



**TOP** Principal investigator, Robert Long removes bear hair from a barbed-wire corral. (Credit: Paula MacKay)

**Contact:** paula.mackay@coe.montana.edu

**Partners include:**

Western Transportation Institute,  
Okanogan-Wenatchee National Forest,  
North Cascades National Park,  
Washington State Department of Transportation,  
Washington Department of Fish and Wildlife, and  
Conservation Northwest.

## Carnivores and Highways

The Cascades Carnivore Connectivity Project (CCCP) is an extensive, multi-partner (Western Transportation Institute, Montana State University, North Cascades National Park, and Okanogan-Wenatchee National Forest) effort to study and ultimately help reduce the barrier effects of major highways and development on carnivores in the North Cascades Ecosystem (NCE) of Washington. Research has shown that transportation corridors characterized by high road densities and substantial vehicle traffic can result in “fracture zones” that are detrimental to carnivore populations because they increase mortality and inhibit natural patterns of animal movement. This scenario becomes all the more important in the context of global climate change, which may require large geographical shifts for some wildlife populations.

Landscape-scale connectivity, which allows animals to move within ecosystems and provides for genetic exchange with outside populations, is a crucial component of carnivore recovery and conservation. In recent years, noninvasive survey methods have enhanced our ability to collect genetic samples from elusive carnivores across expansive landscapes. Samples collected can then enable researchers to assess patterns of gene flow and to visualize the results of movement barriers on the genetic structure of populations.

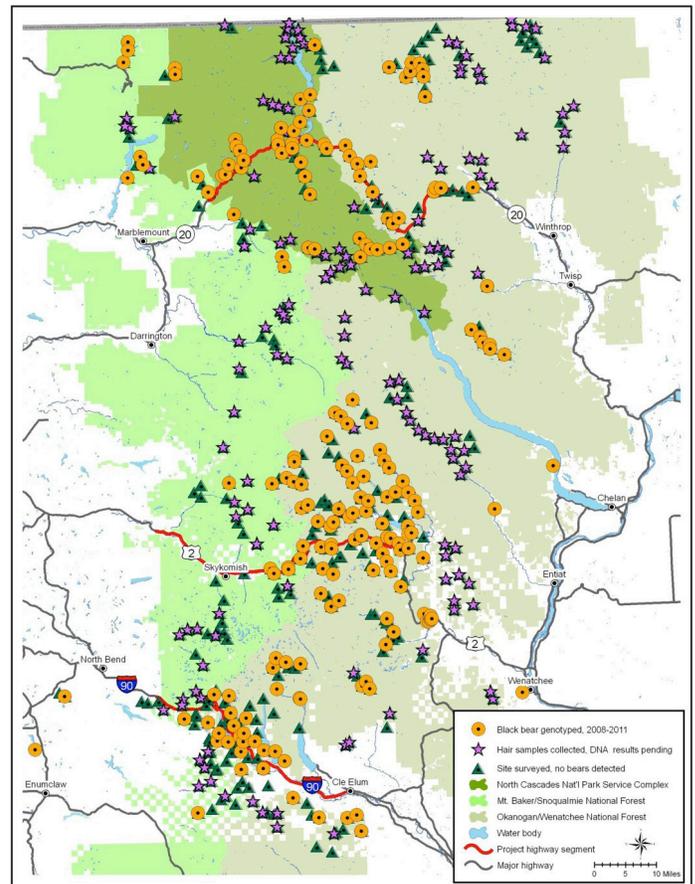
### Status and Trend

Field work began as a pilot study along I-90 and Route 2 in 2008 and has since evolved and expanded in 2009 through 2011 to include SR 20, all major transportation routes that bisect the Washington Cascades. Survey methods have focused on noninvasive techniques used to collect hair samples from primarily black bears (*Ursus americanus*) and American martens (*Martes americana*). In addition, a broader initiative was implemented in 2010, and continuing through 2012, to survey for grizzly bears (*Ursus arctos*) in the North Cascades Ecosystem, as part of the U.S. Fish and Wildlife

Service’s long-term recovery planning process for this species. By the end of the 2011 field season a cumulative total of 569 bear corrals were deployed throughout the NCE. A total of 2,866 hair samples were collected from these corrals, and DNA tests are pending on the 754 sub-selected samples collected during the 2011 field season and sent to Wildlife Genetics International (Nelson, British Columbia). In addition, 351 marten enclosures have been deployed to-date, culminating in 646 hair samples collected. Genetic samples from focal species will be combined for all years 2008 (pilot) through 2011 such that there will be a sufficient sample size to conduct a comprehensive landscape genetic analysis to determine genetic structuring among focal carnivore populations. Preliminary analyses using program STRUCTURE indicate that some population structuring is occurring among black bears in the NCE, with three strong genetic clusters emerging across the study area.

### Discussion

An extensive pool of genetic samples from focal carnivore species will be collected over the course of this project. These samples will allow researchers to



**LEFT** Black bear caught on a remote camera entering barbed wire corral and leaving behind a hair sample for genetic analysis. **RIGHT** Map of study area in North Cascades Ecosystem showing locations of deployed bear corrals and detection results.

create a map of locations where each species was detected—a valuable tool for conservation and land-use planning. DNA samples will also provide important insights into the genetic diversity of surveyed populations, while the combination of location and genetic information will further help describe likely fracture zones and potential corridors for carnivore movement. Samples collected from rare carnivores will help to document the presence of these species, and may yield valuable population-level insights as well (e.g., information regarding the source populations of rare species). Finally, these efforts will produce critical baseline data for future research on climate change and carnivore distribution. This research will help to ensure that transportation planners, land managers, conservationists, and citizens have the scientific information necessary to make sound decisions on behalf of carnivores in this region.

Visit: [www.carnivoreconnectivity.org](http://www.carnivoreconnectivity.org) for more information.