

at the
Crossroads
Transportation & Wildlife

HIGHWAY 3 TRANSPORTATION
CORRIDOR WORKSHOP



Highway 3
Transportation
Corridor
Workshop
Summary

Jan. 28-29, 2008
Fernie, BC

At the Crossroads: Highway 3 Transportation Corridor Workshop Summary

March, 2008
Prepared by:

Rob Ament
Wildlife Conservation Society,
Western Transportation Institute

Tony Clevenger
Western Transportation Institute

Neil Darlow
Yellowstone to Yukon Conservation Initiative

Tracy Lee
Miistakis Institute, University of Calgary



Acknowledgements

The workshop steering committee would like to thank the Calgary Foundation - Galvin Family Fund, Wildlife Conservation Society, Yellowstone to Yukon Conservation Initiative and an anonymous donor for supporting the *At a Crossroads, Highway 3 Transportation Corridor Workshop*.

We would also like to thank the College of the Rockies, Fernie Campus for providing the workshop facilities, Wildsight, Elk Valley branch for workshop beverages and Wendy Francis of Yellowstone Conservation Initiative (Y2Y) for facilitating the discussions.

Photo credits on the cover page Photo Credits: Bob Pisko (truck), Ian Cocks (bears on road) and Kimberly Pearson (elk on road).

Table of Contents

Executive Summary	1
Background	2
Workshop Day 1: January 29, 2008	3
Presentations	4
Dr. Tony Clevenger, Western Transportation Institute	4
Questions/Discussion	5
Ungulates	5
Presentations	5
Dale Paton, University of Calgary	5
Dr. Michael Quinn, Tracy Lee and Danah Duke, University of Calgary, Miistakis Institute	6
Tracy Lee, Miistakis Institute for the Rockies	7
Ungulate Questions/Discussion	7
Facilitated Discussion on Ungulates	8
British Columbia Ungulate data	8
Railway	9
Data Gaps	9
Funding Options	9
Carnivores	9
Presentations	9
Dr. Michael Proctor, independent scientist	9
Dr. Carita Bergman, independent scientist	10
Cheryl-Lesley Chetkiewicz, University of Alberta	10
Dr. Clayton Apps . Dr. John Weaver, Bruce McLellan, Bryce Bateman, Dr. Paul Paquet	11
Trevor Kinley, Sylvan Consulting Ltd.	12
Questions/Discussion	13
Day 2: January 29, 2008	13
Facilitated Discussion on Carnivores	13
Research not represented	13
Research gaps	14
Synthesis Discussion	14
Who is missing?	14
How does science influence transportation planning?	15
Presentations	15
Rob Ament, Western Transportation Institute	15
Leonard Sielecki, British Columbia, Ministry of Transportation	15
Discussion/Questions	16
Final Discussion	17

Workshop Deliverables	18
Scientific Synthesis Discussion	18
Conclusion/Steps Forward	19
Application document	19
Who is taking the lead?	20
Appendix A: Workshop Attendees List	21
Appendix B: Workshop Agenda	22

Executive Summary

In January, 2008 the *At a Crossroads: Highway 3 Transportation Corridor Workshop* convened in Fernie, BC. The workshop focused on the Crowsnest Pass transportation corridor, and was designed to understand efforts to minimize and mitigate adverse road and rail impacts on wildlife populations and ecological connectivity, and to develop a better understanding of the various ongoing wildlife research projects in the region.

The southern Canadian Rocky Mountains are a key connection between the Crown of the Continent Ecosystem (centered about Waterton-Glacier International Peace Park) with the Banff, Jasper, Kootenay, and Yoho mountain parks complex to the north. Maintaining landscape connectivity is crucial for the well being of the many native wildlife species that currently thrive in the region. One area that has been identified as a major challenge to maintaining connectivity is the Highway 3 transportation corridor, a major pinch point for wildlife movement at the northern edge of the Crown of the Continent ecosystem.

The objectives of the Highway 3 Workshop were to:

- Gather scientists conducting wildlife studies in the southern Canadian Rockies to share findings, with a particular focus on their implications surrounding the Highway 3 transportation system.
- Identify through discussion important information gaps or studies not presented at the workshop.
- Hear from transportation planners on the role of science in decision making.
- Develop a consensus on how to disseminate the information collected and presented at the workshop.
- Discuss the format for a scientific synthesis to interpret the information for local communities, decision makers, transportation planners and other non-biologists.

The workshop was designed to convene a variety of research scientists and agency specialists with experience on: 1. highway wildlife mitigation strategies, 2. ungulate movement and collision zones, and, 3. carnivore movement opportunities. The abstract for each presentation has been collected in this workshop summary.

There were a number of information gaps identified at the workshop:

- Ungulate data for the British Columbia portion of the study area is not documented
- Wildlife mortality from the railway in the region is not well understood
- The social setting and context needs to be more fully explored, understood and integrated with the scientific information.

Workshop attendees are listed in Appendix A. Some of the key researchers missing from the workshop included:

- Alberta Foothills Model Forest- Scott Neilson's Resource Selection Function models for SW Alberta
- BC Ministry of Environment - data on CP Rail's wildlife strikes

Key messages emerged as a result of the workshop:

- Mitigation can be effective, the placement of crossing structures is important
- Engaging transportation planners and local communities early in the process will help ensure success.
- Through existing work there is a good understanding of the locations of carnivore movement zones intersecting with the Highway 3 transportation corridor.
- The majority of lands immediately adjacent to Highway 3 are private - a key strategy to maintain connectivity is to procure land easements in the key wildlife crossing areas.
- Ungulate data is well represented in the Alberta portion of Highway 3, but in British Columbia ungulate movement zones need to be identified – this is an opportunity for local knowledge to play a key role or a program like *Road Watch in the Pass* to be expanded to cover this area.
- A synthesis of the existing scientific information with maps is needed to: 1) locate each of the wildlife movement areas for all of the species that have been studied, 2) rank their ecological importance, and 3) identify mitigation options and recommendations where they bisect the transportation system.
- The social and political context is important to understand and integrate with the scientific synthesis and maps. Putting the science into this context will increase the success of the implementation of the recommendations.
- The engagement of transportation agencies is important, as well as identifying agency champions to work with to implement the recommendations.

Agreement was reached by workshop participants to create a report that synthesizes existing research to identify key movement zones (focus on multi-species), rank the zones for conservation action and identify the most feasible transportation mitigation options and recommendations for each site. The workshop steering committee will work toward developing an outline (to be approved by the scientists) to acquire funding support for the synthesis report.

Background

The southern Canadian Rocky Mountains serve to connect the Crown of the Continent Ecosystem (centered about Waterton-Glacier International Peace Park) with the Banff, Jasper, Kootenay, Yoho mountain parks complex to the north. Maintaining landscape connectivity is crucial for the well being of the many native wildlife species that currently thrive in the region. One area that has been identified as a major challenge to maintaining connectivity is the Highway 3 transportation corridor, a major pinch point for wildlife movement at the northern edge of the Crown of the Continent region.

The Highway 3 transportation corridor runs east-west over the Continental Divide at Crowsnest Pass in the Canadian Rockies. Highway 3 is a 2-lane highway supporting 6,000-9,000 vehicles per day, depending on the season and section of road. It serves local commuters from the communities of Coleman, Blairmore, Frank, Hillcrest and Bellevue in Alberta as well as Sparwood and Fernie in British Columbia. The majority of the land adjacent to Highway 3 is private land. Local transportation use is compounded by the increased recreational needs of Calgary and transcontinental trucking. A railway parallels the road and runs the entire length of the corridor. Both modes of transportation are experiencing an increase in traffic volume. The implications for wildlife include direct mortality from collisions with vehicles and trains, fragmentation of the

landscape, and avoidance behavior by wildlife due to the increased activity and presence of humans.

Understanding wildlife use, behavior and habitat integrity along this transportation corridor is imperative for developing mitigation strategies to reduce transportation-wildlife conflicts and maintain habitat connectivity. Fortunately, there have been a number of research projects in the past decade that allow us to better understand how a variety of different wildlife (i.e., bighorn sheep, elk and grizzly bears) use these landscapes. These include the identification of key linkages for large carnivores, including grizzly bears, which cross Highway 3 and the railroad. However, the studies were not developed to focus solely on the transportation corridor and its increasing use. Nor have all of the studies been synthesized to summarize their findings to inform local decision making. Lastly, most conservationists, community leaders and decision makers are unaware of the various findings and their implications for their local landscape and the Highway 3 transportation system. Therefore, a gathering of scientists and conservationists to share and synthesize these studies would greatly enhance the ability of the scientific findings to inform local communities, shape decisions and direct future actions.

Workshop Day 1: January 29, 2008

The workshop design included presentations from key researchers working on ungulates and carnivores in the Highway 3 region, researchers with expertise on highway mitigation and transportation agency personnel responsible for the Highway 3 transportation corridor within the Crown of the Continent.

The workshop was divided into five sections:

1. an overview of wildlife transportation mitigation options,
2. Ungulate research on the Highway 3 transportation corridor including discussions on research not represented and data gaps
3. Carnivore research on the Highway 3 transportation corridor including discussions on research not represented and data gaps
4. Transportation agency staff presentations on implementing science in transportation planning.
5. Discussions on development of a synthesis document for the Highway 3 Transportation Corridor.

The workshop agenda is attached in Appendix 2. The following summary follows the order of the workshop agenda and includes author, title and abstract for each presentation as well as highlights from the questions and discussions. Key messages and next steps are extracted and presented at the end of the workshop summary.

Presentations Day 1

Overview: Potential Solutions to Transportation- Wildlife Conflicts

Dr. Tony Clevenger, Western Transportation Institute

Transportation corridors present some of the most severe human-caused impacts in the vast Yellowstone-to-Yukon ecoregion. Roads can occupy and fragment important wildlife habitat in addition to being a source of mortality from collisions with vehicles. Typically road mitigation projects occur when there is a concern for public safety, sensitive or endangered species are impacted or significant mortality results. Mitigation is one of several solutions to be considered by transportation agencies prior to road improvement or construction. Road alignments can (1) avoid critical habitat, (2) mitigate habitats (and populations) affected, or (3) compensate for the loss of habitat. If mitigation is chosen, then it is important to have predefined project goals and objectives. What is the intended goal of mitigation? It will be important to know how agencies might weight the importance of reducing collisions and barrier effects as that will influence design and performance evaluations. Mitigation planning begins with selecting the alignment with least environmental and social impacts. Alignment impacts can be reduced by having highways traverse the least favorable habitat for wildlife (e.g., north-facing slopes). After alignment selection efforts go into determining wildlife crossing placement; where are the best locations for reducing road-related mortality and barrier effects? Mitigation is permanent and structures last 70-80 years so it is important to consider ecosystem dynamics and landscape changes (natural and human-induced). Mitigation strategies need to be contemplating two scales: site level or local scale planning in design and adjacent habitat and regional scale planning to ensure that the crossing mitigation fits within a regional corridor context. There are many methods used to identify the optimum location for wildlife crossings, including road-kill data, radio-tracking, transects and surveys, GIS-based modeling and local knowledge. Monitoring animal use of wildlife crossings and their populations will allow for performance evaluations. Performance is generally evaluated by amount of mortality reduction, restored movement patterns and also higher population level benefits leading to functional connectivity (increased survival, breeding, and genetic and demographic connectivity).

The science of road ecology and mitigating road impacts on wildlife in particular was poorly developed 10-20 years ago. But today significant advances have been made in technologies used to assist with evaluating and mitigating road impacts (modeling, genetic tools, and telemetry). In North America the amount of science-based data available for decision-making is increasing; however, it is essential to have buy-in from transportation agencies and local communities. The anticipated growth in population and projected highway improvement plans in the Rocky Mountains, coupled with the resounding concern for maintaining large-scale, landscape connectivity will continue to generate interest in conservation tools and applications for addressing the diverse issues linking transport, ecology and local communities.

Questions/Discussion

Please comment on the research highlighting the need for information on successful and unsuccessful crossing events, if mortality data is only available what does this mean from a mitigation perspective.

- The lesson here is that both successful and unsuccessful crossing areas need to be identified prior to mitigation. Mortality data informs unsuccessful crossing but not successful. To obtain areas where wildlife are crossing successfully other data collection methods are

A comment that hunting grizzly bears teaches them to be wary of humans, so animals learn to avoid roads.

- This statement is controversial. There currently is no consensus among scientists and managers that this is a useful management tool for mitigating the effects of roads on wildlife

How do individual animals dispersing long distances react to the crossing structures?

- Currently we are not sure how they are reacting but longer term studies in Banff might allow us to answer this.
- This question does highlight the importance of structure placement, because animals should cue into the location of the structures though habitat cues.

How consistent is crossing structure use is over time (10-15 years)?

- We have not looked at that.

A comment that crossing structures are static and habitat is dynamic, this may present issues in the future.

As a promoter of highway mitigation with the benefit of the latest numbers are crossing structures working?

- They are functional in reducing mortality (80% reduction) and movement is what should be expected. In Banff we are working on a three year genetic connectivity study to understand individual animal movement across the highway. This study should provide a better understanding of the conservation implications.

Ungulates

Presentations

Elk Migration and Movement in Southwest Alberta

Dale Paton, University of Calgary

Elk are an important wildlife resource in southern Alberta and British Columbia. Dale's study is one of a group of 4 graduate students' studies, ranging from elk migration to trophic cascades and the effects of disturbance on elk habitat use. The collection of studies are all part of a 5 year program called the Southwest Alberta Montane study.

One objective of Dale's study is to investigate landscape permeability of elk migration in southwest Alberta. Using GPS and Argos/GPS radio telemetry collars on 90 elk from seven herds will provide data to identify seasonal home ranges, migration corridors used between ranges and the potential effects of linear and patch disturbances to migration and seasonal habitat use. The Crowsnest elk herd is a part of the Montane Study, with 5 collared elk tracked this year and another 5 elk to be collared in February, 2008. Information about elk movement and seasonal use data could be used in planning strategies to maintain elk movement within the Highway 3 transportation corridor.

Wildlife Movement Across Highway 3: A Citizens Approach

**Dr. Michael Quinn, Tracy Lee and Danah Duke,
University of Calgary, Miistakis Institute for the Rockies**

The Miistakis Institute has assisted in developing three spatial datasets with a goal of improving the understanding of large mammal movement across Highway 3 in the Crowsnest Pass of Southwestern Alberta. Recognized as an information gap for the region, Miistakis's approach has been to tap into and develop existing knowledge sources and engage local citizens in the research process. The sources of information presented include, a three year citizen-derived wildlife point observation dataset, a ten year wildlife traffic mortality dataset and local knowledge documentation of large mammal movement zones across Highway 3. Together the three datasets provide a better understanding of collision hotspot crossing areas and multi-species movement zones.

Through the successful implementation of Road Watch in the Pass, a community based monitoring project where citizens enter their wildlife point observations into an interactive mapping tool, a dataset with over 3000 large mammal observations has been collected. The majority of the species are ungulate (deer, bighorn sheep, elk and moose), but there are also rare occurrences of carnivores crossing Highway 3. We have developed a number of methods to identify key crossing areas for different large mammal species. The raw data can be viewed on the mapping tool at www.rockies.ca/roadwatch, mapping products, reports, journal articles and thesis can be viewed on the results page of the Road Watch website.

Highway maintenance contractors in the Pass document wildlife traffic mortality information. Miistakis has used this information to identify high collision zones along Highway 3.

In 2005, 25 local citizens, who were identified as knowledgeable about wildlife movement in the region by Alberta Fish and Wildlife staff were interviewed. Citizens were asked to draw movement zones on a map for a suite of large mammals and to provide contextual information (temporal information or interesting observations). Interview results were summed and areas where there were high levels of agreement were identified. For the rarer species individuals were asked if they had ever witnessed a crossing event.

Together these datasets greatly assist us in understanding where large species are crossing Highway 3; The datasets compliment each other and highlight the value in assessing multiple sources of information for the development of effective mitigation strategies.

A Partnership with Canadian Pacific Railway

Tracy Lee, Miistakis Institute for the Rockies

CP Rail owns and operates the railway line that runs the length of the Highway 3 Transportation Corridor. Their train engineers are required by legislation to report strikes with wildlife to CPR's environment section. Reports generally include species, number of individuals involved in the strike, date, time and location to the nearest mile post. Unfortunately, consistency in reporting is unknown and likely varies between individual train engineers. The data collected by CPR represents the only source of documented knowledge for the region. To better understand the issue of wildlife mortality due to train strikes, Miistakis and CPR have agreed to partner on a research projects.

Phase 1 includes an assessment of CPR strike data to identify possible hotspots along the railway line. These results could also be compared to the Highway 3 wildlife traffic mortality data to identify areas where mitigation of the highway and railway should be simultaneously addressed.

Phase 2 includes documenting the knowledge of train engineers that are interested in and knowledgeable about wildlife. This process has not been developed but will likely involve a series of half day workshops and a community based mapping approach.

Together, we hope these two phases will identify hotspots where a systematic wildlife survey eventually could be implemented. This in turn may lead to a multi-species approach to prioritizing wildlife corridors along the Alberta segment of Highway 3.

Ungulate Questions/Discussion

Has Miistakis been addressing the issue of grain spills with CP Rail?

- No we are not addressing grain spilled since that is not the objective of this working this partnership.

A comment that Highway 2 in Glacier there is a ten-fold increase in grizzly deaths on the railway compared to the highway.

Have you addressed the effect of different speed limits along Highway 3 with the Road Watch data?

- No – but we are interested in starting to look at this (now that we have a considerable dataset to work with) along with other variables, other highway design considerations, speed, etc.

How many trains run between CNP and Cranbrook per day?

- I'm not sure, I think this is a good question for CPRail.

A comment that the experience in Banff is different, there more trains and there is pressure on the engineers to report wildlife strikes – would be useful to replicate this process in the Crowsnest Pass.

A comment that it is important to consider a detection probability in certain areas with Road Watch data and with the systematic surveys because certain stretches of Highway 3 do not have good visibility- maybe you could introduce a weight to these areas.

Why does the railway have to address fish habitat and not other wildlife movement considerations?

- This is a legal/policy issue.
- Fish are addressed under the Federal fisheries act and there is not comparable act for other wildlife.

Is there any information/research that shows how wildlife movement is affected by new residential developments?

- This is an important consideration with the use of wildlife overpasses/underpasses that are relatively permanent on the landscape.
- We know from local knowledge that some wildlife movements have shifted due to developments. Modeling techniques will address this also.
- Clayton Apps et al. recent work addresses this – wildlife movement and how it is impacted by developments on the landscape.

With Road Watch what happens when observations are submitted that are not part of the study area (i.e., Highway 3 west of the BC/AB border)?

- Results outside the study area are not included in analysis. Road Watch could extend into British Columbia but this is currently a funding limitation.

How does participation in Road Watch translate to increased public awareness?

- We have anecdotal evidence that indicates it has altered participants' driving behaviors and Miistakis currently is conducting a survey to more closely examine this question. In addition Miistakis is currently conducting a content analysis of local newspapers, media to determine outreach and level of community interest etc.

Facilitated Discussion on Ungulates (Facilitator: Wendy Francis)

What research is not represented/ Who do we need to engage?

British Columbia Ungulate data

- In 1998, Clayton Apps worked with highway mortality data on Highway 3 in British Columbia. He concluded that mortality data does not necessarily indicate crossing locations (i.e., where they are being hit is not where they are crossing successfully).
- A student is currently working with Y2Y on a mortality assessment of Highway 3 from Creston to Cranbrook. If there is time it may extend from Cranbrook to Alberta border.
- There are 1200 Fording Coal employees that drive this road everyday – these folks need to be engaged in discussions. Could we include these folks as part of a systematic survey with the expansion of the Road Watch program?
- Leonard Sielecki started a community reporting process in 1999 – by mail in cards – to supplement highway surveys – went door to door for a 20km stretch to request public to fill in cards if they observed wildlife or carcasses.

Railway

- The British Columbia Ministry of Environment has a considerable amount of information on the railway but less so with the highway. (Bob Forbes has contact information.)
- How practical would it be to mount a video camera to the front of a train? This would allow a continuous transect survey.
- Strikes may be correlated to density data – if we know the population densities we could calculate potential strike info.
- What are current examples of mitigating rail lines?
 - Noise makers, plowing escape routes, fenced sections, underpasses, bear boards (do not appear to be working in Banff)
- Grain vacuum helps (especially for large spills) but not entirely effective; e.g., not effective for the trickle of grain that sometimes falls along the line.
- Rail lines in the long term will continue to increase in capacity, this issue will only grow.
- One critical issue on the rail line in Banff is speed – is there flexibility to decrease speeds in the CNP since it is not a mail line?
- In Alaska they have run cars out in front of the train to clear the line – this was proven to be successful.

Data Gaps

- Night time movement: Who is on these roads at night? Truck and taxi drivers; RCMP.
- We perhaps need to be addressing landscape ecology more – looking at development changes and what this means for connectivity
- Vegetation mitigation to decrease the attractiveness of wildlife – CP is currently funding research on this in BC (Roy Ray).

Funding Options

- Economic interest of insurance companies – an important consideration.

Carnivores

Presentations

Dr. Michael Proctor, independent scientist

No abstract available.

Ranking corridors along Highway 3 in Alberta and the application of a Grizzly Bear habitat model as an umbrella model to identify multi-species carnivore concerns.

Dr. Carita Bergman, independent scientist

She described an “expert opinion” process used to identify and rank areas of connectivity for large mammals across Highway 3 in Southwest Alberta, combining information from several sources on habitat models, animal movements, wildlife mortality, and previous foci of conservation by non-government organizations. She further elaborated a habitat suitability model derived for grizzly bears, and validated using grizzly bear movement data. In management planning, grizzly bears are often selected as a special species of interest, with the intention that managing for their needs will also cover off the needs of many other species. The application and utility of the grizzly bear to two other large carnivore species, cougar and gray wolf, was presented. Validation of this model for these species was presented through an overlay of wolf and cougar activity kernels that show a high correspondence with high quality grizzly bear habitat, as defined in the model. The utility of this model in accurately predicting movement patterns of other carnivore species is unique.

Where to draw the line: using resource selection functions to identify corridors for grizzly bears *Ursus arctos* and cougars *Puma concolor* in the Crowsnest Pass, southwestern Alberta, Canada

Cheryl-Lesley Chetkiewicz, University of Alberta

Corridors are the cornerstone of many carnivore conservation initiatives at both the local and regional scales. One impediment to advancing corridor planning and implementation is the lack of integration between the structural connectivity inherent in corridor identification and design with the behavioral processes of resource selection and movement that corridors are purported to facilitate. Cheryl collected Global Positioning System (GPS) telemetry data for four (2 females, 2 males) grizzly bears and 13 (7 female, 6 male) cougars captured in the Crowsnest Pass during 2001-2004. A total of 6,643 grizzly bear GPS locations and 5,741 cougar GPS locations were used to develop and validate seasonal resource selection function models to predict the distribution of grizzly bears and cougars. Greenness, a surrogate for forage resources, figured prominently in resource selection function models for grizzly bears whereas topographic measures were more important predictors of cougar occurrence in the Crowsnest Pass. Seasonal resource selection functions were used to develop source nodes and the inverse of the models were used as a surface for least-cost path (LCP) analyses. Merging seasonal paths by species highlighted potential species-specific corridor locations throughout the year. Intersecting paths for both species highlighted potential corridor locations for both species as well as highway crossing zones in each study area. Some of potential highway crossing zones were corroborated with telemetry data. Through static models, RSF and LCP models illustrated potential corridor locations

for two carnivore species in the Crowsnest Pass. These species- and landscape-specific tools offer an objective and adaptive approach for managers and conservation planners attempting to design and identify corridors at a local scale for grizzly bears and cougars in the Canadian Rocky Mountains.

Carnivores, core areas and connectivity across the crowsnest highway

Dr. Clayton Apps¹, Dr. John Weaver², Bruce McLellan⁴, Bryce Bateman¹, Dr. Paul Paquet³

1. Aspen Wildlife Research, 2. Wildlife Conservation Society, 3. World Wildlife Fund and 4. British Columbia Ministry of Forests and Range

The southern Canadian Rocky Mountains support an assemblage of carnivores that appears unique in North America for its intact diversity, and the region is also one of the most strategically important sections in maintaining broad ecological connectivity in the western mountains of North America. The natural connectivity afforded by the predominantly north↔south orientation of the Rocky Mountain ranges is vulnerable to fracture by the Crowsnest Highway (Hwy 3) transportation and development corridor that runs mostly east↔west. Expanding human developments and activities – along the Crowsnest Highway but also throughout the region – pose a threat to maintaining the security and connectivity of habitats and populations across this landscape. The increasing extent and intensity of this network may fragment carnivore populations into smaller and more vulnerable units, reduce gene flow, and restrict options for ecological and geographic shifts in response to climate change.

To address this problem of habitat and population fragmentation, the authors conducted modeling and field research during 2001-2004 to provide critical information pertaining to the viability, security, and connectivity of carnivore populations across the southern Canadian Rockies. In stage 1, they selected a suite of six carnivore species – grizzly bear, lynx, badger, bobcat, wolf, and wolverine – that represent a broad variety of ecological conditions. For each of these landscape species, they developed and applied regional models of distribution and vulnerability across the entire southern Canadian Rockies (30,000 km²). In stage 2, we used hair-snaring and DNA analysis to sample the actual distribution of two species (grizzly bear and lynx) within a zone (10-20 km wide) that paralleled and included the Crowsnest Highway. The authors collected these field data to assess and refine the regional models and to determine occurrence and general movements relative to the highway. In stage 3 (in progress), they placed GPS collars on a sample of GBs captured in landscapes adjacent to the hwy in order to characterize more detailed patterns of landscape occupancy and movements, and to evaluate the human and natural factors that influence these patterns. They discussed results and conservation implications of each research stage. An expanded summary and report addressing the first 2 stages of this work can be found at: www.wcscanada.org/media/file/crowsnest_web.pdf

Badger Roadkill Risk in Relation to the Presence of Culverts and Jersey Barriers

Trevor Kinley, Sylvan Consulting Ltd.

The subspecies of American badger found in British Columbia (*Taxidea taxus jeffersonii*) is provincially red-listed and nationally endangered. The primary cause of mortality is roadkill. European badgers (*Meles meles*) and other carnivores are known to pass under highways using culverts, and there are indications that American badgers do also, suggesting that the presence of more culverts might be associated with lower roadkill risk for American badgers. Furthermore, it has been speculated that roadkill risk is positively associated with the presence of Jersey barriers. These concrete barriers are used along highway edges or between lanes and may trap badgers on roadways. The author compared 39 1-km highway segments in which badger roadkills had occurred to 39 random segments, to see if they differed in the number of culverts and bridges useable by badgers or in the presence or distance covered by Jersey barriers.

About 18% of structures in random segments and 40% in roadkill segments were not passable by badgers. In comparison to random segments, roadkill-associated segments were less likely to have ≥ 2 structures/km passable by badgers (26% of roadkill segments vs. 59% of random segments; $\chi^2 = 8.877$, $P = 0.003$). The mean number of passable structures was apparently also lower for roadkill segments (1.33/km) than for random segments (1.62/km), although the difference was marginally significant ($Z = -1.542$, $P = 0.123$). Using only roadkill records with the highest accuracy (from an existing telemetry database, $n = 6$), differences between roadkill and random segments were apparently greater but the limited sample size resulted in low significance. Collectively, these results support the notion that culvert or bridge frequency is negatively related to badger roadkill risk. The presence or amount of Jersey barrier was not significantly related to roadkill risk, whether considering the full roadkill sample or only those from radio-tagged animals. This may have related to the limited use of Jersey barriers in the study area and their deployment in locations where badger habitat is less abundant (steep, rocky terrain) or where there are options for passing under highways (adjacent to bridges and overpasses).

The author recommended that steps be taken to maximize opportunities for badgers to use culverts to pass under highways. Recognizing the high cost of installing new culverts at a high frequency over extended lengths of highway, options include: (a) repairing or retrofitting existing structures where needed to make them more useable; (b) increasing the odds of badgers finding culverts by clearing vegetation where it obscures entrances, ensuring that marker posts are in place, and potentially installing drift nets to guide movements; (c) selectively installing more culverts, either when highway construction occurs or possibly by boring under highways; and (d) seeking opportunities to investigate culvert or landscape characteristics associated with the use of culverts by badgers.

Questions/Discussion

A comment that the Crowsnest Pass is probably of little consequence to larger core populations of grizzly bear farther north but may be important for smaller and more peninsular populations south.

Are there plans to compare the Alberta Sustainable Resource Development model (from Carita's presentation) with Gord Stenhouse' model from Alberta Foothills Model Forest?

- Yes, ASRD has plans for this.

The Grizzly bear Habitat Suitability Model (HIS) by Carita appears to represent core habitat beyond grizzly bears, it also seems to represent core habitat for cougars and wolves.

What components of the landscape are most at risk and what is causing the risks?

- Rural residential development, oil and gas (like the idea of an interactive model to be able to run different scenarios).

In the genetic research can you tell the difference between bears' natural movement vs. translocated movement across the highway?

- No, this is a confounding variable, unless we can link to ASRD records.

Trends are difficult to monitor, may be from poor past management practices. But every highway in Alberta has a barrier effect genetically for grizzly bears.

There was some discussion on grizzly bear movement corridors and the possibility of there being areas where we don't want grizzlies to stay but would like them to move through. Some areas could even act as sinks-maybe a strategy should be to keep them out of those areas.

Young female grizzly bears disperse slowly and may spend time in corridors rather than just moving through them.

Day 2: January 29, 2008

Facilitated Discussion on Carnivores (facilitator: Wendy Francis)

What Research is not represented / Who do we need to engage?

Research not represented

- Scott Nielson's resource selection function modeling – regional scale modeling – specific to the Alberta side.
- Wolf information – efforts in British Columbia and Alberta to address wolf vulnerability to predation – initiative exploring new methods, partnerships – presents opportunities to strengthen the relationships between conservation organizations and ranchers – which

- has additional implications for grizzly bears and other wildlife – not a specific research piece but a substantial initiative that is currently taking place.
- Bear Smart programs throughout the region that are addressing mortality, sinks, human behavior.

Research gaps

- How do these models and information relate to climate change?
- How effective is signage on the highway for addressing mortality? There is very little information related to this.
- There is very little information on Black Bears, Wolverine, Fisher, River Otter – with respect to Hwy 3 connectivity, need to weigh the cost of obtaining information
- There is considerable biological information - what is missing is how this information feeds into decision making and the geo-social economic landscape/political context of how this information is used for planning purposes – they are not here and when/how do we start engaging these folks?
- Clayton Apps’s work adequately addresses carnivores on the BC side – by expanding Road Watch on the BC side ungulates could be addressed.

Synthesis Discussion

- Require a needs assessment for different audiences if we are to work on a synthesis document. For some groups the Apps et al. document is enough –however the report does not address ungulates – is there a need for further synthesis?
- There are contradictions between research results that should be addressed.
- A municipality’s needs are not entirely addressed with the Apps et al. report- ungulate information is important.
- Social science aspect is missing from discussions – need to include social sciences in our strategies
- Need to be wary of putting science first – while recognizing the objectives of this workshop – also need to recognize the need to address other issues (socio economic, values etc). These tracks should be running parallel to the scientific process.
- Yes – there most definitely is a need for a synthesis – a caution is the need to know what information is most useful for managers/transportation planners, need to pull them into the process.

Who is missing?

- Nature Conservancy British Columbia – they are heavily involved in private land conservation strategies in BC – they have agreements with Tembec (large land holder from the area), free hold lands – these are important strategic components in maintaining connectivity.
- Alberta Sustainable Resource Development (ASRD) Fish and Wildlife and Public Lands representatives are important individuals to be communicating with. Also the British Columbia Ministry of Environment.
- Carlos Carroll is developing new modeling methodologies that are going to be applicable for Hwy 3

- Brad Stelfox – cumulative impacts and predictive modeling tools could be useful when addressing communities. These tools demonstrate the need for action, however none of these results are spatially explicit – Crowsnest Pass may have finer scale needs.

How does science influence transportation planning?

Presentations

Wildlife-Vehicle Collision Reduction Study.

Rob Ament, Western Transportation Institute

Under Section 1119 (n) of the Safe Accountable Flexible Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU), the US Congress directed the Secretary of Transportation to conduct a national Wildlife Vehicle Collision (WVC) study. The Western Transportation Institute conducted this study that details the causes and impacts of wildlife vehicle collisions and identifies potential solutions to this growing safety problem that are applicable in the U.S or Canada. The report demonstrates that WVCs are a growing problem and represent an increasing percentage of the accidents on U.S. roads. It includes an important economic review of the direct costs of WVCs for deer, elk and moose. The report focuses on mitigation methods that reduce the number of collisions between vehicles and large wildlife, such as deer, because these accidents present the greatest safety danger to travelers, and cause the most damage. The study reviews 34 mitigation techniques, a number of which are effective in reducing WVCs, show promise, or are considered good practice, including integrated planning efforts, wildlife fencing and wildlife crossing structures, animal detection systems and public information and education. A major challenge that must be addressed before WVCs can be systematically reduced is improving the consistency and precision of data collection on WVCs. Inconsistent and imprecise data make it difficult to identify and prioritize road sections that require mitigation.

The report can be downloaded from:

http://www.wti.montana.edu/RoadEcology/documents/Wildlife_Vehicle_Collision_Reduction.pdf

Dynamic Knowledge and Static Infrastructure: Wildlife Monitoring and Mitigation in British Columbia

Leonard Sielecki, British Columbia, Ministry of Transportation

The British Columbia Ministry of Transportation (BCMoT) is a pioneer and leader among transportation agencies globally in wildlife monitoring and mitigation. Since the late 1970's, BCMoT has closely monitored wildlife activity at the highway-wildlife habitat interface on major numbered highways under its jurisdiction across British Columbia. In the mid-1980's, BCMoT began designing and building wildlife exclusion systems to protect motorists and wildlife on high speed, limited access Provincial highways. In 1987, BCMoT designed and constructed the first

wildlife overpass in Canada. Now, with approximately 480 kilometres of wildlife exclusion fencing and over 100 wildlife passage structures in place, BCMoT has the most extensive wildlife exclusion network among transportation agencies in North America. Following the guidance of leading wildlife specialists, BCMoT has designed wildlife exclusion systems to safely and effectively protect motorists and wildlife while ensuring critical wildlife habitat connectivity and supporting natural genetic diversity. Initially, wildlife exclusion systems were designed for large ungulates, primarily deer and moose. As the significance of smaller mammals, amphibians and reptiles in the larger ecosystem context has been recognized, BCMoT has responded to accommodate the needs of a growing number of species. Efforts are made to improve and protect wildlife habitats and integrate wildlife passage structures into new highway construction projects, and, when opportunities arise, with highway rehabilitation projects. BCMoT's designs of wildlife fencing and passage structures are evolving to increase their suitability for different species, as the behavioural, movement and habitat characteristics of wild animals are becoming better understood. However, highway infrastructure has a long-term, static, physical nature which limits opportunities to modify it. Consequently, like its counterparts throughout the world, BCMoT faces the challenges of retro-actively improving its existing highway infrastructure for wildlife as advancements in scientific knowledge occur and are published.

Discussion/Questions

Advice from Len:

- It is important to build good will, by working with the highway contractors or ministry staff. Develop these relationships.
- Importance of Western Transportation Institutes (WTI), National Wildlife Vehicle Collision (WVC) study in showing the economic impact of collisions and that mitigation pays for itself. This messaging is really important.

How can government address the issue of wildlife warning signs that are not effective, how do you get the sign out of a system?

- Legally this is very complicated, how do you remove the sign when it warns of a safety issues. If an accident occurs after a sign is removed this could have legal implications for the government.
- It is more likely that existing signage could be enhanced, such as replacing with seasonal signs or more dynamic signs.

The Loop Bridge replacement project along Highway 3 in British Columbia- how can we work to make it a broader initiative to address the importance of a corridor needed here.

- We need the information presented in print form or a letter to our agency. Fish have an incredible amount of legal rights and if this bridge is a fisheries area then we could piggy back on that.

There is an extensive wildlife mitigation program in Arizona that was developed because of a legal suite where an individual hit an elk and sued the Arizona State Department of Transportation for not identifying the safety hazard.

Historically mitigation was designed for deer, moose and elk in this region due to human safety issue.

New technology might include an instrument on a car, lights would flash to an oncoming car as a warning signal.

Advise from BC Ministry of Environment on Highway 3 when planned infrastructure does not address movement areas: How do they react to new information (science).

- An example was provide of Trevor Kinley informing BCMOT of important badger crossing areas, they were flagged in the system- so badger culverts will be considered when upgrades are necessary.
- Stress the need for supportive information (in print) on need for mitigation in an area.
- We need to understand what BCMOT can do within their infrastructure. Len stressed the need for information and documentation of the science and information for transportation planners.
- Rob Aments presentation identified level crossing with gap fencing as highly successful and low cost. As opportunities for construction projects arise and more significant changes can be made.
- A challenge within agency us redirecting animals to specific place to cross, because we are creating an unnatural event- who is responsible when a collision occurs. May create new liability for government.
- Suggest you bring collectively the issue of wildlife connectivity to our ministry and BC Ministry of Environment as a first step.

What is the referral process between BC ministry of Environment and BC Ministry of Transportation?

It depends on situation and if fisheries are involved

How significant an activity would trigger a referral process in BC?

- Endangered Species may- such as recommending lower speed limits- although this is a highly contentious issue.
- Interagency cooperation is important, even international cooperation could play a key role in trigger a referral process.

In Alberta there is a highway upgrade coming on Highway 3; what about in BC?

- There are currently no long term plans in BC for upgrade.

Final Discussion (FACILITATOR: WENDY FRANCIS)

Workshop Deliverables (www.rockies.ca/crossroads)

- Abstracts, Presentations and relevant publications will be posted to the website
- Workshop Proceedings will also be posted on the crossroads website

Scientific Synthesis Discussion

- Look at Lindemayer et al. paper – published 2 months ago as an example of a synthesis documents.
- The process is more important than the product – if just scientists get together to compile a synthesis then there may be a risk that the product is not useful. Should use this opportunity to engage community dialogue then the synthesis may be more effective. Summarize the information and then use it to build a document that has a greater breadth of community buy-in.
- Alternatively, create a core document with no specific audience and then summaries for specific audiences in mind.
- How do the presenters feel about a synthesis document? Recognize there will be difficulty synthesizing information from multiple models.
- It is a waste of resources to simply repackage all of the existing information; we need to discuss the practicalities of doing a synthesis. However, many of the models identified the same crossing locations; it would be significant to look at the multispecies relationships with respect to crossings and to rank these areas to produce a new product.
- It will also be important to talk about the specifics of the discrepancies between model results – we should be addressing this at this workshop.
- Maybe we need to just have an ungulate report developed by Miistakis to be used in conjunction with the Apps report for carnivores?
- It would be beneficial to use the information from this workshop to produce a document to focus on fine-scale movements and identify crossing locations for multi-species. We should also include courser scale recommendations for land securement options.
- Need to first identify a series of problems that we use the information from this workshop to address and then tailor the report to different audiences.
- Also need to create a presentation that summarized the information from the synthesis to be used in tandem with the report – this will have great impact.
- There are two separate issues: 1) wildlife crossings and 2) land securement and we need to differentiate these. Are these different or do they inform each other? Need to first identify the wildlife crossing areas and use this as a starting point to address land use issues and strategies such as securement.
- Private conservancy issues and municipality planning issue – the community needs time to plan for the highway so we need to feed this information into this process.
- Comprehensive science document – no urgent need for this but for the audience of planners, municipalities we can use the information that is readily available and get this out there in short order. This could be followed with more comprehensive science and mitigation options once the issue is at the forefront.
- There is need for more basic concepts to be explored for example the general public knowledge base that roads are detrimental to wildlife is missing. We need to raise the

knowledge base of the general public so there is a common ground to work from to start addressing mitigation and crossing issues. Need the issue to focus on habitat degradation/wilderness values – this is something that resonates with the general public – we need our models to be addressing this in tandem with wildlife issues.

- The most important audience is the local community – if these folks are on board then the land use planners and managers will come on board.
- Crowsnest Conservation Society is planning community forums, one is specifically addressing transportation. This could be an important venue to present the information from this workshop.
- The main audiences for a synthesis is transportation planners, they should be prioritized.

Conclusion/Steps Forward

Key take-home messages from the workshop:

- Mitigation can be effective but the placement of structures or other mitigation options is important.
- Engaging transportation planners and local communities in early in the process will help ensure success.
- Through existing work there is a good understanding of the locations of carnivore movement zones intersecting with the Highway 3 transportation corridor.
- Adjacent to Highway 3 are private - a key strategy to maintain connectivity is to procure land easements in the key wildlife crossing areas.
- Ungulate data is well represented in the Alberta portion of Highway 3, but in British Columbia ungulate movement zones need to be identified – this is an opportunity for local knowledge to play a key role or a program like Road Watch in the Pass to be expanded.
- A synthesis of the existing scientific information with maps is needed to locate each of the wildlife movement areas for all of the species that have been studied, rank their ecological importance, and provide mitigation options and recommendations where they bisect the transportation system.
- The social and political context is important to understand and integrate with the scientific synthesis and maps to increase the success of the implementation of the recommendations.
- The engagement of transportation agencies is important, as well as identifying agency champions to work with to implement the recommendations.

Application document

There was agreement to develop a synthesis document that uses existing science to identify crossing locations (ungulate and carnivore) with a focus on multi-species along the Highway 3 Transportation Corridor. The report would include:

- A review of exiting model discrepancies
- A ranking of movement corridors with a focus on multi-species movement opportunities.
- Suggested mitigation options for movement zone will be identified. Including a fine scale analysis that addresses adjacent land uses and identified land securement needs.
- A regional context that identifies core habitat as a rational as to why the linkages were identified and why they are ranked the way they are.

- The document needs to recognize that science is important but in isolation does not suffice. The social/political landscape is important.
- The primary audiences for this document are transportation and land use planners.

The report could be used as it as a mechanism to open doors for discussion with land and transportation planners.

Who is taking the lead?

- Crossroads Steering Committee (Miistakis, Wildlife Conservation Society, Western Transportation Institute and Yellowstone to Yukon Conservation Initiative) will take the lead and pursue funding options.
- An outline will be sent out to scientists for approval
- At the request of transportation agencies not able to attend the workshop, the steering committee will pursue follow-up meeting.
- Note: Include ASRD, Greg Hale in the process.

Appendix A: Workshop Attendees List

Presenters	Affiliation
Dr. Clayton Apps	Aspen Wildlife Research
Len Sielecki	BC Ministry of Transportation
Dr. Michael Proctor	Independent researcher
Tracy Lee	Miistakis Institute
Dr. Carita Bergman	Parks Canada
Trevor Kinley	Sylvan Consulting Ltd.
Cheryl Chetkiewicz	University of Alberta
Dale Paton	University of Calgary
Dr. Mike Quinn	University of Calgary, Miistakis Institute
Rob Ament	Western Transportation Institute
Dr. Tony Clevenger	Western Transportation Institute
Attendees	
Travis Ripley	Alberta Sustainable Resource Development
Dave Poulton	CPAWS Calgary/Banff
Jenice Bruisma	Crowsnest Conservation Society
Jim Pissot	Defenders of Wildlife Canada
Ben Dorsey	Graduate Student
Danah Duke	Miistakis Institute
Renny Grilz	Nature Conservancy of Canada - Alberta
Larry Simpson	Nature Conservancy of Canada - Alberta
Kristie Romanow	Nature Conservancy of Canada - Alberta
Bob Forbes	Nature Conservancy of Canada - BC
Dianne Pachal	Sierra Club of Canada
Erin Sexton	University of Montana – Flathead Lake Biological Station
Jennifer Miller	Wilberforce Foundation
Casey Brennan/John B/Dave Q	Wildsight
Dave Quinn	Wildsight
Jeremy Guth	Woodcock Foundation
Neil Darlow	Y2Y
Wendy Francis	Y2Y
Sarah Elmeliegi	Y2Y

Appendix B: Workshop Agenda

At the Crossroads: Transportation and Wildlife Highway 3 Transportation Corridor Workshop

AGENDA JANUARY 28-29, 2007

DAY 1

INTRODUCTION

10:00-10:30 **Neil Darlow and Rob Ament** – WELCOME AND OVERVIEW

10:30-11:00 **Dr. Tony Clevenger** – Overview: Potential Solutions to Transportation- Wildlife Conflicts

UNGULATES (15 minutes presentations + 5 questions)

11:00-11:05 **Neil Darlow**- INTRODUCTION TO SESSION

11:05-11:25 **Dale Paton** (University of Calgary- Graduate student): Elk movement in the Crowsnest Pass area.

11:25-11:35 *Coffee Break*

11:35-11:55 **Dr. Mike Quinn and Tracy Lee** (Miistakis Institute for the Rockies): Understanding ungulate movement across Highway 3 in the Crowsnest Pass, Alberta through an examination of data collected and provided by citizens.

11:55-12:15 **Tracy Lee**: Provide an overview of a future research projects between CPRail and Miistakis.

12:15-12:45 Facilitated discussion on ungulates along the Highway 3 Transportation Corridor.
(Facilitator: Wendy Francis)

12:45-1:40 *Lunch*

CARNIVORES (15 minutes presentations + 5 questions)

1:40-1:45 **Rob Ament**- INTRODUCTION TO SESSION

1:45-2:25 **Dr. Michael Proctor** Grizzlies of the Southern Rocky Mountains.

2:25-2:45 **Dr. Carita Bergman** (Parks Canada) Ranking corridors along Highway 3 in Alberta and the application of a Grizzly Bear habitat model as an umbrella model to identify multi-species carnivore concerns.

- 2:45 – 3:00 *Coffee Break*
- 3:00-3:20 **Dr. Clayton Apps** A suite of carnivores in the Southern Rockies; cores, corridors and movements.
- 3:20-3:40 **Cheryl Chetkiewicz** (University of Alberta- PHD Candidate): Cougars, grizzlies and corridors in southern Alberta
- 3:40-4:00 **Trevor Kinley** (Sylvan Consulting Ltd.) Badger Roadkill Risk in Relation to the Presence of Culverts and Jersey Barriers
- 4:00- 4:20 **Dr. Michael Proctor:** An overview of Alberta Foothills Model Forest
- 4:20-4:45 Facilitated discussion on all carnivores along the Highway 3 Transportation Corridor. (Facilitator: Wendy Francis)
- 5:00-6:00 Happy Hour evening social at Park Place Lodge

DAY 2

- 9:00-9:10 **Rob Ament:** REVIEW OF FIRST DAY AND LOOKING FORWARD TO DAY 2
- 9:10-9:20 Facilitated discussion: Other relevant scientific efforts not presented at this conference. (Facilitator: Wendy Francis)
- 9:20- 10:00 General discussion: Knowledge gaps and future studies (Facilitator: Wendy Francis)
- 10:00-10:10 *Coffee Break*

HOW DOES SCIENCE INFLUENCE TRANSPORTATION PLANNING?

- 10:10-10:20 **Tracy Lee** - INTRODUCTION TO SESSION
- 10:20-10:50 **Rob Ament**, Western Transportation Institute, Highlights findings from the National Wildlife Vehicle Collision Study.
- 10:50- 11:10 **Leonard Sielecki**, Environmental Issues Analyst, BC Ministry of Transportation. Implications of a Dynamic Knowledge Base for Designing Wildlife Accident Mitigation Infrastructure on Highways
- 11:10-12:00 Facilitated discussion: questions and discussions about the presentations from transportation agencies (Facilitator: Wendy Francis)
- 12:00-1:00 *Lunch*

DISSEMINATING INFORMATION

- 1:00-1:30 Science for the Public: Discussion on how to disseminate the information collected and presented at the workshop.
- 1:30-2:00 Science for Decision-makers: discuss the format for a scientific synthesis to interpret the information for local communities, decision makers, land-use planners, transportation planners and other non-biologists.
- 2:00-2:20 Next steps and closing remarks.