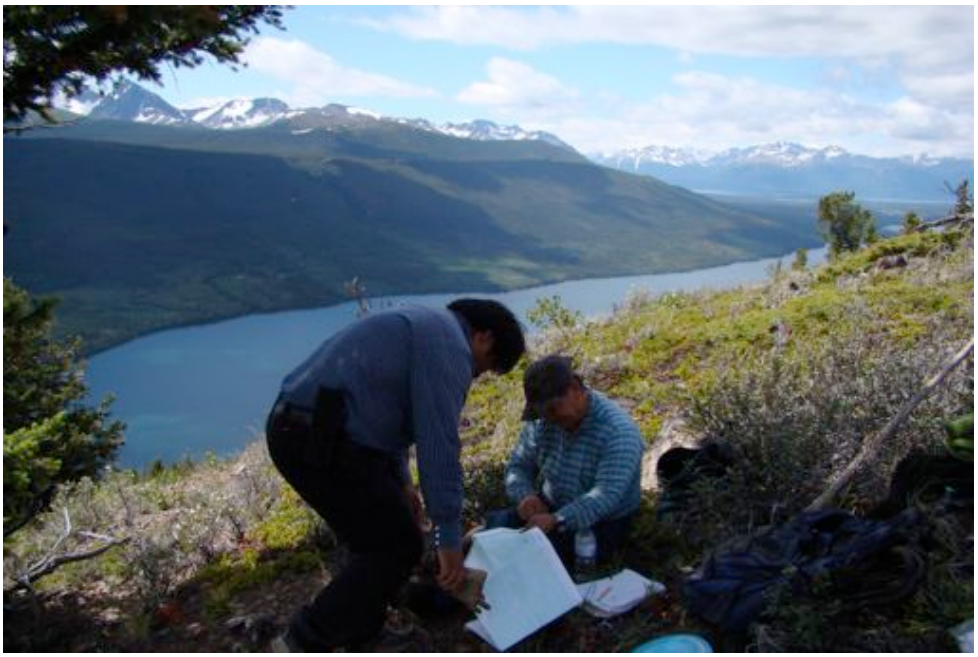
A PRELIMINARY CORE CONSERVATION REVIEW OF THE INTERIOR DRYLAND GRIZZLY BEAR OF CHILCOTIN RANGES IN BRITISH COLUMBIA. February 2011



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[Cover photos: Xeni Gwet'in researchers mapping grizzly bear habitat and trail access on Konni Mtn., Nemiah Valley. Grizzly bear in travel corridor at Auger Lake, remote camera photo]

LEGAL COVENANT FROM THE XENI GWET'IN GOVERNMENT

The Tsilhqot'in have met the test for aboriginal title in the lands described in *Tsilhqot'in Nation v. British Columbia*, 2007 BCSC 1700 ("*Tsilhqot'in Nation*"). *Tsilhqot'in Nation* also recognized the Tsilhqot'in aboriginal right to hunt and trap birds and animals for the purposes of securing animals for work and transportation, food, clothing, shelter, mats, blankets and crafts, as well as for spiritual, ceremonial and cultural uses throughout the Brittany Triangle and the Xeni Gwet'in Trap line. This right is inclusive of a right to capture and use horses for transportation and work. The Court found that the Tsilhqot'in people also have an aboriginal right to trade in skins and pelts as a means of securing a moderate livelihood. These lands are within the Tsilhqot'in traditional territory, the Xeni Gwet'in First Nation's caretaking area, and partially in the Yunesit'in Government's caretaking area. Nothing in this report shall abrogate or derogate from any aboriginal title or aboriginal rights of the Tsilhqot'in, the Xeni Gwet'in First Nation or any Tsilhqot'in or Xeni Gwet'in members. *Both parties are now appealing Tsilhqot'in Nation v. British Columbia, 2007 BCSC 1700.*

[Grizzly mother & yearling, Chilko River – Xeni Gwet'in Caretaker Area, salmon season. Area also used traditionally by First Nations for salmon food resource. W.McCrory photo]

[Grizzly mother and two cubs in whitebark pine habitat in mid September, where they eat pine nuts. Nemiah. Sam Zirnhelt photo]

Conservation overview of grizzly bears of the West Chilcotin Ranges

Dr. L. Craighead and W.P. McCrory, RPBio.

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EXECUTIVE SUMMARY

We used the grizzly bear (*Ursus arctos horribilus*) as a focal and umbrella species for a broad-brush conservation overview of a large and relatively intact area of dry foothills and mountain ranges on the eastern side of the Coast Ranges in the West Chilcotin area of British Columbia, with emphasis on the Xeni Gwet'in (Nemiah) First Nation Caretaker Area (XGCA).

We first reviewed previous conservation-level research in the area including:

- Eco-regional plan by the Nature Conservancy of Canada (NCC),
- 2005 carnivore conservation report for the Cariboo-Chilcotin Conservation Society,
- Conservation strategy for the Cariboo-Chilcotin Beetle Action Coalition,
- British Columbia Mountain Pine Beetle Action Plan (2006-2011),
- BC government land use planning documents and maps for grizzly bear habitats, protected areas and roaded/clearcut areas used for the 1994 Cariboo-Chilcotin Land Use Plan (CCLUP),
- Draft 2004 Chilcotin Sustainable Resource Management Plan (Chilcotin SRMP), and,
- BC government 2009 grizzly bear genetic/conservation analysis for the southern Coast Ranges.

Although these various efforts have addressed aspects of conservation in the Chilcotin at various scales, only one, the 2005 carnivore review using eight focal species, produced a conservation core zone at the scale of a viable wildlife population. None have yet led to increased viability of protection of wild lands. While we recommend more detailed core area/connectivity analysis be done our present report will allow initial decisions to be made so that opportunities for conservation are not lost and crucial landscapes not irrevocably altered.

As a crude measure of grizzly conservation values and population viability, we first used composite Geographic Information System (GIS) maps overlaying the boundaries of the XGCA with the boundaries of the Greater Yellowstone Primary Conservation Area (GYPCA) to examine relative sizes. The GYPCA is 2,387,115 ha and is one of two grizzly bear populations in the continental US that have the potential to be viable in the short term (100 years). The GYPCA ecosystem is not only very large it contains a high proportion (92%) of protected and roadless habitat that allows bears to stay alive in core security habitats. The grizzly bear population in the Chilcotin persists under interior conditions that are somewhat similar to the Yellowstone area and that currently include significant whitebark pine (*Pinus albicaulis*) resources that are critical to enable grizzly bears to accumulate fat reserves in the fall. However, unlike the Yellowstone, the XGCA-Chilcotin area additionally includes spawning Pacific salmon (*Oncohynychus* species) that migrate up the Fraser River system. The total size of the XGCA, including the Brittany Triangle and Nemiah Valley areas, is 777,290 ha. A rough estimate would be that the XGCA includes about 30% of the habitat needed to support a viable grizzly bear population using the 2,387,115-hectare GYPCA as a population viability model for grizzly bears.

Given a rough estimate of the size of the grizzly conservation area needed, we then used iterative GIS models of more or less intact foothills and east side-Coast Range areas, the CCLUP-SRMP grizzly bear capability maps, and CCLUP-SRMP protected and roaded/logged areas to determine what to include in a grizzly bear conservation preserve that totals at least 2,387,115 hectares, the

size of the Greater Yellowstone area. Available data on conservation values (from NCC) and protected areas (IUCN), and expert opinion on habitat suitability (from Wayne McCrory) were then used to outline the preliminary boundary of an area that we feel contains the most important grizzly bear habitat, including the XGCA.

We then compared ground-truthed grizzly habitat surveys and salmon spawning areas in the XGCA with the grizzly bear capability maps (CCLUP and Chilcotin SRMP) and determined that some refinement was needed. To develop a more precise estimate of areas needed to maintain the Chilcotin grizzly bear population, a habitat suitability model was developed through expert opinion ranking six landscape layers (basic thematic mapping, biogeoclimatic zones, road density, slope, elevation, and salmon stream proximity). Several iterations were tested against known grizzly habitat areas on the ground. The grizzly bear suitability model was then used to refine the boundaries of the larger West Chilcotin core grizzly study area. The results indicated that the West Chilcotin, including the Xeni Gwet'in Caretaker Area, still has a core area large enough to support a viable dryland grizzly population despite extirpation on the plateau to the northeast (and a more heavily roaded area along the Klinaklini River within our study, where grizzly bears are already considered extirpated). The total size of this core area is 2,694,310 ha, about 10% larger than the GYPCA.

It was encouraging that the large core area identified in our independent grizzly bear habitat model crudely matched the large core Chilcotin conservation area identified in a previous eight-species carnivore habitat model by Carroll (2005). This author extrapolated from a much larger coarse-scale carnivore model (Caroll et al. 2003 and 2004) for western Canada and Alaska. One of the high value carnivore core areas encompassed a large wilderness extending in an arc from Tweedsmuir Provincial Park in the north, southward to Itcha Ilgachuz Park, and then southeasterly through Nunsti Park to Churn Creek Protected Area. Carroll (2005) considered this area significant on a continental scale.

We found that the Chilcotin-XGCA study area contains 2,363,029 ha of moderate to high quality grizzly bear habitat, which should be adequate to maintain a viable population using the criteria that were applied to the Greater Yellowstone Primary Conservation Area. In fact, the Chilcotin area could support greater densities and a larger population than the Greater Yellowstone because of the abundant salmon resource.

Additionally, our Chilcotin study area boundary may still be a conservative estimate of a grizzly core area as it does not include all of the South Chilcotin Grizzly Bear Population Unit including core grizzly habitats on the southeast to the McGillivray Range, which the recent Apps et al. (2009) genetics study indicates has reasonable grizzly bear densities.

Preserving the high quality grizzly bear and carnivore habitat in the large core area is a good starting point for conserving biodiversity in the region. Retaining the relatively intact nature and ecological complexity of this area will help buffer against large-scale habitat changes anticipated due to climate change much better than if the habitat were fragmented even further.

We used several population estimates from other sources to determine grizzly bear population status within our boundaries. The BC Wildlife Branch data provincially lists this population as threatened and using their data for the three different GPBUs, we estimate a total population of about 250 individuals. Threatened status means that numbers are at least 50% below capacity. Using somewhat more precise estimates from DNA hair analysis, a recent study by NCC

identified 119 individual grizzly bears along the upper Chilko River and Tatlayoko Valley. The NCC grizzly bear study also suggests that within this larger threatened grizzly population, the XGCA may in fact be acting as an important core habitat area for Chilcotin grizzlies. The Apps et al. (2009) genetics study only samples a small portion (Taseko-Chilko) of our large core study area and concluded, based on more precise density estimates, that the South Chilcotin GBPU could have healthier grizzly bear numbers than previously estimated.

In terms of land status, the Xeni Gwet'in First Nation has contributed a major proportion of protected grizzly habitat in the West Chilcotin grizzly core area through the XGCA designation of an aboriginal preserve and wild horse preserve of some 777,290 ha. (Much of the XGCA has also been recognized as a Xeni Gwet'in rights and title area under a recent BC Supreme Court ruling.) Four provincial protected areas within this First Nation preserve comprise some 271,778 ha, or about 1/3 of the XGCA. The Xeni aboriginal/wild horse preserve combined with the 11 provincial protected areas outside of the XGCA comprise some 1,239,761 ha, or 46% of the total proposed West Chilcotin grizzly bear conservation area. Other lands in the conservation area include conservation properties (3,622 ha), federal (908 ha), Indian reserves (5,051 ha), and private land (19,736 ha). Statutory reserves by the BC Wildlife Branch were not included. The largest portion is considered unprotected public lands by the province and is open to resource development. These are also non-treaty aboriginal territories of different First Nations that involve varying levels and types of negotiations with the provincial and federal governments.

The current protection of some 46% of the core conservation area is higher than most other grizzly bear areas of the province, but we suggest more core areas need to be protected in our greater Chilcotin study area. This is based on a comprehensive review of the number of grizzly bears required in a population for long-term viability by a panel of independent bear scientists (Gilbert et al. 2004). They concluded that some 68-84% of the habitat base must be protected, a percentage higher than previously expected.

Recent studies have shown that one of the best ways to protect biodiversity from climate change is to protect large intact areas. The provincial government's 2005 mountain pine beetle action plan also recognized that identifying conservation areas to protect the region's biodiversity should be a high priority. However, since that time the province has failed to take any action.

The next steps should include more detailed conservation planning through use of habitat and connectivity models for multiple focal species. This would help design a conservation plan to protect the best habitat and travel corridor areas for biodiversity, especially in the face of climate change. In the meantime, we are recommending a grizzly bear recovery program and that this report be used in initial land-use decisions to be made so that opportunities for conservation are not lost and crucial landscapes are not irrevocably altered. It is strongly urged that the province enact a grizzly bear recovery program for the threatened Chilcotin grizzly bear population.

[Fraser-run Chinook, Elkin Creek. Imp. salmon-grizzly area in XGCA]

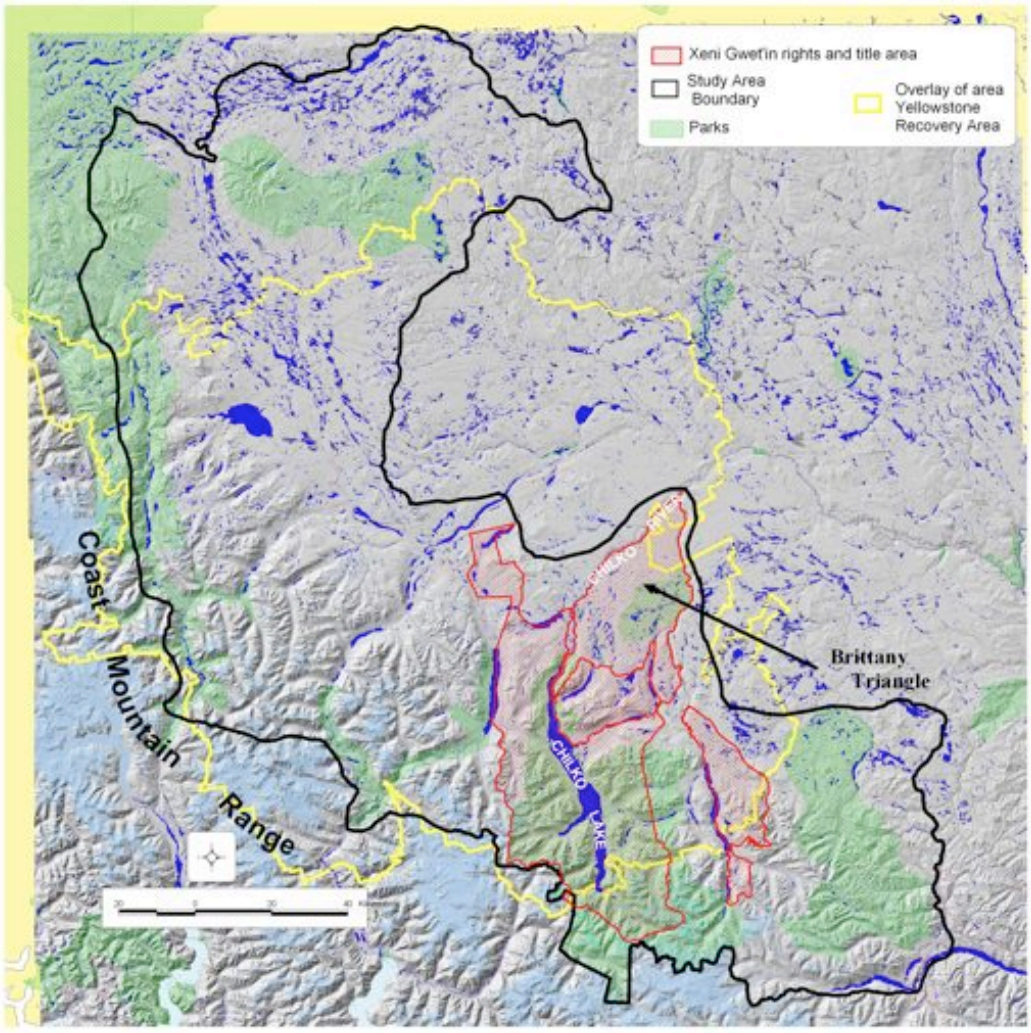

Figure 1. Map showing boundary (black line) of large West Chilcotin grizzly bear core conservation area, Xeni Gwet'in rights and title area (red), provincial protected areas (light green) and overlay of Greater Yellowstone Primary Conservation Area (GYPCA) [yellow line].

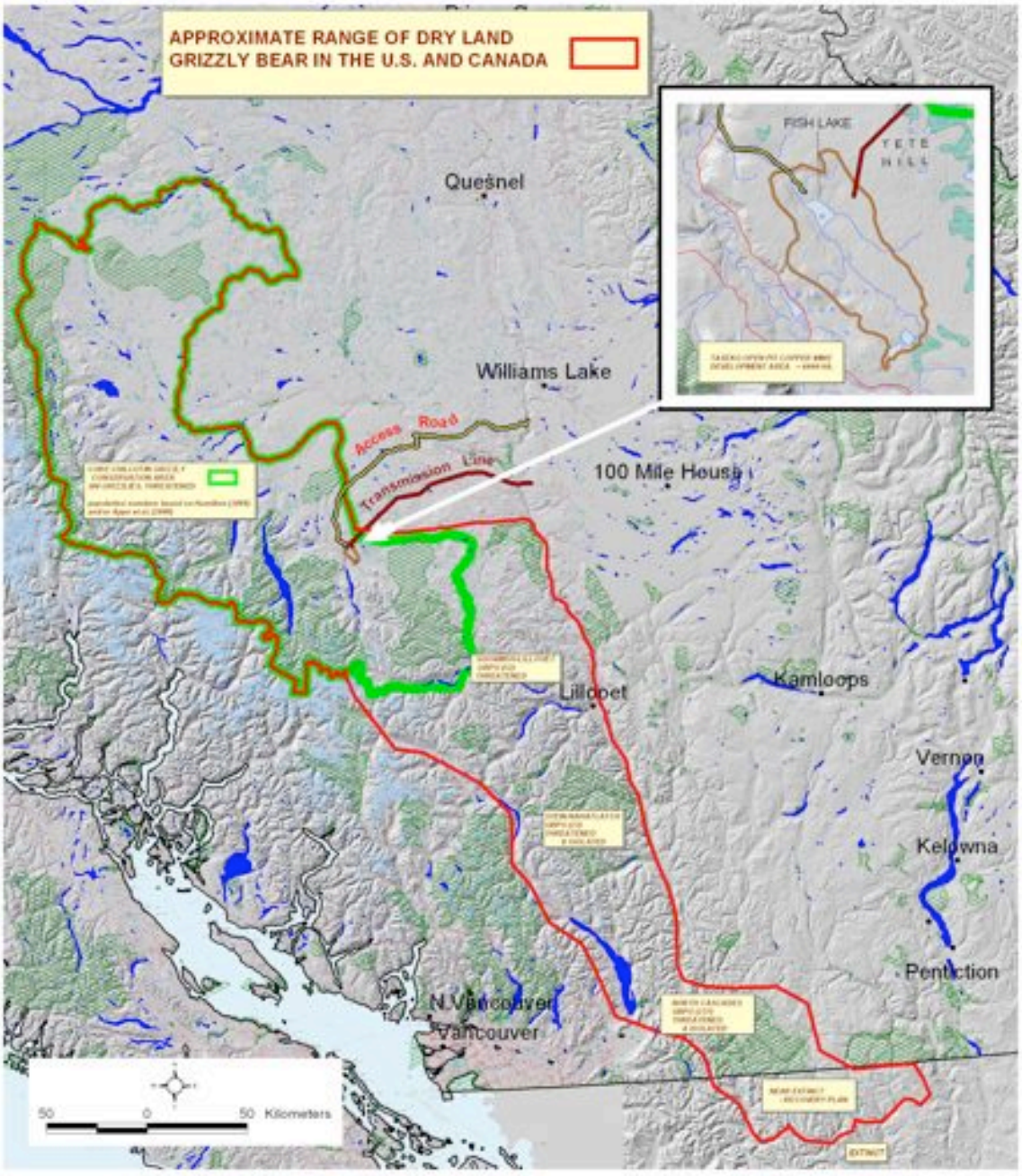

Figure 2. Map showing approximate distribution, estimated numbers of the coastal ranges foothills dryland grizzly bear ecotype. Our larger study area in the north (green boundaries) is the last large surviving enclave of this ancestral type left in North America, it being extinct in the continental United States just south of the Canadian border.

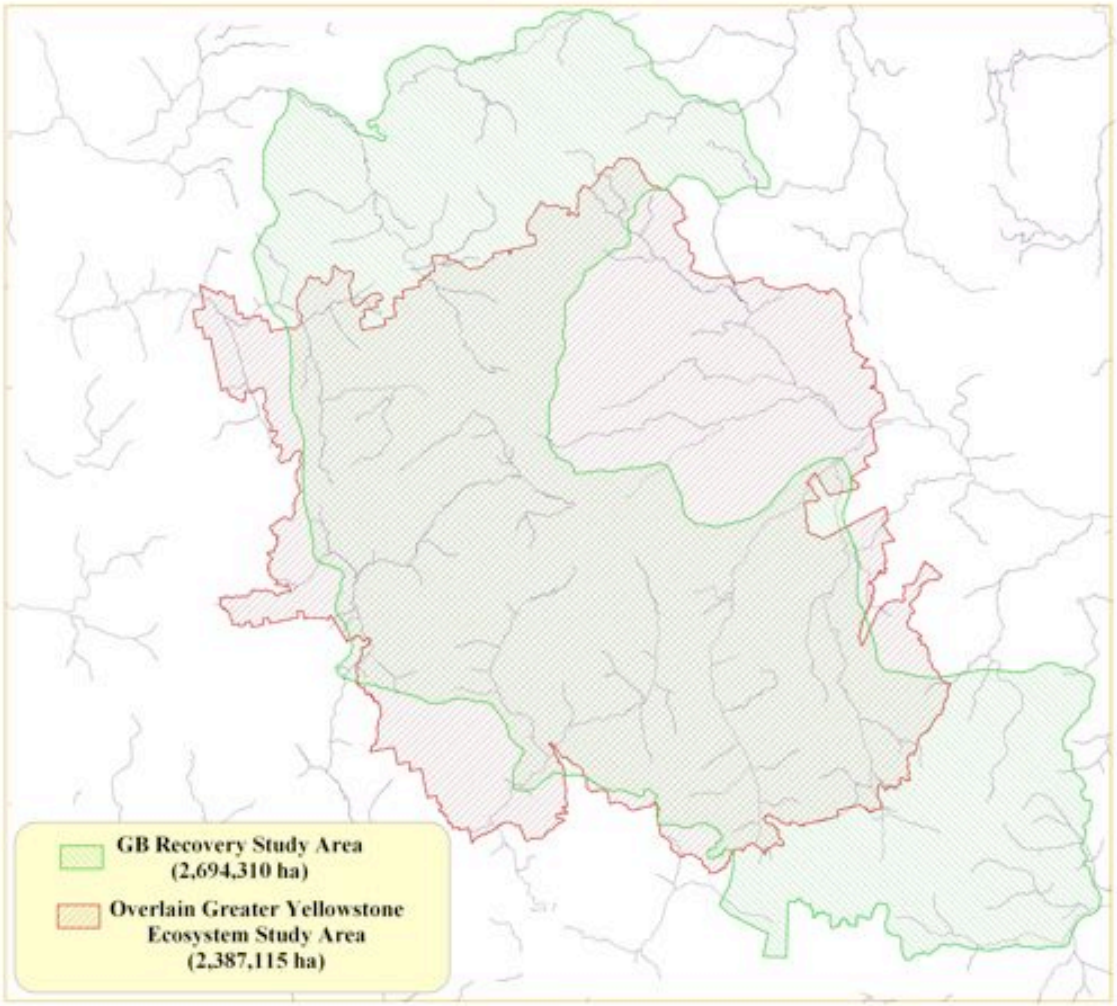

Figure 3. Overlay of Greater Yellowstone Ecosystem Study Area (red) showing larger West Chilcotin Core Grizzly Conservation Area (green). This grizzly population is listed by the province as "threatened" and down to an estimated 250 individuals. Protection of more key habitats and a recovery program are recommended.

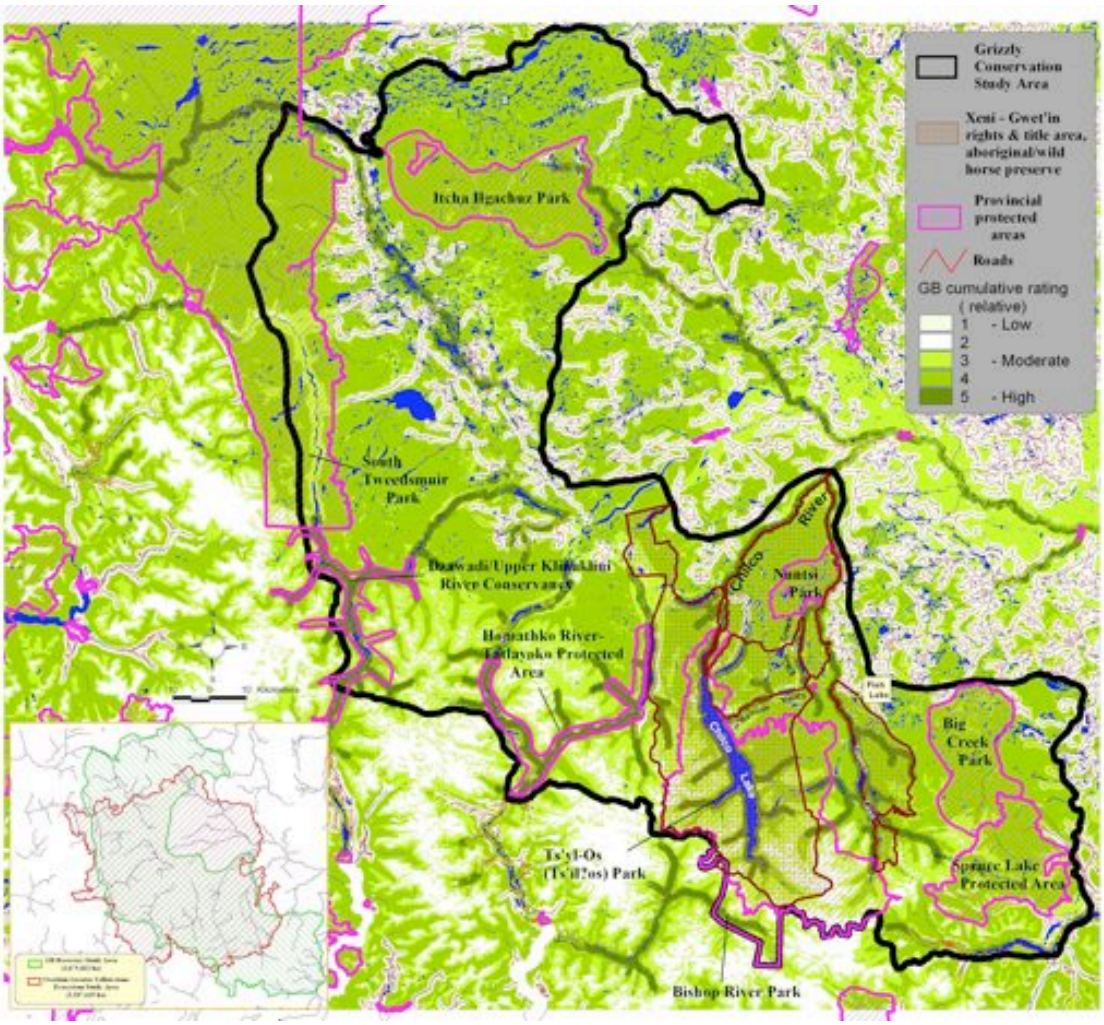

Figure 4. Grizzly bear suitability map. Most of the large grizzly conservation area has moderate habitat values (medium green). Darker green areas show numerous salmon-bearing waters with high value for grizzlies. The Brittany Triangle is shown in pink outline.

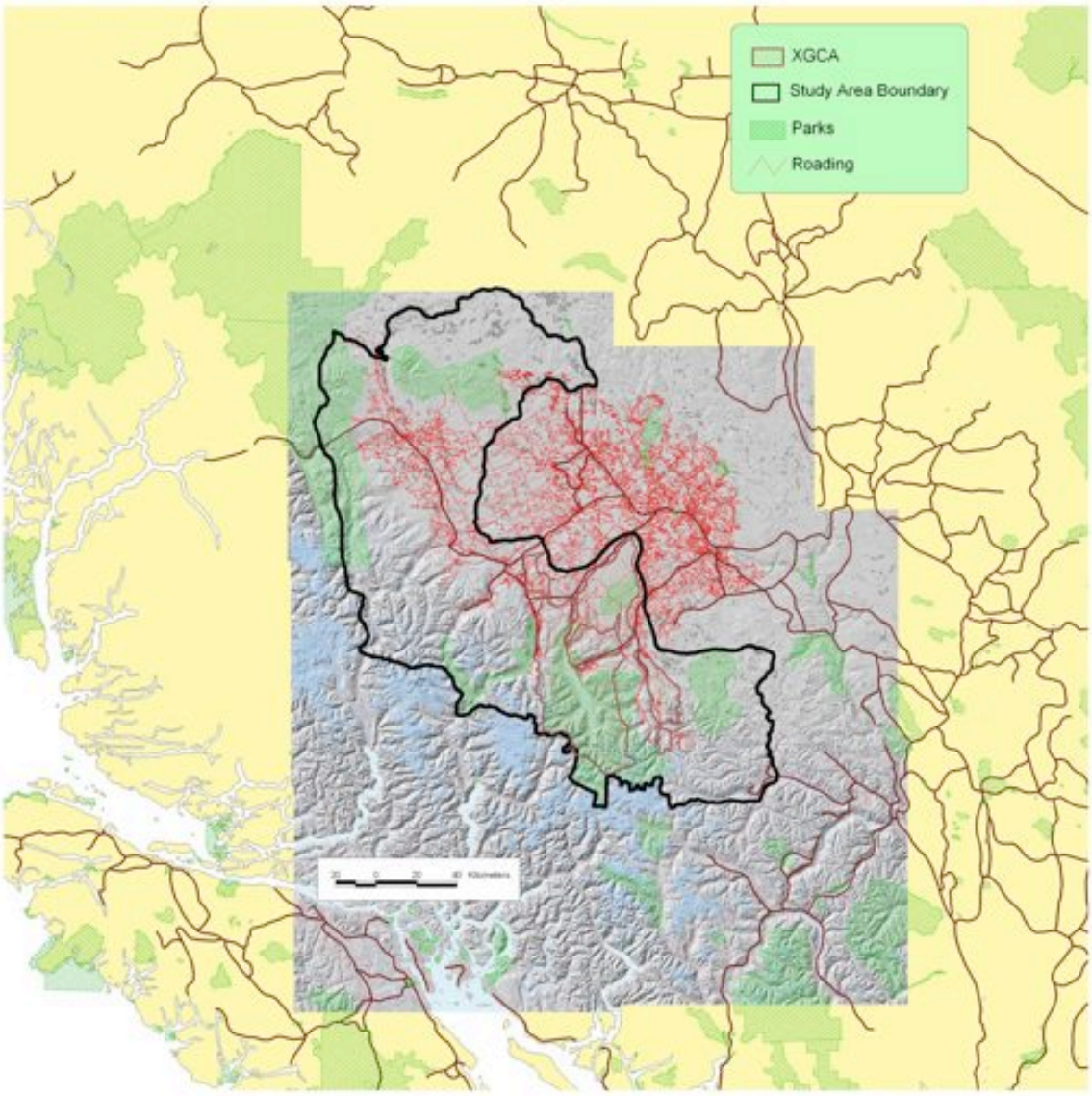

Figure 5. Location of study area in BC. Red shows roaded/clearcut areas, including grizzly bear extirpation area to east of study area. Some roaded/clearcut areas are included inside boundary to connect intact and protected grizzly habitats

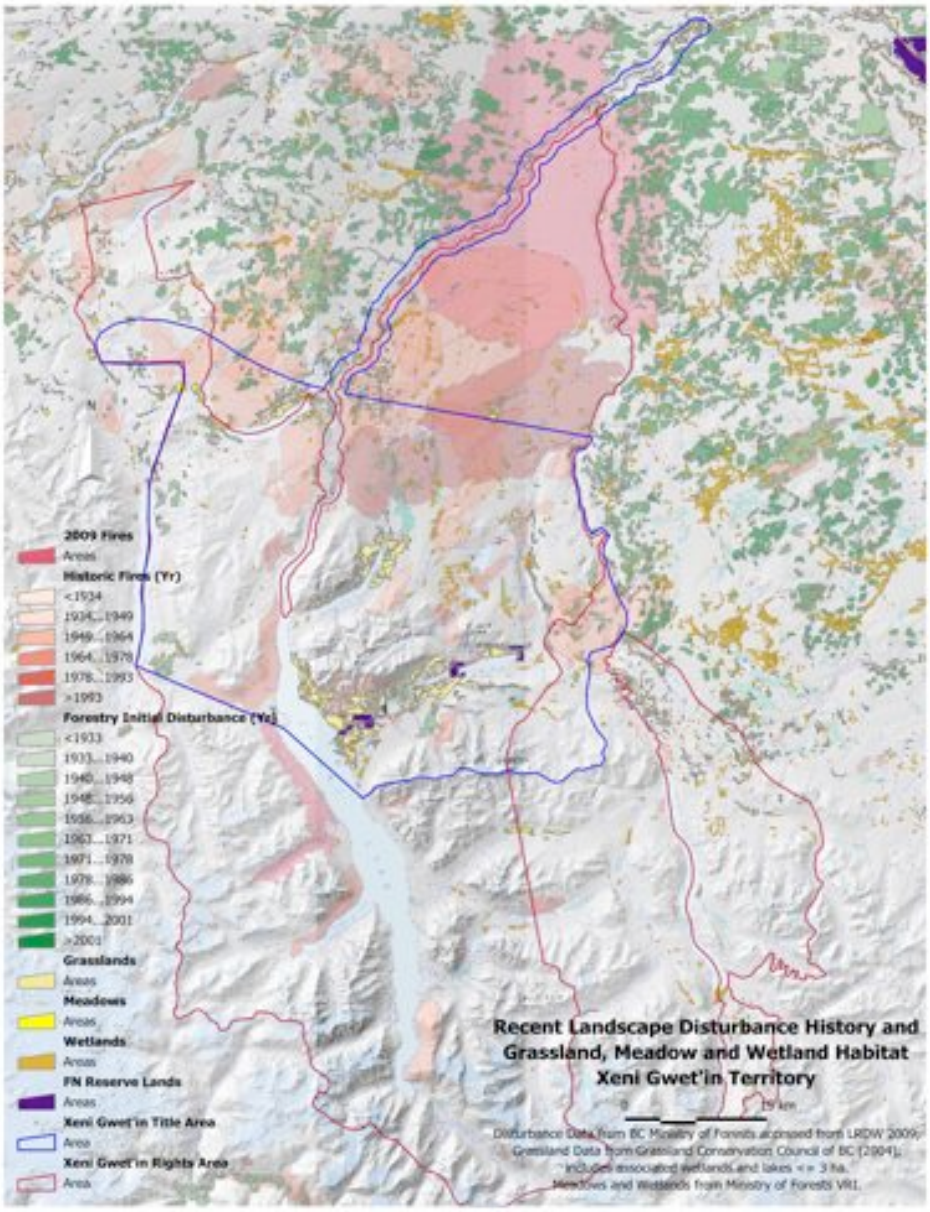

Figure 6. Landscape disturbance map of XGCA. This is all occupied grizzly habitat with different salmon runs. Blue shows boundary of the Xeni Gwet'in Title Area and red shows their Rights Area. The largest wildfires (2003 and 2009) are shown at the northern 1/2 of the Brittany Triangle and beyond.

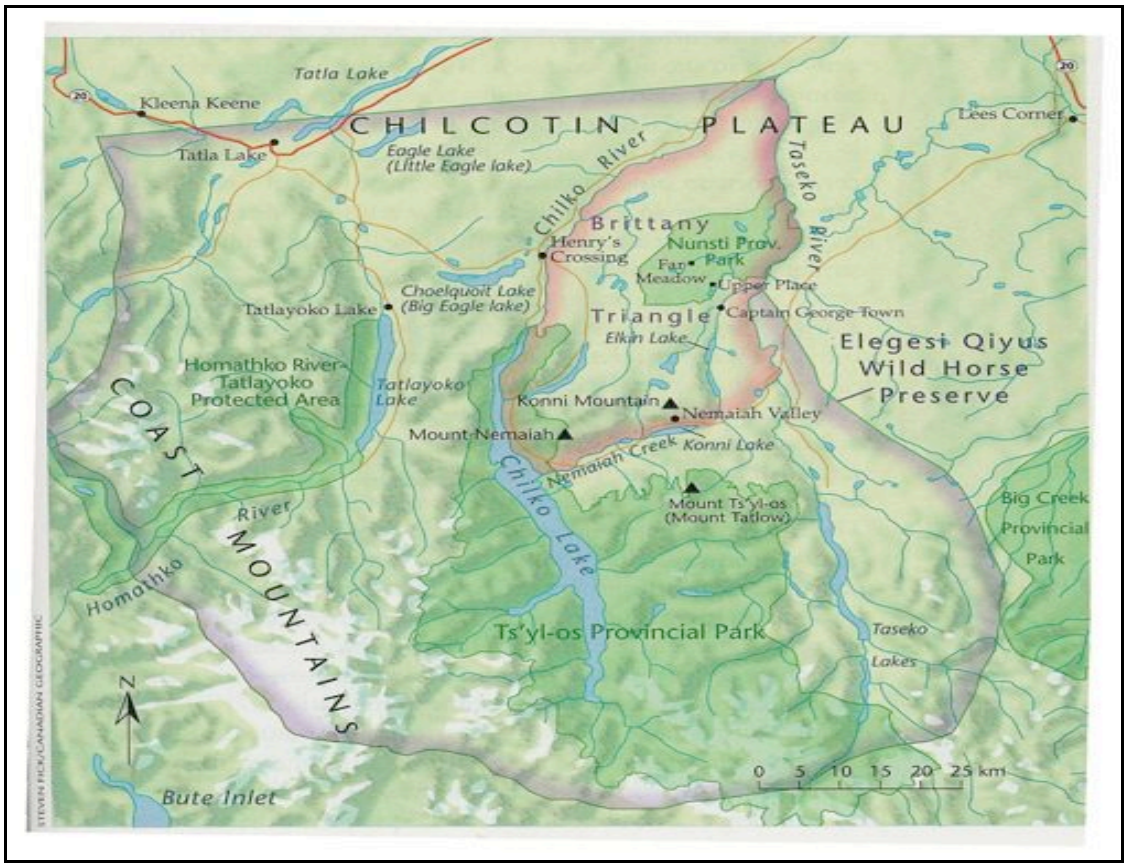

Figure 7: Map of Xeni Gwet'in First Nations traditional lands showing the Brittany Triangle (pink boundary) within the Elegesi Qayus (Nemiah) Wild Horse Preserve (purple boundary) or Xeni Gwet'in Caretaker Area. (www.canadiangeographic.ca/Magazine/ma05/indepth/maps.asp?from=maps).

1.0 INTRODUCTION

1.1 Background

This report describes a basic conservation analysis for grizzly bears for a still relatively intact region of the Chilcotin Plateau and foothill fringes of the Coast Range Mountains in the central interior of British Columbia. The area of occupied grizzly bear habitat is 2,694,282 hectares. This area is considered quite unique in North America in that it still supports all of the native fauna and flora that were present since the Pleistocene and also includes a recent population of wild horses whose ancestry includes Spanish horses that may have migrated here after being introduced to Central America in the early 1500s (McCrory 2002). This relatively intact ecosystem still has the complete guild of North American predators along with California bighorn sheep (*Ovis canadensis californiana*), woodland caribou (*Rangifer tarandus*) and major runs of Pacific wild salmon species).

This report is a broad-brush conservation overview that looks at the Xeni Gwet'in Caretaker Area (XGCA) as a central core (777,290 ha) within the wider Chilcotin region. The XGCA is the homeland of the Xeni Gwet'in or Nemiah First Nation who have resided in the area for thousands of years. This report provides a suggested framework to protect large carnivore species using recovery of the Chilcotin dryland-type grizzly bear as an umbrella species over the long term, and addresses the increasingly important role that intact ecosystems will play in the face of climate change. The area is on the edges of the forested region that was hit hard by the mountain pine beetle epidemic, which began in the early 1980s. Areas farther north have had virtually 100% of pines killed by 2006. The forest ecosystems have been under extreme stress as a result of the BC government's 50-year wildfire exclusion policy combined with warmer-than-average winters and hot summers with drought. This has created conditions favourable for the exponential growth of the mountain pine beetle. Wildfires are expected to increase in frequency and intensity (Dunleavey 2009). In 2003 the Chilko wildfire burned 30,000 hectares of forest of the Brittany Triangle including about 80-90 percent of the forested area of Nuntsi Provincial Park. In the summer of 2009 the even larger Lava Canyon wildfire burned much of the north end of the Brittany Triangle and areas beyond (Figure 5).

The provincial government's mountain pine beetle action plan has recognized that identifying conservation areas to protect the region's biodiversity is a high priority (BC 2008). Large volumes of timber were harvested from areas to the north of our study area under high-intensity salvage logging rules until the U.S. housing industry collapse in 2007 led to a BC lumber industry downturn in 2008.

Scientific tools for identifying specific areas for maintaining biodiversity are well developed and are used for land-use decisions worldwide (Carwardine et al. 2006, 2008). Over the last decade, more systematic methods for conservation planning have been developed, many of which address how best to maximize conservation gains while minimizing "costs" (Snelder et al. 2007). The XGCA and the larger study area were considered using a key focal species, the grizzly bear, as an index to the conservation value of the various components of this ecosystem in a similar fashion as other conservation area designs (Craighead et al. 2008, Craighead and Cross 2005, Jeo et al. 2000, Rumsey et al. 2004). Initial estimates of core habitat which should be protected were compared with the amount of land protected by the 1994 Cariboo-Chilcotin Land Use Plan

[CCLUP] (B.C. Commission on Resources and Environment. 1994), the Xeni Gwet'in Aboriginal and Wild Horse Preserve declarations, and other measures as well as the amount of protection that would be provided through acceptance of the 1994 draft Chilcotin Sustainable Resource Management Plan (Ministry of Sustainable Resource Management. 2004). The grizzly bear population in the Chilcotin (which is listed provincially as threatened) persists under interior conditions that are somewhat similar to the Greater Yellowstone Ecosystem (GYE) and currently includes significant whitebark pine resources that are critical for grizzly bears to accumulate fat reserves in the fall. However, unlike the GYE, this area additionally includes spawning salmon that migrate up the Fraser River system.

The study was funded by the Friends of Nemaiah* Valley (FONV) with a grant from the Fitzhenry Family Foundation. McCrory Wildlife Services provided most of the funding for the GIS mapping component. The study was also supported by the Valhalla Wilderness Society. The study was done with the approval and input from the Xeni Gwet'in First Nation.

1.2 Goals

The report is intended to provide a conservation overview of a large, relatively intact wilderness in the central Chilcotin to help the public, First Nations and provincial government, conservation groups, management agencies and industry provide greater protection and better stewardship in order to encourage them to retain the integrity of this ecosystem in perpetuity.
There are two primary goals of this project. One is to outline the best conservation biology science approaches for future planning and stewardship of the area. This will include determining the current status of the grizzly population based upon MOE data and NCC data. The second is to ensure that this report is widely distributed to the community at large.

2.0 STUDY AREA

The central focus of this study is the Xeni Gwet'in Caretaker Area (XGCA) comprised of 777,290 ha that includes the upper watersheds of two major salmon rivers, the Taseko and Chilko, including an area known as the "Brittany Triangle" (Figures 3 & 6). This area is bounded partly by the Chilko River on the northwest, and the Taseko River on the northeast. Both rivers flow north and eventually join to form the apex of the Brittany Triangle. Within the XGCA are a number of provincial protected areas. Land use and community development issues are expressed in two protective decrees for the whole tribal territory of the XGCA:

- The 1989 Xeni Gwet'in Nendduwh Jid Guzit'in, or Aboriginal Wilderness Declaration.

- The 2002 "?Elegesi Qayus Wild Horse Preserve," or Eagle Lake Henry Cayuse Wild Horse Preserve that covers the same area.

Both declarations prescribe that no industrial logging, mining or hydro-electric developments will be allowed on these aboriginal lands.

In 2007, the Xeni Gwet'in (Tsilhqot'in) met the test for aboriginal title in the lands described in Tsilhqot'in Nation v. British Columbia, 2007 BCSC 1700. This is a first affirmation of aboriginal entitlement for Canada and will strengthen the Xeni Gwet'in Government's capacity to protect and manage their unique homeland ecosystem. Figures 1 and 4 show the Xeni Gwet'in rights and title areas recognized by the BC Supreme Court.

[*We use the common spelling Nemiah throughout the report but FONV uses an earlier version.]

Currently human development and habitation in the XGCA is very low and much of the area is intact wilderness. Besides nine private wilderness tourism lodges, small ranches occur, such as in the Nemiah Valley where most of the Xeni Gwet'in reside, as well as on the northwest side near the Chilko River. A small number of private residences occur throughout on private land.

Surrounding the central Brittany Triangle and the XGCA is our larger study area, which includes the foothills and eastern Coast Ranges between the south end of Ts'ylos Provincial Park and the Bridge River on the south to the Itcha Ilgachuz and Tweedsmuir provincial parks in the north. This area encompasses a number of other First Nations traditional territories. This study area also includes the southwest corner of Nature Conservancy Canada's (NCC) Central Interior Ecoregional Assessment within the Central Interior Ecoprovince (Figure 9 and 10).

The study area lies within the Cariboo Regional District of British Columbia in the southern portion of the Central Interior Ecoregion. The Central Interior Ecoregion covers approximately 24.6 million hectares (ha), or approximately 61 million acres encompassing the Chilcotin, Cariboo, Nechako and McGregor plateaus; the Chilcotin, Bulkley, Thatsa and Hart ranges; and the Omineca and Skeena mountains.

Major population centres in the Cariboo Regional District are Quesnel, Williams Lake, 100 Mile House, and Wells. In 2006, the district's population was estimated at 70,849, with a population density of 0.9 persons per square kilometre (BC Stats 2007b). The main economic driver for the area has been forestry, but cattle ranching, mining and tourism also play important roles in the economy (Iachetti 2008).

To the east of this region large private ranches have been developed beginning with the Gang Ranch in 1883. In addition to First Nations ranching, private ranches, lodges, and outfitters are scattered throughout the region. Road access into most of this region has been greatly restricted until recently. Roads have been developed to provide access for the timber and mining industries and have allowed a gradual increase in other development. However, most of the study area is still unroaded and undeveloped. Much of the area is thus still wilderness and is inhabited by a number of First Nations communities, small cattle ranching operations, wilderness tourism lodges and some forestry and mining development. Many of the First Nations rely partly on the land for subsistence. Roading and clearcut logging on the Chilcotin Plateau is gradually encroaching into this mountain and foothills realm.

3.0 METHODS & APPROACH

This project is an initial prioritization analysis to identify the best areas for habitat conservation that will provide a solid foundation to formulate effective conservation strategies and land-use decisions. Fundamentally, the approach involves modeling concentrations of 'core' habitats needed to sustain populations of key focal species and then identifying critical 'linkage' corridors to help knit the region together to support an integrated ecological system. Grizzly bears were used as the focal species because of their unique characteristics as umbrella species whose habitat needs include areas for a large number of other important species (Brock et al. 2005). Broad-scale planning sets priorities for large regions such as the Chilcotin and the Brittany Triangle. Fine-scale local planning and implementation guides development and land use so that the larger ecosystems can continue to function by maintaining wildlife and habitat at the local level.

Our project used spatially explicit approaches to identify conservation-area networks that meet specified conservation goals as described by Trombulak (2003). Most of these approaches require large amounts of accurate data, habitat models for focal species, and optimization approaches such as those used at a coarser scale by NCC. For the scope of this project, it was decided to make a more basic comparison. It was assumed that the larger study area model has a similar habitat capability to support grizzly bears as the Greater Yellowstone Primary Conservation Area. The Yellowtone (23,871 km^2) is one of two grizzly bear populations in the continental U.S. that have the potential to be viable in the short term (100 years), the other one being the Northern Continental Divide Grizzly bear population (25,000 km^2). These ecosystems are not only very large, but contain a high proportion of protected and roadless habitat respectively that allows bears to stay alive in core security habitats. The Yellowstone has 92% roadless and the Northern Continental 66%.

It was then possible to compare the amount of area that was deemed sufficient to protect a well-studied grizzly population in Yellowstone to a similar sized area in the Chilcotin with roughly the same amount of human impacts. Where appropriate, the habitat cores coincided with the NCC Best Solutions areas. Habitat cores outside of the NCC area were reviewed and identified where additional protection would be warranted to optimize long-term population viability.
A combination of the following was used:

i. A field visit and ecosystem overview in May 2008.

ii. Background literature review.

iii. Review of current status of grizzly bears in the study area.

iv. Iterative GIS conservation mapping overlays to test different model overlays of the Greater Yellowstone Primary Conservation Area (GYPCA) to determine the most intact and representative configuration and size.

v. The Chilcotin SRMP logging and road overlay was used to net out the majority of impacted (roaded) areas along the northeast boundary zone.

vi. Grizzly bear habitat suitability model. A GIS analyst from Applied Conservation GIS developed a grizzly bear habitat model based upon values derived from expert opinion (McCrory and Craighead) for each of six landscape layers. Data layers used were:

- Basic Thematic Mapping (BTM),
- Biogeoclimatic (BGC) Zones,
- Road density,
- Slope,
- Elevation, and,
- Salmon stream proximity.

The values applied to the categories in each of these layers ranged from 1 - 10, similar to a modeling process used for the Inland Temperate Rainforest (ITR) by Craighead and Cross (2005),

but with values adjusted by expert opinion for local habitat types and grizzly preference (Table 1). This can be considered a habitat suitability model. In contrast to habitat capability, suitability is defined as the ability of the habitat in its current condition to provide the life requisites of a species. It is an estimate of how well current habitat conditions provide the specified life requisite(s) of the species being considered. The suitability of the land is frequently less than the capability because of unfavourable seral conditions, road development and other reductions in habitat quality for grizzly bears.

Habitat ratings were based on extensive bear habitat surveys by bear biologist Wayne McCrory and Xeni Gwet'in researchers in the XGCA including the Brittany Triangle, Nemiah Valley, Chilko River Corridor, Fish Lake area, and middle Taseko (McCrory 2002, 2005a, 2005b, 2009). Observations of habitat quality by McCrory and Craighead from the May 2008 field surveys were also incorporated.

The results of existing conservation efforts and public land management plans were also incorporated into our review.

4.0 RESULTS

4.1 Review of relevant conservation studies, land use plans & wildlife/grizzly research

The following conservation efforts and public land management plans were reviewed and incorporated into our localized effort. The following list outlines the diversity of recent plans that have focused on the Chilcotin area:

i. *Cariboo-Chilcotin Land Use Plan*

The Cariboo-Chilcotin Land Use Plan or CCLUP (B.C. Commission on Resources and Environment. 1994) identified the need for a regional biodiversity conservation strategy to maintain ecosystem function and species diversity. The first phase of the biodiversity strategy deals with the relationship of biodiversity to the Short Term Timber Availability Assessment. The area was delineated using 161 draft landscape units for the region with an average size of 36,655 ha in mountainous terrain and 68,403 ha in plateau terrain. Recommended biodiversity emphasis was allocated to each landscape unit in the region using ecosystem representation, habitat of selected red- and blue-listed species, and ecological sensitivity to forest development as criteria. Seral stage guidelines were established with a 20-year goal (2016) to meet recommended seral conditions. However, the widespread outbreak of mountain pine beetle and recent wildfires have altered the management regime. In the Chilcotin District, the landscape units with the current highest (10) conservation ratings were, Westbranch, Minton, and Beeftrail. These units were recommended for higher conservation rating.

ii. *CCLUP Grizzly & Chilcotin Sustainable Resource Management Plan (SRMP) grizzly bear capability models*

For the Cariboo-Chilcotin Land Use Plan, the Wildlife Branch modeled and mapped grizzly bear capability habitat (B.C. Commission on Resources and Environment. 1994). Capability is defined as the ability of the habitat, under the optimal natural (seral) conditions for a species to provide its life requisites, irrespective of the current condition of the habitat. It is an estimate of the highest potential value of a particular habitat for a particular species and is useful in providing predictive

scenarios for various habitat management options. Areas of high capability may or may not contain current grizzly bear habitat or grizzly bears, but if those areas were allowed to reach the climax seral stages of vegetation they should then contain high quality grizzly bear habitat.

In 2004, the Ministry of Sustainable Resource Management (MSRM) completed a Chilcotin grizzly bear habitat capability map for the draft Chilcotin Sustainable Resource Management Plan (SRMP) based on the CCLUP grizzly habitat model. The draft Chilcotin SRMP (MSRM 2004) is intended to be the implementation phase of the directives from the CCLUP. Both habitat capability models (Figures 7 and 8) suggest that the Nemiah Valley and other mountain pockets of the XGCA have low-moderate grizzly capability while the unlogged Brittany Triangle has low capability. Most of the north end of the Cariboo-Chilcotin District in the boreal plateau is considered to have low grizzly bear habitat capability. Much of this area currently has been logged and roaded, or burnt, and has suffered severely from mountain pine beetle infestation.

[Roaded and clearcut areas, West Chilcotin. Photo by G. Fieghan]

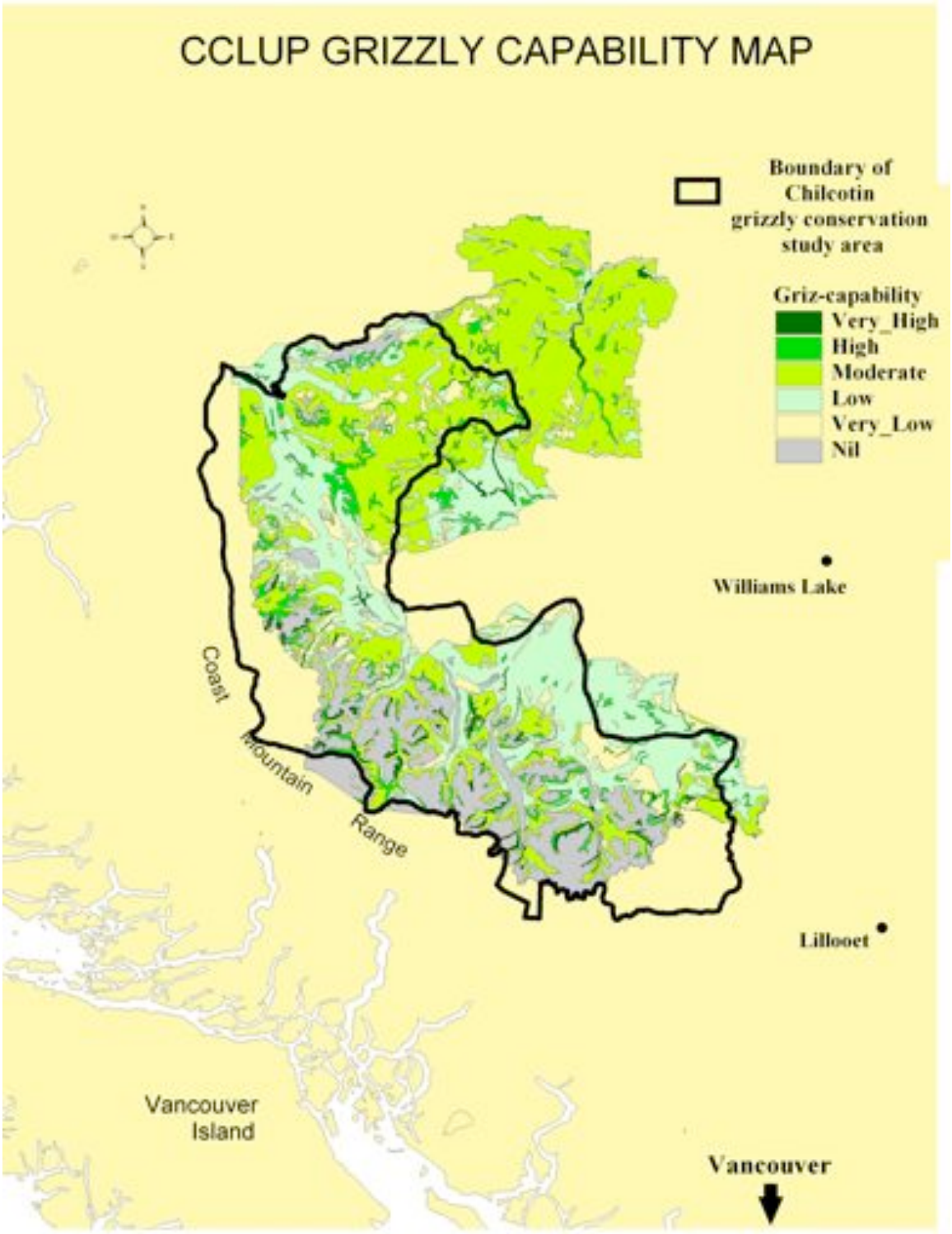

Figure 8. The 1994 CCLUP Grizzly bear habitat capability model. Ground-truthing showed that some of the areas have higher values than indicated such as the Nil (gray).

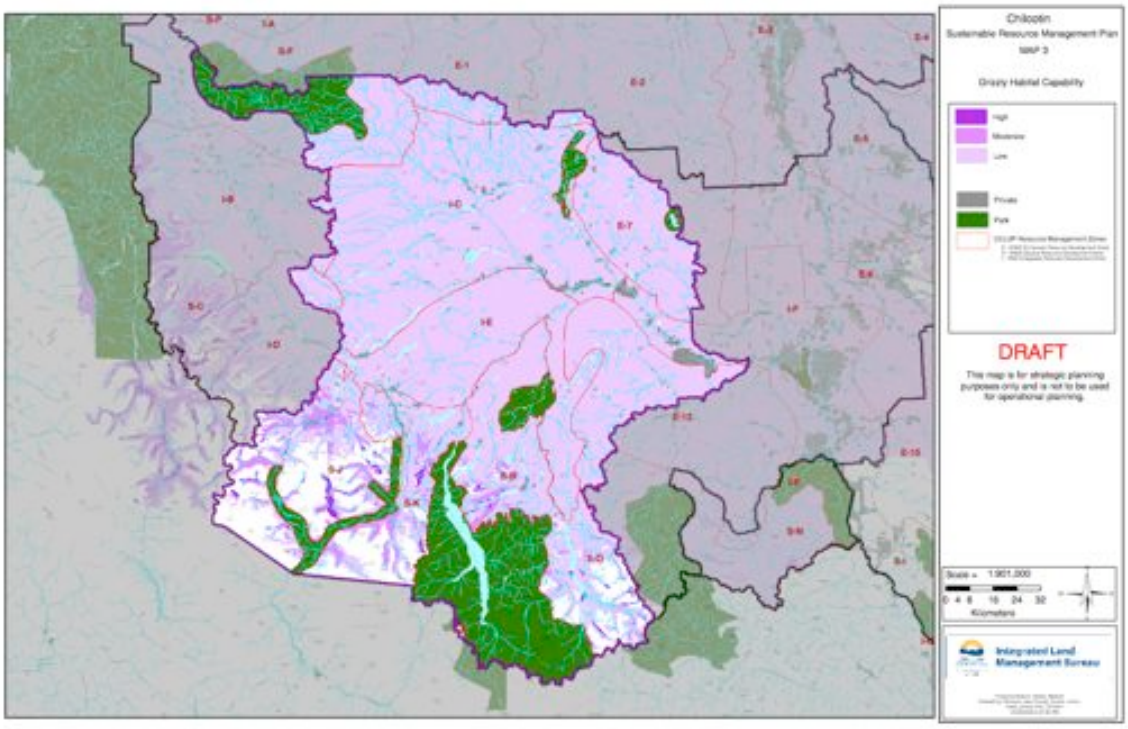

Figure 9. The 2004 Chilcotin SRMP grizzly bear habitat capability model. Again, some of the areas have higher grizzly habitat values than indicated.

iii. *Preliminary Conservation Assessment of the Brittany Triangle*

In 2002 biologist Wayne McCrory conducted a preliminary conservation assessment of the rainshadow wild horse ecosystem in the Brittany Triangle for the Friends of the Nemiah Valley. Habitat transects to identify habitat types were conducted over a total distance of more than 80 kilometres. Nine remote camera stations collected photos of 85 large animals including coyote, moose, mule deer, wolves, mountain lion, Canada lynx, black bears, feral horses, and domestic cows. Grizzly bears were observed in the area. Elkin Creek was reported as the only tributary of the lower Taseko River where salmon spawn. An estimated 600 – 1000 Fraser-run chinook spawn there annually (McCrory 2002). As a result of recommendations for increased protection of the Brittany Triangle, the Xeni Gwet'in in 2002 declared protection not only for the Brittany but their much larger XGCA, the "?Elegesi Qiyus Wild Horse Preserve," or Eagle Lake Henry Cayuse Wild Horse Preserve.

iv. *British Columbia's Mountain Pine Beetle Action Plan 2006-2011*

The BC government developed an action plan to mitigate the impacts of the mountain pine beetle epidemic on forest values, communities and the provincial economy in the short term, and ensure sustainability in the long term (BCMoFR. 2005, BC 2005). The BC Mountain Pine Beetle Action Plan recognizes conservation of biodiversity as a high priority in a dramatically affected

landscape, and it emphasizes that conservation needs to happen sooner rather than later (Iachetti 2008). The Carroll (2005) carnivore study cited next was part of this exercise.

v. *Carnivore Conservation Model for the Cariboo-Chilcotin Conservation Society*

A carnivore conservation model using eight carnivore species for North America identified the Cariboo-Chilcotin as having some of the best remaining habitat for large carnivores in North America, particularly for wolves (Carroll et al. 2003, 2004). Using the results of this model, Carroll (2005) extrapolated the Cariboo-Chilcotin portion as a surrogate for retention planning for the Cariboo-Chilcotin pine beetle management strategy. He used the grizzly bear, black bear, mountain lion, gray wolf, wolverine, coyote, fisher and pine marten as indicators for a suite of other species and landscape/local level ecosystem processes. The modeling showed two areas with the greatest value for carnivore conservation. The first is located in an arc from Tweedsmuir Provincial Park in the north southward to Itcha Ilgachuz Park and then southeasterly through Nunsti Park to the Churn Creek Protected Area. Another large area involved the northern fringes of the region surrounding Kluskoil Lake Park and the large Blackwater River area.

vi. *Nature Conservancy Canada Grizzly Bear Study*

Nature Conservancy Canada (NCC) conducted a grizzly bear study from 2006-2008 to determine population estimates and trends of grizzly bears found in the Tatlayoko Valley during the spring/early summer season and along the upper Chilko River during the fall salmon period (Mueller 2008). A total of 509 hair samples was collected in 2007 and 859 in 2008 for DNA analysis. Results from the first two years indicate that about 21% of the samples were from grizzly bears. Thirty-six (36) individual grizzlies were detected in the Tatlayoko and 83 in the upper Chilko River (an area of low grizzly habitat capability according to the CCLUP capability maps) during these two years. This totaled 119 individual bears. Grizzlies in this area traveled up to 113 km from Gold Bridge in the southeast to access the spawning salmon food resource in the Chilko, and consequently had much larger home ranges than in most other reported grizzly studies. The study concluded that the upper Chilko River could provide a food resource for grizzly bears over a 40,000-km^2 (4,000,000-ha) area, although travel from areas west of the Coast Range was considered unlikely due to the availability of salmon resources there. The Tatlayoko Valley appears to attract grizzly bears during the spring while the upper Chilko attracts and supports grizzlies during the fall. The study concluded that grizzly bears in the Central Chilcotin were considered to be healthy and abundant and the environment is relatively undisturbed.

vii. *Nature Conservancy Canada Central Interior Ecoregional Assessment*

In 2008 NCC complete an ecoregional plan for a much larger interior area (24.6 million hectare) at a coarser scale (Iachetti 2008), but somewhat similar methods can be used at a finer scale. Results of this assessment include a Regional Atlas for Conservation Planning. The main objective for the regional atlas is to map conservation values in the areas infected by mountain pine beetle in order to prioritize landscapes for conservation. The atlas consists of data layers used in the assessment. Spatial optimization analyses using MARXAN identified priority conservation sites at a broad scale (1:50,000 to 1:250,000) over large geographic regions. The assessment resulted in a decision-support framework for conservation planning (Iachetti 2008).

The data were too coarse to provide detailed information for the purposes of our grizzly report, but it does give an indication of broad areas that are considered important for conservation over

the larger area. Maps (Figures 9 and 10) of the Central Interior Auto Best Solution indicate that, relative to the entire Central Interior Ecosystem, there are areas of high conservation value in the Xeni Gwet'in Caretaker Areas and areas to the to the north west and east.

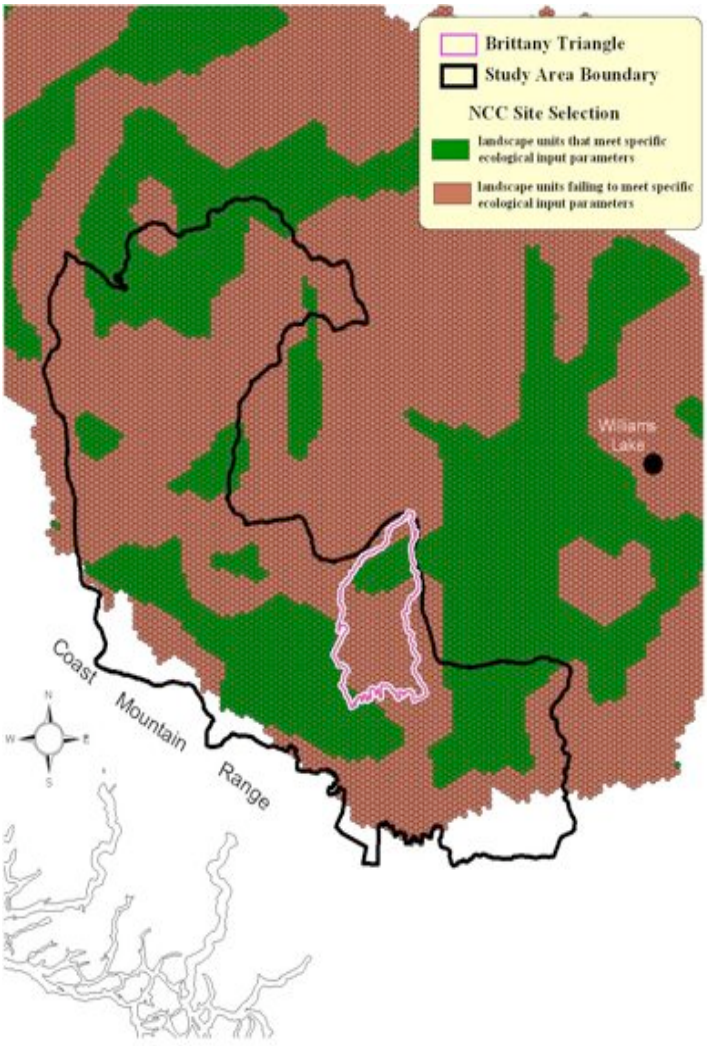

Figure 10. The Nature Conservancy of Canada (NCC) map of the Central BC Interior Auto Best Solution indicates that, relative to the entire Central Interior Ecosystem, there are areas of high conservation value in the Chilko Lake – Nemiah Valley area and north end of the Brittany Triangle as well as on the east and northeast sides of the XGCA (pink boundary).

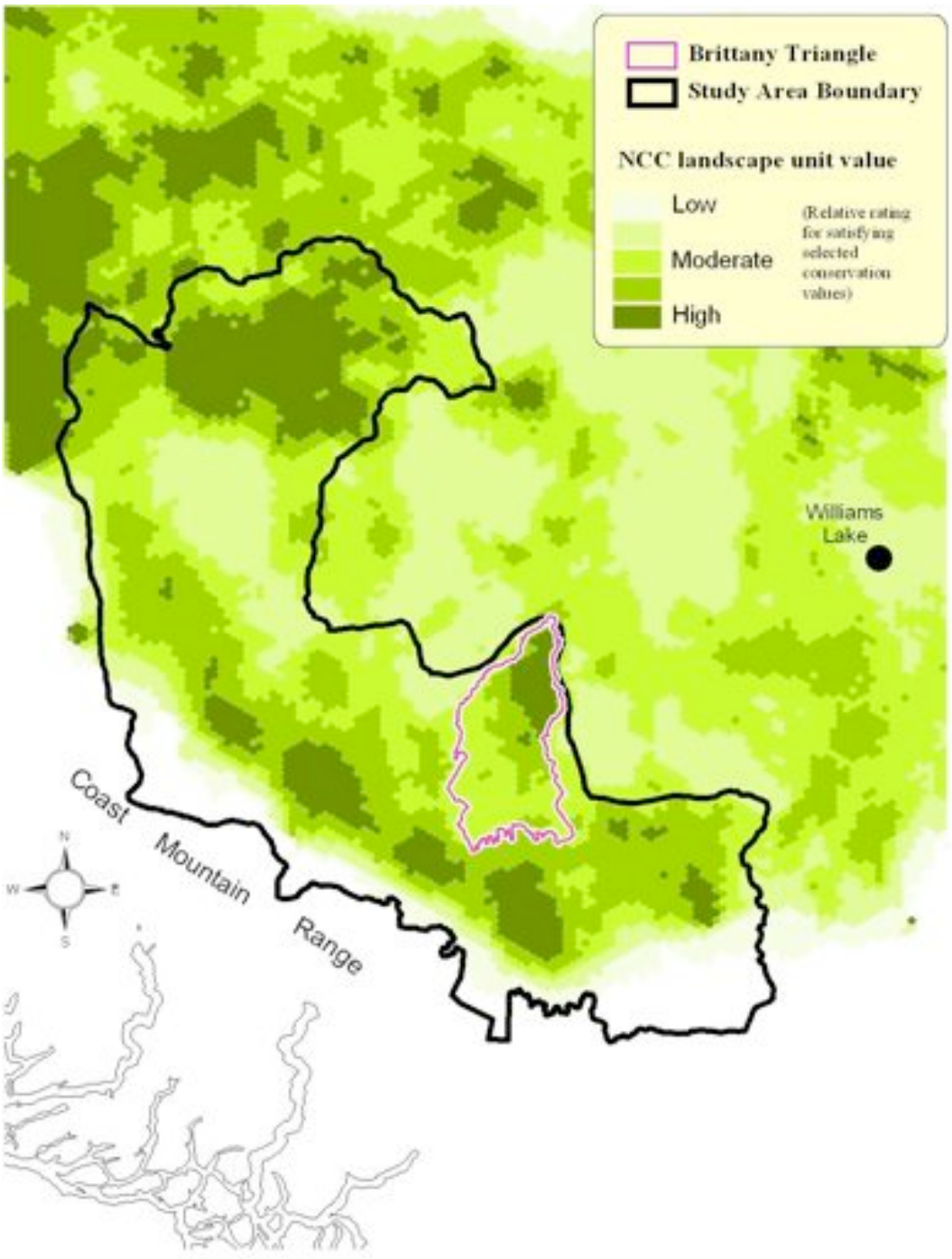

Figure 11. This map of the Central Interior Auto Sum Solution indicates a somewhat similar picture. Relative to the entire Central Interior Ecosystem, there are areas of high conservation value (dark green) in the Nemiah Valley, Brittany Triangle, Taseko, Fish Lake and other areas.

viii. *Genetic analysis of South Coastal Mountains grizzly bears (Apps et al. 2009)*

A recent hair-snag and DNA study of grizzly bear abundance, distribution, connectivity and conservation across the Southern Coast Ranges of British Columbia, that included some information on the Taseko-Chilko and South Chilcotin Ranges areas. In other words, this genetic study only covered a small section of our large Chilcotin Ranges grizzly bear core conservation area. The researchers identified 272 individual grizzly bears in nine genetically discrete population clusters. This included the Taseko-Chilko and South Chilcotin Ranges as two separate clusters. The cluster arrangement indicated ancestral landscapes with little human access now separated by human activity and physiographic features that are likely to inhibit grizzly bear survival and movement. In the south, Stein-Nahatlatch GBPU was estimated to be down to 23 grizzly bears that are isolated. Apps et al. (2009) attributed this isolation of the Stein grizzly bear population on the south from the McGillivray population to the north to grizzly bear mortality associated with human motorized access along the Duffy Lake Road in recent decades, such that resident female grizzly bears have become extirpated north of this road and south of Anderson Lake. Their study did not look at the North Cascades subpopulation further south. Their South Coast Ranges study area has four of the eight threatened GBPUs identified in the province. For regional population recovery and conservation, their results and spatial outputs are focusing efforts to re-establish and maintain population core, peripheral and linkage landscapes. In particular, their study demonstrated the importance of secure source areas in population recovery and expansion to peripheral but connected landscapes.

In conclusion, although these various efforts have addressed aspects of conservation in the Chilcotin at various scales, none of them have yet produced a conservation plan at the scale of a viable wildlife population or have used a focal species approach to conservation planning. The NCC decision-support framework approach promises to provide the tools and the data needed to complete such a plan for the area encompassing the Nemiah Valley and the XGCA, but that approach is not yet completed. Thus the Friends of the Nemiah Valley and the Valhalla Wilderness Society have supported the approach described in this report to provide immediate guidance for making conservation decisions until new data and more comprehensive approaches are available. Given the current economic climate it may take several years for either large conservation NGOs like NCC or small community-based NGOs like FONV and VWS to secure funding for a more detailed and site-specific plan. This report should allow initial decisions to be made so that opportunities for conservation are not lost and crucial landscapes are not irrevocably altered.

4.2 Current status of grizzly bears in the study area at a local and provincial scale

BC Ministry of Environment population information was used to determine population status for the study area at the provincial level, including Austin et al. (2004) and an update by Hamilton in 2008:
http://www.env.gov.bc.ca/wld/documents/gbcs/2008_Grizzly_Population_Estimate_final.pdf

Figure 11 shows the 2004 status of grizzly bears in the province by grizzly bear population unit or GBPU. The Chilcotin study area encompasses a small portion of the Klinaklini-Homathko GBPU (with a total of 109 grizzlies) along with the Blackwater-West Chilcotin GBPU on the north, with an estimated 2008 population of 193 grizzly bears, and the South Chilcotin Ranges GBPU on the south, with an estimated population of 104 grizzly bears. The study area also encompasses a small zone in the Klinaklini Watershed where grizzly bears are considered extirpated. This area is

extensively roaded and logged but involves a critical north-south linkage. Both the Blackwater-West Chilcotin and South Chilcotin Ranges GBPUs are categorized as threatened (pink). They abut to the east on the Chilcotin Plateau, the largest area in the province where grizzly bears are considered extirpated (gray). This data suggests that the Chilcotin grizzly population in our large study area is down to about 250 individuals. This category implies that grizzly bear numbers are at least half of former numbers or capacity (Austin et al. 2004).

The NCC grizzly bear study (Mueller 2008) suggests that within this larger threatened grizzly population, the XGCA may in fact be acting as an important subpopulation core. Nature Conservancy Canada (NCC) conducted a grizzly bear study from 2006-2008 to determine population estimates and trends of grizzly bears found in the Tatlayoko Valley during the spring/early summer season and along the upper Chilko River during the fall salmon period (Mueller 2008). The study identified a total of 119 grizzly bears and concluded that the upper Chilko River could provide a food resource for grizzly bears over a 40,000-km^2 (4,000,000-ha) area, although travel from areas west of the Coast Range is unlikely due to the availability of salmon resources there. The Tatlayoko Valley appears to attract grizzly bears during the spring while the upper Chilko attracts and supports grizzlies during the fall. The study concluded that grizzly bears in the Central Chilcotin were considered to be healthy and abundant and the environment is relatively undisturbed. However, we caution that this may be overly optimistic, given that there are high numbers of salmon that attract grizzly bears from a vast area. Additionally Apps et al. (2009) also found higher densities than they expected in the southern part of the South Chilcotin Ranges GBPU but caution about extrapolating to other areas of the GBPU.

Although this population of dryland grizzlies is no longer hunted, on-going threats include unreported kills from defense-of-life, conflicts at native salmon harvest sites, ranches, mining exploration camps, hunting camps, poaching and road mortalities, mining activities, backcountry recreation and other human activities. The expansion of logging and mining activities into the foothills and mountain zones is another very serious threat, including displacement from preferred habitat because of human or traffic avoidance and fragmentation within home ranges and between population. A partial review of mortality data for the South Chilcotin Ranges GBPU showed that during the 2001-2009 period at least seven grizzlies were reported killed and all were conflict related. In recent years there was also an anonymous report of a mother and two young killed in a local food attractant/conflict situation. Any road kills generally would go undetected. A recent mortality study (McLellan *et al*. 1999) found that in a hunted population, for every bear killed legally there is about one killed illegally. Therefore an estimated 17 grizzly bears have been killed by humans in the Chilcotin Ranges GBPU within the last nine years. Grizzly bears generally cannot sustain mortality higher than 4%, if recovery is desired (Horejsi 1999). Even the loss of one breeding-age female can have serious consequences to maintaining a viable population when numbers become low. Studies using radio-collared grizzlies have demonstrated that female grizzly bears comprise a large proportion of the unreported mortality in BC.

At the continental level our study also showed that the Chilcotin Ranges grizzly bear is the last potentially viable population of grizzlies left in the dryland-grassland ecotype along the eastern fringes of North America's Coastal Ranges and Cascade Mountains. This is a grizzly ecotype that feeds on salmon, but unlike its cousins in the adjacent coastal rainforests, also feeds on whitebark pine nuts, and digs for wild potatoes. This grassland grizzly ecotype is now totally extirpated from a vast area of the Cariboo Region on the east, extinct along the lee of the coastal mountains in the continental US with perhaps a few animals near the Canadian border, and down to an estimated 25 animals in the BC North Cascades GBPU. A recovery program was implemented

for the BC North Cascades but cancelled due to political opposition. Just to the north of this GBPU, Austin et al. (2004) estimated the Stein-Nahatlatch GPPU has 61 grizzly bears. We would guess that perhaps half of the estimated 56 grizzlies left in the Squamish-Lillooet GBPU also occur in the dryland eastern portion. Hamilton and Senger (2006) concluded that without a significant conservation and management effort directed at achieving population recovery, the populations in the Stein-Nahatlatch and Chilcotin Ranges GBPUs are not likely to remain viable.

A recent hair-snag and DNA study of grizzly bear abundance, distribution, connectivity and conservation across the Southern Coast Ranges of British Columbia (Apps et al. 2009), that included some information on the Chilcotin Ranges (Apps pers. comm.), found 272 individual grizzly bears in nine genetically discrete population clusters. The cluster arrangement indicated ancestral landscapes with little human access now separated by human activity and physiographic features that are likely to inhibit grizzly bear survival and movement. For regional population recovery and conservation, their results and spatial outputs are focusing efforts to reestablish and maintain population core, peripheral and linkage landscapes. In particular, their study demonstrated the importance of secure source areas in population recovery and expansion to peripheral but connected landscapes.

Based on this information and given the salmon resources and the moderate-high habitat values that range over much of our West Chilcotin study area, it appears that the current 250 grizzly bears estimated in the overall 2,694,262 ha study area are far below capacity. The area has been closed to grizzly bear hunting since 2004 (Tony Hamilton pers. comm.). It is strongly urged that the province enact a grizzly bear recovery program for the threatened Chilcotin grizzly bear population in our study area.

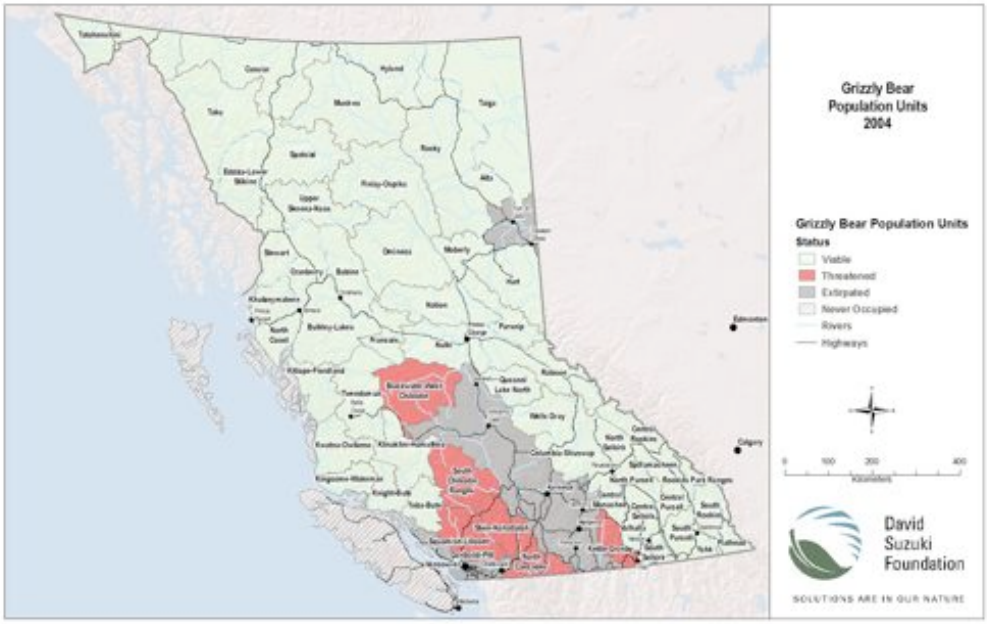

Figure 12. BC Wildlife Branch Grizzly Bear Population Units (GBPUs) for the province. Pink/orange areas show units where grizzly bears are considered threatened, including the Chilcotin Ranges. Gray areas in middle are where grizzly bears are already gone.

4.3 Comparative map analysis of XGCA and proposed Chilcotin Core Grizzly Conservation Area versus Greater Yellowstone Primary Conservation Area (GYPCA)

4.3.1 *Area comparisons & boundary determinations*

Using the GIS lab of Applied Conservation GIS we initially overlaid the boundary of the Greater Yellowstone Primary Conservation Area (GYPCA) with the XGCA (including the Nemiah Valley and Brittany Triangle) to examine relative sizes. The total size of the XGCA including the Brittany Triangle and Nemaih Valley is 777,290 ha. A first rough estimate would be that the XGCA includes about 30% of the habitat needed to support a viable grizzly bear population using the GYPCA as a model for a viable population.

Given a rough estimate of the size of the area needed, we used iterative GIS models of more-or-less intact foothills and east side-Coast Range areas, the CCLUP-SRMP grizzly bear capability maps, and CCLUP-SRMP roaded/logged areas to determine what to include in a preserve that totals at least 2,387,115 hectares, the size of the GYPCA. Available data on conservation values (from NCC) and protected areas (IUCN) and expert opinion on habitat suitability (from Wayne McCrory) was then used to outline an area that we feel contains the most important grizzly bear habitat.

Using the available data and relying heavily on expert opinion we developed a preliminary boundary that encompassed the highest quality of intact grizzly bear habitat, and included isolated protected areas as well as potential connectivity areas between them (Figures 1 and 2). [The outline of the GYPCA has been placed to demonstrate scale only.] We then used the grizzly bear suitability model to refine the boundaries. The area within the boundaries of the proposed Chilcotin core grizzly bear area was found to be 2,694,282 hectares, about 10% larger than the GYPCA.

4.3.2 *Development of grizzly bear habitat suitability model for Chilcotin study area*

We compared the grizzly bear capability maps (CCLUP and SRMP) with known grizzly bear habitat values on the ground and determined that some refinement was needed. For example, important salmon spawning areas in the XGCA and many higher quality subalpine habitats including whitebark pine and moist meadows in the Nemiah Valley were not well represented, as well as spring/fall bearberry/kinnikinnick (*Arctostaphylos uva-ursi*) habitats in the Brittany Triangle. Field surveys showed that approximately half of the spring diet of bears as determined from scats is comprised of over-wintered bearberries (McCrory 2002).

To develop a more precise estimate of areas needed to maintain the Chilcotin grizzly bear population, a habitat suitability model was developed. This identified areas of high to low quality habitat in 5 classes (Figure 3). Habitat values were assigned to each pixel in the land cover database depending upon its BTM (Basic Thematic Mapping) class as shown in Table 1. Pixel values were then summed over all layers. This provided cumulative values for each 100 metre pixel on the landscape ranging from 26 -60. These values were then reclassified to values 1 - 5, "1" being "low" and "5" being "high." These are values for grizzly bear (GB) habitat ranked relative to each other: e.g. a pixel with a rating of "5" has a 'higher' GB habitat value than a pixel with a value of "3". A draft grizzly bear suitability map was then created in ArcView 3.2 using model results and then refined after further ground-truthing against known habitat values on the landscape. Figure 3 shows the final map.

Using this rating system we identified many more areas of moderate to high quality habitat than the CCLUP-SRMP habitat capability models estimated; although our rating system was not directly comparable to the previous government models. The approach indicated that the larger study area contains 2,363,029 ha of moderate to high quality grizzly bear habitat (Table 2), which should be adequate to maintain a viable population using the criteria that were applied to the Greater Yellowstone Primary Conservation Area. In fact, the Chilcotin area can presumably support greater densities and a larger population than the Greater Yellowstone because of the abundant salmon resource. Preserving the high quality grizzly bear habitat is a good starting point for conserving biodiversity in the region. The intactness and ecological complexity of the area will buffer it against large-scale changes due to climate change much better than if the habitat were fragmented even further.

Table 1. Relative grizzly habitat values for habitat suitability modeling. Values based upon expert opinion for the Chilcotin region are compared with similar values for the Inland Temperate Rainforest (ITR).

Grizzly Bbear habitat index	ITR value	Chilcotin value
Land cover class index (BTM class)		
Agriculture	2	2
Alpine	10	8
Barren Surfaces	3	0
Fresh Water	1	0
Glaciers and Snow	3	0
Old Forest	10	10
Range Lands	10	6
Recently Burned	4	10
Recently Logged	8	6
Recreation Activities	na	8
Selectively Logged	8	8
Sub alpine Avalanche Chutes	10	10
Urban	1	0
Wetlands	4	8
Young Forest	10	10
Road Density Index		
mi/mi2		
0-0.01	10	10
0.01-1	10	10
1 - 2	10	10
2 - 4	5	5
4 - 6	3	3
6 - 8	2	2
8 - 10	2	2
10 - 50	1	1
>50	1	1
Elevation Index (m)		
0-1000	10	10
1000-1500	10	10
1500-2000	10	10
>2000	10	10
Slope Index		
%_slope		
0-20	10	10
20-40	10	10
> 40 (40 –60)	10	10
60-80	10	10
80-100	10	10
100-120	10	10
>120	1	1
BGC Index (Biogeoclimatic Zone)		
BAFA (boreal Altai Fescue Alpine)		10
CMA (coast mountain heather Alpine)		5
CWH		8
ESSF		10
IDF		6
IMA (interior mountain heather alpine)		5
MH		10
MS		8
SBPS		8
SBS		8
Salmon Stream buffered areas		10

Table 2. Grizzly bear habitat suitability model ratings. Total area identified in each habitat class sums to 2,694,282 ha. within the preliminary study area boundary	
Class	Total ha
1 - low	3,405
2 - low +	327,848
Total: low – low +	**331,253 ha**
3 - moderate	602,920
4 - moderate +	1,536,644
5 - high	223,465
Total: moderate - high	**2,363,029 ha**
Total area	**2,694,282 ha**

4.4 Land status & amount of protected lands

Our analysis shows that a fairly good portion of the grizzly bear study area is already protected (Figure 11). The entire XGCA has been protected by the Nemiah First Nation as an aboriginal preserve and wild horse preserve of some 777,290 hectares. Four provincial protected areas (Table 3) within this First Nation preserve comprise some 271,778 ha or about 1/3 of the XGCA. Eleven provincial protected areas in our grizzly bear study area outside the XGCA total 462,471 ha. For total protection, we combined the Xeni aboriginal/wild horse preserve with provincial protected areas outside of the XGCA. This amounts to some 1,239,761 ha or 46% of the total proposed Chilcotin grizzly bear conservation area.

Other lands in the conservation area include conservation properties (3,622 ha), federal (908 ha), Indian reserves (5,051 ha) and private land (19,736 ha). There are also some statutory reserves by the BC Wildlife Branch that are not included. The remainder is considered public lands by the province but aboriginal territories by different First Nations under varying negotiations for status concerning aboriginal rights and title (see also study area regarding Xeni Gwet'in aboriginal rights and title).

The current protection of some 46% of the area is higher than most other grizzly bear areas of the province but we suggest more core areas need to be protected in our greater Chilcotin study area. This is based on a comprehensive review of the number of grizzly bears required in a population for long-term viability by a panel of independent bear scientists (Gilbert et al. 2004). They concluded that some 68-84% of the habitat base that must be protected, a percentage higher than previously expected.

Table 3. Provincial protected areas within proposed Chilcotin grizzly core conservation area	
Park or ecological reserve (ER) name	**Area (ha)**
1. Protected areas outside of XGCA	
S. Tweedsmuir Park (E. portion)	Est. 155,049
Itcha Ilgachuz - Ilgachuz Range - (ER)	2,744
Itcha Ilgachuz Park	111,977

Dzawaki/Upper Kliniklini River Conservancy (portion within grizzly study area only)	Est. 30,823
White Pelican	3,953
Nazko Lake	89
Bull Canyon	344
Big Creek ER	216
Big Creek	65,982
Bishop River	19,947
Spruce Lake Protected Area	71,347
Total outside XGCA	**462,471 ha**
2. Protected areas within XGCA	
Nunsti Park	20,898
Homathko River -Tatlayoko	17,575
Ts'il-os Park	233,240
Cardiff Mountain ER	65
Prov. protected areas in XGCA	**271,778 ha**
TOTAL provincial protected areas	**734,249 ha**
Total XGCA or Xeni Gwet'in aboriginal/wild horse preserve (includes Nunsti, Ts'il-os, Homathko River –Tatlayoko and Cardiff Mtn. prov. protected areas)	**777,290 ha**
Total protected including aboriginal /wild horse Preserve & protected areas outside of XGCA	**1,239,761 ha**
As % of total grizzly bear conservation area	**46%**

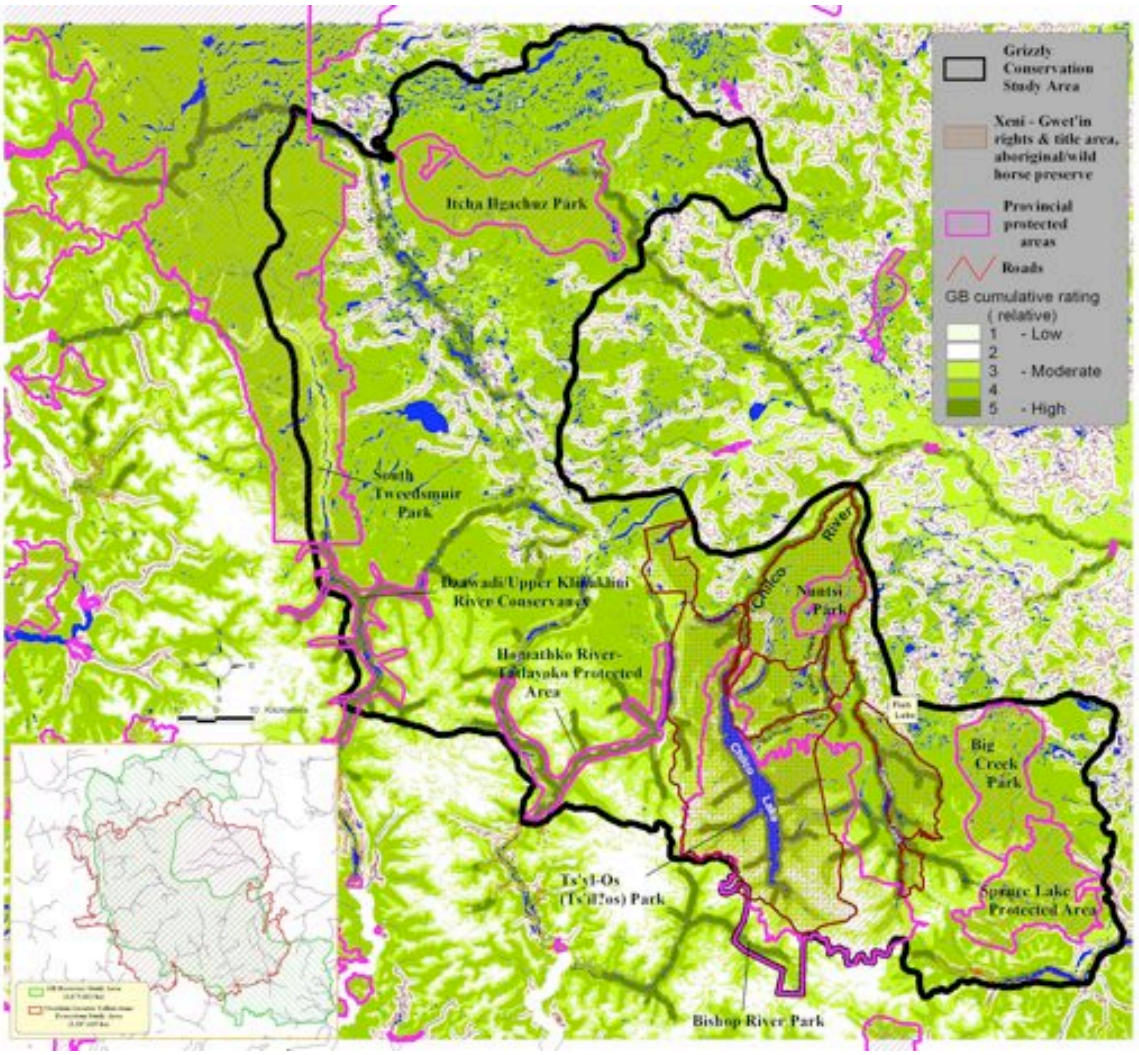

Figure 13. Overlay of grizzly bear suitability map showing provincial protected areas (pink boundary) and Xeni Gwet'in protected aboriginal/wild horse preserve (brown). The Xeni Gwet'in contribute the largest protected area to grizzly bear conservation.

5.0 DISCUSSION

This approach focuses on guiding and implementing community-based local conservation efforts using the best available science within the scope of this project to enable the persistence of wildlife populations and their habitats. This will also assist the Friends of Nemaiah Valley, Valhalla Wilderness Society, Xeni Gwet'in and other First Nations and others to work within existing administrative and management processes to help stitch together a cohesive community-based conservation recovery plan for the wider area. This community-based plan is a critical area within the larger ecosystems (and broader conservation planning efforts) whose protection is important to maintain habitat and connectivity throughout multiple ecosystems (Central Interior and Coastal Mountains) and wildlife metapopulations. This plan is a smaller piece of the broader, regional, conservation picture.

Although we found that the West Chilcotin conservation study area including the Xeni Gwet'in Caretaker Area provides a large mountain and dry foothills ecosystem greater in size than the Greater Yellowstone Primary Conservation Area (GYPCA), the grizzly population in the West Chilcotin is provincially listed as threatened and has an estimated 250 bears, about half of former estimated numbers. Considering that much of the area has moderate potential grizzly bear suitability including major salmon runs, numbers today appear to be well below what could be supported. If grizzlies are to recover and survive in the study area, all areas of intact natural habitat should be conserved. As well, many of the key areas that have been roaded in the process of logging or fighting fire need to be effectively deactivated and left alone so that undisturbed natural habitat can return (McCrory 2005). As the climate changes and natural succession continue, it is likely that some of the plant communities which existed before fire and mountain pine beetle infestation may not return. One possible scenario is that warmer climate and dead trees will result in widespread clearing due to wildfire. As plants return after fires in a warmer and drier landscape there may be greater opportunity for grassland, shrub, and steppe habitats to dominate. Areas in the Coast Range slopes and foothills that have little habitat for species such as grizzly bears may provide more plant foods in the future. Conversely, those areas that contain whitebark pine will decrease in value to grizzly bear as the pines are killed by mountain pine beetle and other diseases. It is highly uncertain if other plants will increase and replace whitebark pine within the next 50 years, which is the minimum length of time before whitebark will recover enough to again produce significant food resources.

Studies now tell us that as climate changes begin to impact our ecosystems, maintaining large areas of intact forests offers the greatest chances for the resiliency and adaptaptions to change by plants and wild animals. Clearcuts offer the least resiliency and carbon storage values. BC forests have some of the highest carbon stores in Canada [avg. 311 tons per hectare] (Wilson and Hebda 2008). Another key component of this ecosystem is the salmon resource. Salmon provide an incredible input of nutrients for both aquatic and terrestrial systems. Nitrogen from marine sources eventually finds its way into the soil along the Chilko River drainage while the salmon that bring it support a much denser population of grizzly and black bears than other similar systems like Yellowstone are capable of. To maintain biodiversity and ecosystem functions in this area, the salmon runs must be preserved: the river system must be kept free-flowing, all salmon spawning areas must be protected, and pollution from all sources including agricultural and industrial must be restricted. Sustainable economies should be encouraged that use the renewable natural resources wisely with little alteration of the landscape. The final decisions on what this landscape will look like in the future will be made by the people who are living and working there today.

6.0 CONCLUSIONS

"Umbrella species" are viewed as those which represent an entire species assemblage of a landscape. Their conservation is seen as providing for the conservation of other community members and their habitats. They may also be classified as "landscape species" in that they "use large, ecologically diverse areas and often have significant impacts on the structure and function of natural ecosystems" (Redford et al. 1999, 2003). As well "their requirements in time and space make them particularly susceptible to human alteration and use of wild landscapes" (Sanderson et al. 2002). In more general use the term "umbrella species" has been applied to any species that confers conservation protection to other co-occurring species (Fleishman et al. 2000, Seddon & Leech 2008). In an analysis of the umbrella effect of a suite of species in the Madison Valley of Montana, grizzly bears were found to have the highest umbrella rating of 63 candidate species.

The grizzly bear showed the highest aggregate score by encompassing 29 of 40 habitats and 17 of 26 identified threats (Brock et al. 2006).

Over the past 150 years, grizzly bears have declined drastically throughout their historic range, which once extended from Alaska to Mexico and from the Pacific coast to near the Mississippi River. In many parts of their surviving range in the continental US, grizzly bears now face shortages of an important food source, whitebark pine nuts, which is needed in the fall for building stores of fat in preparation for winter hibernation. The mountain pine beetle outbreak has decimated whitebark stands, and an introduced fungal disease, pine blister rust, has also killed a significant amount. The full impact of the potential loss of whitebark pine on grizzly bears in the Chilcotin is uncertain but the loss of such an important food source could reduce the carrying capacity for grizzly bears in the region. Additionally, pine blister rust serves as a reminder of the vulnerability of wildlife species to introduced disease.

Grizzly bears are habitat generalists that can adapt to a wide variety of habitat types. However, human encroachment at low elevations has reduced grizzly bear habitat mostly to mountain forests and meadows. Grizzly bears utilize low elevation habitats when there is sufficient space and security where they can avoid human conflicts. As industrial use of grizzly habitat increases there will be less habitat for grizzly bears, and other species, and their population will decrease further. Current population estimates indicate that grizzly habitat, and thus the health of the ecosystem, has been significantly degraded already by human developments: populations have in fact been extirpated from some regions. In order to conserve biodiversity in the region, grizzly habitat should be protected and restored. The status of grizzly bears and grizzly habitat can serve as an index to biodiversity and ecosystem health that should be closely monitored. A more comprehensive suite of umbrella or focal species can be chosen to more completely represent all ecosystem components, but additional research is needed in the area to understand the ecology of animals such as wolverine, elk, and species such as those listed under ‘next steps.’ This brief analysis based upon grizzly bears however can serve as an important first step towards conserving the landscape of the future.

6.1 Next steps

Considering the immense human pressures for development of the Chilcotin study area, including mining and forestry, combined with the large areas of beetle kill and wildfires already generated by fire suppression policies and climate change, we are recommending a more comprehensive conservation plan be done that includes a suite of focal species that represents all ecosystem subzone variants and key ecological processes using a focal species selection process (Brock 2006). In a somewhat similar landscape near Yellowstone Park, 15 focal species were chosen in the Madison Valley (grizzly bear, elk, wolverine, moose, pronghorn, Westslope cutthroat trout, greater sage grouse, boreal toad, arctic grayling, bighorn sheep, black-backed woodpecker, Columbia spotted frog, red-naped sapsucker, yellow warbler, warbling vireo). The habitats that supported them were then selected as conservation targets: Targets identified were:

- Carnivore/forest wildlife habitat
- Carnivore /forest wildlife habitat connectivity
- Elk/pronghorn habitat
- Bighorn sheep habitat
- Sagebrush/grassland bird habitat
- Riparian habitat

- Raptor nesting habitat
- Wetlands

A similar set of suitable focal species and conservation targets could be selected for the Chilcotin. Then using accurate maps of existing vegetation and other land cover (such as the BC Vegetation Resource Inventory [VRI] and Forest Inventory Program [FIP] data) habitat suitability models could be developed to predict the spatial occurrence of habitat for those selected animal species. The issue of scale should be addressed carefully to ensure that the correct resolution of data are matched with an appropriate scale of analysis to produce a meaningful result. VRI data would entail a slightly different modeling approach than BEC data. Models of suitable habitat would then be used as surrogates for species distribution to develop models and maps of 'core' habitat. Suitable habitat for one species can be combined with models of other species to delineate important core habitat for a suite of species. Spatial optimization approaches can then be used to determine minimal areas that meet specific thresholds or targets in terms of number of species 'protected,' percentage of habitat 'protected,' or other metrics. Potential 'corridors' or 'linkages' can then be identified between 'core' areas using appropriate modeling methods. These linkages can then be optimized to identify minimal areas that meet the desired thresholds. Any empirical data on focal species distribution and movement could be used to help validate the model results: models are employed primarily because there is almost never enough empirical data (observations of locations, habitat use, and movements) to map an entire area.

At this point in the process then a conservation plan for the Chilcotin would consist of a rough blueprint for a network of core areas and linkage corridors that define the conservation area or nature reserve or whatever term is desired. Once habitat and core areas have been identified they can be analyzed, using the tools of population viability analysis (PVA), in terms of their ability to maintain a given population (such as grizzly bears) and allow it to persist. Multi-species PVAs can help determine the size and configuration of core areas and linkages that can support a suite of focal species.

Finally, the reserve design or conservation area can be assessed in the light of climate change to determine what the habitat will look like in the future and what other areas need to be considered in order to maintain species and ecosystems. Although the landscape in the future, modified by climate change, is uncertain, there are a few certainties. Focal species in general are selected due to their sensitivity to human activities and developments: providing habitat for their persistence requires the limiting of those human impacts in areas large enough for population persistence. Even if the landscape comes to support different habitats and focal species in the future their conservation will still require areas of limited human impact. Thus the first step in planning for climate change is to identify areas of little human development and to maintain that light human footprint into the future. This is consistent with the recommendations of the provinces' mountain pine beetle action plan (2006 – 2011), which recognized as a high priority the need to that identify conservation areas to protect the region's biodiversity (BC 2008). We can preserve the stage even though the actors may change as the play unfolds.

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