Solving Wicked Problems – Using Human Dimensions to Inform Natural Resource Management

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Kimberley, British Columbia
Canada

Columbia Mountains Institute of Applied Ecology

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Columbia Mountains Institute of Applied Ecology
Box 2568, Revelstoke, British Columbia, Canada V0E 2S0
Phone: 250-837-9311 Fax: 250-837-9311
Email: office@cmiae.org
Website: www.cmiae.org

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- **Sara Dubois**, BC SPCA & University of BC
- **Jenny Feick,** Nature Wise Consulting
- **Howie Harshaw**, University of Alberta
- **Heather Lamson**, BC Fish and Wildlife
- **Kathy Rettie**, University of Calgary
- **Hailey Ross**, Columbia Mountains Institute
- **Jen Smith**, BC Ministry of Forests, Lands and Natural Resource Operations
- **Tara Szkoroupa**, BC Fish and Wildlife

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Conference description

During this conference delegates examined how to use human dimensions research and methods to help resource practitioners resolve "wicked problems" in southeastern BC.

"Human Dimensions … is a reference to the social attitudes, processes, and behaviors related to how we maintain, protect, enhance, and use our natural resources. Today's natural resource managers are increasingly recognizing that natural resource management involves not only ecological processes, but also social processes and consequences as well. In a very basic sense, Human Dimensions examines how the "science of human systems" or theory-based social science can aid in natural resource management."

– Cornell University, Department of Natural Resources

"Wicked" problems are large-scale, long-term policy dilemmas in which multiple and compounding risks and uncertainties combine with sharply divergent public values to generate contentious political stalemates; wicked problems in the environmental arena typically emerge from entrenched conflicts over natural resource management and over the prioritization of economic and conservation goals more generally.

– "Wicked Environmental Problems, Managing Uncertainty and Conflict" by P.J. Balint, R.E. Stewart, A. Desai, and L.C. Walters.

Many problems in natural resource management can be resolved with technical solutions derived from applied natural sciences. However, complex, multi-faceted, contentious and persistent problems require approaches that integrate both natural and social sciences. Understanding human ecology and behaviour will be the key to solving many of these so-called "wicked" problems.

Examples of important human dimensions topics, which comprised the sub-themes for this conference in relation to natural resource management included: risk assessment, decision-making and governance, addressing conflict, natural resource economics, values and ethics, understanding and influencing human behaviour, effectively engaging stakeholders, and first nations perspectives on natural resource management.

Through 1.5 days of presentations, an evening keynote speaker (open to the public), a poster session, field trips, and opportunities for informal dialogue, participants learned how considering the human dimensions of resource management would make their decisions more robust, and their plans more likely to be implemented successfully.

Our event included nineteen presentations, five posters, and two field trips. About 55 people attended the conference. Participants were a multidisciplinary group of people, including: resource managers, public interest groups, consultants, researchers, industry representatives, and academics.

The conference was held at the Kimberley Conference and Athletic Centre, September 30 – Oct 1, 2014.

About the Columbia Mountains Institute of Applied Ecology
www.cmiae.org

The Columbia Mountains Institute of Applied Ecology (CMI) is a non-profit society based in Revelstoke, British Columbia. CMI is known for hosting balanced, science-driven events that bring together managers, researchers, educators, and natural resource practitioners from across southeastern British Columbia. CMI's website includes conference summaries from all of our events, and other resources.

Summaries of presentations

The summaries of presentations in this document were provided by the speakers. Apart from small edits to create consistency in layout and style, the text appears as submitted by the speakers.

The information presented in this document has not been peer reviewed.

1. Human dimensions of fish & wildlife management in BC

Jennifer Smith, Fish & Wildlife Branch, BC Ministry of Forests, Lands and Natural Resource Operations
Victoria, BC
Jennifer.x.Smith@gov.bc.ca

First identified by Rittle and Webber (1973), 'wicked problems' are issues that involve a high degree of social conflict and include diverse and dichotomous opinions of appropriate and effective management interventions. These types of problems usually have no single or simple correct answer and include a high level of uncertainty about cause-effect relationships (Decker et al. 2012). Adding to the uncertainty and challenges of succinctly defining a problem, "the definition of the problem is articulated by the individual experiencing it" (Decker et al. 2012, p. 30) and the scope is often determined by the way in which the individual experiencing it chooses to explain it and the way in which they identify how to resolve the problem (Allen and Gould 1986).

Wicked problems differ in one fundamental way from complex problems (Leong et al. 2012). Complex problems generally involve a number of relationships between various system components that are difficult to understand, but that are governed by natural laws (e.g. market principles, thermodynamics, physics) and include a high degree of confidence in being able to predict outcomes of various management actions (Leong et al. 2012). While wicked problems may fundamentally be complex, they do not have a single "correct" way of defining the problem (Decker et al. 2012).

Human dimensions research and approaches are well-situated to help fish and wildlife managers address wicked problems and to inform more robust and resilient decisions related to responsible use of public resources (Decker et al. 2001a; Decker et al. 2012; Manfredo et al. 2009).

A useful way to describe human dimensions of fish and wildlife management is via social-ecological systems. This approach illustrates the importance of understanding the ecological systems (the structures and functions that fish and wildlife need to sustain themselves), the human systems (the systems and processes that govern individuals, groups and institutions) and the way in which these two processes interact and impact each other (Berkes et al. 2003; Walker et al. 2004).

The importance of using human dimensions in natural resource management has been well documented and eloquently articulated for over three-quarters of a century by renowned authors such as Pinchot (1910), Leopold (1933) and Carson (1962) among others. In its early stages it was referred to more commonly as a land ethic or a conservation ethic. However the recognition that human impacts on fish, wildlife and habitat were intrinsically linked to and required the management and involvement of people was established during this period.

When Europeans first came to North America, there was a perception that an endless bounty of natural riches was available. Until the late 1800's and early 1900's hunting, fishing and trapping were mainly unrestricted and unregulated. This resulted in serious depletions and extinctions of game species such as the Great Auk, Passenger Pigeons and American Bison which were exacerbated by habitat loss and fragmentation (Arizona Game and Fish Department 2010).

The recognition that harvesting could not continue to go unrestricted and unregulated prompted the development and endorsement of the North American Model of Wildlife Conservation. This model of conservation is based on regulated harvest rates, a better understanding of population management and ecosystems functions, the belief that all citizens should be able to enjoy fish and wildlife resources in their natural habitats and that government holds wildlife as a public trust (Arizona Game and Fish Department 2010; Chase et al. 2004; Forstchen and Smith 2014).

The seven foundational concepts of the North American Model of Wildlife Conservation include:

- wildlife being held in the public trust;
- commerce in wildlife being regulated;
- hunting and fishing laws being created through public processes;
- everyone having the opportunity to hunt and fish;

- hunters and anglers fund conservation;
- science being the basis for wildlife policy; and
- wildlife being an international resource (Arizona Game and Fish Department 2010, p.11-13)

British Columbia has been actively managing sustainable harvesting opportunities since the mid 1800's and BC's legislation dealing with wildlife issues can be traced back to 1859 (Murray 1987). Wildlife and fish need to be managed in a way that reflects a variety of values and fulfills differing needs in a way that maintains the confidence of the public in government's management of the resources. The Fish and Wildlife Branch's mandate is to have "*naturally diverse and sustainable fish and wildlife resources supporting varied uses for current and future generations of all British Columbians*" (B.C. Ministry of Environment, 2010). The integration of human dimensions in fish and wildlife management is uniquely situated as a means of more effectively implementing the North American Model of Wildlife Conservation and the Fish and Wildlife Branch's mandate.

The concept of "human dimensions" in natural resource management has gained momentum in the past three decades and is becoming more and more common within management agencies (Decker et al. 2001b). The need to involve the social sciences and the "human" aspects to help inform challenges related to conserving biodiversity is identified by Saunders, Brook and Myers Jr. (2005):

> The challenges ahead for biodiversity conservation will require a better understanding of one species: our own... not only do we need to learn more about human-human relationships and human-nature relationships, but also the questions we ask must be guided by the delineation of desired conservation outcomes (p. 702)

The concept of social-ecological systems provides the base upon which human dimensions (the use of social sciences and public engagement to help inform natural resource management) can be situated (Haider and Morford 2004; Lowe et al. 2009; Phillipson et al. 2009; Reed 2008). The concept of the human dimensions of natural resource management is a pragmatic approach to addressing wicked problems that employs a multi-disciplinary tool box of social sciences, biological sciences and traditional ecological knowledge as well as professionally engaging First Nations, stakeholders and the public in the decision making process (Enck et al. 2006; Manfredo et al. 2009).

The human dimensions of fish and wildlife management seeks to understand the decision making process; the human behaviours that induce change; the effects of change on ecosystem services

and quality of life; and the effectiveness of management strategies to address change (HD.gov 2013; Reed 2008; Philip et al. 2009). The social science component of human dimensions research draws on both qualitative and quantitative methods and methodologies. Qualitative approaches provide a deep understanding of specific phenomenon, are subjective, interpretivistic, and are site specific. Quantitative approaches are based on the traditional scientific method, are generalizable, use an objective lens and are steeped in logical positivism (Patterson et al. 2000). The application of social science theories and methods in fish and wildlife management are used to provide decision makers with an understanding of people's relationships to and impacts on fish and wildlife resources by using experiments, surveys, interviews, observations, stories, choice modelling, existing data, records and documentation along with a whole host of other tools available to address wicked problems (Hendee 1974; Miller and McGee 2001; Riley et al. 2002; Riley et al. 2003).

Stakeholders also play a valuable and integral role in fish and wildlife management; however, agencies are often faced with the challenge of adequately and effectively representing diverse and usually divergent public values when engaging stakeholders (Teel and Manfredo 2009). Conflict typically lies at the heart of wicked problems and can be manifested by the various divergent views and emotional ties that are held by different groups. The key to successful and effective engagement and problem solving is not to avoid these types of conflicts, but to manage them. Unmanaged conflict can lead to polarization, lack of trust, difficult communication and a sense of winners and losers. Whereas managed conflict can lead to better communication, increased trust and professionalism, and a willingness to work through problems together as a team with common goals (Kennedy and Vining 2007).

Social science is key in helping decision makers understand people's values, behaviours and motivations, but it cannot tell us what values are "right" or "wrong". These value-based judgements can be informed by using human dimensions research and effective engagement, but it is up to the decision maker to take into consideration all the available information and render a decision on what they believe is "right".

Using human dimensions in fish and wildlife management can help decision makers address wicked problems and can lead to more robust decisions by employing both social and biological sciences and by effectively consulting and engaging First Nations, stakeholders and the general public. In essence, wicked problems are unlikely to be solved, but they can be effectively managed by using human dimensions to create more informed, robust, resilient and long lasting decision.

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2. *Balancing risk across resource values in forest operations*

Ken Zielke, BC Forest Practices Board
Victoria BC
Ken.Zielke@gov.bc.ca

The following is taken from a 2014 Forest Practices Board Bulletin of the same name, for which Ken was the lead author.

Introduction

BC's provincial forests contain a rich diversity of resource values from which people gain a host of benefits. A reliable flow of some benefits, such as timber harvesting, may at times pose risks to other values. For example, roads that facilitate harvesting in steep terrain can in some areas introduce a risk[1] to water quality from erosion and landslides. Conflicts can arise when decisions about risk are made by those who benefit most, while others must live with the risk. With increasing competition for use of our forest resources, the Board is concerned that mechanisms available to resolve the resulting conflicts between resource users are limited.

A rancher in a central-BC watershed already highly affected by mountain pine beetle and past harvesting - was concerned that additional salvage harvesting by two forest licensees would further impact the water supply to his home and private hay fields. Despite indicators that flooding and stream channel change was probable, one forest licensee did not perceive any potential risk to the rancher. The other informally considered the possibility and took some protective steps before logging.

The rancher had no power to negotiate and no opportunity to appeal either licensee's decision to proceed. The Board found that, in the circumstances, the salvage harvesting added to stream flow issues already apparent in the watershed.[ix, x]

[1] Risk – is, in simple terms, the effect of uncertainty on objectives (*CAN/CSA-ISO 31000, Risk management — Principles and guidelines*, January 2010). Risk in decision-making is generally regarded to be a function of three things - the intrinsic hazard(s) that could influence a potential future impact; the likelihood of that future impact; and the consequences associated with that impact.

A conflicting role

Over the last decade the approach to regulating forest planning and practices in BC changed substantially. The *Forest and Range Practices Act* (FRPA), introduced in 2004, was intended to streamline administration, reduce costs, and encourage innovative practices, in part by giving forest licensees much of the discretion previously held by government officials. Licensees in turn rely on forest professionals to assist them in this role. FRPA provides no mechanism to help resolve disagreements between forest licensees who are expected to use their discretion to make responsible decisions, and others whose interests are potentially affected by those decisions.

In complaints to the Board, non-timber forest resource users often question how a forest licensee can be impartial when making decisions that affect the interests of other people. In their view, it is the forest licensee that stands to benefit the most from forest harvesting, while others must live with the risk of suffering an impact or loss in the future.

In north-central BC, a group of wilderness tourism operators - complained to the Board that a forest licensee had harvested timber near a lake that had been designated for protection in a government-approved, but not legally-binding, land use plan. The tourism operators used the lake for guided-wilderness moose hunts and hike-in fishing. The forest licensee decided that its harvesting plan would be adequate to manage for forest recreation.

The tourism operators disagreed but had no place to appeal the forest licensee's decision. To them, the proximity of the harvesting would result in them having to abandon the lake as part of their business operations, devaluing the businesses and the area's tourism appeal. They were left angry and frustrated that a forest licensee could decide how tourism-industry values might best be managed.[xi]

Current legislation enables, but does not require, forest licensees to conduct risk assessments related to discretionary decisions. Consequently, it is left to forest licensees to identify, assess and manage the risks that their forest activities may present to values such as public safety, water, wildlife, fish, biodiversity, soils, recreation, and visual quality—among others. It is generally expected that these assessments will help licensees to act in a manner that, as much as possible, reduces the risk and mitigates the conflict with other resource users. Yet, with no guarantee of involvement in the decision-making process, and no recourse for appeal if disagreement persists, others potentially affected by these risks see the system as biased and unfair. At the least, it is easy to perceive a conflict of interest in a system where the forest

licensee that benefits from timber harvesting is also empowered to balance those benefits against the risks posed to others.

A difficult situation

When it established the *Forest and Range Practices Act* (FRPA), government assumed that good forest stewardship would result, partly because forest licensees are expected to rely on the advice of resource professionals acting in accordance with the rules of their professional associations.[i, ii] Forest licensees depend on these professionals to identify environmental, economic, and social values potentially at risk from forest development, and to assess those risks, or bring in other specialists as needed. Such diligence helps the licensee to avoid compliance infractions and maintain public[2] trust. Professionals advising licensees are obligated by their professional associations to balance and appropriately mitigate these risks in the licensee's and the public's best interests.[iii] Even so, the approach to risk management in licensee decision-making can be highly variable and is often unclear to those who are potentially affected.

In some situations, professionals working for a forest licensee may be challenged to balance their employer's interests with the greater public interest—potentially placing them in a difficult situation—particularly where both the risk to non-timber values and the potential benefit to the forest licensee are substantial. In such circumstances, even if the forest licensee attempts with diligence to balance resource values and manage risk in the public's best interests, neither it nor its professionals are likely to be seen by the public as being impartial[iv]. At best, this situation creates a perception of bias and, at worst, an unfair imbalance in the decision-making process.

[2] The public - is meant to include; British Columbia residents, businesses, organizations, local governments and First Nations (as per May 26, 2011 MFLNRO strategic policy – Crown allocation principles).

The central issue is that FRPA effectively allows a forest licensee with a vested interest to introduce a risk to non-timber forest resource users on Crown land. The Board is noticing instances where this arrangement is making it challenging to maintain public trust, industry credibility or both[v].

In an audit of forest planning and practices on the coast - the Board found several instances where professionally prepared plans based on earlier risk assessments were changed by forest licensees without further professional involvement, resulting in potential environmental and public safety hazards. In another complaint in the interior, the forest licensee did not implement recommendations provided in professional reports, creating unacceptable environmental and management risks. [xiii, xiv]

The importance of public trust

The forest industry earns its right to access and manage public lands and resources by following rules and acting responsibly to generate more public benefit than harm (sometimes called "social license"). Indeed, all British Columbians have an interest or stake in our provincial forests. Therefore, the credibility enjoyed by BC's forest industry depends on maintaining the confidence of the public, not just its customers and shareholders. The history of forestry in BC has shown that when it comes to balancing forest resource values, how those values might be managed and by whom, contributes dramatically to public confidence and reaction.

In the Board's experience, the licensees and professionals that manage BC's forests mostly comply with the law and generally conduct acceptable practices. But all it takes is one poor decision that doesn't properly balance risks or interests, and the public trust can be broken. Once lost, it may be very difficult to regain.

One of the key challenges with managing risk is that practices today don't necessarily result in consequences until years later and, in spite of the best planning efforts, things can go wrong. Once the public's trust is lost, it may not matter whether a forest licensee assesses risk well and diligently plans to manage risks in the future. In the Board's experience, the public will not support further logging. Thus, future forest planning and developments can be negatively affected by today's riskier practices, whether or not they were diligently executed.

Some watersheds in BC - contain potentially unstable terrain and also provide drinking water. In some cases downstream residents may also be concerned about public safety should a landslide occur. At the same time, forest licensees have rights, obligations and an economic need to harvest timber from Crown lands within these watersheds.

Some years ago, the Board investigated a complaint that involved salvage harvesting in a landslide-prone area within an interior watershed. The stream below provided domestic water to over 100 homes. The residents were concerned about slope stability and risk to their water supply. The licensee was diligent; it conducted appropriate professional assessments and took adequate steps to minimize (but could not eliminate) the risk of a landslide from its activities. The harvesting proceeded and years passed. Then, despite the low risk, a harvesting-related landslide occurred, damaging intakes and making water temporarily undrinkable. The licensee again acted responsibly by providing drinking water, applying remedial measures, and helping to fix the residents' water systems. However, the residents considered the interruption of their water supply a significant and undesirable consequence from, at least in part, activities that they were critical of in the first place.

Although professional assessments were completed and sound practices followed, a damaging landslide happened and, as a consequence, public trust was compromised. It will now be challenging to garner public support for future logging in this watershed. [iv]

The current legal framework puts the forest licensee and its professionals in the challenging, possibly no-win, situation of being the final decision maker. When conflicts arise between forest licensees and other resource users, it often involves a difference in the tolerance of the risks associated with the forest activities. In Board investigations non-timber resource users prefer risk avoidance for proposed timber harvesting, since they are focused on the consequences, no matter how uncertain or unlikely the risk. This is understandable, when the proposed harvesting provides few direct benefits to these resource users. On the other hand, the Board finds that forest licensees are more willing to accept some risk from harvesting and associated activities, since most of the direct benefits and few consequences accrue to them.

In situations where a licensee chooses not to harvest to avoid the risk, the public may not be aware of the decision. Thus, only in rare circumstances will the public ever see a licensee acting beyond their own interest. In similar situations, where a licensee chooses to proceed and conflict over acceptable risk persists, public awareness is generally high. In such circumstances, regardless of how well the risk is ultimately managed, the licensee will always be seen as acting

in its interest first and, should things go wrong, to the detriment of the others. If public distrust builds, at some point the fallout may go beyond the scope of one resource management decision.

What has the Board suggested?

In 2010, the Board reported that FRPA provides a considerable advantage to forest licensees, which could lead to decisions unfavourable to the interests of other forest-related businesses and people.[xi] The Board suggested that an impartial decision-maker be involved where risks are significant. Government did not agree, stating that it would be inconsistent with FRPA's increased reliance on forest licensees and professionals and that the current process of developing and approving forest stewardship plans is designed to minimize these conflicts.[vi]

The Board has since dealt with over a dozen additional complaints and audits that continue to reflect this dilemma. Most of these tend to involve either negative impacts to other Crown-tenured forest-related businesses or risks to important public values such as drinking water. However, the Board has also recently encountered examples that involve substantive risks to public safety and the environment, situations of particular concern with respect to maintaining the public's confidence in the stewardship of its forests.[vii, xiii, xiv]

In the course of its work, the Board has previously suggested that, as the potential for conflict between resource users increases, so too does the importance of forest licensees and their professionals conducting systematic, transparent, and well documented risk-management and decision-making at both the site and landscape-level scales.[v, vii, viii] Open and frequent communication with the people and businesses involved at these scales is essential to success. As well, the Board has proposed that professional associations could further support public confidence by more fully standardizing responsibilities for risk management.[ix] Some guidance exists but more is needed.[3]

Lastly, in the Board's opinion, where licensee practices are responsible, in part, for undesirable outcomes, the licensee should take responsibility to mitigate impacts on other resource users and to reduce remaining environmental risks.[xii] While such actions may not be legally required, they support the principles of social license.

[3] Examples include joint practice documents that deal with standards of care for engineering and forestry professionals dealing with such activities as stream crossings and terrain stability assessments: www.degifs.com. Another example is the Association of BC Forest Professionals' practice guidelines: http://www.abcfp.ca/regulating_the_profession/guidelines.asp.

Conclusion

The goal should be that our forest management framework provides sufficient checks and balances so that the risks to important resource values are always appropriately addressed and, as much as possible, to avoid perceptions of bias and unfair process. The Board believes that beyond meeting legal requirements, the resulting decisions to balance practices on Crown land must be transparent, fair, and reflect the public's risk-benefit preferences. Further, there is a role for an impartial decision-maker, when risks are significant and potential losses or impacts are unacceptable for some resource users. The Board urges government, forest licensees, individual resource professionals, and professional organizations to explore options that will improve our risk management framework, ultimately ensuring that public trust in the stewardship and use of our vast provincial forest is not lost.

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[iv] http://www.abcfp.ca/publications_forms/publications/documents/2013_ABCFP_Public_Opinion_Poll_Results.pdf

[v] http://www.fpb.gov.bc.ca/IRC186_Laird_Creek_Landslide.pdf

[vi] http://www.fpb.gov.bc.ca/IRC163_Government_response.pdf

[vii] http://www.fpb.gov.bc.ca/SIR38_Bridge_Planning_Design_and_Construction.pdf

[viii] http://www.fpb.gov.bc.ca/irc86_bridge_design_and_construction_at_reiseter_creek_near_smithers.pdf

[viiii] http://www.fpb.gov.bc.ca/IRC94_Schroeder_Creek_Road_in_Kootenay_Lake_FD.pdf

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[x] http://www.fpb.gov.bc.ca/IRC179_Logging_and_Winter_Streamflow_in_Twinflower_Creek.pdf

[xi] http://www.fpb.gov.bc.ca/IRC163_Logging_and_Lakeshore_Management_Near_Vanderhoof.pdf

[xii] http://www.fpb.gov.bc.ca/IRC186_Laird_Creek_Landslide.pdf

[xiii] http://www.fpb.gov.bc.ca/ARC139_Audit_of_BCTS_and_TSL_Holders_Campbell_River_District.pdf

[xiv] http://www.fpb.gov.bc.ca/IRC182_Meadow_Creek_Cedar_Ltd_Forest_Practices_and_Government_Enforcement.pdf

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3. *Toward watershed governance in the Columbia River Basin – challenges and opportunities*

Natasha Overduin, Polis Project in Ecological Governance and University of Victoria
Golden, British Columbia
noverdui@uvic.ca

Heather Lescheid, Living Lakes Canada and Wildsight
Nelson, British Columbia
heather@wildsight.ca

We discuss the notion of watershed governance and explain its relevance and importance in the Columbia River basin. We illustrate the challenges and opportunities of moving forward on watershed governance reform with local examples from Lake Windermere and the Elk River Valley.

First, however, what do we mean by the term 'governance'? Governance is defined as the process of societal decision-making – including taking action – and holding those making decisions to account. Governance deals with questions of who, what, where, and how, as well as notions of accountability, legitimacy, and power. The notion of governance is distinct from 'management', which refers to the day-to-day activities associated with implementation of decisions. A governance system encompasses laws, policies, and social values and the broad range of institutions, organizations, and individuals involved in natural resource decision-making. In this era of government cutbacks, increasing demands for water from a broad range of actors, and the need to fully/finally recognize rights and titles of Indigenous nations, it is increasingly understood that making decisions about water is no longer just the responsibility of government. A wide range of actors now express their desire to influence water-decisions. A top-down, one-size-fits-all regulatory approach is not sufficient to address existing and emerging threats and problems.

In developing our understanding of watershed governance opportunities and challenges in the Columbia River Basin, we are not starting from scratch. This topic has been well-examined by researchers. The POLIS Project on Ecological Governance at the University of Victoria recently published its report, "A Blueprint for Watershed Governance in British Columbia." This practical research is geared towards a policy and grassroots audience, as well as academics, and

provides a framework for this discussion. (A brief summary of this document is attached to this proceedings and is also available at www.poliswaterproject.org).

The Blueprint takes what has been learned from places that have experimented with alternative governance structures (places like the Cowichan watershed and the Okanagan) and gives us principles, winning conditions, and action items for moving forward on governance reform. The central premise of the Blueprint is to develop a clear role for watershed entities (WEs) in formal decision-making. WEs would be community-based institutions that operate at a watershed scale to provide a nexus for integrating whole-system thinking with local ecological, economic, and social requirements. Although governance models will be unique to suit different geographical realities, the Blueprint provides tangible lessons and synthesis which can inform our efforts in the Columbia and elsewhere.

Why is watershed governance an important and relevant concept in the Columbia River Basin?

In the Columbia River Basin, there is a wide recognition that we need to adapt our decision-making structures to better deal with historical and existing problems, and new, emerging threats at different scales. For example, at the basin scale, improved coordination is needed to address the fact that salmon life cycles (and those of other fish species) have been disrupted by hydropower development. There are technical challenges to overcome in restoring fish passage in the Columbia River but these are not insurmountable. Also at the basin scale, greater coordination, stakeholder participation, and collaboration is required to address challenges related to changing hydrology due to climate change (glacial melt) and common threats posed by invasive species. At more local and regional scales, ecosystem health is threatened by mismanagement of resource extraction and development, both industry and private. Altogether, these reasons, among many others, provide a rationale for why we need a new, better approach to decision-making for water resources.

Moving forward in adapting governance structures is by no means straightforward. As Bob Sandford (UN Water for Life Decade) said at the fall 2013 “Think Like a Watershed” Symposium, “The biggest challenge to effective Basin-scale water governance is finding a way to believe in and trust one another and work together when there have been so many reasons not to in the past.” In the Columbia River Basin, complexity may be our greatest challenge: the Basin is a region that contains overlapping traditional territories of multiple First Nations; several regional districts; it is an international river basin; and geographically large in scope. What model of governance is appropriate? At what jurisdiction or scale? What duties can be

handed down? How can we resource this? Who should be involved? How will the new Water Sustainability Act change this?

In spite of this complexity, there is also evidence in the Columbia River Basin that existing governance challenges are not intractable. Opportunities are wide-spread and provide a reason for optimism. Firstly, there is high water literacy in the Basin, as evidenced at the "Think Like a Watershed" Symposium. At this event, over 120 people travelled to Fairmont Hot Springs. The Symposium provided an opportunity to build cross-cultural and inter-community dialogue on watershed governance as viewed through multiple lenses including those provided by First Nations leadership, climate change science and pending public policy shifts expected to occur in BC. Keynote speaker John Ralston Saul pointed out that the way to long-term success in watershed governance is to adopt First Nations values and principles in relation to the total environment. Attendees echoed this challenge to change the prevailing Canadian narrative, which is based on elemental economics, to a narrative that is more inclusive and encompasses the principles espoused by First Nations in their relationship to the environment. Great First Nations leadership has already been demonstrated in the Columbia River Basin, which represents a further opportunity in this region. The event proved there in an overwhelming desire to move forward in a tangible way toward watershed governance in the Columbia Basin.

Furthermore, the Columbia River Basin is fortunate to have existing governance structures and institutions, such as the Columbia River Trust, that provide opportunity for dialogue and collaboration. The renegotiation of the Columbia River Treaty may provide additional opportunities for rethinking governance models in the region.

Beyond the idea of creating watershed boards or councils, there are other ways that groups in the watershed are becoming involved in decision-making. In the next section of this presentation, we highlight two "made in the Columbia/Kootenays" versions of citizen involvement in watershed governance. Both of these cases have involved the role of citizen science and they are examples of how this can influence decisions.

Lake Windermere example

The approach taken in Lake Windermere was a combination of partnerships, science, and stewardship. Collaboration was key to every aspect of Wildsight's Lake Windermere Project. Through the East Kootenay Integrated Lake Management Partnership, the project engaged all levels of government, First Nations, community organizations, and businesses in data collection, education, and on-the-ground stewardship activities. For five years the project lead in-depth

water quality monitoring, conducted biological inventories, and aquatic surveys using trusted provincial and federal monitoring protocols such as Sensitive Habitat Inventory Mapping (SHIM), a protocol of Fisheries and Oceans Canada, which identifies high value fish and wildlife habitat and directs shoreline development in a manner that protects those values; and CABIN, the Canadian Aquatic Biomonitoring Network, a stream monitoring protocol developed by Environment Canada, which is used by multiple federal agencies and provincial governments as the standard approach to assessing watershed health.

Because of the trust established with local, provincial and federal governments from the beginning, results were used to update provincial water quality objectives for the lake and develop shoreline management guidelines, which then informed a comprehensive lake management plan that has been adopted into policy.

Lastly, the project engaged our community in developing a water stewardship ethic. Volunteers were trained to do water monitoring; basin wide public events to celebrate water were hosted and in the process educated children and adults about what a healthy watershed means. Now that the project is complete, the Lake Windermere Ambassadors, a group of community volunteers and elected officials, has taken on the task of future monitoring and stewardship. They are helping share the results and implement the recently adopted Lake Management Plan with the goal of ensuring that the lake remains healthy for future generations.

The Lake Windermere Ambassadors Board, now a registered charity, also makes up the Lake Windermere Management Plan Implementation Committee, tasked with implementing the non-regulatory components of the plan. They receive referrals for comment on related project proposals and work closely with government agencies to steward the lake. The Ambassadors engage community members across the watershed through hosting watershed tours, watershed dialogues and continues water quality monitoring with community volunteers.

Elk River Valley example

The Elk River Valley is the case study region for Natasha Overduin's M.A. thesis research. This research project commenced in the summer of 2014 and data collection will continue into early winter. The project is looking at the role of community-based water monitoring in watershed governance, as well as the role of large industries in watershed governance. The Elk River Valley brings these interests together, and the case may yield important lessons for watershed governance in the Columbia River Basin more broadly. In this presentation, context about the Elk River Valley was provided, followed by a discussion of initial research findings and lessons

learned. This ongoing research will be completed in the Spring of 2015 and findings will be available at that time.

Conclusion

Three take-home messages should be emphasized from this presentation:

1. We need to shift from managing watersheds to managing people in watersheds: This means more and different players will be involved in water decisions moving forward. We need to start having conversation proactively, not reactively.
2. There are opportunities and challenges in the Columbia Basin for rethinking watershed governance.
3. There is a spectrum of possibilities for shared decision-making, but governance takes time – we need to bring people together, develop funding base, partnerships, coordination of data and monitoring efforts to create a structure at the watershed scale.

There is a growing need to make changes to how we are governing water resources in the Columbia River Basin. Through ongoing work by POLIS and by groups within the Columbia Basin (Blueprint, 2013 Symposium), and efforts by groups such as Lake Windermere Ambassadors and the Elk River Alliance we can learn ‘what works’ (and what doesn’t work) as we start to think about "tough questions", such as: Which factors drive watershed management decisions currently in our region? What opportunities exist to influence decision-making in the watershed? How are these opportunities changing? What are the potential benefits and risks of implementing shared watershed decision-making approaches in the region?

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4. *Two paradigms of environmental law*

Andrew Gage, West Coast Environmental Law
Vancouver, British Columbia
Andrew_Gage@wcel.org

Introduction

Non-lawyers often assume that environmental laws exist to protect the environment. But the reality is that the Canadian legal system often views environmental laws as a modern innovation, intended to balance the public's interests in the natural environment with the long-established private rights of industry and private land holders. Seen from this perspective, environmental laws sometimes seem more of a limit on individual behaviour than an affirmation of the value that Canadians place on the environment, notwithstanding very strong statements from the Supreme Court of Canada on the fundamental importance of environmental protection to Canadians.

Increasingly, social scientists, political theorists and philosophers are telling us that it's all about the story. The way we look at the world, and understand problems, is about a socially constructed "paradigm."

The mainstream legal way of looking at environmental issues is that they are a recent phenomenon about which the law has traditionally had little to say. Consequently, the lead in addressing these problems must come from the legislator, who is well placed to evaluate the impacts of these new political concerns on existing private property rights and other public demands.

However, the common law contains all the elements of an alternate story. As the Supreme Court of Canada recently noted, the idea that the public has rights in respect of the natural environment has long roots in the common law, dating back to its earliest origins. Recognizing the centrality of the public's environmental rights provides the basis of a story that can be used to frame environmental laws in an entirely different light.

What are Public Environmental Rights?

Despite the Supreme Court's comments about the long roots of the idea of public environmental rights in the common law, the concept has not had a lot of recent attention, and some lawyers may be skeptical that such rights exist in Canadian law – other than the well-established public rights to fish and to use waterways for navigation.

In fact, however, there is judicial and statutory authority in support of the existence of a wide range of public rights in respect of natural features and lands. These include rights to:

- use air;[4]
- fish and the continued existence of fish habitat;[5]
- use water for navigation,[6] and likely for domestic purposes;[7]

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[4] T. Bonyhady. The Law of the Countryside: the Rights of the Public (Abindon, Oxon, U.K.: Professional Books, 1987) ("Bonyhady"), p. 196: "In Roman law air was classified as *res communes* which meant that it was regarded as subject to public use but was thought to be incapable of ownership. … [I]t is probably still appropriate to regard air as *res communes* since it remains open to public use and, in its ordinary state, is not the subject of property rights." Bonyhady cites *Colls v. Home and Colonial Stores Ltd.* (1904), [1904] A.C. 179 at 182-3, in support of this statement: "[Air] is the common property of all, or, to speak more accurately, it is the common right of all to enjoy it, but it is the exclusive property of none." Bonyhady also cites *Millar v. Taylor* (1769) 4 Burr. 2303, 2356, 2357; 98 E.R. 201, 230; *Chasemore v. Richards* (1859) 7 H.L.C. 349; 11 E.R. 140, 152, *Lacroix v. The Queen* (1954) 4 D.L.R. 470, 476; Re the Queen in Right of Manitoba and Air Canada (1978) 86 D.L.R. (3d) 631.

[5] *R. v. Gladstone*, [1996] 2 S.C.R. 723 at para. 67; in addition, in B.C. the right to fish in accordance with the law is affirmed by the *Hunting and Fishing Heritage Act*, below, note 9.

[6] *Friends of the Oldman River Society v. Canada*, [1992] 1 S.C.R. 3.

[7] The case law concerning the public right to use running water is the most complicated of the public rights identified here, and probably the most contentious. There is early English and Canadian authority accepting the existence of such a right: Bonyhady, above, note 1; *Attorney General v. Harrison*, [1866] Ch 466 at 470; *Watson v. City of Toronto Gas and Water Co.*, 10 Vic. 158 (U.C.Q.B.)). In England these cases have been overruled in subsequent decisions in favour of an emphasis on the private rights of riparian owners. The Canadian courts and text books seem to have implicitly accepted the new English emphasis on riparian rights, despite the fact that at least one case explicitly notes that the reason for this departure from the common law as articulated by Bracton was the need to accommodate a rapidly industrializing English society – a consideration which hardly applied to the then newly settled Canada: *Ormerod v. Todmorden Mill Co.* (1883),11 Q.B.D. 155 at 160, per Cave. J. Moreover, the history of water use by early settlers, and the fact that large areas of riparian land remain publicly owned, support the view that the British departure from the *res communes* doctrine was and is inappropriate for Canada. In most provinces the situation is further complicated by legislation governing access to water. While the current B.C. *Water Act* no longer makes reference to a right to use unlicensed water for domestic purposes, the B.C. Court of Appeal has ruled that such a right does still exist, although it is a "fragile right", subject to extinguishments if a water license is granted in respect of that water: *Steadman v. Erickson Gold Mining Co.* (1989), 35 B.C.L.R. (2d) 130 (C.A.).

- use parkland and other lands dedicated for a public purpose;[8]
- hunt wildlife in accordance with the law.[9]

The authorities for the above cited rights refer directly to a public right. However, other commentators have also reviewed cases in which environmental harms have given rise to successful actions in public nuisance, arguing that these actions also define the content of public rights. For example M. Faieta writes:

> The common law has recognized a public right to clean air and to clean lakes, rivers and other watercourses. The courts have recognized that the imposition of statutory duties and obligations, enacted for the public's benefit, also creates "public rights."[10]

Faieta goes on to discuss public nuisance law claims in respect of air, water, soil, flora and fauna, and noise.

Jerry De Marco has suggested that recent Supreme Court of Canada cases imply that a more general right to a safe environment exists. In addition to the Court's statements in *Canfor*, he summarizes these authorities as follows:

> Taken together, the judgments in Canadian Pacific, Hydro-Quebec and Imperial Oil, as well as several provincial and territorial statutes, clearly recognize the existence of environmental rights. Imperial Oil, Hydro-Quebec and Montreal provide further recognition of duties and entitlements that are similar to environmental rights. …[11]

The relationship between these concepts need to be further explored, but there is ample support for the view that public environmental rights do exist at common law. There is every reason to suppose that the Supreme Court was correct in suggesting that public environmental rights exist

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8 See my paper, A. Gage. "Highways, Parks and the Public Trust Doctrine", 18 J.E.L.P. 1 (the "Highways Paper"). From the abstract: "While the common law doctrine of dedication and acceptance is most well known as a means of creating public highways, Canadian courts have also applied it to the creation of other public spaces, including "playgrounds, greenbelts, [and] parks." … Under the Doctrine, a … property owner's actions (or in some cases inaction) may result in the creation of legally enforceable public rights of use of land for recreational and other public purposes."

9 While this right may be controversial at common law, in B.C. it seems to be confirmed by the *Hunting and Fishing Heritage Act*, S.B.C. 2002, c. 79, s. 1, which reads: "A person has the right to hunt and fish in accordance with the law". Whether or not this right also involves a public right in respect of the continued existence of the habitat used by such wildlife, as is the case in respect of the public right to fish, is not clear at this time.

10 M. Faieta et al. Environmental Harm: Civil Actions and Compensation. (Toronto : Butterworths, 1996), p. 46.

11 J. De Marco. "The Supreme Court of Canada's Recognition of Fundamental Environmental Values : What Could be Next in Canadian Environmental Law?", 17 J.E.L.P. 160 (2007) at p. 175.

in Canada, and that they can form the basis for new developments in environmental law in Canada.

Part II – Two paradigms

If the common law has recognized, or could recognize, some fairly significant public environmental rights to, for example, air, water and parkland, the next question is: what are the consequences of those rights?

The "what public rights?" paradigm

The obvious, but unfortunately limited, role for public rights is in lawsuits against those who violate the public's rights – a type of action referred to as a public nuisance.[12] However, while attractive to public interest litigants,[13] the courts have generally held that only the Attorney General – or his or her designate – can bring a claim.[14] In a modern era of environmental legislation, the government generally pursues environmental protection through statutory means, rather than through public nuisance actions, meaning that the most visible manifestation of public rights in environmental protection has seemed obsolete.

As a result, public rights have been largely invisible in modern environmental law cases. Most of the jurisprudence and academic comment on environmental law in the past several years have understood environmental law as a modern innovation. Prior to the modern era, environmental concerns were minor or non-existent, and new laws were required after the industrial revolution to restrain the worst excesses of the market place and of private property rights. Environmental legislation is viewed as representing a departure from a previous era where

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[12] Public nuisance actions have been defined in multiple ways, and can involve the violation of public interests that fall short of an actual public right, but it is well accepted that a violation of a legally recognized public right does constitute a public nuisance.

[13] J. P. McLaren. "*The common law nuisance actions and the environmental battle – Well-tempered swords or broken reeds?*" in *Osgood Hall Law Journal*, Vol. 10, No. 3, December 1972, p. 505 at p. 511.

[14] Someone other than the Attorney General may bring a claim in public nuisance if they are "specially affected" in a manner different from the rest of the public: *Stein and Tessler v. Gonzales et al* (1984), 58 B.C.L.R. 110 at p. 112 and pp. 113-14, cited in *Gleneagles Concerned Parents Committee Society v. British Columbia Ferry Corp.*, 2001 BCSC 512 at para. 79. There is considerable uncertainty over precisely how this test is to be applied, which may be a further factor in deterring public interest litigants from using this tort: See *Gagnier v. Canadian Forest Products*, (1990-11-08) BCSC C 894108, [1990] BCSC 11267.

private property owners were allowed to do whatever they wanted, provided there was no direct interference with other property owners.[15]
According to this view, the government is not required to do anything to protect the environment (and infringe on private rights) that is not clearly required by environmental legislation. Thus the BC Court of Appeal, in a court case concerning a general obligation of the Ministry of Forests to determine that logging plans would "adequately manage and conserve" forest resources, had no difficulty in holding that there was nothing in that general provision requiring that the logging not compromise the continued survival of an endangered species.

> "[The Forest Practices Code] does not require a [District Manager] to be satisfied that forest resources are managed and conserved, but simply that they are "adequately" managed and conserved. *Had the Legislature intended to preclude all logging in an area in which there were endangered species, it could have done so by clear language to that effect."*[16]

In this case the possibility that the District Manager was compromising a public right to the continued existence of the endangered species was never considered by the court. Instead, the assumption was that the forest company could destroy endangered species habitat, and the question was whether the Forest Practices Code limited that right.

A public rights paradigm

But there is another equally compelling story: environmental legislation does not ignore or replace public environmental rights; rather, it is the means by which the Crown protects public environmental rights – the public's legally recognized interests in respect of the environment.

Under the public environmental rights framework, the common law has, since its inception, recognized public rights in respect of the environment. Environmental concerns may now have an unprecedented importance, but they have always been an important concern of the legal system. As a result, private property owners have acquired their property subject to a

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15 The irony is that in many cases the common law evolved with the industrial revolution to accommodate the free-market ideology that accompanied it. Thus, as noted above, the English common law prior to the 1850s did recognize a public environmental right to use water, but this approach was abandoned as impractical in the industrial era: supra, note 4. In actual fact the pre-industrial revolution common law did not always involve the unfettered private property interests that proponents of the mainstream paradigm assume. See also my discussion of the *Writ of Ad Quod Damnum* in Gage, below, note 18.

16 *Western Canada Wilderness Committee v. British Columbia* (2003), 15 B.C.L.R. (4th) 229 (C.A.) at 242.

pre-existing common law duty not to negatively affect the rights of their neighbours, including public environmental rights; government regulation develops and expands upon the existing public rights in respect of a clean environment, adding additional remedies and powers to protect those rights.

This paradigm may be seen in the decision of the Newfoundland and Labrador Court of Appeal in *Labrador Inuit Association v. Newfoundland (Minister of Environment and Labour),* concerning the discretion of the province's Minister of Environment to exempt consideration of certain aspects of a project from a joint federal-provincial assessment of the Voisey Bay mine:

> Both the Parliament of Canada and the Newfoundland Legislature have enacted environmental assessment legislation … The regimes created by these statutes represent a public attempt to develop an appropriate response that takes account of the forces which threaten the existence of the environment. If the rights of future generations to the protection of the present integrity of the natural world are to be taken seriously, and not to be regarded as mere empty rhetoric, care must be taken in the interpretation and application of the legislation. Environmental laws must be construed against their commitment to future generations and against a recognition that, in addressing environmental issues, we often have imperfect knowledge as to the potential impact of activities on the environment. … [Environmental Assessment legislation] must be regarded as something more than a mere statement of lofty intent. It must be a blueprint for protective action.[17]

With this background, the court, not surprisingly, went on to interpret the scope of the environmental assessment broadly, and the Minister's jurisdiction to exclude aspects of that project narrowly. This case, unlike the others cited above, did not concern the Ministerial discretion in setting the scope of an environmental assessment, but rather the approach to be taken in interpreting a memorandum of understanding setting out the scope. However, while concerning a different legal issue, the approach taken by the court of appeal is fundamentally different from the approach taken in those cases.

[17] *Labradour Inuit Association v. Newfoundland (Minister of Environment and Labour)* (1997), 152 D.L.R. (4th) 50 (Nfld. C.A.), pp. 55-56.

Two Paradigms

Consider the differences in perspective between the two paradigms:

The public's environmental interests are protected by statute alone	**Public has common law rights in respect of the environment**
Government's job is to balance private rights and environmental interests; where there is a conflict, the private rights, as the earlier of the two, should be favoured.	Government's job is to protect both public and private rights; where there is a conflict, the public rights, as the earlier of the two, should be favoured.
Until environmental legislation is enacted, the environment has no legal protection. New environmental laws, therefore, can be viewed as restricting or infringing on private rights.	At common law a violation of the public's environmental rights amounts to a public nuisance. Environmental legislation expands on the protections available to these public rights. Private land owners were already obliged to avoid infringing public rights, so environmental legislation generally will not create new liability or infringe on existing private rights.
Government has discretion to allow interference with the environment. If the Legislator intends to restrict that discretion it would do so in clear language.	If the Legislator intended to give government discretion to interfere with public environmental rights, it would do so in clear and unambiguous language.
The government owes procedural fairness to people directly affected by government decisions, but not to the general public.	Public rights are as significant to government decisions as private ones; the government has a duty to consult the public, as holders of environmental rights, as well as people more directly affected by government decisions.

One major advantage to this paradigm shift is that it reflects the way, in the author's experience, that the public tends to understand their relationship to environmental values. While there is no single monolithic entity known as the public, many, probably most, members of the public believe that they have a right to clean air, and to clean water. They believe that the government will protect these rights. Consequently, the public environmental rights framework represents

both a way to translate concerns of members of the public into legal language and, conversely, a way to explain environmental law in a way that may understandable to members of the public.

Statutory Interpretation

It is important to recognize that there is already strong authority that public rights play a key role in understanding legislation. Although it has been largely overlooked in recent jurisprudence and academic commentary, the Canadian courts have, in interpreting statutes, recognized a presumption that the Legislator would not, absent a clear and unambiguous intention to do so, intend to interfere with existing public rights. This is an application of the more general, and better known, rule that legislation should be interpreted as not infringing existing legal rights.

The surprisingly large and well developed body of case law applying this presumption of interpretation is discussed at some length in my article, *Public rights and the lost principle of statutory interpretation*.[18] I will summarize some of the findings of that paper, below.

This presumption of interpretation started with cases concerning the Crown's prerogative powers and the question of whether the Crown can interfere with public rights absent authority from Parliament. Thus, a public right "can only be modified or extinguished by an authorizing statute, and as such a Crown grant of land of itself does not and cannot confer a right to interfere with navigation."[19]

According to this principle, grants or licenses made by the Crown will not be interpreted, absent a clear intention to do so, as authorizing interference with public rights:

> …[T]he Crown cannot grant a license to commit a public nuisance. It would be licensing an individual to do that which interferes with a right which is the common inheritance of the people. … [S]uch a license is not to be implied: it would be derogating from the honour of the Crown to assume an intention to do that which would be injurious to the people …[20]

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[18] Gage, A. "Public rights and the Lost Principle of Statutory Interpretation", 15 J.E.L.P. 107 (the "Statutory Interpretation Paper")

[19] *Friends of the Old Man River Society v. Canada (Ministry of Transport)*, [1992] 1 S.C.R. 3 at 55.

[20] *Attorney General v. Harrison* (1866), 12 Gr. 466 (U.C. Ch.); see also *Rhodes v. Perusse* (1908), 41 S.C.R. 264 at 268-9.

This principle is also applicable to the interpretation of legislation. Thus, in 1910 Iddington, J. referenced:

> [T]he well-known rule that anything in the way of legislation abridging the public rights or the rights of any of the public in favour of one acquiring a concession from Parliament or other legislative body must be construed strictly, and that the right must not be extended by implication.[21]

This principle can even constrain the apparently unlimited discretion of a statutory decision-maker, on the basis that if the legislature had intended the discretion to be used in a way inconsistent with the public right, it would have said so explicitly. Thus, in a case concerning the ability of the federal Minister of Fisheries to discriminate against fishers of Japanese origin, the Supreme Court of Canada, upheld by the Judicial Committee of the Privy Council, explained:

> The [fishing license] regulations in question thus affect both public and private rights of fishing, and they should not be interpreted to derogate from those rights further than may be requisite to give the regulations their necessary and due effect… It is true that the licensing power is committed to the head of the Department [of Fisheries], and no doubt it will be administered with due care, but, if it were intended that he should exercise a discretion to refuse a license to a qualified applicant, there would, I should think, have been something expressive and definitive of that intention…[22]

Similarly, absent explicit statutory authority, general statutory provisions authorizing the ownership, management or regulation of roads or marketplaces, do not allow a local government to exclude members of the public from using those lands or to turn those lands over to a purpose that might limit the public's rights in respect of those roads.[23]

Less clear is whether the courts may infer procedural protections where a statute impacting public rights does not explicitly provide for such procedural steps, in a manner analogous to the presumption of procedural fairness in respect of private rights. For example, would a court ever infer a statutory intention that a decision-maker give public notice prior to making a particularly significant decision, or hold a public hearing?

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[21] *British Columbia Electric Railway v. Crompton* (1910), 43 S.C.R. 1 at 13; for a range of other cases discussing this principle, see Gage, note 18, pp. 121-124.

[22] *Reference re Fisheries Act, 1914 (Canada)*, [1928] S.C.R. 457 at 476-7, affirmed [1929] 3 W.W.R. 449 (Canada P.C.).

[23] *Vancouver v. Burchill*, [1932] SCR 620; *Calgary (city of) v. Cominco Ltd.* [1983] 2 W.W.R. 320 (Alta. Q.B.) at 331; *Guelph v. The Canada Company* (1854) 4 Grant 632; *Hamilton v. Morrison* (1868) 18 U.C.C.P. 228; *In re Peck v. Galt* (1881) 46, U.C.Q.B. 211; *Affleck v. Nelson (City)* (1957), 23 W.W.R. 386 (B.C.S.C.); for discussion of these and other cases, see the *Highways and Parks* article, supra

While there are, so far as the author is aware, no Canadian cases in which the courts have gone so far,[24] there is authority that procedural steps intended to protect the public's rights will be strictly construed against the government:

> [Their Lordships] content themselves with saying that there is excellent authority for requiring statutory conditions to be strictly fulfilled if interference with public rights is to be justified.[25]

Second, where a statute does explicitly set out public hearing and notice requirements related to a public right, administrative law requirements will be adapted to recognize the public's general interest. Thus, it is not necessary to show that a defect in public notice prejudiced the petitioner. It is enough if the notice would not have been clear to a reasonable person; prejudice to the public will then be inferred.[26]

Taken as a whole, then, there is clear authority that legislation governing public rights should be interpreted as not intending to interfere with public rights. For environmental legislation it may be argued that the purpose behind the legislation is actually to protect the same interests that have been traditionally addressed through the legal concept of public rights, and, consequently, that a broad and liberal interpretation of the legislation requires effect to be given to those rights, and efforts on the part of the executive, absent clear authorization by the legislator, to limit those rights should be constrained.

Thus these cases – discussing the importance of public rights in understanding environmental and other legislation – affirm the validity of a story based on public rights.

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[24] There is authority in the U.S. arising from the public trust doctrine: see M.C. Blum, "Public Property and the Democratization of Western Water Law" (1989) 19 Envtl. L. 573 at 590 for discussion of the "hard look doctrine."

[25] *Burrard Inlet Tunnel & Bridge Co. v. "Eurana" (The)*, [1931] 1 D.L.R. 785 at 790 (Canada P.C.); see also *SPEC v. Canada (Attorney General)*, 2003 FCA 239 at paras. 65–67 (Fed. C.A..)

[26] *Wilson v. Secretary of State for the Environment* (1972), [1973] 1 W.L.R. 1083 (Q.B.), adopted by *Central Ontario Coalition Concerning Hydro Transmission Systems v. Ontario Hydro* (1984), 10 D.L.R. (4th) 341 at 368 to 371 (Ont. Div. Ct.).

Conclusion

Governments and courts currently do not typically think in terms of the public's rights in respect of the environment, but in my experience members of the public often do. It should be the job of lawyers and other professionals representing the public to challenge the unstated private-rights first paradigm, and to raise a public rights paradigm that puts the public's interests in respect of the environment on an equal footing to private rights.

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5. *Human wildlife conflict management in BC*

Mike Badry, BC Ministry of Environment
Victoria, British Columbia
mike.badry@gov.bc.ca

Introduction

The British Columbia provincial government is committed to reducing conflicts between wildlife and humans as part of its strategic goal of maintaining safe, healthy communities and a sustainable environment. Reducing these conflicts is essential for protecting human health and safety, maintaining biodiversity and reducing property damage.

Human-wildlife conflicts occur in both urban and rural areas, and range from nuisance encounters with small wildlife such as squirrels to attacks by large predators such as bears on pets, livestock or humans. These conflicts can cause human injuries and death, destruction of wildlife, and damage to property, resulting in financial impacts on businesses and local governments.

The traditional response to human-wildlife conflicts has been to react to them as they occur. The government of British Columbia has put more and more resources into responding to a growing number of complaints about wildlife. However, increased resources have not prevented conflicts or reduced their numbers. As British Columbia's population grows, more of us come into contact with wildlife. The ineffectiveness of traditional response methods in reducing human-wildlife conflicts and the need to maximize benefits from public resources calls for a new approach.

The solution is prevention. In 2003 the (then) BC Ministry of Water, Land and Air Protection released the Wildlife-Human Conflicts Prevention Strategy (http://www.env.gov.bc.ca/cos/info/wildlife_human_interaction/strategy.pdf). The strategy focuses on managing human-wildlife contacts where they happen — in communities and regions. It requires roles for local governments, non-governmental organizations (NGOs), First Nations, businesses and individuals, along with the provincial government. All these partners must be responsible and accountable for their prevention actions.

The presentation will highlight 3 programs that fall within the wildlife conflict strategy:

"Bear Smart Communities"

The "Bear Smart" Community Program (http://www.env.gov.bc.ca/wld/bearsmart/) has been designed by the BC Ministry of Environment in partnership with the British Columbia

Conservation Foundation and the Union of British Columbia Municipalities. It is a voluntary, preventative conservation measure that encourages communities, businesses and individuals to work together. The goal is to address the root causes of human-bear conflicts, thereby reducing the risks to human safety and private property, as well as the number of bears that have to be destroyed each year.

This program is based on a series of criteria that communities must achieve in order to be recognized as being "Bear Smart":

1. Prepare a bear hazard assessment of the community and surrounding area.

2. Prepare a bear/human conflict management plan that is designed to address the bear hazards and land-use conflicts identified in the previous step.

3. Revise planning and decision-making documents to be consistent with the bear/human conflict management plan.

4. Implement the continuing education program, directed at all sectors of the community and consistent with Ministry standards (e.g. Bear Aware)

5. Develop and maintain a bear-proof municipal solid waste management system.

6. Implement “Bear Smart” bylaws prohibiting the provision of food to bears as a result of intent, neglect, or irresponsible management of attractants.

One of our key measures of success, the number of bears killed annually, has shown a promising trend. The average number of bears killed due to conflict has steadily declined and we hope to see this trend continue.

Over 20 communities in BC are actively pursuing “Bear Smart” and six communities: Kamloops, Squamish, Lions Bay, Whistler, Port Alberni and Naramata have successfully attained official “Bear Smart” status.

Urban Ungulate Conflict Analysis

There is a growing concern within many B.C. communities with respect to the growing numbers of deer populating urban areas. These increases are creating some issues such as higher rates of car accidents involving deer, aggressive behavior towards pets and humans, and damage to vegetation and landscaping.

Recognizing this issue, Ministry staff conducted a thorough review of urban deer conflicts, called "British Columbia Urban Ungulate Conflict Analysis" (http://www.env.gov.bc.ca/cos/info/wildlife_human_interaction/UrbanUngulates.html). The purpose of the project was to identify mitigation options for urban ungulate conflicts, including:

- identifying the scope of the conflict;
- reviewing current information regarding conflict reduction, including management practices in other jurisdictions and their effectiveness; and
- providing recommendations regarding a strategy to deliver conflict reduction programs in B.C. and effective management practices to implement.

The report includes conflict reduction strategies, such as repellents, landscaping alternatives, fencing, and vehicle collision mitigation. Population reduction strategies are also discussed in the report, such as capture and relocate programs, as are fertility control strategies and administrative options such as bylaws, regulations, and public education.

The report recommends communities set up Community Deer Management Committees and that these committees develop comprehensive management strategies based on consensus-based decision making.

WildSafeBC

WildSafeBC (https://wildsafebc.com/) is an expansion of the highly successful Bear Aware program. By expanding the focus from reducing human-bear conflicts to reducing human-wildlife conflicts we will be able to utilize the existing infrastructure and delivery models to help communities address their growing problems with deer, coyotes, cougars and other wildlife.

The objectives of *WildsafeBC* are:

1. Create safer communities with respect to wildlife - both in terms of reduction in threats to personal safety and reduction in property damage.
2. Reduce the number of animals being destroyed due to preventable circumstances.
3. Increase public awareness and understanding so that when animals are destroyed the attention is placed on the circumstances that created the situation, not the destruction itself.

In 2014 the WildSafeBC program has 26 Coordinators throughout the province serving over 100 communities. Together they have made 18,000 door to door contacts, over 2,000,000 media contacts, and over 100,000 contacts at outdoor events.
By working with communities to live responsibly with wildlife we can drastically reduce conflicts and can reduce the number of animals destroyed due to this conflict.

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6. *Engaging stakeholders in addressing natural resource management conflicts – a case of cognitive framing*

Presenter: Rachel Nicole Roberts, School of Environmental and Forest Sciences, University of Washington
Seattle Washington
Rnr4@uw.edu

Abstract

Intense and prolonged environmental conflicts are a staple of the modern day natural resource management field. Disagreements over management practices exist because of misalignments between different groups' identifications or perceptions of what the issues are that make up the conflict. A cognitive framing approach to natural resource management issues that seeks to more clearly define frames held by each stakeholder group is necessary. Cognitive framing encourages clear problem construction while reducing the influence of other stakeholders' conflicting perspectives. To execute this cognitive framing process, stakeholders were engaged, through focus group conversations with like-minded others, as part of the efforts of a neutral forum to facilitate discussion of management decisions performed on state trust lands on the Olympic Peninsula. Interviews were conducted with representatives from local tribes, environmental groups, the timber industry, beneficiaries of trust land revenues, local government officials and residents. I explored stakeholders' frames of the problems with forest management and potential ways of addressing those problems. Interviews were recorded, transcribed verbatim, and thematic analysis was conducted. I identified key areas of consensus and disagreements among parties and illuminated common ground among stakeholder groups. I discuss the implication of my findings and the limitations of this approach to addressing natural resource management conflicts.

Introduction

The case study

This paper focuses on a forest management conflict on the western Olympic Peninsula of Washington State, USA. This area is some of the most productive timber land in the world (Washington State, 1989) and includes the majority of Washington's remaining stands of moist old-growth forest (DNR, 2014). It is associated with many threatened and endangered species, including the Northern Spotted Owl, Marbled Murrelet, and various salmonids (USDOI, 2014).

The peninsula's towns are highly dependent upon the local timber supply (Washington State, 1989). These forests are only one part of a larger, national debate that began in the 1960's over the management of old-growth forests on public lands throughout the western United States.

The forest that I focus on in this paper is the Olympic Experimental State Forest (OESF) – a collection of state trust lands on the western Olympic Peninsula. These state trust lands are managed by the Washington State Department of Natural Resources (DNR) under a mandate to generate revenue for specific beneficiaries, including schools, universities, hospitals, libraries, and other state- and county-level services (Washington State, 1989, DNR, 2014). On the OESF, the DNR generates the majority of its revenue from timber receipts (DNR, 2014). This forest was established to balance economic, social, and ecological values on the landscape, and was acknowledged to be a commercial forest with the potential for experimentation of harvest and regeneration techniques (Washington State, 1989). In recent years, revenue and timber harvest from the OESF have fallen, leaving beneficiaries without this income stream and straining the local economy and community. Lawsuits from environmental groups have ended in settlement agreements that further restrict harvest in this forest. In an attempt to address these issues, this project was initiated through the Olympic Natural Resources Center (ONRC): a facility established as a research platform as well as a neutral forum for conversations from all stakeholders on the management of the OESF.

Intractable conflicts

In today's natural resource management field, environmental problems increasingly reach high levels of conflict. Labelled as "intractable" (Lewicki, Gray, & Elliott, 2003) or "wicked" (Balint, 2011), these conflicts are, to varying degrees, resistant to traditional mediation approaches to conflict resolution and are identified by their ambiguity, complexity, and prolonged nature (Putnam & Wondolleck, 2003). A human dimensions approach to these problems acknowledges that they exist and persist because of their social contexts, and that social sciences can provide insights into how to increase the tractability of natural resource conflicts.

Framing

Problems are considered highly intractable when, "[d]eveloping a credible and acceptable problem definition and generating approaches to resolving it are elusive" (Putnam & Wondolleck, 2003). In this paper, I apply a method that allows for clear problem definition and identification of areas of consensus and disagreement according to how the problem is understood and exists in the disputants' minds. The way that stakeholders view the issues that make up a conflict are referred to as their *frames*.

Approaches to framing can be either interactional or cognitive. An interactional approach to framing looks at how meaning is co-constructed during the interactions between disputants (Dewulf, Gray, Putnam, Lewicki, Aarts, Bouwen, & van Woerkum, 2009). This approach is appropriate for understanding how frames are aligned and created during interactions between different stakeholder groups (Dewulf et al., 2009). However, during interactions in intractable conflicts, disputants may influence each other and frame issues strategically and oppositionally, instead of how they exist alone in the disputants' minds. In situations such as the OESF conflict, physically interactive framing is unlikely to succeed due to the high level of intractability. A cognitive psychology approach to framing is more appropriate when the intractability is due to the individual issues of the conflict not being clearly understood by the stakeholders (Dewulf et al., 2009). In cognitive psychology, frames are cognitive structures that organize and interpret experiences and knowledge (Bartlett, 1932, Minsky, 1975). In a conflict, these cognitive frames are interpretations of an individuals' interactions with the problem and are used by that person to determine how to interact with the problem in the future. Cognitive framing may not represent a complete and total representation of the problem: interviewing groups individually many not allow stakeholders to adequately address the views of other disputants (Asah, Bengston, Wendt, & Nelson, 2012). It is therefore important to note this approach's limitation in understanding a particular frame's view of other groups' frames.

Approaching social problems through framing can employ two different "core tasks": diagnostic framing (problem identification and its source) and prognostic framing (proposed solutions and strategies to carry them out) (Benford & Snow, 2000). These tasks allow identification of each group's understanding of what the problem is and how to solve it. Both were applied in this research; the two main questions asked during our interviews were "What are the problems with the way the OESF is being managed?" and, "What are the solutions to those problems?". By being able to understand both of these frames for the different stakeholder groups, their frames could be compared to one another's in order to identify on which issues groups agreed and disagreed.

Cognitive framing theory implies that a restructuring of frames might lead to frame alterations (Dewulf et al., 2009). Reframing is necessary for intractable conflicts to be perceived of in a different or new understanding (Gray, 2003). Because high intractability is due to conflicting frames of the problem, a conflict may be rendered as more approachable if it these frames can be realigned. Grey (2003) posits that reframing is more easily done with the help of a neutral third party that has no direct stake in the conflict: this party must, "attempt to reformulate and re-present to the parties an interpretation of the conflict." This process involves taking stakeholders' frames and comparing them, requiring identification of the degree to which there is consensus or

disagreement of each problem and solution. By illuminating common ground between different stakeholder groups, the problem can be reframed around issues with high agreement, allowing the conflict to be more easily approached and brought to a more tractable level.

Method

For this case study, the ONRC's ability to act as a neutral forum for facilitating these discussions was crucial. The neutral forum functions as a stable centerpiece that can approach each group individually for this initial phase of cognitive framing.

Seven focus group conversations were conducted with the various stakeholder groups involved in the conflict. Focus groups consisted of 5-8 like-minded individuals of the same stakeholder group, and conversations were led by a moderator. Discussions lasted approximately 2 hours each. The seven focus groups had a total of 43 participants, with 3 beneficiary groups, 2 environmental groups, 1 timber industry group, and 1 group that consisted of 3 different Native American tribal nations. Interviews were recorded and transcribed verbatim, and transcripts were then coded into themes as expressed by the participants.

Consensus and Disagreement
This paper will focus inter-group consensus and disagreement - comparisons between the different stakeholder groups - as opposed to intra-group, which would look at agreement or disagreements between different focus groups of similar stakeholder groups.

Example:

Inter-group Agreement: Beneficiary Groups and Industry Group
Intra-group Agreement: Beneficiary Group 1 and Beneficiary Group 2

Once the data was coded into thematic categories which represented major issue of the conflict, areas of consensus and disagreement were identified. Consensus was identified by issues where a higher number of stakeholder groups identified with that issue and/or its sub-issues. Disagreement was identified by issues where a lower number, or even only one, stakeholder group identified with that issue.

Example of Higher Agreement:

Problem: "DNR Thinning"

Issue Frame: "The DNR Is Not Thinning Correctly"

Beneficiary Group Agreement: *"The biggest bang for your buck you can do in terms of silviculture is doing you pre-commercial tree thinning. That accelerates the growth rate, which accelerates the harvest rate…which accelerates your revenue stream back to your trust beneficiaries. But [DNR] made a decision to say we're not [going to] do pre-commercial tree thinning."*

Industry Group Agreement: *"[The] policy was that they got to clear-cut an acre for every acre they were going to thin…They've kind of screwed up the whole process because they've done all the clear-cut acres and none of the thinning acres."*

Conservation Group Agreement: *"So the question is, how do you get from the short rotation practice that we use now to the long rotation practices that would actually be better for the community, produce more jobs, more revenue, better wood. That's through ecological thinning."*

Example of Lower Agreement:

Solution: "State Trust Lands System"

Issue Frame: "The System Should Stay"

Conservation Group Agreement: *"If you totally removed the money from the beneficiaries, they have no incentive to keep the DNR managing that forest, and the counties will have a significant incentive to sell it off. You don't want to take away all of the financial incentives to keep that land in public ownership."*

Issue Frame: "The System Should Go"

Beneficiary Group Agreement: *"We have been funding education from timber revenue since the 1800's…We should be coming up with a whole new way to fund education rather than creating pressure to cut trees because we desperately need the money to send our kids to decent schools"*

Because of the nature of focus group interviews and our open-ended structure, it is possible that some issue areas may have actually been of importance to some stakeholder groups, but were not brought up during our conversation. Therefore, it is important to emphasize that these are examples of issues that were of high importance and prevalence to the respective stakeholder groups.

Findings

This paper includes some examples of the issue frames of the conflict and demonstrates the level of agreement of disagreement amongst the various stakeholder groups (Table 1). These examples are specific issues that are part of even larger issue areas – for example, there are many sub-frames to the larger frame of "The DNR Agency Is the Problem with Management". Specific problems identified within this category include frames such as "DNR Employees Do Not Have Enough Experience", and, expanded upon in this paper, the frame of "The DNR Doesn't Want to Work with Other Stakeholders".

At the time of writing, full data analysis was not completed: this data should be understood as preliminary data used to illustrate the research.

Table 1: Examples of issue frames in order of relative high (top) to low (bottom) agreement.

Issue Frame	Stakeholder	Stakeholder Quote
Problem: The DNR Is Not Thinning Correctly – High Agreement	Beneficiaries	"The biggest bang for your buck you can do in terms of silviculture is doing you pre-commercial tree thinning. That accelerates the growth rate, which accelerates the harvest rate…which accelerates your revenue stream back to your trust beneficiaries. But [DNR] made a decision to say we're not [going to] do pre-commercial tree thinning."
	Industry	"[The] policy was that they got to clear-cut an acre for every acre they were going to thin…They've kind of screwed up the whole process because they've done all the clear-cut acres and none of the thinning acres."
	Conservationists	"So the question is, how do you get from the short rotation practice that we use now to the long rotation practices that would actually be better for the community, produce more jobs, more revenue, better wood. That's through ecological thinning."
Problem: The DNR Doesn't Want to Work with Other Stakeholders – High Agreement	Beneficiaries	"There is an element in DNR HQ that benefits from either an apathy [towards] beneficiaries or creating an us-versus-them…The most disappointing thing throughout this process [is that] we were led to believe that the DNR was as committed to making the OESF work as we were committed to working with them in a partnership"

	Conservationists	"When we had our watershed group…the timber industry brought up our state legislator and he told us that not only could we not go in and monitor water conditions…We couldn't do it, the tribes couldn't do it, the state Department of Ecology couldn't do it, the Washington Department of Fish and Wildlife couldn't do it. Nobody could do it." … "We said we would do [monitoring] ourselves and we'd do it with them… They're not interested. We never hear back."
	Tribes	"They never offer to say, 'This is the literature we're going by and based on this literature, we're [going to] set up our experiment this way,' and, 'Do you have any good ideas where we should do that? Any ideas of where we shouldn't do that?' We never hear that."
Solution: The OESF Should Be Privatized – Moderate Agreement	Beneficiaries	"What would happen if one were to go the legislature…and say okay, here's our proposal. We will put out to bid the Olympic Experimental State Forest be managed by somebody from the private sector"
	Industry	"From a banking standpoint, you could take the OESF land base…and give it to an independent forester [or]forest economist and say, if you could manage this under [state law], under the Habitat Conservation Plan…just take it and see what you can come up with for a revenue value."
Solution: The OESF Should Apply Carbon Credits – Moderate Agreement	Beneficiaries	"Cut timber represents cash to us…[and] standing timber has a potential value to us in carbon credits that have offsets [through] legislation…So either side, whether the timber is standing or whether it is cut, we feel that the [school] can benefit from that."

	Conservationists	"We need to look at these forests as if these are going to be a major carbon store, which is a huge opportunity for us, and a huge opportunity for revenue to the timber industry and to the DNR who owns them."
Problem: The State Trust Lands System – Moderate Disagreement	Beneficiaries	"We have been funding education from timber revenue since the 1800's…We should be coming up with a whole new way to fund education rather than creating pressure to cut trees because we desperately need the money to send our kids to decent schools"
	Conservationists	"If you totally removed the money from the beneficiaries, they have no incentive to keep the DNR managing that forest, and the counties will have a significant incentive to sell it off. You don't want to take away all of the financial incentives to keep that land in public ownership."
Problem: Original Intent of an "Un-zoned" OESF – High Disagreement	Industry	"If somebody actually did what they intended to do with this experimental forest, which was draw a line around that 250,000 acres and let it be managed in a migratory pattern of cut. You clear cut this acre, you thin this one"
	Conservationists	"I think the assumption that you can have an un-zoned approach is completely not supported by the science of what spotted owls need for maintaining themselves, which is a key objective of the OESF's strategy; to provide for the survival and recovery of the spotted owl."

Conclusions

Cognitive framing allows for natural resource management problems to be restructured and reduced in their intractability. The analysis in this paper allows for stakeholder groups to identify areas of common ground with other groups and to recognize that areas of consensus exist in this conflict. While more thorough data analysis remains to be completed, some initial recommendations can be made.

A Q-sort method would allow the shortcomings of this cognitive framing approach to be addressed. I recommend this to be a follow-up step to this research to allow an understanding of the frames of this concept from both a cognitive and more interactional approach. Secondly, if interactional reframing were to be approached in the future, areas where there is a high level of consensus should be the starting point for these conversations.

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7. *Wolves, shorebirds and conflict with domesticated dogs: To leash or not to leash*

Presenter: Matthew Bowes, Department of Geography, University of Victoria
Gabriolla, British Columbia
matthewbowes71@yahoo.ca

Co-Authors:
Peter Keller, Department of Geography, University of Victoria
Robert Gifford, Department of Psychology, University of Victoria
Rick Rollins, Department of Recreation and Tourism Management, Vancouver Island University

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Introduction

Wolves from Pacific Rim National Park Reserve on the west coast of Vancouver Island and surrounding wilderness areas have started to move outside of their natural habitat into the nearby towns of Tofino and Ucluelet to predate on dogs and other local animals, creating a hazard for people and a serious human–wildlife challenge. Within the park, wolves are attracted to dogs belonging to park visitors. When park visitors allow their dogs to run free off leash, dogs become sources of easy prey, creating potentially dangerous interactions with park visitors, habituation of wolves, and conflict with wolves in Tofino and Ucluelet. Off-leash dogs also displace shorebirds from sensitive habitat when dogs are allowed to run free on the park's beaches (Zharikov 2011). Attempts to enforce leash laws in the park have been unsuccessful (Zharikov 2011) and there is a need to better understand non-compliance with these regulations.

The greatest success in influencing the actions of park visitors comes from understanding what they think about a particular behaviour. The purpose of this study is to identify beliefs and barriers of park visitors with their dogs to compliance with leash regulations. Results are intended to inform education, communication and park interpretation strategies to influence visitor behaviour.

Conceptual Framework – Theory of Planned Behaviour

According to theory of planned behaviour (Fishbein & Ajzen 2010) (Fig. 1) decision-making is influenced by:

(1) Our attitudes about performing the behavior (e.g. is it good or bad to comply with the dog leashing regulation);
(2) Our perceived norms (subjective norm) about performing the behaviour (e.g. do important others think I should comply with the dog leashing regulation)
(3) Our perceived control (perceived behavioural control) about performing the behaviour (e.g. how much ease or difficulty do I feel about complying with the dog leashing regulation)
(4) Our actual control of performing the behaviour (e.g. moderated by skills, abilities and environmental factors)
(5) Background variables based on the individual, social and information factors.

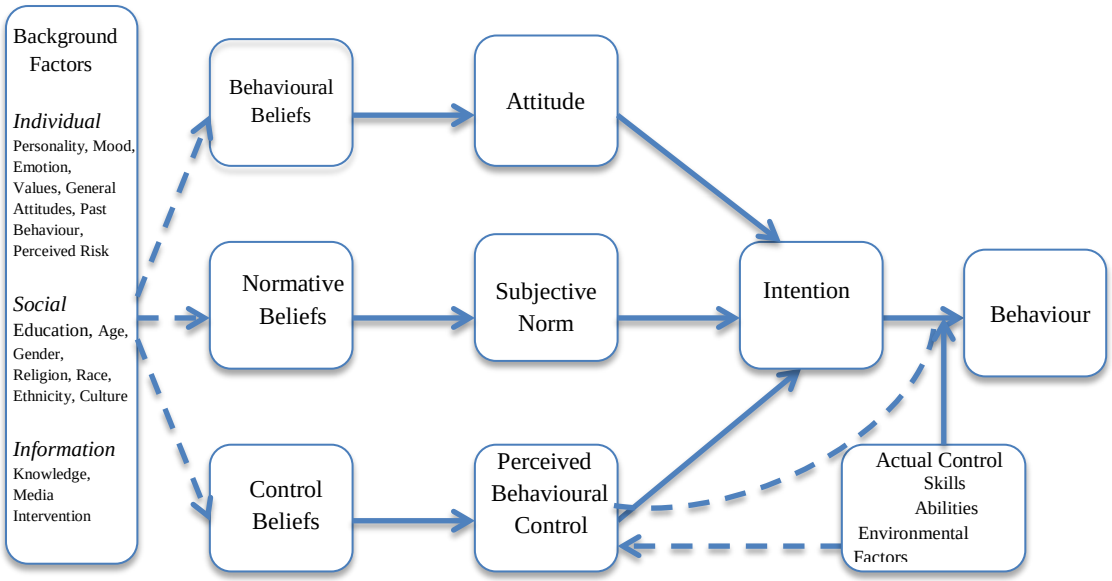

Figure 1. Theory of Planned Behaviour (adapted from Fishbein & Ajzen 2010)

In particular, attitude, subjective norm and perceived behavioural control are shaped by our beliefs about each factor. In this study we were especially interested in the behavioural beliefs that shape attitudes, because these beliefs have the potential to be influenced by persuasive arguments (e.g. messaging in park interpretation) designed to influence attitudes and subsequent behaviours related to compliance with leash laws in the park. Examples of behavioural beliefs include:

(1) Keeping my dog on leash will make my dog safer from wolves
(2) Keeping my dog on leash will mean my dog loses freedom to run and play

Method

Following Middlestadt, Bhattacharyya, Rosenbaum, Fishbein & Shepherd (1996), semi structured interviews (n = 42) were conducted with a convenience sample of compliers (n = 21) and non-compliers (n = 21) from June to September 2014 on the main beaches of the park. Beliefs were identified with a content analysis of the interview responses. From these beliefs, a questionnaire for face-to-face interviews was developed and tested and administered to a random sample of compliers (n=162) and non-compliers (n=140) interviewed in July to September of 2013 on the main beaches of the park.

Results

Intentions to comply with the dog leashing regulations are strongly influenced by attitude (R^2 = 0.49); subjective norm (R2 = 0.55); perceived subjective norm (R2 = 0.36), and the multiple correlation on intention is strong (R2 = 0.73); however, compliance behavior is only moderately influenced by intentions (R2 = 0.22) Surprisingly, attitudes to comply were only moderately influenced by behavioral beliefs (R2 = 0.25). In order to address this, further analysis explored the potential impacts of habitual behavior; and ambivalence.

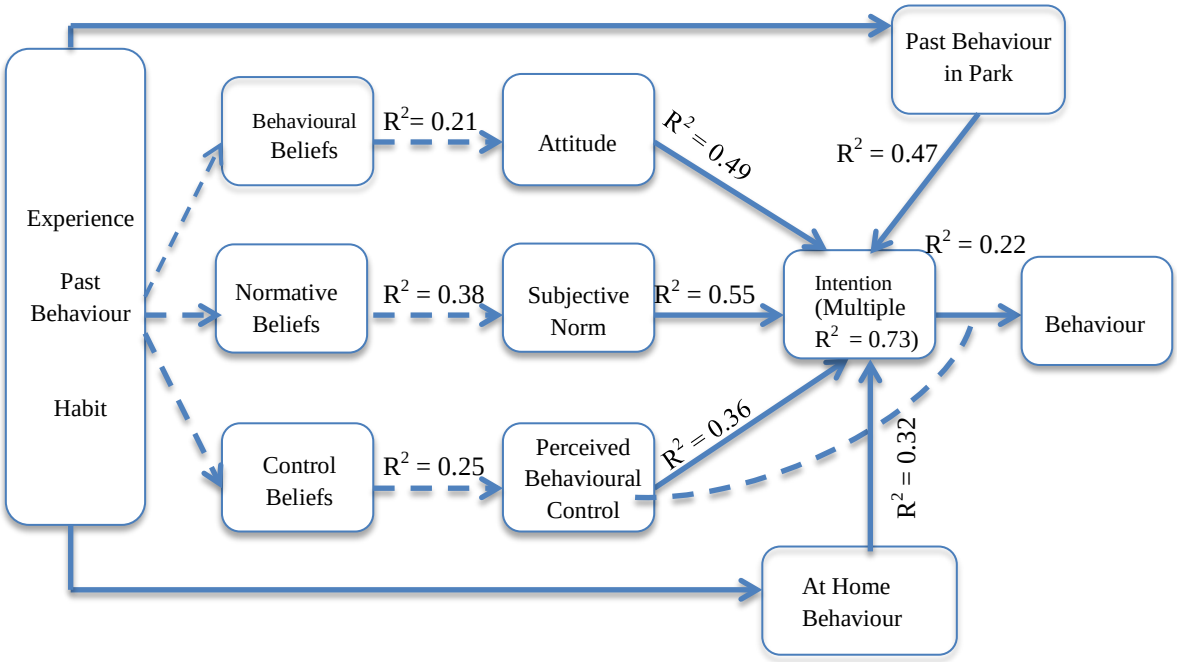

Figure 3. Testing Theory of Planned Behaviour (adapted from Fishbein & Ajzen 2010)

Habit and Past Behaviour

Past behaviour (Ajzen 1991; Albarracín, Johnson, Fishbein, & Muellerleile 2001; Conner & Armitage 1998; Ouellette & Wood 1998; Ajzen & Fishbein 2005) and habit, which is a frequently repeated and routine action, are thought to be possible limitations of the theory of planned behavior. Habit negates reasoning in the decision making process and is replaced by an automatic behavioural response (e.g. Aarts, Verplanken, & Van Knippenberg 1998; Conner & Armitage 1998; Verplanken & Orbell 2003). Without any reasoned decision to perform the behaviour, persuasive communication is not likely to be effective (Manfredo & Bright 1991). In this study, the relationship between past experience (the percentage of time dogs were leashed in the park) and intention was quite strong (R2 = 0.47). Further, at home behaviour was correlated with intention to have the dog on-leash (R2 = 0.32).

This suggests that the habitual behaviour of leashing dogs is overriding the reasoning process, and will make persuasive communication more challenging (see also Hughes, Ham & Brown 2009).

Ambivalence

Ambivalence occurs when conflicting beliefs held by an individual result in an inability to access these beliefs when making decisions and is linked to a reduced inclination to 'act' (Connor, Povey, Sparks, James & Shepherd 2003), or in this example, to comply with leash laws in the park. In this study, the sample was subdivided into a 'low ambivalence' group (n = 64) and a 'high ambivalence' group (n = 237) by selecting two 'conflicted' attitudinal beliefs, in the sense that one was a 'positive' outcome while the other was a 'negative' outcome. The positive outcome is 'more control over my dog,' and the negative outcome is ' the dog has less freedom to run.' The model proved to be more effective for the low ambivalence group (multiple R2 = 0.774), compared to the high ambivalence group (multiple R2 = 0.479).

Recommendations

Reliance on ad hoc information based strategies to encourage compliance behaviour is unlikely to be successful. Even when informed by theory, the effects of habit and past behaviour (see also Hughes, Ham & Brown, 2009) and ambivalence create specific challenges to compliance behaviour when it comes to keeping dog's on-leash in the park. Strategies need to consider a multifaceted approach to deal with non-compliers (see also Hughes, Ham & Brown, 2009) such as: Community-based strategies and campaigns that emphasize personal contact (see Mackenzie-Mohr 2011); increased enforcement; physical boundaries such as off-leash areas; rewards; incentives; disincentives; and targeting the high ambivalence group by highlighting conflicting beliefs.

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8. *A cost-benefit analysis of mitigating human-beaver conflicts: An innovative approach*

Presenter: Glynnis Hood, University of Alberta, Augustana Campus
Camrose, Alberta
ghood@ualberta.ca

Co-Authors:
Varghese Manaloor and Brendan Dzioba, University of Alberta, Augustana CampusCamrose, Alberta
manaloor@ualberta.ca, dzioba@ualberta.ca

Summary

With the loss of approximately 70% of non-boreal wetlands in Alberta, there has been an associated decline of waterfowl and fish habitat. Although regulatory measures exist to prevent further loss of wetlands, the draining of wetlands maintained or created by beavers is rarely quantified or enforced, despite several studies that indicate that these wetlands provide critical habitat to fish, waterfowl, and other aquatic species and are more resilient to drought. Our research combines aspects of environmental management and economic decision-making to address wetland loss and the disruption of recreational uses of popular trails. Using a benefit-cost analysis and cost effectiveness analysis, we assessed management actions regarding current and potential beaver-human conflicts.

The goal of this study was to quantify the efficacy of "traditional" beaver management approaches and "emerging" methods to compare their benefits and costs. "Traditional" approaches often include dam and/or colony removal, while "emerging" approaches include the use of pond levellers, custom fencing, and commercial products. By combining historic and current management costs from managers, "willingness to pay" contingent valuation data from park users, and the costs of new approaches, we were able to determine the most cost-effective means for beaver management in the Cooking Lake / Blackfoot Provincial Recreation Area in east-central Alberta. Almost all devices installed in 2011, have required little to no maintenance, and an additional nine pond levellers installed since reveal similar results. Cost savings for management agencies are significant. Our study informs best management practices to help address a common human-wildlife conflict without compromising wetland function.

Acknowledgments

We thank the following funding agencies: Alberta Tourism, Parks and Recreation; the Beaver Hills Initiative, Alberta Conservation Association, Alberta Trail Riders Association, Alberta Sport, Parks, Recreation and Wildlife Foundation, and Surface Flow Control. We also thank our field assistants Nick Yarmey, Samantha Matters, and Duncan Abercrombie. Dr. Dee Patriquin and staff with Alberta Parks also contributed many volunteer hours to this project.

References

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The link to the Journal of Environmental Economics and Management is http://www.sciencedirect.com/science/journal/00950696

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9. The costs of co-existence: Economic impact of wildlife to producers

Presenter: Kim Good, Miistakis Institute
Calgary, Alberta
kim@rockies.ca

Co-Authors:
Tracy Lee and Danah Duke, Miistakis Institute
Calgary, Alberta
tracy@rockies.ca, danah@rockies.ca

Introduction

Beef producers share the landscape with many species of wildlife. Wildlife is an important component of our natural heritage, providing a wide array of values for Albertans. However, co-existing with wildlife often results in an economic burden to livestock producers in the form of opportunity costs, property damage/loss, prevention and management.

Literature and anecdotal information indicates a majority of beef producers' value wildlife on their property, and will tolerate some damage from wildlife. Research also shows that once associated costs pass a personal threshold, producers will take action to prevent further damages and loss to their operation from wildlife (Conover 1994, 1998; Rollins et al. 2004). It is therefore important to understand how wildlife impacts the financial health of producers because ultimately healthy wildlife populations are partly dependent on human tolerance. In addition, understanding the economic costs to the producer is important for developing effective mitigation strategies to promote co-existence of wildlife.

The Miistakis Institute in partnership with the Alberta Beef Producers developed a study to help:

- Provide context to how wildlife affect the financial health and stability of beef producers;
- Inform policy and programs earmarked to reduce conflicts or address the economic burden to beef producers; and
- Identify higher risk communities in Alberta where prevention, management and compensation programs may need to be modified.

The objectives of the study were to:

- Identify the species involved in conflict with beef producers;
- Evaluate the estimated economic costs to beef producers in Alberta and within ABP zones from ungulates, carnivores and birds co-existing on agricultural lands; and
- Develop comprehensive lists of costs associated with opportunity loss, property damage and prevention and management, including both direct and indirect costs.

The methodology for the study included:

- An online survey for Alberta beef producers to complete
- Literature Reviews
- A review of compensation data from two compensation agencies

There are some limitations inherent in this study, we did not consider the economics costs of wildlife impacts to the entire beef industry; we did not quantify the value wildlife provide to beef producers; and a full assessment of current government and non-government programs to promote co-existence and reduce conflicts was not completed. Another limitation was target numbers of responses necessary to be confident in regional responses were not achieved.

Results

Six hundred and seventy two (672) beef producers started the survey of an estimated total 19,998 producers in Alberta. This overall response rate provides 99% confidence with a 5% margin of error in the results at a provincial scale.

As this is a complicated problem it is important to understand the context within which beef producers answered the rest of the survey. The first section of questions in the survey gathered information about producers' perceptions and attitudes of wildlife. The statements tested were ideas that came from other research and from conversations with producers.

- "It is important for me to know there are healthy populations of large carnivores in Alberta." 75% of respondents agreed with this statement, 16% were neutral and 8% disagreed with this statement.
- "It is important for me to know there are healthy populations of ungulates in Alberta." 83% of respondents agreed with this statement, 11% were neutral and 6% disagreed.

- "Wildlife living amongst and moving through beef operations results in economic impact to the landowner." 88% agreed with this statement, 5% were neutral and 7% disagreed.
- "I feel I have to remove problem wildlife once the costs get too high." 81% agreed, 10% were neutral and 9% disagreed.
- "The presence of wildlife on private property is a part of nature that comes with owning land." 80% agreed, 7% were neutral while 13% disagreed.
- "The responsibility of ensuring healthy wildlife populations is born unevenly by agricultural landowners." 71% of respondents agree with this, 18% were neutral, and 12% disagreed.

Alberta beef producers' responses show a strong agreement with what other literature reports. The final statement in this section "The economic impacts I have experienced from wildlife on my beef operation is tolerable." did not show agreement among producers - 40% agreed, 10% were neutral and 50% disagreed. These results indicate that while producers appreciate and value wildlife the personal economic impact is in many cases beyond current tolerance levels.

In an effort to determine personal economic thresholds, producers were asked what percentage of economic loss they were willing to accept. Fifty percent (50%) of full time producers reported they would tolerate a 1% or less of loss. Twenty five percent (25%) were willing to accept between 1-5% while 25% were willing to accept between 5-10%. There were five outliers willing to accept losses between 10-25%.

Respondents reported they were most impacted by ungulates (81%), carnivores (74%), and birds (44%). Six percent (6%) reported no problems with wildlife. As a result of wildlife impacts respondents reported that economic loss was the greatest concern, following by livestock safety, increased time management, disease transmission, and finally human safety.

Respondents indicated that the carnivore having the greatest impact to beef producer operations is coyote (88%), wolf (43%), cougar (28%), black bear (26%) and grizzly bear (19%). The cattle types being most affected by predation by carnivores in Alberta are calves (reported by 95% of producers who experience impacts from carnivore species), cows (32%), yearlings (21%), and bulls (7%).

Producers were then asked if they are reporting these losses to Alberta Fish and Wildlife in order to receive compensation. The survey results show that 62% of respondents are not reporting any predation events; 24% report some and 12% report all of them. It is important to understand reported versus not reported predation events as reported numbers are often used to assess the scale of impact and therefore influence policy and program design. When the reported numbers

are 62% less than actual impact, a full picture is not being drawn for policy makers and program designers. It should be noted that large number of the events include coyote incidents and coyote are not a species for which their damage qualifies for compensation programs.

Producers were then asked why they are not reporting these losses. The most prominent response at over 80% was that the *burden of proof is too great*. *Programmatic issues* were the next highest response at just over 70% – some of detailed responses in this category included coyotes not being covered, Fish and Wildlife officers not having enough time or resources to help. In addition just over 40% of producers who responded to this question, had the impression that there would be *no benefit to reporting*. *Issues with agency* were reported 25% of the time and included such reasons as individual officers interpreting the evidence differently from each other. A number of producers *did not know there was an opportunity to report.* Around 10% identified such losses as a *cost of doing business* and a slightly smaller group have just *dealt with the problem themselves*.

Next steps in this project are to complete the analysis of survey responses for ungulate and birds. Create recommendations for stakeholders about how to move this discussion towards some resolution that helps beef producers and wildlife populations.

Acknowledgements
Special thanks to our partners and funders: Alberta Beef Producers, a number of Alberta municipalities and TD Friends of the Environment.

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10. Commons – an approach to resource management that integrates human systems with planetary systems

Jan Inglis, Independent Scholar
Nelson, British Columbia
janinglis@telus.net

Parts of this document have been adapted from a longer more expansive document which is available at https://pure.uvt.nl/portal/files/4122995/Inglis_Commons_15_09_2014.pdf

Defining a New Commons Paradigm

The term "commons" represents both an old pre industrial form of cultural norms and practises regarding how natural resources are managed as well as a new post-industrial vision, narrative and set of values and practises for how society could be more sustainably aligned with the planetary systems we depend on and create new forms of common wealth.

Complex issues or "wicked problems" in resource management, are symptoms of what anthropologist and social scientist Gregory Bateson[27], in 1979, called an "epistemological error". This error is based on an assumption that we can be independent or separate from the systemic workings of the natural environment and planetary systems. When we look at the state of our world, it is clear that our physical environment is under threat, our social systems are failing in many parts of the world, and our economic system is unstable. What is less evident, however, is that our current, potentially life-threatening situation is a symptom of our ways of perceiving, or not perceiving, interdependent relationships. It has arisen in part due to the assumptions of separation that underlie our current dominant worldview. In response to our current challenging situation of resource depletion and climate change, to name a few, a new, and also old paradigm, has been gaining attention. It is based on a belief that nature and human activity are intrinsically in relationship.

In short, commons is defined as three interconnected elements: a pool of resources shared in common, the community of people who depend on those resources, and the values, customs and processes they have developed to make decisions about the protection, management, and enhancement of those shared resources for current and future users. This new paradigm offers not only a galvanizing philosophical framework, but also a set of operating principles and a methodology for transforming our economic, social, legal, and technical structures to support sustainability in a 21st century context. It can offer one integrating name for multiple concerns

[27] Bateson, G. (1979). *Mind and nature: A necessary unity (Advances in systems theory, complexity, and the human sciences)*. New Jersey: Hampton Press.

such as water shortage, food security, indigenous rights, democracy, labour rights, privatization, habitat protection, pollution, etc.

The term"Resource Management" brings up the question of *who* is managing what resources, f*or whose benefit* and according to what *criteria or context*? The field of commons is attempting to address some of these questions. Also the term "resource management" tends to refer to natural resources whereas commons resource management can include human created resources like knowledge, culture, language, inventions, and the internet etc. These are abundant resources. Our collective capacities to comprehend the new context in which we live and to evolve our actions in alignment with our now threatened planetary commons might be one of our most significant and yet unused and unsupported resource we have. So this gives another twist to the concept of "human dimensions", i.e. not just in relation to the conflicts which are created due to our different perspectives and motivations, but also to an untapped commons resource that also needs to be protected and certainly enhanced.

Roots of an Earlier Paradigm of Resource Management

Most of our current operating system or word view that directs our economic activity and influence resource management was designed in a different context, during the period of enlightenment or scientific or industrial revolution of the 15th.and 16th century when our human capacities seemed unlimited and resources ever- abundant. A significant practice of this period and a precursor to the creation of a market-based economy was the "enclosure" of the resources and traditional practices people relied on for subsistence.[28] Prior to this modernist period or Age of Reason, activities associated with land, including the gathering of wood, hunting, creation of crafts and home building plus the rituals and cultures arising from that place, were considered to be shared or common. "Commons" referred not just to the shared land but to all of the interconnected activities of relationships amongst people, land and cultural agreements built over time, which supported sustainability, safety and creativity. However, in the 16th century, this set of relationships was impacted by changing views regarding individual rights to control land. Some people were granted rights of access that others were not. In England, these rights were defined and conferred by King Henry V111 as part of his desire to separate from the Catholic Church and buy loyalty from supporters by gifting them land. Land which had offered "value in use" for subsistence, took on "value in exchange" for buying loyalty, power, and wealth. That which had been considered common became "enclosed", separating people, cultures, and nature, and separating production from consumption. What people produced was not in the scale of what was used by them, but was transported, traded, bought, and sold, often several times before being consumed by others far from the origin and conditions of the production.

[28] Linebaugh, P. (2008). The Magna Carta manifesto: liberties and commons for all. Berkeley, CA: University of California Press.

Out of this period an assumption of economics arose that many still hold (especially in classical economics in democratic countries) i.e., that healthy markets will result in social well-being for all that are willing to work. Economic historian Karl Polanyi[29] turns this assumption on its head and argues that our institutionalized social relationships have instead become instruments to serve the well-being of an artificially created market system. The implications of this inverted arrangement on our current and future relationships with each other and nature are enormous and are relevant to many of the issues surrounding depleting resources and climate change that we are now experiencing.

However it is important to remember that we did, at one time, collectively agree to certain customary rights or "common laws" to uphold fundamental interdependent relationships with each other, the land and our cultural resources[30]. In aboriginal cultures, for instance, these agreements were typically passed on through oral traditions, rather than written agreements. In England, agreements on rights were sanctioned in the Magna Carta in 1215 and the subsequent Charter of the Forest in 1217. The Charter ensured that free men could access the royal forests to enjoy such rights as *pannage* (pasture for their pigs), *estover* (collecting firewood), *agistment* (grazing), or *turbary* (cutting of turf for fuel). However ancient rights stating that gains from land and labour should not be privatized for the benefit of the few but should be available for the benefit of all, have been all but lost. However those supporting the commons movement and the public trust doctrine are attempting to reawaken us to the basic and necessary rights that we have forgotten or handed over to others.

According to many, the whole economic formula underlying this industrial economics or market state economics is inherently artificial and unsustainable and requires a complete overhaul. It has become based on short term debt-based decisions. But we are now so reliant on this structure for weekly wages or pension payments that there is little motivation, capacity, or even safety to step outside of it long enough to critique its soundness and to design a new system. Any threat to the current financial system, such as happened in the stock market crashes of the 1930s and again in 2008 sends people scurrying back to shore up the mythical giant. A sense of well-being is no longer derived from the group's well-being as was more prevalent during pre industrial times but in our individual capacity to earn and spend.

A commons approach to economics proposes we look outside the current beliefs of the industrial economic system completely and not do as Einstein warned (i.e., try to fix the problem with the same thinking that created it). This is the basis of the critique of some solutions such as cap and trade, or pricing "ecosystem services." The commons approach would look at putting a cap on depletable resources and gaining rent, only if there was excess, which would be placed back into

[29] Polanyi, K. (1944). *The great transformation.* Boston: Beacon Press.

[30] Linebaugh, P. (2008). The Magna Carta manifesto: liberties and commons for all. Berkeley, CA: University of California Press.

the commons. Commons based economics also would put more emphasis on the wealth available through an abundance of replenishable nonmaterial resources to balance the limitations and vulnerabilities of our depletable material resources. It would mean moving from a debt-based scarcity model of economic to a wealth-based economy and it would attempt to reunite the split between producers and consumers.

Comparing the Economic Paradigms

Here is a simplified comparison of assumptions

INDUSTRIALIZED ECONOMICS (MARKET-STATE) PARADIGM:

- Natural resources are always abundant, free, and can be privatized
- The economy will float all boats, and debt enhances economic options
- Governments role is to keep economy moving and efficient, and unfettered private ownership is often most efficient
- Weigh decisions against short term profit margins,
- Legitimacy comes from job creation and tax reduction

COMMONS ECONOMICS PARADIGM:

- Natural resources have limits and are shared: public property
- You never use up the resources you need to survive i.e. the principle
- Put a cap on the principle and make informed decisions as to whether to trade or reinvest the surplus back into the commons
- Government role is a trustee of long term well-being of citizens and environment
- Weigh decisions against long term sustainability
- Legitimacy comes from maintaining laws of nature and intergenerational, international justice

Is it utopian and therefore pointless to believe this change in paradigms could happen? Paradigms change when it becomes clear to a significant number of people that the old methods are no longer working and new methods are required, and available, to better meet the new conditions. We are in the midst of this change i.e. understanding that the current beliefs and behaviours are not working for our long term common good. New ways are being contemplated and tested in governance, law, economics and education. As in all historic cases old regimes do not die easily and have very powerful vested interests that will be bolstered. However by presenting a framework of public trust rights and procedures[31] the anomalies of the old economic

[31] Wood, M. (2014). *Nature's trust: Environmental law for a new ecological age.* New York, New York: Cambridge University Press.

paradigm may be curbed while at the same time enlivening the move towards a more sustainable set of commons practises.

Clarifying Public, Private and Common Good

People have often been lulled into assuming that the term "public good " is the same as "common good ". The meaning of "public" has crept to become synonymous with government management. The role of government management has shifted from protecting the common resource for current and future generations to a vaguer term of "protecting the public interest." This latter understanding can often be used to justify a centralized government granting exclusive access to private companies under the espoused assumption that the market is the effective vehicle to meet the "public interest." Possibly, when resources were more plentiful, the implications of this short-term view were less apparent, but now, amongst many, there is a growing recognition that some essential natural resources are limited and depletable. Instead of this giving cause to pause, governments instead are doing the same thing but harder i.e. using their publicly sanctioned rights to speed up granting development permits for environmentally destructive practice even further afield such as for fracking within a university campus, logging within endangered grizzly habitat, flooding a whole community in order to build a power dam, or allowing oil rigs into the unstable ocean depths. All of this is done with the justification that the public good is being achieved by keeping the economy running, and running ahead of the fear of dwindling resources. Meanwhile, communities have lost access to their common goods and a sense of their sovereign rights, while still being willing to assume that their governments and economic growth will take care of them. The blurred assumption has justified dumping pollutants into common areas especially into the unprotected shared areas of atmosphere and the oceans. Who is looking after the commons and future generations?

Can We Take Care of our Resources Commons?

With the growing awareness that no group or institution seems to have the capacity and legitimacy to take care of commons for present and future generation it raises the question of people's capacities to do so. Ecologist Garrett Hardin[32] in an 1968 article entitled "Tragedy of the Commons" seemed to echo some of Hobbes' earlier assumptions regarding the trustworthiness of ordinary people to take care of their shared resources. He indicated, since humans had an inherent propensity to compete based on rational self-interest, people will predictably damage their shared resources through overuse. This damage he felt could only be prevented if people's natural instincts are controlled through increased government regulation or motivated through privatization and market incentives. This assumption justified many current government intervention policies. However, Nobel Laureate author Elinor Ostrom, after over 30

[32] Hardin, G. (1968). The Tragedy of the Commons. *Science*, 162 (1243-1248).

years of cross-cultural research, arrived at a much different perspective of people's capacities.[33] Although her research was focused on local commons, the results indicated that when able to relate to each other, and to the resource they want to protect, people will find ways to work collaboratively to manage, sustain and replenish their commons.

Evolving Capacities through Public Processes

The results of Ostrom's research points to the need for well-designed public processes that support citizens to relate effectively to each other and their resources, and to be more engaged in taking care of their commons. Continued economic dependence on greater resource extraction in order to keep the economy working and to provide jobs is often an automatically legitimized choice, without there being available any process for the public, without pressure of outcome bias, to weigh the pros and cons of these actions especially in light of long term priorities and implication. Taking up the role of being trustees of our common resources will involves multiple complex decisions. However, people are seldom aware of how complex the process of decision making is personally, let alone collectively. If we are to respond adequately to the complexity of resource management, we must make *collective* decisions, some of which will be quite difficult, about priorities, policies, and actions. It, therefore, is important to amplify the significance of this often-overlooked process of making public decisions, the very essence of co-governance of commons, and offer ways to observe, understand, and thus support comprehensive decision making. Quick public "consultation" processes are not only inadequate for supporting such social learning, they also can create further distrust and apathy. The field of adult development, transformative learning and deliberative democracy have much to offer this essential "human dimension" of resource management so that we can bring our best selves forward to respond to the complex web of sub issues and multiple perspectives that naturally make up these issues. Research has shown that well designed processes do move people from avoidance and hopelessness to deeper engagement and are an essential element of evolving our capacities to address the complexities we are currently faced with.[34] [35] If we do not even talk together about the issues which face us, we will certainly not be able to collectively respond to them, or to stimulate our evolutionary capacity to create a more functional paradigm.

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[33] Ostrom, E. (1990a). *Governing the commons: The evolution of institutions for collective action*. Cambridge: Cambridge University Press

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[35] Ross, S. N. (2006). Perspectives on troubled Interactions: What happened when a small group began to address its community's adversarial political culture. *Integral Review*, 2: 139-209

11. Are modern humans unsustainable?

Dr. William Rees, University of British Columbia
Vancouver, British Columbia
wrees@mail.ubc.ca

Dr. William Rees provided the keynote talk for this conference on the evening of September 30, 2014 which was attended by approximately 70 people. His presentation was based on the following three papers which may be found online:

Avoiding Collapse: An agenda for sustainable degrowth and relocalizing the economy. 2011. Canadian Centre for Policy Alternatives. https://www.policyalternatives.ca/sites/default/files/uploads/publications/BC%20Office/2014/06/ccpa-bc_AvoidingCollapse_Rees.pdf

The Way Forward. 2012. Solutions Journal. http://www.thesolutionsjournal.com/node/1113

What's Blocking Sustainability? Human nature, cognition, and denial. 2010. Sustainability: Science, Practice & Policy journal. http://sspp.proquest.com/archives/vol6iss2/1001-012.rees.html

Additional Resources

Post Carbon Institute http://www.postcarbon.org

Desmog Canada http://www.desmogblog.com

Real Climate http://www.realclimate.org

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12. Ktunaxa perspectives on natural resource management

Bonnie Harvey, Lands and Resource Stewardship Assistant for Ktunaxa Nation
Cranbrook, British Columbia
BHarvey@ktunaxa.org

The Ktunaxa have occupied our Territory since time immemorial and we have deep spiritual, cultural, social and socio-economic connections to the land and the water, within our Territory. Our relationship to the land and water is supported by our oral histories and our teachings. Our Creation Story follows the waterways within our Territory, highlighting the importance of the Columbia and Kootenay Rivers; both being central to our worldview. We were created in interdependence with the land and water, and were given covenants by the Creator to protect, honour and celebrate what the Creator has given us. Ktunaxa law, given to us by the Creator, speaks to why we were put on the land. The land gives us the resources to survive, and in return, we must protect and not overuse the land. Our law is grounded in the fact that all things are connected and must be kept in balance; it is the foundation of our spirituality. The Ktunaxa philosophy of stewardship of the lands and waters is the recognition that we are a part of the land, and that our connectedness to it requires that we have respect for all things as anything that affects one, affects everything else.

The Ktunaxa Nation Council Lands and Resources Sector builds on these principles, applying Ktunaxa values to our strategy for lands and resources stewardship. The Ktunaxa approach to engagement with government and other third parties around land and resource use and management has always incorporated our cultural and spiritual values, and in this way, we maintain a balance between protection of ecological and cultural values, and economic prosperity for our citizens.

The Ktunaxa Nation Council is the governing body which represents four Ktunaxa communities, St. Mary's, Akisqnuk, Tobacco Plains and Lower Kootenay. Within the Ktunaxa Nation Council, there are four pillars which are represented by four Sector Councils, Economic, Social, Traditional Knowledge and Language and Lands and Resources. Each Sector has a Council comprised of one member from each community council. The Lands and Resources Council is mandated to make decisions in the Territory off reserve. The Lands and Resources Council is supported by Sector staff.
The Lands and Resources Sector incorporate Ktunaxa values and principles into our stewardship strategies.

The Ktunaxa approach to engagement with other governments and third parties is based on mutual trust, recognition and respect.

Keeping with the theme of this conference, Lands and Resources are face with many problems while stewarding Ktunaxa Lands, and we have attempted to come up with innovative solutions to these problems are founded on our core cultural values.

Problem: Increased development on Kootenay Lake, not only with very little recognition of Ktunaxa interests, but also no clear path to recognition of potential cumulative effects.

Solution: The Kootenay Lake Partnership. The purpose of the partnership is to address increasing growth and development pressures. Membership: Local, Provincial, Federal and Ktunaxa Government agencies. The mission is to develop collaborative approaches to lake management.

The KLP is completing a Kootenay Lake foreshore management plan, which will include a shoreline guidance document to be used by developers to aid with their application processes. This guidance document will use an Aquatic Habitat Index to inform management strategies for ecological values. It will also incorporate an Archaeological Overview Assessment to aid in minimizing impact to archaeological resources. Finally, it will include a Ktunaxa Cultural Values Study intended to identify areas that have cultural, ecological, socio-economic or religious value and ensure that these values are maintained/enhanced or that impacts to those values are mitigated. This innovative strategy will link different levels of planning. It does more than just map areas of traditional use, but will identify areas of potential use based on VALUES and proposed management strategies for those values instead of for a specific place.

Example: The value identified by Ktunaxa is Kokanee. The management strategy could be to protect spawning habitat. Another management strategy for the same value would be to identify areas where Ktunaxa access Kokanee and keep that access available.

Problem: Numerous coalmine expansion projects requiring Environmental Assessments. The process allows very little opportunity for Ktunaxa values and interests to be properly identified and meaningfully addressed.

Solution: Proponent hires Ktunaxa Nation Council to write the Assessment of Impacts to Ktunaxa Interests within the Environmental Assessment Certificate Application. Who knows better what the impacts of a coalmine expansion would be to Ktunaxa interests then the Ktunaxa themselves?

KNC Approach:

- Wrote Chapter C for the Line Creek Environmental Assessment Certificate Application.
- Ktunaxa Use and Interest Study to better understand its citizens interests
- Ktunaxa Diet Study to understand how Ktunaxa use and consume traditional foods
- Impacts to ecology affect their health and well-being

KNC worked with knowledge holders and technical experts to assess impacts of Coal Mine development to Ktunaxa Values and Interests. This model has worked so well that it is now being conducted by the KNC for **SIX** more EA's within Ktunaxa Territory.
The preceding are just two of many examples of the Ktunaxa taking a leadership role in stewarding the lands and resources within their Territory. The Ktunaxa approach is one that incorporates a holistic view of the environment that we are a part of. It is recognition that we are a part of the land and that we have respect for all things. Ktunaxa covenants for land stewardship are grounded in the fact that all things are connected and must be kept in balance.

Our People Care for the Land, the Land Cares for Our People.

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13. From crisis to co-management: the decline of the Bathurst caribou herd

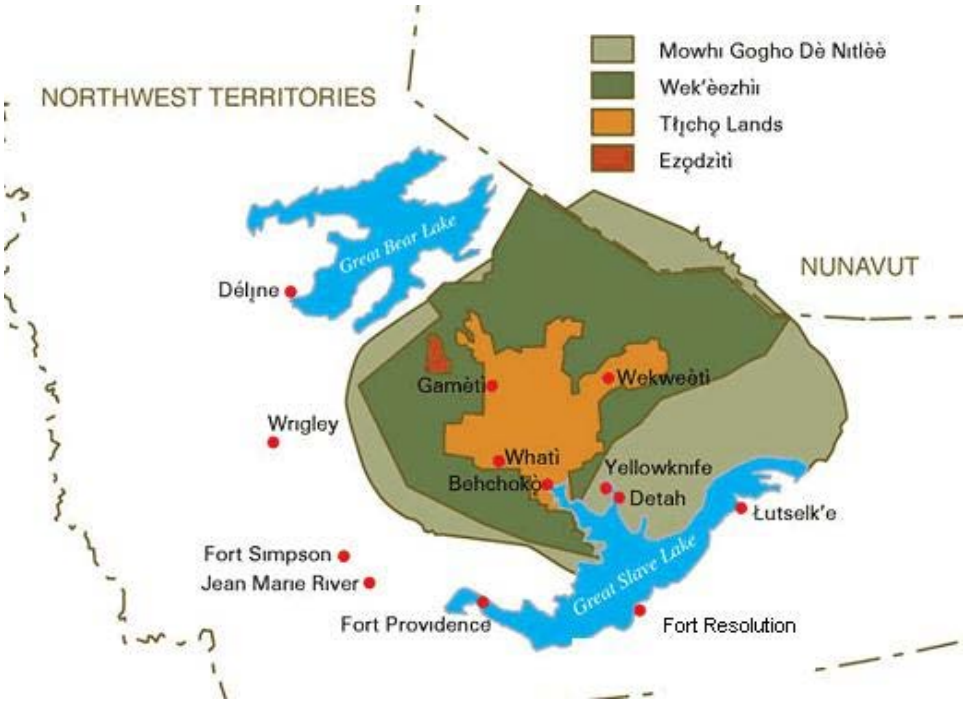
Kerri Garner, Department of Culture and lands Protection for the Tlicho Government (former position)
Cranbrook, British Columbia
garner.kerri@gmail.com

Introduction

The decline of the Bathurst caribou herd is presented as a wicked problem that has the human dimension intimately connected at every step of the way. The Tłı̨chǫ (tlee-chon) are today still largely dependent upon the caribou for food and practicing cultural activities. The annual range of the Bathurst herd extends from Nunavut where the calving area is located, through the tundra and in to the taiga winter range of the Northwest Territories (NWT). Over an annual cycle, the herd crosses through various Aboriginal groups' traditional territories, which means that it is the people and land use that must be managed, not the caribou. In order to develop and implement effective management actions, the participation and support of the decisions by the community members who are out on the land is critical. This requires extensive time, energy, knowledge, education, trust and relationships to be built between Aboriginal Government, non Aboriginal Government, scientists, traditional knowledge holders, community members and political leadership.

Tłı̨chǫ Agreement and Co-management Responsibilities

The Tłı̨chǫ, also known as Dogrib, are a Dene First Nations people living in the Northwest Territories. They settled a land claim and self-governance agreement in 2005, which was the first combined land claim *and* self-governance agreement to be signed in the Northwest Territories. The Tłı̨chǫ negotiated surface subsurface ownership of one contiguous block of land that equals approximately 39,000 square kilometers. In addition to control over their land, the Tłı̨chǫ Agreement also specified co-management responsibilities for wildlife as established in Chapter 12 of the Agreement. Under Chapter 12, the Wek'èezhìi Renewable Resources board (WRRB) was established as an institution of public Government to co-manage wildlife within the Wek'èezhìi boundary. The WRRB is responsible for managing wildlife and wildlife habitat (forests, plants and protected areas) in the area known as Wek'èezhìi (See Map on the following page).



Tłı̨chǫ and Caribou

The inter-dependence between the Tłı̨chǫ and Ekwo (Caribou) could be considered the fundamental pillar or essence of Tłı̨chǫ culture. The Tłı̨chǫ people and other aboriginal people in the North have depended upon the caribou for their physical, mental and spiritual needs since time immemorial. Since the time of Yamozah[36], the Tłı̨chǫ have lived in co-existence with the caribou, with traditional rules and laws of respect and appreciation defining the relationship between the Tłı̨chǫ and the caribou. The Tłı̨chǫ culture, language and way of life is based on the caribou and its migration patterns, with the caribou providing for them shelter, clothing, bedding and food. The caribou is the basis of Tłı̨chǫ traditional knowledge and legends, traditions and practices. Tłı̨chǫ traditional trails follow the paths of the caribou towards the barrenlands with campsites, gravesites and places of spiritual significance all being described by placenames along the way. These placenames are dependent upon the soil and the landscape, determining the harvest methods and telling the story about the place it describes.

[36] Yamǫǫ̨zha, is considered the most important of the Tłı̨chǫ culture-heroes. Yamǫǫ̨zha is noted for his creation of many components of the landscape, for assisting with the transformation of floating time into linear time, for establishing many of the laws and cultural rules important to Tłı̨chǫ existence, for mediating the enduring relationship between the Tłı̨chǫ and the animals with which they share the landscape, and from which they draw nourishment, and for making the landscape secure. (from Andrews, T., J.B. Zoe and A. Herter. Yamǫǫ̨zha – Sacred Sites and the Anthropology of Travel. In Trails of Our Ancestors: Building a Nation. Tłı̨chǫ Government, Behchoko, NT. 54 pp.)

Today the Tłı̨chǫ are still materially dependent upon caribou as a source of country food for many families. The respect and spiritual relationship with caribou is still alive and well in Tłı̨chǫ communities. To hunt caribou is a significant part of Tłı̨chǫ culture and the activity of planning and conducting the hunt as well as preparing and eating the meat is a basis for social interactions, familial relationships and knowledge transfer between generations. The ability to hunt caribou and provide for families is of significant importance for many Tłı̨chǫ culturally, economically, socially and for health and well being.

The Decline of the Bathurst Caribou and Beginning of Co-Management

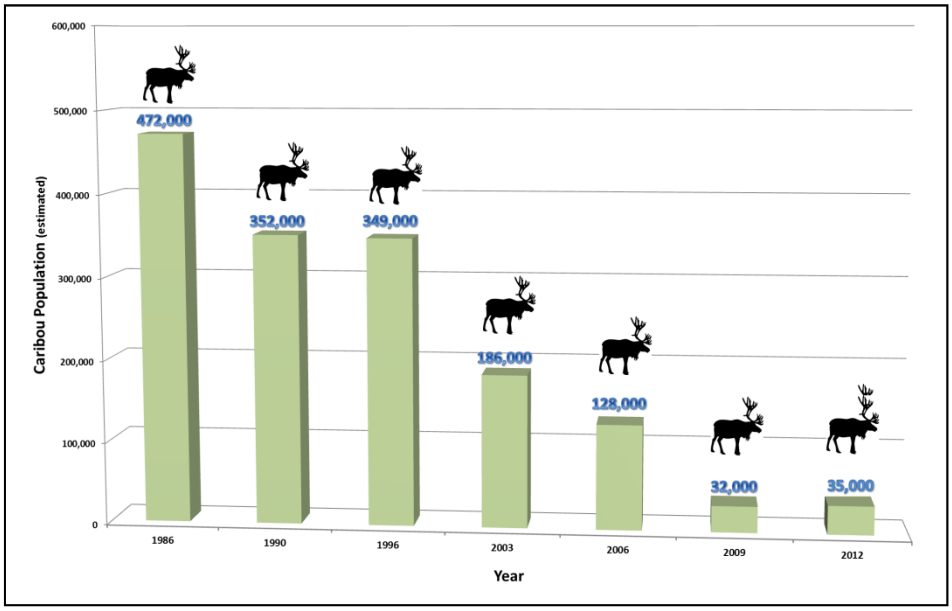
In 2006, a calving ground survey revealed that the herd had declined from over 400,000 in the early 1980's to 128,000 caribou (See Figure 1 below). The Government of the Northwest Territories (GNWT) submitted a management proposal to the WRRB in 2007. The WRRB did not accept the proposal, and indicated that under Chapter 12 of the Agreement, a 'Joint' proposal had to submitted by both the GNWT and the Tłı̨chǫ Government (TG). Due to timing of the processes, the GNWT and TG determined it was reasonable to wait for the 2009 survey population estimates before a proposal was submitted. Following the results of the survey in 2009 where it was clear the population has suffered a further decrease in population to 32,000 animals, the TG and GNWT worked together and submitted a joint management proposal to the WRRB in November of 2009. In this proposal they came to consensus on the following:

- Elimination of Commercial Harvest tags;
- Elimination of tags for outfitting;
- Elimination of tags for residents.

The two Governments did not however come to consensus on aboriginal harvest. GNWT wanted full restrictions; TG did not support a closure of the aboriginal harvest.

Despite working together up until this point, the GNWT imposed a full closure of harvest of the Bathurst in the NWT on January 1, 2010, until the issue of aboriginal harvest could be resolved. This was done with limited consultation and was cause for significant concern for the Tłı̨chǫ and other aboriginal groups in the NWT. Based on the unilateral actions by the GNWT, a strong and prevailing perception in Tłı̨chǫ communities was that the Tłı̨chǫ Agreement had failed to protect their aboriginal right to harvest caribou. This became a key challenge for the Tłı̨chǫ Government, which on the one hand was meant to serve the interests of its people, yet on the other hand it was also meant to develop and implement co-management actions on wildlife.

Figure 1



In March 2010, a public hearing was held to consider the Joint Management Proposal. The hearing ended in adjournment with the Tłı̨chǫ Government and ENR requesting an opportunity to go back to the table to work together again, with the intent to come to consensus on the outstanding issues of aboriginal harvest.

Following the adjournment, the Tłı̨chǫ Government and ENR established a working group to move toward resolution of the key issues of aboriginal harvest utilizing an adaptive co-management framework. During this time the GNWT put to the Supreme Court a reference question with the intent of determining their plenary jurisdiction, which would have potentially undermined the authority and intent of the Tłı̨chǫ Agreement. Eventually GNWT pulled the reference question from the Court, in order to maintain a positive relationship with aboriginal Governments so that all Governments could put their time and resources into the real issue at hand - managing and conserving the Bathurst caribou.

After extensive collaboration, TG and GNWT submitted a 'Revised Joint Management Proposal' which was much more holistic in nature than the original proposal. This proposal considered from the start the important socio-cultural role of caribou to Tłı̨chǫ language, culture and way of life. The ultimate goal of the proposal was to stabilize and recover the Bathurst caribou herd. Agreement was reached on aboriginal harvest, with a 'harvest target'[37] of 150 Bathurst caribou for Tłı̨chǫ communities, which were allocated to the community of Wekweètì - this community was established because it is located in the middle of the Bathurst caribou winter range and they do not have easy access to other caribou (150 were also allotted to the Yellowknives Dene First Nation (YKDFN) who are also traditional harvesters of the Bathurst caribou). In order to reduce the demographic impact of a cow-dominated harvest, the recommended sex ratio of the harvest target was 80% bulls and 20% cows. Additional considerations in the Revised Proposal included increasing support for wolf hunters and trappers and an improved education component overall.

Public Hearings were held again in August 2010 and the WRRB generally supported the majority of the recommendations made in the Revised Joint Proposal and made 60 recommendations to consider in moving forward.

Implementation of the 'Revised Joint Management Proposal'

There were numerous successes in the implementation of the Revised Joint Management Proposal, as well as many lessons learned and extensive room for improvement. The fact that this proposal and the co-management process were developed following the GNWT-imposed hunting ban and with limited consultation (due to time constraints), made implementation extremely challenging because Tłı̨chǫ communities were initially very circumspect about the motives of GNWT and by extension the Tłı̨chǫ Government.

Despite this challenging beginning, there were numerous successes including:

- *Establishment of a co-management proces*s
- *Overall Success of Harvest Target*
- *Significant Engagement and Involvement of Community Members including:*
    - Establishment of the **Tłı̨chǫ Ekwo Working Group** (TEWG) - a steering committee that consisted of mostly Elders and key community members and who provided guidance to the TG on caribou co-management overall;

[37] The Tłı̨chǫ fought for the concept of a 'harvest target' as opposed to a Total Allowable Harvest (TAH) during the public hearings for the Joint Management Proposal in August, 2010. A 'harvest target' was argued for rather than a TAH as the idea that absolute numbers could be set would be out of line with the reality that caribou population numbers cannot be known with the kind of precisions that a total allowable harvest seems to imply. In addition, the concept of a TAH is a very top-down approach and to be successful in implementing harvest management restrictions, community engagement and support is crucial. A harvest target was an idea created by and implemented by the Tłı̨chǫ Government.

- **Wildlife Coordinator** hired by TG whose primary responsibility was to work with community members on education and information sharing; and obtaining community input into numerous aspects of caribou co-management;
- Development of the **Tłı̨chǫ Caribou Team (TCT)** - a team of Elders, hunters and youth who were actively engaged to learn about caribou co-management and to work with community members to engage and educate them about caribou co-management;
- **Community Based Caribou Health and Monitoring Program** was developed and implemented. TG worked closely with GNWT to train approximately 15 hunters from the communities to collect health and monitoring samples from hunter-killed caribou; data collected through this program would provide information on health and condition of caribou;
- **Community Harvest Monitors** hired by GNWT - one community member from each community was hired to collect harvest data from community members and others harvesting in the area. There was extensive room for improvement in this respect as monitors had limited training and enforcement abilities;
- In addition to all of the above, there were numerous community consultation sessions as new information came in and for general education purposes as well as harvesters meetings etc.

Bathurst Caribou calving ground photographic survey 2012 - Stabilization of the Herd
In June 2012, GNWT conducted a photographic survey of the Bathurst calving grounds with the results showing that the herd seemed to have stabilized at approximately 35,000 animals. This appeared to be good news for the caribou, the Tłı̨chǫ and GNWT. In response to this new information, TG and GNWT recognized that they still needed to exercise the precautionary principle and began to work together on an 'Updated (short term) Joint Management Proposal'.

This updated Joint Management Proposal evaluated the work that had been done and included new information and recommendations. Key points of this proposal included:

- **Harvest Target:** maintain harvest target of 300 Bathurst caribou with 80% bulls and 20% cows (to be shared equally between Tłı̨chǫ and YKDFN);
- **Predator Management**: increase the harvest of wolves through a community-based wolf harvest program;
- **Improved Herd Monitoring**: increase the number of satellite collars on Bathurst caribou from to 30 on cows and an additional 20 on bulls;
- **Community Monitor Training Program**: TG and GNWT to develop a comprehensive monitoring and education training program;
- Continue to work on the development of Bathurst Range Management Plan;
- Continue to work on and implement Bathurst Long Term Comprehensive Management Planning Process.

This proposal was submitted to the WRRB in June, 2014 and Tłı̨chǫ Government conducted community consultation on the proposal in May and June of 2014.

Reconnaissance Survey(s), Summer 2014: Major Decisions ahead

In June 2014, GNWT conducted aerial reconnaissance surveys of the Bathurst and Bluenose East caribou calving grounds. The results of the survey suggested that densities of caribou on the Bathurst calving ground had declined by ~70% over the past two years, from an estimate of 14,100 breeding females on the calving ground in 2012 to an extrapolated estimate of 3,600 in June 2014. Although reconnaissance surveys are done to monitor the relative abundance of caribou on the calving ground and not designed to accurately estimate population size, the key result was that the reconnaissance survey suggested that the Bathurst herd had declined substantially since June 2012 and the rate of decline was cause for concern. Similarly, surveys of the Bluenose East caribou indicated that the herd had declined from approximately 66,000 by another 30 percent to ~30-40,000 animals.

The reconnaissance survey results have become a serious concern and on August 27, 2014, the GNWT Minister for the Department of Environment and Natural Resources (ENR) brought together political leadership from all NWT Aboriginal organizations to discuss the recent results for both the Bathurst and Bluenose East caribou herds. In response to feedback from Aboriginal leaders, the Minister supported the creation of a large technical working group to meet further and review available data for development of potential management recommendations for both the Bathurst and Bluenose East herds. The Minister established tight timelines and in early November 2014 is bringing the Aboriginal Political leadership together where it is expected that management actions will be discussed and agreed upon prior to the winter hunting season. The outcomes of these meetings are still to come and the future of the caribou and caribou co-management are uncertain at this point.

Key Challenges and Lessons Learned

There are many key lessons that have been learned over the past 5 years. Caribou co-management is not about managing the caribou, but managing people and land uses. It is also about managing expectations - which can often be unrealistic. Below are some of the key lessons learned over the past many years, with hopes that recognizing and learning from these lessons will make caribou co-management in the North stronger in the coming years.

No one reason for the decline

Despite numerous questions and extensive research, there are no simple answers to the question of what has caused the decline? The practical reality is that harvest is the one lever that can be pulled that is measurable and the impacts can be generally understood. However, there are a likely a myriad of factors that have contributed to the decline including: industrial development - direct and indirect effects of habitat loss and/or disturbance to caribou, exploration activities, winter roads (direct impacts and access), predation, fire on the winter range, summer insect harassment, changing local weather patterns, climate change, changes in harvest methods and

access including access to caribou through winter roads, snowmobiles, high powered rifles etc. To add to the challenges facing the Bathurst and BNE, the summer of 2014 was an intense fire year with a significant amount of habitat burnt. This may potentially have implications for both herds in the coming years.

Taking action without complete information

To consider restriction of aboriginal harvest of caribou was not an easy decision for either the GNWT or Tłı̨chǫ Government. A key challenge for Tlicho communities was to understand how caribou herds are surveyed, so that they could appreciate the population estimates and meaningfully participate in developing management options. One major lesson is that open and regular communication along with timely sharing of all relevant information and data with co-management partners is imperative to building a respectful and effective parthership, which is the basis for successful co-management. Timeliness in communication is a crucial factor, especially during a 'caribou crisis' because delays in communication cascade in to delays in developing management options, community consultation, and ultimately decision-making. Although the information may not be perfect, decisions need to be considered and weighed based on biological data and the social/cultural values of co-management partners. Caribou co-management decisions are not simply based on science to solve ecological issues, because those decisions are encompassed within a broader social-ecological system that requires equal consideration of social and cultural values .

Distribution of caribou herds during the winter hunting season

The seasonal distribution of the Bathurst and Bluenose East caribou herds is dynamic and varies from one year to the next. Thus, for any given winter harvest season, depending on the actual distribution of BNE and Bathurst caribou the following challenges for harvest management of caribou occur:

- Harvest restrictions in one defined area may simply result in a shift of harvest effort to an adjacent area. The harvest target of 300 Bathurst caribou was applied to a specified geographic area. Although the objective to limit hunting of Bathurst caribou in those specific management zones was largely met, hunters may use winter ice roads to access another area to hunt caribou resulting in a *shift i*n harvest from the Bathurst to the BNE herd.
- When the herds overlap spatially it is not possible to implement harvest practices that focus on a specific herd because it is not possible to tell the difference between a BNE or Bathurst caribou in the field. So Bathurst caribou may be hunted if they move in to a management zone that currently has no restrictions because it was designated as an area for BNE caribou (based on historic patterns of winter range use)

Access to the BNE herd by Tłı̨chǫ is generally dependent upon an ice road. Since the BNE caribou were in the southern extent of their winter distribution over the past several years, accessibility was closely associated with the ice road. Thus, due to the timing of caribou movements and that bulls tend to migrate through the area at the beginning and end of the season, and ability to access bulls vs. cows can be difficult , leading to a potentially higher cow harvest than originally intended.

This said, new and creative ways need to be developed in order to manage with this complexity at play.

Migratory species cross jurisdictional boundaries
The Bathurst herd calves in Nunavut near Bathurst inlet and migrates south through Akaitcho traditional territory and then winters to a large degree on Tłįchǫ lands. The Bluenose East herd also calves in Nunavut, travels south and in the past many years it has wintered on Sahtu and also Tłįchǫ Lands. This makes management of a species difficult as different land claim groups have different management boards and regimes in place – or in the case of Akaitcho or the Metis, they have not settled a land claim as of yet and have no management board. There is no one mechanism to manage this migratory species - yet[38]. Wildlife management can be difficult for migratory species such as barren-ground caribou because management actions may not be coordinated for all governments and jurisdictions within the annual range of the herd. In this case, restrictions have been placed on almost all harvest of the Bathurst except for the harvest target of 300 for Tłįchǫ and YKDFN. Meanwhile, across the border in Nunavut, outfitters still receive 70 bull caribou tags (approximately half of what the Tłįchǫ receive) and there are no additional harvest restrictions. In addition, within Nunavut there are numerous proposed developments including open pit mines, all season roads and a port on or near the calving grounds of the Bathurst (and varying levels of exploration etc. currently) which could have potentially significant impacts on the Bathurst at a time when they are very vulnerable.

Meaningful engagement at all levels critical
The success of co-management is dependent on meaningful engagement and communication at all levels - political leadership, Government to Government, staff level and communities. Sharing of data, information and knowledge needs to occur from each side and both traditional knowledge and science must be considered equally and respectfully. A critical part of success is the meaningful and true incorporation of traditional knowledge into the co-management regime. Regular communication is imperative whether it be face to face in meetings and workshops or one on one. Scheduled meetings amongst managers must be implemented and regular monitoring and evaluation of the work that is being conducted is critical to ensure that lessons are being learned and built upon.

Community Involvement Critical
Community involvement is perhaps the most important component of managing a species that people are so dependent upon, over such a vast area. ENR and TG both need to work with communities on a regular basis, keeping them informed and engaged on all aspects of caribou co-management. This goes beyond community meetings but truly meaningful engagement and

[38] The WRRB has begun to implement 12.11 of the Tlicho Agreement by bringing the parties together to develop a comprehensive proposal for the management of the Bathurst caribou herd, which will likely result in the establishment of a Management Board that has the appropriate parties at the table to provide advice and recommendations to manage the Bathurst herd.

involvement and training of community members to participate in the management of the caribou into the future. This must include Elders, harvesters, women and youth. Each group must be engaged in a meaningful way.

Resources Required – Time, Money and Commitment
All of the above lessons learned and recommendations take resources – time, money and commitment - by all parties. Writing a proposal or a management plan is in essence the easy part. Capacity to implement and actual implementation of that plan through realistic means and timelines is the critical element and cannot be underestimated.

Conclusion
The story of caribou co-management for the Tlicho is still in its infancy and has many chapters to come. Co-management was established as a key principle in the Tłı̨chǫ Agreement; however implementation is a multifaceted and challenging reality. Caribou co-management goes beyond the management of caribou and brings in the complex interplay of biological, cultural, social and economic factors. The human dimensions of wildlife management cannot be underestimated and must be a core consideration in the way forward. At times, difficult decisions need to be made under challenging circumstances and in order to make these decisions more socially acceptable and to minimize impacts careful consideration of the human dimensions is critical. Mutual respect and a commitment to regular and open communication are foundational pillars for governments, institutions, and stakeholders involved in successful co-management.

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14. Managing ecological and angler fisheries values in the East Kootenays

Co-Presenters:
Heather Lamson, BC Ministry of Forests, Lands and Natural Resource Operations
Cranbrook, British Columbia
heather.lamson@gov.bc.ca

Sherri McPherson, Lotic Environmental
Cranbrook, British Columbia
sherri.mcpherson@lotic.co

Summary

Whiteswan Lake is nestled in the Rocky Mountains approximately 55 km south east of Invermere. The Provincial Fish and Wildlife Branch has actively managed Whiteswan Lake since the 1950's, creating one of the most popular rainbow trout angling opportunities in the Kootenay region. Whiteswan Lake Provincial Park was created in 1978, and built on the fishery the lake provided. To create the fishery, fisheries management measures included applying toxaphene to Whiteswan Lake in 1959 and 1961 to eliminate undesirable fish species prior to stocking with reproductive rainbow trout (*Oncorhynchus mykiss*), which established a self-sustaining population. Rainbow Trout are not native to the East Kootenay Region, and hybridize with Westslope Cutthroat Trout (*O. clarkii lewisi*, WCT) which are native to the region and listed as a species of Special Concern both in Canada under the federal Species at Risk Act (SARA) and in British Columbia. Hybridization with non-native rainbow trout is one of the greatest threats to WCT throughout its North American range (Allendorf and Leary 1988, Behnke 2002). Hybridization occurs when WCT interbreed with the closely related species, rainbow trout. The hybrid offspring are fertile and are able to successfully reproduce with WCT or rainbow trout, furthering the spread of rainbow trout genes throughout the WCT population. The outcome rarely favours the native WCT, with common threats including: loss of all pure WCT in the population, increased straying of hybrids to neighbouring populations, and a loss of local adaptive traits (Hitt *et al*. 2003, Rubidge and Taylor 2005, Boyer *et al*. 2008). Whiteswan Lake has been identified as a local hotspot for contributing rainbow trout genes to the White River in the upper Kootenay River system. Rainbow trout have emigrated over the falls on Outlet Creek, a tributary to the White River. Hybridization has been confirmed upstream of the Outlet Creek/White River confluence (Rubidge and Taylor 2004), and Whiteswan Lake is the source.

Over the past 20 years, this mounting research on the effects of hybridization on WCT prompted the Provincial Fish and Wildlife Branch to explore options to manage escaping rainbow trout from Whiteswan Lake. The Province discontinued fertile rainbow trout stocking in 2003, attempted to set up a seasonal barrier fence to preclude spawning rainbow from emigrating, used

fry traps to monitor fry movement towards the White River and discontinued a spawning channel on Whiteswan Lake.

Fisheries management efforts at Whiteswan Lake towards managing the established non-native rainbow trout population were met with opposition from anglers. The Province realized the need to engage these stakeholders in a process that would draw up a fisheries plan for action at Whiteswan Lake Park. The Province hired an independent consultant, Lotic Environmental Ltd to lead and prepare the Whiteswan Lake Provincial Park Fisheries Management Plan. There were dual objectives for the Fisheries Plan:

1) Reduce the risks to native westslope cutthroat trout downstream of the park caused by the non-native, naturalized rainbow trout emigrating from Whiteswan Lake; and,
2) Maintain high quality recreational angling opportunities in Whiteswan and Alces Lakes.

The first step towards completing the Fisheries Plan, was a literature review on past management efforts and current fishery values and conservation concerns. Following this, Lotic Environmental facilitated a 2-day workshop with government and stakeholders (participants). Participants in the process included angling group representatives throughout the region, First Nations, BC Parks, Freshwater Fisheries Society of BC and the BC Fisheries Branch. Through activities and surveys conducted at the workshop, valued components, potential options, limitations and additional information needs were identified by participants. Using participant level of consensus, professional experience, and additional scientific information, recommendations were prepared for meeting objectives. The results from the workshop were used to complete a Draft Fisheries Plan. The Draft was reviewed in detail during a second one-day workshop with participants, which lead to finalization of the document. The recommendations were presented as a Fisheries Management action schedule with structured decision points (Figure 1).

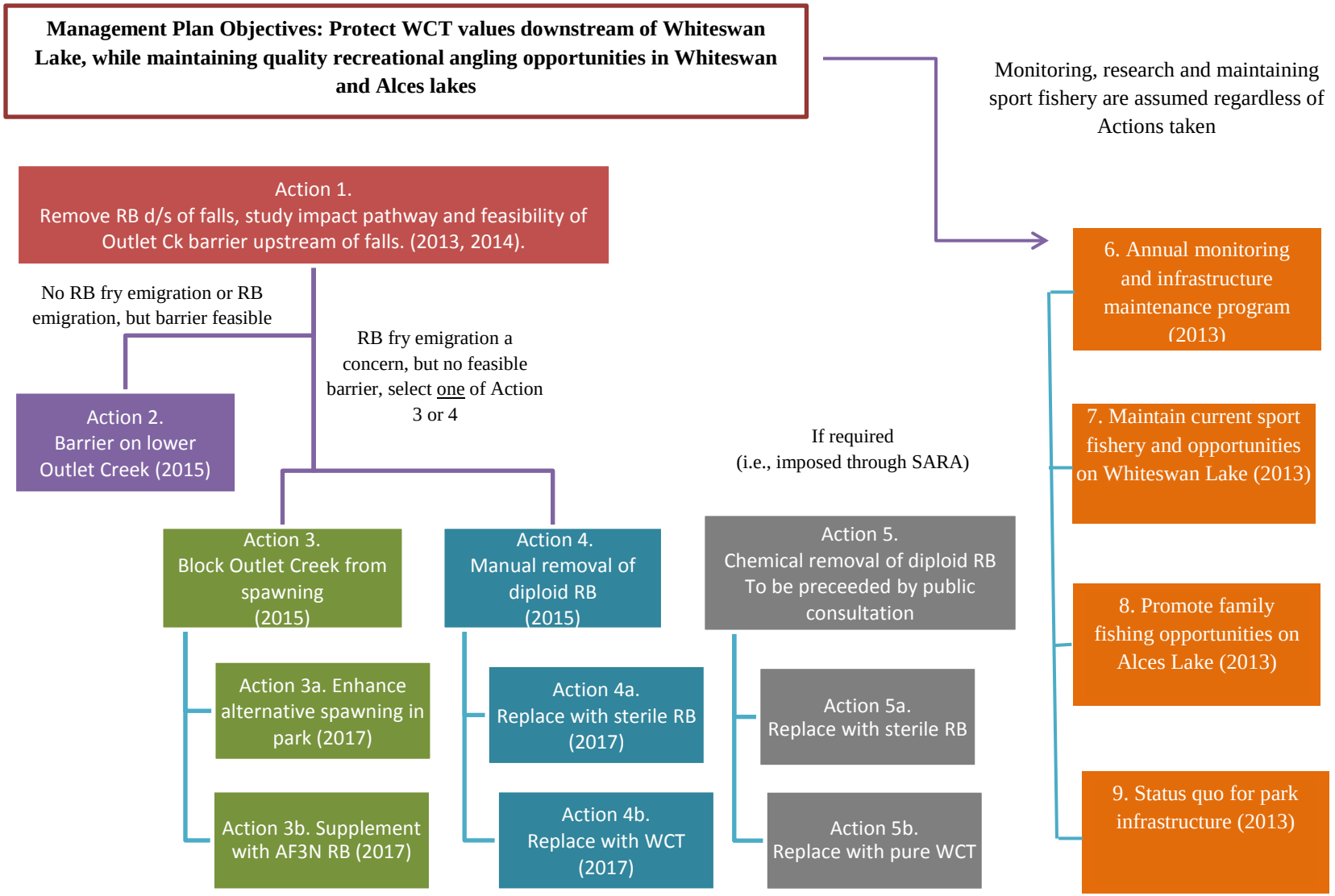

Figure 1. Actions and implementation timeframe (WCT = westslope cutthroat trout, RB = rainbow trout, SARA = Federal *Species at Risk*

The Whiteswan Lake Provincial Park Fisheries Management Plan is available to the public on the Ecological Reports Catalogue (http://www.env.gov.bc.ca/ecocat/).

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15. Ethical dilemmas in climate change adaptation for natural resource management

Jenny Feick, Nature Wise Consulting
Victoria, British Columbia
jenny.feick@gmail.com
http://naturewise.me/consulting/

Summary

Adapting to climate change presents a wicked problem for natural resource managers (Karl et al. 2011; Maani 2013), as outlined in Table 1. Although climate change is a multi-faceted, large-scale (global) problem, its effects vary depending on the region, specific locality and natural resource. Many human activities and natural factors contribute to the current rate and extent of climate change and numerous interdependencies exist among the climate, natural ecosystems and human civilization. This requires an interdisciplinary approach to understand and resolve problems arising from climate change effects on natural resources. Solutions involve difficult trade-offs among conflicting goals. This presents people with choices between short and long term risks and benefits, personal and collective advantages and disadvantages, and conflicting moral imperatives. Societal and individual values and contexts differ, and both social and ethical dilemmas[1] arise. The focus of this paper is on what the academic literature tells us about some of the social and ethical dilemmas associated with climate change adaptation for natural resource management. It draws on several fields of human dimensions research, and where possible, provides examples from south-eastern British Columbia (B.C.).

[1] Social dilemmas describe conflicts where group interests collide with private interests. In other words, a harmful result for everyone ensues if most people choose to do what most benefits them as an individual, or vice versa. Relevant examples include the public good dilemma and the tragedy of the commons. Psychology offers insights into social dilemmas by questioning the usual economic and game theory assumptions that individuals only pursue their narrow self-interest and by explaining the complexity of individual decision-making behaviour using various theories. Ethical dilemmas describe complex situations involving mental conflicts between moral imperatives, where to obey one rule results in violating another. Figuring out how to assess current societal responsibility to future generations who must live with a climate that people today are shaping is a classic and pertinent example. Ethical systems allow for, and sometimes outline, trade-offs, or hierarchies of priorities in decision-making. Resolving ethical dilemmas is rarely simple. Moral imperatives change as people and institutions reconsider and revisit similar dilemmas that recur within their societies.

Table 1: Characteristics of Wicked Problems Applicable to Climate Change Adaptation for Natural Resource Management (adapted from Karl et al. 2011)

✓ Large scale, with a need for landscape level solutions
✓ Evade clear definition, have multiple interpretations from multiple interests, none right or wrong
✓ Pose many uncertainties and risks (environmental, economic and social)
✓ Unstable, with attempts to solve leading to unforeseen consequences, creating a continuous spiral of change, so that natural resource managers are forced to try to address a constantly moving target
✓ Multi-causal, with many interdependencies, involving trade-offs among conflicting goals
✓ Present people with social and ethical choices where public values differ, creating ethical dilemmas
✓ Require long term, altruistic thinking

University of Victoria Environmental Psychology Professor, Dr. Robert Gifford, and colleagues developed and refined conceptual frameworks to depict human dimensions of climate change (Gifford 2006, 2007, 2008 and 2009; Swim et al. 2009; Gifford, Kormos and McIntyre 2011; Gifford and Nilsson 2014).

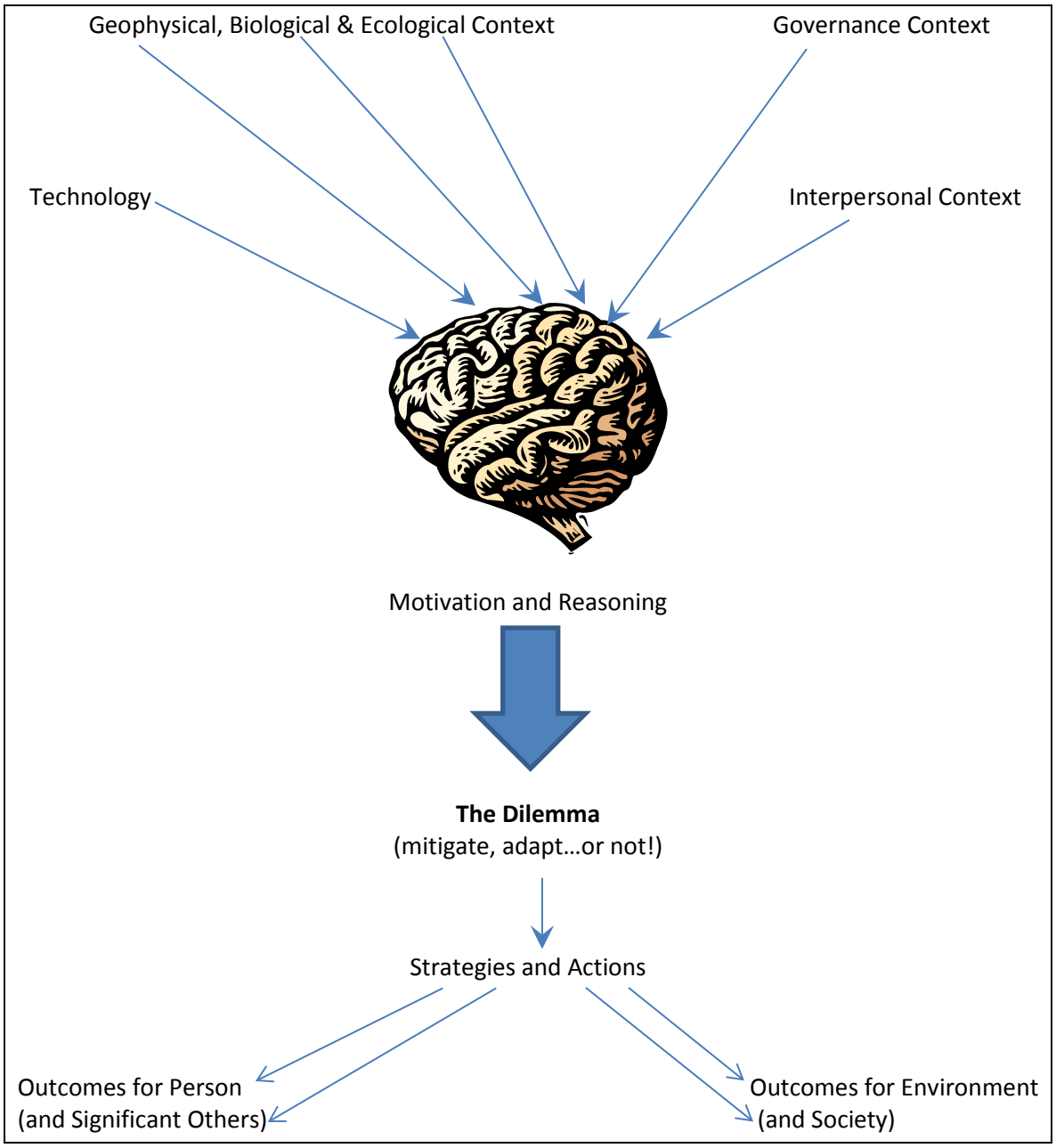

Figure 1 illustrates a simplified conceptual model applicable to climate change based on Gifford's (2006, 2008, 2009) applications of Psychology's general model of social dilemmas. It illustrates that context[2] affects human motivation and reasoning. Gifford notes that thinking about the effects of climate change leads to the first two basic social dilemmas: whether to take action to address climate change or not, and then; whether the

[2] Gifford (2009) included geo-physical, technology, governance and interpersonal considerations to which I added the biological and ecological context.

action should be to mitigate climate change by reducing greenhouse gas (GHG) emissions, or to adapt to climate change, or do both. From there, people develop strategies, make decisions, and act. This results in various outcomes for both the individual and others, as well as for society and the environment. Those outcomes then affect the various types of context.

As pointed out in Karl et al. (2011), human use of natural resources has altered global climate systems, in turn affecting all other natural life-support systems. Now, changing climate affects the natural resources and their use by humans in a non-linear feedback loop. This produces unexpected and amplified results, including tipping points in natural systems that affect the viability of certain ecosystems, species and human communities. One need only recall the unprecedented outbreak of Mountain Pine Beetle in B.C. and the cascading ecological, economic and social effects (Gayton 2008; O'Riordan 2008; Ritchie 2009).

Nature responds to climate change and its associated changes in the geo-physical environment in several, well documented ways (Gayton 2008; Inkley et al. 2008; Cobben 2012; IPCC 2014a, b and c). Species move, adapt their behaviour, or perish. Species respond differently and at different rates. As species alter their behaviour, the timing of natural events or phenology changes, i.e. certain plants bloom sooner than normal, some marine invertebrates move to a different depth in the ocean, migration patterns change, etc. This often results in mal-adaption and de-coupling of the availability of food, mates or other factors important to life. The ranges of species shift, as areas with previously inhospitable climate become more favourable, and places with formerly favourable climate become hostile. The composition of existing habitats transforms as species move and adapt. As this occurs, the distinction between native and exotic species loses ecological relevance (Aubin et al. 2011).

As species move and habitats change in response to climate variations, new combinations emerge (Hobbs and Suding 2009). These novel ecosystems can stem from either from the degradation and invasion of 'wild', natural or semi-natural systems or from the abandonment of intensively managed systems (Harris et al. 2006). Ecosystem structure and functions change as a result.

Nature has responded to climate change throughout the history of life on Earth. Of greatest concern with the current climate change episode is that the natural migration of many plant and animal species will likely not keep up with the current rapid rate of climate change, especially when they encounter human made barriers to movement such

as culverts, roads, and vast urban areas (Tyedmers and Ward 2001; Gayton 2008; Inkley et al. 2008; Minteer and Collins 2010; Aubin et al. 2012; Ament et al. 2014).
Climate change creates repercussions for natural resource management. Several pose challenges to natural resource practitioners as they address climate change effects on natural resources.

1. Human society and the global economy rely on the continuous provision of a huge variety of ecosystem services, many of which are treated as "free goods", e.g. carbon sequestration, water purification, soil building, pollination, etc. Their availability and quality will change as the climate changes (O'Riordan 2009; McDaniels 2009; Columbia Basin Trust 2012).
2. Natural resource management agencies will not be able to just use the past to predict what they will experience in the future (Tyedmers and Ward 2001; Gayton 2008; Inkley et al, 2008; Bunnel and Kremsater 2012). Awareness of the historic natural range of variability in various systems (forest fire periodicity, major flood intervals, peak population levels of commercially important fish species, etc.) will be insufficient (Millar and Woolfenden 1999; Millar et al. 2007). Studying Nature's response to past climate change episodes along with developing future scenarios based on climate forecasts, may provide useful insights (Columbia Basin Trust 2012; Morgan 2012).
3. Serious difficulties will occur when trying to predict with any accuracy the number of trees or the population sizes and distributions of fish and wildlife species (Tyedmers and Ward 2001; Gayton 2008; Inkley et al. 2008; Baron et al. 2009; Bunnel and Kremsater 2012). For example, most of the B.C. Government's surveys of Moose populations could not be completed in the winter of 2010 because of weather conditions that were too warm. In these situations, Moose, with their heavy winter coats, hide out in heavily wooded areas, seeking cool conditions, and are thus not visible in aerial surveys. The lack of snow or slushy snow conditions also makes it challenging to see Moose tracks (Hatter, pers. comm, 2010).
4. Planning systems based on rigid identification of what constitutes specific ecological communities such as the BEC Zone system in B.C. will become less useful (Hamann and Wang 2006; Gayton 2008; O'Riordan 2009; Bunnell and Kremsater 2012; Morgan 2012).
5. Inflexible natural resource allocation policies based on knowing the exact size and distribution of natural resources, including trees, fish and wildlife species, will not work (Tyedmers and Ward 2001; Gayton 2008; Inkley et al. 2008; O'Riordan 2009; Bunnel and Kremsater 2012).

Increasingly, natural resource managers will need to focus their efforts to foster the resiliency of habitats and ecosystems and to maintain connections among the various ecosystems, so that species can move to areas with suitable conditions if their current habitat becomes compromised (Gayton 2008; Inkley et al. 2008; O'Riordan 2009; Campbell et al. 2009; Ament et al. 2011).

Natural resource management decisions in a world with a changing climate will continue to create complex, seemingly unsolvable problems. These will pose major social dilemmas that are very stressful problems for natural resource managers to try to address as they provide advice to the elected officials charged with making these life and death decisions.

Dr. Tim McDaniels at the University of British Columbia conducts risk and decision analysis research related to climate change adaptation for both urban systems and the complex socio-ecological systems outside of cities (McDaniels 2009; McDaniels et al. 1999, 2006, 2012). In contrast with the urban systems, McDaniels and his colleagues discovered that little or no knowledge exists about how complex social-ecological systems will function outside of the known historical climate range. They also found that ecosystems in the Pacific Northwest and elsewhere, are already under stress from human activities and that natural resources are often already completely allocated or even over allocated, in the case of water and some fish species. They found that the current natural resource management practices are often ill structured in terms of objectives, clear alternatives and understanding of trade-offs. Furthermore, natural resource management agencies and their stakeholders resist changing practices and appear puzzled about how to deal with emerging ecological change at this large scale. McDaniels (2009) concludes that climate change adaptation is much harder to manage in large scale socio-ecological systems than for urban infrastructure.

How can natural resource management practitioners incorporate climate change adaptation into natural resource management and avoid or address the associated wicked problems? The United States Forest Service (USFS) uses four strategic steps: Review, Rank, Resolve and Observe (Millar 2007; Peterson et al. 2011), which can be applied at any scale.

1. Review: Build a knowledge base and internal capacity to understand the scientific literature and the various climate projection models, and what other jurisdictions are doing related to climate change adaptation for natural resource management. Assess where natural resources are vulnerable. Identify gaps in our laws, policies and other tools that could help conserve natural resources as climate changes.

2. Rank: Evaluate and rank the various options and best practices that could be employed in a particular area (province, region or on a particular site), as well as the capacity to implement these measures directly or indirectly.

3. Resolve: Consider climate change effects on natural resources while influencing and making land and natural resource management decisions, applying various adaptation tools, and promoting and facilitating the application of climate change adaptation strategies and tactics by other organizations.

4. Observe: Monitor the effectiveness of adaptation options and adjust management as needed.

While there are ethical dilemmas in selecting what literature to study and which climate models to use, as well as in assessing vulnerabilities, identifying gaps, and deciding what to monitor, this paper focuses on steps two and three --- ranking and resolving. Whenever natural resource managers need to rank and choose what approach to take at the various scales, social and ethical dilemmas arise. Three main choices exist:

1. Do nothing different from current management practices to prepare for climate change effects on natural resources, a viable option when present and anticipated future risks are low to moderate, adaptation costly, and timely response options are available (Peterson et al. 2011);
2. Choose to react to an extreme event or after major disturbance, as was done with the Mountain Pine Beetle in B.C. (Gayton 2008; Ritchie 2008; Haeussler and Hamilton, 2012); or
3. Be proactive by planning and implementing adaptation strategies, as is being proposed with the Landscape Conservation Co-operative (LCC) Program, including the Great Northern LCC that encompasses southeastern B.C. (Glick et al. 2009; USFWS 2010; Chambers et al. 2013).

Social and ethical dilemmas develop as natural resource managers set priorities for climate change adaptation. Intergenerational dilemmas emerge when those entrusted with managing publically owned natural resources consider the time frame of when to spend funds to take action. Should we do things that will benefit the economy now, or invest in what will benefit future generations? When elected officials make decisions about land use, resource development and allocation, they need to think about what will be best in the longer term as well as the immediate future. By placing efforts in the short term on actions that will cause no irreparable harm, they can benefit both present and future generations.

Setting priorities for climate change adaptation also provides the best time to reconsider organizational goals and practices and to determine whether they are realistic in light of climate change (Glick et al. 2009; Hauessler and Hamilton 2012; Peterson et al. 2011; Morgan 2012). At the conclusion of the Future Forests Ecosystems Initiative, Hauessler and Hamilton (2012) advised the BC Government to update their strategies and priorities for timber harvesting and silvicultural systems to reflect forecasted climatic conditions. Morgan (2012) observed that broad direction for land and resource management was developed largely without consideration of climate change and should be updated. He pointed to the lack of mandate and resources as the largest barriers to adaptation at the regional scale, followed by restrictive legislation and policy, and then planning capacity. He recommends improving the BC Government's adaptive capacity "by increasing the awareness of provincial leaders, by improving regional knowledge, by updating resource management policy (goals), by improving and land and resource planning, by motivating private enterprise and by removing restrictive legislation". Ensuring natural resource practitioners see a direct connection between the concept of climate change and their routine priority activities fosters "mainstreaming", which enhances the effectiveness of climate change adaptation efforts (Williamson et al. 2012).

Over the long term, we can anticipate surprises – the extent and speed of the Mountain Pine Beetle outbreak in B.C. surprised many (Gayton 2008; Kurtz 2008; Melton 2011; Ritchie 2008). Polar Bear researchers did not think that Polar Bears could live off of seabird eggs when their favourite food, Ringed Seals, were not available, and yet they are (Iverson et al. 2014). No one predicted that Galapagos Fur Seals would move to islands off the coast of Peru when the small fish that were their favourite prey moved in response to the warming water temperatures around the Galapagos Islands (Collyns 2010)! Also, by preparing for the effects of climate change on natural resources, agencies can ease the transition from the former way of doing things to the new approach (Hansen and Hoffman 2003; Millar 2007; Inkley et al. 2008; Glick et al. 2009; Hansen and Hoffman 2010; Hansen et al. 2010).

To address and reduce some of the ethical dilemmas, Peterson et al. (2011) recommend taking a tiered approach to setting climate change adaptation priorities, starting with "Win-Win" Actions that reduce the impacts of climate change while providing other benefits (e.g. improving fish passage through culverts), "No Regrets" Actions that provide important benefits at relatively little additional cost or risk (protecting riparian areas in parks), and "Piggybacking" climate adaptation into priorities determined by other projects (protecting forests as a means of carbon offsetting (Wilson and Hebda 2008; Baron et al. 2009; O'Riordan 2009; Pojar 2009; Hansen et al. 2010).

As the magnitude and pace of climate change exerts greater effects on natural resources, natural resource managers tend towards taking a triage approach[3] to help determine whether to take action or not (Millar et al. 2007). Natural resource management agencies already use a triage framework with species at risk decisions, despite public criticism (Anthony 2014). The B.C. Government's attempts to recover the dwindling herds of Mountain Caribou in the Kootenays indicate that politicians consider it high priority (Messier et al. 2004; Mountain Caribou Science Team 2006). The decisions on recovery actions affect not just caribou, but also the fate of predators like wolves, cougars and wolverines, and alternate prey species such as moose, elk and deer (Wilson 2009). Ethical dilemmas abound.

The climate change adaptation literature discusses various tactical approaches to resolve or take action to prepare for and adapt to climate change affecting natural resources. These include practicing "the Five Rs of adaptation", as promoted and implemented by Dr. Connie Millar and others in the USFS. While there are ethical dilemmas that crop up with all five of the approaches listed in Table 2, this paper focuses on two specific techniques associated with the Realignment Approach: Assisted Migration and Re-Wilding, including the controversial proposals for De-extinction.

[3] A process-based approach for treating emergency situations when need exceeds capacity to respond adequately. Categories for priorities are set based on: need for immediate attention, urgency of condition, capacity for treatment, likelihood of success (Peterson 2010).

Table 2: The Five Rs of Climate Change Adaptation (adapted from Millar 2009; Peterson et al. 2011)

1. Increase Resistance to Change, the "Homeland Security" Approach: On a short-term basis, improve the defenses of high-value natural resources against the effects of climate change.
2. Promote Resilience to Change, the "Health Care" Approach: Maintain the health and vigour of the ecosystem containing the natural resources. Manage the ecosystem and natural resources after a disturbance to foster its return to a prior condition. Accommodate gradual change.
3. Enable Ecosystems and Resources to Respond to Change. "Beginner's Mind" Approach: Responding to and managing change is the most proactive approach described. This strategy assumes that a decision-maker acknowledges the inevitability of change and adopts the humility that we have limited capacity to understand what change will happen at the scales needed by managers. Many types of actions can assist species, ecosystems, or resources to move to new and adapted conditions and processes. Some choices are highly deterministic, acting as if we can predict what changes will occur. Others are based on uncertainty about direction of change.
4. Realign Conditions to Current and Future Dynamics. "Auto-Mechanic" approach. For systems that have been pushed (manipulated, disturbed) far out of range of natural variability, actions that promote alignment with current conditions and processes may be the best approaches for restoration rather than returning to historic conditions.
5. Establish Refugia. "RRSP" approach. There are places where because of local micro-climatic conditions or other factors, will offer refuges for species trying to adapt as the climate changes, for example, sheltered, moist forests or other areas where colder temperatures tend to linger or get trapped, lichen communities in wet, glacial toe slope areas (Gayton 2008; Millar and Thompson 2010; Haeussler and Hamilton 2012).

The assisted migration of species, also termed managed relocation or assisted colonization, involves humans moving other species into what they forecast will be more suitable as their future habitat. Different forms of assisted migration have different objectives:

- Conserve market-based goods like timber – Fifteen tree species are currently being "assisted" in the Pacific Northwest (O'Neil et al. 2011, 2013)
- Prevent species extinction – the Pika is on the candidate list in the USA to be moved further north as there has been a dramatic decline in the Pika population in

the basin and range region due to habitat loss related to climate change (Beever et al. 2010; Smith 2014).

- Conserve ecosystem processes and services – while moving suites of species has been discussed in the academic literature, few published case studies exist (Aubin et al. 2011). Re-wilding initiatives are proposed as a means of changing conservation biology from "managing extinction to actively restoring natural processes" (Donlan et al. 2005) may provide opportunities to study.

Conservation biologists often view assisted migration as an extremely expensive, risk-fraught method that is highly dependent on having good data and may detract from other effective adaptation strategies like maintaining connections between protected areas (Minteer and Collins 2010; Aubin et al. 2011). In the Pacific Northwest, a few projects have moved different at risk butterfly species to more northerly areas of their range (Millar 2008; Powell 2013), a challenging enterprise involving inter-jurisdictional co-operation. A not for profit recovery team proposed moving Oregon Spotted Frogs to a lake about five kilometres outside their historic range, one that was higher in elevation. It cleared all the B.C. provincial and Canadian federal hurdles until the very last one, but didn't proceed (Tory Stevens, pers. comm. 2013).

Many foresters, however, seem to be embracing the assisted migration approach, as a way of maintaining the biodiversity, health and productivity of forests under continued climate change. The B.C. Government is attempting to grow commercially important tree species in areas higher in elevation and further north than they currently exist (Leeche et al. 2011; O'Neil et al. 2011, 2013). They plant approximately 200 million seedlings in B.C. each year. When those trees are harvested 60-80 years after planting, the climate could be three to four degrees warmer than when the seedlings took root, exposing the trees to maladaptation and health risks. Thus, forestry researchers in the Pacific Northwest initiated a large, long-term climate change research study called the Assisted Migration Adaptation Trial (AMAT) to better understand tree species' climate tolerances. Seeds from 15 species[4] growing in B.C. and neighbouring American states ere planted between 2009 and 2012 at 48 reforestation sites from northern California to the southern Yukon. Their growth and health is monitored and related to the climate of

[4] including Sub-alpine fir, Amabilis fir, Grand fir, Western red cedar, Yellow cypress, Western hemlock, Trembling aspen, Paper birch, Sitka spruce, Interior spruce (a hybrid of White spruce and Engelmann spruce), Western larch, Douglas-fir, Lodgepole pine, Western white pine, and Ponderosa pine (O'Neil et al. 2011).

the plantations, enabling researchers to identify the seed sources most likely to be best adapted to current and future climates. The information guides revisions to provincial species and seed source selection and transfer guidelines. Other provincial governments are following suit (Eskelin et al. 2011; Ste-Marie et al. 2014). Aubin et al. (2011) identifies three common ethical dilemmas associated with assisted migration:

1. Should people intervene in any natural processes, including the responses of Nature to climate change effects? One's response to this will depend on whether one has an anthropocentric or an ecocentric view, whether one is trained in forestry or conservation biology, and whether one's objectives are economic or conservation.

2. What are the ecological risks and benefits of assisted migration? The problem is that given the uncertainties associated with this complex issue, risk assessments are unlikely to lead to a consensus about an assisted migration. Risk assessments reflect goals, assumptions, and desired outcomes.

3. Is it managed relocation, or from the perspective of species in the area receiving the assisted migrants, is it assisted invasion of an alien species? Assisted migration could disrupt key ecological processes, threaten native species through predation, competition, or disease, and/or adversely affect local genetics via hybridization.

Aubin et al. (2011) advise that before proceeding with any assisted migration initiative, natural resource management practitioners need to ask and satisfactorily answer several basic questions: 1. Why? Clarify the objectives (conservation or economic?). 2. Who? Identify specifically who will be moved and the criteria used to decide. 3. When? Identify thresholds that will trigger an assisted migration response. 4. Where? Choose the source location, the recipient system and the criteria used to select them. 5. What? Specify goals and the reference system. How? Outline risk and evaluation metrics. They stress the importance of public discussion about and understanding of the issues prior to moving ahead with any assisted migration projects. Minter and Collins (2010) caution that "Given the complexity and novelty of many of the issues at stake in the MR debate, a more dynamic and pragmatic approach to ethical analysis and debate is needed to help ecologists, conservationists, and environmental decision makers come to grips with [assisted migration] and the emerging ethical challenges of ecological policy and management under global environmental change".

Rewilding is large-scale conservation aimed at restoring and protecting natural processes and core wilderness areas, providing connectivity between such areas, and protecting or reintroducing apex predators and keystone species. Several popular books promote this

concept at various scales (Foreman 2004; Fraser 2010; Mackinnon 2013; Monbiot 2013). They all cite the re-introduction of the Timber Wolf to the Greater Yellowstone Ecosystem from wolves originating in Alberta and B.C. as one of the best known, most thoroughly studied examples of rewilding.

MacKinnon (2013) describes the Earth today as a “10 percent world”, a planet with just one-tenth of its former abundance of species thanks to a litany of human caused extinctions, extirpations and species and ecosystems eradications. He describes how each generation bases what is “normal” on what Nature looks like when they are children. Each generation inherits from its ancestors an impoverished flora and fauna and suffers collective amnesia, “a great forgetting” about the changes humans have wrought. To stem the tide of species extinction, rewilding aims to save species by restoring habitats, reviving fish and wildlife migration corridors, and helping people and predators co-exist (Fraser 2010). In addition to promoting the re-introduction of missing keystone species to restore former trophic function, Monbiot (2013) advocates allowing land and sea to become "self-willed, i.e., to evolve without human interference, stating that this approach could bring unexpected solutions to environmental problems, including climate change. MacKinnon (2013) encourages people to recall what Nature was like in the distant past, to appreciate and conserve what survives today, and to reimagine Nature as it could be in the future through re-wilding efforts.

Initiatives to re-wild are happening around the world. Fraser (2010) describes vast projects are turning Europe's former Iron Curtain into a greenbelt, creating trans-frontier Peace Parks to renew elephant routes throughout Africa, and linking protected areas from the Yukon to Mexico and beyond. Devoted to rewilding North America, the Rewilding Institute's Mission as identified on their website (http://rewilding.org/rewildit/) is “To develop and promote the ideas and strategies to advance continental-scale conservation in North America, particularly the need for large carnivores and a permeable landscape for their movement, and to offer a bold, scientifically-credible, practically achievable, and hopeful vision for the future of wild Nature and human civilization in North America.”

The most controversial type of rewilding is de-extinction. In “Undoing Forever”, an Ideas program on CBC Radio, Britt Wray explores the science, ethics and implications of this topic - http://www.cbc.ca/ideas/episodes/2014/06/19/undoing-forever/ . Also called resurrection biology or species revivalism, de-extinction is the process of creating an organism, which is a member of or resembles an extinct species, or a breeding population of such organisms. Cloning is the most widely proposed method, although selective breeding has also been proposed. The Passenger Pigeon is the poster child of this initiative, with projects underway, and events planned for 2014, the centenary of this

species' extinction (see http://passengerpigeon.org/flights.html and http://longnow.org/revive/what-we-do/passenger-pigeon/). The Band-tailed Pigeon, found in B.C., is the species most closely related and thus able to be used to clone Passenger Pigeons. There is even a whole movement to bring back the extinct mammals of the Pleistocene Era as a way to really re-wild North America (Donlan et al. 2005; Church and Regis, 2012; MacKinnon 2013; Zimmer 2013).

The Long Now Foundation advocates bringing extinct species back to life. The slogans "Revive & Restore Extinct Species Back to Life" and "Ecological Enrichment through Extinct Species Revival" appear on their website - http://longnow.org/revive/ . This organization of geneticists, biologists, and others, advocates de-extinction since genomic techniques have advanced and it is now feasible to reconstitute the genomes of vanquished species in living form using genetic material from preserved specimens and archaeological artifacts. The Long Run Foundation recognizes that de-extinction poses ethical dilemmas and has goals to "develop an ethical framework" and "deepen the public discourse on the topic."

Numerous ethical dilemmas exist for Re-Wilding and De-Extinction initiatives (Jorgensen 2013; Zimmer 2013). Two key questions are: Do extirpated and/or extinct species have an ethical right to exist?, and Do people have a moral obligation to reintroduce species that they have extirpated or made extinct? In stark contrast to others (Foreman 2004; Donlan 2005; Fraser 2010; MacKinnon 2013; Monbiot 2013), Zimmer (2013) maintains that humanity has no responsibility or obligation to pursue de-extinction of long extinct species, and refutes that reviving them solves any urgent problem. Other ethical considerations include: How does society identify and weigh ecological risks and benefits? How do decision-makers weigh other considerations, be they social (public safety), economic (costs to taxpayers), or practical and logistical (adequate habitat)?

Sandler (2009; 2014), Zimmer (2013) and Jorgensen (2013) examined ethical considerations both in favor of and against de-extinction. Proponents assert it is a matter of justice; that bringing extinct species back to life would re-establish lost values and create new values. They state that natural resource managers need this tactic as a last resort, given the state of extinctions today from human causes. Critics of de-extinction believe it is an unnatural and arrogant approach ---"playing metaphorical God" (Anthony 2014). Many fear it could cause animal suffering; create ecological problems, and

threaten human health and safety. Zimmer (2013) asserts that the main reasons to pursue de-extinction lie in the status of revived species as scientific and technological achievements. His primary concerns about using de-extinction as a conservation strategy include that it fails to prevent species extinctions, does nothing to address the causes of extinction, and could prove counterproductive to species conservation efforts. Jorgensen (2013) adds that humanities researchers can make a significant contribution to the much-needed public discussion of de-extinction's ethical dilemmas since philosophers and historians possess "the appropriate theoretical background for conceptualizing what is at stake".

Zimmer (2013) concludes that "legitimate ecological, political, animal welfare, legal, or human health concerns associated with a de-extinction (and reintroduction) must be thoroughly addressed for it to be ethically acceptable". Jorgensen (2013) suggests that the already well-established standards for species reintroduction projects could provide a solid foundation for de-extinction initiatives.

The climate change adaptation literature now includes how various fields of human dimensions research can contribute to resolving wicked problems in natural resource management. This paper focuses on the contributions from three of these fields: Psychology, Ethics, and Management Sciences, specifically Decision Theory. Environmental Psychologist, Dr. Bob Gifford at the University of Victoria has produced a body of work on the psychological barriers to taking action on climate change and how to overcome these obstacles that he terms "the Dragons of Inaction" (Gifford 2009, 2011). Gifford (2011) states that mental barriers impede behavioral choices that would facilitate both climate change mitigation and adaptation. Many individuals take some ameliorative action, yet most could do more, were they not hindered by any or all of the seven categories of psychological barriers featured in Table 3. By working with other scientists, technical experts, and policymakers, psychologists can help citizens "slay the dragons" by overcoming these patterns of thinking.

Table 3: Psychological Barriers to Climate Change Mitigation and Adaptation (from Gifford 2011)

General Psychological Barrier	Specific Manifestation
Limited cognition	Ancient brain
	Ignorance
	Environmental numbness
	Uncertainty
	Judgmental discounting
	Optimism bias
	Perceived behavioral control/self-efficacy
Ideologies	Worldviews
	Supra-human powers
	Techno-salvation
	System justification
Comparisons with others	Social comparison
	Social norms and networks
	Perceived inequity
Sunk costs	Financial investments
	Behavioral momentum
	Conflicting values, goals & aspirations
Discredence	Mistrust
	Perceived program
	inadequacy
	Denial
	Reactance
Perceived risks	Functional
	Physical
	Financial
	Social
	Psychological
	Temporal
Limited behavior	Tokenism
	Rebound effect

George Marshall, United Kingdom (UK) climate change communications specialist, has studied how the brain works, including its evolutionary origins, and the resulting

perceptions of threats, cognitive blind spots, love of storytelling, fear of death, and deepest instincts to defend one's family and tribe that characterize human thought. As founder of the Climate Outreach Information Network, a UK charity specializing in public engagement around climate change, Marshall (2014a, b) and his colleague Adam Corner (2013a, b), a researcher specialising in the psychology of communicating climate change, offer ways to improve communications about climate change to prompt and sustain action. One of their key recommendations is to create a more compelling narrative that appeals to both "right wing" and "right brain" thinking, appealing to the emotions, feelings, values, assumptions, prejudices, stories and heroes that tend to influence most people`s decisions. Marshall (2014a, b) believes that by understanding what excites, threatens, and motivates human beings, that individuals and governments can rethink and reimagine how best to address climate change. Morgan (2012) came to similar conclusions.

The field of Psychology also offers de-biasing strategies or "cognitive repairs" to help reduce the biases that can undermine attempts to solve wicked problems in climate change adaptation or other natural resource management issues (Gifford 2011; Gregory et al. 2012; Larrick 2004; Milkman et al. 2008a, b). Certain cognitive repairs use context-specific rules to fix specific types of biases. Others involve individuals asking themselves to consider the opposite. Asking what are some reasons for why my initial assumption, conclusion, judgement, choice, decision, etc. might be wrong, prompts consideration of alternative interpretations. This reduces several types of bias, including confirmation bias in finding and assessing new information, overconfidence, hindsight biases and anchoring effects (Larrick 2004).

The field of Ethics can also inform climate change adaptation for natural resource management. Fox (2004) suggests that one of the many aspects of ethical analysis that could assist in resolving the types of dilemmas that arise in natural resource management is to remember certain philosophical tenets:

1. "ought" implies "can" but "can" does not imply "ought" (i.e. just because we can create Woolly Mammoths from ancient DNA, it doesn't mean we should).
2. "can" implies a choice; not everyone will choose the same path.
3. "is" does not imply "ought" (i.e. just because something "is" a certain way scientifically or factually, does not mean it ought to be that way in an ethical sense).

Fox (2004) asserts that "To understand human nature is to understand the difficulty of saying "no" to "can"". He also cautions natural resource managers to avoid confusing the realm of fact with the realm of value. In Ethics, the realm of fact informs the realm of value. Moreover, scientists possess no greater qualifications than others to make value judgments outside the realm of science. Scientists, especially those trained in the natural, physical and applied sciences, purport to be objective. However, studies demonstrate that scientific and technical experts, including natural resource professionals trained in natural and applied sciences, can be biased (Clark 1994; Pielke 2007; Melton, 2011; Sarewitz 2012).

Based on research in several areas of B.C., including the Flathead Valley in the Kootenays, Dr. Tim McDaniels (2009; McDaniels et al. 2012) recommends that natural resource management agencies and their partners, clients and stakeholders use judgment based approaches such as structured decision-making (SDM) that find robust alternatives. A strength of SDM is that it makes explicit facts, values, biases, objectives, consequences of choices and trade-offs, making it more likely as a means to build healthy ecosystems resilient to climate change (Gregory et al. 2012; McDaniels et al. 1999, 2012). Aubin et al. (2011) also underscore the importance of clearly identifying all underlying goals, motives, principles and values for different assisted migration actions.

In SDM processes, or any other approach used to solve the wicked problems of climate change adaptation in natural resource management, findings from all three of these fields indicate how crucial distinguishing between the roles of the scientist and the decision maker can be (Fox 2004; Pielke 2007; Skolnikoff 2008; Gregory et al. 2012). The role of the scientist or technical expert is to suggest possible consequences of actions and help attach probabilities to alternative futures. The role of the scientist or technical expert is not, however, to make the final decision by setting thresholds of acceptable risk, or by injecting personal ethical weighting factors in the summing of positive and negative consequences. That is the role of ethics as reflected in public policy, as manifested through public input, and as dictated by public and personal "purposes". The ethics of consequences, the ethics of principle, and the ethics of purpose all enter into public and private decision-making. That is the role of ethics as reflected in public policy, as manifested through public input, and as dictated by public and personal "purposes". Finally, as Fox (2004) points out, the Natural Sciences and Ethics are inter-dependent fields of study and human endeavor. Both derive from similar human intellectual capabilities: "the ability to wonder, to imagine alternative actions, to project possible consequences, and to evaluate and choose among alternatives". Thus, natural resource

managers and elected officials should consider both science and ethics when grappling with wicked problems in natural resource management because “Ethics without Science is at best uninformed and at worst delusive; and Science without Ethics is at best unguided and at worst downright dangerous”.

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16. Caring for place – factors influencing orientations to property management among residential shoreline landowners on Kootenay Lake, BC

Candance Batycki, Windhorse Strategies & Royal Roads University
Nelson, British Columbia
candacebatycki@gmail.com

This presentation summarized Candace's Master of Arts thesis, which forms part of the requirements of my pending degree of Master of Arts in Environment and Management from Royal Roads University. It's mostly an environmental psychology inquiry: I wanted to know why people care about places, and what might motivate them to take action to protect a given place.

The Project

My research project is a multi-method case study that explored the knowledge, views, perspectives and behaviors of residential shoreline property owners on Kootenay Lake as regards lake ecology and management, and inquired into these property owners' understanding of, and engagement in, lake stewardship practices. Aspects explored included sense of place, ecological and cultural knowledge, property management approaches, and personal history.

The research was designed to be useful to government agencies, including First Nations, as well as civil society organizations such as the Friends of Kootenay Lake, in encouraging a stewardship ethic on Kootenay Lake through community education, policy development, and community-based social marketing programs. I also hope it will be of use to water stewards across Canada.

The Problem

Freshwater resources are critical for sustaining biodiversity – including human life – as well as human societies and economies. The property management approaches of shoreline landowners are of key importance to conserving the biodiversity of freshwater lakes, since shoreline development can alter riparian and littoral habitats, impacting aquatic food webs and ecosystem function (Francis, 2009). Non-compliance with rules

governing lakeshore development on BC's freshwater lakes was identified as a major challenge by the Ecosystems Branch of the BC Ministry of Environment in 2007 (BC Ministry of Environment, 2010).

Welcome to Kootenay Lake

Kootenay Lake is an oligotrophic lake with three arms: the south, north and west; the main lake (north and south arms) is 107 km long, with a mean depth of 100m and a surface area of 420km2 (AMEC Earth and Environmental, 2009). Kootenay Lake supports several important fisheries, including the world's largest rainbow trout, the Gerrard rainbow, which is indigenous only to Kootenay Lake. White sturgeon, a species listed as endangered under the Canadian Species at Risk Act, is known to have critical habitats within Kootenay Lake (Schleppe, 2011). The keystone species is the kokanee, a landlocked salmon that spawns in the lake's feeder creeks.

Shoreline Development

In 2008 Fisheries & Oceans Canada commissioned a survey that found shoreline properties along the West Arm of Kootenay Lake were increasingly being managed in ways that may contribute to loss of biodiversity, including through foreshore modification activities such as beach grooming and the construction of groynes (rock jetties) and retaining walls (AMEC, 2009). Between 2004 and 2008, residential land use on the West Arm increased by 15%; this was accompanied by an overall net loss of riparian vegetation and an increase in the number of foreshore modifications, potentially impacting fish habitat (AMEC, 2009). A subsequent study of the main lake found that 20% of the shoreline has been impacted by habitat modifications including groynes, boat basins, docks, and retaining walls (Schleppe, 2011).

Data Collection and Analysis

Face-to-face semi-structured interviews were conducted with 24 shoreline property owners, most of them at their homes, in summer 2013. The sample set began with referrals and was built snowball-style, balanced between full-time and seasonal residents, and geographic representation around the lake. Interviews were transcribed verbatim, and analyzed using grounded theory, a research design that seeks to generate new theory from data, as opposed to testing existing theory. Grounded theory methods used included initial coding and categorization of data, the writing of reflexive memos throughout the analysis process, constant comparative analysis (comparison among codes and

categories), the development of theoretical sensitivity, intermediate coding, theoretical integration, and narrative (Birks & Mills, 2011).

"Sense of place" has been defined as "A multi-dimensional construct representing beliefs, emotions and behavioral commitments concerning a particular geographic setting" (Jorgensen & Stedman, 2005). A major turning point during the analysis was the decision to structure the coding framework according to the three aspects of sense of place in attitude theory: affective, behavioral and cognitive. I also coded for attributes: age, gender, lake section, seasonality, numbers of generations on the lake, profession, years at current property, retirement status, engagement in motorized recreational activities, and whether or not the property was previously owned by a family member.

Classifying Participants

Two classification systems were developed: three classes of property management approach (natural, semi-natural, groomed) and four levels of relative ecological knowledge (low, medium, high, very high). Using these classes, and data on attributes, three property management cohorts were described.

1. "Natural" cohort (eight members): 5 of 8 very high ecological knowledge, tend to be in their fifties, still working, middle-class incomes, more females, only non-motorized activities
2. "Groomed" cohort (five members): all retired from higher-paid professions, full-time lakeshore residents, over 60, all do motorized activities; ecological knowledge also very high
3. "Semi-natural" cohort (eleven members): mixed bag, but also almost all (10 of 11) do motorized activities

Findings

Affective Domain (Memories and Emotions)

- Everybody loves the lake, for some it is spiritual
- Childhood memories play large role (2+ generation)
- Importance of family and for 2+ generation, legacy
- Concern about ecological change across time, but also presence of shifting baseline syndrome: interviewees tended to measure change based on their first memories of the lake, rather than seeing the lake in a larger temporal context.

Behavioral Domain

Activities (in order by number of respondents mentioning behavior): swimming (18), hanging out (16), paddling (15), fishing (14), motorized watersports (13), motorized touring (10), "looking at it" (8), hosting guests (6).

Instrumental behaviors such as the installation of docks, railways and boathouses are usually conducted to enable consummatory behaviors such as being able to easily access boats, especially larger motorized craft that are not easily pulled up on a beach. Beach grooming is conducted to facilitate enjoyment of a sandy beach. The cognitive informs behavior in service to the affective: property management is about accessing the shoreline and making that experience as comfortable and simple as possible, so one can conduct consummatory activities with ease. As seen above, where relatively little motorized recreational activity is taking place, property management tends to the "natural", whereas in the "groomed" cohort, all interviewees reported motorized activities. In another example, an interviewee whose property is considered "groomed" discussed the value of removing rocks from the beach as removing hazards for children and elders.

Cognitive Domain (Beliefs, Values, Attitudes, Perceptions)

- Community and social capital is generally low, especially among seasonal residents
- Concerns about retaining public access, now and in the future, with more and larger homes, more Albertans
- Development not seen as major problem on main lake due to isolation and cold water; more concerns on West Arm; big development such as golf courses, hotels or timeshares not wanted anywhere
- Fluctuating water levels due to dam management seen as major issue; often attributed to US control
- Mixed attitudes to regulation; governance seen as fragmented/complicated
- First Nations seen mostly in historic context
- Mixed understanding of riparian rights; understanding of jurisdiction very basic; federal government seen as absent
- Tepid response to idea of management plan
- Strong values around maintaining clean water for drinking, swimming, fish
- Very little use of terms "stewardship" or "sustainability"
- Meme: "We love this lake and it's better than the others"

Conclusions and Recommendations

[A]ttachment and satisfaction exert independent influences on intention to engage in place-protective behavior: respondents with higher levels of place attachment and lower levels of place satisfaction are more willing to act to counter environmental changes to their lake…We are most willing to defend places that are strongly tied to our identity and for which we hold negative attitudes ('important but threatened'). (Stedman, 2002)

- Lake is "happy place": low problem perception makes it hard to motivate stewardship and shift social norms
- Recommend strategic communications and social marketing, new narrative (consider framing around lake as commons)
- Little knowledge of how property management practices affect lake ecology: recommend public education (printed materials, mail-outs, signs, community events)
- Address invisibility of properties, emphasize personal contact, cultivate community leaders for social diffusion
- "Ambassadors" program with site visits, property naturalization support
- Importance of visible commitment and recognition -- driveway signs, T-shirts -- with taglines that reflect desired behaviors
- Use messages that play to sense of pride, proactivity, differentiation, "keep it natural"
- Define "stewardship" broadly; forget "sustainability" – use "clean", "natural"
- Pilot programs where problem perception is stronger (West Arm)
- Involve landowners early in governance discussions
- Raise First Nations visibility (note that some actions in this regard have been taken since the interviews were conducted, and more is planned)
- Create opportunities for dialogue and community development (social capital)

A new narrative is needed, a narrative that understands and describes the lake as a commons, that places the lake in a larger frame of reference in both space and time, that emphasizes the importance of family and legacy in the broadest sense, including all species; a narrative that characterizes simple, proactive actions taken today as wise stewardship for generations to come.

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17. Building a conservation community – Lessons from a long-term collaboration

Presenter: Dee L. Patriquin, Faculty of Physical Education, University of Alberta
Edmonton, Alberta
dee.patriquin@bhccorp.ca

Co-Author: E. Halpenny, Faculty of Physical Recreation, University of Alberta
Edmonton, Alberta

Abstract

Collaboration has been suggested as an alternative approach to sustainable management, particularly in cases where management would benefit from direct involvement of affected stakeholders. Examples of successful collaboration have been rare, particularly for regionally based land management initiatives. In a qualitative case study of a long-term (10 year) voluntary collaboration between three levels of government and non-governmental organizations, we explored the contributions of social capital and place to a series of projects affecting regional sustainability. Social capital research suggests that trust, reciprocation and trust-building might play a role in successful collaboration. Place-based governance research suggests a role for place to motivate management action. In this case, both factors appear to play a role in facilitating collaboration, but only after the management issues are 'translated' into a form meaningful to the diverse membership. Our case study provides an empirical analysis of approaches used to recruit support to innovative land management initiatives that rely heavily on cooperation and scientific knowledge. This presentation will review results of this recently completed study of the Beaver Hills Initiative (BHI). Over its 10 year history, the BHI has tackled increasingly complex initiatives encouraging cooperative management among government and ENGO organizations responsible for land management of the Beaver Hills Moraine, a regionally significant natural area. Our results offer practical suggestions to enhance the adoption of innovative approaches to complex problems such as sustainable land management.

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18. Climate change adaptation in the south Selkirks of BC

Presenter: Howie Harshaw, Faculty of Physical Recreation, University of Alberta
Edmonton, Alberta
harshaw@ualberta.ca

Abstract

Climate change poses significant challenges to the management of British Columbia's forests, including potential decreases in forest productivity due to insects and disease, extreme weather events, and a spatial shift of ecosystems. Associated with these ecological impacts are social and economic impacts that will affect the resiliency of communities throughout the Province; some communities, particularly resource-dependent ones, are undergoing transitions in response to new these ecological (and consequent economic) realities. There has been growing recognition that examinations of climate change adaptation, such as the transition of communities, ought to explicitly address the human dimensions of natural resources, and incorporate social science approaches to inform evidence-based decision-making for local communities and the Provincial Government.

Fostering resiliency on the land base requires healthy ecosystems, thriving economies, vibrant communities, and meaningful connections amongst these dimensions. Fostering adaptation requires that undue burdens not be placed on vulnerable elements of the system (Adger *et al*. 2009). The concept of adaptation is closely related to resiliency: "… the capacity for humans to change their behaviours, economic relationships, and social institutions such that economic vitality is maintained and social stresses are minimized" (Joseph & Krishaswamy, 2010, p. 129).

In an effort to understand ecological, economic, and social adaptation and resiliency in British Columbia's forests and the communities that depend on them, the socio-cultural values of residents of the South Selkirks region were surveyed, and their opinions about the relative priorities of resiliency factors for communities in transition were assessed. Respondents were asked to consider a series of paired trade-offs among six resiliency factors for communities in transition. The six resiliency factors were derived from a set of fifteen resiliency factors for communities in transition that were identified by Joseph & Krishnaswamy (2010):

1. Economic Diversity (diverse sources of local income).
2. Natural Resources (local access to natural resources).
3. Local Control Over Enterprise (local control of natural resource-based businesses).
4. Stakeholder-Driven Planning (community planning involves local citizens).
5. Human Capital (development and maintenance of skills, knowledge, and creativity for community members).
6. Social Capital (strong relationships between community members that foster trust and productivity)s.

The Thurstone Scale technique (Case V) was used to analyze respondents' preferences for six resiliency factors for communities in transition. Respondents were presented with a series of paired resiliency factors, and asked which factor (in each pair) was their priority (Thurstone 1974). The resultant observations reflect the proportions of times one factor is judged to be a greater or lower priority than the other factors.

A total of 520 completed questionnaires were received (401 from non-Aboriginal respondents; 59 from Aboriginal respondents; and 60 community/land-use managers and planners). The priorities of these three sample groups were different. In particular, Aboriginal respondents placed a higher priority on the "Community planning involves local citizens" factor than non-Aboriginal and community/land-use manager and planner respondents did; and non-Aboriginal and community/land-use managers and planners respondents placed a higher priority on the "Diverse sources of local income" factor than Aboriginal respondents. Implications of these results are discussed.

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19. Not all surveys are created equal – methodological mistakes in human dimensions of natural resource management

Sarah Dubois, BC Society for the Prevention of Cruelty to Animals, and University of British Columbia
Vancouver, British Columbia
sdubois@spca.bc.ca

Summary

In general, most Natural Resource Managers are not formally trained in social science methodology, yet many are required in their roles to participate in public engagement activities. A lack of understanding of the rigour of process behind engagement techniques such as surveys, can put Natural Resource Managers and Policy Developers at risk of liability if management actions are taken based on invalid public engagement results. This is of concern to the BC SPCA as it applies to the management of wildlife. This presentation will use the example of urban deer management in BC to demonstrate the challenges with using surveys without a diligent understanding of this potentially useful Human Dimensions methodology.

The BC SPCA is an evidence-based organization, which means we use science to guide policy development within our shelters, in our outreach programs and in our positions on societal animal use issues. The BC SPCA exists as a result of strong social attitudes, values and behaviour towards the protection of animals and the concern for their welfare. The BC SPCA is thus a reflection of broad public values for animal welfare in our time. Therefore, a strength of the organization is that it is able to filter expert evidence through the frame of public values to create policies that are aligned with wider values. This is one of the two main roles the BC SPCA fulfills in order to advocate for the protection and enhancement of the quality of life for domestic, farm and wild animals.

The other role of the BC SPCA stems from our responsibilities mandated under law. The BC SPCA is quite unique in that it is the only charity in the province that was not created under the Societies Act, but rather under the Prevention of Cruelty to Animals Act (PCA Act). As the only animal welfare organization in BC with the authority to enforce laws related to animal cruelty and recommend charges to Crown, it should be noted this work is funded entirely by public donations.

The PCA Act applies to wildlife in captivity, which includes exotic pets, wildlife in rehabilitation, animals in entertainment or research, and free-ranging animals that are temporarily confined (e.g., traps, corrals). Further, sections pertaining to animal cruelty in the federal Criminal Code of Canada (S445.1) are also enforced by the BC SPCA and pertain to all wildlife (both captive and free-living) as “Every one commits an offence

who (a) wilfully causes or, being the owner, wilfully permits to be caused unnecessary pain, suffering or injury to an animal or a bird."

There are many benefits to public engagement in Natural Resource Management, and in particular wildlife management, given the "public" ownership of wildlife by the Crown. Engagement can range on a continuum from informing to consulting, involving, collaborating and empowering. Effective and meaningful engagement can create better informed decisions, generate long-term and sustainable solutions, increase acceptance of the decisions, and reduce costly opposition. But how this is achieved relies on the methods used, which depend upon the time and resources available to the process.

Engagement through surveys is not new, and has been done for decades in-person (e.g., intercept survey), by phone (e.g., polling), by mail, and more recently online. The goal of many surveys it to get a good understanding of the questions asked by achieving a high response rate of the targeted audience and in some cases, when researchers want to be able to say "the community believes that", a representative sample is aimed for. Survey method choice is often based on cost, timeliness to administer, and the ease of understanding for both the participants to engage and for researcher to implement – ideally, the goal is that data is unbiased and able to be interpreted, and sometimes it is to be generalized to other populations.

The type of data to be collected in a survey can be items like frequency (e.g., how many times did you visit the park last year?); cost (e.g., how much did you spend on traveling to the park last year; or what would you pay to visit the park); a sense of items or issues (e.g., what activities did you participate in when attending the park; which of these items concern you about visiting); or even values on an attitude scale (e.g., how important is visiting this park to you; rank your preference for changes at the park). In essence, surveys can get at the "what", "so what" and "now what" or a combination of all. However, it is important to point out that when surveys are used to develop policy based on their results, questions of survey validity are fundamental.

There has been a rise of online surveys as of late, it is the "SurveyMonkey" effect – a sense that anyone can create a survey at any time quickly and easily to collect data for distribution. A very reputable publication in natural resource management recently outlined caution in using online surveys in an entire special edition: Human Dimensions of Wildlife (2011) Issue 16 - Special Issue: advantages and disadvantages of online surveys.

There are tremendous pros to using online surveys as they are indeed fast at collecting data, have a wide reach, are relatively cheap, and easy to produce. The main con to online surveys however, is that there can be a significant voluntary response bias. Looking at the four main error considerations for surveys, online modes can have all four:

- Coverage error = the concern for unbiased recruitment as not all individuals have a computer, internet access, or are computer-literate
- Measurement error = can occur when surveys are poorly worded and have imperfect scales
- Sampling error = the potential for very different possible samples from the population, often expressed as the "margin of error" but rarely reported out on online surveys
- Non-response error = online surveys do not attempt to determine the potential answers of non-respondents and whether they differ from those who did answer

The relevant wildlife management issue considered here in the context of surveys is that of urban deer in BC. These deer live at the interface or among human settlements and have adapted to feeding, breeding and raising young here. As a result, there have been increased deer-human interactions reported in yards and on farms, with pets and people, and via vehicle impacts. Different communities are facing different urban deer issues: some have overabundant deer; others may be facing conflict with habituated or food-conditioned deer; and where populations are stable, there have even been "rogue gang deer" causing problems (e.g., Cranbrook). Regardless of the deer status, it is apparent that the cultural carrying capacity for deer has been reached in some areas of the province.

Looking historically at the management of the urban deer issue, in 2009, communities asked the Province to address the situation at the Union of BC Municipalities meeting. In 2010, the Ministry of Environment contracted the Urban Ungulate Conflict Analysis to be written, which gave some deer management responsibilities to local governments. In order for the Ministry to assist a community with an urban deer issue, the Ministry first required communities to:

1) Form local Urban Deer Committees
2) Gather community input (generally via a community survey)
3) Change bylaws (e.g., wildlife feeding, fencing)
4) Conduct a deer count
5) Review all management options
6) And if a cull was desired, apply for MOE permits

Further, in the BC Urban Ungulate Conflict Analysis, some information on how to gather community input was provided in Appendix D. This section offered example questions in the Landowner/Resident Survey Forms that could ask about damage, expenditures and the appropriateness of management actions to be undertaken. It also included 24 references for literature based on, or about, public opinion surveys (however most sources were from academic journals generally not available to municipalities). And finally, contact information for 5 survey experts was given. Alternative to a survey, the

concept of a community referendum was also presented, whereby residents vote (yes/no) to decide whether or not to implement a proposed deer management proposal.

This idea of municipal wildlife management is very new in BC, as generally all wildlife management is conducted by the Province. Now numerous surveys are being developed and used by municipal policy staff to guide wildlife management plans in Cranbrook, Kimberley, Invermere, Elkford, and Grand Forks, among others. The Capital Regional District used a Citizen Advisory Committee process which in itself presented its own issues. In Invermere, a legal challenge to their deer management program (cull) was made in 2012, and evidence was presented at trial in BC Supreme Court on the validity of the survey method that most municipalities had been following. Despite concerns for the inappropriate survey methodology from groups like the BC SPCA and others, this was the first time in a legal proceeding that it was challenged. An evaluation of the survey method process rigour and a line-by-line assessment of the document were performed by an expert witness, a University of British Columbia Social Scientist.

When looking back at the management events, the City of Cranbrook took the first steps in 2010, conducting deer counts and establishing there was no overpopulation, but rather an issue with habituated and rogue deer. The City of Cranbrook conducted community surveys in 2010 & 2014, and performed two culls. In Invermere in 2011, they copied the Cranbrook process, forming a deer committee, conducting a deer count and a community survey. In 2012, the cull started until a temporary Supreme Court injunction stopped the cull, citing lack of appropriate process for community consultation. After a year of legal dispute in 2013, a judge ruled that there was no proof that adequate notice about deer meetings and decisions was not given; but there was no ruling on experts' evidence (discrediting the deer count and survey), leaving this as an open liability.

The most recent open online survey conducted in 2014 by Cranbrook again shows the problems with this survey method: no intro questions asked to verify if participant is a Cranbook resident (living locally or temporarily elsewhere) or even if participate was the age of majority, which is required for a lawful survey. Of particular significance, the results are far from representative, despite media releases stating the survey was successful. For example, in September 2010, 1,429 surveys were completed. Four year later, in March 2014, 1,628 surveys (1,470 online, 158 paper) were completed. However, city staff finally considered that the survey could be taken by non-Cranbrook residents and found that only 929 surveys completed came from local IP addresses (no mention of any duplicates); 681 came from out-of-town IP addresses; and 18 surveys were not tabulated as staff were unable to determine their location (note 18 responses came from 1 IP). Looking at the population of Cranbrook, 19,364 people live in the city proper as per the last census; meaning the survey results represent only 4.8% of the community. As there was no qualifier question about where the boundaries of Cranbrook are, if one counts the rural areas, the population is 25,753, meaning only 3.6% of residents were represented in the survey. In Invermere, the mail survey was targeted at one adult per

household, which in itself often creates a gender bias for response. Here, the response rate was 16.2% or 195 of the 1,219 households in town.

Therefore, looking at the results of these surveys based on the questions, recruitment, analysis and overall survey methods, there are considerable issues that make the surveys invalid:

- Open online recruitment with anonymous participation
- No qualification questions (age, location) = no unique identifier per participant
- No assurances only local residents included
- Can participate multiple times (on different browsers and from different IP locations)
- Response rate is skewed (from out of town IP, multiple entries, no way to ensure multiple responses from same IP came from different adults in household)
- The recruitment was non-representative of the community (although it's possible to have a representative sample from small sampling, must be as per census criteria)
- Item order and likert scale issues were present throughout the survey
- Leading and biased questions were present throughout the survey
- Double barrel questions were present and uninterpretable
- No qualitative analysis of the comments was conducted
- No non-response checks were completed

To summarize, public participation is greatly needed to solicit and incorporate broad public values in wildlife policy development. Surveys can have a broader reach than open houses, focus groups, stakeholder committees, etc., and their questions can evaluate issues and their importance. However, there is a strict rigour to survey recruitment, design, analysis, result interpretation and overall meaning. The legal challenge to the Invermere deer cull flagged survey methods in the existing urban deer management protocol as being an invalid tool used in management justification. This remains an unresolved liability and thus further community survey work on the urban deer issue should halt and be completely reassessed.

There are ways to do online surveys with small sample sizes and here are two examples if interested:

Dubois, S., & Harshaw, H. W. (2013). Exploring "humane" dimensions of wildlife. Human Dimensions of Wildlife 18(1): 1-19.

Jacobs, M. H., Vaske, J. J., Dubois, S., & Fehres, P. (2014). More than fear: role of emotions in acceptability of lethal control of wolves. European Journal of Wildlife Research 60: 589-598.

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Posters & Displays

1. Failing to plan or planning to fail: A case for a new protected areas vision for British Columbia

Jenny Feick & Mike Fenger, Friends of Ecological Reserves of BC
Victoria, British Columbia
jenny.feick@gmail.com

Given the wicked problems of climate change, the accelerating pace of natural resource development in British Columbia (B.C.), and economic factors, the Friends of Ecological Reserves (FER) see an urgent need for a robust, new protected areas conservation strategy, which would include the creation of new Ecological Reserves (ERs) and a system that explicitly considers the rapidly changing natural and cultural landscape and shifting climate context. This vision includes strategic regional land use and natural resource planning with full involvement of First Nations (FN) as well as stakeholders in the private, public and civil society sectors.

This would provide a means to collaboratively craft measures at a local level for sustainable use of natural resources that are mindful of our shared future. A sub-regional strategic planning process would determine the sustainable, long term integration needed to optimize conservation opportunities while adding economic developments. B.C. has the largest and most intact ecosystems remaining in North America in the least developed landscapes south of the 60th parallel. The strategic land use plans of the 1990s established the current protected areas but are dated in light of changes. The effectiveness of conservation measures among protected areas such as Old Growth Management Areas, Wildlife Habitat Areas and various riparian reserve protection measures are unknown. Land use plans did not consider climate change effects or the pace and scale of cumulative effects. There is sufficient evidence that the status quo for resource management is not working in BC, though that is not widely understood by the public.

Accelerated natural resource development in a period of global climate change warrants an equally accelerated and efficient process to address strategic conservation values before options to make foresighted decisions disappear. Strategic conservation planning seeks to increase the probability of sustaining the diversity of Canada's most ecologically diverse and biologically rich province.

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2. *Human and free-roaming horse interactions*

Adela Tesarek, Department of Geography, University of Calgary
Calgary, Alberta
adela.kincaid@ucalgary.ca

Wicked problems have been identified as: being incomplete, containing contradictory elements, possessing changing requirements, exhibiting complex interdependencies and being notoriously difficult to solve. One example of a wicked problem is that of free roaming horses (FRH) in Alberta. Human and free roaming horse interactions challenge decision makers and the existing, inherent categorizations that define animals as stray, feral, introduced and wild. Local Alberta interest groups and individuals hold varying and often contradictory (contentious) perspectives toward the horses. Historic and cultural viewpoints from Aboriginal, Métis, settler posterity and long-term residents contribute useful, relevant and much needed local knowledge about the horses. People who have longitudinal and extensive experience with FRH have much to offer to informing policy as a result of their practical experience and knowledge. Fundamentally, wicked problems are a social process; thus, I use social mapping that pictorially displays social worlds and perspectives to illustrate the complexity of the FRH problem. Constructing social maps of those involved is useful for showing connections and relationships between interest groups and individuals. The applied value of social mapping is providing a well-formed understanding of actors and actants that sets the stage for a prospective democratic policy process. With appropriate care and attention being given to the differences in social and physical environments, social mapping may be useful to help understand similar free roaming horse situations in British Columbia.

Local knowledge can inform future policy on free roaming horses. Attributes that have been identified as helpful for finding better solutions to wicked problems are: value sharing rather than debate; inclusiveness of all interest groups and individuals; courtesy and respect; high levels of thinking to make connections between complex interdependencies; multidisciplinary, interdisciplinary, and transdisciplinary understandings; holistic rather than linear thinking; and an exploratory, flexible approach. Given the above attributes, the management of FRH is a wicked problem that may be addressed, in part, through democratizing continuously evolving social policy that would benefit from including local values held by various interest groups and individuals. More broadly, wicked problems generally could benefit from the use of social mapping techniques where local values, interdependencies, and higher levels of understanding are sought.

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3. *Perceptions of human-wildlife conflict among residents living near beaver habitat*

Nicholas Yarmey, Department of Science, University of Alberta
Camrose, Alberta
yarmey@ualberta.ca

Some people consider the beaver (*Castor canadensis*) to be a pest species whose habitat modification causes unreasonable damage to human property, yet to others it is an ally in the fight against wetland loss and decreasing biodiversity. Perceptions of beaver and their management are complex and often polarized, and for effective management we must address these competing points of view. Using semi-structured interviews, this study explores how landowners in Beaver County, Alberta experience human-beaver conflict, how they would like to see it resolved, and the costs and/or benefits of living near beavers. As part of an ongoing research project to evaluate the biological and economic efficacy of a beaver management tool (i.e. pond leveling device), these interviews highlight the social dynamics that are an inherent part of human-wildlife conflicts. With a better understanding of how residents define beaver problems and what constitutes a good solution, we can develop conservation goals and management strategies that are endorsed at the local level.

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4. Rocky Mountain Trench Ecosystem Restoration Program (display)

Randy Harris, Rocky Mountain Trench Ecosystem Resource Program, Team Leader, Randy.Harris@gov.bc.ca

Trish Barnes. Rocky Mountain Trench Ecosystem Resource Program, Communications, trencheroutreach@gmail.com

The Rocky Mountain Trench Ecosystem Restoration Program (ER Program) is a long-term undertaking by a coalition of stakeholders working together to restore fire-maintained grassland and open forest ecosystems in the East Kootenay region of southeastern British Columbia.

Restoring grasslands and open forests enhances biodiversity, restores habitat for species at risk, improves grazing for cattle and wildlife, improves forest health and reduces the risk of severe wildfire.

This coalition works because its partners are committed to the goal of restoration. The ER Program's key document is the *Blueprint for Action, 2013*, an update of two earlier key documents.

The *Blueprint for Action, 2013* reflects input from stakeholders, partners and treatment monitoring results. It is available online, at http://trench-er.com/our_blueprint.

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5. *Columbia Shuswap Invasive Species Society & East Kootenay Invasive Plant Council (display)*

Robyn Hooper, Columbia Shuswap Invasive Species Society, Program Coordinator

The Columbia Shuswap Invasive Species Society (CSISS) was established in April of 2013 after a series of meetings and consultations with land managers, residents and other stakeholders with the aim to develop a collaborative and coordinated approach to invasive species management in the region. The CSISS joins a network of 17 regional invasive species groups in BC; these groups work in cooperation with the Invasive Species Council of BC to inspire action, coordinate management and prevent the spread of invasive species within their jurisdictions.

The display focused on priority aquatic and terrestrial species in the Columbia Basin region, including programs by CSISS, the East Kootenay Invasive Plant Council, and the Invasive Species Council of B.C. For more information please visit the CSISS website at: wwww.columbiashuswapinvasives.org or email info@columbiashuswapinvasives.org

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Field trip descriptions

1. St. Mary's Indian Band: District Heating Project and Co-Management

Julie Couse, Director of Lands and Natural Resources, St. Mary's Indian Band
Kimberley, British Columbia
jcouse@aqam.net

Attendees will travel to the St. Mary's Indian Band Kootenay No. 1 Reserve situated 10 minutes North of Cranbrook. The field trip will be to view our District heating system* which converts biomass into bioenergy so as to reduce greenhouse gas emissions, limit heating costs, continue our ecosystem restoration efforts, and take a significant step towards energy self-sufficiency. This project is one example of our tipi-pole approach to good-governance. It has been a collaborative effort of the economic, operations, and lands departments. Additionally, we will discuss St. Mary's unique ability to self-govern our on reserve lands and natural resources through recent ratification of our Land Code as well as the Band's overall goals and objectives for land management.

* Installation of the boiler system should be complete by the end of the summer, however, we will not be commissioning the unit until the winter months. Therefore during the tour we explain how it works but the system will not be operational.

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2. Managing Conflict: Lessons from the Rocky Mountain Trench Ecosystem Restoration Program

Randy Harris, Rocky Mountain Trench Ecosystem Resource Program, Ecosystem Restoration Team Leader, and BC Ministry of Forests, Lands and Natural Resource Operations, Randy.Harris@gov.bc.ca

Trish Barnes. Rocky Mountain Trench Ecosystem Resource Program, Communications, trencheroutreach@gmail.com

Dan Murphy, Rocky Mountain Trench Ecosystem Resources Society, Coordinator, dgmurphy@telus.net

Kimberley, British Columbia

Land use in the Rocky Mountain Trench has been a contentious issue with waves of conflicting studies, reports, plans and conferences dating back to the 1960's. One of the biggest sources of contention was the partitioning of the use of grasslands between the cattle industry and native wildlife. After thirty years of conflict a consensus was struck between the ranching, hunting, environmental and logging communities and the decision enshrined in the Kootenay Boundary Land Use Plan of 1997. The original decision was to concentrate efforts on reducing the amount of forest encroachment onto grasslands as since the 1950's the Rocky Mountain Trench of British Columbia has lost 50% of its natural grasslands by ingrowth and ingress of Ponderosa Pine and Douglas fir into the margins of the grasslands.

An official interagency Ecosystem Restoration program in was started 1998, the program was designed to be overseen by a steering committee of local stakeholders, licensees and agency managers who review the work of an operations committee (composed of local resources professionals) who run the contracts and carry out the work. The Rocky Mountain Trench Natural Resources Society is a coalition of 10 hunting, ranching, environmental and conservation organizations who have a seat on both committees. Since its inception the program has treated over 48,722 hectares and grown from treating 600 hectares a year to 4,000 hectares per year. More to the point the program has reduced conflict around the land uses of the Trench. What lessons can be found in the history of the ER program are:

- Clearly focus on an objective that diverse groups can agree to

- Maintain public oversight and strategic direction of the program
- Follow the findings of science and monitoring so the program to adapt to best management practices and strategies
- Reach out to like-minded groups who have similar landscape goals and form new partnerships. Since the program started the ER program now includes restoration activities with lands held by BC Parks, Canadian National Parks, the Nature Conservancy of Canada, the Nature Trust of BC and First Nations so as to create a true landscape level program
- Adapt to the evolving concerns of the citizens. The ER program now accommodates initiatives in Wildland Urban interface projects, biofuel, invasive plant management and rare and endangered species.
- Maintenance of an active communications strategy to reach the partners and citizens of the valley.

This was a three stop, 4 hour tour for two wheel drive (high centre) vehicles starting and ending within 20 minutes of the Kimberley site:

Stop 1 Kimberley Airport Pasture. Topics to discuss:

- Whether to grow trees or grass on a site.
- Considering biofuel and pulpwood as an alternate crop to saw logs
- Integrating harvest, badgers and interface concerns on a block

Stop 2 and 3 Rouse Pasture along the LD Ranch Rd. Topics to discuss:

- Public reaction to tree cutting on a high use recreation site
- Reaction of Forest Licensee to negative feedback
- Creation of Best management Practices for forest Harvesting in Ecosystem Restoration areas

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Summary of conference evaluation forms

There were 55 people at the conference, and 18 evaluation forms were returned. Not all forms had a response for each question.

1. ***How well did the conference meet your expectation?***

Exceeded Expectations: 6 people
Fully met expectations: 9 people
Met most expectations: 1 people
Met only a few expectations: 1 person
Did not meet any expectations: 0 people

2. ***Suggest two or three key things you learned at this conference, and list anything that you will now do differently in the future.***

- Conference reinforced need for stakeholder consultation and collaboration, good guidelines for stakeholder engagement
- Conference reinforced that effective environmental management requires effective management of people
- Learned that people doing human dimensions work in their jobs often don't have the proper training (eg., to create surveys, effectively engage stakeholders, etc.)
- Made connections with people doing effective human dimensions work
- Candace Batycki's research findings which can be applied to broader picture issues, and environmental education. Interesting to note that absentee landlords, although well educational, are not necessary as attached and aware of the environment around their place, thus are less likely to protect it.
- Howie Harshaw's research methods – proved effective and good model for others to follow
- Appreciated the high-level thinking brought forward by the high-calibre keynote speaker
- Good larger overviews of global challenges and changes that both reinforce my work and give me more sources to research
- First Nations presentations were sited as being interesting, and helped with understanding of what makes for genuine consultation. Seven people said that these presentations will effect her approach to their work in this area, as well as increased their appreciation for it. Some people mentioned general increased awareness of issues First Nations people face in the realm of natural resource management
- Reinforced need for proactive planning in resource management
- Methodologies for engagement presented that proved useful/effective. Three people indicated they will research these methodologies further and aim to implement in their own work

- Bottom-up approaches to resource management seemed to be most effective
- Great details about on the ground local resource management that I will share with people in various fields
- The next steps in my current work will start with a survey, as well as some co-management efforts – I learned many tactical approaches that we will be able to use and met people who will serve as fantastic resources here
- Community-based water monitoring, lots of great tips on how-to
- Theory of Planned Behaviour – this was new to me and will be useful
- Inspiring to be reminded of the need to engage with people respectfully in ways that respect their values and perspectives
- Many conceptual frameworks were interesting such as Social Mapping (Adela Kincaid, Theory of Planned Behaviour (M. Bowes), Active Network Theory (D. Patriquin)
- Increased my awareness of which agencies are actively working on Natural Resource Management (with Human Dimensions in mind.)
- Importance of protecting lakeshoreline from development
- Importance of being cognizant of bylaws in place that I work within when making recommendations to board of directors
- Overduin and Lesheid talk taught me how widespread the watershed management in our area is and needs to be. This will be a great resource to myself and my colleagues
- Increased my awareness and thinking around the complexity of multi-stakeholder projects and problems and the multiple views/interests of people in these problems
- The importance of a narrative/story in influencing human behaviour
- How essential it is to get all stakeholders at the table no matter what level/scale the issue in order to be effective
- Innovative ways to manage beaver damage
- Many resources listed by speakers sited as being great resources for delegates that they will follow-up on/read

3. If we run a sequel to this conference what topics would you like to see included/be addressed?

- The role of science and a shift from positivism (objectivity / subjectivity of science)
- Traditional ecological knowledge, local knowledge
- Transdisciplinarity / interdiscilinarity
- More on human-wildlife conflict

- Narratives, stories, discourse-use in research and practice
- Positive examples of taking action on climate change
- Environmental law
- Solving problems at different time scales (ie., crisis management – short term, and long-term collaboration)
- More methodological approaches to achieving successful collaboration – an entire event just on this
- Green infrastructure/technology development & implementation in communities
- More focus on case-study examples of successful projects, and how to implement the concepts/methods they employed
- Effective land use planning v. development pressures
- Workshop on effective methods of public engagement and public consultation
    - With respect to land use planning
    - With respect to First Nations (numerous suggestions on this one – suggestions that this be the focus of an event in and of itself)
    - Developing key criteria for effective public consultation
- Workshop on facilitation skills
- Presentations that specifically respond to the assertion that wicked problems cannot be solved, they can only be managed – request for presentations that have specific examples of this
- How to sustain one's practice through "wickedness" which can be exhausting, frustrating, even demoralizing
- How to work through difference and conflict. Conflict resolution. (2)
- How to work through/acoomodate the various levels/mind-space/backgrounds that each person shows up with (phychological, cultural, behavioural, social/systemic) – perhaps using Wilbers Integral Approach
- Human Dimensions of Natural Resource Management focused on Non-Governmental Organizations'' work
- Presentations on examples which did not work with explanations on why this was the case – lessons learned
- Addressing the tension between resource protection within context of paradigm of economic growth
- How to deal with personal/professional compromises – the dilemma of a typical resource manager: What we want to do versus what we have to do
- Governance structures for natural resource management
- The role of social phychology and cognitive framing
- HD of cumulative effects management
- More on understanding and influencing human behaviours and environmental ethics, including/or with the addition of best practices for influencing decision-makers

- Focused event on how to shift focus from “managing a resource” to “managing people” providing multi-scale examples
- Would be interested to see more industry-based presentations
- Landscape-level management problems (4)

4. General comments concerning the conference?

- Very well done – thank you and congratulations
- Setting was fantastic, intimate group size, fantastic group of people, very well organized. (numerous!)
- This conference was perfect for networking due to smaller group size and the people who attended. (4)
- Appreciated use of the microphone for questions so that everyone could hear. (2)
- Although I realize time was tight, I would have appreciated a bit more time for questions. Also I thought it would have been nice if people who were asking questions stated their name and their interest/affiliation (ie, forester) as this often provides context to their question
- Thank you for organizing such a well-organized and informative conference
- Would be nice to explore ways of offering conference that reflect ‘living simpler” values (eg., accommodation was extravagant, food likely had a large footprint, etc.)
- Consider more virtual presentations for the future for those who would otherwise not fly in – the face-to-face could come from a small group discussions rather than just Q & A
- Great diversity of speakers from both the applied and research realms
- Really appreciated the times being specifically allocated for networking opportunities
- I left the conference with lots to think about – very thought-provoking
- Attending this conference was a wonderful experience – what a great, positive and influential group of people!

5. The Columbia Mountains Institute is always looking for suggestions for courses and workshops. Our niche is offering continuing education for ecologists, foresters, biologists, and resource managers. Do you have any suggestions for courses or events you like us to organize?

- intermediate course in “R” programming specifically addressing model building
- course or conference on managing and decisions making under uncertainty
- invasive species – aquatic species

- "applied" ecology/biology courses for people who do not have a science background
- conflict resolution
- stakeholder engagement
- how geomorphology/hydrology of the Rockies and other mountains in the Basin will be affected by the expected change in climate. What changes we can make, if an, to prepare for climate change. (ie., equivalent clear cut areas out dated given the expected increase in severe rainfall events, are there too many roads, will rivers silt in, etc.)
- face-to-face meetings of CMI members in each community if possible? Perhaps facilitate gatherings of biologists to discuss current issues, their work, etc. similar to monthly lab meetings/biology beers – a fun platform for local info to be shared informally, and provide community-building.)
- A course on managing your tenure 101
- Land use planning
- Environmental management planning
- EA's & CEAA

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