Title
Citizen Monitoring Along Interstate 90 at Snoqualmie Pass

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Abstract: Interstate 90 over the Cascades is significant barrier to over 250 species of wildlife, including cougar, elk, deer, mustelids (otters, fishers, badgers, etc.), amphibians and reptiles. In the vicinity of Snoqualmie Pass, urban development to the west and agriculture and resort development on the east has shrunk the forest connecting north and south Cascades to less than 64.6 kilometers wide.

The Washington State Department of Transportation (WSDOT) is proposing to expand a 24.15-kilometer stretch of Interstate 90 just east of Snoqualmie Pass through a particularly critical zone for north-south wildlife corridors. These corridors have been identified through numerous studies, and the state has made ecological connectivity a project goal, along with increasing capacity, straightening curves, and repaving. A preferred alternative design for this project was chosen in summer 2006 that includes numerous high quality crossing structures, and was endorsed by the I-90 Wildlife Bridges Coalition.

The I-90 Wildlife Bridges Coalition is made up of over 40 local and national conservation organizations and has been working with WSDOT, other public officials, transportation interests, and the public to promote high quality wildlife crossing structures in this project while educating the public in our state about transportation and ecology issues. An additional role beyond advocacy and education that the coalition has engaged in during 2006 is citizen wildlife monitoring at the proposed crossing structure locations.

Good data is available to inform where to build crossing structures. WSDOT and the US Forest Service collaborated on a study entitled I-90 Snoqualmie Pass Wildlife Habitat Linkage Assessment (Singleton and Lehmkuhl, 2000) that used tracking and and road-kill counts to map existing crossing activity. Additional relevant information comes from analysis leading to the Snoqualmie Pass Adaptive Management Area Plan and I-90 Land Exchange (US Forest Service, 1997 and 1999) and Washington State Dept. of Fish and Wildlife studies of cougar movements using radio collars.

Recent land acquisitions and national forest management changes have dramatically improved the outlook for habitat quality near the project. In recent years, purchases, donations, and exchanges have brought more than 50,000 acres of land valued at $200 million into public ownership and protection. The Forest Service is committing to additional habitat restoration, such as road removal.

In light of these changes to the landscape and the large investment of the crossing structures, the coalition is acting to contribute to the data collection of current and future wildlife usage of habitat in the project vicinity. The coalition has sponsored digital remote cameras that have been installed at proposed crossing structure locations to gather still photograph and video images of wildlife moving through the area. These cameras are maintained by coalition volunteer teams, and data is shared through the website. This winter the coalition has launched a partnership with the Wilderness Awareness School to begin snow tracking monitoring at selected proposed crossing structure locations to compliment our current remote camera program. Both of these programs have begun this year, and are intended for long term monitoring.

The coalition has grown out of a history of grassroots activism and collaboration around the Central Cascades region. Citizen involvement has played a critical role in the management policies of this area. The I-90 project will be a greater success due to the high level of attention, input, and assistance received from the public. Public involvement peaked in the spring of 2005 with the release of the Draft Environmental Impact Statement bringing in thousands of public comments. Involvement continues throughout the state through efforts of education such as our annual *Bridging Futures* contest, advocacy, and monitoring by the coalition.

Introduction

Interstate 90 over the Cascades is significant barrier to over 250 species of wildlife, including cougar, elk, deer, mustelids (otters, fishers, badgers, etc.), amphibians and reptiles. In the vicinity of Snoqualmie Pass, urban development to the west and agriculture and resort development on the east has shrunk the forest connecting north and south Cascades to less than 64.6 kilometers wide.

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Citizen Monitoring Program Overview

The Citizen Monitoring Project uses trained volunteers to monitor the location and movement of wildlife in the vicinity of proposed wildlife crossing sites along Interstate-90 in the Washington Cascades between Snoqualmie Pass and Easton. As a high profile project at a major recreation destination, there is substantial interest from citizens who would like to understand and be involved in the decision making process. The Cascade project aims to improve understanding of the impact on wildlife of this major highway renovation, while also aims to involve and educate the public regarding road ecology and wildlife tracking. This document reports results from the first year of monitoring.

The project has been designed to answer these questions:

1. What species of wildlife are present in the habitat adjacent to the interstate and what are their current patterns of use in areas proposed for construction of crossings?
2. Will these patterns be affected by the addition of crossing structures and if so how?
3. There are ungulates and rare carnivores in the area which are of high interest to conservationists and wildlife managers. Which of these are present in the areas of the proposed crossings, and what are their discernable behaviors in relation to the road?
4. How effectively can a volunteer based citizen science effort carry out a rigorous scientific endeavor to answer the first three questions?

Through snow tracking surveys, volunteers collected data on the location and movement patterns of wildlife along the Interstate at sites with planned crossing structures. Through this report and reports to come in subsequent years, findings will be made available to land managers, the Washington State Department of Transportation, and public interest groups with the intention of helping to guide final decisions about the location and type of construction. Monitoring will continue during and after the construction period. Data obtained before, during and after highway construction will help test the function of crossing structures and assess changes in permeability of the Interstate for medium and large mammals. During the first field season (winter 2006-2007) six transects were monitored using snow tracking methods. Five of the survey sites coincide with planned wildlife crossings (Gold Creek, Price/Noble Creek East, Price Noble Creek West, and Easton Hill North and South). The remaining location, Hyak/Silver Fir, is the site of a proposed expansion to the Snoqualmie Summit ski resort and is not adjacent to the Interstate (see Appendix A for site maps.) Over 50 volunteers participated in this field season to produce the findings in this report.

Animal tracking, and particularly snow tracking, is increasingly recognized as a reliable and rigorous method for wildlife research. Indeed, snow tracking is one of the key methods recommended by the United States Forest Service for

certain kinds of wildlife surveys, for example in the detection of rare carnivores (Zielinksi and Kucera 1995). Some studies have found snow tracking to be more effective for detecting target species than other methods when compared (Bull et al. 1992, cited in Zielinksi and Kucera 1995; and Copeland, J., cited in Zielinksi and Kucera 1995). Collection of tracking data during non-snow seasons requires observers with a higher degree of skill but has been incorporated into other road ecology surveys (Barnum 2003, van Manen et al. 2001).

Tracking is a relatively established methodology for monitoring animals at wildlife crossing structures and along road corridors (for instance: Clevenger et al 2002, van Manen et al 2001, Barnum 2003, Singleton and Lehmkuhl 2000). The procedures vary depending on the natural conditions on the ground, time of year, and specific goals of the research. Methods include the use of track plates and artificially prepared ground specifically at crossing sites (Clevenger 2003, Singleton and Lehmkuhl 2000), and transects along which track and sign data is collected (Barnum 2003, Singleton and Lehmkuhl 2000).

One previous study of wildlife connectivity was conducted in the I-90 Cascades corridor by Singleton and Lehmkuhl (2000) as part of the planning process for the I-90 Snoqualmie East Project. Singleton and Lehmkuhl combined snow tracking data with road kill records, habitat and terrain parameters, motion sensing cameras and track plates to inform the choice of locations for the planned I-90 wildlife crossings.

In addition to winter snow tracking surveys, several motion-sensing cameras are managed by volunteers along the Interstate corridor. Cameras are active year round and supplement information gathered through tracking surveys. Starting in the Spring of 2007, tracking surveys will be piloted quarterly during non-snow seasons. Camera locations existed at three key connectivity zones in the I-90 project: Gold Creek, Hyak Creek, and Price/Noble Creek. A team of 15 volunteers maintain and routinely check the cameras for maintenance.

The remote camera program captures wildlife in the area by offering solid proof of presence through photographs. The location of cameras to date has been based on field review of the habitat near proposed structures, but in the future will combine the knowledge learned from snow tracking results. Remote cameras are used widely by agencies to record presence of wildlife in specific locations, and are utilized at a larger scale than this project by the Southern Rockies Ecosystem Project's Citizen Monitoring.

Snowtracking Field Results

Data

No Level 1 species (see appendix for species ratings) were detected during the field season (see Appendix D). A single cougar (Puma concolor) was detected and subsequently trailed, at Price-Noble Creek. Bobcat (Lynx rufus) comprised nearly half of all reliable detections, and was found at all highway transect sites (figure 1). Coyote (Canis latrans) was detected at all sites, including the lower elevations of the Hyak site, except Easton Hill, and after bobcat, was the most frequently detected species. American marten (Martes Americana) was detected with regularity, though only at the highest elevation portions of the Hyak/Silver Fir site. It is likely that these records represent a single individual. The species was not detected at any of the highway sites. We found evidence of two species, raccoon (Procyon lotor) and river otter (Lutra Canadensis), predicted by habitat to be marginal or absent within the study area (table 1). The only large mammal species predicted but not detected was porcupine (Erethizon dorsatum).

It is important to note that detection frequency would be best regarded primarily as an indicator of presence, and secondarily as an index of intensity of use. Detection frequency is not an index of population size, or of density. Even in the imaginary situation in which all species were distributed at equal densities across the landscape, it is unreasonable to assume equal probability of encountering sign of all species, due to ecological differences between them.

Of the four animals trailed at highway sites three (bobcat, coyote, and cougar), clearly moved along parallel to the highway for distances of 100 yards or more. The single cougar trailing effort was cut short due to nightfall before a relationship to the road was discerned, though the data that was collected suggests that the animal was moving parallel and perpendicular to the road.

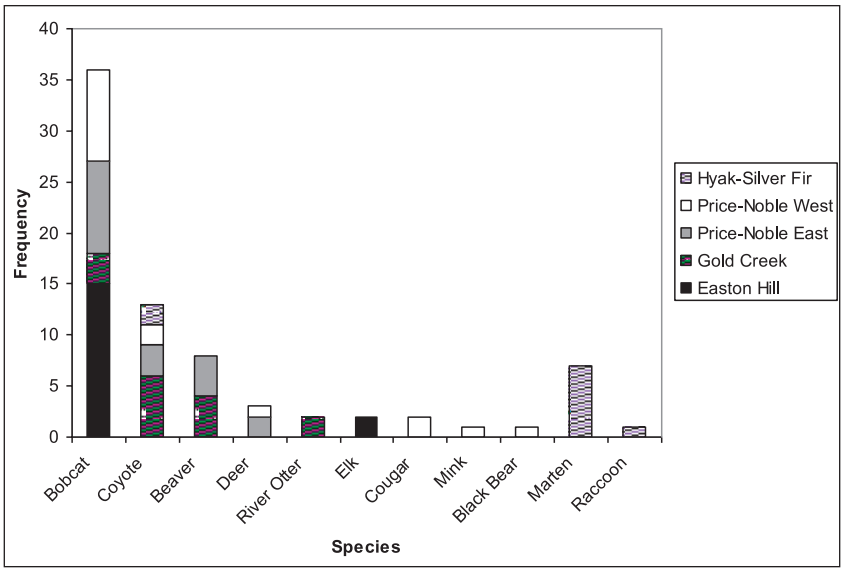

Figure 1. Frequency of species detections partitioned by site.

Species	Detected	Washington GAP Status/Notes
Beaver	x	present
Black Bear	x	present/seasonal
Bobcat	x	present
Cougar	x	present
Coyote	x	present
Elk	x	present
Fisher		extinct
Hoary Marmot		marginal/seasonal
Marten	x	present
Mink	x	present
Mountain Goat		marginal
Mule Deer	x	present
Porcupine		present
Raccoon	x	marginal/absent
Red Fox		rare
River Otter	x	marginal
Wolverine		extremely rare

Table 1: Expected and detected species. Expected species list based on 1997 Washington GAP Analysis (Johnson and Cassidy 1997)

Site	Visits	Detections/Visit	Shannon's Diversity Index (H' = -∑plnp)
Easton Hill	2	8.5	0.3622
Gold Creek	3	5	1.3095
Price-Noble East	3	6	1.2236
Price-Noble West	2	8	1.3634
Hyak-Silver Fir	3	3.33	0.8018

Discussion

Shannon's H', confirming what cursory analysis suggests, shows that Easton Hill and Hyak-Silver Fir sites are less diverse that other sites sampled, though this hypothesis was not statistically tested, as environmental factors were not accounted for in our sampling methods. Of the four highway sites, Easton Hill is the only site which can be said to be exclusively upland, with all other sites incorporating a diversity of upland and riparian habitats, and it is likely this factor which accounts for the observed differences in H'. Likewise, it is apparent on the ground at the Hyak-Silver Fir site that there is far less diversity associated with cover and habitat structures than at the riparian associated sites along I-90.

As one of the goals of the CWMP study is to detect rare carnivores within the I-90 corridor, we consider the almost one-to-one correspondence between expected and detected large mammal species, as well as the detection of species predicted by GAP Analysis as absent or marginal, to be indicative of sound methodology in regard to ability to construct an accurate, representative presence-absence database.

Based on location data (See Figure 5, Appendix A), it is likely that a baited camera trap placed in the vicinity of Hyak Lake would be successful in documenting the presence of American marten, a species of concern, during non-winter months. It may be possible in the future to utilize trailing records to create and assess the utilization distributions of

individual animals within the study area, such as the presumed individual marten at the Hyak Creek. However, such work is typically accomplished via telemetry, and the methodologies to do so using trailing data have been neither developed nor tested.

Remote Camera Field Results

Data

Three camera locations were selected in the first year of monitoring at Gold Creek, Hyak Creek, and Rock Knob. No Level 1 species were documented at any of the locations. Due to technical problems with old equipment at the Gold Creek location, no photographs of wildlife resulted. Difficulties included separation of the sensor from the camera, film exposure prior to processing, and camera failure.

The Hyak Creek camera recorded one Level 2 species, a pine marten, in April 2006. This was supported with numerous photographs of Level 3 species elk, snowshoe hare, deer, and coyote.

The Rock Knob camera is located in between Price and Noble Creeks in habitat just north of the proposed Rock Knob overpass in the I-90 Snoqualmie East Project. The camera detected Level 3 species such as bobcat, deer, elk, and coyotes.

Discussion

The photograph of a pine marten in the Hyak Creek corridor is significant in displaying the importance of this forest type in this location, which is being considered for development through an adjacent ski area. The other species recorded were expected within this corridor, and compliment the tracks found through the snowtracking data.

Coordination With Other Information

To further compare and compliment the data of our citizen monitoring, we reached out to other observations in this landscape throughout the year. In February 2006, a report from a University of Washington graduate student was sent to the US Forest Service of wolverine tracks in the Alpine Lakes Wilderness about 3 miles from Gold Creek. The report was submitted with photographs that help to verify the potential presence of this species. In October 2006, a photograph by the Yakama Nation's remote cameras captured a wolverine prescence south of Interstate 90 in Klickitat County area.

Our fiscal sponsor organization and steering committee member, Conservation Northwest, runs an annual Rare Carnivore Remote Camera Program in conjunction with the US Fish and Wildlife Service. In the summer of 2006, a camera they located in habitat north of Interstate 90 in the Nappequa Valley of the Glacier Peak wilderness documented a wolverine through several photographs as well as many Level 3 species such as black bear and elk.

Conclusion

In our first season of our Citizen Monitoring Program we identified the success and importance of our efforts, as well as the areas where we could improve. The combination of our snowtracking and remote camera programs did confirm the current presence of species in the I-90 corridor, as well as noting additional presence as recorded by other sources. Through the first year we have not fully recorded the patterns of use within these corridors with our limited equipment and data collection points. More specifically than noting the presence of species, our efforts did detect a Level 2 species in an important corridor.

The level of effectiveness of our volunteer effort can be viewed through our results of the first year, the coordination of this information with other studies, and how the program grows in the future. There is a clear impact of not only the information that this study generates, but in the engagement of citizens in collecting data to invest them in the landscape and transportation project. It is also evident that the data is not as valuable if it stands alone, but in coordination of what we are learning through other citizen and agency actions it does add value. Finally, there is room for growth in our program for better equipment and locations to improve on our data collection.

Appendix A: Species Priority List

Tracking priority for this study in descending order

Level 1
Wolverine
Fisher
Lynx
Wolf
Mountain Goat
Grizzly Bear

Level 2
Cougar
Marten
Elk
Mule Deer
Mountain Red Fox

Level 3
Black bear
Bobcat
Coyote
Raccoon
River Otter
Beaver
Mink
All other species larger than Snowshoe Hare

Do not record: Snowshoe Hare and smaller animals

KEY
Level 1 species were to be trailed wherever possible, and as far as possible to gather maximum information about these critical rare species. These species would be trailed even before a transect was completed if there was risk of considerable track degradation before the return leg.

Level 2 species were trailed in the absence of Level 1 species, after completing the outward leg of a transect, where time was available. Animals were trailed towards the road primarily, and their behaviors recorded.

Level 3 species were recorded on the transect data sheet with all other species but were not trailed unless all other transect activities were completed.