USDA Forest Service
U.S. DEPARTMENT OF AGRICULTURE

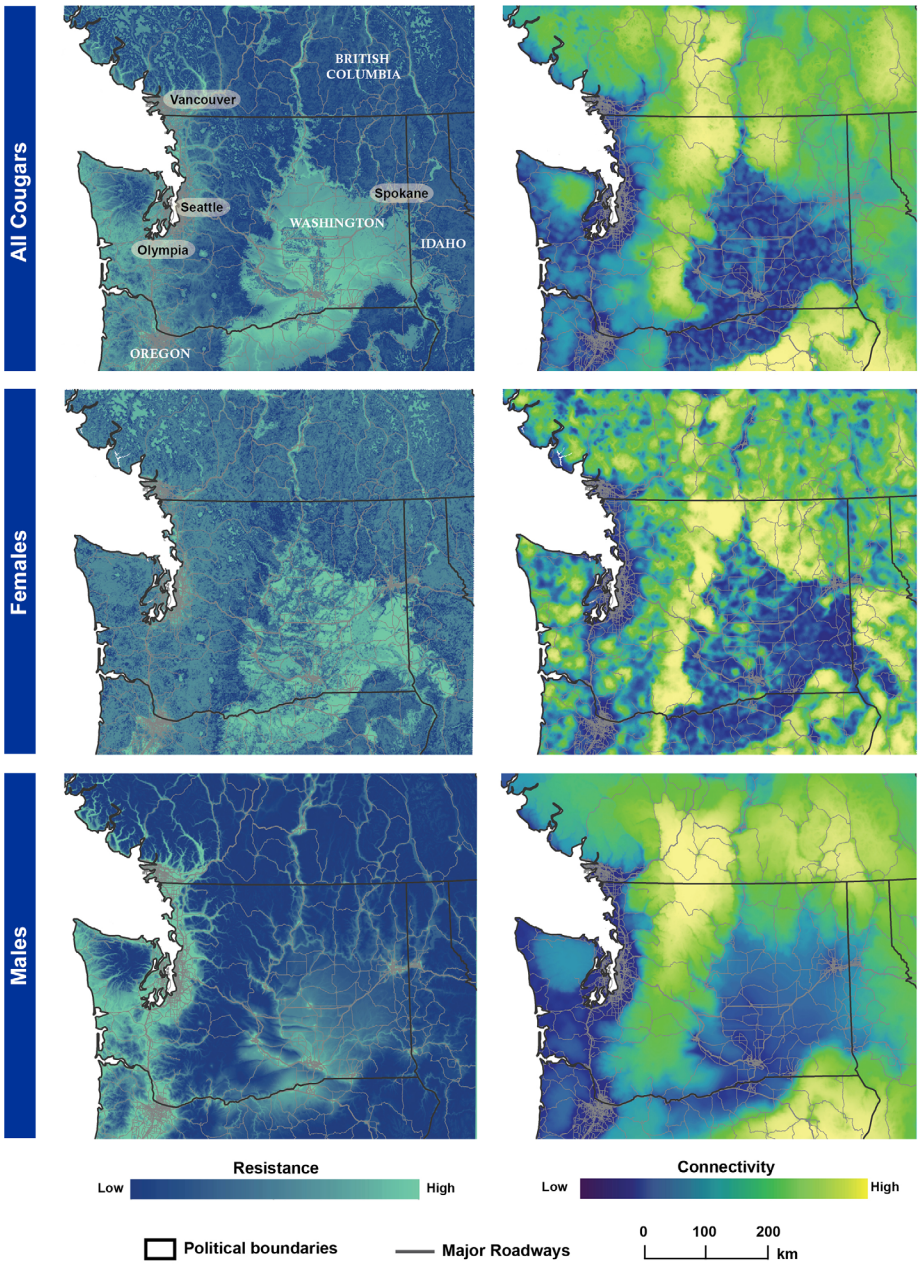
Rocky Mountain Research Station
Science You Can Use *(in 5 minutes)*
JULY 2023

Isolation Consequences: Researchers discover Olympic Peninsula cougars are becoming more isolated based on genetic evidence

Using genetic material from what may be the largest DNA database of its kind on cougars, researchers mapped the connectivity of these wild cat populations across Washington and into British Columbia, Canada. One of the big reveals from tracking how cougar genes flow across the state is: Cougars on the Olympic Peninsula—especially males—are not likely to mingle with other populations.

"The population on the Olympic Peninsula is becoming more isolated from other cougar populations in the state," said lead author Kathy Zeller, a research biologist with the Rocky Mountain Research Station's Aldo Leopold Wilderness Research Institute. This means that these cougars are not breeding very extensively with other populations.

Inbreeding leads to low genetic diversity, which can lower survival



Resistance to cougar movement for all cougars, females, and males (left column), and connectivity (right column) estimated from cougar DNA throughout Washington and south-central British Columbia.

rates, further dilute the gene pool, and cause local extinction. “Genetic diversity on the Olympic Peninsula is not that dire yet, but it’s trending in that direction,” Zeller said.

This research identified Interstate 5 as a possible barrier for the Olympic populations. “It would be a good place for focusing interventions or helping to facilitate movement across that highway corridor there,” she added, “because male cats are getting out but not getting in. So, there’s not a lot of exchange of genetic material from outside populations.”

Using genetic data to model landscape connectivity is a relatively new technique. Genetic data not only captures movement, but it also can track dispersal and breeding success over generations. In this case, the researchers used genetic data from more than 1,900 cougars collected over 15 years.

The researchers produced spatially explicit maps to help managers understand long-term cougar movements through Washington and into surrounding areas. For example, there are sections along the Interstate 5 corridor that appear to offer better gene flow between populations than others. On-the-ground fieldwork could help identify relatively simple solutions to ensure connectivity across barriers like roadways.

“So, if there are things that can be done to maintain or increase connectivity now in a proactive approach, it could prevent more costly reactive interventions in the future, which may or may not work,” Zeller said.

As expected, high gene flow was associated with habitat features like tree cover, but not with agriculture or roads. However, the researchers did not anticipate the sex-specific differences in how males and females move within these different landscapes.

“This is very surprising because males move much farther, so you would think that they would carry that genetic material farther and have actually lower inbreeding,” Zeller noted. “It definitely highlights the fact that in species with different dispersal propensities, there might be real and important differences between the sexes.”

A companion paper to this study focuses on cougar population genetics, finding up to six cougar subgroups that are divided by geography.

Key Findings/Management Implications

- Researchers used genetic data collected over 15 years from more than 1,900 cougars to map connectivity between cougar populations in Washington state and surrounding areas. This helps to identify locations where management can enhance movement between populations.
- More cougars are leaving than coming onto the Olympic Peninsula. This could lead to inbreeding and health problems for the Olympic population.
- It is recommended that sex-specific differences in male and female movement patterns be considered in future landscape genetic research and management decisions.

Further Reading

Warren, Matthew J.; Wallin, David O.; Beausoleil, Richard A.; Warheit, Kenneth I. 2016. Forest cover mediates genetic connectivity of northwestern cougars. Conservation Genetics. 17: 1011–1024.

Wultsch, Claudia; Zeller, Katherine A.; Welfelt, Lindsay S.; Beausoleil, Richard A. 2023. Genetic diversity, gene flow, and source sink dynamics of cougars in the Pacific Northwest. Conservation Genetics.

Zeller, Katherine A.; Wultsch, Claudia; Welfelt, Lindsay S.; Beausoleil, Richard A.; Landguth, Erin L. 2023. Accounting for sex specific differences in gene flow and functional connectivity for cougars and implications for management. Landscape Ecology. 38: 223–237.

Lead Scientist

Kathy Zeller is a research biologist with the Rocky Mountain Research Station, Aldo Leopold Wilderness Research Institute. Her research integrates the fields of landscape ecology, wildlife biology, genetics, and conservation biology to understand wildlife population dynamics, habitat relationships, and movement.