

A photograph of a two-lane road curving through a forested area. A car is visible in the distance. On the left side of the road, a deer is standing near a gravel shoulder. A yellow traffic sign with a deer silhouette and the text 'SLOW DOWN' is visible on the right side of the road. The background shows dense evergreen trees and a clear sky.

WILDLIFE DETECTION SYSTEM

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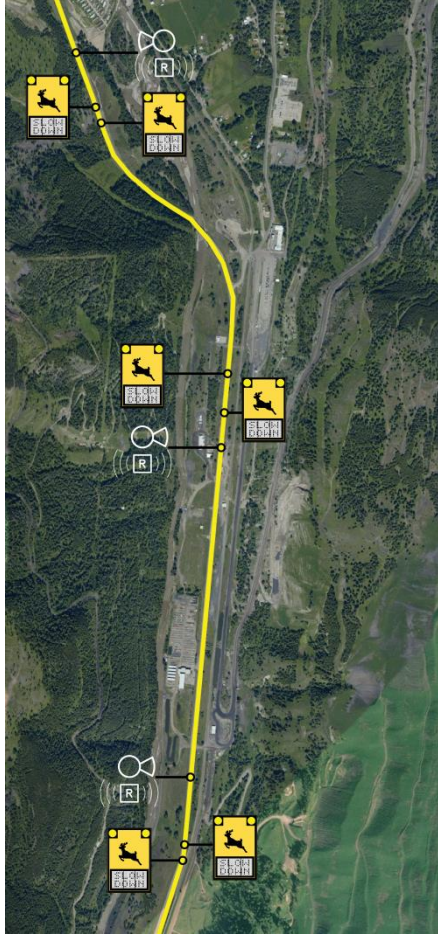
COLLISION PREDICTION AND PREVENTION

2019 CARSP CONFERENCE

CALGARY, ALBERTA

MAY 27, 2019

Background

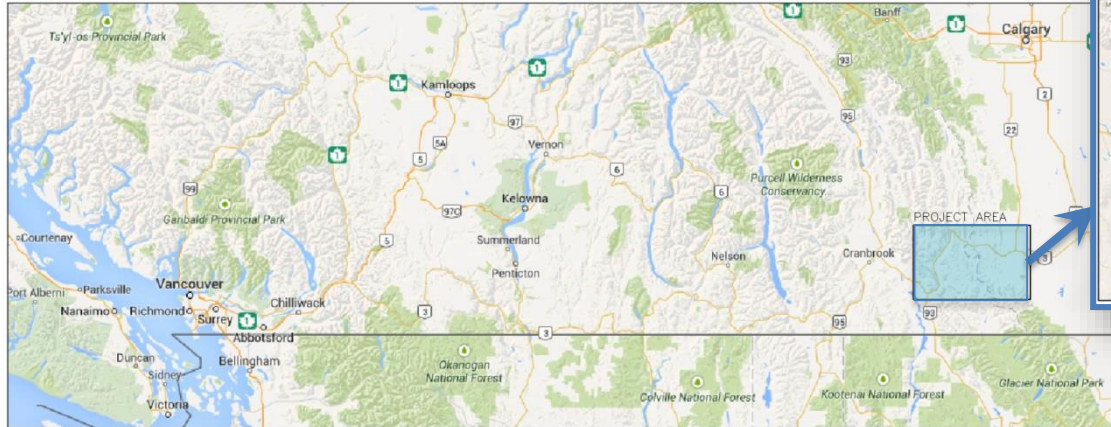


- Each year, thousands of Animal-Vehicle Collisions (AVCs) are reported on British Columbian (BC) provincial highways
- Collisions endanger various wildlife species, result in death and serious injuries, and cost millions of dollars annually

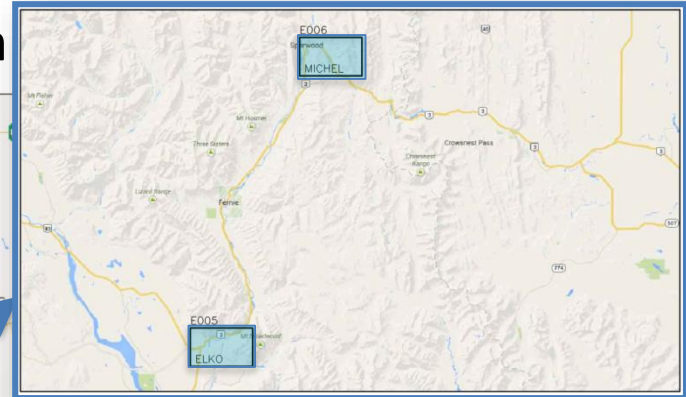
- Through analysis of historical collisions information, Highway 3 section between Cranbrook, BC and Alberta border identified as having one of the highest densities of large animal collisions in the province
- Project conceived to design, implement, and commission an effective Wildlife Detection System (WDS) for reducing the number of wildlife incidents along highway corridor

Project Locations

- **Corridor 1: Michel** approximately 6km section of Highway 3, just east of Sparwood, BC
- **Corridor 2: Elko** approximately 4km section of Highway 3, just east of the Highway 3 and Highway 93 junction



PROJECT AREA OVERVIEW
N.T.S.



- High profile: identified in BC On The Move
- Followed a thorough methodology
 - Functional requirements
 - Past project analysis
 - Technology research and evaluation
 - Extensive field investigation
 - Preliminary and detailed designs
 - Thorough software and system specifications
 - RFP for selection of technology integrator
 - Extensive testing and data validation

- Past project analysis
 - Market and literature analysis
 - Significant outreach to numerous other jurisdictions across North America to determine:
 - ◆ What's been tried
 - ◆ What worked and what didn't
- Findings
 - **MANY OTHER WDS PROJECTS HAVE FAILED**

- Reasons for Failure
 - Insufficient technical expertise
 - Inappropriate application of technology
 - Insufficient data validation
 - Insufficient level of sophistication
- Findings guided the design and implementation
 - Apply methodology and technologies from other industries (Security)

- Upon detection of wildlife, the WDS activates advisory signs
- Signs stay active for the duration that the wildlife is within the detection zone
- When wildlife clears the detection zone, the WDS deactivates the advisory signs
- Detection zone coverage area:
 - Within 4m of paint line on each shoulder, along entire corridor

Concept of Operations



System Overview



- System designed to detect the presence of large animals: deer, elk, moose, and sheep
- WDS consists of a dense deployment of ITS field components:
 - Detectors
 - Cameras
 - DMS and static signing
 - Field Controllers
 - Software

Messaging Signs

- Gateway Signs
 - On overhead structures, similar to Advance Warning Signs
 - At Extents of the detection corridors
- Advisory Signs
 - Intermediate locations along the corridor
 - When activated: Notify that wildlife has been detected
 - When deactivated: Remind motorists they are in detection corridor



- Radars

- Ground based surveillance radars
- Design for perimeter intrusion detection applications
- Cover large area (1400m radius)

- Blind spot mitigation

- Radars have inherent blind spot
- Ideal locations for sensor also had significant tracks
- Video analytics used to cover blind spot



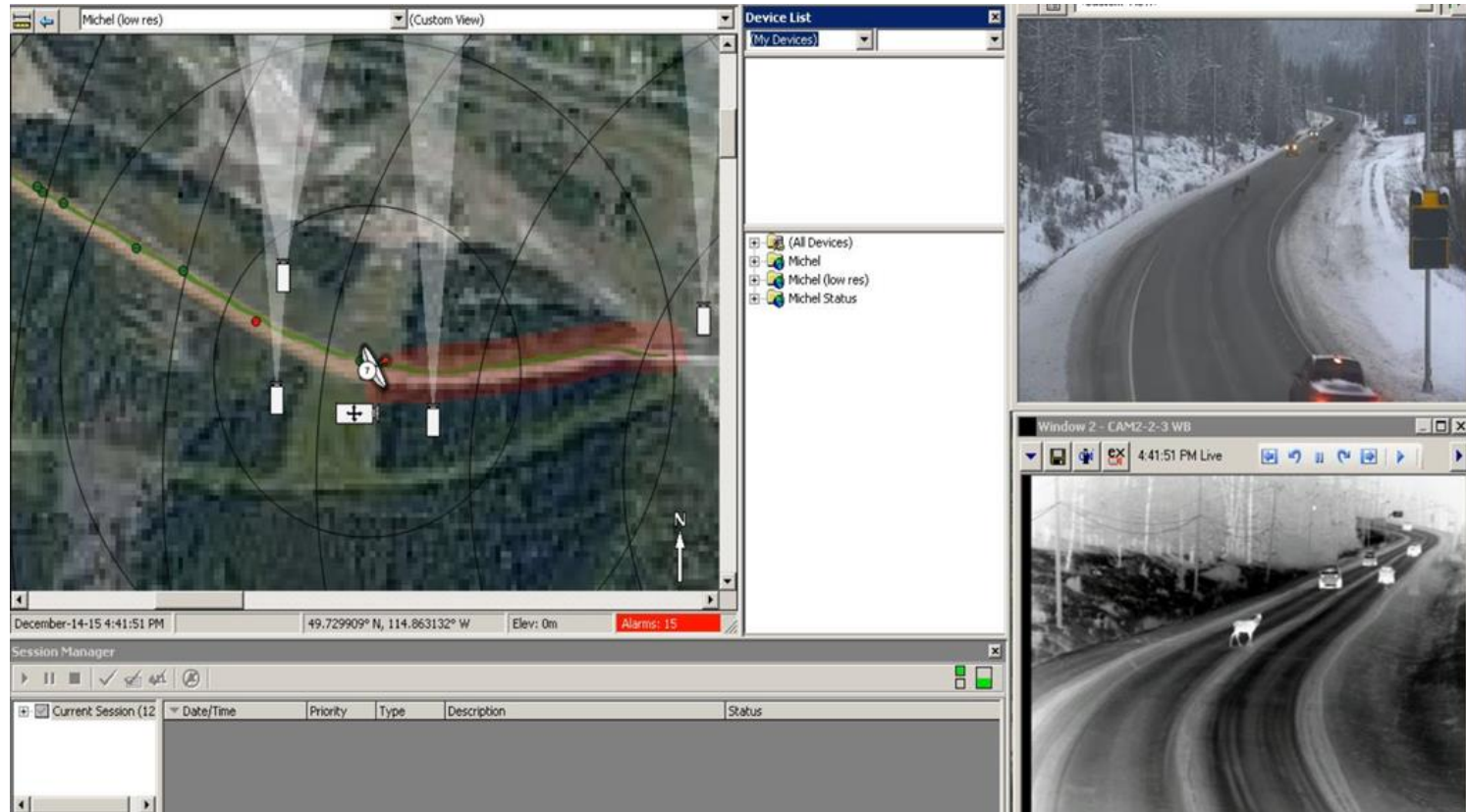
- Drawbacks to Radars
 - High initial cost
 - Operate on line of site
 - ◆ Sensitive to terrain geometry
 - Reflections can be challenging

Detection Technology

- System augmented with cameras for data validation, calibration, and troubleshooting
 - Colour PTZ
 - Fixed thermal
- Video recording system integrated into ATMS



- System operates autonomously
- Integrates all devices into common platform
 - Control
 - Detection algorithms
 - Reporting
 - Maintenance alerts
- Auto-tracking of detected objects with PTZ slaved to radar
- Detection events are synchronized with video recording



- Effective system operation has to deal with a variety of conditions and exceptions:
 - Multiple animals
 - Animal behavior: Grazing, lingering on the sides of the road, startle response
 - Cars, trucks, motorcycles, cyclists, and pedestrians
 - Inclement weather
 - Terrain and obstructions
- Extensive filtering scripts applied over multiple layers of detection zones

Testing and Data Validation

- Critical to demonstrate and prove accurate performance of the system
- Rigorous and systematic testing methodology developed and applied
- Testing
 - Identify issues
 - Adjust sensor configurations
 - Accurately validate detection capability
- Use of realistic test subjects armed with GPS and radios



Detection Examples



Detection Examples



Wildlife Detection System

May 27th, 2019

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Detection Examples



Detection Examples



Challenges and Lessons Learned

- Performance risk due to media coverage and high profile attention
- Remoteness of site
- Metal signs
- Uncooperative test subjects
- Key metric is system activation time, not false alarm rate



Challenges and Lessons Learned

- KISS principle does not always apply
- A sufficiently sophisticated system is required to support accurate, reliable operation
- Data validation is just as important as we thought it would be → cameras
- Key metric is system activation time, not false alarm rate



Accuracy and Performance

- System proven to be 97% accurate
- Pre-activation AVC data gathered from ICBC and area maintenance contractor data
- Significant AVC reduction

Elko: 79%

Michel: 23%



Future Configuration

- Mobile platform and the mission recorder

Questions?

THANK YOU FOR YOUR TIME