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THE WILDLIFE PROTECTION  
SYSTEM: EARLY SUCCESSES AND  
CHALLENGES USING INFRARED  
TECHNOLOGY TO DETECT DEER,  
WARN DRIVERS, AND MONITOR  
DEER BEHAVIOR

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# THE WILDLIFE PROTECTION SYSTEM: EARLY SUCCESSES AND CHALLENGES USING INFRARED TECHNOLOGY TO DETECT DEER, WARN DRIVERS, AND MONITOR DEER BEHAVIOR

## Abstract

Wildlife-vehicle accidents result in substantial personal, environmental and economic losses, including human injuries, fatalities, loss of wildlife, and vehicle damage. In British Columbia, about 16,000 such collisions occur annually, including unreported cases. This typically results in two to three human deaths (Sielecki 2001) and claims to the Insurance Corporation of British Columbia (ICBC) of over CDN\$25 million, excluding “swerved-to-miss” accidents. As Farrell (2002) notes, the problems associated with wildlife-vehicle collisions are global, pervasive and increasing, yet most of the literature suggests that many mitigation techniques have limited utility because they are ineffective at reducing collisions or have large impacts on natural wildlife movements. Project Objectives The Wildlife Protection System (WPS) is designed to use infrared cameras to detect wildlife on or near highways. When wildlife is detected, flashing lights are triggered, warning drivers to reduce speed and anticipate wildlife on the roadway. The objectives of this project are to: 1. Determine the ability of the WPS to detect wildlife and warn motorists. 2. Determine the speed response of drivers to wildlife-activated warning lights. 3. Document wildlife behavior near highways using 24-hour infrared video footage in order to develop more effective wildlife collision mitigation strategies. Funding Source and Total Budget Funding for this project was provided by the Insurance Corporation of British Columbia, Intrans Tech (part of the Rainbow Group of Companies), Parks Canada, the BC Conservation Foundation, the Columbia Basin Fish and Wildlife Compensation Program, FLIR Systems, Inc., OCTEC Ltd., and QWIP Technologies. In 2002, over CDN\$600,000 was spent on development and preliminary testing of the system. Methodology The first trial was initiated in the summer of 2002 in Kootenay National Park, British Columbia, Canada. In the trial, a camera was mounted on a 6-m pole at each end of a 2-km stretch of highway. Adjacent to each pole was a trailer containing a computer (with tracking software), two radar guns, and a conventional digital video camera. Continuous (24-hour) infrared and conventional video footage was recorded. In

addition, an “event log” was generated in an Excel spreadsheet that recorded traffic speeds before and within the test zone, and animal detections within the zone. A number of technical difficulties prevented the system from becoming fully operational in 2002. However, we were able to view 24-hour infrared video footage of deer behavior in the highway right-of-way (ROW) over 16 days from 29 August to 7 October 2002. We recorded the number of deer present on the ROW during five-minute samples at the beginning of every half-hour, along with their location and some behaviors (in ditch, on roadside approaching highway, on roadside retreating from highway, standing on road, crossing road), whether they were running, whether a car was present, and if crossing, whether the attempt was successful and whether there was a near-miss with a vehicle. Summary of Findings and Their Applications Successes from this preliminary trial include confirmation of the camera’s ability to track wildlife within a 1-km range, and collection of infrared video data, providing a unique opportunity to study wildlife behavior on and near road systems. We recorded 1131 deer-minutes of behavior (number of deer events multiplied by the time they were present in the sampling period). Based on hourly totals of deer-minutes, we stratified the 24-hour period into night (midnight to 7 AM), midday (7 AM to 7 PM) and evening (7 PM to midnight). Both the number of deer and the duration of their stay in the ROW were greatest during the night, intermediate during the evening, and lowest during midday, so the number of deer-minutes per hour was over 2x higher at night than evening, and over 15x higher at night than midday. However, deer were more likely to exhibit behaviors of concern to motorists during midday. For example, within sample periods, the following measures were higher per deer during midday than evening or night, respectively: approaches to highway (0.70, 0.60, 0.43), running approaches to highway (0.42, 0.09, 0.03), stepping onto the highway surface (0.14, 0.10, 0.10), attempted or successful highway crossings (0.12, 0.08, 0.08), and crossing in front of oncoming cars (0.05, 0.00, 0.02). The relatively higher rate of high-risk behaviors during midday is compounded by the fact that vehicle numbers were much higher during ICOET 2003 Proceedings 391 Making Connections midday (263/hr) than evening (182/hr) or night (70/hr). Driving in daylight probably increases deer visibility dramatically, but being within the line-ups of cars more typical of midday presumably decreases the driver’s field of view and may increase the collision hazard and severity associated with a driver swerving or making a sudden stop. Implications for Future Research/Policy If further test trials are successful, this new technology should be used to reduce wildlife-vehicle collisions. The WPS offers several advantages over conventional mitigation strategies including:

- Wildlife cannot become habituated as they might to scents, reflectors, and other deterrents because the system focuses on the actions of motorists, rather than animal behavior.
- Drivers are less likely to become complacent to the warning system because it is only triggered temporarily when wildlife is present.
- This system does not interfere with the natural movement of wildlife, nor require the construction of overpasses or underpasses to allow for highway crossings.
- In contrast to permanent structures, such as overpasses and underpasses, this system is highly portable and

can be moved seasonally to high risk areas, or relocated in response to changing wildlife populations and movements, adjacent land-use and traffic patterns.

- This system can operate 24-hours/day, in contrast to some mitigation tools that operate only at night. Wildlife behavior data collected from this trial in August to October, 2002 suggests that despite the number and duration of deer events in the ROW being higher at night or evening than midday, deer exhibit behaviors more likely to result in accidents during midday. High midday traffic volumes may partly negate the visibility benefits that would otherwise exist from driving in daylight. The portable infrared video recording system could also be used as a research tool for wildlife accident mitigation such as documenting wildlife crossing rates prior to construction of new highways to determine best locations for overpasses and tunnels (if they are deemed necessary) and assessing the effectiveness of other existing mitigation tools, such as reflectors, repellents, and whistles by documenting wildlife behavioral response. The system could be employed in a broad range of other off-highway wildlife behavior research as the trailers are fully portable, unobtrusive, and provide 24-hour/day recordings. The 2003 tests will focus on continued assessment and refinement of the technical aspects of the WPS, evaluating the effectiveness of the warning lights in altering driver speed, and documentation of wildlife behavior in the test zone.

## **THE WILDLIFE PROTECTION SYSTEM: EARLY SUCCESSES AND CHALLENGES USING INFRARED TECHNOLOGY TO DETECT DEER, WARN DRIVERS, AND MONITOR DEER BEHAVIOR**

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### **Problem Statement**

Wildlife-vehicle accidents result in substantial personal, environmental and economic losses, including human injuries, fatalities, loss of wildlife, and vehicle damage. In British Columbia, about 16,000 such collisions occur annually, including unreported cases. This typically results in two to three human deaths (Sielecki 2001) and claims to the Insurance Corporation of British Columbia (ICBC) of over CDN\$25 million, excluding “swerved-to-miss” accidents. As Farrell (2002) notes, the problems associated with wildlife-vehicle collisions are global, pervasive and increasing, yet most of the literature suggests that many mitigation techniques have limited utility because they are ineffective at reducing collisions or have large impacts on natural wildlife movements.

### **Project Objectives**

The *Wildlife Protection System* (WPS) is designed to use infrared cameras to detect wildlife on or near highways. When wildlife is detected, flashing lights are triggered, warning drivers to reduce speed and anticipate wildlife on the roadway. The objectives of this project are to:

1. Determine the ability of the WPS to detect wildlife and warn motorists.
2. Determine the speed response of drivers to wildlife-activated warning lights.
3. Document wildlife behavior near highways using 24-hour infrared video footage in order to develop more effective wildlife collision mitigation strategies.

### **Funding Source and Total Budget**

Funding for this project was provided by the Insurance Corporation of British Columbia, Intrans Tech (part of the Rainbow Group of Companies), Parks Canada, the BC Conservation Foundation, the Columbia Basin Fish and Wildlife Compensation Program, FLIR Systems, Inc., OCTEC Ltd., and QWIP Technologies. In 2002, over CDN\$600,000 was spent on development and preliminary testing of the system.

### **Methodology**

The first trial was initiated in the summer of 2002 in Kootenay National Park, British Columbia, Canada. In the trial, a camera was mounted on a 6-m pole at each end of a 2-km stretch of highway. Adjacent to each pole was a trailer containing a computer (with tracking software), two radar guns, and a conventional digital video camera. Continuous (24-hour) infrared and conventional video footage was recorded. In addition, an “event log” was generated in an Excel spreadsheet that recorded traffic speeds before and within the test zone, and animal detections within the zone. A number of technical difficulties prevented the system from becoming fully operational in 2002. However, we were able to view 24-hour infrared video footage of deer behavior in the highway right-of-way (ROW) over 16 days from 29 August to 7 October 2002.

We recorded the number of deer present on the ROW during five-minute samples at the beginning of every half-hour, along with their location and some behaviors (in ditch, on roadside approaching highway, on roadside retreating from highway, standing on road, crossing road), whether they were running, whether a car was present, and if crossing, whether the attempt was successful and whether there was a near-miss with a vehicle.

### **Summary of Findings and Their Applications**

Successes from this preliminary trial include confirmation of the camera’s ability to track wildlife within a 1-km range, and collection of infrared video data, providing a unique opportunity to study wildlife behavior on and near road systems.

We recorded 1131 deer-minutes of behavior (number of deer events multiplied by the time they were present in the sampling period). Based on hourly totals of deer-minutes, we stratified the 24-hour period into night (midnight to 7 AM), midday (7 AM to 7 PM) and evening (7 PM to midnight). Both the number of deer and the duration of their stay in the ROW were greatest during the night, intermediate during the evening, and lowest during midday, so the number of deer-minutes per hour was over 2x higher at night than evening, and over 15x higher at night than midday. However, deer were more likely to exhibit behaviors of concern to motorists during midday. For example, within sample periods, the following measures were higher per deer during midday than evening or night, respectively: approaches to highway (0.70, 0.60, 0.43), running approaches to highway (0.42, 0.09, 0.03), stepping onto the highway surface (0.14, 0.10, 0.10), attempted or successful highway crossings (0.12, 0.08, 0.08), and crossing in front of oncoming cars (0.05, 0.00, 0.02). The relatively higher rate of high-risk behaviors during midday is compounded by the fact that vehicle numbers were much higher during

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### **Implications for Future Research/Policy**

If further test trials are successful, this new technology should be used to reduce wildlife-vehicle collisions. The WPS offers several advantages over conventional mitigation strategies including:

- Wildlife cannot become habituated as they might to scents, reflectors, and other deterrents because the system focuses on the actions of motorists, rather than animal behavior.
- Drivers are less likely to become complacent to the warning system because it is only triggered temporarily when wildlife is present.
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- In contrast to permanent structures, such as overpasses and underpasses, this system is highly portable and can be moved seasonally to high risk areas, or relocated in response to changing wildlife populations and movements, adjacent land-use and traffic patterns.
- This system can operate 24-hours/day, in contrast to some mitigation tools that operate only at night. Wildlife behavior data collected from this trial in August to October, 2002 suggests that despite the number and duration of deer events in the ROW being higher at night or evening than midday, deer exhibit behaviors more likely to result in accidents during midday. High midday traffic volumes may partly negate the visibility benefits that would otherwise exist from driving in daylight.

The portable infrared video recording system could also be used as a research tool for wildlife accident mitigation such as documenting wildlife crossing rates prior to construction of new highways to determine best locations for overpasses and tunnels (if they are deemed necessary) and assessing the effectiveness of other existing mitigation tools, such as reflectors, repellents, and whistles by documenting wildlife behavioral response. The system could be employed in a broad range of other off-highway wildlife behavior research as the trailers are fully portable, unobtrusive, and provide 24-hour/day recordings.

The 2003 tests will focus on continued assessment and refinement of the technical aspects of the WPS, evaluating the effectiveness of the warning lights in altering driver speed, and documentation of wildlife behavior in the test zone.

**Website for More Info:** For more information on this project, check the BC Conservation Foundation website at <http://bccf.com/wvap/> or Intrans Tech's website at <http://www.intranstech.com/>.

**Biographical Sketch:** Nancy Newhouse is a senior biologist with Sylvan Consulting Ltd. She is currently under contract to the Insurance Corporation of British Columbia (ICBC) to assess a number of wildlife accident mitigation strategies, including the Wildlife Protection System (WPS). Funding for the WPS has been provided by a coalition of partners including ICBC, Innovative Transportation Technology Inc. (Rainbow Group of Companies), Parks Canada and the Columbia Basin Fish and Wildlife Compensation Program. Nancy has also been actively involved in numerous other wildlife conservation projects including badger research, riparian research and wildlife viewing programs. Nancy holds a Bachelor of Science and a Master of Environmental Design degree.

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