



CREATING A WILDLIFE-VEHICLE COLLISION CLEARING HOUSE IN CANADA: A FEASIBILITY STUDY



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EXECUTIVE SUMMARY

Wildlife-Vehicle Collisions (WVCs) are a serious burden to our society. The consequences are profound and include significant socio-economic, traffic safety and environmental costs. Not only do WVCs in Canada result in death and serious injuries, but certain species become endangered and are at risk of disappearing altogether, which is a threat to biodiversity in our country.

To properly address these issues, data of good quality are needed. However, such data are currently lacking in Canada from a number of perspectives. For example, an important limitation of data relates to the level of detail with respect to the location of WVCs. Today, it is often not possible to accurately measure where WVCs actually occur. Also, available data sources are scattered which makes it more challenging to intimately understand how this problem affects our society at a national and regional level. Of greater concern, data about species involved in WVCs are lacking. Such limitations are problematic because they impede measuring species-specific impacts of WVCs on wildlife populations as well as the development and efficient implementation of species-specific and effective measures. Without detailed knowledge of where and when collisions occur and the species affected it becomes difficult, if not impossible, to properly implement targeted mitigation measures.

As such, there is an urgent need to establish a national centralized clearing house in Canada that contains current and accurate data on WVCs. Detailed information such as time of day, season, socio-economic costs, type of roadway, accurate location, and animal type provides invaluable information for researchers and practitioners across disciplines to adequately research and apply effective solutions to the problem. In response to this urgent need, State Farm has provided funding to the Traffic Injury Research Foundation (TIRF) and Eco-Kare International to conduct a study to gauge the feasibility of creating such a clearing house; this report is the second deliverable of this project.

The first deliverable in this project laid the foundation for the feasibility study (see Vanlaar et al. 2012). This report, the second deliverable, describes the feasibility study. The goals of this second deliverable are:

- > To investigate the feasibility of establishing a WVC clearing house in Canada;
- > To develop an action plan to create a clearing house.

In order to achieve these goals a dedicated methodology was adopted. This methodology consists of two steps: first, essential components of a WVC clearing house are identified; second, the feasibility of incorporating each component in the clearing house is assessed.

1. INTRODUCTION

1.1 Background

In Canada, the issue of wildlife-vehicle collisions (WVCs) has never been more prevalent in the news than it is today. This is not surprising considering statistics from Transport Canada have shown that there is an increasing trend in reported collisions with large ungulate species, such as deer, and moose each year from 1999-2003 (L-P Tardif & Associates 2003, 2006).

Despite this increasing trend, data to inform solutions to the problem are limited. At present in Canada, there is no centralized data clearing house that can increase understanding of this problem of WVCs or ways it can be addressed. Presently, there are various data sets in Canada that contain some information but they are scattered across agencies such as Transport Canada, Provincial Ministries of Transportation and Highways or their equivalents and the Provincial Ministries of Natural Resources or Environment. However, there are discrepancies between counts of WVCs between national and provincial data sets, and the type of data collected between specific agencies (L-P Tardif & Associates 2003).

The toll of WVCs has resulted in deaths and injuries among humans, and has had an adverse effect on wildlife. Some species of wildlife in Canada have become endangered or have been labeled at risk of extirpation due, in part, to WVCs. Furthermore, despite the fact that consequences of WVCs are significant in terms of socio-economic, traffic safety, and environmental costs, this issue has not received the same degree of scrutiny as other road safety issues such as impaired driving, vulnerable road users, fatigue, and distracted driving to name a few, and this has resulted in a persistent lack of knowledge about the issue. This lack of knowledge is a barrier to the integration of various species-specific mitigation solutions into mainstream road safety and environmental protocols.

As such, the establishment of a national centralized clearing house that contains current and accurate data on WVCs is urgently needed. Detailed information such as time of day, season, socio-economic costs, type of roadway, accurate location, and animal type provides invaluable information for researchers and practitioners across disciplines to adequately research and apply effective solutions to the problem. In response to this urgent need, State Farm has provided funding to the Traffic Injury Research Foundation (TIRF) and Eco-Kare International to conduct a study into the feasibility of creating such a clearing house; this report is the second deliverable of this project.

1.2 Objectives

The main purpose of this study is to determine the feasibility of creating a WVC clearing house that will contain two major attributes: data and resources. The central repository of data and its derivatives can lead to a better understanding of WVC impacts and help manage the issue, facilitate research, and provide

solutions. In addition to data, additional resources such as links and documentation that can enhance a WVC data clearing house are also examined.

In addition to assessing the feasibility of creating a WVC clearing house, developing an action plan for the actual creation of the clearing house is another important objective of this study.

It is expected that users of the WVC clearing house would be members of the public, researchers from several disciplines including road safety, wildlife biology, and traffic engineering, and members of the media. Researchers from these different disciplines may have different perspectives on the problem of WVCs and essential priorities. Considering this range of users' backgrounds and perspectives, it is important for a WVC clearing house to be sufficiently inclusive to be relevant to all of these user groups. As such, providing the foundation for the creation of a versatile WVC clearing house that is relevant to each of these user groups is another important overall goal of this study.

1.3 Overview

Section 2 describes the methodology that was used to conduct this feasibility study. It explains that the adopted approach consists of two steps, first an environmental scan to select components for inclusion in the clearing house and, second an assessment of the feasibility of including each of these components. Section 3 briefly describes the results of the environmental scan and in Section 4, the feasibility of including different key components in a WVC clearing house is assessed. Section 5 contains conclusions and in Section 6 recommendations are formulated. In essence, these recommendations serve as an action plan for the creation of a WVC clearing house.

2. METHODOLOGY

The methodology adopted in this feasibility study consists of two steps. The first step is defining what to include in the WVC clearing house; the second step is then to assess how feasible it would be to actually include the different components identified in the first step.

With respect to the first step, two sources of information have been used to determine what components to include in a WVC clearing house. First, based on the research carried out in Deliverable 1 of this project (see Vanlaar et al. 2012), the types of components useful for the creation of a WVC clearing house were considered. Second, an environmental scan of websites of different research centres, both in the field of transportation as well as the environment, provided the information to complete the list of potential components to include in a WVC clearing house.

Current practices adopted in WVC research centres were determined by reviewing existing WVC research centre websites. The seven WVC research centres that were included in this review are:

- > Deer Vehicle Crash Information Clearinghouse (DVCIC), an agency housed at the University of Minnesota using state-based data and information from 11 participating U.S. states;
- > Road Ecology Center at the University of California-Davis, an academic/governmental partnership noted for its citizen-science based program (California Road-Kill Observation System);
- > California Department of Transportation's Wildlife Crossings Guidance Manual, an interactive website that allows users to comment on, edit or revise information regarding WVCs;
- > Center for Transportation and Environment (CTE) at North Carolina State University, an agency with a national perspective that seeks to improve transportation infrastructure while considering the environment;
- > Wildlife Collision Prevention Program (maintained by the British Columbia Conservation Foundation), a partnership of non-profit and insurance companies (Insurance Corporation of British Columbia) that summarizes rather than houses data;
- > Ontario Road Ecology Group (OREG), a non-profit agency raising public awareness and providing education about road ecology in Ontario as well as research and solutions for mitigation; and,
- > Western Transportation Research Institute, based at Montana State University, performing academic and consulting research primarily in Western North America (including research at Banff National Park), and currently piloting a Road-kill Observation Collection System that uses a palm pilot device.

These organizations generally provide both data summaries and resources about the impacts of roads on the environment. They offer a variety of types of information that are available in WVC research centres and that would be relevant for inclusion in a WVC clearing house.

In order to be able to consider additional components that could potentially be useful for a WVC clearing house, a review of non-WVC research centres was also performed. This endeavour sought to adopt as broad a selection of potential components as possible to help avoid overlooking certain components, simply because they are not typically included in existing WVC websites. For example, data that can be

queried is not often included in existing WVC websites, mainly because it is very challenging to obtain such data. However, that does not mean that assessing the feasibility of such a component is not important to this study. Therefore, three research centres were examined specifically for the data that they provide online. These research centres are:

- > National Center for Statistics and Analysis (NCSA), a branch of the National Highway Traffic Safety Administration (NHTSA) of the United States Department of Transportation;
- > Office of Highway Policy Information, a branch of the Federal Highway Administration (FHWA) of the United States Department of Transportation; and,
- > Statistics Canada, Canada's national statistics agency.

Non-WVC research centres that focused on road safety related aspects were also reviewed for other key components. They were chosen on the basis of their expertise and ongoing research. They include:

- > Motorcycle Safety Foundation (MSF), a not-for-profit foundation, supported by motorcycle manufacturers whose mandate is to provide leadership in motorcycle safety;
- > New South Wales Centre (NSW) for Road Safety, a branch of the Department of Transport for the Australian state of New South Wales, whose work in the area of speed management is within the framework of its greater goal, which is to change cultural values on road safety;
- > Hands-Free Info, a California-based organization that aspires to reduce the number of distracted-driver accidents on U.S. highways and to this purpose, advocates the use of hands-free cell phone devices in vehicles;
- > Société de l'assurance automobile du Québec (SAAQ), the provincial automobile insurance corporation in Quebec, whose work in researching driver fatigue complies with its general research on road safety issues;
- > The Century Council, which represents the American distilling industry in its efforts to reduce drinking and driving;
- > arrive alive DRIVE SOBER, a registered charity collaborating with key stakeholders and community partners that, as part of its fight against impaired driving in Ontario, maintains a website for its campaign; and,
- > Two websites maintained by TIRF, the Young and New Driver Resource Centre (YNDRC) which serves as a comprehensive source of information on young and new driver safety, and Change the Conversation, a website dedicated to a national educational program committed to reducing impaired driving.

The results of this review have been summarized and are available in Section 3. This section briefly describes the key components that should be included in a WVC clearing house. A more detailed description of the actual results from the environmental scan was used as an internal document to inform the selection of key components and the assessment of their feasibility.

Once the key components were identified and information about them was gathered from all of the WVC and non-WVC research centres included in the review, the next step was to assess the feasibility of including each of these components. The feasibility of obtaining raw data and other types of data for

the inclusion in a WVC clearing house is examined in Section 4.1. The feasibility of including other key components like links or documentation is described in Sections 4.2 to 4.4.

3. KEY COMPONENTS FOR INCLUSION IN A WVC CLEARING HOUSE

As explained previously, this section contains the results from the first step in this feasibility study, i.e., an environmental scan to inform the selection of key components to include in a WVC clearing house. This section contains a brief summary of these key components while a more detailed description of the results of the environmental scan was used as an internal document for the purposes of this study.

3.1 Background and mission statement

A background statement provides general information about the website including a justification for its existence; goals and objectives; contributions (financially, intellectually or otherwise); and partners. A mission statement can be part of this background section and typically describes the mission and related goals of an organization or association that serves as the manager or custodian of the website. WVC and non-WVC research centres were examined to determine if and how such a statement had been included on their website.

3.2 Data

The presence of data in a WVC clearing house facilitates research opportunities for its users. It makes it possible to help answer important research questions. In addition, summaries from analyzed data can illustrate the current magnitude of a particular problem and, if data from multiple points in time are available, trends can be studied. Both WVC and non-WVC research centres were studied to examine such important aspects as types of data, how data are presented, temporal span of data and access to it, and cost of data. The following sub-categories of data are used in Section 4 when assessing the feasibility of including this component in the WVC clearing house:

- > Raw data (actual data sets that can be used for analysis);
- > Summarized data (this includes fact sheets with pre-packaged summaries of data; more generally speaking, this category also pertains to subject content and overlaps to some extent with the next category entitled 'Literature');
- > Query-friendly data (this refers to raw data made available in a format that is more easily queried compared to raw data per se); and,
- > Citizen science collected data (this refers to the different types of data that become available through the efforts of laymen as opposed to professionals like scientists or government employees).

3.3 Literature

This key component refers to literature of interest that can range from detailed reports and peer-reviewed studies to news releases or fact sheets (the latter being summaries of available literature and made

available by topic in the clearing house; cf. fact sheets of data and potential overlap with the sub-category entitled 'summarized data' in the previous section). WVC and non-WVC research centres were reviewed to see what types of literature they offer to online users.

3.4 Links

Links allow a user to obtain more information on a given issue from different sources. For this purpose, the review checked to see if WVC and non-WVC research centres posted such links. This included:

- > Other organizations engaged in similar research; or,
- > Upcoming conferences dealing with the issue.

3.5 Communications

A clearing house's website can include a component that enables interaction with the research community as well as the general public. Among the interactive tools that can be included within this communications component are:

- > Forum for online users to post questions and/or comments;
- > Online quiz dealing with the issue;
- > Online polls on related topics; and,
- > Blog discussing ongoing research and news.

4. FEASIBILITY OF INCORPORATING KEY COMPONENTS IN A WVC CLEARING HOUSE

This section contains the results of the second step in this study, i.e., assessing the feasibility of including key components in the WVC clearing house that were identified in the environmental scan as described in Section 3. Key components included in this section are Data (Section 4.1), Literature (Section 4.2), Links (Section 4.3), and Communications (Section 4.4).

Note that background and mission statement is not included in this section because the feasibility of including this in a clearing house is obvious given that it does not depend on factors or actors outside of the control of the creators of the clearing house – essentially it is straightforward to include such statement in a website.

4.1 Data

This section investigates the feasibility of including the following types of data:

- > Raw data;
- > Summarized data;
- > Query-friendly data; and,
- > Citizen science collected data.

Furthermore, it also includes a supplementary section called metadata, which is information about the data in the clearing house, followed by a summary section.

4.1.1 Raw data

This component pertains to centralizing raw data sets in a WVC clearing house with the intention of making them available for analysis and to develop resources in the clearing house. Access to such data sets can be public (for example like the crash data from the National Highway Traffic Safety Administration in the U.S.) or restricted (for example access is contingent on the signing of an agreement between the custodian of the data and the user of the data).

Table 1 summarizes information from several important data sources in Canada, more precisely location, i.e., geographic coverage of the data; responsible agency; ownership; frequency of data collection; and comments. Feasibility of obtaining these data for inclusion in the WVC clearing house was determined using three factors: responsible agency, ownership and frequency of data collection. Feasibility was assessed as high when data are routinely collected by one agency and maintained in a central repository. Moderate or low feasibility was defined for situations where data are scattered among different agencies, or if the data are not routinely collected and therefore would involve higher costs or require more efforts to compile the data accurately and systematically.

Table 1: Relative feasibility of obtaining raw data

WVC Data	Location	Responsible Agency	Ownership	Automation of Data Collection/ Summaries	Comments	Feasibility of Obtaining
Insurance Corporations	BC, SK, MB, QC	Insurance Corporations	Corporate	Routinely	- Submitted to Transport Canada annually in a compiled database - Summarized by corporation annually	High
Insurance Corporations	ON	Collected by many major corporations (~199)	Corporate	Routinely	Data request by Morrison Hershfield (2011) outstanding	Moderate
Police Reported	All	Provincial or municipal transportation agency	Provincial and municipal governments	Routinely	- Submitted to Transport Canada annually in a compiled database - Provincial summaries vary - Need to translate geodetic system or location by km post to general latitude and longitude	High
Municipal By-law Services or Animal Services	Edmonton, Ottawa, Prince George	Municipal public works or animal services departments	Municipal governments	Not routinely	- Varies by jurisdiction - Overlap of data collection among several agencies such as fire and public works departments (Rea 2004)	Moderate/Low
Medical Examiner and Coroner Offices	BC, AB, SK, MB, NL	Medical Examiner and Coroner Offices	Provincial governments	Not routinely	- Varies by jurisdiction and scattered among health offices - Presence of national database unknown - Possible privacy issues	Moderate/Low
Maintenance Contractors	BC, ON, QC, AB (regional); NL, NB, NS, SK, MB	Provincial Transportation or Natural Resources departments	Provincial or municipal government	Not routinely	- Some data collected regionally and may need to be compiled	Moderate/Low

WVC Data	Location	Responsible Agency	Ownership	Automation of Data Collection/ Summaries	Comments	Feasibility of Obtaining
Park Wardens and Conservation Officers	Banff National Park, AB Fish and Wildlife, Kootenay National Park	Fish and Wildlife, Park Agency	Federal or provincial government	Not routinely	- Scattered among jurisdictions - Data not routinely entered	Moderate/Low
Research Biologists	Region specific	Data submitted to funding agency	Funding agency (government, corporation or non-profit)	Not routinely	- Ownership varies - Data not routinely entered into central database	Moderate/Low
Citizen Scientists	Region specific	Non-profit agency, academic research institute or government	Non-profit agency, academic research institute or government	Not routinely	- Ownership varies - Compilation and data entry dependent upon limited resources	Moderate/Low

From Table 1 it is clear that some raw data will be more easily obtained than other raw data. For example, WVC data compiled by provincial insurance corporations and police reported data that are routinely submitted to government transportation agencies (e.g., Transport Canada) should be easier to obtain. On the other hand, the feasibility of obtaining data that are not centrally located or routinely collected, and therefore more likely subject to inconsistencies among various jurisdictions or different ownership agreements would be low to moderate.

In terms of expertise needed to obtain access to such raw data, a senior manager with good networking skills will be required to increase the success of this endeavour. Also, this person will need to have some understanding of legal aspects of intellectual property and ownership to avoid creating liabilities. Someone with a background in database management will be required when data sets become available. Deliverables related to this type of data would be the actual data sets that can be successfully included and analyzed in the clearing house.

4.1.2 Summarized data

WVC data are often compiled and summarized, for example as part of a government agency's annual report or for a not-for-profit website. Such summaries can be compiled, linked and referenced in the clearing house. To illustrate, nationwide data summaries are already accessible for Transport Canada data on the internet from 1996 to 2003 (L-P Tardif & Associates 2003, 2006). Such relevant compilations include fact sheets showing the frequency of WVCs with various species by time of day or month or year. Some of these compilations may also overlap with other items in the Literature component (see Section 4.2).

Overall, the feasibility of obtaining data from summary reports and compiling them into the clearing house is high and feasible in the short-term. In terms of expertise required for this purpose, a researcher will be

needed to identify and locate relevant data compilations. In the medium- and long-term, this researcher will not only need to identify and locate such compilations but also create their own summary compilations based on research gaps and using data compiled in the clearing house. Deliverables will be standard summary tables that will become more advanced as the clearing house establishes itself.

4.1.3 Query-friendly data

Once the data are obtained and compiled for the clearing house it may be more efficient and user friendly to enable online users to perform some basic queries related to WVCs. Such data analysis tools would be more feasible in the long-term once the extent of data and their summaries in the clearing house are compiled and assessed.

Expertise required for this purpose will be a researcher with a strong background in data analysis to gauge what type of analysis tool is needed to best suit this purpose. Many off-the-shelf software packages are available these days and can be integrated into a website for online use. Deliverables from this type of data include basic summary tables as well as more advanced and complex summary tables, tailored to the specific needs of the end-user.

4.1.4 Citizen science collected data

A future objective of the WVC clearing house may be to collect its own data as part of a large-scale citizen science and awareness program. This type of data collection in its simplest form would require an online data collection form. A more complex version involves the use of a data collection device such as a palm pilot device or a smart phone app available to users with a smart phone. The advantages of using a data collection device such as a smart phone application are twofold. First, interested users will most likely have the data collection device and know how to use it. Second, this will enable more accurate collection of collision location.

At this point in time, the feasibility of pursuing this is considered low to moderate. The reason is that this form of data collection has already been initiated by several non-profit and academic organizations across Europe and North America, e.g., Road Watch in British Columbia. Therefore, it may be more viable to not collect the data ourselves but to first establish partnerships and data sharing agreements with other organizations that have created tools for collecting this type of data. The long-term goal would then be to provide a solution for these groups to standardize data collection or data for inclusion into the clearing house. In the interim, links can be established to their research sites.

Expertise in the short-term will require a researcher with good networking skills to identify these data collection projects so they can be included, or referred to in the clearing house. In the long-term a researcher with a background in programming may be required to develop an online form or smart phone application as well as a researcher with subject matter knowledge to assess, filter and standardize submitted data. Deliverables will include increased awareness of this type of data collection, data collected

by citizen scientists, and Geographic Positioning System referenced data that could potentially produce more accurate data with respect to collision location.

4.1.5 Metadata

In terms of data collection, a novel, yet inexpensive initiative that can be immediately initiated is the production of a compendium of the various WVC data sets in Canada by region, as has been initiated in Deliverable 1 (see Section 3 of Vanlaar et al. 2012). This can be further elaborated on by compiling metadata such as data dictionaries, ownership rules, and accessibility for each dataset within specific jurisdictions.

The next logical step is to determine how these databases are related to one another and where possible linkages could be established to eliminate redundancies and improve data collection protocols. The deliverable from this endeavour would be especially useful for data collection agencies. A researcher with an intimate understanding of the subject matter would be required to map out the relationships between the different databases.

4.1.6 Summary

Table 2 contains a summary of the different aspects discussed in sections 4.1.1 through 4.1.5. For each type of data the feasibility, required expertise and potential deliverables are described. It can be seen that the feasibility of including each type of data varies from Low to High depending on their availability.

Table 2: Relative feasibility of all data types

Data Type	Feasibility	Expertise required		Deliverables	
		Short-Term (Year 1)	Long-Term (Ongoing)	Short-Term	Long-Term
Raw data	Varies (cf. Table 1)	Senior manager with good networking skills and knowledge of legal aspects related to IP; data base manager	Senior manager with good networking skills and knowledge of legal aspects related to IP; data base manager	Contact database, agreement template, list of data available	Raw data
Summarized data	High	Researcher to identify and locate summaries	Researcher to identify, locate and create own summaries	Preliminary table summaries	Advanced table Summaries
Query friendly data	Moderate	Researchers with background in data analysis	Web designer to create, maintain and update search engine tool	Summary report, tailored to needs of end-user	Advanced summary reports, tailored to needs of end-user
Citizen science collected data	Low/ Moderate	Researcher with intimate subject matter knowledge	Researcher with intimate subject matter knowledge and background in programming	Summary report	More accurate raw data source for all species
Metadata	High	Researcher with intimate subject matter knowledge	Researcher with intimate subject matter knowledge; database manager to establish links between data	Compendium, metadata like data dictionaries	Mapping of relations between databases; recommendations for data collection

4.2 Literature

The feasibility of including the following types of documents in the literature component of a WVC clearing house is reviewed in this section:

- > Safety tips and bulletins dealing with WVCs;
- > News updates;
- > Possible solutions to reduce WVCs, and;
- > Library of relevant materials.

4.2.1 Safety tips and bulletins dealing with WVCs

Safety tips that assist a motorist in avoiding a WVC can be made available in a WVC clearing house. These may include general safety tips for road users such as avoiding alcohol or drugs, driving at a safe speed, paying attention to the road ahead, and being well-rested. Or more specifically, these tips may include driving techniques that could minimize injury if striking a large animal cannot be avoided.

There already exist several examples of safety tips and bulletins to include in a WVC clearing house. To illustrate, there is a publication by the British Columbia Conservation Foundation which offers hints on how to prevent involvement in a collision with a moose (British Columbia Conservation Foundation 2010). These safety tips and bulletins could be included in, or summarized for a WVC clearing house.

To include safety tips and bulletins in the literature component would require a moderate level of involvement from a web designer/webmaster and researcher in the short-term. Scrutiny of the safety tips and bulletins is needed to ensure that the wording of the message does not contradict safe driving behaviour. Also, a compilation of safety tips for drivers encountering certain species of wildlife (e.g., moose, deer, turtles) should be verified for accuracy. Regular updates would be required to keep this portion of the clearing house relevant and timely.

4.2.2 News updates

A useful feature of the clearing house would be to provide updates such as news releases to educate or provide up-to-date information to online users and the media about WVCs. As the clearing house becomes more established, an archive of news releases can be built for access by the public.

A moderate level of involvement would be required from a researcher in the short-term to compile existing information in a concise and easy-to-read update as well as a moderate level of commitment on the part of a web designer/ webmaster to add these items to the WVC clearing house website. Subsequently, the expertise of both a webmaster and researcher would only be required for information updates to the clearing house.

4.2.3 Possible solutions to reduce WVCs

Solutions to reduce WVCs can be presented in terms of mitigation measures such as wildlife fencing, overpasses and underpasses, and the removal of salt pools near roadways (see Figure 2 in Vanlaar et al. 2012). This information can be presented in the form of fact sheets with some background about the solution as well as evidence for its effectiveness.

A moderate level of commitment would be required in the short-term for a researcher to review the materials and for a web designer/webmaster to place this item in the clearing house. Once this item has been established, both the webmaster and researcher would be needed to update the clearing house in the long-term.

It should be noted that this is a rapidly growing field, and, as a consequence, there already exist several examples of solutions, and their effectiveness is continually being monitored. For example, there is an ongoing debate in terms of the effectiveness and affordability of some mitigation techniques like reflectors and increased lighting on roadways. An expert with an intimate understanding of WVC problems and possible solutions should be consulted in both the short-term and long-term to keep the information current and credible. With ongoing scrutiny, an update of problems and solutions would be highly feasible and warranted in the long-term.

4.2.4 Library of relevant materials

Since much of the WVC-related research has taken place in the past decade, many published reports, peer-reviewed journal articles, and media articles are available online. Furthermore, when reviewing the literature in Deliverable 1 of this project (see Vanlaar et al. 2012), a broad and varied collection of WVC-related literature has been initiated and the result of this effort can serve as a starting point for an online library.

In terms of short-time commitment by experts, a high level of involvement would be required by a web designer/webmaster to create a visually appealing online library that can be readily navigated and searched. As far as the responsibilities of the researcher are concerned, it would take a moderate amount of labour for materials added to the library to be reviewed for credibility and relevance. A potential additional task for the researcher would include creating and maintaining a glossary.

Based on the availability of the materials it appears that establishing a library based on existing references is very feasible in the short-term and can be made available to users. This will also be feasible in the long-term as materials are added.

4.2.5 Summary

Table 3 summarizes the information discussed in sections 4.2.1 through 4.2.4. It summarizes information regarding the feasibility of obtaining and including each of the four items in the short-term (first year of the

clearing house) and long-term (ongoing), as well as expertise required, and deliverables that can be offered. It can be seen that the feasibility of providing these items is high.

Table 3: Relative feasibility of four different types of resources from the literature

Type of Resource	Feasibility	Expertise		Deliverables	
		Short-Term (Year 1)	Long-Term (Ongoing)	Short-Term	Long-Term
Safety tips and bulletins	High	Researcher with intimate subject matter knowledge; web designer/webmaster to update clearing house	Researcher with intimate subject matter knowledge; webmaster to update clearing house	safety tips, brief bulletin	safety tips, bulletin with trends
News updates	High	Researcher with intimate subject matter knowledge; web designer/webmaster to update clearing house	Researcher with intimate subject matter knowledge; webmaster to update clearing house	current news	updates and archives
WVC solutions	High	Researcher with intimate subject matter knowledge; web designer/webmaster to update clearing house	Researcher with intimate subject matter knowledge; webmaster to update clearing house	known solutions	additional solutions
Library	High	Researcher with intimate subject matter knowledge; web designer/webmaster to update clearing house	Researcher with intimate subject matter knowledge; webmaster to update clearing house	references already gathered	additional references and pdf's

4.3 Links

The feasibility of including the following types of links in a WVC clearing house has been reviewed in this section:

- > Other organizations conducting similar research, and;
- > Upcoming conferences.

Other organizations conduct or have conducted research on WVCs. Various wildlife biologists, traffic safety engineers, road safety professionals, health centres, insurance companies and government departments are among those who have engaged in research dealing with WVCs and their research has been referenced in Deliverable 1 of this project (see Vanlaar et al. 2012). Links to these organizations can be easily established.

Also, there are organizations that conduct conferences dealing specifically with WVCs, or who have, in the past, allowed presentations to be made dealing with this particular issue. Offering a link to organizations that conduct or sponsor this research would be beneficial.

Initially, a moderate level of involvement is needed from a web designer/webmaster who will add the links to the website. A similar degree of commitment will be required of a researcher to review and recommend to which organizations' links should be posted. Long-term involvement will be low for both of these experts but there will still be an expectation to keep this section up to date.

4.4 Communications

The feasibility of including the following types of interactive tools in the communications component of a WVC clearing house has been reviewed in this section:

- > Forum for online user questions and comments;
- > Quiz dealing with WVC facts;
- > Polls on WVC-related topics, and;
- > Blog on WVC research and updates.

4.4.1 Forum for online user questions and comments

A forum for users to post questions and/or comments would be valuable for a WVC clearing house. This would not only serve to educate the public and to inform them about new initiatives, but also to inform the clearing house on which particular aspects of WVCs are of the greatest concern to the public.

At the outset, moderate levels of involvement would be required from the web designer who would create this item and a researcher to monitor, respond to, and summarize the comments and questions from online users.

Once the forum has been established, some time would be required of a web designer/webmaster. It is anticipated that the researcher will have to continue to be involved to a moderate degree. Making this forum available is highly feasible in both the short-term and long-term.

4.4.2 Quiz dealing with WVC facts

An online quiz could prove to be an effective way to engage public interest in learning more about WVCs and solutions. This could be conceived quite readily by relying on the literature as well as facts and myths sections of existing WVC research centre websites as reference material.

A researcher is required to ensure the questions and answers are relevant and accurate. An editor would be needed to ensure proper wording is used for a lay audience. Involvement of a web designer/webmaster is needed to format and post this item on the website. For all three of these persons, the level of involvement in the short-term is moderate and the long-term involvement is expected to be low.

4.4.3 Polls on WVC-related topics

Polls targeted to specific users of the clearing house such as transportation planners and/or everyday motorists could be delivered through the clearing house. This item would be effective at polling online users concerning their perceptions of the frequency or severity of WVCs and perceived effectiveness of solutions across different audiences.

A researcher is required to develop the poll and analyze the results while a web designer/webmaster is needed to post the poll and its results to the clearing house. Long-term dedication to the maintenance of

this item would be lower for both persons. The inclusion of a poll or polls in a WVC clearing house is very feasible in both the short-term and long-term.

4.4.4 Blog on WVC research and updates

It is very feasible for a blog to be included as one of the features of the WVC clearing house to provide updates and news about the clearing house. In addition, an interactive blog could form the basis for online users to post questions and or comments.

The requirements for the expertise of both a web designer/webmaster and researcher would be moderate in the short-term. A moderate level of involvement would be required in both the short and long-term to keep the blog alive, updated and appealing.

4.4.5 Summary

Table 4 summarizes the information regarding the feasibility of including all of the interactive tools discussed in sections 4.4.1 through 4.4.4, both with respect to short-term (first year of the clearing house) and long-term (ongoing) expertise required and deliverables that can be offered. As is apparent from this table, the feasibility of including these components in a WVC clearing house is high.

Table 4: Relative feasibility of four different types of interactive tools

Type of Resource	Feasibility	Expertise		Deliverables	
		Short-Term (Year 1)	Long-Term (Ongoing)	Short-Term	Long-Term
Online forum	High	Researcher with intimate subject matter knowledge; web designer/webmaster	Researcher with intimate subject matter knowledge; web designer/webmaster	Online comments, questions and answers	Online comments, questions and answers
Quiz dealing with WVC facts	High	Researcher with intimate subject matter knowledge; editor and web designer/webmaster	Researcher with intimate subject matter knowledge; editor and web designer/webmaster	Quizzes and quick facts	Quizzes and quick facts
Polls on WVC-related topics	High	Researcher with intimate subject matter knowledge; web designer/webmaster	Researcher with intimate subject matter knowledge; web designer/webmaster	Polls and analyzed results	Polls and analyzed results
Blog on WVC research and updates	High	Researcher with intimate subject matter knowledge; web designer/webmaster	Researcher with intimate subject matter knowledge; web designer/webmaster	Blog	Blog

5. CONCLUSIONS

WVCs are a serious burden to our society. The consequences are profound and include significant socio-economic, traffic safety and environmental costs. Not only do WVCs in Canada result in death and serious injuries for motorists, but WVCs also threaten biodiversity because certain wildlife species become endangered and are at risk of disappearing altogether. To properly address these issues, data of good quality are needed. However, it is clear that such data are currently lacking in Canada and, as a consequence, that the creation of a WVC clearing house to make such information available, is timely.

In this report, a feasibility study has been conducted to assess if, and how a WVC clearing house can be created in Canada to fill this gap. The methodology adopted to achieve this goal consisted of two steps. First, an environmental scan has been completed to identify potential key components of such a clearing house. For this purpose, a variety of websites have been analyzed in detail to inform the selection of components. Second, once potential key components were identified, the feasibility of including them in a WVC clearing house was evaluated. Several criteria were used to assess feasibility, including availability of data and materials, and expertise required to develop key components, both in the short-term and long-term.

Generally speaking, four main components were identified: Data, Literature, Links and Communications. These components were further divided into subcategories. With respect to the actual feasibility of including each of these components, it can be concluded that this varies across components and their subcategories. For example, while it is very feasible in the short-term to include a variety of literature-related subcategories, it will very likely be more challenging to obtain raw data and make this available to the public, not in the least due to legal aspects of ownership and intellectual property. Also, another challenge akin to the production of a WVC clearing house, or any clearing house or website for that matter, is to keep it current. While it may be very feasible to include certain products at the outset, it may be more challenging to produce up to date deliverables without sustained funding.

In conclusion, the creation of a nationwide centralized WVC clearing house with data and resources has to be based on a long-term vision that would need to be completed in several steps. Notably with respect to the data component, it is not realistic to assume that it will be possible to house all data types that are currently scattered among the provinces and multiple jurisdictions and agencies in Canada until partnerships have been established. However, it is more feasible to obtain relevant and accessible summaries and compendia of information that will facilitate more efficient and standardized data collection, which will ultimately facilitate research and solutions for WVCs in Canada. Such an approach will take time.

In the next section recommendations are formulated based on the outcomes of this feasibility study. Essentially, taken together these recommendations form an action plan that can be adopted to create a WVC clearing house in Canada.

6. RECOMMENDATIONS

Based on the outcomes and conclusions of the first deliverable of this project (see Vanlaar et al. 2012), the second deliverable, i.e., this current report, as well as experience gained from creating online curricula and educational programs, the following approach is recommended to build a WVC clearing house in Canada.

It is recommended to adopt a three-step process whereby the WVC clearing house would be created in a first step and launched in a second step, followed by a maintenance phase in a third step. The first step would not only involve the development of a structure, wireframe and brand for the clearing house website but also the creation of the actual content. With respect to the creation of content, this would involve collecting already existing materials that can be made available in the clearing house or to which links can be established. It also involves the creation of new materials like fact sheets or a library.

Another important aspect in this first step is adopting a dedicated approach to tailor the creation of this clearing house to the specific needs of end users. This would involve using TIRF's knowledge transfer model (see e.g., Robertson et al. 2009). There are two core components of TIRF's model that are unique and that can bring innovation to the creation of this clearing house. First, this model acknowledges the broader contextual and operational features associated with the delivery of programs such as a clearing house using a "systems approach". In this respect, "system" refers to the context in which strategies are implemented and delivered (e.g., goals of scheme, levels of communication, information-sharing protocols, etc.) and structures or entities used to deliver these strategies to a designated target group (e.g., agencies/stakeholders involved in the delivery, licensing system, custodians and owners of data, department of natural resources). In this regard, the successful delivery of the clearing house requires the ability to recognize, understand and mediate the diverse practical concerns and contextual environments of professionals involved in the field of WVCs. As such, an important step in the creation of the clearing house will be to solicit input from professionals in this field to ensure the clearing house addresses their needs in a fashion that suits them best; this can be accomplished through key-informant interviews and focus groups. This also pertains to networking to begin building partnerships with the goal of obtaining data that can be made available through the clearing house to researchers or the public at large.

Finally, this first step will also involve a peer review process by recognized experts in the field before launching the clearing house to ensure accuracy of content.

The second step is the launch of the clearing house. This will involve activities mainly to raise awareness among relevant communities like researchers, government and the public about the existence of the clearing house. Creating positive and strong brand recognition will be important, not in the least to help build partnerships to obtain data sources that can be made available through the clearing house. Stakeholders and partners should be involved to enhance credibility of the initiative. A dedicated dissemination strategy will have to be developed to support the launch.

Finally, as mentioned previously, keeping the clearing house current is essential. Therefore an annual maintenance component is required to keep the clearing house alive once it has been launched. This would include not only the creation of new materials but also the continued pursuit of obtaining new data sources and materials relevant to new initiatives adopted by the clearing house.

It is estimated that the first step, i.e., the creation will take six to nine months and would cost approximately \$150,000 (it warrants mentioning that this is a ball park estimate; the actual cost will depend on the scope and functionality of the website). The second step, i.e., the launch of the clearing house can take place within one month upon completion of the clearing house. A budget of approximately \$25,000 is needed to support this launch to ensure broad exposure. Finally, an annual maintenance budget of approximately \$30,000 is required. This would be used not only to keep the clearing house current and continue to obtain more data, but also to network with other potential sponsors to secure continued funding for the clearing house.

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