



Reconnecting Nature

How wildlife corridors can help save species



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September, 2021

Acknowledgments

Environment America Research & Policy Center sincerely thanks Ellen Montgomery and Steve Blackledge, colleagues at Environment America Research & Policy Center, for their review of drafts of this document, as well as their insights and suggestions. Many thanks to James Horrox at the Frontier Group, for his thorough review of the document.

Thanks to SaveLACougars, the Kentucky Natural Lands Trust, the Chicago Park District, Yellowstone to Yukon Conservation Initiative, the Nature Conservancy, the Staying Connected Initiative and the Maine Mountain Collaborative, for reviewing key pieces of the report and offering their feedback.

The authors bear responsibility for any factual errors. The recommendations are those of Environment America Research & Policy Center. The views expressed in this report are those of the authors and do not necessarily reflect the views of our funders or those who provided review.

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Layout: To The Point Collaborative, tothepointcollaborative.com

Cover: Elk in line to jump the fence. Wichita Mountains Wildlife Refuge, SW Oklahoma. Photo: Larry Smith, Flickr, Creative Commons 2.0

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Introduction

We need more nature. More nature means abundant wildlife in our world, from butterflies floating by to coyotes howling at night to whale tails breaching the surface just visible from shore.

Nature works better when it's connected. But in the U.S., our wild spaces have been fragmented into many pieces by roads, fences and other products of human development that block the movement of animals. And as we designate new wild spaces, they are often isolated from other areas of habitat. This can push whole ecosystems out of balance, cut off genetic flow between populations, leave animals short of key resources, interrupt migration cycles and leave species more susceptible to other challenges like disease, wildfires and climate change.

While we cannot fully restore ecosystems where roads and cities lie, we must think creatively about how best to restore some semblance of complete ecosystems. A key solution to habitat fragmentation is to create wildlife corridors, projects that reconnect separated habitats, keeping in mind a species' need

for adequate space, food, water, shelter and mates. Corridors can be made up of single projects or networks of small-scale infrastructure, including but not limited to wildlife crossings; conservation easements and land management plans to provide areas of core habitat along which animals can move; and large-scale networks of refuges along migratory paths.

This report provides seven examples of proposed or existing wildlife corridors. It explains what they are, how they work and the ways in which species can recover or even thrive as a result of a concerted effort to reconnect fractured habitats.

The U.S. has multiple laws and policies aimed at protecting species, including the Endangered Species Act, the Marine Mammal Protection Act and the Migratory Birds Treaty Act. As part of a broader exploration of strategies to complement the existing framework of wildlife protection laws, federal, state and local governments should embrace wildlife corridors as a means of protecting our country's amazing wildlife.

Examples of wildlife corridors that can reconnect nature and save species

Bridging California's cougar populations

Los Angeles' urban cougar population is in peril

The Santa Monica Mountains, adjacent to the city of Los Angeles, are home to one of the world's only urban cougar populations. Although this population is stable for now, its long-term survival is threatened by habitat fragmentation caused by freeways, in particular High-

way 101.¹ This dangerous ten-lane highway confines the cougar population to one area of habitat, depriving the cats of the ability to break out into new territory. Since the 101 also blocks new cougars from coming in from the outside world, the Santa Monica Mountains' cougar population is inbreeding and continually losing genetic diversity. This smaller, homogeneous gene pool heightens the cougars' susceptibility to disease

Photo: Living Habitats



Figure 1. Liberty Canyon Wildlife Crossing, a proposed vegetated bridge that will span LA's Highway 101.

and birth defects.² A 2016-study by the National Park Service and researchers from NPS, UCLA, UC Davis and Utah State University predicts that if inbreeding continues at this rate, there is a 15–22% chance the Santa Monica Mountains' cougar population will be wiped out within the next 50 years.³

Bridging habitats over Highway 101

The 2016 study presented wildlife crossings as key to overcoming the barrier of Highway 101- and sustaining the long-term future of Los Angeles' cougar population. The wildlife crossing at Liberty Canyon, a 165-foot-wide land bridge crossing Highway 101 that will link the Santa Monica cougar habitat to public land in Simi Hills to the north, is being built through a public-private partnership. The main partners are Caltrans, National Wildlife Federation, Santa Monica Mountains Conservancy, National Park Service and the Resource Conservation District of the Santa Monica Mountains.⁴ Creating this pathway into the threatened population's Santa Monica Mountains habitat will introduce cougars from other areas into the

population. The result would be genetically diverse - and more resilient - cougar populations throughout southern California. According to the NPS and UCLA study, introducing just one immigrant into the Santa Monica Mountains population every two to four years would slash their extinction probability to 2.4%.⁵ When built, the land bridge will be vegetated to simulate the cougars' habitat and dampen highway noise, encouraging the cats' movement across the structure.⁶

Appalachian forest connectivity supports ecosystems in Kentucky

Pine Mountain: Maintaining an important Appalachian link for native species

The Pine Mountain Wildlands Corridor, a 125-mile forested ridge in the biodiverse mountains of Eastern Kentucky, plays an important role in connecting forest habitat from Tennessee to Virginia.⁷ The ridgeline is within Central Appalachia and part of a continental-scale conservation vision known as the Eastern



Figure 2. Forest connectivity is important for large mammals like black bears, which provide essential ecosystem services such as nutrient dispersal.

Wildway.⁸ The corridor is home to thousands of native species, including endangered Indiana bats and threatened northern long-eared bats that inhabit the region's limestone caves.^{9,10} Central Appalachia is home to the mixed mesophytic forest, one of the most biodiverse ecosystems in the United States.¹¹ In Kentucky, these forests are important for migratory species such as the neotropical birds that come from Central and South America to nest each summer. Additionally, these intact forests are home to black bears, which need interconnected space to roam, forage and mate. Because black bears provide essential ecosystem functions like regulating seed and nutrient dispersal, maintaining healthy habitats for bears is important to overall ecosystem health.

Historically, parts of the Appalachian forests, including portions of Pine Mountain itself, have experienced extensive resource extraction, including from limestone quarries, logging, coal mining and natural gas drilling.^{12,13,14} Extraction remains a threat to this key wildlife corridor. However, conservation and the resulting public lands are becoming a valued asset as the region transitions to a more diversified and sustainable economy.

Maintaining a matrix of protected lands

Kentucky Natural Lands Trust is working with federal, state, private and nonprofit partners to protect this corridor by purchasing parcels from willing landowners and safeguarding forested wildlands for perpetuity.¹⁵ So far, they have protected more than 50,000 acres of wild habitat.¹⁶ Ultimately, a connected patchwork of nature preserves, national and state forests, state parks and wildlife management areas will ensure this mountain continues to be a key corridor connecting Central Appalachian forest habitats.

While Pine Mountain is an important corridor in itself, the Kentucky Natural Lands Trust is working with partners on an even-greater stretch of contiguous forest extending across the Appalachian range along the Eastern Wildway. As Appalachian forests recover from decades of resource exploitation, corridors of protected habitat can help maintain forest connectivity that ensures a strong foundation for the vital ecosystems that inhabit them.¹⁷



Figure 3. Every year, millions of birds such as the threatened rufa red knot migrate across the Great Lakes. Wildlife refuges along their flight paths provide birds with shelter and food.

An urban bird sanctuary in the heart of Chicago

Habitat fragmentation threatens Great Lakes migratory birds

Every spring and fall, millions of migratory species, such as federally endangered Great Lakes piping plovers and monarch butterflies, rely on coastal stopover habitat as they migrate across The Great Lakes.¹⁸ Native habitats near the lakes are important sources of food and shelter for migratory fliers on their long seasonal journeys. Urbanization, invasive species, pollution and climate change along the coasts of the Great Lakes have limited the amount of stopover habitat available for the birds and other flyers.¹⁹

Transforming an urban park into a resting place for birds

Establishing wildlife refuges along major flyways provides birds with corridors that make their migrations safer.²⁰ To provide more contiguous habitat, the Chicago Park District established the Burnham Wildlife Corridor, a 100-acre strip of urban wilderness along the city's southern Lake Michigan shoreline.²¹ Situated

within the greater Mississippi Flyway, the corridor hosts native prairie, savanna and woodland habitats that are important sanctuaries for migratory birds and other animal and plant species. Roughly 300 species of birds, including the state- and federally-threatened rufa red knot, shelter in this area during their migratory routes along Lake Michigan.²² Part of the corridor is vegetated with oak trees, which host numerous caterpillar species that are a major food source for the birds. The Burnham Wildlife Corridor is also accessible to the public, allowing visitors to learn about the importance of wildlife refuges and native habitat in urban settings.²³

Reconnecting grizzly bears in the Northern Rockies

Remnants of a bear population

The Northern Rockies contain the sole remaining grizzly bear population in the lower 48 states, numbering approximately 1,810 bears.²⁴ Throughout the nineteenth and twentieth centuries, grizzly habitat in the Northern Rockies was fragmented into smaller patches by roads, logging, livestock grazing and other human development. These smaller habitats do not provide the bears with sufficient space for foraging

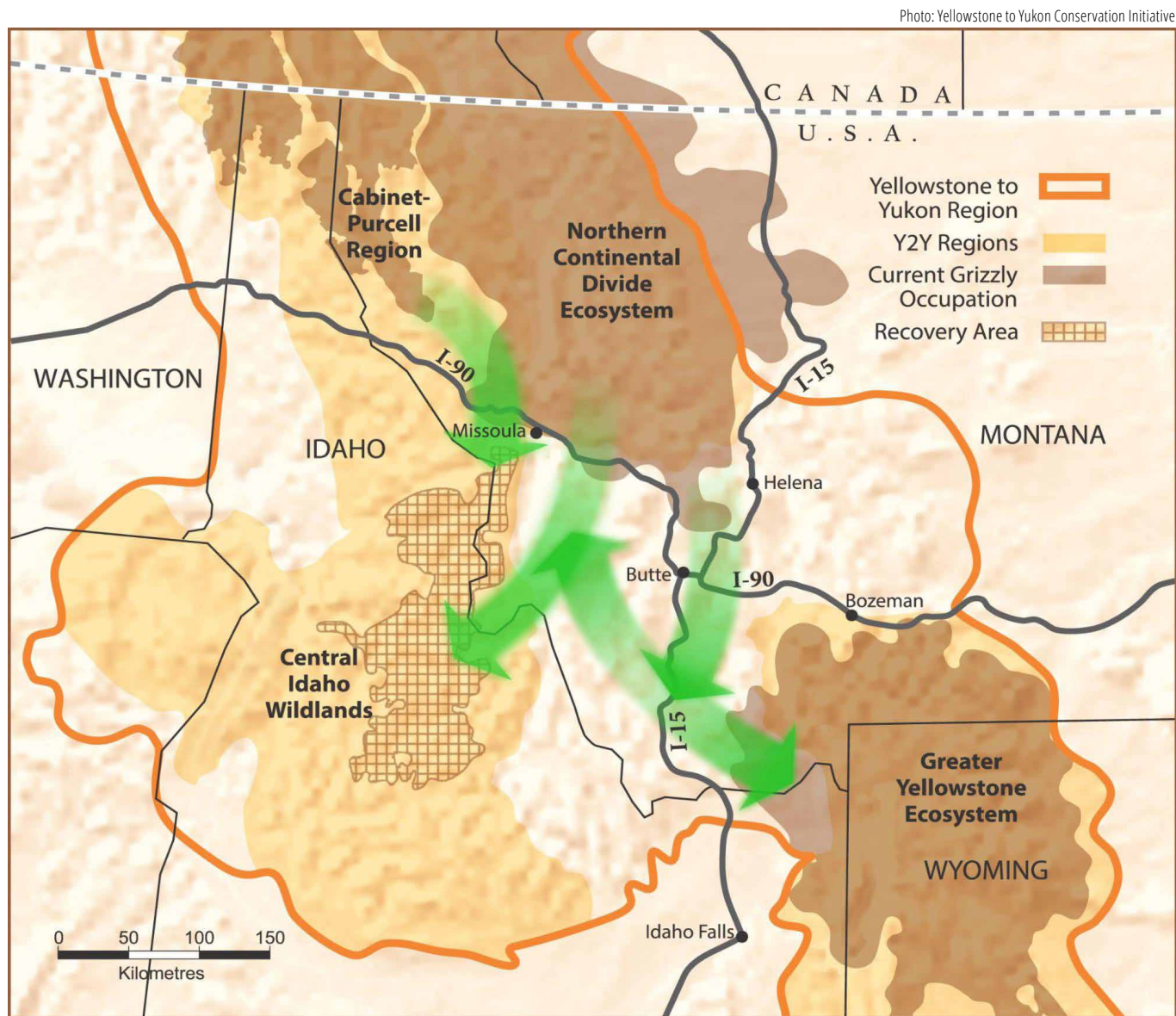


Figure 4. Yellowstone to Yukon's proposed corridor system to reconnect grizzly bear populations in the Northern Rockies.

and mating; grizzlies are known to be solitary animals and need hundreds of square miles of habitat in order to feed, roam and mate.^{25,26} Small, fragmented populations face health consequences that threaten their survival: ecological studies indicate that leaving grizzly populations small and isolated makes them vulnerable to problems that come with decreasing genetic diversity, such as birth defects and susceptibility to disease.²⁷

A return to historic ranges

Conservation groups, including the Yellowstone to Yukon Conservation Initiative (Y2Y), are collaborating with agencies and Indigenous communities in the U.S. and Canada to reconnect grizzly bear populations throughout the Northern Rockies. Natural areas between grizzly bear habitat in Montana, Wyoming and Idaho are being expanded and protected so they can reconnect grizzly populations with prime habitat in the Bitterroot Ecosystem Recovery Area in central Idaho.²⁸ By working with willing property owners to establish conservation easements and purchasing and protecting land, Y2Y and its partners are establishing corridors that will give grizzly bears

the space they need, as well as the means for isolated populations to intermix and build genetically diverse, robust populations.²⁹

Preparing New England's ecosystems for climate migrations

Implications of a warming climate on the Northern Appalachian-Acadian Ecoregion

The Northern Appalachian-Acadian Ecoregion extends from northern New York through Maine and Vermont, all the way to Quebec and Nova Scotia. Extensive coastlines, inland mountain ranges and various types of forests throughout the area provide habitat to a rich variety of mammals, birds and plants, creating one of the most biodiverse ecoregions in North America.³⁰ This natural open space will play a critical role in allowing species to shift their ranges in response to environmental changes.³¹ However, commercial and industrial development in the ecoregion's forested mountains threatens to fragment the core habitat that provides plants and animals with pathways for climate migrations.³²

Photo: Keith Williams via flickr_cc by 2.0



Figure 5. In a warming climate, Canada lynx depend on climate corridors in the Northeast for new habitat.

Land protections pave a way for species headed north

Government agencies, private organizations and citizens are collaborating to establish corridor systems that keep habitat interlinked throughout the region. For example, partnerships like the Staying Connected Initiative, which functions at the full ecoregion scale, and the Maine Mountain Collaborative, which works in one portion of the ecoregion in western Maine, are working to study animal movement, identify locations for wildlife crossings, pursue restoration projects and protect key areas that link up core habitats throughout the state.^{33, 34} These corridors will provide a way for ecosystems and species like black bears, martens and lynx to migrate northwards as global temperatures continue to rise.³⁵

Wyoming's wildlife crossings allow western herds to migrate safely

Roads are obstacles for America's largest migratory herds

Every year, millions of ungulate animals ~ mule deer, moose, elk and pronghorn ~ migrate across the western United States. These animals travel as far as 150 miles seasonally and are dependent on the west's large, interconnected swaths of open habitat in order to manage the transition between seasons. In western states like Wyoming, roads pose a major threat to migrating herds, which can comprise more than ten thousand animals.³⁶ Roadways disrupt migration routes and put animals at risk of lethal vehicular collision; every year, more than 6,000 elk, pronghorn, deer and moose are killed by vehicles on Wyoming roads alone.³⁷

Photo: Tom Koerner/USFWS



Figure 6. Wyoming is an important location for the largest ungulate migrations in the United States.



Figure 7. Anadromous fish, such as salmon, depend on aquatic connectivity to migrate between oceans and rivers. Dams impede aquatic connectivity, blocking fish from upstream habitat.

Mapping out networks of wildlife crossing structures using data

Preserving Wyoming's ungulate herds means ensuring that they can safely migrate across an increasing number of man-made obstacles, including roadways. Using data-driven approaches, local agencies and organizations such as the Wyoming Wildlife and Roadways Initiative, a joint project by the Wyoming Game & Fish Department and Wyoming Department of Transportation, use wildlife crossing structures to make roads safer for large migratory mammals.³⁸ Approximately [240 roadway sites](#) throughout the state were identified as posing the greatest risk to wildlife and motorists. [Forty-three sites](#) were identified as high-priority and in need of crossing structures such as underpasses and overpasses. Wildlife crossing structures have already been built at several of these sites. Data shows that wildlife-vehicle collisions associated with these sites have decreased by more than 80 percent, thanks to the

addition of wildlife crossing structures.³⁹ Other western states through which large ungulate migrations pass are also creating effective wildlife corridors that allow animals to safely navigate roads.⁴⁰

Restoring aquatic connectivity for salmon in Washington

Dams unravel river ecosystems

Prior to its damming in the early twentieth century, the Elwha River in Washington state flowed freely from the Olympic Peninsula's inland mountain ranges to the Strait of Juan de Fuca.⁴¹ Huge schools of salmon and other native anadromous fish species would swim unimpeded to their spawning grounds along the 45-mile long river. Birds and mammals that fed on these fish passed their nutrients into the surrounding riverbanks, supporting robust forest ecosystems.⁴²

In the early twentieth century, the river was plugged with the Elwha and Glines Canyon Dams to provide hydropower for the northwest's growing timber industry. These dams limited fishes' access to just a few miles of river, cutting off key spawning habitat upstream. The dams also prevented sediment and nutrients from naturally flowing downstream, causing riverbanks to erode and spawning habitats to deteriorate. By separating upstream and downstream habitat, the dams ended up decimating local salmon populations.⁴³ The large-scale loss of fish meant the elimination of a significant food source for many species of birds and mammals, from bald eagles, to black bears, to orca – and the decline of riverine ecosystems along the Elwha.⁴⁴

Removing dams revives Elwha River ecosystems

The passage of the Elwha River Ecosystem and Fisheries Restoration Act in 1992 required the removal

of the Elwha and Glines Canyon dams and subsequent projects to restore and monitor the damaged Elwha River ecosystems.⁴⁵ Since the removal of these dams in the past decade, fish populations have begun to rebound.⁴⁶ With the return of the fish and the restoration of natural sediment flow, other species are starting to benefit. For example, the renewed salmon population is already improving the health and longevity of the local American dipper population, as studies indicate that these birds benefit from access to salmon as a nutrient-rich food source.⁴⁷ Because of the dams' disruption to natural ecosystem and riverine patterns, the National Park Service estimates that it will take at least a generation for the Elwha River's ecosystems to return to their natural state. However, the steady return of salmon to the river since the removal of the dams demonstrates the potential for wildlife corridors to bring back aquatic wildlife populations and recover damaged ecosystems.

Policy recommendations

The United States has multiple laws and policies aimed at protecting species. Wildlife corridors can complement existing laws by strategically reconnecting isolated and fragmented habitats. Doing so allows for the free movement of animals (and their genes), resulting in increased biodiversity and healthier, more sustainable ecosystems. Moreover, corridors would help prepare America's wildlife for 21st century challenges such as habitat loss, wildfire and climate change.

Recommendations for Congress

Congress should fund wildlife corridors and create structures for agencies to collaborate in developing a national plan to reconnect nature.

Congress should also fund fish and wildlife crossings that will reduce wildlife-vehicle collisions and connect habitat in the next transportation reauthorization bill.

Congress should look to states that have already adopted wildlife corridor bills to find best practices in developing corridors that effectively connect habitats and increase animal population and health.

Congress should utilize the Great American Outdoors Act's expansion of the Land and Water Conservation Fund, where appropriate, to reconnect habitats.

Recommendations for the Interior Department

In 2018, Interior Secretary Zinke signed Secretarial Order 3362. This order set up a program, coordinated between the federal government and 11 western states, aiming to increase habitat and habitat

connectivity to help elk, mule deer and pronghorn with their yearly migrations. The Interior Department should build on this order by including other animals such as bears and migratory birds, and the department should expand the scope of the order beyond those 11 states.

Recommendations for Department of Transportation

The department should dedicate resources to adding or retrofitting structures in such a way as to reduce wildlife-vehicle collisions and increase habitat connectivity.

Recommendations for local and state governments

States should adopt policies similar to wildlife corridor laws in New Mexico (SB228) and Oregon (HB 2834), which require state fish and wildlife agencies to study wildlife movement and work with state transportation agencies to identify priority locations for wildlife crossings. States should develop pilot programs and start working to identify the highest value corridor opportunities.

Recommendations for individuals

Individuals can help support projects like the LA cougars crossing, which has been largely funded by private donations. Individuals should also consider helping birds and pollinators by planting local native vegetation on their property, effectively creating stopover habitat in their backyards.

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