiatives useful for a future event elsewhere)

Groups to provide greater detail for specific and realistic options at a suitable scale (regional or very local)	2
More time/Full day event	2
More focused activities	2
More details on modelling/ all layer presented	2
More industry perspective	1
Marketing and financial incentives	1
Cross-compliance initiatives in other jurisdictions that could inform better engagement strategies	1
Brainstorm of strategies/actions that could be undertaken by different groups	1
Next steps/implementation on a wide scale	1
Expand to Provincial scale	1
Outputs that can be used for planning	1
Resistance to corridors from workshop audience may be around the perception of "planning down" to a constrained area	1
Resistance to corridors from a land manager/owner's perspective may be around constraints to land use - how can land use and connectivity be accommodated	1
Include other datasets in GIS*	1
Liked the openness and desire from everyone to see this work	1
Where are these corridors going	1
Species-specific needs incorporated for various species (small scale needs, corridor requirements needed)	1
S. Okanagan Anarchist Mountain to Nighthawk crossing and across border	1
What is currently being done for connectivity?	1
Have City of Kelowna rep. present corridor locations in Kelowna	1
Select one or two examples and work through the steps required	1
I am prepared to give the necessary time as it pertains to Crown Land and Rangeland in the Okanagan	1
A great snapshot, would like to dive into the modelling a bit more	1
Great job. I really think workshops like these further the ideas and energy around connectivity. Many Thanks.	1
Would need defined project/end product	1