

BC PROTECTED AREAS RESEARCH FORUM

2013

BOOK OF ABSTRACTS



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ABSTRACTS OF PRESENTATIONS & SPECIAL SESSIONS:

Connectivity (1-3)

Y2Y Conservation Initiative: Connecting Landscapes at the Continental Scale – Wendy Francis, Yellowstone to Yukon Conservation Initiative

Two long-term trends, habitat fragmentation and climate change, threaten biodiversity and the provision of ecosystem services. Establishing networks of protected areas and maintaining connectivity between them is the most recommended prescription for minimizing the impacts of these influences. Conservation planning must occur at the scale at which climate and evolutionary changes occur. The Yellowstone to Yukon Conservation Initiative (Y2Y) is one of the world's oldest and most advanced efforts to establish a large-scale network of protected areas and maintain connectivity between them. Working with a network of more than 125 partners, Y2Y promotes the establishment of new protected areas and their management for biodiversity conservation. Programs also support the mitigation of highway and railway impacts on wildlife, provide education and resources for minimizing conflicts between communities and wildlife, restore and remove industrial access roads, protect private lands through purchase or easement, and, when necessary, oppose inappropriate development. Successful outcomes to date include doubling the extent of protected lands from 10 to 20%, protecting private lands within continentally-significant wildlife corridors, and acting as an inspiration for similar large connectivity efforts around the world. This presentation will review the origins of Y2Y and provide a snapshot of its accomplishments and current activities.

A Conservation Vision for The Peace River Break – Juri Peepre, Yellowstone to Yukon Conservation Initiative

The Peace River Break (PRB) is one of the most ecologically diverse landscapes in the Yellowstone to Yukon Region, yet there are few protected areas, decreasing intact habitat for wide-ranging wildlife species, and a rapidly expanding industrial footprint—including the prospect of a third hydroelectric dam and reservoir on the Peace River. If the pace of development here continues unchecked, this key linkage between two protected cores within the Y2Y landscape could be severed. Y2Y has been working with First Nations, local ENGOS and other local partners towards a shared conservation vision for the region. This presentation will make the case for a landscape scale conservation strategy in the PRB, connecting the Rocky Mountain provincial parks south of the Peace River, with the Muskwa-Kechika Management Area to the north. Recent and proposed research by Y2Y and its partners focuses on wildlife connectivity in the PRB, underpinning the conservation vision for the region. The proposed vision is based on conserving remaining core wildlife habitat along the Rocky Mountains, providing secure wildlife habitat linkages north-south and east-west, and protecting river corridors, while limiting the cumulative impacts of industrial uses. Y2Y envisions protecting the natural and cultural heritage of the Peace River valley, by keeping the river and its tributaries free flowing downstream of existing dams.

Counter Mapping for Conservation: Challenges and Opportunities in the Peace River Break (Research Snapper) – Tim Burkhart, UNBC MA NRES Graduate Student

The Peace River Break is in the north east section of the province situated at the narrowest point of the Rocky Mountain range allowing for critical movement and ecological connections east-west over the Rockies and north-south between the mountain national parks and the Muskwa-Kechika Management Area to the north. The purpose of this research project is to investigate the best practices to a) develop a publically accessible geo-spatial database for the Peace River Break that brings together both community and traditional knowledge and values along with scientific and technical information and b) to develop a prototype for that database. This information will then be used by partners, Landsong Heritage Consulting, Ltd and Yellowstone to Yukon Conservation Initiative to help shape conservation planning and implementation strategies for the Peace River Break.

Protected Areas and Grizzly Bear Fragmentation and Connectivity in Southern BC and Alberta – Michael Proctor, Wayne Kasworm, Chris Servheen and Mark Boyce, Birchdale Ecological

Fragmentation is a threat to wildlife worldwide and managers need solutions to reverse this trend. Grizzly bears, often considered an umbrella and focal species for large mammals and carnivores, in southern British Columbia, Alberta, and northern USA are fragmented by human settlement and highways. In response to current management needs and future challenges associated with climate change, we are working to enhance inter-area connectivity in this region. Our goal is to manage habitats and people in a way that facilitates inter-area bear movement and thus persistence of bear subpopulations across this region. Protected areas in this region cover a significant portion of backcountry land that overlaps a good portion of high quality grizzly habitat and thus have the potential to contribute to backcountry security for this species. We carried out a large-scale fragmentation and connectivity analysis across this broad region. Our fragmentation assessment used 3100 grizzly bears in an individual-based genetic analysis and 800 radio-collared bears following individual movements. Our connectivity/linkage analysis used Resource Selection Function modeling of 40,000 GPS telemetry locations to identify core habitat and Circuit Theory to identify linkages. We evaluated our predictions with empirical data. We present spatially explicit results and discuss them in relation to the role Protected Areas plays in contributing to the entire system of core and linkage areas. One conclusion this work demonstrates is that Parks cannot do their job in preserving ecosystems and ecological processes in isolation and must be considered from a perspective that entails the entire ecosystem.

Next Stop Herschel Island! An ice-free Northwest Passage brings new challenges to an Arctic island – Cameron Eckert, Yukon Parks

Protected Area Carbon Management – Thomas Rodengen, Wolfgang Haider, Marlow Pellat and Karen Kohfeld, Simon Fraser University/Parks Canada

Building on the success of the Climate Change Mitigation in Protected Areas discussion at BCPARF in 2011, this presentation reveals the need to understand where carbon fits into protected area management and how protected area managers can contribute their opinions on the future of carbon management in Canada.

Waning Wetlands: Evaluating the loss of closed-basin ponds in British Columbia's Semi-arid Rangeland – Aaron Coelho, Lance Robinson, Phil Dearden and Grant Murray, Vancouver Island University/University of Victoria

In the last 10-15 years there has been an observed loss of closed-basin ponds in British Columbia's (BC) semi-arid rangelands. The loss of ponds has become a concern for cattle ranchers and may impact endangered wildlife and vegetation. The objectives of this study are to 1) evaluate if ponds located in a semi-arid regions of BC are diminishing and 2) determine if there is a correlation between the results obtained in objective one and climate change. For objective one, satellite imagery from eight sites across BC are being analysed using GIS software. The water surface area of ponds in each site are being mapped from three time periods between 1995 and 2012 to evaluate the change in water body number and size over time. Objective two is based on a meteorological case study of the Lac du Bois grasslands. For closed-basin ponds in semi-arid areas, precipitation, in the form of rain or snow, and evaporation are major components of the hydrological cycle. Precipitation is likely the main form of input and evaporation the main form of output from these ponds. The amount of precipitation in a given year can have a considerable effect on the recharge of ponds. Likewise, the amount of evaporation from a water body is sensitive to changes in weather. Weather data from the Lac du Bois area is being assessed for total yearly precipitation and potential evaporation is being calculated. The data from this study will create awareness of potential problems and assist in future water management decisions.

Connecting Landscapes Through Possibilities, Integrating Ecological Data Using A Soft Computing Framework – Frank Pouw and Mila Kwiatkowska, Thompson Rivers University

Ecosystem management and ecological research rely on our ability to understand the behaviour of natural systems. But the validity of many models used to represent complex ecosystems suffer because of imprecision, uncertainty and sparsity common to ecological data. Additionally, these traditional systems can only incorporate that expert knowledge which can be expressed numerically. These deficiencies exist because the models are built using a Boolean-logic framework and are designed to statistically predict probabilities from sufficient quantities of precise numeric data. Alternatively, “soft-computing” frameworks have been developed to accommodate imprecise data. This talk will present fuzzy logic, a knowledge-based soft-computing approach. It will discuss how Fuzzy Logic has been used in decision support systems for ecosystem management and present its use in our current research on bioacoustic processing. This technique is well suited to ecology because it interprets the meaning of data values and linguistically expresses expert knowledge to predict the “possibility” of an outcome.

Transboundary Connectivity – Tory Stevens, BC Parks

Building on a five year effort in Washington State to identify important places for connectivity, a new collaboration between BC and Washington is focusing on a portion of the transboundary area (the Okanagan – Kettle) at a smaller scale. The intent is to use both focal species and a landscape integrity model to provide decision makers and land managers with tools to help them make more informed decisions to keep landscapes connected. A closely associated project will add future climate into the decision making process by identifying climate corridors.

Managing Protected Areas in a time of change: Focusing in on a moving target – Marlow Pellatt, Parks Canada

As scientists and practitioners we grapple with the challenge of maintaining resilience and ecological integrity in protected areas in a time of unprecedented change. Protected areas are experiencing pressure from urban/rural development, resource extraction, invasive species, pollution, and climate change. The challenge for conservation scientists and practitioners is how to protect current species, features and characteristics; yet plan and act in ways that will allow for species and ecosystems to adapt to significant change in the environment. Ideas such as the preservation of the wilderness primeval in conjunction with the “evolution” of novel ecosystems, or the selection of temporally connected climate refugia will challenge the way we manage protected areas. In this talk I will examine how we can use ecological restoration projects to enhance resilience of ecosystems to promote future adaptation; how temporal connectivity and climate refugia provide the "space" needed to give “time” for adaptation; how assisted migration may well become part of an adaptive management strategy for protected areas; how management for ecological integrity may provide the opportunity for increased carbon sequestration. These topics are becoming more common among protected area practitioners and no doubt will influence future management actions.

Canadian Parks and Protected Areas: Helping Canada Weather Climate Change– Eva Riccius, BC Parks

The Canadian Parks Council Climate Change Working Group has explored the role of protected areas in climate change adaptation. These include protecting safe havens, connecting and restoring landscapes and seascapes, protecting ecosystem services, supporting healthy communities, and inspiring and engaging Canadians by building knowledge and understanding of impacts and solutions. The working group has representatives from Parks Canada and from nearly every province and territory across the country. Practical examples from around the country will illustrate the various roles played by protected area systems.

Human Dimensions (1-3)

Archaeological Considerations in Park Management: A Little Goes a Long Way – Christine Mueller and David Archer, Northwest Community College

Archaeological resource management, though generally considered to be an important issue, often results in less than optimum outcomes. This presentation looks at one successful example, the 2010-11 Boardwalk Replacement Program on the Lucy Islands or Lax Spa'na, a small offshore archipelago west of Prince Rupert. The project accomplished two important goals: firstly, it used a method of construction that resulted in zero impact on the local archaeological resources; and, secondly, it included a basic assessment of those resources, greatly enhancing our understanding of the Lucy Islands and their role in the past lives of the region's inhabitants. There is now evidence for human occupation of the Lucy Islands beginning over 9,000 years ago, making it one of the oldest known sites on the north coast. Moreover, there is further evidence from a related DNA study that the inhabitants of this site some 6000 years ago have a direct genetic connection to the modern indigenous population of the area. The success of this project reinforces the value of conservation efforts for all archaeological sites in this province, regardless of size or location.

Connecting ecological and experiential landscapes: A coupled ecological – social system for recreational fishing in BC. – Wolfgang Haider (SFU), Kora Dabrowska (SFU), John Post (U of Calgary) and Murdoch McAlister (UBC)

By definition, sport fishing, as a consumptive recreational activity, is a very resource dependent leisure pursuit, in which the quality of the resource strongly influences angler satisfaction and their types of experiences. The mandate of management agencies is a dual one, as they are charged with looking after the resource, and provide satisfactory experiences for anglers. Consequently they need ecological information as well as information about anglers. So far relevant data collection and analysis are often undertaken separately for ecology where anglers might be perceived as top predators, or social science research on anglers is isolated from solid appreciation of the resource. Yet the reality is a continuous relationship of feedbacks between the two. Therefore we have embarked on a multi-year interdisciplinary research project that culminates in a coupled social-ecological systems model accounting for the constant feedback between the two

systems, in this case for lake trout and kokanee in BC. This presentation will focus on the human dimensions aspect of the project, present some crucial aspects of relevant data collection, including a choice experiment, and explain how the social model will be coupled with the ecological models, which ultimately will work as a spatially explicit simulation model across the entire landscape of freshwater lakes in BC.

Conservation Management of Complex Landscapes: Balancing conservation of species and ecosystems at risk with human use – Leanna Warman, The Nature Trust of BC

The Nature Trust of British Columbia, a leading land conservation organization in BC, is working on an exciting conservation project that will have positive implications for management of species at risk in a landscape with varied land tenure. A recent acquisition by The Nature Trust of BC has increased the White Lake Basin Biodiversity Ranch to 8463 hectares of private land, leased federal land, and provincial Crown grazing license. The grazing license also overlaps an adjacent 3745 hectare Provincial Park. The White Lake Basin is a critical biodiversity area with one of the largest intact grasslands in the South Okanagan region of BC. Our goal is to conserve and restore natural grassland and associated ecosystems thereby enhancing contiguity and resiliency of the landscape and supporting both a diverse, thriving community of native plants and animals, and a viable cattle ranching enterprise. The management of this landscape involves a conservation organization, Federal and Provincial government agencies, and a livestock ranch. This situation offers a rare opportunity to investigate some of the challenges of implementing recovery plans for multiple species and ecosystems at risk, under the federal Species at Risk Act legislation, on a working ranch. An ecosystem-based management plan is being prepared with the intent of taking a proactive approach to address multiple overlapping species at risk requirements and socio-economic interests of a cattle ranch. Issues related to these seemingly divergent, yet predominately complementary goals are being addressed through research, monitoring, and consultation with species at risk experts.

Estimating annual participation and use rates for mountain based outdoor recreation for British Columbia – Steve Kux and Wolfgang Haider, SFU

Given the extensive nature of outdoor recreation activities, estimating the number of users and intensity of use is a challenge in all cases. The challenge magnifies in proportion when administrative units become very large, as in British Columbia, and when the majority of these activities take place in remote or very remote locations, as is the case for mountain-based recreation activities. Yet these were precisely the questions that the BC Federation of Mountain Clubs desired to have answered. In order to manage this project within very limited funds, we used a randomly selected internet panel of 1000 respondents to record the participation and frequency of participation in a long list of activities. Additional questions also allowed the estimation of typical distances travelled for the respective activities, as well as the expenditures associated with these activities. This presentation will explain the method and provide an overview of the results, including main comparisons between user groups, and the regions of BC.

Research in Progress: Effects of special natural places on human wellness, experience, and values – Don Carruthers Den Hoed, University of Calgary

While conservation is the main goal of parks, these special places also provide economic, social, and personal benefits. Recently, a growing body of academic literature and popular initiatives such as Healthy by Nature indicate that nature as a health intervention is appealing to park managers hoping to increase the relevance of protected areas. This talk will overview my PhD research examining the effects of experiences in nature on human health and wellness, and on the connection with the natural world felt after nature experiences. Unlike many studies, which often lump all natural experiences under the heading of "green" or "forest" this research will also consider effects of presenting sites as special, such as parks or sacred sites. In the first phase, I will interview managers, board members, and elders about special natural places (parks, conservancies, and sacred sites) in the eastern slopes, and how these sites are differentiated from non-special natural places. In the second phase, participants will have one-hour experiences in an urban setting and in a "special" natural place. This will allow comparison among participants who visited different sites, whether parks, sacred sites, or non-designated sites. Pre- and post-experience testing will measure changes in stress levels through blood pressure, heart rate, and cortisol (stress). Questionnaires will assess connectedness to, and values of, nature. Finally, data will be analyzed for indications that participants hold anthropocentric views of nature. Finally, data will be analyzed for indications that participants hold anthropocentric views of nature, and if different designations of special sites results in different healing or transformative experiences.

In the Shadow of Machu Picchu – Joe Pavelka, Mt. Royal University

The iconic Peruvian cultural site of Machu Picchu has grown in popularity in the past 15 years, with considerable support from throngs of Western tourists. The most common way to access the site is by train, but trails leading to Machu Picchu are similarly increasing in popularity. The primary trail is the famous Inka Trail although it is recognized to have reached peak capacity. The Salkantay Trail (a five-day trek reaching 4,600m) is recognized to be the next 'approved' trek to the site. Unlike the Inka Trail the Salkantay weaves through a working landscape of villages where local residents struggle to understand how they fit into the tourism economy. This presentation draws upon: a quantitative study of perceptions of the trail and its future by trekkers along the trail; a three month community development project in the area; and over ten years of consistent observation and contact with residents of the trail to provide unique insight into the development of a 'new' trail. The presentation will provide a broader context of development and demonstrate the inextricable connection between landscapes - Machu Picchu and trail development; the complexity of tourism and culture management in a developing country, and the important role tourists play in shaping livelihoods and policy. Research shows Salkantay trekkers seek authenticity, residents prefer to deal with independent trekkers and tour companies wish to see the route 'controlled'. Data suggests somewhat of a contested future for the trail as the government moves to make it the official 'overflow' trail.

Carrying Capacity of Provincial Parks in the Sea-to-Sky Corridor (Research Snapper) – Katy Chambers and Joanna Hirner, BC Parks

Provincial parks in the Squamish-Whistler (Sea to Sky) corridor are seeing exponential growth in use, in back- and front-country areas and in all seasons. For example, in Stawamus Chief Park near Squamish, up to 2,500 people per day have been counted on the Chief Backside Trail. In Garibaldi Park, the Garibaldi Lake backcountry camping and hiking area is estimated to receive ~15,000 visitors per year. BC Parks has few methods in place to manage this high use, and has not assessed how much use these parks can take before impacts on environmental values and visitor experience become unacceptable. Issues include crowded trails, shelters and camping areas, and overflowing parking lots. In addition, some high use facilities are located in sensitive habitats, such as subalpine/alpine meadows where vegetation can take decades to recover from impacts. It is inspiring to see so many people enjoy the parks, but at what cost? How can park managers best use limited resources to ensure high quality visitor experience and minimal damage to the environment? BC Parks is seeking advice and research interest from the academic and park management community to explore and answer questions around carrying capacity in Sea to Sky corridor parks. Specifically: 1) What kind of impacts is high use having on environmental values, visitor experience, park management, and the wider community?; 2) Can we determine a carrying capacity or limit to acceptable use for these parks?; and 3) What methods can we use to manage use within acceptable limits?

Connecting Landscapes: an Examination of the Role of Protected Area Governance – Rick Rollins (VIU), Grant Murray (VIU), Alex Kisingo (College of African Wildlife Management), Phil Dearden (U Vic) and Marlea Clark (U Vic)

Protected Areas are an important vehicle for conserving biodiversity, as well as providing many direct human benefits, such as tourism, and support for local livelihoods. However conservation science has demonstrated that protected areas can be more effective in meeting these objectives, if they are better connected to surrounding biophysical and human landscapes. A key factor is the role of protected area governance, defined as “the processes that determine how decisions are made, and how stakeholders have their say in the management of protected areas.” In this study we examined the characteristics of good governance, and how to measure it. We noted that most studies have used qualitative methods, but few have employed a quantitative technique. Accordingly we developed a questionnaire derived from a review of the literature, key informant interviews, and focus groups. This study was undertaken in the Serengeti region of Tanzania, in East Africa, with a random sample of 389 individuals selected from six communities during 2012. Factor analysis was used to group governance related statements into 10 coherent factors that demonstrate high psychometric validity as measured by factor loadings, explained variance, and alpha reliability. Overall, scores on each of these governance factors were low to moderate, indicating specific areas for improvement. In BC there is a similar need to expand conservation strategies beyond park boundaries, requiring effective engagement with nearby communities. This study provides a methodology to evaluate and support that process.

Application of a landscape level ecosystem-based management Governance Assessment Framework To The Southern Gulf Islands, BC: Some preliminary findings – Carleigh Randall, VIU, Lance Robinson, Phil Dearden (U Vic), Grant Murray (VIU), Rick Rollins (VIU) and Leslie King (VIU)

This paper reports on the preliminary findings of an application of the Governance Assessment Framework, a new, proposed tool to understand governance structures and processes within landscape level ecosystems that are larger than parks and smaller than provinces. The overall aim of the larger project was to develop a governance assessment framework for ecosystem-based management at the landscape level and test the outcomes in several case studies in Africa and Canada. This paper reports on one of these case studies, and presents preliminary results of the governance assessment for the Southern Gulf Islands, (SGI) in British Columbia, Canada. Preliminary results reveal a highly complex jurisdictional and governance environment, consisting of multiple federal, provincial, regional and local governments. Various stakeholders' values are identified and where these values diverge and converge provide a challenging governance environment. Preliminary assessment of the governance structures and processes that mediate these myriad values is discussed.

Exploring the Potential for Tourism Related Payment for Ecosystem Services in Tla-o-qui-aht Tribal Parks – Dani Burrows & Carleigh Randall (VIU)

New approaches to conservation, such as Payment for Ecosystem Services (PES), are being embraced as they have the potential to effectively reflect the importance of and valuation of ecosystem services and act as a means of sustainable revenue generation. However, as a relatively new concept, there are few case studies in existence that have documented its success and limitations. The potential use of PES as a conservation mechanism in a First Nations context presents some additional analytical opportunities relating to cultural views and traditions, sovereignty and land ownership. These are potential key factors in the application of PES strategies and ones that have not been addressed specifically in relation to tourism. This study examined the role of a tourism related PES scheme within Tla-o-qui-aht Tribal Parks. Specifically the potential of a PES scheme to generate tourism revenue and contribute to the economic, environmental and cultural sustainability of Tla-o-qui-aht Tribal Parks was addressed. Several key challenges such as: cultural differences, program structure and communication and successes such as: outfitter and tourism support and conservation awareness/benefits, regarding the PES scheme emerged from the semi-structured interviews with key Tribal Park and tourism outfitter informants.

An Ad Hoc Approach To Cultural Heritage Site Protection In Desolation Sound Provincial Park Lessons Learned While Building Culturally Appropriate Kayak Campsites – Dylan Eyers, BC Parks

Over the past number of years recreational users and park manager have caused inadvertent impacts to significant cultural heritage sites throughout Desolation Sound Provincial Marine Park. Cultural sites such as burial caves, midden sites, fish harvest features and culturally modified trees have suffered notable impacts as a result of traditionally accepted park management practices and recreational uses within

the marine park. In 2011, BC Parks received a strongly worded letter to from Chief Williams of the Sliammon First Nation urging BC Parks to do a better job of protecting cultural heritage values within their traditional territory. Shortly after BC Parks initiated the Cultural Site Protection Plan and Recreation Site Development Project (CURE). Working collaboratively with First Nations, archeologists, the academic community, and commerci kayak community, BC Parks was able to develop culturally appropriate designated campsites to divert recreational use away for culturally sensitive areas. Dylan Evers, led the project, and will discuss the challenge and success of the CURE project, while identifying the large gaps where further research is required to improve the protection of cultural sites within protected areas.

Protecting BC's Landscapes from the Godzilla's of the Invasive Species World (Workshop)

Inter-ministry Invasive Species Working Group – Judy Miller, BC Parks

Judy will introduce the Inter-Ministry Invasive Species Working Group (IMISWG) and what it does. The group is sponsoring this Invasive Species Workshop. The IMISWG is a provincial government group that coordinates a wide range of activities on crown land in BC. The group collaborates on priority species management, research, biocontrol, legislation, regulations and policies. It develops the provincial strategic plan, the Early Detection and Rapid Response plan and determines the status of noxious weeds for the BC Weed Control Act Schedule A. The group also includes the management of aquatic invasive species, rapid response and legislation/regulation such as the Controlled Alien Species regulation. The IMISWG works closely with the Invasive Species Council of BC and the regional invasive species committees throughout the province.

A New Direction Using Old Principles: Understanding Plant Biology and Ecology to Control Evasive Species – Catherine Tarasoff, Michigan Technological University/Thompson Rivers University

Invasive species control and ecosystem restoration have been marred with many examples of failure. Invasive species continue to spread at an alarming rate, and restoration attempts often do not meet our management objectives. Could it be that prioritizing restoration objectives above understanding the biology of the weedy invaders is limiting our success? Using an example from my current research portfolio, I will describe how I have incorporated the fundamentals of Ecologically-Based Invasive Plant Management (EBIPM) with Weed Science to research a new control method for yellow flag iris.

Here Come the Greys (yet again!) – Karl Larsen

The Eastern Grey Squirrel is considered one of the top 100 invasive species in the world, having had considerable impacts on ecosystems on different sides of the oceans. Here in BC, this species has firmly established itself on the west coast of the province and now it is doing the same within the province's interior. A lack of an immediate control response has allowed the animal to begin spreading throughout the Okanagan valley. As with many invasive species, it is difficult to construct a concrete, definitive forecast of exactly what effects this animal will have in this region. However, the plastic nature of this animal and its notoriety as an invasive species suggests impacts of some sort will happen. Of particular (and perhaps, academic) interest will be the interaction seen when grey squirrels expand and contact the Eastern Fox Squirrel, yet another introduced squirrel species that has been residing in the south Okanagan for some time.

Big Bad Invasive Plants: Knotweed and Giant Hogweed – Joanna Hirner, BC Parks

Giant hogweed (*Heracleum mantegazzianum*) and knotweed species are invasive plants that are particularly problematic and widespread in the South Coast region of British Columbia. Knotweed species threaten biodiversity by outcompeting native plants and increasing soil erosion potential in riparian areas. Knotweeds can also have serious economic impacts because they can grow through walls and concrete and threaten infrastructure. Giant hogweed causes important ecological impacts by outcompeting native plants, particularly in riparian areas. This invasive plant is also a public health concern because its sap can cause burns, blisters and scarring when in contact with skin. Both of these plants are challenging to control: giant hogweed has prolific seed production and dangerous sap, and knotweed grows and spreads quickly via rhizomes and can regenerate from even a tiny amount of plant material left in the ground. In this talk I will present examples from the South Coast region of the problems these invasive plants have caused, and how these species are being managed. This will include examples from parks and protected areas, and the implications of these plants for park management will be discussed.

Impact of Invasive Fishes on Protected Areas in BC – Brian Heise, Thompson Rivers University

Introduced largemouth bass, smallmouth bass, yellow perch and northern pike have the potential to cause extirpation of native fishes in small lakes in BC. Even yellow perch, the smallest of these fish species, consume out-migrating juvenile salmon, and juvenile rainbow trout. Recent research in Okanagan lakes has shown that perch diets vary from lake to lake depending on habitat and the presence of predators. Control of perch and bass in small lakes is best done using the piscicide rotenone. For larger lakes and those containing valuable fisheries, prevention through education is the only answer. Attempts to maintain natural fish communities in protected areas are hampered by the desire of some members of the public to create fishing opportunities for bass and perch. Early detection of invasive fishes in watersheds when abundances are low may be helped by monitoring with eDNA; the application of this technique is a priority research area.

Invasive Ants of British Columbia – Robert Higgins, Thompson Rivers University

Cold Canadian winters have long provided the free ecosystem service of limiting the distribution of invasive insects, especially exotic ants that are typically temperature sensitive. The identification of the Argentine ant (*Linepithema humile*) in Victoria in 2013, however, is an indicator that such protection is weakening. The Argentine ant is not alone. In 2010 the European fire ant (*Myrmica rubra*) was identified in North Vancouver and is now known to be established in many locations in southwestern BC, including parks in Richmond, Vancouver and North Vancouver. An economic impact assessment commissioned by the province of BC suggested that costs of \$100 million/yr may be incurred if this species spreads across its potential range. Further, an additional European *Myrmica* species has just been confirmed that appears to have spread extensively without notice until this year. Parks and protected areas are both at risk from these introductions. Recreational use will be constrained and biodiversity impacts are likely. In this presentation, I will discuss these new arrivals, their impacts and early attempts at control.

Invasive Species Council (ISCBC) and Invasive Species Prevention – Jennie McCaffery, ISCBC

The ISCBC is a registered charity whose vision is to have BC's landscapes, communities and businesses free of the negative impacts of invasive species. The ISCBC is focused on prevention, through promoting education and awareness, and improving operations that decrease the economic, environmental and social impacts caused by invasive species. The ISCBC facilitates collaboration among all parties including governments, First Nations, business and communities to seek joint solutions that help increase economic viability, environmental resilience and decrease impacts to BC citizens. Prevention is key, the ISCBC works to prevent further introduction and spread of invasive species through targeted educational and operational programs that are employed provincially.

Urban Parks (Workshop)

Planning for the Establishment of Regional PAs in the Capital Regional District -Jeff Ward and Lynn Wilson, Capitol Regional District Parks

Just over half the world's people live in cities and this proportion is expected to increase to about 60 percent by 2030 (IUCN). In North America the ecological, social and economic impact of people living in major metropolitan areas extends beyond the urban, suburban and rural settlement area to create a regional footprint. This footprint results in an increasing consumption of natural areas and loss of biodiversity and ecosystem services to land uses needed to sustain the regional population growth. There is a real imperative to address the establishment of a system of protected areas in metropolitan regions. The Capital Regional District is the second most populated metropolitan area in British Columbia. The CRD is a desirable place to live and the region's population is expected to increase from the

current total of 365,000 to 475,000 in 2038. The regional footprint of people living in the CRD's settlement areas will impact existing regional parks and increase pressure to convert natural areas to settlement land uses. The idea of establishing a system of protected areas in the CRD dates to the 1950's. Through regional park strategic planning over the past 20 years the CRD has addressed the need for protected areas in this growing metropolitan region. This presentation will highlight the need for planning for protected areas in a metropolitan regional setting, CRD's actions to establish a system of protected areas for both the conservation of regionally significant natural areas and outdoor recreation and CRD's initiative to conserve at least half of the region's land base for nature.

Imagining Urban Parks of the Future (Discussion) – Joe Pavelka, Mt. Royal University

Urban parks are an increasingly important part of our daily landscape and how most of us connect with nature on daily basis. We accept the value of consistent connection with nature and given that over 80% of Canadians live in cities, urban parks are a focus for that connectivity. We also recognize that broader patterns of park use are changing, including a decrease in backcountry activity in most national and provincial parks, and a demographic profile of Canadians that is getting older (and younger) and more ethnically diverse which translates into non-traditional demands on natural spaces and a growing emphasis on urban rather than wilderness parks. In the past three decades urban parks have evolved to occupy a key role in connecting people with nature, but the urban park has itself evolved to reflect changes in consumer culture, development ideals, and notions of the livable city. The urban park, more so than a wilderness park, exists as a dynamic reflection of society including our collective aspirations and fears. The focus of this presentation is the community consultation component of the ImagineParks 2040 project to provide a vision of Calgary's parks and open space thirty years into the future. Data from nine focus group consultations are presented in a themed format that provide unique insight into the urban park of the future including the myriad challenges (and possible solutions) understood that lay ahead for urban parks and agencies. This session will appeal to a variety of parks and planning oriented audiences.

Whitebark Pine Recovery and Restoration (Workshop)

Whitebark Pine – Challenges and Opportunities for Species Recovery – Randy Moody, Keefer Ecological Services

Whitebark pine is a keystone species of treeline ecosystems. It has a mutualistic relationship with the Clark's Nutcracker, a bird that is nearly exclusively responsible for distributing the seeds of the tree on the landscape. Whitebark pine is also an important food source for small and large mammals such as red squirrels and grizzly bears. Whitebark pine has been classed as endangered under the federal Species at Risk Act due to the existing and potential impacts of white pine blister rust, mountain pine beetle, and climate change. The main cause of decline, white pine blister rust, is an introduced pathogen to which whitebark pine has little resistance. Since rust occurs throughout the Canadian range of whitebark pine, simply protecting populations of whitebark pine will not suffice to save the species as rust impacts will continue to occur. Pro-active management, such as screening for resistance to blister rust and planting seedlings, is required for species recovery. Working on recovery programs within protected areas poses challenges due to access and activity constraints that may not be present on other portions of the landbase.

The Importance of Protected Areas to Whitebark Pine Recover: The case for restoration in parks - Adrian Leslie, Selkirk College

Abstract to follow.

Bats, Bugs and Toads!

Looming threats for bats: White Nose Syndrome and Wind Turbine Impacts – Cori Lausen, Wildlife Conservation Society Canada

Wind turbines and White Nose Syndrome (WNS) have killed millions of bats in North America within the past decade. WNS alone has killed nearly 7 million bats in eastern North America since 2007, and it has been estimated that wind turbines have killed at least 2 million. There is increasing urgency to establish baseline data about bat diversity, relative abundance and habitats. Our protected areas may provide locations for long term monitoring of trends to assess cumulative impacts of wind energy development and WNS die-back. As part of several long term bat research projects, I have conducted inventory and radiotracking in or around more than a dozen provincial parks over recent years. I report on both summer and winter species diversity with special emphasis on winter bat ecology as it pertains to preparing for the arrival of White Nose Syndrome. Of the 16 bat species in this province, 13 are thought to hibernate in B.C. and are thus at risk of WNS; two are thought to migrate out of the province for winter and may be at high risk of wind turbine mortality; and one is thought to do both, migrating shorter distances to hibernate in southern or coastal areas of BC. I present an overview of a province-wide winter bat ecology study, and highlight the role that parks could play in this large scale bat conservation effort.

Drug from the dark: Potential of cave microorganisms in drug discovery – Naowarat Cheeptham, Thompson Rivers University

Caves have been little studied for their potential as sources of novel microbial species and bioactive compounds with new scaffolds. In such low nutrient recycling environments, community relationships among organisms and their potential utility are poorly understood. We present the first study of cave microbiology from a number of caves in British Columbia and suggest that these habitats have great potential for the isolation of novel bioactive substances. Over 500 bacterial and fungal isolates were obtained from the caves. Plug assays were employed to screen for the production of compounds with inhibitory activity against a wide range of pathogens. Chemotaxonomic study and phylogenetic analysis of bacterial isolates were conducted for preliminary identification. A number of the cave bacteria tested demonstrated active antimicrobial activities against the target microorganisms with each unique inhibitory pattern. SEM showed the presence of microscopic life forms in rock and wall samples tested. 16S rRNA gene sequences revealed that 90% of the selected bacteria isolated from Helmcken Falls cave belong to the Streptomyces genus and the remaining 10% were Bacillus, Pseudomonas, Nocardia, and Erwinia genera. Some isolates showed a similarity to unidentified ribosomal RNA sequences in databases. We also have data from other studied caves in BC.

Once a Spadefoot Always a Spadefoot? Movement and habitat use of the Great Basin Spadefoot (*Spea intermontana*) at its northern limit – Jocelyn Garner

The Great Basin spadefoot (*Spea intermontana*) ranges from Arizona to British Columbia (BC) in western North America, being typically associated with arid environments. However, at the northern limit of the species (south-central BC; 51°18'11" N, 121°23'51" W), the ecosystem contains only small patches of grassland interspersed within a forested landscape, and the climate is relatively cool and wet. Due to the threatened status of spadefoots in this region, breeding ponds have been identified, but effective management will require broader data on habitat use away from these bodies of water. Using telemetry, we examined movement patterns and determined habitat characteristics for these animals surrounding diurnal retreat sites. Despite the rarity of these animals, over two years we were able to track 19 spadefoots for varying lengths of time. The telemetered spadefoots showed periodic, eruptive movements, where single or multiple retreat sites were utilized for a period of time, prior to larger movements that took the animal to another area (with another set of retreat sites). Often retreat sites were used repeatedly; individuals would emerge to forage, travel to breeding ponds, and/or utilize other sites, sometimes retracing their movement patterns over large distances. The average maximum distance from breeding ponds was 140 m, although some individuals ventured up to 370 m from aquatic habitat. Spadefoots selected for retreat sites with higher proportions of bare ground and rock, suggesting that spadefoots at this location are, like conspecifics further south, still tied to habitat characteristics of arid environments. Management strategies should account for these habitat preferences within a protected terrestrial zone of at least 140 m from aquatic habitat.

Healthy by Nature (Workshop)

Building on the global *Healthy Parks, Healthy People* initiative, Healthy by Nature is a Canadian-led effort to deliberately investigate and take meaningful action towards improving public health through increasing access to nature. Healthy by Nature is built on three key principles:

- Spending time in nature improves human health;
- Human health depends on healthy ecosystems;
- Parks and protected areas contribute to vibrant, healthy communities.

During this panel, three different approaches will be presented showcasing different ways that parks professionals and researchers are taking action on these principles. The panelist will share their approach, current outcomes and future directions.

1. Healthy by Nature in a Northern BC Context - Pam Wright, UNBC
2. Effects of “Special” Natural Sites on Human Wellness, Experience, and Values - Don Carruthers Den Hoed, Alberta Parks
3. BC Parks and the Cross-Government Healthy by Nature Working Group – Eva Riccius, BC Parks

Disturbance and Restoration

Pines, Grass and Fire – Don Gayton, Min. FLNRO

Ponderosa pine (*Pinus ponderosa*) ecosystems in British Columbia have high concentrations of biodiversity and species at risk, yet they are poorly represented in BC's Parks, Protected Areas and Ecological Reserves. Numerous studies suggest frequent, low-intensity fire was a historical disturbance pattern in this ecosystem type, and that many Ponderosa sites are now substantially departed from their traditional disturbance regime. Fire history was analyzed in the Trout Creek Ecological Reserve (ER) near Summerland, BC, a 75 ha parcel in the PPxh1 biogeoclimatic variant. Using fire-scarred trees and stumps, the author determined historical fire return interval and degree of current departure. Ecological implications and management options are discussed, for the ER and for southern Interior Ponderosa sites.

Haynes Point Restoration Project – Kirk Safford, BC Parks

Haynes Point Provincial Park on Osoyoos Lake contains the southernmost shrub/steppe, riparian, and wetland ecosystems in the provincial park system in the warmest and driest part of the country. These ecosystems are provincially red listed as they have seen dramatic declines in the Okanagan valley over recent decades. Since European settlement of the valley, the vegetation communities of the park have undergone substantial change driven by a number of factors, including lake water level control, surrounding agriculture and urban development, recreational development and introduction of invasive species. The general vegetation trend since has been an increase in tree canopy and shrub layers that are currently dominated by non-native and invasive species. BC Parks has initiated a long term (10+ year) restoration project with partners to shift the trajectory

from increasing non-native trees toward native vegetation communities relevant to current site conditions. Challenges will be discussed.

How To Manage Ponderosa Pine Ecosystems In BC's Protected Areas After The Pine Beetle – Alan Vyse, Thompson Rivers University

Ponderosa pine (*Pinus ponderosa*) ecosystems are relatively rare and biologically important in British Columbia. Small areas of this ecotype are protected by National, Provincial and Municipal agencies, communities and private conservation organizations. Active management by these groups has taken the form of efforts to reduce forest fire hazard and enhance habitat for specific animals through thinning and prescribed burning. Future management efforts in these protected areas are in question because the recent mountain pine beetle (*Dendroctonus ponderosae*) epidemic. Almost all of the larger pine trees (>30cm) were killed over thousands of hectares of ponderosa pine forest in the northernmost portion of the range, including pine forests in protected areas. What are the implications for future management of protected areas in both affected and unaffected areas? I will report results of a detailed study by the TRU ponderosa pine study of twenty two ponderosa pine stands in the Thompson, Nicola and south Okanagan valleys, twelve of which experienced severe mountain pine beetle mortality. Future management practices will be discussed.

East Kootenay Trench Restoration – Mike Gall, BC Parks

Balancing the recreational and conservation mandates of BC Parks presents many ups and downs to park managers. Mike will take you on a rock and roll trip over 14 years of ecological work in the East Kootenay Trench, and show you what 2 million dollars worth of restoration means to endangered plant communities. This presentation offers suggestions, innovative measures, tips, humour, and insights into managing ecological restoration on open forest grasslands. Discover the species at risk that benefit from this work and how it all fits into the bigger landscape unit level picture. Historical perspectives and modern day challenges for this work are a trip in themselves!

First Nations Guided Experiences as Essential for Sustaining Protected Areas: The Stein Valley Nlaka'pamux Heritage Park (Roundtable Discussion)

The session is a roundtable discussion that builds on past work of Thompson Rivers University (TRU) and Lytton First Nation (LFN). In 2008-11, they worked together to deliver a First Nations guided experience into the Stein Valley Nlaka'pamux Heritage Park. The discussion is aimed at building on this experience, and suggesting that First Nations guided visitor experiences can contribute to mutual respect and understanding, reconciliation among First Nations and non-First Nations peoples, and is ultimately essential for connecting the cultural, social and political landscapes for protected area opportunities and challenges ahead for all peoples.

- Rob Hood, Thompson Rivers University
- Ruby Dunstan, Lytton First Nation
- Karen Dunstan, Lytton First Nation

Partnerships and Perspectives

Failing To Plan Or Planning To Fail A Case For A New Vision For Protected Areas In BC – Mike Fenger & Jenny Feick, Friends of Ecological Reserves

Given climate change, the pace of natural resource development in British Columbia and economic factors, the Friends of Ecological Reserves (FER) see an urgent need for a robust new protected areas conservation strategy, including their role within their current and future landscape and climate context. Strategic regional land use and natural resource planning with full involvement of First Nations as well as stakeholders in the private, public and civil society could provide a means to collaboratively craft a vision for our collective shared future. A strategic planning process can determine what optimum conservation/development options exist for public lands/FNs lands and decision-making criteria. British Columbians have a unique and important opportunity. The province has the largest and most intact remaining ecosystems remaining in North America in the least developed landscapes south of the 60th parallel. The outdated strategic land use plans of the 1990s that established the current Protected Areas along with the conservation measures in the former Forest Practices Act (such as Old Growth Management Areas, Wildlife Habitat Areas and riparian reserve protection), which dealt with the matrix between Protected Areas did not consider climate change effects or the pace and scale of cumulative effects. Accelerated natural resource development in a period of global climate change warrants an equally accelerated process to address strategic conservation values before choices 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. The current and future role of ecological area in light of climate change needs to be considered as part of a new BC protected areas conservation strategy.

Ecological Reserves fulfilling their Mandate for Research and Education – Garry Fletcher, Friends of Ecological Reserves

When Ecological Reserves were first being set up from 1974 on, some universities and colleges in British Columbia went to great lengths to involve their faculty and students in baseline research and ecological documentation. Currently, with the onset of changing environmental conditions, and advances in remote sensing technology, there is a strong case to be made for getting back into the field to revisit the reserves to follow up, and add new benchmarks to previous baseline monitoring. The potential for Research in the Race Rocks Ecological Reserve will be presented to demonstrate the accessibility for research in a marine ecological reserve where the unique situation of on-sight housing is available. The ability of the Friends of Ecological reserves website to reveal the history of past research and to document further research in the province's Ecological reserves will also be highlighted.

The Galiano Learning Centre: a multi-use approach to conservation – Keith Erickson, Galiano Conservancy Association

The Galiano Conservancy is developing a Learning Centre on a 76 hectare parcel of land as part of the recently completed Mid Galiano Conservation Network. The property has a high conservation value, featuring over 2 km of waterfront with old growth Douglas-fir forest, rolling topography with mixed forests, wetlands and a vernal spring, and a connection to the Conservation Network. In addition to its conservation value, the Learning Centre property is important culturally, and will provide the venue for many youth to reconnect with nature and learn to live in a sustainable way. The Learning Centre highlights a non-traditional approach to land conservation: allowing for multiple-use zoning to incorporate human uses of the natural resources and education programming with restoration and preservation of the land. The management plan for the land follows the Principles of Ecosystem Based Conservation Planning, and stands to serve as a leading example in collaborative conservation planning. The land was evaluated in terms of its ecological integrity, cultural history and community and Conservancy values. We will discuss the collaborative planning efforts that went into the creation of the management plan, and the potential benefits of using the Learning Centre as a case study for regional conservation planning.

Using Remote Sensing Cameras to Answer Operational and Inventory, Monitoring and Research Questions (Roundtable Discussion)

Scott Back & Anna McIndoe, BC Parks

The use of remote sensing cameras in the natural resource sector is increasing dramatically. This is likely due to the technological advancements and affordability of cameras. There are many different uses of these devices ranging from answering operational questions about recreation use and compliance to Inventory, monitoring and research questions about wildlife. Researchers commonly use animal occurrence data collected with VHF-radio and GPS collars to understand the movements and distribution of animals. Although a powerful technique for revealing animal movements and the co-occurrence of predators and prey, the purchase and deployment of animal collars is costly and invasive. Cameras are particularly useful when deployed at locations where the occurrence of an animal is predictable. They can also be used to identify the co-occurrence of predators and prey. These devices may not provide the same amount of animal occurrence data as a GPS collar but they can provide useful insights into the movements and distribution of wildlife at a much lower cost and with fewer risks. The discussion will begin with a short presentation on remote sensing camera projects in the Northern Region of BC Parks. Participants will then be broken into smaller groups to explore questions related to the different types of uses and limitations of using remote sensing cameras. The discussion will be a benefit to participants interested in learning about the use of remote sensing cameras or participants already involved in using cameras wanting learn about how others have designed their camera project.

POSTER ABSTRACTS

Cold, Dark and Dynamic: The identification of psychrophilic fungi in Nakimu caves -

Baylee Out (TRU), Sarah Boyle (Mt Revelstoke and Glacier National Parks), Naowarat Cheeptham (TRU)

The Nakimu caves of Glacier National Park are an extreme environment with limited nutrients, a constant cold temperature and no light. Fungi are important members of this cave ecosystem and as a result of their adaptation to harsh conditions, become a source of novel metabolites such as antimicrobial agents and bioactive metabolites, which have the potential for industrial importance. This project is the first mycological investigation of the psychrophilic fungi in the Nakimu Caves of Glacier National Park. Twenty nine soil samples and twenty six surface swabs from the cave were cultured on Sabouraud agar at 4°C for up to eight weeks to draw out the varieties of psychrophilic and psychrotolerant species in the soil from the cave's twilight, transition and deep zones. The fungi were characterized morphologically, using Rose Bengal agar and spore staining, followed by IST sequencing of fungal DNA, which is the standard barcode region of DNA to determine the species of fungi living in the cave system and the relation between the cave's fungal flora from the 65 cultured isolates.

Isolation Of And Screening For Potential Antibiotic Producing Actinomycetes From Tupper Cave System, British Columbia

Hayfaa Bibi Zafiirah Golap Khan, Tiago Rodrigues, Ariga Avanesian, Raniyah Alnadh, Nick Vieira and Naowarat Cheeptham
Thompson Rivers University

Bacteria that are adapted to thriving in extreme habitats such as caves may be candidates of the new class of antibiotics. The antimicrobial activity of 266 cave isolates was tested using Plug Agar Assay technique; the pathogenic bacteria used in this study were MDR-*Staphylococcus aureus*, *Micrococcus luteus*, ESBL-*Escherichia coli* and *Acinetobacter baumannii*. For optimal growth and antimicrobial production, these cave bacteria were cultured on R₂A agar at 25°C for 7 to 14 days prior to the plug assay. To screen for antimicrobial activity, a bioassay plate was prepared with each pathogenic bacterium at the concentration of 1.5×10^3 cells/mL (OD₆₀₀ 0.132) in a 250mL molten Nutrient agar. Then, an agar plug of each of the cave bacteria was transferred from the R₂A agar plates to the prepared assay plates, and then they were incubated at 35°C overnight. Of the 80 cave isolates screened, nine showed antimicrobial activity against MDR-*Staphylococcus aureus* and seven against *Micrococcus luteus*. These cave isolates are selected as potential antimicrobial producing candidates. In conclusion, isolation and preliminary screening of cave actinomycetes against pathogenic bacteria may contribute to the discovery of novel antibiotics against resistant pathogens.

Fine scale habitat needs may reveal 'hotspots' for management: where exactly do turtles hibernate in a reservoir?

Amy Leeming and Karl Larsen
Thompson Rivers University

The occurrence of different behavioral tactics within populations provides a unique opportunity to study how and why animals respond to their environment. Variations in overwintering tactics have been detected across neighboring groups of Western Painted Turtles occupying a single body of water (a reservoir in central BC). Preliminary study has revealed that turtles in one patch of habitat within the reservoir hibernate communally inside a floating island of vegetation, whereas in a nearby bay the animals hibernate in a much more dispersed fashion. We explored this phenomenon more fully with telemetry in the winter of 2012-2013. Within the reservoir, the aggregated turtles (n=6 turtles, area = ~28.3 ha) overwintered ~3.4 m from one another, whereas the dispersed turtles (n=8 turtles, area = ~81.5 ha) ranged from 19 – 785 m from one another. At each overwintering location, physicochemical data [temperature (°C), dissolved oxygen (mg/L) & conductivity ($\mu\text{s}/\text{cm}$)], ice and water depth (cm), and turtle shell temperature (°C) were recorded. Turtles tended to choose overwinter locations with mean physicochemical values ranging from 0.5-1.7°C, 2.4 – 8.4 mg/L and 51.3 – 101.3 $\mu\text{s}/\text{cm}$, varying by location. Currently, we are continuing this study with increased sample sizes of telemetered turtles and additional forms of data collection. The results of this research serves to identify hibernating sites for these animals, but also allows comment on the adoption of different tactics (in this case, for hibernating) used by animals existing in the same population. Further, this research will provide a better understanding of physiological tolerance levels, overwinter survival, and/or the plastic behavior of the WPT, contributing to future conservation and management plans for these animals.

Exploring The Connections Between Outdoor Recreation, Nature, And Human Well-Being In Vanderhoof, BC

Carling Mathews
UNBC MA NRES Student

Northern British Columbia offers diverse opportunities for outdoor recreation activities such as fishing, hunting, hiking, skiing, and snowshoeing. With a wilderness area twice the size of the United Kingdom, nature is often nearby in northern BC if not in one's backyard. In addition to facilitating recreation opportunities, exposure to natural spaces (both passive and active), also has a positive influence on human well-being. While a meaningful amount of literature has identified the well-being benefits of human-nature interactions, research on the topic has been conducted in largely urban environments in contrast to northern rural settings where outdoor recreation opportunities are perhaps more accessible, and thus more of a lifestyle than a purposeful activity. A baseline understanding of the connections northerner's make between outdoor recreation and well-being is needed in order for local decision-makers to promote and facilitate human-nature interactions. Grounded in naturalistic inquiry using qualitative methods, and with a case study approach, this thesis will explore perspectives of the connections among outdoor recreation, nature, and well-being. Perceptions will be sought through in-depth semi-structured interviews with members of the Vanderhoof community. The project hopes to engage with three different

community groups including decision-makers, community leaders, and the general public.

Sagebrush Seedling Establishment On Reclaimed Bentonite Mine Sites In Wyoming

Catherine Tarasoff

Michigan Technological University/Thompson Rivers University

Restoration of disturbed communities in the arid Big Horn Basin of Wyoming is challenging. Combine environmental factors with bentonite mining practices and the establishment of Wyoming sagebrush becomes nearly impossible. Our research objectives were to improve seedling transplant survival and growth across three site conditions (failed sites, moderate soil, excellent soil) with the use of two seedling amendments (copper treatment and water retention crystals). We also monitored the time of the year mortality occurred. Seven month old seedlings were transplanted Spring 2011. Survival was very high in September 2011, indicating very low transplant shock and summer drought stress. Most mortality occurred over the winter of 2011-12. Growth rates were exceptional at the moderate and excellent site conditions, and highly variable at the failed sites.

How To Manage For An Open Meadow Species Under A Forest Carbon-Credit Program In Denman Island Provincial Park: Challenges And Innovative Solutions

Erica McClaren

BC Parks

This poster outlines the Taylor's Checkerspot butterfly and its habitat requirements and how these habitat requirements are difficult to accommodate within a regenerating forest, especially within BC Parks' jurisdiction and under a carbon-credit program. I will discuss all the community partners and the role they have played and the paths moving forward.

Rare Plant Monitoring in Okanagan Parks and Protected Areas

Kirk Safford

BC Parks

Many parks and protected areas in the Okanagan contain provincially red and blue listed plants, several of which are federally endangered species where critical habitat has been defined under Section 41 (1)(c) of the Species at Risk Act. Some of these parks have high recreational use tenured range use, or other activities (legal and illegal) that are potential threats to defined critical habitat. Very little is known about how these rare species respond to human activity, or other variables. In conjunction with the Canada Wildlife Service, BC Parks has initiated development

of monitoring methods for known rare plant populations, focused primarily on species with defined critical habitat.

Backcountry Recreation Impact Monitoring (BRIM) - 15 Years Later

Megan Taylor
Selkirk College

Backcountry Recreation Impact Monitoring (BRIM) is a technique developed and implemented by BC Parks in the late 1990's. The intent of this study is to determine the state of BRIM 15 years after its implementation. Specifically, we hope to determine to what extent is BRIM is still being used; if it has produced useful data; what impediments may exist, and how field staff view this tool.

Can Passive Climate Chambers Increase and Stabilize Temperature in BC's Dry Coastal Forests?

Morgan Bawtree, Heather Klassen & Sari Saunders
BC Ministry of Forests Lands and Natural Resource Operations

Since 2010, we have studied relationships among site condition, vegetation composition and productivity and climate to evaluate impacts of climate change on dry south coastal forests of British Columbia. To date, we have conducted field and modeling work to understand current and historic relationships among these factors; we are now initiating the experimental component of our program. Extensive research has been conducted on the impacts of climate change using passive climate chambers on grasslands and tundra, but little work has been done using passive climate chambers in forests. We examined the viability of open-top chambers in our study area by assessing whether they could stabilize a 1-2°C increase in air temperature throughout the test period, without ecologically significant effects on other climatic drivers. We monitored three different prototype chambers, in high and low canopy cover (N=6 chambers total) in forested sites of southeastern Vancouver Island. The prototypes were an adapted ITEX polycarbonate hexagon chamber, and a tent and wooden drum, coated with greenhouse polyethylene sheeting. We then measured the temperature at 50cm, and 15cm above ground, and 5cm below ground- inside each of the chambers, and in paired plots under similar canopy cover, outside each chamber. We evaluated differences in mean temperature and variance between each chamber type and the external plots to ascertain the feasibility of raising and maintaining temperature experimentally. These data inform the next phase of our study evaluating hypotheses of shifts in plant communities and species vigour under projected climate conditions.

Mapping and Monitoring Wilderness Character in the Muskwa Kechika

Pam Wright
UNBC

The Muskwa-Kechika Management Area (M-KMA), established in 1998 in northeastern British Columbia covers approximately 6.4 million ha.

Touted as one of the last true wilderness regions south of the 60th parallel, the M-KMA has globally significant populations of large mammals in complex predator-prey relationships. Central to the management ethos of the area, the M-KMA Act identifies the management intent is to *maintain in perpetuity the wilderness quality*. The M-K is often referred to as a 'Working Wilderness'. Although the idea of wilderness is at the crux of the management of the M-K mapping wilderness values has been limited and monitoring wilderness condition non-existent. Working in conjunction with the M-KMA Management Board the intent of this project is to begin to help define to identify a suite of criteria and indicators to assess wilderness quality and to begin to map and monitor these wilderness characteristics.

Do Cave Bacteria in BC Have Potential to Produce New Antimicrobial Metabolites?

Raniyah Alnahdi, Laiel C. Soliman, Kingsley Donkor, Ken Wagner, Kent Watson, and Naowarat Cheeptham
Thompson Rivers University

The discovery of new and more effective antibiotics continues to be a priority given the frequency of the emerging multi-drug resistant pathogenic microorganisms. Thus, scientists are searching for new antibiotics from microorganisms selected from extreme habitats like caves. Various cave bacteria species were found in caves and could be the source of new antibiotics. The objective of our work is to isolate cave bacteria from a volcanic cave in Wells Gray Provincial Park in BC and to see whether they would produce metabolites with antimicrobial activity against multi-drug resistant pathogens. This study used 16 cave strains previously isolated and screened against a panel of drug resistant pathogens. Upon retesting, 4 out of 16 cave bacterial isolates, RA001, RA003, RA004, and PM58B-RA, demonstrated antimicrobial activity against *Mycobacterium smegmatis*, *Micrococcus luteus*, *Acinetobacter baumannii* and MDR-*Staphylococcus aureus*. To study the conditions for optimal growth and antimicrobial production, these four bacteria were further cultured in different fermentation broth media (namely Hickey-Tresner, R₂A, V-8 juice and ISP-2) and incubated at 12 and 25°C for 14 days. During the course of fermentation, the percentage of packed cell volume (%PCV), antimicrobial activity and pH were observed and recorded daily. It was found that each of the bacteria demonstrated antimicrobial activity against different pathogens at various times of fermentation and temperature. Overall, R₂A broth medium and the lower temperature of 12°C appear to be vital to the antimicrobial production in cave bacteria used in this study. Isolation and purification of the antimicrobial compounds of these isolates are under investigation using the optimal growth conditions determined in this study. We attempted to identify these bacteria using chemotaxonomic study, 16S rRNA sequencing and MALDI-TOF MS. PM58B was found to be a member of the genus *Bacillus licheniformis*, RA001, and RA004 were identified as *Arthrobacter agilis*, while RA003 was identified as a species level of *Sphingopyxis terrae*. In conclusion, cave bacteria are promising sources of antimicrobial compounds. Isolation, optimization and study of these bacteria from caves may be useful in discovery of new antimicrobial drugs. Additionally, the knowledge obtained from this study in regards to cave bacteria and their roles in cave formation and degradation will add to existing information on cave conversation.

Counter Mapping for Conservation

Tim Burkhart

UNBC MA NRES Graduate Student

Through the creation of a web-accessible spatial mapping 'hub' for the Peace River Break region of BC, as part of an internship with the Yellowstone to Yukon Conservation Initiative, I am examining what opportunities and challenges GIS technology presents for conservation movements in empowering local communities to take a lead in decision-making over protecting their landscapes, in generating public engagement with conservation practices and efforts, and in challenging the limits of conservation to the fixed protected area. GIS technology provides a powerful tool for articulating visions of protected space and for equipping social movements with quantifiable, visual productions of their goals, but can potentially marginalize communities and individuals who do not have the expertise or resources GIS demands. A GIS-facilitated conservation strategy must embrace a new reflexive epistemology that addresses and integrates multiple voices, views and understanding of local conservation desires in the context of larger, regional conservation vision such as Yellowstone to Yukon. While maps have the capacity to fix places in our minds, they also can expand concepts such as the conservation area design beyond patches of protected areas, to landscape-scale protection of ecosystems, and beyond bounded territorial spaces to engage conservation goals more fully in everyday spaces and practices.

Long-term Ecological Monitoring in BC Parks

Tory Stevens

BC Parks

After a cautious start in 2011, the Long-term Ecological Monitoring program in BC Parks is closing in on the half-way mark of their goal of 100 core sites. Sites have been established throughout the province in all five of the focus biomes: alpine, grassland, intertidal, forest and wetland. This poster describes the program, why it is still working when times are tough and shows where all the current sites are located.