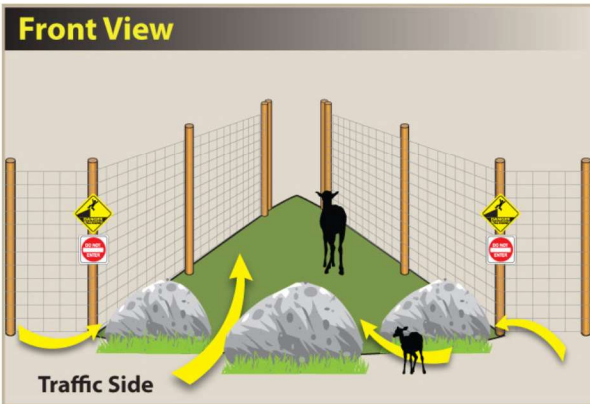




WILDLIFE PROGRAM



Ministry of
Transportation
and Infrastructure

Wildlife Program – BCMOTI Environmental Management Branch

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British Columbia Ministry of Transportation and Infrastructure. May 2020.

Introduction

The Wildlife Program of the British Columbia Ministry of Transportation and Infrastructure (BCMOTI) is the cornerstone of wildlife protection on British Columbia highways. The program is responsible for highway-related wildlife protection initiatives for British Columbia's wild indigenous and feral non-indigenous terrestrial species. These species range from small amphibians, like toads and frogs, to large ungulates, like wild horses, moose and bison. The program provides BCMOTI a single point of contact for all wildlife/highway-related issues, ranging from media inquiries to technology development. The program is instrumental in BCMOTI's efforts to protect wildlife by raising road-user awareness of wildlife, directing Ministry wildlife-vehicle collision reduction investments, and exploring potential solutions for wildlife-vehicle collisions.

The Wildlife Program is a stand-alone program that draws upon the expertise of BCMOTI's environmental, structural, electrical, geotechnical and traffic safety professionals, and a wide range of external wildlife professionals and academics. The program builds upon the experiences shared by other transportation agencies to develop, test and refine new concepts in wildlife protection. This approach expedites wildlife-related projects by integrating them quickly into existing infrastructure and operational practises.

The program relies heavily on monitoring and data analysis for the strategic deployment of wildlife protection investments. With wildlife exclusion systems costing upwards of \$750,000 per kilometre to build, and wildlife detection systems costing upwards of two million dollars each, the program focuses resources where they can be cost-effective.

Building positive relationships between BCMOTI and stakeholders – which includes fish and game associations, First Nations and NGO's – is an integral part of the Wildlife Program. Through Social Media, such as Facebook and Twitter, the program is engaging a growing public audience. Wildlife Wednesday blogs provides easily accessible information, satisfying growing public interest in wildlife protection. Program campaigns have targeted vulnerable road users, including motorcyclists and cyclists. The program supports youth activities, like the BC Wildlife Federation Wild Kidz camps, to raise wildlife awareness among future road users.

The Wildlife Program provides an example of how transportation agencies draw upon internal technical and professional resources from a wide range of disciplines to comprehensively manage and direct wildlife protection initiatives to provide wildlife, road users and taxpayers maximum benefit.

Background

The Wildlife Program has evolved as BCMOTI's approach to wildlife-vehicle collision monitoring and mitigation has become more comprehensive and sophisticated over the last 25 years. The program incorporates the Ministry's Wildlife Accident Reporting System (WARS), Wildlife Exclusion System Improvement Program and Wildlife Monitoring Program. While its primary objective is public safety through the reduction of wildlife-vehicle collisions on provincial roads and highways under the Ministry's jurisdiction, the program strives to support provincial wildlife protection goals when opportunities arise along provincial roads and highways.

For the last decade, the Wildlife Program has had an annual budget of \$825,000. Although this amount is small relative to the over \$500 million annually allocated for provincial highway operations, the Wildlife Program is able to leverage its resources with other government ministries and stakeholders to maximize wildlife protection efforts. Often big, well-funded projects attract the most public attention. However, while many of the projects supported by the Wildlife Program are small and low profile, collectively they contribute substantially to the protection of wildlife and safety of road users along provincial roads and highways.

The program has five main components:

- (1) monitoring, analysis and evaluation,
- (2) policy and design standards development
- (3) mitigation
- (4) research and innovation
- (5) communications, public outreach and stakeholder engagement

(1) Monitoring, analysis and evaluation

Extensive monitoring, data collection and analysis provide the foundation to support decision making for wildlife protection investments along highways in British Columbia. Drawing upon over 40 years of highway-related wildlife mortality data in BCMOTI's Wildlife Accident Reporting System (WARS), the Wildlife Program is able to identify problematic wildlife-vehicle collision locations and emerging species-related collision trends (Figure 1). Since 2018, with the advent of new Ministry maintenance contracts, WARS reporting has transitioned from a manual, paper-based, monthly reporting format to a web-based one. Previously, wildlife-vehicle collision locations on highways were reported using a linear referencing system and manually entered into a Microsoft Access-based platform. This arrangement made mapping the data extremely challenging and time-consuming. Now, wildlife-vehicle collision locations are reported with GPS coordinates and immediately imported via a Ministry Sharepoint site into the new WARS analysis tool, making mapping extremely fast and simple (Figure 2).

Over the last decade, the Wildlife Program has established a network of wildlife monitoring cameras at each of BCMOTI's wildlife crossing structures. Each year the Wildlife Monitoring Program collects over 200,000 wildlife photos that are analyzed to assess species-specific wildlife use of the structures. Quantifying wildlife use of wildlife-related infrastructure is

essential for determining the effectiveness of Ministry wildlife protection investments. The Wildlife Program wildlife monitoring ranges from large province-wide implications to an extremely narrow focus of species-specific issues.

To obtain greater knowledge and insight into the wildlife-highway interface, BCMOTI partners with the BC Ministry of Forest, Lands, Natural Resource Operations and Rural Development (BCFLNRD) to radio collar wildlife along provincial highway corridors (Figures 3 and 4). To date, BCMOTI has supported elk tracking along Highways 3 and 93 near the BC/Alberta border, Big Horn Sheep tracking along Highway 3 near the Canada/US border, deer tracking along Highway 97C in the BC Interior, and Roosevelt Elk tracking along Highway 18 on Vancouver Island.



Figure 1: Aftermath of a wildlife-vehicle collision

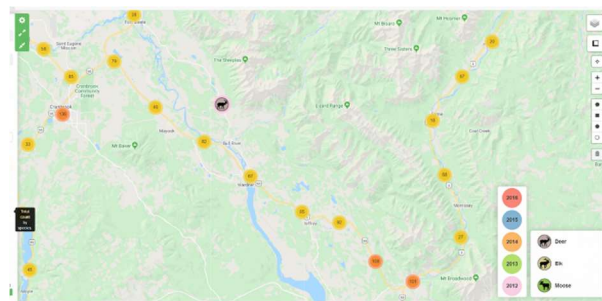


Figure 2: New WARS analysis tool



Figure 3: Radio collared deer passing through wildlife underpass on Highway 97C

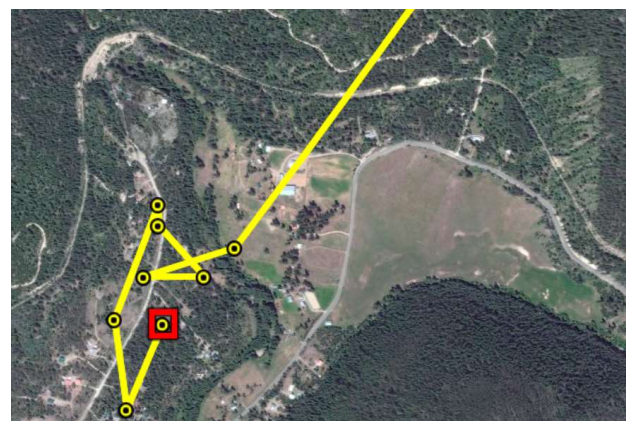


Figure 4: Track of radio collared deer across Highway 97C

(2) Policy and design standards development

From a transportation agency perspective, dealing with wildlife is becoming an increasingly complex task. Evolving federal and provincial legislation and regulations regarding species and risk acts create a more burdensome environment for transportation planners, designers and

engineers. The ability for a transportation agency to successfully navigate this environment requires supportive internal guidance. Misperceptions between professions can create barriers to open and constructive dialogue. Consequently, understanding and respecting the importance and influence of each profession involved in delivering safe and efficient transportation systems is essential. For BCMOTI, the Wildlife Program takes on an intermediary role between its staff and the BC Ministry of Forests, Lands, Natural Resources and Rural Development (BCFLNRD) and the BC Ministry of Environment (BCMOE). The Wildlife Program acts as a liaison and advocate for both wildlife interests and responsible engineering designs, operations and practices between BCMOTI and the other provincial agencies. By developing BCMOTI policies for wildlife protection, the Wildlife Program enables BCMOTI to conform with external federal and provincial legislation and regulations to facilitate highway system operations and development. BCMOTI's wildlife carcass handling advisory and wildlife migration response protocol help guide Ministry staff and maintenance contractors in the field.

The Wildlife Program works closely with BCMOTI engineers and technicians to design wildlife-friendly infrastructure that protects wildlife. Wildlife exclusion fencing, and its components, such as jump-outs, one-way gates, and ungulate guards, must withstand vigorous engineering scrutiny and provide a safe environment for wildlife. The Wildlife Program consults with species-specific wildlife consultants and material suppliers to support BCMOTI engineering and technical staff in designing optimal, cost-effective wildlife protection infrastructure. After extensive review and evaluation, the results of this process are formalized in BCMOTI's Standard Specifications for Highway Construction.

(3) Mitigation

The Wildlife Program operates in two basic modes: reactive and proactive. The reactive mode deals with unexpected or unpredicted wildlife events such as toadlet migrations across highways or Mountain Goat herds emerging on highways to lick winter road salt. Unexpected and unpredicted wildlife events require immediate responses for wildlife and road user safety, including the recruitment of species-specific wildlife consultants, the procurement of equipment and supplies, the mobilization of field staff, and the liaison with the Ministry's Public Affairs and Social Media offices.

In the winter of 2019, when notified by Ministry District office staff that a herd of rare Mountain Goats was becoming a risk to road users by licking winter road salt on Highway 31, the Wildlife Program was able to respond immediately to protect the animals. Working directly with the provincial wildlife veterinarian and a wildlife biologist from the regional operations division of the BC Ministry of Forest, Lands and Natural Resource Operation and Rural Development (BCFLNRD), BCMOTI developed and executed a response plan.

By arranging for a wildlife consultant to manage volunteers from the Town of Lardeau, and supplying sacks of the appropriately formulated livestock salt, the Wildlife Program was able to support the construction of an intercept salt-feeding station on a mountain bluff near Highway 31. Within days, the feeding station was in place and operational. The station has been

extremely effective in reducing road-related goat mortality by encouraging the animals away from the winter road salt they seek on the highway. Although environmentally and safety-oriented, BCMOTI's efforts to protect the Mountain Goats had a significant social element as the town identifies the herd as an integral part of the community's ecosystem. For less than \$7,000, the Wildlife Program was able to build goodwill with the town and protect both the goats and motorists.



Figure 5: Mountain Goats licking salt on Highway 31



Figure 6: Mountain Goats at salt feeding station

In a proactive mode, the Wildlife Program is now identifying other locations along highways where winter road salt use may be increasing due to changes in climate and/or highway maintenance activities. BCMOTI is trying to determine if additional intercept salt-feeding stations may be required for other species of wildlife at locations around the province.

Although commonly considered a rural driving hazard, wildlife are increasingly becoming an urban and suburban problem for road users in many communities in British Columbia. In response, to this situation, the Provincial Urban Deer Advisory Committee (PUDAC) was established with representatives from the Provincial Government, local governments, Union of B.C. Municipalities and the Society for the Prevention of Cruelty to Animals. Through its Wildlife Program, BCMOTI is providing expertise for the initiative.

(4) Research and innovation

Transportation agencies typically have a wealth of extremely resourceful and innovative staff. Everyone who drives on roads and highways has a vested interest in personal safety with regards to potential wildlife-vehicle collisions. When faced with a situation where current technology and approaches for protecting wildlife and road users are limited, the Wildlife Program develops new approaches by accessing the knowledge and imagination of BCMOTI's staff. The solutions vary from infrastructure advancements to increasing public awareness.

Moving an idea from a concept to reality for highway operations requires input and buy-in from a wide range of Ministry interests. Prior to the Trans-Canada (Highway 1) improvements, east

of Revelstoke, the Ministry had never used a jump-out to enable wildlife to exit a wildlife exclusion system. Moving the idea of a wildlife jump-out from a concept to reality was made possible with consideration from geotechnical, traffic safety, and maintenance engineers. A simple concept, involving the placement of soil against a retaining wall, required the understanding and acceptance of these engineering disciplines. The Wildlife Program was able to establish a positive dialogue and accommodate the various engineering disciplines concerns and develop a design that met all concerns (Figures 7 and 8).

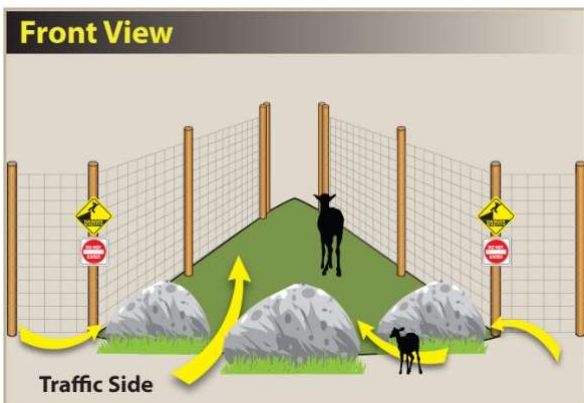


Figure 7: Wildlife jump-out concept



Figure 8: Wildlife jump-out in field (Aerial View)

The complexity of developing a new generation of effective wildlife protection solutions requires the combined efforts of experts from an increasingly wide range of professions. Currently, BCMOTI is working closely with researchers in the Electrical Engineering Department at the University of Victoria on developing a wildlife-friendly, tunable coloured lighting system for bridge decks (Figure 9). The goal of the project is to modify bridge deck lighting to produce species-specific, wildlife-friendly conditions while providing road users a safe crossing structure. One early development in this research has been the successful application of Artificial Intelligence (AI) and Deep Learning to identify and differentiate between wildlife and humans in photos taken by monitoring cameras (Figures 10 and 11).

Wildlife Friendly Tunable Colour Illumination Concept for Bridge Decks

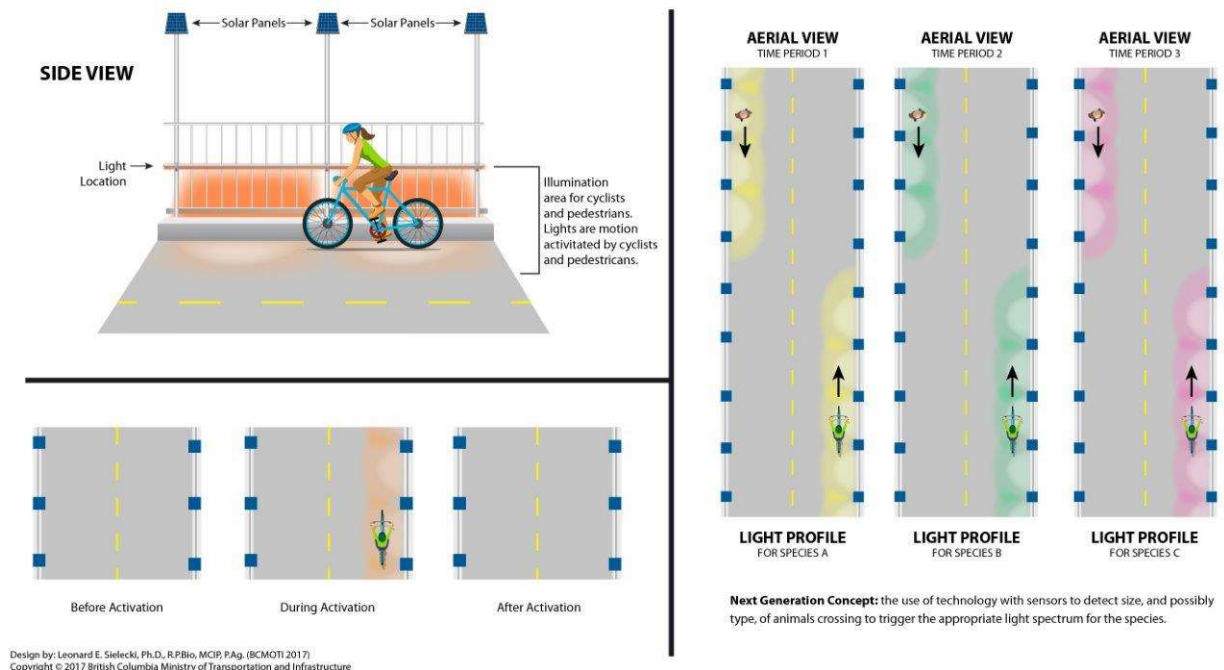


Figure 9: Wildlife Friendly Tunable Colour Illumination Concept for Bridge Decks

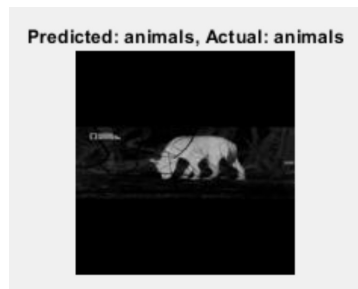


Figure 10: Animal detection with Deep Learning
(Source: Electrical Engineering Department, University of Victoria)



Figure 11: Human Detection with Deep Learning
(Source: Electrical Engineering Department, University of Victoria)

(5) Communications, public outreach and stakeholder engagement

Throughout Canada, transportation agencies are dealing with a legacy of environmentally unsustainable highway systems created at a time when public expectations and government regulations were focused largely on increasing safe mobility for road users. However, public expectations for the protection of wildlife on roads and highways have grown significantly over the last 40 years. Social media platforms, such as Facebook and Twitter, are bringing wildlife issues to a wider audience range and increasing public interaction on these issues.

As a result, a growing component of the Wildlife Program is communications, public outreach and stakeholder engagement. The program competes for the attention its audience with an extremely wide range of news and entertainment platforms. Consequently, format, timeliness and relevance are critical elements for the success of wildlife awareness messaging for current and future road users (Figures 12 and 13). Communicating wildlife hazards has evolved beyond static, species-specific warning signs to Social Media platforms to engage current and future road users (Figures 14 and 15).

Messaging concepts and graphic materials are presented to informal Ministry focus groups for feedback. Throughout British Columbia, Ministry staff have the potential to encounter wildlife on roads and highways in urban, suburban and rural settings. The invitation to participate in these focus groups spans across the Ministry, from administrative support staff to senior executives. Drawing upon the first-hand experiences of a wide range of individuals provides a wealth of information about wildlife and road-user interactions. Insight can be drawn upon from anyone in a transportation agency, regardless of profession or trade.



Figure 12: Graphics development



Figure 13: Wildlife awareness messaging



Figure 14: Static species-specific wildlife warning sign

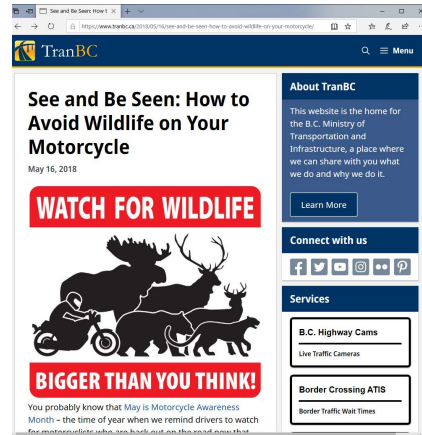


Figure 15: TranBC Social Media blog for motorcyclists

Internal Agency Outreach

Increasing BCMOTI staff awareness of wildlife on roads and highways increases the potential for wildlife-vehicle collisions avoidance and an understanding of the large role the Ministry plays in wildlife protection. Consequently, early engagement of new agency employees helps raise their wildlife awareness. The Wildlife Program gives presentations to agency staff, ranging from administrative and financial staff to planners and engineers which helps establish a common wildlife appreciation and awareness mindset. Over the last 25 years, corporate sentiments towards protecting wildlife have evolved considerably to reflect evolving public sentiments.



Figure 16: Outreach to Ministry co-op students



Figure 17: Outreach to senior Ministry executives

Public Outreach and Stakeholder Engagement

British Columbian wildlife is an integral part of the province's identity. For many residents, wildlife represents an extremely valuable resource. The Provincial social, economic and cultural

values of wildlife are important factors that BCMOTI strives to recognize and respect. The rare Kermode bears (Spirit Bears) that cross Highway 113, in northwestern British Columbia, hold an important place in the oral history and traditions of the First Nations of the Central and North Coast regions of the province. The large herds of Big Horn Sheep that frequent Highway 93 in the Town of Radium in the Rocky Mountains, entertain tourists from around the world. The Mountain Goats found along Highway 31 in the province's interior are considered an integral part of the Town of Lardeau's identity by the town's residents. Moose that forage along Highway 16 in northern British Columbia represent an essential food source for subsistence hunters as well as a source of livelihood for guide fitters. The Wildlife Program is a key component of BCMOTI's ongoing efforts to support provincial and local goals to preserve and protect wildlife. The program also strives to support greater Provincial wildlife goals when opportunities unique to BCMOTI develop.

In the mid-2010s, the Wildlife Program organized and coordinated access to the Ministry's maintenance contractors to help the BC Ministry of Health to collect corvids for its West Nile Virus monitoring activities along the BC/Alberta border. In 2019, the Wildlife Program provided the same support to the BC Ministry of Forests, Lands and Natural Resource Operations and Rural Development for its collection of deer carcasses along the BC/Montana border for Chronic Wasting Disease (CWD) monitoring.

Outreach to Future Road Users

An increasingly important target for the Wildlife Program's wildlife awareness messaging are future road users. In British Columbia, societal costs of wildlife-vehicle collisions continue to grow each year. However, by investing resources in raising wildlife awareness among future road users, there is potential for greater societal payback in the years to come. By making wildlife awareness a subconscious element early in a road user's mind, there is the opportunity to pre-condition future road users to expect wildlife along provincial roads and highways. For the last five years, the Wildlife Program has been contributing resources to youth-oriented activities, such as the BC Wildlife Federation's Wild Kidz summer camps and CoreySafe, a BC non-profit promoting motorcycle safety for youth (Figures 18 and 19).

Networking Nationally and Internationally

BCMOTI is always looking for new ways to protect wildlife and road users on highways in British Columbia. In order to increase opportunities to learn more, Wildlife Program staff network with road ecologists in transportation agencies across Canada and around the globe. BCMOTI has been a supporter of the International Conference on Ecology and Transportation (ICOET) since the conference's inception in 2001. Over the last two decades, the Ministry's Wildlife Program staff have presented numerous papers on the Ministry's wildlife protection initiatives and participated as members of the conference's steering, program, and awards committees. ICOET offers BCMOTI a valuable opportunity to benefit from advancements in wildlife protection developed by road ecologists working for transportation authorities around the world. Through

its participation in ICOET, Wildlife Program staff have established networks to share and foster wildlife protection innovations.



Figure 18: Wildlife awareness for children
(Source: Elke Wind)



Figure 19: Motorcycle safety with CoreySafeBC

The Future

The natural ecosystems that British Columbia provincial highways pass through have always been dynamic environments. However, the impacts of climate change may be contributing to unforeseen challenges for protecting wildlife and road users. As provincial temperature and precipitation patterns evolve, so will wildlife habitats. If anticipated trends occur, a wide range of wildlife species may be expected to make unprecedented adaptations in their populations and geographic distributions. New and innovative, but practical and effective solutions will be needed for maintaining and increasing wildlife habitat connectivity across highways and reducing the potential for wildlife-vehicle collisions. In preparation, BCMOTI's Wildlife Program is collecting and analyzing an increasing amount of information on wildlife found on and near provincial highways. Drawing upon the wealth of knowledge found among transportation and natural resource agencies, First Nations, academia, consultants and wildlife organizations in British Columbia, and around the world, will be key to developing and delivering successful wildlife protection initiatives.