THE CHALLENGES OF INTEGRATIVE APPROACHES IN WILDLIFE MANAGEMENT: CARIBOU MANAGEMENT IN INSULAR NEWFOUNDLAND

by

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Abstract

The field of wildlife management is evolving and adopting Integrated Resource Management (IRM) approaches. As part of this evolution, contemporary wildlife management is informed by a greater diversity of stakeholders and other land-use issues than in the past and also acknowledges the place of individual wildlife species in the larger ecosystem. Though well-recorded from a theoretical perspective, the extent to which this evolution is manifested in an applied wildlife management setting has received little attention in the literature.

This dissertation explores and further elucidates the connection between the overarching field of IRM and the current Human Dimensions-focused stage in the evolution of the North American Model of Wildlife Management. Through a case study of woodland caribou (*Rangifer tarandus-caribou*) management on the island of Newfoundland, Canada, this research examines the extent to which the purported trends toward more IRM approaches are manifest on the ground

Stakeholder interviews and a content analysis of relevant popular media articles and other published materials were analyzed using an analytical framework that was based on a series of characteristic dimensions of IRM. Study findings suggest that while the various dimensions of IRM are, to varying extents, manifest in the wildlife management context identified, the significant challenges of fragmented management departments, disciplines, and a lack of a formalized structure for stakeholder engagement remain. This dissertation makes a unique contribution to the IRM and human dimensions of wildlife management (HDWM) literatures by identifying and exploring a significant gap between theory and practice in wildlife management and by also identifying and analyzing a lack of attention to managing wildlife in the public trust.

The latter sections of this dissertation return to the research questions to address the challenges of adopting more integrated approaches in the context of caribou management in Newfoundland. The dissertation also contributes to the practice of wildlife management by concluding with the identification of an opportunity to implement a more resilient, stakeholder-engaged management structure that is insulated from the ebb and flow of agency staff and budget allocations and that can help ensure the sustainable management of wildlife in the public trust.

Lay Summary

Experts who study wildlife management have documented important changes in the field over the last several decades. Most recently, these changes suggest a transition toward more Integrated Resource Management (IRM) approaches.

This study reveals that, there is a gap between what is written in the literature and how wildlife management is carried out. Evidence of this gap comes from a case study of caribou management on the island of Newfoundland on Canada's east coast. By conducting interviews with stakeholders and by critically reviewing relevant news stories, government press releases, and government reports, I determined that while there is some evidence of integrative approaches being practiced in the context of Newfoundland caribou management, significant challenges remain that inhibit the adoption integrative approaches. This thesis concludes with suggestions regarding how these challenges can be overcome to allow wildlife management to evolve and attain the subjective and objective benefits of IRM.

Preface

My interest in the field of human dimensions of resource and wildlife management is the direct result of growing up in a rural, resource-based community in the province of Newfoundland and Labrador. As almost all the residents of my hometown are (or at least were) employed in either the forestry or fishing industry, it is not surprising that I have taken an interest in the resource management decision making that had, and continues to have, such a large impact on the residents of my hometown and other resource users. This interest is reflected in my academic studies at both the undergraduate and graduate level.

My small, resource-based-town furnished me with an early exposure, at approximately 10 years of age, to the strong coupling between social and ecological systems. Like countless other families in Atlantic Canada at the time, my family was significantly impacted by the collapse of the northern cod fishery in the early 1990s. The loss of this economic and cultural backbone sent shockwaves throughout rural Newfoundland and Labrador and resulted in unemployment, financial hardship, outmigration, and a host of resulting social ills. In many rural communities, the collapse of the cod fishery also resulted in much anger and mistrust directed toward those government officials charged with managing the resource. During this time, passionate discussions about the perceived incompetence, indifference, and dishonestly of federal fisheries resource managers were common at dinner tables throughout rural Newfoundland and Labrador.

Upon beginning graduate studies, it was revealed to me that, likely as a result this experience during my formative years, my writing betrayed an implicit prejudice against resource managers and their willingness and ability to manage resources in the public trust. Once this was pointed out to me by my supervisor, I had the opportunity to revisit and re-evaluate some of the social norms that had helped shape my perspectives. Since that time I have worked

closely and cordially with resource managers at various levels in several different countries - and perhaps most closely with wildlife managers in the context of the current study. While I am confident that my perspective on the capabilities of resource managers is decidedly less negative and myopic than earlier in my academic career, I feel the need to acknowledge this point here as in many of the subsequent chapters I discuss the relationship between resource managers and users and also address the topic of the willingness and capacity of managers to act as trustees of wildlife as per the Public Trust Doctrine. I am confident, however, that my analysis of this evidence and associated conclusions are arrived at objectively and by way of the evidence provided.

This dissertation is an original intellectual product of the author, Stephen Edmund Decker. The interview portion of the research was approved by the University of British Columbia's Research Ethics Board (H14-00122). The inclusion of copyrighted material has been permitted by the copyright holders.

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List of Acronyms

HDWM: Human Dimensions of Wildlife Management

IRM: Integrated Resource Management

CRC: Caribou Resource Committee

EBM: Ecosystem Based Management

WAC: Wildlife Acceptance Capacity

TEK: Traditional Ecological Knowledge

AIM: Adaptive Impact Management

TK: Traditional Knowledge

LK: Local Knowledge

NGO: Non-Governmental Organization

ILUC: Interdepartmental Land Use Committee

CAQDA: Computer Assisted Qualitative Data Analysis

COSEWIC: Committee On the Status of Endangered Wildlife in Canada

NLWF: Newfoundland and Labrador Wildlife Federation

NLOA: Newfoundland and Labrador Outfitters Association

CWDC: Canadian Wildlife Directors' Committee

CPAWS: Canadian Parks and Wilderness Society

WGP: Wildlife Governance Principles

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I am also grateful to the interviewees who participated in my study and the many other individuals who assisted by sharing or alerting me to relevant popular media articles or simply taking the time to talk through their experience and perspectives regarding the research context. Many of these individuals gave freely of their time even while experiencing the great professional and personal turmoil resulting from provincial government layoffs and budget cuts.

My colleagues at the Grenfell Campus of Memorial University, where I was employed as a Lecturer in Geography and Environmental Studies throughout the data collection and dissertation writing stages of my doctoral program, are also deserving of recognition. In addition to offering their heartfelt encouragement, many also worked to ensure my teaching, research, and service commitments at Grenfell had minimal impact on my studies.

Last, but certainly not least, I would like to thank my parents, Ed and Janet Decker; my wife, Sherry; and my children, Emily and Gabriel, for their patience, understanding, support, and encouragement.

Dedication

In dedicating this thesis, I find myself first looking back, and then forward. Looking back, I realize that the path that has led me to this stage really began with the mentorship of Dr. Nick Novakowski. Nick was my most influential and inspiriting professor during my undergraduate degree in Environmental Studies at the Grenfell Campus of Memorial University. He encouraged me to go to graduate school (in truth, he was adamant that I do so!) and then, when I returned to the Grenfell Campus, as a Lecturer, Nick quickly became a close friend and invaluable colleague. Unfortunately, Nick passed away in 2015 and I'd like to dedicate this thesis to his memory. In looking forward, I would also like to dedicate this thesis to my children, Emily and Gabriel, whose boundless interest in and love of the natural environment provides hope for a more sustainable future.

Chapter 1. Introduction

North American wildlife management has changed significantly since its game animal and consumptive user-focused beginnings in the latter half of the 1800s and has evolved into a management model informed by the Human Dimensions of Wildlife Management (HDWM) (Gigliotti, Shroufe & Gurtin, 2009). Many scholars suggest that evolution in the field is continuing with trends toward wildlife management practices that are more closely aligned with components of Integrated Resource Management (IRM) (Bhattacharyya & Slocombe, 2017; Gigliotti et al., 2009; Scalet, 2007).

Integrative efforts and components of IRM are means to facilitate subjectively and objectively better decisions through earnest consideration of a diversity of knowledge sources and problem definitions (Freddy, et al. 2004; Lawrence & Daniels, 1996), taking an ecosystem approach as opposed to viewing individual species or ecosystem components in isolation (Berkes & Folke, 1998; Bennett, 2017; Slocombe, 1998; Grumbine, 1994), and by legitimizing diverse forms of knowledge (Kendrick & Manseau, 2008; Moller, Berkes, Lyver & Kislaliogla, 2004; Kendrick, 2003). Others emphasize the importance of integrative management approaches in fostering a more diverse ownership of the decision-making process, its findings and resulting management strategies (Lachapelle & McCool, 2005; Lawrence & Daniels, 1996); building trust between adversarial groups (Ring, 2009; Kendrick, 2003; Rhoads, Wilson, Urban & Herricks, 1999); and identifying and adopting stakeholder-defined impacts as management foci (Enck et al., 2006; Riley et al., 2002). Slocombe and Hanna (2007) suggest that integrated approaches seek to reconcile the following dimensions: disciplines; information; spatial/ecological units; governments; agencies; interests/sectors; and perceptions, attitudes and values as just some of the dimensions that integrated approaches seek to reconcile.

Chapter 2. Integrated Resource Management as a Theoretical Framework

Integrated approaches (the applied strategies used to foster greater integration) and concepts of IRM (the guiding principles of the integrative management perspective) are essential for further advancement of wildlife management and to truly realize the benefits of the field's current stage in its evolution that is informed by HDWM. Integrated Resource Management is therefore a fitting theoretical framework to guide this research.

With roots in the Conservation Movement of the late 19th and early 20th Centuries (Slocombe & Hanna, 2007; Kline, 1997, Mitchell, 1986), IRM predates by more than 100 years the contemporary calls for integrated management efforts in wildlife management. Integrated resource management is, therefore, well 'ahead of the curve' in terms of addressing the many challenges inherent in efforts to integrate the various dimensions warranting consideration in contemporary resource management contexts.

Exploring linkages between IRM and HDWM can help reveal the role of IRM components in addressing both past and future challenges in HDWM. Indeed several wildlife management scholars have highlighted the need for integration and, consequently, integrative approaches in wildlife management (Gigliotti et al., 2009; Ring, 2009; Enck et al., 2006; Riley et al., 2003; Riley et al., 2002; Ewel, 2001). Moreover, papers in the HDWM literature show a growing interest in integrative approaches to wildlife management. Some HDWM scholars have identified an "emerging paradigm" in wildlife management that identifies the management of stakeholder-defined impacts as the "essence of wildlife management" (Riley et al., 2002). Impacts are defined by Riley and colleagues (2002, p. 587) as "a subset of effects from wildlife-related interactions or events sufficiently important to warrant management attention". Others have noted that a focus on impacts acts as a catalyst for integrating the traditionally isolated

human and biological dimensions in wildlife management efforts (Decker et al., 2006; Riley et al., 2002; Ring, 2009). It seems that just as the multi-use and multi-value nature of forests and water basins initiated discussions of IRM more than a century ago (Slocombe & Hanna, 2007; Mitchell, 1986), wildlife-related impacts are catalyzing current efforts to adopt integrated approaches in the field of wildlife management.

Such evolution in the field of IRM begs the question of what has changed? And why do problems persist? Many things have changed, not the least of which is the ever-increasing knowledge of the complexity of natural systems, increasing attention to the importance of acknowledging coupled social-ecological systems in subjectively and objectively effective resource management, and the increasing frequency of earnest public involvement efforts (Slocombe & Hanna, 2007).

Concurrent with the shifts in the field is contemporary scholarly interest in reaffirming, and in some cases, reevaluating wildlife managers' adherence to the Public Trust Doctrine (Artelle, et al., 2018; Decker et. al., 2014a; Forstchen & Smith, 2014; Jacobson & Haubold, 2014; Organ, Decker, Stevens, Lama & Doyle-Capitman, 2014; Pomeranz, et al., 2014; Smith, 2011), which helps form the basis of the North American Model of Wildlife Conservation – the model best fitting in the management context in question. "The Public Trust Doctrine holds that wildlife are property owned by no one and are held in trust by government for the benefit of present and future generations of citizens" (Organ & Batcheller, 2009, p. 161). As such, the doctrine holds that the public places *trust* in government officials to act as stewards on its behalf, to manage the resource for the benefit of all, with fairness of access and the long-term sustainability of the species at the fore of policy and decision making.

The basis of the Public Trust Doctrine extends back to Roman Law (AD529) which established that natural resources should be treated as public property, this tenet, along with many other aspects of Roman civil law, found its way into the Magna Carta (AD1215), and eventually, after the identification of the king as trustee of such resources, into English civil law. In applying English law to its American colonies, the principle stating that the king should act as the trustee of wildlife was brought to the New World. After American independence, trusteeship of wildlife was conferred to the states (Sax, 1999; Organ & Batcheller, 2009). Similarly, in Canada, the Crown, as part of its responsibility for huge tracks of land yet-unclaimed for settlement, was charged with safeguarding wildlife populations (Organ & Batcheller, 2009), a responsibility then passed on to appropriate federal, provincial, and territorial government departments and agencies. As wildlife belongs to all Canadians and is thus to be held in public trust, the federal-level Canadian Wildlife Service has wildlife and associated land management responsibilities for migratory species, while the provinces, and in some cases territories, develop management guidelines and harvest levels for wildlife populations in their jurisdictions (Heffelfinger, 2013).

For most of the 150 years of the North American Model of Wildlife Conservation, and the Public Trust Doctrine on which it is based (Organ, et al., 2014), the "Public," or beneficiaries upon whose behalf wildlife were to be managed by government trustees, almost exclusively included consumptive users (Organ & Batcheller, 2009). Then, as the third, human dimensions-focused phase of wildlife management emerged in the 1970s, the near-exclusive game species and hunting interest-focus began to be questioned by increasingly diverse stakeholders. Managers soon found that the top-down, game animal-focused strategies used during the second phase were no longer considered acceptable by the public. Previously overlooked stakeholders

began to criticize managers' failure to address the conservation of non-game species (Van Dyke, 2008) and an inability of emerging, non-consumptive stakeholders to earnestly engage in the policy making and decision-making process. Given the field's past, and in some cases enduring, focus on consumptive users, this much greater diversity of stakeholders has challenged wildlife managers in their efforts to maintain their role as trustees of wildlife resources while also facilitating effective stakeholder involvement efforts. This challenge is very apparent in the context of caribou management in Newfoundland where a diversity of values placed on caribou is juxtaposed with an equally diverse and expanding suite of population and habitat pressures.

Since managing wildlife on behalf of citizens will include the practical need to think about a single resource such as caribou (*Rangifer tarandus*) within a holistic context—one which recognizes the interrelationships between social dimensions, economic uses of land and resources, and ecological realities—the links to integrated resource management are evident conceptually, if not always in practice.

It is this most recent/emerging shift toward more integrative approaches that is the focus of this thesis. Based on an in-depth examination of recent caribou management efforts in the province of Newfoundland and Labrador, Canada, this thesis contributes to the literature on evolution in the field of wildlife management toward more integrative approaches (Figure 1). I will also present information regarding the perhaps-unrealized

Figure 1. Male Woodland caribou in Newfoundland (© 2012 Safari Club International, by permission)

onus on trust managers, those wildlife management agencies charged with managing wildlife in the public trust, to more effectively adhere to the Public Trust Doctrine. It will be argued that to help achieve the tenets of the Public Trust Doctrine, management agencies should actively foster the development of civil society interest groups and the associated management structure that will allow stakeholder groups to make earnest contributions to wildlife management and decision making.

2.1 Research Rationale

If the field of wildlife management is indeed transitioning into a new phase more closely aligned with IRM approaches, why are there enduring disagreements between managers and other stakeholders in some wildlife management contexts (Heberlein, 2004; Weeks & Packard, 1997), examples of a lack of collaboration and coordination between management agencies in other contexts (Dale & Newman, 2007) and a continued emphasis on command and control management approaches in still other contexts (Holling & Meffe, 1996)? Despite the widespread acceptance of IRM and the stated importance of integrated management approaches to tackling problems in complex social-ecological systems, the

integration and application of IRM continues to present formidable challenges for many areas of resource and environmental management (Slocombe & Hanna, 2007; Lawrence & Deagen, 2001; McCool & Guthrie, 2001). Throughout its long history, and perhaps even more so in recent decades, wildlife management has faced a series of substantial and evolving integration challenges. Efforts to address these challenges are reflected in the field's stages of evolution, new definitions of wildlife management, and even new definitions of success in wildlife management.

With a considerable amount of scholarly discourse in wildlife management already devoted to the development or adoption of integrated approaches (Ring, 2009; Wilson & Clark, 2007; Riley et al., 2003; Riley et al., 2002), there is a need to explore the nature of enduring conflicts surrounding efforts to facilitate integration among relevant government departments, between stakeholders and decision makers, the place of integrated approaches in wildlife management, and the implications for wildlife management theory and practice, especially as it relates to reaffirming adherence to the Public Trust Doctrine.

While the literature suggests a trend toward more integrated approaches in wildlife management, questions remain regarding how and to what extent such trends are manifest 'on the ground' and even whether shifts toward integration are feasible or desirable in all contexts. To explore these questions, research is needed to reveal stakeholder perspectives regarding the objectives of wildlife management in a particular context and identify challenges and opportunities for adopting more integrative approaches. Research is also needed to examine wildlife management plans and actions that explore opportunities for more integrative management approaches such as collaboration between relevant government agencies and departments or adopting more ecosystem-based management approaches.

In this thesis I address the case of the management of caribou populations in Insular Newfoundland (hereafter referred to as simply Newfoundland). This wildlife management context was adopted as the empirical basis of this thesis. In recent years, caribou populations in Newfoundland have declined by approximately 60%: from 90,000 animals in 1996 to 37,000 animals in 2008, with the population just recently beginning to stabilize (Department of Environment and Conservation, 2008; 2015). In response to these declines, the Wildlife Division of the Department of Environment and Conservation initiated the Enhanced Caribou Management Strategy in 2006 (Government of Newfoundland and Labrador, 2009). In addition to the significant natural science-focused research and management efforts associated with this strategy, the Minister of the Department of Environment and Conservation also committed to "working with key stakeholders to ensure sound management of our caribou herds, and [considering] their insights…as we work toward the long-term goal of sustaining these herds for future generations" (Department of Environment and Conservation, 2008, para. 78).

In working toward this commitment, the Government of Newfoundland and Labrador established the Caribou Resource Committee (CRC) in 2008. Serving as a quasi-terms of reference, a press release from the Government of Newfoundland and Labrador (2009, para. 1) stated that the CRC was to "act as a two-way conduit taking information from the committee to the respective stakeholder groups, while also providing a means for these groups to be directly engaged in the work of the [five-year caribou-management] strategy". This committee included representatives of the Aboriginal Women's Network; the Newfoundland and Labrador Wildlife Federation; the Notre Dame Rod and Gun Club; the Newfoundland and Labrador Outfitters Association; the Department of Environment and Conservation (including the branches of Environment, Sustainable Development and Strategic Science, and Natural Heritage); the Rural

Secretariat; the Department of Tourism, Culture and Recreation; the Newfoundland and Labrador Trappers Association; and the Department of Natural Resources (Government of Newfoundland and Labrador, 2009).

The establishment, composition, and perceived merits of this Committee, as well as the Province's overall management response to the caribou decline, presents an exceptional opportunity to 'ground truth' the purported trends toward more integrative wildlife management approaches identified in the literature. The relevance of this case study is underscored by the fact that, prior to the CRC, few if any established mechanisms were in place for information exchange between managers and stakeholder groups in the context of Newfoundland wildlife management. Furthermore, though the CRC was established for a specific time period and purpose, it may represent a model for more integrated, locally-relevant, and responsible wildlife management and decision making in the future. The importance of such a model, which shares knowledge and decision-making authority with relevant stakeholders, is perhaps even more relevant given recent, significant budget and staffing cuts within the provincial wildlife management division (in fact the body referred to as the 'Wildlife Division' in this research was restructured during the spring 2017 round of budget cuts and layoffs) (Roberts, 2017). While the consequent impacts of these cuts will undoubtedly reduce wildlife managers' ability to obtain meaningful data upon which to base decisions, it is conceivable that the reduced provincial wildlife research and management capacity will be the impetus for moving toward a more integrative research and management model that effectively engages stakeholders in the management of the province's wildlife resources.

Concurrent with the need to reaffirm the role of wildlife managers as trust managers (per the Public Trust Doctrine) of the wildlife resource in the context of caribou management in

Newfoundland is the discourse surrounding current caribou management efforts and associated research foci in the province. Much of this discourse suggests a significant disconnect between the management efforts pursued by managers and what some stakeholders have identified as fundamental objectives. Fundamental objectives are defined by Riley et al. (2002) as the reasons why management is needed and what it should accomplish in terms of stakeholder-defined impacts. This fragmentation exists in Newfoundland despite efforts by managers to solicit and incorporate the views of at least some of the stakeholder groups associated with caribou management (through the CRC).

Popular media interviews with some stakeholder groups (particularly the outfitting industry) also indicate a perceived lack of integration of information from less conventional knowledge sources. For instance, the significant declines in insular caribou populations have translated into lower hunting success rates and consequent losses in revenues for many outfitters (Hutchings, 2007; McGrath, 2005). Consequently, some outfitters, especially those who rely primarily on caribou hunting in Newfoundland, strongly supported a cull of caribou predators including black bears (*Ursus americanus*), lynx (*Lynx canadensis*), and especially coyotes (*Canis latrans*) (Kean, 2008; Newell, 2008). Exemplifying a perception by some outfitters that the Wildlife Division of the Provincial Department of Environment and Conservation was not adequately addressing declining caribou numbers, one outfitter stated that "[w]e have to do something about it now - not next year, but now…[t]he minister is having a prod at something that needs a bomb dropped on it" (Newell, 2008, para 5).

2.2 Brief Objectives Statement and Research Questions

Given the purported trend toward more integrative approaches in wildlife management, such disagreements give rise to a series of key research questions, which are relevant both to Newfoundland caribou management and other wildlife management contexts across North America, indeed wherever management agencies seek to maintain their commitment to the Public Trust Doctrine. In this thesis, I address six questions that employ the dimensions of IRM as an analytical framework and that help elucidate challenges and options for advancing IRM-based approaches to wildlife management:

1. Has the trend toward integrative approaches, as identified in the literature, been translated into the planning and implementation of caribou management efforts in Newfoundland?
2. Are agencies, other than those branches tasked specifically with wildlife management, involved in the planning and implementation of wildlife management efforts in the province?
3. How are disciplines other than those focused on wildlife biology (notably the social sciences) engaged in the development and implementation of caribou management?
4. What are the challenges and opportunities associated with engaging a greater diversity of disciplines to manage caribou in a more integrative manner?
5. Are concepts of ecosystem-based management incorporated into wildlife management planning and implementation in the province?
6. Are stakeholders` views integrated into decisions about caribou management?

While the overarching field of IRM has been enriched by its long use in forest and water resource management and, in more contemporary applications, is supported by the components of Ecosystem-Based Management (EBM), adaptive management and informed by the concept of

coupled social-ecological systems, the adoption of integrated approaches in the field of HDWM is a relatively recent evolution.

Examining linkages between integrated resource management and modern wildlife management can provide important empirical and theoretical knowledge about the state of wildlife management more generally. Taken together, the research questions listed above can be viewed as elements of the much larger question of what should be the theoretical basis of Wildlife Management? As wildlife management has evolved, new phases, new definitions of success, and even new definitions of wildlife management have been emphasized and adopted (Decker et al., 2009; Gigliotti et al., 2009; Scalet, 2007; Riley et al., 2002). While early views on wildlife management in the late 1800s and early 1900s emphasized restrictive game regulations (Gigliotti et al., 2009; Loo, 2006) and habitat or population-related interventions to help sustain or increase game populations for consumptive users (Leopold, 1933), modern interpretations identify the management of wildlife *impacts* as the "essence of wildlife management" (Decker, et al., 2009; Riley et al., 2002). This evolution in definitions of success and identification of relevant stakeholders coincides with two recent, complementary discussions in the wildlife management literature regarding trends toward more integrative approaches and calls for reaffirming managers' adherence to the Public Trust Doctrine.

In this thesis, examining managers' and other stakeholders' perspectives on the objectives of wildlife management has provided empirical evidence of the extent to which the shift toward integration, as identified in the literature, is manifest in the context of Newfoundland caribou management. Examining a particular wildlife management issue can also identify similarities and differences about objectives held by stakeholder groups and managers. It may be the case that the difference between managers and other stakeholders is not quite as schismatic as it may seem.

Before delving into the specifics of the Newfoundland caribou management case study and the contribution of the study findings to answering the research questions listed above, a discussion of the theories, concepts and evolution of wildlife management toward more integrated approaches is warranted.

2.3 Organization of the Dissertation

In the next chapter, I focus on the field of IRM and its evolution. In Chapter four, I explore the connection between IRM and the field of Wildlife Management with a discussion on the phases of wildlife management that have been observed during the field's evolution toward more integrated approaches. Chapter four also highlights several 'bridging concepts' that tie the current human dimensions-focused phase of wildlife management and the overarching field of IRM. Chapter five describes the research method and data collection and analysis employed in the empirical component of the research. Chapters six and seven provide information on the research context including Newfoundland's wildlife management system, caribou population status, drivers of change, and other aspects of the 'presenting situation'. Chapter eight provides information on each of the stakeholder groups represented on the Caribou Resource Committee. Chapter nine presents study results regarding the manifestation of the dimensions of IRM in the case study context. Chapter 10 provides a discussion of these results and makes connections with supporting theories and literature. Chapter 11 offers conclusions regarding key themes and research outcomes. Finally, chapter 12 outlines the opportunities for greater stakeholder group development and engagement afforded by recent crises in provincial wildlife management.

2.3.1 A Note on the use of the term “Paradigm Shifts”

As some readers may feel that there are scholars whose use of ‘paradigm shifts’, when referring to changes in the field of wildlife management, is inaccurate, a brief section is included in this thesis to address the use of the term “paradigm”. As presented by Kuhn (1962), a scientific paradigm represents a theoretical orientation that is supported by a particular set of research approaches and provides a lens through which to evaluate research results. As the fundamental theoretical orientation of a field changes, a new paradigm is introduced and the research questions asked and the phenomena observed change substantively. Undoubtedly, the recent shift away from wildlife management’s dogged adherence to a focus on game animals and consumptive users, and other significant transitions that the field has undergone in the last several decades, are very much paradigm shift-like. Indeed, some scholars have identified three eras in the evolution of the field (further explained below) from a focus on Restrictive Game Regulations (late 1800s – early 1900s) during the first era, to Leopold’s (1933) Environmental Interventions (1930s – 1960s) of the second, to the more contemporary (1970s – current) Human Dimensions-focused phase. While sometimes presented as paradigm shifts (Gigliotti, et al., 2009; Rilely, et al., 2002), these phases, and the potential emerging era focused on IRM approaches, fall short of the truly revolutionary changes discussed by Kuhn (1962).

A paradigm shift, as defined by Kuhn (1962) is substantially more revolutionary than the more gradual progression or evolution witnessed in the field of wildlife management. As stated by Kuhn (1962, p. 103), "the normal-scientific tradition that emerges from a scientific revolution is not only incompatible but actually incommensurable with that which has gone before”. Such a complete replacement of old paradigms by new paradigms does not coincide with the more gradual evolution of the field as recorded by wildlife management scholars. The use of the term

paradigm shift will therefore be used infrequently in this dissertation and only in those instances where scholars' use of the term is reflected in the content of the thesis.

Chapter 3. Integrated Resource Management

The realization that ecosystems are complex is not new (see Elton, 1930; Connell & Sousa, 1983). This realization, however, has generated substantial interest in how we respond to and manage ecosystems (Carlsson & Berkes, 2005; Gunderson & Holling, 2002) as complexity and uncertainty have significant implications for the choice of resource management approach (Carlsson & Berkes, 2005; Lachepelle, McCool & Patterson, 2003; Bellamy, McDonald, Syme & Butterworth, 1999). System complexity and an increase in the number of wicked problems have been accompanied by calls from increasingly diverse stakeholders for greater decision-making transparency and influence (Lachapelle et al., 2003). This combination has necessitated significant shifts and evolution in fields of research related to environmental planning and management (Friedmann 1973; Gigliotti, et al., 2009; Margerum, 1997; Riley et al., 2002; Slocombe & Hanna, 2007).

Acknowledging the need to change from a command and control, equilibrium-seeking management approach (Holling & Meffe, 1996), Moller, Berkes, Lyver and Kislalioglu (2004, p. 11), state that "[t]here is a growing recognition that conventional scientific approaches may be insufficient in the face of complexity." Similarly, Ludwig (2001, p. 763) states, "we need to change our approach to complicated environmental problems. There are no experts on these problems, nor can there be." Ludwig (2001) seems to support the abovementioned evolution in wildlife management and suggests that these complex social-ecological systems, of which human resource use and ecosystem impact are part, are best addressed using participatory decision-making processes in which scientists and local people work together. The benefits of such integrated management approaches to resource management decision making have long been acknowledged in the natural resource and environmental management literature (Table 1).

3.1. Components of Integrated Resource Management

IRM has achieved widespread acceptance as a guiding principle in fields related to resource and environmental management (Slocombe & Hanna, 2007). Similar to the use of backcasting (which involves identifying a desired future state and then developing means to achieve said state) in the development of policies directed toward sustainable development (Dreborg, 1996), several concepts have been identified as a means of contributing to IRM as a desired future. As suggested by Robinson (1990), however, backcasting is explicitly normative which may account for somewhat different areas of emphasis in the components identified as contributing to IRM.

In addition to the components of EBM and Adaptive Management (Berkes, 2008; Slocombe, 2004; Lee, 1999; Slocombe, 1998; Holling, 1986), a third, long-standing concept that informs all other components of IRM is coupled social-ecological systems. As stated by Berkes, Colding and Folke (2003; and Berkes & Folke, 1998), social systems such as resource governance systems, knowledge concerning human-environment interactions, and environmental worldviews are inextricably linked with ecosystems and thus influence the organisms in an ecosystem and their interaction with their environment. Berkes et al. (2003) suggest that the extent of social-ecological linkages is such that one cannot be separated from the other. Quinn (2012, p. xxiv) applies similar thinking to protected area governance and states “Effective governance affects not only ecosystems and biodiversity, but also human health and well-being”.

Table 1.
Sampling of Benefits of Integrated Approaches

Benefit	Reference(s)
Fostering a more diverse ownership of the process, its findings and resulting management strategies	Lachapelle & McCool, 2005; Lawrence & Daniels, 1996
Legitimizing diverse forms of knowledge	Moller et al, 2004
Emphasizing ends to management as opposed to means (i.e. identifying stakeholder-defined management foci)	Riley et al, 2002
Making subjectively and objectively better decisions through earnest consideration of a diversity of knowledge sources and problem definitions	Lawrence & Daniels, 1996
Shifting from single objective-yield focus to one that informs the sustainable provision of various goods and services	Messier, et. al., 2015
Managing for whole ecosystems as opposed to individual species	Berkes & Folke, 1998
Fostering trust between traditionally adversarial groups	Ring, 2009; Kendrick, 2003; Rhoads, Wilson, Urban & Herricks, 1999

3.2 Shifts Toward Integration

While often spurred by the increasing frequency and magnitude of wicked problems, shifts toward more integrated approaches are hardly new (Slocombe & Hanna, 2007; Mitchell, 1986; McHarg, 1969). Mitchell (1986), for example, dates ideas of comprehensive natural resource management back to 1878 when John Wesley Powell called for extensive and comprehensive reclamation plans for arid areas of the Western United States (Powell's plans highlighted the interrelatedness of various aspects of the natural environment and management sectors). Integration has a long history in resource management with many manifestations, refinements and new semantic labels.

> "Integration has long been a strong theme in natural resources, particularly in forest and water resource management. Since the late nineteenth century, a collection of paradigms has evolved from the early ideas of conservation and wise use…which included integrated resource management, multiple use, ecosystem approaches, adaptive management, and various decision making tools such as environmental assessment or policy analysis." Slocombe and Hanna (2007, p. 2)

The early adoption of integrated approaches in natural resource management can be attributed to the complex, multi-use and multi-valued resource management sectors that managers were then, as now, asked to manage. River systems and forest areas are host to a wide variety of often-competing values and management priorities. It is not surprising that efforts to integrate multiple uses and values began in these areas as early as the late 19th and early 20th century (Mitchell, 1986; Mitchell & Shrubsole, 2007; Slocombe & Hanna, 2007). For instance, integration in the area of watershed management was well established in the 1930s and 1940s in parts of Canada and the United States while the actual term Integrated Resource Management was popularized in the 1960s following curriculum development projects supported by the Society of American Foresters (Slocombe & Hanna, 2007). Similarly, resource or conservation efforts at the transboundary interface also foster such integrative thinking. Quinn (2012) compares such contexts to the ecological concept of ecotones where natural and social systems overlap.

While maintaining the interdisciplinary/multi-resource sector-focus of early IRM approaches, contemporary definitions of IRM emphasize components and linkages most vital to generating an adequate understanding of, and effective response to, complex resource and environmental management issues (Mitchell, 2002). Slocombe and Hanna (2007) suggest that

today, IRM is focused on two key dimensions: the natural environment (specifically natural systems thinking) and forms of consultations, participation and collaboration. Thus current versions of IRM, in addition to acknowledging the role of effective resource management in contributing to both healthy economies and ecosystems, also involve the integration of community and expert participation as well as institutional and policy considerations (Bellamy, et al., 1999).

Generally, shifts toward integrative resource management are seen as a response to increasingly contentious and complex problems (Bellamy & Johnson, 2000). As suggested by Slocombe and Hanna (2007) such integration challenges are the result of a fragmentation - the opposite of integration – of interests, social and ecological systems, jurisdictions, management responsibility, and the like. Rittel and Webber (1973) refer to these as "wicked" problems while Miller (1993, p. 563) defines them as "complex, messy problems about which little is known." Still others define wicked problems as those with "great uncertainty about cause–effect relationships and where values and goals are conflicting or competing" (Lachapelle & McCool, 2005, p. 279). Kroll (2007, p. 228) identifies "habitat loss due to human population growth, the spread of exotic species, and the forest health crisis" as common examples of wicked problems. Similarly, Ludwig (2001, p. 758) lists "the conservation of world forest resources, the conservation of endangered and threatened species, and global climate change" as other prominent examples.

The IRM components of EBM and Adaptive Management are both means of addressing complex resource and environmental management issues. EBM emphasizes the ecosystem concepts of scale, complexity, interrelatedness, and human influence (Grumbine, 1994; Slocombe, 2004; 1998). Like EBM, adaptive management also highlights the importance of

ecologically appropriate management scales, but also emphasizes the importance of employing management strategies as policy experiments to foster learning and increase effectiveness (Berkes, 2008; Holling, 1986; Lee, 1999). Relatedly, adaptive management also builds the capacity of institutions to adapt to change (Berkes, 2008; Holling, 1986; Lee, 1999).

This evolution toward the contemporary foci of IRM is particularly evident in the field of wildlife management. As discussed in greater detail below, scholars who have chronicled the evolution of the field of wildlife management identify three eras with some identifying the emergence of a fourth (Brown & Wurman, 2009; Gigliotti et al., 2009; Loo, 2006; Manfredo, 2008; Scalet, 2007), each with its own notion of wildlife management and each describing a trend toward more integrative management approaches. It is important to understand the evolution of the field through these earlier shifts as it helps shed light on current wildlife management challenges and approaches.

For instance, despite some scholars and practitioners adopting a modern definition of a stakeholder as "any person who will be affected by, or will affect wildlife management" (Decker, Brown & Knuth, 1996; Riley et al., 2002;), the field's early (during the first two phases of wildlife management: late 1800s – mid 1960s) focus on consumptive users continues to challenge managers' abilities (real and perceived) to address the concerns of more diverse and skeptical stakeholders in some contemporary contexts (Gigliotti et al., 2009; Van Dyke, 2008). Moreover, this close association with consumptive users is also leading to unprecedented challenges in the financial aspects of wildlife management. As the number of hunters decline throughout North America, traditional funding for state wildlife management, which in the Unites States is generated in part from hunting license sales and taxes on firearms, is also disappearing (Jacobson, Decker & Carpenter, 2007). Admittedly, these lingering challenges are

exacerbated by the less-than-universal adoption of such broad definitions of stakeholder and, relatedly, the halting transition into a more pluralistic and integrative phase of wildlife management.

Chapter 4. Evolution of Wildlife Management

Early views on the merits of human dimensions research in the area of natural resource management were focused on economic-based research (e.g., economic ornithology – Whelan, Şekercioğlu, & Wenny, 2015) leading to a preoccupation (both real and perceived) with this rather limited area of social science research (Ewert, 1996). More recent views concerning HDWM research often extend beyond economic considerations. For many, the research foci that come to mind when one refers to the 'human dimensions of wildlife management' are components of what Manfredo, Decker and Duda (1998) broadly refer to as 'social information.' Depending on the motivations of the researcher, components of these social dimensions have been identified more specifically as hunter motivations and satisfaction (Decker & Connelly, 1989); attitudes, beliefs, and levels of support or opposition regarding wildlife management strategies (Decker & Bath, 2010; Decker, Bath, Simms, Lindner & Reisinger, 2010); demographic characteristics and trends (Bath, 1996; Mangun, 1992); cultural-social carrying capacity (Decker & Purdy, 1988; Green, Askins & West, 1997), willingness to pay for wildlife conservation efforts (Bath, 1998); traditional ecological knowledge; and natural science-based wildlife knowledge (Moller et al., 2004).

These dimensions, however, represent only a small part of what comes under the field's purview as HDWM is concerned not only with *which* dimensions are studied but also *how* this research is conducted (Loker, Decker & Chase, 1998; Manfredo et al., 1998) as well as the tools and techniques for *applying* human dimensions information in decision making contexts (Chase, Decker & Lauber, 2004; Loker, Decker & Schwager, 1999; Jacobson & Decker, 2008;). HDWM researchers have also recently operationalized human dimensions information by sometimes borrowing from other fields (often the overarching field of IRM) or proposing novel frameworks

and approaches for *integrating* social information into what are traditionally wildlife management contexts that are informed predominantly by natural science information (Decker et al., 2006; Enck et al., 2006; Riley et al., 2003; Riley et al., 2002; Ring, 2009).

Such human dimensions considerations, however, were not always an accepted part of wildlife management. The current HD-informed stage of wildlife management is preceded by two earlier phases that, by comparison, gave little consideration to the broader social dimensions of wildlife management and focused instead on game animal management (Gigliotti et al., 2009).

Exemplifying this early concentration on game animals is the establishment of the New York Sportsman Club in 1844. Considered one of the earliest organized wildlife conservation efforts in North America, the New York Sportsman Club began just ahead of the Conservation Movement and wildlife management's first phase (Brown & Wurman, 2009). The Club employed the legal expertise of many of its members to aggressively target wildlife law breakers and to develop and lobby for stronger game laws (2009). With few other game conservation efforts being employed at the time, the Sportsman Club's approach proved successful and was soon adopted in neighboring areas and even into Canada. Loo (2006) describes the emergence of several influential sportsmen's clubs in Canada during the mid-1800s which, like the New York Club, both influenced local game laws and spurred the development of larger scale legislation.

4.1 The First Phase of Wildlife Management

The predominatly prescriptive approaches such as those initiated by the New York Sportsman Club set the stage for the first phase of wildlife management in the late 1800s as this region saw the introduction of game wardens to enforce increasingly restrictive game regulations (Gigliotti et al., 2009). These approaches were essentially 'supply side' efforts aimed at

maintaining or increasing game populations by restricting the number of 'withdrawals' by hunting and poaching (Loo, 2006). Though this first phase sought to build upon the momentum of the Sportsman Club's approach, game populations continued to decrease and as Aldo Leopold stated at the time "[t]he set of ideas which served to string out the remnants of the virgin game supply, and to which many conservationists feel an intense personal loyalty, seems to have reached the limit of its effectiveness. Something new must be done" (1933, p. 411).

4.2. The Second Phase of Wildlife Management

Aldo Leopold, widely considered the father of North American game management (Noss, 1998), was trained as a forester under the mentorship of the first professional forester who was born in America, Gifford Pinchot. Pinchot ushered in a new era of resource management through the establishment and intensive management of forest reserves (Pinchot, 1947; Thomas, 1998). By seeming to apply some of the principles of his foresters' training (such as pest management and efforts to foster regeneration) to wildlife management, Leopold developed a new approach to wildlife management that helped establish a new era in the field (Manfredo, 2008).

The beginning of this second phase in the 1930s coincided with the release of Leopold's seminal book *Game Management* (1933) in which he outlined management approaches that, in addition to the strict regulations of the first phase, also included efforts to manipulate the natural environment to conserve game animals. Leopold identified the following strategies for wildlife conservation under this new phase of wildlife management: predator control, reservation game lands, artificial replenishment (e.g., restocking and reintroductions) and environmental controls (e.g., control of food, shelter and disease). The introduction of these strategies emphasized the importance of formal management agencies and trained managers and wardens who were able to administer these new approaches.

Wildlife managers operating under the second phase of wildlife management were assisted by government, which lent credibility to their efforts, and by influential stakeholders interested mainly in the conservation of game populations for consumptive use (i.e., hunting and fishing) (Gigliotti et al., 2009). However, just as Leopold's later works (Leopold, 1949) displayed an evolution in thinking toward a more ecological approach to nature conservation including the consideration of a Land Ethic and intrinsic values of wildlife, the field of wildlife management also continued to evolve toward its next phase. By the 1960s, with the emergence of environmentalism, both the credibility of government and the diversity of perspectives regarding wildlife management had changed considerably.

4.3 The Third Phase of Wildlife Management

Like the modern Environmental Movement, the third and current phase of wildlife management began in the 1960s (Gigliotti et al., 2009). During this time, approaches to game management based solely on natural science began to be questioned by diverse and skeptical stakeholders. Managers soon found that the public no longer considered the top-down strategies focused on game animals acceptable. New stakeholders began to criticize managers' failure to address the conservation of non-game species (Van Dyke, 2008) and the views of both consumptive and non-consumptive users of wildlife. The credibility and effectiveness of government agencies also began to be questioned at this time (Alford, 2001) as citizens reacted to several high profile environmental crises, such as the shipwreck and resulting oil spill of the Torrey Canyon (Vaughan, 2017) and fire along the lower reaches of the then-heavily polluted Cuyahoga River (Rotman, 2017), leading to public demand for more participatory forms of decision making.

To meet these new challenges and address the HDWM, managers had to once again expand their areas of expertise. The importance of addressing the social dimensions of wildlife management was highlighted by some authors in the middle of the 20th century (Gigliotti et al., 2009; Manfredo, 2008). It was, however, not until the 1970s (Hendee & Potter, 1971) that the importance of human dimensions research began to gain traction among practitioners working the area of natural resource management.

The current, or third phase of wildlife management, which focuses on human dimensions, "deals with assessment and application of social information in fish and wildlife decision making" (Manfredo et al., 1998, p. 280). Manfredo, Vaske & Sikorowski (1996, p. 54) provide a more functional definition of HDWM and describe it as "an area of investigation which attempts to describe, predict, understand, and affect human thought and action." The transition into this current phase, however, has not been without problems. Perhaps stemming from management agencies' long history of catering to the needs of consumptive users (Manfredo et al., 1998), initial efforts sometimes failed to address the true diversity of values placed on wildlife. Not surprisingly such approaches did not adequately address the public's desire for earnest consideration of the views of non-consumptive users and more participatory forms of decision making. As the current phase became established, large amounts of human dimensions information was amassed that focused on describing the perceptions, attitudes, values and motivations of wildlife management stakeholders but in some cases little of this information was incorporated into management activities (Gigliotti et al., 2009).

4.4 The Third Phase and Beyond

When we consider the increasing importance of human dimensions aspects throughout wildlife management, it becomes apparent that the field of HDWM encompasses much more

than conducting surveys of attitudes (Manfredo et al., 1998). As stated by Brown (2009, p.9) "[f]rom what was an elite system of decision-making about the management and use of natural resources...a far more pluralistic and democratic system has been forged". Some have suggested, however, that the largely biophysical-oriented training of many resource and wildlife managers (Manfredo et al., 1998) may challenge efforts to reconcile stakeholder and manager perspectives and adopt approaches that integrate information on human dimensions (Jacobsen & McDuff, 1998). Indeed, while local resource managers are often responsible for fostering integrative management approaches (Mitchell, 2002) these managers sometimes lack experience in the social sciences (Jacobsen & McDuff, 1998) and may thus be ill-prepared to address the social aspects of a particular management issue. While some research has shown that there remains reluctance among managers to share decision-making authority with other stakeholders (especially in contexts that are predominantly technical (Mascarenhas & Scarce, 2004)), human dimensions concepts and approaches are increasingly seen as an integral part of modern wildlife management as HDWM becomes part of the 'way of doing business' in wildlife management (Manfredo et al., 1998; Riley et al., 2002). Generally, wildlife managers accept that "sustaining fish and wildlife will depend on people, which means that managers must understand these people and their relationships to fish and wildlife" (Brown, 2009, p.7).

HDWM is thus perhaps best viewed as a philosophical orientation where both human and natural science dimensions are considered throughout the wildlife management process. Indeed, several authors have proposed new definitions of wildlife management to reflect the significance of social science considerations. Decker et al. (2009, p. 324) state that "[w]ildlife management is more than conflict resolution, renewable harvest of wildlife, and preservation or restoration of wildlife…[it]…is about understanding and managing the impacts of direct and indirect human-

wildlife interactions." Riley and colleagues, in their work outlining the concept of adaptive impact management, also highlight the importance of stakeholder-defined impacts in identifying management foci and put forward the following definition of wildlife management to coincide with what they refer to as yet another "emerging paradigm" in the field: "[w]ildlife management is the guidance of decision-making processes and implementation of practices to purposefully influence interactions among and between people, wildlife, and habitats to achieve impacts valued by stakeholders" (2002, p. 586).

Though seeming ambitious, Riley et al.'s (2002) suggestion that wildlife impact management is "the essence of wildlife management" is not unprecedented. Decker and Purdy in their work on applying the concept of carrying capacity to public acceptance of wildlife note that "any significant discrepancy between the management objective and WAC [wildlife acceptance capacity] for a key constituency represents a potential management problem" (1988, p. 55). The importance of stakeholder-defined impacts (defined by Riley et al. (2002, p. 587)) as "significant beneficial and detrimental effects resulting from events or interactions involving humans and wildlife (including wildlife habitats), wildlife management interventions, and various stakeholders.") in establishing and prioritizing management objectives was also highlighted earlier by Shaw (1985) and similarly, Anderson's 1985 definition of wildlife management identified "human benefit" (p. 3) as the goal of management.

Why then, with these earlier examples pointing to the importance of stakeholder-defined impacts in setting management priorities, do Riley et al. (2002) identify their focus on impact management as an "emerging paradigm" within the current human dimensions-focused phase of wildlife management? The answer lies in Decker et al's. (1992) review of some then-recent works that noted an important lack of effort among some researchers and practitioners to

integrate human and biological dimensions into the wildlife management contexts in question. In practicing such fragmented wildlife management, researchers and managers acknowledged the importance of human dimensions research (and continued to amass human dimensions data) but failed to incorporate such data into management (Decker et al., 1992). In essence, such integration challenges refer to what Hanna (2013, pers comm) characterizes as "data with no place to go or few mechanisms for use in decision making or implementation." Riley et al. (2002) identify and encourage a shift from such fragmented approaches to more integrative and participatory forms of wildlife management.

4.5 Exploring Trends Toward Integration

While efforts to address the integration gap identified by Decker et al. (1992) represent an important step forward for the field of wildlife management (Riley et al., 2002), lingering integration challenges remain in HDWM. Since its inception, the field of HDWM has faced a series of significant integration challenges requiring HDWM scholars to borrow from the field of IRM. Of particular interest in the area of linkages between HDWM and the approaches associated with IRM are the concepts of coupled social-ecological systems, EBM, and adaptive management. These areas hold promise as bridging concepts between IRM and HDWM as they shed light on challenges and opportunities for adopting more integrated approaches in wildlife management.

4.5.1 Coupled Social-Ecological Systems

Acknowledging linkages between social and ecological systems means adopting a systems approach (Berkes & Folke, 1998). Unlike earlier definitions that saw humans as external

to ecosystems, a systems-based definition of ecosystem explicitly identifies humans as part of the ecosystem and acknowledges positive and negative feedbacks between the natural environment and social systems (Berkes & Folke, 1998). These social systems include "property rights, land and resource tenure systems, systems of knowledge pertinent to environment and resources, and world views and ethics concerning environment and resources" (1998, p. 4). Berkes and Folke (1998) proposed the term 'social-ecological systems', which abbreviates neither 'social' nor 'ecological' to emphasize both the importance of each component and the interrelatedness between them.

Also central to discussions of systems approaches are the terms complexity, uncertainty and change. Ecosystems are not static but constantly change (Holling, 1973). Because of the complex interrelationship between ecosystem components, however, predicting such changes is also complex. This propensity to change does not mean that ecosystems are unstable; rather stability in ecosystems comes from the ability of the ecosystem to respond appropriately to change (i.e. withstand perturbations without crossing a threshold to a fundamentally different structure) and sometimes shift to another steady or equilibrium state while still maintaining the integrity of the overall system (Holling, 1973). Scholars of adaptive management refer to this as resilience and define it as "the capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks" (Walker, Holling, Carpenter, & Kinzig, 2004, p. 4). Brown and Williams (2015, p. 4) put forward that "[r]esearch on resilience of social-ecological systems often involves the capacity for system functions to persist and adapt in response to a disturbance". Resource crises result when the resource ecosystem can no longer respond appropriately to change (i.e. is no longer resilient) (Gunderson, 2000).

While ecosystems are often considered to be complex, many of the command-and-control style resource management efforts (which include an assumption that we can actively control ecosystem structure and function to manage for a particular ecosystem state indefinitely into the future (Hilderbrand, Watts, & Randle, 2005)) used to date have likely contributed to rapid and unpredictable ecosystem changes resulting in significant resource crashes (Berkes & Folke, 1998; Gunderson, 2000; Holling & Meffe, 1996). In an effort to maintain a more lucrative, predictable and easily managed rate of resource consumption (often discussed in terms of maximum sustained yield or total allowable catch), we have arrested the natural variability of ecosystems by manipulating ecosystem components and suppressing natural successional change and natural variability in the ecosystem. The result of this control of ecosystems is a diminished resilience of both the resource ecosystem and the social systems that depend on it (Holling, 1986). As stated by Holling and Meffe (1996, p. 328) "if natural levels of variation in system behaviour are reduced through command-and-control, then the system becomes less resilient to external perturbations, resulting in crises and surprises."

Crises and surprises in social systems result from resource-based communities and resource development institutions depending on levels of resource use that are artificially held constant or even increased through intensive environmental management. By not allowing for natural variations in the resource ecosystem, local economies are not sufficiently diverse to adapt to the significant changes that occur when the social-ecological system finally flips (Holling & Meffe, 1996). When natural variability is removed from ecosystems, management agencies are also guilty of becoming myopic, self-reinforcing and inflexible, and can become complacent in their environmental monitoring efforts and focus instead on efficiently delivering a constant rate of resource products (Carpenter & Brock, 2008; Holling & Meffe, 1996).

As stated by Holling and Meffe (1996, p. 335), “command-and-control management can lead to short term economic returns, but it also increases the vulnerability of ecosystems to perturbations that otherwise could be absorbed.” Thus the need for a more holistic approach to management, both from an institutional and ecological perspective, is obvious. In response, components of IRM have been developed to guide the integration of the various dimensions identified by Slocombe and Hanna (2007). Ecosystem-based management and adaptive management are two such components.

4.5.2 Ecosystem-Based Management

Slocombe (1998) notes that EBM is focused on managing activities within ecosystems (as opposed to managing ecosystems) and is thus able to be applied at sufficiently large spatial scales in transdisciplinary and integrative contexts (Slocombe, 1998; 1993a; 1993b). Based on longstanding characteristics of ecosystem approaches (Table 2) (Grumbine, 1994; Slocombe, 1998), EBM is cognizant of the ecosystem concepts of scale, complexity, interrelatedness, and human influence.

EBM also places a value on spatial and temporal context. This focus on place helps ground management and helps foster a sense of ownership more than concepts like sustainable development which have a less-grounded/identifiable geographical focus (Slocombe, 1998). EBM has been adopted widely in recent decades (Hanna, Clarke & Slocombe, 2008; Sardà, O’Higgins, Cormier, Diedrich, & Tintoré, 2014) and with a focus

Table 2.
Characteristics of Ecosystem Approaches

An ecosystem approach…
- describes parts, systems, environments and their interactions
- is holistic, comprehensive, trans-disciplinary
- includes people and their activities in the ecosystem
- describes system dynamics (e.g., through concepts of stability and feedback)
- defines the ecosystem naturally (e.g., bioregionally instead of arbitrarily)
- looks at different levels / scales of system structure, processes and function
- recognizes goals and taking an active management orientation
- incorporates actor-system dynamics and institutional factors in the analysis
- uses an anticipatory, flexible, research and planning process
- entails an implicit or explicit ethics of quality, well-being, and integrity
- recognizes systemic limits to action – defining and seeking sustainability

(Adapted from Slocombe, 1998)

on bioregional management units, ecological integrity, and interconnections within and beyond borders EBM has been identified as especially applicable for managing protected areas and water basins (Hanna et al., 2008; Slocombe, 1998; Yaffee, 1996).

When one considers some of the most common barriers facing EBM efforts (Table 3), however, it becomes obvious that the main challenges of adopting such a holistic approach are not ecological but are rather social or institutional in nature. Indeed, the level of conceptual, spatial and institutional integration required in EBM has raised flags for some critics. For example, in his examination of the administrative and institutional challenges facing EBM, Imperial (1999, p. 450) states that "many authors underestimate the problems associated with changing organizational arrangements and incorporating human values into decision-making processes". Slocombe (1993b) also recognizes these difficulties and identifies challenges in achieving the necessary integration both between the policies of government and between different disciplines. As stated by Yaffee (1996, p. 725) "[c]learly many of the key principles underlying ecosystem-based approaches create significant challenges for how human activities

Table 3.
Common Barriers to Ecosystem-Based Management

Fragmentation and specialization in administration and research
Competition within and between agencies and governments
Arbitrary, politically defined management units
Short-term, local and self-interested politics and economic determinism
A structural and functional orientation
Obscure terms and goals such as sustainability and integrity
Top-down planning and management processes
Poor use of existing information

(Adapted from Slocombe, 1998)

are organized." Yaffee (1996, p. 724) suggests that such challenges likely contribute to the adoption of watered-down versions of EBM that are perhaps best referred to as "ecosystem-based approaches" which though not meeting all the criteria of EBM, are examples of "ecosystem management written in small letters."

4.5.3 Adaptive Management

To address these challenges management must be both cognizant of and informed by ecosystem characteristics and adapt to changing circumstances (Messier et al., 2015; Slocombe, 1998). A preoccupation, however, with the command-and-control status quo of a hypothetical steady state ecosystem delivering a constant volume of resources sometimes leads managers to disregard opportunities to adopt more adaptive management approaches (Walters, 1997). Also, given the complexity of ecosystems, the introduction of alternative management strategies could have significant, unknown consequences. Active adaptive management has been proposed as a management structure that can deal with such uncertainty by treating management efforts as experiments (Lee, 1993; Walters, 1986; Walters & Holling 1990) and learning from alternative

management options (Armitage, Berkes & Doubleday, 2007). Adaptive management has also been employed in wildlife management as a means to effectively integrate the human and ecological dimensions associated with wildlife-related impacts (Enck et al., 2006)

Despite these integrative benefits, some have sought to improve upon the largely natural science-based goals associated with adaptive management efforts (Enck et al., 2006) while others have highlighted practical challenges facing adaptive management such as a lack of 'buy in' by agencies seeking to protect status-quo management approaches and concerns over potential losses as optimum management strategies are being selected (Walters, 1997). Finally, skeptical and uninformed stakeholders may give little consideration to adaptive management's emphasis on learning, but instead view it as little more than highly trained experts simply using trial and error. In response to these challenges, adaptive management has evolved significantly. New hybrid forms of adaptive management incorporate characteristics of collaborative management and also emphasize the importance of concepts such as resilience thinking and governance approaches.

Adaptive co-management blends the co-management basis of respect for and incorporation of alternative knowledge systems and sharing of decision-making power by government and other stakeholders with the resilience and learning focus of adaptive management (Armitage et al., 2007; Folke, Hahn, Olsson & Norberg, 2005; Plummer & FitzGibbon, 2004). Emerging from this combination, adaptive co-management has been attributed with "provid[ing] an evolving and place-specific governance approach that supports strategies that help respond to feedback (both social and ecological) and orient social-ecological systems toward sustainable trajectories" (Armitage et al., 2007, p. 5). As this definition suggests, the goal of this form of adaptive management is not about trying to achieve some optimal level

of ecosystem productivity but is instead focused on optimal management capacity through earnest stakeholder engagement (Johnson, 1999). The term adaptive governance has been proposed to emphasize the importance of this management capacity and highlight the role of social contexts in enabling management that is both adaptive and adopts ecosystem-based approaches (Dietz, Ostrom & Stern, 2003). According to Pierre (2000, p. 4) governance refers to "sustaining co-ordination and coherence among a wide variety of actors with different purposes and objectives such as political actors and institutions, cooperate interests, civil society, and transnational organizations." Adaptive governance is then described as a way to operationalize adaptive management as it is cognizant of and grounded in the often-complex, multi-objective interplay between the various actors associated with management in dynamic ecosystems (Dietz et al., 2003; Folke et al., 2005; Cvitanovic, 2015).

4.6 Integration Challenges in Wildlife Management

As wildlife management has continued to evolve toward greater integration of human dimensions (Gigliotti et al., 2009), scholars and practitioners have faced a series of challenges. For instance, in the years leading up to the establishment of the field of HDWM, scholars and practitioners were challenged with establishing the credibility of social science research in the traditionally biological science-focused field of wildlife management. While human dimensions considerations are generally accepted as integral to or nested within wildlife management today (Gigliotti et al., 2009; Decker et al., 2009; Riley et al., 2002), such social science perspectives had little credibility three decades ago. Writing in 1987, Decker, Brown & Mattfeld highlighted this challenge of disciplinary integration and outlined three significant barriers for integrating social science into wildlife management:

- Biological bias of wildlife management agency staff and management approaches

- Communications gap between biological and social scientists requiring explicit efforts by social scientists to acquaint wildlife managers with the terminology and methodologies of social science research
- Wildlife managers' image of social science that its findings are less-than-credible and that the extent of social science methodology is simple surveys

Although the challenges in the field are rarely discussed in terms of IRM, shifts toward HDWM are fostering the integration of dimensions previously considered in isolation, if considered at all. This ongoing integration pertains to efforts to employ effective public involvement to solicit relevant information to integrate with complementary science-focused wildlife information. As wildlife managers continue to face 'wicked' and increasingly contentious wildlife management issues, both scholars and practitioners are being challenged to adopt integrated approaches and find themselves borrowing from the broad field of IRM.

One example of the ongoing evolution of wildlife management toward more integrated approaches is the recent reevaluation of the Public Trust Doctrine in light of addressing the interests of an increasing diversity of wildlife stakeholders. The Public Trust Doctrine "proposes that resources common to humans – including air; running water; the sea; and, in North America, wildlife – should be held in trust for all people by the state" (Manfredo, 2008, p. 15). It follows then, that to serve the public interest, wildlife trustees must have a good understanding of public values. Efforts to solicit and integrate information regarding such public values requires effective strategies for public involvement. As stated by Manfredo (2008, p. 22), "[t]he human dimensions sciences can offer unique contributions to wildlife conservation. They can provide information that helps decision makers understand the interests and more effectively adhere to the tenets of the Public Trust Doctrine".

4.6.1 Nested Interdisciplinary Challenges

While considerable evolution has been documented in the field of wildlife management; evolution which describes increasing credibility and integration of social and biological science perspectives, other scholars have revealed an apparent lack of adherence to some of the foundational science-based hallmarks of North American wildlife management. Artelle, et al. (2018) found that most of the 667 management jurisdictions they surveyed in the United States and Canada contained fewer than half of the indicator criteria of a credible science-based approach to management. As many of the hallmarks and criteria (e.g. subjecting management plans to external review responding to public inquiry, and providing appropriate management information to the public) identified in the study pertain directly to the aforementioned fragmented approaches, the need foster greater integration in wildlife management is ongoing.

One type of integration challenge facing HDWM involves establishing the credibility of social science research in the traditionally biology-focused field of wildlife management. As "interdisciplinary" often refers to the integration of or cooperation between unrelated disciplines to achieve a common research goal (Tress, Tress & Fry, 2005), the term "nested" is included here to acknowledge the fact that while social science was once considered an obscure area of research outside the purview of wildlife management, human dimensions considerations and wildlife management are in fact inextricable. While the field of HDWM is generally accepted as integral to or nested within wildlife management today (Decker et al., 2009; Gigliotti et al., 2009; Riley et al., 2002), the integration of such social science perspectives with the biological science (identified by Tress, Tress & Fry (2005) as a transdisciplinary approach) received little attention until recent decades and the significant challenges of integrating natural and social science dimensions into a less fragmented approach persist in some contexts.

Although such challenges featured prominently in the first decades following the introduction of HDWM in the early 1970s (Gigliotti et al., 2009), the literature suggests that while there is an enduring need to demonstrate the importance of social science perspectives in successful wildlife management (Freddy et al., 2004), significant progress has been made in overcoming these integration challenges. This opinion is supported by modern definitions of wildlife management that acknowledge the importance of human dimensions considerations (Decker et al., 2009; Riley et al., 2002).

While wildlife management has come a long way in adopting efforts to integrate various dimensions under HDWM, the integration facilitated by some IRM approaches surpasses that of HDWM efforts. As in the HDWM literature, Slocombe and Hanna (2007) identify the disciplinary boundaries of research as one set of dimensions that are often fragmented and thus requiring integration in the pursuit of IRM. Though early IRM sought to integrate related resource sectors to avoid duplication and conflict (Slocombe & Hanna, 2007), modern versions of IRM also integrate community and expert participation as well as institutional and policy considerations (Bellamy et al., 1999). The importance of such social science input in IRM is emphasized by Slocombe and Hanna (2007), who suggest that recent thinking with respect to IRM is focused on two key dimensions: the natural environment (specifically systems thinking perspectives) and various forms of consultations, participation and collaboration.

The adaptive co-management variation on traditional adaptive management exemplifies a commitment to earnest efforts to not only solicit but also integrate social information into resource management. Adaptive co-management blends respect for and incorporation of alternative knowledge systems and sharing of decision-making power by government and other stakeholders with the resilience and learning focus of adaptive management (Armitage et al.,

2007; Folke et al., 2005; Plummer & FitzGibbon, 2004). Adaptive co-management not only seeks to integrate western science-based knowledge with local and traditional ecological knowledge (TEK) but looks to TEK and indigenous perspectives on coexisting with and learning from the landscape as the basis of original forms of adaptive management (Moller et al., 2004; Nadasdy, 2007).

While the integration of different forms of knowledge is far from an assured outcome of adaptive co-management (Armitage, 2008; Nadasdy, 2005), the potential for adaptive co-management to facilitate even greater levels of integration of human and biological dimensions in wildlife management is obvious. In fact, almost 20 years ago adaptive management was identified as the process of choice for waterfowl harvest in the United States and adaptive harvest management was also identified by a committee of The Wildlife Society as an approach that could help integrate science and management (Johnson & Chase, 2000; Lancia et al., 1996).

More recently, Riley and colleagues (2002; 2003) also acknowledge the importance of adaptive management in wildlife management efforts and presented their own variant called adaptive impact management (AIM). Riley et al.'s (2002; 2003) AIM, with its focus on integration and stakeholder-defined wildlife impacts perhaps more closely aligns with adaptive co-management than classic adaptive management.

The potential of co-management arrangements to respond to conflicting interests from increasingly demanding stakeholders and foster ownership of decision making in often-contentious wildlife management contexts has been well documented in the HDWM literature. Some scholars also suggest that co-management is deserving of consideration for application in a wider variety of wildlife management contexts (Chase, Schusler & Decker, 2000; Decker & Chase, 1997). The utility of co-management arrangements in resource management efforts is

exemplified by the formal adoption of co-management into comprehensive land claims agreements in Northern Canada (Armitage, 2008; Moller et al., 2004). Several authors (Table 4) have explored efforts to integrate TEK and western science to manage wildlife more effectively in Canada, particularly caribou, under such co-management arrangements.

The more general term of Traditional Knowledge (TK), is defined as "a unified world-view incorporating all aspects of aboriginal society, spirituality, economy, and culture" (Dale & Armitage, 2010, p. 2), while TEK, the natural environment-focused subset of TK (2010) pertains to the functioning of local ecosystems and land skills (Pierce, Ford, Cunsolo-Wilcox, & Smit, 2015). While these terms have a distinct focus on the local and traditional knowledge of Aboriginal peoples, TEK, and other locally-relevant and locally-based forms of knowledge, often referred to as Local Knowledge (LK) can be produced by all stakeholders, both Aboriginal and non-Aboriginal.

Table 4.
Relevant TEK Research in Canadian Wildlife Management

Species	Location	Management Collaboration	Reference
Beaver (*Castor canadensis*)	James Bay / Northern Quebec	Collaboration between Cree hunters and provincial resource managers	Berkes, Feeny, McCay & Acheson, 1989
Grizzly Bear (*Ursus arctos horribilis*)	British Columbia	Amalgamating TEK/LEK and western scientific knowledge to identify and understand spatial and temporal range shifts of Grizzly bears	Service, Adams,Artelle, Paquet, Grant, & Darimont, 2014
Barren Ground Caribou (*Rangifer tarandus groenlandicus*)	Northwest Territories / Nunavut	Beverly-Qamanirjuaq Caribou Management Board. Co-management body made up of government managers and members of the Inuit, Dëne, and Métis.	Kendrick & Manseau, 2008; Kendrick, 2003
Barren Ground Caribou	Northwest Territories / Nunavut	Community-based monitoring of caribou body condition relying mainly on body fat.	Lyver & K'É, 2005
Barren Ground Caribou	Northwest Territories / Nunavut	Incorporating Denésǫłiné systems of monitoring, sharing information about, and adapting to changes in caribou migration patterns to better adapt to future ecological changes	Parlee, Manseau & K'É, 2005
Woodland Caribou (*Rangifer tarandus caribou*)	British Columbia	Evaluating the strengths and weaknesses of Western science and TEK in predicting caribou habitat selection.	Polfus, Heinemeyer, Hebblewhite, & Taku River Tlingit First Nation, 2014
Narwhal (*Monodon monoceros*)	Nunavut	Knowledge co-production using diverse types and sources of knowledge including TEK.	Dale & Armitage, 2011
Peary Caribou (*Rangifer tarandus. pearyi*), Muskox (*Ovibos moschatus*)		TEK regarding hunting and land skills in climate change adaptation and related changes in subsistence hunting	Pearce, Ford, Cunsolo Wilcox, & Smit, 2015.

> [The term] ‘Local knowledge’ is preferred by some as it emphasizes the fact that knowledge generated and held by resource-users (aboriginals included) is often limited to a fairly specific geographic context. It also recognizes that detailed understandings of ecosystems may not only be held by aboriginals but by non-aboriginal user-groups as well (Dale & Armitage, 2010, p. 2)

For those charged with managing wildlife in the public trust, the role of co-management arrangements as a means of facilitating the necessary knowledge exchange (LK and western scientific) and relationships between wildlife trustees and concerned segments of the public should not be overlooked. In efforts to adhere to the Public Trust Doctrine, co-management arrangements can furnish trustees with not only locally-based ecological information, but also with the rapport necessary to better understand the publics on whose behalf they are to manage wildlife species.

4.6.2 Vertical Integration Challenges

This category of challenges can be further subdivided into the following two areas: 1) efforts to gather information from stakeholders and interest groups and, 2) efforts to incorporate such information into wildlife management. The former set of challenges relates to using appropriate public involvement techniques, while the latter set of challenges relate to operationalizing human dimensions information to inform management efforts.

4.6.2.1 Public Involvement and the Administrative Process

Writing almost five decades ago, Henning (1968, p. 246) made explicit what was already known by many of the natural resource managers working at the time: “politics, with its struggle

of power, interests, and values, is definitely involved in the administrative process of natural resources." Henning's statement acknowledges the often-complex mixture of multi-level governance actors that influence the administration of natural resources. Within this conglomerate of governance, Francis (2007) acknowledges the importance of what some refer to as the 'third sector' (connected to but separate from the public and private sectors) of civil society interest groups who, often through non-governmental organizations (NGOs), greatly influence the administrative process.

Pierre (2000) also identifies other parties to governance which, in addition to 'the government' and other state actors, influence administrative process. According to Pierre (2000, p. 4) governance refers to "sustaining co-ordination and coherence among a wide variety of actors with different purposes and objectives such as political actors and institutions, cooperative interests, civil society, and transnational organizations." Such increases in the influence of non-state actors (e.g., civil society and institutions) in administrative processes has been ongoing since the Progressive era of the early 20th Century when concerns about the ability of elected officials to represent the public interest effectively and fairly resulted in appointments of citizens to boards and commissions (Mitchell, 1997). While this was a significant step toward a more responsible and responsive governance approach, the nature and representativeness of public appointments can be contentious and debated. Consequently, public skepticism of government has continued to increase in many contexts resulting in a desire for increasingly participatory decision-making approaches (Jacobson & Decker, 2008).

As the administration of wildlife resources is a direct product of governance, the trend toward truly participatory or deliberative democracy has elicited a range of views from stakeholders in the wildlife management arena. Some resource and wildlife managers are

concerned that this trend will both erode the role of expert scientific judgment in decisions (Mascarenhas & Scarce, 2004) and present considerable practical challenges as existing bureaucracies are not equipped to embrace truly deliberative processes (Jacobson & Decker, 2008). Other scholars suggest such participatory approaches may not be well suited to address the large range of influence and opinions of the stakeholder groups often associated with natural resource and wildlife management efforts (Jacobson & Decker, 2008). Conversely, some scholars suggest that the deliberation among stakeholder groups, which is inherent in such participatory approaches, is central to resolving seemingly intractable conflicts (Elliot, Gray & Lewicki, 2003; Schusler & Decker, 2002). As suggested by Kleinschmit, Böcher, & Giessen (2009), debates regarding 'top down' versus more 'bottom up' approaches highlight the importance of argument and deliberation in contributing to accountable, legitimate, and effective policy and decision making.

Such differing views regarding the credibility and role stakeholders in contributing to decision making processes coincides with Dovers and Price's (2007) distinction between informative and decisive integration. Information from stakeholders has traditionally served an 'informative' role – and thus, when compared with the decisive form of integration, had less influence on actual decision making and policy formulation. In contrast, decisive integration involves collaboration between relevant disciplines or government departments and agencies to make significant contributions to decision making and policy-development (Dovers & Price, 2007).

Public involvement approaches, the applied aspect of HDWM, can be employed to help reduce conflict, build trust, and credibility between managers and the public and forestall litigation by those who wish their voices to be heard (Bath & Enck 2003; Lawrence & Deagen

2001). Public involvement is essential for effective IRM as eliciting the beliefs, perceptions, attitudes and values of stakeholders is the first step in understanding opinions and knowledge of different interests and consequently integrating this information into management. Effective public participation can also build support for change and aid in implementation. Well-designed efforts for public involvement are of great importance to successful resource and wildlife management.

Local resource managers are often responsible for gathering information from or bringing together diverse stakeholders (Mitchell, 2002). These managers are often well trained in the biological and ecological aspects of resource management but often lack training and experience in the social sciences (Jacobson & McDuff, 1998). Indeed research by Decker and Bath (2010) found significant discrepancies between European experts in managing large herbivores and general public participants concerning preferences for characteristics and methods of public involvement commonly used in wildlife management contexts. For example while large herbivore restoration experts attributed high levels of importance to including scientific information in decision making, general public respondents attributed high levels of importance to the cost effectiveness and representativeness of the public involvement effort (Decker & Bath, 2010). Addressing such public involvement challenges is of great importance as the extent to which decision-making processes are tailored to those characteristics most preferred by members of the public has an impact on the willingness of the public to accept resulting decisions (Lauber & Knuth 1999; Decker & Bath, 2010).

4.6.2.2 Integrating Human Dimensions Information in Wildlife Management

HDWM researchers have recently begun efforts to operationalize human dimensions information by proposing sometimes-novel frameworks and approaches for integrating social information into what are traditionally biology-focused wildlife management contexts. Such efforts are the result of a natural evolution after addressing earlier challenges (after we have gathered the information from stakeholders, what do we do with it?) and a need to address calls for more effective integration of social information into management (Gigliotti et al., 2009). In fact several recent HDWM works discuss the importance of applying what are essentially IRM approaches and concepts in wildlife management contexts (Enck et al., 2006; Ewel, 2001; Riley et al., 2002; Riley et al., 2003; Ring, 2009). HDWM researchers acknowledge that simply gathering and analyzing human dimensions information will not lead to its integration with biological considerations in the wildlife management process; targeted efforts are needed to facilitate this integration (Decker et al., 2006; Heberlein, 2004).

If human-dimensions considerations are indeed part of wildlife management, why then are targeted and novel approaches needed to integrate human dimensions into wildlife management? In some cases, the problem stems from a lack of effective communication between social science researchers and managers regarding the type of human dimensions information needed in a particular management context. By creating a manager's model or conceptual map of where human dimensions considerations fit into or are required in a management system, Decker and colleagues (2006) identified aspects of human dimensions research that could fill information gaps in the management system. Thus to address the challenge of matching science research managers' needs, human dimensions researchers need to collaborate with managers to

identify and provide the forms of social science information that is required by managers and can consequently influence policy (Decker et al., 2006).

Similarly, some scholars suggest that challenges of integrating human dimensions information into wildlife management stem from an improper framing of the management objectives. Riley et al. (2002) advocate the adoption of two levels of objectives – fundamental and enabling – that are informed by stakeholder opinion and can better guide management efforts than traditional ecologically or biologically-defined goals. Fundamental objectives indicate why management is needed and what it should accomplish in terms of stakeholder-defined impacts (Enck et al., 2006; Riley et al., 2002) while "[e]nabling objectives specify outcomes and management actions needed to achieve fundamental objectives" (Enck et al., 2006, p. 699).

Similar to Riley's et al. (2002) focus on impacts, several other scholars also emphasize human-wildlife conflicts and stakeholder-defined impacts (Decker et al., 2006; Riley et al., 2002; Ring, 2009) as means to facilitate discussions of integrated approaches to wildlife management. As impacts are "defined and weighted by human values" (Riley et al., 2002) the human dimension automatically earns a 'seat at the table' in any discussions regarding efforts to manage human-wildlife impacts and conflicts. Decker et al. (2006) acknowledge the role of impacts in catalyzing discussions around integrated approaches to wildlife disease management (WDM) and state that "WDM presents a challenge and an opportunity to integrate biological and human dimensions insight for improved wildlife management" (2006, p. 152). Similarly Ring (2009, p. 91) states "integrative biodiversity research is especially important when dealing with human-wildlife conflicts". While a focus on stakeholder-defined impacts may facilitate greater integration between the human and biological dimensions of wildlife management, true IRM

demands the integration of a wider variety of dimensions than just human and biological considerations.

The fundamental and enabling objectives identified by Riley et al. (2002) also share similarities with the substantive and procedural goals of EBM identified by Slocombe (1998). Both identify the achievement of enabling objectives and procedural goals (respectively) as prerequisites for achieving higher level fundamental objectives and substantive goals, Riley et al. (2002) and Slocombe (1998) differ on which higher level goals and objectives should entail. While Riley et al. (2002) advocate the adoption of stakeholder-defined wildlife impacts as one of the fundamental objectives of wildlife management, Slocombe (1998, p. 486) identifies substantive goals as "desired states or characteristics of the ecosystem being managed." As explained further below, a focus on stakeholder-defined impacts holds many benefits for current efforts to achieve integration in wildlife management. If, however, wildlife management is poised for yet another shift (Gigliotti et al., 2009; Scalet, 2007), and is to adopt an ecosystem-based approach to management, managers would be wise to follow Slocombe's (1998) example and expand fundamental objectives to better reflect ecosystem-scale goals.

4.6.3 Horizontal Integration Challenges

This last phase of integration challenges in wildlife management pertains to efforts to facilitate a more holistic approach to resource management– essentially facilitating integration between what Dale (2001; Dale & Newman, 2007) refers to as the silos of resource management agencies in Canada. Again, addressing this set of challenges is a natural progression as wildlife management better integrates social science information into its activities. Such horizontal integration coincides with Dovers and Price's (2007) decisive integration as once integration

between the silos is achieved, relevant parties are able to contribute directly to decision-making processes. Unlike the other sets of challenges outlined above, however, which involved interactions between stakeholders, social scientists and wildlife managers, addressing the fragmentation of authority for resource management will require a combined effort among various resource management agencies.

4.6.3.1 Fragmentation of Authority

Perhaps the most prevalent integration challenge facing natural resource management practitioners is the fragmentation of authority over natural resources (Slocombe & Hanna, 2007). In Canada, such fragmentation arguably began in 1867 with the British North America (BNA) Act. In allocating natural resource jurisdiction and responsibility between various federal, territorial and provincial government departments, the BNA Act set the stage for the resource management agency silos that today face challenges in responding to interdependent resource management challenges with integrative solutions (Dale & Newman, 2007). Despite numerous attempts to reorganize resource management agencies to better reflect the interconnectedness of various resource sectors and their parent ecosystems, such efforts have often failed to gain widespread support (Government of Newfoundland and Labrador, 2000; Miller, Gale & Brown, 1987).

One such reorganization attempt can be found in the province of Newfoundland and Labrador where responses to crown land development applications from provincial resource management agencies were sometimes contradictory, thus posing significant challenges for both the Crown Lands Division and applicants. In an attempt to facilitate a more coherent and coordinated assessment of crown lands applications, the Lands Management Division (a then

newly formed management division) established the Interdepartmental Land Use Committee (ILUC) in 1983 (Fugate, 1986). The committee's rather ambitious goal was to "coordinate government's resource development activities" (Fugate, 1986, p. 219). More specifically the committee was to "[act] as a "clearing house" for development programs, policies, legislation and proposed administrative and/or planning boundaries [and] where possible, to integrate resource and land uses through the development of land use policies and Regional Crown Land Plans" (p. 219). As outlined by Miller et al. (1987), such administrative models have often proved unsuccessful. Indeed Fugate (1986) outlined several challenges facing the ILUC from its inception. In addition to a lack of a guiding land-use policy and scant or non-existent econometric and resource inventory data, Fugate (1986) also identified fragmentation in administrative and legislative resource management mechanisms as impeding integration.

Despite these challenges the ILUC still exists, having survived several reorganizations of provincial resource management departments and branches. The ILUC is identified as the 'go to' body to "ensure public sector policies and decisions on land use and resource management are related and complementary" (Department of Environment and Conservation, 2010, para. 2). The actual efficacy of this committee, however, has not yet been definitively evaluated.

Hopper, McDonald and Mitchell (1999) identify the establishment of a new agency or committee (such as the ILUC) as an example of an explicit and targeted effort to achieve integration between resource management agencies. Hopper et al. (1999) contrast such high levels of intervention with voluntary or minimalist approaches where agencies cooperate out of trust and goodwill. It seems, however, that in the case of the ILUC even coercion has brought about little integration.

4.7 Evolving Definitions of Success

Just as the field of wildlife management and its challenges have evolved, so to have definitions of success in wildlife management. During the first phase of wildlife management, success was relatively simply defined. Gigliotti et al. (2009), and earlier Hendee (1974), noted that in this first era managers catered to a narrowly-focused set of stakeholders interested primarily, if not solely, in the hunting of game animals. The measuring stick for success was thus simply the number of game animals harvested
(Hendee, 1974). During the second phase of wildlife management, specifically after World War II, wildlife managers' initial measure of success became somewhat inadequate. As the public's wilderness recreation increased, the relative importance of hunting wildlife began to decrease (Brown, 2009) translating into an apparent decrease in the success (at least when using former hunting-focused metrics) of wildlife management efforts. Contrary to managers' expectations, however, participation in wilderness pursuits continued to increase despite fewer numbers of fish and wildlife being consumed. In response, wildlife managers adopted 'days-a-field' as a new measure of success but also doggedly held on to the perception that the consumption of game was the motivation for days-a-field and thus a prerequisite for satisfaction (Gigliotti et al., 2009; Hendee, 1974).

Managers soon realized that hunting contributed only partially to wildlife users' satisfaction. Questions regarding the true components of wildlife users' satisfaction required the application of the newly recognized field of HDWM (Gigliotti et al., 2009). Hendee (1974), who together with Potter (and other colleagues of that period) helped increase the awareness of HDWM research with the publication of their important paper just three years before (see Hendee & Potter, 1971), conducted some of this important early HDWM research and described

a range of satisfactions delivered by outdoor activities that extended into stakeholders' non-consumptive values of wildlife. This pivotal work added new dimensions to managers' definitions of wildlife management success and helped shift the focus beyond the harvest-related measures so closely monitored by wildlife managers at the time (Gigliotti et al., 2009)

4.7.1 Integrated Definition of Success

If indeed the field of wildlife management is adopting characteristics of IRM, definitions of success in wildlife management must therefore also be integrative. Definitions of success in interdisciplinary approaches to conservation should explicitly include interdisciplinary criteria (Bellamy et al., 1999; Margoluis & Salafsky, 1998). Indeed successful management goes beyond simple products and delivers other dimensions of success such as learning, relationship building and ownership of the management effort (Lachapelle et al., 2003). In the case of my research in this thesis, success can be gauged both objectively (in terms of caribou conservation gains) and subjectively (in terms of a stakeholder engagement that is perceived to be earnest and fair).

4.7.2 Addressing Impacts as Success

On the surface, defining success as addressing stakeholder impacts may seem to exclude input from areas of biological research and equate to management by polling, which Decker & Chase (1997) strongly caution against. The identification and management of impacts, however, is actually a process that demands the integration of human and biological dimensions. While the evaluation of effects, and consequently the identification of impacts, is based on values, the work of managers and scientists is essential for investigating, describing, predicting, and communicating about the magnitude and influence of these effects (Bazzsaz et al., 1998). Further

integration between human and biological dimensions can occur if scientists call upon human dimensions researchers to identify gaps in stakeholder knowledge (White, 2001).

Stakeholder defined impacts, however, are by definition grounded in the management context in question and, in turn, this relevance to the area and its stakeholders helps foster ownership of the decision-making process and its outcomes. Riley et al. (2002) identify these and other benefits of focusing on stakeholder-defined impacts in their discussion of Adaptive Impact Management (AIM). According to Riley et al. (2002), these benefits include:

- Increased relevancy of wildlife management to society
- Greater stakeholder satisfaction
- Managers more likely to and capable of embracing change and uncertainty rather than avoiding it
- Learning becomes a motivator as well as a product throughout the management system

AIM builds on conventional adaptive management (Gunderson, Holling & Light, 1995; Holling, 1978; Lee, 1993; Walters, 1986) but shifts the focus of management away from wildlife population or species habitat objectives and instead recognizes these as enabling objectives that may be necessary to achieve fundamental objectives defined by stakeholder-defined impacts. Riley et al. (2003, p. 88) provide the following example to help explain the connection between fundamental and enabling objectives

> A fundamental objective of black bear management could be to increase the psychological well-being of a community in which negative black bear–human interactions are frequent events. Enabling objectives state how fundamental objectives

will be achieved. An enabling objective… could be to increase the level of education about successfully living with black bears in that particular community.

The learning referred to in the list of benefits above, while an essential part of propelling simple trial-and-error into the realm of adaptive management (Armitage et al., 2007) also serves an integrative function as it results from interactions and a sharing of perspectives between managers, stakeholders and scientists to develop common understanding (Riley et al., 2002; Schusler, Decker & Pfeffer, 2003).

Fundamental objectives indicate why management is needed and what it should accomplish in terms of stakeholder-defined impacts (Enck et al., 2006; Riley et al., 2002) while "[e]nabling objectives specify outcomes and management actions needed to achieve fundamental objectives" (Enck et al., 2006, p. 699). Thus, as stated by Decker et al. (2006), to achieve 1st order or fundamental objectives, management efforts are designed to manipulate factors contributing to 2nd order or enabling objectives. Pairing fundamental objectives, which are often defined using social dimensions, and enabling objectives, which are often articulated from a natural science or biophysical-focused perspective in this manner emphasizes social-ecological integration in wildlife management and also allows managers, with help from stakeholders, to evaluate alternate enabling objectives (Riley et al., 2002). By tying management alternatives to stakeholder-desired outcomes managers have greater flexibility for treating management strategies as experiments, an essential component of adaptive management (Lee, 1993). Finally, by working with stakeholders to evaluate the impact of various enabling objectives on fundamental objectives, managers and scientists are better able to respond to uncertainty, which is also central to adaptive management (Holling, 1978) as well as adaptive co-management (Armitage, et al., 2007).

Based on the ideas of AIM (Riley et al., 2002; 2003), successful wildlife management entails maximizing positive wildlife impacts and minimizing negative wildlife impacts. While such an impact management approach might seem overly simple, addressing wildlife impacts is integrative, locally relevant, adaptive, and measurable. Identifying impact management as "the essence of wildlife management" (Riley et al., 2002) marks a significant turning point in wildlife management. New definitions of wildlife management that incorporate impact management have been proposed and are gaining acceptance and some identify impact management as an "emerging paradigm" in wildlife management (Riley et al., 2002). While a focus on stakeholder-defined impacts holds many benefits for current efforts to achieve higher levels of integration in wildlife management, the field of wildlife management continues to evolve and managers must be prepared to formulate new definitions of success to coincide with new directions in wildlife management. If wildlife management is set to transition into a new phase based on ecosystem management approaches (Gigliotti et al., 2009; Scalet, 2007), managers must be prepared to be not only proactive, but also expand definitions of success to better reflect ecosystem-scale goals.

Chapter 5. Method and Approach

In this thesis, I examine the extent to which components of IRM are incorporated into the planning and implementation of wildlife management efforts associated with declining caribou populations in Newfoundland. I focus on several prominent components that are often at the center of contemporary integrated resource and environmental management efforts: disciplines; information; spatial/ecological units; governments; agencies; interests/sectors; and perceptions, attitudes and values (Slocombe & Hanna, 2007). My research objectives are defined in terms of these dimensions of IRM and relevant stakeholders' interest in, adoption of, and attention toward integrating these dimensions in planning and management efforts.

To answer my research questions, the methodological approach I adopt for this dissertation employs two qualitative research techniques: content analysis and stakeholder interviews. Combining these research methods contributes to a deeper understanding of the caribou management context, stakeholder perspectives, and the status of provincial wildlife management efforts in terms of integrated management approaches.

To accomplish these research objectives, I used three sources of evidence (interviews, popular media items, and government press releases) as a form of research method triangulation (Schwandt, 2007). Yin (2009) notes the importance of employing complementary and corroborating sources of evidence and cautions that without such triangulation of sources the case study will be weakened by a reliance on just interview data. As stated by Yin (2009, p. 103), "[f]or case studies, the most important use of documents is to corroborate and augment evidence from other sources…Because of their overall value, documents play an explicit role in any data collection in doing case studies".

Specifically, I used the following research methods and sources of evidence:

- I conducted 18 in-depth interviews with CRC members and other relevant stakeholders (this latter group includes those individuals sometimes asked to provide information to the CRC regarding specific issues). This aspect of the research elucidates stakeholder perspectives regarding the objectives of wildlife management and identifies challenges and opportunities for adopting more integrative approaches.
- I analyzed approximately 15 management plans, press releases, and relevant academic literature. This examination of the published literature and other relevant materials of wildlife management activities (press releases, meeting minutes, management plans and interviews with managers) was conducted to explore interest in and opportunities for adopting integrative management approaches such as collaboration between disciplines or government agencies or shifts toward ecosystem-based management approaches. Materials considered valid for analysis included those items that focused on caribou management in Newfoundland from 2000 to 2016. A selection of provincial government press releases is included in Appendix A.
- I analyzed approximately 20 relevant popular media articles. Examining the popular media discourse surrounding caribou management in the province. This provided me with an understanding of how such issues are framed in the popular literature. Materials considered valid for this part of the analysis included popular media items that focused on caribou management in Newfoundland from 2000 to 2016. A selection of these is also included in Appendix A.

Stakeholder perspectives can vary greatly between and even within groups associated with caribou management efforts in Newfoundland. The ideal method for gathering this information would allow participants to speak freely and would also allow me to identify points

of dissent and common ground between stakeholder groups and managers. Given the importance of hearing participants' own voices in gaining an in-depth understanding of stakeholder perspectives, the most appropriate approach was to gather information from stakeholders directly using an inductive approach.

To gather data for this dissertation, I used in-depth interviews. These interviews employed open-ended questions (Yin, 2009) to allow interviewees to express their opinions regarding both the framing of the problem in question as well as the desired objectives of management. As stated by Marshall and Rossman (2006, p. 101), this method [in-depth interviews] "is based on an assumption fundamental to qualitative research: The participant's perspective on the phenomenon of interest should unfold as the participant views it (the emic perspective), not as the researcher views it (the etic perspective)". While interviews were based on a set of pre-determined, open-ended questions, participants' were given and displayed considerable latitude in their answers and thus provided me with a rich narrative upon which to conduct my analysis. Such an emic perspective also allows the researcher to learn the background and context of the issue from the participant's perspective. This understanding was essential in identifying areas of common ground as well as the basis of disagreements about management approaches and the contested nature of knowledge and experience associated with caribou management in Newfoundland.

Kahn and Cannell (1957) describe interviewing as "a conversation with a purpose" (as cited in Marshall & Rossman, 2006, p. 101), and while the interview should be structured around general topics and questions it should allow participants to tell their own stories regarding their perspectives. Researchers should, however, ensure that interview questions stay on topic and are tailored towards the goals of the study (Miller & Salkind, 2002). This caution is especially

important when using open-ended questions as such interview methods are less structured than other quantitative research techniques and thus may be influenced by the approach and biases of the interviewer. Despite the need to safeguard against such problems, however, open-ended questions are a valuable research tool and are considered "appropriate and powerful under conditions that require probing of attitude and reaction formations and ascertaining information that is interlocked in a social system or personality structure" (Miller & Salkind, 2002, p. 310).

5.1 Research Methods and Data Analysis

The interview portion of the research was approved by the University of British Columbia's Research Ethics board (H14-00122). The 18 in-depth interviews were conducted with participants in the main stakeholder groups affected by caribou management. Interviews were recorded using a digital voice recorder and later transcribed for analysis. While I completed the majority of interview transcription, a research assistant did assist with some aspects. The research assistant signed a non-disclosure form prior to beginning the transcription process.

5.1.1 Deriving Data in Qualitative Research

As suggested by Mason (1996, p. 54), 'reading' interviews in an interpretative sense allows a researcher to "make inferences about something outside of the interview interaction itself". For such inferences to be credible, however, interviews must be transformed into reliable data. The creation of such data has important implications for how interviews are conducted and recorded, how interviews are interpreted, and how other qualitative analysis, such as content analysis, are carried out. The management and analysis of qualitative data is often a daunting task for social scientists. Mason (1996) suggests that researchers must not only employ a

consistent system for organizing and sorting their data, but must also have a clear idea of what constitutes data in the context of their research. While many of the complexities of sorting, organizing, and analyzing data can be addressed by employing specialized Computer Assisted Qualitative Data Analysis (CAQDA) software (NVivo11© software was used to carry out data analysis for this dissertation), the decision on what qualifies as data depends on what the researcher wishes to learn.

One of my main goals was to explore the extent to which dimensions of IRM are manifest in the management of declining caribou populations in Newfoundland. Thus, 'data', for the purpose of this research, comprised information from relevant popular media items, management plans, published literature, and interviews that focused on the dimensions of IRM (disciplines; information; spatial/ecological units; governments; agencies; interests/sectors; and perceptions, attitudes and values (Slocombe & Hanna, 2007)). These dimensions formed the analytical framework for this analysis and were used as 'nodes' or themes in the CAQDA software under which the data derived from popular media articles, press releases, publications, and interviews were organized. Analyzing data in this manner allowed for an organized examination of the discourse surrounding dimensions of integrated resource management in the caribou management case study.

5.1.2 Interviews

While the formal, recorded portion of the interview was usually one to two hours in duration, most interview sessions began and/or ended with more informal discussions about the research context, the policy setting, and the interviewees' work and other contributions to

wildlife management. These informal interactions were important in helping me gain a deeper understanding of the research context.

As the management context is fractious and sensitive, securing an interview often required rapport-building. This trust-building process took place over weeks and even months for some informants, and often involved numerous, less formal interactions (dialogue/conversation) well before a formal interview was granted. Given this process, some portions of interviews could not be quoted in the thesis and as such cannot be an explicit part of the analysis. In such cases interviewees asked that some of their statements be kept 'off the record' as they were discussing a particularly controversial topic or referring specifically to a particular individual.

While these extra-interview contributions are not used as interview data, they did contribute greatly to my understanding of the research context and added depth and richness to the interview. As put forward by Glaser (2002): 'All is Data', an assertion further explained and supported by Charmaz (2006, p.16) who suggests that, while data quality and its usefulness for interpretation varies, "[e]verything you learn in the research setting(s) or about your research topic can serve as data". This information provides a substantive understanding of the challenges and interpersonal setting within which stakeholders work together. The eventual formal interview was the culmination of a careful process of building relationships with informants, well before the point of being able to ask the interview questions. This approach provided an opportunity to understand the perspectives, experiences and beliefs of informants, adding to the depth of understanding the factors that shape stakeholders' contributions to wildlife management.

Interactions with prospective/eventual study participants and opportunities to gain a greater understanding of the research and management context and history also included

attending the Labrador Research Forum in May 2017 (which included several significant discussions on caribou population declines, the species' importance to Indigenous people, and the contentious nature of caribou management). I also attended the Wildlife Division's 2016/2017 Annual Big Game, Small Game, and Fur Plan Presentation (November, 2015) and wildlife management-related meetings with the Wildlife Division Director (May, 2016). Through my other research projects (including working with Division staff to conduct a review of a human dimensions survey for the North American Waterfowl Management Plan (October, 2015)), working closely with the Division director and senior manager of research to prepare an internal report (Decker & Edwards, 2016) on the relevance and merits of the Canadian Wildlife Directors' Committee (CWDC), and working with senior managers to conduct an ongoing baseline study of Newfoundland residents' attitudes and beliefs regarding the 2015 – 2020 Moose Management Plan, I was also able to interact with various Wildlife Division staff. These and other less formal interactions with Wildlife Division staff, consumptive users of wildlife, Indigenous groups, and other relevant stakeholders, were afforded through my position as a faculty member in the Environmental Studies program at Memorial University's Grenfell Campus.

Interactions with relevant stakeholders, considered discussions regarding the research topic, and my own personal experience with and knowledge of various aspects of the research context and history, whether gained from living and working in the study context or as part of my dissertation research, contribute to the research process by alerting me to pursue concepts and types of research questions of particular relevance to the context in question. Such information is referred to by Blumer (1969) as sensitizing concepts. Collectively, research

interviews and other less-formal means of gaining a deeper understanding of the research context contribute to the in-depth nature of the research.

The initial stakeholder groups that I contacted included members of the CRC that was established by the Department of Environment and Conservation in 2008 (Government of Newfoundland and Labrador, 2009). The committee was formed to act as a forum for information exchange between stakeholder groups and managers associated with caribou management efforts in Newfoundland (2009). This committee included representatives from the Aboriginal Women's Network; the Newfoundland and Labrador Wildlife Federation; the Notre Dame Rod and Gun Club; the Newfoundland and Labrador Outfitters Association; the Department of Environment and Conservation; the Rural Secretariat; the Department of Tourism, Culture and Recreation; the Newfoundland and Labrador Trappers Association; and the Department of Natural Resources (Government of Newfoundland and Labrador, 2009). The interviews conducted with representatives of these groups comprise a near-census of the CRC as at least one member of all groups except one was interviewed. I made several attempts to contact the Committee representative of this last stakeholder group but was not successful. Unfortunately, this was the only member of this stakeholder group able to provide comment on group's participation in the CRC.

While the composition of the committee is wide ranging, throughout the data collection phase of the study, I made efforts to ensure that any other concerned or affected stakeholder groups were identified and invited to participate in the study. Participants were asked a series of open-ended questions (Table 5) regarding perceptions of the problem of caribou declines, the objectives of caribou management in the province, the status of manager or public/lay knowledge, and the integration of input from different management agencies. This aspect of the

research allowed me to compare views between stakeholder group representatives regarding caribou management objectives, the status of various forms of knowledge, as well as perspectives on how the problem of caribou decline is framed.

Interview questions were developed based upon both my own *a priori* understanding of the research context (and associated sensitizing concepts; Blumer, 1969) and also the underlying IRM theories upon which the study is based. The first two interview questions were used to establish interviewees' position in the research context, their stakeholder group affiliation, and their perspectives regarding the caribou decline and its ramifications. This pair of questions helped inform my understanding of the differences of opinion between stakeholders regarding the caribou decline and management efforts. For instance, while some interviewees held that the decline was simply part of the caribou's natural population cycle, others criticized the provincial Wildlife Division for failing to register the decline, initially failing to adjust hunting quotas in response to a falling population, or failing to take stronger action to reduce the number of predators on caribou. Interviewees' responses to these questions helped me probe responses to subsequent interview questions.

The remainder of the interview questions, excluding the last two, were used to gain evidence of the extent to which the local caribou management context manifested the purported trend in the literature toward more integrated approaches. These interview questions focused on public involvement and efforts to solicit and integrate various types and sources of knowledge into decision making about caribou management. Such topics coincide with the IRM field's focus (per Slocombe & Hanna, 2007) on the natural environment and forms of consultations, participation and collaboration.

Table 5.
Interview Questions

1. Please describe your experience with caribou management efforts in the province
2. What is the status of caribou herds in the province? Is there a problem, what is it? What are the main issues surrounding this problem?
3. How would you define successful caribou management in the province? (Emphasis on process or outcome will not be specified to examine respondent's desired area of focus)
4. If not discussed previously: how would you define successful decision-making/management process with respect to caribou management in Newfoundland?
5. Based on your definition of successful decision-making process, how successful are current caribou management efforts?
6. What should be the main objectives of caribou management in the province with respect to the management process?
7. What actions are required to meet the objectives you have identified?
8. Which, if any, of the objectives you identified are being met? How? Which ones are not? Why?
9. Who is involved in making caribou management decisions? Is everyone involved who should be involved? (who/why/why not)?
10. Should the concerns/opinions of some segments of the population (whether organized stakeholder groups or informal groups or classes of residents) carry more weight than others? Which ones? Why?
11. Are there groups who you feel should not be involved in making caribou management decisions? (who/why/why not)?
12. What is the role of information from managers (the Wildlife Division) in caribou management decision-making in the province?
13. For stakeholders: to what extent are the views of your group integrated into caribou management decision making?
14. For managers: how do you integrate stakeholder views into decision making and management efforts?
15. For managers: to what extent do you integrate the views of other provincial departments, agencies, and branches whose mandates relate in some way to caribou management efforts in the province?
16. Is there anything else you would like to tell me about caribou management in the province that we have not already discussed?
17. Are there any other individuals or groups that you think I should talk to regarding these issues?

This set of questions about consultation and integration also provided indirect evidence of the extent to which the Public Trust Doctrine was adhered to in Newfoundland caribou management. If wildlife managers are to truly act as trustees of wildlife, there must be opportunities to solicit and integrate information from public stakeholder groups, and all citizens, on whose behalf wildlife conservation is to be carried out.

5.1.3. Analysis of Management Plans, Press Releases, and Popular Media Articles

The final component of my research involved examining relevant popular media articles, management plans, and press releases of the provincial Wildlife Division and the overarching department of Environment and Conservation (note that the names of these departments changed due to provincial government restructuring in 2017). The latter were obtained from the Provincial News Releases website and from correspondence with wildlife division staff members while the former were collected from the online archives of local news media outlets. A total of 45 such items was examined. A selection of these documents are appended at the end of this thesis. Materials considered valid for analysis included those popular media articles, management plans, and press releases that focused on caribou management in Newfoundland from 2000 to 2016 (this period captures the time during which the recent caribou population decline was discovered and consequent management responses).

The analysis of popular media articles, management plans, and press releases as a research method requires more rigorous treatment than simple careful reading of documents. The more systematic method of content analysis has been defined as "a phase of information-processing in which communication content is transformed, through objective and systematic application of categorization rules, into data that can be summarized and compared" (Paisley,

1969, p. 133). As suggested by Holsti (1969), authentic content analysis, like many methods of scientific inquiry, must be objective, systematic, and generate data that is generalizable and linked with theory.

As with the interview data above, Nvivo 11© was employed to apply the analytical framework, comprised of the dimensions of IRM, to the management plans, press releases, and popular media articles. This helped bring order to the data and aided in identifying relevant themes.

Chapter 6. The Study Setting

6.1 Wildlife Management as a System

A system can be defined as a set of interacting parts that have coherence or identity. While terms and concepts generally associated with systems approaches often relate to purely biophysical systems, their relevance to social systems is sometimes less clear (Brown & Williams, 2015). For instance, while it may be relatively easy to understand how systems concepts such as complexity, resilience, dynamics, and adaptation relate to an ecosystem, it is less clear how these concepts relate to a social-ecological system. Berkes and Davidson-Hunt (2008), however, clearly identify humans as "part of complex adaptive system[s] that includ[e] both social and ecological subsystems". Similarly, Scheffer, Westly, Brock & Holmgren (2002, p. 195) highlight the characteristics of dynamics and adaptation in social and ecological systems and state that "[e]cosystems change in response to the stress imposed by human use, and human societies adjust their behaviour affecting ecosystems in response to perceived changes in these systems".

As Kay (2008, p. 15) suggests, the first step in seeking a system-based understanding of an issue is to "identify the key elements of the situation and the relationships between them". The wildlife management system, composed of the interactions among wildlife species, their habitats, and the people who depend on or are affected by their management (Decker, Riley, & Siemer, 2012; Giles, 1978), is described as part of a social-ecological system. The recent significant decline in the population of caribou, Newfoundland's largest native herbivore, thus presents an opportunity to examine this wildlife management issue as an integrated, social-ecological system.

6.2 The Presenting Situation: Components of Newfoundland's Caribou Management Context

To guide my examination of this system, I will loosely follow the Peruvian framework as outlined by Murray, Sanchez-Choy and Sanchez-Zayala (2008). This framework highlights linkages between ecosystems and human health (Murray et al., 2008) but provides an effective way of organizing elements influencing the management issue in question. The Peruvian framework is composed of four interconnected areas of analysis to be addressed by researchers seeking a clearer understanding of the system: The Presenting Situation, Analysis of the Presenting Situation, Description of System Dynamics and Key Relationships, and The Research Agenda. Table 6 presents a brief overview of the application of the Peruvian framework to caribou management in Newfoundland. Below, each stage of the framework is explored in greater depth in relation to caribou management in Newfoundland. This will be followed by the dissertation sections pertaining to research results, conclusions, and future opportunities.

6.2.1 Human History in Newfoundland prior to Confederation

By the time Giovanni Caboto (John Cabot) 'discovered' Newfoundland for England in 1497, Indigenous groups had been living on the island for more than 5000 years (Newfoundland and Labrador Heritage, 2018a). Following the Maritime Archaic peoples, who seem to have all but died out by 3000 B.P. (Baker, 2003; Newfoundland and Labrador Heritage, 2018a), the Groswater people became prevalent on the island from approximately 3200 B.P. until their numbers also declined considerably by 2200 B.P. (Newfoundland and Labrador Heritage, 2018b). The next Indigenous group to occupy the Island was the Dorset people who, before

Table 6.
Peruvian Framework Applied to Newfoundland Caribou Management

<table>
<tr><td>Presenting Issues
- Caribou populations in NL decreased by 60% in just 12 years
- Recently arrived, coyote perceived by many as the cause of caribou decline
- Sustainable caribou management strategy identified as a priority for NL government
- Conflicting opinions of the cause of decline by public and managers
- Largely a consumptive user-focus in stakeholder input</td><td>Historical Review
- History of distrust of and conflict between resource users and management agencies
- Caribou is NL’s largest native herbivore (cultural significance)
- Few attempts at integrated fish and wildlife management approaches
- Strong history of resource exploitation and consequent caribou habitat alteration</td></tr>
<tr><td>Stakeholder Analysis
- Stakeholders include: wildlife managers, general public, hunting outfitters, hunters and conservation groups
- Little evidence of engagement with Qalipu and Miawpukek First Nations Bands
- Important to understand manager’s opinions about local knowledge/opinions to promote a social-ecological systems approach
- Conflicting views between groups</td><td>Issue Analysis
- Public perceptions of role of coyotes in caribou declines proving important
- Population decline part of natural cycle but poses significant social-ecological impacts
- Little opportunity for broad stakeholder input
- Some call for the eradication of coyotes
- Ongoing challenges in promoting an integrated approach to management</td></tr>
<tr><td colspan="2">The Research Agenda
- Main challenges facing caribou management in Newfoundland include difficult-to-predict factors such as global climate change impacts and changes in predator numbers and also challenge of lack of cooperation between stakeholders and managers
- Ways forward for working toward more integrated approaches to wildlife management</td></tr>
<tr><td colspan="2">Description of System Dynamics and Key Relationships
- Influence of various system components on caribou population numbers
- Drivers of change in the system: hunting of caribou, caribou predation, and habitat changes.
- Key relationship for the system is also a driver of change: lack of interaction and collaboration between managers and stakeholders</td></tr>
<tr><td colspan="2">Policy and Governance Analysis
- Governance issues stem from a consumptive user-focused approach to management
- Governance issues stemming from stakeholder desires to contribute to management
- Nested spheres of influence regarding levels of government responsible for wildlife management</td></tr>
</table>

dying out in by 1200 B.P., were contemporaries of the Beothuk people (Baker, 2003; Newfoundland and Labrador Heritage, 2018b).

When Vikings reached the northern tip of the Newfoundland's Northern Peninsula in 1000 B.P, the Beothuk people were still present in Newfoundland and at that time had already inhabited the Island for two centuries or more. Because of battles with newly-arriving Europeans, however, a lack of resistance to their diseases, and restricted access to critical resources, members of the Beothuk Aboriginal group numbered less than 1000 by the time of John Cabot's visit and became extinct when the last surviving Beothuk woman died in 1829 (Baker, 2003). Today, the only First Nation group remaining in Newfoundland is the Mi'kmaq people. Though the Mi'kmaq people have lived on the Island since the 1500s, they were not granted a reserve and Indian status by the federal government until 1987 (Baker, 2003; Qalipu First Nation, 2016) when the Miawpukek Reserve was established on the south coast of Newfoundland. Today, as many as 100,000 individuals in Newfoundland continue to seek formal recognition as founding members of the Qalipu Mi'kmaq First Nation band (Government of Canada, 2017; Hanrahan, n.d.). The Qalipu, band is comprised of 66 traditional Mi'kmaq communities, many along Newfoundland's south and west coasts (Qalipu First Nation, 2016).

It is important to distinguish between the island of Newfoundland and the Labrador portion of the province with respect to Indigenous peoples. The Labrador portion of the province is home to substantial populations of people from three distinct Indigenous groups: the Inuit of Nunatsiavut, The Southern Inuit of NunatuKavut, and the Labrador Innu. Through their strong connection to the land as well as formal self-governance arrangements, land claims agreements, and well-organized Indigenous group representation, Indigenous peoples in Labrador are able to

participate in a greater number of wildlife-related advisory groups while few if any formal stakeholder engagement processes exist for informed wildlife management in Newfoundland,

The first official European settlements were established in Newfoundland in the early 1600s (Baker, 2003). Over the next 300 years, English control of the island, and its lucrative cod fishery, was challenged several times by the French until 1904, when France relinquished all claims to the Island except for the islands of St. Pierre and Miquelon located near Newfoundland's south coast (Baker, 2003); these islands remain French territory today. In 1949, Newfoundland's first provincial government was established and the former British colony became Canada's youngest province (Baker, 2003).

6.2.2 The Natural Environment

Newfoundland and Labrador is Canada's most easterly province. The province is composed of the main island of Newfoundland, which is approximately 111,400 km^2, and the more northerly Labrador portion, which is part of mainland Canada and is approximately 294,300 km^2 (Government of NL – Land Area, 2018) (Figure 2). In describing the terrestrial characteristics of Newfoundland, the Island is often divided into three zones, which are in turn subdivided into ecoregions (Bell, 2002) (Figure 3).

Figure 2. Map of Newfoundland and Labrador (© 2002 Natural Resources Canada, open government licence https://open.canada.ca/en/open-government-licence-canada)

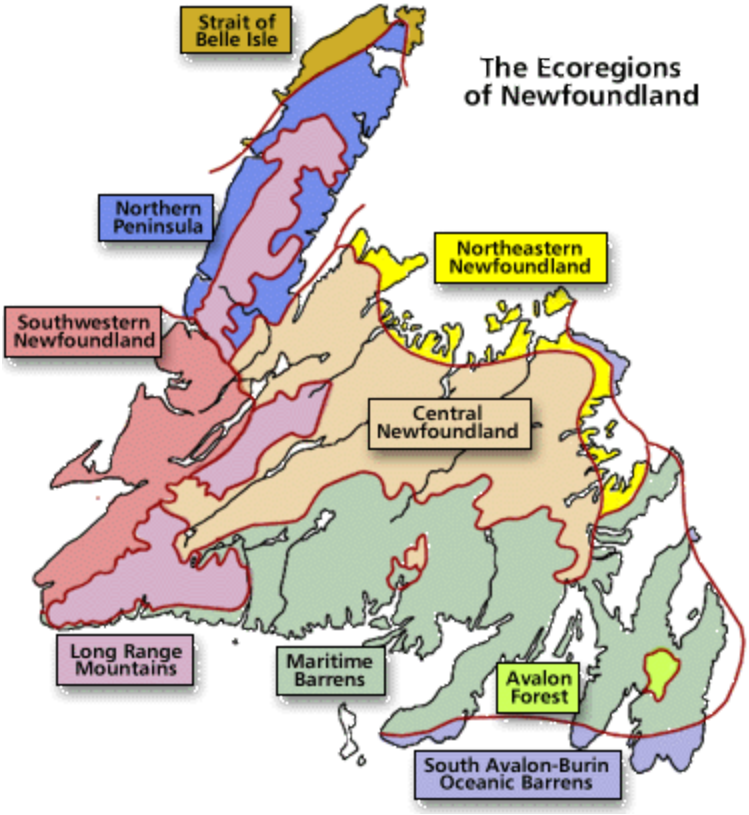

Figure 3. Ecoregions of Newfoundland (© Riche, 2002, by permission)

The southern boreal zone includes the following ecoregions: Avalon Forest, South Avalon Burin Oceanic Barrens, Southwest Newfoundland, and the southern portion of the Long Range Mountains. The middle boreal zone is composed of Northern Peninsula, Northeastern Newfoundland, and Central Newfoundland ecoregions. Finally, the northern boreal zone includes the northern portion of the Long Range Mountains ecoregion and the Strait of Bell Island ecoregion (Bell, 2002).

Newfoundland has cool summers and cold to mild winters. Precipitation ranges from 900 mm to 1600 mm per year. Throughout the Island's ecoregions mean annual temperatures range from 2.5^{o}C to 5.5^{o}C with mean summer temperatures between 10^{o}C and 12.5^{o}C, and average winter temperatures between –5.5^{o}C and -1^{o}C (Bell, 2002). With the exception of the south coast

where extensive wetland barrens can be found (Figure 4), the vegetation of Newfoundland is composed mainly of Black spruce (*Picea mariana*) forest throughout the centre of the Island with Balsam fir (*Abies balsamea*) forests nearer the coasts (Figure 5). Throughout Newfoundland, forest areas are intermixed with or in close proximity to intermittent and sometimes-extensive plateaus and lowlands. These barren areas are often referred to as moss or rock and heath barrens (Schaefer & Mahoney, 2007).

Newfoundland is home to several mammal and bird species which prey on or scavenge caribou. These include black bears, lynx, fox (*Vulpes vulpes*) and bald eagles (*Hallaeetus leucocephalus*) (Bell, 2002; Department of Environment and Conservation – Land Mammals, n.d.). In addition to these native species, several other non-native animals also closely interact with insular caribou populations. These species have been introduced or have naturally expanded their range to Newfoundland.

The most relevant intentional species introduction is moose (*Alces alces*) (introduced 1904) (Department of Environment and Conservation – Land Mammals, n.d.) while Coyotes (Figure 6), the only animal in recent years to naturally expand its range to include insular Newfoundland, are likely also the most controversial in discussions related to caribou conservation. Since crossing sea ice from Nova Scotia during the mid-1980s (Figure 7) coyotes have spread throughout insular Newfoundland (Blake, 2006).

Figure 4. Woodland Caribou in Wetland Barren Area. (© 2012 Randell et al., by permission)

Figure 5. Newfoundland Forest Landscape. (© 2011 Wiersma, by permission)

Figure 6. Eastern Coyote in Newfoundland. (© 2017 Robertson, by permission)

Figure 7. Expanding Range of the Eastern Coyote (© 2006 Blake, by permission)

In Newfoundland, coyotes are often blamed for contributing to recent significant declines in caribou populations but are seen by others as filling an important ecological niche left after the human-induced extinction of the Newfoundland wolf (*Canis lupus beothucus*) (extinct since approximately 1922) (Department of Environment and Conservation – Land Mammals, n.d.; Schaeffer & Mahoney, 2007).

6.2.3 Caribou Population Status and Decline

The preferred habitat of woodland caribou includes mainly old growth coniferous forests in winter and more open scrub and barren areas in summer, areas where they can access ground-level and arboreal lichens (Schaefer & Mahoney, 2007; Thomas & Gray, 2002). It is not surprising therefore that the distribution of Woodland caribou across Canada very closely reflects the distribution of the nation's boreal forest (Figure 8). While western populations of caribou are considerably more fragmented, and therefore more vulnerable, than those in more central and eastern areas (Ray, et al. 2014; Thomas & Gray, 2002), populations across Canada are experiencing significant declines.

The latest woodland caribou status assessment by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC, 2014) indicates that the status of the Newfoundland population has changed since the 2002 assessment. While the Newfoundland population was deemed Not at Risk in 2002, this status has now been upgraded to Special Concern (Figure 9). As stated by COSEWIC 2014,

> This population has fluctuated in abundance over the last 100 years and presently has declined by approximately 60% over the last 3 caribou generations. The decline was due to limited forage when the population was at high density, harvest, and predation.

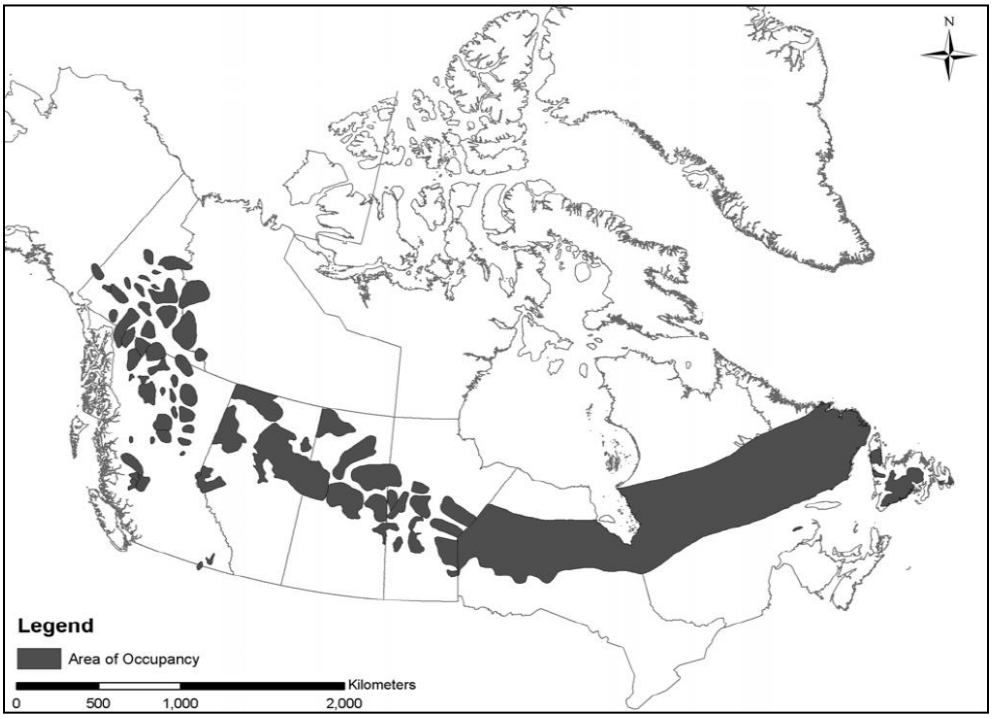

Figure 8. Canadian Distribution of Woodland Caribou. (© 2002 Thomas & Gray, by permission)

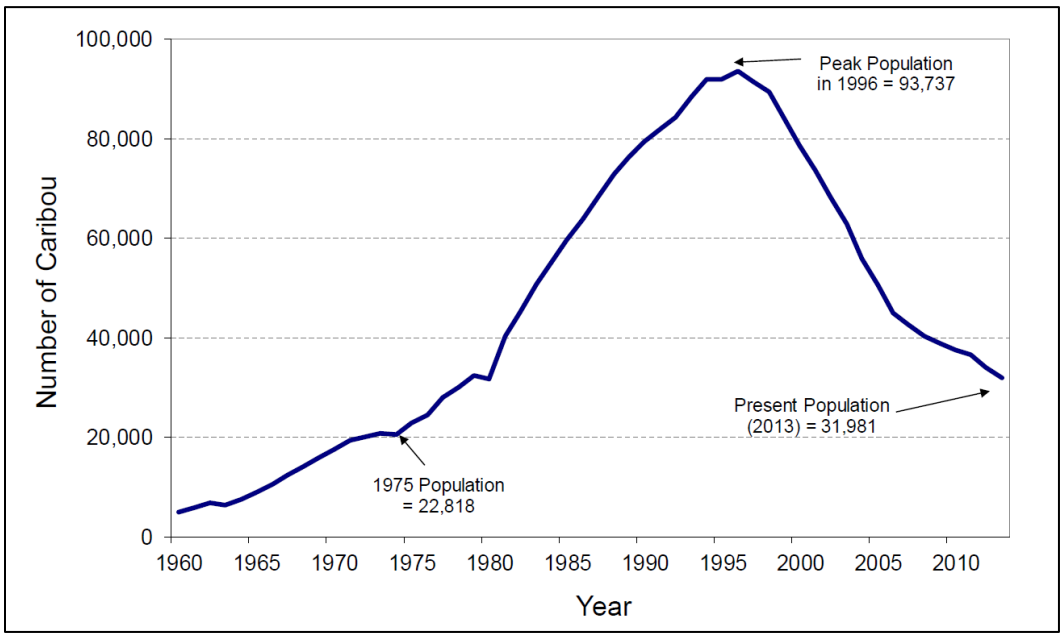

Figure 9. Estimated Abundance of Newfoundland Caribou. (© 2014 Weir, et al., by permission)

Prior to the 2014 COSEWIC report, and foretelling the change in the Newfoundland caribou population's assessment status from Not at Risk in 2002 to Special Concern in 2014, a

Various indices suggest that the population is improving but there is concern that Eastern Coyote, which has recently arrived to Newfoundland, may become a significant predator and influence recruitment such that the population continues to decline. (COSEWIC, 2014, p. 3)

2008 press release from the Newfoundland and Labrador Department of Environment and Conservation presented emerging research findings regarding the decline. By 2008, Provincial wildlife managers reported that caribou populations in Newfoundland had decreased by an average of 60% and some of the Island's herds (Figure 10) had fallen by as much as 90%. This decrease represented a reduction from 90,000 animals in 1996 to 37,000 animals just 12 years later (Government of Newfoundland and Labrador, 2008).

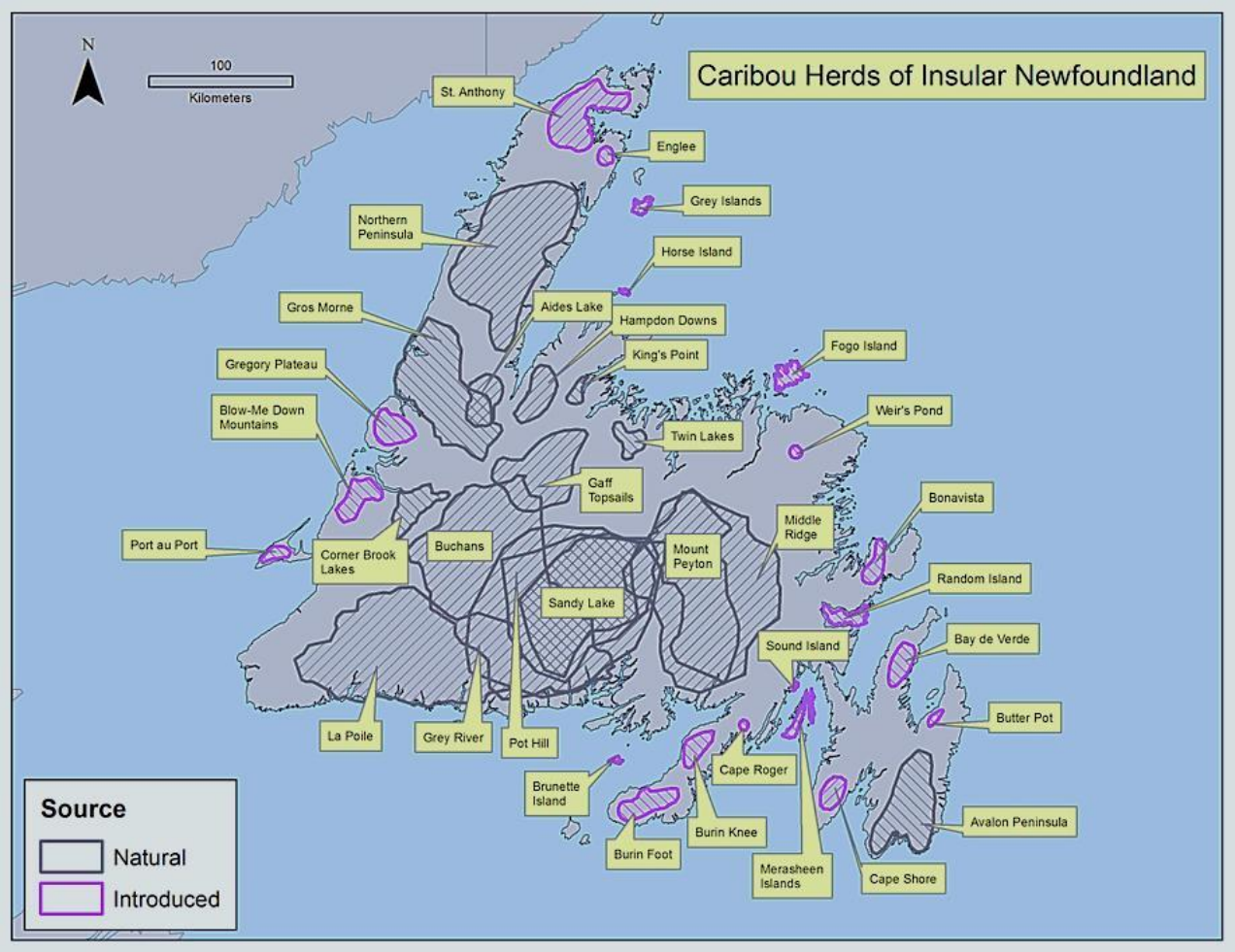

Figure 10. Newfoundland Caribou Herds. (© 2015 Kuehl, by permission)

Chapter 7. Analysis of the Presenting Situation: Key Relationships and Drivers of Change

Drivers of change in socio-ecological systems can be natural and social. From the system analysis presented here, several key drivers of change can be identified that have the potential to significantly influence the management of caribou in Newfoundland. These drivers include: the cultural significance of caribou, caribou declines and the issue of predation by coyotes, the impacts of natural resource exploitation, and caribou hunting.

7.1 Cultural Significance of Caribou

The cultural significance of caribou, or reindeer, as domesticated herds are referred to in northern Europe, can be traced back as early as 12,000 B.C. when early Europeans began to rely on these animals as their main prey species in postglacial Europe (Müller-Wille et al., 2006). The domestication of reindeer (which includes keeping herds of various sizes, using tamed reindeer as decoys to capture wild caribou, milking, and using the animals for transport and draught purposes) began approximately 2000 years ago (Müller-Wille et al., 2006). From this time forward, various levels of domestication spread throughout Europe, eventually reaching northernmost Europe by the late seventh century A.D. (Müller-Wille et al., 2006).

For Newfoundland's first human inhabitants, caribou held both spiritual significance and also utilitarian value. Even today Indigenous, First Nations groups, and even non-Indigenous people across Canada continue to attribute spiritual significance to caribou (Figure 11) and also hunt the animal for subsistence purposes (Kendrick, 2003; Thomas & Gray, 2002). For the Qalipu, one of Newfoundland's two First Nation Mi'kmaq Indigenous Bands, the importance

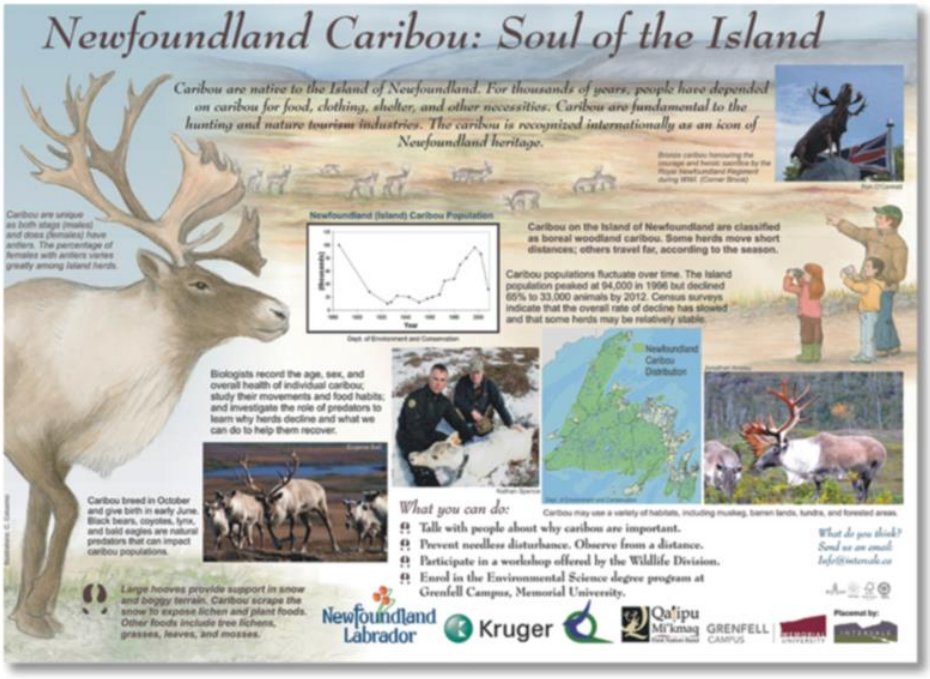

Figure 11. Newfoundland Caribou - Focused Information Placemat. (© 2016 Intervale Associates, by permission)

of caribou is not only represented in the name of their band: Qalipu (ha-lee-boo) which means Caribou in Mi'kmaw language, but is manifested in all aspects of their culture.

> The caribou were a staple of the Mi'kmaq people and were essential to their survival in Newfoundland. They were used for food, tools, clothing, wigwam covering and floor blankets, caribou-skin canoes, moccasins, snowshoes, caribou-hide packsacks…Using a name that is linked to wandering and migration makes sense for a landless band, because the native people lived a lifestyle similar to the caribou. They were not tied down to surveyed and fenced-in land, and they travelled the length and breadth of Newfoundland in their wanderings. The caribou, even in early times, were considered noble and dignified (Qalipu First Nation, 2016, para., 8).

Furthermore, as newly arriving Europeans began to settle in Newfoundland, the caribou provided a source of materials and food and also came to symbolize their new home. This symbolism was exemplified as early as 1637 when an Elk-like representation of a caribou was incorporated into the Newfoundland coat of arms (Figure 12) (Canadian Heritage, 2009). Recently the provincial Liberal party presented a proposal to redesign the coat of arms to include a more accurate representation of a caribou and a more accurate and respectful depiction of the province's indigenous peoples (Fitzpatrick, 2018). In 1795, a caribou symbol was also included in the Royal Newfoundland Regiment's Badge (Figure 13). As this unit was established in 1795, it is interesting to note that though many of the soldiers of the Royal Newfoundland Regiment would have been first or second generation immigrants to Newfoundland, this storied military unit adopted the caribou as a symbol of their new homeland (Veterans Affairs Canada, 2008).

7.2. Caribou Declines and the Issue of Predation by Coyotes

The literature pertaining to caribou management offers a variety of possible reasons for declines in caribou populations across Canada. Some of the most often cited reasons include: parasites and disease; habitat degradation from residential construction, energy infrastructure, or forestry; predation; climate change and weather; and hunting
(Blake, 2006; Mahoney & Schaefer, 2002; Mahoney & Virgl, 2003; Schaefer & Mahoney, 2007; Thomas & Gray, 2002). While all these causes are also present in Newfoundland, a 2015 provincial government report summarizing the preceding intensive five-year caribou research and management initiative concluded that the Newfoundland caribou population decline was

Figure 12. Newfoundland Coat of Arms. (© 2018 Government of Newfoundland and Labrador, by permission. Retreived from Heritage Newfoundland and Labrador, 2011)

Figure 13. Royal Newfoundland Regiment (RNR) Badge. (© 2018 Provided courtesy of RNR and the Department of National Defence. Retreived from Government of Canada – Canadian Army, 2018)

simply the latest in series of historical cycles between unsustainably high populations and consequent population crashes (Department of Environment and Conservation, 2015).

Although the current caribou population decline seems to be part of a natural, multigenerational cycle (COSEWIC, 2014), a number of factors have been identified as contributing to the recent decline. Licenced hunting of caribou, which continued even during the first years of the decline with relatively high harvest quotas based on past, high population estimates, undoubtedly contributed to the inevitable population decline (Government of Newfoundland, 2015). At various times habitat degradation and behavioural interruptions from forestry operations and hydroelectric development as well as incidents of disease outbreaks have also been identified as limiting factors for Newfoundland caribou populations (Mahoney & Schaefer, 2002; Schaefer & Mahoney, 2007; Mahoney & Virgl, 2003).

The provincial Department of Environment and Conservation (2015; 2008) has identified predation, particularly by black bears and coyotes, as influencing the caribou population decline through a reduction in calf survival (Figure 14). Predator management, especially the management of coyotes, is perhaps the most conspicuous and controversial of the drivers of change in this system. Although coyotes reached Newfoundland naturally (Blake, 2006), public reaction to these animals and wildlife managers' management plans for these and other caribou predators undoubtedly extends into the social realm. With many coyote hunting opportunities available to Newfoundland residents and, until recently, the provincial government providing a scientific research reward for coyote carcass submission, public perception of coyotes directly influences hunting pressure on this predator. While there is no evidence of an established mechanism for information exchange between wildlife managers and stakeholders, the perception of coyotes by both hunting outfitters and the general public (Frank, Glikman,

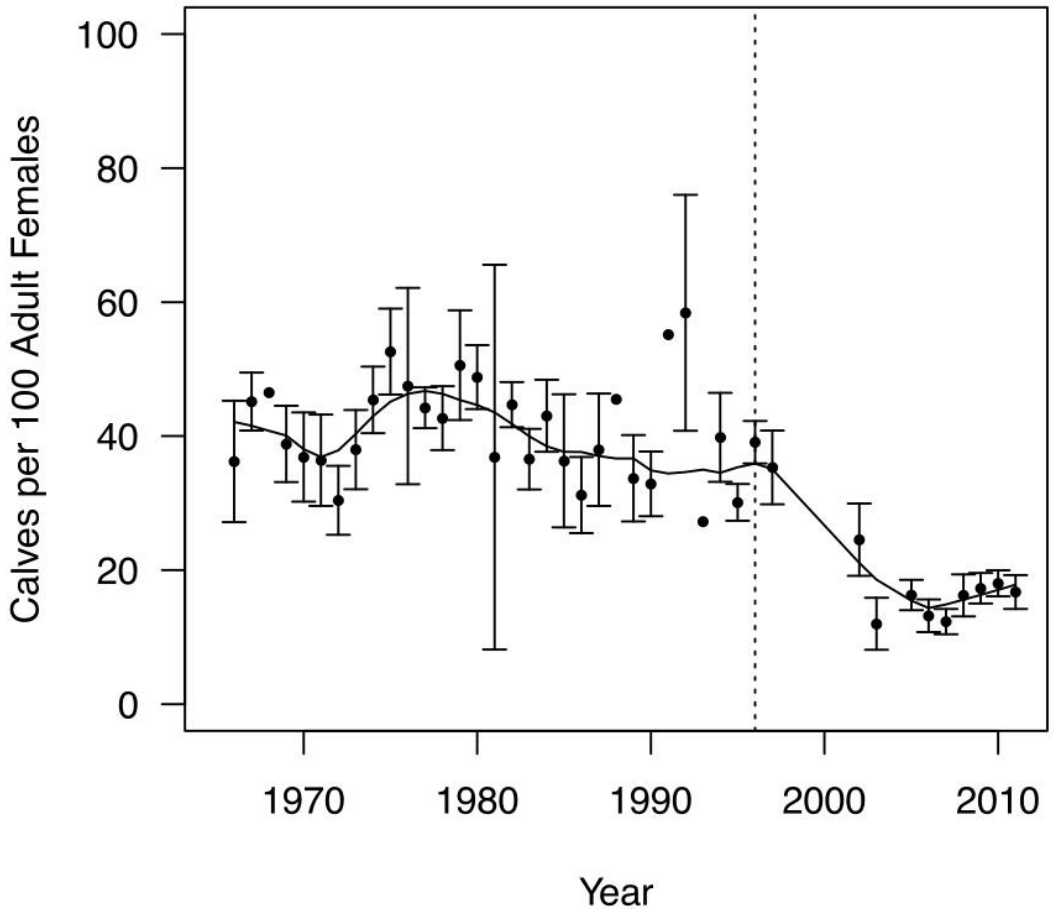

Figure 14. Caribou Calf Abundance. (© 2014 Weir, Morrison, Luther & Mahoney, by permission)

Sutherland, & Bath, 2016) will likely influence the extent to which wildlife managers attempt to control coyote numbers through bounties and coyote hunting seasons.

7.3 Resource Exploitation

First nations groups relied heavily on caribou and other animals for their food, clothing and tools. Later, with European settlement, the Island's rich cod fishing grounds became Newfoundland's most valuable resource (Overton, 1980). Then, as European immigrants established more formal settlements, Newfoundland's forest and mineral resources increased in

importance (Overton, 1980). Eventually, the hydroelectric potential of the province's rivers was realized and several hydroelectric dams were constructed (Baker, 2003; Mahoney & Schaefer, 2002). Most recently, oil has become one of the Island's most lucrative resources and several major oil wells have been established just offshore (Baker, 2003).

Just as in western Canada (Ray et al., 2014; Thomas & Gray, 2002), habitat degradation and change is likely an important driver of change in Newfoundland's caribou management. Forestry operations and hydroelectric developments affect the habitat, behaviour, and predation of caribou in Newfoundland (Mahoney & Schaefer, 2002; Mahoney & Virgl, 2003; Schaefer & Mahoney, 2007). If forestry operations and oil, mineral and hydroelectric resource exploitation continue in Newfoundland, impacts on caribou habitat and consequently caribou populations will undoubtedly increase (Figure 15). For example, the Muskrat Falls hydroelectricity development may have contributed to the significant decline of the once great George River Caribou Herd in Labrador (Wall, 2016). In the final report on the five-year caribou research and management initiative, however, the impact of resource development on Newfoundland caribou was found to be negligible owing to the Island's large tracts of as-yet- undeveloped, intact caribou habitat (Department of Environment and Conservation, 2015).

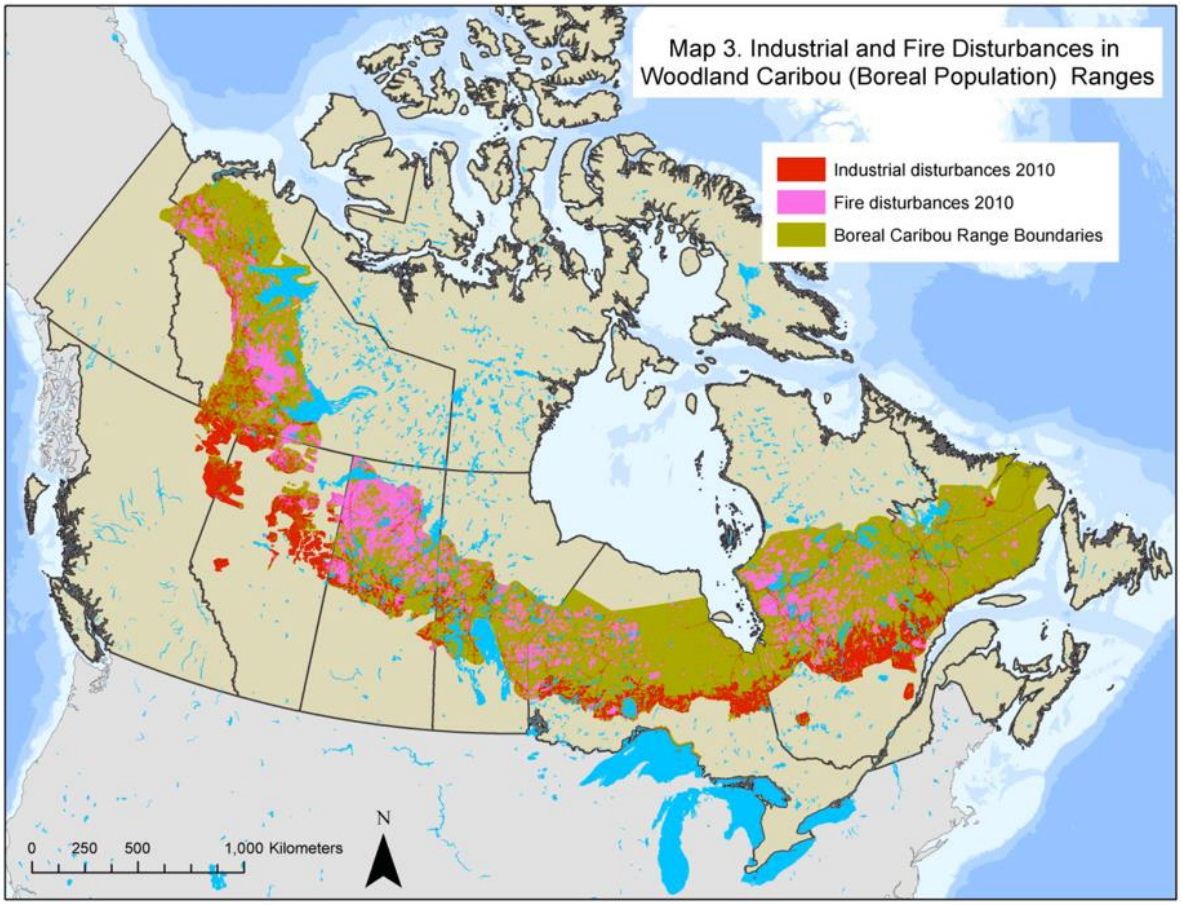

Figure 15. Distribution of Industrial and Fire Disturbance in Woodland Caribou Habitat. (© 2012 Lee, by permission)

7.4 Hunting

Hunting of wildlife species is a common way for some societal groups to supplement their food supply and carry on cultural traditions; hunting is also an important recreational activity for hunters as well as a lucrative endeavour for outfitters (Brown et al., 2000). While these factors influence hunting pressure on Newfoundland's caribou, perhaps the greatest influence on hunting rates in the province is wildlife managers' dependence on hunting to control population numbers (Brown, et al., 2000). Although the most recent population status assessment by COSEWIC (2014) identifies Newfoundland caribou as a population of Special Concern, the 2002 assessment of the same population found them to be Not at Risk and, according to the

authors of the 2002 assessment report, the Newfoundland population was, at that time, identified as one of only a few local populations across Canada that was increasing (Thomas & Gray, 2002). As predicted in the work by Brown et al. (2000), Thomas and Gray (2002) identified the importance of hunting as a mechanism to control the increasing populations in Newfoundland and avoid impending carrying capacity-related habitat damage. As the impending caribou population decline was still unanticipated in the 2002 COSEWIC assessment, caribou hunting quotas in Newfoundland were maintained and even increased in the 2000s even as populations were, in reality, rapidly declining.

While it is likely that people have hunted Newfoundland caribou since the arrival of the first humans on the Island approximately 5,000 years ago, licensed hunting began only in the early 1970s (Schaefer & Mahoney, 2007). Within two decades, caribou license holders were harvesting just over 1,000 animals per year (Schaefer & Mahoney, 2007). By the 2007-08 caribou hunting season the number of licenses issued had increased to 2,800 (Department of Environment and Conservation, 2009). In response to significant declines in caribou populations, however, the number of licenses was reduced to 1,200 for the 2008-09 hunting season, and some areas of the province were closed to hunting altogether (Department of Environment and Conservation, 2009). More recently, during the 2015- 2016 hunting season, Caribou hunting quotas on Newfoundland Island were set at just 745 animals, a slight increase from the 740 animal quota of the previous season (Department of Environment and Conservation, 2015).

Chapter 8. Stakeholder Group Overview

Stakeholder groups represented on the CRC were contacted for interviews for the study. These stakeholder groups include the Newfoundland Aboriginal Women's Network; the Newfoundland and Labrador Wildlife Federation; the Notre Dame Rod and Gun Club; the Newfoundland and Labrador Outfitters Association; the Department of Environment and Conservation; the Rural Secretariat; the Department of Tourism, Culture and Recreation; the Newfoundland and Labrador Trappers Association; and the Department of Natural Resources (Government of Newfoundland and Labrador, 2009). All but the Aboriginal Women's Network were successfully interviewed for the study. Considerable efforts were made to contact the Aboriginal Women's Network representative who served on the Caribou Rescue Committee but this person had moved out of the region and I was unable to arrange an interview. Each of the remaining stakeholder groups represented on the Caribou Resource Committee is expanded upon below. Before providing this overview, however, the lack of representation of Indigenous groups in both the CRC and in the data collection phase of this study warrants further discussion.

As outlined above, there are significant differences in Indigenous populations and levels of engagement in wildlife management between Newfoundland and Labrador. With the Miawpukek and Qalipu First Nations bands established in Newfoundland, the absence of representation of these bands on the CRC is unfortunate. While it was not possible to ascertain what efforts were taken to engage local Indigenous groups on the CRC, the Aboriginal Women's Network was the only indigenous group to be represented. As Indigenous perspectives are often seen as fostering environmentally sustainable livelihood systems (Magni, 2016), the IRM approaches sought in the context of caribou management in Newfoundland would undoubtedly be well-informed by such holistic perspectives. Indeed, this close connection between wildlife

and Indigenous peoples is well documented in Labrador where a number of integrated resource management efforts benefited from an earnest engagement of local Indigenous groups. Examples of such collaboration include the Torngat Wildlife and Plants Co-management Board (Torngat Secretariat, 2015) and provincial government's planned co-management of the George River and Torngat caribou herds in Labrador (Government of Newfoundland and Labrador, 2018).The lack of involvement of either the Miawpukek or Qalipu First Nations bands on the CRC calls into question the extent to which CRC membership truly represented the diversity of views regarding caribou management in the province. Any future iteration of the Newfoundland CRC must ensure adequate Indigenous representation as well as a greater diversity of other groups as well.

8.1 Newfoundland and Labrador Wildlife Federation

The Newfoundland and Labrador Wildlife Federation is the provincial branch of the Canadian Wildlife Federation and promotes itself as being the "largest and oldest conservation organization in the province with over 22 affiliated conservation groups and several thousand members" (NLWF, n.d., para. 2). The NLWF engages in conservation issues in a variety of ways, including conservation education, advocacy and lobbying efforts, and even wildlife research and monitoring (NLWF, n.d.).

8.2 The Notre Dame Rod and Gun Club

The Notre Dame Rod and Gun Club, one of eight in the province, is based in Lewisporte and provides shooting range facilities, comradeship to members, and advocates for fish and wildlife conservation. The Club's advocacy role is often carried out through contributions to popular media articles, often by calling into question staff or funding reductions for conservation

and enforcement (Wells, 2015); or promoting nature conservation measures such as the creation of new protected areas (Quinn, 2016).

8.3 Newfoundland and Labrador Outfitters Association

The Newfoundland and Labrador Outfitters Association (NLOA) represents 63% or approximately 110 outfitting businesses in Newfoundland and Labrador (BTCRD/NLOA, 2015). The goals of the NLOA include the following: develop positive working relationships with relevant government departments and organizations, provide assistance and information to outfitters to help enhance their business, and promote and expand the industry for the benefit of their members and the province as a whole (NLOA, 2013). According to the NLOA, the outfitting industry contributes $40 million annually to the provincial economy (Hutchings, 2007) (Figure 16). With significant declines in insular caribou populations, however, many outfitters have experienced lower hunting success rates and consequent losses in revenues (Hutchings, 2007; McGrath, 2005). Many hunting outfitters, especially those who rely on caribou hunting in Newfoundland, strongly support a cull of caribou predators including black bears, lynx, and especially coyotes (Kean, 2008; Newell, 2008).

Figure 16. Online Advertisement for Newfoundland-based Outfitting Company. (© 2011 Efford's Hunting Adventures, by permission)

When one considers the monetary value of Newfoundland's outfitting industry, their extensive membership base throughout the province, and the industry's strong opinions regarding caribou and predator management, the importance of this industry to the socio-ecological system of caribou management in Newfoundland becomes obvious. Perhaps further emphasizing the importance of the outfitter stakeholder group in Newfoundland's caribou management system is the fact that the cull of predators, as called for by some in the outfitting industry, has also been promoted by the provincial Department of Environment and Conservation (along with significant reductions in hunting quotas) as one of their main caribou conservation strategies to be tested as part of the five-year caribou research and management initiative (Department of Environment and Conservation, 2008).

8.4 Department of Environment and Conservation

Wildlife managers in Newfoundland are usually employees of the Wildlife Division of the Provincial Department of Environment and Conservation (recently renamed as the

Department of Fisheries and Land Resources). With the initiation of the Enhanced Caribou Management Strategy in 2006 by the Wildlife Division, caribou management was firmly established as one of the main priorities of the division and the department as a whole (Department of Environment and Conservation, 2007). The $15.3 million earmarked for the development of this strategy allowed wildlife managers to complete the necessary research to establish baseline information on the natural environment to inform future management of caribou in the province (Department of Environment and Conservation, 2008).

In addition to the natural environment research foci of this strategy, the Department of Environment and Conservation also committed to "clarifying the roles and responsibilities of the various stakeholders in wildlife research and management to ensure better cooperation and management of wildlife in the Province" (Department of Environment and Conservation, 2007). In working toward this commitment, the CRC was established to facilitate the exchange of information between managers and stakeholders (Department of Environment and Conservation, 2009).

Like most other government departments in the province, the Department of Environment and Conservation has recently undergone significant restructuring. The new (2017) Department of Fisheries and Land Resources now houses the Lands Branch, the Natural Areas Program, and, most relevant to the current issue in question, the Divisions of Wildlife and Fish and Wildlife Enforcement (Executive Council, 2017). This iteration of restructuring for the Department of Environment and Conservation, and the associated wildlife-related portfolios, is the latest in a series of attempts to reorganize the division and its branches over the years in the name of efficiency. The implications of such restructuring are expanded upon in next chapter.

8.5 Rural Secretariat

Again, like most other provincial government departments, the Rural Secretariat was recently reorganized under a new structure. Since 2012, the Office of Public Engagement absorbed the Rural Secretariat and four other offices that focused on public engagement (Government of Newfoundland and Labrador – Involve NL, n.d.). The inclusion of a representative of the Rural Secretariat on the CRC reflects the economic, cultural, and social importance of the caribou to the rural communities of Newfoundland. Fittingly, the first mandate of the Rural Secretariat is to "[p]romote the well-being of rural Newfoundland and Labrador through a comprehensive and coordinated approach aimed at integrating economic, social, [and] cultural aspects of rural and regional development" (St. Anthony – Port au Choix Regional Council of the Rural Secretariat, 2012, p. 15).

8.6 The Department of Tourism, Culture, and Recreation

Reorganized as the Department of Tourism, Culture, Industry, and Innovation in February of 2017, the former Department of Tourism, Culture, and Recreation, which was represented on the CRC, was charged with a diverse mandate that included supporting and developing "the tourism and cultural and heritage industries, and increased participation in physical activity and sport to improve the economic, social, and physical well-being of the people of Newfoundland and Labrador" (Department of Tourism, Culture and Recreation, 2008, p. 3). The primary connection between this department and the caribou discussions relate to the tourism potential from wildlife viewing and the province's outfitting industry.

8.7 Provincial Department of Natural Resources

Prior to provincial department restructuring in 2015 and again, in February 2017, the Department of Natural Resources included the Forestry and Agrifoods Agency. While a number of portfolios falling under this Department's umbrella relate to caribou management in Newfoundland, perhaps the most relevant is forest resource management. The Forestry and Agrifoods branch is currently housed within the Department of Fisheries and Land Resources. This new departmental structure separates portfolios related to renewable resource industries from those pertaining to non-renewable resources (Executive Council, 2017). The Forest Services branch is guided by the following vision:

> To conserve, manage and use the ecosystems of the Province, while ensuring the productivity and sustainability of these systems and their functions, which sustain forests and to provide for the utilization of resources by the people of the Province under the principles of sustainable development, an ecologically-based management philosophy, and sound environmental practices (Department of Fisheries and Land Resources, 2017, para 1).

With its mandate to manage forest resources that occur on the same landscape as Newfoundland's caribou, the inclusion of the Department of Natural Resources on the CRC is both fitting and perhaps indicative of a desire for a more integrated resource management approach to caribou research and management.

8.8 Newfoundland and Labrador Trappers Association

Similar to the NLWN, the Newfoundland and Labrador Trappers Association also engages in a variety of activities in pursuit of their mandate to "promote and preserve the

trapping heritage of our province" (Newfoundland and Labrador Trappers Association, 2014, para. 1). Since their inception in 1977, the main activities pursued by the Trappers Association include promoting trapper education, lobbying relevant provincial government bodies in support of the Association's mandate, and also "educating new and veteran trappers, as well as the interested public, in the latest innovative methods, equipment and economic and cultural value of our profession" (Newfoundland and Labrador Trappers Association, 2014, para. 1).

8.9 Provincial Wildlife Policy and Governance Context

Though conservation or enforcement officers are often the most visible representatives of wildlife management in the province, wildlife management policy and decision making rests with the Wildlife Division (currently housed within the Department of Fisheries and Land Resources but formerly, during the time period identified as the focus for my work, within the Department of Environment and Conservation). While the Wildlife Division is the government agency often seen as the decision-making body in wildlife research, conservation, and management, it is perhaps best viewed as a part of the larger governance structure hierarchy made up of interactions between a variety of other institutions and actors that influence management direction (Francis, 2007). In describing governance and its influence on caribou management in Newfoundland it becomes obvious that while there are a number of actors and institutions affected by the direction of caribou management in the province, there are few opportunities for these groups to have an earnest influence on wildlife management decisions (Figure 17).

While some provincial wildlife management direction is provided by federal guidance (e.g. species at risk), the preferences voiced by relevant provincial ministers, an inter-provincial

committee of wildlife directors (the CWDC), and the wildlife division researcher's own scientific and contextual understanding of the issues in question, this more simplified management model (8.2) differs considerably from the Adaptive Impact Management (AIM) model presented by Riley et al., (2003) and a later manager's model for wildlife disease management presented Decker et al. (2006). For both the AIM and disease management models stakeholder input is necessary from the beginning as the impacts warranting management attention are defined through stakeholder input.

In Newfoundland wildlife management, however, the only provincial actors for which there is an established mechanism for providing input into wildlife management and decision making are consumptive wildlife users as much of the data upon which wildlife management decisions are based comes from hunters in the form of big game harvest effort, rates, and locations (Department of Environment and Conservation – Hunting and Trapping Guide, 2009). The only formal collaboration conduit between wildlife managers and stakeholders was the CRC, which was established for a specific purpose and for a short period of time (the five-year caribou research and management initiative). As discussed in later chapters, this committee or one like it could play an important role in more integrated approaches to provincial wildlife management in the future (Figure 17)

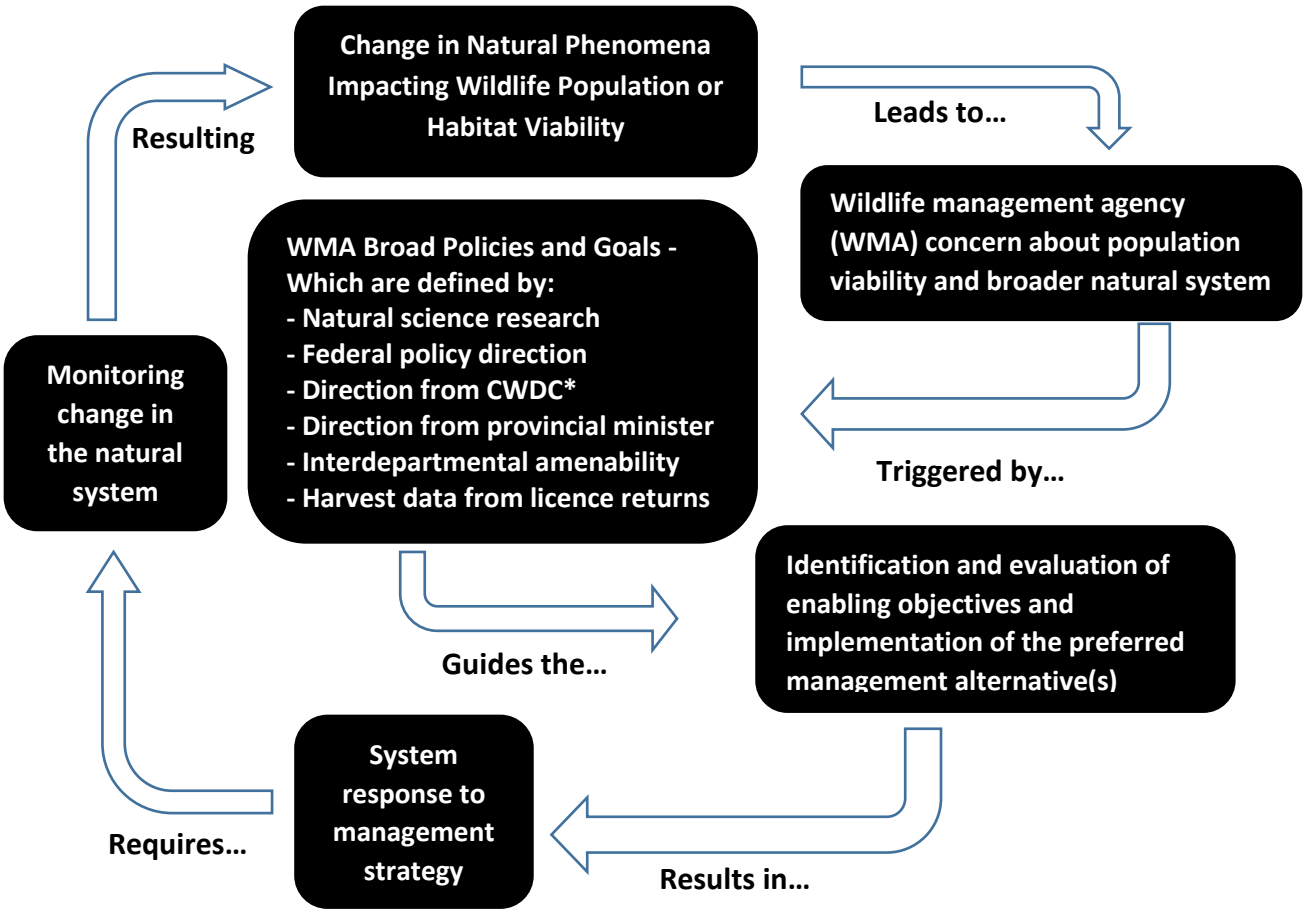

Figure 17. Simplified Wildlife Management Model with No Opportunity for Formal Stakeholder Input

8.9.1. Challenges

Issues of complexity and difficulty of prediction are important challenges facing managers of Newfoundland's caribou populations. Drivers of change such as changes in predator numbers or the influence of global climate change on caribou habitat are difficult to predict. One overarching challenge can, however, be identified that has a clear and immediate impact on caribou management in Newfoundland: the challenge of fostering cooperation between managers

and stakeholders in the province. A wildlife management system is composed of the interaction between wildlife species, their habitats, and the people who depend on, affect, or are affected by management (Giles, 1978). As evidenced by a lack of an established means of information exchange or any form of long-term cooperation organization between wildlife managers and stakeholders, wildlife in the province has traditionally been managed from a biological and ecological understanding of the species with management information coming mainly from harvest data. This continued lack of collaboration between managers and a wider diversity of stakeholders is a pervasive challenge facing the caribou management system in Newfoundland.

As stated by Nobel, Ramirez, and Lightfoot (2008, p. 152) in their discussion of the challenges of linking hard and soft systems "[a] further challenge is the complexity of relationships between local and national policy makers and their clients, the local community". This statement coincides very well with each of the key relationships that have the potential to influence change in the caribou management system in Newfoundland. The lack of a dedicated, long-term intermediary organization between stakeholders and wildlife managers has the potential to negatively influence the legitimacy and thus effectiveness of future caribou management (Figure 17). For instance, hunters and outfitters might react negatively to significant reductions in the number of caribou hunting licences issued by the Department of Environment and Conservation if the stakeholders are unaware of or disagree about appropriate caribou management. Similarly, without some form of consensus or collaboration between stakeholders and wildlife managers regarding the role of predation or various forms of habitat degradation on caribou populations, managers can expect little cooperation and compliance with the management strategies they propose to address this issue.

Chapter 9. Dimensions of Integrated Resource Management in Newfoundland Caribou Management

The results from this study are organized to facilitate an examination of how the various dimensions of IRM are manifested in caribou management in Newfoundland. The dimensions of IRM identified by Slocombe and Hanna (2007) include disciplines; information; spatial/ecological units; governments; agencies; interests/sectors; and perceptions, attitudes and values. As some IRM dimensions are closely related and were addressed in concert or simultaneously in both interviews and popular media articles, the dimensions are grouped here into three categories to frame this results section.

The three general categories and the IRM dimensions associated with each include the following:

Horizontal Integration. Efforts to address the fragmentation of authority for resource management between various government departments and agencies, horizontally, at the same (federal or provincial) level. The IRM dimensions falling within this general category include Governments (especially relevant provincial government departments), Agencies, and Interests/Sectors (e.g. forestry, hunting, conservation).

Vertical Integration. Identification and application of appropriate public involvement strategies to solicit relevant information from affected stakeholder groups as well as efforts to integrate this human dimensions information to inform management. The IRM dimensions falling within this category include Perceptions, Attitudes and Values; Disciplines (especially the integration of natural and social science perspectives), and Information.

Ecosystem Approaches. The data and discourse emerging from interviews and popular media articles pertaining to landscape-scale and ecosystem-based management efforts, adaptive management, and the IRM dimension of Spatial-Ecological Units.

9.1 Horizontal Integration

To elucidate the extent to which horizontal integration was manifested in the context of caribou management in Newfoundland, interview data, departmental reports and popular media articles were analyzed with the intention of isolating discussion pertaining to horizontal integration, such as integration of or fragmentation between relevant government departments, interest groups, and sectors. The need for greater integration between relevant government departments and the sometimes-diverse interests they represent was highlighted by a majority of interviewees and in a considerable number of popular media articles and press releases. In fact all 18 interviewees addressed the importance of horizontal integration in some form, with many referencing the need for successful caribou management to be informed both by strong wildlife research (e.g., field surveys of caribou and predators, habitat and forage capacity, population/animal health assessments) *and* information regarding the cultural and economic significance of caribou and various management strategies; these latter values were often represented by the provincial departments of Tourism and Forestry. The need for such integration was well articulated by one interview participant, who called attention to fragmentation between government departments that resulted in a breakdown in collaboration and coordination,

> "I think what's required in this particular case is a higher-order direction on what the decision makers want us to do. [Currently] a central agency within government tells the Wildlife Division this is your mandate and tells Forestry or Agrifoods this is your mandate and you squirrel away and do your separate things and hope everything works out. And most times it doesn't unless someone at the end of the day provides direction and says 'listen we're going to get along here and we got to find a way to move things forward in harmony'" (Interview #8).

Similarly, when discussing successful caribou management approaches, one interviewee acknowledged both the ecological and social aspects,

> "…I think there are two aspects to it [successful caribou management in Newfoundland]. One would be an ecological one, so we have populations…whose persistence is assured…[w]here caribou are still playing the role that they normally do as important herbivores as important prey items…they are doing their ecological role…I think that the other part [of being] successful would be the connection to people… successful in my mind would also mean some cultural attachment…or just understand the value of caribou to the culture of the people on the Island" (Interview #7).

With the intent of fostering a more horizontally integrated approach, the government of Newfoundland and Labrador has taken steps to combine (geographically at least) the departments responsible for the management of forests, wildlife, and agriculture. In 2000, then Premier Brian Tobin announced the regionalization of nine government departments to areas outside of the capital city of St. John's. The relocation of 275 positions was promoted in a press release from the Premier's office as a way to both "make government more accessible in different parts of the province, [and to also help] more evenly distribute the economic benefits of government to more communities" (Government of Newfoundland and Labrador, 2000, para. 2). Included among these relocated departments was the Department of Forest Resources and Agrifoods, which at the time also housed the Inland Fish and Wildlife Branch, the body responsible for the management of big and small game, endangered species, and inland fish.

From the standpoint of integrated resource management, moving the Inland Fish and Wildlife Branch to Corner Brook to "permit a further integration with the department's forestry

mandate, which is already located in Corner Brook" (2000, para. 42) was an ambitious goal. The Premier's office acknowledged the importance of such integration and stated that,

> "The department has adopted an eco-system based approach to the management of our outdoor resources. Ecosystem management strategies take values into consideration including forestry, wildlife, fish, rare plants, eco-tourism potential and recreational use. The consolidation of Wildlife & Inland Fish and Forestry Headquarters into one location will strengthen the department's ecosystem management philosophy" (2000, para. 43).

Ambitions such as these coincide directly with the integrative approaches necessary to reduce fragmentation and achieve horizontal integration.

Discourse about the importance of bringing relevant values and government departments together to address caribou management challenges in Newfoundland was also evident in popular media articles and provincial government reports. Though many of the provincial government reports were focused on natural science, almost 25% of the 45 popular media articles and provincial government reports addressed, to varying extents, topics related to integration, inter/multidisciplinary approaches, ecosystem-based approaches, collaboration, or landscape-scale approaches. For instance, a 2011 bulletin from the Canadian Boreal Initiative stated,

> "to conserve caribou and facilitate more effective forest management planning, the Island of Newfoundland should adopt a landscape-level approach that seeks to maintain large intact landscapes across areas inhabited by caribou. …Until an effective approach to managing large intact landscapes is developed, the Newfoundland and Labrador Department of Natural Resources should adopt a temporary deferral on new commercial

harvesting and road building within intact forest landscapes occupied by caribou" (Wells, Jacob, Goudie, & Feldgajer, 2011, p. 2).

Similarly, a 2015 provincial government report on insular caribou populations stated that,

> "Conservation and sustainable use of Newfoundland's caribou population over the long term will require collaboration of scientists, managers, enforcement officials, land developers and resource extraction industries" (Government of Newfoundland and Labrador, 2015, p. viii).

9.2 Horizontal Fragmentation

While the goals of the relocation of a number of government offices from the capital city to Corner Brook did coincide with the aims of IRM, the result was a geographical separation of wildlife science research (which remained in St. John's and was eventually directed by the Sustainable Development and Strategic Science Branch) and wildlife management (which was headquartered in Corner Brook). Related to this relocation, a substantial number of interviewees highlighted a period of significant fragmentation both within the provincial Wildlife portfolio (between the areas of wildlife research and wildlife management) and between the Wildlife Division and the Department of Forestry in the province. Of the 18 interviews conducted, 11 interviewees, acknowledged fragmentation between these two essential components and cited instances of inadequate information sharing or collaboration, thus preventing truly effective wildlife conservation. The quotations below capture the sentiment expressed by many of the interviewees who called attention to this fragmentation:

> "I don't know that the best use is made of the data for caribou management…you know there are some sensitivities regarding caribou management and that doesn't help, right?

> There's some of this, I guess, friction between agencies and you know…if that were to be removed I think management could be improved" (Interview #9).
>
> "…there was a critical five-year period there after the wildlife division got shifted to Corner Brook and the upheaval that resulted from that and the acrimony, the internal acrimony that resulted from it" (Interview #14).
>
> "Because of the way that the caribou initiative was carried out, there was, in my experience, very little contact with wildlife division by itself – this [the Five-Year Caribou Strategy] was a separate entity, it was funded in a certain window of time…and while there was some flow of information…it was, let's say, difficult for a variety of reasons having to do with historical mistrust between the somewhat fractured, that's putting it mildly, effort on the island. So information flow happened, but it was difficult" (Interview #6).

Commenting more specifically on the apparent fragmentation within the wildlife management portfolio, one interviewee stated:

> "There are two groups and [for] the caribou piece specifically, it seems like the SDSS [Sustainable Development and Strategic Science based in St. John's] had been given some authority, they certainly were given a substantial budget to look at this question of what the optimal number of caribou ought to be. But at the same time the Wildlife Division [based in Corner Brook], which apparently, even though they were within the same department, are completely separate from those activities…were, I assume, in parallel trying to do similar work and it became known to many people very soon that there was…not always harmony between those two" (Interview #8).

Similarly, another interviewee acknowledged the management challenges caused by the, separation (geographical and otherwise) between science (St. John's) and management (Corner Brook). In discussing the separation of the two in 2000, one interviewee stated that,

> "It became much more difficult for the folks charged with management to access information and there were several instances of people being very angry about that" (Interview #11).

Unfortunately, it seems that efforts to foster integration between relevant departments and agencies, in this case forestry, agriculture, and wildlife, instead inadvertently contributed to fragmentation not only between departments but also between the areas of science and management within the wildlife portfolio. Commenting on the seemingly long-held and entrenched incongruity, whether real or perceived, between these two sectors, one interviewee stated,

> "what you had was a bunch of…wildlife biologists in the wildlife division and they had spent a good part of their career angry at habitat deterioration that they perceived was the outcome of forestry operations and suddenly their adversaries were supposed to be their chums, and that just didn't work" (Interview #11).

Similarly, regarding efforts to foster greater collaboration between other provincial natural resource management departments and the Wildlife Division, one participant stated,

> "there has to be an admission [by] the authorities that are tasked with managing wildlife in this province to…acknowledge the fact that there needs to be inclusion in the decision-making process and in spite of us [a provincial natural resource management department] having asked to be part of the decision-making process, we were not permitted to be part of it…at various intervals we had requested to be part of the discussion and you know we

were asked for our input but not permitted to be at the table where the real questions were taking place" (Interview #8).

Both interviewees and popular media articles reported that the timing of the disruption caused by the relocation and attempted integration of the above-mentioned departments unfortunately directly coincided with an important turning point in the status and trajectory of Newfoundland caribou populations. The rapid shift in Newfoundland caribou populations from growth, to a peak population in excess of 90,000 animals in 1996, to the beginning of a rapid decline (by 9%/year during some periods), occurred between the mid-late 1990s and early 2000s (Mahoney & Weir, 2009), which coincided with this tumultuous time for those provincial bodies charged with wildlife research and management.

The challenges and management implications of this population shift were not lost on those closely associated with caribou management efforts. As one interviewee stated,

"It seems that nobody was inspired to do their job as wildlife managers…so for five years nothing really got done and this was the critical five years" (Interview #14).

The suggestion that the work of provincial wildlife managers and researchers was sidetracked during this pivotal time period is supported by the fact that in an otherwise essentially unbroken record of research, caribou population data gaps occur during this transition period. By the time the caribou research program was restarted, caribou population trajectories had changed drastically (Figure 18). This coincidence of disrupted research and management when the trajectory of the caribou population reversed is captured succinctly by one interviewee,

"if you look at [the caribou population data] there is a break. That's [the data are] virtually continuous from the late 1970s, early 1980s until 1997 I think, something like that [a data gap] until something like 2004, that was the [caribou] population peak. Just at

> the time when we should have been trying to learn what was going on, that [research on caribou populations] turned off and I know, I was there…That was largely due to "small p" politics, so much disruption of the department that research essentially turned off at the crucial moment" (Interview #7).

This untimely data gap has also been highlighted in the popular media with one CBC News article stating,

> "Newfoundland and Labrador kept excellent data on caribou for nearly 100 years, but in 1997, the work of counting the animals abruptly stopped. When it resumed in 2003, researchers were shocked to discover that almost no caribou calves were surviving their first year" (CBC News, 2012, para. 3)

The fragmentation within the wildlife portfolio also negatively affected the department's ability to formulate and implement effective management efforts. Commenting on what were perceived to be inappropriate caribou hunting licence allocations during the early stages of the caribou population decline, one anonymous letter to the editor presented an opinion regarding an unfortunate combination of factors detracting from effective caribou conservation,

> "Licences were increased from 4,525 in 1996 to 7,730 in 2001 and occurred at a time when the wildlife division was in total disarray and the coyote was just getting a foothold throughout the island" (Letter to the Editor, 2008, para. 4).

Since the initiation of the Caribou Recovery Program in 2008 extensive, detailed, and rigorous data have been collected on many relevant indices of caribou population status and trajectories (Government of Newfoundland and Labrador, 2015). Through modeling and interpolation of information from before and after the 1997 – 2003 data gap (Figure 18), provincial government researchers have filled in the information gaps created during the years

when no data were gathered. Figure 18 however, shows the significant transition in caribou calf recruitment that occurred during the 1997 – 2003 lapse in data collection. In the 2002 assessment by COSEWIC, Newfoundland caribou were the only North American population of Woodland caribou to be declared as “Not At Risk”, and at that time, Newfoundland was home to 82,000 by COSEWIC, Newfoundland caribou were the only North American population of Woodland caribou to be declared as “Not At Risk”, and at that time, Newfoundland was home to 82,000

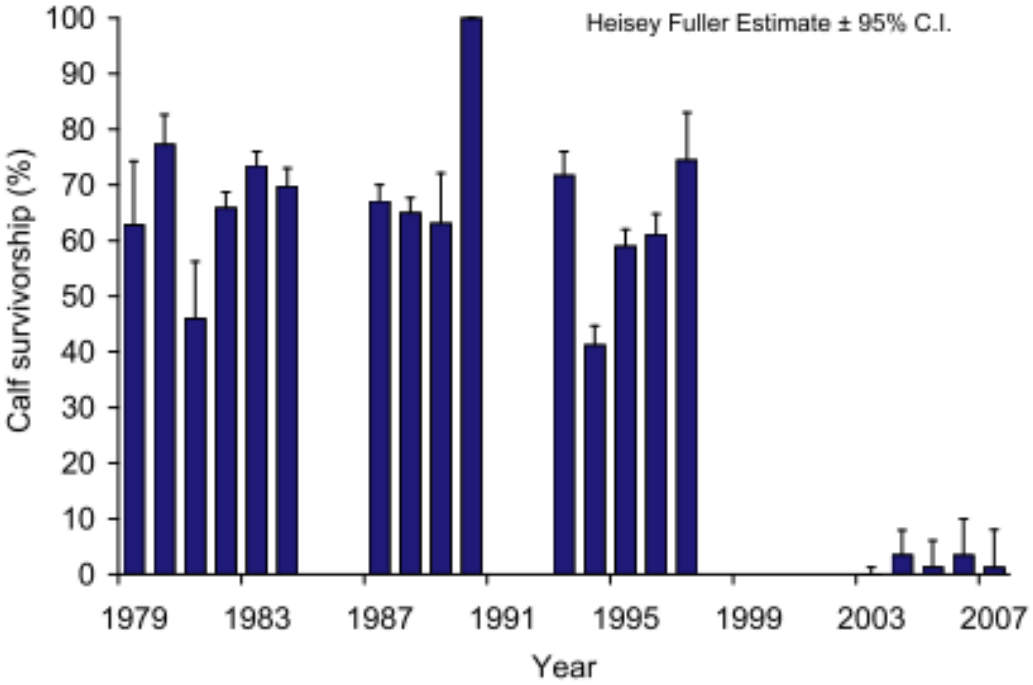

Figure 178. Survivorship Estimates for Caribou Calves from 1979-2005. (© 2009 Mahoney & Weir, by permission)

caribou, which represented 80% of all Woodland caribou in North America (Trindade, et al., 2011). By 2012, however, the population had fallen by 66% to 32,000 animals (Government of Newfoundland and Labrador, 2015).and a more recent COSEWIC assessment in 2014 assessed Newfoundland Woodland caribou as a Species of Special Concern (COSEWIC, 2014).

9.3 Vertical Integration

Vertical integration refers to the application of public involvement strategies to solicit relevant information from affected stakeholder groups as well as efforts to effectively integrate this human dimensions information into management. In this case study, there were some efforts to move beyond the traditional wildlife biology inputs and to solicit information from other affected stakeholder groups. In the context of caribou management in Newfoundland, the CRC is the most obvious manifestation of vertical integration.

9.3.1 Caribou Resource Committee

The CRC was established in 2008 as a means of information exchange between stakeholder groups and the Sustainable Development and Strategic Science branch of the provincial government, which was responsible for studying caribou population declines and developing a management strategy (Government of Newfoundland and Labrador, 2009, para. 1). The composition of the committee was diverse and included representatives of 12 stakeholder groups associated with caribou management in the province (Government of Newfoundland and Labrador, 2009).

The CRC, however, represented only special interest groups and not necessarily the broader public interest. Related to this point, one interviewee stated the following:

> "…we don't have a great diversity of NGOs in this province…to argue articulately in the public domain for their views…what we have is a very simplified decision-making process that largely sees the decisions flowing between the professionals within government responsible for these resources and the government officials who ultimately make the decision" (Interview #17).

While the diversity of NGOs in the province likely falls short of other jurisdictions in Canada, it seems that while some stakeholder groups, such as Newfoundland's First Nations bands mentioned above, are present and active in the province, they were not represented on the CRC. Relatedly, one interview participant identified concerns regarding the composition of the committee and the extent to which its members truly represented the range of interests associated with the caribou management in the province. Commenting on the composition of the committee the interviewee stated,

> "…it seems that some of them [CRC members] may even be…preselected…I think probably for the right intent, but they are also invited because I think there is a view that they're the people who might best help government navigate this issue. Either because they will be more cooperative or because you know they are just the people that are identified as probably useful for committee structures….But there's a risk in how you choose, and if you don't set up a system where you know it's very open, transparent and maybe equal in terms of who can come to the table then maybe you lose something there because you're making certain assumptions" (Interview #1).

The manner in which stakeholder group representatives are selected by those convening such a committee can influence the actual and perceived efficacy of the group. Details on how CRC representatives were chosen is not available, but the above statement suggests that specific individuals may have been invited to form the committee. While, as expanded upon below, a diversity of groups should be invited to join such a committee, the selection of representatives should be left to each individual group. Such attention to the equity of procedure (how decisions are made and by whom) is highlighted by Dawson, Martin & Danielsen (2018) as an important objective for effective protected areas governance. In the context of Newfoundland caribou

management, adopting such a practice will both address concerns of collusion between representatives and those convening the group and also foster a greater sense of ownership of the process by the groups represented.

Discussions by most interviewees regarding the CRC, however, were more positive. In commenting on the interests represented on the committee one participant stated,

> "…the caribou resource committee was struck to involve stakeholders from the community...everybody who is there I think has some valuable kind of role to play or…simply as an information conduit to the membership or their own stakeholders…. They can pass on the information and the community at large can decide what they want to do with it" (Interview #2).

Similarly, commenting on the merits of the CRC, one interviewee stated,

> "…it's…important to provide a voice to anybody who thinks they have an interest in it [caribou population decline and associated management responses] ...I think the Caribou Resource Committee did that. You know my thinking is that it captured a very wide range of perspectives, both government and non-government" (Interview #8).

Still another interviewee commented positively on the function of the CRC and stated,

> "…[through the CRC]…the different members have suggested lines of research that we might want to take part in…so we certainly considered those…" (Interview #9)

With few avenues for participation available to stakeholders previously (or even subsequently), it is not surprising that many participants in the current study indicated strong support for the CRC and the opportunities for information sharing it provided. As noted by one interviewee,

> "Up until now [prior to the CRC], most of this stuff [wildlife management decision making] has been done sort of 'in house' without any real input from the community or stakeholders like the NLWF [Newfoundland and Labrador Wildlife Federation] or the outfitters association, and other groups like that. This is, seems to me anyway, the first real effort at getting stakeholders like that involved in the process, in the management process and I think that is something that's going to have to continue for sure" (Interview #2).

Similarly, another interviewee commented on the role of the CRC in providing a venue for an open and respectful exchange of information.

> "The Caribou Resource Committee process did a real good job at facilitating a discussion amongst all stakeholder groups that had an interest and educat[ed] me, I learned a lot from that process that I didn't know about outfitting. And it was only through healthy debate at that table" (Interview #8).

9.4 Integrating Different Types and Sources of Information

Participants indicated a strong desire to have both stakeholder information and scientific research information respected and integrated into management efforts. For instance, when asked for their opinion regarding successful caribou management, one interviewee articulated the need for both natural and social science knowledge and perspectives:

> "I think there are two aspects to it. One would be an ecological one, so we have populations…whose persistence is assured...where caribou are still playing the role that they normally do as important herbivores as important prey items, for example they are doing their ecological role that population persistence is assured. I think that the other

part successful would be the connection to people. So we know [the] relationship of caribou to Newfoundlanders" (Interview #7)

Similarly, another interviewee also mentioned the need for natural and social science in successful caribou management process and stated,

> "successful caribou management would first and foremost take into consideration…an appropriate population density, but at the same time not being oblivious of the views of other resource users and [the] needs of folks who have depended on caribou for a long time for subsistence" (Interview #8).

The multifaceted nature of the effects, and thus diverse interests associated with caribou management issues facing Newfoundland, was captured by one interviewee who stated,

> "I don't think it's [the caribou population decline] a one dimensional problem I think it's a multi-dimensional problem, there's a lot of considerations, to take into account, you have economic issues with outfitters, you have tourism industry, you have people in conservation biology, you know there is a lot of intangible values about caribou it is a bit of an icon of our province, this point of view spiritually all the way to hunting for food to many, so we have a broad interest and value in caribou, so it is critical that the objectives we set manage it in a sustainable way but take into account a lot of values and interests as best we can" (Interview #1)

When asked about the contribution of various sources of information to decision making, one interviewee echoed this perspective and acknowledged that while "non-scientists" may have information that may contribute to the decision-making process, it should be evaluated differently than the contributions of research and management professionals.

> "I don't want to overplay the role of the scientist here, but the problem with, the non… and maybe I shouldn't use the word science, maybe it's information. Those of us who had really detailed information about what happened versus those of us who know the surface of it" (Interview #5).

Not surprisingly, differences of opinion persist regarding both the validity of different sources of information and also the extent to which information solicited from stakeholders should contribute to management. This sentiment is captured well by one interviewee who stated,

> "Guidance and advice is not necessarily equal…I think…the value you get in advice has to be…assessed you know in light of the expertise…that's providing that advice. If you have naïve information or misinformation then you have to start discounting some of that and getting on with information that you know, is valid and is useful…I think decision makers have to probably place a little bit of priority on some types of advice given its background and given the expertise behind it and given the motives behind it too" (interview #1).

This distinction between stakeholder information and "expert input" coincides with the discussions in the literature (Dovers and Price, 2007) regarding the distinction between informative and decisive forms of Integration, discussed below.

9.5 Bridging the Gap between Informative and Decisive Integration

Dovers and Price (2007) make the distinction between informative integration, which refers to efforts to solicit various types of information from relevant disciplines and stakeholders to help *inform* decision-making processes, and decisive integration, which involves the *formulation* of actual decisions and policy. Important parallels can be drawn between the

categories of vertical and horizontal integration in Newfoundland caribou management presented above and the categories of informative and decisive integration as presented by Dovers and Price (2007). While interviewee comments show that participants in the CRC wanted more effective horizontal and vertical integration, there is little evidence in this case study of efforts by wildlife managers to elevate stakeholder input to the level of decisive integration and thus facilitate the earnest engagement of stakeholders in actual decision making.

A number of interviewees advocated for bridging the gap between informative integration and decisive integration. As stated by one interviewee:

> "what we need is a process that's inclusive and has more moving parts with meaningful roles to have…a reception of information, a delivery of information from the experts and an opportunity to meaningfully influence the dialogue and decision making. For instance, if you ask…[the]…public, ok, here's our data, do you think we should manage these populations to rise and fall or do we manage them and try to maintain 60 – 65,000 animals and hopefully reduce these perturbations? And professionals should be able to say here are the risks and benefits of each of these approaches, which do you think is best? But we don't do that. We don't do anything even remotely close to that, so that's what we should be doing" (Interview #17).

Similarly, another interviewee indicated the risk of stakeholders becoming disillusioned if not given the opportunity to make an earnest contribution to the decision-making process,

> "To me successful decision making means that the right players sit around the table and have an open frank discussion and then come to some decision around that …but that government needs to be open to it as much as anybody else. You can't expect the outfitter to come to the table and lay bare his soul and government to say "mhmm, yeah, well"

> [interviewee's inflection suggests this is to mean indifference/apathy], there has to be…you gotta establish trust around that [the decision-making process] and you have to be seen to establish trust. It's not enough to say "ok we're here now, we're open, we're gonna be doing it" (Interview #15).

Yet another interviewee suggested that decision-making processes void of earnest public involvement contributes to mistrust of wildlife trustees,

> "There is a mistrust of government where unless the [decision making] process is open…so you're managing a resource on behalf of the people but you're a government entity or you work directly for government…but people don't think that you work for government and therefore what you say is true or right…there's a huge mistrust of government which has gone from politicians to public servants" (Interview #16).

Reiterating the absence of a formal stakeholder-engagement structure, one interviewee stated,

> "Successful decision making has to be far more inclusive in this province than it is…[there is]… very little mechanism of any meaningful nature for the public at large to engage in that decision-making process" (Interview #17).

Similarly, another interviewee expressed displeasure with the lack of a formal committee that is truly representative of the diversity of interests regarding caribou management in Newfoundland,

> "in terms of going out and formally engaging multiple sectors it doesn't really happen very well in my opinion...in the past [prior to the CRC] there have been committees of stakeholders that have been engaged to [formally] advise on caribou management decisions…but what there hasn't really ever been to my knowledge is a committee that includes people that don't have a vested interest, people who aren't financially interested" (Interview #12).

While not referring specifically to the CRC, or stakeholder groups more generally, disillusionment with the integrity of wildlife managers as trustees was also reported in an anonymous but strongly-worded letter to the editor that called attention to increases in license sales during the first few years of the caribou decline and questioned the actual role of coyote predation in the decline,

> "those unparalleled [caribou] licence increases [which occurred just as caribou populations began to decrease] were in response to intensive lobbying from special interest groups. And [it's] not surprising within a few short years the folly of increasing quotas without the science to support such a decision became evident when everyone realized that the caribou population could no longer sustain those great financial expectations. However, rather than accept responsibility for the part they contributed to this caribou population decline, hunters and outfitters alike pointed the finger at the coyote as the culprit" (Letter to the Editor, 2008, para. 7).

In discussing the perceived inadequacy of efforts to provide an effective means for stakeholders to provide input into wildlife decision making, a number of interviewees referenced the district-level public consultation process used by forest resource managers as an example of a more effective process,

> "I've said for many, many years: if we did as good a job in wildlife with respect to what forestry was doing [regarding public consultation], we would have made an order of magnitude leap forward, but of course we don't" (Interview #17).

Again referencing the public consultation process employed by the Forestry Division another interviewee stated,

> "[the] forestry branch carries out a very comprehensive public consultation process in its forest management planning process…most often it does create some controversy…but at the end of the day it is a comprehensive process and anyone who thinks they have an interest in it is invited to attend and participate in it…I don't see that in wildlife and if it exists it's certainly not something that I would have saw fit to participate in…because I just didn't know it existed" (Interview #8).

In discussing a current lack of integration and a desire for greater integration of the general public and stakeholders in wildlife-related decision making, several interviewees adopted a more normative tone. One interviewee acknowledged the need for greater engagement with stakeholders in decision making by posing a rhetorical question,

> "Do we have any oversight body whose responsibility it is to review the decisions of the professionals and the government and be able to make comments on it or to make decisions even around that? NO! But that's common in many jurisdictions; wildlife commissions in the United States do exactly that" (Interview #17).

Similarly, another interviewee also called for a more formalized and inclusive decision-making process by stating,

> "we need to have a conversation in Newfoundland and Labrador about caribou not just in times of crisis but…some kind of council or board or co-management board, or something like that, where scientists and managers and outfitters and informed members or interested members of the public can discuss caribou maybe on a yearly basis" (Interview #7).

Interviewee contributions on this topic reflect a desire for greater efforts to bridge the gap between informative and decisive integration. Such an evolution in decision making and policy-

formulation will require wildlife trustees to revisit the importance of Public Trust Thinking and also work to facilitate consultation and collaboration that reflect the characteristics of good governance.

9.6 The Manifestation of Ecosystem Approaches

While much of the transition toward a more holistic IRM approach to caribou management in Newfoundland involves fostering both horizontal and vertical integration, IRM approaches also require landscape-scale, multi-species, and ecosystem-based management efforts. To determine the extent to which such holistic, ecosystem-approaches were manifest in the context of caribou management in Newfoundland, interview transcripts, popular media articles, and provincial government reports were mined for information pertaining to landscape-scale and ecosystem-based management efforts, adaptive management, and the IRM dimension of Spatial-Ecological Units.

Through various related discussions, interviewees offered insight on the topics of landscape-scale and ecosystem-based management approaches. A number of interviewees discussed the connection between caribou population changes, habitat conditions, and the impact of resource development on habitat. For example, one interviewee commented:

> "I believe there's not enough current emphasis on the habitat issue and tied into that of course is that I don't think our forestry plan that we have in the province is tied into wildlife concerns as much as it should be. The focus…in this province is development, development, development, right? So, wherever you can extract some value from the land or environment that's where most of the effort and money is going. But that's not something…[that]…will be able to go hand in hand with effective wildlife management in the future" (Interview #2).

Another aspect of ecosystem-based approaches emphasized in the literature (Dearden & Mitchell, 2012, p. 165) is the "dynamic nature of the ecosystem". One interviewee acknowledged such natural fluctuations in wildlife populations and, also in-line with ecosystem-based thinking, commented on connections between caribou forage availability and the natural disturbance of forest fires,

> "animal populations left to themselves peak and crash all the time; that's the way it happens. In the…70s and 80s it was extremely lush; the tops of the hills were loaded with lichens and then you go back a few years later and there is hardly anything left…we've controlled forest fires pretty well in the later years. One time [in the past] forest fires came and they burned and after that the barren lands produced the type of food that caribou liked and we haven't had any major, major burns since the 60s" (Interview #3).

Among interviewees, social-ecological systems thinking was evident in comments surrounding caribou declines and the viability of the province's outfitting industry. However, one interviewee suggested the social-ecological connection was not fully appreciated by some wildlife scientists,

> While…everybody wanted the herds to be sustained, [some] individuals were facing huge financial disruption and loss and scientists look at it from a different perspective all together: "we need to keep the caribou because we need to keep the caribou blah blah blah" and that doesn't always go over well when people are facing personal ruin, which some of them [outfitters] were" (Interview #15).

A similar lag in the uptake of ecosystem-based management efforts was also reported in response to managers' apparent enduring focus on single species approaches. According to one interviewee, the purported transition toward broader ecosystem thinking may not yet be fully implemented on the ground,

> "I think there's still…individual species that because of their direct impact and influence and interest [from] the public for which I work, [some species will still receive]…huge efforts in their management in spite of some of these other kind of perspectives about ecosystem management" (Interview #10).

The quotations above suggest that while at least some components of ecosystem-level thinking are part of the vernacular of stakeholders, there are some instances where ecosystem-level thinking is less well developed among wildlife trust administrators. In their written communications, however, trust administrators clearly acknowledge the importance of ecosystem-level approaches. For instance, in describing the province's caribou research and recovery strategy Fifield, Lewis, and Gullage (2012, p.1) state, "It is a comprehensive program to improve Newfoundland caribou management by improving ecosystem-level knowledge of caribou and their predators." An earlier report by wildlife trust administrators also cited ecosystem-level management considerations by acknowledging the connections between ecosystem components and the implications of resource development on caribou habitat.

> "It must also be borne in mind that available habitat can be influenced by human activity, not only as a result of direct habitat alteration (e.g., timber harvesting) but also through induced avoidance by caribou of even preferred habitat, in response to human activity" (Mahoney & Weir, 2009, p.19).

Also exemplifying provincial wildlife professionals' knowledge of the importance of multi-species thinking is a popular media interview with Shane Mahoney, then director of the Sustainable Development and Strategic Science Branch. When discussing the trajectory of caribou populations in the province, the director stated,

> "…bear in mind it's never a fixed point…Figuring out and achieving that sustainable

> population will require the management not only of caribou, but of predator populations, such as black bears, coyotes and lynx. We really are taking a system approach here, and we're studying the bears, we're studying the coyotes, at the same time that we're studying the prey" (Romaniuk, 2012, para. 22 – 25).

As suggested by some of the earlier statements from interviewees, however, it seems that such ecosystem-level thinking in actual on-the-ground management efforts remains incomplete. Provincial chapters of national stakeholder groups concerned by the caribou population decline in Newfoundland also call attention to wildlife trustees' alleged inattention to ecosystem-scale management approaches. For instance, the Newfoundland chapter of the Canadian Parks and Wilderness Society (CPAWS) in their evaluation of caribou conservation efforts stated,

> "In Newfoundland and Labrador, we are discouraged about the lack of progress our government has made in developing effective caribou conservation measures over the past year…On the Island of Newfoundland, there is an over-emphasis on predator control as the solution to improving calf survival rates. There is little or no discussion of the interaction of habitat quality in exacerbating the documented effects by predators, and the burgeoning numbers of the introduced moose that keep predator populations high while caribou numbers rapidly decline" (CPAWS, 2013, para. 2).

Similar sentiments regarding wildlife managers' perceived lack of attention to ecosystem-level considerations were also echoed in the popular media. In a local newspaper, an invited commentary by a prominent environmental scientist highlighted a perceived lack of attention by provincial natural resource managers to acknowledge the connection between habitat degradation and caribou population declines,

> "Woodland caribou are in serious trouble on the island of Newfoundland and the public

> need to reflect on the major contributing factors. The fact that these ungulates need intact mature coniferous forests is why they are called "woodland" caribou…Caribou abandon traditional range when clearcuts and related logging activity approach within 10 kilometres of core areas" (Goudie, 2010, para. 4)

A final point related to the transition toward more ecosystem-based approaches pertains to the application of management efforts at scales that better coincide with the ecological needs of the management context in question; that is to say a shift away from purely politically-defined management units. Interviewees were divided regarding the extent to which caribou research and management in Newfoundland adequately addressed such management scale considerations. In discussing collaboration with other jurisdictions facing caribou declines one interviewee stated,

> "I think it's dangerous to extrapolate from Scandinavia or Alaska to a place like Newfoundland and vice versa because nature is a little too complex for us, it is not that simple, but even when we do have some understanding of fundamental principles and biological principles on a large mammal like this, the fact is it's usually much more complicated than we have the tools for" (Interview #1).

Conversely, as part of a similar discussion, another interviewee stated,

> "…the Newfoundland situation I don't think is any different than you know lots of caribou populations certainly across North America, where you do see these you know periodicities of cycles of hyper abundance and then fairly long periods of quite low abundance, and then they build up again" (Interview #10).

Greater collaboration and information sharing with other jurisdictions was also supported by another interviewee who stated,

> "…a lot of these sort of studies and research and actions plans and what have you are much the same as what's going on in other provinces…the ones that have caribou have declining populations and that's something that probably should have been tapped into more than it was or is" (Interview # 2).

While caribou populations in Newfoundland are similar to other Woodland caribou herds in that they are experiencing significant declines (Morrison, et al., 2012), it seems that some unique contextual factors (e.g. less concerns regarding habitat disturbance in this jurisdictions than in other habitat areas across Canada) preclude simply generalizing "studies, research, and action plans" (Interview #2) from other jurisdictions to address caribou declines in Newfoundland.

Chapter 10. Key Themes and Research Outcomes

The overall objective of this research was to examine the extent to which components of integrated resource management were incorporated into the planning and implementation of wildlife management efforts associated with declining caribou populations in Newfoundland. Six research questions were identified in support of this objective. This concluding section provides a review of findings in response to the research questions and reflects on the overarching research objective.

The research questions identified for this study can be grouped into three categories. The first two questions can be grouped together under the area of vertical integration while questions three and four pertain to the related areas of horizontal integration and ecosystem based approaches. Taken together, the final two questions are not dissimilar to the overarching research objective and, in addressing these, will provide a fitting summary of my findings.

10.1 Vertical Integration and Managing Wildlife in the Public Trust

In this study, interview contributions and content analysis furnished extensive information to help address the first two research questions that focused on stakeholder engagement and interdisciplinary integration. While there was little evidence of efforts to enlist other disciplines in caribou management efforts, the CRC was, for the most part, very well received by interviewees as an earnest attempt to achieve greater vertical integration. The CRC provided a greater diversity of views (relative to a previous lack of stakeholder engagement), regarding caribou management efforts and the impacts of caribou management decisions. While two interviewees did raise concerns regarding how committee members were selected and the extent to which the CRC represented all viewpoints regarding caribou declines in the province,

the CRC could be considered as a model to build upon for establishing a more formalized and empowered stakeholder group to engage in caribou management discussions in a long term and more effective way. The potential for a more formalized stakeholder engagement process, including earnest efforts to engage with Indigenous groups, to inform Newfoundland wildlife management will be explored in the next chapter.

The effective engagement of stakeholders in decision-making, perhaps more than any of the other dimensions of IRM, requires the integration of disciplines that are often considered in isolation. In fact, the term "interdisciplinary" often refers to the integration of or cooperation between *unrelated* disciplines to achieve a common research goal (Tress, Tress & Fry, 2005). Similarly, Dovers and Price (2007, p. 43) acknowledge "connections across major disciplinary divides – such as social and natural sciences and the humanities – might be expected to be more difficult to achieve".

In the traditionally biology-focused field of wildlife management, establishing the credibility and importance of social science research is a recent and ongoing transition (Freddy et al., 2004; Gigliotti et al., 2009). In most jurisdictions, however, human dimensions concepts and approaches are increasingly accepted as essential for effective wildlife management in contemporary contexts (Forstchen & Smith, 2014; Hunt, 2013; Manfredo et al., 1998; Riley et al., 2002). Wildlife managers increasingly accept that "sustaining fish and wildlife will depend on people, which means that managers must understand these people and their relationships to fish and wildlife" (Brown, 2009, p.7).

Given the contentious nature of many wildlife management issues, especially in cases of scarce wildlife (Enck & Bath, 2012), it is obvious that management efforts based solely on natural science are not sufficient and must be also informed by human dimensions. In the caribou

management case study, the CRC represents the only formal effort to achieve such vertical integration. Although the extent to which committee representatives effectively acted as information conduits with their respective stakeholder groups was not assessed, the CRC represents a significant, albeit historically atypical, effort to solicit information from a diversity of stakeholders affected by caribou management in the province.

It is important to note, however, that simply basing management decisions on some index of public attitudes or stakeholder opinion, without also integrating natural science information, is equally problematic. Decker and Chase (1997, p. 794) warn of such 'management by public poll' approaches and suggest that while "human dimensions knowledge aids decision-making, [it] seldom, if ever, in itself reveals what should be done in a particular situation. In most situations, wildlife managers must avoid any temptation to use only stakeholder preferences as the basis for decisions."

Sources and types of information with relevance to resource and wildlife management efforts are varied, often present different forms of information (e.g. anecdotal, historical, quantitative, or geospatial), and have differing levels of credibility or relevance to the management efforts in question. For Newfoundland caribou, some interviewees emphasized what they saw as differences in the role and perhaps even credibility of information coming from experts vs. non-experts (Interview #5) and, similarly, the difference between guidance (presumably provided by experts) and advice (presumably provided by non-experts) (Interview #1).

This distinction between the perceived credibility and role of stakeholder information and "expert input" coincides with the discussions in the literature (Dovers & Price, 2007) regarding the merits of informative and decisive forms of integration. Addressing fragmentation and

working toward greater integration of various types and sources of information is an important step toward more integrated resource and wildlife management efforts. This assertion is supported by both contemporary scholars in the field of wildlife management and study participants regarding the extent to which stakeholder groups (which are often seen as contributing to just informative integration) should be given the opportunity to make an earnest contribution to the decision-making process, and thus participate more formally in decisive integration. This final point relates directly to discussions in the literature that identify a need, given the increasing complexity of the natural resource management context, for the evolution of wildlife management practice toward more integrative approaches that are built upon Public Trust thinking and supported by elements of good governance (Decker et. al., 2016; Jacobson & Haubold, 2014). A means of addressing this need will be presented in the section 10.3.

10.2 Horizontal and Ecosystem-Based Approaches

In response to the third research question regarding interdepartmental integration: study results show little evidence of explicit efforts to achieve horizontal integration by engaging with other disciplines or government branches in discussions regarding caribou management in the province. In fact, interview contributions and content analysis clearly identify a period of significant fragmentation both within the provincial wildlife portfolio (between the areas of wildlife research and wildlife management) and between the Wildlife Division and the Department of Forestry in the province. This fragmentation impacted both the objective (note significant change in caribou population trajectory during the gap in population data collection which occurred during the tumultuous relocation of offices) and subjective (note interviewee contributions and popular media articles referencing the animosity and preoccupation resulting from this attempt at horizontal integration) efficacy of the associated public trust managers.

The importance of greater integration between relevant government departments and the interests they represent was highlighted both by interviewees and in popular media articles and press releases. These data, however, suggest that while much of the discourse surrounding caribou management efforts in Newfoundland focused on the importance of efforts to achieve horizontal integration and thus help foster more integrated decisions, such efforts are hindered by significant fragmentation challenges between and even within wildlife management related divisions.

As the complexity of wildlife population models continues to increase (e.g. Population Viability Analysis (Anderson, Sunde, Pellegrino, Loescheke, & Pertoldi, 2017)), those managers charged with implementing associated management strategies sometimes struggle to understand and effectively interpret model outputs (Chapron, 2015). This disconnect between science and management can, similar to that experienced in the context of Newfoundland caribou management, have serious implications for effective wildlife management and departmental collaboration. To address this problem, some scholars highlight the merits of new, innovative technology. Chapron (2015) proposes that greater integration between science and management can be achieved by using apps (applications - small software programs downloaded onto mobile devices) which translate the complex data and source codes of models into practical outputs better aligned with managers' needs. While such efforts to streamline the wildlife management model through more effective integration of science and management coincides with one of the sought-after dimensions of IRM, the reduced capacity of managers to interpret complex population models was identified as the impetus for the proposed integrative strategy.

With a number of departments related to natural resource management in Newfoundland experiencing a substantial reduction in capacity due to layoffs and restructuring, the challenges

and merits of such innovative means to achieve more effective and integrative management efforts should be considered. One such example, as discussed above, is the failure of an ambitious attempt to foster collaboration between relevant government departments through the relocation of the forestry and wildlife departments to Corner Brook. While one would expect that given the ease and speed of information sharing afforded by today's advanced information technology, such as the population modelling app suggested by Chapron (2015), the distance between St. John's and Corner Brook would be irrelevant. In reality, however, it seems that geography, or perhaps some other less-quantifiable phenomenon, served to impede effective information exchange between people at the two locations.

The 700 km shift in from St. John's to Corner Brook had significant career and family impacts for employees asked to move. This upheaval caused significant professional and personal turbulence leading up to, during, and immediately following the relocation. While some affected employees accepted the relocation without much objection, others resisted this significant change: some sought alternate arrangements within the Branch, others moved into positions in other departments, and still others quit their positions rather than move across the province.

While some interviewees cited personality conflicts as contributing significantly to the fragmentation between science and management (interviewee contributions on this matter are not detailed here due to concerns of confidentiality), there exists a rich literature on the rigidity of established resource management bureaucracies and the affinity for the status quo. This literature helps explain both the enduring fragmentation and animosity between relevant interests and sectors, government departments, and also between science and management of wildlife in Newfoundland. As discussed in the next chapter, to transition from a resource management

structure that traditionally saw very little integration between government departments to one in which forestry, in-land fisheries, and wildlife management are to work together to foster an "ecosystem management philosophy" takes more than a simple consolidation of office space.

As suggested by Young (2008), integration challenges can be exacerbated by characteristics of institutions. Young (2008) identifies such problems as: collective action problems (individuals within a group pursue personal goals through self-serving actions), social practices problems (where compliance with institutional rules becomes second nature in the pursuit of appropriateness and little consideration is given to larger consequences) and knowledge-action problems (where agency understanding of and response to environmental problems is shaped by governance systems and prevailing discourses). Carpenter and Brock (2008) present similar institutional problems in terms of traps where institutions that are rigid, self-reinforcing and inflexible are in a "rigidity trap" whereas institutions that, despite having the potential for change, do not have the capacity (e.g. resource or organizational capacity) to realize this change are in a "poverty trap".

The failed St. John's to Corner Brook horizontal integration effort has characteristics of both a rigidity trap and a poverty trap. The siloed nature of natural resource management departments in the province obstructed the hoped-for cooperation between forest and wildlife managers. As outlined above, a number of interviewees noted this incongruity citing a lack of effective collaborative relationships between wildlife research scientists and managers and between relevant government departments,

> "…suddenly their adversaries were supposed to be their chums, and that just didn't work" (Interview #11)

> "…we were asked for our input but not permitted to be at the table where the real questions were taking place" (Interview #8).

Evidence of a poverty trap also emerged during interviews. Interviewees made reference to a lack of integrative direction from an overarching, organizing body resulting in enduring fragmentation between relevant government departments.

> "I think what's required in this particular case is a higher-order direction on what the decision makers want us to do" (Interview #8)

One consequence of the fragmentation and turmoil of these traps is the setting of inappropriate caribou hunting licence quotas during the first years of the population decline. Provincial wildlife researchers admit that, "the high rate of harvest in the early part of the decline phase exacerbated the rate of decline" (Government of Newfoundland and Labrador 2015, p. 42). This finding both reaffirms the unfortunate timing of the 1997 – 2003 gap in caribou population data and also highlights the significant management ramifications of the fragmentation, both geographically and professionally, of science and management between St. John's and Corner Brook.

In less than a decade, provincial wildlife research and management priorities had to switch from management of an abundant species to management of a scarce species. As noted by Enck and Bath (2012, p. 189), "some of the most contentious wildlife issues in the history of modern wildlife management have been about scarce wildlife management." The saliency of management of scarce wildlife is, perhaps, to be expected as concerns of scarcity of a desirable wildlife species bring to the fore a diversity of stakeholder values such as the animal's ecological significance, cultural and spiritual impacts of a declining number of individuals, and the economic ramifications of reduced or restricted consumptive or non-consumptive uses of the

animal. The importance of effectively responding to wildlife scarcity therefore has great subjective and objective importance for managers.

While much of the transition toward an IRM approach to caribou management in Newfoundland involves bridging the gap between vertical and horizontal integration (and in turn between informative and decisive integration) and facilitating the adoption of Public Trust-based and good governance-informed Wildlife Governance Principles (WGP) (per Decker et al., 2016), IRM approaches also require the adoption of landscape-scale, multi-species, and ecosystem-based management. In addressing my fourth research question focused on the manifestation of ecosystem-based approaches in the context of caribou management in Newfoundland, I found that while wildlife trustees did indeed advocate for the adoption of management approaches informed by ecosystem-level considerations, a number of interviewees and popular media items highlighted an apparent lack of appreciation of both the landscape scape and coupled social-ecological system considerations fundamental to ecosystem-based approaches.

The importance of such a landscape-scale approach is emphasized by Liu and Taylor (2002) who provide a hypothetical example where a myopic focus on timber harvesting leads to unintended changes in deer populations, which in turn increase the number of deer-vehicle accidents, increase crop damage, and even reduce forest regeneration. As stated by Liu and Taylor (2002, p.11),

> "This example illustrates the need for simultaneously and holistically managing deer, timber, and other natural resources in the landscape. To eliminate or minimize such conflicts and maintain high landscape integrity, it is important to take an integrated approach that incorporates multi-scale, cross boundary, and adaptive management"

Given the insightful discussion offered by interviewees regarding topics relating to Vertical and Horizontal Integration, it is not surprising that interviewees also commented regarding the merits of landscape-scale and ecosystem-based management approaches. Interviewees' acknowledgement of the importance of a landscape approach to management, and their knowledge of the interactions between the components of natural systems, coincides with Slocombe's (1998) set of characteristics of ecosystem approaches.

Social-ecological systems thinking was very evident among interviewees with much of the discourse surrounding the connection between caribou population declines and the implications for both resident hunters and the province's outfitting industry. There is a perception among some interviewees, however, that the extent and relative importance of such social-ecological connections are perhaps not yet fully appreciated by some wildlife trust managers. Similarly, some interviewees reported that the practice of emphasizing ecosystems over single species approaches, a prerequisite of ecosystem-based approaches (Dearden & Mitchell, 2012), is also somewhat underdeveloped in the context of caribou management in Newfoundland. An analysis of popular media articles and relevant government reports, however, showed that ecosystem-level thinking is indeed part of the discourse of wildlife trust administrators.

Another indicator of a transition toward more ecosystem-based approaches pertains to the choice of spatial-ecological units appropriate to caribou management. Slocombe (1998), in his presentation of characteristics of ecosystem approaches, cautions against the enduring tendency to employ arbitrary (from a natural systems perspective), politically defined management units. This assertion is reaffirmed by the Secretariat of the Convention on Biological Diversity (2004) which suggests that those employing ecosystem-based approaches must define the ecosystem

naturally using bioregional units that better coincide with natural systems. Given that Woodland caribou population declines are a continent-wide phenomenon (Mahoney & Weir, 2009), research into causes of population declines and management responses in Newfoundland leads to questions of scale and discussions regarding the extent to which findings from other jurisdictions regarding causes of population declines and effective recovery strategies can be generalized to Newfoundland.

For their part, wildlife trustees have considered the topic of appropriate spatial-ecological units. In Newfoundland, like other jurisdictions, a main driver of caribou declines is low calf survival and recruitment (Mahoney & Weir, 2009; Morrison et al., 2012). In Newfoundland, however, predation is the main proximate cause of low calf survival (Mahoney & Weir, 2009; Trindade et al., 2011). As stated by Mahoney and Weir (2009, p. 6), however, "there have been many anthropogenic and natural changes to the island ecosystem, including changes to habitat and the predator guild of caribou, which may affect the capacity for caribou to recover." Thus it seems that, as suggested by some interviewees, while there are merits to looking more broadly (in a geographical or jurisdictional sense) at the causes of caribou declines and effective recovery strategies, local conditions can cause the appropriate spatial-ecological unit scale to shrink considerably. Mahoney and Weir (2009, p. 10) provide a more specific description of these locally unique conditions and state that,

> "Previously, it was primarily black bear and lynx which preyed on caribou calves, whereas we now record predation by black bear, lynx, coyotes, and bald eagles. While the proportion of calves killed by coyotes and eagles is new, the proportion of calves killed by black bears has decreased, suggesting possible competitive interaction between predators. Furthermore, during the 2003-2007 studies the percentage of death ascribed to

> individual predators varied between the Gaff Topsails, Mount Peyton and Middle Ridge herds (data not shown). Such variability means that efforts to reduce predation pressure may require herd specific strategies."

Given the importance of locally unique factors such as these, it is not surprising that Mahoney and Weir (2009, p. 6) state [h]erds are the units of caribou conservation."

The evolution in wildlife management, which, as outlined in the following chapter, will be facilitated to some extent by the adoption of the WGPs, also requires a shift to broader management approaches that are informed by coupled social-ecological systems thinking (Decker et al. 2016). Just as moving toward more integrative approaches requires both wildlife trust administrators and beneficiaries to foster Vertical and Horizontal integration in management, so too must each of these actors work to foster ecosystem-level thinking and action.

10.3 The Importance of Decisive Integration

In the literature, and in some management contexts in North America (e.g. kincentric ecology perspectives in co-management of wildlife in British Columbia (Bhattacharyya & Slocombe, 2018)), wildlife management is moving toward more integrative approaches (Organ et al., 2014). Efforts to manage for wildlife impacts and the need to address conflict and contentious management issues have assisted in this transition. Addressing impacts requires input from both natural and social dimensions and impact management thus serves an integrating function (Ring, 2009; Riley et. al., 2002). As my final research questions (and in a more general sense, my overarching research objective) focus on the extent to which the wildlife management

evolution documented in the literature is manifest in a particular wildlife management context, addressing these questions provides a fitting summary of my study findings.

In the case of Newfoundland caribou management, despite the fact that significant and rapid caribou population declines have significant cultural, economic, and ecological impacts, there is little evidence of the purported trend toward more integrative wildlife management approaches. While this study has made unique contributions to the discourse surrounding the importance of greater collaboration between relevant government departments, stakeholders, and sectors, and a desire to shift toward IRM approaches, it is clear that for the most part, caribou management in Newfoundland has been limited to command and control management approaches (per Holling & Meffe, 1996) and, as noted in other contexts by Gigliotti et al. (2009), rarely extended beyond addressing the needs of consumptive users of wildlife. Though the CRC, which was designed as a short-term means of information exchange between managers and selected stakeholders, does represent an interesting attempt at greater vertical integration, the degree to which CRC members represented the true diversity of perspectives relevant to caribou management was questioned by some.

In response to the last research question (focused on challenges and opportunities for fostering a more integrative approach to wildlife management in Newfoundland) my findings also highlight the significant challenges posed by an enduring fragmentation both within and between relevant departments and between stakeholders and trust managers. These challenges are the result of what Carpenter and Brock (2008) and Young (2008) refer to as institutional characteristics that result in an adherence to the status quo and self-serving actions (Carpenter and Brock, 2008; Young, 2008). Such challenges were evident in the less-than-successful attempt at horizontal integration via the amalgamation of provincial departments under one roof

on the province's west coast. Vertical integration challenges were also identified, with some interviewees questioning the extent to which the CRC truly represented the diversity of interests regarding caribou management in Newfoundland while others lamented the lack of opportunity for stakeholder engagement following the dissolution of the CRC.

Perhaps one of the most important points emerging from this study relates to the need to bridge the gap between informative and decisive integration. Dovers and Price (2007) suggest that often the integration of stakeholder and general public beliefs, attitudes, and values into resource management falls short of contributing directly to decision making and instead plays a peripheral or informing role. Conversely, integration between relevant disciplines and government departments or agencies often, though not in this case study, contributes much more directly to actual decision making and policy formulation and is referred to as decisive integration. As the field of wildlife management continues to evolve and adopt more characteristics of IRM, the importance of earnest stakeholder engagement in decision making, and consequently bridging the gap between informative and decisive integration, also increases.

Related to this evolution, a number of recent works show increasing attention to the management implications of Public Trust Thinking (Decker et al., 2014, 2015; Forstchen & Smith, 2014) and consequently broadening the scope of management beneficiaries beyond consumptive users. In adhering to their mandate to manage wildlife in the public trust, wildlife managers in Newfoundland must engage in earnest efforts to develop an in-depth understanding of their publics and effectively engage them in decision making. Such efforts require adherence to the tenants of good governance and the adoption of the WGPs outlined by Decker, et al., (2016) (Table 7).

In the context of caribou management in Newfoundland, wildlife trustees are further

challenged by a lack of organized NGOs with which to engage, or perhaps more accurately, by a lack of NGOs that are perceived as having a relevant stake in such discussions. As the groups represented on the original CRC do not comprise an exhaustive list relevant stakeholders (e.g. lack of representation from First Nations Bands and nature conservation organizations), it is possible that those asked to convene the original CRC betrayed the enduring focus on consumptive users so common during the field's earlier phases of evolution. To address this shortcoming, a more modern, less-restrictive definition of stakeholder should be adopted. Decker, et al. 2015 suggest the use of 'wildlife beneficiaries', a term which expands opportunity for engagement to all citizens, not just the special interest groups sometimes referred to as stakeholders. An impartial process for selecting representatives to join committees must also be adopted. López-Bao, Chapron & Treves (2017, p. 139) also caution against a focus on narrow, entrenched interests and identify a lack of a broader, participatory decision making process as the "Achilles heel of participatory conservation"

If wildlife management in Newfoundland is to follow the Public Trust Doctrine and keep pace with the field's evolution toward IRM approaches, trustees must work to develop both stakeholder capacity (through social learning) and appropriate engagement structures. The importance of fostering efforts to develop the capacity of affected stakeholder groups to help realize the benefits of Public Trust Thinking has also been recognized by Hare, Decker, Smith, Forstchen, and Jacobson (2017, p. 519), "[i]t [overcoming he impediments to public trust thinking] will only be achieved through committed collaboration and cooperation among governmental and nongovernmental partners immersed and invested in specific conservation issues, supported and legitimized by diverse beneficiaries engaged throughout decision-making processes". While such efforts to delve into the realm of building social capital and fostering

social learning among stakeholder groups may seem beyond the scope of work for wildlife trustees, the subjective and objective benefits of earnest engagement with diverse wildlife beneficiaries supports the assertion by Riley et al., (2002) that such efforts to address the impacts of wildlife management truly is the essence of wildlife management.

Chapter 11. A More Integrated Approach to Caribou Management in the Public Trust

This research has presented information from interviews, popular media articles, and provincial government reports, which provides evidence of a desire to adopt a more integrative approach to wildlife management in Newfoundland. In the context of caribou management in the province there is, however, a lack of evidence of efforts to continue (following the dissolution of the CRC) even this level of stakeholder engagement. In the case study examined, there is also no evidence of a formal mechanism to engage with a greater diversity of wildlife beneficiaries or a means to elevate stakeholder input to bridge the gap between informative and decisive integration.

The necessity of effective stakeholder engagement when managing resources in the Public Trust (Decker et al., 2016) coincides directly with the tenets of good governance. According to Pierre (2000, p. 4) governance refers to "sustaining co-ordination and coherence among a wide variety of actors with different purposes and objectives such as political actors and institutions, cooperate interests, civil society, and transnational organizations." Building upon these decision-making practices and procedures, good governance "promotes equity, participation, pluralism, transparency, accountability and the rule of law, in a manner that is effective, efficient and enduring" (United Nations, 2016, para. 2). When one considers the core concepts of both Public Trust thinking and good governance, it is not surprising that a number of common traits can be identified that coincide with IRM thinking and are directly relevant to wildlife management (Decker et al., 2016; Weiss, 2000).

Advancing wildlife management by revisiting and reviving Public Trust thinking and working to align management efforts more closely with good governance has been highlighted in a series of recent works by HDWM scholars (Decker et. al., 2014b; Forstchen & Smith, 2014;

Jacobson & Haubold, 2014; Organ et al., 2014; Pomeranz et al., 2014; Smith, 2011). Many of these works lament the creeping erosion of the Public Trust Doctrine by "forces that restrict or remove public access to wildlife resources and by the unwillingness of courts to apply the public trust beyond what is codified in law" (Organ & Batcheller, 2009, p. 166). Perhaps even more applicable in the context of caribou management in Newfoundland, however, are the undesirable outcomes associated with wildlife management systems that are not firmly rooted in Public Trust thinking. Batcheller et al. (2010, pp. 10-11) identify the outcomes of detachment from Public Trust thinking as:

- a diminished connection or indifference toward wildlife resources stemming from a disassociation with nature, which means wildlife may become irrelevant to the general public thereby reducing public support for conservation.
- wildlife resources that are viewed as an artifact of the past, separated from modern life, to be seen and appreciated yet with a lack of understanding and acceptance of sustainable use, and
- wildlife resources viewed as a liability or threat to be minimized to the extent possible rather than an asset to be conserved and managed for the benefit of current and future generations.

Batcheller et al. (2010) extend the detachment stemming from a lack of attention to Public Trust thinking from disillusionment with the management agency, where one might expect it to fall, to the actual wildlife resource. Regardless of where stakeholders' apathy falls, the importance of adhering to the Public Trust Doctrine is nonetheless obvious. It is troubling, and perhaps telling of the wildlife management context in Newfoundland, and one might reasonably suspect likely in other jurisdictions as well, that to a greater or lesser extent, evidence of each of the above less-

than-favorable outcomes are present in the current discourse surrounding caribou management in the province, at least as it relates to disillusionment with the management agency or process. As evidenced in both interviewee contributions and popular media article content, when stakeholders, the beneficiaries in the Public Trust Doctrine, are denied earnest engagement in decision making, disillusionment with the wildlife management process and disengagement with the wildlife resource managers are possible outcomes.

As was noted above, addressing these challenges require earnest efforts to engage stakeholders in decision making; working toward this evolution in wildlife management approaches will bridge the gap between informative and decisive integration and foster adherence to good governance and Public Trust thinking. As stated by Batcheller et al. (2010, p. 15),

> "The public is the beneficiary of the trust for whom assets are managed. Trustee accountability for those assets is necessary for the PTD [Public Trust Doctrine] to be effective, and will be best served with an informed and engaged public. Public input into decision-making processes will help assure trustee understanding of and responsiveness to contemporary needs, as well as public understanding of competing demands on trust resources."

Dovers and Price (2007) refer to horizontal collaboration, absent of the true disciplinary integration that would be required when integrating natural science and social science information (concerning the perceptions, attitudes, and values of related stakeholder groups), as a lesser or "additive" degree of integration, one that is void of the mutual appraisal of the operating assumptions and methods of the collaborating disciplines that is central to more truly integrative forms of collaboration. Thus while efforts to achieve greater horizontal integration are

imperative, it is important to note that such inter-departmental collaboration captures just one part of the evolution toward integration in the field of wildlife management and overlooks efforts to reconcile the disconnection between informative and decisive integration – which translates into a disconnect between beneficiaries and the decision making process.

In pursuit of such evolution in wildlife management approaches, Decker et al. (2016) have formulated 10 Wildlife Governance Principles (WGP) (Table 7). These WGPs are designed to help advance thinking and practice in wildlife management by combining key components of Public Trust thinking and good governance.

While the potential benefits of embracing the WGP identified by Decker et al. (2016) are clear and align to address current shortcomings in wildlife conservation efforts, the actual adoption and implementation of these principles will undoubtedly be impeded due to the inertia of current processes and decision making structures, as outlined above. Decker et al. (2016, p. 293) also refer to a number of other institutional challenges, including "unknown or alienated beneficiaries, special interest group exclusivity, and narrow conservation outcomes" that can impede the adoption of WGP. These challenges align well with Young's (2008) findings following the application of 'new institutionalism' thinking to analyze environmental governance systems, which suggest that integration challenges can be exacerbated by characteristics of institutions, which sometimes present their own problems. Young (2008) outlines these problems as: collective action problems, social practice problems, and knowledge-action problems. Carpenter and Brock (2008) present similar institutional problems in terms of traps where institutions that are rigid and self-reinforcing are said to be in a rigidity trap whereas institutions that, despite having the potential for change, do not have the capacity to realize this change and move the system forward are said to be in a poverty trap (Carpenter & Brock, 2008). As

Table 7
Wildlife Governance Principles

Wildlife governance will be adaptable and responsive to citizens' current needs and interests, while also being forward-looking to conserver options of future generations.
Wildlife governance will seek an incorporate multiple and diverse perspectives.
Wildlife governance will apply social and ecological science, citizens' knowledge, and trust administrators' judgement.
Wildlife governance will produce multiple, sustainable benefits for all beneficiaries.
Wildlife governance will ensure that trust administrators are responsible for maintaining trust resources and allocating benefits from the trust.
Wildlife governance will be publicly accessible and transparent.
Wildlife governance will ensue that trust administrators are publicly accountable.
Wildlife governance will include means for citizens to become informed and engaged in decision making.
Wildlife governance will include opportunities for trust administrators to meet their obligations in partnerships with non-governmental entities.
Wildlife governance will facilitate collaboration and coordination across ecological, jurisdictional and ownership boundaries.

(Adapted from Decker, et al., 2016)

suggested by Decker et al. (2016), and similar to the rigidity traps, social practice, and collective action problems identified by Carpenter and Brock (2008) and Young (2008) above, reluctance to change and adherence to the status quo by wildlife trustees (relevant, elected and appointed officials), trust managers (wildlife conservation professionals) and perhaps even beneficiaries, may be the biggest challenge facing adoption of WGPs. This inertia has also been identified more recently as "institutional resistance" by Hare, et al. (2017) in their presentation of challenges and solutions regarding the application of Public Trust thinking in wildlife governance. Hare and colleagues (2017) also identify an additional seven challenges to applying Public Trust thinking. The challenges presented by Hare et al. (2107) pertain to issues of wildlife

trustees' responsibilities in fostering Public Trust thinking, the importance of impartiality in terms of broad stakeholder group engagement, including beneficiaries in decision making, accountability of wildlife management, and the legitimacy of the decision-making process. Not surprisingly, many of the solutions proposed for these challenges coincide with the WGP presented above as well as the need to foster more decisive integration – these characteristics are evident in the integrative wildlife management model presented below.

Unlike in the United States where wildlife trusteeship in many states extends to formally appointed wildlife conservation commissions that are comprised of affected stakeholders with wildlife management decision-making authority (i.e., decisive integration) (Jacobson & Haubold, 2014), such explicit efforts to ensure stakeholder input on wildlife management is largely absent in Newfoundland. While some examples of such engagement may be seen in the activities of resource management and assessment boards in Canada's north (e.g. The Beverly and Qamanirjuaq Caribou Management Board, n.d.), the Canadian experience is largely one of seeing stakeholders as advisory, and often involved through ad hoc structures, with little formal power or authority to create policy and direct operational and management activities. Influence is exercised through the willingness of agencies to listen to and accept the advice of such groups, or through the political and social power of stakeholders exerted through political sway. In Newfoundland, in addition to the likely almost-universal challenges of fostering Public Trust thinking, is the fact that there are hardly any organized stakeholder groups which, even if given the opportunity to contribute to decisive integration, could effectively engage in decision making efforts and, in so doing, hold trustees accountable.

While figure 17 above presented a rather simplified overview of the current management structure for caribou management in the Newfoundland, figure 19 presents a more integrative

wildlife management process achieved through earnest and ongoing engagement with a hypothetical Wildlife Beneficiary Governance Committee (WBGC). Decker et al. (2015) suggest that wildlife beneficiaries represent a much greater diversity of perspectives than the special interest groups often labelled as "stakeholders". In the context of wildlife management in Newfoundland, a WBGC would therefore represent a greater diversity of viewpoints than the original CRC that was established in 2009 as part of the Enhanced Caribou Management Strategy. In addition to the original CRC members (listed above), the composition of the proposed WBGC should therefore, also include non-consumptive users of wildlife, those who value wildlife intrinsically, First Nations bands, representatives of federal and provincial environment-related government departments, and other relevant beneficiaries. The process for selecting the representatives of each of these groups should be left up to each group. Figure 19 also shows (using callouts) some of the other WGP-based benefits associated with such engagement efforts which include: social learning, greater public support for management strategies, interdepartmental collaboration, rapport building between beneficiaries and managers, adherence to Public Trust Thinking, and greater integration between natural and social science.

The importance of not only recognizing established stakeholder groups but also fostering efforts to aid in their establishment and function is central to responsible wildlife management. Indeed many of the "possible paths to solution" [solutions to the challenges of realizing the benefits of Public Trust Thinking] identified by Hare et al. 2017) include a number of references to such explicit efforts including establishing relationships with private landowners and NGOs, developing communication between trust administrators and historically excluded beneficiaries, establishing rules to ensure diversity of interests are represented, and broadening beneficiary participation.

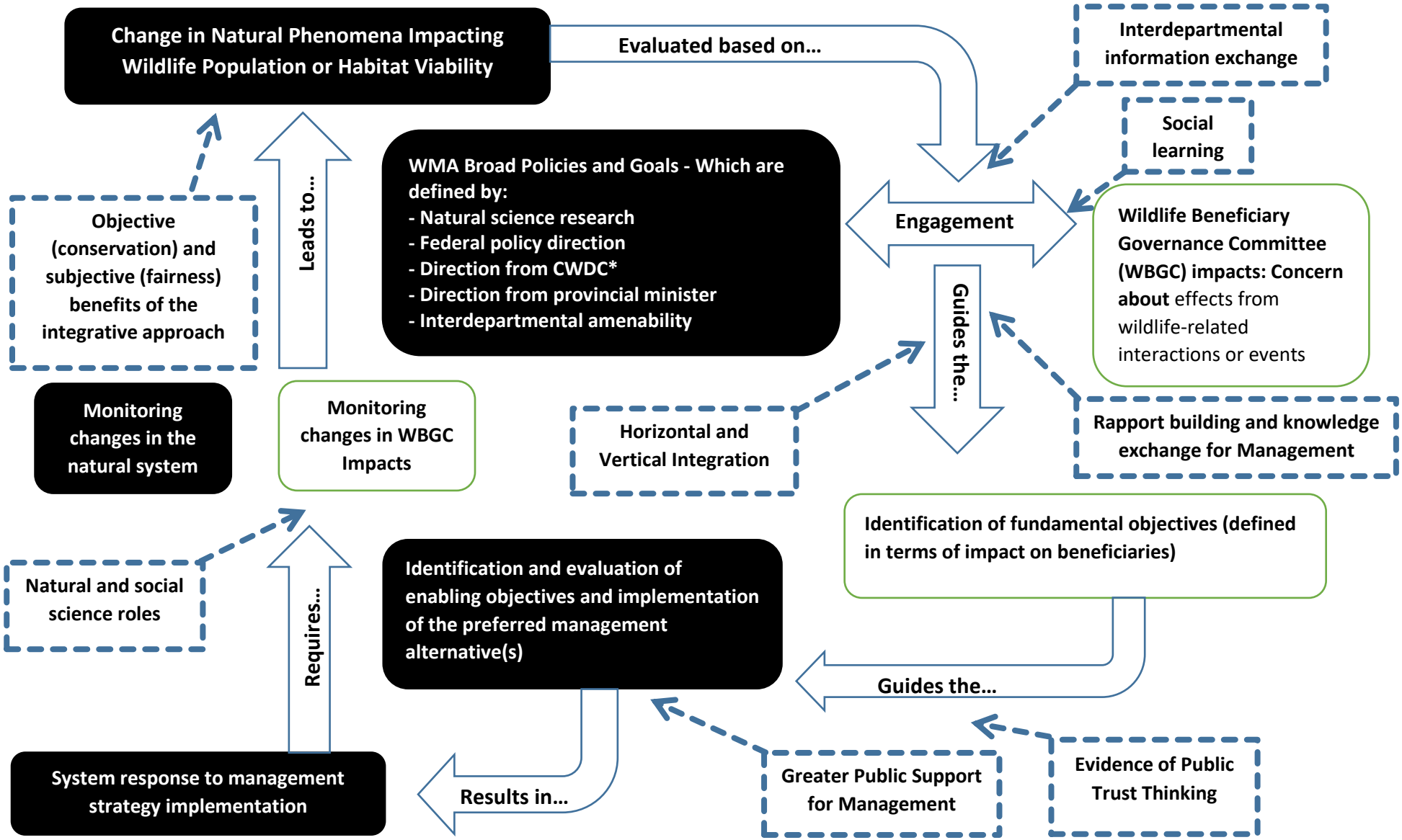

Figure 189. An Integrative Approach to Wildlife Management in Newfoundland.

* *Note.* white background rectangles show roles and benefits for engagement with hypothetical WBGC while black background rectangles show original process stages

In the context of wildlife management in Newfoundland, however, such stakeholder groups are, except for mainly consumptive users (e.g., hunting and trapping associations), virtually non-existent or, as in the case of the CRC, not often part of consultation efforts. The need for more formalized stakeholder engagement has been relayed through a number of interviewee contributions presented earlier. Thus it seems that despite a study by Bathceller, et al (2010) which found that, in constitutional or statutory language at least, Canadian provinces and territories satisfactorily addressed almost all criteria of the Public Trust Doctrine, including accountability of trustees (Batcheller, et al., 2010), in practice, much work remains to be done in Newfoundland, and likely in other jurisdictions as well.

Before one can even begin to move towards bridging the gap between vertical and horizontal integration, before efforts to link informative and decisive integration, and before efforts to reinstate Public Trust thinking and good governance by adopting Decker et al.'s (2016) WGPs and the solutions outlined by Hare et al. (2017), a diverse and robust cadre of beneficiaries must be effectively engaged and, where necessary, established and cultivated, in Newfoundland. The need to nurture this third sector (Francis, 2007) is recognized by Pomeranz et al. (2014), who suggest that as trends in wildlife management shift toward more locally-focused approaches, agency staff will be limited in their capacity and should employ a more effective, regional-level stakeholder engagement approach. In a contribution to a local newspaper commenting on efforts by the provincial government to foster collaboration between the portfolios of Wildlife and Forestry, a well-known environmental scientist also acknowledged the importance of evaluating agency capacity for addressing a more integrative and ecosystem-based approach to wildlife management and stated, "The human mind abhors change, and you can't take individuals trained as industrial foresters and turn them overnight into ecosystem

managers, which is what DNR [the Department of Natural Resources] has attempted by reclassifying its District Unit foresters" (Goudie, 2010, para. 9).

Similarly, Decker et al. (2016) counsel that the responsibility for such efforts to 'set the stage' for the adoption of WGPs should be shared among all the players in the wildlife conservation institution and state that,

> "the onus for change lies not only with trust administrators but also with individual beneficiaries and organizations that represent various interests in wildlife, all of whom are responsible for establishing appropriate trustee-beneficiary relations with public wildlife agencies and supporting necessary change both politically and monetarily" (Decker et. al., 2016, p. 4).

While for some wildlife managers and powerful special interest groups, sharing decision making responsibility with stakeholder beneficiaries may seem like relinquishing power (Decker et al., 2016), such efforts represent a positive evolution in the practice of wildlife management, a shift toward the theories and approaches of the field of IRM. As stated by Decker et al. (2016, p.5) wildlife management needs to "shift from operating under a framework focused predominately on a narrow set of wildlife interests, to a social-ecological paradigm and concomitant approach to wildlife conservation that embraces the interests and participation of a broader public."

Chapter 12. Conclusions, Crisis, and Opportunity: Building Resilience in Wildlife Management

This research provided case study based evidence of a significant gap between theory and practice in wildlife management. Evidence is also presented in support of efforts to earnestly engage with wildlife stakeholders and foster the development of the 'third sector' to contribute to wildlife management efforts in Newfoundland. The original contribution of this thesis to the IRM and HDWM literature is strengthened by an examination of the challenges and opportunities of adopting more integrated approaches in the context of caribou management in Newfoundland and by the identification of a integrative wildlife management model to foster a more resilient, stakeholder-engaged management structure that can help ensure the sustainable management of wildlife in the public trust.

In this work, I also refer to recent, significant staffing cuts and substantial reorganization of the provincial Department of Environment and Climate Change and especially the Wildlife Division that it once housed (Figure 20). The intersection of these two topics: a keen desire for greater engagement of stakeholders and the reduced capacity of wildlife management agencies, presents a rich opportunity for evolution in the practice of wildlife management in the province.

While the staffing cuts were part of a public sector-wide reduction in staff and budgets in an effort to rein in provincial budget deficits, many felt that those departments and agencies with portfolios related to the environment and resource conservation were unfairly targeted. Dr. Bill Montevecchi, a professor in Cognitive and Behavioral Ecology at Memorial University and outspoken nature conservationist expressed his views regarding these latest cuts as follows:

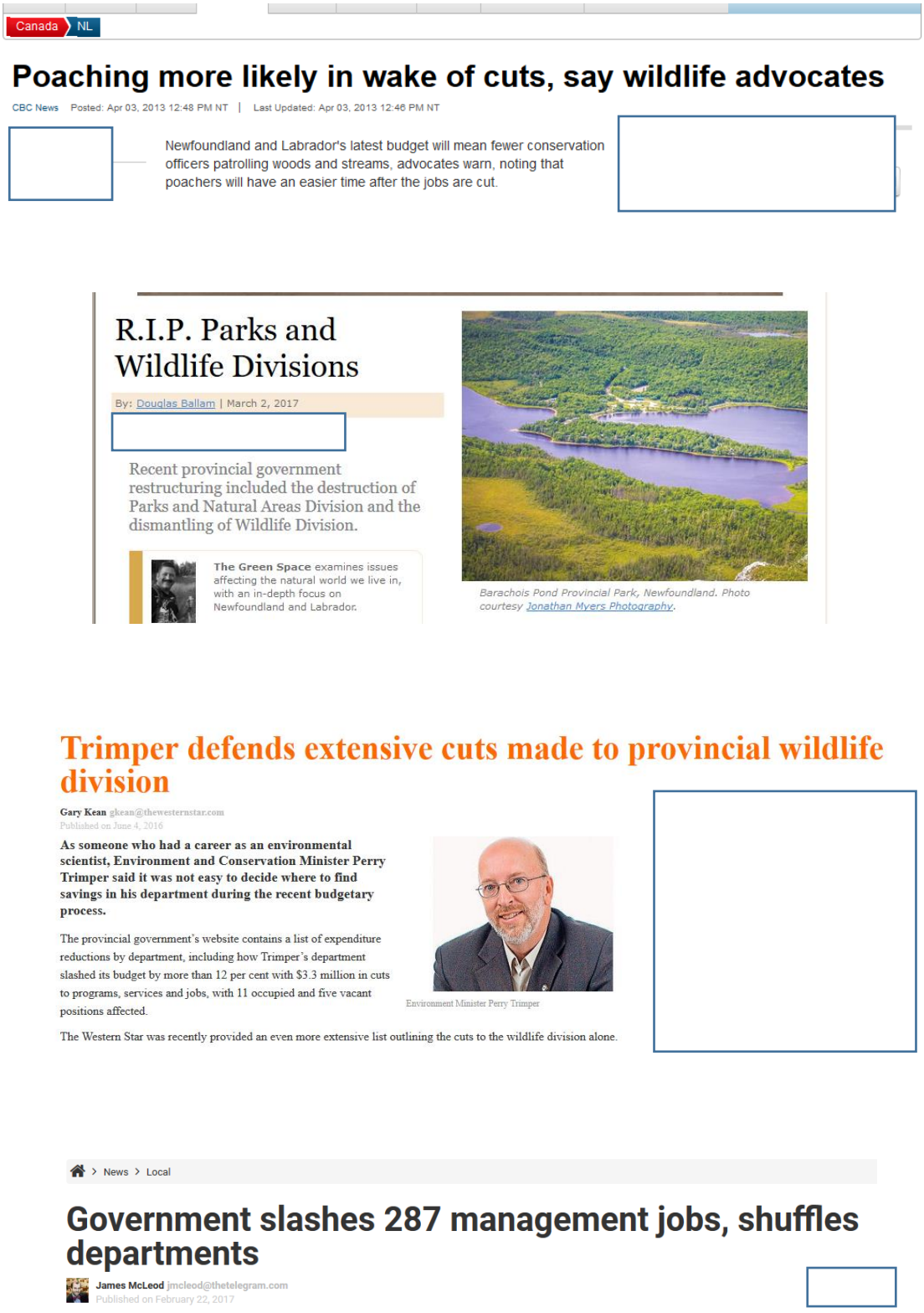

Figure 20. Concerns Regarding Departmental Budget Cuts in the Popular Media. (© 2013 CBC News, by permission; © 2017 The Independent, by permission; © 2016 The Western Star, by permission; © 2017 The Telegram, by permission)

“Newfoundland and Labrador's wildlife resources are at the heart our province's heritage and culture.” The opening line of the former Department of Environment and Climate Change website says it all. If only we believed it. The ongoing “death by a thousand cuts” has achieved its goal. The province’s environmental support structures have been damaged to the point of incapacitation…The elimination of programs, the firings of expert biologists and environmental scientists and the hodgepodged organizational reform of the province’s environment and other departments has created a non-functional system. (Montevecchi, 2017)

Given the greatly-reduced capacity and efficacy of provincial environment and resource conservation agencies, there is little evidence of a silver lining for the remaining fractured and incapacitated wildlife trustees striving to deliver their mandate of nature conservation. There is hope, however. Holling (2004), in his discussion on adaptive cycles and connections between the Panarchy framework (Gunderson & Holling, 2002) and transformation in other anthropogenic systems, underscores the great opportunities for reorganization that can only be made available through crisis. The concept of an Adaptive Cycle (Figure 21) is rooted in the study of ecosystem dynamics and consists of four distinct phases: growth or exploitation (represented in the figure by the letter ‘r’), conservation (‘K’), collapse or release (‘Ω’), and reorganization (‘α’) (The Resilience Alliance, n.d.). The transitions between phases in the adaptive cycle are termed accumulation: the transition from growth to conservation, and reorganization: the transition from collapse to reorganization, with this second transition leading to renewal to restart the cycle (Figure 21). Gunderson and Holling’s (2002) Panarchy framework describes a nested hierarchy of adaptive cycles that are connected through different phases or levels over time or space. In explaining the connection between crisis and opportunity Holling states,

> Growth is important, but even more so are the forces in a healthy system that dominate during episodes when growth is halted or reversed, when deep uncertainty explodes, or when several alternative futures are unexpectedly perceived. Suddenly, the resulting unpredictability stifles informed action or triggers ignorant reaction. It is a time of back-loop crisis, but also of opportunity. (2004, p. 4)

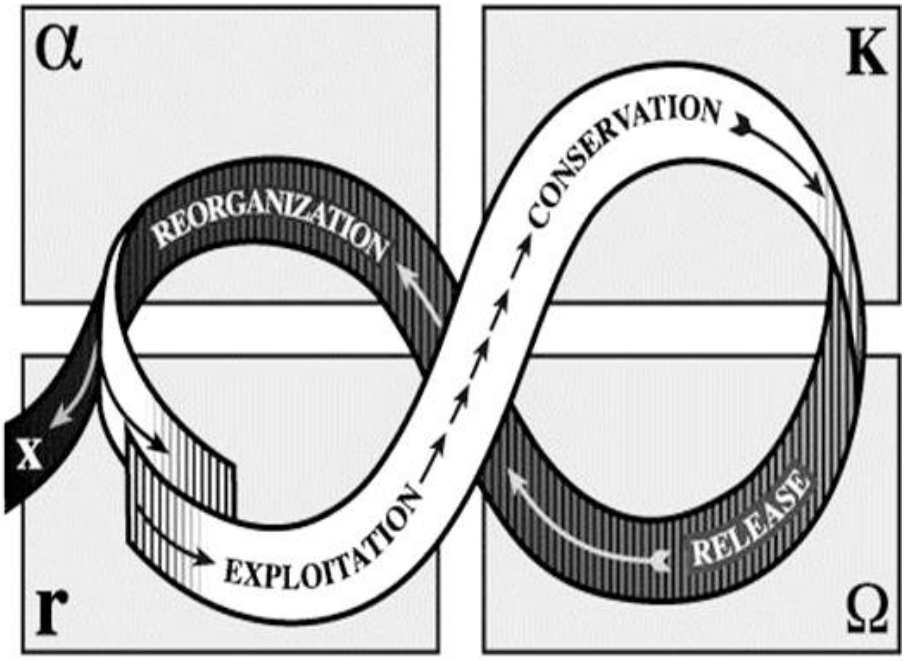

Figure 191. The Adaptive Cycle**.** (From *Panarchy* edited by Lance H. Gunderson and C.S. Holling. Copyright © 2002 Island Press. Reproduced by permission of Island Press, Washington, DC)

When viewed as an adaptive cycle, the current crisis facing provincial wildlife managers and agencies presents an opportunity to evolve away from the current, top-down wildlife management structure and *reorganize* with a more integrative and pluralistic approach that involves the establishment of and engagement with the Wildlife Beneficiary Governance Committee (WBGC) proposed above and consequently the incorporation of Decker's et al. (2016) wildlife governance principles and a *renewed* adherence to the Public Trust Doctrine. As

is obvious from the concerns expressed in interviews and popular media items regarding the much-reduced capacity of wildlife managers to effectively research and conserve wildlife in the province, the current top-down management system is not resilient to the recurring perturbations of budget cuts and layoffs. If, however, bureaucratic structures were in place to support and earnestly engage with beneficiaries in a long-term and meaningful way, environment and resource conservation in the province would be much more resilient to such perturbations and insulated from the ebb and flow of provincial budget priorities and sometimes-rapidly changing partisan management priorities. While this study did not assess the capacity of provincial government departments to allow for this evolution, my study has shown empirical data and scholarly literature in strong support of the effective development of and engagement with the third sector in wildlife management in Newfoundland.

If, as proposed above, the WBGC, with its diverse composition of well-represented beneficiaries, was established as a long-term entity and imbued with the ability to earnestly inform decision-making, lobby government, and engage the broader public in salient caribou-related issues, the impact of the recent deconstruction of the Wildlife Division on caribou management would be reduced. The impact of the budget cuts and restructuring could be mitigated by the WBGC members' ability to maintain the institutional memory of caribou management issues and to engage their respective beneficiary groups and the broader public in lobbying for maintaining or restoring the capacity of the Division. With such empowerment, WBGC members would also be able to ensure that the views of the public, in whose trust wildlife is to be managed, are made known to trustees. As the CRC was already trialed as an engaged, informative stakeholder group in the context of caribou management in Newfoundland, and as many participants applauded its composition and function, and lamented its end, the

proposed WBGC could be seen as an considerably-improved model for a more formal, appropriately empowered body, perhaps similar to the wildlife commissions employed in some areas of the United States.

Of course, any intention to transition the WBGC or any other stakeholder or beneficiary group from an informative integration role to a decisive integration role should not be taken lightly. Such a shift requires due consideration of both the challenges posed by other similar structures (Lord & Cheng, 2006) and, relatedly, how the engagement structure should be designed to avoid previously identified pitfalls while maintaining effectiveness (Talley, Schneider & Lindquist, 2016).

12.1 The Theoretical Basis and Strategy for Developing the Third Sector

The theoretical framework underlying this thesis comes from the field of IRM. From this theoretical basis, the seven dimensions of IRM, as outlined by Slocombe and Hanna (2007), were employed to shape my research questions and to guide my data collection and analysis. When considering the rationale for the widespread shift toward integrated approaches, a large number of scholars have outlined the objective and subjective benefits of integrated approaches (Berkes & Folke, 1998; Enck et al., 2006; Freddy, et al., 2004; Grumbine, 1994; Kendrick, 2003; Kendrick & Manseau, 2008; Lachapelle & McCool, 2005; Lawrence & Daniels, 1996; Moller et al., 2004; Riley et al., 2002; Slocombe, 1998; Slocombe & Hanna, 2007).

These benefits (Table 8) coincide directly with the dimensions of IRM. By taking a systems perspective, adopting ecosystem-based and adaptive management approaches, fostering multidisciplinary methodologies, and practicing earnest public engagement, resource and wildlife management can more effectively address fragmentation between and within disciplines; sources and types of information; spatial/ecological units; governments; agencies;

Table 8.
Subjective and Objective Benefits of Integrated Resource Management Approaches

Subjective Benefits of IRM	Objective Benefits of IRM
Fairness of decision making process	Bio-regionally defined management units
Shared ownership of decisions	Diversity of problem definitions
Mutual (manager/stakeholder) respect and trust	Diverse forms and sources of knowledge
Development of social infrastructure (efficacy of the third sector through social learning)	Recognizing social-ecological system linkages
Removal of barriers / Rapport building between managers and stakeholders	Adaptive (impact) management

interests/sectors; and perceptions, attitudes and values. Fostering the development of a third sector in Newfoundland caribou management is therefore an essential prerequisite for addressing the fragmentation in IRM dimensions, as identified in the chapters above.

Given the well-documented challenges of transitioning to more integrated approaches in Newfoundland wildlife management, however, if the impetus for this next evolution in the field must come from an institutional body removed from the inertia of the sometimes myopic, trapped (per Carpenter & Brock, 2008; Young, 2008), and recently incapacitated wildlife management structures at the provincial level. As Hare et al. (2017, p.519) state in their examination of the challenges and solutions of "institutional resistance" in applying Public Trust thinking in wildlife governance,

> Doing so [overcoming institutional resistance challenges] will require significant changes to many practices and processes of wildlife conservation, and the philosophical orientation upon which they are founded. It will only be achieved through committed collaboration and cooperation among governmental and nongovernmental partners

> immersed and invested in specific conservation issues, supported and legitimized by diverse beneficiaries engaged throughout decision-making processes.

The Canadian Wildlife Directors Committee (CWDC) is well positioned to champion this much-needed evolution in the practice of provincial wildlife management. The CWDC is composed of representatives from the 13 Canadian provinces and territories who are charged with wildlife conservation in their respective jurisdictions (CWDC, 2015). The Committee also includes federal-level representation from Environment and Climate Change Canada, the Parks Canada Agency, and the Department of Fisheries and Oceans. Fittingly, the strategic vision of the CWDC coincides very well with many of the tenants of IRM,

> Contribute to the maintenance of biodiversity by ensuring healthy populations of wildlife and the habitats that support them across their natural distributions that maintain or enhance the ecological, social, cultural and economic benefits of wildlife in Canada (CWDC, 2015, p. 2)

In pursuit of this vision, the CWDC relies on "a collegial partnership of the [above] jurisdictions / agencies and works with stakeholders and partners to affect wildlife conservation on the landscape" (CWDC, 2015, p. 1). As outlined by Decker and Edwards (2016), the CWDC has sought to aid provincial and territorial agencies in their pursuit of effective and efficient wildlife conservation though the identification and promotion of management direction of interprovincial or regional importance, by providing a forum for information sharing on best practice, and by bringing the Committee's collective knowledge and influence to bear on contentious, trans-border, or especially challenging issues.

With evidence (from both the current study and earlier work on the efficacy of the CWDC by Decker and Edwards, 2016) of fragmented approaches already emerging within and

between some jurisdictions, the CWDC can bring its information and influence to bear to free provincial wildlife management agencies from the rigidity and poverty traps that currently encumber their evolution toward IRM. As stated by Decker and Edwards (2016, p. 21),

> Thankfully, the CWDC is not encumbered by the inertia of a rigid bureaucracy as provincial or territorial agencies might be and CWDC members are free to foster the evolution of the Committee to enable it to more effectively support local agencies and respond to changing priorities and approaches in wildlife management in Canada.

One of the main mechanisms of influence at the provincial agency level that is available to the CWDC is regional workshopping efforts. While the CWDC strives to address issues of interprovincial importance, national-level initiatives sometimes suffer from a lack of relevance at the regional or provincial level (Decker & Edwards, 2016). Decker and Edwards (2016) suggest that a regional approach may find a middle ground between the "too-general" nation-wide topics and the "too-specific", context/province-specific approaches and thus contribute more effectively to the formulation of local management strategies while also maintaining relevance to at least several provincial or territorial jurisdictions. Provincial wildlife managers would likely benefit greatly from a series of regionally-themed CWDC workshops (perhaps focused on the impacts and associated management implications of important regional wildlife species) that concentrated on the challenges and benefits of adopting IRM approaches in wildlife management. Of course these workshops should also focus on the importance of fostering the development of the third sector (e.g. the WBGC proposed here) as a means to facilitate the subjective and objective benefits that the transition toward IRM would deliver. Decker and Edwards (2016, p. 18) in their examination of CWDC members' most preferred workshop themes found that

the themes of information sharing, large landscape/ecosystem-based approaches and human dimensions were identified in several instances by participants as being important and relevant and, in the case of human dimensions and landscape-scale management, were identified as the most informative workshop topics to date.

To arrest the increasing rate of species loss and habitat degradation, wildlife management needs to evolve and take action to remain relevant and effective. Embarking on this next stage will require greater integration of the social aspects of wildlife use and management with technical and scientific knowledge, and the development of integrative institutional systems and structures that build and hold trust. Given the supra-provincial focus of the CWDC, the committee's already-established mechanism for regional wildlife management policy influence, and committee members' pre-existing interest in topics related to IRM-related themes, the CWDC has the potential to help usher in the next stage in the evolution of wildlife management toward IRM.

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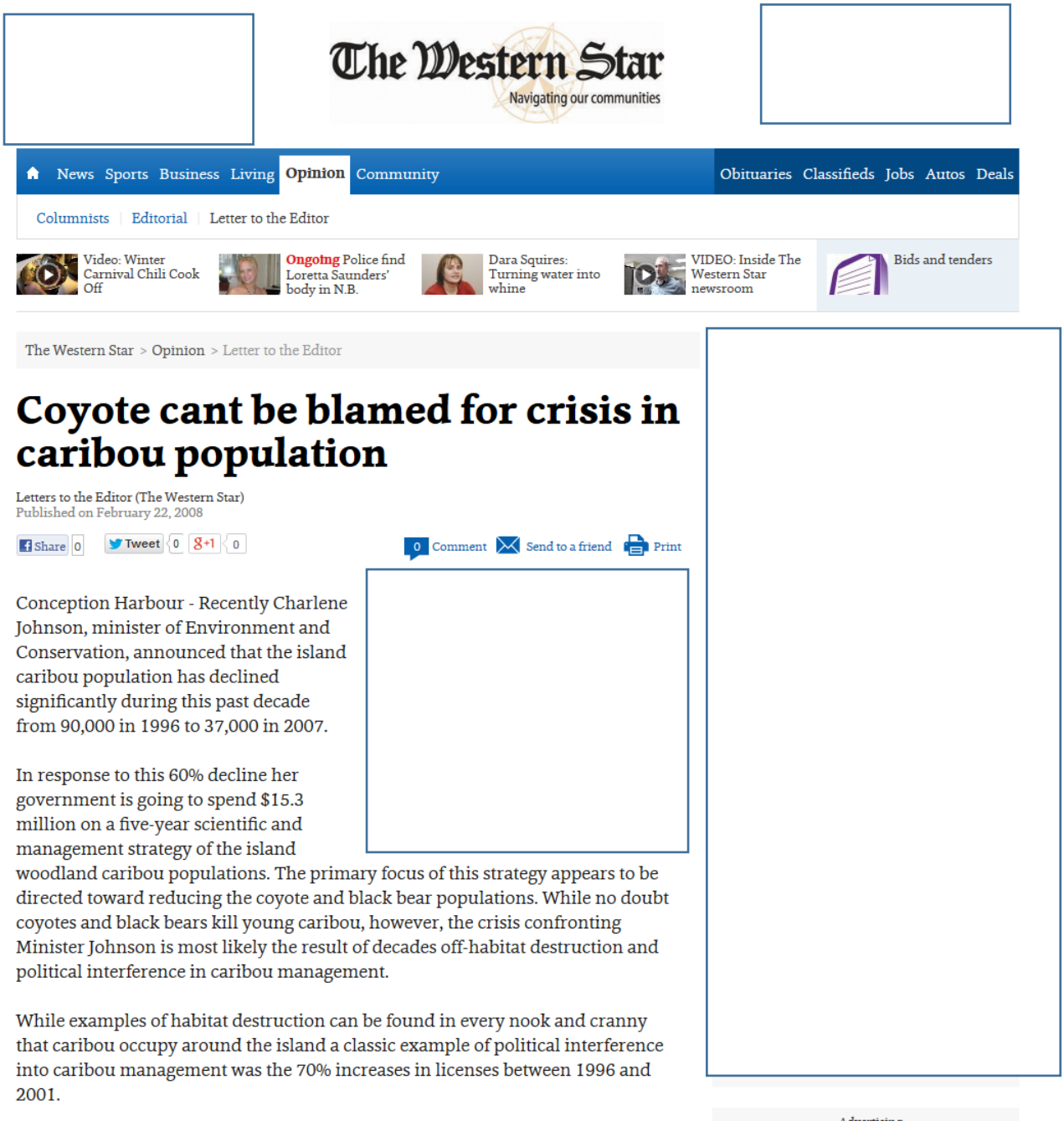
Appendix

Selection of popular media items and press releases presented in chronological order



Licences were increased from 4,525 in 1996 to 7,730 in 2001 and occurred at a time when the wildlife division was in total disarray and the coyote was just getting a foothold throughout the island. Further the only scientific data available at the time to support those increased quotas had been done a decade earlier.

On Feb. 17, 1997, Beaton Tulk, than minister responsible for wildlife, announced that he had increased the caribou quota by 1,190 from 4,525 to 5,715 for the 97/98 hunting season he noted that this quota was the highest in the history of Newfoundland.

Tulk than extended congratulations to hunters and wildlife staff for their excellent management of the caribou population and proudly announced that as result of this great management Newfoundlanders would now be able to reap great financial benefits from this resource.

Ironically, those unparalleled licence increases were in response to intensive lobbying from special interest groups. And not surprising within a few short years the folly of increasing quotas without the science to support such a decision became evident when everyone realized that the caribou population could no longer sustain those great financial expectations. However, rather than accept responsibility for the part they contributed to this caribou population decline hunters and outfitters alike pointed the finger at the coyote as the culprit.

Thus the coyote became the scapegoat for all the caribou woes and the call went out to eradicate this predator from the island.

Unfortunately, it is far too late to cry coyote now that humans have forced the native caribou to the brink of extinction. Needless to say a more creative solution other than killing predators must be found to keep this native caribou from going the way Newfoundland wolf.

But spending $15.3 million to kill coyotes and black bears in the hope that a big caribou buck will survive so its trophy antlers can be sold to some rich American is by any stretch of the imagination a ridiculous waste of taxpayer's dollars.

Environment and Conservation
February 7, 2008

Five-Year Caribou Strategy Seeks to Address Declining Populations

The Minister of Environment and Conservation, the Honourable Charlene Johnson, today announced $15.3 million in funding for a five-year scientific and management strategy of the island woodland caribou populations. The strategy builds upon earlier efforts to better understand and mitigate the current decline in woodland caribou numbers and the role of predators in this decline. Since 2006 and 2007, in response to evidence of a continued decline, the Provincial Government invested an additional $3.7 million in new funding in science and management efforts over two years, the results of which led to the development of this five-year caribou strategy. Part of this effort will be directed toward reducing predator numbers through legal harvests in order to determine the effect on caribou populations.

"Our recent studies of our woodland caribou populations have revealed some startling data from a conservation standpoint," said Minister Johnson. "We take the issue of the declining population extremely seriously, and remain steadfast in ensuring proper management measures are in place to mitigate the decline. Our five-year scientific and management strategy will give us a better understanding of the current decline in woodland caribou populations. The caribou strategy focuses on the continuation of the collection of necessary caribou data; initiation of a predator-caribou ecology study; implementation of an enhanced information and education program; cooperation with the Department of Natural Resources to improve wildlife management; increased emphasis on habitat assessment; and a province-wide regional assessment of black bear populations, one of the key predators of caribou calves."

These science initiatives will provide the necessary context to quantify the effect of reducing predator numbers on the survival of caribou.

Caribou populations have been in a state of decline since the mid to late 1990s. A provincial assessment of caribou populations, carried out by the Wildlife Division of the Department of Environment and Conservation over the past couple of years, has confirmed these declines. From an estimated peak of over 90,000 caribou in 1996, the current population is estimated at 37,000, representing a decrease of approximately 60 per cent. Predators such as the black bear, coyote and lynx are the major factors associated with this decline. Results to date indicate declines have been in the range of 40-60 per cent for most herds on the island portion of the province; however, the Grey River Herd has decreased by approximately 90 per cent of its historically highest population level. This has resulted in the need to close this area to all hunting efforts, commencing the fall of 2008.

"The Grey River Herd statistics suggest that immediate conservation measures are necessary. Therefore, all hunting efforts in the area will be suspended in the fall of 2008," said Minister Johnson. "Further assessments of other herds on the South Coast portion of the province and Northern Peninsula also point toward the necessity for stringent conservation efforts such as decreased quotas."

Between 2001-06, the overall resident and non-resident quota for caribou decreased from 7,730 to 4,635, or 40 per cent. In 2007, the quota was reduced to 2,760 and, for 2008 – due to continued resource decline – the licence quota has been set at 1,235.

"This scientific and management strategy is consistent with our government's commitment to sustainable development and science-based decision making," said Minister Johnson. "The goals of the strategy will be achieved by working with key stakeholders to ensure sound management of our caribou herds, and their insights will be considered as we work toward the long-term goal of sustaining these herds for future generations. The implementation of this strategy will enable government to intervene in a proactive manner."

The minister also stated that in addition to the environmental importance of a healthy caribou population, a sustainable caribou herd has great economic and social significance, particularly for rural areas of the province. "We understand the iconic value of caribou and its place in the cultural fabric of our province. Equally so, we recognize the recreational and economic role it plays in many of our rural regions," said Minister Johnson. "This strategy will be a major additional effort to assist in better understanding and mitigating the caribou decline."

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The Telegram

More coyotes, fewer caribou

Letters to the Editor (The Telegram)
Published on March 17, 2008

The relationship between eastern coyotes and woodland caribou has again been thrust into the spotlight with the recent announcement of a $15-million caribou project.

The president of the Newfoundland and Labrador Outfitters Association recently complained about the province's handling of the caribou crisis ("Discouraged by province's caribou strategy," Telegram, March 8).

Letters to the editor - The relationship between eastern coyotes and woodland caribou has again been thrust into the spotlight with the recent announcement of a $15-million caribou project.

The president of the Newfoundland and Labrador Outfitters Association recently complained about the province's handling of the caribou crisis ("Discouraged by province's caribou strategy," Telegram, March 8).

For years, the provincial government has ignored woodsmen's claims that coyotes are ravaging caribou. For example, on two occasions I wrote the premier regarding coyotes/caribou and received no response.

Four years ago, I published a book entitled "The Newfoundland Coyote," which documented the eastern coyote's effectiveness in preying on Newfoundland's woodland caribou.

I have come to the conclusion that both elected politicians and government bureaucrats care little what resident hunters, outfitters and trappers know about coyotes. The experience of eyewitness woodsmen is dismissed as non-scientific, anecdotal evidence.

At the same time, the majority of the general public are apparently apathetic about the caribou crisis.

Interestingly enough, caribou populations are not crashing in isolated areas, such as the Grey Islands, Merasheen Island, Fogo Island and on the Cape Shore. To me, the reason is clear. There is no coyote predation on the offshore islands, and coyotes have yet to establish themselves significant numbers on the Cape Shore.

Coyote experiment

I challenge government to conduct an experiment. I suggest we capture some coyotes, then place breeding pairs on the offshore islands and several pairs on th Cape Shore. I wonder what would be the effect on the docile caribou?

I believe the future of woodland caribou in Newfoundland is bleak. Our caribou will survive into the future, but at substantially reduced numbers. We may have little or no hunting quotas.

We will probably not see the large herds of the 1980s again. Yes, caribou decline in the early 20th century and rebuilt their numbers. However, in that period the wolf went extinct.

Today, we have a caribou crash worsened by the predation of relentless little wolves. Herd recruitment is hampered by coyotes killing newborn calves, and also preying on adults in the winter, including pregnant does.

Coyotes will drive the caribou into a deep ravine made worse by forage issues, lo of habitat and Newfoundland's limited amount of prey species.

The widely read source on eastern coyotes is biologist Gerry Parker's 1995 book "Eastern Coyote." Parker hypothesized that coyotes in Newfoundland would principally prey on snowshoe hare. Wrong.

Parker also wrote that "direct predation (by coyotes) on adult caribou (in Newfoundland) is also unlikely." Wrong again.

However, provincial government biologists apparently continue to lean on Parker's work as a primary source on coyote habitats.

So, the government biologists who advise our elected politicians are ignoring local outdoorsmen, and are relying on a work which grossly underestimated the ability of coyotes to prey on caribou. That combination spells big trouble for Newfoundland's woodland caribou.

NL: Can oil justify danger to caribou in Parsons Pond?

Aaron Beswick
Published on May 19, 2009

Parsons Pond Mayor Brenda Biggin shows the map of a proposed access road to two exploratory oil drilling locations. The road passes near a sensitive caribou' area and is unpopular with some. Northern Pen photo.

[PARSON'S POND, NL] - No one was against **drilling for oil** at a public meeting held in **Parsons Pond** last Tuesday, but the route of a proposed **access road** drew **strong criticism**.

An **Alberta-based exploration company, Leprechaun Resources Ltd.**, has filed an undertaking with the **Department of Environment**, requesting permission to build a 10.4 km access road running from Five Mile Road across feeder gulch to access two proposed **experimental drilling locations**. The third proposed place for drilling can be accessed from Five Mile Road. The proposed road runs between two locations marked as **"sensitive" caribou habitat** by provincial government maps.

The public meeting, which wasn't attended by a representative of Leprechaun Resources, was called by **Parsons Pond Town Council** to discuss the proposal.

"I see the interest as a good thing for the area," **Mayor Brenda Biggin** told the approximately 70 people who filled the small meeting room. "I was told that if we were in favour of the project we'd better contact the Department of Environment and tell them why we think it's good. The concern is that the road will give easier access, but I think both sides can work in harmony. We're not talking about destroying the area, we're talking about putting a road in."

When asked, no one indicated they had written to support the project.

Outfitter Roger Keough was the first member of the public to address the crowd. "I have no objection to **oil development**, but we have put a lot of money into this community. Over the past two years we've lost 90 per cent of our caribou licences and have had to lay off four guides and a cook," said Keough, a member of the provincial outfitters association, which wrote a letter requesting a new route for the access road. "Caribou has put a lot more meals on plates in Parsons Pond than oil has."

Keough's opinion received applause. Others at the meeting who have worked in the Western Canadian oil industry raised questions as to whether roads disturb caribou.

Robbie Coles has worked in **Northern Alberta** for four years, where there are caribou, and he recommended the use of **rig mats** - steel and wood plating that is laid over the ground after freeze-up and removed in the spring. "Three wells is only short-term work - if they don't hit oil then they won't need a permanent road," said Coles. "I support the exploration so long as there isn't too much damage done to the area. We use rig mats all the time in Alberta and they do the trick, causing a minimal amount of damage."

When contacted by ***the Pen***, Leprechaun Resources president **John Maher** explained that his company is looking at rig mats, among other options. "We're trying to design the roads with minimal impact on the environment - just a road or trail big enough to get the rig in to the location," said Maher. "We're waiting for the snow to go and maybe then we could refine the road layout."

He estimated that "the better half of a hundred" people would be employed over the six months of drilling, though many of them wouldn't come from the area. The company is in the process of getting approval from the Department of Environment and if they're allowed, Maher said drilling could begin in **early fall**.

For her part, **Crystal Smith** ended the meeting by standing and saying, "I look around and only see a handful of young people. And that's because there's only a handful of young people left. For myself, oil won't make a difference, but it will for the young. I think people want some hope and the exploration has given them hope."

Declining population; Outfitters expect caribou hunt will be banned by 2010

Published on April 03, 2009

Howley -

In Newfoundland, the number of woodland caribou is in sharp decline.

The woodland caribou population stood, as of February 2008, at an estimated 37,000 animals - a drop from 90,000 in 1996, according to the Department of Environment and Conservation.

Outfitter Raymond Broughton and other outfitters are predicting the woodland caribou hunt will be banned by 2010. Broughton is pictured with some coyote carcasses and a stuffed fox to illustrate the size of the coyote. Star Photo by Ashley Fitzpatrick

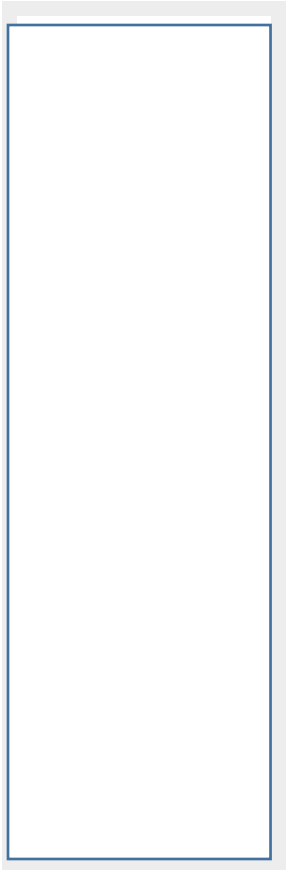
That number has continued to drop, say three provincial outfitters, Ray Broughton, Wayne Holloway and Cyril Pelley, who are each predicting a complete ban on the hunting of woodland caribou by 2010.

Broughton is the owner of Ray's Hunting and Fishing in Howley, Holloway owns Pine Ridge Lodge in Mount Pearl and Pelley is the president of the Newfoundland and Labrador Outfitters Association and the owner of Island Safaris in Springdale.

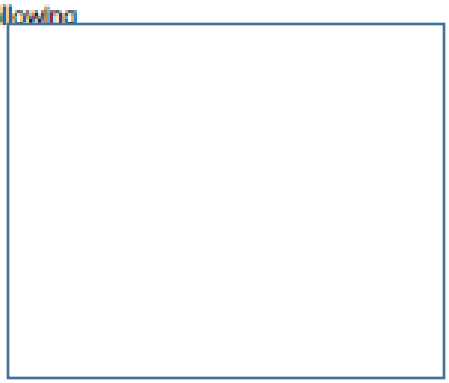
"If the decline maintains the curb that it's on now, we're about one year from a closure of the caribou hunt," said Pelley.

He believes government will cut off hunting at approximately 25,000 animals.

"People in the loop - myself and other outfitters - know exactly where this is heading next year," said Broughton.



The statements from the outfitters come following the release this week of the 2009-2010 Hunting and Trapping Guide, published by the Department of Environment and Conservation.



The guide states there will be a total of 880 licences available for the hunting of woodland caribou this year, a decrease of 355 licences from 2008.

When asked about a potential ban on all woodland caribou hunting, a representative for the Department of Environment and Conservation said nothing has been set for the future one way or the other.

"Current surveys support a limited caribou hunt. However, if future surveys show a further decline in the populations, then the number allocated for hunting will also have to reflect the decline," said Melony O'Neill, director of communications for the department.

Financial impact of wait and see

But not knowing whether there will be a woodland caribou hunt next year or not

is not an option for outfitters, said their association president.

Already, said Pelley, outfitters are losing millions of dollars from their industry due to the declining caribou populations, and thus, a declining number of hunting licences.

"It's a $40 million industry. We've lost $10 million out of our business - 86 per cent of our (caribou) quota in less than two years," he said in reference to the effect of the decline.

In addition, Pelley said the association regularly travels to trade shows in the United States in January and February to push for future bookings by American tourists.
That process was impeded this year, he said, as hunting licences were not announced before the shows. "We didn't find out until about a week ago Sunday what we had this year," he said. "That's when outfitters are normally booking for the next year."
Pelley is asking government to provide a lead time of at least 18 months on licence numbers - or existence - to be able to avoid the situation.
"It embarrassed us on the world market," he said, as outfitters couldn't state exactly what was being offered to hunt.

Too much focus on study

Despite the financial losses, the outfitters said they are mainly concerned with the survival and development of the caribou population, as a healthy caribou population is the best thing for their business "and for the soul," said Broughton.

All three claim that the $15.3 million being spent on the five-year strategy for caribou currently invests too much in environmental study and assessment and not enough into "aggressive action."

The outfitters stated that aggressive action is required to protect the woodland caribou, for example through a "predator removal program" that would address predation of calves by black bear, lynx, bald eagles and coyotes.

"We can go on studying this and the last page of the study report will be the obituary of the woodland caribou," said Holloway.

In announcing the $15.3 million in new funding in February 2008, the Department of Environment and Conservation stated that the "science initiatives will provide the necessary context to quantify the effect of reducing predator numbers on the survival of caribou."

Meanwhile, the three outfitters said they themselves would respect any ban on the hunting of woodland caribou, if that is the decision in 2010.

Caribou surveys using paint markings to get underway in Newfoundland

Staff ~ The Telegram
Published on March 08, 2010

The province's Department of Environment and Conservation says it will conduct a mark-resight population census of the Middle Ridge caribou herd in the eastern and central portions of the island, beginning later this week.

The survey - which uses a highly visible red paint to mark animals - will conclude by the end of March.

According to a news release, as part of a mark-resight census, there is a requirement for a number of caribou to be marked using a highly visible red paint. Once a number of animals in the herd have been marked, they will be counted and the relative ratio of marked animals versus unmarked animals will assist in establishing the total population estimate for the herd.

Neither the marking of the caribou, nor the paint itself, poses any harm to the animal. As the marked caribou lose their winter coat this spring, the red marking will fall off the animals.

Coyote cull

Deana Stokes Sullivan
Published on July 22, 2010

More than 5,000 carcasses registered with province since 1991

Early one morning in February, when Ross Hinks was checking his rabbit snares, he found another predator already feasting on his catch.

The natural resources director with Conne River's Miawpukek First Nation government said his snares were set within walking distance, about a kilometre, from his cabin, located about an hour's drive from the community on Newfoundland's southeast shore.

The predator was an Eastern Coyote, believed to be descended from a coyote-wolf mix, which has been blamed for a decline in the Grey River caribou population in the area.

The Miawpukek First Nation community is about 560 kms from St. John's.

Hinks said he saw the coyote before it detected his presence. He loaded his gun and shot it.

"It was a very large animal, quite honestly," he said. "It must have been in the range, I would say, every bit of 60 to 70 pounds ... I was amazed by the good condition it was in. It was very fat."

A few years ago, some band council members witnessed coyotes stalking caribou and saw first-hand some of the damage done to the herd by coyote attacks.

According to the provincial Department of Environment and Conservation, an increase in coyote hunting licences offered by the province in recent years has resulted in larger harvests of the predators. Over the past three years, about 700 coyotes have been trapped or shot annually in Newfoundland. That's up from 374 coyotes harvested in 2005-06 and 357 in 2004-05.

A government official says a total of 5,789 coyote carcasses have been registered with government from 1991 to 2009, representing the vast majority of animals harvested.

The province offers a coyote carcass registration reward of $25, as an incentive to gain access to carcasses to assist with biological investigation of the species. This includes carcass evaluation to assess their diets.

Efforts are also continuing to evaluate their ecological impacts through a radio collaring program.

The department says most coyotes have been hunted along the South coast barrens, with the least being harvested on the Avalon.

Hinks believes the increased hunting pressure has made a difference in the number of coyotes in the Conne River area because he hasn't heard of as many sightings recently. However, he said, during the winter, there wasn't enough snow for residents use their snowmobiles much and get on the land to observe them.

While there's still concern about the Grey River caribou population, Hinks said there seems to be a few more animals around this year and a few more yearlings.

In 2008, the province announced a five-year caribou strategy to address declining populations. An assessment indicated the caribou population in the province had dropped about 60 per cent, to an estimated 37,000, from a peak of more than 90,000 in 1996.

Results indicated declines of 40 to 60 per cent for most herds on the island and up to 90 per cent for the Grey River herd.

The Department of Environment spokesperson said bounties, as a means to eradicate coyotes have been suggested, but experience from other jurisdictions where coyotes are native or have invaded, indicate they are ineffective over the long term at controlling them.

While it's not possible to determine the exact coyote population in the province,

the department says it's probably still increasing and the coyote permanently established on all parts of the island.

> « *"It was a very large animal, quite honestly."* »
>
> - *said Ross Hinks*

A 2006 government publication said coyote densities in New Brunswick were estimated at less than 0.1 per square kilometre. In this province, it considered a density of 0.05 per square kilometre, or half that of New Brunswick, as a reasonable estimate. Assuming the province's entire land mass of 112,000 square kilometres is occupied by coyotes, this would yield a population estimate of 5,600 coyotes.

Coyotes in this province are harvested by multiple methods, including a coyote specific hunting licence, provincial trapper's licence, incidental harvest by legal hunters, under authority of all other licence types for big and small game, and under permit in extenuating circumstances.

Coyotes were added as a trapping species in 1992 and, according to the environment department, each year about 1,800 to 2,000 trapping licences are sold annually at a cost of $10 each. The trapping season runs from Oct. 20 to Feb. 1.

Legislative amendments were made in 2002, allowing small and big game hunters to take coyotes incidentally. About 25,000 small game and 35,000 big game hunters avail of this opportunity annually.

The coyote hunting licence was introduced in 2004 and is free or charge to qualified hunters. More than 2,500 coyote licences were issued in 2008, according to the province.

Trappers, however, are responsible for the majority of the increase in coyotes harvested since 2002. According to the environment department, in any given year, more than 70 per cent of the coyote harvest is taken by trappers.

The province has been offering coyote hunter workshops in an effort to increase hunter participation.

While Hinks supports the coyote hunt, he said one of the biggest concerns people have voiced to him is that government regulations are too restrictive with respect to weapons permitted.

Provincial regulations state the weapons must be "a centrefire rifle not greater than .225 calibre, or a shotgun using shot size No. 2 or larger."

A coyote brochure, produced by government, goes on to say most coyote hunters and ammunition manufacturers do not consider rimfire 22s adequate for harvesting coyotes, and these firearms are not permitted.

Other examples of centrefire rifles, not greater than .225 calibre which are permitted, include the 17 Remington, 218 Bee, 22 Hornet, 220 Swift, 225 Winchester, 223 WSSM, and the 204 Ruger.

Hinks said most of these rifles are very expensive. "People say, 'I don't know why you're not allowed to use a regular 22.' It would certainly do the job and have more people participating, to say the least."

While hunting pressure is reducing the number of coyotes, Hinks said he still believes there are a lot of these predators on the southeast coast. He said, just about every time he goes to his cabin, there's signs that they've been around including tracks and feces.

Although there have been safety concerns, especially for children, Hinks said the coyotes he's seen up close have seemed "very wary" of humans. "As soon as we see them, they're gone," he said.

dss@thetelegram.com

Woodland caribou: Going down with the trees

Ian Goudie
Published on March 18, 2010

Boreal Forests are living ecosystems that support thousands of species that have evolved over millennia. Like all ecosystems, if you impact one part then you affect another. Big business has monopolized our forest landscape, and been supported by Government policies of extensive clear-cutting, single species silviculture, and favouring even-aged regeneration. Vast areas of our forest landscape that once supported mixed age, mixed species and mixed size stands, the cornerstone of biological diversity, are now monocultures.

Woodland caribou are in serious trouble on the island of Newfoundland and the public need to reflect on the major contributing factors. The fact that these ungulates need intact mature coniferous forests is why they are called "woodland" caribou. They require old-growth forests for the calving period as well as tree lichens and relief from heavy snow fall in winter. Caribou abandon traditional range when clear-cuts and related logging activity approach within 10 kilometres of core areas.

Guest commentary -

Boreal Forests are living ecosystems that support thousands of species that have evolved over millennia. Like all ecosystems, if you impact one part then you affect another. Big business has monopolized our forest landscape, and been supported by Government policies of extensive clear-cutting, single species silviculture, and favouring even-aged regeneration. Vast areas of our forest landscape that once supported mixed age, mixed species and mixed size stands, the cornerstone of biological diversity, are now monocultures.

Woodland caribou are in serious trouble on the island of Newfoundland and the public need to reflect on the major contributing factors. The fact that these ungulates need intact mature coniferous forests is why they are called "woodland" caribou. They require old-growth forests for the calving period as well as tree lichens and relief from heavy snow fall in winter. Caribou abandon traditional range when clear-cuts and related logging activity approach within 10 kilometres of core areas.

At first blush, one would think that the Minister of Environment and Conservation is doing the right thing by providing guidelines to Department of Natural Resources (DNR) (Forestry Service) and the one remaining pulp and paper giant in an effort to influence the 5-Year Forest District Operating Plans. In a document entitled 'Forest Management Guidelines for Woodland Caribou For the Island of Newfoundland: Final Draft January 2007' we learn some startling facts. Thirty-seven core areas and associated 10 kilometre buffers are identified but the core areas are permitted to be harvested for 25 per cent over mature growth and buffer areas for 70 per cent of their older coniferous growth. Whatever the value of the scientific research on this iconic species has yielded is certainly totally lost in this outcome. This is not sustainable management. It might represent an attempt to find compromise to a biological reality that has no compromise but the public will never know the true influences behind this paradox.

The plot thickens because as you further look into these 37 core areas and their buffers, you come to discover that many of them have already been cut out, and/or are currently approved to be cut out, and in some cases were basically deforested before being designated. It is convenient for the DNR to continue to flout its Sustainable Forest Management Strategy (2003) because without overarching principles grounded in science, they can claim ostensibly to be undertaking sustainable management.

Something is badly amok when our caribou forests cannot be maintained and adequately buffered from forest harvesting. Then again, neither are spawning habitats of salmon, habitats of birds, viewscapes, outfitting lodges, cottage owners, and a sundry other resources being adequately "managed", and it all has to do with a mindset centered in the DNR that has free reign on our public forest lands.

Einstein's dictum states that problems cannot be solved by the same mindset that made them. Looking at this mindset in the context of conventional forestry we hit the brick wall called Annual Allowable Cut (AAC), the 'sacred cow' of industrial forestry. If you read the Government's Sustainable Forest Management Strategy (2003) (SFMS) you find that there is "...a lack of an intermediate age forest in insular Newfoundland..." (p.34) which is a polite way of telling you that our forests have been over-harvested. Like over-fishing, it is worldwide phenomenon. The mindset is that any and all fibre that is outside of legislated protected areas is available to the industrial forester for "allocation" into the AAC. Because this fibre calculation is spread across a vast landscape, it is simply not all available, and the inflated quantity gets taken out in a smaller geographic unit. Anything that jeopardizes this, such as increased buffers for salmon spawning and outfitting lodges, and/or protection of core areas for woodland caribou, are considered forms of "alienation". Yes, our essential forest habitats to maintain healthy forest ecosystems are "alienated" lands. How preposterous is this! In ecosystem-based management (EBM) you have to determine what to leave on the landscape to ensure healthy indicator species like caribou before you determine what to take. You cannot evolve ecosystem-based management from the mindset of conventional AAC.

Remembering Einstein's dictum, it is good to reflect on how our DNR is able to maintain status quo. In large part, this is because they have been able to limit planning of the landscape to their Forest District Planning Process. The AAC comes to this table already determined, and not open to discussion hence flouting the founding principle of EBM because they have already determined 'what to take'. But the control doesn't stop there because senior DNR bureaucrats have infiltrated important evolving entities like the Model Forest and the Caribou Recovery Team ensuring politico-pathic agendas are played out. Than end, of course, is to minimize the lands that are "alienated" from the AAC. It's a paradigm, and in earlier periods of human societies, scientists were burned at the stake for challenging convention; the earth is round not flat; the forest is an ecosystem not a cornfield. We need new thinkers. The human mind abhors change, and you can't take individuals trained as industrial foresters and turn them overnight into ecosystem managers, which is what DNR has attempted by reclassifying its District Unit foresters.

For the first time in about 100 years, central Newfoundland is freed from the strangle-hold of feeding a pulp and paper giant with enough fibre to squeeze out a kilometre of newsprint a day, and our over-harvested forests remain as testimonial to that legacy.

The SFMS has no guidelines or working principles. All part of the politico-pathic agenda to maintain the old school mindset that you can't allow forest lands to be "alienated" from fibre production. For sure, we can say that Einstein was right again. In his book 'Lost Landscapes and Failed Economies' Thomas Power notes that extractive industries produce uniform commodities that are readily available from other sources, and over-supply is the reason that these industries are in decline. By contrast, clean air, safe water, endangered wildlife, intact ecosystems, and scenic beauty are in dangerously short supply. Therefore the values associated with intact landscapes are very high indeed. Power claims that the relative importance of the goods and services that the natural world offers has already shifted away from the extractive to the environmental. Are we getting that? Environmental quality has become a central element of local economic bases and vitality. This would partly explain why the MUN study demonstrated about 70 per cent of residents of central and western Newfoundland do not believe our forests are being managed sustainably. This and the failing forest industry in Newfoundland are sending the refrain that 'the times are a-changing'.

Dr. Ian Goudie is an environmental scientist and co-ordinator of the Coalition for Sustainable Forests of Newfoundland and Labrador. Interested public are encouraged to engage through nlforests@cpaws.org.

Caribou and forestry

Published on November 23, 2011

The recent news story "Group calls for protection of woodland caribou" (Nov. 17) supported some disappointing statements by Minister Terry French of the Department of Environment and Conservation.

I am left to wonder whether the minister actually read the report released by the Canadian Boreal Initiative or was representing polarized views of development and the environment from within his government.

The crux of the report's message states:

"To conserve caribou and facilitate more effective forest management planning, the Island of Newfoundland should adopt a landscape-level approach that seeks to maintain large intact landscapes across areas inhabited by caribou. This approach can be incorporated into the upcoming 2013 Sustainable Forest Management Strategy for Newfoundland and Labrador. Until an effective approach to managing large intact landscapes is developed, the Newfoundland and Labrador Department of Natural Resources should adopt a temporary deferral on new commercial harvesting and road building within intact forest landscapes

occupied by caribou."

Keep caribou in mind

What we are saying here is that as development proceeds (meaning forestry and mining), it needs to be planned in such a way as to optimize existing intact landscape because the effects of predators on caribou are minimum in forest landscape that lacks roads, clear-cuts and other man-made features.

We all concur that predators are mediating declines but it is also critical to integrate this information with habitat management that ensures populations can remain self-sustaining. Newfoundland is blessed with opportunity to provide leadership in integrated landuse planning of our forest ecosystem, which is the basis for sustainable economic development.

Healthy ecosystems support healthy economies.

Ian Goudie

forest science co-ordinator

Canadian Parks and Wilderness Society

Newfoundland and Labrador Chapter

(Goudie, 2011 -)

Group calls for protection of woodland caribou

Barb Sweet
Published on November 24, 2011

Species in 'steep and rapid decline,' says report

Terry French

The Canadian Boreal Initiative is calling on the provincial government to temporarily halt new forest harvesting and road building in woodland habitat areas, among other things, but Environment Minister Terry French said that ban is not going to happen.

Releasing a report on the woodland caribou's habitat, the environmental group said government should not allow any new harvesting or roads until a five-year caribou strategy is completed, as well as the 2013 sustainable forest management strategy and research is finished.

It also called on government to adopt caribou management that maintains large intact habitat landscapes across the island.

The group also wants the province to adopt a natural areas plan and put priority on protecting areas that overlap with caribou ranges.

But Mr. French said the department is in the fourth year of a five-year, $15-million research project, and science suggests that predators such as bears, coyotes and lynx are to blame for declines in caribou, not development and fores-try activities.

"There's no evidence for us to stop fores- try or mining," Mr. French said.

Mr. French said the province is studying the possibility of expanding protected habitats.

But he said the decline of the caribou population has some good news — calves are stronger, indicating the decline is slowing and the signs are good for the future.

"We are headed in the right direction. We are not out of the woods yet, absolutely not," he said.

The report notes that significant habitat remains in Newfoundland, protection of those areas are inadequate in the face of pressures like forest harvesting, industrial development and construction of roads and transmission lines that mar the suitability of the land and constrain caribou movement, but increase access for hunters.

"Woodland caribou in Newfoundland have recently experienced a steep and rapid decline," the report reads.

"While predation on caribou calves is a key reason for this decline, habitat alteration from human land use and activities can result in functional habitat loss - a decline in caribou occupancy well beyond the immediate footprint of the disturbance."

In 2002, the woodland caribou population was 85,000, more than double the entire Boreal population in Canada, and was not considered at-risk. But, according to the report, since the late 1990s when the Newfoundland caribou population peaked at 96,000, caribou numbers have experienced "a severe and rapid decline." The total population in December 2009 was estimated to be 32,000.

Larry Innes, executive director of the Canadian Boreal Initiative, said in a news release the province has an opportunity to position itself as a national leader on caribou conservation.

"We still have the opportunity to develop conservation solutions through collaboration between the province, industry, local communities and Aboriginal governments. This is far preferable to trying to manage conflicting demands in a crisis," he said.

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New report:

Intact Habitat Landscapes and Woodland Caribou on the Island of Newfoundland

Woodland caribou in Newfoundland have recently experienced a steep and rapid decline. While predation on caribou calves is a key reason for this decline, habitat alteration from human land use and activities can result in functional habitat loss - a decline in caribou occupancy well beyond the immediate footprint of the disturbance. Disturbed areas also allow predators easier access to caribou herds.

Recommendations in this report include:

- The government of Newfoundland and Labrador adopt a **landscape-level approach to caribou management** that seeks to maintain large intact habitat landscapes across the Island of Newfoundland.
- The government of Newfoundland and Labrador apply a **temporary deferral on all new forest harvesting and road building within intact habitat landscapes** that support caribou until the completion of the 5 year Caribou Strategy, the 2013 Sustainable Forest Management Strategy and the conclusion of the Adaptive Management Research Project.
- The government of Newfoundland and Labrador implement the **Natural Areas System Plan and prioritize protecting candidate areas** that overlap with caribou occupancy areas.

Click here to download **Intact Habitat Landscapes and Woodland Caribou on the Island of Newfoundland**

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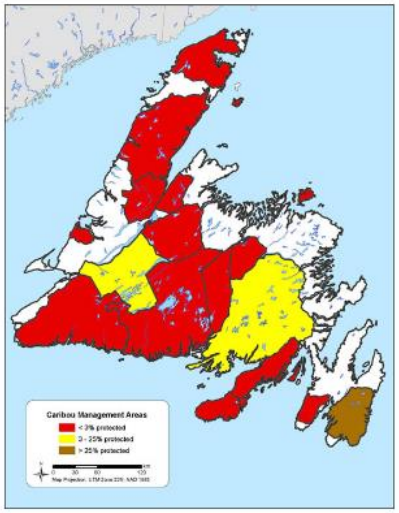
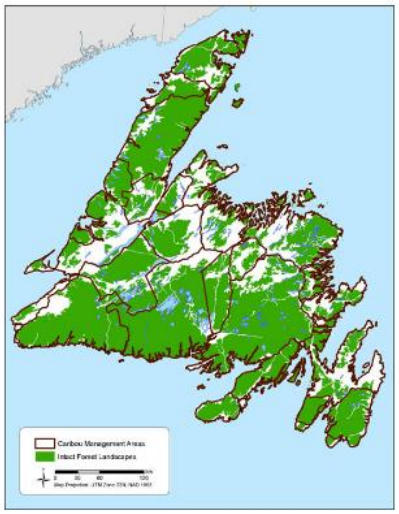


Map: Percentage of Newfoundland caribou management areas protected



Map: Intact landscapes and caribou management areas of Newfoundland

Contact:
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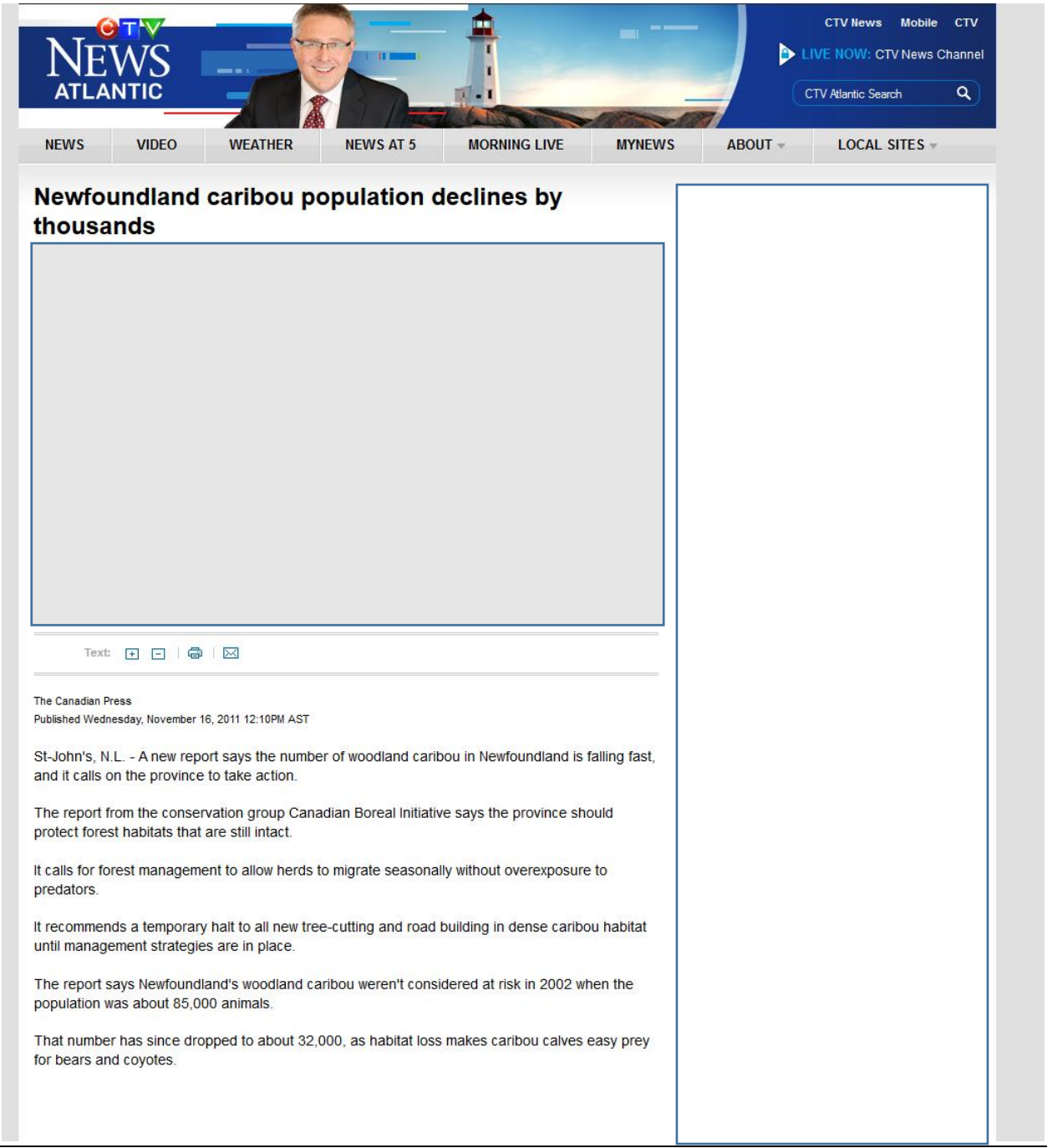
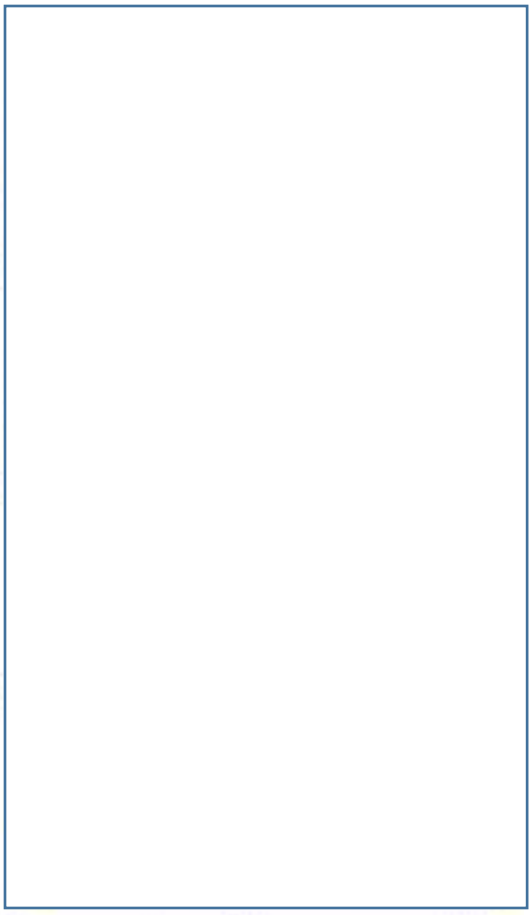


The Telegram > News > Local

Caribou survey gets underway

Published on February 22, 2012



The province's Department of Environment and Conservation staff will be using paint markers and low-flying aircraft to conduct a survey of woodland caribou herds on the island from now until the end of March.

To conduct the survey, staff will be marking selected caribou with red paint on the western portion of the island and the Northern Peninsula, according to news release.

Once the caribou have been marked, staff will again survey the herds and estimate herd sizes by the ratio of paint-marked caribou to unmarked animals. The paint will be lost from the animals once they lose their winter coat.

Minister of Environment and Conservation Terry French said the monitoring work is part of the province's five-year caribou strategy announced in 2008, and the use of science-based methods is a part of that plan.

"Conducting surveys of caribou, along with other methods such as information gathering from hunters is very important to this process and, ultimately, to our goals of ensuring the long-term sustainability of our wildlife," he said.

Caribou Survey Taking Place on Northern Peninsula, Newfoundland and Labrador

By: Newfoundland and Labrador Department of Environment and Conservation
Posted on: 02/22/12

Recommend 0

A population survey will be carried out over the next several weeks on Northern Peninsula caribou herds, as part of the Provincial Government's ongoing research and management efforts for woodland caribou on the island portion of the province. The survey is taking place in the vicinities of Deer Lake, Baie Verte, north along the Northern Peninsula to St. Anthony, and will include the Gregory Plateau, Aides Lake, Hampton Downs, Northern Peninsula, Gros Morne and St. Anthony caribou herds.

"Caribou are an important resource to the people of this province from many aspects, including recreational, social and economic standpoints," said the Honourable Terry French, Minister of Environment and Conservation. "We are committed to ensuring an updated monitoring and inventory program for our herds. These efforts are also linked to the ongoing research and management initiatives associated with the province's five-year caribou strategy announced in 2008. "

As part of the survey, a number of caribou will be marked using a highly-visible red paint. Once a number of animals in the herd have been marked, they will be surveyed again at a later date. The population size will then be estimated for each herd using a formula that calculates the ratio of marked animals versus unmarked animals. Neither the marking of the caribou, nor the paint itself, poses any harm to the animal. As marked caribou lose their winter coat in the spring, the red marking will also disappear from the animals.

The public are also advised that low-level flying aircraft will be used in the area to conduct this census work. The census will be ongoing until the end of March.

"Management of all wildlife in our province relies on ensuring we have current information that is science-based and available to us in a timely manner to help inform our decisions," said Minister French. "Conducting surveys of caribou, along with other methods such as information gathering from hunters is very important to this process and, ultimately, to our goals of ensuring the long-term sustainability of our wildlife."

Newfoundland Labrador | Caribou

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Finland intrigued by Newfoundland caribou conservation plan: Minister

Published on May 18, 2012

Newfoundland and Labrador's five-year caribou strategy has caught the attention of Finland, following an international conference on wildlife management held in South Africa.

Minister of Environment and Conservation Terry French. — File photo by Keith Gosse/The Telegram

Minister of Environment and Conservation Terry French attended the conference, and said in a news release that Finland was interested in the province's strategy due to the decline of their own caribou populations.

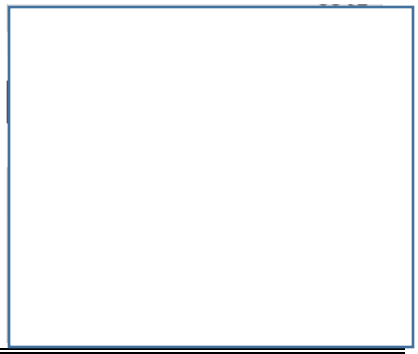
"The representatives from Finland would like to open an information exchange on the work we are doing here and are interested in visiting our province to learn first-hand about the strategy," he said.

The conference explored the role of economics in wildlife conservation.

The caribou strategy is budgeted at $15.3 million over five years.

The international aspect of the conference allows the provincial government to see how other countries are dealing with similar conservation issues, and how Newfoundland and Labrador can apply the best practices developed by those countries, said French.

The Cape Town, South Africa conference was the 59th general assembly of the International Council for Game and Wildlife Conservation, a group that was founded in 1923 and has members in more than 90 countries.



Outfitters optimistic about improving fortunes

CBC News Posted: Dec 09, 2012 1:14 PM NT | Last Updated: Dec 09, 2012 1:12 PM NT

Outfitters meeting 1:49

Outfitting in Newfoundland and Labrador hasn't always been the easiest business, but it is now a growing industry.

Ron Hicks, the president of the Newfoundland and Labrador Outfitters Association, says outfitting was a struggling industry for some time.

"Over the last few years, globally, the economic turn down, we were hit really hard with that," Hicks said.

With the 2008 global recession, outfitters in province noticed the decline in the number of American clients.

However, Hicks said things have started to look up.

"The pendulum is starting to swing in a good direction," he said. "We've had pretty much a decade of challenges.

"And when I say challenges, I don't mean just little things — it's very severe impacts."

Ron Hicks, president of Newfoundland and Labrador Outfitters Association, says business is looking up for N.L. outfitters. (CBC)

A major concern within the industry is the maintenance of the moose population.

The provincial government is currently working on a 5-year moose management plan for Newfoundland.

"We all need to think about this a little more thoroughly and put a good, balanced management plan in place," Hicks said. "Which I know they are working towards now."

Researchers and presenters will be sharing their findings concerning animal populations, such as moose and caribou, during the meeting.

Hicks said that sales are up for 2012, and prospects for 2013 are already looking good.

"We've been around a long time, we are the oldest form of tourism in the province," Hicks said.

"The key thing is, I say, resources."

The convention and general meeting will continue through this week at the Glynmill Inn in Corner Brook.

George River caribou herd at all-time low

While outfitting's popularity is on the rise, the number of caribou to hunt is steadily diminishing.

Environment and Conservation Minister Tom Hedderson says this year's caribou population is 22,000.

In the 1990's, the population was somewhere around half a million.

"With that information … we're going to bring forward management measures this season, and of course for long term as well," Hedderson said.

He said there are many factors contributing to the decreasing population, not just hunting.

"We have to take into account all of the factors," Hedderson said. "The accessibility of food is a major, major contributing factor. Predation, disease, parasites, climate change."

During last year's caribou hunt, 2,300 animals were legally killed.

"We're going to have to look at all aspects of the hunt this year as a factor," Hedderson said.

On Wednesday, the Labrador Hunting Association called for a ban on hunting caribou until the herd shows signs of recovering.

Tony Chubbs, the president of the association, said that such a ban would need to include both aboriginal and non-aboriginal hunters.

"22 per cent of those animals were killed by licensed hunters," Chubbs said. "The rest of the aboriginal hunt accounted for 66 per cent.

"Unless aboriginal hunt is curtailed as well, it's pretty much meaningless to imply any sort of restrictions."

The province has yet to release its hunt plan for this year.

Scientists hope to solve caribou mystery

Tobias Romaniuk
Published on June 23, 2012

Published on June 23, 2012

Steve Gullage and Frank Norman weigh a caribou calf before fitting it with a radio collar. — Submitted Photo by Colleen Soulliere

Strategy attempts to discover why herds declined and are now rebounding

There are many unanswered questions about what caused the rapid decline of caribou populations in the 1990s, and part of the problem is that the answer is not simple.

The caribou strategy, a five-year study of animals on the island portion of the province which began in 2008, is supposed to explain the decline and devise a way to help caribou populations recover.

Shane Mahoney, a research biologist and executive director for sustainable development and strategic science with the Department of Environment, is leading the project.

He said understanding the current situation requires looking back nearly a century.

The current population arc is a repeat of what happened between the 1890s and 1920s, when the number of caribou fell from an estimated 100,000 to 15,000.

The wolf disappeared, coyotes were scarce and hunting was banned. Despite this, the caribou didn't begin to recover until the 1960s.

"What is often missed (is) the period between the peaks, how long it took before the population started to increase," said Mahoney.

Caribou have a relatively conservative reproductive strategy; they have only one calf, no matter how much food is available, even in captivity.

From the 1960s to the 1990s, herd populations steadily increased, peaking at 100,000 animals. By the mid-1990s, the population began to decline again, with a 60 per cent drop in population from 1999 to 2009.

Estimates place the current population around 32,000.

Some herds, such as the Avalon and Grey River herds, showed declines of more than 90 per cent.

What caused it? The answer involves a complex web of factors, and pointing to any one cause as the definitive answer isn't easy.

"Single causes are very difficult to explain satisfactorily for what takes place in a system such as this," said Mahoney.

Predators, food supply issues and the condition of the caribou all play a part.

"There are these layers of interaction between variables, which is a whole part of the reason, of course, that we developed this very elaborate scientific approach and a strategy to try and tease these various pieces apart," he said.

Few calves survive

A progress report, written by Mahoney, states that while the underlying cause of the decline is unknown, research shows predation led to low calf survival rates.

"Whether this high rate of predation mortality is primarily due to changes in predator populations (increased populations, the arrival of coyote to the island) or to changes in vulnerability of the calves (smaller or weaker calves), or some combination, is unknown," the report says.

Also contributing to the decline is evidence that suggests the caribou population is outgrowing its habitat.

"Although the body of evidence is consistent with a density-dependent decline ... the root cause of the population decline remains elusive," states the report.

It would appear from the evidence that a population of 100,000 caribou is too large for the forests of Newfoundland to support. But they can support more than 32,000.

Between those two figures is a sustainable population number, which Mahoney and his team of researchers are still trying to determine.

"What is a reasonable population that might be maintained in the long term that perhaps does not experience these extreme highs and lows? This is one of the central questions for the caribou strategy to answer," he said.

Changes in antler and jaw bone size, pregnancy rates and other indicators are used to determine the health of a herd, and from that data a sustainable population number is developed.

"But bear in mind it's never a fixed point," Mahoney cautioned.

Figuring out and achieving that sustainable population will require the management not only of caribou, but of predator populations, such as black bears, coyotes and lynx.

"We really are taking a system approach here, and we're studying the bears, we're studying the coyotes, at the same time that we're studying the prey."

The first step in achieving a sustainable caribou population is to halt the population decline.

The problem is, insufficient calves are surviving. Still, based on the research since 2003, the calf survival rate has increased somewhat, said Mahoney.

From 2003 to 2005, the survival rate was from zero to five per cent.

Newfoundland Labrador
CANADA

News Releases

Environment and Conservation
May 18, 2012

Provincial Caribou Strategy Gains Attention on International Stage

The Provincial Government's five-year caribou strategy announced in 2008 recently garnered attention at the 59th General Assembly of the International Council for Game and Wildlife Conservation. The forum, held in Cape Town, South Africa from May 8 to 11, focused on the economic value of ecosystems and biodiversity. The Honourable Terry French, Minister of Environment and Conservation, represented the Government of Newfoundland and Labrador at the forum.

"The Newfoundland caribou strategy was of interest to a number of member countries, particularly the delegation from Finland who expressed a strong interest in the strategy because of the significant decline in wild forest reindeer populations in their country," said Minister French. "The representatives from Finland would like to open an information exchange on the work we are doing here and are interested in visiting our province to learn first-hand about the strategy. This certainly speaks to the best practices approach which is a cornerstone of forums like this."

The theme of the assembly, The Economics of Wildlife Conservation, explored the role that economics play in conservation of species and ecosystems and how sustainable practices can be beneficial to the planet as a whole. Within this context, the application of research findings from the five-year, $15.3 million provincial caribou strategy generated considerable interest at the event.

"International forums of this magnitude provide an opportunity to learn about the sustainable practices of other countries and how we can apply best practices in the management of our wildlife species where similarities exist," said Minister French. "From a look at Finland's moose management plan to the history and economics of sustainable wildlife management in southern Africa, the message is clear – conserving biodiversity and exploring the sustainable use of our wildlife resources is important to every corner of the globe."

The International Council for Game and Wildlife Conservation was founded in 1923 in Budapest and has become a key scientific and policy think tank on conservation and sustainable use issues, with representation from more than 90 countries.

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Under threat

James McLeod
Published on June 25, 2012

Government spends millions to understand woodland caribou

The "kill site" doesn't look like much; just a empty patch of bog in the Newfoundland wilderness, nowhere near anything.

Scientist Shane Mahoney sees the scene differently; a bear killed a caribou here.

Weathered skull fragments testify to an animal cracking the head open to eat the nutritious brains. Other bone shards support the assessment.

"They like the brains," Environment Minister Terry French says with a big grin.

When coyotes or lynx make a kill, it looks completely different. Coyotes tend to tear the baby caribou in half and bury it.

This kill site and hundreds of others like in in southern central Newfoundland are at the front line of the province's $15.3-million caribou management strategy.

Mahoney, executive director for sustainable development and strategic science with the Department of Environment and Conservation has been studying the caribou for decades.

In the last few years, he says, they've made a "quantum leap" in their understanding of the species.

Scientists have been putting radio collars on newly born calves, and tracking their movements.

If a calf is killed, the collar starts sending out a different sort of signal, and they can go to the kill site and figure out which predator did the deed.

They swab the wounds and bones for DNA, and can often pick up saliva from the predators, figuring out which species — and sometimes which individual animal — made the kill.

"We are generating the first ever really refined map of the island from a caribou perspective, from a habitat perspective. That will be a massive innovation," Mahoney says. "We're trying to understand this system in as much detail as possible so that we don't make any mistakes."

In the 1990s, the caribou population increased up to more than 100,000 animals, and then plummeted dramatically.

Today, there are around 32,000 caribou on the island of Newfoundland, but the population is slowly decreasing.

Not too long ago, the situation was much more alarming. Back in 2003, virtually no calves made it past a year.

"We'd collar calves in these populations and none would survive. Not one," Mahoney says. "You'd see maybe 500 caribou and maybe one calf."

French says that as far as he's concerned, the $15.3 million the government has put up to understand the caribou is money well spent.


View the gallery

"It's such an iconic animal to us in so many different ways," he says. "Look at the outfitting industry, which is a $40 million industry in our province that employs a lot of Newfoundlanders and Labradorians in good jobs. A lot of them in rural Newfoundland too; there's not too many outfitting industries in St. John's."

For French, the possibility of having a comprehensive understanding of caribou, their predators, and their ecosystem means the government can make smarter decisions, especially when it comes to environmental impacts and industrial development.

"Although we allow industrial development, it's sustainable development. You make sure you don't interfere with the caribou herds and if you do, you work around it," he said. "That's what it's all about in our department — mitigating the environmental impact."

After finishing up at the kill site, French and Mahoney move on to another part of the wilderness where they find a large herd of hundreds of animals.

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Canadian Ministry Supports Caribou Research Strategy

For the past six years SCI Foundation has partnered with the Newfoundland Ministry of Environment to support a major research initiative on the Woodland Caribou. Caribou herds across the north have always been subject to wide fluctuations in numbers with rapid growth in numbers often followed by severe declines in herd numbers. The Woodland caribou in its native Newfoundland range was experiencing a particularly alarming rate of decline in the late 1990's and so it was that the government funded one of the largest field programs on a single species that has ever been conducted. The program was organized by Shane Mahoney along with government and university researchers and was funded by the government at approximately $15 million with additional support from SCIF. One of the key objectives was to examine the relationship between woodland caribou calf recruitment and predator management. The project is in its second phase of predator removal. Researchers have removed coyotes from the study areas and are monitoring the effects on calf survival.

Recognizing the importance of woodland caribou to the people of the island, the Newfoundland Ministry of Environment has agreed to continue funding for the Caribou Strategy despite the economic stress experienced in the region. Tourism is dependent on robust natural resources in Canada and there is an overwhelming desire to maintain the iconic caribou on the landscape for diverse reasons, including hunting.

Information

This entry was posted on September 4, 2013 by firstforwildlife and tagged Caribou, firstforwildlife, Newfoundland, Safari Club, SCI Foundation.

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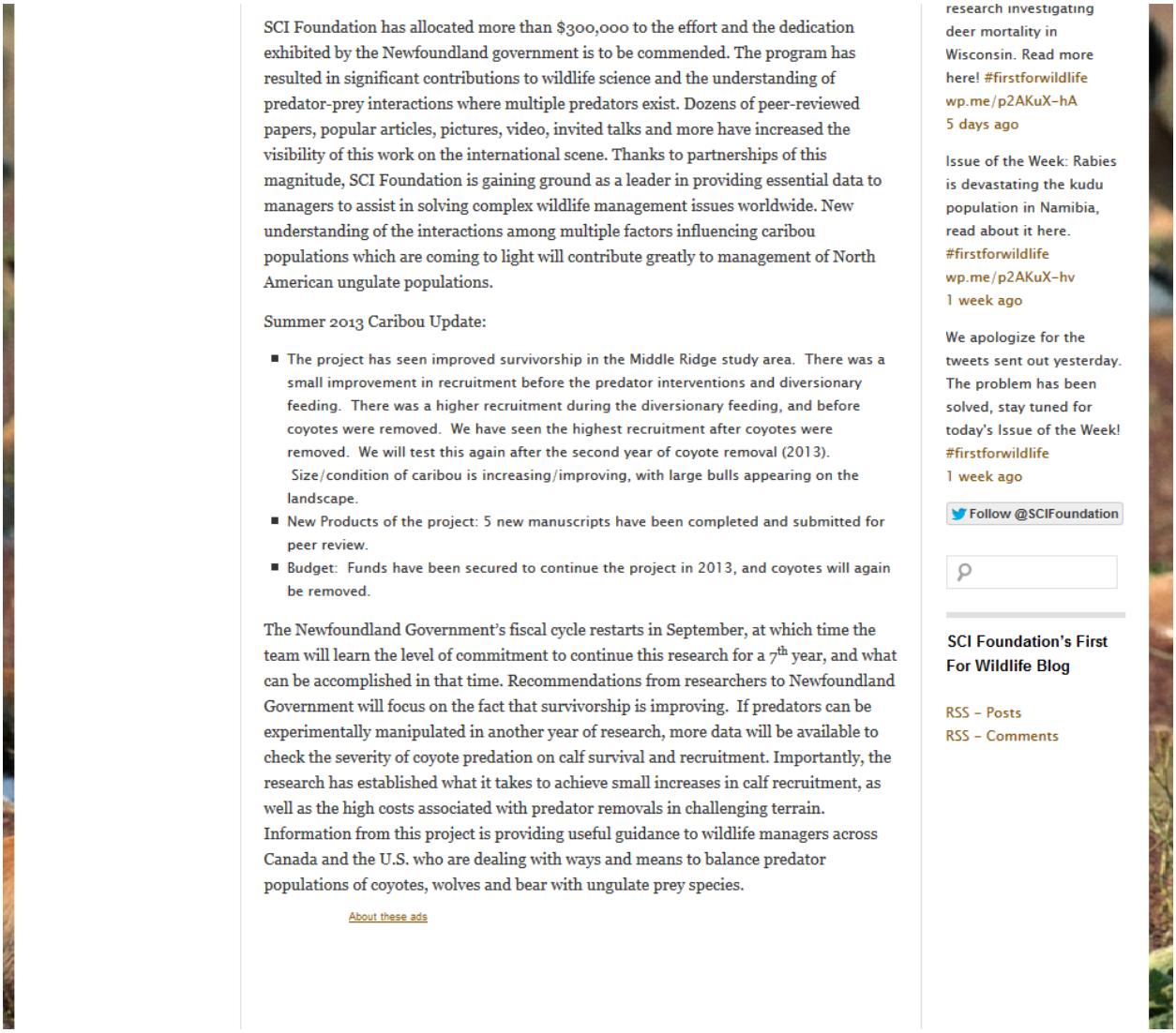

SCI Foundation has allocated more than $300,000 to the effort and the dedication exhibited by the Newfoundland government is to be commended. The program has resulted in significant contributions to wildlife science and the understanding of predator-prey interactions where multiple predators exist. Dozens of peer-reviewed papers, popular articles, pictures, video, invited talks and more have increased the visibility of this work on the international scene. Thanks to partnerships of this magnitude, SCI Foundation is gaining ground as a leader in providing essential data to managers to assist in solving complex wildlife management issues worldwide. New understanding of the interactions among multiple factors influencing caribou populations which are coming to light will contribute greatly to management of North American ungulate populations.

Summer 2013 Caribou Update:

- The project has seen improved survivorship in the Middle Ridge study area. There was a small improvement in recruitment before the predator interventions and diversionary feeding. There was a higher recruitment during the diversionary feeding, and before coyotes were removed. We have seen the highest recruitment after coyotes were removed. We will test this again after the second year of coyote removal (2013). Size/condition of caribou is increasing/improving, with large bulls appearing on the landscape.
- New Products of the project: 5 new manuscripts have been completed and submitted for peer review.
- Budget: Funds have been secured to continue the project in 2013, and coyotes will again be removed.

The Newfoundland Government's fiscal cycle restarts in September, at which time the team will learn the level of commitment to continue this research for a 7th year, and what can be accomplished in that time. Recommendations from researchers to Newfoundland Government will focus on the fact that survivorship is improving. If predators can be experimentally manipulated in another year of research, more data will be available to check the severity of coyote predation on calf survival and recruitment. Importantly, the research has established what it takes to achieve small increases in calf recruitment, as well as the high costs associated with predator removals in challenging terrain. Information from this project is providing useful guidance to wildlife managers across Canada and the U.S. who are dealing with ways and means to balance predator populations of coyotes, wolves and bear with ungulate prey species.

research investigating deer mortality in Wisconsin. Read more here! #firstforwildlife wp.me/p2AKuX-hA
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We apologize for the tweets sent out yesterday. The problem has been solved, stay tuned for today's Issue of the Week! #firstforwildlife
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SCI Foundation's First For Wildlife Blog

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Caribou surveys to take place in Middle Ridge area

Published on March 01, 2013

Research team helicopter pilots look on as a caribou trots in front of them. — Telegram file photo

As part of the ongoing management efforts of caribou in the province, the Department of Environment and Conservation is advising the public that it will be conducting a mark-resight population census of the Middle Ridge caribou herd in the eastern and central portions of the island, beginning early next week and ending later in March.

The department said in a news release, as part of a mark-resight census, a number of caribou will be marked using a highly visible red paint. Once a number of animals in the herd have been marked, they will be counted and the relative ratio of marked animals versus unmarked animals will assist in establishing the total population estimate for the herd.

he release says the marking of the caribou and the paint itself poses no harm to the animals. As the marked caribou lose their winter coat this spring, the red marking will fall off.

The public is also advised that low-level flying aircraft will be used in the area to conduct much of this work.

President of the Newfoundland and Labrador Outfitters Association wants province to gain more exposure

Gary Kean
Published on December 09, 2013

CORNER BROOK — Ron Hicks is back for a fourth term as president of the Newfoundland and Labrador Outfitters Association and hopes to keep the momentum of the past three years going strong.

The Grand Falls-Windsor resident has been in the outfitting business for 20 years and operates Snowshoe Lake Hunting and Fishing in central Newfoundland.

© Gary Kean
Ron Hicks of Grand Falls-Windsor was re-elected president of the Newfoundland and Labrador Outfitters Association at its annual general meeting in Corner Brook on Saturday, Dec. 7, 2013.

He was re-elected president at the association's annual general meeting in Corner Brook Saturday.

"The key thing for me personally has been to build good relations with various organizations, government departments and the personalities involved in this industry," he said following three days of meetings in Corner Brook. "You build sound partnerships and you accomplish so much more when you work on those levels."

Hicks is excited about the association's three-year marketing plan that the industry hopes will lead to more exposure for the hunting and fishing experiences Newfoundland and Labrador offers to the global marketplace. The plan will also help outfitting businesses and their staff with professional development and be better able to promote themselves at trade shows and through their own marketing efforts.

'Game changer'

Part of the strategy is to bring in media from outside the province to go on expeditions or do stories about what the sector has to offer.

"It's a game changer in terms of what it can bring to members," he said of the marketing plan.

The association has other challenges to contend with in order to maintain the experiences the province's hunting and fishing opportunities are renowned for. During the convention component of the association's meetings, there was a lot of discussion about what can be done to address the increasing shortage of guides in the outfitting business recently and how wildlife resources are managed.

With caribou herd numbers declining, particularly drastically in Labrador, Hicks said the province needs an effective action plan to enhance the survival rate for caribou calves.

"That's the only way the herds can rebound," he said.

Taking measures to address wildlife population levels is not only good for the outfitting industry, said Hicks. It also preserves the ability of the everyday resident to continue partaking in traditional hunting and fishing activities.

"If moose rates, for example, drop to where (hunting) success rates are low and residents have to hunt extremely hard for them, it's not the same quality experience they're used to," said Hicks.

There are also significant concerns about fishing resources. With major industrial developments happening in Labrador and that area expecting a population boom because of the work there, Hicks said protecting the fishing habitat there has to be taken into consideration.

"We're not against those kinds of (development) happening, but we are saying let's do these things in a sensible fashion so all these values are not put in jeopardy," he said. "We have a gem here that is appreciated by the world. It's largely unknown and we are the exception to the rule. We need to protect that."

On the island portion of the province, outfitters are concerned about the expansion of aquaculture and the threat of diseased Atlantic salmon, especially in light of consideration being given to closing down many rivers along the south coast of Newfoundland to the angling of wild Atlantic salmon.

"We've been going to all the meetings (concerning Atlantic salmon) and we will continue to do so," said Hicks. "It's too serious a problem to not keep addressing."
