UNDERSTANDING THE ACCEPTABILITY OF LETHAL MANAGEMENT TOWARD CANIDS ON THE ISLAND PORTION OF NEWFOUNDLAND AND LABRADOR

by © Christopher Dabon

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Abstract

The overall purpose of this wildlife management study is to understand the acceptability of lethal management toward coyotes and wolves (canids) on the island portion of Newfoundland and Labrador. Data were collected from residents in communities in close spatial proximity to Gros Morne National Park and Terra Nova National Park. Self-administered questionnaires were collected (n=342) using a drop off and pick up method. Overall, respondents held very negative cognitions toward coyotes and wolves. This contributed to high level of agreement and acceptance toward lethal management. Attitudes were the best predictor of lethal management within this study. This research study provides salient information for wildlife managers to consider when gauging public acceptance of lethal management and provides a reference to aid managers to mitigate and avoid human-canid conflict such as targeting a shift in attitudes from negative to positive.

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Co-Authorship Statement

The author of this thesis has been the primary researcher of this study. This included review of literature, preparation of the research proposal, design of the research instrument, data collection and analysis, and manuscript preparation. All co-authors and committee members have provided valuable guidance, support, and feedback especially through the technical analysis and interpretation of data.

The author of this thesis has been the primary and co-ordinating author of both manuscripts within the body of this thesis. All co-authors provided assistance through data analysis, interpretation, and dissemination. Further, they provided valuable feedback and guidance throughout the process of the study. Direction was given throughout the revision of multiple drafts. The paragraphs below detail the journals that have been selected for submission for each of the manuscripts and the order of the co-authors following the primary author.

The first manuscript *"Emotions toward coyotes and wolves and the acceptability of lethal management toward canids in Newfoundland, Canada: An application of the Potential for Conflict Index$_2$"*, was prepared collaboratively by Dr. Alistair J. Bath (MUN), and Ms. Monica Engel (MUN). This paper has been submitted to *Canid Conservation Biology.*

The second manuscript *"Understanding lethal management toward coyotes on the island portion of Newfoundland and Labrador, Canada",* was prepared collaboratively with Dr. Alistair J. Bath (MUN), and Ms. Monica Engel (MUN). This paper has been submitted to *Human Dimensions of Wildlife*.

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Overview

This thesis is organized into four chapters. Chapter 1, *Introduction*, presents a brief introduction and overview of human dimensions of wildlife (HDW), the history and interaction between coyotes, wolves, and humans on the island portion of Newfoundland and Labrador, Canada. Further, this chapter presents the research objectives and importance of this study, the conceptual frameworks used to guide the research, the study area, and methodologies used.

The next two chapters consist of scientific papers: Chapter 2, *Emotions toward coyotes and wolves and the acceptability of lethal management toward canids in Newfoundland, Canada: An application of the Potential for Conflict Index*$_2$ and Chapter 3, *Understanding lethal management toward coyotes on the island portion of Newfoundland and Labrador, Canada.* Both papers are currently under review. Chapter 2 has been submitted to Canid Biology and Conservation, a journal that aims to rapidly disseminate research on biology and conservation of all members of the canid family. It publishes applied and theoretical research papers and topics that range from conflicts between canids and humans to population status and distribution of canids. Fittingly, Chapter 2, deals with an applied approach to human-canid conflict. Chapter 3, has been submitted to Human Dimensions of Wildlife, an international journal that is dedicated to the study of social integrations in fisheries and wildlife management. The focus is placed on theoretical and practical applications and impacts. Given that Chapter 3 focuses on applying a contemporary theoretical approach to understanding cognitions the paper fits nicely.

Chapter 4, Summary, explains the key findings of this study and its contribution to HDW and canid management in Newfoundland. This chapter also addresses the knowledge gap that this research explored and offers direction for further research to address future knowledge gaps. Finally, this chapter provides management suggestions for wildlife managers to aid in the management of coyote populations on the island portion of Newfoundland and Labrador. The quantitative research instrument used for both papers can be found in the *Appendix*.

Chapter 1: Introduction

Human Dimensions of Wildlife

Geographers have long sought to understand and examine the relationship humans have with the environment. Wildlife managers too have sought to understand the relationship between people and wildlife (Pattison, 1964). Famously, in the early 1940's Aldo Leopold remarked that the problem with game management was not how we ought to handle the game, but instead how we handle the people (Flader, 1974). Since then wildlife managers have struggled to implement management strategies without effectively involving the public (Bath, 1998). Understanding public opinion and public acceptance is key to the success of wildlife conservation and management as it helps to identify public concerns (Bath, 1998; Jacobs, Vaske, Dubois, Fehres, 2014), the first step toward conflict resolution.

Traditional wildlife management was essentially applied wildlife biology. However, this shifted to include studies of animals, habitats, and people. The study of people within wildlife management has been labelled as the human dimensions of wildlife (HDW) (Bath, 1998). Initially, human dimensions (HD) was introduced into academia in 1973 by Dr. John Hendee and Dr. Clay Schoenfeld at the North American Wildlife and Resource Conference. The term referred to the recognized need for social aspects to be integrated into fish and wildlife management (Decker, Brown, & Siemer, 2001). Since then, the term has expanded in response to the growing need of understanding public engagement, support, and opposition for wildlife policies and species management plans. More recently HD work has been adapted to a wide range of disciplines that include;

agriculture management, protected areas, forest management, and marine conservation (Bennett, Roth, Klain, Chan, Christie, Clark, & Wyborn, 2016; Dearden & Mitchell, 2012; Ward, Doney, Vodden, & Bath, 2018).

However, the application of HD is most commonly used in wildlife management and plays a crucial role in the conservation and management of large carnivores (Pidallu, Quenette, Mounet, Lescureux, Borelli-Massines, Dubarry, Gimenez, 2016). HDW is defined as how people value wildlife, their attitudes toward wildlife, how they are affected by wildlife, and how they affect wildlife (Decker et al., 2001). HDW began by using quantitative sociological methods; since then the field has developed several conceptual frameworks to measure and predict management situations (Decker, Riley, & Siemer, 2012). In addition, a growing number of researchers are exploring how attitudes and values differ over space and time in relation to wildlife management issues and natural resources (Bath, Olszanska, Okarma, 2008; Decker & Bath 2010).

HDW research offers a more holistic approach to fish and wildlife management. It offers a salient insight into the social factors that contribute to human impact on wildlife, and it has led to more effective, improved, and integrated management strategies (Decker et al., 2012). The sub-field of HDW is broad and expands to include practices from fields such as; geography, social psychology, tourism, public engagement, leisure and recreation, and outdoor studies, and many more. Therefore, HDW is fundamentally interdisciplinary (Johansson, Sjöström, Karlsson, & Brännlund, 2012; Vaske & Donnelly, 1999). The ethos of HDW is characterized by cognitions specifically values, value orientations, beliefs, attitudes, norms, behavioural intention, and behaviour (Heberlein & Ericsson, 2008; Majić & Bath, 2010; Vaske & Donnelly, 1999). These cognitions have

been organized into a hierarchy coined by Vaske & Donnelly (1999) as the cognitive hierarchy. Studies that use the Cognitive Hierarchy are usually able to account for approximately 50% of variability in an individual's intention to either support or oppose a wildlife management decision (Sponarski, Vaske, and Bath, 2015b).

HDW research like any academic discipline tests and develops theories but also goes beyond research by using very applied problem-solving tools like facilitated workshops to resolve conflicts (Bath, 2009). Very well tested theoretical frameworks have been established to examine cognitions and how they influence and affect management strategies. Knowledge from HD research when effectively shared with wildlife managers can offer an understanding of public consensus and support around management policies (Decker et., 2001; Sijtsma, Vaske, & Jacobs, 2012; Sponarski, Vaske, & Bath, 2015a; Vaske Beaman, Barreto, & Shelby, 2010). HDW work presents a means and platform for public involvement in wildlife management in a representative manner (Bath, 1998).

Bath (1998) noted that up until the late 90's much of HDW research focused primarily on hunting, fishing, urban wildlife, and the economic values of wildlife. In the late 90's the largest shift in the field came when HDW research entered the region of wildlife management decision making. This marked a shift from decision making that only incorporated biological and technical input to a more dynamic process that integrated human and social considerations (Manfredo, Teel, Tara, & Henry, 2009). Currently, the field continues to expand to apply to a broad number of other fields, as they too have recognized the need for human and social science considerations. During the 2000's and 2010's HDW research has touched on issues that include illegal trade

(Nijman, Oo, & Shwe, 2017), water governance (Curran, 2015), fisheries management (Bennet et al., 2015; Heck, Stedman, Gaden, 2015), and indigenous rights (Hazzah, Bath, Dolrenry, Dickman, & Frank, 2017), and many others.

However, there is still room for development within the field. Some promising emerging concepts include the application of emotions and emotional dispositions and their role in predicting behaviour (Jacobs, Vaske, & Roemer, 2012; Sponarski et al. 2015a). Vaske et al. (2013) and Jacobs et al. (2012) explicitly state that research and literature on emotions and their affect on behaviour is relatively scarce. Given that studies of emotional responses toward animals are considered one of the most captivating and engaging areas of study for the future of HDW research (Manfredo, 2008), the role that they have to play is yet to be fully understood and explored.

In the last decade Decker et al. (2010) noted that HDW focus has shifted from large herbivores to large carnivores. Indeed, there is a great deal of recent literature from the HDW field that focuses on large carnivores (Bruskotter, Vaske, & Schmidt, 2009; Ciucci, & Boitani, 2012; Hazzah et al., 2017; Engel, Vaske, Bath, & Marchini, 2017; Gore, Knuth, Curtis, & Shanahan, 2006), in particular coyotes (*Canis* latrans) (Fox, 2005; Fox, 2006; Frank et al., 2016; Sponarski et al., 2015a; Sponarski 2015b). However, no HDW research to date has focused on understanding the acceptability of lethal management toward coyotes on the island portion of Newfoundland and Labrador. This is needed as coyotes have arrived relatively recently to the island portion of the province.

Wildlife species naturally expand their range often to fill unoccupied ecological niches. When carnivores newly arrive to an area, they are often met with fear and persecution (Frank, Glikman, Sutherland, & Bath, 2016; Johansson et al., 2012). They

can also become the source of problems for human and other biological entities, especially in regions where the public and wildlife are not accustomed to the naturally introduced species (Hermann, Voß, & Menzel, 2013). The natural introduction of species into new territories inevitably results in human-species interactions, that often can result in conflict (Wieczorek-Hudenko, Decker, & Siemer, 2008) leading to negative social impacts that can be understood through social science research and studies.

Canids on the Island Portion of Newfoundland and Labrador

The establishment of coyotes to the island portion of Newfoundland and Labrador is often described as being the most significant ecological event to happen since the introduction of moose that took place over 100 years ago (Department of Environment and Conservation, 2006). Since the extinction of wolves (*Canis lupus*) in 1911, Newfoundland had no natural predator able to fill the niche left vacant up until 1985 when coyotes arrived naturally to the province (NL Wildlife Division, 2013). Understandably, having a foreign predator on the island caused much consternation, especially among outfitters, hunters, sheep farmers, and guides. Much debate has been focused on the impact they have had on the dwindling Newfoundland Caribou population (Department of Environment and Conservation, 2006). Caribou numbers have declined in the province due to a variety of reasons including changing land use, hunting pressure, black bear predation, disease, climate change (Schaefer & Mahoney, 2013), and possibly coyote predation. The latter is often the easiest to blame.

Coyotes are adaptable, resourceful, and resilient all of which have helped them to successfully colonize most of North America in the last 100 years (Fox, 2005; White &

Gehrt, 2009). No other carnivore in recent years has been as successful as the coyote at expanding its range (NL Wildlife Division, 2013). Further, the extinction of localized wolves and rapid urbanization helped to provide the foundations for coyote populations to thrive (NL Wildlife Division, 2017). By the 1970's coyote populations had become ubiquitous throughout North America. By the 1980's they were a common sight within Atlantic Canada where they have been extremely successful given that there is little to no competition (Martínez-Espiñeira, 2006).

Likely the first sighting of coyotes on the island portion of Newfoundland and Labrador, occurred during the winter of 1985 (Department of Environment and Conservation, 2006). Reports were made claiming wolf like dogs were coming ashore from surface ice near the Port au Port Peninsula, which is located on the southwestern coast of the island. The first confirmed coyote on the island was in 1987 in Deer Lake. Since 1985 confirmed traveling of coyotes on ice from mainland Canada have continued, meaning that they are continuing to immigrate onto the island. Species traveling on ice is not a new phenomenon. In fact, it is speculated that many wildlife species such as caribou and bears were able to reach the island travelling on ice (Department of Environment and Conservation, 2006).

By the mid 1990's coyotes were able to effectively establish themselves on the island, as they had been confirmed throughout (Department of Environment and Conservation, 2006). The most recent estimate is that there are around 5,600 coyotes on the island portion of Newfoundland and Labrador. Further, while the Newfoundland wolf was effectively eviscerated from the island in 1911, there have been occasional reports and sightings of wolves on the island, who similar to coyotes are thought to have reached

the island travelling on ice (NL Wildlife Division, 2013). In 2012, a hunter killed a grey wolf which was the first recorded sighting of a wolf on the island portion of the province since their extinction. Since then a total of four wolf carcasses have been discovered on the island portion of the province. There have also been reports of hybrids of eastern coyotes and grey wolves on this island; as of 2017, eleven such hybrids have been confirmed. While such hybrids are common elsewhere, this is something new to the province (CBC News, 2017). Therefore, understanding public perceptions toward canids is salient.

Figure 1. Coyote expansion and establishment in Eastern North America (Department of Environment and Conservation, 2006).

Human-Coyote Interactions, Management, and Gaps in Knowledge

Research has shown that interactions between humans and species increase as the population of the species increases (Whittaker, Vaske, & Manfredo, 2006). Interactions can lead to conflict especially human-coyote interactions (Frank, 2015). Conflict tends to arise from the species' behaviour and tendencies such as feeding on garbage (Carbyn, 1989), attacking pets (Draheim, Rockwood, Guagnano, Parsons, 2011; Timm, Baker, Bennett, & Coolahan, 2004), killing livestock (Mitchell, Jaeger, & Barrett, 2004), and in rare cases attacks on humans (White et al., 2009), and fatal attacks on humans (Sponarski et al., 2015a). Relevance of this is seen as since their arrival on the island portion of Newfoundland and Labrador, the coyote population has increased to 5,600. Further, concerns of safety and property damage usually lead to negative attitudes and provoke controversy over the species and the appropriate management of them (White et al., 2009)

After the confirmation of coyotes on the island in 1987 initial research and management conducted in Newfoundland focused on ways to completely eradicate the species for fear of their impact on big game. Despite aerial slaughters, poisons, and bounties conducted in other areas to eliminate coyotes, nothing has proven effective as a means to eviscerate the species (Department of Environment and Conservation, 2006), illustrating their adept ability to be resilient and adapt (Fox et al., 2005). Since the realization that coyotes are in Newfoundland to stay, more adaptive and selective approaches have been adopted as management responses to the establishment of the species such as fencing livestock and public outreach and education (NL Wildlife

Division, 2013) to minimize fear and reduce potential negative human-coyote interactions.

Since their arrival there has been extensive biological research conducted to understand their expansion, biology (Bridger, Baggs, & Finney-Crawley, 2009; NL Wildlife Division, 2011), and impacts on food webs (Strong, & Leroux, 2014). The biological aspect of resource management is important, however, it is not holistic as each resource management issue has two major components: a human component and a biophysical one (Bath, 1998). Given the relatively scarce HDW research on coyotes in Newfoundland (Frank, 2015; Sutherland, 2010), there is a need for a better understanding of this social or human dimension to better address the environmental issue. Public acceptance is salient for wildlife management policies to succeed (Jacobs et al., 2014). Understanding where public support and consensus lies can serve to mitigate conflict when human-wildlife interactions occur (Fix, Teel, Manfredo, Boston, 2010), especially between a species that is relatively new to the spatial location, such as coyotes on the island portion of Newfoundland and Labrador.

Research Objectives

The overarching goal of this study is to better understand and interpret how residents living in the communities within and surrounding Gros Morne National Park (GMNP) and Terra Nova National Park (TNNP) feel about coyotes (*Canis latrans*) and to some lesser extent wolves (*Canis lupus*). This study documented the support and consensus residents had toward the management of those species. Specifically, this study examined the acceptability of lethal management. Lethal management can be described as

the management practice that adopts lethal control of a wildlife species in response to a controversy caused by that particular species. Different types of lethal management include using rifles and poisoning the species in order to destroy it (Martínez-Espiñeira, 2006).

The specific objectives of this study are:

1. To understand the acceptability of lethal management toward coyotes and wolves (canids).
2. To understand the factors that explain the acceptability of lethal management toward coyotes.

These objectives were explored in two manuscripts that follow in this thesis. The first objective places heavier emphasis on the practical application of understanding public support or opposition for lethal management toward canids in Newfoundland, while the second objective places heavier emphasis on theoretical understanding of acceptance of lethal management. Both objectives are dual in nature, meaning they both hold practical and theoretical implications. The data collected provides a baseline set of knowledge to aid wildlife managers in making the difficult and often contentious decisions regarding lethal management. Without recent or accurate data, wildlife management decisions often become popularity contests between key interest groups, stakeholders, or individuals, where the loudest voice or opinion is the only one that is heard and adopted into the strategy (Bath, 1998). HD research provides invaluable data that contributes to an understanding of the broader view of the public. This allows wildlife managers to balance the loud voices in the room with a holistic understanding of public support and consensus for management options (Bath, 1998).

Outline of Papers

The manuscripts are written to stand alone but collectively contribute to the overall goal of the HD project which is to understand lethal management toward canids on the island portion of Newfoundland and Labrador. However, the concepts in each of the papers are independent. The first manuscript places heavier emphasis on the application of practical concepts such as exploring where public consensus lies regarding lethal management of canids. The second manuscript has a larger theoretical implication as it aims to explain the best predictor of lethal management and why it is that people either support or oppose lethal control. Abstracts for both papers (Chapters 2 and 3) can be found below:

Chapter 2 submitted to *Canid Biology and Conservation*, is titled "Emotions toward coyotes and wolves and the acceptability of lethal management toward canids in Newfoundland, Canada: An application of the Potential for Conflict Index$_2$." *Canid Biology and Conservation* is a journal that places emphasis on understanding all forms of human-canid conflict such as this one.

We explored the acceptability of lethal management toward canids on the island portion of Newfoundland and Labrador, Canada. Data were obtained from 342 self-administered questionnaires from communities neighbouring Terra Nova National Park and Gros Morne National Park in the summer of 2017. Overall respondents had mostly negative emotions toward canids, and an extremely high acceptance of lethal management across seven different scenarios. Moreover, respondents who held negative emotions were more accepting of killing canids and had a higher degree of consensus as illustrated by

the Potential for Conflict Index2. In contrast, respondents who had positive emotions toward canids had less consensus and viewed lethal management as less acceptable. Understanding the acceptability of lethal management under different scenarios allows managers to make informed decisions based on a solid understanding of the public's viewpoint that will serve to mitigate conflict and balance loud views traditionally heard in the public forum.

Chapter 3 submitted to *Human Dimensions of Wildlife*, is titled "Understanding lethal management toward coyotes on the island portion of Newfoundland and Labrador, Canada." *Human Dimensions of Wildlife* is a journal explicitly focused on human-wildlife interactions. It is considered one of the top peer-reviewed journals within the realm of HD research.

Coyotes (*Canis latrans*) are a relatively new species to the island portion of Newfoundland and Labrador, Canada. Since their arrival in 1985 research has consistently documented extreme negative cognitions toward them. This has contributed to a low tolerance for their existence and a high threshold for the acceptability of their lethal management under various scenarios. Data were collected from self-administered questionnaires (n = 342) of Newfoundland residents living near National Parks. A multiple regression model examined how the dependent variable, "lethal management," was influenced by three independent variables: "attitudes," "existence beliefs," and "emotions." Together the predictors explained 49% of variability in lethal management. Attitudes accounted for most of the variation (ΔR_2 = .483) followed by existence beliefs (ΔR_2 = .011). Emotions were not statistically significant and excluded from the model.

This study provides theoretical and practical implications for coyote management. To increase tolerance and decrease support for lethal management, attitudes need to be targeted to shift them from negative to positive. Our results support and further validate the cognitive hierarchy framework.

Relevance of Research

This research has practical and theoretical importance for the management of canids on the island portion of Newfoundland and Labrador, and canid management more broadly. This research addresses a management need to:

- Assess the cognitions toward coyotes of residents living close to national parks. The decision to sample individuals residing in communities surrounding Newfoundland's two national parks served two purposes. The first was that residents in rural communities, such as the ones surrounding the parks, are more likely to encounter canids when compared to individuals residing in urban settings (Engel, Vaske, Bath, & Marchini, 2016). The second purpose was to understand human-canid interactions with residents who live close to national parks. This is very relevant following the only recorded adult human fatality caused by a coyote in North America which occured in 2009, in Cape Breton Highlands National Park (CBC, 2009), also located in Atlantic Canada.
- Understand where public support or opposition lies with regards to lethal management toward canids.
- Understand the driving forces behind a high willingness to support and accept lethal management practices toward coyotes.

- Build on previous research assessing public cognitions toward coyotes (Sutherland, 2010) to monitor human opinions over time and as the coyote population increases, decreases, or remains stable to document how attitudes, existence beliefs, and emotions change.

In addition, this research has responded to literature recommendations to examine and explore the role emotions play within the context of HDW (Jacobs et al., 2012; Jacobs et al., 2014; Manfredo, 2008; Sponarski et al., 2015b; Vaske et al., 2013). The study severs to further validate the cognitive hierarchy, specifically, attitudes and their ability to predict behaviour (Vaske et al., 2013). Moreover, it serves to predict an individual's willingness to accept or oppose a management action, such as lethal control (Sponarski et al., 2015b). These results contribute to the already large existing body of literature about large carnivores, however, given the unique cultural setting and spatial location it provides an interesting nuance to the theoretical frame and literature.

Finally, this research will add to a relatively new body of literature within HDW focused on the application of the Potential for Conflict Index$_2$ (PCI$_2$) (Vaske et al., 2010). PCI$_2$ is a conceptual representation of consensus between and within interest groups. PCI$_2$ was created in order to display complex statistical data to a non-statistical collection (Engel et al., 2017). Its purpose is to effectively disseminate knowledge concerning support or opposition in an accessible manner (Doney, 2017). Its application within the HDW field has been limited. The tool has proven to successfully display where support and consensus lies with regards to the acceptability of lethal management toward coyotes and large cats (Engel et al., 2017; Sponarski et al., 2015a). Therefore, this tool is applied

to examine the support or opposition of lethal management toward canids on the island portion of Newfoundland and Labrador.

Conceptual Framework

The conceptual basis for this research is an extension and application of the framework found in the HDW literature (Bruskotter et al., 2009; Jacobs et al., 2012; Manfredo, 2008; Sponarski et al., 2015a; Vaske et al., 1999; Vaske et al., 2010), and is an approach to understanding human behaviour through psychological, cognitive, and emotional processes (Fulton, Manfredo, & Lipscomb, 1996; Jacobs et al., 2014). More specifically this research explores the relationship between existence beliefs, attitudes, emotional responses, and behavioural intention. The relationships explored are based on the cognitive hierarchy (Fulton et al., 1996; Vaske et al., 1999). The conceptual framework is explained in more detail in the chapters to come.

Data Collection

Data were collected between June and August 2017 using a drop-off/ pick-up method (Vaske, 2008). The questionnaire contained close-ended and multiple-choice questions where measured responses were either negative, neutral, or positive. Participant identity remained completely anonymous and confidential. Therefore, names, telephone numbers, and addresses were not asked or collected. The only exclusion of participants was minors under the age of 18. The justification for this was that they are not included in the age of majority and are limited in their ability to influence public decisions as they cannot legally vote.

The questionnaire had six sections (see Appendix) that explored several concepts, however, for the purposes of the research objectives, only the following were analyzed:

- Existence beliefs toward canids.
- Attitudes toward canids.
- Emotions toward canids: specifically, the emotional response of fear.
- Behavioural intention: Acceptability of lethal management toward canids with regards to specific human-canid interactions.

Upon the initial interaction with the potential respondent the scope of the project was explained by the primary researcher. If the resident was not present at the time, the questionnaire was dropped off with a cover page outlining the aim of the study. All data were collected voluntarily; participants had the right to decline completing the questionnaire at any point between the initial interaction and the pick-up date. Once the questionnaire was completed and collected consent was implied. Given that no identifiable information was collected to ensure confidentiality and anonymity, once the questionnaire was collected and complied data could not be removed. All the appropriate ethics approvals for this study were obtained through Memorial University of Newfoundland Interdisciplinary Committee on Ethics in Human Research (REB file #:20180115).

Chapter 2: Emotions toward coyotes and wolves and the acceptability of lethal management toward canids in Newfoundland, Canada: An application of the Potential for Conflict Index2.

Introduction

The existence of canids (wolves and coyotes) in Newfoundland has long been a contentious matter. The last Newfoundland wolf (*Canis lupus*) was killed in 1911 (NL Wildlife Division, 2013). In contrast, coyotes (*Canis latranas*) have naturally expanded across North America and more recently onto the island portion of the province. The first sighting of coyotes in Newfoundland was in 1985 (Department of Environment and Conservation, 2006). It is believed that coyotes arrived on the island by crossing the Gulf of St. Lawrence on ice and it is thought that they would excel on the island portion of the province due to the niche that wolves left open (NL Wildlife Division, 2017). Currently, there are an estimated 5,600 coyotes on the island (NL Wildlife Division, 2013). In addition, there has been 4 confirmed wolf carcasses, which similar to the coyote are thought to have arrived across the ice, and 11 confirmed wolf-coyote hybrid carcasses (CBC, 2017). Since the arrival of coyotes, Newfoundlanders have expressed a low willingness to coexist with them and have expressed extreme negative feelings toward them (Department of Environment and Conservation, 2006; Frank, 2015; Frank et al., 2016).

Naturally, the introduction of coyotes on an island presents the potential for negative human-coyote interactions. Research has shown that as human and wildlife populations increase so too does the potential for conflict and controversy (e.g., Timm, Baker, Bennett, & Coolahan, 2004; Wieczorek-Hudenko, Decker, & Siemer, 2008; Wittmann, Vaske, Manfredo, & Zinn, 1998). In the fall of 2009, Cape Breton Highlands National Park in Nova Scotia, another Atlantic Canadian province, experienced the only known human adult fatality caused by a coyote (CBC, 2009). This caused an increased need for managers to understand human-coyote conflict, especially within the context of National Parks and Atlantic Canada. In addition, coyotes do kill small pets and occasionally livestock (Mitchell, Jaeger, & Barrett, 2004). Thus, there is a need to understand Newfoundlander's acceptability of lethal management in a wide range of contexts and scenarios such as seeing a canid track or a canid to those circumstances when human property and life are threatened or damaged. Therefore, the objectives of this study are to understand where consensus and support lies regarding the acceptability of lethal management toward coyotes in given scenarios and to assess the impact emotions may or may not have on it.

Human dimensions of wildlife and lethal management

Human dimensions of wildlife (HDW) research places emphasis on studying human-wildlife interactions to understand the relationship and ultimately promote conservation (Bath, 1998). For wildlife management strategies to succeed, public acceptance must be understood (Jacobs, Vaske, Dubois, & Fehres, 2014). Acceptability refers to the extent that people are willing to find a management policy either acceptable

or unacceptable (Engel, Vaske, Bath, & Marchini, 2017; Jacobs et al., 2014). People do not always agree or share the same opinion on what behavior is acceptable and what is not (Engel et al., 2017). Therefore, understanding where public acceptance and consensus lies can serve to mitigate conflict and minimize controversy when human-wildlife interactions occur (Fix, Teel, Manfredo, Boston, 2010; Sijtsma, Vaske, & Jacobs, 2012).

Lethal management is a response to a controversy caused by wildlife and involves destroying the wildlife using lethal measures such as using rifles or poisons (Martínez-Espiñeira, 2006). Considering lethal management is a complex and controversial issue; managers are expected to understand the public landscape of consensus and support before adopting such a response (Martínez-Espiñeira, 2006)

When wildlife species cause serious human injury or even death, management responses are expected to be made quickly and often in such instances lethal management is adopted as the most practical solution to a problem situation (Jacobs et al., 2014; McNay, 2002). Alternative methods of non-lethal control such as capturing and relocating the species can be expensive and time consuming and are not always successful. These management actions may not even be possible in countries that are so densely populated that there is no space for relocation to occur (Beringer, Mabry, Meyer, Wallendorf, & Eddleman, 2004). In contrast, lethal control is seen as effective and cost-efficient. Acceptance of lethal management varies by the severity of the issue and the spatial context (Sijtsma et al., 2012), therefore, it is important to understand it on a local level.

Emotions

A recent trend in HDW research has been to examine the role emotions play in guiding behaviour (Jacobs, Fehres, & Campbell, 2012; Jacobs, Vaske, & Roemer, 2012; Manfredo, 2008). Emotions-based research has been identified as one of the most exciting, influential, and engaging areas of study that has emerged out of contemporary HDW research (Manfredo, 2008, Sponarski, Vaske, & Bath, 2015b). However, compared to other cognitive research such as attitudinal or wildlife value orientation studies, empirical research on emotions is scarce in HDW (Manfredo, 2008).

The term "affect" in attitude research generally refers to a class of feelings experienced by humans, and emotions are generally included under this category by researchers (Manfredo, 2008; Vaske, Roemer, & Taylor, 2013). While the study of emotions is complex (Izard, 2007), most researchers agree that emotional responses are made of four components: physiological reactions (e.g., sweating, increased heartbeat), expressive reactions (e.g., frowning), behavioural tendencies (e.g., avoiding or seeking something), and emotional experiences (e.g., calm, tense, upset, pleased; Cornelius, 1996). Emotions are a basic mental capacity that shape or impact other mental processes such as memories (Talarico & Rubin 2007), and decision making (Winkielman, Knutson, Paulus, & Trujillo, 2007). Interactions with wildlife can evoke strong emotions that an individual is likely to remember (Jacobs et al., 2013), and can be a driving factor that either attracts us to wildlife or causes us to avoid it (Manfredo, 2008: Vaske et al., 2013). In addition, such emotions serve to influence our decision-making process with regards to our behavior toward wildlife (Slagle, Bruskotter, & Wilson, 2012).

In HDW research, the starting point for the study of emotions has been emotional dispositions (Jacobs et al., 2012). Emotional disposition is similar to all mental disposition traits. Traits reflect *who you are*, while states reflect *how you are*. In contrast to states, traits are always present in one's cognition, even if they are not active (Hamaker, Nesselroade, & Molenaar, 2007). Emotional dispositions act as the material that interprets one's emotional relevance based on the stimuli; therefore, they are an intrinsic cause of emotional response, which is a state. Emotional responses to a stimulus can either be positive or negative and can serve as a function that influences someone's willingness' to either support or oppose a management policy (Vaske et al., 2013). Understanding emotional responses to wildlife is useful to understand human-wildlife interactions and relationships and can serve to help managers make better management decisions (Bright & Manfredo, 1996). When emotions are elicited toward specific large carnivores they have the potential to offer insight into the acceptability of lethal management. Specifically, our study explored the experiential aspect of emotional responses (scared/ not scared, nervous/ relaxed, tense/calm, upset/pleased) toward wolves and coyotes.

Potential for Conflict Index$_2$ (PCI$_2$)

To measure the acceptability of lethal management toward canids on the island portion of Newfoundland and Labrador, PCI$_2$ was used. Further, differences among people's emotions toward canids were evaluated to examine if consensus changed according to the type of emotion elicited. Lethal management was explored through seven different scenarios (see tracks, see the canid, attacks pet/livestock, kills pet/livestock,

attacks community member, attacks me, and kills community member) and emotions were divided into three categories (negative, neutral, and positive).

The potential for conflict index was developed out of the necessity to elucidate statistical figures concerning consensus to an audience with little statistical understanding to increase comprehension and improve the dissemination of knowledge. It is a tool that facilitates the understanding of statistical data (Engel, et al., 2017; Sponarski, Vaske, & Bath, 2015a; Vaske, 2008; Vaske, Beaman, Barreto, & Shelby, 2010). It was developed to address the shortcomings of traditional measures of consensus such as standard deviation, co-efficient variation, and interquartile ranges (Manning, 2011) that do not have upper bounds limiting their ability to illustrate findings (Engel et al., 2017). The PCI_2 ranges from 0 to 1. The least amount of consensus is equal to one and represents the greatest potential for conflict. This means that respondents are evenly split (50% and 50%) between viewing something as unacceptable and acceptable. In contrast the greatest amount of consensus is equal to zero. This means that respondents are in complete agreement (100%) of viewing something as either unacceptable or acceptable (Vaske et al., 2010).

PCI_2 is displayed using graphs. Consensus is represented through bubbles where the larger the bubble, the smaller the amount of consensus, while the smaller the bubble, the greater the consensus. Ergo, the size of the bubble is indicative of the magnitude or potential for conflict. The mean response is represented by the center of the bubble on the y-axis which depicts the acceptability or unacceptability of the matter relative to the neutral point (Vaske et al., 2010).

Hypotheses

Based on previous research (Engel et al., 2017; Wittmann, Vaske, Manfredo, & Zinn, 1998) the following hypotheses were anticipated:

H_1: As the severity of the human-canid interaction increases so too will the acceptability of lethal management.

H_2: The higher degree of severity of human-canid interaction will produce a higher degree of consensus.

H_3: The overall mean of acceptability of lethal management will be higher for respondents with negative emotions than that of respondents with positive emotions in every scenario.

H_4: As the human-wildlife interaction increases in severity, respondents with negative emotions will have greater consensus than respondents with positive emotions.

Methods

Study area

Data were collected from residents on the island portion of Newfoundland and Labrador, Canada. Within the island two specific study areas were targeted which include the surrounding areas of Gros Morne National Park (GMNP) and Terra Nova National Park (TNNP). Gros Morne National Park is located on the western coast of Newfoundland and borders the Gulf of St. Lawrence. It is 1,805 km^2 in size and is a designated UNESCO world heritage site. Terra Nova National Park is located on the east coast of Newfoundland along several inlets of Bonavista Bay and is 400 km^2 in size. Data were collected from residents based on their proximity to the National Parks.

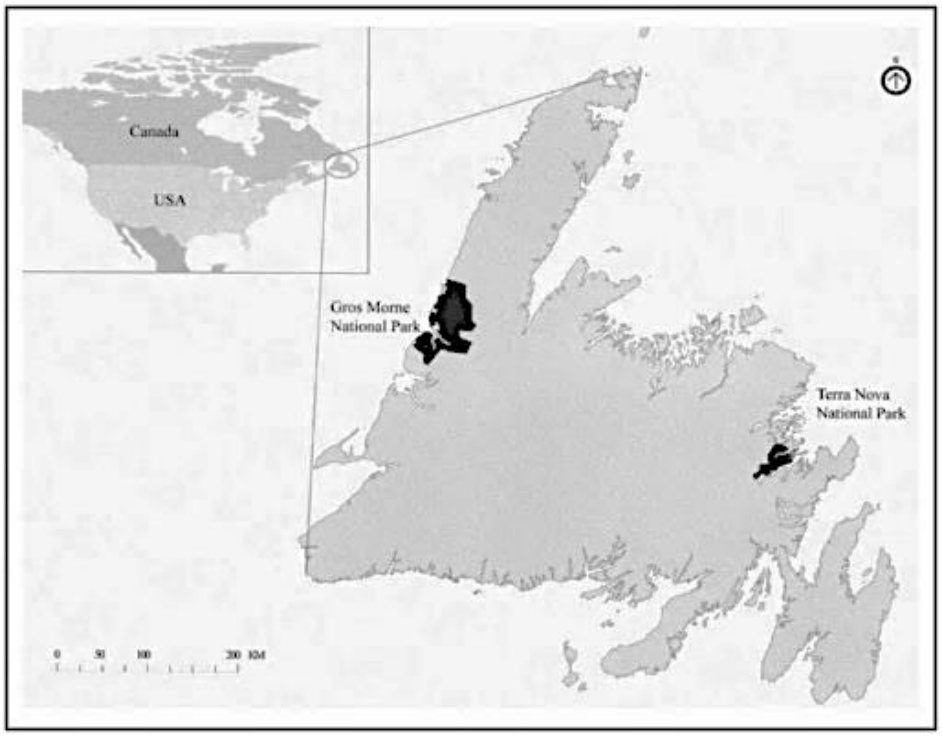

Figure 2. Map highlighting Gros Morne National Park and Terra Nova National Park in black (Gosse, Hermanutz, Mclaren, Deering, & Knight, 2011).

Data collection

Data were collected between June and August 2017. The following communities exist in and near TNNP: Port Blandford, Musgravetown, Bloomfield, Bunyan's Cove, Cannings Cove, Town of Terra Nova, Charlottetown, Traytown, Sandringham, Eastport, Salvage, Sandy Cove, Happy Adventure, and Glovertown. The total number of questionnaires randomly distributed in these communities was 289. Further, the following communities exist in and near GMNP: Parson's Pond, Cow Head, St. Pauls, Sally's Cove, Rocky Harbour, Norris Point, Glenburnie, Birchy Head, Shoal Brook, Bonne Bay, Woody Point, and Trout River. The total number of questionnaires randomly distributed in these communities was 482. Thus, a total of 771 questionnaires were distributed.

Questionnaires were dropped off at houses using a systematic random sample based on the populations of each area. A cover page informed the resident that all participation was voluntary. The pick-up date was clearly labeled on the front page of the questionnaire. If residents were present at the time of the drop-off the purpose and goal of the research was briefly explained orally.

Research instrument, design, and analysis

To assess the acceptability of lethal management, respondents were asked to evaluate to what extent they agreed or disagreed with killing canids in seven different scenarios: (1) If I see a coyote/wolf tracks; (2) If I see a coyote/wolf; (3) If a coyote/wolf attacks my pet and/or livestock; (4) If a coyote/wolf kills my pet and/or livestock; (5) If a coyote/wolf attacks someone in the community; (6) If a coyote/wolf attacks me; and (7) If a coyote/wolf kills someone in the community. Separate questions were asked for coyotes and wolves and responses were coded on a 5-point scale ranging from (-2) strongly disagree, (-1) disagree, (0) neutral, (+1) agree, and (+2) strongly agree. Thus, negative mean scores represent opposition toward lethal management and positive mean scores represent support for lethal management.

Emotions were evaluated through four different experiential emotional responses related to fear: (1) scared/not scared, (2) relaxed/nervous, (3) calm/tense, (4) pleased/upset. Emotional responses related to fear were chosen as research has shown that they are positively associated to behavioural intention such as perceived danger (Johansson & Karlsson, 2011). Respondents were asked to evaluate to what extent they would feel scared or not scared if they were to see a wolf/coyote in the outdoors. For each

of the other three emotional responses, respondents were asked to what extent would they feel one or the other. Responses were re-coded for analysis on a three-point scale: (-1) negative emotions (scared/nervous/tense/upset), (0) neutral emotions, (+1) positive emotions (not scared/relaxed/calm/pleased). Negative mean scores represent negative emotions and positive mean scores represent positive emotions.

Paired *t*-tests were used to compare emotional responses for coyotes and wolves, and the overall acceptability of killing coyotes and wolves across the seven different scenarios. There was no statistical difference between wolves and coyotes, thus the responses for the two canids were combined into one category (canid). To examine internal consistency of the four emotional responses, Cronbach's alpha reliability analysis was used. One-way analysis of variance (ANOVA) was used to compare mean scores of respondents holding negative, neutral, and positive emotions toward canids. Finally, PCI_2 was used to elucidate the overall consensus of the acceptability to lethal management, and the degree of consensus among respondents holding negative, neutral, and positive emotions toward canids.

Results

Sample

Of the 771 questionnaires distributed, 342 of them were completed and returned, yielding a response rate of 45%. Sixty percent of the respondents were male, and 40% percent were female. The average age of respondents was 50 years, where the minimum age was 18 years and the maximum age was 93 years, hence accounting for a range of 75 years.

General acceptability of killing canids

In general, as the scenarios became more severe in nature there was an increase of support for lethal management illustrated by significant differences in the overall mean acceptability of killing a canid, thus supporting H_1 (i.e. as the severity of the human-canid interactions increases so too will the acceptability of lethal management).

Generally, people were opposed to killing the canids in scenario 1 (see canid tracks) (M = -0.61, SD ± 1.26). Sixty-five percent of people disagreed, 11% were neutral and 28% accepted killing canids. On average people disagreed with killing canids in scenario 2 (see canid; M = -0.51, SD ± 1.29). Most people (61%) disagreed, 11% were neutral, and 28% accepted killing the canid. In scenario 3 (canid attacks pet/livestock) most people were in favour of killing the canid (M = 0.99, SD ± 1.07). Only 12% of people disagreed with killing the canid, 9% were neutral, and more than three-quarters (79%) agreed with killing the canids. In scenario 4 (canid kills pet/livestock) most people (81%) found it acceptable to kill the canid (M = 1.06, SD ± 1). Only 8% of people disagreed with killing the canid and 11% were neutral. In scenario 5 (canid attacks community member) most people agreed (92%) that it is acceptable to kill the canids (M = 1.37, SD ± 0.8). Four percent disagreed with killing the canid and 4% were neutral. In scenario 6 (canid attacks me) most people (93%) agreed with killing the canid (M = 1.37, SD ± 0.78). 3% disagreed with killing the canid, while 4% were neutral. In scenario 7 (canid kills a community member) people (94%) supported lethal management (M = 1.46, SD ± 0.76). Four percent disagreed with killing the canid and 2% were neutral.

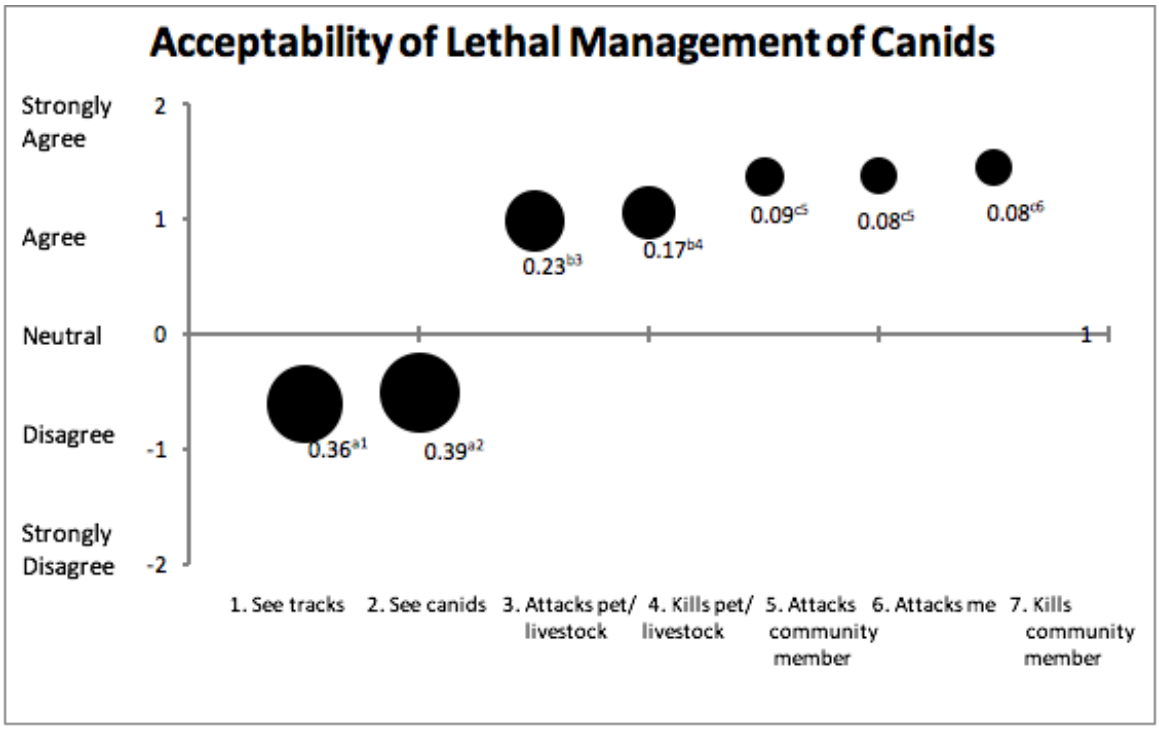

Figure 3. Mean acceptance rating and Potential for Conflict Index$_2$ (PCI$_2$) values for overall acceptability of lethal management of canids across the seven scenarios. Different superscript letters ($^{a, b, c}$) below the PCI$_2$ values represent significant (d) difference in consensus ($p < 0.05$). Different superscript numbers ($^{1, 2, 3, 4, 5, 6}$) above the PCI$_2$ values represent significant differences between means ($p < 0.05$).

Scenario 1 and 2 were found to have no significant difference in consensus ($p<0.05$; Fig.3) between each other, nor were scenario 3 and 4, or Scenario 5, 6, and 7. When comparing means scenarios 5 and 6 were the only scenarios found to have no significant difference (M_5 & M_6 = 1.36, $p<0.05$). Every other scenario when compared with one another had a significant difference between means ($p<0.05$). Scenarios 1 and 2 produced lower levels of consensus (0.36-.39) when compared with scenarios 3 to 7 (0.8-0.23) that produced generally high levels of consensus. This supports hypothesis 2, as the

severity of the interaction increases so does the level of consensus (i.e. PCI_2 values became smaller).

Emotional scale

When combined all four items of emotions (scared/not scared, nervous/relaxed, tense/calm, upset/pleased) had a Cronbach's alpha of 0.87, meaning they can be combined to generalize for a scale of emotional response (Vaske, 2008). On average people held negative emotions toward canids (M = -0.53, SD ± 0.81). Overall, 73% of people held negative emotions toward canids, 7% were neutral, and 20% had positive emotions. However, while a strong Cronbach's alpha suggests these items can be combined as a scale, when separated into four separate items some important differences and similarities appear in the results below.

Acceptability of lethal management (scared/not scared)

Generally, respondents felt that if they were to see a canid in the outdoors then they would feel scared (M = -0.26, SD ± 0.89). Fifty-six percent of people reported that they would feel scared, while 14% were neutral, and 30% said that they would not feel scared. Regardless of the scenario, people who were scared were more willing to accept lethal management than those who felt neutral or not scared. Mean responses for the acceptability of lethal management significantly differed between individuals who were scared and those who were not in every scenario (p <0.05; Table 1). This supports hypothesis 3 that the overall mean of acceptability of lethal management will be higher for respondents with negative emotions than those with positive emotions in every scenario.

Table 1. One-way analysis of variance comparisons between people that are scared, neutral, and not scared for seven human-canid interactions.

Scenarios	Emotions (M)[1]			*F*-value	*p* value	Eta (n)
	Scared	Neutral	Not Scared			
Scenario 1: If I see canid tracks the canid should be killed.	-.26[a]	-.91[b]	-1.17[b]	20.89	<.001	.11
Scenario 2: If I see a canid the canid should be killed.	-.16[a]	-.79[b]	-1.09[b]	20.22	<.001	.11
Scenario 3: If a canid attacks my pet or livestock the canid should be killed.	1.19[a]	.96[ab]	.6[b]	10.09	<.001	.057
Scenario 4: If a canid kills my pet or livestock the canid should be killed.	1.29[a]	1[ab]	.67[b]	13.62	<.001	.076
Scenario 5: If a canid attacks someone in the community, the canid should be killed.	1.5[a]	1.19[ab]	1.2[b]	5.56	.004	.032
Scenario 6: If a canid attacks me the canid should be killed.	1.5[a]	1.17[b]	1.19[b]	7.7	.001	.044
Scenario 7: If a canid kills someone in the community, the canid should be killed.	1.56[a]	1.26[b]	1.34[b]	4.95	.008	.029

Cell entries are means ranging from -2 (strongly disagree to =2 (strongly agree). Means with different subscripts differ statistically at $p<0.05$ based on Bonferroni and Tamhane post hoc tests.

In scenario 1 seeing the tracks of a canid, people who were not scared or neutral were more likely to disagree ($PCI_2 = .2$) that killing canids was acceptable. People who were scared were less likely to agree that killing canids was unacceptable ($PCI_2 = 0.4$). In scenario 2 there was a moderate level of consensus within all groups (PCI_2 range 0.24-0.39), those who were not scared had a higher level of consensus than those who were. In scenario 3 and 4 people who felt scared (PCI_2 range 0.12-0.18) or neutral (PCI_2 range 0.14-0.17) held a relatively high level of consensus in support of lethal management. People who were not scared had a moderate level of consensus in both scenarios (PCI_2 range 0.3-0.24) in support of lethal management. The final three scenarios had a high

level of consensus no matter the emotional response (PCI_2 range 0.04-0.17). In the last five scenarios, people who felt scared of canids had a higher level of consensus than those who did not feel scared, all of which support lethal management (Fig. 4). This supports hypothesis 4 which states that as the human-wildlife interaction increases in severity, respondents with negative emotions will have more consensus, while respondents with positive emotions will have lower consensus.

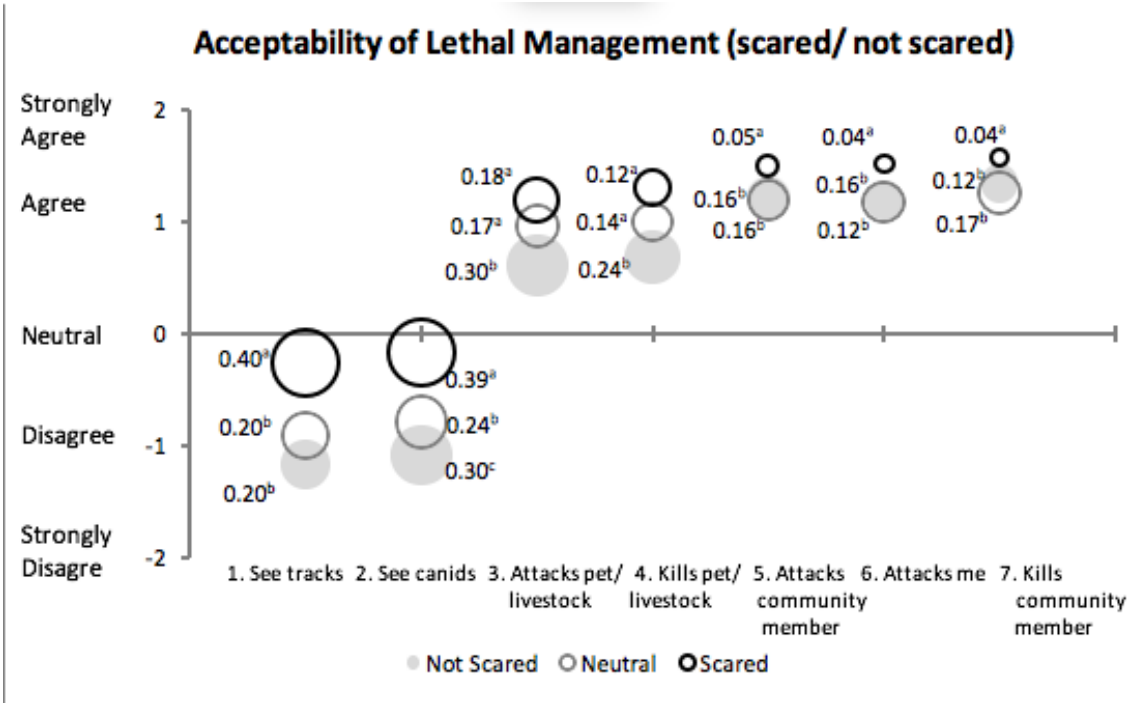

Figure 4. Mean acceptance ratings and Potential for Conflict Index$_2$ (PCI_2) values for acceptability of killing canids by being scared, neutral, or not scared across seven scenarios of people-canid interactions. Different superscript letters ($^{a, b, c}$) above the PCI_2 values represent significant (d) difference in consensus ($p < 0.05$).

Acceptability of lethal management (nervous/relaxed)

Overall, people felt that if they were to see a canid in the outdoors then they would feel nervous (M = -0.65, SD ± 0.68). Most people (77%) reported that they would feel nervous, 11% were neutral, and 12% said that they would feel relaxed. Regardless of the scenario, people who felt nervous when they saw canids were more willing to accept lethal management than those who felt neutral or relaxed. In every scenario mean responses for those who were nervous were higher than those who were relaxed. Further, there is a significant difference in means (p<0.05; table 2) between people who were nervous and those who were relaxed, thus supporting hypothesis 3 -- the overall mean of acceptability of lethal management will be higher for respondents with negative emotions than that of respondents with positive emotions in every scenario.

Table 2. One-way analysis of variance comparisons between people that are nervous, neutral, and relaxed for seven human-canid interactions.

Scenarios	Emotions (M)[1]			F-value	p value	Eta (n)
	Nervous	Neutral	Relaxed			
Scenario 1: If I see canid tracks the canid should be killed.	-.4[a]	-1.21[b]	-1.44[b]	17.97	<.001	.31
Scenario 2: If I see a canid the canid should be killed.	-.29[a]	-1.26[b]	-1.31[b]	19.63	<.001	.33
Scenario 3: If a canid attacks my pet or livestock the canid should be killed.	1.16[a]	.61[b]	.31[b]	14.7	<.001	.29
Scenario 4: If a canid kills my pet or livestock the canid should be killed.	1.26[a]	.66[b]	.36[b]	20.5	<.001	.33
Scenario 5: If a canid attacks someone in the community, the canid should be killed.	1.49[a]	1.18[ab]	.85[b]	14.4	<.001	.28
Scenario 6: If a canid attacks me the canid should be killed.	1.49[a]	1.16[b]	.9[b]	13.53	<.001	.28
Scenario 7: If a canid kills someone in the community, the canid should be killed.	1.57[a]	1.29[ab]	1[b]	12.58	<.001	.27

Cell entries are means ranging from -2 (strongly disagree to =2 (strongly agree). Means with different subscripts differ statistically at p<0.05 based on Bonferroni and Tamhane post hoc tests.

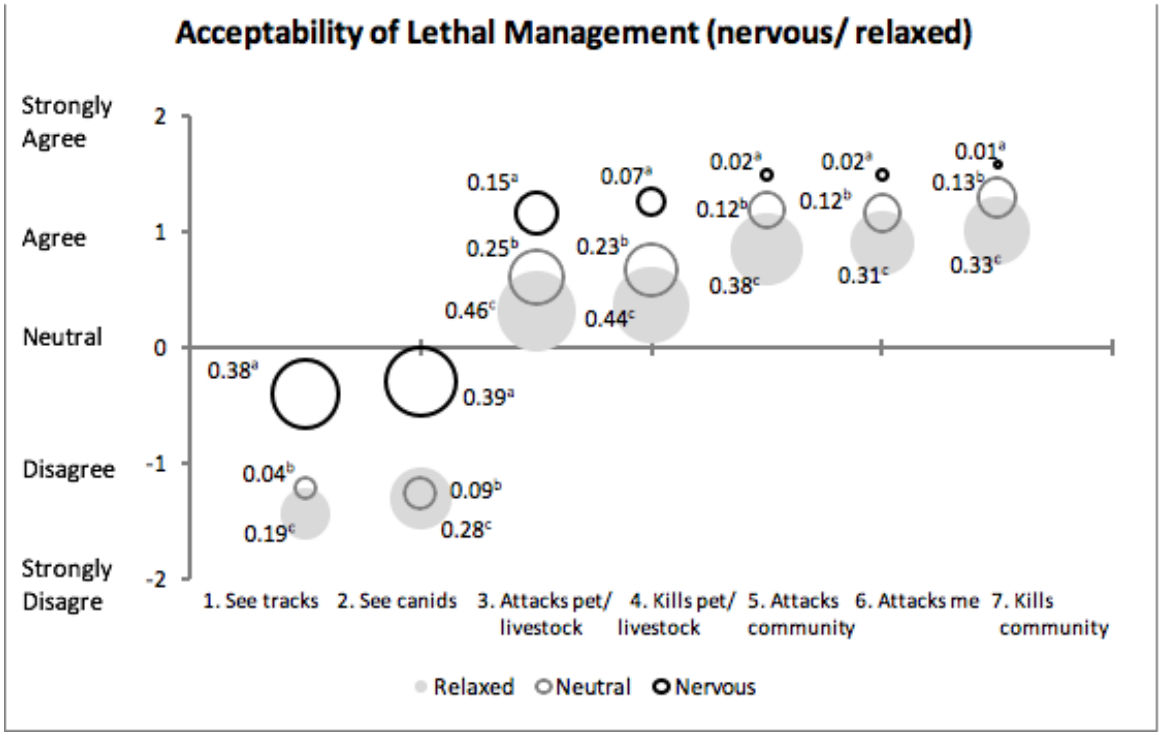

Figure 5. Mean acceptance ratings and Potential for Conflict Index$_2$ (PCI_2) values for acceptability of killing canids by being nervous, neutral, or relaxed across seven scenarios of people-canid interactions. Different superscript letters ($^{a, b, c}$) above the PCI_2 values represent significant (d) difference in consensus ($p < 0.05$).

In scenario 1, people who felt relaxed ($PCI_2 = 0.19$) or neutral ($PCI_2 = 0.04$) had a relatively high level of consensus in disagreement for killing canids when compared to being nervous ($PCI_2 = 0.38$). In scenario 2 people who felt relaxed ($PCI_2 = 0.28$) or neutral ($PCI_2 = 0.09$) had higher levels of consensus when compared to people who felt nervous ($PCI_2 = 0.39$). The next five scenarios have lower degrees of consensus across the relaxed group. For scenarios 3-7, people who felt nervous had a high level of consensus (PCI_2 range 0.01-0.15) in support of lethal management, while those who were neutral had lower level of consensus (PCI_2 range 0.12-0.25) in support of hypothesis 4. In

contrast, there was relatively low level, of consensus for people who felt relaxed (PCI_2 range 0.31-0.46) in support for lethal management.

Acceptability of lethal management (tense/calm)

Generally, people felt that if they were to see a canid in the outdoors then they would feel tense (M = -0.62, SD ± 0.7). Most people (75%) reported that they would feel tense, 12% were neutral, and 13% said that they would feel calm. Irrespective of the scenario people who felt tense when they saw canids were more willing to accept lethal management than those who felt neutral or calm. The mean responses for people who felt tense were more accepting of lethal management in every scenario when compared with those who felt calm. Interestingly, there is a significant difference in means (p<0.05; table 3) between people who felt tense and those who felt calm for the first four scenarios, however, there is no difference in means (p>0.05) between the two emotions for the last three more severe scenarios. Regardless, this evidence supports hypothesis 3 that the overall mean of acceptability of lethal management will be higher for respondents with negative emotions than those with positive emotions in every scenario.

Similar to previous findings (relaxed/nervous), levels of consensus in disagreement of lethal management were higher for those who had positive (calm) or neutral emotions toward canids in scenario 1 (PCI_2 range 0.07-0.09) and 2 (PCI_2 range 0.11-0.20) when compared with people who felt tense in scenario 1 (PCI_2 = 0.40) and scenario 2 (PCI_2 = 0.41); such large PCI_2 values indicate a lack of consensus. For scenarios 3-7 residents who felt tense had a high level of consensus (PCI_2 range 0.04-0.17) in support of lethal management. In contrast, there was less consensus for

respondents who felt neutral (PCI_2 range 0.20-0.33) and those who felt calm (PCI_2 range 0.17-0.34) in support for lethal management. Therefore, hypothesis 4 that states as the human-wildlife interaction increases in severity, respondents with negative emotions will have a higher degree of consensus, while respondents with positive emotions will have a lower degree of consensus, is also supported.

Table 3. One-way analysis of variance comparisons between people that are tense, neutral, and calm for seven human-canid interactions.

Scenarios	Emotions (M)[1]			*F*-value	*p* value	Eta (n)
	Tense	Neutral	Calm			
Scenario 1: If I see canid tracks the canid should be killed.	-.4[a]	-1.15[b]	-1.42[b]	17.64	<.001	.31
Scenario 2: If I see a canid the canid should be killed.	.31[a]	-1.1[b]	-1.3[b]	7.16	<.001	.31
Scenario 3: If a canid attacks my pet or livestock the canid should be killed.	1.13[a]	.51[b]	.53[b]	.54	<.001	.24
Scenario 4: If a canid kills my pet or livestock the canid should be killed.	1.22[a]	.61[b]	.58[b]	3.22	<.001	.27
Scenario 5: If a canid attacks someone in the community, the canid should be killed.	1.47[a]	.95[b]	1.16[a]	9.28	<.001	.23
Scenario 6: If a canid attacks me the canid should be killed.	1.47[a]	.95[b]	1.19[a]	9.4	<.001	.23
Scenario 7: If a canid kills someone in the community, the canid should be killed.	1.54[a]	1.07[b]	1.3[a]	7.94	<.001	.21

Cell entries are means ranging from -2 (strongly disagree to =2 (strongly agree). Means with different subscripts differ statistically at $p<0.05$ based on Bonferroni and Tamhane post hoc tests.

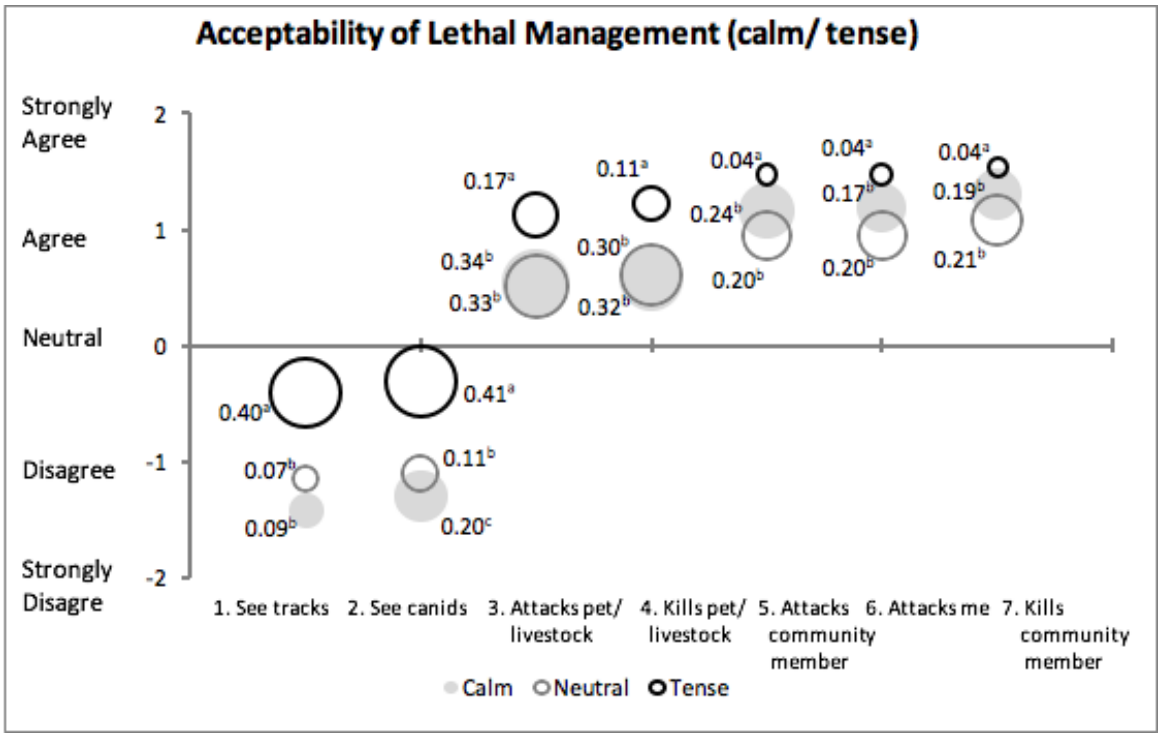

Figure 6. Mean acceptance ratings and Potential for Conflict Index$_2$ (PCI_2) values for acceptability of killing canids by being tense, neutral, or calm across seven scenarios of people-canid interactions. Different superscript letters ($^{a, b, c}$) above the PCI_2 values represent significant (d) difference in consensus ($p < 0.05$).

Acceptability of lethal management (upset/pleased)

Overall, people felt that if they were to see a canid in the outdoors then they would feel slightly upset (M = -0.34, SD ± 0.81). About half of the people (56%) reported that they would feel upset, 22% were neutral, and 22% said that they would be pleased. No matter the scenario, people who said they would be upset when they saw canids were more willing to accept lethal management than those who felt neutral or pleased. People who reported they would be upset were more accepting of lethal management in every scenario when compared with those who reported they would feel pleased. Between those

who reported they would feel upset and those who reported they would feel pleased there was a significant difference in means (p<0.05; table 4) in each of the seven scenarios. Thus, this provides unequivocal evidence to support hypothesis 3 that the overall mean of acceptability of lethal management will be higher for respondents with negative emotions than that of respondents with positive emotions in every scenario.

Table 4. One-way analysis of variance comparisons between people that are upset, neutral, and pleased for seven human-canid interactions.

Scenarios	Emotions (M)[1]			F-value	p value	Eta (n)
	Upset	Neutral	Pleased			
Scenario 1: If I see canid tracks the canid should be killed.	-.09[a]	-1[b]	-1.58[c]	54.94	<.001	.50
Scenario 2: If I see a canid the canid should be killed.	.01[a]	-.93[b]	-1.48[c]	52.85	<.001	.49
Scenario 3: If a canid attacks my pet or livestock the canid should be killed.	1.3[a]	.88[b]	.26[c]	29.88	<.001	.39
Scenario 4: If a canid kills my pet or livestock the canid should be killed.	1.4[a]	.85[b]	.44[c]	32.16	<.001	.41
Scenario 5: If a canid attacks someone in the community, the canid should be killed.	1.55[a]	1.19[b]	1.08[b]	12.71	<.001	.27
Scenario 6: If a canid attacks me the canid should be killed.	1.56[a]	1.24[b]	1.02[b]	15.75	<.001	.30
Scenario 7: If a canid kills someone in the community, the canid should be killed.	1.61[a]	1.36[b]	1.19[b]	9.53	<.001	.23

Cell entries are means ranging from -2 (strongly disagree to =2 (strongly agree). Means with different subscripts differ statistically at p<0.05 based on Bonferroni and Tamhane post hoc tests.

Using the emotions of feeling either pleased or upset we see the same trend that occurred in the previous analysis. In scenario 1 those who had positive emotions (pleased) toward canids were in complete agreement that killing canids was unacceptable (PCI_2 = 0.00), those that were neutral also held a high level of consensus (PCI_2 = 0.08). In contrast there was much ambivalence in opposition over lethal management for those who felt negatively (upset) toward canids (PCI_2 = 0.41). Scenario 2 and scenario 1 were similar as those who felt either neutral or pleased held a high degree of consensus (PCI_2 range 0.10-

0.11) in opposition toward lethal management, while those who felt upset held a low level of consensus (PCI_2 = 0.40) in favour of lethal management. However, in the final five scenarios there was much more consensus for those who felt upset (PCI_2 range 0.02-0.11). Similarly, there was a high level of consensus (PCI_2 range 0.05-0.18) in support of lethal management found within those who were neutral. In contrast there was less consensus (PCI_2 range 0.21-0.36) in support of lethal management for those who would feel pleased should they see a canid in the outdoors. These results support hypothesis 4.

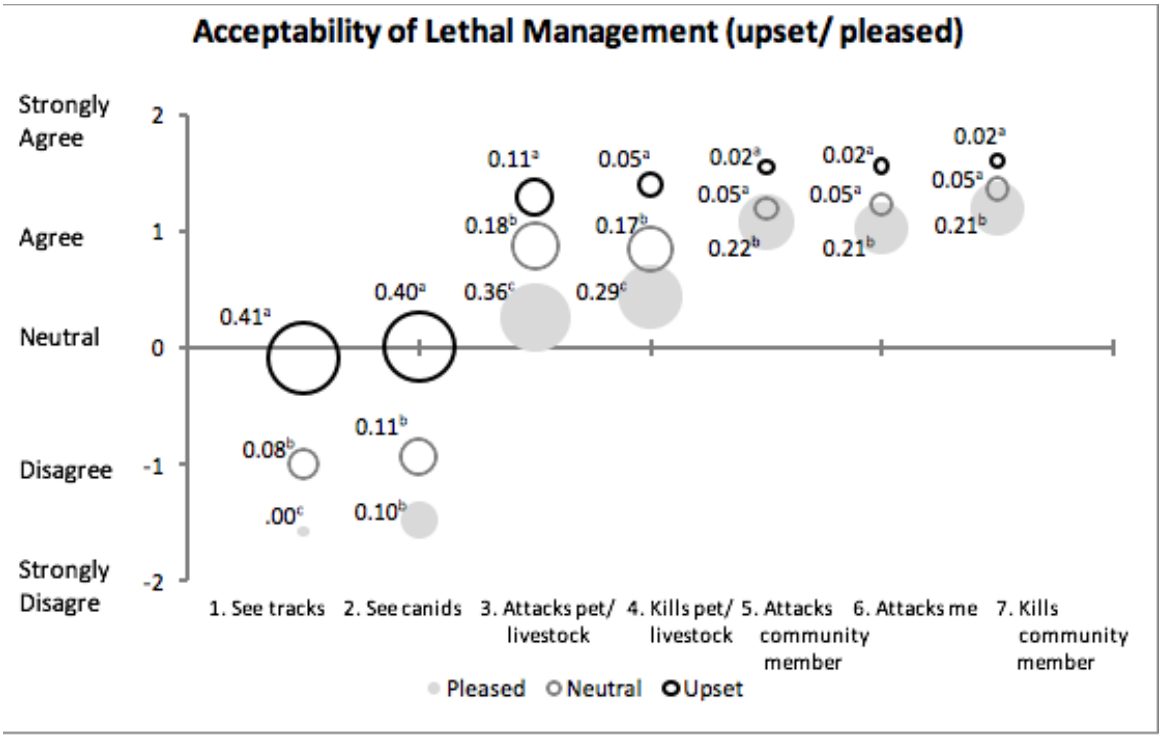

Figure 7. Mean acceptance ratings and Potential for Conflict Index$_2$ (PCI_2) values for acceptability of killing canids by being upset, neutral, or pleased across seven scenarios of people-canid interactions. Different superscript letters ($^{a, b, c}$) above the PCI_2 values represent significant (d) difference in consensus ($p < 0.05$).

Discussion

No matter the scenario, killing canids on average was considered acceptable by Newfoundland residents living close to GMNP and TNNP. As the intensity of the human-canid interaction increased so did the acceptability and consensus of lethal management. This supports other research that has found acceptability of destroying an animal more acceptable as the severity of human-wildlife interaction increased (Engel et al., 2017; Whittmann et al., 1998). When acceptability of lethal management was divided into sub-groups based on emotional responses, those who reported negative emotions toward canids were more accepting of killing the canid in each of the last five situations (scared/not scared, nervous/relaxed, tense/calm, upset/pleased), and as the human-wildlife interaction increased in severity, respondents with negative emotions had greater consensus than respondents with positive emotions.

In scenario 1 and 2 (see canid tracks and see the canid, respectively) both yielded opposition to lethal management. One reason for respondents to have opposition of lethal management for these scenarios was that they were not site specific. For instance, earlier research suggests that dependent on where the wildlife tracks, or wildlife species were spotted it could influence the response to lethal management (Altrichter, Boaglio, & Perovic, 2006; Jedrzejewski. Abarca, Viloria, Cerda, Lew, Takiff, Abadia, Velozo, et al., 2011). If tracks or the species were seen in someone's backyard they would likely be more supporting of lethal management to avoid possible future attacks (Zimmermann, Walpole, & Leader-Williams, 2005). Such results continue to emphasize the importance

for researchers to be specific in context when asking questions in order to get useful results to aid wildlife management decision–making process.

The mean acceptance of killing canids was significantly different between those who held negative emotions and those who held positive emotions twenty-five of the twenty-eight scenarios (7 scenarios x 4 emotional responses = 28). This suggests that indeed, individual emotional responses do impact lethal management and mean acceptance of killing canids in our study.

Practical implications

When compared to other studies using PCI_2 to interpret the acceptability of lethal management (e.g. Engel et al., 2017) the results of our study exhibit an exceptionally high degree of support for lethal management. Although wildlife can cause conflict, tolerance can be based on several things such as their perceived benefits which include social, cultural, and economic considerations (Madden, 2004). This suggests that currently respondents may see canids as having little to no perceived benefits. While, this study was not representative of the Newfoundland general public province-wide, it does represent residents living close to National Parks on the island portion of Newfoundland and Labrador to a large degree. Residents living close to national parks are more likely to encounter wildlife and their attitudes and subsequent behaviours can highly influence the survivability of wildlife in their "backyards". A NIMBY (Not In My Back Yard) attitude while documented in many resource management issues particularly related to nuclear facilities (Greenberg, 2009), has been less often explored with residents living next to protected areas (Sponarski et al., 2015a). Therefore, while managers may perceive

residents choosing to live near nature may be more tolerant of it our results suggest not; there is considerable overall support and consensus for lethal management as a response when addressing human-coyote interactions, regardless of the fact that lethal management in most cases is contentious (Martínez-Espiñeira, 2006). While there is much consensus and support for lethal management, it may not always be the best response (Sijtsma et al., 2012).

Our research affirms what previous research has suggested (Frank et al., 2016) concerning extreme negative feelings toward canids amongst Newfoundland residents. This comes as a contrast to other study areas where overall people have positive cognitions toward large carnivores, whether it be lions (e.g., Hazzah, Bath, Dolrenry, Dickman, & Frank, 2017), jaguars and pumas (Engel et al., 2017), bears (Kaczensky, Blazic, & Gossow, 2004) or wolves (Glikman, Bath, & Vaske, 2010). Effective strategies that promote tolerance include outreach programs which could be used as a basis for co-existence (Draheim, Rockwood, Guagnano, & Parsons, 2011). One example of the effectiveness of such programs can be seen in Vancouver which has a high tolerance for coyotes (Frank, 2015). In addition, another method that has proved to be effective at achieving higher tolerance is the use of experiential education programs to increase perceived control about human-coyote interactions and decrease perceived risk and perceived likelihood of an interaction to occur (Sponarski, Vaske, Bath, & Loeffler, 2016). Research has shown that beliefs and attitudes surrounding naturalized species are dominated by what little knowledge is known about them (Majić, & Bath, 2010). In this case where coyotes are a naturalized species to Newfoundland what little knowledge

known to Newfoundlanders about them has been dominated by negative stories such as the human-coyote fatality in Cape Breton, Nova Scotia (Sponarski et al., 2015a).

If people are to be less willing to accept lethal management, a shift in cognitions needs to occur. While difficult, that task is not out of the question as Majić & Bath (2010) have efficaciously illustrated in their study about attitude shifts toward wolves from negative to positive in Croatia.

Future Research Related to Findings

The successful application of PCI_2 in this study further validates its use for disseminating consensus within and between different emotional responses toward canids and provides additional evidence that it can be used as an effective tool for wildlife managers to understand wildlife conflict and promote coexistence. Moreover, its application illustrates that emotions impact peoples' willingness to either support or oppose lethal management, confirming the need for them to be considered when implementing wildlife management strategies. Future research should target the extent at which emotions can predict lethal management compared with other cognitions such as existence beliefs and attitudes that have already been confirmed to typically predict approximately 50% of the variability of an individual's support or opposition to lethal management (Sponarski et al., 2015b; Vaske et al., 2013).

Further use of PCI_2 that could be done within the context of the island portion of Newfoundland and Labrador, could include examining the willingness to support or oppose the continuation of moose hunting within its National Parks (GMNP & TNNP). Intense over browsing by moose within GMNP and TNNP led to the introduction of an

annual moose cull in both National Parks, where up until 2011 hunting within the park limits had been strictly prohibited (Parks Canada, 2017). Therefore, it would be valuable to know where the consensus concerning this issue lies. Interest groups could include hunters, residents, and park visitors. Based on PCI_2 researchers could examine the consensus within and between those different interest groups and examine their mean support or opposition for the management strategy. In doing so, conclusions could be made based on the potential for conflict that the strategy may, or may not, present.

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Chapter 3: Understanding lethal management toward coyotes on the island portion of Newfoundland and Labrador, Canada.

Introduction

Coyotes (*Canis latrans*) are not native to the island portion of Newfoundland and Labrador, Canada. They were first observed on the island in 1985 (Department of Environment and Conservation, 2006). Given, that there is no natural predator on the island, as the last Newfoundland wolf was killed in 1911, coyotes have managed to thrive and fill a vacant niche (NL Wildlife Division, 2017). Current estimates suggest there are approximately 5,600 coyotes on the island, meaning that they have effectively established themselves as a permanent species to the province (NL Wildlife Division, 2013). Research has shown that as wildlife populations increase so too do negative human-wildlife interactions, often resulting in conflict (Whittaker, Vaske, & Manfredo, 2006). Further, the likelihood that conflict will occur increases when the species feeds on garbage (Wieczorek-Hudenko, 2012), kills livestock (Alexander, & Quinn, 2011), and can in some cases injure or kill humans (Sponarski, Vaske, Bath, 2015a; Sponarski, Vaske, Bath, 2015b). Thus, there is a need to explore and understand human-coyote interactions on the island portion of the province where they have established themselves as a permanent species.

Conflict often occurs when there is a disagreement between people concerning the appropriate management approaches within a specific context (Frank, 2015). Therefore, when human-wildlife conflicts occur, wildlife managers are presented with a variety of options to mitigate the incident. These options include, capture and relocation, frightening

the species away, and lethal management (Bruskotter, Vaske, & Schmidt, 2009). Naturally, each method has its pros and cons. For example, trapping and relocating can be both time and cost inefficient. It can also be ineffective if the species naturally returns to the original location (Beringer, Mabry, Meyer, Wallendorf, & Eddleman, 2004). In contrast, lethal management has proven to be effective in controlling populations, however, it is not always viewed as a popular management option, especially in urban locations that are densely populated and is often seen as controversial (Fulton, Skerl, Shank, & Lime, 2004). Therefore, it is important to fully understand what explains the acceptability of lethal management, as public acceptance is a salient aspect to wildlife conservation and management (Jacobs, Vaske, Dubois, & Fehres, 2014). Understanding what drives lethal management can serve to mitigate controversy and offer theoretical insights (Sijtsma, Vaske, & Jacobs, 2012). To fully understand lethal management cognitive and emotional considerations must be considered (Bruskotter et al., 2009; Loyd & Miller; 2010).

Cognitions toward coyotes in Newfoundland have only been studied in one case which elucidated extreme negative feelings toward the coyotes (Frank, Glikman, Sutherland, & Bath, 2016). Empirical research has shown that residents living next to Canadian National Parks hold more negative attitudes and report more fear when compared to visitors and the staff of the parks (Sponarski et al., 2015b). In contrast, most studies involving cognitions toward large carnivores have produced positive cognitions toward the species such as jaguars and pumas in Brazil (Engel, Vaske, Bath, & Marchini, 2017), wolves and brown bears in central Italy (Glikman, Vaske, Bath, Ciucci, & Boitani, 2012), and lions in Kenya (Hazzah, Bath, Dolrenry, Dickman, & Frank, 2017). Previous

studies have also produced a low willingness to accept lethal management such as wolves in Utah (Bruskotter et al., 2009) and jaguars and pumas in Brazil (Engel et al., 2017). Therefore, this research paper explores the driving influences that make lethal management overall acceptable to the respondents, where in most other study cases lethal management is unacceptable. Further, it examined which of the applied cognitions serve to predict lethal management the most.

Theoretical framework

The foundation of human dimensions of wildlife (HDW) research infers that human behaviour toward wildlife is dictated by a hierarchy of cognitions, from broad values and value orientations to more specific cognitions such as attitudes, emotions, and norms (Engel et al., 2017; Vaske, Manfredo, 2012; Vaske & Donnelly, 1999). Essentially the cognitions have been arranged from general to specific (Frank et al., 2016; Sponarski et al., 2015b). Moreover, specific cognitions are better predictors of specific behaviour than general cognitions.

Values are defined as fundamental cognitions that shape a person's basic belief pattern; they are few, slow to change, and transgress all levels of cognitions and tend to be shared by individuals apart of similar cultures (Manfredo, 2008). Directly above values in the inverse triangle cognitive hierarchy are beliefs. Beliefs serve to reinforce our fundamental values and give meaning to them (Vaske et al., 1999). Beliefs can be sequestered into two categories: impact beliefs (e.g. damage caused by a species) and existence beliefs (e.g. species have the right to exist). This research focused on the influence of existence beliefs. Understanding beliefs helps to elucidate attitudes toward

species. Attitudes are defined as people's mental state toward a specific object. This mental state influences whether people will respond positively or negatively toward a species such as wolves or coyotes (Fulton, Manfredo & Lipscomb, 1996).

Attitudes are comprised of cognitive and affective components. Cognitive components are comprised of beliefs and knowledge (e.g. knowledge of species). Affective components are comprised of a range of feelings such as moods or sensations (Manfredo, 2008). As an example, fear is an affective component of attitudes and recognized as one of the key components influencing other affective components of attitude (Bjerke, Vitterso, & Kaltenborn, 2000; Jacobs, Vaske, & Roemer, 2012). Fear is also an emotional response as it describes how you are (Frank 2016; Jacobs et al., 2012; Jacobs et al., 2014). Thus, while emotions play an influential part in shaping attitudes, they are also considered to be an autonomous cognition. Although disputed, emotions are described as psychological or behavioural responses to a context that can serve to cause a "human attraction or aversion toward wildlife (Sponarski et al., 2015b)."

Cognitive and affective (emotions) aspects of attitude ultimately shape people's willingness or non-willingness to engage in a certain behaviour (behavioural intention) and forms the basis of how someone will react in a given circumstance or context (Frank et al., 2016; Manfredo, 2008; Vaske et al., 1999). Lethal management is a reaction to a given scenario or context and can be viewed as either acceptable or unacceptable (Engel et al., 2017; Jacobs et al., 2014). Cognitive and affective aspects shape people's willingness or non-willingness to engage in lethal management. Thus, within the context of this research support or opposition to lethal management is a behavioral intention.

Typically studies that use the cognitive hierarchy are usually able to predict up to 50% of the variability of management decisions (Vaske, Roemer, & Taylor, 2013). This leaves half of the variance unaccounted for. Emerging research suggests that emotions, such as fear, have a role to play in accounting for the rest of the variability (Jacobs et al., 2012; Sponarski, 2015b). Manfredo (2008) has described emotions as one of the most exciting and dynamic emerging fields of study within HDW. Hence, this study looked to explore the predictive capability of emotional responses, specifically fear, when combined and compared to traditional applications of the cognitive hierarchy.

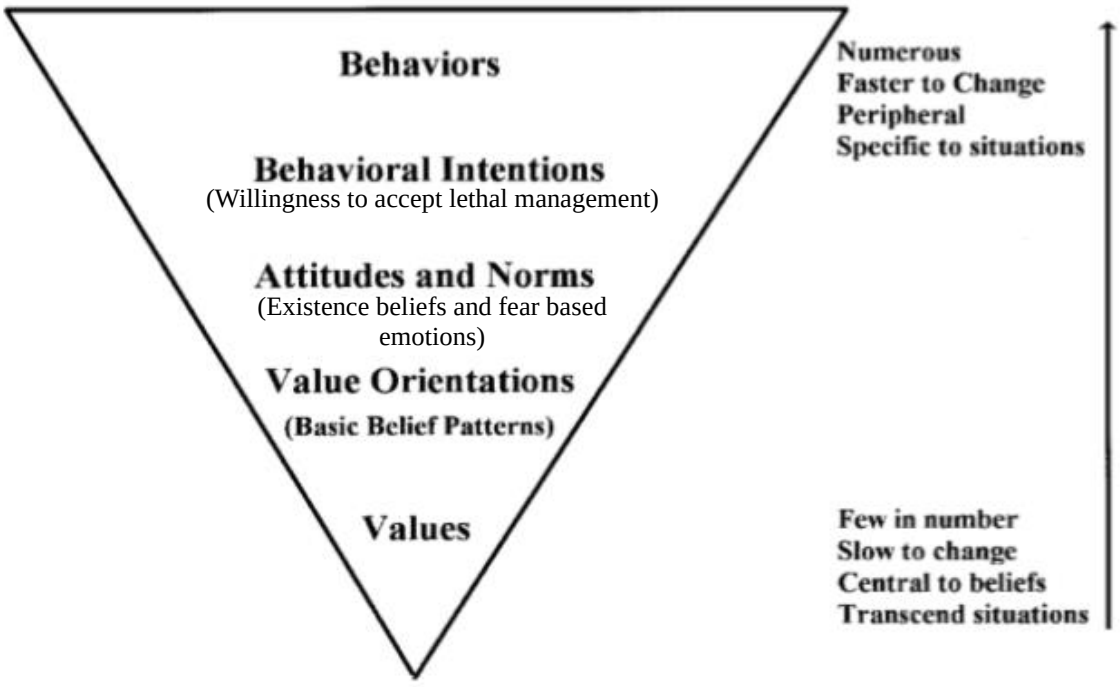

Figure 8. The cognitive hierarchy for understanding coyotes in a Newfoundland context adapted from Vaske & Donnelly (1999).

Hypotheses

The following hypotheses were explored:

H_1: Each of the four cognitions (existence beliefs, attitudes, emotions, and behavioural intention) will have a positive relationship with each other.

H_2: Attitudes toward coyotes will be the best predictor of behavioural intention (lethal management).

H_3: Existence beliefs toward coyotes will predict behavioural intention (lethal management).

H_4: Emotions toward coyotes will predict behavioural intention (lethal management).

Methods

Study area

Data were collected on the island portion of Newfoundland and Labrador, which is the most easterly province in Atlantic Canada. Two study areas were chosen Gros Morne National Park (GMNP) and Terra Nova National Park (TNNP). GMNP is Newfoundland's largest national park and is located on the west coast and borders the Gulf of St. Lawrence. TNNP is located on the east coast and is located along several inlets of Bonavista Bay. Together the study areas represented rural communities located near national parks on the island portion of Newfoundland and Labrador.

Individuals residing in the communities surrounding these parks were targeted based on their physical proximity to the park and their rural setting. This served two purposes, the first was that residents in these communities were more likely to encounter a coyote when compared to individuals residing in an urban setting such as St. John's

(Engel, Vaske, Bath, & Marchini, 2016). In addition, it provided context in understanding human-coyote relationships with residents who live in and around national parks. The latter is extremely relevant to the situational context considering the only recorded adult human fatality caused by a coyote in North America occurred in Cape Breton Highlands National Park in 2009 (CBC, 2009), also located in Atlantic Canada.

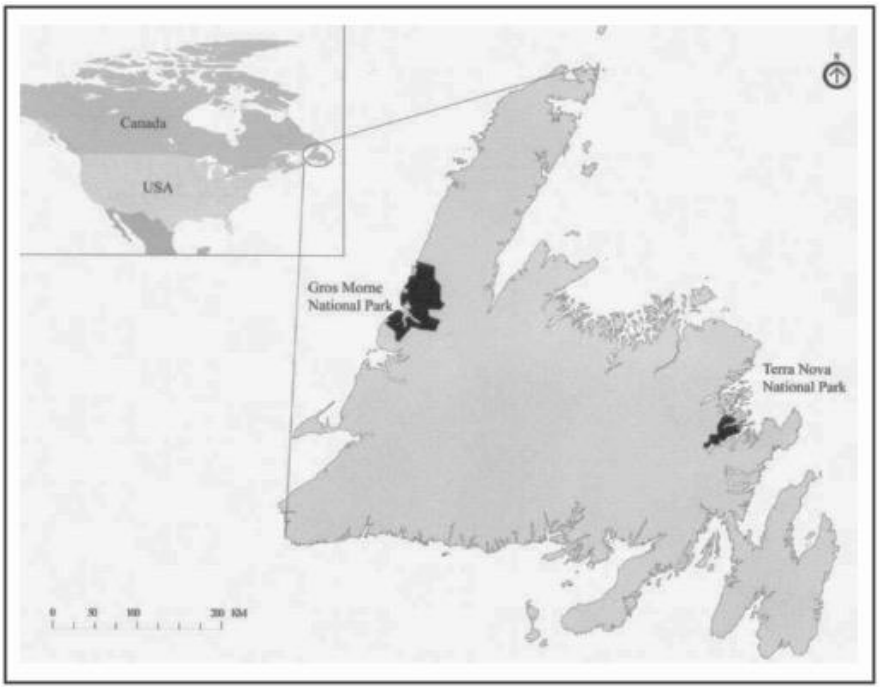

Figure 9. Map highlighting Gros Morne National Park and Terra Nova National Park in black (Gosse, Hermanutz, Mclaren, Deering, & Knight, 2011).

Data collection

Data were collected using a drop-off/ pick-up method. Questionnaires were dropped off at residents' homes using a systematic random sample and self-administered. The cover page of the questionnaire explained the purpose, goals, and objectives of the study. Detailed instructions on how to complete the questionnaire and instructions of the nature of participation were offered. A date was provided when the primary researcher

would return to pick-up the questionnaire should it be completed or not. If the residents were at home at the time of the drop-off a brief explanation of the goals and purpose of the study were offered orally.

Data were collected between June and August 2017. Questionnaires were distributed to residents randomly selected from rural communities living near TNNP and GMNP. The following communities near TNNP were targeted for data collection: Port Blandford, Musgravetown, Bloomfield, Bunyan's Cove, Cannings Cove, Town of Terra Nova, Charlottetown, Traytown, Sandringham, Eastport, Salvage, Sandy Cove, Happy Adventure, and Glovertown. The total number of questionnaires distributed in these communities was 289. The response rate was 48% (n=138). The following communities in the GMNP area targeted for data collection were: Parson's Pond, Cow Head, St. Pauls, Sally's Cove, Rocky Harbour, Norris Point, Glenburnie, Birchy Head, Shoal Brook, Bonne Bay, Woody Point, and Trout River. The total number of questionnaires distributed in these communities was 482. The response rate was 42% (n=204). In total 771 questionnaires were distributed and 342 were returned completed or partially completed, contributing to an overall response of 44%, which is a response rate higher than acceptable as defined by Mitra and Lankford (1999).

Analysis variables

Four latent constructs of cognition were assessed: (a) existence beliefs toward coyotes (3 items), (b) attitudes toward coyotes (3 items), (c) emotional responses toward coyotes, specifically fear (4 items), and behavioral intention with respect to the acceptability of lethal management (7 items).

Existence beliefs were formed using three items. Each item explored to what extent respondents agreed or disagreed with each of the following statements: (1) Coyotes have the right to exist in Gros Morne National Park and Terra Nova National Park, (2) The presence of coyotes in Gros Morne National Park and Terra Nova National Park is the sign of a healthy environment, (3) I may never see a coyote but it is important to know they exist in the parks. The answers were coded on 5-point scale of strongly disagree (-2), disagree (-1), neutral (0), agree (+1), and strongly agree (+2). When combined the three items formed the latent construct of existence beliefs toward coyotes. Negative mean scores represent negative existence beliefs toward coyotes and positive mean scores represent positive existence beliefs toward coyotes.

Attitudes were formed using three items. The first two items asked: "To what extent do you disagree or agree with the following statement?" (1) Coyotes are nuisance animals in the region, (2) I feel coyotes pose a threat to the people in the region. These responses were coded on a 5-point scale of strongly agree (-2), agree (-1), neutral (0), disagree (+1), and strongly disagree (+2). The final question used to form the cognition of attitudes asked "To what extent do you like or dislike coyotes?" Responses were coded on a 5-point scale of strongly dislike (-2), dislike (-1), neutral (0), like (+1), and strongly like (+2). When combined these three items formed the latent construct of attitudes toward coyotes. Negative mean scores represent negative attitudes toward coyotes and positive mean scores represent positive attitudes toward coyotes.

Emotions and more specifically the emotional response of fear was formed using four items. Question (1) asked "If you saw coyotes in the outdoors to what extent would you feel scared/not scared?" Question (2) asked "If you saw coyotes in the outdoors to

what extent would you feel relaxed/nervous?" Question (3) asked "If you saw coyotes in the outdoors to what extent would you feel calm/tense?" Question (4) asked "If you saw coyotes in the outdoors to what extent would you feel pleased/upset?" Responses were coded on a 5-point scale of very scared, very nervous, very tense, very upset (-2), scared, nervous, tense, upset (-1), neutral (0), slightly scared, relaxed, slightly calm, pleased (+1), and not scared at all, very relaxed, very calm, very pleased (+2). These four items were then combined to create the latent construct of emotional response toward coyotes. Negative mean scores represent negative emotional responses toward coyotes and positive mean scores represent positive emotional responses toward coyotes.

The behavioural intention of lethal management was formed using seven items. Each question asked "To what extent do you disagree or agree with the following statements?" (1) If I see coyote tracks the coyote should be killed, (2) If I see a coyote the coyote should be killed, (3) If a coyote attacks my pet or livestock the coyote should be killed, (4) If a coyote kills my pet or livestock the coyote should be killed, (5) If a coyote attacks someone in the community, the coyote should be killed, (6) If a coyote attacks me, the coyote should be killed, (7) If a coyote kills someone in the community, the coyote should be killed. Responses were coded on a 5-point scale from strongly agree (-2), to strongly disagree (+2), with neutral being (0). When combined these items formed the acceptability of lethal management toward coyotes. Negative mean scores represent support for lethal management toward coyotes and positive mean scores represent opposition for lethal management toward coyotes

Data analysis

Cronbach's alpha was used to test the internal consistency in each of the four scales to ensure each item was indicative of the scale they intended to represent. Once Cronbach's alpha confirmed the internal consistency data were consolidated into four different scales. This was done using a summated rating index, which combined the items into one variable. Pearson's correlation was then used to decipher the direction and strength of each relationship between the four scales and to ensure that there was in fact connections and relationships between the scales. This was followed by a multiple regression model (stepwise method) that was used to elucidate variance and determine the best predictor of the dependent variable. The independent variables were (emotions, attitudes, existence beliefs) and the dependent variable was behavioural intention (lethal management). Justification for the use of regression models can be seen in their effective application in countless studies such as Frank et al. (2016) where feelings toward coyotes were predicted, Vaske, Roemer, & Taylor (2013), where the acceptability of wolf management actions was predicted, Sijtsma et al. (2012), where the acceptability of lethal control of wildlife that damages agriculture was predicted, and Bruskotter et al. (2009), where the acceptance of lethal control toward wolves in Utah was predicted.

Results

The questionnaire was completed by 342 individuals. This produced a combined response rate of 45% between the two study areas. Sixty percent of the respondents were male, and 40% percent were female. The average age was 50, the minimum age was 18 and the maximum age was 93 accounting for a range of 75.

Table 5. Descriptive statistics and reliability for existence beliefs, attitudes, emotions, and lethal management.

	Mean	Standard deviation	Inter-item correlation	Cronbach 's alpha
EXISTENCE BELIEFS				.85
Coyotes have the right to exist in GMNP & TNNP.[a]	-.01	1.27	.80	
The presence of coyotes in GMNP and TNNP is a sign of a healthy environment.[a]	-.04	1.2	.75	
I may never see a coyote but it is important to know that they exist in the parks.[a]	.26	1.3	.61	
Existence beliefs summated	.07	1.1		
ATTITUDES				.84
Coyotes are nuisance animals in the region.[b]	-.35	1.25	.75	
I feel coyotes pose a threat to the people in the region.[b]	-.10	1.29	.75	
I like/dislike coyotes.[c]	-.56	1.16	.60	
Attitudes summated	-.34	1.06		
EMOTIONS (fear)				.92
Not scared/ scared.[d]	-.2	1.4	.79	
Relaxed/ nervous.[d]	-.78	1.11	.87	
Calm/ tense.[d]	-.76	1.13	.86	
Pleased/ upset.[d]	-.44	1.2	.75	
Emotions (fear) summated	-.55	1.1		
LETHAL MANAGEMENT				.89
If I see coyote track the coyote should be killed.[b]	.62	1.23	.58	
If I see a coyote the coyote should be killed.[b]	.50	1.3	.60	
If a coyote attacks my pet or livestock the coyote should be killed.[b]	-.94	1.1	.75	
If a coyote kills my pet or livestock the coyote should be killed.[b]	-1.03	1	.81	
If a coyote attacks someone in the community, the coyote should be killed.[b]	-1.36	.79	.76	
If a coyote attacks me, the coyote should be killed.[b]	-1.34	.81	.76	
If a coyote kills someone in the community, the coyote should be killed.[b]	-1.41	.78	.72	
Lethal management summated	-.71	.78		

[a] Measured from strongly disagree (-2) to strongly agree (2), with neutral being (0).
[b] Measured from strongly agree (-2) to strongly disagree (2), with neutral being (0).
[c] Measured from strongly dislike (-2) to strongly like (2) with neutral being (0).
[d] Measured from scared/nervous/tense/upset (-2) to not scared/ relaxed/ calm/ pleased (2), with neutral being (0).

The 3-item scale for existence beliefs produced a Cronbach's alpha of .85 which is a good indication of internal consistency (Vaske, 2008), meaning the items represented the concept being measured and could be summated into one item. On average respondents held slightly above neutral existence beliefs toward coyotes (M = .07, SD ± 1.1). Of the respondents, 39% held negative existence beliefs, 17% were neutral, and 44% held positive existence beliefs.

The 3-item scale for attitudes produced a Cronbach's alpha of .84. On average people held slightly negative attitudes toward coyotes (M = -.34, SD ± 1.06). 58% of respondents held negative attitudes, 9% were neutral, and 33% held positive attitudes.

The 4-item scale for emotional responses produced a Cronbach's alpha reliability estimate of .92. Overall people held a negative emotional response toward coyotes (M = -.55, SD ± 1.1). 65% of the respondents held a negative emotional response, 9% were neutral, and 26% had a positive response. The strongest emotional item for respondents was feeling tense or calm, where 70% self-reported that they would feel tense, 13% identified they would be neutral, and 17% said they'd feel calm.

The final 7-item scale for behavioural intention with regards to lethal management produced a Cronbach's alpha of .89. Overall, based on the scenarios, people were accepting of lethal management (M = -.71, SD ± .78). Regardless of the scenario 85% of people were in favour of lethal management, 2% were neutral, and 13% were opposed to killing coyotes.

Inter-item correlations

Positive correlations were confirmed between each variable supporting H_1 (see Table 6 & Fig. 10). A typical relationship for correlation requires at least .3, while a Pearson *r* of .5 or higher is required to have a substantial relationship between two variables (Gliner, Vaske, & Morgan, 2001).

Table 6. Results of Pearson correlation coefficients between scales.

	Lethal Management	Existence beliefs	Attitudes	Emotions
Lethal management		.49	.68	.42
Existence beliefs	.49		.64	.51
Attitudes	.68	.64		.54
Emotions (fear)	.42	.51	.54	

Each correlation is statistically significant ($p<.05$)

Two typical relationships exist between the items. The first is between emotions and lethal management ($r = .42$). The other is between existence beliefs and lethal management ($r = .49$). There are also several substantial relationships that are illustrated. The first is between existence beliefs and emotions ($r = .51$). The next is between emotions and attitudes ($r = .54$). A strong relationship exists between existence beliefs and attitudes ($r = .64$). The final and strongest correlation exists between attitudes and lethal management with a Pearson *r* value of .68. Each correlation was statistically significant ($p<.05$).

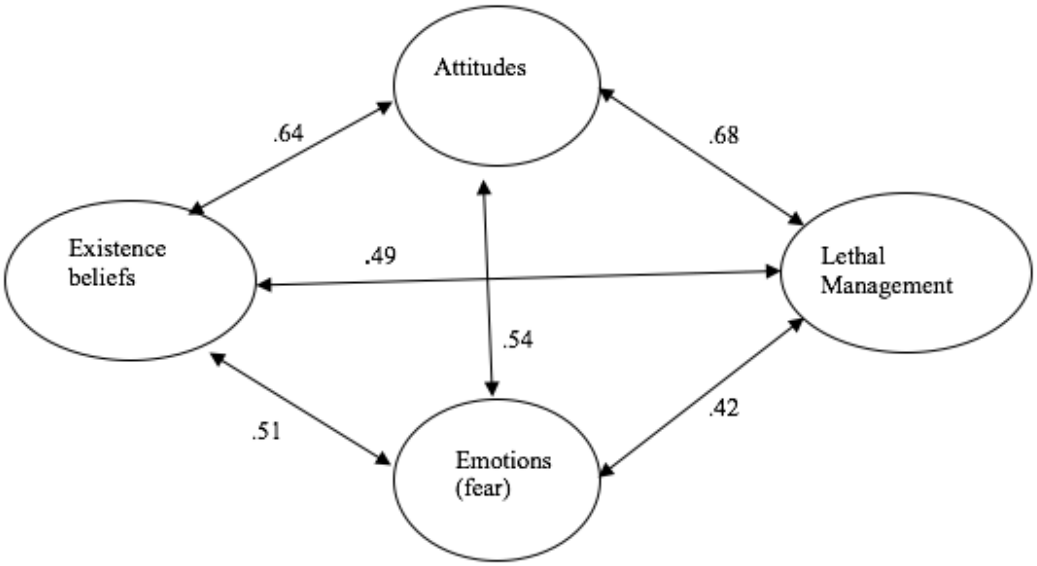

Figure 10. Pearson's R correlations between each developed scale.

Multiple regression model

Each independent variable had a positive Pearson's *R* correlation with the dependent variable (lethal management) and each relationship was statistically significant. Attitudes had the strongest correlation with lethal management ($R = .70$), followed by existence beliefs ($R = .53$) and emotions ($R = .45$). When the independent variables were entered into the multiple regression model they accounted for 49% of the variance in lethal management toward coyotes ($R^2 = .494$, adjusted $R^2 = .491$).

Consistent with the cognitive hierarchy framework attitudes were the strongest predictor of lethal management ($\Delta R_2 = .483$, $p < .001$). Based on the positive correlation, negative attitudes were able to predict support for lethal management and positive attitudes were able to predict opposition for lethal management. This supports H_2 that stated attitudes would be the best predictor of lethal management. Existence beliefs to a

much lesser extent were a predictor of lethal management ($\Delta R_2 = .011$, $p < .001$), supporting H_3. Emotions were not a significant predictor of lethal management and were excluded from the model. Therefore, H_4 which stated that emotions would predict lethal management is rejected.

Table 7. Multiple regression model predicting lethal management

Dependent variable: Lethal management						
	Dependent Variables	R^2 value	Adjusted R^2 value	$R_2\Delta$	F change	P-value (Anova)
1	Attitudes	.483	.481	.483	299.293	.001
2	Attitudes & Existence Beliefs	.494	.491	.011	156.037	.001

*Emotions (fear) not statistically significant, therefore, excluded from model.

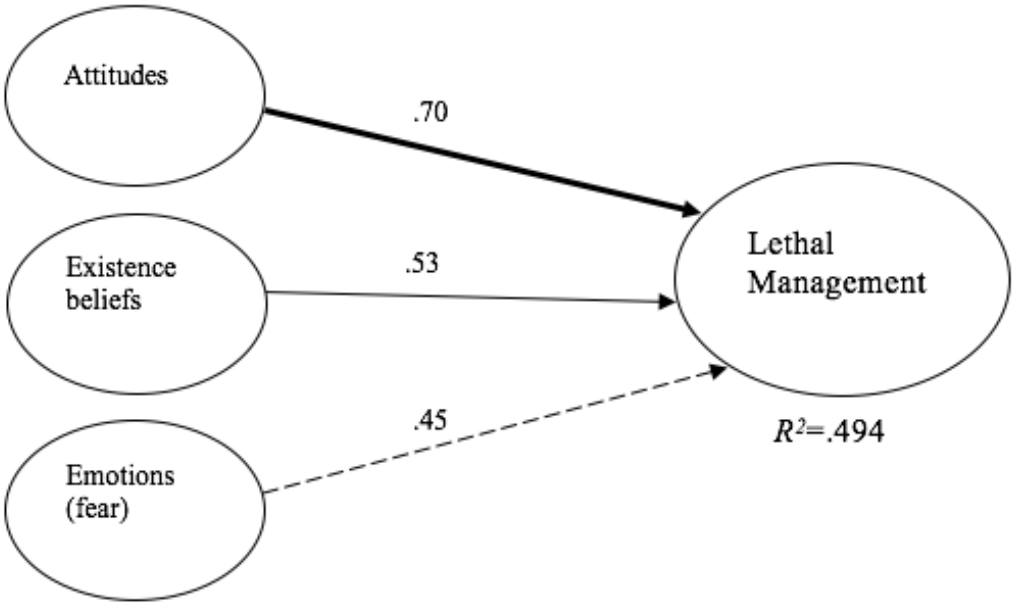

Figure 11. Standardized regression coefficients of the predictors of the multiple regression analysis ($R^2 = .494$, adjusted $R^2 = .491$). The boldness of the lines suggests the strength of the relationship. The dotted line represents no statistical significance for explained variance.

Discussion

Overall, the study results support three of the four hypotheses. Hypothesis 1 was supported illustrating that in human-wildlife interaction issues there are indeed strong relationships between lethal management, existence beliefs, attitudes, and emotions (fear). Multiple regression analysis results revealed as hypothesized (H_2) that attitudes explained the most variance in lethal management. Existence beliefs were also a statistically significant predictor of lethal management supporting H_3. Finally, emotions were found to have no statistical significance for predicting lethal management rejecting H_4. Therefore, despite recent dialogue within HDW about the potential role of emotions in aiding with the explanation of human behaviour, this doesn't appear to be the silver bullet HDW researchers have been waiting for, at least not in predicting the extreme support for lethal management in this coyote example in Newfoundland. However, we believe emotions may still play a role in lethal management but the area requires further exploration with different species, potentially different scale items and study groups.

Theoretical implications

This study explored two theoretical avenues. The first was the cognitive hierarchy and the second was the role emotional responses play within the context of HDW. Within the field of HDW the cognitive hierarchy is a well-established theoretical framework that has been validated through countless empirical studies (Fulton et al., 1996; Sponarski, Vaske, Bath, & Musiani, 2014; Vaske et., 1999; Whittaker et al., 2006). Further validation of the cognitive hierarchy can be seen through this empirical study. To begin H_2 was formed through the application of the cognitive hierarchy and the notion that

attitudes explain the most variance in behavioral intention. The results, as predicted, proved this to be the case giving credence to the use of the framework. H_3 was also formed using the cognitive hierarchy and also validated.

In contrast, empirical research on emotions and the role they play within the context of the field remains sparse (Jacobs et al., 2012; Manfredo, 2008). Research has suggested that while the cognitive hierarchy is usually able to predict close to 50% of variance, the remainder of variability could be explained by emotions and emotional responses (Sponarski et al., 2015b). Moreover, the role of emotions has so far shown to hold potential through studies that validate their use (Jacobs et al., 2012, Jacobs et al., 2014, Sponarski et al., 2015b). In contrast, emotions measured only as fear in our study did not prove to be statistically significant within our multiple regression model.

Applied implications

Lethal management in most cases is contentious and disputed (Martínez-Espiñeira, 2006; Sijtsma et al., 2012). Although for Newfoundland residents a great deal of consensus exists around their support for lethal management toward the new predator, the coyote. Most people may be willing to accept non-lethal alternatives if they are informed that lethal management is not the most economically efficient strategy to adopt and if they are aware of the human-wildlife conflict (Coluccy, Drobney, Graber, Sheriff, & Witter, 2001). Unfortunately, we didn't explore this aspect. This research suggests that managers now face the management challenge of working with these strong negative viewpoints. Previous management policies toward coyotes on the island portion of Newfoundland and Labrador have explored the idea of completely eviscerating them

from the landscape (NL Wildlife Division, 2013). However, wildlife management is not a popularity contest and policies shouldn't be adopted based on a few loud vocal voices (Bath, 1998). In fact, after effectively listening and giving a voice to residents living next to protected areas in Newfoundland, and finding support for policies that are difficult to implement, managers have much work to do. There is a need to decrease fear, change public attitudes, and improve existence beliefs about coyotes.

Attitudes have proven to account for the most variance in lethal management, therefore, should wildlife managers wish to generate more acceptance toward coyotes then improving attitudes should be where they start. Research has shown that the transition from pre-adolescent to adolescent is a vital period for the formation of attitudes. During this time attitudes and values toward wildlife and the environment are formed and solidified (Bath & Farmer, 2000). Focus should be placed on this demographic as youth are future decision makers. Research in conservation psychology has shown that empathy and care is developed through knowledge, affect, and social context. Therefore, education for changing attitudes works best in an experiential environment that incorporates all three. Such strategies that have proven to be effective in facilitating positive attitudes toward wildlife among youth include environmental education and stewardship. (Consorte-McCrea, Nigbur, & Bath, 2017). As wildlife populations increase so too will human-wildlife interactions (Whittaker et al., 2006), if attitudes toward coyotes are not addressed with each human-coyote interaction that occurs the severity of controversy will also be exacerbated. Further, negative attitudes will only solidify.

Conclusions

In this study, attitudes were found to be the best predictor of behavioural intention with regards to lethal management. This closely supports the theoretical framework of the cognitive hierarchy (Vaske et al., 1999). Therefore, it further validates it as a useful tool in understanding human-wildlife conflict mitigation and management. While, this study targeted understanding the reasons why acceptance of lethal management toward coyotes was so high, future research could be directed toward educating people on the benefits that coyotes can bring to a province that has no natural predator (Wildlife division, 2013). Such work would be beneficial in establishing more positive attitudes: this could lead to an overall higher degree of acceptance toward coyotes (Majić & Bath 2010). Coyotes are not native to the island of Newfoundland, rather they have naturally expanded to the province, (NL Wildlife Division, 2017), and given the fact that they are an extremely resilient and adaptable species they have become naturalized and are here to stay (Fox & Papouchis, 2005). Therefore, public support and acceptance is necessary if coexistence is to be achieved with the new predator (Frank, 2016).

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Chapter 4: Summary

The purpose of this thesis is to build on existing human dimensions of wildlife (HDW) research on canids and lethal management. More specifically it provides a local understanding of cognitions toward canids and canid management on the island portion of Newfoundland and Labrador to provide useful, informed recommendations to more efficaciously manage canid populations in the province for future generations.

The following section consists of a highlight of key findings from the quantitative research, and an analysis of how the findings either fit into the current literature or do not. This chapter also includes recommendations for future canid research in Newfoundland and direction for future research in HDW. The last section offers recommendations for wildlife managers and decision makers on the best management practices and policies to effectively manage canids in the province based on the research findings from Chapter 2 and 3 of this thesis.

The quantitative data for this research proved invaluable and supported the objective of documenting and understanding cognitions toward canids and canid management. While, the data collected is not representative of the entire province, we are able to generalize the data to the communities surrounding the national parks on the island portion of Newfoundland and Labrador to a certain degree. Given that rural residents are more likely to experience human-canid interactions this knowledge is salient. Further, the data has provided theoretical and practical implications for canid management in Newfoundland and more broadly.

Discussion

Lethal management in most cases is a contentious management strategy. (Martínez-Espiñeira, 2006; Sijtsma et al., 2012). If such a management action is to be initiated, public support and consensus must be understood to minimize controversy (Fix et al., 2010). Since the arrival of coyotes on the island portion of Newfoundland and Labrador management has been focused on biological, ecological, and financial implications (Department of Environment and Conservation, 2006), meaning that the social and human dimension have, until recently, been complacently overlooked. Implementing HDW research into wildlife management can help managers interpret the social landscape of wildlife issues (Bright & Manfredo 1996; Decker et al., 2012). Effective management strategies are proactive, as opposed to reactive, and predict and mitigate controversy before it happens (Frank, 2015). This study was able to quantify levels of support and opposition to lethal management by understanding cognitive and emotional predictors of behavioral intention. It was also able to demonstrate the extent of consensus and support regarding lethal management toward canids on the island portion of Newfoundland and Labrador.

Consistent with relevant literature in the HDW field, Chapter 2 was able to validate the Potential for Conflict Index$_2$ as a valuable visual tool to display where consensus and support lies with regards to lethal management (Doney, 2017; Sponarski et al., 2015a; Vaske et al., 2010). This study was also able to prove that emotion influences support or opposition toward lethal management, further supporting the validation for their role in HDW research that has been illustrated in previous studies (Jacobs et al.,

2014; Sponarski et al., 2015b; Vaske et al., 2013). However, in Chapter 3 our results suggested that they were not a statistically significant predictor of lethal management. Moreover, the application of PCI_2 was able to show that differences of support and consensus exist between those who have positive, neutral, and negative emotional responses to canids in the outdoors. Our results showed that as the intensity of the human-wildlife interaction increased so did the acceptability and willingness to support lethal management consistent with our research (Engel et al., 2017; Wittmann, Vaske, Manfredo, & Zinn, 1998). Much of the previous literature surrounding lethal management elucidated results where people had low-willingness to accept it as a management policy based on their positive cognitions toward the species (Bruskotter et al., 2009; Engel et al., 2017; Jacbos et al., 2014). Interestingly, this study contrasted dramatically to previous studies in that it yielded a high level of support and consensus toward lethal management based on vehement negative emotions toward the species.

In Chapter 3 we also found our research to be consistent with the relevant literature on the cognitive hierarchy. Our research further validated its application. Consistent with the literature attitudes were proven to be the best predictor of behavioural intention (lethal management) (Sponarski, Vaske, Bath, & Musiani, 2014; Treves, Naughton-Treves, & Shelley, 2013; Vaske et al., 1999). Where this research differed from previous literature was the significance of emotions. Recent research within HDW has placed emphasis on the potential predictive capability of emotions and emotional responses (Jacobs et al., 2014; Manfredo, 2008; Sponarski et al., 2015b; Vaske et al., 2013). However, the application of emotions in this study proved fruitless as they were not a predictor of behavioural intention. When combined with other scales in a multiple

regression model, emotions yielded no statistical significance. Therefore, while other applications and studies of emotions have yielded evidence to support their emerging role within the context of the field (Jacobs et al., 2012; Johansson, & Karlsson, 2011) this study and its application did not. Instead this research served to solidify the traditional application of attitudes to predict behaviour. To establish emotions as a predictor of behavioral intention more research needs to be done to properly elucidate the information gap.

Given that carnivores elicit strong emotions and emotional responses it is interesting that their application in Chapter 2 did not yield statistical significance for predicting lethal management. The study of emotions is complex and nebulous at best (Izard, 2007). Debate regarding effective measurement instruments for recording emotions has caused much consternation for researchers (Vaske et al., 2013) and can be seen as one of the shortcomings when attempting to measure and apply them. Perhaps, within our field we don't know yet how to effectively separate emotions from attitudes as the concepts are highly embedded at interrelated (Jacobs et al., 2012). Gaps in knowledge regarding emotions and their application within the field exist, specifically the ones mentioned above, if they are to be properly integrated more research needs to be done.

In conclusion, this thesis has relevance to the field of HDW as it (a) explored how and to what extent emotional responses impact support and consensus of lethal management, and (b) explored and identified the best predictor of lethal management toward coyotes on the island portion of Newfoundland and Labrador. The research contributes to a growing body of literature on the application of PCI_2 and adds to a relatively small but expanding body of literature focused on illustrating the role of

emotions within the field. In addition, this research has explored a unique context of human-coyote interactions and management as Newfoundland is an island province and coyotes are a newly established species on the island. Results from this research should provide wildlife managers with important insight and knowledge into public perceptions surrounding the acceptability of lethal management. In summary, a low level of tolerance was observed resulting in a low willingness to co-exist with the species. To mitigate public opinion and controversy toward coyotes, future research and management strategies are needed in order to promote co-existence and tolerance toward the newly established species on the island portion of Newfoundland and Labrador. One effective example is educational workshops which have proven to decrease fear and perceived risk of large carnivores such as the coyote (Sponarski, Vaske, Bath, & Loeffler, 2016).

Financial and time constraints limited the ability to increase the sample size and geographic scope of this study. For future research to be representative, sampling must include urban city centres (e.g., St. John's, Corner Brook). With consideration of the limitations of this study, the following section of this chapter outlines recommendations for future research, and recommendations for wildlife managers and decision makers on coyote management on the island portion of Newfoundland and Labrador.

Recommendations for Future Research

1. Expand the use of emotions beyond the experiential emotional response of fear and its application to acceptability of lethal management (see Jacobs et al., 2014) One possibility could be to look at how emotions impact lethal and non-lethal control (Vaske et al., 2013).

2. One limitation of this study was that it exclusively examined acceptability of lethal management toward canids in given situations. Further research on the island portion of Newfoundland and Labrador should target other species such as; moose, bears, and lynx. In addition, other forms of control should be examined as a response to human-wildlife interactions such as capture and relocation, frightening the species away using rubber bullets, or continued monitoring of the situation (Doney, 2017; Sijtsma et al., 2012; Werner, & Clark, 2006). Other research opportunities exist to explore more situations and contexts of human-wildlife interactions, to determine the most acceptable management response in given interactions.
3. Future research should focus on being representative of all residents in Newfoundland and not only the residents living near or within National Parks. Wildlife management is often at a local or regional scale and such data would allow managers to understand whether the same policy is the best fit everywhere in the province.
4. Similar to many studies in human dimensions (HD), this study was able to predict close to 50% of the variability in an individual's support or opposition of a management action by using the cognitive hierarchy, particularly attitudes (Jacobs et al., 2012; Sponarski, 2015b; Vaske et al., 2013). However, there still remains 50% of variability in behavioral intention left to be explained. Emotions have been identified as the potential silver bullet to explaining variability, however, their limitation of integration into the field may be the instrument that they are measured by. Currently the only way that emotions are measured in HDW

research is through self-reported questions. Future HDW research should integrate other ways of measuring emotions such as skin response, analysis of brain response, and heartbeat response (Desmet, 2004; Vaske et al., 2013).

5. A short coming of this study was that it only focused on understanding lethal management from a quantitative perspective. Employing a qualitative component or a mixed method approach could lead to a deeper understanding of fear, mistrust, and means to address these concerns in future management strategies.
6. Male respondents accounted for the majority of responses (60%), while the average age of respondents was 50 years, meaning that the gender and age of respondents may have affected the results. Further research could examine whether differences in age and gender were significant influences to the variables being investigated, as research has shown (Vaske, 2008) that variations do exist between the two.

Recommendations for Managers and Decision Makers

1. Maintain and increase dialogues and build relationship with residents to provide a platform where individuals and interest groups (hunters, farmers, and wildlife societies) can openly and constructively discuss issues, threats, or concerns surrounding coyotes and coyote management. This is more applicable to rural communities where residents are more likely to encounter coyotes compared to an urban setting such as St. John's (Engel, Vaske, Bath, & Marchini, 2016). This can be achieved through the implementation of applied HD facilitated workshops (see Bath, 2009).

2. Continue biological monitoring of coyotes to understand population demographics and spatial movements. This will be important to determine when more social science needs to be integrated into coyote management (e.g., Increase in coyote populations will lead to increase in human-coyote interactions, therefore a better understanding of the relationship will be required).
3. Although there is a high level of support and consensus for lethal management it isn't always the appropriate management response to a human-wildlife interaction (Sijtsma et al., 2012). Therefore, programs need to be developed by wildlife managers and decision makers to improve attitudes, decrease fear, and limit support for lethal management (Kaczensky, Blazic, & Gossow, 2004; Majić et al., 2010) to increase acceptance and tolerance toward coyotes. The goal is to create harmonious co-existence between coyotes and humans (Frank, 2015). One method that has proved to be effective at achieving this is the use of experiential education programs to increase perceived control about human-coyote interactions and decrease perceived risk and perceived likelihood of an interaction to occur (Sponarski, et al., 2016).
4. Management strategies must place emphasis on developing communication campaigns and education programs (Doney, 2017). The public must be educated on ways to avoid negative interactions with coyotes such as: not leaving pets unattended, not feeding and familiarizing the species with human contact, being alert and aware of signs that might indicate coyote behaviour, making your presence known when outdoors as coyotes ultimately fear human interaction and will avoid it if they are aware of human activity (Kitchen, Gese, & Schauser,

2000; Parker, 1995; Timm et al., 2004). Ultimately less interaction means less potential for controversy leading to conflict (Frank 2015; Whittaker et al., 2006).

5. Wildlife-based tourism has proven to improve local economies and can serve as a key component to a country's tourism industry (Akama, & Kieti, 2003). Moreover, hunting and fishing are important traditional forms of wildlife tourism. Therefore, opening a coyote season for foreign hunters could prove to increase tourism and yield economic benefits (MacKay, & Campbell, 2004).

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Appendix

Informed Consent Form

Title:	**Understanding attitudes and emotions toward moose, coyotes and wolves in Newfoundland**
Researcher(s):	**Christopher Dabon, project coordinator, M.A. Candidate, Memorial University of Newfoundland. E-mail: cwd451@mun.ca.**
Supervisor(s):	**Dr. Alistair Bath, project supervisor, professor at Memorial University of Newfoundland. E-mail: abath@mun.ca**

You are invited to take part in a research project entitled *"Understanding attitudes and emotions toward moose, coyotes, and wolves in Newfoundland."*

This form is part of the process of informed consent. It will give you the basic idea of what the research is about, your role in the participation process, what your participation will involve, and how it will contribute to management solutions. Further, it will also describe your right to withdraw from the study. In order to decide whether you wish to participate in this research study, it is important that you understand the risks and benefits as a means to make an informed and educated decision. It is essential that you take the time to read this carefully and to understand the information that will be given to you. If you have any questions do not hesitate to contact the primary researcher, Chris Dabon.

This research is entirely voluntary, that is to say it is your choice to participate or withdraw. If you do not wish to participate there will be no negative consequences for you, now or later on. Your participation will not be reported to community or government officials. It will be used as a part of my Master's thesis at Memorial University of Newfoundland. You are free to respond positively, negatively, or neutral to each question. As well, you are free to skip any questions that you do not wish to answer. Once the data is collected your responses will be grouped with other questionnaires and your information will be strictly confidential and anonymous.

Introduction:
My name is Chris Dabon, I am a Master's candidate at Memorial University of Newfoundland in the Department of Geography. As part of my Master's thesis I am conducting research under the supervision of Dr. Alistair Bath. You are invited to take

part in my research project entitled *"Understanding attitudes and emotions toward moose coyotes and wolves in Newfoundland."*

Purpose of Study:
In 2011, hunting moose in Newfoundland's National Parks began as a way to combat the overabundant moose population and ensure ecological integrity. When implementing managerial strategies, it is important that informed decisions are made. In order to do this, it is essential that the public is given a voice and opportunity to have an input. Therefore, the purpose of the study is to gather data in order to understand the acceptability of hunting moose in National Parks in order to present managerial suggestions that promote public support and consensus. Further, emphasis will also be placed on understanding the acceptability of lethal management toward coyotes and wolves.

What You Will Do in this Study:
Households in your community will be selected randomly to participate in this research project. If you agree to participate, we can complete the questionnaire in an interview-type manner at the time that suits you best. The second option is to complete the questionnaire on your own time in private.

Length of Time:
The questionnaire will take a total of 15-20 minutes.

Withdrawal from the study:
As a participant in this study you will be given the right to withdraw from this study at any point between our initial contact (now) and the time of collection at your own discretion. Seeing as no identifiable information will be collected to ensure anonymity of you answers, data will not be able to be removed once it is complete and compiled to a larger group of responses.

Implied Consent:
During the first interaction with the primary researcher you will be notified of the scope and objectives of the project, as well as, assured of the anonymity and confidentiality. Next you will be asked if you would like to participate and continue. If you are not home when the questionnaire is delivered, then you will be verbally advised when the questionnaire is picked up. That being said, if contact is unable to be made then you are free to leave the completed or uncompleted questionnaire sealed in the provided bags on your doorknob in order to be picked up. If no contact is made and you complete the questionnaire, consent will be implied.

Possible benefits:
The purpose of this project is to incorporate the public's voice into moose and moose management decisions. Doing this will help to allow for future decisions to be based on public support and consensus.

Possible risks:
Given that all information and responses collected will remain strictly confidential and anonymous little if any risks can be associated with the voluntary completion of this questionnaire. That being said, financial, emotional, or physical risks are extremely unlikely for participants.

Confidentiality:
Confidentiality refers to the ethical duty of protecting participants' identities, personal information, and data from unauthorized access, use, or disclosure. The data collected for this research project will be used to publish papers and be presented at conferences. The data will be presented in statistical form making it impossible for individuals to be identified.

Anonymity:
Anonymity refers to protecting participants' identifying characteristics, such as name, address, or telephone number. This study will make every reasonable effort to ensure participant anonymity. All participants in this study will remain strictly anonymous; personal information, including names, addresses, telephone numbers, and personal identifiers will not be collected. To ensure anonymity, all responses will not be opened until multiple surveys are collected. As well, to ensure anonymity please to not put your name or any other personal identifying pieces of information on your completed questionnaire.

Storage of Data:
The principal investigator (Chris Dabon) and the principal supervisor (Dr. Alistair Bath), will be the only individuals with access to the data. Hardcopy data will be stored in the primary supervisor's (Dr. Alistair Bath) office, under lock and key. Electronic data will be kept in the possession of the primary investigator (Chris Dabon) on a password-protected computer. Data will be kept for a minimum of five years, as required by Memorial University's Policy on Integrity in Scholarly Research. Questionnaires will be destroyed after the five-year minimum retention period.

Reporting of Results:
Data collected from this research will be published in my thesis, journal articles, and conference presentations. The thesis will be publically available at the QEII library at Memorial University. Data reported will only be presented in statistical form making it not possible for any participants to be identified.

Sharing of Results with Participants:
Research collection will only be made possible through the cooperation of participants. This means that the primary researcher (Chris Dabon) will make every reasonable attempt to share the results with the participants as a means to thank them. The intention for this project is to return to the study area once data collection has been completed, analyzed, and coded. Results will be presented in a community consultation meeting with key stakeholders and interest groups. Should participants be interested in attending they will be welcome to do so.

Questions:
You are welcome to ask questions at any time before, during, or after your participation in this research. If you would like more information about this study, please contact me by email at cwd451@mun.ca or by phone at +1902-449-2475. This information is also included on the cover page of the questionnaire delivered.

The proposal for this research has been reviewed by the Interdisciplinary Committee on Ethics in Human Research and found to be in compliance with Memorial University's ethics policy. If you have ethical concerns about the research, such as the way you have been treated or your rights as a participant, you may contact the Chairperson of the ICEHR at icehr@mun.ca or by telephone at (**709) 864-2561.**

Questionnaire Contents

Understanding Attitudes and Emotions toward Moose, Coyotes, and Wolves

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Newfoundland, Canada.

Dear Resident,

I invite you to participate in this research project. Memorial University of Newfoundland is interested in learning more about the attitudes and emotions toward moose and moose management in Newfoundland and specific management possibilities inside Gros Morne and Terra Nova National Park.

We are sending this questionnaire to houses in your community randomly, but, your participation is voluntary and you have the right to decline. The questionnaire will take a total of 15-20 minutes. Should you wish to complete the questionnaire it can be administered in person at the point of initial contact or it can be dropped off and completed later in private. If you wish to have the questionnaire dropped off, I, Chris Dabon, will arrange to pick up your completed questionnaire within a couple of days and can be left on your doorknob, completed or not, sealed in the bag provided.

You will not be reported to community or government officials for your participation; it will be used as a part of my Master's thesis at Memorial University of Newfoundland. You are free to respond positively, negatively, or neutral to each question and you can skip any questions that you do not wish to answer. You also have the right to withdraw from the study at any time between the point of initial contact and the time of collection at your own discretion. Your answers will be grouped with those of other respondents and your identity will be kept anonymous and strictly confidential.

Thank you for your time and for expressing your views on this topic. Your responses and answers are valuable. If you have any questions about the project please feel free to contact me by phone at +1902-449-2475, or by email, at cwd451@mun.ca.

Sincerely,

Chris Dabon
Project Coordinator,
Memorial University M.A Candidate
cwd451@mun.ca

Alistair Bath
Project Supervisor,
Professor
abath@mun.ca

A Study Conducted Cooperatively by:

MEMORIAL UNIVERSITY

Conseil de recherches en sciences humaines du Canada
Social Sciences and Humanities Research Council of Canada
Canada

The proposal for this research has been approved by the Interdisciplinary Committee on Ethics in Human Research at Memorial University. If you have ethical concerns about the research (such as the way you have been treated or your rights as a participant), you may contact the Chairperson of the ICEHR at icehr@mun.ca or by telephone at (**709) 864-2561**.

SECTION 1: The following questions will ask you general questions about wildlife.

1. **To what extent do you agree or disagree with each of the following?** *(For each statement, circle the number that best represents your response.)*

	Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
Humans should manage wildlife populations so that humans benefit.	1	2	3	4	5
Animals should have similar rights to the rights of humans.	1	2	3	4	5
We should strive for a world where there's an abundance of wildlife.	1	2	3	4	5
I feel a strong emotional bond with animals.	1	2	3	4	5
Wildlife are on earth primarily for people to use.	1	2	3	4	5
We should strive for a world where humans and wildlife can live side by side without fear.	1	2	3	4	5
People who want to hunt should have the opportunity to do so.	1	2	3	4	5

2. **To what extent do you agree or disagree with each of the following?** *(For each statement, circle the number that best represents your response.)*

	Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
Humans should manage moose populations so that humans benefit.	1	2	3	4	5
Moose should have similar rights to the rights of humans.	1	2	3	4	5
We should strive for a world where there's an abundance of moose.	1	2	3	4	5
I feel a strong emotional bond with moose.	1	2	3	4	5
Moose are on earth primarily for people to use.	1	2	3	4	5
We should strive for a world where humans and moose can live side by side without fear.	1	2	3	4	5
People who hunt moose should have an opportunity to do so.	1	2	3	4	5

3. **To what extent do you agree or disagree with each of the following?** *(For each statement, circle the number that best represents your response.)*

	Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
Humans should manage coyote populations so that humans benefit.	1	2	3	4	5
Coyotes should have similar rights to the rights of humans.	1	2	3	4	5
We should strive for a world where there's an abundance of coyotes.	1	2	3	4	5
I feel a strong emotional bond with coyotes.	1	2	3	4	5
Coyotes are on earth primarily for people to use.	1	2	3	4	5
We should strive for a world where humans and coyotes can live side by side without fear.	1	2	3	4	5
People who want to hunt coyotes should have the opportunity to do so.	1	2	3	4	5

1. **To what extent do you agree or disagree with each of the following?** *(For each statement, circle the number that best represents your response.)*

	Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
Humans should manage wolf populations so that humans benefit.	1	2	3	4	5
Wolves should have similar rights to the rights of humans.	1	2	3	4	5
We should strive for a world where there's an abundance of wolves.	1	2	3	4	5
I feel a strong emotional bond with wolves.	1	2	3	4	5
Wolves are on earth primarily for people to use.	1	2	3	4	5
We should strive for a world where humans and wolves can live side by side without fear.	1	2	3	4	5
People who want to hunt wolves should have an opportunity to do so.	1	2	3	4	5

SECTION 2: The following questions ask you for your opinion on acceptability of lethal management towards moose, coyotes, and wolves.

1. **To what extent do you disagree or agree with each of the following statements?** *(For each statement circle the number that best represents your response.)*

	Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
If I see a moose in the outdoors the moose should be killed.	1	2	3	4	5
If I see a moose crossing the highway the moose should be killed.	1	2	3	4	5
If a moose causes a motor vehicle collision the moose should be killed.	1	2	3	4	5
If moose are damaging the forest their population should be reduced.	1	2	3	4	5
If moose are damaging the forest inside a National Park their population should be reduced.	1	2	3	4	5

2. To what extent do you disagree or agree with each of the following statements? *(For each statement circle the number that best represents your response.)*

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
If I see coyote tracks the coyote should be killed.	1	2	3	4	5
If I see a coyote the coyote should be killed.	1	2	3	4	5
If a coyote attacks my pet or livestock the coyote should be killed.	1	2	3	4	5
If a coyote kills my pet or livestock the coyote should be killed.	1	2	3	4	5
If a coyote attacks someone in the community, the coyote should be killed.	1	2	3	4	5
If a coyote attacks me the coyote should be killed.	1	2	3	4	5
If a coyote kills someone in the community, the coyote should be killed.	1	2	3	4	5

3. To what extent do you disagree or agree with each of the following statements? *(For each statement circle the number that best represents your response.)*

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
If I see wolf tracks the wolf should be killed.	1	2	3	4	5
If I see a wolf the wolf should be killed.	1	2	3	4	5
If a wolf attacks my pet or livestock the wolf should be killed.	1	2	3	4	5
If a wolf kills my pet or livestock the wolf should be killed by wildlife officials.	1	2	3	4	5
If a wolf attacks someone in the community, the wolf should be killed by wildlife officials.	1	2	3	4	5
If a wolf attacks me the wolf should be killed.	1	2	3	4	5
If a wolf kills someone in the community, the wolf should be killed.	1	2	3	4	5

4. To what extent do you disagree or agree with each of the following statements? *(For each statement circle the number that best represents your response.)*

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Moose are nuisance animals in the region.	1	2	3	4	5
Coyotes are nuisance animals in the region.	1	2	3	4	5
I feel moose pose a threat to the people in the region.	1	2	3	4	5
I feel coyotes pose a threat to the people in the region.	1	2	3	4	5

5. To what extent do you like or dislike the following animals? *(For each animal circle the number that best represents your response.)*

	Strongly Dislike	Dislike	Neutral	Like	Strongly Like
Moose	1	2	3	4	5
Coyotes	1	2	3	4	5
Wolves	1	2	3	4	5

SECTION 3: The following questions will ask you for your opinion on moose, coyotes, and wolves.

1. In general, do you think of moose in Newfoundland as: *(For each statement, circle the number that best represents your response.)*

	Extremely	Slightly	Neither	Slightly	Extremely	
Bad	1	2	3	4	5	Good
Harmful	1	2	3	4	5	Beneficial
Negative	1	2	3	4	5	Positive
Unpleasant	1	2	3	4	5	Pleasant

2. In general, do you think of coyotes in Newfoundland as: *(For each statement, circle the number that best represents your response.)*

	Extremely	Slightly	Neither	Slightly	Extremely	
Bad	1	2	3	4	5	Good
Harmful	1	2	3	4	5	Beneficial
Negative	1	2	3	4	5	Positive
Unpleasant	1	2	3	4	5	Pleasant

3. In general, do you think of wolves as: *(For each statement, circle the number that best represents your response.)*

	Extremely	Slightly	Neither	Slightly	Extremely	
Bad	1	2	3	4	5	Good
Harmful	1	2	3	4	5	Beneficial
Negative	1	2	3	4	5	Positive
Unpleasant	1	2	3	4	5	Pleasant

1. **To what extent do you disagree or agree with each of the following statements?** *(For each statement circle the number that best represents your response.)*

	Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
Moose have the right to exist in Gros Morne National Park and Terra Nova National Park.	1	2	3	4	5
The presence of moose in Gros Morne National Park and Terra Nova National Park is the sign of a healthy environment.	1	2	3	4	5
I may never see a moose but it is important to know they exist in the parks.	1	2	3	4	5

1. **To what extent do you disagree or agree with each of the following statements?** *(For each statement circle the number that best represents your response.)*

	Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
Coyotes have the right to exist in Gros Morne National Park and Terra Nova National Park.	1	2	3	4	5
The presence of coyotes in Gros Morne National Park and Terra Nova National Park is the sign of a healthy environment.	1	2	3	4	5
I may never see a coyote but it is important to know they exist in the parks.	1	2	3	4	5

1. **To what extent do you disagree or agree with each of the following statements?** *(For each statement circle the number that best represents your response.)*

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Wolves have the right to exist in Gros Morne National Park and Terra Nova National Park.	1	2	3	4	5
The presence of wolves in Gros Morne National Park and Terra Nova National Park is the sign of a healthy environment.	1	2	3	4	5
I may never see a wolf but it is important to know they exist in the parks.	1	2	3	4	5

SECTION 4: The following questions will be used to understand emotions toward moose, coyotes, and wolves.

1. If you saw one of following animals in the outdoors to what extent would you scared/ not scared?

	Not Scared at all	Slightly Scared	Neutral	Scared	Very Scared
Moose	1	2	3	4	5
Coyotes	1	2	3	4	5
Wolves	1	2	3	4	5

1. If you saw one of following animals in the outdoors to what extent would you feel relaxed/ nervous?

	Very Relaxed	Relaxed	Neutral	Nervous	Very Nervous
Moose	1	2	3	4	5
Coyotes	1	2	3	4	5
Wolves	1	2	3	4	5

2. If you saw one of following animals in the outdoors to what extent would you feel calm/ tense?

	Very Calm	Slightly Calm	Neutral	Tense	Very Tense
Moose	1	2	3	4	5
Coyotes	1	2	3	4	5
Wolves	1	2	3	4	5

3. If you saw one of following animals in the outdoors to what extent would you feel pleased/ upset?

	Very Pleased	Pleased	Neutral	Upset	Very Upset
Moose	1	2	3	4	5
Coyotes	1	2	3	4	5
Wolves	1	2	3	4	5

SECTION 5: The following questions are intended to gauge your opinion on wolf reintroduction.

4. **To what extent do you disagree or agree with each of the following statements?** *(For each statement circle the number that best represents your response.)*

	Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
The monetary costs of reintroducing wolves to Gros Morne and Terra Nova National Park will exceed any benefit gained by having wolf in the park.	1	2	3	4	5
Because healthy levels of wolves exist in Canada there is no need for wolves in Newfoundland	1	2	3	4	5
Wolves would have a significant impact on big game hunting opportunities near Gros Morne and Terra Nova National Park.	1	2	3	4	5
Wolf reintroduction to Gros Morne and Terra Nova National Park would help balance the moose population.	1	2	3	4	5

SECTION 6: Please provide the following information about yourself. Thank you.

1. Are you:
Male
Female
Other

Do you identify as a rural or urban resident?
Urban
Rural

Do you identify as a (*check those that apply)*:
Local resident
Park visitor
Hunter

What is your age?

Are there any other comments you wish to make?

On behalf of myself, Dr. Alistair Bath, and Memorial University of Newfoundland, thank you again for your participation.