Every day we travel along a system of roads to meet our need for food, shelter, and family. Wildlife species also use a network of paths to access their basic survival needs. Although we think of roads as thin linear strips with only a slight influence on the landscape, human paths have serious consequences for animals and people. Roads fragment wildlife habitat, which reduces an animal's access to resources on the other side of the road. And when animals do attempt to cross over, this action can be fatal to them and to the humans driving on the road. The Critical Paths Project is an effort to keep wildlife habitat connected and improve safety for motorists.

Roads and Wildlife: Fragmented Habitat and Driving Hazards

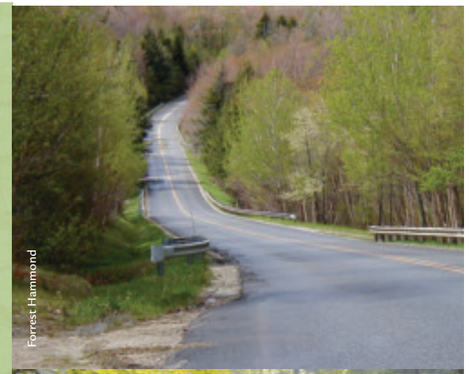
Habitat requirements for each wildlife species differ. The size of the habitat can be anywhere from a few yards to thousands of acres. Food sources consist of different plants and animals. Shelter can be a rock or cave. But regardless of the special characteristics, all animals need to move freely within their habitats. A black bear in New England, for example, requires 10,000 acres of land to successfully meet its annual life needs and will travel great distances to find food sources. But even small creatures migrate to survive. In the spring, amphibians like the spotted salamander travel from hibernation sites to breeding pools.

Roads fragment wildlife habitat by presenting barriers that prevent animals from accessing essential feeding grounds, breeding areas, and shelter. A road barrier can be anything from traffic noise to pollution to the way it is physically built. Traffic noise, for instance, prevents some songbirds and marsh-nesting birds from locating mates and discourages nesting and the rearing of young. Some species of nocturnal frogs will avoid a road because of the lighting. Guardrails, steep shoulders, brush, and traffic are examples of physical barriers. In one case, maintenance workers in Vermont reported following a bear who was desperately trying to get off the road but couldn't find a gap in the guardrail.

When human and wildlife travel networks overlap, the results can be uncompromising and fatal. Animals are frequently drawn to saltlicks, water, or desirable vegetation along the road. For example, in Northern New England motorists reported swerving around a cow moose and her calf that frequently came down to lick the road salt throughout the winter. According to the National Highway Traffic Safety Administration, animal-vehicle accidents cost $1 billion annually in property damage and cause an average of 165 human deaths. For the animals involved, collisions with vehicles are the leading direct human cause of wildlife mortality, surpassing hunting.

These problems are becoming more severe as our climate changes. Since 1970, the Northeast has been warming at a rate of 0.5° F per decade, with winter temperatures rising 1.3°F per decade. This warming trend is changing the vegetation and the migratory behavior of animals. Species that survive in northern temperate climates are moving farther north to find suitable habitat and sources of food that no longer exist where they are. They are encountering roads all along the way. In a warming world, connecting migratory corridors for wildlife is more crucial than ever.

Animal-vehicle accidents cost $1 billion annually in property damage and cause an average of 165 human deaths. – National Highway Traffic Safety Administration


Forrest Hammond

John Austin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Safe Crossings for Wildlife and People

The Critical Paths Project is working to accommodate wildlife movement around and through the transportation system and to minimize habitat fragmentation. In Vermont, a partnership of conservation organizations, municipalities, state and federal agencies, and citizens are studying how roads affect wildlife populations and devising common-sense and cost-effective solutions that benefit both wildlife and people. A team of state biologists and conservation organizations have identified eleven critical "Priority Crossing Zones" along the spine of the Green Mountains that are essential to south-north wildlife movement. The researchers assessed the physical features of the crossings and the natural features of adjacent landscapes. They tracked and monitored wildlife movement patterns at each crossing over an extended period of time. Then, in consultation with resource professionals, transportation experts, and local citizens, they developed key strategies to make our roads safer and improve wildlife habitat connectivity:

- **Road mitigation.** Gaps in guardrails allow animals to exit the road quickly. Less salt can be used. Along with lowering speed limits, improved road signage warns motorists they are entering a wildlife crossing zone. Culverts (water pipes under the road) constructed with wildlife in mind allow reptiles, amphibians, and small mammals such as fox and coyote to pass under the road. Over- and underpasses allow animals to pass above or below traffic.
- **Roadside improvements for traffic safety and wildlife crossing.** Removing trees and thick brush along the shoulder of the road improves visibility for drivers. Removing salt licks reduces the time wildlife spend near roadsides. Roadside vegetation and other improvements are made to encourage wildlife to cross at places where it is safe.
- **Land conservation.** Conserving land adjacent to a critical road crossing may afford wildlife several safe crossing options and promote habitat connectivity.
- **Local land use planning.** Towns and regions can incorporate specific provisions within their plans and related ordinances that provide for crossings for wildlife and safer roads for people. For example, carefully crafted subdivision regulations and creative zoning strategies, such as wildlife overlay districts, can ensure that new development minimizes the negative affects to wildlife crossings.

As wildlife habitat comes under increasing pressure from road development and climate change, the work of the Critical Paths Project will help enhance migration pathways, strengthen wildlife populations, and reduce animal-vehicle collisions. If you wish more information about the Critical Paths Project, please contact either the National Wildlife Federation Northeast Regional Center at **knightc@nwf.org** or the Vermont Natural Resources Council at **jfidel@vnrc.org**.

The Critical Paths report can be found online at:
http://www.nwf.org/northeast or
http://www.vnrc.org/library/publications

As shown here safe crossings involve making roads more animal-friendly, researching how wildlife access habitat, alerting motorists, and undertaking smart town planning.

Where There Are Houses There Will Be Roads

From the Critical Paths report....

In 1970, there were 165,063 housing units in Vermont. By 2000 this number had increased to 240.634. From 1960 to 1990, Vermont's rural population increased by 59%. And where there are houses, there must be roads. In the last quarter of the 20th century, Vermont expanded its road system by an average of 26 miles per year to a total of about 14,251 miles. The number of vehicle miles traveled by Vermont residents is growing at seven times the rate of population growth. As of 2008, Vermont had a total of 14,122 miles of public roadways, and 13 major roadways running east to west, bisecting large tracts of undeveloped lands that run north to south along the length of the state. This type of development necessitates the construction of new roads, which increase habitat fragmentation as the roads dissect contiguous blocks of core habitat that are critical to the survival of a multitude of native species.

The Critical Paths partners:

The National Wildlife Federation — *Northeast Regional Office*

Vermont Natural Resources Council

Vermont Department of Fish & Wildlife

Vermont Agency of Transportation

U.S. Forest Service — *Green Mountain National Forest*

The Critical Paths Project funding:

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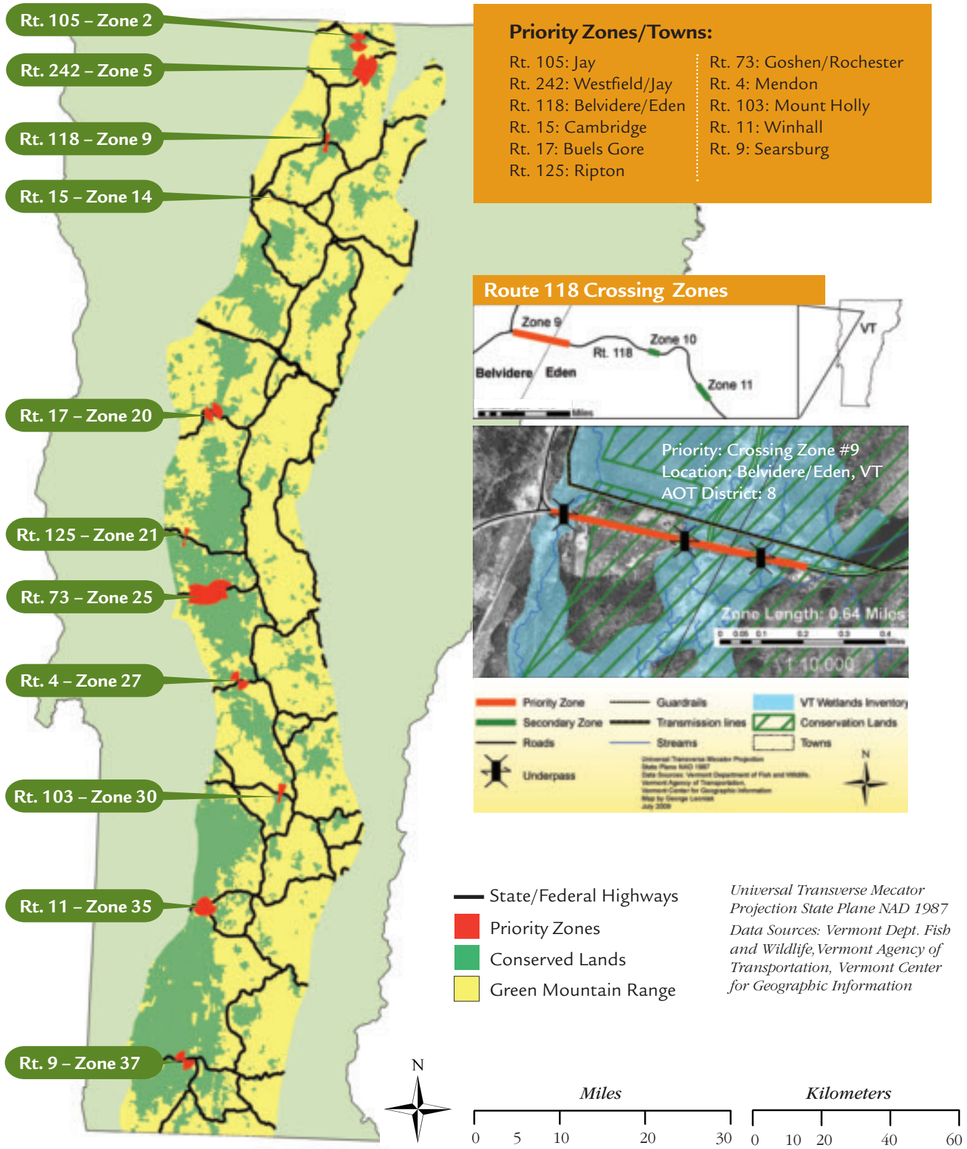
Priority Wildlife Crossing Zones

As shown on this map, the Critical Paths Project has identified 11 priority zones of the 38 wildlife crossings that were surveyed along the spine of Vermont's Green Mountains. The inset map (below right) shows the three zones that were monitored along Route 118, and highlights the detailed physical characteristics of the priority zone between Belvidere and Eden. Priority crossing zones were selected based upon criteria such as high species use and diversity, the presence of core habitat on either side of the road, as well as natural and physical features.



Priority Zones/Towns:

Rt. 105: Jay
Rt. 242: Westfield/Jay
Rt. 118: Belvidere/Eden
Rt. 15: Cambridge
Rt. 17: Buels Gore
Rt. 125: Ripton
Rt. 73: Goshen/Rochester
Rt. 4: Mendon
Rt. 103: Mount Holly
Rt. 11: Winhall
Rt. 9: Searsburg

Route 118 Crossing Zones

Universal Transverse Mecator Projection State Plane NAD 1987
Data Sources: Vermont Dept. Fish and Wildlife, Vermont Agency of Transportation, Vermont Center for Geographic Information

Map by George Leontiak July 2009

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Critical Paths

Making Roadways Permeable for Wildlife and Human Safety

In the evening dusk, a female black bear and her two cubs stop beside a busy road. Across the road from them is a stand of beech trees they frequent to eat nuts that help build fat reserves needed for the long winter hibernation. Cars and trucks speed by as people make their way home from work, go to the market to pick up something for dinner or pick their children up from school. All too frequently, wildlife face the life or death dilemma of whether or not to cross a busy roadway in an effort to find food, shelter, or a suitable migration route.