Assessing Habitat Connectivity Through Transportation Corridors on a Broad Scale: an Interagency Approach

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Abstract

Highways have long been considered to have an adverse impact on wildlife, but until recently very little work has been completed to determine how to minimize these impacts. The highway/wildlife impact recently became an issue in Washington State when the US Forest Service designated a portion of Wenatchee and Mount Baker Snoqualmie National Forests as an Adaptive Management Area (AMA). A major management objective for this area is providing habitat connectivity. Interstate 90, the major east-west transportation corridor in Washington State, passes through the Wenatchee and Mt. Baker-Snoqualmie National Forests, in the AMA, posing a challenge to meeting their mandated requirement to maintain habitat connectivity through the Snoqualmie Pass AMA. Consideration of these issues lead to the partnering of both the Forest Service and the Washington State Department of Transportation (WSDOT) in a joint study which will identify ways to provide for habitat connectivity across the highway. The goal of the study is to examine the relationships between wildlife and interstate highways corridors, in terms of habitat connectivity and human safety, then use that information in conjunction with a complementary Forest Service landscape study to develop a general methodology for integrating transportation and landscape planning. The study will determine where connectivity corridors are located and where they should be maintained within the study area. Management strategies and techniques will be developed which will help facilitate both organizations in meeting their goals of providing habitat connectivity while providing for a safe and cost effective transportation system for the people of Washington State.

Introduction

Wildlife managers have expressed concern that highways create significant barriers to movement and sources of mortality for wildlife, resulting in fragmented populations and lowered population viability for some species (Maehr et al. 1991, Bennett 1991). This problem may be most severe for species with slow reproduction rates and large ranges of movement or dispersal; medium to large forest carnivores are considered to be particularly vulnerable to its effects (Rudiger 1996). In addition to these direct impacts to wildlife are the indirect impacts, the avoidance of the roadway and the habitat in close proximity to the roadway that many species such as elk and grizzly bears exhibit. From a human perspective, motor vehicle collisions with large mammals, such as deer and elk, are a serious safety hazard to motorists and result in considerable property damage (Romin and Bissonette 1996).

Major highways also contribute to the fragmentation of habitat. This has become a major issue for forest management agencies, especially for late-successional forests and their related old growth dependent species. While habitat connectivity is normally a topic dealt with by wildlife management agencies and not transportation agencies, the increased listing of species under the ESA and the potential of the direct mortality of a listed species due to the existence or expansion of a highway has made planning for habitat connectivity an issue. In Florida the presence of public lands managed for natural values and the presence of the endangered Florida panther provided the impetuous for the Florida Department of Transportation to include wildlife undercrossings in the highway design during the construction of Alligator Alley - Interstate 75 across the southern end of the state (Evink 1996). For Washington State Department of Transportation, (WSDOT), this issue arose when the Draft Environmental Impact Statement (DEIS) for the Snoqualmie Pass Adaptive Management Area (AMA) Plan was issued by the Wenatchee and Mt. Baker-Snoqualmie National Forests. The main focuses of the AMA include maintaining habitat conductivity, maintaining and creating late-successional habitat, and maintaining connectivity of all organisms in the AMA.

The Wenatchee and Mt. Baker-Snoqualmie National Forests are part of a large contiguous block of public land encompassing much of the Cascade Mountains Range, a north-south trending Range which extends from Canada through Northern California. Public lands in the Cascades include two national parks (North Cascades National Park and Mt. Rainier National Park), and four National Forests (Mt. Baker-Snoqualmie, Okanogan, Wenatchee, and the Gifford Pinchot). These lands form an almost unbroken band of federally-owned property extending from the Canada border to the Oregon border.

There are five east-west trending highways which cross the Cascades only three of which are open during the winter. Except for a short stretch of highway on the east side of Mt. Rainier National Park, there are no north-south running highways in the Cascades. The main highway is Interstate (I) 90 which crosses the Cascades through Snoqualmie Pass in the center of the state. It is the major transportation, energy, communication and recreational corridor connecting eastern and western Washington (USDA 1997). Interstate 90 varies from two lanes to four lanes in each direction and from being separated by a median barrier to being separated by a mile of natural habitat. The highway bisects part of the Mount Baker-Snoqualmie and Wenatchee National Forests.

The Interstate 90 transportation corridor was identified as a barrier to animal movement in the FEIS for the AMA. Yet this concern was not discussed with WSDOT during the preparation of the DEIS. Once WSDOT reviewed a copy of the DEIS, meetings were initiated with the Forest Service as none of the recent WSDOT planning efforts within the corridor included means intended for animal movement across the highway. Based on the needs of WSDOT to provide a safe highway and the Forest Service's need to maintain connectivity, the agencies joined forces to initiate a study which will integrate an ecosystem management approach with transportation planning to maintain habitat connectivity and enhance driver safety for the Snoqualmie Pass area.

The Study

The study contains two major components. The first is being completed by the Forest Service and consists of a landscape corridor/connectivity modeling study. The second component which is funded by WSDOT examines the relationships between wildlife and interstate highway corridors in terms of habitat connectivity and human safety. The information gained from both components will be combined to develop a general methodology for integrating transportation and landscape planning. The study will use the Snoqualmie Pass AMA as a case study to facilitate the successful implementation of the AMA Management Plan.

The study objectives include:

1. Develop spatial landscape models that identify the location of current late-successional habitat corridors for several "indicator" species.

2. Determine the nature of highway and road barrier effects on animal movements and populations.

3. Develop highway management approaches for integrating wildlife conservation and human safety.

The study is in the process of developing the indicator species models. The habitat connectivity models will simulate current landscape conditions without highway barriers. Indicator species selected for the study include American marten, Northern spotted owl, and elk. These species were selected to represent guilds important in the study area. The American marten represents forest carnivores which are tied to late successional forests and have a low tolerance for human influences. Spotted owls are a species of major concern in the AMA and the Pacific Northwest. They have been intensely studied and data on demographics and movement patterns are available for the AMA. Elk were chosen for their importance as a game species and because they are a major species of concern relative to highway safety. There are several other species which are under consideration but which will not be as intensely modeled; these include the grizzly bear, the Cascades red fox, northern red back vole and long-toed salamander. The grizzly bear is considered an umbrella species, representing wide ranging species which are sensitive to human disturbance. The Cascade red fox is a highly mobile, fairly common, small carnivore, which may be used for telemetry or other road crossing oriented studies. Both the salamander and the vole are widely distributed throughout the state, but they are low mobility species to which I-90 may form an impassable barrier. The models create GIS maps of habitat suitable for meeting the life cycle requirements for the species, and areas suitable for dispersing. These maps will show the existing corridors, and the gaps in the habitats. Models will be created under current conditions, and then under various habitat management alternatives and time lines e.g. 10, 30 and 50 years in the future. Using these models, both current and future connectivity needs can be addressed.

Simultaneous with the model development is the development of a database on highway crossing conditions. While it is assumed that the highway constitutes some form of a barrier to movement, the degree and means of wildlife movement is not know. The database will document how wildlife are presently crossing the highway and how any existing structures may be utilized. An inventory of the existing bridges, culverts, overpasses, and other highway features throughout the AMA will form the backbone of the database. Habitat along the highway will be classified and potential crossing structures will be monitored through the use of cameras. Snow tracking will be used to monitor animal behavior at these crossing. Spotted owl radio telemetry and banding records will be examined to determine if and where owls cross the highway. Additional radio collar studies may be completed on marten, fishers or Cascade red fox to examine road crossing behavior.

Road kill data will be used to evaluate for which species I-90 is a source of mortality, and to determine whether habitat corridor locations coincide with high mortality areas. Over 15 years of data is available for deer and elk, and additional roadkill surveys for small and medium sized mammals and birds will be conducted.

The data collected from the snow tracking, culvert/bridge monitoring, and roadkill data will be used to refine the connectivity models. The models will be examined under various scenarios to determine the impacts that I-90 has on habitat connectivity. Mitigation strategies for landscape and highway management will be developed based on the models and information collected at crossing points. Included in the models is the ability to predict future vegetation changes, and vegetation management goals. This will allow WSDOT to determine where wildlife under-or overcrossings are required to maintain connectivity and allow for safe movement of animals across the roadway.

Expected Results

Two types of benefits are anticipated from this study, general benefits which relate to the process, and direct benefits to I-90 and the AMA. General benefits include the creation of the methodology for integrating management of the forest landscape and the transportation corridor to maintain or restore habitat connectivity and ensure human safety. The methodology can then be applied to other highways throughout the state and others nationally. The study will also provide general parameters for where wildlife crossings should be located.

Direct benefits for WSDOT include determining which locations on I -90 would be suitable for crossings based on animal movement patterns and the habitat connectivity models. Information collected on the use of existing structures as crossing structures can be used to modify future structures to facilitate wildlife movement. All of this information can be used in future planning efforts on this corridor, and deer and elk vehicle collisions may be reduced as a result. The Forest Service can use the information on where I-90 is a barrier to wildlife and the models to plan future timber harvest and land acquisitions activities.

Conclusion

A partnership approach has been initiated between WSDOT and the US Forest Service to address potentially conflicting public mandates, and improve habitat connectivity concerns within the Snoqualmie Pass AMA. A major part of the partnership is a joint study which will use landscape and species based models to identify current habitat corridors, identify current crossing conditions, and determine where existing barriers occur. Mitigation strategies will be developed which will help facilitate both organizations in meeting their goals of providing habitat connectivity while providing for a safe and cost effective transportation system for the people of Washington State.

References Cited

Bennett, A.F. 1991. Roads, Roadsides and Wildlife Conservation: A review. Pages 99-117 in D.A. Saunders and R.J. Hobbs, eds. Nature Conservation 2L the Role of Corridors. Surrey Beatty & Sons Pty Limited, NSW Australia..

Evink, G. 1996. Florida Department of Transportation Initiatives Related to Wildlife Mortality. In: Evink, G.L., P. Garret, D. Zeigler and J.Berry eds: Trends in Addressing Transportation Related Wildlife Mortality. Proceedings of the transportation related wildlife mortality seminar. June 1996. State of Florida Department of Transportation Environmental Management Office. Tallahassee Florida. FL-ER-58-96.

Maehr, D.S., E.D. Land, and M.E. Roelke. 1991. Mortality patterns of Panthers in Southwest Florida. Proceedings of the Annual Conference of Southeastern Association of Fish and Wildlife Agencies 45:201-207.

Romin, L.A. and J.A. Bissonette. 1996. Deer-Vehicle Collisions: Status of State Monitoring Activities and Mitigation Efforts. Wildlife Society Bulletin 24(2):276-283.

Ruediger, B. 1996. The relationship between rare carnivores and Highways. In: Evink, G.L., P. Garret, D. Zeigler and J.Berry eds: Trends in Addressing Transportation Related Wildlife Mortality. Proceedings of the transportation related wildlife mortality seminar. June 1996. State of Florida Department of Transportation Environmental Management Office. Tallahassee Florida. FL-ER-58-96.

USDA. 1997. Final Environmental Impact Statement: Snoqualmie Pass Adaptive Management Area. Wenatchee and Mt. Baker-Snoqualmie National Forests, Pacific Northwest Region, Portland OR; U.S. Fish and Wildlife Service, Western Washington Office Olympia, WA.