

**2010  
West Chilcotin  
Ecosystem Restoration Plan**

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**Submitted to:  
CCERSC /Sub-committee**

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## Executive Summary

The Cariboo Chilcotin Ecosystem Restoration Steering Committee was established to address issues of ecosystem restoration across the Cariboo-Chilcotin region. The West Chilcotin was identified as a pilot area for developing an Ecosystem Restoration Strategy that would include not only Grassland Benchmark areas, but other ecosystems and habitats. The primary goal of the initiative was to develop a 5 year Ecosystem Restoration Plan of prioritized “shelf ready” projects with the input of West Chilcotin community members.

Information gathered for the project included two main sources: existing plans/reports and input from West Chilcotin communities that included First Nations, local community groups, individuals, and government ministry representatives. To facilitate community input we held meetings at two main communities in the West Chilcotin (Nimpo Lake and Tatla Lake) and with the Chief and Council of the Ulkatcho First Nation and the Chief and Council of the Alexis Creek First Nation. Meetings followed “World Cafe” principals to encourage open communication between participants. This process led to the development of 122 projects, which were reduced to 27 fully developed project areas after removing projects that were outside the scope of ecosystem restoration or that required further development.

Projects in the final list were rated by the authors using three factors: current status, ecosystem benefit, and probability of success with each factor scored on a 5 point scale. Higher scores in a factor reflected a higher value attributed to the project due to a more imperilled status, greater ecosystem benefits from completing the project, and a higher probability of success. Projects were scored independently by each author and averaged over the three factors to produce an overall score.

In general projects scoring high had been previously identified in other reports and had existing treatment recommendations. Examples of high scoring projects include riparian restoration on the Puntzi Creek and mapping fire skips for pine mushroom retention. Projects scoring in the middle range generally had an unknown status, required an inventory to identify impacted components, or had some uncertainty as to their probability of success. Projects receiving the lowest rankings were those where the degree of ecosystem impairment was uncertain, were knowledge based, and had some uncertainty as to whether knowledge gained would translate into a change in land use and/or ecosystem benefit.

Two exceptions to the higher ranking generalizations are two policy related projects aimed at preventing damage to ecosystems. All 3 team members independently rated the woody debris retention and landscape connectivity projects highly because of their important roles in long term forest ecosystem productivity and resilience. These roles are crucial in the context of increasing ecosystem stressors such as climate change and human development. It was felt that these projects were an investment in stewardship policies that would help prevent costly restoration work in the future.

This pilot project has successfully identified a wide range of ecosystem restoration projects by engaging community members in the process. It is hoped that this project will not only result in improved ecosystem function in the West Chilcotin, but help illustrate methods of increasing community input through participation and mutual learning between stakeholders and ecosystem restoration practitioners.

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# Introduction

## Background

The Cariboo Chilcotin Ecosystem Restoration Steering Committee (CCERC) was established to address issues of ecosystem restoration across the Cariboo/Chilcotin region. The initial focus of the group was on Grasslands restoration. In 2009 the committee decided to broaden the scope of restoration work to open forest landscapes and other habitats in need of restoration. The West Chilcotin was identified as a pilot area for developing an Ecosystem Restoration Strategy that would include not only Grassland Benchmark areas, but other ecosystems and habitats. The primary goals of the initiative were to develop an Ecosystem Restoration plan with the input of community members and develop a plan of prioritized “shelf ready” projects.

## Study Area

The study area for this project was defined by communities in order to facilitate local participation in the development of the ER Strategy. The following communities were engaged in the process: Ulkatcho; Redstone; Anahim Lake, Nimpo Lake; Kleena Kleene; Tatla Lake; Tatlayoko and Puntzi Lake. All communities are located within the West Chilcotin, and the projects identified by the participating communities are also within this region of the Province. The area encompassed by the projects is presented in the Project Area Map (Appendix 1).

The West Chilcotin is located on the Interior Plateau of British Columbia. It is a remote region of the Province that extends from the Tweedsmuir Park in the west to Puntzi Lake in the East and from the Blackwater River in the north to Tatlayoko Lake in the south. The area is dominated by high elevation pine forests, but encompasses a wide range of ecosystems including the Sub-boreal Pine Spruce, Montane Spruce, Interior Douglas-fir, Engelmann Spruce Subalpine Fir and their sub variants.

The West Chilcotin climate is characterized by hot dry summers and cold dry winters. Forest lands in the region are dominated by lodgepole pine stands at mid to high elevations, with small stands of spruce and aspen locally abundant. Lower elevations are dominated by Douglas-fir and mixed lodgepole pine – Douglas-fir stands. These forestlands fall within the Natural Disturbance Type 3 (NDT3) and Natural Disturbance Type 4 (NDT4) ecosystems (Province of BC 1995). Historically, fire was the primary disturbance factor in NDT3 and NDT4 ecosystems. Wildfires provided a natural pest and disease control mechanism in these stands, helping to maintain vegetative species composition, forest structure, and regulating coarse woody debris loading (Province of BC 1995). Forest management objectives that included fire suppression have significantly disrupted natural processes in these ecosystems. The cumulative effect of the consequences of fire suppression (for example the current mountain pine beetle epidemic) coupled with other factors such as climate change will likely result in further stresses to ecosystems in the area.

The area is sparsely populated with main communities at Tatla Lake, Nimpo Lake and Anahim Lake, as well as many smaller communities, resorts, and ranches dispersed across the plateau. The Ulkatcho First Nation and Alexis Creek First Nation have their main communities in the area as well as many smaller Indian Reserves. The primary industry in the area has been logging though other activities such as ranching, tourism, non-timber forest products, back country recreation, fishing, and hunting are also significant.

## **Ecosystem Restoration**

Ecosystem Restoration (ER) is defined as the process of assisting with the recovery of an ecosystem that has been degraded, damaged, or destroyed. The purpose of this project is to develop a strategic ecosystem restoration plan for the West Chilcotin that is operationally usable. To do this a restoration plan has been developed that primarily focuses on identifying a list of prioritized restoration treatments that are ready for on the ground implementation. The development of the list was facilitated through community input processes, a review of the literature, and consultation with Provincial government agencies (Ministry of Forest and Range, MOFR; Ministry of Environment, MOE; and see the Provincial ER Strategy at [www.for.gov.bc.ca/hra/restoration](http://www.for.gov.bc.ca/hra/restoration)). Prioritization is based on an assessment of ecosystem services, public safety, biodiversity and the viability and/or likelihood of success of the project. This report will be distributed to resource managers in the Cariboo-Chilcotin to facilitate the planning and funding of operational restoration treatments within the study area. The intent is that the shelf-ready projects outlined in this report would be available to any community or funding group; however, all of the projects will require appropriate Government approvals and permits prior to implementation.

## **Methods**

As part of the process of developing the 5 Year Ecosystem Restoration Strategy, we worked with a sub-committee of the CCERC, the 5 Year West Chilcotin Strategic Plan Subcommittee, to ensure that the project maintained its original scope and that any concerns were identified and addressed throughout the project. The intent of this project was to link to and build upon existing information, reports, plans, maps, and initiatives related to ecosystems and their use in the West Chilcotin as much as possible. In addition, climate change scenarios produced for the region, guidance from the Chief Foresters Future Forest Ecosystems Initiative, and the scientific literature pertinent to the understanding of ecosystem processes, ecosystem resilience, and ecosystem management were also utilized. Table 1 lists the reports and initiatives that were used for guidance in both the community engagement processes and strategy development. Links to these reports can be found in Appendix 2.

The project team worked with the 5 Year West Chilcotin Strategic Plan Subcommittee to develop a communication letter and information package for the project (Appendix 3). The intent of the letter and package was to discuss the projects goals and objectives; introduce the methods we proposed for obtaining stakeholder/community input; identify appropriate ecosystem restoration topics; as well as provide information on the dates, times and locations of the community sessions. The 5 Year West Chilcotin Strategic Plan Subcommittee also provided input on the initial list of potential projects that was developed and subsequent drafts of the report.

One of the primary goals for developing an Ecosystem Restoration plan for the West Chilcotin was to engage local communities, stakeholders and the general public in identifying restoration needs for the area. In order to ensure as many people as possible were informed of the project, we developed a list of stakeholders using previous stakeholder lists from other community based projects in the area and then confirming the information during follow-up phone calls. Two First Nations have main communities in the area (Ulkatcho and Tsi Del Del). They were contacted through their Band Managers, and meetings were established with their Chief and Councils. Government employees with relevant knowledge of the area were identified and contacted. Finally, the general public was informed through a mail out, newspaper ads, and postings at community gathering locations.

**Table 1. Sources of information used to guide the development of the 2010 West Chilcotin 5 Year Ecosystem Restoration Project (See Appendix 2 for links).**

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• The BA Blackwell grasslands prioritization project	• Anahim Round Table Reports (ART) and Plans
• Lonesome Lake Fire Rehabilitation Plan	• Cariboo Strategic Regional Restoration Plan
• Cariboo-Chilcotin Land Use Plan	• Tatla Community Plan
• West Chilcotin Sub Regional Plan	• CCBAC – Conservation Strategy
• Nature Conservancy of Canada Biodiversity Study of the Central Interior Plateau	• Wildlife Habitat Mapping, such as wildlife corridors mapped for Conservation Society
• Chief Foresters – Future Forest Ecosystems Initiative	• Interface Fire Plans for communities, CRD, First Nations
• Forest Renewal BC, Forest Investment Account, and Science Council of BC Reports, and studies	• Type 2 Silviculture Analyses from 2005 and 2006
• First Nations values and traditional ecological knowledge (recognizing confidentiality issues)	• Invasive plant plans, inventories and resources

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To obtain a productive exchange of ideas, values, and perspectives for ecosystem restoration in the West Chilcotin, we held four World Café<sup>1</sup> events at two central locations across the region (Tatla Lake and Nimpo Lake) in early May prior to the main tourism season. The Café atmosphere was established by having tables where 5 – 7 people could engage in informal discussion. Snacks and beverages were available during the discussions to help create a fun and productive atmosphere. The World Café events were conducted twice on the same day (e.g. 11am to 3pm and 4pm to 8pm) in order to facilitate opportunities for broad participation. Facilitators were used to help stimulate discussion, clarify concepts/techniques, and record ideas for ecosystem restoration. Meetings with Chief and Council of the two First Nations were held prior to the World Cafes following the same guiding principles as the broader community meetings. Participation by band members at the community World Cafés was also encouraged.

Ideas for ecosystem restoration that were recorded at the sessions or submitted directly to the authors were formed into projects that addressed the issues of concern. The projects are diverse and range from those with previously developed prescriptions to more general areas of concern that in some cases require multiple steps to implement.

### **Public /Participant Input**

Based on discussions at the World Café sessions, meetings with First Nations, and submissions made directly to the project team, a project list was organized and developed into the package that was sent to World Café participants and to the strategic plan subcommittee for review (Appendix 4). Workshop participants were asked to record the importance that the different projects represented for them.

The review and rating package was sent to total of 34 participants and a response rate of 32% was achieved (Appendix 4). A response rate of 50% is deemed adequate for assuming the respondents

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<sup>1</sup> Welcome to The World Café. <http://www.theworldcafe.com/index.htm> (accessed 25 January 2010).

represent a random sample of the participants (Babbie 2007). Of the 11 surveys returned, 4 respondents provided additional comments or supplemental information. Two commented on the Charlotte Lake stocking project and the Rainbow Trout inventory project, 1 was opposed to the Charlotte Lake stocking project and gave background information regarding their opposition and sent information on an impact assessment that was conducted regarding stocking Charlotte Lake. Another respondent provided cautionary comments about both of these projects. A project to revive the Kappan Mountain Lookout trail was recommended by another respondent and a document providing background information and a rationale for conducting the work was included. A fourth respondent provided a list of their top four project choices.

Our response rate was low and there is likelihood that the respondents differ from non-respondents in multiple ways. Given this, the information obtained from the survey data cannot be used to determine which projects should be included for ER work, and the results have not be used to establish the overall rankings for ER work in the West Chilcotin presented in this document. However, the information gathered in this questionnaire may be useful for identifying community priorities from within the final prioritized project list. For example, projects accepted as ER projects based on the objectives of this work have been ranked according to the criteria established below (see Rating Process). Projects that have the same rank can then be sorted according to community values from the survey data to determine which should be implemented first.

## **Rating Process**

The authors with input from the strategic plan subcommittee reduced the initial project list to a final list of 27 projects that fit with the principals of ecosystem restoration and were considered feasible. Some projects in the initial list were outside the scope of ER work and it is suggested that they be referred to another agency. Other projects require more development and should be reviewed for future inclusion into the Ecosystem Restoration Plan. A list of these projects is presented in Appendix 5.

Projects in the final list were rated by the authors using three factors: current status, ecosystem benefit, and probability of success. Each factor was scored on a 5 point scale with higher scores in a factor reflecting greater value for the project. Table 2 provides a description of each factor and the criteria used to rate the projects. All projects were scored independently by each author, with the sum of the scores divided by 15 to provide an overall ranking that ranged between 0 – 1 for each project. Where final scores differ significantly (i.e. >25% difference), the projects were reviewed by all team members to identify differences in opinion. After team members reviewed the differences in scoring and obtained additional information where required, the project was independently rescored. A list of projects that still differed in score by >25% after rescored and the nature of the differences in opinion is provided in Appendix 6.

Table 2. Criteria used to rate ecosystem restoration projects developed for the West Chilcotin in 2010.

Factor	Description	Criteria
Current status	The current state of the ecosystem component, types of disturbances, and impacts of the disturbances, on the component.	Projects scoring high under this factor would involve red listed species and significantly impaired ecosystem processes. Low scores would be for projects that involve common/ widespread species, where ecosystems had low degrees of impairment, and for minor local effects.
Ecosystem benefit	Role of the component in ecosystem function and benefits of the project in restoring ecosystem function.	Projects scoring high under this factor would address maintaining critical ecosystem processes/species at risk across the region. Projects with local effects or addressing more widespread species would have moderate scores, while projects with little ecosystem benefits would score low.
Probability of success	Identification of project attributes that would increase/decrease the probability of success.	Projects with high scores would have few hindrances, well developed techniques, and available expertise.

## **Ecosystem Restoration Projects**

### **Non Timber Forest Products**

#### **Pine Mushroom Habitat Restoration**

*Ecosystem Benefit:* Pine mushroom is an important forest resource in the West Chilcotin of British Columbia. The species influences stand structure and may act as a natural thinning agent in mature and old growth pine forests in the Chilcotin. It is also a commercially important forest botanical. For a thorough review of the many roles of decaying wood and fungi in ecosystems see Lonsdale et al. (2007).

*Problem:* The production of pine mushrooms in this area of the province is dependent on the below ground association between the fungus and the roots of mature and old lodgepole pine trees. The mountain pine beetle infestation, recent large-scale fires, and timber harvest have significantly impacted the availability of the habitat where the mushroom fruits. Habitat availability may affect the sources and dispersal of inoculum across the landscape. Habitat supply could be depleted to the point where it



may not be sufficient to maintain a viable population of the species in light of the number, size, and distribution of both natural and human caused disturbances.

**Location:** Pine dominated stands in the SBPSxc and SBPSmc, MSxv1, ESSFv, 01 and 02 site series. Specific areas have been recommended for reclamation treatments through previous reports (FFT, Lonesome Lake, McClinchy, and Kleena Kleene Fire reports; Mills and Schuetz 2005).

**Project 1: Implementation of prescriptions to restore pine mushroom habitat. Ranking Score – 0.73**  
(Overview Map 1 and Detailed Maps 1-4).

Project#	Description	Cost	Linkages
1a	Identify treatment stratum prior to implementation as pine mushroom occupies relatively small discrete areas within the surveyed polygons. Develop site plans for each stratum as per the list of treatment options identified in the FFT report (Bravi and Chapman, 2010). Identify treatment stratum and develop site plans for polygon 7, 7A, 10 and 21.	\$7,000	FFT, MOFR (Bill Chapman), Ulkatcho
1b	Implementation of recommended site prescriptions.	Up to \$100,000/yr	FFT 2010
1c	Conduct full surveys where stocking densities were questionable.	\$10,000	FFT 2010

**Project 2: Map fire skips for pine mushroom habitat recovery. Ranking Score – 0.80**  
(Overview Map 4)

Project#	Description	Cost	Linkages
2	Map fire skips on the Lonesome Lake, McClinchy and Kleena Kleene fires that contain the attributes associated with pine mushroom presence and recommend exclusions from the THLB. Wildlife habitat features could be mapped at the same time.	\$46,700	Mills and Shcutz 2005, MOFR (Bob Osmechenko)

## Fire Management and Restoration

### Fuel Management

**Ecosystem Benefit:** Reduce risk of catastrophic fire, protect human values and ensure public safety.

**Problem:** Previous fire suppression practices and mountain pine beetle killed trees have increased fuel loading across the West Chilcotin. Increased ground and ladder fuels due to dead trees and the development of a new understory have increased the risk of intense wild fires in the area. Risks to public safety, human values, and ecological values are significant in several areas.

**Location:** Unauthorized Recreation Site at Charlotte Lake, Tatlayoko Recreation Sites, Area J.

**Project 3: Fuel Management – Charlotte Lake and Tatalayoko Recreation Sites. Ranking score – 0.64**  
(Overview Maps 3, 4).

Project#	Description	Cost	Linkages
3a	Develop fuel management plan for unauthorized Charlotte Lake (CL) camp site and Tatlayoko Recreation (TR) Site (see maps).	\$7,000	Fraser Basin Council, MOF
3b	Implement fuel management prescriptions.	\$25,000 (CL) \$60,000 (TR)	

## Prescribed Burning

**Ecosystem Benefit:** Reintroduce fire in the landscape to ensure fire dependent species and processes are maintained and to reduce the risk of catastrophic wildfire.

**Problem:** Fire is a natural process that occurs periodically and at varying scales in the West Chilcotin. Over the past several decades fire suppression activities have removed fire from the landscape resulting in the loss of important ecosystem processes and habitat. Reintroducing fire via prescribed burns can provide an avenue for restoring this important process while respecting public safety concerns.

**Location:** Morrison Meadow and Corkscrew Basin were identified during meetings as areas of focus for prescribed burning of grasslands and Redbrush and Corkscrew Basin were identified as focus areas for burning to enhance Moose habitat.

**Project 4: Prescribed Burns - Grasslands. Ranking score – 0.76**  
(Overview Map 1)

Project#	Description	Cost	Linkages
4a	Identify grassland/meadow habitat (Morrison Meadow Road and Corkscrew Basin) used by livestock and wildlife that requires burning to restore habitat values.	\$2000	Grasslands Council, MoFR, Cattlemens Association
4b	Within areas specified, develop burn plans using MoFR Fire specialists and prioritize treatment areas.	\$5000	
4c	Implement burn plans as per above using MoFR Unit crews.	\$5000 - \$10,000	

**Project 5: Prescribed Burns – Moose. Ranking score – 0.67**

(Overview Maps 1, 2, 4)

Project#	Description	Cost	Linkages
5a	Identify areas (Redbrush and Corckscrew Basin) that require burning to restore moose forage values. Primary targets will be overgrown shrub carrs to enhance moose habitat.	\$4000	MoFR, MOE
5b	Within areas specified, develop burn plans to enhance wildlife habitat, identify and prioritize treatment areas.	\$5000	
5c	Implement burn plans as per above.	\$15,000	

**Project 6: Prescribed Burns - Wildfire Risk Reduction. Ranking score – 0.67**

Project#	Description	Cost	Linkages
6a	Develop burn plans to reduce the risk of catastrophic wildfire outbreaks, identify and prioritize treatment areas.	\$5000	MoFR, MOE and Community Associations
6b	Implement burn plans as per above.	\$15,000	

**Fire Restoration**

**Ecosystem Benefit:** Ensure restoration plans previously developed to maintain multiple values are implemented.

**Problem:** The Lonesome Lake, Kleena Kleene and Bigstick Fire Restoration Plan was developed in 2005/06 through the Forest for Tomorrow fund. The plan was developed via a public consultation process in coordination with a review of the higher level plans and objectives. A total of 7 resource areas were identified and restoration recommendations were made with an overall restoration budget amounting to 1.4 million dollars. It is unclear to date what restoration recommendations from this plan have been implemented (Mills and Schuetz 2005).

**Location:** Lonesome Lake, Kleena Kleene and McClinchy Fires.

**Project 7: Lonesome Lake, Kleena Kleene and McClinchy Restoration. Ranking score – 0.55**

(Overview Maps 3, 4)

Project#	Description	Cost	Linkages
7a	Conduct an audit of recommendations in the fire restoration plan to determine what treatments/work have been completed and prioritize remaining restoration recommendations	\$5000.00	MoFR(Bob Osmachanko), YKW
7b	Implement restoration treatments as per prioritized plan (costs are dependent on findings).		

## Wildlife and Wildlife Habitat

### Wildlife Trees

**Ecosystem Benefit:** Wildlife trees provide important habitats for organisms to feed, rest, and reproduce. Important features of wildlife trees are usually associated with old growth forests. These features include large diameter, presence of cavities, large limbs, and other structures such as mistletoe or gall deformities resulting in limb masses. The supply of wildlife trees can be enhanced using silviculture techniques that decrease the time required for suitable trees to develop (Lewis 1998) (also see Integrating Ecosystem Restoration into Forest Management [http://www.env.gov.bc.ca/wld/documents/fia\\_docs/ecosystem\\_restoration.pdf](http://www.env.gov.bc.ca/wld/documents/fia_docs/ecosystem_restoration.pdf)).

**Problem:** Insect epidemics such as the MPB and associated salvage harvesting are reducing the supply of wildlife trees which is likely to affect species that require this habitat.

**Location:** Areas of the SBPSxc in the West Chilcotin

**Project 8: Treatments to promote development of wildlife trees. Ranking score – 0.69**

(Overview Maps 1-4)

Project#	Description	Cost	Linkages
8a	Identify areas where the supply of wildlife trees is likely to be deficient.	\$5000	MOE, Habitat Steward, MoFR, Stearship
8b	Develop prescriptions/treatments (variable intensity spacing, fungal inoculations, etc) to promote the development of wildlife trees.	\$10,000	
8c	Implement treatments in affected areas.	\$10,000 – 100,000	

## **Fisher Den Trees**

**Ecosystem Benefit:** Maintain critical habitat for a species at risk in the West Chilcotin. Fisher are a Provincially Blue listed species that uses cavities in large old trees for reproduction. It is important that the supply of maternal den sites for Fisher is maintained throughout the short, mid and long term. Activities that promote the development of future den trees (see wildlife trees) will help meet their needs in the mid to long term. However, reproductive habitat is required in the short term. This can be accomplished using den boxes which would be erected in areas of suitable fisher habitat (Davis 2009).

**Problem:** The supply of suitable den trees will decrease in the near future due to the mountain pine beetle epidemic and subsequent fall down of trees/salvage harvesting. This will impact the reproductive success of an already blue listed species.

**Location:** Known denning areas and riparian areas in the IDFdk4, SBPSmc, and SBPSxc

### **Project 9: Fisher Reproductive Den Boxes. Ranking score – 0.73**

(Overview Maps 1, 2)

<b>Project#</b>	<b>Description</b>	<b>Cost</b>	<b>Linkages</b>
9a	Identify known areas of fisher habitat where den trees are likely to be deficient.	\$5000.00	MOE (Randy Wright), Ulkatcho and Alexis Creek First Nation.
9b	Construct and erect den boxes in identified areas.	\$50,000.00	
9c	Monitor use of den boxes.	\$30,000.00	

## **Wolf Dietary Assessment**

**Ecosystem Benefit:** Wolves form part of a complex predator-prey system in the West Chilcotin. Understanding the dynamics of this system is critical to the maintenance of a balanced predator/prey relationship between wolves and other species, most importantly caribou.

**Problem:** Recently, wolf numbers have been thought to be on the rise and this may have repercussions for species such as caribou as well as have implications for ranchers. Winter scat samples were collected in the West Chilcotin during the 2009/2010 winter using FIA funds. Analysis of existing scat samples would help determine winter wolf diet components and aid in management of this predator/prey system.

**Location:** West Chilcotin

**Project 10: Wolf Dietary Assessment. Ranking score – 0.69**

Project#	Description	Cost	Linkages
10	Analyse existing scat samples for prey composition and make recommendations for further work on wolves.	\$5,000	MOE (Randy Wright), Alexis Creek First Nation and Ulkatcho.

**Assessment of MPB impacts on Caribou**

**Ecosystem Benefit:** Monitoring MPB impacts on caribou to recommend management strategies for maintaining them in the West Chilcotin.

**Problem:** The mountain pine beetle disturbance in the West Chilcotin has had unknown impacts on caribou habitat use, forage, mobility, range distribution and population trends.

**Location:** West Chilcotin.

**Project 11: Caribou Monitoring. Ranking score – 0.64**

(Overview Maps 1-4)

Project#	Description	Cost	Linkages
11a	Monitoring program development and collaring 40 caribou	\$140,000.	MOE/FIA, Alexis Creek First Nation and Ulkatcho.
11b	Monitor 40 caribou for 3 years	\$120,000.	
11c	Data analysis and reporting for restoration recommendations	\$60,000.	

**Assessment of Amphibians**

**Ecosystem Benefit:** Providing baseline information on amphibians in the West Chilcotin will be important in sustaining them.

**Problem:** Dramatic declines in amphibian populations, including population crashes and mass localized extinctions, have been noted since the 1980s from locations all over the world. These declines are perceived as one of the most critical threats to global biodiversity, and several causes are believed to be involved, including disease, habitat destruction, pollution, pesticide use, etc.

**Location:** A defined project location will require the development of a monitoring program

**Project 12: Amphibian Monitoring. Ranking score – 0.60**

Project#	Description	Cost	Linkages
12a	Monitoring program development	\$5000.	MOE
12b	Implementation of monitoring program	\$50,000.	

**Assessment of Bats**

**Ecosystem Benefit:** Bats are important components of biodiversity and they are natural predators of insects which can also be pests affecting our forests (e.g. spruce budworm). Providing baseline information on bats in the West Chilcotin will be important in sustaining them.

**Problem:** In the last few decades bat populations have been declining at alarming rates worldwide. Baseline assessments are required to help sustain this species group.

**Location:** A defined project location will require the development of a monitoring program

**Project 13: Bat Monitoring. Ranking score – 0.60**

Project#	Description	Cost	Linkages
13a	Bat monitoring program development	\$5000.	MOE
13b	Implementation of bat monitoring program	\$50,000.	

**Watersheds**

**Water Storage**

**Ecosystem Benefit:** Water is critical to the survival of plants, animals and people. Planning for water storage and increasing soil water holding capacity is essential for maintaining ecosystem functions, resilience and forest productivity especially in the context of climate change (Perry et al. 1989).

**Problem:** West Chilcotin ecosystems are extremely dry and nutrient poor. Recent changes due to the MPB have resulted in overstory canopy losses. Losses to overstory canopy impact hydrological processes resulting in changes to evapotranspiration rates. Consequently there are shorter periods of time when water is available for use. Many residents of the West Chilcotin have expressed concern about low water levels in recent years in lakes and wetlands in the area.

**Location:** Areas around Eagle Lake and Choelquoit Lake were identified.

**Project 14: Promote Water Storage. Ranking score – 0.67**

(Overview Map 3)

Project#	Description	Cost	Linkages
14a	Develop a plan to increase water storage. Identify watersheds with capacity for increased water storage by exploring opportunities for; wetland creation and/or expansion, reservoir creation and/or expansion, beaver introductions and/or management.	\$10,000.	MOE, DFO, Fraser Basin Council and Ducks Unlimited
14b	Implement the plan.	Up to 100,000/yr	

**Riparian Restoration and/or Protection**

**Ecosystem Benefit:** Riparian restoration treatments can help to stabilize stream banks, reduce erosion, reduce downstream sedimentation and pool loss, improve shade and water quality, improve insect and debris supply to streams, elevate water tables and riparian/upland plant production, increase water storage for slow release at base flow, improve wildlife habitat, and increase habitat for non-timber forest products.

**Problem:** Stream channels, water quality, and fish production can be degraded by losses in riparian vegetation. Logging, over-grazing, trampling, mining, roads, and recreation can degrade or eliminate riparian vegetation.

**Location:** Heavily utilized areas on public and private land in the West Chilcotin. Streams identified by locals as having degraded reaches include: Kappan Ck, Beef Trail R, Dean R, Chilanko R, McClinchy R, Green R, Kleena Kleene R, Marys Ck, Homathko R, Mosley Ck, Natshialla Ck, Holtry Ck Guishon Ck, and Leaman Ck.

**Project 15: Riparian Restoration/Protection. Ranking score – 0.67**

(Overview Maps 1-4)

Project#	Description	Cost	Linkages
15a	Locate degraded stream/riparian ecosystems using collaboration, literature review, and walk through assessments	\$5000	MOE, DFO and Fraser Basin
15b	Develop site specific prescriptions to restore or protect damaged riparian ecosystems (fencing, live staking, planting, transplants w/equipment, bank armour, bio-engineering)	\$5000 - \$10,000	
15c	Implement selected riparian protection or restoration projects	\$10,000 - \$100,000	



**Project 16: Riparian Restoration Homathko – Mosely Rivers. Ranking score – 0.78**

(Overview Map 3)

16a	Reassess impacted reaches of Homathko River and update prescriptions (G3 Consulting 1999).	\$3,000.00	MOE and DFO
16b	Implement stream restoration prescriptions.	\$20,000 - \$30,000/site	

**Project 17: Riparian Restoration Puntzi Creek. Ranking score – 0.84**

(Overview Map 2)

17a	Review Puntzi Creek Habitat Restoration document and prepare prescriptions (Davis 2009).	\$3,000.00	MOE, DFO and Alexis Creek First Nation
17b	Implement stream restoration prescriptions.	\$20,000 - \$30,000/site	

**Project 18: “Clean the Dean”** (Overview Map 1)

18	Remove trash from the Dean in and near Ulkatcho to improve habitat, water quality and aesthetic values. The project should include a public participation and education component	\$7,000.00	MOE, DFO and Ulkatcho
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**Livestock Impacts and Management**

**Fencing and Hardening**

***Ecosystem Benefit:*** Reduce grazing and browsing impact in riparian areas, reduce damage to wildlife and fish habitat, and raise water tables (Fitch et al. 2003).

***Problem:*** Cattle tend to congregate in riparian areas, especially during hot dry seasons and sometimes overgrazing in these areas occurs. Overgrazing in riparian areas and grasslands can undermine plant health, diminish habitat for threatened species and biodiversity and reduce forage production. The strategic placement of fences and other infrastructure can assist in controlling the impact cattle have on ecosystems.

***Location:*** Range areas of the West Chilcotin

**Project 19: Fencing - Chilanko Marsh and Chilcotin Lake. Ranking score – 0.80**  
(Overview Map 3)

Project#	Description	Cost	Linkages
19	Repair of 4.5 km s of log fence and building of 1km of new log fence at Chilcotin Lake.	\$60,000	MoFR (Chris Schmidt) and Alexis Creek First Nation
	Replacement of existing log fence at Chilanko Marsh.	\$60,000	

**Project 20: Fencing - Riparian Areas. Ranking score – 0.64**

Project#	Description	Cost	Linkages
20a	Develop a prioritized range fencing plan for the West Chilcotin in collaboration with ranchers and MoFR.	\$5,000	West Chilcotin Cattlemen Association, MoFR and MOE
20b	Implement range fencing (log, rail) to better manage grassland ecosystems, riparian impacts, and forage production.	\$5,000 to \$100,000	

**Project 21: Reduce Livestock Watering Impacts. Ranking score – 0.69**

Project#	Description	Cost	Linkages
21a	Identify locations where cattle are impacting riparian areas/streams.	\$3000	Cattlemens Association, DFO, MOFR and MOE
21b	Reduce cattle watering impacts on streams and riparian areas by hardening access ramps with geo-textiles and gravel or by developing off channel watering infrastructure.	\$3,000 - \$40,000	

**Recreation**

**Trails**

**Ecosystem Benefit:** Clear popular trails of MPB windfall, increase protection at sensitive ecosystems, and provide signage that increases public knowledge of ecosystem health.

**Problem:** MPB has generated pine deadfall obstructing some popular recreation trails. In addition off road vehicles and/or inappropriate camping can damage sensitive ecosystems. The presence of clearly marked and maintained trails will direct recreation activities to appropriate areas and help maintain habitat.

**Location:** Kappan Mountain Trail, Tatla Lake Trails, Precipice Valley, Horn/Bluff Lakes, Grease Trail, Rainbow Mountains, Martin Lake, Itcha Ilgatchuz.

**Project 22: Trail Clearing and Signage. Ranking score – 0.62**  
(Overview Maps 1-4)

Project#	Description	Cost	Linkages
22a	Prioritize the trails for treatment and identify site specific maintenance needs.	\$3,000	Min of TCA (Doug Harris), MOE, MoFR, Ulkatcho and Alexis Creek First Nation.
22b	Clear pine deadfall from identified trails and provide signage.	\$5,000 - \$20,000	

**Stewardship/Policy Projects**

**Woody Debris Retention and Recruitment**

**Ecosystem Benefit:** Policies and practices that promote water and soil conservation as well as biodiversity form the basis for maintaining resilient, productive and healthy ecosystems. Woody Debris (fine, coarse and standing retention wood) is important for water retention (Perry et al. 1989), soil building, nutrient release, maintenance of the cation/ion balance in soils, non-timber forest products and wildlife habitat (Lonsdale et al. 2008) (Stevens 1997). Soils need woody debris to maintain their productive capacity and biological diversity. Soils contain 90% of the diversity in ecosystems and the severe lack of dead wood in European managed forests is one of the key reasons for biodiversity loss in European forests.

**Problem:** New markets for fibre such as biofuel or pellets will place increased demand for low quality logs that were previously left in harvested areas. Currently, Provincial woody debris policies are not sufficient to ensure retention of this vital ecosystem component. Deficits of woody debris in ecosystems can take centuries to restore naturally; therefore, policies and practices are required to retain this valuable ecosystem component.

**Location:** West Chilcotin. See overview map (defined area for plan)

**Project 23: Woody Debris Retention. Ranking score – 0.75**

Project#	Description	Cost	Linkages
23a	Woody Debris policy review and recommendations.		MoFR, MOE, YKW, TDD, BCTS, Tatla Resource Association and Anahim Lake Round Table.
23b	Lobby Government and industry to establish biologically relevant woody debris management policies.		

### **Planning for Retention/Connectivity**

**Ecosystem Benefit:** Policies and practices that promote forest connectivity will result in improved ecosystem resilience to external impacts such as human use and climate change (Dawson 1997).

**Problem:** Under the current forest tenure system, there is no overall landscape level planning for ecosystem connectivity. Previously, MOE Ecosystem Officers in each forest district made recommendations for retention to promote connectivity and were aware of the location of all proposed harvesting in the area. Planning for connectivity is now completed by individual forest licencees. This can be accomplished for connectivity at the cutblock and perhaps watershed level; however, licencees areas of operation overlap and different companies can harvest areas of forest that have been left behind by other licencees that are not specified as wildlife tree patches. This can result in poor connectivity in landscapes with extensive harvesting. An overview plan has been developed for the Anahim Supply Block and Forest Ecosystem Networks have been designated in other areas of the West Chilcotin.

**Location:** West Chilcotin. See overview map (defined area for plan)

#### **Project 24: Connectivity planning for increase resilience. Ranking score – 0.80**

(Overview Maps 1-4)

<b>Project#</b>	<b>Description</b>	<b>Cost</b>	<b>Linkages</b>
24a	Review existing plans/policies for retention/connectivity and make recommendations for retention areas/corridors to improve the resilience of forest ecosystems.	\$10,000	MoFR, MOE, YKW, TDD, BCTS, Tatla Resource Association and Anahim Lake Round Table.
24b	Lobby Government and industry to institute biologically relevant connectivity plans.		

### **Ecological Resilience Tools**

**Ecosystem Benefit:** Increase ecological resilience by ensuring that local people and communities are equipped to communicate, promote, and implement the 'How and Why' of creating resilience. Many local people and communities are actively involved in land use planning in the West Chilcotin and local stewardship is critical for ecosystem restoration (Campbell et al. 2009).

**Problem:** Multiple external impacts are simultaneously affecting ecosystems in the West Chilcotin. Resource managers are beginning to look at ways to create and maintain ecological resilience as a method for planning for future unknown changes. Some of the concepts are complex and not currently common knowledge.

**Location:** Across the West Chilcotin

**Project 25: “Building resilience” tool kit/booklet. Ranking score – 0.60**

<b>Project#</b>	<b>Description</b>	<b>Cost</b>	<b>Linkages</b>
25	Booklet/Tool kit development for local resource groups to use as a planning guide.		Ulkatcho, Alexis Creek First Nation, Local Community Associations.

**Reduce Carbon Footprint**

**Ecosystem Benefit:** Reduction of the carbon footprint across the West Chilcotin and promotion of awareness about carbon impacts and how to reduce them will decrease the effects human impacts on ecosystems at the local and global scale (Spittlehouse 2008).

**Problem:** Carbon is one of the main greenhouse gasses responsible for the increase in global temperatures. By reducing the amount of emissions, the rate and magnitude of future climate change may be reduced. A variety of activities have been identified to reduce the carbon footprint in the West Chilcotin.

**Location:** Across the West Chilcotin

**Project 26: Carbon Footprint Workshop. Ranking score – 0.64**

<b>Project#</b>	<b>Description</b>	<b>Cost</b>	<b>Linkages</b>
26	Development and delivery of workshop on barriers/solutions to creating local opportunities to reduce carbon footprint.	\$10,000	Ulkatcho, Alexis Creek First Nation, Local Community Associations.

**Riparian Rehabilitation Tools**

**Ecosystem Benefit:** This project provides an effective, inexpensive, and simple way to link landowners and managers with “how to” information on restoring and protecting riparian and shoreline habitats. Developing a YouTube video on simple restoration techniques will provide an inexpensive way to decimated information to people who are interested.

**Problem:** Landowners are recognizing riparian damage, witnessing erosion and land loss, and would like to improve shoreline habitat for birds and wildlife. Contracting out restoration projects can be expensive; but smaller projects can be completed by individual landowners or community groups if they have some training in basic restoration/stabilization work. Information on conducting simple restoration procedures is not readily available.

**Location:** The West Chilcotin and Beyond.

**Project 27: Willow Planting. Ranking score – 0.67**

Project#	Description	Cost	Linkages
27	Develop a YouTube 'how to' video tutorial on stake planting of willow, cottonwood, and dogwood showing how to stabilize riparian areas.	\$25,000	MOE, DFO and Local Communities.

## Results and Discussion

A list of ecosystem restoration concerns and potential projects for the West Chilcotin was produced based on information obtained at meetings with First Nations (TSi Del Del and Ulkatcho), World Café events, and input from Provincial government ministries. The compiled information resulted in 122 projects identified. A project list (Appendix 4) was organized and developed into a package that was sent to World Café participants and the strategic plan subcommittee for review and comment. Input from this review process as well as an internal project review conducted by team members resulted in the final list of 27 project areas. Many of the projects involve multiple steps or phases (e.g. assessment and execution) which can be completed independently. The final list of projects and their overall ranking is presented in Table 4. Projects that did not make the final project list were rejected for a number of reasons. Some projects were outside the scope of ecosystem restoration and we have suggested that they be referred to another agency. Other projects requiring further development or additional data and should be reviewed for inclusion in any future Ecosystem Restoration Plan for this area (Appendix 5).

In general projects scoring high were projects that ranked high in terms of a direct ecosystem benefit and had been previously recommended in an earlier study or report. Projects in the middle range of scoring were projects having an unknown status, requiring an inventory or having some uncertainty as to their probability of success. Projects receiving the lowest rankings were those having a single species focus and/or were knowledge based and with some uncertainty as to whether knowledge gained would translate into a change in land use and/or ecosystem benefit.

Two exceptions to the higher ranking generalizations are the two policy related projects aimed at preventing damage to ecosystems. All 3 team members independently rated the woody debris retention and landscape connectivity projects highly because of their important roles in long term forest ecosystem productivity and resilience (wildlife and soil input driven processes), especially in the context of increasing ecosystem stressors such as climate change and human development. It was felt that these projects were an investment in stewardship policies that would help prevent costly restoration work in the future.

Three projects with indirect ecosystem benefit that received lower scorings were education based. There was uncertainty as to the public receptivity to new emerging concepts and the lack of ‘on the ground’ direct and immediate ecosystem benefits. The first of these proposed workshop projects would be designed to raise awareness (and perhaps action) by providing planning table tools to stakeholders around the topic of resilience planning to mitigate long term impacts on ecosystems. The carbon footprint workshop would be designed to increase awareness around local and global fossil fuel use as well as means of reducing use of these fuels in the short, mid and long-term.

One project, Project #12a Caribou Monitoring, was rated high for current status by all three team members, two members scored the project high for Ecosystem benefit while the third had doubts about the direct benefits of the project. When scoring was examined under probability of success one team member gave a high score while the other two had doubts about successful outcomes for this project. Final ratings resulted in a 27% difference in overall score between team members. The project was discussed further at a face to face meeting, but differences in opinion were not resolved. A table of rationales given by each team member is included in Appendix 6 while team member rationales for all project scoring are included as a digital Appendix 7 to this document.

Lastly, this pilot project has successfully identified a wide range of ecosystem restoration projects in the West Chilcotin by engaging community members in the process. We believe that the “World Cafe” events fostered open sharing of ecosystem restoration ideas as well as information on barriers to the success of some projects. Low turnout is a common problem for public meetings; however, holding two meetings at different times of day at each location increased the ability of local people to participate. Meeting with First Nations band leaders provided ideas for potential projects and cultivated relationships that will facilitate the implementation of projects. Finally, it is hoped that this project will not only result in improved ecosystem function in the West Chilcotin, but help illustrate methods of increasing community input through participation and mutual learning between stakeholders and ecosystem restoration practitioners.

**Table 3. Overall scoring for ecosystem restoration projects recommended for the West Chilcotin. Scores have been averaged under each factor for the three authors and overall score is the average for all authors (CS – Current Status; EB – Ecosystem Benefit; PS – Probability of Success; % Diff – percent difference in score between the highest and lowest overall scores of the three authors).**

Project name	Project #	CS#	EB#	PS #	Overall score	% Diff
Riparian Restoration Puntzi Creek	17a	0.87	0.93	0.80	0.84	0.07
Map fire skips for pine mushroom habitat recovery	2	0.80	0.80	0.80	0.80	0.00
Fencing - Chilanko Marsh and Chilcotin Lake	19	0.87	0.73	0.80	0.80	0.14
Connectivity	24	0.87	0.87	0.67	0.80	0.20
Riparian Restoration Homathko – Moseley Rivers	16a	0.80	0.80	0.73	0.78	0.07
Prescribed Burns - Grasslands	4a	0.80	0.80	0.67	0.76	0.07
Woody Debris Retention	23	0.87	0.87	0.53	0.75	0.14
Implementation of prescriptions to restore pine mushroom habitat	1a	0.80	0.73	0.67	0.73	0.00
Fisher Reproductive Den Boxes	9a	0.87	0.73	0.60	0.73	0.14
Develop and implement monitoring program for Caribou in the West Chilcotin	11a	0.87	0.73	0.53	0.71	0.27
Wolf Dietary Assessment	10	0.80	0.60	0.60	0.69	0.20
Reduce Livestock Watering Impacts	21a	0.60	0.67	0.80	0.69	0.20
Treatments to promote development of wildlife trees	8a	0.73	0.73	0.60	0.69	0.07
Prescribed Burns - Moose	5a	0.67	0.67	0.67	0.67	0.20
Prescribed Burns - Wildfire Risk Reduction	6a	0.80	0.73	0.47	0.67	0.20
Promote Water Storage	14a	0.80	0.67	0.53	0.67	0.20
Riparian Restoration/Protection	15a	0.60	0.67	0.73	0.67	0.20
Willow Planting	27	0.67	0.60	0.73	0.67	0.33
Fuel Management –Charlotte Lake Camp Site and Tatalayoko Recreation Sites	3a	0.80	0.47	0.67	0.64	0.13
Fencing - Riparian Areas	20a	0.53	0.73	0.67	0.64	0.13
Carbon Footprint Workshop	26	0.73	0.73	0.53	0.64	0.20
Trail Clearing and Signage	22a	0.73	0.33	0.80	0.62	0.07
Amphibian Monitoring	12a	0.67	0.53	0.60	0.60	0.20
Bat Monitoring	13a	0.67	0.53	0.60	0.60	0.20
“Building resilience” tool kit/booklet	25	0.67	0.67	0.47	0.60	0.20
Lonesome Lake, Kleena Kleene and McClinchy Restoration	7a	0.53	0.67	0.47	0.55	0.20
Clean the Dean	18	0.60	0.60	0.47	0.53	0.13



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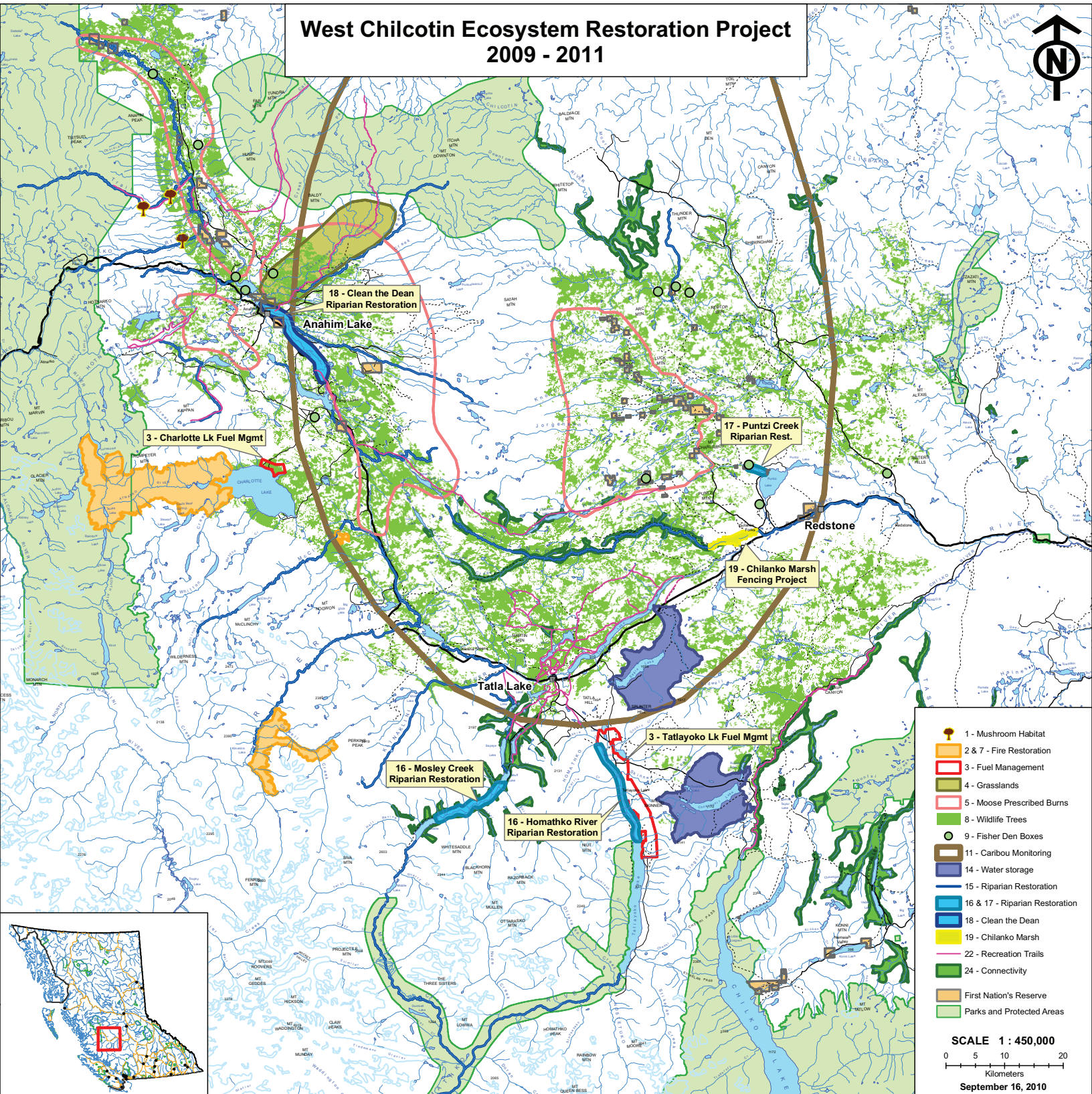
## Appendices

The overview map is attached to this document as Appendix 1 however due to the size of the Appendices the remaining maps and other information is contained in a separate Appendix document.

1. **Maps** – maps include a project area map, four overview maps, and individual detailed maps for several projects where these were available.
2. **Resources** – web based links to ecosystem restoration resources specific to the Cariboo – Chilcotin and general resources on ecosystem restoration.
3. **Stakeholder communication letter and information package** – package sent to participants.
4. **Table of Projects** – the complete list of projects sent to stakeholders as well as the public ranking results for the projects.
5. **Projects Referred Elsewhere or Deferred for Future Consideration** – projects considered outside the scope of this work and other projects that should be reviewed for future inclusion into future Ecosystem Restoration Plans.
6. **Rationales for Scoring Differences >25%** - table of scores and scoring rationale for projects where authors had scoring differences that were greater than 25%.
7. **Digital Appendix of Consultant Ranking** – consultant comments and rationale for ranking.

## **Appendix 1: Maps**

# West Chilcotin Ecosystem Restoration Project 2009 - 2011



18 - Clean the Dean  
Riparian Restoration

Anahim Lake

3 - Charlotte Lk Fuel Mgmt

CHARLOTTE LAKE

17 - Puntzi Creek  
Riparian Rest.

Redstone





19 - Chilanko Marsh  
Fencing Project

Tatla Lake

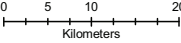
16 - Mosley Creek  
Riparian Restoration

16 - Homathko River  
Riparian Restoration

3 - Tatlayoko Lk Fuel Mgmt

-  1 - Mushroom Habitat
-  2 & 7 - Fire Restoration
-  3 - Fuel Management
-  4 - Grasslands
-  5 - Moose Prescribed Burns
-  8 - Wildlife Trees
-  9 - Fisher Den Boxes
-  11 - Caribou Monitoring
-  14 - Water storage
-  15 - Riparian Restoration
-  16 & 17 - Riparian Restoration
-  18 - Clean the Dean
-  19 - Chilanko Marsh
-  22 - Recreation Trails
-  24 - Connectivity
-  First Nation's Reserve
-  Parks and Protected Areas

SCALE 1 : 450,000



September 16, 2010

