ECOSYSTEM CONNECTIVITY

Okanagan Institute for Biodiversity, Resilience and Ecosystem Services (BRAES)

Habitat patches:

Undisturbed natural areas containing suitable habitat or resources for a species, population, or ecological process. Core habitat patches become isolated by natural disturbance processes, such as fire, wind and landslides, and by building roads, utility corridors, and other human development. Along with corridors, habitat patches are the building blocks of ecosystem connectivity.

Corridors:

Link of suitable habitat joining two or more habitat patch areas. Corridors may be 'stepping stones' of habitat spread closely enough across the landscape to allow for movement between patches (e.g., wetlands), or they may be continuous areas of habitat (e.g., along streams).

Ecosystem services:

The benefits we receive from the natural world that promote and sustain human well-being. They include food, water, timber, air quality, water filtration, climate regulation, biodiversity, medicines, fresh erosion and pest control, flood and drought regulation, pollination, waste treatment, aesthetic values, recreational opportunities, etc.

Further information

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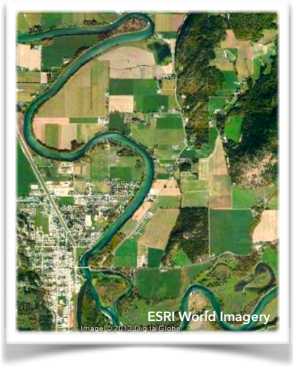
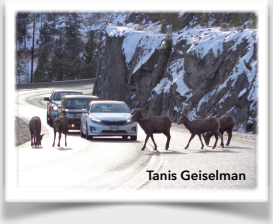
What is **ecosystem connectivity?**

Ecosystem connectivity is the conservation and maintenance of a linked network of natural areas. Connected natural areas ensure that species can move across landscapes. Maintaining ecosystem connectivity is also crucial for supporting the ecological processes that sustain our wildlife and human populations. These processes support the production of **ecosystem services**, such as fresh water, food production, pollination, pest and disease control, flood and drought regulation, recreational areas, etc. People in the Okanagan depend on these ecosystem services for their livelihoods and well-being.

Connected natural areas can be viewed as **habitat patches** linked by **corridors** through which wildlife and ecosystem processes can move, flow, and interact. The degree of ecosystem connectivity on our landscapes is shaped by natural features such as the slope of the land, vegetation, wetlands, streams, and lakes, and by human settlements, infrastructure and land uses. Plant and animal species rely on connectivity for migration, colonization and breeding. Also, the production of many ecosystem services is dependent upon the flow of organisms and materials through a landscape. Disrupting these flows can seriously affect the ability of a region to support diverse and resilient ecosystems and healthy communities.





Fragmentation:

The severing of larger ecosystem patches into smaller, isolated fragments. In fragmented landscapes, some (or all) flows between patches are restricted or prevented by barriers. Fragmentation is the opposite of connectivity.

Fragmentation of our landscapes is the key threat to ecosystem connectivity. Fragmentation can occur naturally through processes such as fires and floods, which may destroy vast areas of habitat and isolate patches from one another. Areas with human settlement further contribute to fragmentation through urban and rural development, intensive agriculture, roads, powerlines, railroads, and other land uses. Human development and related infrastructure tend to be concentrated in valley bottoms and near water, which are also important areas for ecosystem connectivity.

Why is ecosystem connectivity important for **wildlife** and **habitat**?

Ecosystem connectivity is essential for helping wildlife move about the landscape to find food, shelter, water, mates that are not closely related, and an escape route if danger threatens them. Connectivity is important for supporting migration, re-population of areas after disturbances, climate change-induced range shifts, and biodiversity. Connectivity can provide habitat refuges, prevent populations from becoming isolated from one another, and help support the recovery of vulnerable or threatened species after disturbances.

The Okanagan is truly a special place. It is home to some of the highest concentrations of species, many of which are listed as being of special concern or at risk of extinction, and is recognized as one of the most endangered natural places in Canada. Some of our species and ecosystems are found nowhere else in the world. The region also has one of the highest rates of human population growth and development in the country and, unfortunately, the resulting habitat loss and **fragmentation** is seriously threatening ecological connectivity in the Okanagan. For example, we have lost roughly 90% of wetlands and 60% of gentle slope grassland ecosystems since humans started to settle here. If we are to sustain our wildlife populations for current and future generations, it is critical to address this *now* by maintaining and restoring connectivity across our landscape.

Why is ecosystem connectivity important for **people**?

Connected ecosystems function better than non-connected ecosystems, which in turn support human survival. For example, patches of natural habitat near agricultural areas support wild pollinators and ranging livestock, which provide us with food. Riparian corridors (which are vegetated areas along streams, lakes and wetlands) also help filter, store and regulate the flow of water for use by people and agriculture, and provide flood and drought protection. Vegetated corridors provide shade and store carbon, which moderates local temperatures and helps regulate global climate change. Connected ecosystems provide recreational and spiritual opportunities for people to connect with nature, which reduces stress, improves memory, and increases understanding about the value of the environment to our lives and lifestyles.

From a socioeconomic standpoint, connectivity is required by many of our key resource and community sectors including agriculture, forestry, recreation, tourism, and culture. The natural capital of ecosystem services in the Okanagan region has been estimated at $6.7 billion per year. In other words, this is the amount we would need to spend in order to produce the services that ecosystems currently provide our communities for free. Maintaining these services through environmental land use planning and conservation is much less costly in the long-term than trying to restore ecological processes once they are degraded.

Examples from home: Planning for connectivity in the Okanagan

Local organizations have taken progressive steps to encourage connectivity throughout the Okanagan. In 2014, the Okanagan Collaborative Conservation Program (OCCP) published 'Designing and Implementing Ecosystem Connectivity in the Okanagan', which provides general background on connectivity, outlines steps required to develop connectivity strategies, and reviews relevant regulatory resources. The Regional District of Central Okanagan (RDCO), the University of British Columbia Okanagan (UBCO), the OCCP, and other regional stakeholders are collaborating on a **regional** project titled: 'Planning for Ecosystem Connectivity in the Central Okanagan' to identify, map, and plan for wildlife and wildlife habitat (see **Figure 1**) and ecosystem services connectivity. The Okanagan Similkameen Stewardship Society has assisted in the development of several **sub-regional** habitat and corridor conservation strategies in partnership with land owners, managers, and community groups. The District of Lake Country has applied connectivity planning principles to a **local** rezoning application that fell within a connectivity corridor area, and identified potential covenants to retain a corridor and protect sensitive habitats. The most successful connectivity strategies are collaborative and recognize the needs of both nature and people.

How do we enhance connectivity on the ground?

Connectivity enhances landscape resilience to environmental disturbances such as climate change, and it is becoming increasingly crucial to incorporate connectivity into regional land use planning. Ecosystem connectivity planning aims to do four things: select the best individual patches and corridors, which are those designed to maximize width; include a variety of riparian and upland habitats with multiple diverse vegetation layers; consider the requirements and limitations of species and ecosystem services; and facilitate flow across elevations and latitudes. The wider the corridor the better, as larger areas are generally more diverse, are less impacted by adjacent land uses and edge effects (e.g., invasive species, predators, etc.), and provide more habitat. Ideally, corridors are able to serve multiple functions, such as providing wildlife habitat, recreation, and climate regulation, among other ecosystem services.

The habitat requirements of many species may be underestimated, so it is a good idea to retain the largest/widest natural corridors possible. However, planning for connectivity is not restricted to large-scale conservation areas, and considers the maintenance of other important land uses. A variety of mitigation strategies can be used to restore and enhance connectivity (Table 1).

Planned corridors are important for protecting connectivity, but they are only part of the solution. Natural habitat areas on private land, urban greenspaces, utility corridors, planted boulevards, and even vegetated backyards can be important contributors to overall landscape connectivity conservation efforts by enhancing the connections between conservation network areas.

Table 1. Corridor and patch strategies to enhance connectivity at different spatial scales

	Local	Sub-regional	Regional
Corridors	hedgerows, fencerows, streams, roadsides, forest corridors,	rivers, riparian vegetation, links between reserves	major rivers, mountain ranges, strips on land between land masses
Patches	native plant areas, small wooded areas, wetlands, gardens and parks in cities	small reserves, vegetated patches in farmland, regional parks, regenerating old growth forests patches in cutblocks	wetlands along waterfowl migration routes, alpine habitats along a mountain chain

Call to Action

We call on developers, planners, and home owners to take steps to help enhance connectivity by doing the following: planting native species; removing unneeded fencing and/or replacing with wildlife-friendly fencing; widening riparian buffers; and incorporating connectivity into land use planning.

Scales of connectivity

In practice, ecosystem connectivity planning considers three scales across the landscape: local, sub-regional and regional. Establishing a variety of corridors at all three planning scales is an important feature of successful regional corridor planning.

Regional

Regional corridors are significant in width (>500 m) and provide dispersal areas as well as significant habitat for a variety of species. They typically serve to connect altitudinal or latitudinal migratory pathways, and should be at least twice the width of a species' home range.

Sub-regional

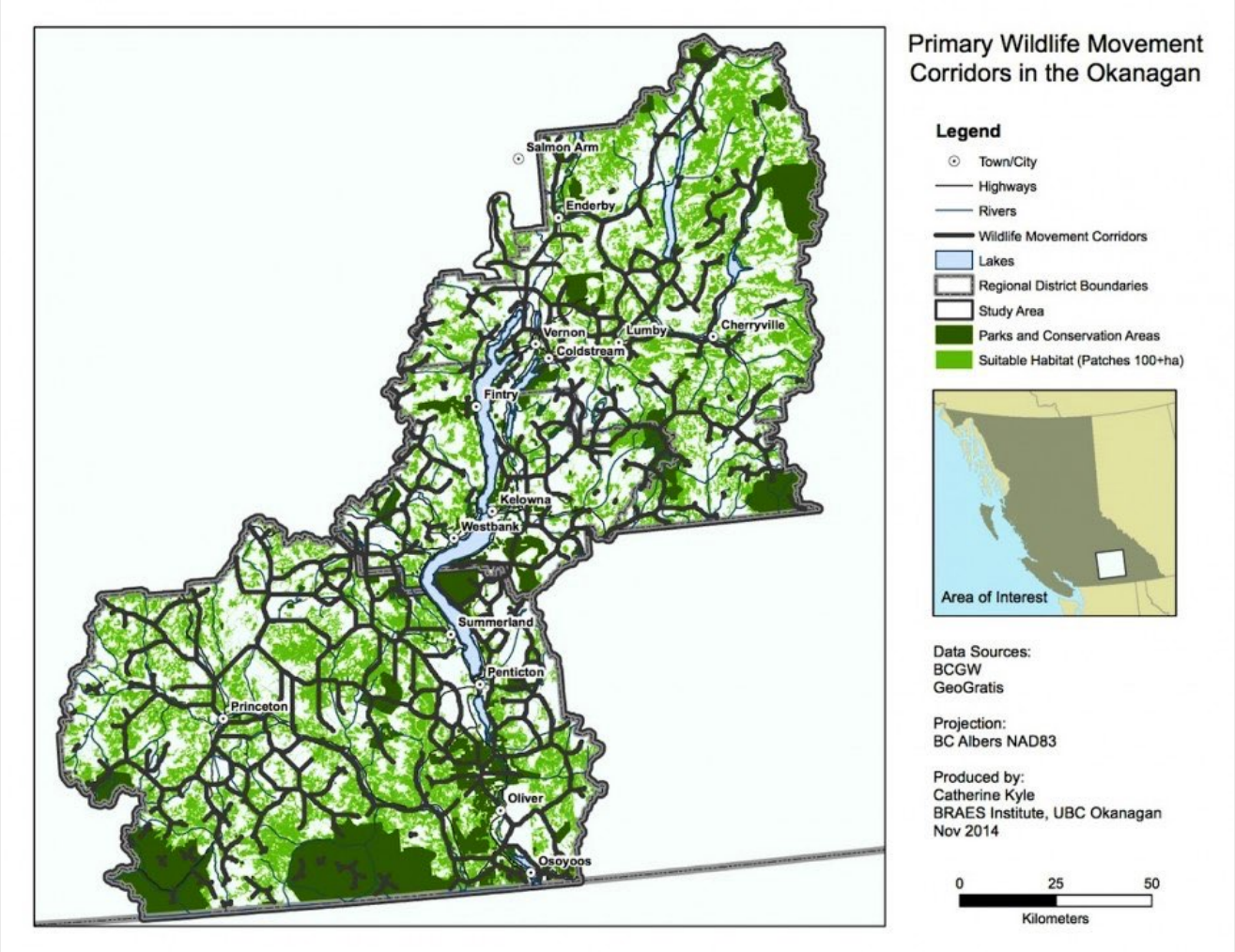
Sub-regional corridors are wide enough (up to 300 m) to provide links for species movements and dispersal, but may not be large enough to provide substantial habitat within themselves. They typically connect larger landscape features such as ridgelines and valley bottom areas.

Local

Local corridors are small (up to 50 m wide) links, such as streams and wildlife overpasses, that provide connections between patches.

Figure 1: Wildlife corridors in the Okanagan

A collaborative project has helped identify potential regional and sub-regional corridors for wildlife species in the Okanagan. The RDCO, UBCO, and McGill University have created wildlife connectivity maps using data from the Okanagan Biodiversity Conservation Strategy (BCS). 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. Next, ecosystem services mapping and modelling will be completed to identify where they are produced on our landscape, and to determine whether there are key corridor areas that may be important for maintaining both wildlife and ecosystem services connectivity.



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