The Northwest as a Hotbed of Innovation for Conserving Climate-Connectivity

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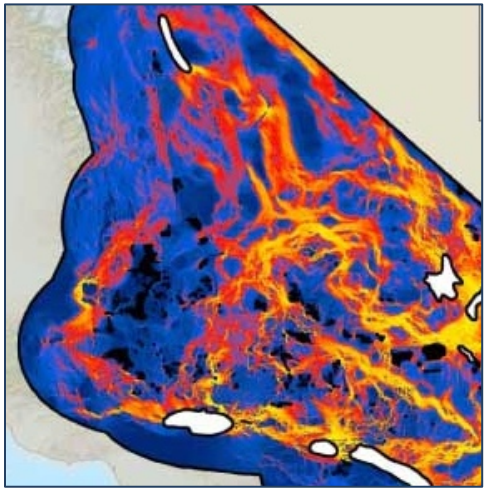
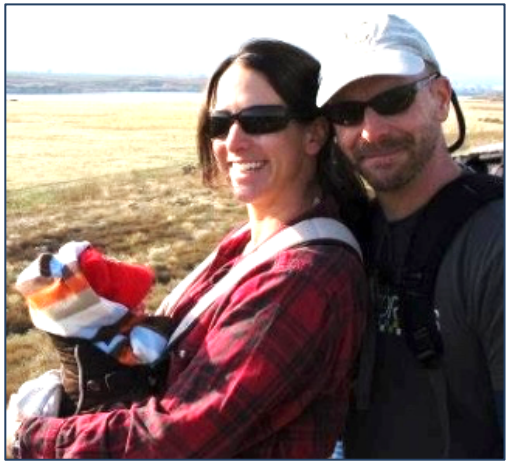
Brad McRae

13 August 1967- 12 July 2017

CIRCUITSCAPE





Brad McRae graduate student scholarship fund:
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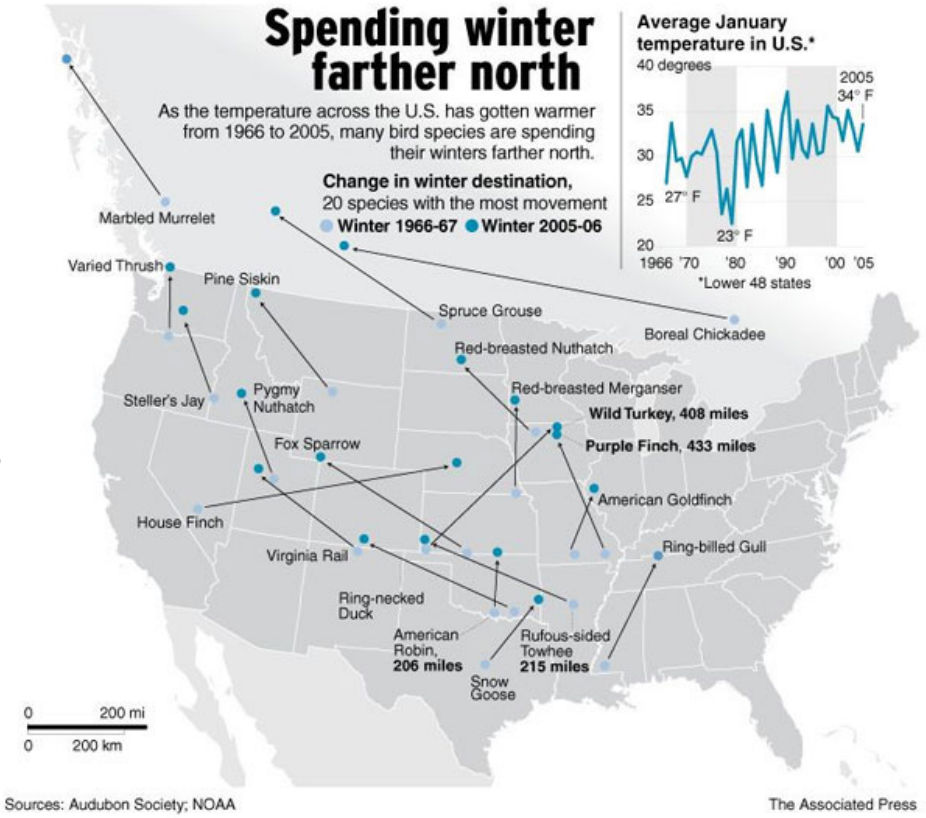
Species are moving as they track shifting areas of climatic suitability

Globally, over past century:

- Upward ~11m per decade
- Poleward ~17km per decade

(Chen et al. 2011)



….and they'll need to move farther and faster as climate change accelerates

Species will have to traverse increasingly degraded and fragmented habitats

% human influence relative to maximum influence in each biome

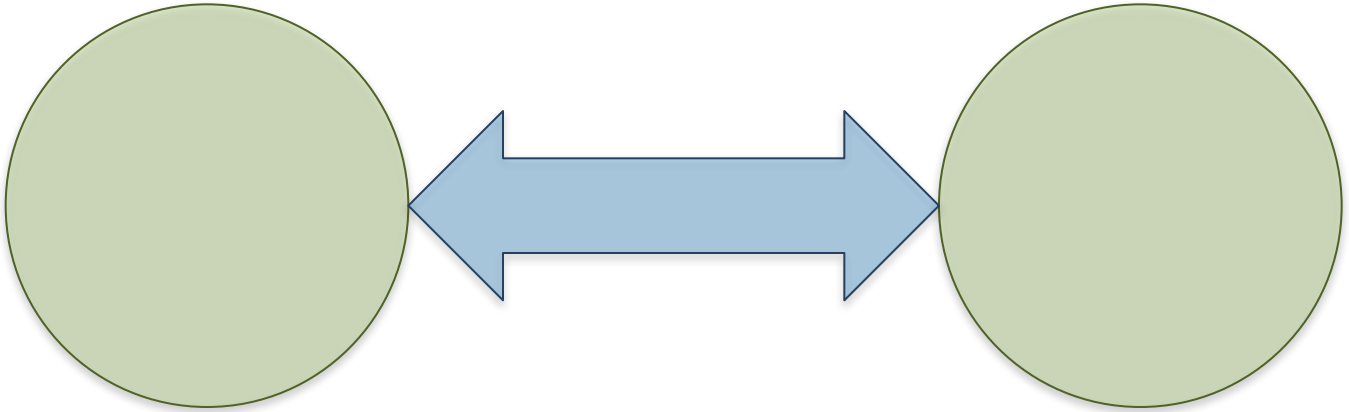
0 - 10% | 10 - 20% | 20 - 30% | 30 - 40% | 40 - 50% | 50 - 100%

(Kareiva et al. 2007)

Enhancing habitat connectivity is a leading climate adaptation strategy

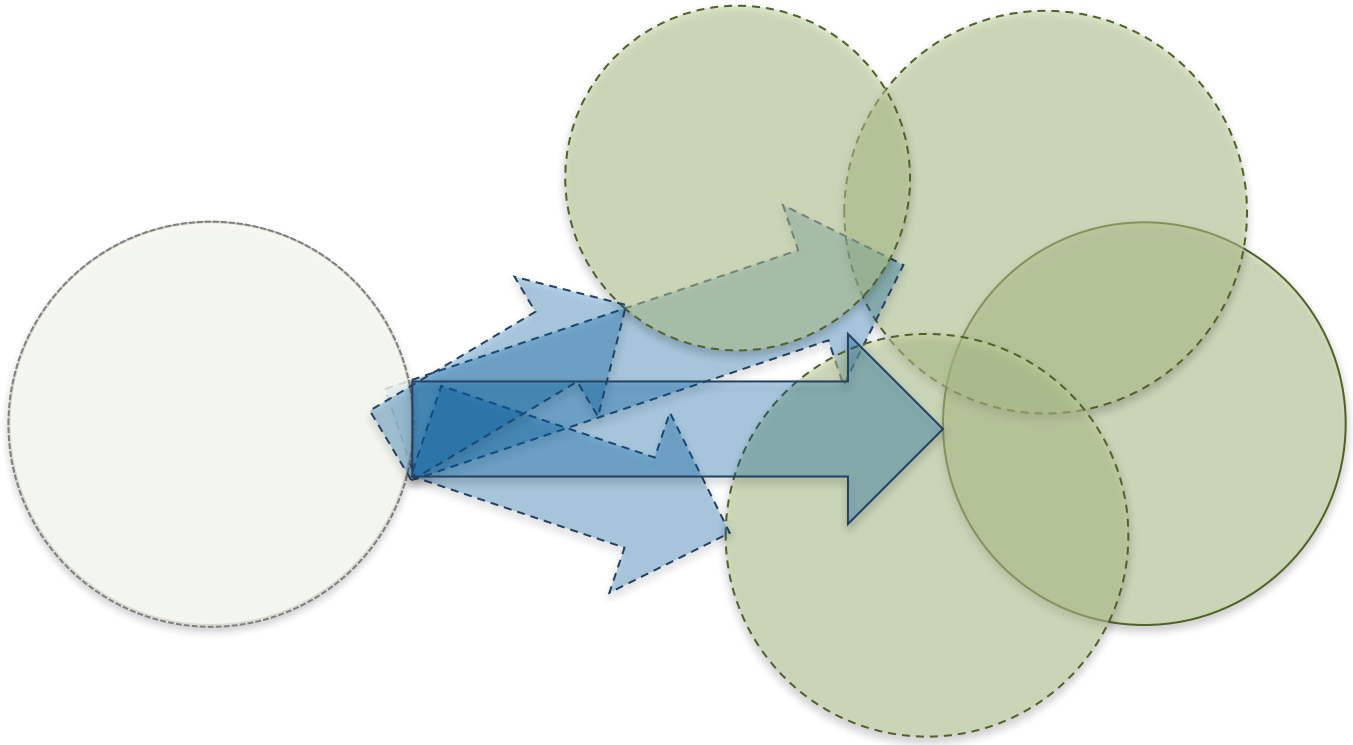
But how can we ensure that we're providing for range movements in response to climate change?

Traditional connectivity modeling approaches identify corridors among existing habitat patches



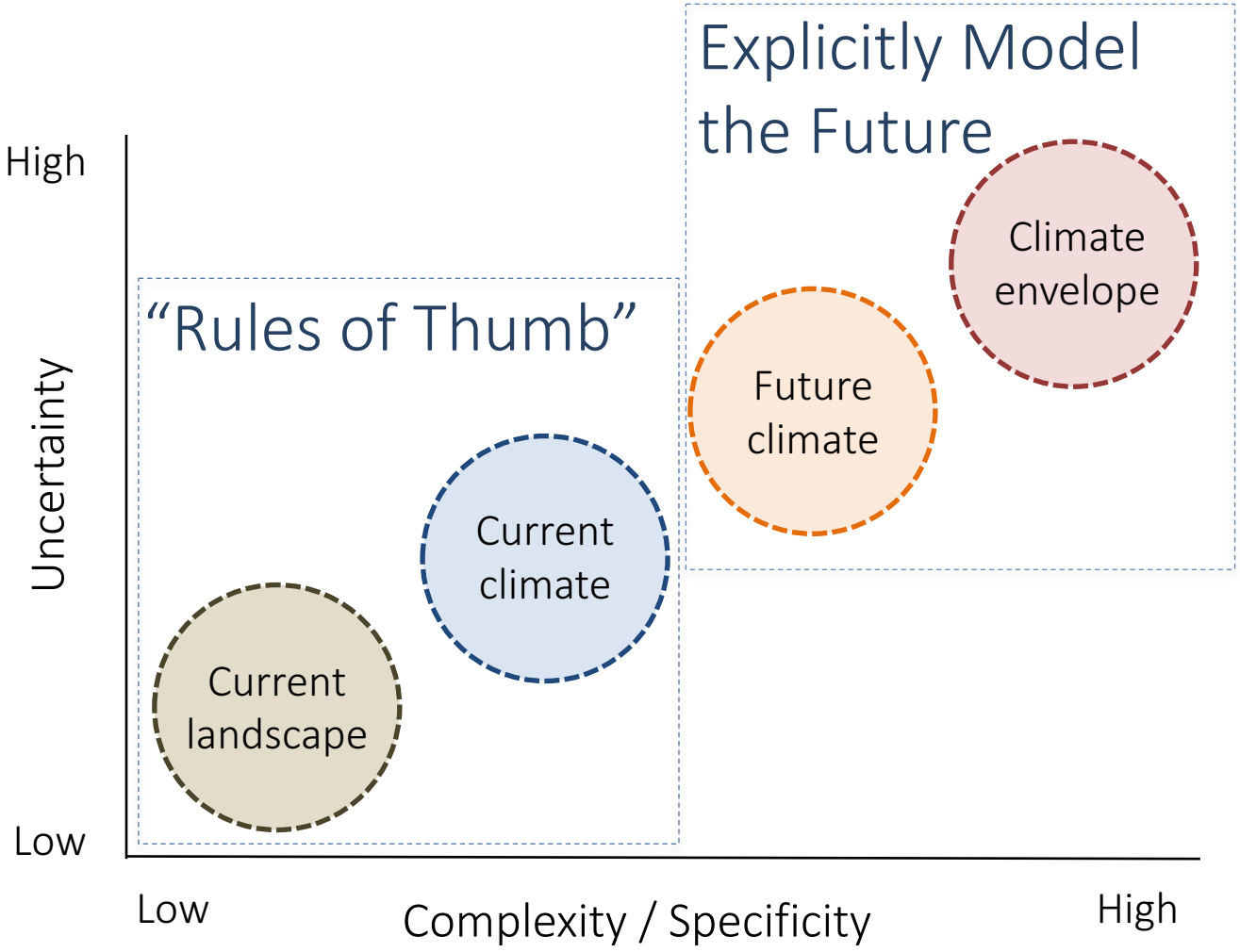
Corridor connecting current habitat patches

Identifying climate corridors requires accounting for directional movement



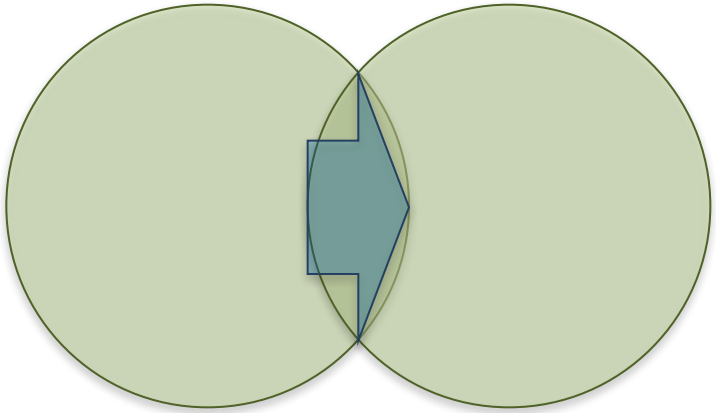
Corridor connecting current and future habitat patches

Diverse climate corridor modeling approaches have been developed to address these challenges

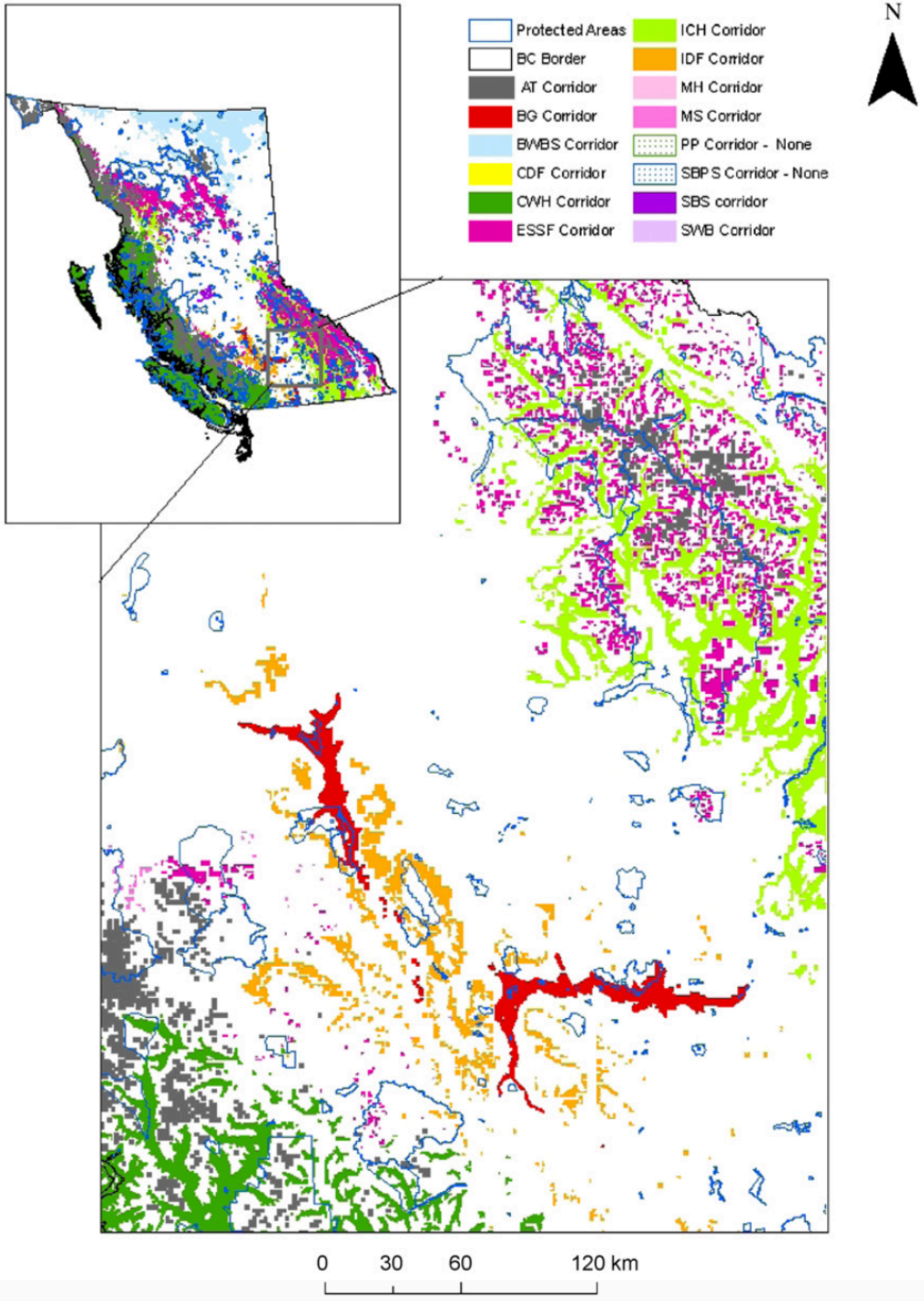


I. Climate corridors based on explicit models of the future

Climate corridors based on projected future ranges

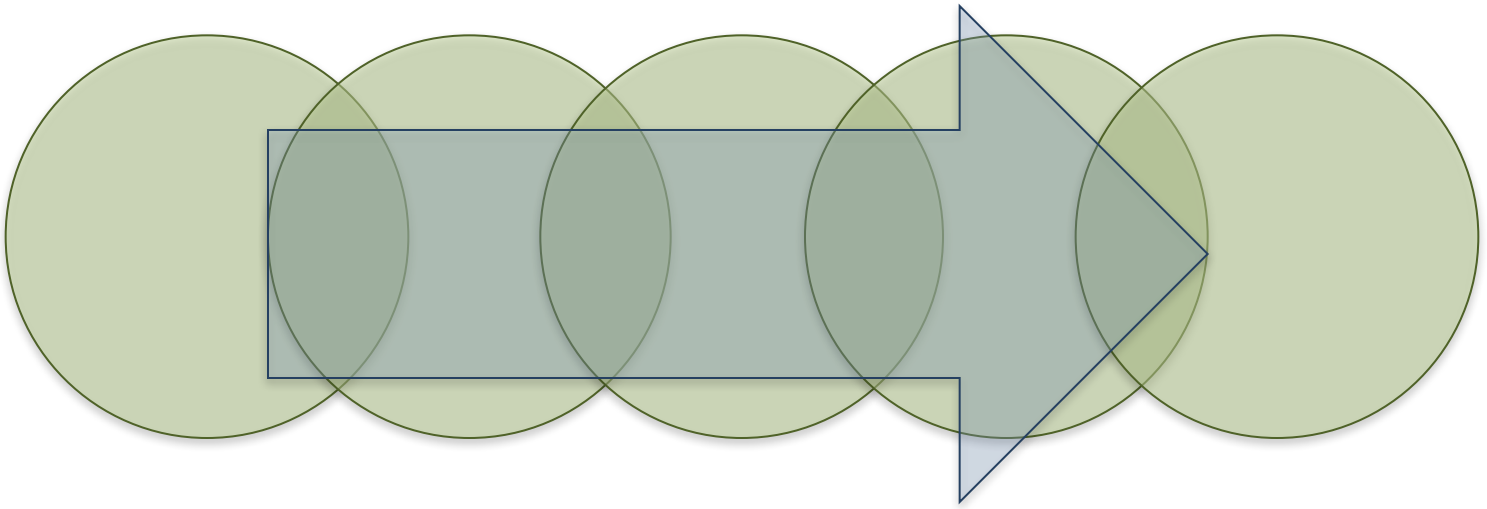


Corridor connecting current and projected future climate envelopes



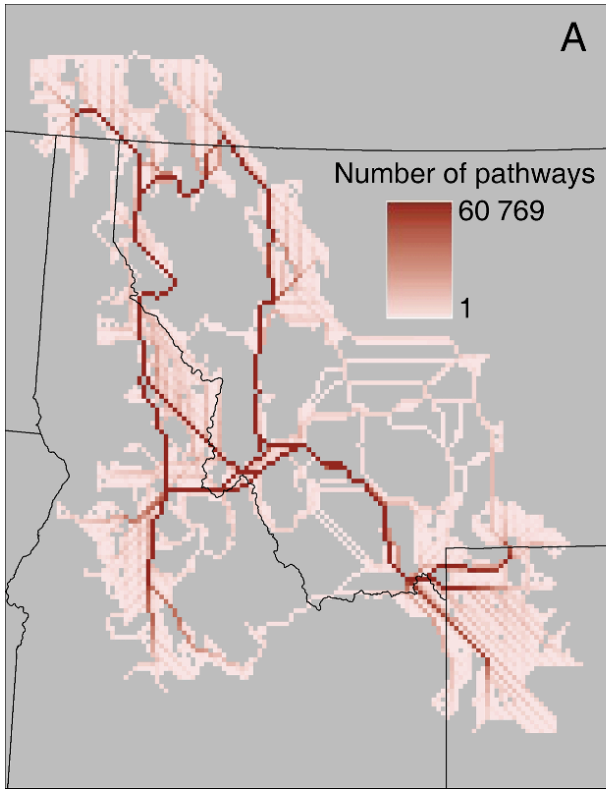
Rose & Burton 2009

Climate corridors based on projected future ranges



Corridor connecting current and projected future climate envelopes

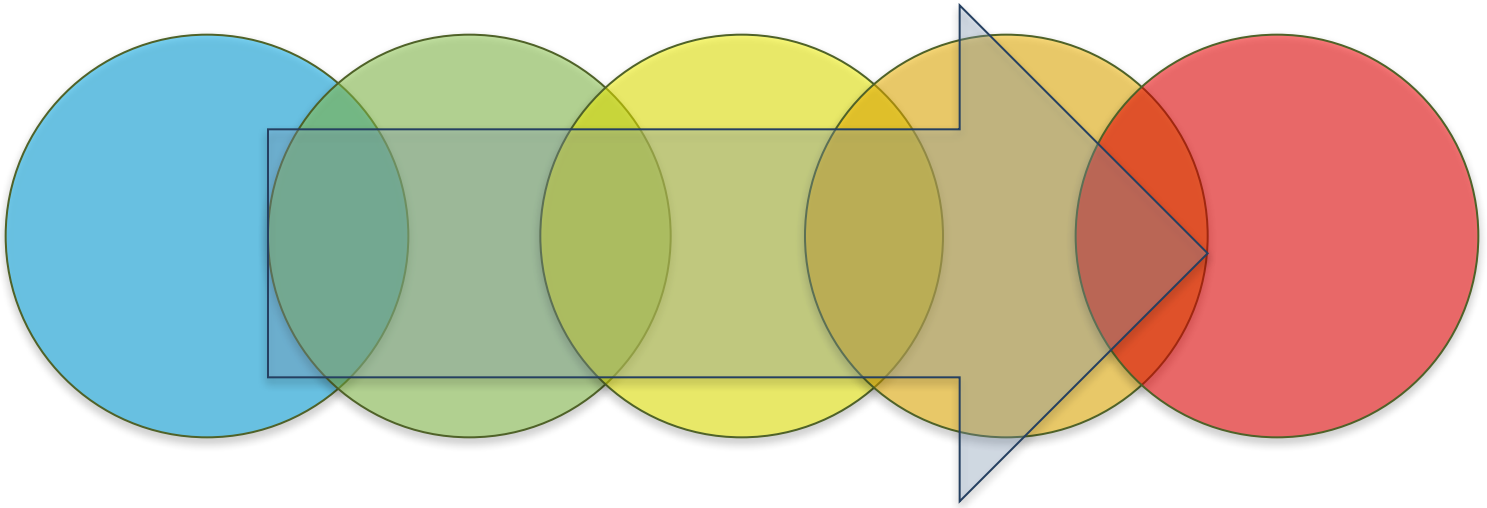
Wolverine future corridors



Historical

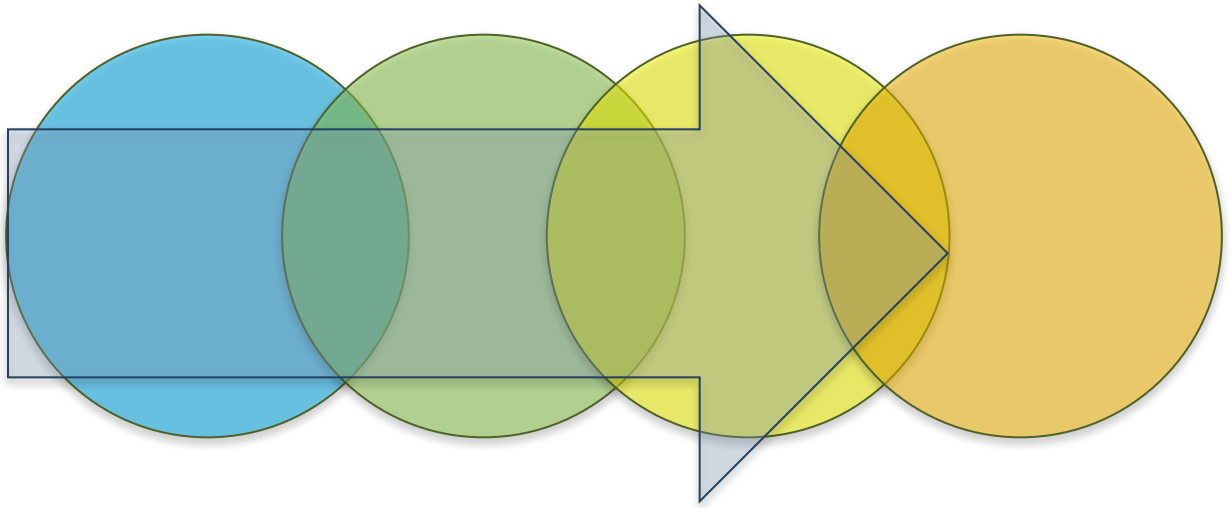
McKelvey et al. 2012

Climate corridors based on climate trajectories



Corridor connecting current and future climates

Climate corridors based on climate trajectories



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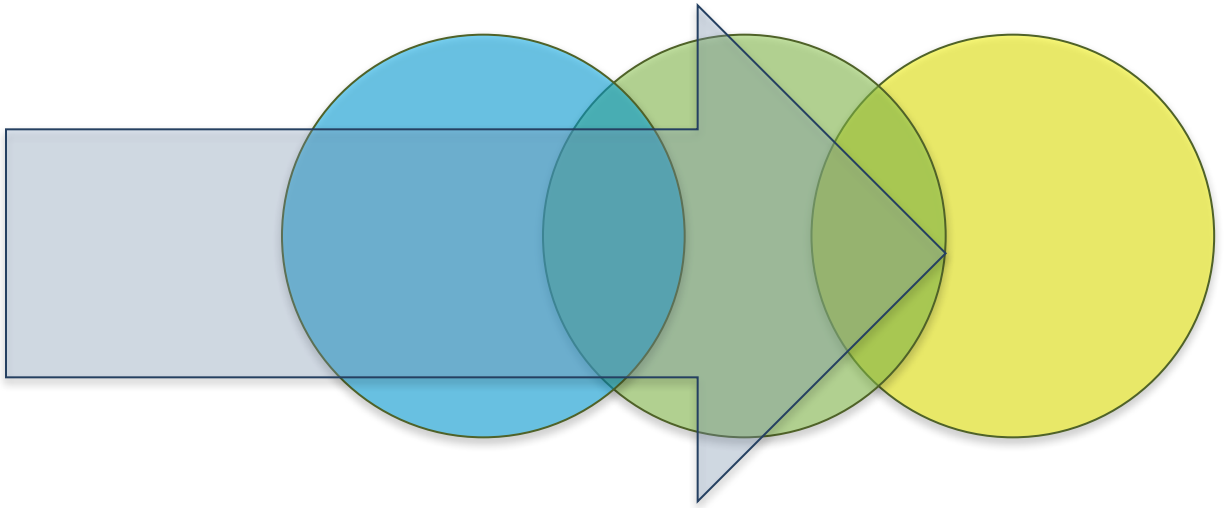
Climate corridors based on climate trajectories



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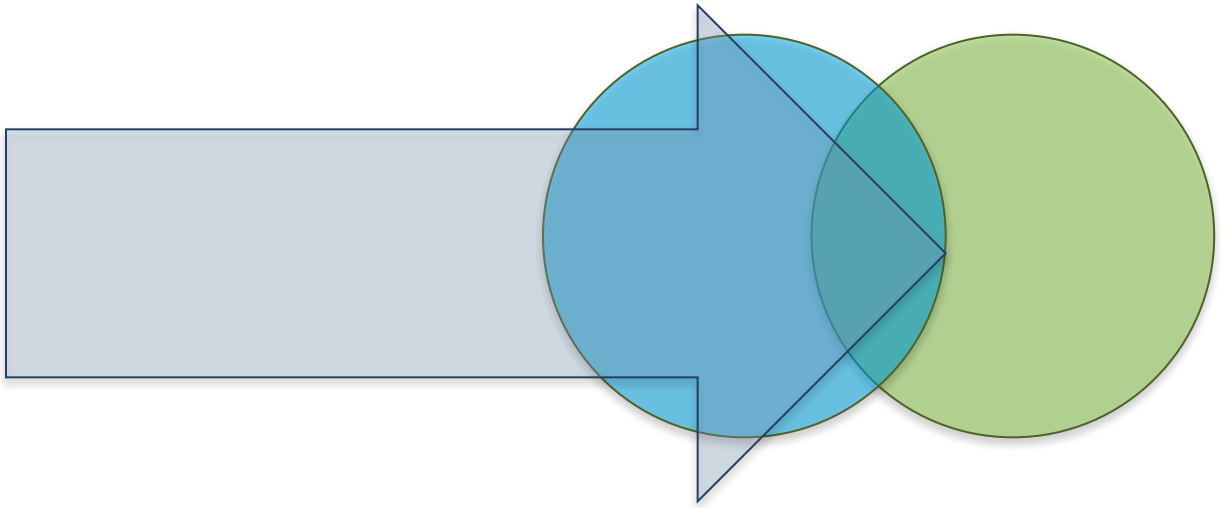
Climate corridors based on climate trajectories



Corridor connecting current and future climates

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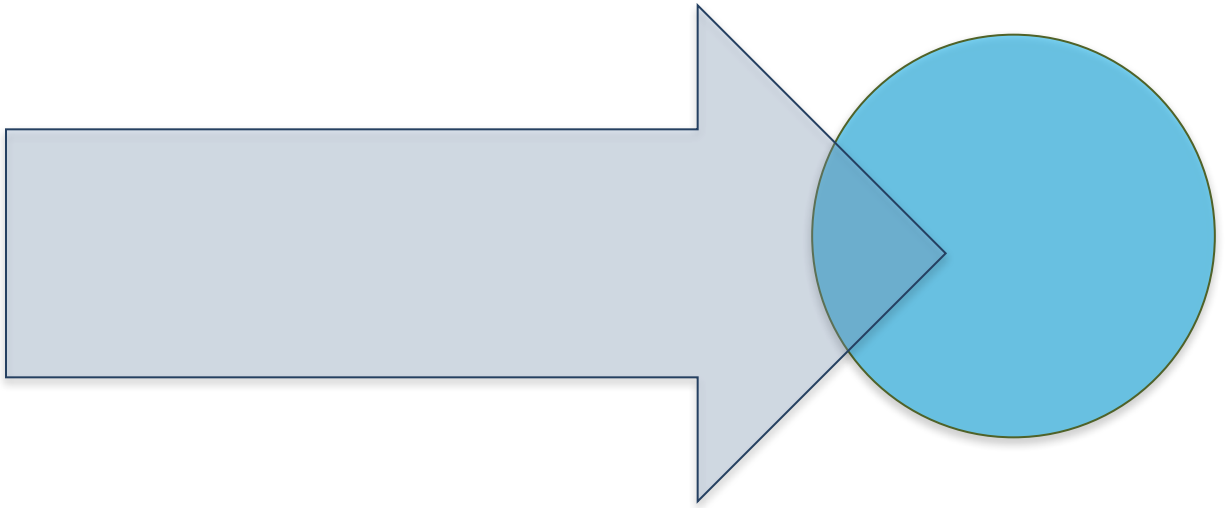
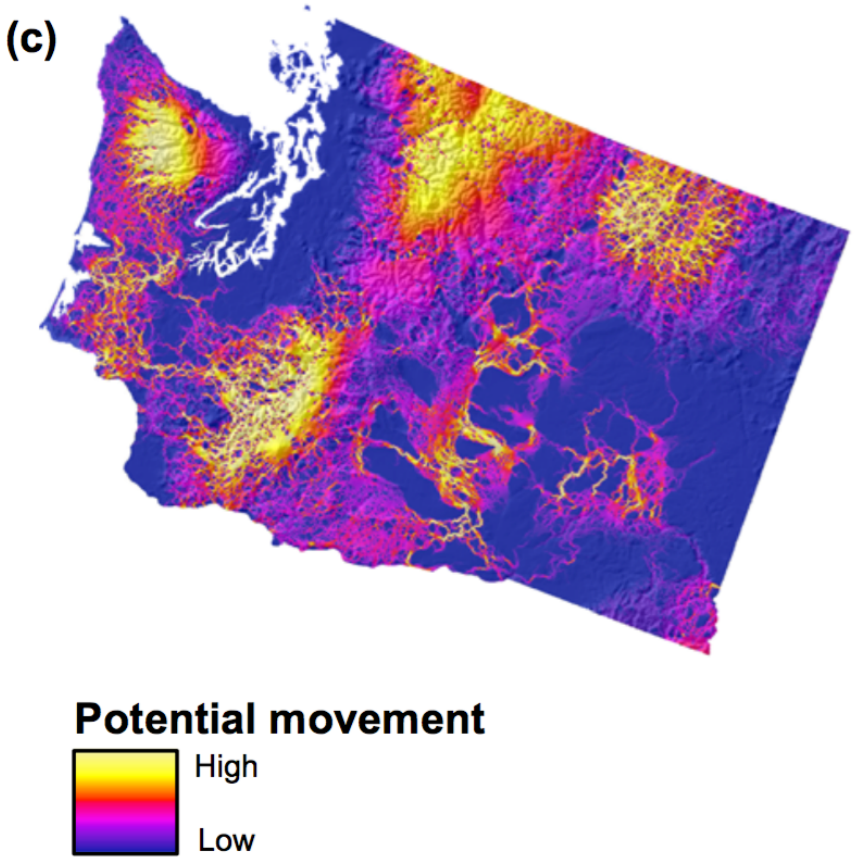


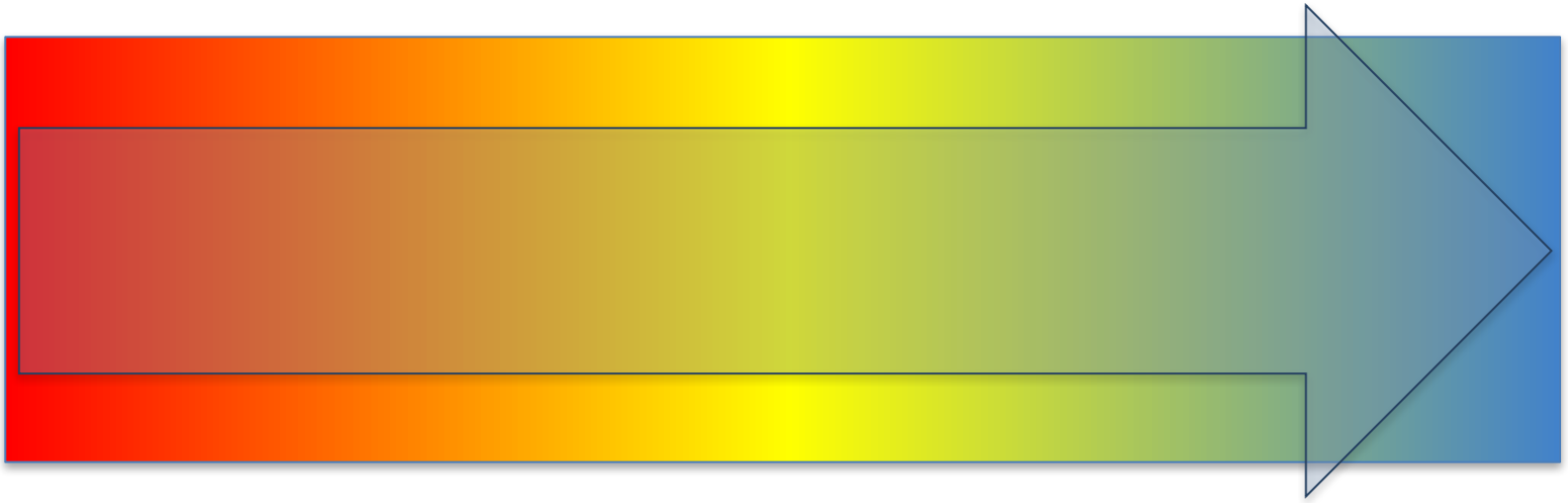
Corridor connecting current and future climates



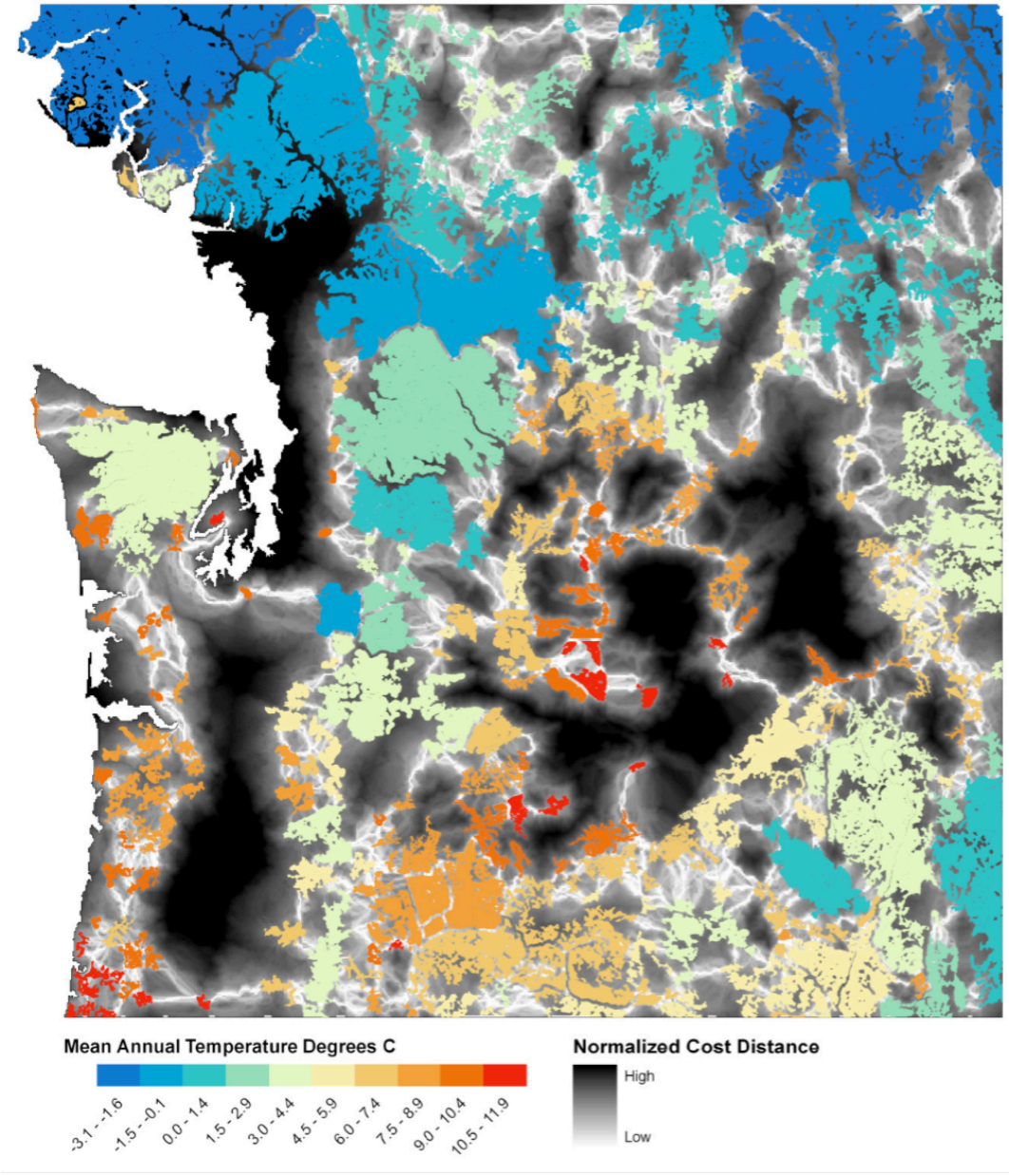
Littlefield et al. 2017

II. Climate corridors based on “Rules of Thumb”

Climate corridors based on environmental gradients



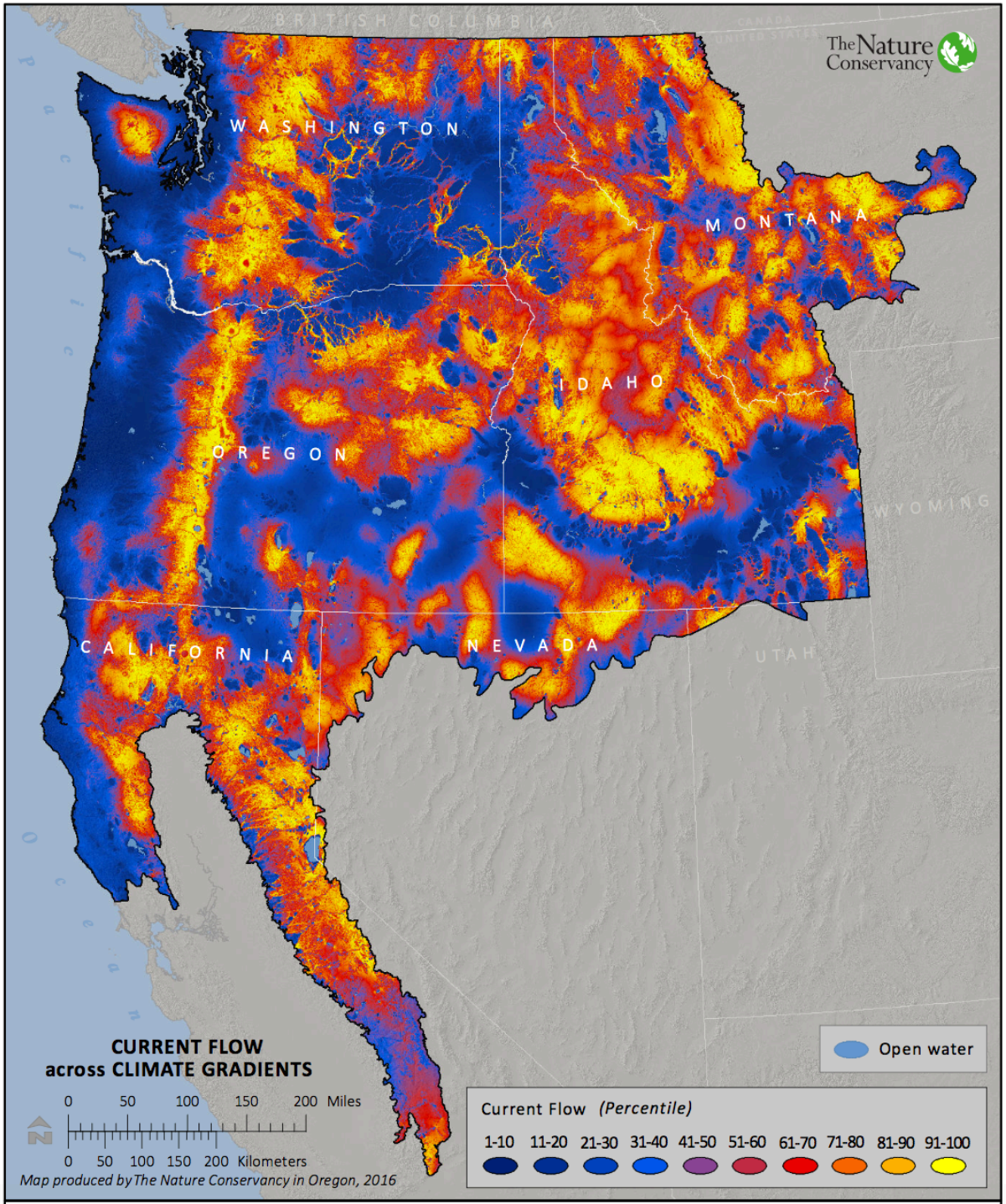
Climate-Gradient Corridors



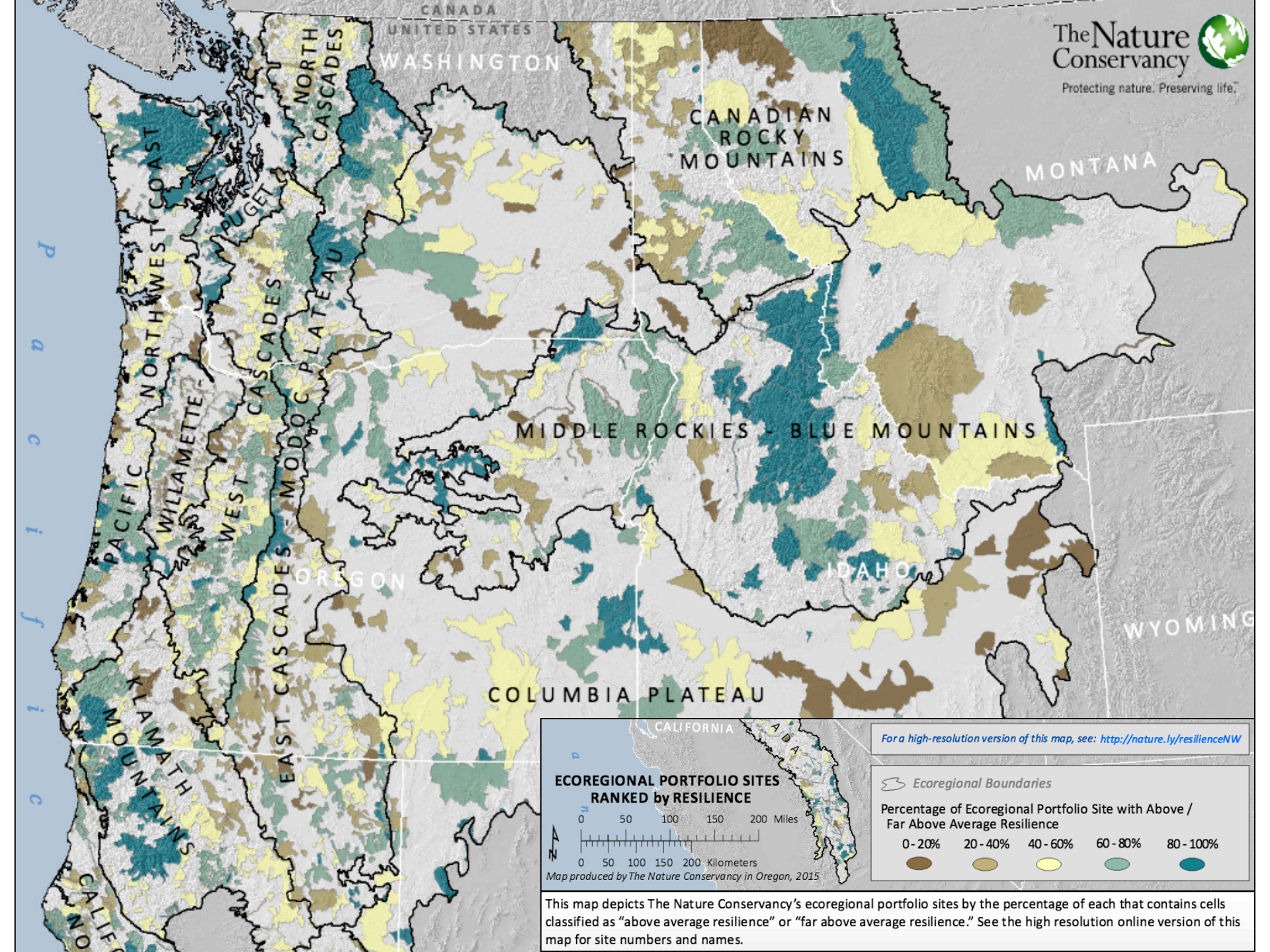
WASHINGTON WILDLIFE HABITAT CONNECTIVITY WORKING GROUP

Nunez et al. 2013

Climate-Gradient Corridors



Corridors modeled to promote range shifts without accounting for directionality



This map depicts The Nature Conservancy's ecoregional portfolio sites by the percentage of each that contains cells classified as "above average resilience" or "far above average resilience." See the high resolution online version of this map for site numbers and names.

Who is using these models
to make decisions?

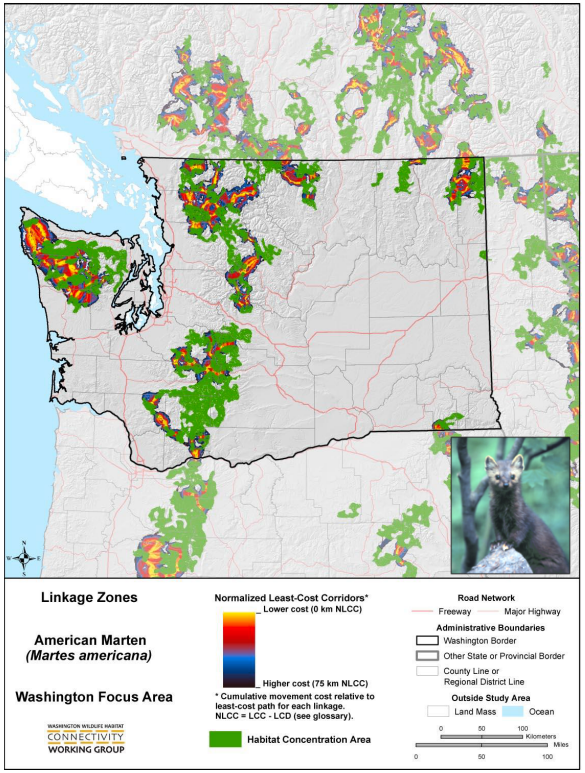
The Washington Connected Landscapes Project

WASHINGTON WILDLIFE HABITAT CONNECTIVITY WORKING GROUP

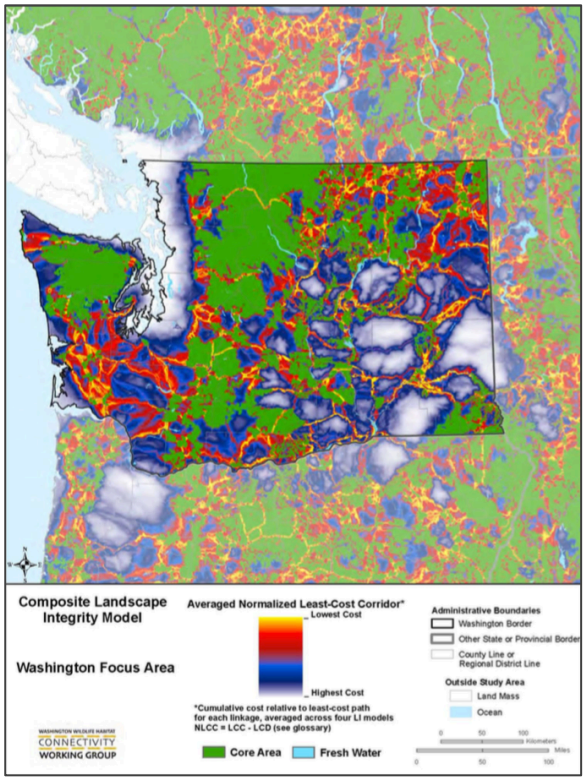
The Washington Connected Landscapes Project

WASHINGTON WILDLIFE HABITAT CONNECTIVITY WORKING GROUP

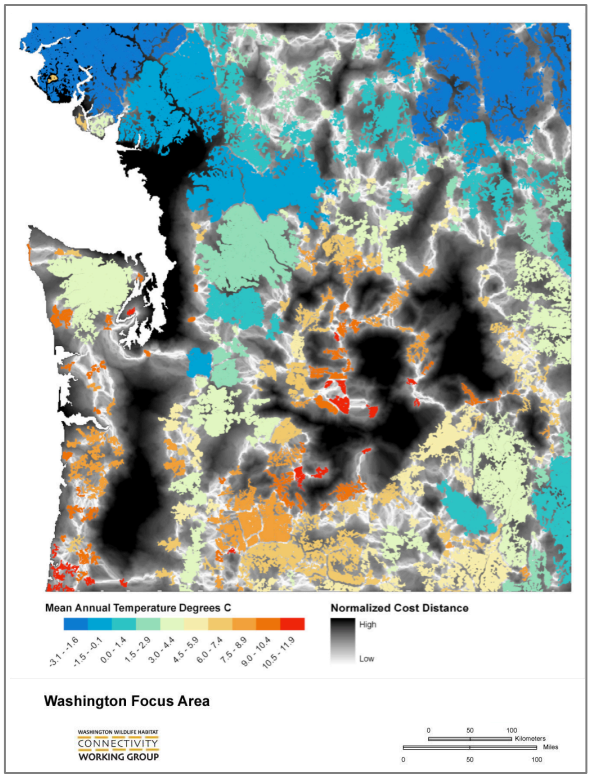
Focal Species



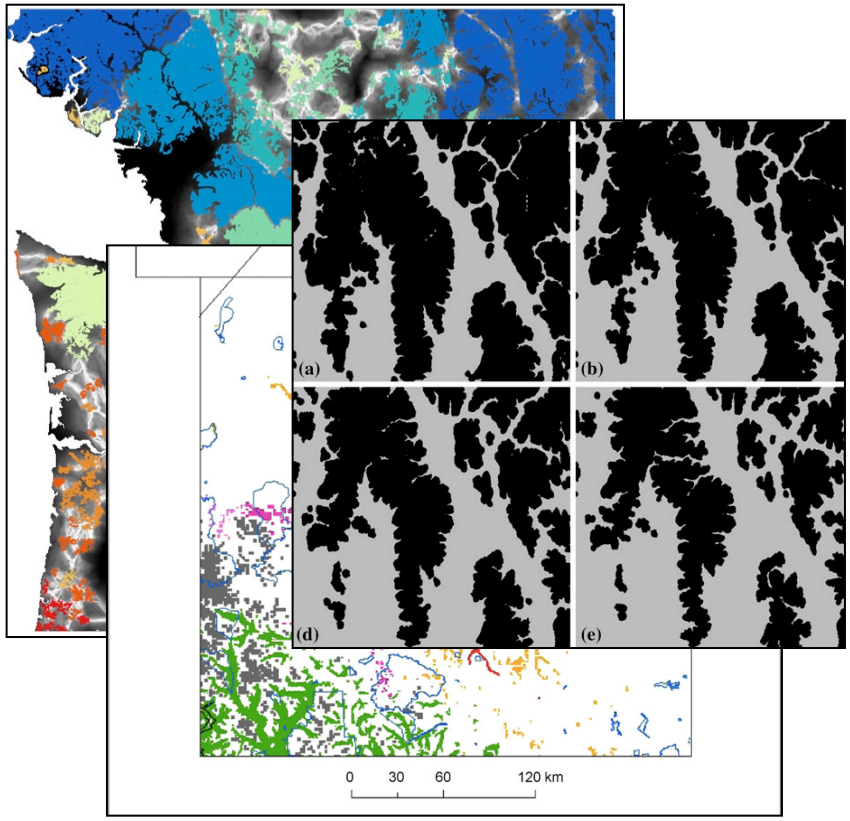
Landscape Integrity



Climate-Gradient Corridors

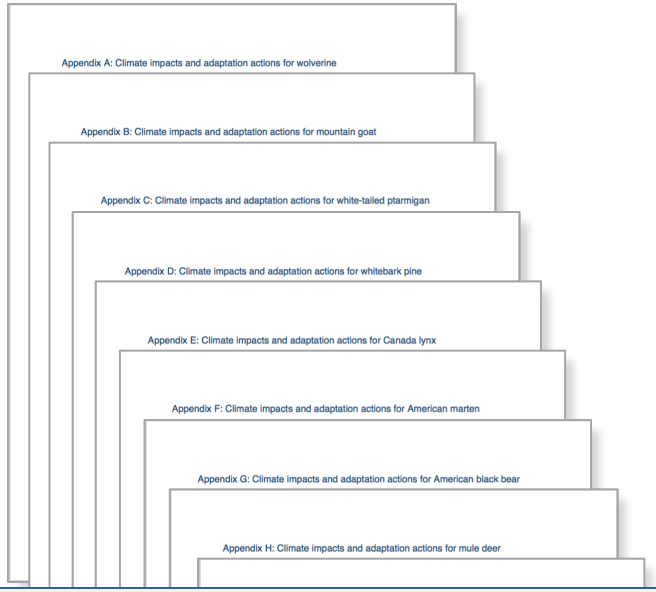


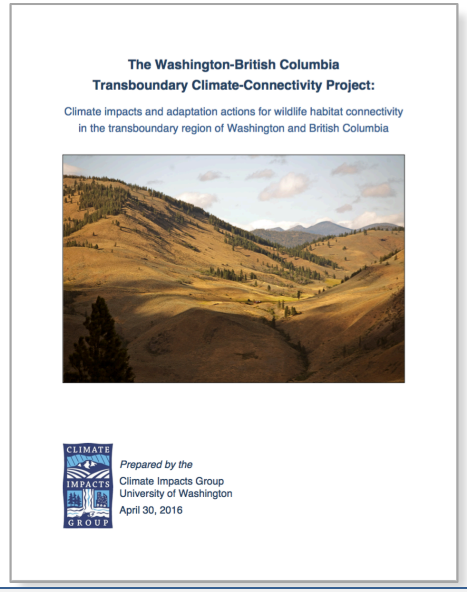
Washington - British Columbia Transboundary Climate-Connectivity Project

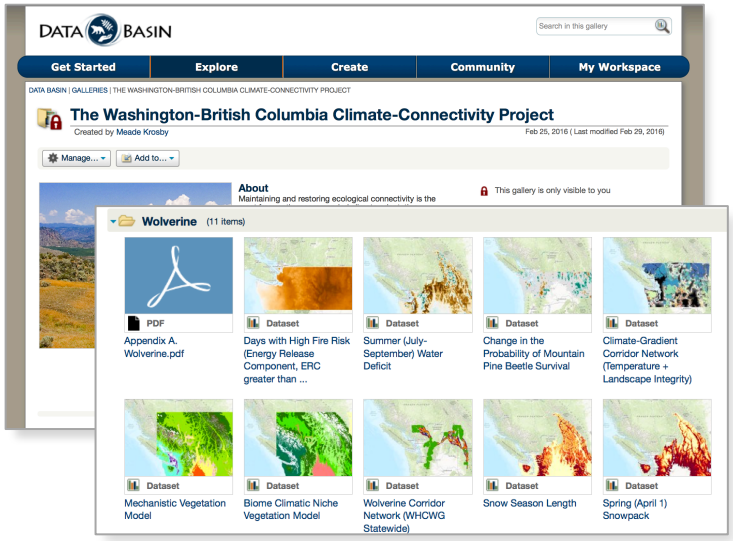


How can we use existing models to adapt connectivity conservation to climate change?


Protect Salmon
Preserve Habitat







Models alone aren't enough to inform decision-making

Appendix M: Climate impacts and adaptation actions for the Okanagan-Kettle region

The Washington-British Columbia Transboundary Climate-Connectivity Project engaged science-practice partnerships to identify potential climate impacts on wildlife habitat connectivity and adaptation actions for addressing these impacts in the transboundary region of Washington and British Columbia.[1] Project partners focused their assessment on a suite of case study species, a vegetation system, and a region chosen for their shared priority status among project partners, representation of diverse habitat types and climate sensitivities, and data availability. This appendix describes potential climate impacts and adaptation actions identified for the Okanagan-Kettle region.

Figure M.1. A view of the Okanagan Valley.

The Okanagan-Kettle region straddles the Washington-British Columbia border from the Coast Range and Cascade Mountains (to the west) to the Monashee Mountains and Kettle Range (to the east) (Fig. M.2).[2] This region features relatively well-connected montane habitats found at higher elevations, and highly fragmented shrub-steppe habitats found at lower elevations, where development and highways present significant barriers to wildlife movement.[3] Notable movement barriers in the region include Highways 3A and 97, which run north-south along the length of the Okanagan Valley, creating a significant barrier to east-west movement. In the British Columbia section of the Okanagan Valley, east-west connectivity is also extremely constrained by a series of lakes interspersed with small towns and development (Appendix M.1).

Future climate change may present additional challenges and needs for habitat connectivity in the Okanagan-Kettle region.[3,4] First, climate change may impact core habitat areas and dispersal corridors in ways that may make them more or less permeable to wildlife movement. Second, existing core habitat areas and corridors may be distributed on the landscape in ways that make them more or less able to accommodate climate-driven shifts in species distributions. For such reasons, connectivity enhancement has become the most frequently recommended climate adaptation strategy for biodiversity conservation.[5] However, little work has been done to translate this broad strategy into specific, on-the-ground actions for connectivity conservation under climate change. Furthermore, to our knowledge, no previous work has identified specific climate impacts or adaptation responses for wildlife habitat connectivity in the Okanagan-Kettle region (but see Transboundary Connectivity Group (2016)[6]). To address these needs, we describe here a novel effort to identify and address potential climate impacts on wildlife habitat connectivity in the Okanagan-Kettle region of Washington and British Columbia.

Potential climate impacts on habitat connectivity

Project partners focused on identifying potential climate impacts on the heavily fragmented valley floors that present major barriers to wildlife movement within the Okanagan-Kettle region (Fig. M.2), with an emphasis on habitat connectivity priority areas previously identified for the region (Appendix M.1). To

[1] This report is Appendix M of the Washington-British Columbia Transboundary Climate-Connectivity Project; for more information about the project's rationale, partners, methods, and results, see Krosby et al. (2016).[2]

Take homes and remaining needs

- A wide range of climate corridor modeling approaches are available
- More comparison among approaches is needed
- The Northwest has been an innovator and early adopter of climate-connectivity conservation
- Promoting implementation requires significant investment in interpretation and capacity-building

Thank you!

Questions?

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