

Appendices – West Chilcotin Ecosystem Restoration Project

- 1. Maps** – Maps include an overall project 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**
- 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

Appendix 2: Resources

The BA Blackwell grasslands prioritization project:

http://archive.ilmb.gov.bc.ca/slrp/lrmp/williamslake/cariboo_chilcotin/news/files/cc_er_strplan_blackwell_grassland_benchmark_2007.pdf

Cariboo Strategic Regional Restoration Plan:

http://www.for.gov.bc.ca/hfd/library/documents/bib98256_Cariboo.pdf

Lonesome Lake Fire Rehabilitation Plan:

http://www.for.gov.bc.ca/hfd/library/FIA/2006/LBIP_4527007a.pdf

Cariboo-Chilcotin Land Use Plan:

http://archive.ilmb.gov.bc.ca/slrp/lrmp/williamslake/cariboo_chilcotin/plan/biodiv/index.html

Chilcotin Sub Regional Plan:

http://ilmbwww.gov.bc.ca/slrp/srmp/north/chilcotin/reports/Final_draft_to_CMC.pdf

Forest Renewal BC, Forest Investment Account, and Science Council of BC Reports, and studies:

<http://nrin.forrex.org/>

Tsi Del Del – Sustainable Forest Management Plan <http://www.for.gov.bc.ca/hfd/library/FIA/2003/FIA-03-04-0085.pdf>

Nature Conservancy of Canada Biodiversity Study of the Central Interior Plateau:

<http://science.natureconservancy.ca/centralinterior/>

CCBAC – Conservation Strategy: Maintaining Ecological Systems and Communities in the Face of Change

<http://www.cconserv.org/254%20-%20301.pdf>

Interface Fire Plans for communities, CRD, First Nations:

<http://www.cariboord.bc.ca/DesktopModules/Bring2mind/DMX/Download.aspx?EntryId=1869&PortalId=0&DownloadMethod=attachment>

Invasive plant plans, inventories and resources: http://www.for.gov.bc.ca/hfp/invasive/IAP_01.htm ;

<http://www.invasiveplantcouncilbc.ca/>

Chief Foresters – Future Forest Ecosystems Initiative: http://www.for.gov.bc.ca/hts/Future_Forests/

Ecological restoration Guidelines for BC:

http://www.env.gov.bc.ca/fia/documents/TERP_eco_rest_guidelines/intro/index.html

Yun Ka Whu'ten Holdings Ltd. strategic resource plan for wildlife at risk in the Anahim supply block: draft

<http://www.for.gov.bc.ca/hfd/library/fia/html/FIA2004MR012.htm>

Identification of large areas relatively un-impacted by existing development in the Cariboo-Chilcotin for temporary retention. Cariboo-Chilcotin Conservation Society. Please contact Marg Evans at ccentre@ccconserv.org if you would like a copy of this report

Silviculture Guidelines and Practices for Maintaining or Recruiting Key Habitat Objectives:

http://www.env.gov.bc.ca/wld/documents/fia_docs/mca_silvbmp.pdf

Chilcotin Mountains Trail System: www.chilcotinwilderness.ca

Cariboo-Chilcotin Land Use Plan:

http://archive.ilmb.gov.bc.ca/slrp/lrmp/williamslake/cariboo_chilcotin/plan/biodiv/index.html

Hydrology for watersheds effected by MPB in Interior:

http://www.for.gov.bc.ca/hfp/mountain_pine_beetle/stewardship/hydrology/index.htm

Forest Practices Board - Effect of MPB and Salvage Harvesting on Streamflow:

http://www.fpb.gov.bc.ca/special/investigations/SIR16/The_Effect_of_Mountain_Pine_Beetle_Attack_and_Salvage_Harvesting_on_Streamflows_SIR16.pdf

Fish Habitat Rehabilitation Procedures: http://www.env.gov.bc.ca/wld/documents/wrp/wrtc_9.pdf

Bio-Engineering: www.trcr.bc.ca/docs/2002-polster.pdf

BC Environmental Farm Plan: www.bcac.bc.ca

Public consultation report for the development of indicators and targets for the Sustainable Forest Management Plan of the Anahim Supply Block:

http://www.for.gov.bc.ca/hfd/library/FIA/2005/LBIP_4346001.pdf

Repressed Pine Project: <http://fia.forrex.org/reports/FIA-04-05-0023.pdf>

Preparing for Climate Change – MOFR: http://www.for.gov.bc.ca/mof/Climate_Change/

Integrating Ecosystem Restoration Into Forest Management:

http://www.env.gov.bc.ca/wld/documents/fia_docs/ecosystem_restoration.pdf

Managing for pine mushrooms through the mountain pine beetle epidemic in the West Chilcotin

http://www.for.gov.bc.ca/hfd/Pubs/RSI/FSP/EN/RSI_EN09.htm

Non-timber forest products: <http://www.for.gov.bc.ca/hre/ntfp;>

<http://canadaforests.nrcan.gc.ca/article/borealntfp;>

<http://www.modelforest.net/cmfn/en/initiatives/nfp>

Integrating Non-Timber Forest Products into Forest Planning and Practices in British Columbia:

<http://cntr.royalroads.ca/node/86>

Grassland conservation council of BC: <http://www.bcgrasslands.org/default.htm>

The Burning Question-Mountain Pine Beetle and Fire in our Forests:

http://mpb.cfs.nrcan.gc.ca/biology/fire-video_e.html

Wildfire Management Branch: <http://bcwildfire.ca>: Interface Fire and Safety:

<http://bcwildfire.ca/faq/interface.htm>;

http://www.pep.bc.ca/hazard_preparedness/wildfire_information.html

Prescribed Burning: <http://www.mb.ec.gc.ca/nature/whp/prgrass/df03s41.en.html>;
<http://canadaforests.nrcan.gc.ca/article/prescribedburning>

Pacific Climate Impacts Consortium: www.pacificclimate.org Preparing for Climate Change – MOFR:
http://www.for.gov.bc.ca/mof/Climate_Change/

Chief Foresters Guidance on Landscape and Stand Level Structural Retention:
http://www.for.gov.bc.ca/hfp/mountain_pine_beetle/stewardship/cf_retention_guidance_dec2005.pdf

Intergovernmental Panel on Climate Change: <http://www.ipcc.ch/>

Climate change in the Cariboo Chilcotin: www.forrex.org/publications/link/ISS53/vol10_no3_art10.pdf

Ducks Unlimited: <http://wetlandsfortomorrow.ducks.ca/homepage>

Technical Guidance for Creating Wetlands:
http://www.dec.ny.gov/docs/materials_minerals_pdf/wetland.pdf

Restoring and Creating Wetlands: <http://www.epa.gov/owow/wetlands/pdf/restore.pdf>

Watershed Stewardship – A Guide for Agriculture contains lots of good information on how well functioning riparian areas store more water including guidelines for their protection:
<http://www.dfo-mpo.gc.ca/Library/216753.pdf>

Appendix 3: Community/Stakeholder Correspondence and Cafe Package Documents

Dear West Chiclotin Stakeholder,

As per our earlier letter regarding the development of an Ecosystem Restoration Strategy for the region please find included the information package containing background information to assist you in preparing for the “World Café” events. The packet contains materials relevant to possible projects and ecosystems in your neighbourhood in the context of restoration.

Maps will be available at the meetings to identify specific project locations. If you have coordinates and/or photographs of areas you think restoration work is needed please bring them.

It would be difficult for any one person or small group of people to identify all of the potential ecosystem restoration projects for an area this large. We are excited to work with you on this project and thank you in advance for your contributions as they are essential for the project’s success.

“World Café” events

Nimpo Lake, May 19, 2010 - 11am to 3pm and/or 4pm to 8pm @ the Bean out West.

Tatla Lake, May 20, 2010 - 11am to 3pm and/or 4pm to 8pm @ the Community Hall.

Definition: A World Café is a simple method of engaging people in conversation to explore issues, perspectives, and ideas (in our case ecosystem restoration). Learn more at www.theworldcafe.com .

Questions about the project, the café approach, or the materials in the information packet are welcome. Please do not hesitate to contact one of the team members listed below. We look forward to your participation.

Sincerely,

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**WEST CHILCOTIN
ECOSYSTEM RESTORATION
PROJECT**

Information for Participants

28 April 2010

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1.0 INTRODUCTION

Ecosystem Restoration is defined as the process of assisting with the recovery of an ecosystem that has been degraded, damaged, or destroyed. Restoration work can encompass a wide variety of activities but generally is conducted to re-establish ecological characteristics and processes such as restoring plant communities, water drainage patterns, etc. Our team has been contracted to develop a prioritized 5 year ecosystem restoration plan for the West Chilcotin. We will do this by gathering input from First Nations, West Chilcotin stakeholders, and members of the general public that have interests (economic, recreation, and/or ecological) in the ecosystems of the West Chilcotin. The final ecosystem restoration plan will incorporate existing reports and planning processes. The outcome will be a report that contains prioritized shelf ready projects for the area. The goal is to have a 5 year plan to assist in the recovery of damaged ecosystems that can be used to access funding and create local employment.

To gather input and allow ecosystem restoration ideas to be shared among interested communities, stakeholder groups and local people, we will host four *World Café*¹ events at two central locations in the West Chilcotin (Tatla Lake and Nimpo Lake). The Café atmosphere will be set up using tables where 5 – 7 people can engage in informal discussion. A ‘barista’ will be available for snacks and beverages during the discussions and an informal meal will be provided to help create a fun and productive atmosphere. The World Café events will be held in May at the two locations with two sessions being conducted on the same day (11am to 3pm and 4pm to 8pm) in order to facilitate opportunities for broad participation. Each table will have an ecosystem topic that will provide a theme to promote ideas for ecosystem restoration projects. The topics will be:

- Fire,
- Forest Harvesting and Silviculture,,
- Non-timber Forest Products,
- Grasslands,
- Livestock and Riparian areas,
- Watersheds,
- Long Term Climate Change and Managing for Resilience,
- Tourism and Recreation,
- Wildlife Habitats,

When you arrive you will choose a table (topic of interest). Members of our group will be available to answer questions, stimulate discussion, and record ideas for ecosystem restoration projects. You will be free to move between tables so you can contribute to all topics that interest you. Ideas will not be restricted to these topics. The topics are provided as an overview but all ecosystem restoration ideas will be considered for this plan. At the end of the day, restoration discussions/ideas will be presented to the large group for a final discussion. Our team will review the discussion materials from these events

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

and prioritize projects based on feasibility, cost, benefit, and compatibility with ecosystem restoration objectives.

Appendix 1 lists projects and reports that will be considered during the development of this plan. The difference between this project and previous projects is that the output will be a prioritized list of potential ecosystem projects that can be taken off the shelf and implemented when funds are available.

Ecological restoration includes a broad range of activities. This information package is meant to provide you with a basic overview of ideas on the types of projects that can be included. Projects can range from those concentrating on restoring local ecosystems, such as a degraded stream, to restoring ecological processes, such as fire. It may be helpful to divide projects into two broad types:

- **Fix-it** projects where there is a direct problem, such as trails that have pine blowdown blocking them or an eroding road section that is pumping sediment into a stream.
- **Prevention** projects which address the reasons why ecosystems are failing, such as poor road planning/deactivation strategies, altered natural fire regimes, or lack of protection for sensitive ecosystems.

Maps will be available at the meetings to identify specific project locations. If you have coordinates and/or photographs of areas you think restoration work is needed please bring them.

It would be difficult for any one person or small group of people to identify all of the potential ecosystem restoration projects for an area this large. We are excited to work with you on this project and thank you in advance for your contributions as they are essential for the project's success.

2.0 DESCRIPTION OF ECOSYSTEM TOPICS

2.1 Long Term Climate Change and Managing for Resilience

Description: In BC, a changing climate is generating stress for some species as ecosystems are expected to be forced upward in elevation and northward in distribution. Scientists suggest that warming will accelerate in the B.C. Interior and it is already increasing 0.5° C per decade. This will result in: shorter winters, more seasonal rain, earlier bud break, declining mountain glaciers, less annual snowpack, shorter operational seasons for forest workers, more forest closures due to drought and fire hazard, less late summer soil moisture (drought), and lower summer stream flows. In addition, warmer temperatures are expected to increase the frequency and severity of ice storms, floods, drought, and wildfire (varying from year to year and across the region). On the positive side, some species will benefit from increased temperature and precipitation, while others will struggle as conditions move outside

their genetic tolerances. Warmer temperatures are expected to favour invasive weeds, insect pests and pathogens, and may cause species or whole ecosystems to move into a more stressful regime. The seriousness of long-term climate change cannot be overstated. In forestry there are two approaches to dealing with the consequences of climate change, adaptation and mitigation. *Adaptation* is proactively adjusting management for ecological resilience, while *mitigation* includes managing for enhanced carbon storage and reducing carbon emissions.

Resilience is the capacity of a natural system or living organism to resist stress or adversity and to recover or rebound following a disturbance setback. Research suggests that ecological resilience is generally enhanced by abundant resources (soil moisture, soil fungi, soil organic matter, soil nutrients, and wildlife), and by prior exposure to disturbance. Biodiversity contributes to ecological resilience by enabling populations to evolve in response to disturbance. It is important to emulate natural disturbance and plan biological legacies that closely model what is left after a natural disturbance (i.e., what to leave is as important as what to take).

Types of Projects: Prevention or mitigation against climate change requires managing carbon; that is, managing to reduce emissions of green house gases (GHGs) and/or managing to increase carbon storage. In forests and range lands carbon is stored in aboveground biomass (live and dead trees, shrubs and grasses) and in soils; whereas, fossil fuel burning, slash burning, and wildfires emit carbon dioxide to the atmosphere.

Specific Examples: Suggestions for mitigation practices include: using more fuel efficient vehicles, reducing travel; reducing slash burning and redistributing roadside slash to the cutblock; promoting local agriculture and economies that reduce dependence on transportation.

Links:

Pacific Climate Impacts Consortium: www.pacificclimate.org

Chief Foresters – Future Forest Ecosystems Initiative: http://www.for.gov.bc.ca/hts/Future_Forests/

Preparing for Climate Change – MOFR: http://www.for.gov.bc.ca/mof/Climate_Change/

Chief Foresters Guidance on Landscape and Stand Level Structural Retention:
http://www.for.gov.bc.ca/hfp/mountain_pine_beetle/stewardship/cf_retention_guidance_dec2005.pdf

Intergovernmental Panel on Climate Change: <http://www.ipcc.ch/>

Climate change in the Cariboo Chilcotin: www.forrex.org/publications/link/ISS53/vol10_no3_art10.pdf

2.2 Fire

Description: Wildfire is a natural process that is a part of a functioning ecosystem. Over the last several decades fire suppression practices have created problems for ecosystems, such as decreased forest health and increased threat, severity and number of forest fires in the province. In the West Chilcotin the risk of wildfire is now greater because of the increase in fuel reservoirs created by trees killed by the mountain pine beetle. The wildfire risk in the region will continue to increase due to global warming trends. Regardless, a balance needs to be struck between the risks that wildfires present to public safety, economics and socio-cultural values and the importance of wildfire in maintaining ecosystem function. For the purposes of this ecosystem restoration strategy we will consider fire management

projects that include both the management of fire for public safety and for ecosystem function. For example managing wildfire risks at the community interface and landscape level are critical precautionary measures while using fire for regenerating fire dependent species and rejuvenating specific habitat types is equally important. Additionally, projects that focus on restoration of previously burned areas should also be considered.

Types of projects: Fix-it projects may include restoration of burned areas and the introduction of prescribed burns to restore or rejuvenate fire dependent species, increase biodiversity and ecosystem resilience. Preventative projects could range from fuel management activities at the community wild land interface to using prescribed burns for decreasing fuel loads in a controlled manner.

Specific examples: Examples of fix-it projects include using a prescribed burn in a grassland area where the ingress of trees threatens to convert it to a forested area and replanting a previously burned site where regeneration rates are low. A preventative example would be the removal of dead pine trees at a community interface thereby limiting excess fuels in case of a wildfire.

Links:

The Burning Question-Mountain Pine Beetle and Fire in our Forests:

http://mpb.cfs.nrcan.gc.ca/biology/fire-video_e.html

Wildfire Management Branch: <http://bcwildfire.ca>

Interface Fire and Safety: <http://bcwildfire.ca/fag/interface.htm>

http://www.pep.bc.ca/hazard_preparedness/wildfire_information.html

Prescribed Burning: <http://www.mb.ec.gc.ca/nature/whp/prgrass/df03s41.en.html>

<http://canadaforests.nrcan.gc.ca/article/prescribedburning>

2.3 Grassland

Description: Grasslands are open landscapes where grasses and dry land shrubs dominate the vegetation and there are few trees. Cariboo-Chilcotin grasslands are special ecosystems that are important for their high biodiversity and forage values both for livestock and wildlife. In BC, grasslands support 30% of the provincially vulnerable species and make up some of the last relatively intact grassland ecosystems in Western North America. While the majority of grasslands in this area are located adjacent to the Fraser and Chilcotin Rivers, small pockets of grassland are also found throughout the West Chilcotin. The biggest threats to grasslands are the loss of fire, in-growth of forest, invasive species, some recreation activities, over grazing, intensive agriculture, and urban development.

Types of Projects: Examples of fix-it type projects include identifying grasslands that have deteriorated; using prescribed fire and logging of forest in-growth to maintain grasslands; and removing invasive plants. Prevention type projects include monitoring programs to promote sustainable use; education programs for ATV users; and restoring natural fire regimes.

Specific Examples: Historically, fire was used in the West Chilcotin to reduce tree in-growth and increase forage. Opportunities exist to create fire management plans in consultation with the Ministry of Forest for grassland areas.

Links for More Information:

A CONSERVATION STRATEGY - Maintaining Ecological Systems and Communities in the Face of Change
Appendix VII: <http://www.cconserv.org/254%20-%20301.pdf>

Grassland conservation council of BC: <http://www.bcgrasslands.org/default.htm>

2.4 Non-Timber Forest Products

Description: Non-timber forest products (NTFPs) are forest derived commodities other than structural timber and lumber products. They include wild mushrooms, botanical foods and medicines and a range of other resources found in the forest. The biology and ecology of many non-timber forest products are not yet well understood. As a result, management recommendations for maintaining many NTFPs are limited. Current large scale changes to ecosystems in the West Chilcotin caused by fire, the mountain pine beetle, salvage harvesting, and unforeseen changes due to shifts in climate may damage and/or eliminate habitats NTFPs occupy. Planning restoration activities for these resources will be a challenge. Both direct restoration efforts, such as restoring specific habitat conditions and indirect efforts like implementing strategies to increase (*restore?*) ecosystem resilience should be considered. An example of an NTFP impacted by both natural and human generated ecosystem changes is the pine mushroom. In the West Chilcotin, the pine mushroom fungus requires a relationship with the live roots of mature pine trees in order to fruit. Tree mortality caused by the mountain pine beetle and logging have resulted in losses of pine mushroom fruiting habitat. Silviculture practices such as planting nursery stock may further threaten the fungi's fruiting habitat by introducing foreign microbial species which could cause changes in soil microbial communities including diminishing or eliminating the pine mushroom fungus. Additionally, the removal of excess wood debris from logged areas is decreasing both nutrient resources and water retention capacity on these sites. As a result negative impacts to site productivity and the regeneration capacity of pine mushroom habitat can be assumed.

Types of Projects: Fix it projects will include measures that attempt to restore the quality and quantity of NTFP habitats. Treatments might be limited to a single activity or could include the development of a comprehensive plan that includes several activities. Prevention projects could include identifying and preserving important habitats before problems arise as well as increasing ecosystem resilience in general.

Specific Examples: An example of a fix-it project would be to increase the available nutrients and moisture holding capacity in a pine mushroom area by falling a percentage of dead pine trees. An example of a preventative project would be the creation of a special management area around a medicinal plant harvest site.

Links:

Managing for pine mushrooms through the mountain pine beetle epidemic in the West Chilcotin
http://www.for.gov.bc.ca/hfd/Pubs/RSI/FSP/EN/RSI_EN09.htm

Non-timber forest products: <http://www.for.gov.bc.ca/hre/ntfp>

<http://canadaforests.nrcan.gc.ca/article/borealntfp>

<http://www.modelforest.net/cmfn/en/initiatives/nfp>

Integrating Non-Timber Forest Products into Forest Planning and Practices in British Columbia

<http://cntr.royalroads.ca/node/86>

2.5 Forest Harvesting and Silviculture

Description: Logging is an important economic activity in the Cariboo-Chilcotin that helps sustain many communities. Currently, most harvesting is focused on pine leading stands that have a high proportion of trees killed by MPB. The quality of this dead wood is deteriorating over time and most of the trees will fall over during the next 10 years. New initiatives are under development to promote greater utilization of beetle wood as biofuel and pellets. Larger logs that are left in the forest are also important in maintaining wildlife and non-timber forest product habitat in the West Chilcotin. Future forests will also need to be adapted to climate change. Managing our forests for ecological resilience and reduced susceptibility to climate change, requires increasing complexity or variability at the stand and landscape levels. Stands that are diverse in composition, structure, and pattern on the landscape are known to be more resilient. Planning that results in more varied stands and landscapes will improve habitat for wildlife, increase forest resistance to disturbance, and facilitate adaptation of organisms.

Types of Projects: Examples of fix-it type projects include reforesting areas not currently growing forests and treatments to increase growth rates in existing forests. Prevention type projects include monitoring to assess if timber harvest is meeting targets and indicators for Sustainable Forest Management; trials to assess harvest regimes for non-timber forest products; and assessing the need for changes in forest practices to promote more resilient ecosystems.

Specific Examples: Fix-it type projects include planting the Carrier backlog blocks; fertilization of repressed pine stands, and variable density stand thinning. Prevention type projects include: monitoring using the Yun Ka Whu'ten Holdings Ltd indicators/targets for sustainable forest management; promoting increased retention by forest companies; making recommendations to government regarding variable stand stocking densities, making deciduous species acceptable and preferred trees after logging, modify stocking surveys to accommodate open patches within forest stands, lower stocking standard for percentages of cutblocks, extending free to grow dates and rotation ages for portions of the landscape, and protecting advanced regeneration.

Links:

Public consultation report for the development of indicators and targets for the Sustainable Forest Management Plan of the Anahim Supply Block:

http://www.for.gov.bc.ca/hfd/library/FIA/2005/LBIP_4346001.pdf

Repressed Pine Project: <http://fia.forrex.org/reports/FIA-04-05-0023.pdf>

Preparing for Climate Change – MOFR: http://www.for.gov.bc.ca/mof/Climate_Change/

Integrating Ecosystem Restoration Into Forest Management:

http://www.env.gov.bc.ca/wld/documents/fia_docs/ecosystem_restoration.pdf

2.6 Livestock and Riparian Areas

Description: In the drier ecosystems and/or during the hot summers, cattle tend to congregate and hang out in riparian areas. Sometimes these zones become overgrazed. Overgrazing in riparian areas can have severe consequences on channel stability and the plant and animal communities that rely on these areas. In some areas, 75% of birds and mammals depend on riparian habitats at least part of the year. Flooding disturbances, the diversity of soil types, and the variety of moisture regimes creates a diverse riparian ecosystem in terms of structure, composition, and species richness with many edges and habitats. The importance of riparian communities to birds, small mammals, furbearers, waterfowl, ungulates, insects, and to ecosystem processes cannot be overemphasized.

Riparian vegetation protects and stabilizes streambank soils, deflects and slows erosion, assists streambed development by influencing transportation and deposition rates of materials. These functions play major roles in recovery processes following both natural and/or human caused disturbance. Riparian vegetation also plays important roles in moderating stream temperature extremes and in maintaining higher summer low flows that are important for many fish species.

Types of Projects: Fix-it type projects for riparian ecosystems include planting willow, dogwood, or cottonwood cuttings to speed up riparian recovery. Bio-engineering techniques (revetments, wattle fences, brush layers, live staking, palisades) can be used to stabilize damaged and eroding streambanks. Fencing riparian areas to restrict livestock access to streams and constructing hardened access ramps for livestock watering also help prevent damage. Prevention type projects include conducting a riparian health assessment to identify areas where problems may be occurring. A riparian pasture can be created to control timing and intensity of grazing in riparian areas.

Specific Examples: Workshops on bio-engineering or sustainable agriculture could be put on in the West Chilcotin. Riparian fencing and planting programs can be conducted on impacted reaches.

Links:

Bio-Engineering: www.trcr.bc.ca/docs/2002-polster.pdf

Ecology of Riparian Ecosystems of Northeast Oregon – Thesis 1995 – Richard Case
<http://ir.library.oregonstate.edu/jspui/handle/1957/10456>

Riparian Areas – A Users Guide to Health: <http://cowsandfish.org/>

BC Environmental Farm Plan: www.bcac.bc.ca

2.7 Watersheds

Description: Watersheds or drainages are areas that are geographically defined by height of land or slope of land and are affected by the same hydrological processes or water ways. Hydrological processes in the Watersheds of the West Chilcotin have been impacted by; the mountain pine beetle (MPB), logging, road construction and other development. For example the MPB has reduced the live

forest canopy increasing the amount of water (snow and rain) directly contacting the ground. This increased ground water will result in increased spring run-offs as ground snow melts. Timber harvest further decreases the interception of snow and rain by trees while roads act as channels that redirect surface run off. Climate scientists project shorter warmer winters, less annual snowpack, declining mountain glaciers, less late summer soil moisture, higher frequency and intensity of flooding, and lower summer stream flows. Higher and more rapid spring peak flows are more erosive and have the potential for numerous downstream damaging effects including: sedimentation, channel plugging in lower reaches, channel widening and filling in of pool habitats, and damage to human structures (ditches, roads, culverts, bridges, fields, and buildings). Additionally, ecosystem productivity is expected to decrease as soil nutrients run-off with increased spring water flows.

Maintaining pools, complex stream structures, spawning areas, shade, and connectivity are critical to the survival of trout and salmon. Changes to channel condition due to extreme flows can reduce the amount of spawning and rearing habitat for fish. Well structured channels are also resistant to extreme peak flow events. Historic roads often did not account for fish passage when installing culverts and old roads can also be sources of sediment due to poor design. Maintaining fish access to all areas of the watershed and rehabilitating sources of sediments helps maintain the productive capacity of streams for aquatic species.

Types of Projects: Fix-it projects for damaged watersheds include replacing barrier culverts, constructing fish ladders around irrigation dams, identifying and stopping sources of sediment, placing large woody debris/boulders in streams, and pool-riffle reconstruction. Projects to prevent watershed damage include minimizing harvesting in riparian areas, developing forest, rangeland, and agricultural water conservation strategies, develop alternative irrigation strategies that reduce consumption, salvage harvest in stages by using a variety of cutting intensities and retention strategies distributed over the landscape to desynchronize runoff.

Specific Examples: Reconstruct pool-riffle habitat in lower reaches of Puntzi Creek to provide more rearing/overwinter habitat. Partner with Ducks Unlimited to create wetlands/ impoundments, reduce livestock access to riparian areas. Identify and rehabilitate sources of sediment to streams. Promote landscape level planning for salvage harvesting to maintain forest cover on some areas of the landscape.

Links:

Hydrology for watersheds effected by MPB in Interior:

http://www.for.gov.bc.ca/hfp/mountain_pine_beetle/stewardship/hydrology/index.htm

Forest Practices Board - Effect of MPB and Salvage Harvesting on Streamflow:

http://www.fpb.gov.bc.ca/special/investigations/SIR16/The_Effect_of_Mountain_Pine_Beetle_Attack_and_Salvage_Harvesting_on_Streamflows_SIR16.pdf

CCBAC – Conservation Strategy: [www.cconserv.org/1 - 52.pdf](http://www.cconserv.org/1-52.pdf)

Fish Habitat Rehabilitation Procedures:

http://www.env.gov.bc.ca/wld/documents/wrp/wrtc_9.pdf 2.8 Tourism and Recreation

Description: Backcountry recreation is the focus of most tourism operations with ecosystem interests in the West Chilcotin. Present commercial recreation use of trails includes horse trips, guide-outfitting, hiking, mountaineering, and backcountry skiing. Facilities vary from tent camps and rustic cabins to well-established lodges. The current MPB epidemic is likely to have impacted on some or all of these uses.

The MPB epidemic has reset the stage for many of the West-Chilcotin forests. A dead forest is also a regenerating forest with green and dead legacies and an early recovering ecosystem. Such a forest is still fully functioning with aesthetic values, complexity, and research opportunities. Scientists state that 65% of animals occupying a pine forest are enhanced by the MPB epidemic. A naturally recovering dead forest with its diversity of legacies and renewal processes probably has tourism value. It certainly has benefits for many wildlife species, is valuable for research, and serves as an example of the resiliency and processes inherent in ecosystems. In addition to wilderness tourism and cultural/heritage tourism, ecological tourism based on ecosystem processes, the epidemic itself, the recovery of stands, and the role of legacies could have potential marketing value.

Types of Projects: Fix-it type projects include trail maintenance, clearing of dead pine blow down, trail signage, existing trail mapping, trail guides that describe features along the way, and developing/maintaining rustic camp sites. Prevention type projects include planning recreation areas, the construction of new trail systems, new roads for accessing beetle killed wood, as well as updating access management plans and deactivation plans with a tourism and recreation focus..

Specific Examples: Clearing blow down and posting signage along established trail systems. The West Chilcotin Tourism Association has endorsed the establishment of a trail system along the Chilcotin Mountains to provide for expanded wilderness tourism opportunities. Planning for trail projects such as this and other uses prior to its establishment to ensure that the productive capacities of ecosystems are maintained.

Links:

Chilcotin Mountains Trail System: www.chilcotinwilderness.ca

CCBAC – Conservation Strategy: [www.cconserv.org/1 - 52.pdf](http://www.cconserv.org/1-52.pdf)

Cariboo-Chilcotin Land Use Plan:

http://archive.ilmb.gov.bc.ca/slrp/lrmp/williamslake/cariboo_chilcotin/plan/biodiv/index.html

2.9 Wildlife Habitat

Description: Wildlife habitats include the areas and structures that animals use for reproduction, feeding, and cover. Animals that use a narrow range of habitats to meet one or more of these requirements are vulnerable to natural and human caused changes to ecosystems. Fire suppression, the current MPB epidemic, timber harvesting, and climate change have impacted wildlife habitat in the West Chilcotin

For example, the combined impacts of mountain pine beetle and harvesting has reduced the amount of older lodgepole pine habitat. Fisher have their young in cavities of large old trees including lodgepole

pine. Loss of these trees has reduced denning opportunities for fisher and other species that use cavities. For other wildlife, large areas of windthrow pine resulting from MPB kill may form barriers to wildlife movements. Fire suppression has in some cases caused in-growth of small diameter trees resulting in stands more susceptible to large scale intense crown fires and insect infestations. Wildlife such as mule deer depend on these stands for winter cover and will be impacted if they are lost. Another example is the increased use of or piling and burning of woody debris, which removes or reduces habitat that provides cover and feeding opportunities for many wildlife species.

Types of Projects: Examples of fix-it type projects include those that increase the quality or quantity of wildlife habitat. These types of projects range from prescribed burns, restoring degraded wetland habitats to supplementing the supply of structures for nesting/denning. Prevention projects include identifying and preserving important habitats before problems arise. For instance, impacts of climate change are difficult to predict, but projects that provide linkages, corridors, or other mechanisms to facilitate the movement of wildlife as they respond to climate changes increases the chances for species survival.

Specific Examples: Prescribed burning of pine stands to decrease the effects of blowdown on wildlife movement and promote natural ecosystem processes. Building and erecting den/nest boxes to compensate for short - mid term losses of this habitat. , Promoting the acceptance of deciduous trees in forestry, which develop cavities more quickly than conifers.. Designing wildlife corridors that allow wildlife to move through the Chilcotin promotes resilience to climate change. Planning for woody debris recruitment and retention, in particular large diameter woody debris.

Links for More Information:

[Yun Ka Whu'ten Holdings Ltd. strategic resource plan for wildlife at risk in the Anahim supply block: draft](http://www.for.gov.bc.ca/hfd/library/fia/html/FIA2004MR012.htm)
<http://www.for.gov.bc.ca/hfd/library/fia/html/FIA2004MR012.htm>

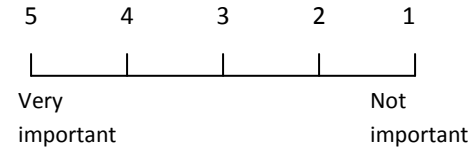
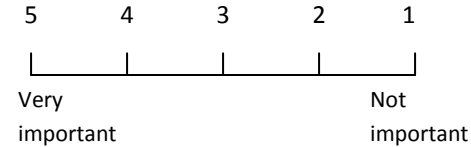
Identification of large areas relatively un-impacted by existing development in the Cariboo-Chilcotin for temporary retention. Cariboo-Chilcotin Conservation Society. Please contact Marg Evans at ccentre@ccconserv.org if you would like a copy of this report

Silviculture Guidelines and Practices for Maintaining or Recruiting Key Habitat Objectives:
http://www.env.gov.bc.ca/wld/documents/fia_docs/mca_silvbmp.pdf

Appendix 1: Links to other reports on ecosystem restoration in the Cariboo-Chilcotin

- The BA Blackwell grasslands prioritization project:
http://archive.ilmb.gov.bc.ca/slrp/lrmp/williamslake/cariboo_chilcotin/news/files/cc_er_strplan_blackwell_grassland_benchmark_2007.pdf
- Cariboo Strategic Regional Restoration Plan:
http://www.for.gov.bc.ca/hfd/library/documents/bib98256_Cariboo.pdf
- Lonesome Lake Fire Rehabilitation Plan:
http://www.for.gov.bc.ca/hfd/library/FIA/2006/LBIP_4527007a.pdf

- Cariboo-Chilcotin Land Use Plan:
http://archive.ilmb.gov.bc.ca/slrp/lrmp/williamslake/cariboo_chilcotin/plan/biodiv/index.html
- Chilcotin Sub Regional Plan:
http://ilmbwww.gov.bc.ca/slrp/srmp/north/chilcotin/reports/Final_draft_to_CMC.pdf
- Forest Renewal BC, Forest Investment Account, and Science Council of BC Reports, and studies:
<http://nrin.forrex.org/>
- Tsi Del Del – Sustainable Forest Management Plan
<http://www.for.gov.bc.ca/hfd/library/FIA/2003/FIA-03-04-0085.pdf>
- Nature Conservancy of Canada Biodiversity Study of the Central Interior Plateau:
<http://science.natureconservancy.ca/centralinterior/>
- CCBC – Conservation Strategy: <http://www.ccconserv.org/254%20-%20301.pdf>
- Interface Fire Plans for communities, CRD, First Nations:
<http://www.cariboord.bc.ca/DesktopModules/Bring2mind/DMX/Download.aspx?EntryId=1869&PortalId=0&DownloadMethod=attachment>
- Invasive plant plans, inventories and resources:
http://www.for.gov.bc.ca/hfp/invasive/IAP_01.htm ; <http://www.invasiveplantcouncilbc.ca/>
- Chief Foresters – Future Forest Ecosystems Initiative:
http://www.for.gov.bc.ca/hts/Future_Forests/
- Ecological restoration Guidelines for BC:
http://www.env.gov.bc.ca/fia/documents/TERP_eco_rest_guidelines/intro/index.html

	increase soil water holding capacity help mitigate these impacts.				
Increase Ecological Resilience – Forest retention planning	Planning is required for retention areas that will help increase the resilience of forest stands. Retention areas provide connectivity across the landscape that allows organisms to move with the changes in vegetation that are forecast to occur as climate changes. This will also address the impacts associated with large-scale salvage harvesting of MPB impacted stands. There are existing plans for retention in Anahim (e.g. Wildlife Strategy for the Anahim Supply Block) and Tatla supply blocks that are likely to provide a basis for planning. However, a review of the applicability of the plans is required before implementation.	1. Review existing plans/policies for retention/connectivity and make recommendations for retention areas/corridors to improve the resilience of forest ecosystems.	Improved ecosystem resilience to changes due to human use and climate.	In your opinion how important is this project area? Please indicate by circling the appropriate number on the scale. 	<ul style="list-style-type: none"> 1. 1/11 2. 2/11 3. 3/11 4. 3/11 5. 2/11
Increase Ecological Resilience – Native vegetation	Native vegetation has adapted to local climates that have changed in the past. These varieties are more likely to contain genetics that allow the plants to be sustained as climate changes in the future.	1. Review existing policies and make recommendations for policy changes to increase natural regeneration of trees on harvested areas.	Improved ecosystem resilience to changes due to human use and climate.	In your opinion how important is this project area? Please indicate by circling the appropriate number on the scale. 	<ul style="list-style-type: none"> 1. 1/11 2. 3/11 3. 2/11 4. 4/11 5. 0/11 <p>No Response. 1/11</p>

Reduce Carbon Footprint	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.	<ol style="list-style-type: none"> 1. Workshop to identify barriers and solutions to creating local opportunities. 2. Create/encourage local economies, non-timber forest product coop, local beef sales. 3. Explore opportunities for alternatives to diesel generation and back-up power options (co-gen, ROR, etc). 4. Explore opportunities for local food production via greenhouses. 5. Explore opportunities for bus/van service to and from the area. 6. Develop and deliver a climate change workshop. 	Reduction of the carbon footprint across the West Chilcotin and promotion of awareness about carbon impacts and how to reduce them.	In your opinion how important is this project area? Please indicate by circling the appropriate number on the scale.	<ol style="list-style-type: none"> 1. 1/11 2. 3/11 3. 3/11 4. 1/11 5. 2/11 <p>No Response. 1/11</p>
Identification of NTFP's and habitats	One of the barriers to protecting and maintaining alternative forest products is that little is known about the specific conditions and habitat required for their growth. Identifying the ecosystems and the biological requirements for the growth of these resources will enable restoration and preservation. A top priority for this is soapberry and Labrador tea.	<ol style="list-style-type: none"> 1. This would be a multi phase project involving the following steps: <ol style="list-style-type: none"> a. Create a list of locally important NTFP's (food, medicines and other botanicals). b. Conduct a literature and Traditional Knowledge review of what is known about identified NTFP's. c. Conduct prioritized biological and ecological assessments. d. Conduct habitat mapping 	Protection and monitoring of important habitats and plant species.	In your opinion how important is this project area? Please indicate by circling the appropriate number on the scale.	<ol style="list-style-type: none"> 1. 0/11 2. 4/11 3. 3/11 4. 2/11 5. 2/11

Rehabilitation of Charlotte Lake Fire Guard	Fire guard at Charlotte lake needs rehabilitation as it has become a road which people use to drive ATVs into sensitive ecosystems (alpine).	<ol style="list-style-type: none"> Assess fire guard and prepare remediation prescriptions. Implement remediation prescriptions. 	Restore degraded site.	<p>In your opinion how important is this project area? Please indicate by circling the appropriate number on the scale.</p> <p>5 4 3 2 1</p> <p>Very important Not important</p>	<ol style="list-style-type: none"> 2/11 2/11 2/11 3/11 1/11 <p>No Response. 1/11</p>
Lonesome Lake, Kleena Kleene and Bigstick Fire Restoration	A community driven plan was developed in 2006 to carry out restoration treatments on the Lonesome Lake, McClinchy and Kleena Kleene Fires. The recommendations made in this planning document should be carried forward.	<ol style="list-style-type: none"> Conduct an audit of the recommendations from the plan and identify the restoration priorities. Implement treatments 	Ensure values impacted by fire are restored.	<p>In your opinion how important is this project area? Please indicate by circling the appropriate number on the scale.</p> <p>5 4 3 2 1</p> <p>Very important Not important</p>	<ol style="list-style-type: none"> 1/11 3/11 1/11 4/11 1/11 <p>No Response. 1/11</p>
Livestock bridge replacement	There are bridges in the Anahim Lake area that were built to protect creeks and facilitate livestock crossing that are in disrepair. Repairing these structures would ensure that they continue to protect aquatic resources.	<ol style="list-style-type: none"> Locate bridges requiring repair and/or replacement. Replace structures. 	Improved stream, fish, and water quality, as well as increased livestock protection for animals crossing steep banked creeks	<p>In your opinion how important is this project area? Please indicate by circling the appropriate number on the scale.</p> <p>5 4 3 2 1</p> <p>Very important Not important</p>	<ol style="list-style-type: none"> 2/11 0/11 3/11 4/11 1/11 <p>No Response. 1/11</p>
Prioritized range fencing plan	Range fencing is important for reducing grazing impact on streams as well as utilization of upland forage. A prioritized plan for the West Chilcotin.	<ol style="list-style-type: none"> Develop fencing plan with cattlemen and MOFR. Implement fencing projects 	Improved control of livestock and livestock impact on ecosystems	<p>In your opinion how important is this project area? Please indicate by circling the appropriate number on the scale.</p> <p>5 4 3 2 1</p> <p>Very important Not important</p>	<ol style="list-style-type: none"> 1/11 2/11 2/11 3/11 3/11

Education plan to reduce netting of spawners	Over fishing of spawners has been reported to be impacting fish at some lakes. A targeted educational approach may reduce this problem (i.e., Chilko and Bluff Lakes, perhaps others)	1. Develop educational materials and approaches	Enhanced fishery and stewardship.	In your opinion how important is this project area? Please indicate by circling the appropriate number on the scale. 5 4 3 2 1 ----- Very important Not important	1. 2/11 2. 1/11 3. 2/11 4. 2/11 5. 3/11 No Response. 1/11
Stream and riparian habitat surveys /Sediment source surveys	Stream channels and riparian habitat can be damaged by logging, riparian plant removal, livestock trampling, overgrazing, vehicles, mining, and recreation. These activities can impact stream structure and create sediment sources that negatively affect water quantity/quality, fish and riparian habitat, and water temperature. Impacted channels can be protected, replanted and stabilized, and/or managed differently. Several streams were suggested to require surveys (Kapan Ck, Beef Trail R, Dean R, Chilanko R, McClinchy R, Green R, Kleena Kleene R, Marys Ck, Natshialla Ck, Holtry Ck, Guishon Ck, and Leaman Ck)	1. Conduct stream habitat and riparian condition surveys in selected reaches and watersheds. 2. Develop plans to protect and restore damaged stream/riparian ecosystems . 3. Develop prescriptions to increase pool habitat in streams where pools are few. 4. Conduct riparian planting of willows, cottonwood, and dogwood at selected reaches. 5. Organize workshop to teach riparian planting (bioengineering) to landowners and stewards.	Reduce channel erosion and lateral migration, reduce spawning gravel sedimentation, reduce land loss, improve shade and water quality, improve fish habitat, improve riparian wildlife habitat, improve water storage capacity, and improve riparian/upland forage production	In your opinion how important is this project area? Please indicate by circling the appropriate number on the scale. 5 4 3 2 1 ----- Very important Not important	1. 2/11 2. 2/11 3. 0/11 4. 2/11 5. 5/11
Clean the Dean	It has been reported that refuse along the Dean River has visual quality impacts as well impacts to riparian and stream function. This project has been suggested as a stewardship education project for community and youth.	1. Host a workshop on BC Rivers Day that includes an educational component and a cleanup of the Dean R.	Cleaning the Dean would have educational as well as aesthetic and ecosystem value	In your opinion how important is this project area? Please indicate by circling the appropriate number on the scale. 5 4 3 2 1 ----- Very important Not important	1. 0/11 2. 2/11 3. 5/11 4. 2/11 5. 2/11

Puntzi Creek Restoration	Pool frequency was found to be low in lower Puntzi Creek limiting rainbow trout production (Davis 2009 - Level 1 Fish Habitat Assessment). Pool habitat frequency can be increased using log weirs, boulder clusters, deflectors, free form whole tree debris, etc.	1. Develop prescriptions for selected reaches in lower portions of Puntzi Ck. 2. Implement prescriptions.	Restore and improves pool habitat, sediment/debris trapping, reduce erosive peak flow stream energy, and increase fisheries production	In your opinion how important is this project area? Please indicate by circling the appropriate number on the scale. 5 4 3 2 1 ----- Very important Not important	1. 1/11 2. 2/11 3. 1/11 4. 5/11 5. 1/11 No Response. 1/11
Culvert Fish Passage Inspections	Culverts especially perched culverts can be a barrier to fish passage. Fish will avoid passing through a culvert if it is not buried, does not have a natural stream bed, or is perched above a jumping height.	1. Conduct culvert inspection survey in watersheds where culver inspection data does not exist. 2. Remove and replace barrier culverts as determined in the survey.	The identification and removal of barriers would restore fish distributions and fisheries production	In your opinion how important is this project area? Please indicate by circling the appropriate number on the scale. 5 4 3 2 1 ----- Very important Not important	1. 0/11 2. 1/11 3. 2/11 4. 3/11 5. 5/11
Homathko River riparian restoration	The Upper Homathko River is home to rainbow and bull trout as well as numerous non-game species. The 1999 G3 Consulting report outlines general and specific issues pertaining to these stream/riparian ecosystems including recommendations for projects. Riparian planting, hardening of stock access points, community education, and bank protection are some of the projects that are identified.	1. Utilize the 1999 G3 Consulting report as a starting point for identifying restoration projects. 2. Develop a prioritized plan for addressing concerns. 3. Implement projects.	Restore Homathko River stream ecosystems to the benefit of the river and its rainbow and bull trout populations.	In your opinion how important is this project area? Please indicate by circling the appropriate number on the scale. 5 4 3 2 1 ----- Very important Not important	1. 1/11 2. 2/11 3. 1/11 4. 4/11 5. 2/11 No Response. 1/11
Reduce cattle watering impacts on streams	Heavy stock traffic accessing water along vulnerable streams can trample banks, damage channels, eliminate vegetation, reduce water quality, and impact fish habitat. Options to address these impacts include hardening selected watering ramps with geotextiles	1. Inventory to determine stream reaches, lakeshores, and wetlands on both private and Crown land where cattle impacts are occurring. 2. Develop prescriptions for selected sites. 3. Implement prescriptions.	Reduce impacts on riparian areas and streams, such as bank destabilization, habitat loss, and sediment generation.	In your opinion how important is this project area? Please indicate by circling the appropriate number on the scale. 5 4 3 2 1 ----- Very important Not important	1. 1/11 2. 0/11 3. 4/11 4. 2/11 5. 4/11

	Analysis of existing scat samples would help determine winter wolf diet components and aid in management of this predator/prey system.				
Caribou	A 4 year Monitoring Project employing GPS and VHF collar technology is proposed to investigate the impact of Mountain Pine Beetle (MPB) on caribou habitat use, forage, mobility, range distribution, and population trends in the West Chilcotin.	<ol style="list-style-type: none"> 1. Development of a Monitoring Program. 2. Capture and collaring 40 caribou in year 1. 3. Remote, non-invasive monitoring of GPS collared animals from year 1 through 3. 4. Population inventory in year 2 by using mark-re-sight methodology. 5. Analysis/reporting of data results in year 4. 	Maintenance of caribou in the West Chilcotin	<p>In your opinion how important is this project area? Please indicate by circling the appropriate number on the scale.</p> <p style="text-align: center;">5 4 3 2 1</p> <p style="text-align: center;"> ----- ----- ----- ----- </p> <p>Very important Not important</p>	<ol style="list-style-type: none"> 1. 1/11 2. 1/11 3. 2/11 4. 3/11 5. 4/11
Amphibian	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. Providing baseline information on amphibians in the West Chilcotin will be important in sustaining them.	<ol style="list-style-type: none"> 1. Develop a monitoring program for amphibians in the West Chilcotin. 2. Implement monitoring program. 	Maintenance of biodiversity in the Chilcotin.	<p>In your opinion how important is this project area? Please indicate by circling the appropriate number on the scale.</p> <p style="text-align: center;">5 4 3 2 1</p> <p style="text-align: center;"> ----- ----- ----- ----- </p> <p>Very important Not important</p>	<ol style="list-style-type: none"> 1. 1/11 2. 0/11 3. 1/11 4. 6/11 5. 3/11

Bats	In the last few decades bat populations have been declining at alarming rates worldwide. Baseline assessments are required to help sustain this species group.	1. Develop a monitoring program for bats in the West Chilcotin. 2. Implement monitoring program.	Maintenance of biodiversity in the Chilcotin.	<p>In your opinion how important is this project area? Please indicate by circling the appropriate number on the scale.</p> <p style="text-align: center;">5 4 3 2 1</p> <div style="display: flex; justify-content: space-around; width: 100px; margin: auto;"> </div> <p style="display: flex; justify-content: space-between; width: 100px; margin: auto;"> Very important Not important </p>	<p>1. 2/11 2. 0/11 3. 3/11 4. 3/11 5. 3/11</p>
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Please feel free to provide us with any additional comments or opinions you may have on the importance of specific projects.

Out of the 11 surveys returned 4 respondents provided additional comments or supplemental information. Two commented on the supplementation of salmon and trout, 1 was opposed and gave background information regarding their opposition and impact assessment results for Charlotte Lake and the other provided precautionary advice about this project. A trail project to revive the Kappan Mountain Lookout trail was included by another respondent. A fourth respondent provided a list of their top four projects choices.

Appendix 5 – Projects Recommended for Deferral or Referral to another Agency

Some projects were outside the scope of this work. It is suggested that they be referred to another agency. Other projects should be reviewed for inclusion in a future Ecosystem Restoration Plan for the area.

Category	Brief	Specific Projects	Ecosystem Benefits
Increase Ecological Resilience – Water Planning	Water is critical to the survival and well being of plants, animals, and people. Climate scientists project increasing frequency of extremes as carbon builds in the atmosphere. Predictions are for more frequent and higher peak flows (flooding and erosion) and in general declining water tables, lake levels, well water, and less summer flow for fish and irrigation. As climate warms winters will be shorter and summers will lengthen. Projects that conserve water, increase water storage, and increase soil water holding capacity help mitigate these impacts.	<ol style="list-style-type: none"> 5. Review water withdrawal allocations in drought prone watersheds. 6. Develop a wise use water management plan (conservation irrigation). 7. Explore and lobby for forest practices that will increase soil water holding capacity (increased debris retention). 	Policies and practices that conserve and store water in forest soils and floodplains will help mitigate the impact of climate change and maintain the resilience and productivity of forest and stream ecosystems.
Increase Ecological Resilience – Native vegetation	Native vegetation has adapted to local climates that have changed in the past. These varieties are more likely to contain genetics that allow the plants to be sustained as climate changes in the future.	<ol style="list-style-type: none"> 1. Review existing policies and make recommendations for policy changes to increase natural regeneration of trees on harvested areas. 	Improved ecosystem resilience to changes due to human use and climate.
Identification of NTFP's and habitats	One of the barriers to protecting and maintaining alternative forest products is that little is known about the specific conditions and habitat required for their growth. Identifying the ecosystems and the biological requirements for the growth of these resources will enable restoration and preservation. A top priority for this is soapberry and Labrador tea.	<ol style="list-style-type: none"> 2. This would be a multi phase project involving the following steps: <ol style="list-style-type: none"> a. Create a list of locally important NTFP's (food, medicines and other botanicals). b. Conduct a literature and Traditional Knowledge review of what is known about identified NTFP's. c. Conduct prioritized biological and ecological assessments. d. Conduct habitat mapping 	Protection and monitoring of important habitats and plant species.
Mushroom and NTFP harvest awareness	Harvesting of non-timber/alternative forest products provides local opportunities for economic gain, sustenance food gathering, recreational enjoyment, and tourism opportunities. As little is known about the habitat and growth requirements of many of these resources there are some	<ol style="list-style-type: none"> 5. Identify best harvest practices through workshops and literature reviews. 6. Develop a pamphlet about concerns and possible solutions. 	Create awareness about sustainable harvest practices for NTFP's, a sense of local stewardship, and restore degraded morel mushroom sites.

	concerns about harvest practices. Commercial harvests bring large numbers of transient and local pickers to remote forest areas. Camps are commonly established in harvest areas and can become degraded sites with garbage and other human generated disturbances. Clean-up of these areas is important to protect /restore the sites for other values.	7. Develop a pamphlet about best picking/camping practices to address large commercial harvest impacts to ecosystems, wildlife, etc. 8. Develop and implement a cleanup plan for Morel Mushroom harvest camps.	
NTFP utilization and marketing workshop	Non-timber forest products such as fur, berries, mushrooms, traditional medicines and wood are currently used to make crafts, personal use items and/or are sold for economic gain. Exploring additional opportunities for NTFP use and marketing would be useful in promoting stewardship.	2. Plan and hold a community workshop on NTFP utilization and marketing.	Promote local stewardship and create a more resilient economy for communities in the West Chilcotin.
Trapping workshop	Trapping skills have been lost. Workshops can inspire and teach trapping skills as well as wildlife conservation and management	2. Work with the BC Trappers Association to deliver trapping workshops in the West Chilcotin.	Provide opportunities for local stewardship and build stewardship awareness.
Traditional/ Wild Medicines workshop	Knowledge about the use of wild botanical plants for making traditional medicines and home remedies is being lost with the older generation. A workshop can provide an opportunity to pass this knowledge on to younger generations and interested people as well as provide opportunities to discuss stewardship and sustainable utilization of these resources.	1. Plan and hold a community workshop on Traditional/Wild Medicines.	Provide opportunities for local stewardship and build stewardship awareness.
Tatla Fire Restoration	The Tatla fire was in some cases a stand replacing fire that burned repressed stands of dense pine. The potential for these stands to grow back as repressed is high.	3. Conduct surveys and develop prescriptions to restore productive habitats for all uses. 4. Implement prescriptions.	Ensure restoration of values impacted by the fire.

Fuel Management	Fire proofing of the entire area J (West Chilcotin) needs to be followed through with.	<ul style="list-style-type: none"> 6. Complete fire proofing of Area J (West Chilcotin). 7. Provide local training for S100, First Aid, Falling and Bucking, danger tree assessment etc so that locals can conduct treatments. 8. Identify funding sources to carry out fuel management activities. 	Protect human values and ensure public safety.
Lava Canyon Fire rehabilitation	The Lava canyon fire burnt a significant area of the West Chilcotin. As the fire burnt across a large area that has multiple values a comprehensive restoration plan for impacted areas and values needs to be developed with local involvement.	<ul style="list-style-type: none"> 3. Rehabilitate fire guards, in particular the fire guard developed along the Lava Canyon Traditional Trail. 4. Develop a fire rehabilitation plan for the Lava Canyon fire. 	Re-establish trails and restore values impacted by the Lava Canyon Fire.
Rehabilitation of Charlotte Lake Fire Guard	Fire guard at charlotte lake needs rehabilitation as it has become a road which people use to drive ATVs into sensitive ecosystems (alpine).	<ul style="list-style-type: none"> 3. Assess fire guard and prepare remediation prescriptions. 4. Implement remediation prescriptions. 	Restore degraded site.
Livestock bridge replacement	There are bridges in the Anahim Lake area that were built to protect creeks and facilitate livestock crossing that are in disrepair. Repairing these structures would ensure that they continue to protect aquatic resources.	<ul style="list-style-type: none"> 1. Locate bridges requiring repair and/or replacement. 2. Replace structures. 	Improved stream, fish, and water quality, as well as increased livestock protection for animals crossing steep banked creeks

Invasive weed control	A principle cause of invasive weeds is lack of education. Providing education on the identification and management of invasive weeds will help manage and reduce their spread . Training local people will also provide employment opportunities.	<ol style="list-style-type: none"> 4. Training on invasive weeds identification and management. 5. Develop a prioritized weed eradication plan. 6. Implement eradication plan using local workers. 	Reduce spread of invasive weeds
Road Deactivation and Access Management Plan	Some roads may be diverting natural drainage patterns and/or are a source of active and ongoing sediment. Roads can be deactivated (culverts removed), some can be closed to vehicle traffic, and some can be put to bed (recontoured ripped and planted). The area around Tatla Lake has been suggested for this work.	<ol style="list-style-type: none"> 1. Develop prescriptions in conjunction with an access management plan 2. Implement prescriptions 	Improve stream flow and water quality
Lake water quality assessments / Lakeshore riparian habitat restoration	Shoreline septic systems, shoreline activities, and the removal of riparian vegetation can affect water quality in lakes. BC Lakes Stewardship Society provides materials and resources in support of lake stewardship (Nimpo, Charlotte, Anahim, Tatla, Horn, and Eagle Lakes - and others as determined)	<ol style="list-style-type: none"> 3. Conduct water quality assessments. 4. Prepare and/or distribute educational materials related to stewardship (pamphlets, posters, mail outs, workshops). 	Identification of lake pollution sources and areas of riparian degradation can lead to better stewardship.
Rainbow Trout Inventory	Fish data is lacking in some lakes. Inventories of selected lakes can highlight opportunities for fish enhancement, restocking, and/or barrier removal projects (Pelican Lake, Long Lake, Deep Trail Lake, others to be determined).	<ol style="list-style-type: none"> 4. Conduct fish surveys at selected lakes. 5. Assess habitat suitability where needed. 6. Implement projects to enhance fishery 	Identifies and fills gaps in fisheries information

Education plan to reduce netting of spawners	Over fishing of spawners has been reported to be impacting fish at some lakes. A targeted educational approach may reduce this problem (i.e., Chilko and Bluff Lakes, perhaps others)	2. Develop educational materials and approaches	Enhanced fishery and stewardship.
Culvert Fish Passage Inspections	Culverts especially perched culverts can be a barrier to fish passage. Fish will avoid passing through a culvert if it is not buried, does not have a natural stream bed, or is perched above a jumping height.	1. Conduct culvert inspection survey in watersheds where culver inspection data does not exist. 2. Remove and replace barrier culverts as determined in the survey.	The identification and removal of barriers would restore fish distributions and fisheries production
Reduce cattle watering impacts on streams	Heavy stock traffic accessing water along vulnerable streams can trample banks, damage channels, eliminate vegetation, reduce water quality, and impact fish habitat. Options to address these impacts include hardening selected watering ramps with geotextiles and gravel and constructing off-channel watering sites.	1. Inventory to determine stream reaches, lakeshores, and wetlands on both private and Crown land where cattle impacts are occurring. 2. Develop prescriptions for selected sites. 3. Implement prescriptions.	Reduce impacts on riparian areas and streams, such as bank destabilization, habitat loss, and sediment generation.
Education program to promote Environmental Farm Plan	Environmental Farm Plan provides producers with workshops, resources, and funding to reduce environmental impact	2. Provide workshop promoting the Environmental Farm Plan.	Improved control to minimize agricultural impacts on ecosystems
Water and septic plan for Tatla Lake	No plan or sharing agreement exists for water sewer and/or septic at the community of Tatla Lake.	1. Develop a plan for community water. 2. Implement the plan	Community benefits, economic benefits, environmental benefits

Protection of sensitive habitats	Recreation (off road vehicles) can damage sensitive habitats (especially grasslands, alpine, and streams) by wheel ruts, campfire scars, rubbish, plant damage, tree damage, excessive firewood removal. A bunchgrass ecosystem near the Precipice has been suggested for this and there are likely other areas that are damaged or at risk.	<ol style="list-style-type: none"> 1. Inventory sites experiencing heavy recreation traffic 2. Develop prescriptions to protect, inform, and mitigate damage. 3. Implement recommendations 	Protection of sensitive ecosystems and education for recreational groups.
Beaver management	Beaver are nature's water engineers with benefits that include more water storage, higher water tables and forest plant production, higher summer stream flows, enhanced fishery. However beaver can flood fields and roads and can impact hay and pasture production	<ol style="list-style-type: none"> 1. Where beaver are assessed to be a problem more than a benefit they can be trapped and dams can be lowered or removed. 2. Where beaver are assessed to be a benefit and are missing from the ecosystem they can be reintroduced (when appropriate). 	Manage beaver to the benefit of ecosystems, to mitigate drought, and to improve access to hay land and/or to increase pasture
Bio-control mistletoe	Mistletoe provides forage for wildlife, promotes stand structures that are unique, and may have relationships with other organisms that are important, but that are still not fully understood.	<ol style="list-style-type: none"> 1. Develop a bio-control trial for mistletoe using procedures from CFS as an alternative to conventional eradication. 	Maintain ecosystem function by ensuring that all processes are present.
Carrier Backlog	There are stands harvested by Carrier which have silviculture obligations that have reverted to the Crown and are not satisfactorily restocked (NSR). The Carrier backlog plan was developed in the early 2000s to identify silviculture needs on the reverted licenses in the Tatla and Anahim Supply Blocks. This plan needs to be revisited to ensure that needs are still the same. Management of these areas could be applied using an ecosystem perspective that follows natural seral projections (in some locations) to promote multiple resource values.	<ol style="list-style-type: none"> 1. Revisit Carrier Backlog Plan to determine if needs are still the same. 2. Conduct additional surveys where required. 3. Implement planting/treatments recommended by surveys. 	Improved ecosystem resilience to changes due to human use and climate.
Supplement lost salmon stocks	Salmon stocks are at increased risk due to global warming, global contaminants, and overfishing. Locally, stocks are on the decline in both the Dean and Atnarko Rivers. This poses a problem for tourism and local food fisheries. Developing supplemental fish stocks can help alleviate these impacts. One possible location for this is the development kokanee fishery for Charlotte Lake.	<ol style="list-style-type: none"> 1. Assess Charlotte Lake for the potential of a kokanee fishery. 	Increase the diversity of fish species in the West Chilcotin

Protection of snake hibernacula	There are is a known snake hibernacula near Poison Lakes that does not have protection at this current time.	1. Document the location of the hibernacula and work with MOE to create a WHA that ensures that the feature is preserved.	Maintain sensitive ecosystem elements
Moose Assessments	Assessments of moose population levels, harvesting strategies, and the capability of moose winter range is required for the West Chilcotin. .	<ul style="list-style-type: none"> 5. Conduct population surveys 6. Assess harvesting strategies for moose. 7. Assess moose browse in wintering areas and develop prioritized treatments to increase productivity. 8. Implement browse enhancement treatments. 	Maintain regionally important species

Appendix 6 – Project With Overall Scoring Differences >25%

Team member	Project #	Name	Current status	CS#	EB	EB#	PS	PS#	Score
Larry Davis	12a	Caribou monitoring	Caribou calving rates have declined in recent years and information is required to help maintain this species	4	Caribou are an important ecosystem component in this area. Provincially, they are blue listed and the II herd was previously stable to increasing allowing it to be used to supplement other herds	4	Technologies and expertise for this project are present and well developed.	4	0.80
Becky Bravi	12a	Caribou monitoring	Blue listed species. Recently, in further decline.	5	This is critical question. Losses in populations have cumulative impacts across ecosystems that are difficult to predict. Habitat restoration options aimed at Caribou may impact other species positively.	5	Dependent on funding from multiple agencies. Does MOE have a good relationship with FN's in the West Chilcotin? This could significantly hinder the project.	2	0.80
Richard Case	12a	Caribou monitoring	West Chilcotin caribou are in decline - they are a threatened species - the science about their decline is unclear	4	knowledge based benefit - indirect benefit - not on the ground ecosystem restoration - perhaps information will generate better habitat stewardship	2	very expensive - results may not lead anywhere or be effective in policy making - issue has been thoroughly debated	2	0.53