NAWPA Committee

The North American Intergovernmental Committee on Cooperation for Wilderness and Protected Area Conservation
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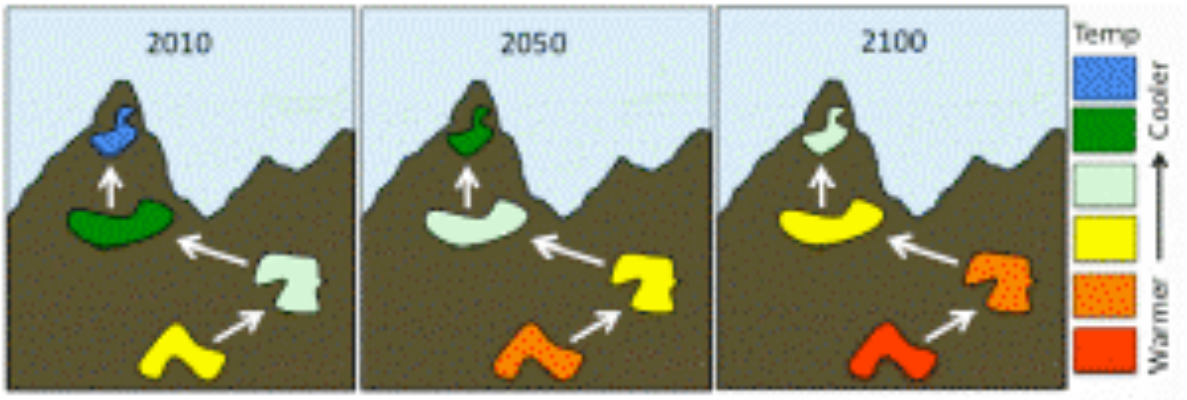
NAWPA COMMITTEE
CLIMATE CHANGE WORKING GROUP

CASE STUDY OF CLIMATE CHANGE IMPACTS AND SOLUTIONS

CLIMATE SUITABLE WILDLIFE HABITAT CONNECTIVITY [MULTIPLE AGENCIES/ENTITIES; CO-FUNDING FROM GREAT NORTHERN LCC AND NORTH PACIFIC LCC (FWS FUNDS)]

ALL TERRESTRIAL AREAS AND ECOSYSTEMS IN THE STATE OF WASHINGTON



Simplified graphic displaying pathways for wildlife in a changing climate

KEY MESSAGES

- *Connectivity conservation is particularly important in the face of climate change. A key means by which wildlife respond to climate change is to adjust their geographic ranges to remain in areas with suitable climate and habitat characteristics.*

- *As the climate has warmed over the past century, the ranges of diverse species have begun moving upward in both elevation and latitude (as one example). These kinds of shifts will become even more important over the coming century as climate change becomes more severe. And yet, wildlife attempting to follow suitable climates will increasingly encounter barriers as they move through fragmented landscapes. Providing a connected network of habitats for wildlife to move as conditions change will help conserve biodiversity into the future.*

IMPLICATIONS FOR PROTECTED AREA MANAGERS RESULTING FROM CHANGING CORRIDORS

- As the climate changes, human land use may impede species from tracking areas with suitable climates. Maintaining connectivity between areas of different temperatures could allow organisms not constrained by limited dispersal to move along temperature gradients and allow species to continue to occupy the same temperature space as the climate warms.
- In the past, species moved great distances relatively unimpeded in response to climatic change (Parmesan & Yohe 2003; Martinez-Meyer et al. 2004).

- Given the rate of projected future climate change, it is likely species will need to move farther in the 21st century (Schloss et al. 2012), and they may encounter substantial anthropogenic barriers that were not present in the past (Sanderson et al. 2002).
- Thus, maintaining connectivity—the degree to which a landscape facilitates the movement of organisms (Tischendorf & Fahrig 2000)—is the most frequently recommended strategy for conserving species diversity in a changing climate (Heller & Zavaleta 2009).

CRITICAL STRATEGIES AND ACTIONS TO MITIGATE OR ADAPT TO IMPACTS

- The Washington Wildlife Habitat Connectivity Working Group used a coarse-filter approach to identify broad corridors for movement between areas where human influence is low while simultaneously routing the corridors along present-day spatial gradients of temperature.
- Researchers modified a cost–distance algorithm to model these corridors and tested the model with data on current land-use and climate patterns in the Pacific Northwest of the United States. The resulting maps identified a network of patches and corridors across which species may move as climates change. The corridors are likely to be robust to uncertainty in the magnitude and direction of future climate change because they are derived from gradients and land-use patterns. The assumptions applied in the model simplified the stability of temperature gradients and species responses to climate change and land use, but the model is flexible enough to be tailored to specific regions by incorporating other climate variables or movement costs.
- When used at appropriate resolutions, this approach may be of value to local, regional, and continental conservation initiatives seeking to promote species movements in a changing climate.
- The strength of this approach it that it identifies corridors of natural lands that cross temperature gradients, a concept that is easily understood but does not rely on predictions of specific movements of individual species. (Such species predictions contain nested uncertainties, and also it is difficult to combine individual bioclimatic corridors for all species in a region into a single network because species-specific corridors can differ greatly among species.)
- Limitations: Parameters in the model are inherently subjective. The temperature threshold used to decide whether to link patches and the cost distances applied to land use and differences in temperature depend on themodeler's judgment. An iterative process of modeling was used with different potential resistance values that resulted in corridors that kept the rate of temperature change in the corridor uniform in direction and avoided areas of agricultural, urban, and exurban land uses. Although subjective, this approach provided a rigorous, transparent, and repeatable way of assessing the effects of different factors. But, other factors such as riparian corridors, and local topographical or geological factors are also likely to be important. Maintaining connectivity for long-distance migrations of birds, ungulates, and other organisms and among wetlands and aquatic systems is not addressed by the climate-gradient approach. These dimensions of connectivity for climate change could be analyzed separately and merged with a climate-gradient based network.

PARTNERS: Organizations that are represented by individuals in the full working group participating in product review, meetings, updates, subgroups, and/or other levels of engagement include: Arid Lands Initiative, BC Parks, Bureau of Land Management, Bureau of Reclamation, Colville Confederated Tribes, Conservation Northwest, Conservation Science Inst., Defenders of Wildlife, Gifford Pinchot Task Force, Hells Canyon Preservation Council, Herrera Consulting, Idaho Dept. of Fish & Game, Ministry of Environment, Oregon Dept. of Fish & Wildlife, SC Wildlands, Shoalwater Bay Indian Tribe, Sierra Club, South Okanagan Similkameen Conservation Program, The Nature Conservancy, The Orainne Society, The Wilderness Society, Univ. of WA, US Fish & Wildlife, US Forest Service, WA Biodiversity Council, WA Dept. of Fish & Wildlife, WA Dept. of Natural Resources, WA Dept. of Transportation, WA State Parks, Western Environmental Law Center, Western Transportation Inst., Yakama Tribes.

USE THE MODEL: fully automated software to undertake this type of analysis is freely available at https://code.google.com/p/linkage-mapper/, thanks to our partners at The Nature Conservancy.

LEARN MORE: A somewhat longer synopsis is also available at this site. The citations above, can be found in the following publication: Nuñez et al. (2013) Connectivity Planning to Address Climate Change. *Conservation Biology*. doi: 10.1111/cobi.12014.

WASHINGTON WILDLIFE HABITAT CONNECTIVITY WORKING GROUP WEBSITE:
HTTP://WACONNECTED.ORG/