INVENTORY OF WILDLIFE, ECOLOGICAL, AND LANDSCAPE CONNECTIVITY VALUES, TSILHQOT'IN FIRST NATIONS CULTURAL/HERITAGE VALUES, & RESOURCE CONFLICTS IN THE DASIQOX-TASEKO WATERSHED, BC CHILCOTIN

FINAL REPORT (Revised) August 4, 2014

For Xeni Gwet'in & Yunesit'in First Nations

By Wayne McCrory, RPBio
McCrory Wildlife Services Ltd.
Phone: 250-358-7796; email: mccrorywildlife@netidea.com
and
First Nations cultural/heritage research: Linda Smith, MSc, & Alice William
GIS mapping by Baden Cross, Applied Conservation GIS
Corridor modeling by Dr. Lance Craighead, Craighead Research Institute

LEGAL COVENANT FROM THE XENI GWET'IN GOVERNMENT

When the draft of this report was completed in March 2014, the following legal covenant was included: *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 (Vickers J, 2007) 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 (Tachelach'ed) and the Xeni Gwet'in Trapline. 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.*

On June 26, 2014, the Supreme Court of Canada (SCC) in *Tsilhqot'in Nation v. British Columbia* granted the Xeni Gwet'in aboriginal title over their claim area, including a northern section of the Dasiqox-Taseko protection proposal study area.

We experience a spiritual longing to be out on the land. My worldview, the holistic way I view the world, and the cumulative grief I have inherited, and experienced during my extensive research, make it very challenging for me to remain positive in the present time with all that is happening. Our past is embedded within the clearcuts; the broken landscapes hold our most cherished memories. But, it is the disfigured land we see first, it is the emotional pain we experience first, and this anguish overshadows what was there before. Now, we must build upon these layers, and create new visions on the land. But, it is impossible to obliterate the horror on the landscapes and see past this, to the purity and the cultural wealth that was there before. How can a Tsilhqot'in create new life and new memories upon what was butchered, and bring new life upon what appears to be dying?

In my mind, everything is connected. We are Nenqayni, and Tsilhqot'in have been connected to their lands for many generations, and Tsilhqot'in elders would say this connection has been there since time began. The land is what makes us complete; it is an extension of our body and our soul; it is what gives us joy; it is what gives us security; it protects us; it feeds us; it comforts us; it heals us; it is Our Mother. We love our land and its life forms. Like an infant away from its mother, most Tsilhqot'in feel lost elsewhere, and we miss our landscapes.

-- Linda R. Smith. 2012. Nabas oral literature documentation. A collaboration research study with the Yunesit'in Government (Stone Band) and the Xeni Gwet'in Government (Nemiah Band). Final Report to Terralingua.

Alice William's memories of the Xeni Gwet'in traditional way life as a child at Lower Dasiqox-Taseko Lake

Joseph said this whole area was used by the Bigad, and other elders who passed on, for hunting, berry-picking, marmot hunts; sometime people gathered to visit and fish. The little lakes between Nabas^ and Wasp Lake were filled with rainbow trout. Dad used to go down to Taseko from the winter home at Little Fish Lake. He had set lines he kept checking every other day, and he caught big Dolly Vardens and bull trout.

I remember that he took me on a lot of excursions on horseback. I sat on his lap when he went on saddle horse to the Taseko Lake to check his fish lines, and sometimes nets in the ice. I remember enjoying myself sliding down the ice that was on the edge of the Taseko Lake, the ice made a curve when it froze, it looked like a frozen wave of water, and this is where I was sliding. I played while dad was checking his fishing gear for fish, then he would set them (net, lines) again.

Mom had Otis, my youngest brother, and I bury some of my siblings' dried umbilical cords there at the Beece Creek meadows. This was a tradition for Chilcotins. The children would become good hunters if you buried them in deer, moose, goat, and sheep hoof prints. They would be good berry-pickers if you buried them by berry bushes. It probably applies to fish as well. I will have to ask some elders about fish.

Mom gave us these dried cords in a cloth, and Otis and I dug a hole in a moose track and buried them there. When we got back to the camp, Mom told everyone what she made us do. Everyone said we probably buried them in some cow tracks. They assumed that we didn't know anything about tracks and didn't know any difference. Otis was about 5 years old, and I was about 8.

Cover photo: Lower Dasiqox-Taseko Lake. W. McCrory photo.

ACKNOWLEDGEMENTS

The researcher would like to offer special thanks and appreciation to the Xeni Gwet'in and Yunesit'in First Nations, as well as to the Tsilhqot'in National Government (TNG) for supporting and assisting with this project. In particular, First Nations researchers and knowledge-keepers Alice William (Xeni Gwet'in) and Linda Smith (Yunesit'in) are thanked profusely for providing significant cultural/heritage information, critical reviews of all wildlife and salmon information, as well as sharing their rich, personal experiences of the Dasiqox. Sechanalyagh!

Friends of Nemaiah Valley (FONV), Valhalla Wilderness Society (VWS), and Environmental Mining Education Foundation are thanked for their ongoing support. In particular, David Williams of FONV deserves special thanks for his ongoing support and community outreach on the proposal.

The Wilburforce Foundation is thanked for providing the grant that made this report come to life. The report could not have been completed without additional support funding through the Valhalla Wilderness Society courtesy of the McLean Foundation, Stewart Fund, Ed Wolf, Strat and Sa-Hali Funds (Vancouver Foundation), David Summers, Emam and Paula Khan, Samantha McIntyre, L. Tiberti Fund, and others.

Dr. Lance Craighead, of the Montana-based Craighead Research Institute, is thanked for doing the technical piece of wildlife connectivity corridors. GIS analyst Baden Cross is thanked for his excellent GIS resource maps. Mary Thurber of TNG is thanked for providing some base maps.

Biologist Randy Moody is thanked for providing information on whitebark pine and reviewing the draft of that section. Biologist and editor Maggie Paquet is thanked for her expert hand in tuning up the report and doing a fine layout.

Alice William and Tom Dillabough are thanked for their kind hospitality and assistance while we used Yohetta Wilderness Lodge as our base of operations.

Finally, the researcher would also like to express gratitude to Maureen and Jerry Tickner for providing a warm living space and meals in Williams Lake.

TABLE OF CONTENTS

LIST OF TABLES

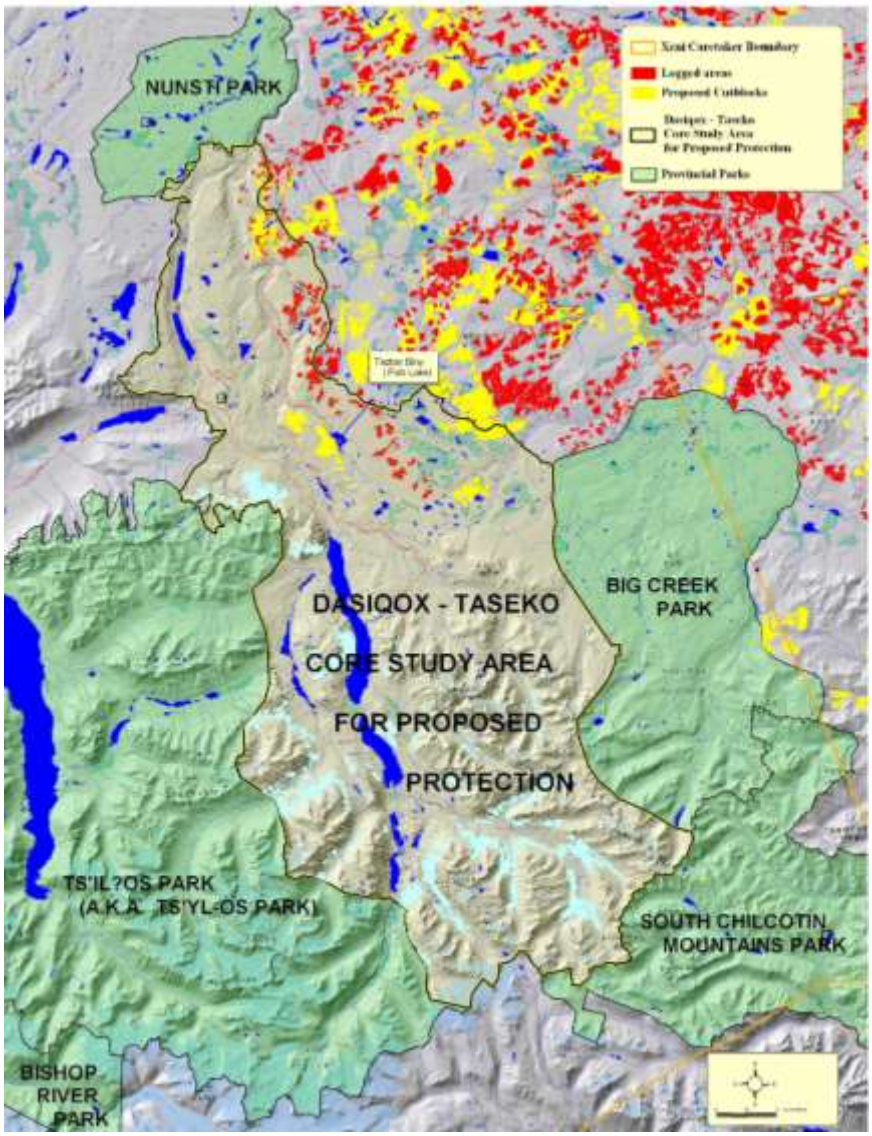
LIST OF MAPS

LIST OF FIGURES

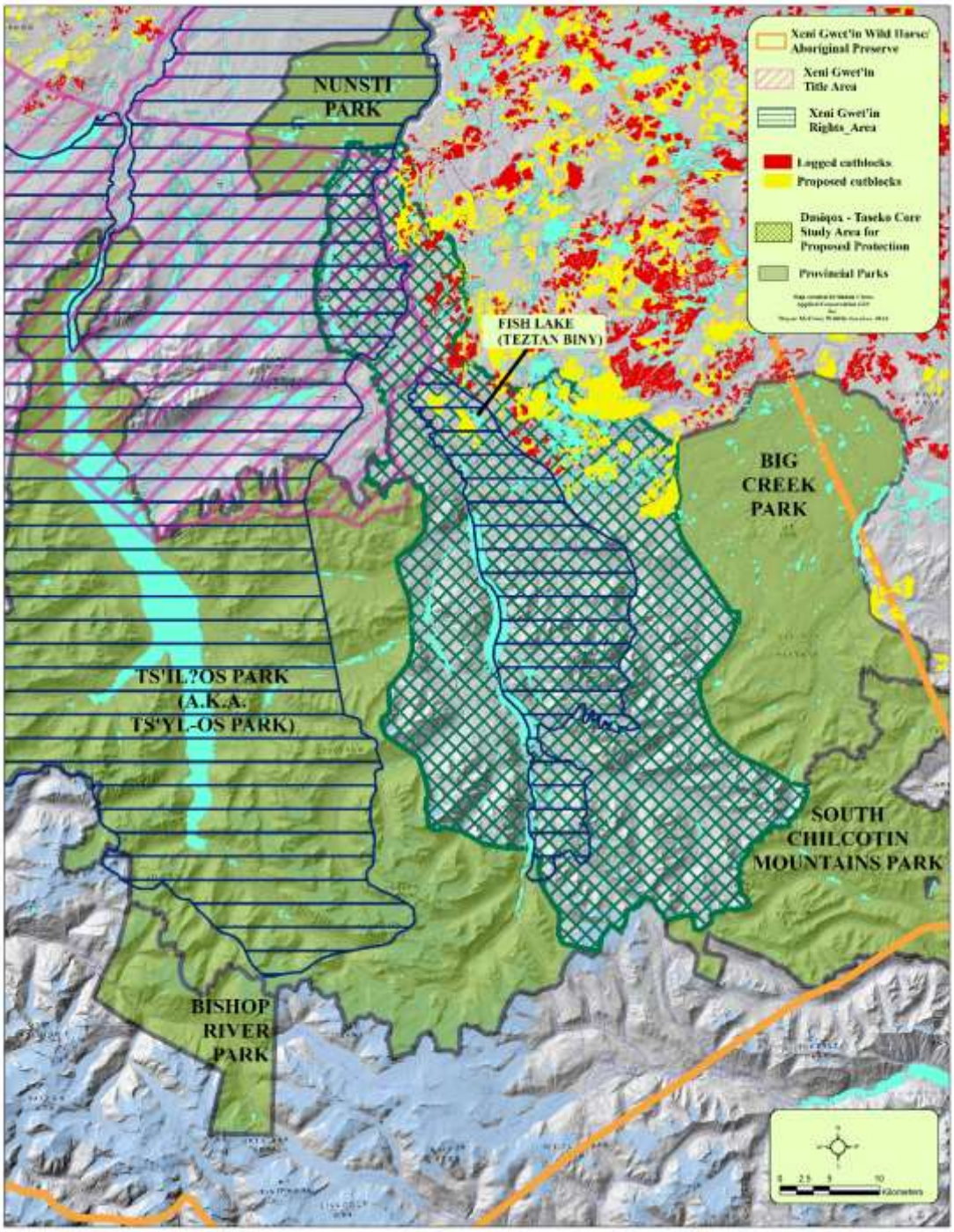
KEY FINDINGS & RECOMMENDATIONS

STUDY AREA AND BOUNDARIES STILL REQUIRE COMMUNITY INPUT

Map 1a shows the current study area boundaries encompassing some 184,794 hectares (ha) (456,620 acres). The proposal boundary requires further community input from the Xeni Gwet'in, Yunesit'in, and Tsilhqot'in National Government. The initial boundaries were determined in 2010 with the Xeni Gwet'in Chief and Council and were also presented for input at one community meeting at Nemiah. The study area is within the Xeni Gwet'in Caretaker Area (XGCA) and Yunesit'in Caretaker Area (YCA).



Map 1a. Shows the Dasiqox-Taseko protection study area (light grey-green) that is strategically situated to connect five important provincial Class A parks (green). The protection proposal boundaries are not final and require more community input.



Map 1b. Shows the Xeni Gwet'in Supreme Court of Canada (SCC 2014) aboriginal title area and 2007 rights areas in relation to the Dasiqox-Taseko protection study area. About 1/10 of the proposal is in the title area and about 1/3 is in the rights areas. Part of the title area and all of the rights areas were also recognized by the BC Supreme Court (Vickers 2007) and confer an obligation to the Xeni Gwet'in to protect wildlife and other values for the benefit all generations.

PRELIMINARY XENI GWET'IN AND YUNESIT'IN CULTURAL, HERITAGE, AND TRADITIONAL USE VALUES

First Nations researchers and knowledge-keepers Alice William (Xeni Gwet'in) and Linda Smith (Yunesit'in) provided the bulk of information for this part of the review and guided what could be shared and what was too sensitive. All evidence gathered herein indicates that the Dasiqox-Taseko study area is an extremely rich First Nations cultural/heritage landscape. This includes legends and stories passed down through centuries of oral tradition, such as the Tsilhqot'in origin story, *The Woman and the Dog (Lhindesch'oysh)* (Linda Smith pers. comm.); knowledge of people buried or cremated out in hidden corners of the Dasiqox-Taseko and the life stories of these people; ancient ways and medicinal and food plant gathering areas for surviving off the land; gravesite areas where wars were fought in hand-to-hand combat; sites of winter villages where First People used underground lodge technology (kekules) (Figure 2) and the heat of the earth to survive the cold Arctic-like winters; and intimate knowledge of animal, plant, and fish gathering sites that went by the seasons and the swing of the moon and the Earth's turn.

Extensive clearcut logging planned for the Dasiqox-Taseko study area in the 2014 Williams Lake Timber Supply Area (TSA) review threatens many of the First Nations values identified, just as did the proposed mine at Teztan Biny (Fish Lake), that can't be conserved by parceling the land off into little saved bits and pieces here and there. The only option to protect this rich cultural/heritage landscape is through a designation of full protection status, such as a combined Tribal Park/provincial Class A Park or Conservancy.

Figure 1. Researchers Alice and Norman William grew up in the Dasiqox-Taseko area and retain much of the rich traditional knowledge of the landscape passed down orally from their parents and their ancestors.

Figure 2. Pithouse/kekule depression is all that remains of an ancient underground lodge at a village site in Gunn Valley. (Photo from Smith and Holmes 2010).

The research in this report barely scratches the surface of the diverse cultural/heritage values of the study area. I am therefore recommending that a much more comprehensive documentation be done as a stand-alone report prepared jointly by the Xeni Gwet'in and Yunesit'in.

INVENTORY OF FOCAL SPECIES AND KEYSTONE CULTURAL SPECIES FOR CONSERVATION AREA DESIGN

Using different criteria, key species were selected for their values as conservation focal species and cultural keystone species of the Xeni Gwet'in and Yunesit'in First Nations. Focal species for conservation were determined from information available, field surveys, sensitivity to disturbance, and the scientific literature. Cultural keystone species were determined by traditional use values and cultural/heritage importance to the First Nations communities. First Nations names for the different species have been included.

The study area was found to have high values for the following focal and keystone cultural species: grizzly bear (nunitsiny) grey wolf (nun), wolverine (nuŝtil, nulh-eteghish), mule deer (nists'i), moose (mus), California bighorn sheep (debi), mountain goat (ŝebay), wild Pacific salmon [sockeye (ts'eman), coho (dandzex), chinook (jaŝ)], and whitebark pine (ets'i-chen, ets'igwel-chen). Two hooved keystone cultural species: elk (bedzɪsh?) and woodland caribou (nists'i7igut'in?) disappeared in the 1800s, while two hooved species were added to the ecosystem: moose (mus) migrated naturally into the area in the 1910-1920s, while the horse (naŝlhiny) appears to have been brought in from the south by the Tsilhqot'in about 1750.

Even the first Canadian Environmental Assessment Agency (CEAA) Review Panel for the proposed open pit mine at Teztan Biny (Fish Lake) recognized the uniqueness of the Dasiqox-Taseko are as a: …*pristine, untouched, and unique ecosystem with exceptional vistas, clear glacial fed lakes and streams, relative remoteness and abundant wildlife*.

The high species diversity creates a rich and unique Chilcotin cultural/heritage landscape and predator-prey ecosystem that should be protected at all costs, particularly for the manner in which it connects five important provincial parks.

Following are some of the salient features identified:

1. Keystone cultural values for all focal species were found to be very high, including traditional uses, local harvesting areas, and incorporation of stories and legends within the First Nations cultures.
2. The Dasiqox-Taseko study area is within a large carnivore conservation study area identified by a previous independent study. The study found that the West Chilcotin has some of the best remaining habitat for large carnivores in North America. The study modeled eight carnivore species.
3. The grizzly bear is one of the best keystone and umbrella species to use for conservation design because if it is protected at a viable population level many other species will also be protected. A recent conservation review concluded that the Chilcotin Ranges grizzly bear is internationally significant because it is the last stronghold of a viable core population of grizzly bears left in the dryland-grassland ecotype along the eastern fringes of North America's West Coast Mountain Ranges and Cascade Mountains. This dryland grizzly bear ecotype is extinct in the US and is considered threatened in the South Coast mountains in BC, including in the Chilcotin.
4. Chilcotin grizzly bears in the study area are already now an enclave population with mass extinction having already occurred on much of the plateau to the north-west due to ranching, logging, over-hunting, and other human elements. One review shows that human-caused mortality of grizzly bears along the northern cattle ranching and logging fringes is high and acts as a "population sink." This makes protection of the Dasiqox-Taseko core grizzly bear enclave all that more important. If the proposed clearcut logging of the study area, as proposed in the 2014 Williams Lake TSA review goes ahead, it is anticipated that the Chilcotin Ranges grizzly bear will be extirpated over time, as have its cousins south of the Canada/US border.
5. Considered a unique "dryland" ecotype, the Chilcotin Ranges grizzly not only feeds on salmon but also fattens in the fall on whitebark pinenuts (Figure 3) and corms of wild potatoes and bear-claw. Data from a DNA study by the province found 36 grizzly bears occupying the mid-upper Dasiqox-Taseko study area. Given the exceptional habitat and landscape connectivity values, the study area, if protected, would provide a key core source population for recovery of grizzly bears in the South Coast mountains. DNA studies show the Chilcotin grizzly bear travels over large areas. Trophy-hunting should remain closed due to a high rate of human-bear conflict and reported and unreported mortality around the northern fringes of the XGCA and YCA.

Figure 3. Family of grizzly bears in whitebark pine stand in autumn in Nemiah high country. The bears likely had moved up to feed on whitebark pinenuts after the local salmon runs were over. [Photo: Sam Zirnhelt]

6. The grey wolf still occurs throughout the study area (Figure 4) and is not a federal or provincial listed species-of-concern. Using different density estimates from several sources, there could be a minimum of 4-27 wolves, or up to 4-7 packs, totalling 24-84 wolves. Wolves in the Chilcotin undergo high mortality due to a history of persecution and aggressive government kill policies, despite evidence of very low conflict with livestock. Some evidence indicates that the constant control killing of wolves breaks down the social structure of packs with established territories and causes increased livestock predation. Part of the study area and adjacent provincial parks should be designated a benchmark carnivore conservation area where wolves are protected. A wolf diet study supported by the Xeni Gwet'in and others is ongoing in the north end of the Dasiqox-Taseko study area.
7. Wolverines are expected to occur throughout the study area, but their numbers are not known. They are blue-listed provincially and are a species of Special Concern federally. Wolverines have a high demographic sensitivity to adult mortality, which raises a serious concern that commercial trapping in the study area could have a detrimental effect on their meta-population dynamics.

Figure 4. Remote camera photo of lone wolf at Blue Lake in the Brittany Triangle. (Photo by Sadie Parr)

8. Moose, mule deer, California bighorn sheep, and mountain goats occur in varying numbers in the study area as keystone cultural species and are considered of high value to First Nation subsistence. Interviews indicate numbers have declined in recent decades. Moose have declined because of a combination of excessive logging of beetle-infected lodgepole pine forests and excess mortality by hunters.
9. The study area is a major migration corridor and seasonal habitat for mule deer that winter along the Fraser River. Maintaining the ecological integrity of migration corridors is considered of high value to First Nations. Although not quantified, some California bighorn sheep may also migrate from their mountain enclaves to wintering grounds in the Fraser River canyon, thereby maintaining good gene flow in meta-populations.
10. Historic records and First Nations oral history both indicate elk were common in the area and disappeared for unknown reasons. A preliminary review of potential habitats suggests that the study area may have suitable pocket grasslands suitable for winter range.
11. Historic records and First Nations oral history indicate woodland caribou were common in the area and disappeared for unknown reasons. Woodland caribou in the Chilcotin area survive in winter on terrestrial lichens in old lodgepole pine forests and windswept alpine areas. A preliminary GIS map review of potential winter range showed that some viable habitat remains. However, further roading and clearcutting on the east side of the Dasiqox-Taseko continues to threaten removal of older age lodgepole pine forests as potential caribou winter range. The federal government is implementing a recovery strategy for caribou in the region.

12. More investigation is needed about potential recovery of both elk and woodland caribou, especially as restoration of one or both of these once-common species would highly benefit native and non-native subsistence hunters who rely annually on ungulates for food. This is of particular relevance given the recent crash of the moose population. A recovery program for woodland caribou is only considered viable if the Dasiqox-Taseko is fully protected from industrial-scale forestry and if any potential surrounding winter old pine forest habitat is also protected.

13. A map analysis found that there are 10,135 ha of whitebark pine habitats in the study area (Figure 5). These occur in mountain areas at mid to high elevations. The stands, generally mixed with other conifer species, appear to be part of the largest, healthiest whitebark pine stands remaining in western Canada that have not been decimated by white pine blister rust, the mountain pine beetle, and climate change-driven wildfires. Whitebark pine is listed as threatened federally and blue-listed provincially, but no federal or provincial recovery plans have been developed. My field surveys in the study area established that grizzly bears feed extensively on whitebark pinenuts in the late fall by raiding red squirrel middens. However, more quantification is needed. We aged a small number of whitebark pine trees to be up to 500-800 years old.

Figure 5. Xeni Gwet'in researcher Alice William at 800-year old whitebark pine tree along the Pellaire Mine Road in Falls River. Apparently, the tree was partially bulldozed over during road construction and has now become more horizontal.

14. The study area has important spawning habitat for three species of wild Pacific salmon (chinook, sockeye, and coho) that make very long journeys via the Fraser and Chilcotin rivers (Map 2). The federal Department of Fisheries and Oceans (DFO) has done limited salmon counts and habitat surveys in the Dasiqox-Taseko, which are difficult due to the high turbidity

of the glacier-fed river and lake systems. The low sockeye run in Yohetta Creek is considered a unique genetic stock that is endangered. Traditional First Nation occupation of the study area based on pithouse (kekule) village site locations in Elkin Creek and the Dasiqox-Taseko appear related to key areas where salmon could be harvested in fall (Figure 6). None of the Dasiqox-Taseko salmon runs are in existing provincial parks, which were created out of the Cariboo-Chilcotin land use plan. Protection of the study area will protect known and unknown salmon runs of high value to the ecosystem, including key sites where grizzly bears feed on salmon in fall.

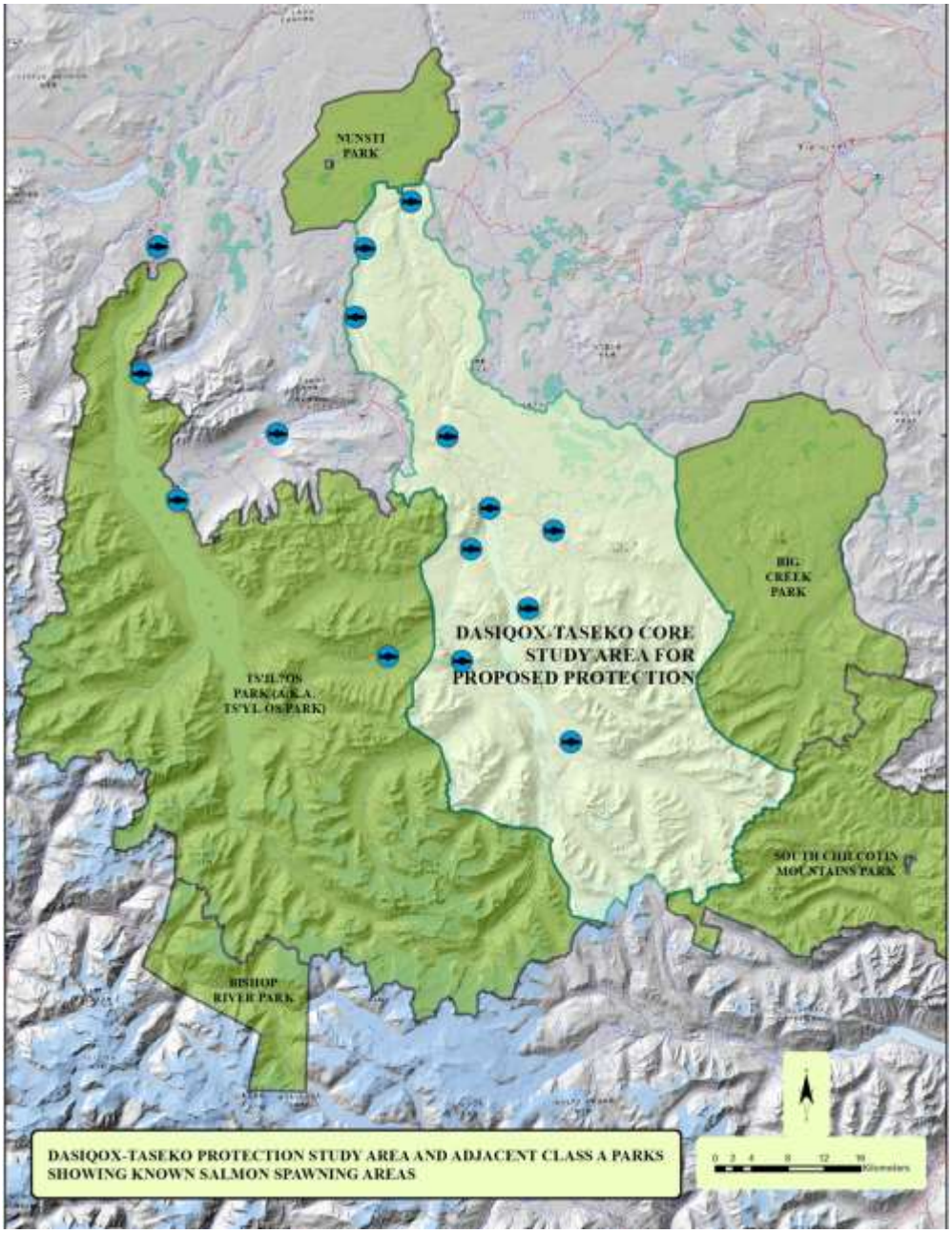
Figure 6. Giant Jaŝ (chinook or spring salmon) harvested about 1981 during a traditional fall fisheries by the William family using a gill net for drift netting across the Dasiqox (Dasiqox-Taseko) River at the outlet of Lower Dasiqox-Taseko Lake.

LANDSCAPE CONNECTIVITY VALUES OF THE DASIQOX-TASEKO STUDY AREA: ECOLOGICAL AND TSILHQOT'IN CULTURAL/ HERITAGE CONSIDERATIONS

15. Several field studies and GIS landscape connectivity modeling using two approaches found that the Dasiqox-Taseko study area is a high value linkage landscape that connects five provincial parks (Map 3) in a way that is important to maintaining their ecological integrity and genetic diversity for grizzly bears, California bighorn sheep, and other wildlife, as well as to protect a large network of ancient First Nations travel trails.

16. Ancient Tsilhqot'in trails, such as travel routes for local uses and long-distance trade trails, criss-cross the Dasiqox-Taseko study area, some of them likely going back thousands of years if their age could ever be measured.

17. Mule deer migrate seasonally through the study area between wintering and summering grounds (Figure 7).
18. Two GIS corridor model approaches using grizzly bears found high connectivity values between the adjoining parks, especially in riparian zones.
19. Planned logging, as outlined in the 2014 Williams Lake TSA, will severely fragment the linkage landscape of the Dasiqox-Taseko study area and threaten connectivity values, which will lead to isolation and degraded ecological integrity of the five important provincial parks.



Map 2. Some of the salmon-spawning areas in the Chilko and Dasiqox-Taseko watersheds where grizzly bears congregate to feed on salmon in fall.

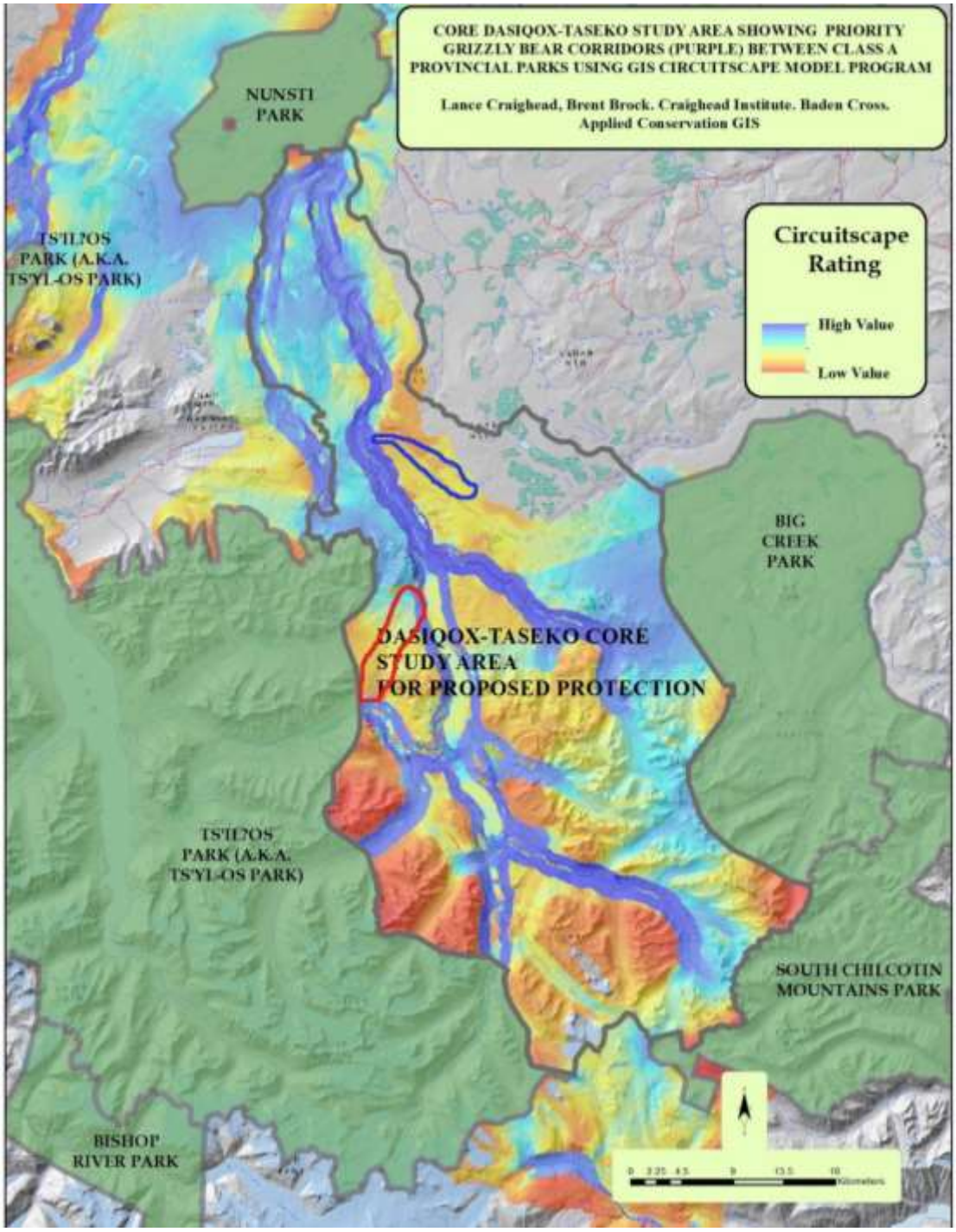
Figure 7. Mule deer swimming across Dasiqox-Taseko Lake during annual fall migration to wintering grounds near the Fraser River. (Photo by Alice William)

RESOURCE CONFLICTS: PRELIMINARY REVIEW OF MINING AND MINERAL TENURES

20. This was not a comprehensive review of mining exploration, development history, and mineral tenures in the Dasiqox-Taseko study area, but a more detailed review should be done by an expert in the field as an important next step.

21. The mid-upper Dasiqox-Taseko has been subjected to over a century of fairly intensive mineral exploration that has led to the development of a only a small number of small gold and other base metal ore bodies of questionable value that appear to have been mined out (Taylor-Windfall) and/or have been partially mined but are currently inactive (Pellaire).

22. The large proven low-grade sulphide gold-copper deposit underlying Teztan Biny (Fish Lake) appears to be an exception to the rule relative to the small size of the few known mineral deposits that have been explored over the last century or so in the study area. As with the very controversial Windy-Craggy mine in northwest BC that eventually became part of a provincial park because wilderness values superseded the very high and potentially destructive environmental costs of mining the massive sulphide copper-gold-silver ore body there, so has a similar ore body at Teztan Biny (Fish Lake) been proven by two CEAA Panels to similarly have environmental (and First Nations cultural/heritage) costs that are unacceptably high. The Prosperity-New Prosperity mine proposals would have entailed the largest open pit mine in Canada, along with a huge tailings pond.



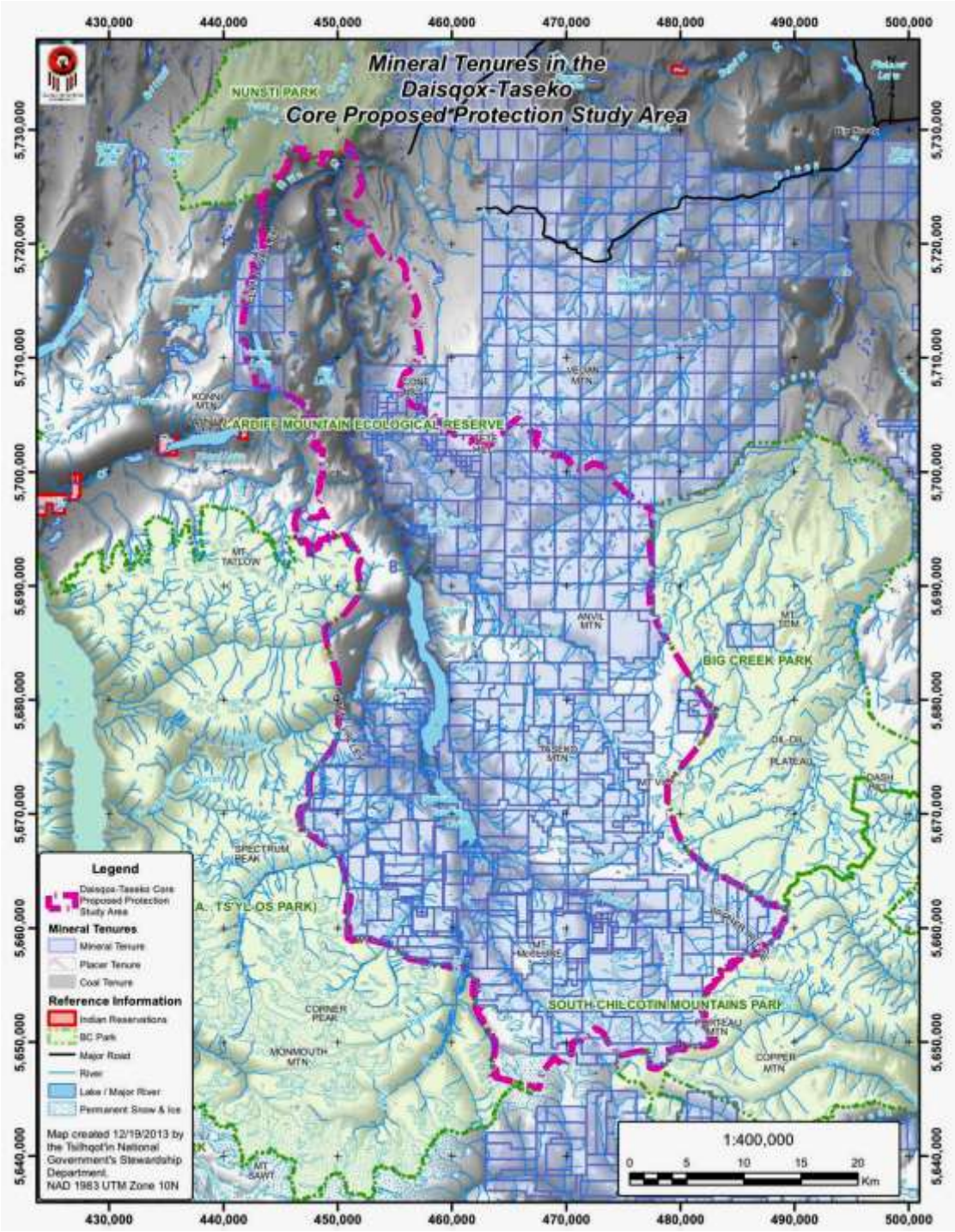
Map 3. Cost distance connectivity model shows the lowest travel costs and best corridors for grizzly bears to be along the riparian areas (purple).

23. Currently, nearly all of the Dasiqox-Taseko study area has some form of mineral tenure (Map 4) over it, much appearing to be speculative as mineral claims for subsurface rights can now be “staked” online for a nominal fee. Now that the New Prosperity Mine has been turned down for the second time, due to significant adverse environmental, cultural/heritage and other impacts, it is likely that speculative mining interest in the area will decrease. Since only 10% of the Dasiqox proposal is in the recognized Aboriginal title area and 30% is in the rights areas, it is likely the both the BC Supreme Court and Canada Supreme Court rulings will have much influence on the mineral tenures in the proposal area; although this is beyond the scope of my expertise.

24. Although further detailed documentation of mineral tenures and ownership should be done, the majority of the tenures are likely provincial mineral claims acquired from the province at nominal cost. Mineral claims and other mining tenures don’t mean full-time ownership or perpetual mineral rights, with the exception of what may be a small number of “Crown-granted” mineral claims from early times.

25. In 2010, the province granted Taseko Mines Ltd. a long-term, renewable, 25-year mining lease for the Prosperity gold-copper project. The size of the lease is 3,500 ha or 35 km^2. The lease area includes Teztan Biny (Fish Lake), Yanah Biny (Little Fish Lake), and the surrounding area called Nabas.

26. Field surveys show that the provincial government lacks oversight and enforcement of environmental and other damage caused by mine exploration and development in the study area (see figures 8 and 9). The Pellaire mining camp and ore concentrator were allowed to be situated in the run-out zones of two avalanche paths; an open tailings pond was allowed next to a small stream draining into the Falls River, which is part of the Dasiqox-Taseko salmon system. Drums containing fuel and chemicals have been left exposed to the weather since 2008, and old equipment has been left abandoned; despite this particular mine and mine camp being adjacent to Ts'il?os Provincial Park. Stored sulphide ore piles are likely leaching contaminants into the watershed. An abandoned bulldozer has sat at the Pellaire airport for several decades. In the lower Tchaikazan, a mining company has left an abandoned travel trailer and a large area of diamond drill core boxes, all deteriorating.



Map 4. Shows that in 2013 nearly all of the Dasiqox-Taseko study area (pink outline) had some form of mineral tenure (blue), much of it speculative. However, Taseko Mines Ltd. has a 25-year government mining lease at Teztan Biny (Fish Lake) that is 35 km² (Map Courtesy of Tsilhqot'in National Government (TNG)).

Figure 8. Small gold mine ore concentrator and tailings pond (foreground) at Pellaire mine camp, Falls Creek. The mining camp is in the run-out zone of two large avalanche paths on each side of the valley. The mine site is currently in a state of abandonment and the tailings pond may be leaching contaminants into a small creek that runs into the Falls River. Fuel storage barrels and mine chemical barrels also have been left to the elements.

Figure 9. Abandoned and deteriorating trailer at a mining camp in the lower Tchaikazan area.

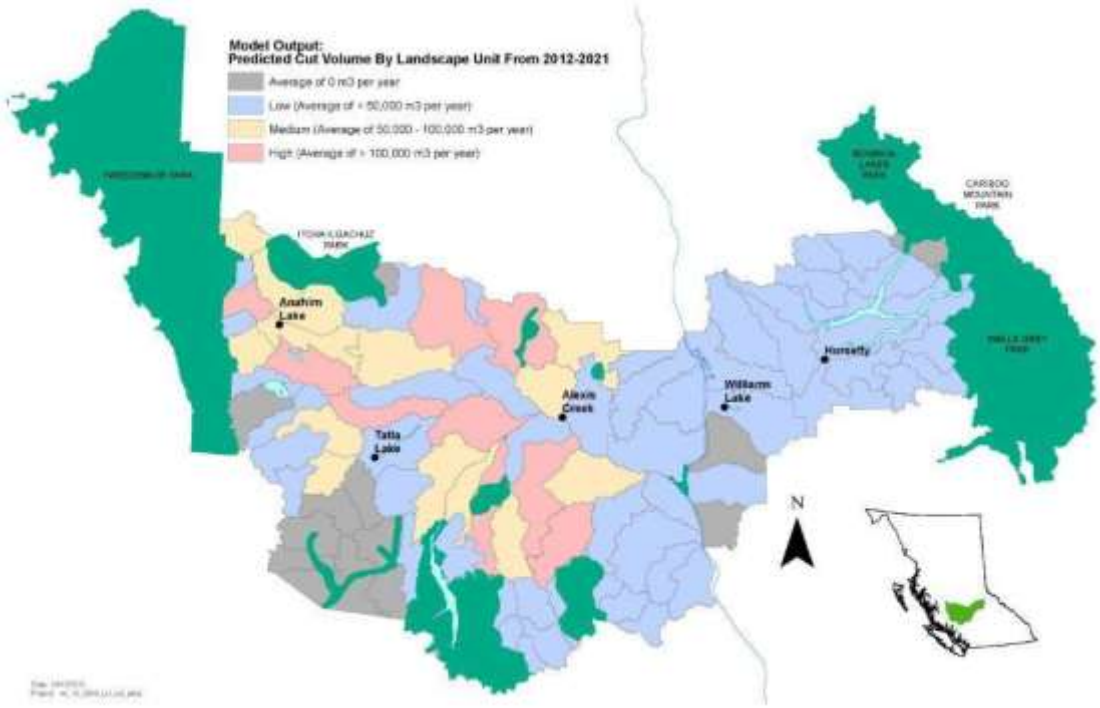
RESOURCE CONFLICTS: PRELIMINARY REVIEW OF INDUSTRIAL-SCALE LOGGING TENURES AND WILLIAMS LAKE TIMBER SUPPLY AREA (TSA) LOGGING PLANS FOR THE STUDY AREA

27. The Dasiqox-Taseko study area is part of the Williams Lake Timber Supply Area (TSA), one of the largest in the province (4.93 million ha). The recent 2014 TSA review indicates that the province has approved the allowable annual cut (AAC) for the Williams Lake TSA to be more than doubled since 2007 because of the mountain pine beetle infestation.

28. The 2014 TSA review indicates that logging is planned to begin in 2014 for most or all landscape units within the Dasiqox-Taseko study area and will continue for the next 20 or more years (Map 5).

29. Planned logging, if allowed to proceed in the study area, as outlined in the 2014 Williams Lake TSA, will severely fragment the linkage landscape of the Dasiqox-Taseko study area, threatening its critical connectivity values and leading to isolation and degraded ecological integrity of the five important provincial parks. Environmental costs to society will be high, including the inability of recovery plans for species-at-risk to be effective. As well, the provincial parks represent a huge investment by society in protection of biodiversity.

Figure 10. Recent massive clearcutting by Tolko Cariboo Woodlands in the Big Creek area. This could hardly be called creating a benign landscape for any sensitive wildlife like the grizzly bear, wolverine, Canada lynx, and other species to survive in, and foretells what will happen to the rest of the unlogged Dasiqox-Taseko study area if logging is not curtailed. Some of this area was likely former woodland caribou winter range and continued logging of mature lodgepole pine that is in potential winter range will erode any potential for a caribou recovery plan. (Photo by Jeremy Williams)



Map 5. Shows that that the province plans to log in all of the landscape units in the Dasiqox-Taseko study area over the next 20 years. These are the areas in light purple, light brown, and light orange at the bottom end of the map between Ts'il?os, Nunsti, and Big Creek Parks (dark green). Logging is planned to commence in some landscape units this year (MFLNRO 2014).

CURRENT PROTECTION

30. My review shows that the Xeni Gwet'in Aboriginal/Wild Horse Preserve decrees made for the whole Xeni traditional territory offer full protection from industrial forestry, mining, and hydroelectric development at the scale of a fully protected provincial or national park. Aboriginal decree protection also meets the international criteria for protection, including the International Union for the Conservation of Nature's (IUCN) definition of a protected area and the 2003 World Congress definition of an Indigenous and Community Conserved Area (ICCA). However, because the Xeni Gwet'in Aboriginal/Wild Horse Preserve areas have not been officially recognized by the provincial or federal governments, extractive industries have already degraded some 16% of the preserve area; and a large proposed open pit mine has generated significant local, provincial, and national controversy. The province has also let out mineral tenures to private mining companies that blanket most of the Dasiqox-Taseko area.

31. A sufficiency analysis shows that the existing level of non-First Nations protection initiatives recognized by the province is inadequate and, if clearcut logging is allowed to proceed as per the 2014 Williams Lake TSA, industrial-scale forestry will lead to eventual extirpation of sensitive species, such as the threatened Chilcotin grizzly bear, wolverine, and others. Current non-native "protection" measures include one small ecological reserve, one small (proposed) provincial grizzly bear Wildlife Habitat Area (WHA), a Wilderness Tourism-Forest Sector Avoidance Area Strategy Agreement, potential (but currently nonexistent) species-at-risk recovery plans, and species protection guidelines under the Chilcotin Special Resource

Management Plan (SRMP). These do not meet any reasonable legal, regulatory, or scientific criteria needed to sustain the long-term viability of the existing sensitive ecology or biota and rich First Nations cultural/heritage values of the Dasiqox-Taseko study area.

32. Priority recommendations are made (following) for First Nations to develop a strong strategy to fully protect the Dasiqox-Taseko study area, which, in my opinion, would be equal to or surpass any national park or national park reserve in the western mountains of Canada. This should be done in a manner that meets the mandate of the full protection decreed by the community and elders in 1989 and 2002 regarding the Xeni Gwet'in Aboriginal/Wild Horse Preserve. Time is of the essence. To quote one First Nations chief in the Chilcotin (Anon. 2012): *By the time we negotiate a treaty or rights and title, there won't be anything left to protect.*

33. Recognition of aboriginal rights and title over part of the study area only strengthens the ability of Xeni Gwet'in First Nations to protect the area in the face of an onslaught of clearcut logging and mining interests. The now recognized Xeni Gwet'in aboriginal title at the north end of the study area, and overlaying about 1/10 of the protection proposal, as well as the recognized rights that overlay about 1/3 of the Dasiqox, will provide some greater leverage by the Xeni Gwet'in and Yunesit'in towards full protection. The Vickers (2007) BC Supreme Court ruling made it very clear that [then-] current clearcutting under BC forestry policies endangered wildlife and thus the rights of the Xeni Gwet'in to trap and hunt in the recognized rights area.

34. Paquet (2013) reviewed various protection options for the Xeni Gwet'in First Nation ranging from national parks and national park reserves to provincial ecological reserves, different classes of provincial parks, provincial conservancies (a comparatively recent designation), tribal park declarations, and protection under the BC Environment and Land Use Act. Community input to date suggests both the Xeni Gwet'in and the Yunesit'in favour a Tribal Park designation (David Williams pers. comm.). However, according to Paquet (2013), *'Tribal park' is not a legally recognised designation, either provincially or federally.* The BC government has considered them to be Crown lands and will allow logging, mining, and other industrial uses of, and activities on, these lands. The one exception was the Stein, which was first declared a Tribal Park and then (largely due to extreme pressure from the First Nation and the public) ended up being protected as a Class A provincial park and retaining the reference to Tribal Park. Perhaps now that the SCC has recognized aboriginal title and rights over part of the Dasiqox-Taseko protection proposal area, declaration of a Tribal Park may have more leverage in getting recognized protection.

PRIORITY RECOMMENDATIONS

As important first actions, I recommend that the Xeni Gwet'in and Yunesit'in First Nations consider the following steps towards full protection of the Dasiqox-Taseko study area:

1. Since the core study area boundaries I used were determined with limited community input, this needs to be completed.

2. A good next step would be to register the final community protection proposal for Dasiqox-Taseko study area (as well as the Xeni Gwet'in Aboriginal/Wild Horse Preserve) with the World Congress Indigenous and Community Conserved Area (ICCA) registry www.iccaregistry.org.

3. Given existing circumstances of aboriginal rights and title for part of the study area, a Tribal Park designation over the whole study area by the Xeni Gwet'in and Yunesit'in should be considered as a further declaration of First Nations protection, reinforcing the 1989 Aboriginal Preserve declaration and the 2002 Wild Horse Preserve protection designation over the same Xeni Gwet'in Caretaker area. Given the imminence of proposed logging plans and mining interests, declaration of a Tribal Park should be considered as quickly as possible.

4. Careful consideration should be given to having the province adding to the Tribal Park an overlay of provincial legislated protection as a Conservancy or Class A park, similar to the final protection provided by the 1987 Nlaka'pamux (Stein Valley) Tribal Heritage Park agreed to by the St'at'imc First Nation and the BC government, which conferred provincial recognition as a Class A park. One of the apparent benefits of the phrase "tribal park" is that it publicly declares that the area is important to First Nations and is off limits to industrial development. One of the obvious benefits of adding Class A legislated protection to a Tribal Park is that it offers a more permanent and secure level of protection so that long term Tribal Park protection is not left to political changes that may come about after band council elections.

5. More documentation should be done of First Nations cultural/heritage values. This should be done by the Xeni Gwet'in and Yunesit'in communities. Further research is needed on wildlife connectivity values, woodland caribou winter range modeling of mature pine forests slated to be logged, all logging and mineral tenures, and case studies on mining-park conflicts where park protection was an issue.

6. Steps to get some form of reliable protection that overrides current mineral and logging tenures will be challenging and require further analysis and community consultation. Case studies are needed of similar complex situations, such as the creation of the Alsek-Tatshenshini Provincial Park that included the controversial Windy-Craggy proposed mine area. Dealing with existing "Crown" logging and mining tenures will still have to be addressed with the province.

7. Concerning the areas of abandoned mine equipment, old trailers, drill core boxes, potential for the unmaintained Pellaire mine camp, tailings pond, and ore storage piles to cause environmental damage (including the mine camp potentially being avalanched into Falls Creek), the Xeni Gwet'in should file a formal complaint with the Ministry of Mines and Energy as well as with the Ministry of Forests, Land and Natural Resource Operations (MFLNRO) website: Natural Resource Violation Reporting Line www.for.gov.bc.ca/hen/nrv/ Toll Free Number: 1-844-NRO-TIPS.

1.0 INTRODUCTION

Fed by numerous icefields tucked into the lee of the Coast Mountains, the wild and fast Dasiqox-Taseko River spills out of Dasiqox-Taseko (Whitewater) Lakes, wends its way through the foothills, and flows across the Chilcotin Plateau as a milky blue-white ribbon of rapids and back-eddies. So turbid from suspended glacial silt year-round, it is almost impossible to count salmon and other fish. Quickly, after passing through the foothills, it flows northward, forming the eastern boundary of the Brittany Triangle, home to Canada's most remote populations of wild horses. At the north end of the Triangle, it joins with its sister river, the Chilko, to form the mighty Chilcotin River, which then heads east to join the famous Fraser River.

This Dasiqox-Taseko conservation inventory and evaluation is an outgrowth of many things. As early as 1937, the Federation of British Columbia Naturalists recognized the outstanding wilderness preservation values of the South Chilcotin Ranges and recommended the establishment of a large provincial park spanning from Chilko Lake to the South Chilcotin (BC Spaces for Nature 2011). In 1987, the Valhalla Wilderness Society produced BC's first composite map of wilderness protection proposals that included park proposals in the Chilcotin put forward by various conservation groups. This included proposed protection of a portion of the Dasiqox-Taseko as part of the larger South Chilcotin Wilderness Proposal. (Ultimately, only a smaller South Chilcotin Park was eventually protected.)

In 1989, the Xeni Gwet'in led a successful community blockade of a proposed logging road to the Brittany Triangle. A new bridge had been proposed at a place on the Chilko River called Henry's Crossing. The Xeni then produced the 1989 *Xeni Gwet'in Nendduwh Jid Guzit'in*, or Aboriginal Wilderness Declaration, to protect their large caretaker area, an area nearly as large as Yellowstone National Park. The Xeni protection designation decreed that there would be no industrial logging, mining, and hydroelectric development.

In 1992, as various proposals for new parks in the Cariboo-Chilcotin emerged from conservation groups, BC Spaces for Nature Executive Director Ric Careless integrated various wilderness proposals in the Chilcotin into a much larger vision for protection called the Chilcotin Ark (BC Spaces for Nature 2011). In 1994, as a result of efforts by BC Spaces for Nature, other conservation groups, and the Xeni Gwet'in First Nation, a number of new provincial Class A parks were designated in the Chilcotin Ranges under the Cariboo-Chilcotin Land and Resources Management Plan (CCLRMP) (BC Commission on Resources and Environment 1994). New Class A parks in the area included Ts'il?os, Nunsti, Big Creek, and Bishop River. While most of the Chilko watershed was protected in Ts'il?os Provincial Park, only a portion of the western side of the Upper Dasiqox-Taseko was protected in the same park. Much of the core headwaters of the Dasiqox-Taseko, including known and unknown salmon-bearing tributaries, remained unprotected. The unprotected area was designated a Special Resource Management Zone (SRMZ) in the 1994 CCLRMP, where it was intended to allow logging and mining with special guidelines to protect other values.

The Brittany Triangle was also designated an SRMZ but, as with other SRMZs in the province, no special guidelines were ever produced by government and the forest industry then marched into

many SRMZs through the open door policy of the province. Despite the 1989 Xeni blockade at Henry's Crossing, pressures to log the Brittany SRMZ continued to mount. In 2002, following scientific recommendations from a wild horse/ wildlife study of the Brittany Triangle (McCrory 2002), the Xeni Gwet'in ramped up the aboriginal protection decree for their aboriginal preserve by bringing a second overlay decree with a focus on wild horses. The preserve is called the "?Elegesi Qiyus Wild Horse Preserve," or Eagle Lake Henry Cayuse Wild Horse Preserve that covers the same area.

Since neither the provincial nor federal governments recognized aboriginal decrees or Tribal Park declarations for protection, the Xeni Gwet'in have had to deal with the proposed Taseko Mine at Teztan Biny (Fish Lake), as well as clearcut logging and roading around the outer fringes of their aboriginal/wild horse preserve. We estimate some 16% of the reserve has been fragmented by logging roads and clearcuts since the 1989 declaration.

First Nations and conservation groups concerns for the industrial-scale incursions into the Dasiqox-Taseko came to a head during the two Canadian Environmental Assessment Agency (CEAA) panel hearings in 2010 and 2013 on Taseko Mine's proposal at Teztan Biny (Fish Lake). Much was focussed on how the proposed mine would affect the grizzly bears and other species, as well as on the very high cultural/heritage values in the area. This precipitated a growing concern as to how best to protect the Dasiqox-Taseko wilderness and cultural/heritage landscape, particularly as both CEAA panels concluded that the proposed mine would have significant adverse effects on the environment and on First Nations cultural/heritage values.

Impetus for protection was also fuelled by a conservation review of the grizzly bears of BC's South Chilcotin Ranges by Craighead and McCrory (2010), which recommended more habitat be protected for the species. The grizzly bear study area was about the same size as Yellowstone National Park and encompassed the plateau lands, foothills, and eastern Coast Ranges from Ts'il?os Provincial Park and the Bridge River on the south, to the Itcha Ilgachuz and Tweedsmuir provincial parks on the north. The study recommended more protection of grizzly bear habitats.

Following the 2010 CEAA Panel findings, in March 2011, the Xeni Gwet'in First Nation signed a Band Council Resolution (BCR) supporting them working with three environmental groups (Friends of Nemaiah Valley[1]-FONV, Environmental Mining Education Foundation-EMEF, and Valhalla Wilderness Society-VWS) to study and achieve formal protection of the Upper Dasiqox-Taseko Wilderness and other areas identified as ecologically significant for grizzly bears and other wildlife. The Xeni BCR stated:

> *This motion references the report prepared for Valhalla Wilderness Society and Friends of Nemaiah Valley title: 'A Preliminary Conservation Review of the Interior Grizzly Bear of Chilcotin Ranges in British Columbia, May 3, 2010', also noting that formal protection of said areas and activities aimed at achieving this end are without prejudice to 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.*

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

As a result, the environmental groups cooperated with the Xeni Gwet'in to produce a draft map of the Dasiqox-Taseko protection proposal area and a two-page colour brochure that was circulated to the Xeni community to explain the protection concept and seek input. Also, David Williams, president of FONV, obtained a grant from Mountain Equipment Co-op to continue with community outreach in 2012. He subsequently sought agreement with the St'at'imc First Nation to expand the Dasiqox-Taseko protection proposal beyond the headwaters southward into the Lillooet area. The draft boundaries were expanded to include the St'at'imc areas of concern. However, by the end of 2012, the St'at'imc had not committed to the concept and informed Tsilhqot'in leadership that they could not agree to work with them to implement a conservancy at this time. Consequently, the boundary was pulled back to the headwaters divide of the Dasiqox-Taseko. Since that time, the St'at'imc have met with the Tsilhqot'in to further study ways to protect the area together.

In April 2013, at the request of the Xeni Gwet'in, FONV hired a consultant (Paquet 2013) to prepare a report on parks as mechanisms to protect cultural and biological diversity. The report included a review of the pros and cons of provincial legislative designations (Class A Parks, Class E and Class F conservancies) and non-legislative tribal park declarations by First Nations. In 2013, the Wilburforce Foundation became interested in supporting the protection initiative by providing a grant to FONV for community outreach work for 1-2 years. They also provided most of the funding for this technical review of biological and First Nations cultural/heritage values of the Dasiqox-Taseko protection proposal area.

This goal of this report was to complete a short summary technical/inventory report that would build on and strengthen the current database on First Nations cultural/heritage values, ecological/traditional wildlife values, including travel corridors and resource conflicts, of the 184,794 ha Dasiqox-Taseko wilderness protection proposal in the BC Chilcotin. The study is meant to be an adjunct to the current Friends of Nemaiah Valley (FONV) socio-economic community-based study with the Xeni Gwet'in and Yunesit'in First Nations governments.

A priority of my inventory study was to identify and summarize First Nations cultural/ heritage values that are under threat from logging and mining, and help build the case for their protection. This included some field surveys by Xeni Gwet'in knowledge-keepers and researchers. My compendium also includes identification and an inventory of important focal species for conservation and important "cultural keystone species,"[2,] including a number that are federally or provincially listed as under threat, including but not limited to grizzly bears, grey wolves, wolverines, California bighorn sheep, mule deer, wild Pacific salmon, whitebark pine, and others considered relevant. Resource conflicts with mining and logging interests and tenures were summarized and mapped. A gap analysis was also done to identify areas where further inventory and study will be needed in order to forward and inform and enlighten our understanding of the initiative to protect the area.

[2] The term "cultural keystone species" is defined by Garibaldi and Turner (2004) as "culturally salient species that shape in a major way the cultural identity of a people. Their importance is reflected in the fundamental roles these species play in diet, materials, medicine, and/or spiritual practices."

2.0 STUDY AREA

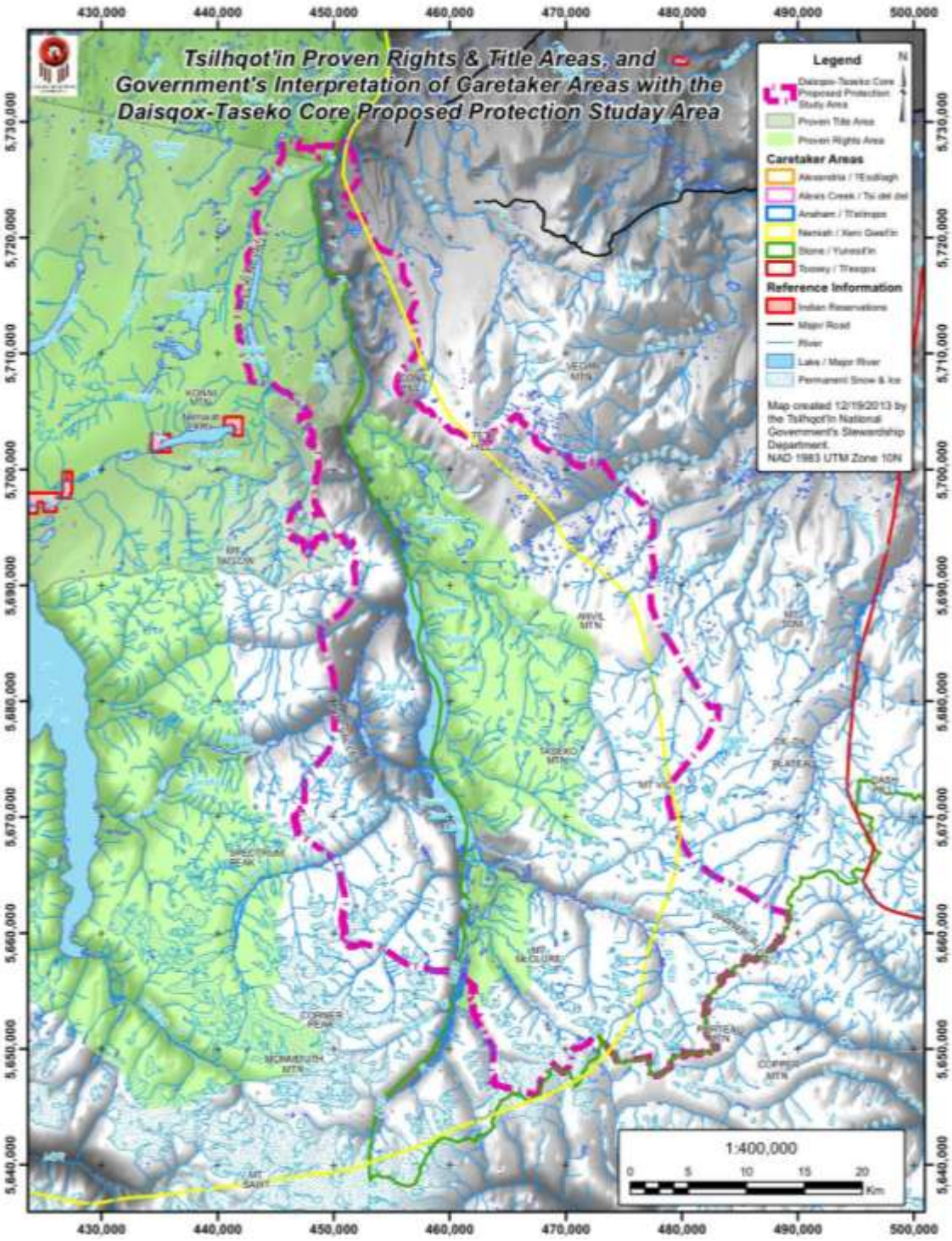
Map 1 (on p. 1) shows the current study area boundaries encompassing some 184,794 hectares (ha) (456,620 acres). The proposal boundary requires further community input from the Xeni Gwet'in and Yunesit'in Nations, and the Tsilhqot'in National Government. The initial boundaries were determined in 2010 with the Xeni Gwet'in Chief and Council and were presented for input at one community meeting at Nemiah.

The study area lies within the Cariboo Regional District of British Columbia in the southern portion of the Central Interior Ecoregion. This Ecoregion covers about 24.6 million 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.

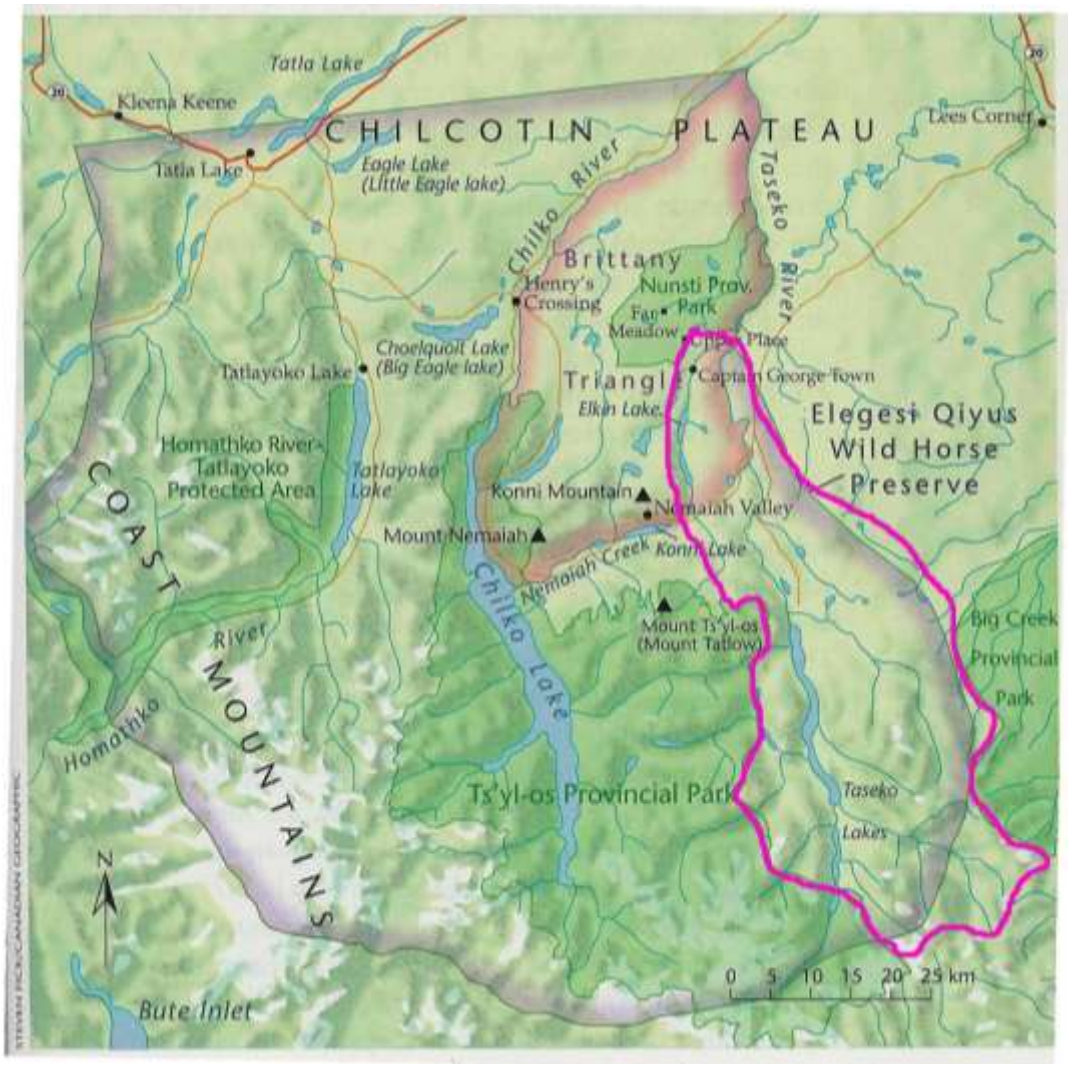
Major population centres in the Cariboo Regional District are Quesnel, Williams Lake, 100 Mile House, and Wells. The district's population in 2006 was estimated at 70,849. Although the main economic driver for the area has been forestry, cattle ranching, mining and tourism also play important roles (Iachetti 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.

Closer to home, the study area (Map 6) falls within the caretaker areas, spiritual homelands and traditional fishing, hunting, and trapping locations of the Xeni Gwet'in (Nemiah) and Yunesit'in (Stone) First Nations (Map 7).



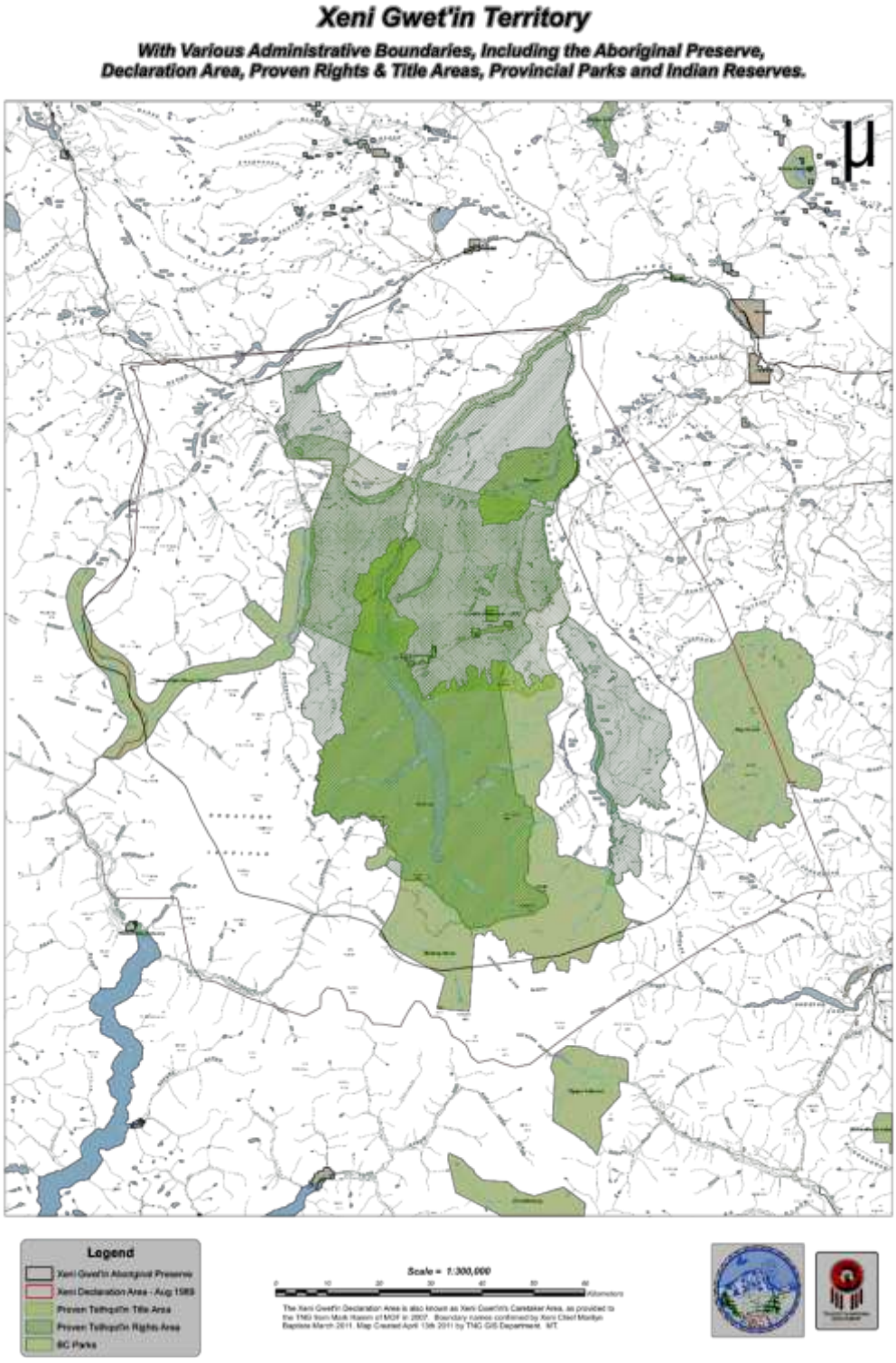
Map 6. Shows the Dasiqox-Taseko protection proposal area (pink dotted line) in relation to the Xeni Gwet'in Caretaker Area (XGCA) (yellow line) and Yunesit'in Caretaker Area (YCA) (green line). Map Courtesy of Tsilhqot'in National Government (TNG).



Map 7. Dasiqox-Taseko protection study area (pink) in relation to the Elegesi Qiyus Wild Horse Preserve (shaded light purple outline).

The Xeni Gwet'in Caretaker Area (XGCA), also known as the Nemiah Aboriginal Preserve/?Elegesi Qayus Wild Horse Preserve, comprises some 777,290 ha that includes the upper watersheds of two major salmon rivers, the Dasiqox-Taseko and the Chilko. The Yunesit'in Caretaker Area (YCA) comprises some 856,667 ha. The YCA overlaps with some of the XGCA and includes not only most of the mid-upper Dasiqox-Taseko watershed, but large areas that have been logged on the Chilcotin Plateau to the north and areas on the west side of Big Creek Park that extend down into the Fraser River grasslands and canyon 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 (Vickers **J**. 2007). Map 8 shows the Xeni Gwet'in rights and title areas recognized by the BC Supreme Court. As noted in greater detail in section 4.5 of this report, on June 26, 2014 the Supreme Court of Canada (SCC) granted the Xeni Gwet'in aboriginal title to the claim area shown on Map 8.



Map 8. Xeni Gwet'in Declaration Area (thin red line) – 1989 showing Proven Tsilhqot'in Title Area (lighter green, cross hatching) and Proven Tsilhqot'in Rights Area (darker green, cross-hatching).

Currently, human development and habitation in the XGCA is very low; much of the area is intact wilderness, except for large clearcut and roaded areas around the periphery. 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. There are several small private land holdings in Gunn Valley and two small commercial tourism lodges, one in Gunn Valley and the other at the outlet of lower Dasiqox-Taseko Lake.

There are a number of primitive access roads built mostly by mining companies, including one to the Pellaire Mine in Falls River. This is the only commercial mine that has been developed so far within the upper Dasiqox-Taseko watershed; although exploration activities have been extensive. Historic and modern mining tenures blanket the study area and mining has become very controversial with Canada's largest open pit gold-copper mine being proposed by Taseko Mines Limited (TML) within the boundaries of the aboriginal/wild horse preserve at Teztan Biny (Fish Lake). As a result of a second Canadian Environmental Assessment Agency (CEAA) panel review in 2013, the Federal Minister of Environment on February 26, 2014, announced the mine at Teztan Biny may not proceed due to significant adverse environmental effects that cannot be mitigated (CEAA 2014).

There are also a number of forestry licences that cover the study area.

3.0 STUDY APPROACH

3.1 USE OF FOCAL SPECIES FOR CONSERVATION COMBINED WITH CULTURAL KEYSTONE SPECIES

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).

Most conservation biology design assessments require large amounts of accurate data, habitat models for focal species, and optimization approaches for conservation assessment (Trombulak 2003). For the scope of this project, we decided to do a more ground-level focal species inventory, including a basic spatially explicit model of grizzly bear travel corridors across the landscape.

I also used a somewhat different conservation biology approach to my landscape ecology evaluation of the Dasiqox-Taseko study area in that, based on over a decade of first-hand background research and inventory in the area with the Xeni Gwet'in, I have come to regard and appreciate that the study area is not just a wilderness area *per se*, but an extraordinary First Nations cultural/heritage landscape with ancient village sites, graves, hundreds of special place names, and trail networks. Thus, part of this report is formatted to reflect this concept. I used not only a loose ecological definition of focal, umbrella, and keystone species as prescribed by Eycott et al. (2007) but, for some of the species profiles, I used "cultural keystone species" as defined by Garibaldi and Turner (2004).

Focal species (Eycott et al. 2007) are simply species of interest or study or that have information available; keystone species are: *species that have an effect on ecosystem function that is disproportionately large compared to their biomass/number*; umbrella species are: *a species that is used to represent some of the needs of some other species.* For example, salmon are a keystone species because they support many other species such as grizzly bears, wolves, insects, and so on.

Cultural keystone species are defined by Garibaldi and Turner (2004) as:

> *…culturally salient species that shape in a major way the cultural identity of a people. Their importance is reflected in the fundamental roles these species play in diet, materials, medicine, and/or spiritual practices.*

Both First Nations researchers on the project, Linda Smith and Alice William, shared invaluable information on this topic as well as provided critical information for the ecological component for some but not all of the species. Although I might not normally have used mule deer and moose as focal species for conservation design, because they rank high with First Nations as a keystone cultural species, they were included in this report as a focal species of interest. For some focal species, such as the grey wolf, there was limited information since there has never been a study of their population numbers and seasonal diet in the Chilcotin, despite their significance as an arch predator. As well, although woodland caribou and elk have been extirpated from the study area, they were found to be so important in the past as keystone cultural species that they were also included due to their value for ecosystem recovery in this region.

The following suite of focal and keystone cultural species included:

- grizzly bear
- grey wolf
- wolverine
- moose
- mule deer
- California bighorn sheep
- mountain goat
- elk
- woodland caribou
- wild Pacific salmon (chinook, coho, sockeye)
- whitebark pine

3.2 METHODS USED TO DETERMINE XENI GWET'IN AND YUNESIT'IN CULTURAL, HERITAGE, & TRADITIONAL USE VALUES BY USING KEYSTONE CULTURAL WILDLIFE SPECIES AND SALMON

This section was not intended to be a comprehensive review of the oral, archaeological, and anthropological documentation of Tsilhqot'in values in the study area, but rather to identify salient First Nations features, such as keystone cultural wildlife species that would be of overall significance to protection of the study area. To gather this information, traditional knowledge-keepers and researchers Alice William (Xeni Gwet'in) and Linda Smith (Yunesit'in) relied on interviews done for other studies, as well as on their extensive traditional knowledge and information found in the published literature. This included First Nations information available in the records of the two CEAA Panel hearings (2010, 2013) on the proposed mine at Teztan Biny (Fish Lake). Oral history and site information was also documented in conjunction with field surveys by Alice William and Norman William in Gunn Valley and at Teztan Biny (Fish Lake). A wealth of traditional-based information from elders and community members provides much of the basic keystone cultural wildlife and other information used throughout this report. Alice William and Linda Smith also provided guidance as to which of their traditional knowledge base could be shared and what was too sensitive for the public domain.

Additionally, as part of the Wilburforce project, I provided Alice and Norman William with support funding to document cultural/heritage sites they had personal knowledge of in Gunn Valley. Their field work was from October 15 -20, 2013. By previous agreement, the field surveys, field notes, and final report done by Alice is owned by Alice and the Xeni Gwet'in, and any information used in my report from these surveys would have to be approved by them. It is still being reviewed.

Due to the short time frame and limited budget of my study, the wealth of Tsilhqot'in cultural/heritage history that was forthcoming overlays the Dasiqox-Taseko like a rich and never-ending human tapestry. We feel that we have barely scratched the surface. For these reasons, I am strongly recommending that further documentation be done by the Xeni Gwet'in and Yunesit'in as a stand-alone report of their values.

3.3 APPROACH FOR CONSERVATION AREA DESIGN ASSESSMENT USING FOCAL SPECIES INVENTORY

A combination of the following was used as the approach for the focal species inventory:

Background literature review, including previous wildlife and salmon reports in the Xeni Gwet'in Caretaker Area, a 2012 federally funded Aboriginal Fund for Species at Risk (AFSAR) study, and others.

Reconnaissance-level field surveys in October 2013, supplemented by field surveys in September 2013 and 2012 in Gunn Valley and Falls Creek. As well, grizzly bear habitat surveys (2010, 2013) relating to my assessments of Taseko Mine's environmental impact studies for their New Prosperity Mine proposal application at Teztan Biny (Fish Lake) were also used.

GIS conservation maps were only done for some species: whitebark pine and grizzly bears. GIS mapping for species was done by GIS analyst Baden Cross using ArcGIS 10.2 and ArcView 3.2a (ESRI 2000). I used the previous grizzly bear suitability map (Craighead and McCrory 2010).

3.4 METHODS USED TO DEVELOP A GRIZZLY BEAR CONNECTIVITY MODEL

Grizzly bear connectivity was modeled using two GIS modeling approaches: cost-distance and circuit theory (Circuitscape). The grizzly bear habitat suitability sublayer from Craighead and McCrory (2010) was provided by Baden Cross of Applied Conservation GIS. Some discussion was had concerning adding whitebark pine to the grizzly bear suitability map because of the high importance of whitebark pinenuts to grizzly bears. However, it was decided to use the earlier version of the suitability map due to time and budget constraints.

The 1-10 habitat values used for the 2010 grizzly bear suitability layer from Craighead and McCrory (2010) were inverted and then rescaled from 1-100 to create a cost (or friction) surface. Rescaling was necessary in order to create an appropriate range of cost weightings for modeling. Parks were used as core habitat patches for the connectivity modeling. Parks with contiguous boundaries (Ts'il?os/Bishop River parks, and Big Creek/South Chilcotin Mountains parks) were consolidated into single source patches resulting in three geographically discreet patches. A cost-distance model was generated using "Linkage Assistant", which is an ArcGIS toolbox developed by the Craighead Institute to facilitate advanced cost-distance wildlife connectivity modeling. "Linkage Assistant" performs the following steps:

1. Generate cost surface for each source patch
2. Generate corridor rasters between all possible pair-wise combinations of source patches
3. Generate combined corridor map by calculating the cell-based minimum for all corridor rasters

The best 10% of values (the threshold rounded to the nearest 5% needed to encompass best linkages between all patch pairs) were extracted from the combined corridor raster to create the final Cost-Distance Connectivity Map (Map 24, p. 131).

The next step involved a circuit theory model that was generated using Circuitscape that applied a pair-wise comparison among source patches of core grizzly bear suitability habitat. The resulting cumulative current density layer was extracted using the same mask described for the cost-distance model and used to create the final Circuitscape Connectivity Map (Map 25, p. 132).

3.5 METHOD USED TO MAP WHITEBARK PINE STANDS IN THE XENI GWET'IN ABORIGINAL/WILD HORSE PRESERVE & THE DASIQOX-TASEKO STUDY AREA

In June 2013, GIS analyst Baden Cross prepared a preliminary map for the Valhalla Wilderness Society of whitebark pine stands, and existing and proposed logged cutblocks within the Xeni Gwet'in aboriginal/wild horse preserve in order to identify the extent of this significant grizzly bear habitat for pinenuts. The data for proposed and existing logging cutblocks was obtained courtesy

of the GIS lab of the Tsilhqot'in National Government. Whitebark pine data was obtained from the BC government Vegetation Resource Inventory (VRI) database . (http://www.data.gov.bc.ca/dbc/catalogue/detail.page?config=dbc&P110=recorduid:173885&recorduid=173885&title=VRI%20%20Forest%20Vegetation%20Composite%20Polygons%20and%20Rank%201%20. Layer updated 2013-01-21).

The whitebark pine map was a coarse-level attempt to identify all VRI polygons that contained whitebark pine, even though there was also some question as to the accuracy of the forest typing of whitebark pine in the VRI database (Randy Moody pers. comm.). The map was considered a starting point for a more detailed mapping identification of whitebark stands. Basically, the first version of the map showed all VRI polygons that contain whitebark pine with the abundance of pine varying in each polygon according to the accompanying VRI data table. Species 1 in the table shows the most plentiful tree species, species 2 the second most, species 3 the third most, and so on for categories 4, 5, and 6. The adjoining column shows the percentage of each species in each polygon. In the June version of the map, we used whitebark pine as a first, second, or third leading species. In November 2013, the map was re-done to show whitebark pine polygons in all categories, although the database had no whitebark pine in category 6. We also prepared a table that showed the amount by area of total polygons that had whitebark pine as the dominant species 1 (which would indicate the purest stands even though there would be other species) and the total amount of area where whitebark is included with other species in varying proportions (categories 2 to 5). In this regard, some researchers consider whitebark stands at lower elevations where they are more mixed with other conifer species as being more important to grizzly bear pinenut feeding than purer stands at higher elevations, as the higher mix of conifer species cones makes for higher red squirrel population levels and thus more whitebark cone middens for grizzly bears to raid.

3.6 APPROACH USED TO ASSESS FOREST HARVESTING LICENCES AND MINERAL TENURES

This was done at a basic level using maps provided by TNG and tenure information available on government websites. Some field surveys were done of mining sites in Falls Creek (Pellaire), Mt. Vic, and the lower Tchaikazan Valley, including photo-documentation of site damage and equipment debris. The information gathered was incidental to my evaluation, at the time, of grizzly bears feeding on whitebark pinenuts.

Literature Cited or Consulted for Sections 1.0, 2.0, And 3.0

BC Commission on Resources and Environment. 1994. Cariboo-Chilcotin Land Use Plan. 237 pp.

Canadian Environmental Assessment Agency (CEAA 2010). The Report of the Federal Review Panel, Dasiqox-Taseko Mines Limited Prosperity Gold-Copper Mine Project.

Canadian Environmental Assessment Agency (CEAA 2013). The Report of the Federal Review Panel, Dasiqox-Taseko Mines Limited Prosperity Gold-Copper Mine Project.

Canadian Environmental Assessment Agency (CEAA). 2014. News Release. New Prosperity Gold-Copper Project – Environmental Assessment Decision. http://www.ceaa-acee.gc.ca/050/document-eng.cfm?document=98459. Accessed February 26, 2014.

Carwardine, J., W.A. Rochester, K.S. Richardson, K.J. Williams, R.L. Pressey, and H.P. Possingham. 2006. Conservation planning with irreplaceability: does the method matter? Biodiversity Conservation DOI10.1007/s10531-006-9055-4.

Carwardine, J., C.J. Klein, K.A. Wilson, R.L. Pressey, and H.P. Possingham. 2008. Hitting the target and missing the point: target-based conservation planning in context. Conservation Letters 2 (2009) 3–10.

Craighead, L., and W.P. McCrory. 2010. A preliminary core conservation review of the dryland grizzly bear of the Chilcotin Ranges in British Columbia. Report to Friends of Nemaiah Valley, Valhalla Wilderness Society, and Xeni Gwet'in First Nation Government.

Garibaldi, A., and N. Turner. 2004. Cultural keystone species: implications for ecological conservation and restoration. Ecology and Society 9(3): 1. [online] URL: http://www.ecologyandsociety.org/vol9/iss3/art1/.

Iachetti 2008. A Decision-Support Framework for Conservation Planning in the Central Interior Ecoregion of British Columbia, Canada. Nature Conservancy of Canada. Unpublished report for Alcoa Foundation Conservation and Sustainability Fellowship and World Conservation Union (IUCN). 113 pp.

McCrory, W. 2002a. Preliminary conservation assessment of the rainshadow wild horse ecosystem, Brittany Triangle, Chilcotin, British Columbia. A review of grizzly and black bears, other wildlife, feral horses and wild salmon. Report to Friends of Nemaiah Valley.

McCrory, 2010. An independent & cumulative effects review of Dasiqox-Taseko Mine's environmental impact assessment documents: Proposed Prosperity Mine at Fish Lake {Terrestrial Wildlife Component]. CEAR reference number 09-05-44811.

Paquet, M.P. 2013. Parks as mechanisms to protect cultural and biological diversity. Land use designations: definitions, descriptions, and legislation. Report to Friends of Nemaiah Valley (FONV). 15 pp.

Snelder, T.H., K.L. Dey, and J R. Leathwick. 2007. A procedure for making optimal selection of input variables for multivariate environmental classifications. Conservation Biology 21:365-375.

Smith, L.R. 2012. Nabas oral literature documentation. A collaboration research study with the Yunesit'in Government (Stone Band) and the Xeni Gwet'in Government (Nemiah Band). Final Report to Terralingua.

Tsilhqot'in Nation *v.* British Columbia, 2007 BCSC 1700.

Trombulak, S.C. 2003. An Integrative Model of Landscape-scale Conservation in the 21st Century in B.A. Minteer and R.E. Manning, editors. Reconstructing Conservation. Island Press, Washington, DC.

Vickers **J** Tsilhqot'in Nation v. British Columbia. No. BCSC 1700 Registry No. 90-0913 British Columbia Supreme Court 2007. Transcripts: Testimony October 21, 2003; Cross-examination Oct. 18, 2004

Vickers, **J**. Tsilhqot'in Nation v. British Columbia [2007] BCSC 1700. http://www.courts.gov.bc.ca/jdb-txt/sc/07/17/2007bcsc1700.pdf. Accessed 13 March 2014.

4.0 RESULTS AND DISCUSSION

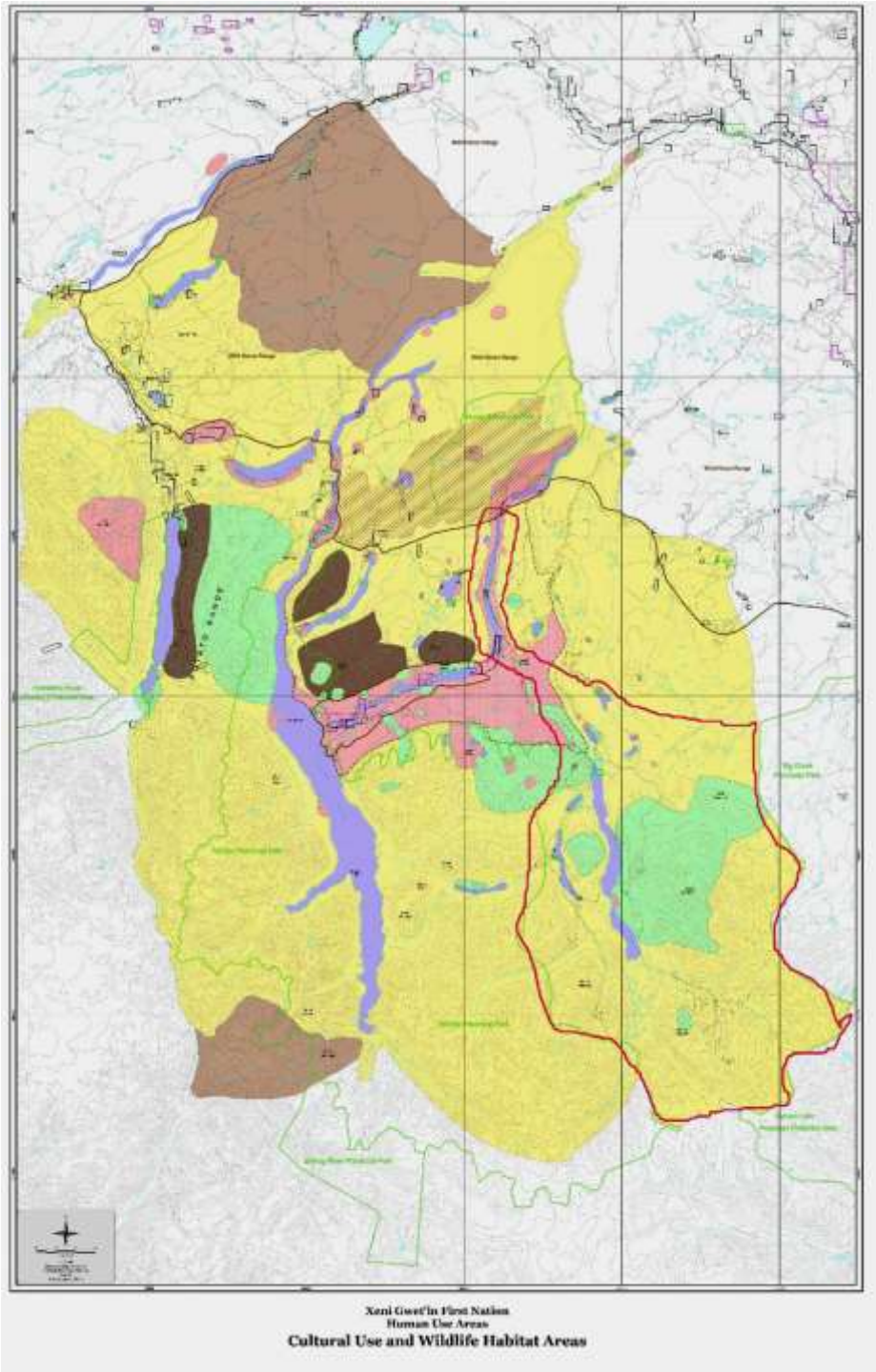
4.1 PRELIMINARY XENI GWET'IN AND YUNESIT'IN CULTURAL, HERITAGE, AND TRADITIONAL USE VALUES

All evidence gathered herein indicates that the Dasiqox-Taseko study area is an extremely rich First Nation cultural/heritage landscape (Map 9). This includes legends and stories passed down through centuries of oral tradition, such as the Tsilhqot'in origin story, *The Woman and the Dog (Lhindesch'oysh)* (Linda Smith pers. comm.); knowledge of people buried or cremated out in the Dasiqox-Taseko and the life stories of those people; ancient ways; and medicinal and food plant gathering areas for surviving off the land; gravesite areas, where wars were fought in hand-to-hand combat; sites of winter villages, where First Peoples used underground lodge technology (kekule pithouses) and the heat of the earth to survive the cold Arctic-like winters; and intimate knowledge of animal, plant, and fish-gathering sites that went by the seasons and the swing of the moon and the Earth's turn around the sun. I am, therefore, recommending that a much more comprehensive documentation be done.

To be noted is that often these First Peoples left little behind to mark their passage through the landscape. According to Linda Smith (2012):

> *Tsilhqot'in ancestors have handed down numerous laws, protocols, restrictions, and rules based on the need to preserve, sustain, and show respect for all species, resources, and the lands. One ancient Tsilhqot'in philosophy is to leave no footprint. Tsilhqot'in ancestors have left few clues and tools, yet, have successfully manoeuvred themselves through major climatic periods, shifting geographies, unpredictable food resources, catastrophes, and have maintained their ways of life to this day despite steady colonizing efforts.*

The following are a few brief comments on Tsilhqot'in cultural, heritage, and traditional use values within the proposal study area. Traditional knowledge-keepers and researchers Alice William (Xeni Gwet'in) and Linda Smith (Yunesit'in) provided much of the basic information that is embedded throughout this report in the different species descriptions.



Map 9. Cultural use and wildlife habitat areas map by Silva Forest Foundation for Xeni Gwet'in showing traditional plant gathering areas (light green), traditional fishing areas (blue-purple) and traditional trapping and hunting areas (yellow) in the Dasiqox-Taseko study area (outlined in red). The small amount of cultural area (pink) for the upper Dasiqox-Taseko reflects a lack of inventory rather than a lack of cultural sites.

According to Benson and Mathews (2013) there has been little archaeological research done in the Chilcotin Plateau, in contrast to other areas of British Columbia. Although there have been several archaeological impact assessments and inventories done in Tsilhqot'in territory, there have been only a few in-depth archaeological studies and research projects in the Dasiqox-Taseko. The controversial proposed open pit gold-copper mine at Teztan Biny (Fish Lake) and associated 2010-2013 CEAA Panel hearings precipitated much more detailed archaeological/anthropological research than had previously taken place in the area, as well as an unprecedented outpouring of traditional knowledge. Recent archaeological studies at Fish Lake (Teztan Biny) have revealed that First Nation occupation goes back at least 5,000 years (David Williams, pers. comm.). According to Yip and Choquette (1995), a large pithouse village in the Dasiqox-Taseko Lakes locality was dated between 2,000-1,000 years before present (Magne 1985, in Busy and Alexander 1993:90). The authors note that Magne suggested the occupation came to an end because of failure of the salmon runs. According to Alice William (pers. comm.), this village was possibly Tsilhqot'in or taken over by another group; or possibly the people moved south to warmer climates. She knows a few elders who have knowledge of Tsilhqot'ins living in and around the Nicola Valley and Merritt area.

Figure 11. Cultural pithouse/kekule depression is all that remains of an ancient underground lodge at a village site in Gunn Valley. (Photo from Smith and Holmes 2010).

Today, the whole area is still an important traditional food gathering and cultural/heritage area for the Xeni Gwet'in and Yunesit'in, as well as for their wilderness tourism programs and sacred/spiritual pursuits. As noted by Benson and Mathews (2013):

> *It is evident that Nabas and Teztan Biny area is a significant, highly utilized cultural landscape that the Tsilhqot'in Elders have a strong connection to and that they continue to utilize in a variety of ways. The burial sites at Nabas and Teztan Biny have spiritual significance to the Tsilhqot'in people. It was evident during our field visit that there are many undocumented burials that are important to the Tsilhqot'in Elders and knowledge-holders. In addition to the burial locations, burial features, and spiritual sites that the Elders showed us during this field visit, they also pointed out other important aspects of the locations that we visited. They showed us foot, horse, wagon, and sleigh trails; trapping sites; campsites; and family hayfields and corrals. They pointed out the locations of fishing sites, places to get fresh water, and the locations of berries, mushrooms and medicinal plants…The Elders learned these places from their parents and grandparents. They remember knowledge that their parents and grandparents shared with them about these locations…*

The Dasiqox-Taseko has also always been a historic travel route and crossroads between the First Nations to the north and the south. According to evidence in Roger William v British Columbia (Vickers 2007, pp. 119-120), Dr. Brealey confirmed from the historical record that the Tsilhqot'in trail network through Tl'echid Gunaz (Long Valley) and Yuhitah (Yohetta Valley) was of pre-contact origin. In addition, Dr. Brealey noted that the Euro-Canadian record of Tsilhqot'in trails is far from exhaustive, and stated: *there would have been countless subsidiary trails, routes, creeks or portages that would have been used by Tsilhqot'ins…*

This initial study barely scratches the surface of these rich cultural/heritage values. This report is not the place to do a comprehensive inventory review. I am recommending much more comprehensive documentation be done.

Literature Cited or Consulted for the First Nations Cultural/Heritage Section

Benson, E., and D. Mathews. 2013. The identification of ancestral Tsilhqot'in graves within the vicinity of the proposed New Prosperity mine: *Nabas and Teztan Biny,* July 4-5, 2013. Confidential report to Tsilhqo'tin National Government (TNG).

Ehrhart-English, C.L. 1994. The heritage significance of the Fish Lake study area: Ethnography. Report prepared for Dasiqox-Taseko Mines Ltd.

Smith, G., and R. Holmes. 2010. The Xeni Gwet'in Caretaker Area Fisheries Enhancement Projects. Report prepared for Xeni Gwet'in First Nations Government by Cariboo Envirotech Ltd. Likely, BC.

Smith, L.R. 2012. Nabas oral literature documentation. A collaboration research study with the Yunesit'in Government (Stone Band) and the Xeni Gwet'in Government (Nemiah Band). Final Report to Terralingua.

Vickers, J. Tsilhqot'in Nation v. British Columbia [2007] BCSC 1700. http://www.courts.gov.bc.ca/jdb-txt/sc/07/17/2007bcsc1700.pdf. Accessed 13 March 2014.

William, A., and N. William. 2013. Tsilhqot'in cultural survey. Gunn Valley. Preliminary reconnaissance survey for Xeni Gwet'in First Nation. Supported by Wilburforce Foundation.

Yip, A., and W. Choquette. 1995. Tsilhqot'in Traditional Territory: A cultural heritage overview study. 2 volumes. Prepared for Tsilhqot'in National Government, Williams Lake, BC.

4.2 INVENTORY OF FOCAL SPECIES AND KEYSTONE CULTURAL SPECIES FOR CONSERVATION AREA DESIGN

> *Grizzly bears, wolverines, wolves, cougars, and other large carnivores are the essence of wild landscapes...They are one of the defining elements in the landscape, adding mystery and fascination and, with regard to bears, wolves and cougars, an element of challenge. For conservation-oriented scientists and land use planners, large carnivores help to define ecological integrity and the challenge of maintaining complex natural systems*.
> -- Dr. Stephen Herrero in "A Sense of Place: Issues, attitudes and resources in the Yellowstone to Yukon Ecoregion" (Harvey et al. 1998).

4.2.1 Grizzly Bear: *Nunitsiny*

This Dasiqox-Taseko inventory/conservation study was an outgrowth of two carnivore conservation studies that included the South Chilcotin grizzly bear. A carnivore conservation model using eight carnivore species for North America identified the Cariboo-Chilcotin as having some of the best remaining habitat in North America for large carnivores, 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, grey 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. This included part of our Dasiqox-Taseko study area. The other large area involved the northern fringes of the region surrounding Kluskoil Lake Park and the large Blackwater River area.

Another study was a broad-brush conservation overview using grizzly bears as a focal and umbrella species for the 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) (Craighead and McCrory 2010). This study found that this area was comparable to the Greater Yellowstone Grizzly Bear Ecosystem in size and was serving as a large core refugia for grizzly bears, despite the face that part of the grizzly bear population is considered threatened. The study recommended that if more habitat was protected for grizzly bears in the West Chilcotin, many other species would benefit.

As well, over the past three years, considerable attention had to be given the potential impacts to the grizzly bears in the region of the proposed Taseko Mines Ltd. (TML) open pit mine at Teztan Biny (Fish Lake). This included some habitat and grizzly bear use research at Teztan Biny (Fish Lake) that culminated in two impact statement reports that were presented to the first and second CEAA hearings on the mine (McCrory 2010, McCrory 2013).

4.2.1.1 The Chilcotin “dryland” grizzly bear as a conservation indicator

The Chilcotin grizzly bear is often referred to as a “dryland” grizzly bear in reference to it surviving in association with a dry Interior climate and an ecosystem with grasslands. It is somewhat unique in the western Coastal Mountains as this grizzly not only feeds on salmon, but also on whitebark pinenuts and digs for wild potatoes and bear-claw.

Grizzly bears in the Dasiqox-Taseko study area represent a core mountain/foothills population bordered on the east by a wide Interior provincial zone of extirpation. Given that the grizzly bears would have large home ranges, it is likely that ranching and clearcut logging/heavily roaded areas to the north and east of study area represent “population sink” areas for the Dasiqox-Taseko core grizzlies. In these areas, the risk of mortality increases as the grizzly bears wander further into the more intensively developed landscapes outside of the core Dasiqox-Taseko stronghold.

The grizzly bear was selected as a focal species because it is commonly regarded as a good indicator of ecosystem health and well-being. It is also a good keystone and umbrella species. Paquet (pers. comm.) analyzed niche overlap for 410 terrestrial vertebrates in the central Canadian Rockies and found that by protecting habitat needs of the grizzly bear, a high number additional species (98% of those found in the ecosystem) would also be protected, such as the Canada Lynx and the grey wolf. This means that if effective protective measures and good management are undertaken for this one bear species, many other wildlife populations in the same area should automatically be taken care of; although today climate change is producing considerable uncertainty.

An important conservation context is that the grizzly bear is one of North America’s slowest reproducing mammals. Knight and Ebert (1985) note that when dealing with a small population of long-lived animals with a low reproductive rate, the population dynamics can be influenced by perturbations of the age and sex structure. The ability of female grizzly bears to contribute to a bear population is limited by late sexual maturity (usually 5+ years), low survivability of the young (up to 50% mortality in the first year for cubs in some instances), and a 3-5 year non-breeding interval while the female is raising her young. Female grizzlies also peak in behavioural and reproductive maturity at 9 to 12 years (Craighead et al. 1995a). Should a female grizzly bear live long enough (at least 15-20 years), she will be lucky to contribute four adult offspring to the population. There is also some evidence that reproductive participation by male grizzlies is restricted to large and mature males (Craighead et al. 1995a). In the Arctic, reproduction by males may be confined to individuals nine or more years of age (Craighead et al. 1995b), although this may or may not apply to the BC coast.

This very slow reproductive cycle has made the species highly vulnerable to population declines leading to extirpation and then extinction. As well, where remnant subpopulations still survive in small numbers, recovery may take many decades and require drastic changes to existing land use practices and control of man-induced mortality if recovery, and not extirpation, is to happen at all. I will return to this aspect later in the report.

The cornerstones of grizzly bear recovery management are mortality reduction and improved quality and security of habitats. In some cases, grizzly bear populations may become so small

and fragmented that augmentation (bringing in bears from other areas with healthy numbers) may be necessary to speed up the recovery process and also to overcome the risk of genetic in-breeding caused by fragmentation and isolation from other subpopulations. This was proposed in the North Cascades grizzly bear recovery plan for the areas south of Dasiqox-Taseko near the US border (North Cascades Grizzly Bear Recovery Team, 2004) until the provincial government cancelled the entire recovery plan.

The fraction of grizzly bears that do breed constitute what is known as the genetically effective population size (Horejsi 1999). The effective population size is estimated to be between 24-32% of the total number of bears in a population, although it may be lower where numbers are significantly reduced (Harris and Allendorf 1989), such as in the South Chilcotin Ranges. For example, for the subpopulation of 36 grizzly bears (based on the Apps *et al*. 2009 study) shown to inhabit the middle to upper Dasiqox-Taseko, the effective population size would only be 9-12 individuals. Small isolated populations with fewer than 100 animals are considered at serious conservation risk (IUCN 2003).

4.2.1.2 The Chilcotin "Dryland" grizzly bear as a keystone cultural species for First Nations

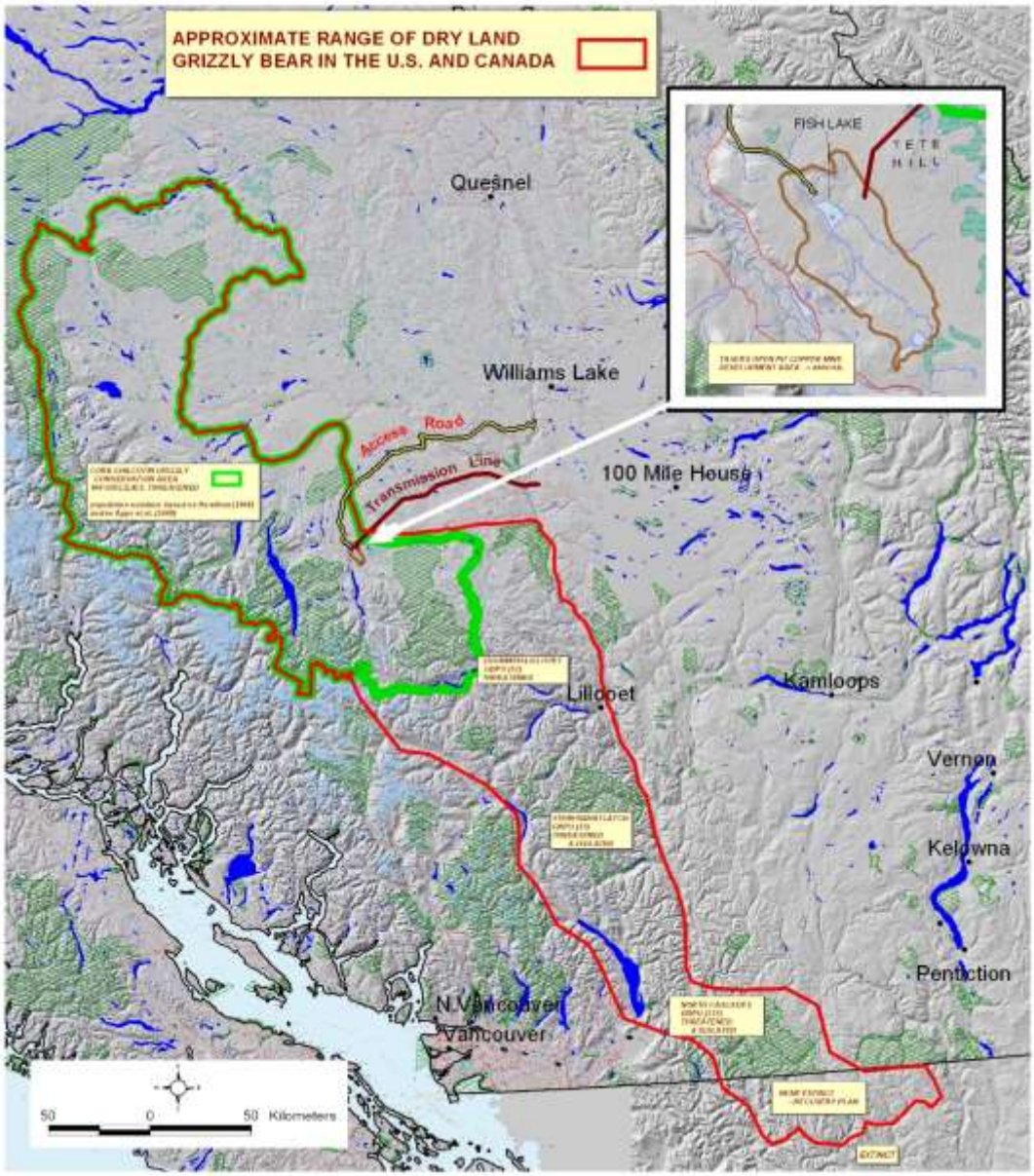
Today, many Tsilhqot'in treat the grizzly bear with respect. To some, it is feared less than the Chilcotin black bear and is regarded as less dangerous if crossed (Harry Setah, pers. comm. to W. McCrory, 2005). According to Alice William:

> *Our elders taught us to respect nunitsiny, the grizzly bear, including not saying anything bad about them as they can hear. Also, as children, we were taught by our mom and dad not to let children scream around camp as this would attract grizzly bears.*

4.2.1.3 International significance

International recognition of the vulnerability of British Columbia's grizzly bear population includes a European Union (EU) ban on the importation of any trophy grizzly bear parts into EU member countries.

The South Chilcotin grizzly bear is also internationally important for the following reasons. The dryland grizzly ecotype inhabits drier grassland habitats than its cousins in the adjacent coastal rainforests just to the west across the high mountains. This grassland grizzly ecotype is now totally extirpated from a vast area of the Cariboo Region to the east, is extinct along the lee of the coastal mountains in the continental US, with perhaps a few animals near the Canadian border, and is down to an estimated 23 animals in the BC North Cascades GBPU. Just to the north of this GBPU, Apps et al. (2009) used more precise methods to estimate that the Stein-Nahatlatch GBPU was down to an isolated 23 individuals, rather than the 61 grizzlies estimated by Austin et al. (2004). We would guess that perhaps half of the roughly 52 grizzlies estimated by Apps et al. (2009) to be remaining in the Squamish-Lillooet GBPU would occur in the dryland eastern portion.



Map 10. 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. The proposed New Prosperity Mine at Teztan Biny (Fish Lake) shown in the insert box was recently turned down by the federal government and likely no longer poses a significant adverse effect on grizzly bears in the study area.

From a continental perspective, a recent conservation review (Craighead and McCrory 2010) concluded 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 Coast Mountain Ranges and Cascade Mountains (Map10). The larger West Chilcotin grizzly bear conservation study area identified by Craighead and McCrory (2010) included a small portion of the Klinaklini-Homathko GBPU, the Blackwater-West Chilcotin GBPU, and about half of the South

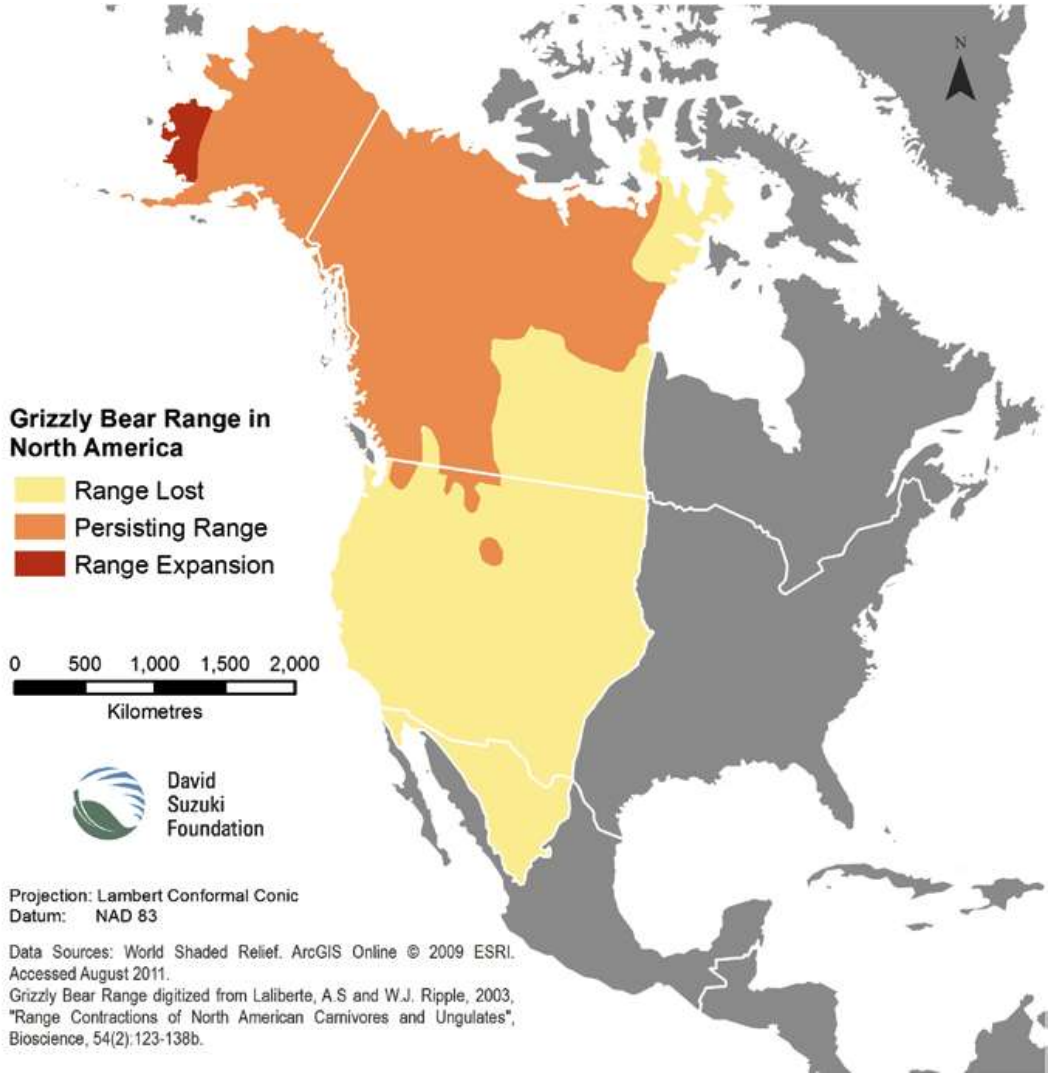
Chilcotin Ranges GBPU. The 250 grizzly bears estimated in this region would be internationally significant since no other place along the whole western mountain chain of North America has such a large population of this ecotype. Despite historic declines of the South Chilcotin grizzly population, the conservation study by Craighead and McCrory (2010) showed that an area of viable grizzly habitat larger than the Greater Yellowstone Grizzly Bear Population Conservation Area (GYPCA) still exists along the east side of the Coast Ranges, their foothills, and partially onto the Chilcotin Plateau, ranging from the head of the Dasiqox-Taseko River northwest to Tweedsmuir Provincial Park.

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, but contains a high proportion (92%) of protected and roadless habitat that allows bears to stay alive in core security habitats. The Craighead and McCrory (2010) study found that some 46% of the greater Chilcotin grizzly bear conservation area was already protected through a network of provincial parks and the Xeni Gwet'in aboriginal/wild horse preserve declaration. Much of the Chilcotin grizzly area was also found to have moderate value grizzly bear habitat. The current protection is higher than most other grizzly bear regions of the province, but the study recommended that more core areas need to be protected. This was 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). The panel concluded that some 68% of the habitat base must be protected, a higher percentage than previously expected. The Craighead-McCrory study also recommended that the province implement their planned grizzly bear recovery plan for the area.

4.2.1.4 Federal: Committee on the Status of Endangered Wildlife in Canada (COSEWIC)

COSEWIC lists the grizzly bear as a "Species of Concern." In 2002, COSEWIC warned that

> *The genetic and geographic continuity that currently prevents their identification as distinct population units is at risk... Preventing the slow northward migration of this line depends on active steps to conserve these insular and peninsular populations.*

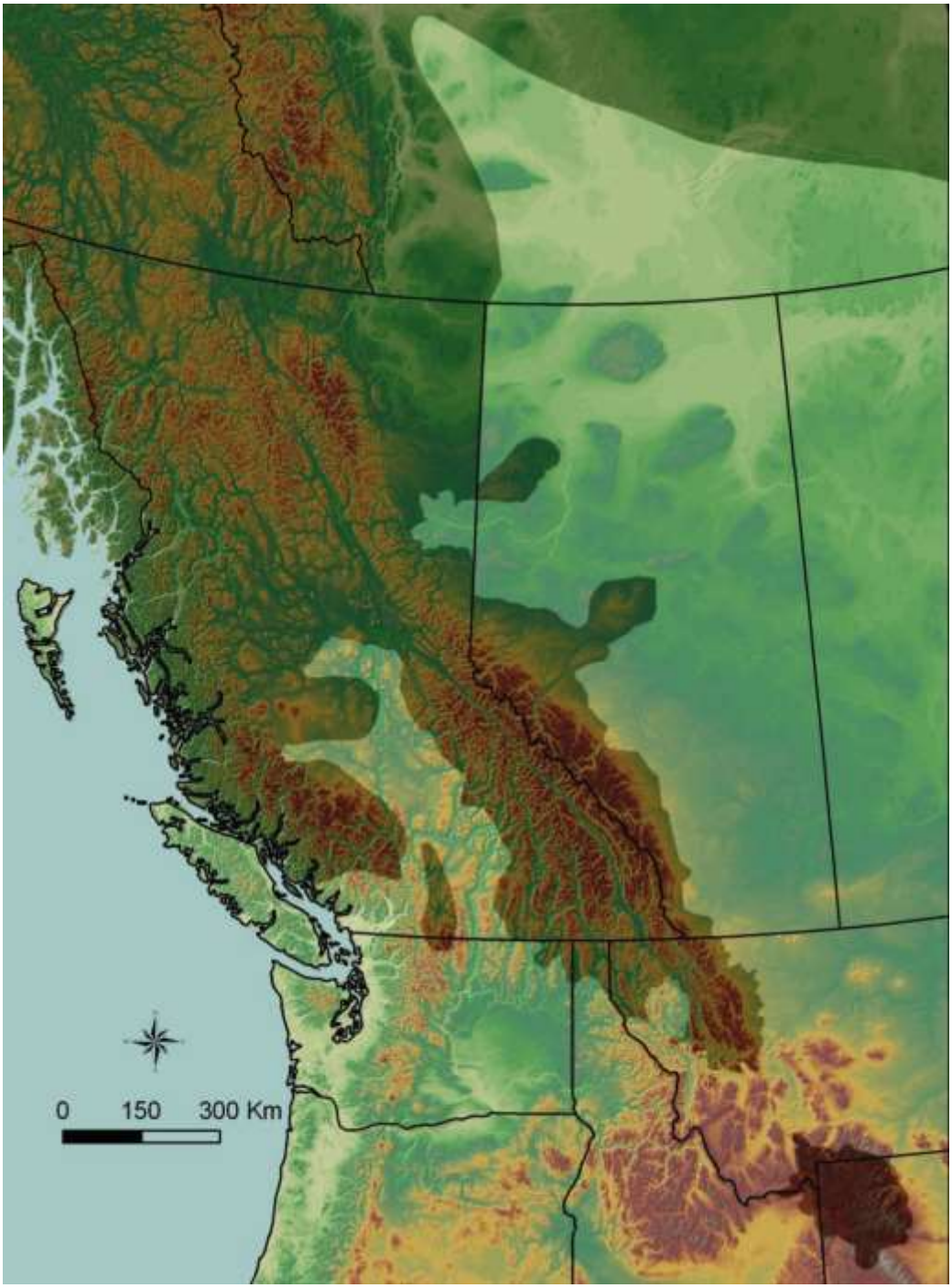


Map 11. Current and historic range of the grizzly bear in North America. The Chilcotin dryland grizzly bear is near the south west corner of current distribution, near the extinction zone (yellow). (David Suzuki Foundation)

A 1990 review of the status of grizzly bears in Canada revealed that they were extinct in 24% of their former range; that of the remaining grizzly bear habitat, 63% is designated as vulnerable or threatened (MELP 1995a). Grizzly bear range and distribution in North America continues to shrink (Map 11, Map 12.)

When COSEWIC reassessed their status in 2012, these concerns were again emphasized:

> *A number of populations in the southern extent of its range in Alberta and southern BC are known to be declining, and their poor condition in some parts of the range, combined with their naturally low reproductive rates and increasing pressures of resource extraction and cumulative impacts in currently intact parts of the range, heighten concern for this species if such pressures are not successfully reversed.*



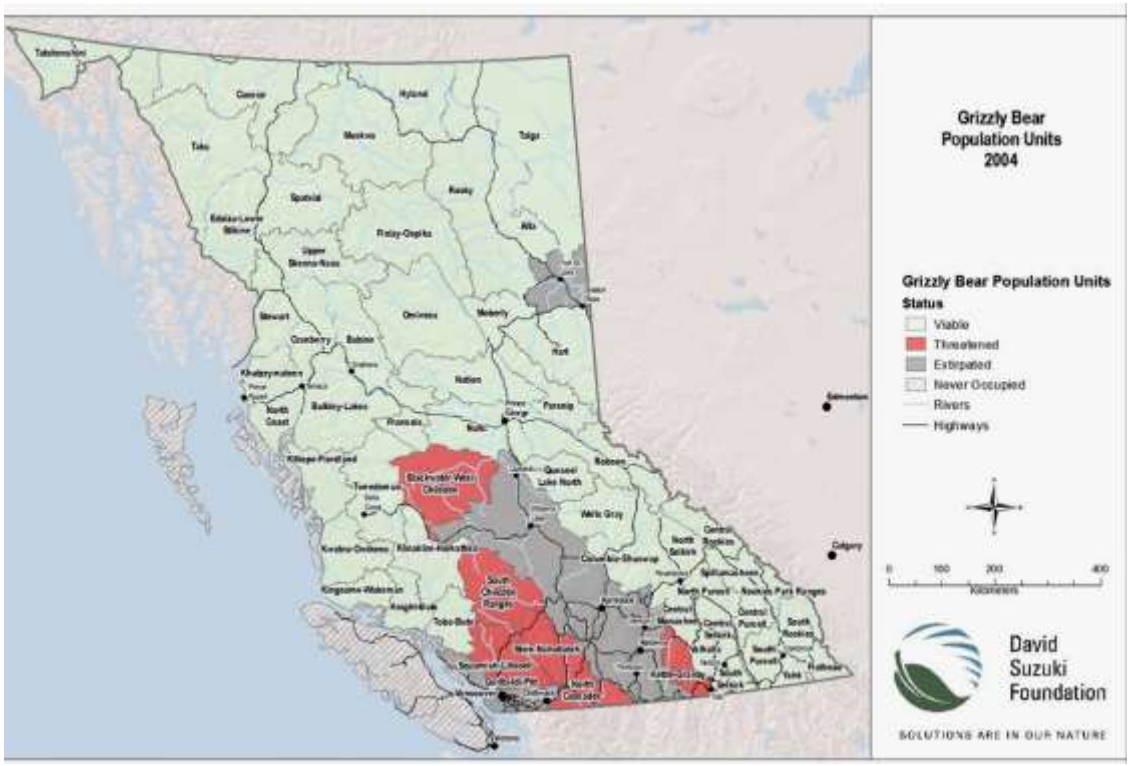
Map 12. Shaded area is the current distribution of grizzly bears in North America (Proctor et al. 2012). Again the South Chilcotin grizzly bears are near the central grassland zone in BC where grizzly bears no longer survive. British Columbia is one of the last bastions for grizzly bears in Canada and has the most diverse ecotypes ranging from the wet BC mainland coast, the dry interior, the interior wetbelt and northern suboreal.

However, the federal government has so far failed to legally list the grizzly's "Special Concern" status under the Species-at-Risk Act, as recommended by COSEWIC. Gailus (2012)

recommends that in the absence of provincial actions to protect BC's threatened grizzly bear subpopulations, the federal government should list the small and increasingly isolated grizzly subpopulations in southern BC under the safety net provision of the federal Species-at-Risk Act. By doing so, he felt this would provide the impetus for both federal and provincial governments to work together on recovery plans to ensure that all of Canada's grizzly bears remain a fundamental part of our natural and cultural heritage.

4.2.1.5 Provincial: threatened but no recovery plans

BC has 56 Grizzly bear population units (GBPU) (Map 13). Populations in nine of the 56 GBPUs are considered "threatened." All 250 grizzly bears estimated in this Chilcotin dryland grizzly conservation area identified by the Craighead-McCrory report (2010) are under threatened status provincially.



Map 13. Grizzly Bear Population Units (GBPUs) and conservation status. The Dasiqox-Taseko study area lies in middle the South Chilcotin Ranges GBPU, which is provincially threatened (pink-orange). (Map from David Suzuki Foundation)

Within this area, the total size of the South Chilcotin Ranges GBPU is 1,620,065 ha (16,201 km^2), with an estimated 15,220 km^2 of usable habitat (or 95% of the total area). In 2003, some 23% of the GBPU had a road density >0.6 km of roads/km^2. (http://www.env.gov.bc.ca/soe/indicators/plants-and-animals/grizzly-bears.html?WT.ac=LU_Grizzly-status). Despite the recently revised BC Wildlife Branch population estimate that doubled the number of hypothetical grizzlies in the South Chilcotin Ranges GBPU, the South Chilcotin grizzly bear is still listed provincially as

"threatened" (Tony Hamilton pers. comm.). The provincial conservation status of "threatened" means the population estimate is <50% of carrying capacity.

A goal of the 1995 British Columbia Grizzly Bear Conservation Strategy (GBCS) was to recover the threatened subpopulations to viable status. None of this has happened over the past 18 years. The province has yet to implement a recommended grizzly bear recovery plan for all of the threatened GBPUs in the South Coast Mountains except for one for the North Cascades GBPU, which in 2003, unfortunately, was cancelled by the Ministry due to controversy over a plan for population augmentation. Nor has British Columbia enacted standalone provincial endangered species legislation so that threatened grizzly bear subpopulations can be legally protected and recovered.

The southern portion of the South Chilcotin Ranges GBPU, south of the Dasiqox-Taseko lies within the Upper Lillooet area and was included in the province's 2008 Sea-to-Sky Land and Resource Management Plan (LRMP). The final plan directed that the province complete a recovery plan/strategy for all four threatened GBPUs (Squamish-Lillooet, Garibaldi-Pitt, South Chilcotin Ranges, Stein-Nahatlatch) (BCFLNRO 2008, p 77). Despite this having provincial cabinet-level and First Nations endorsement, five years later, recovery planning for grizzly bears has yet to be implemented (C. Ruddy et al. 2012 letter to BC government). As for the South Chilcotin Ranges GBPU, the province recently indicated in a letter to the federal CEAA Panel on the proposed New Prosperity Mine that it had no commitment to implement a grizzly bear recovery plan for the South Chilcotin Ranges GBPU (CEAA Panel, June 14, 2013, Reference 103165).

This failure of both the Canadian federal government and BC provincial government to implement adequate legislation and recovery plans for BC's dwindling grizzly bear populations means the South Chilcotin GBPU remains in a precarious and tenuous position and is extremely vulnerable to any further human-induced impacts, including increased mortality. This is all the more reason to protect as much intact grizzly bear habitat as possible while it is still undeveloped.

As noted elsewhere, the Dasiqox-Taseko study area has a core grizzly bear subpopulation and productive habitat landscape that would serve as an excellent source population for recovery of bears throughout the South Chilcotin Ranges GBPU, as well as more endangered populations to the south. Experiences in Sweden and the contiguous United States indicate that human-caused grizzly bear mortality can be reduced sufficiently to allow grizzly bear populations to recover. Threatened grizzly bear populations in the US have increased substantially in the Yellowstone and Northern Continental Divide areas following implementation of strong recovery plans (Lance Craighead pers. comm.).

According to a recent comparative review of grizzly bear recovery in the US and Canada, Gailus (2012) notes that:

> *In the US, tens of thousands of square kilometres of habitat were protected from further industrial development, thousands of kilometres of roads were closed or decommissioned, and government agencies worked with hunters, ranchers, landowners and Native American tribes to reduce conflicts with grizzly bears and reverse the trend of*

unsustainable rates of grizzly mortality. Although many critics suggest that grizzly bear recovery in the United States has been too slow and is incomplete, there is little doubt that progress has been made. Grizzly bear populations in Yellowstone and the Northern Continental Divide ecosystems have tripled over the last 30 years, there is significant public support and tolerance for grizzly bears in these areas, and efforts to improve habitat conditions and population size in the Cabinet-Yaak, Selkirk and North Cascade population units are beginning to intensify. Meanwhile, in Canada, the evidence suggests that things are not improving – and, in some cases, are getting worse rather than better – for the small, fragmented and highly threatened subpopulations in western Alberta and southern BC. There are numerous reasons for the lack of progress on the Canadian side of the border, including lack of political will, but perhaps the most significant one is the absence of strong legislation to protect species at risk in Alberta and British Columbia. Neither Alberta nor British Columbia have endangered species legislation, and the federal Species at Risk Act has proven to be ineffective at protecting many threatened or endangered species even on federal lands. A recent report from Ecojustice, which evaluated the effectiveness of Canada's endangered species legislation, gave the federal government a grade of C-, largely because it routinely fails to follow its own law. Both Alberta and BC received an F. The federal government also refuses to use the Species at Risk Act's safety net provision to protect species at risk (and the habitat on which they depend) on provincial lands when provincial governments refuse to do so. The foundation of success in the United States is the federal Endangered Species Act.

4.2.1.6 Dasiqox-Taseko grizzly bears are an ancestral grizzly bear landscape as revealed by a genetic analysis of South Coast Mountains grizzly bears (Apps et al. 2009)

A recent hair-snagging and DNA study (Apps *et al*. 2009) of grizzly bear abundance, distribution, connectivity, and conservation across the Southern Coast Mountains of British Columbia, which included some sampling from the Dasiqox-Taseko-Chilko and South Chilcotin Ranges areas, found 272 individual grizzly bears in nine genetically discrete population clusters. The South Coast Ranges study area has four of the eight threatened GBPUs identified in the province.

The study concluded that:

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 movement and survival. One such discrete cluster is in the South Chilcotin Ranges.

Additionally, the study concluded that the Dasiqox-Taseko-Chilko group might originate from a relatively small and isolated ancestral population between Dasiqox-Taseko and Chilko lakes (p.57).

For regional population recovery and conservation, the DNA study results and spatial outputs suggested focusing efforts to re-establish and maintain population core, peripheral, and linkage landscapes. In particular, the Apps et al. (2009) study demonstrated the importance of secure source areas to population recovery, and expansion to peripheral but connected landscapes.

In my opinion, grizzly bears in the mid-upper Dasiqox-Taseko would help serve as a major source population for recovery of the smaller and endangered grizzly groupings in the south that are on the verge of winking out, provided that the core habitat for the Upper Dasiqox-Taseko core population is maintained at its current roadless status, including without further mining and logging incursions. The now-rejected New Prosperity Mine proposal posed a serious threat to this recovery possibility (McCrory 2013).

4.2.1.7 Grizzly bear population estimate for the South Chilcotin Ranges GBPU and Dasiqox-Taseko study area

In summary, several approaches were used to estimate grizzly bear numbers in the study area. The more reliable approach was derived from an intensive DNA grid study by the Ministry that showed 36 grizzly bears present in the mid-upper Dasiqox-Taseko watershed in the spring of 2007. These numbers were considered significant in that they represent a core population in the South Chilcotin GBPU reflective of generally high quality habitat and large unroaded security areas found in the study area. Field surveys suggested that grizzly bear numbers are considerably lower at the north end of the study area.

According to the province's 2012 grizzly bear status report, the South Chilcotin Ranges GBPU has an estimated population of 203 grizzly bears, based on inventory data. The estimated population density is 13 grizzly bears/1000 km^2. The Wildlife Branch recently doubled their population estimate for the GBPU from the 104 bears previously estimated by Hamilton (2008). The Ministry claimed that this increase did not reflect an increase in actual numbers but used new and more detailed inventory information to estimate population size. According to provincial biologist Tony Hamilton (email June 26, 2013), the rationale for increasing the population estimate for this GBPU was the application of densities from the most recent DNA projects in the Wildlife Management Unit.

I used two approaches to estimate grizzly bear numbers for the Dasiqox-Taseko study area (184,794 ha/1,848 km^2). Using the Wildlife Branch's latest density estimate of 13 grizzlies/1000 km^2, the study area would have about 24 grizzly bears. This estimate was not considered reliable in light of the 36 grizzly bears confirmed by DNA studies to inhabit the mid-upper Dasiqox-Taseko, as explained below.

The more reliable second approach was to determine the number of grizzly bears detected on the grid Map (Figure A-12) by the Apps et al. (2009) DNA study that covered the mid-upper Dasiqox-Taseko area (Map 14, p. 48). The DNA study showed that a total of 36 grizzly bears were detected in this area between June 7 and July 20, 2007 (Table 1). This means that in the six-week period of late spring and early summer of 2007, there were 19 females, 14 males, and 3 grizzly bears with unidentified gender using the mid-upper Dasiqox-Taseko watershed. I considered the presence of this many grizzly bears in the spring significant and reflective of the high quality nearly roadless core habitat in the mid-upper Dasiqox-Taseko, including numerous wetlands, productive subalpine meadows, and an abundance of spawning rainbow trout at Teztan Biny (Fish Lake).

The 36 individual grizzlies found in 2007 in the mid-upper Dasiqox-Taseko is also significant when considered in a regional context. Although a small sample area of the total South Chilcotin Ranges GBPU, the 36 grizzly bears represent over 1/3 of the previous population estimate for 100 bears for the GBPU, and 1/6 of the revised estimate of 203 grizzlies. This number also represents 7.5% of the entire South Coast Mountains DNA study area of 40,000 km^2.

Remote cameras and field surveys over the past ten years in the Brittany Triangle suggest a lower density of grizzly bears at the north end of the Dasiqox-Taseko study area that borders this large wild horse plateau habitat (see Figure 12 on following page).

4.2.1.8 Grizzly bear habitat values: moderate to high in the Dasiqox-Taseko study area

Habitat values in the study area are discussed in greater detail in my two studies of the potential impacts of the proposed Taseko Mining company's open pit mine at Teztan Biny (Fish Lake) (McCrory 2010, 2013). In particular, large areas of wetlands and rainbow trout spawning habitat in the proposed mine development area (MDA) were identified as regionally significant to grizzly bears.

The overall assessment of grizzly bear habitat suitability for the Dasiqox-Taseko study area (Craighead and McCrory 2010) indicated that it is generally of moderate value, with riparian areas of high value habitat. This was based on a habitat map model that was only partially ground-truthed (Map 15). Salmon values were included in the ranking of habitat values for the riparian areas. In 2012 and 2013, additional field surveys and mapping showed that the study area has large mountain areas where whitebark pine stands and their annual production of nutritious pinenuts are of high value to grizzly bears (see section 4.2.11.7). As well, spring grizzly bear feeding on spawning rainbow trout was confirmed as a regionally significant feeding behaviour at Teztan Biny (Fish Lake). Grizzly bear habitat values in the study area were thus to be considerably higher as a result of 2012-2013 surveys than was predicted in the 2010 habitat suitability map model.

Figure 12. Three of only four grizzly bears observed in six weeks of field transects in Brittany Triangle-Nunsti Park-Nemiah Valley May-June, 2013 by Sadie Parr, representing a consistent observation of very low population numbers over the past decade in this core area. These sub-adults will likely be separated from the mother in mating season, repre-senting the kind of slow grizzly bear popula-tion increment that appears not to be recovering in this subpopulation [Photo: Sadie Parr].

Table 1. Number of individual grizzly bears in the mid-upper Dasiqox-Taseko watershed based on DNA hair detections from June 7 and July 20, 2007, derived from Apps et al. (2009)

Grid Plot #	# Males	# Females	Unknown	Total #
4	2	4	0	6
5	3	0	0	3
6	1	0	0	1
7	0	1	0	1
12	2	0	0	2
13	1	2	1	4
14	0	0	1	1
15	0	0	0	0
16	0	1	0	1
25	2	0	0	2
26	0	1	0	1
27	1	0	0	1
28	1	1	0	2
29	0	2	0	2
39	1	3	1	5
40	0	0	0	0
41	0	2	0	2
42	0	2	0	2
TOTAL	**14**	**19**	**3**	**36**

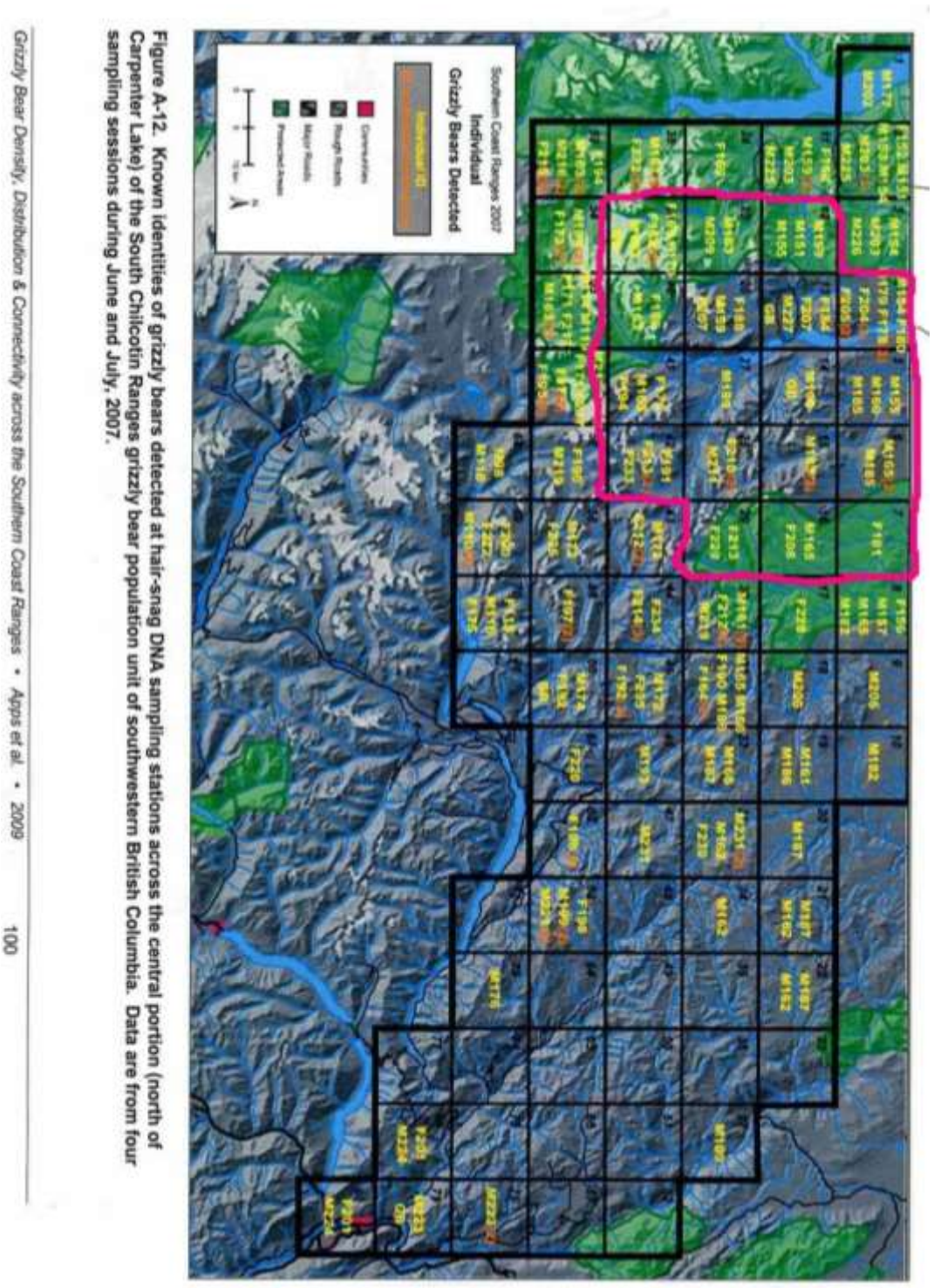
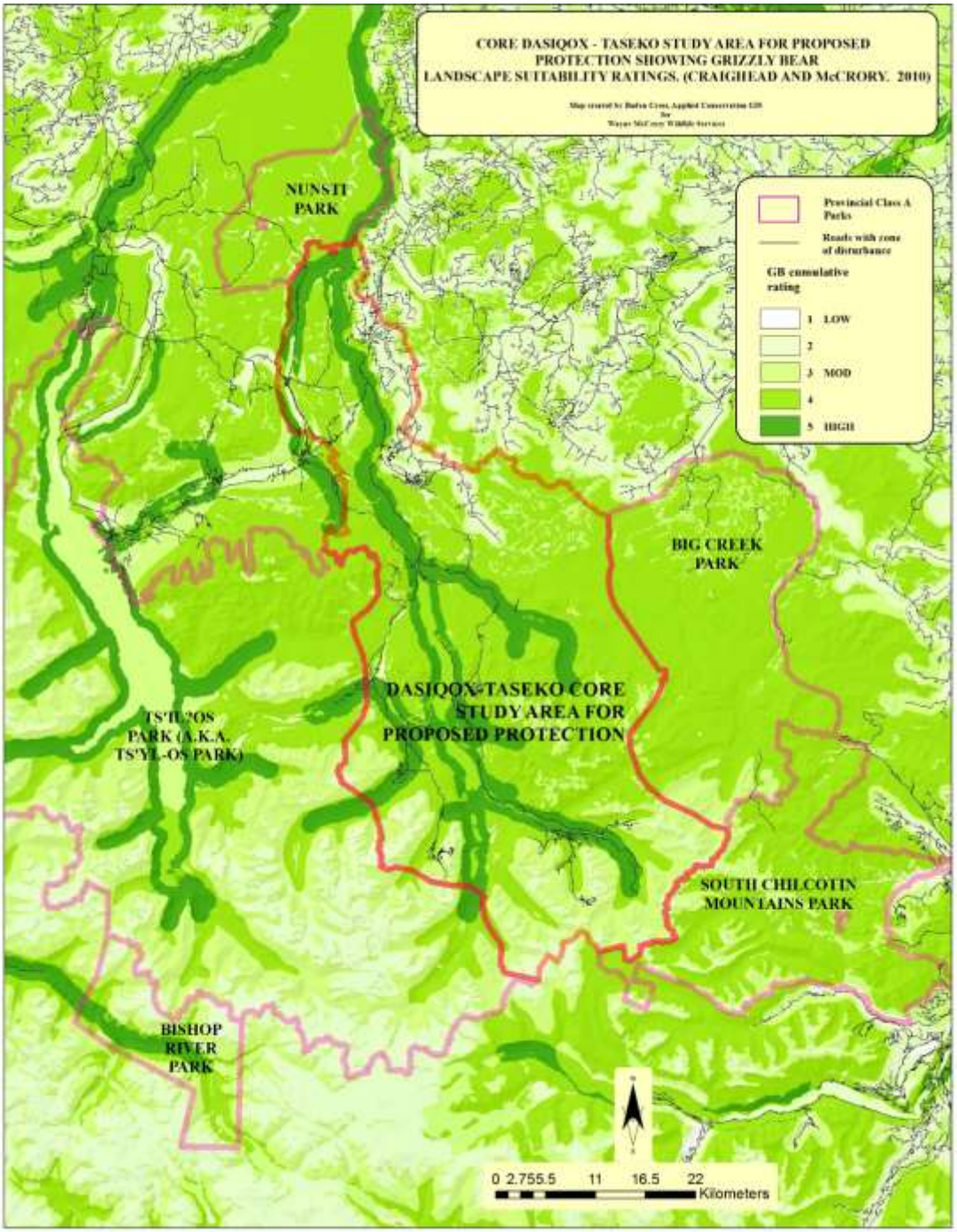


Figure A-12. Known identities of grizzly bears detected at hair-snag DNA sampling stations across the central portion (north of Carpenter Lake) of the South Chilcotin Ranges grizzly bear population unit of southwestern British Columbia. Data are from four sampling sessions during June and July, 2007.

Grizzly Bear Density, Distribution & Connectivity across the Southern Coast Ranges • Apps et al. • 2009 100

Map 14. From Apps et al. (2009) DNA study showing grids for hair snagging for DNA analysis. We used the grids for the mid-upper Dasiqox-Taseko (pink) to determine that 36 grizzly bears used the area in June-July 2007.



Map 15. Grizzly bear habitat suitability map model (Craighead and McCrory 2010) showing mostly moderate habitat values (middle green) for the Dasiqox-Taseko study area, with high values areas in the valley bottoms/riparian corridors. Salmon values were included in ranking the riparian habitat values for grizzlies. The map does not show the extensive high value whitebark pine habitats established in the study area (2013) and therefore under represents the habitat suitability.

4.2.1.9 Grizzly bear habitat values: grizzly bear population viability in Dasiqox-Taseko study area may be linked to overall salmon and whitebark pinenut availability as well as rainbow trout availability at Teztan Biny – Fish Lake

Grizzly bears in the study area are fortunate to have periodic seasonal access to nutrition-rich foods, including wild salmon, trout at Fish Lake (Teztan Biny), and whitebark pinenuts. This gives Chilcotin grizzly bears a survival advantage compared to dryland regions where salmon have been lost and where whitebark pine has been impacted by disease and insects (such as in Yellowstone National Park).

This seasonal access to rich food resources may help explain the large size of some Chilcotin grizzly bears that I and others have observed.

Salmon-grizzly bear areas and whitebark pine use by grizzly bears in the study area are discussed in greater detail in the respective sections (4.2.10.2 and 4.2.11.7). As noted, today, the Chilcotin is one of the few regions left in North America where grizzly bears still fatten in the autumn on a combination of whitebark pine, salmon, berries, and other food resources. Salmon have been eliminated in many other areas of western North America where whitebark pine occurs.

Studies done elsewhere shed some light on just how important salmon, whitebark pinenuts, and rainbow trout are to the well-being of Chilcotin grizzly bears. Several of these studies have used analyses of stable isotopes analyzed in grizzly bear hair and blood samples to quantify the importance of some key foods in their annual diet. For example, stable isotope studies have shown that grizzly bears with access to the salmon resource have heavier body weights, produce larger litters, and are found at higher population densities than grizzly bears that do not have access to salmon (Hilderbrand *et. al*. 1999). As noted elsewhere in my report, a stable isotope study of hair and blood samples collected from grizzly bears in the Greater Yellowstone Ecosystem (Felicetti et al. 2003, 2012) showed that grizzly bear survival is strongly linked to variations in availability of whitebark pinenuts. Using the distinctive sulphur-isotope signature for pinenuts (which is different from all other food items consumed by grizzly bears), the researchers found that during years of low pine cone abundance grizzly bears made minimal use of pinenuts, but during years of abundant cones use of pinenuts increased significantly. Cutthroat trout are another important food for Yellowstone grizzly bears. The bears commonly catch and eat spawning cutthroat trout after they migrate from Yellowstone Lake to its tributaries to reproduce. The high digestibility and protein and lipid content of spawning cutthroat trout are one of the highest sources of net digestible energy for grizzly bears in the Yellowstone ecosystem (Mealey 1975, Knight et al. 1984, Reinhart 1990). Grizzly bears were found to most successfully fish where small shallow streams or shallow riffle areas in larger streams made fish capture viable (Hoskins 1975). In Yellowstone, spawning cutthroat trout were found to comprise 90% of the spring diet of some grizzly bears, with females making more use than males. This suggested that nutrition from spawning trout may be an important food for females with nursing young (Robbins et al. 2006). This late-spring and early-summer food source is believed to help bears regain body mass after emerging from their winter dens and also helps female grizzlies with young meet the energetic needs of lactation.

According to Norman and Alice William (pers. comm.), *in spring, grizzly bears in our Dasiqox-Taseko study area feed on rainbow trout in small tributary streams at Teztan Biny (Fish Lake)*. This was confirmed by our follow-up field research in 2012. Our study concluded that Teztan Biny was a grizzly bear "hotspot" activity centre in the spring because of the trout feeding activity combined with a major movement corridor for bears. Using fisheries data from Taseko Mines studies, I calculated the overall available spawning trout biomass at Fish Lake to be 78,143 kilograms, or 171,915 pounds, although only a portion of this biomass would spawn in shallow riffles where they could be caught by bears. I estimated some 15-20 or more grizzly bears would feed at spawning trout "hot spots" at Fish Lake in May and June. As in Yellowstone, the high digestibility and protein and lipid content of spawning trout at Teztan Biny (Fish Lake) would be one of the highest sources of net digestible energy available in the spring-early summer diet of Chilcotin grizzly bears. The utilization of spawning rainbow trout by grizzly bears in BC inland waters has only been anecdotally reported from a few other areas and appears to be a very rare phenomenon (McCrory 2013).

4.2.1.10 DNA studies show some grizzly bears make long-range movements

In my Teztan Biny (Fish Lake) study of grizzly bears (McCrory 2013), it was determined that some grizzly bears in the study area make long-range movements because of their large home ranges, especially adult males. By analyzing data from the Apps *et al.* (2009) DNA-based inventory for the mid-upper Dasiqox-Taseko, it was shown that adult male grizzly bears made more movements in and out of the Dasiqox-Taseko than adult females. Of the 19 females, 17 stayed within the Dasiqox-Taseko during the six weeks of sampling (July 7-20, 2007). To further our understanding of grizzly bear movements in the study area, in 2012, we collected grizzly bear hair from mark trees in the Teztan Biny (Fish Lake) area and Falls River. In 2013, we collected grizzly bear hair from mark trees in various areas on the west side of the Dasiqox-Taseko study area, including Mt. Vic, the Pellaire mine road, Gunn Valley, and the lower Tchaikazan. DNA analysis was done by Wildlife Genetics International. They used their DNA computer program to compare the individual grizzlies identified in our 2012-2013 study with 224 grizzly bears from Chilko River (Mueller 2008, 2012), and 399 grizzly bears from the South Coast dataset of Apps *et al.* (2009). I then used this information to ascertain any grizzly bear movements.

The results from the 2013 hair collection period were disappointing, especially as we cleaned the mark trees of hair in September and then re-sampled in October to get fresh hair. Of 10 samples sent in for DNA analysis, one was a new grizzly that used a mark tree high on Mt. Vic that had not been previously detected in any of the DNA studies; the other was a male grizzly bear (S-2) that had been previously detected at a number of different locations.

The DNA results were interesting and showed that male grizzly bears make short- and long-distance movements. A male grizzly bear detected near Teztan Biny (Fish Lake) in the 2012 sample had been previously detected in May 2010 at Tatlayoko Valley (Mueller pers. comm.) on the far west side of the Xeni Gwet'in Caretaker Area. Another male grizzly bear from the 2012 sampling period at Teztan Biny (Fish Lake) had also been detected during June and July 2007 at two hair-snagging stations on the east side of Chilko Lake and to the south of Nemiah Creek (Apps et al. 2009). It also showed up at a hair-snagging station at Canoe Crossing on the Upper

Chilko River in October 2011 (Mueller 2012). Another male grizzly (S-2) that had used a mark tree near Yanah Biny (Little Fish Lake) between late May and mid-September 2012, had been previously detected in June and July 2007 at two hair-snagging stations on the west side of Upper Taseko Lake at what appears to be Yohetta Creek (Apps et al. 2009). In fall 2013, the same grizzly was found to have used the whitebark pine mark tree in Falls Creek.

Literature Cited or Consulted for Section on Grizzly Bears

Austin, M.A., D.C. Heard, and A.N. Hamilton. 2004. Grizzly Bear (*Ursus arctos*) harvest management in British Columbia. BC Ministry of Water, Land and Air Protection, Victoria, BC. 9 pp. Found at http://www.env.gov.bc.ca/wld/documents/gb_harvest_mgmt.pdf . See Appendix 3 Austin and Wrenshall, 2004).

British Columbia Ministry of Environment, Lands and Parks (MELP). 1995a. Conservation of grizzly bears in British Columbia: Background report. BC Ministry of Environment, Lands and Parks, Victoria. 70 pp.

British Columbia Ministry of Environment, Lands and Parks (MELP). 1995a. 1995b. A future for the grizzly: British Columbia grizzly bear conservation strategy. BC Ministry of Environment, Lands and Parks, Victoria. 15 pp.

Carroll, C. 2005. Priorities for carnivore conservation in the Cariboo-Chilcotin. Cariboo Chilcotin Conservation Society. Williams Lake, BC. 21 pp.

Carroll, C., R.F. Noss, and P.C. Paquet. 2004. 2005. Priorities for large carnivore conservation in western Canada and Alaska: A preliminary analysis of habitat and population viability for wolf and grizzly bear. Unpublished report to the Wilburforce Foundation, Seattle, WA.

COSEWIC. 2012. In Press. COSEWIC Assessment and Status Report on the Grizzly Bear (*Ursus arctos*) in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa, ON.

Craighead, J.J., J.S. Sumner, and J.A. Mitchell. 1995a. The grizzly bears of Yellowstone: their ecology in the Yellowstone Ecosystem, 1959-1992. Island Press, Washington, DC.

Craighead, L.D., D. Paektau, H.V Reynolds, E.R. Vyse, and C. Strobeck. 1995b. Microsatellite analysis of paternity and reproduction in arctic grizzly bears. J. Heredity 86(4): 255-261.

Craighead, L., and W.P. McCrory. 2010. A preliminary core conservation review of the dryland grizzly bear of the Chilcotin Ranges in British Columbia. Report to Friends of Nemaiah Valley, Valhalla Wilderness Society and Xeni Gwet'in First Nation Government.

Felicetti, L.A., C.C. Schwartz, R.O. Rye, M.A. Haroldson, K.A. Gunther, D.L. Phillips, and C.T. Robbins. 2012. Use of sulfur and nitrogen stable isotopes to determine the importance of whitebark pine nuts to Yellowstone grizzly bears. US Geological Survey, Northern Rocky Mountain Science Centre. gcmd.nasa.gov/records/GCMD_NRMSC_sulfurnitrogenstableisotopes.html. Accessed December 3, 2013.

Gailus, J., F. Moola, and M. Connolly. 2010. Ensuring a future for BC's grizzly bear population. Natural Resources Defense Council & David Suzuki Foundation report.

Gailus, J. 2013. Securing a national treasure: Protecting Canada's grizzly bears. David Suzuki Foundation report.

Garibaldi, A., and N. Turner. 2004. Cultural keystone species: implications for ecological conservation and restoration. Published by The Resilience Alliance in Ecology and Society 9(3): 1. http://www.ecologyandsociety.org/vol9/iss3/art1

Hamilton, A.N., D.C. Heard, and M.A. Austin. 2004. British Columbia Grizzly Bear (*Ursus arctos*) population estimate 2004. BC Ministry of Water, Land and Air Protection. Victoria, BC. 7pp. Available at: www.env.gov.bc.ca/wld/documents/gb_bc_pop_est.pdf

Harvey, A., L. Willcox, and B. Robinson. 1998. A sense of place. Issues, attitudes and resources in the Yellowstone to Yukon Ecoregion. 158 pp.

Hilderbrand G.V., C.C. Schwartz, C.T. Robbins, M.E. Jacoby, T.A. Hanley, S.M. Arthur, and C. Servheen, 1999. The importance of meat, particularly salmon, to body size, populations productivity, and conservation of North American brown bears. Canadian Journal of Zoology, 77, 132-138.

Hoskins, W.P. 1975. Yellowstone Lake tributary survey project. US Dep. Inter., Natl. Park Serv., Interagency Grizzly Bear Study Team, unpubl. rep. 10 pp.

IUCN. 2003. Guidelines for application of IUCN Red List Criteria at Regional Levels. Version 3.0. IUCN Species Survival Commission. IUCN – The World Conservation Union, Gland, Switzerland and Cambridge, UK

Knight, R.R., and L.L. Eberhardt.1985. Population dynamics of Yellowstone grizzly bears. Ecology 66(2):323-334.

McCrory, W.P. 2010. An independent & cumulative effects review of Dasiqox-Taseko Mine's environmental impact assessment documents: Proposed Prosperity Mine at Fish Lake: Terrestrial/Wildlife Component. CEAR reference number 09-05-44811.

McCrory, W.P. 2013. McCrory Wildlife Services Ltd. response to 2011 Terrestrial-Wildlife component of the Environmental Impact Statement (EIS) & associated documents regarding the proposed New Prosperity gold-copper mine project at Teztan Biny (Fish Lake) with specific reference to the grizzly bear (with added comments on northwestern toad & wild horses). Report for Friends of Nemaiah Valley (FONV). Final report submitted to New Prosperity CEAA Panel August 20, 2013.

Mealey, S.P. 1975. The natural food habits of free-ranging grizzly bears in Yellowstone National Park, 1973-1974. MS Thesis, Montana State Univ., Bozeman. 158 pp.

Mueller, C. 2008. Grizzly bears in the Tatlayoko Valley and along the upper Chilko River: population estimates and movements. Annual Progress and Data Summary Report: year 2 (2007). Unpublished report. Nature Conservancy Canada. 27 pp.

Proctor, M., D. Paetkau, B.N. McLellan, G.B. Stenhouse, K.C. Kendall, R.D. Mace, W.F. Kasworm, C. Servheen, C.L. Lausen, M.I. Gibeau, W.L. Wakkinen, M.A. Haroldson, G. Mowat, C.D. Apps, L.M. Ciarniello, R.M. Barclay, M.S. Boyce, C.C. Schwartz, and C. Strobeck. 2012. Population fragmentation and inter-ecosystem movements of grizzly bears in Western Canada and the Northern United States. Wildlife Monographs 180:1–46. Available at http://www.nrmsc.usgs.gov/files/norock/publications/2012_Grizzly_population_fragmentation.pdf . Accessed 6 August 2013.

Reinhart, D.P. 1990. Grizzly bear habitat use on cutthroat trout spawning streams in tributaries of Yellowstone Lake. MS Thesis, Montana State Univ., Bozeman. 128 pp.

4.2.2 Grey Wolf: *Nun*

> The animal shall not be measured by man. In a world older and more complete than ours, they move finished and complete, gifted with extension of the senses we have lost or never attained, living by voices we shall never hear. They are not brethren; they are not underlings; they are other nations, caught with ourselves in the net of life and time, fellow prisoners of the splendor and travail of the earth.
> —Henry Beston, *The Outermost House: A Year of Life On The Great Beach of Cape Cod*

4.2.2.1 Background

The wolf is another excellent focal species for conservation because of its keystone role in multi-level predator-prey relationships, complex social behaviour (runs in packs), and wide-ranging territory. In Canada, the grey wolf (*Canis lupus*) has been designated as Not-at-Risk by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) because of its widespread distribution, with no evidence of population declines over the last decade.

Wolves still exist throughout the XGCA and YCA, despite over a century of persecution in the Chilcotin from trapping, control kills by ranchers, indiscriminate killing, poison control, and other wolf-kill methods. Part of their ability to survive such persecution in the Chilcotin is likely because they still have large core habitats in remote wilderness areas as refugia, with little human intervention, including commercial trap lines, such as Ts'il?os Provincial Park and parts of the Brittany Triangle. The remoteness and intact core habitat of these areas serve a two-fold purpose in wolf persistence: 1). Such areas provide a variety and abundance of potential prey species for wolves, which are obligate carnivores with large territorial requirements, and 2). These areas are difficult to access and thus hunting opportunities, as well as human-wolf conflicts, are reduced allowing wolves (and other animals) to die from natural causes instead of human influences.

Wolves were considered vermin in the province from 1906 to 1955, with a bounty system in place. They were also poisoned on the range using 1080, strychnine and cyanide. Until the late 1960s, wolves were not protected through game laws. Game laws were enacted in 1966. Trapping was disallowed from that year until 1976 (BC Wildlife Branch 1979). The persecution throughout the first half of the 20th century actually made its mark and caused the wolf population in BC to decline in the late 1950s; but it has since been recovering and expanding (MFLNRO 2012).

Field surveys and interviews suggest that a number of wolf packs still range throughout much of the XGCA, including the Nemiah Valley and Brittany Triangle. Our 2012 and 2013 field surveys also confirmed that wolves still range throughout much of the Dasiqox-Taseko study area that includes some of the Yunesit'in Caretaker Area (YCA). However, their status in the more heavily logged, roaded, and fragmented plateau country to the north of the Dasiqox-Taseko study area is not known.

Figure 13. Remote camera photo of lone wolf at Blue Lake in the Brittany Triangle. (Photo by Sadie Parr)

At least one pack appeared to be resident in the core Brittany Triangle wild horse study area prior to the large 2003 wildfire (McCrory 2002). Wolves in the region tend to avoid people most of the time because they are trapped in the winter and are shot on sight by some local residents who carry firearms at all times and shoot wolves at every opportunity. For example, two wolves were shot north of Bald Mountain in the Nemiah Valley in 2012. In winter 2010, I also found one shot in the hind leg and killed about 0.5 km off of the Whitewater Road from Hanceville, at about km 43.

There have been a few instances of wolves attacking domestic horses in the Nemiah Valley (Jon Tanis, pers. comm.) and at Taseko Lodge at the outlet of Dasiqox-Taseko Lake (Mrs. S. Reuters, pers. comm.). Predation on domestic cattle in the Nemiah Valley and surrounding area is inferred, but has not been quantified.

The province released a draft wolf management plan (MFLNRO 2012) in 2012 for public review, which has come under severe public and scientific criticism due to its aggressive suite of wolf control policies, including use of leghold traps on private land, shooting from helicopters on mountain caribou winter range, and a liberal hunting season. The draft plan has still not been finalized, while additional wolf control measures have been quietly implemented by the province.

The draft plan also ignores credible science regarding the ineffectiveness of some wolf control measures; i.e., control measures of wolves related to livestock predation can lead to an increase rather than a decrease in livestock predation. This is due to control measures breaking down the

security and stable social structure of established wolf packs. According to a review by Parr (2014):

> *Controlling wolves through hunting and trapping them does not lead to a predictable nor consistent change in wolf population, but it does fracture stable family groups (Rutledge et al. 2010, Wallach et al 2009). Contemporary research suggests that a disruption of wolf social structure (through indiscriminate killing) can also influence the ecological role of wolves and lead to increased conflicts with livestock and humans (Wallach et al 2009, Rutledge et al 2010). One observable symptom of pack disintegration (loss of social stability regardless of population size) appears to be an increase in attack rates on livestock (Muhly et al. 2010, Wallach et al 2009).*
>
> *Dr.s Chris Darimont, Paul Paquet, and Linda Rutledge are among several wolf biologists who urge that conservation of wolves and ecosystems requires managing the species at the level of the family unit. This will require maintaining not only viable populations, but also naturally functioning populations where 'fitness is likely to be optimized when evolutionary adaptation is driven by natural rather than artificial (i.e., human-mediated) selection pressures' (Rutledge et al. 2010, and personal communication).*
>
> *Rutledge et al. (2010) state that this 'social component may stimulate natural regulation at other trophic levels' and is 'evolutionarily important.' The stability of wolf packs may be as important to their role as a keystone species as population size, but this critical factor is not often considered in conservation-management plans for wolves in North America.*

Currently, the Xeni Gwet'in, Valhalla Wilderness Society (VWS), and Friends of Nemaiah Valley (FONV) are sponsoring a wolf diet study in the Brittany Triangle and Nemiah Valley. Wolf biologist Sadie Parr is using wolf scats and stable isotopes from hair samples collected in the field to determine what prey species the wolves are selecting, including wild horses and domestic cattle. The study is intended to provide much-needed baseline information on current wolf control policies in the Chilcotin by the BC government, which are not based on sound science. It will also shed light on trophic relationships and energy flow in this region, and help to detect the occurrence of wolf dietary specialization and presence of seasonal dietary shifts.

4.2.2.2 Tsilhqot'in cultural/heritage values

We gathered only limited information. AFSAR interviews by Alice William indicated that some elders felt there were too many wolves and that they needed to be controlled, while others felt wolves needed to be protected.

According to Alice William (pers. comm.), *if you kill a wolf you don't touch it right after you kill it. There is some kind of negative power when you kill it. If you let the blood cool down then you can touch it, but don't let children touch it*.

Wolves have been incorporated into the Xeni Gwet'in wildlife tourism plan as having a high level of ecological and viewing interest for a First Nation tourism program (McCrory 2005). In some areas of North America, wolf viewing and howling is a popular outdoor activity. In Ontario's Algonquin Provincial Park there are commercial eco-tours that feature wolves howling and visitors learning to howl like wolves. On the BC coast, where the focus of some recent First Nations eco-

tours has been on viewing white spirit (Kermode) bears and grizzly bears, there is a high interest in viewing wolves and learning of their ecology (Dr. Paul Paquet, pers. comm.).

4.2.2.3 Estimate of wolf numbers, mortality factors, and their status in the Dasiqox-Taseko study area

There are still a number of active traplines in the study area where wolves are trapped or otherwise killed for their fur. For example, trapper Fritz Dieck (pers. comm.) shot two wolves out of a pack of 16 along Elkin Creek (at the north end of the study area) on October 15, 2012. Dieck also traps in Gunn Valley and Falls River, where he feels there are several resident lone male wolves. Last year he observed that a pack of 14 moved into his trapline area and he intends to trap 10 over the winter to reduce the population (pers. comm. Oct. 17, 2013). Trapper Ian Bridges trapped four wolves in the Elkin Creek area (Chaunigan Lake) in December 2013-January 2014 (Sadie Parr, pers. comm.).

It was difficult to estimate the number of wolves in the study area since government density estimates vary considerably. The preliminary wolf management plan for British Columbia (BC Wildlife Branch 1979) estimated a population of about 200 (100–300) wolves for the entire Cariboo Region 5. The wolf distribution map in the 1979 wolf management report showed that most of the XGCA had a density of “few/very few” wolves, while a number of smaller areas had a “moderate/plentiful” density; however no density numbers were included in the report. The report did list density estimates for wolves from northeast BC of 1 per 85 km^2-171 km^2. In a BC predator-prey ecosystems map published by the provincial Wildlife and Habitat Protection branches, Blower and Demarchi (1994) showed a wolf density of moderate (1 per 100-300 km^2) for the area that includes the XGCA and YCA. The 2012 draft wolf management plan for the province (MFLNRO 2012) uses 5-15 wolves per 1000 km^2 for high-density wolf areas, and 2-5 wolves per 1000 km^2 for low-density wolf areas. The ministry also used different density estimates based on prey biomass.

Map 16. The Dasiqox-Taseko study area is located in the west portion of Cariboo Region 5 on this wolf density map from MFLNRO (2012), in a low-density area (light green).

The MFLNRO (2012) draft wolf management plan estimates 650-1,150 wolves for the Cariboo Region (5) by using combined density estimates. Map 16 indicates that the XGCA and Dasiqox-Taseko would be in a low-density area. However, by using both the low and high-density MFLNRO (2012) estimates for the Dasiqox-Taseko study area (184,794 ha or 1,848 km^2), I estimated numbers to be 4-27 wolves. Using a crude estimate of home range size for an individual pack based on averaged pack sizes from elsewhere of one pack of 6-12 wolves per 250-400 km^2 (Dr. Paul Paquet, pers. comm.), the Dasiqox-Taseko study area could support up to 4-7 packs or 24-84 wolves. As noted in my report on the Brittany Triangle wild horse area (McCrory 2002), sightings, vocalizations (howls), frequency of fresh scats, and remote camera photos suggested at least one wolf pack was resident in Nunsti Provincial Park. In August 2001, one camera site recorded a single movement of about 11 individuals in one pack, including 5-6 young of the year.

Figure 14. Pack of three wolves on the hunt in the Brittany Triangle wild horse area, winter 2012.

A wildlife study in part of the Dasiqox-Taseko study area (Sopuck et al. 1997) reported that only a few wolves appeared to exist in the area at that time. This is likely a reliable observation since the researchers carried out extensive winter track counts. Recent 2013-2014 surveys in the Brittany Triangle and Nemiah Valley by wolf biologist Sadie Parr, and my own surveys in fall 2012/2013 in the Dasiqox-Taseko watershed, suggest that although numbers currently seem to be low, wolf packs appear to still range throughout much of the Dasiqox-Taseko study area despite mortality from trapping and indiscriminate shooting.

Observations along lower Dasiqox-Taseko Lake in fall 2013 indicate that some wolves use the lakeshore for travel. Observations from winter fieldwork in 2013/14 indicated that wolves routinely travel along ridges as well as frozen lakes and rivers in the northern part of the Dasiqox-Taseko study area (Sadie Parr, pers. comm). This helps them to move efficiently during times of snow

and cover large areas in search of prey. Although fresh tracks were obvious, only a small amount of wolf scat (less than 40) was observed (and collected) over several hundred kilometres (minimum 600 km) of travel along survey routes during the wolf study 2013/14 (Sadie Parr, pers. comm.).

It is recommended that core carnivore conservation areas be set aside in remote wilderness zones in the study area away from active traplines and livestock grazing areas where wolves are protected in order to maintain benchmark core population areas.

Figure 15. One of two wolves shot indiscriminately by a local resident north of Bald Mountain in the Nemiah Valley in 2012.

4.2.3 Wolverine: Nuŝtil, Nulh-Eteghish

The wolverine is also a good focal species due to its low population density, wide-ranging use of landscapes, and sensitivity to human disturbance, including commercial trapping, habitat fragmentation from logging and roading, and outdoor recreation activities around female winter natal/maternal den habitat. The species has a high demographic sensitivity to adult mortality that

raises a serious concern that commercial trapping could have a detrimental effect on their metapopulation dynamics. The current understanding is that no other type of human activity has the same potential to cause wolverine populations to become dangerously small or locally extirpated (Ruggiero et al. 2007).

The mainland subspecies in BC is on the provincial Blue list; federally, the western Canadian population is considered to be a Species of Special Concern (COSEWIC 2002).

Their ecology is unusual in that, like the grizzly bear, wolverines have an interesting winter denning ecology in the high country. In winter, both species use dens in the high country to survive, each species having a different den type and associated biological need; the grizzly to hibernate for the winter, the adult female wolverine to birth and raise kits in the middle of winter (late February to April). Adult female wolverines will dig long tunnels under the snow, often down to buried boulders or logs, where their young are born (natal dens). Later, the kits are raised in a series of similar dens (maternal dens) where they are nursed by the mother, who also goes off and hunts for food. In one study, a female was known to carry food 22 km back to the den (see McCrory 2005).

It appears that very little is known about the wolverine in the study area; likely, it occurs at low densities. We observed several tracks in our studies in the Brittany Triangle, but no detections were made at our remote camera sites (McCrory 2002). According to interviews, wolverines occur in remote areas of XGCA and a juvenile was reported visiting a residence in the Nemiah Valley in the winter of 2004/05 (R. William pers. comm.).

In the general Gunn Valley area of the Dasiqox-Taseko study area, Sopuck et al. (1997) concluded that the wolverine could be expected to be found throughout their study area. They felt from field observations that riparian areas provided important travel corridors for the species. In examining records for two traplines in the area, a total of four wolverines were trapped between 1985 and 1997.

As reported in their extensive literature review of the effects of linear developments on wildlife species, Jalkotzy et al. (1997) considered that the impacts of land use activities on wolverine are likely similar to those on grizzly bears. However, the authors note that the effects of roads and other linear developments have not been examined to any great extent for wolverines. Some results indicate they may avoid highways, but have used ski trails extensively for travel.

There is considerable evidence that wolverines are also sensitive to various types of human recreation disturbance, including snowmobile activity. A literature search indicates that female wolverines appear most vulnerable in proximity to reproductive den sites in winter and often move to new locations with the slightest disturbance. A detailed review is provided in the Xeni Gwet'in access management plan (McCrory 2005b).

Literature Cited or Consulted for Wolf and Wolverine Sections

BC Wildlife Branch. 1979. Preliminary wolf management plan for British Columbia. Victoria, BC.

Blower, D., and R. Demarchi. 1994. Large predator-prey ecosystems. Wildlife distribution mapping. BC Wildlife and Habitat Protection Branch, Victoria, BC.

Committee on the Status of Endangered Wildlife in Canada (COSEWIC). 2002. Canadian Species at Risk. www.speciesatrisk.gc.ca

Jalkotzy, M.G., P.I. Ross, and M.D. Nasserden. 1997. The effects of linear developments on wildlife: A review of selected scientific literature. Prep. for Can. Assn. of Petroleum Producers. Arc Wildlife Services Ltd.

McCrory, W. 2005a. Background tourism feasibility study – wild species viewing & guidelines. Xeni Gwet'in First Nation, Chilcotin, BC.

McCrory, W. 2005. Proposed access management plan for Xeni Gwet'in First Nations Caretaker Area, Chilcotin, BC.

Ministry of Forests, Lands and Natural Resource Operations (MFLNRO). 2012. Draft Management Plan for the Grey Wolf (*Canis lupus*) in British Columbia.

Muhly, T., C.C. Gates, C. Callaghan, and M. Musiani. (2010). In Musiani, Boitani, & Paquet (Eds.), The World of Wolves: new perspectives on ecology, behaviour, and management. (pp. 242-273). Calgary: University of Calgary Press.

Parr, S. 2014. Draft progress report on 2013-2014 pilot study of the grey wolf (*Canis lupus*) feeding ecology in the Brittany Triangle and Nemiah Valley, Chilcotin, British Columbia. Draft report to Valhalla Wilderness Society.

Ruggiero, L.K., K. McKelvey, J. Aubry, D. Copeland, D. Pletscher, and M. Hornocker. 2007. Wolverine Conservation and Management. Journal of Wildlife Management 71 (7):2145.

Rutledge, L., B. Patterson, K. Mills, K. Loveless, D. Murray, and B. White (2010). Protection from harvesting restores the natural social structure of eastern wolf packs. Biological Conservation 143: 332-339. DOI: 10.1016/j.biocon.2009.10.017

Wallach, A.D., E.G. Ritchie, J. Read, and A.J. O'Neill (2009). More than Mere Numbers: The Impact of Lethal Control on the Social Stability of a Top-Order Predator. PloS ONE 4 (9): 1-7, e6861

4.2.4 Mule Deer: *Nists'i*

Mule Deer constitute the most abundant and widespread herbivore in southern British Columbia (Shackleton 1999), with densities the highest in the central and south-central areas of the province.

Although the mule deer is not generally considered a focal species for scientific conservation area design, mule deer are included in this report as a focal species for conservation and a keystone cultural species primarily because for a very long time they have been an important subsistence food for First Nations and, since the advent of Europeans into the region, also to non-Aboriginal hunters. As well, there is evidence their numbers are declining. According to Alice William: *We have interviewed the Tsilhqot'in elders from Xeni and another species they said to be at risk was mule deer*.

It is also noted that during the 2006-2007 Lillooet Land and Resources Management Plan (LRMP) process to the south of the Dasiqox-Taseko study area, the St'at'imc considered mule deer an important focal species for conservation and cultural values, along with grizzly bears, and made recommendations for large areas of important mule deer and grizzly bear habitats to be

considered in designing new protected areas. With the current decline in moose populations in the Chilcotin, mule deer are even more important to consider as a key species in the Dasiqox study area design. Impacts to the migratory mule deer populations from the proposed New Prosperity Mine development at Teztan Biny (Fish Lake) was one of the primary concerns for First Nations. Given that the species is mostly a seasonal migrant to the Dasiqox – Dasiqox-Taseko from the Fraser River area, protecting their intact homeland and migration corridors is very important from both a conservation and cultural/heritage perspective.

4.2.4.1 Importance of mule deer to Xeni Gwet'in and Yunesit'in First Nations

Today, both moose and mule deer are considered of great importance as subsistence food for a traditional lifestyle in the region rather than as a species managed for wildlife viewing (Raphael Williams, pers. comm.).

According to Linda Smith (2014):

> *Deer is one of the important Tsilhqot'in cultural keystone species along with moose, and in former times, elk and caribou were also heavily relied upon for sustenance and contributed heavily to the maintenance of the Tsilhqot'in traditional lifestyle. From ancient times, deer have drawn Tsilhqot'in to specific places along its migration route and habitat. The remains of favoured dwelling sites can still be seen especially where the confluence of game, fish, plant food and medicines were located in abundance. Traditional deer hunting blinds both built in trees and in rock formations are intact, except those made from wood.*

Tsilhqot'in have designated seven terms for deer (nists'i 'deer') to differentiate the different ages, as is done in English (nists'i-yaz 'fawn', nists'i-dad 'yearling', nists'i-ad 'doe', nisdzinz 'buck'), as well as terms to signify the season by referring to its condition or its coat (dant$aysh 'spring deer', nists'iltsugh 'fall deer'). These terms and their cultural uses suggest a considerable accumulated knowledge over a vast time period. Deer is mentioned in an origin story (Lhindesch'oysh); there are six or more ceremonies related to good hunting practices; deer power has been used in traditional healing; and deer images are imbricated onto spruce root baskets. This imbrication technique has been handed down through the generations from those featured in the ancient Tsilhqot'in stories: "The Bear and the Woman" (Ts'iqi Ses Ghaghinda), "The Bear Who Disciplined a Hunter" (Ses Deni Xughinqad), "Raven Goes Fishing" (Datsan Lhuy Qa7adet'in), and deer is also mentioned in the Tsilhqot'in origin story, "The Woman and the Dog" (Lhindesch'oysh). As well, there are many specialized anatomical terminology for deer and other terms for the ancient preservation techniques and additional cultural uses, including its meat for protein (eaten fresh, dried, aged, heat dried), its fat (condiment, hide softener), its stomach (fat container, tripe), its udder and tongue (delicacies), its brain (food, hide softener), its antlers (weapons, tools), its hide (clothing, mat, string, rope, snowshoe webbing, blanket, etc.), and its hooves (footwear and belt attachments for dancing). All of the above terms, food, and cultural items created from any game mammal definitely make good trade items.

Elk and caribou are in the same category as deer in terms of their cultural uses, but their hides may be slightly harder to prepare for tanning as deer skin, which is thinner and therefore easier to

prepare for tanning. Most Tsilhqot'in individuals want to learn about their traditions, so publications of books on Tsilhqot'in traditions, stories, knowledge, and beliefs about deer and the maintenance of the deer herds will extend these traditions into the future.

According to Alice William:

> *Mule deer have provided a staple diet for Tsilhqot'in and still do today. In the past before modern conveniences, the Tsilhqot'in cut up and dried the meat on drying racks; they also used to salt them down in crocks for the winter use. Our elders, our parents, used up as much of the deer as possible; they cut up the head into pieces, boiled it up and made soup. Liver, kidney, heart, tripe, and intestines were a delicacy in our family. We skinned the legs and roasted them on the fire for the tasty chewy tendons, sinew, and the marrow. Our family ate everything that was edible. The Tsilhqot'in use the deer hides for clothing to use or sell.*

4.2.4.2 Ecological considerations

Mule deer are generally only a common late spring-summer-early fall resident in the study area as most of them migrate to and from wintering grounds in less harsh winter habitats at lower elevations along the Fraser River "breaks" and valley areas (Norman Williams pers. comm., Chilko Lake Study Team 1993). In periodic years, deep snow and other harsh winter conditions in the middle to upper Dasiqox-Taseko is likely a limiting factor for any mule deer using the study area for a wintering grounds, such as potentially suitable habitats identified in Gunn Valley. There are reports of seasonal migrations of 60 km, with deer traveling up to 120 km between winter and summer ranges (Shackleton (1999). Just to the south of our Dasiqox (Dasiqox-Taseko) study area near Lillooet, the St'at'imc have an ongoing study of mule deer migration using collared animals. So far, this study found that migration patterns showed considerable variation with each doe taking a unique route to the summer fawning range. For example, one doe was found to remain on an irrigation crop field for the entire fawning period using an area <3 km in diameter, while another doe migrated 97 km (one-way) to its summer fawning range in the mountains (Wright 2008). The study found that migration routes documented using telemetry coincided closely with traditionally known routes identified by St'at'imc elders. These routes have not been publicized due to their sensitive nature.

During the past several years of field surveys with Alice and Normal William in the Dasiqox-Taseko watershed, they pointed out many areas where mule deer make their seasonal migrations to and from their wintering grounds along the Fraser River. As traditional Xeni Gwet'in knowledge keepers, their information is based on their intimate familiarity of the region and ancestral traditional ecological knowledge passed down from their forebears. There is even a mountain named after a traditional mule deer migration pattern. Such ancestral deer migration patterns would be disrupted by logging and roading in the area, along with serious concerns of over-hunting should industry continue its extensive roading and clearcutting south into this intact wilderness and mule deer haven and migratory zone. More specific details of these ancestral mule deer migration patterns is not included in this report due to the need to protect it.

As with traditional knowledge and studies in the Xeni Gwet'in Wild Horse/Aboriginal Preserve, the St'at'imc study also found that some mule deer are non-migratory and stay in the South Chilcotin Ranges as year-round residents. McCrory (2002) found evidence of small numbers of mule deer wintering in February in the Brittany Triangle in pine forest - pine grass habitat and along the more open old-growth Douglas fir-bunchgrass "breaks" of the Dasiqox (Dasiqox-Taseko) River. According to Alice William (pers. comm.), many more deer used to stay in the Dasiqox-Taseko area over the winter. She attributes this to there being several thousand wild horses at the time in the whole Chilcotin country, including the mid-upper Dasiqox-Dasiqox-Taseko. (A few ranchers at the time complained about them.) According to Alice William:

> *In the winter, the deer stayed on the hillsides around Dasiqox-Taseko, Gunn Valley eating behind the horses and left their shed antlers behind on the hillside. My family remembers all this. My sister Joanne remembers that they were on the road from Stoney and stopped at Davidson Bridge at that time. They camped there or stayed in the cabin (burned down since) and dad would walk up or ride up and shoot some deer to take back for their winter food. I remember seeing a buck deer in rut and dad shot it on the way to Dasiqox-Taseko Lake Lodge… The elders remember that there used to be more and bigger bucks at that time when the horses were around.*

The Xeni Gwet'in feel mule deer populations are on the decline. Alice William provided the following perspectives from her own long-term experience and from interviews:

> *Tom and I have hunted every year and have noticed about 75% of decline within the last 30 years. It was not a problem to bag a deer in a day and we used to see more deer in the summer. We would go watch wildlife on the hillsides and deer would walk right up to us and now they are very skittish, we, (Tom and I) think possibly due to an increase in wolf and grizzly in the area.*

Rocky Quilt : *Deer are pretty low, too. One year they opened it for does, and everyone—women and kids—were allowed 2 does per hunt and almost wiped the deer out.*

Maria William: *We have been getting deep snow now for three years and we lost a lot of our animals. I don't like it, it really breaks my heart. The world is dying and our animals are dying off. I keep saying that I don't want that to happen*.

According to Wright (2008), mule deer are also experiencing declines in the Lillooet area, which includes the South Chilcotin Ranges where many St'at'imc and non-St'at'imc residents have been noticing a significant decrease in the number of deer on important spring range.

4.2.5 Moose: *Mus*

Moose are the largest living member of the deer family. Their common North American name is derived from a native Algonkian name that means "eaters of twigs". Moose are recent arrivals. They appear to have arrived in the Chilcotin between 1910 and 1920, about 170 years after it was estimated that the Xeni Gwet'in and other First Nations brought the first horses into the area from trading with First Nations horse cultures to the south. Research by Linda Smith (2014) indicates

that according to Eric Collier (1959. pp.146-147), the first moose harvested by Tsilhqot'in hunters in Riske Creek was in the late summer of 1916.

As stated by Linda Smith (2014), this recent time factor is reflected in the Tsilhqot'in terms for moose in that the English name has simply been adapted for this mammal (i.e., mus 'moose', mus-ad 'cow moose', mus-bul 'bull moose', and mus-yaz 'moose calf').

According to Alice William: *I remember that dad (Jimmy Bulyan) told a story about a Tsilhqot'in man shooting a moose... one of the first ones in the country and it tasted like willows*. In an interview, Martin Quilt told Alice William: *My dad went to Bull Moose Mountain and he counted 75 head of moose. That must've been the time when they (Mus) first moved in*.

The arrival of the long-legged, heavily snouted "Mus" member of the deer family observed by the Tsilhqot'in and early ranchers was also of great interest to zoologists, who have done considerable research to explain this unusual natural phenomenon. According to Cowan and Guiget (1978), one of the most spectacular events involving large mammals in the province has been the southward range expansion of the moose. Prior to 1920, there were virtually no moose south of the Hazelton-Prince George line. The BC Game Commission reports for moose (1913-1915) in 1913 indicated that "these magnificent animals continue to work their way south…A bull moose was lately seen as far south as the 108 Mile House, on the Cariboo Road." This southward range expansion in BC is part of a post-glacial dispersal from northern refugia, where they apparently survived the last ice age (Klein 1965). They are still expanding their range southward on the BC coast, as in southeast Alaska (Cook and MacDonald 1999).

Today moose occur throughout the Xeni Gwet'in and Yunesit'in territory. The Ungulate Winter Range (UWR) Map 5 in the province's draft Chilcotin SRMP report (Ministry of Sustainable Resource Management 2004) indicates that moose are addressed through key wetlands and riparian management, but at the time, no ungulate winter ranges were set in the Chilcotin.

The moose was identified as an important keystone cultural species and focal species for conservation for this study. This is not only because they are so very important to native and non-native people as a source of food and many other things, but because they have recently been undergoing drastic declines in their population.

4.2.5.1 Importance of moose to Xeni Gwet'in and Yunesit'in First Nations

Today, the Chilcotin moose has become an invaluable staple for both Tsilhqot'in and non-Aboriginal people alike. It helped to replace the earlier disappearance of woodland caribou and elk from the ecosystem.

As stated by Linda Smith (2014), *Most of the Tsilhqot'in cultural traditions and knowledge for the deer have been assigned to the moose as well, including the hunting knowledge, anatomical terms, the cultural ways of preserving its meat, and the beliefs and ceremonies. Interestingly though, there is one moose song and dance that was performed by the late Chief Louie Quilt of Yunesit'in*.

According to Alice William: *Dad made rawhide ropes from Mus. Uncle Francis made fancy hackamores and bridles. Some Tsilhqot'in women made buckskin for moccasins, vests, jackets, briefcases, robes; and coats were made from the hides with the hair attached*.

4.2.5.2 Conservation concerns

There is every indication today that moose populations on the Chilcotin Plateau and South Chilcotin Ranges are being negatively impacted by the extensive road networks and clearcuts, as well as by over-hunting made possible by the increased motorized access created by logging roads and the easier visibility of animals in clearcuts. Today, moose numbers have declined so much that Alice and her brother Norman found in their AFSAR interviews that all of the Tsilhqot'in elders and hunters felt the "Mus" should be a species-at-risk. Elders made the following comments:

Mabel Soloman: *There are no more, and there is a law against getting cow moose, too*.

Rocky Quilt: *There's not enough moose around. I was talking to the nurse's husband and he said there's no moose around here and they live around Brittany*.

Mrs. Cecelia William: *Moose and deer, people don't see too many anymore*.

Sonny Lulua: *There's not much of them left and their number is going way downhill, it's going on four years now when I used to count over 20 moose, now it's lucky if there's three or four of them around. Since they opened up the 4500 Road, the numbers have gone down*.

According to Alice William:

> *There used to be thousands of moose in the Chilcotin at one time. Our family saw them close to our camps during hay harvesting season during summer and fall. We heard the sounds of moose fighting in the distance during the nights from our tent; it sounded like the knocking together of two big plywood boards. And we had to be careful when we ventured out during rutting season; we heard stories of how vicious moose were during this time.*

The outstanding concerns regarding the decline of moose in the Chilcotin by the Tsilhqot'in elders and hunters and others was recently confirmed by an independent study commissioned by the provincial government. A review of moose populations in the Cariboo Region by McNay et al. (2013) indicated that moose numbers have actually been declining for some time. A 1998 review by the province of moose hunter kill statistics indicated that moose declined in the region from 1985 to 1997. Population surveys by the Wildlife Branch in three areas of the Cariboo Region in 2012 and 2013 also indicated that moose were declining. McNay et al. (2013) did a third-party independent review of the situation which supported the Ministry's conclusions that there was a region-wide decline in moose numbers. The researchers concluded that the "most plausible" explanation for a serious decline in moose populations in the Cariboo (including the Chilcotin) is the mountain pine beetle epidemic, especially the large-scale salvage logging that followed. The report found that *the vulnerability of moose could have increased due either to the change in habitat (dead trees), to increased salvage logging (removal of cover), or to the change in access associated with salvage logging (more roads).*

This should have come as no surprise, in my opinion. It is really stating the obvious. Having done moose winter surveys of salvaged, logged, and unlogged areas of the Chilcotin Military Block for the Tl'esqox (Toosey) First Nation in the mid 1990s (McCrory 1995), I could not agree more with the research concerning the impacts of salvage logging on moose numbers.

The McNay et al. (2013) report also concluded that because the government reduced the number of allowable hunts and because cows and calves also declined, not just bulls taken by licensed hunters, it is likely that the *unsustainable portion of mortality must come from either unregulated hunting or natural sources*.

It is surprising that the province ignored its own extensive baseline research on the value to moose of mature coniferous forests when it allocated vast areas of Chilcotin lodgepole pine to be overcut for so-called "salvage logging." According to Perry (1999), moose use of the coniferous forests has been documented in three moose habitat studies in the Southern and Central Interior. In the Kamloops area, a study conducted from February 1996 to January 1998 showed use of coniferous forests by moose occurred in all seasons, ranging from 31-49% use per season. Mixed coniferous/deciduous forest was also selected during all seasons ranging from 26-41% use per season. At Anahim Lake, a 1986 radio-telemetry study (Baker 1990) showed that during winter, moose used spruce wetlands and spruce forests more frequently than expected. It was also determined that moose concentrated winter use within 100 m of the forest/wetland edge and virtually did not use open areas greater than 200 m from the edge. The study concluded that the combination of food and cover in areas of spruce and edge were likely the main factors determining winter use of these habitats by moose. The most frequently consumed forage in winter was bog birch, lodgepole pine, willow, sedge, and some serviceberry. The average home range of moose varied from 20.7 km^2 to 45.2 km^2.

In view of these studies, it is surprising that the province is still continuing to allow the forest industry to over-cut the Chilcotin with only minimal protection for moose. This is all the more reason to protect the remaining intact forested and non-forested moose habitats of the Dasiqox-Taseko study area.

Because the Dasiqox-Taseko study area is more remote and has far fewer roads and less hunting than many of the logged areas of the Chilcotin Plateau to the north, it is likely acting as a core population "source" area for moose; although, as noted previously, numbers here also appear to have declined from former times (Alice William pers. comm.).

4.2.6 "Disappeared" But Important Cultural Keystone Species: Rocky Mountain Elk - *Bedzɪsh?*) and Woodland Caribou - *Nists'i7igut'in?*

Two very important ungulate species, the Rocky Mountain elk and woodland caribou, have disappeared from the Xeni Gwet'in wild horse/aboriginal preserve; elk apparently before the mid-1800s and caribou by the 1930s, for reasons that are not clearly understood. Based on Xeni Gwet'in and Yunesit'in knowledge and historical documentation, one of the core areas in the Chilcotin for both woodland caribou and elk appeared to be the Dasiqox-Taseko study area.

The disappearance of the two once-abundant ungulates—elk and woodland caribou—since colonization exemplifies the vulnerability of the ecosystem to species disruptions and losses,

even those with a fairly strong reproductive capacity, and at a time prior to the advent of conventional forestry with its extensive roading and clearcut logging.

Despite their decline and disappearance over the previous two centuries, elk and woodland caribou each still has high importance as a keystone cultural species to the Tsilhqot'in people, thus we considered them an important conservation focal species for this study in terms of their apparent potential for recovery.

The potential for both the elk and caribou to be re-established in the Dasiqox-Taseko study area would first require separate recovery feasibility studies, including inventory of potential wintering habitats for each species, which differ. Such a recovery feasibility study should be pursued by the Tsilhqot'in and conservation/hunting groups with absolute vigour, in my opinion, since viable and productive habitats appear to exist for both species, including pocket grasslands for elk, and alpine and forested habitat with terrestrial lichens for wintering caribou. Considering the apparent past abundance of each of these species, some of the existing habitats may still be quite productive. Protection of these remaining potentially intact habitats and migration corridors for elk and woodland caribou in the Dasiqox-Taseko study area should be a major factor in the feasibility of their recovery.

4.2.6.1 Elk: Denichugh

A review of the early Hudson's Bay Company (HBC) fort journals (Fort Chilcotin, 1840; Fort Alexandria, various years) shows just how common elk (and woodland caribou) used to be during the early to mid 1800s on the Chilcotin Plateau and probably the South Chilcotin Ranges, how important they were as a food resource for First Nations, and the small numbers of HBC fur traders inhabiting local trading posts. At the time, HBC referred to the elk as "red deer" due to their resemblance to the European red deer, a close relative.

Importance of elk to Xeni Gwet'in and Yunesit'in First Nations

As stated by Linda Smith:

> *Elk (Denichugh) is referred to in the Tsilhqot'in origin story "The Woman and the Dog" (Lhindesch'oysh). Elders say that Denichugh was one of the prehistoric mammals that preyed upon people; they tell of how Lhindesch'oysh, one of the main characters in the story, was able to change Denichugh's food preference from humans to its present plant diet. Lhindesch'oysh always carried a staff that was made from the antler of an elk. Elders include as part of this story that all the species of birds that exist today were created from the flesh of Denichugh, as well as amphibians and reptiles.*

Clearly, this is a highly significant mammal to the Tsilhqot'in. Helena Myers (1989) said that in ancient times, Denichugh was the only game that existed.

The other Tsilhqot'in names for elk are Denɨg, Denɨgchugh, and Nists'i-Igut'in (Lit. It looks like deer). A clarification was made to the name "Denichugh" by Eugene Williams of Xeni (pers. comm.), who told one story of how four hunters killed a "Su-Denichugh" (Lit. The-Real-Denichugh). Su-Denichugh in this context likely means "mammoth" as Williams described the animal as being so large that all four hunters were able to take overnight shelter inside its

carcass. The hunters were too far from home in the winter and it was too dark for them to return home with their food harvest.

In addition to the two stories mentioned above, there is a water body in the Big Creek area that is named after a Denichugh of the past (Denichugh-Tughinlhti or Deni̓gchugh-Tughinlhti, Lit. “A-Denichugh-Was-Lying-In-The-Water,” meaning that its carcass was seen in the lake at one time).

Generally, elk have become extinct in the Tsilhqot’in territory and, with them, all of the cultural knowledge is lost to the younger Tsilhqot’in generations. The reintroduction of elk to the area will surely facilitate the revival of relevant cultural traditions. The Tsilhqot’in names for these mammals require more research with elders to determine what mammal is represented by the names, as well as to ask additional questions for cultural knowledge surrounding both the elk and the mammoth. The name of the lake in Big Creek may also be elaborated upon by elders if further research is initiated in the Tsilhqot’in communities.

Hypothetical reasons for the disappearance of the elk

No one really knows exactly when and why elk disappeared from the montane grasslands of the Central Interior of BC, but vanish almost entirely they did some time in the 1800s, while their distant cousins also barely survived far to the east over many mountain ranges, in the Rocky Mountains, where they, too, became so depleted in numbers that reintroductions with elk from the States had to be done in some of the early mountain national parks, such as Banff.

Alice William and Norman William grew up at Nabas (Fish Lake, Little Fish Lake, Anvil Mtn.), Onion Lakes, and Dasiqox-Taseko Lakes and saw the remains of many elk. According to Alice:

> *My family lived there and my siblings and I grew up there so we just took it for granted that it was a common occurrence to see all these elk and caribou antlers on the ground among the trees and moss, and they were in good condition. I think that collectors probably picked them up.*

They saw hundreds of old caribou and elk antlers scattered throughout the wilderness where they went; some of them were actually embedded in the moss. Their father, Jimmy Bulyan, told them he hung a pair of locked Elk antlers in a tree somewhere between Nabas and Big Creek.

Cowan and Guiget (1978) mention that elk remains, attributable to the early part of the nineteenth century, were numerous throughout the Cariboo District from Williams Lake to Kamloops. According to Shackleton (1999), dating of elk antlers found in the bottom of bogs and ponds indicated that the species inhabited the Chilcotin 150 years ago. This suggests they may have disappeared some time before the mid 1800s; although nothing appears exact about this.

There are various theories for their disappearance. Collier (1959) reports on a conversation with a Tsilhqot'in Elder who remembered large herds of elk in the Chilcotin and attributed their disappearance to a severe winter in about 1835-1836 when lots of First Nations people also starved to death. In my opinion, I rather suspect that a combination of changes in hunting strategies and harvest rates as a result of early European fur trade influence may have played a hand in the over-hunting and extirpation of the species. This included the introduction of firearms (muskets), combined with the use of horses for hunting and packing, resulting in the introduction

of increased hunting pressure from the dependency of HBC posts on wild game (and salmon), and development of a commercial HBC market for animal hides that included elk and caribou skins.

In her research for this report, Linda Smith suggested the possibility of the influence on wildlife/elk survival in the Chilcotin of volcanic ash on weather patterns from the eruption in 1815 of Mount Tambora, an enormous volcano on a remote Indonesian island in the Indian Ocean. The dust shrouded the globe, blocking sunlight with the result that the following year, 1816, did not have a normal summer. In the Northern Hemisphere crops failed and livestock starved to death, leading to the worst famine of the century (http://history1800s.about.com/od/crimesanddisasters/a/The-Year-Without-A-Summer.htm, accessed: Dec 22, 2013). Such catastrophic weather patterns could also have affected forage and winter survival for wildlife in western North America, including elk and caribou in the Chilcotin, where weather extremes are known to occur naturally without global volcanic ash perturbations to climate.

In the Columbia Basin to the south, archaeological evidence suggests that elk may have been more common in the basin over the last few thousand years than they were during the last 200 years. However, what is not clear is whether their decline was due to overhunting, climate change, or competition from horses (Dixon and Lyman 1996).

Conservation and potential for recovery

A number of elk re-introductions have been done by the BC Wildlife Branch in the Central Interior. According to Shackleton (1999), starting in 1917, elk were reintroduced from Alberta and the East Kootenays to many areas of the Southern Interior, including Lillooet. According to Cowan and Guiget (1978), some elk began reappearing in the Bridge River area, the Chilcotin Plateau, and other areas in the Cariboo District and were likely from an earlier introduction at the Yalakom River. A proposed reintroduction project for the Chilcotin grasslands by the BC Wildlife Branch in the 1960s failed to get off of the ground because of fierce opposition from the ranching community (Choate 2001), which is most unfortunate, in my opinion.

Although for nearly a century, small numbers of elk have been drifting back into the Chilcotin from introduced herds further south, they have so far failed to occupy and establish viable foundation herds in the vast areas of pocket grasslands and wetlands, especially in the more remote habitats where competition with cattle would be non-existent or nominal. This may be because the few that do come back are killed by hunters.

According to an interview by Alice William, elder Martin Quilt said that: *Francis saw elk at New Meadow and there were elk tracks on Vedan Mountain. We tracked them. This was about 20 years ago on Whitewater Meadow and the mountains just behind.*

During my 2013 field surveys in the Dasiqox – Dasiqox-Taseko study area, I saw excellent montane grassland elk habitat in good condition in Gunn Valley and some areas on the east side of the Dasiqox-Taseko River that was similar in quality to our Rocky Mountain National Parks.

Keeping the study area in its intact wilderness state, combined with the large areas of already protected habitats in the surrounding Class A provincial parks, will greatly improve the prognosis for a recovery program for elk, which would be an invaluable undertaking (along with woodland

caribou recovery) by society to improve native and non-native subsistence on wild meat and also help take the hunting pressure off the currently declining populations of moose and mule deer.

I strongly recommend a feasibility study be carried out as soon as possible on the elk matter. Elk should be protected from hunting during the recovery period.

4.2.6.2 Woodland caribou: Bedzɨsh, Gwedzɨsh)

Although woodland caribou used to be abundant in the study area, they disappeared. However, there appears to be good potential for recovery if what looks like core wintering habitat in the study area is protected instead of roaded and logged.

Woodland caribou are a good indicator species for human disturbances in the southern and central part of the province and are now being used as a focal species in conservation area design analyses (see Craighead and Cross 2005). There are mounting concerns about caribou survival in southern areas of the province due to a combination of human-caused mortality, clearcutting, excessive snowmobile and heli-skiing access in sensitive winter habitat areas, and other factors, with predators often unnecessarily receiving the blame.

Written records, First Nations traditional knowledge, and old remains such as antlers indicate that caribou likely occurred in healthy numbers on the Chilcotin Plateau, South Chilcotin Ranges, and Dasiqox-Taseko study area but disappeared around the 1930s, if not before. Because of this, their importance to First Nations, and because what appears to be the strong potential for recovery in the Dasiqox-Taseko study area, we have included them as a cultural keystone species as well as a focal species for conservation and recovery planning.

There are two different caribou ecotypes in the province: one (known as mountain caribou) that feeds on arboreal lichens in the winter in mature forest, and one that feeds mainly on terrestrial lichens on open, wind-swept slopes but also, to a lesser degree, on terrestrial lichens in mature lodge pole pine forests (Spalding 2000). In the Cariboo region, the now highly endangered mountain caribou inhabit the Cariboo Mountains and Inland Temperate Rainforest to the east of the Fraser River, while the terrestrial lichen-feeding ecotype of woodland caribou ranges in the drier mountains well to the west of the Fraser River. These are considered threatened.

The former distribution of woodland caribou in the Xeni Gwet'in wild horse/aboriginal preserve would have represented the most southerly extension of this terrestrial lichen-feeding caribou ecotype. These caribou still exist in good numbers in similar mountainous dryland habitats just to the northwest of Xeni-Yunesit'in traditional areas, including large numbers in the Itcha-Ilgachuz and adjacent Charlotte Alplands and Tweedsmuir Provincial Park. Spalding (2000) considered this population of about 1700 animals "stable," although others indicate different population estimates that may be in a declining state. Unfortunately, the Chilcotin woodland caribou population is no longer officially considered stable and is listed by COSEWIC as threatened.

It is a noteworthy, if not an alarming, ecological change that they have disappeared so fast from the Xeni-Yunesit'in traditional areas before the advent of extensive conventional logging.

Importance of caribou to Xeni Gwet'in and Yunesit'in First Nations

As noted by Linda Smith (2014), the Tsilhqot'in have traditionally harvested caribou (Bedzɨsh, Gwedzɨsh) and have used it intensively in multiple ways and in large quantities, as suggested in the ancient origin story "The Woman and the Dog" (Lhindesch'oysh). The anatomical terms, uses, ceremonies, and beliefs for caribou are the same for deer; moreover, there is a plant named after caribou, Bedɨsh-Yedeyan (Lit. Caribou eats it), or Bedzɨsh-Ts'iyan (Lit. Caribou food). In English, this plant is called "Labrador Tea, Swamp Tea, or Caribou Tea." The traditional knowledge about caribou is likely retained by the Tsi Del Del gwet'in (People from Redstone Reserve) as caribou still exist within their caretaker area. The reintroduction of caribou herds to the Yunesit'in and Xeni caretaker areas would help to revitalize and enrich traditional knowledge related to this species.

Spalding (2000) quotes McDougall (1822) that caribou were important for the well-being of the Chilcotin aboriginal people. He describes them as warmly clad in good elk and caribou skins. Spalding feels these caribou may have been hunted and killed in the Itcha or Ilgachuz mountains (north of the Xeni area).

Evidence of previous caribou occupation

As previously noted, Alice William and Norman William grew up at Nabas (Fish Lake, Little Fish Lake, Anvil Mtn.), Onion Lakes, and Dasiqox-Taseko Lakes and saw the old remains of many caribou, especially antlers. According to Alice:

> *My family lived there and my siblings and I grew up there so we just took it for granted that it was a common occurrence to see all these elk and caribou antlers on the ground among the trees and moss, and they were in good condition.*

According to Alice, there was an old caribou antler on top of Buck Mountain for several decades until someone took it for a souvenir. According to Norman William, there used to be many caribou antlers around Anvil Mountain: You could not go very far in the Nabas area without seeing elk and caribou antlers.

Following is the result of one interview for the species-at-risk study (AFSAR) by researcher Alice William:

> *I showed a photo of a caribou to Mrs. Mabel William and asked her, 'What do you call this one?' She said, 'It's Bedzish; I never got the chance to see them, they lived on the land before me, and they died off before I was born. Now all you can see are their antlers lying around.' Mabel William is about 95-96 years old.*

Spalding (2000) provides an excellent review of the early history of woodland caribou in British Columbia that confirms traditional Xeni Gwet'in and Yunesit'in knowledge of their previous occurrence; noting also that they extended south into the Bridge River area. There is a black and white map (Figure 8 in Spalding) showing distribution of caribou in British Columbia in 1999, confirming that they no longer exist in the Xeni Gwet'in and Yunesit'in Caretaker Areas. Figure 5, p. 14 in Spalding shows historical observations that includes these traditional areas.

Following are a number of historic observations of caribou from Spalding (2000, table 15) that could possibly be in the Xeni-Yunesit'in areas: 1830s (Cox 1831 "reindeer... in great numbers" in mountains, Upper Chilcotin), 1870s (Anon 1877 "Reindeer" numerous on plateau at hd. Chilcotin R.), a similar observation for 1882. Spalding (2000) interprets these as the Chilcotin Plateau north of the Xeni-Yunesit'in areas, but they could very well be from these areas, in my opinion, and are, therefore, worth listing.

The following historic caribou records are from Spalding's (2000) review of historic caribou records and most could apply to the Dasiqox-Taseko study area:

- *Lamb (1960) quoting Simon Fraser in 1808: "[The Chilcotin River] runs through a fine country abounding with plenty of animals such as …Carriboux [and others]"; Jan. 2, 1822 (McDougall 1822): Chilcotin Lk. appears that the Carriboux are the most numerous [of large animals] at certain times;*
- *Late 1800s (Martin 1893): Chilko Lake vic. A.W. Phair guided hunters for Caribou.*
- *July 17, 1907 (MacDonald 1907): Caribou on "White River". (Ed. note: At that time was likely referring to the Dasiqox-Taseko or Whitewater River).*
- *Dec. 2, 1919. (Moore 1919): Tatlayoko and upper Chilko Lakes good caribou country.*

Spalding (2000) also reports Lawson Sugden picking up a small caribou antler in the vicinity of Mt. Tatlow (Martin 1993), as well as old antlers found in the vicinity of Nemiah Valley, RCAF Pk., and Dash Pk. between 1989-1996 (Young 1999). For details of the citations, please see Spalding (2000). The references to old caribou antlers in the region are similar to observations of old caribou antlers in Nabas reported by Alice and Norman William.

After a historic review, Spalding (2000) concluded that caribou are now fewer in number in British Columbia than two centuries ago, but to attempt a guess at what the caribou population might have been is risky. However, the author believes that when the first Europeans arrived, there were probably twice today's 16,500 animals, approximately 30,000 to 35,000 caribou. Numbers began to decline as early as the late 19th century, and this continued into the 1940s. Following these initial losses, caribou numbers generally showed some increase in the south, but never returned to pre-decline levels. The author believes that excessive hunting in combination with ongoing predation was the principal cause of early declines of caribou, but habitat loss from wildfire, severe winter weather, and disease may have also been contributing factors.

According to Spalding (2000), when caribou abandoned the mountains of the upper Bridge, Dasiqox-Taseko, and Chilko Rivers, and upper Big Creek, is not clear from the historic record. The antlers found from the 1950s to the 1990s were probably less than 50 years old, and it is likely that caribou used these ranges until the 1930s, at least; perhaps a stray caribou may still be occasionally found.

Recent sightings

There have been several recent sightings. Nancy Opperman (pers. comm.) observed a caribou on the highway some years ago near Hanceville. About 15-20 years ago, Trina Phillips-Setah (pers. comm.) and her father observed a small herd of caribou near Twin Lakes in the Nemiah Valley (which is at the north end of our Dasiqox-Taseko study area).

Current West Chilcotin distribution and estimated population

According to Apps et al. (2001), Woodland caribou (*Rangifer tarandus caribou*) in the north and west portions of British Columbia are considered to be of the "northern" ecotype (Heard and Vagt 1998). Caribou of this ecotype occur in mountainous areas receiving relatively low snowfall. They typically winter either in mature to old low-elevation forests or on windswept alpine slopes, and their winter diet consists primarily of terrestrial lichens. Herds at the southern limit of this ecotype's distribution…are listed as threatened by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2000). The total range of northern caribou in BC has declined during this century (Spalding 2000) and some subpopulations have been reduced in number.

Estimates of numbers of woodland caribou remaining in the west Chilcotin vary. According to Perry (1999), there are three different herds of woodland caribou (based on calving areas) in the western portion of the Cariboo-Chilcotin region:

- Itcha-Ilgachuz Mountains (Up to 2,100 animals)
- Rainbow Mountains (about 100-150 caribou)
- Charlotte Alplands (about 50 caribou) were transported by capture/helicopter from the Itcha-Ilgachuz)

The Itcha-Ilgachuz herd remained fairly stable from the mid-1980s to the mid-1990s, but appeared to increase. According to Perry (199), record numbers were counted in the Wildlife Branch's survey. However, Spalding (2000) pegs the numbers in the Western Chilcotin Uplands at about 1,700.

According to Apps et al. (2001), caribou herds associated with the Itcha and Ilgachuz mountains and the nearby Rainbow Mountains of west-central British Columbia consisted of approximately 2,000 and 125 animals, respectively (Young and Freeman 2001). As these two herds share a common winter range, they are considered to be part of the same population (Hatler 1987). Although overall population numbers are considered to be stable, their long-term conservation is of concern due to a large portion of their winter range occurring outside of protected areas and being subject to forestry development (Young and Shaw 1998).

A more recent population summary by Environment Canada (2012) states that the introduced Charlotte Uplands herd has about 50 animals, the Itcha-Ilgachuz some 1,367 (min. count), the Rainbow Range 50, and throughout Tweedsmuir Provincial Park 250.

According to information provided by Linda Smith (2014), the caribou in the Charlotte Lake uplands and elsewhere may be suffering from snowmobile access. According to Stuart Kohut (2014, pers. comm. with Linda Smith):

> *Caribou is an endangered species in Charlotte Lake and the surrounding mountains, and the real issue in the Caribou Mountain Area is snowmobilers. Yanks Peak and another mountain in the area are extensively used by snowmobilers and these mountains have always been a popular area for this activity. The mountains are easy access for just about anybody. The snowmobiles freak out the caribou herds and stress them out, disrupting the herds and their calving area. When they get spooked, they run away from*

their safe zones and they end up in wolf territories. A conservation organization dedicated to the caribou in these locations can be found online.

West Chilcotin winter habitats

In terms of winter range of the Itcha Ilgachuz and Rainbow Mountain caribou, Apps et al. (2001) define their winter habitat as follows:

During winter, alpine-dwelling animals from both herds were associated with high elevation, dry landscapes with little forest cover and low productivity, while low elevation, wet landscapes with open or closed forest cover were avoided. Winter habitat selection by forest-dwelling caribou was for broad landscapes of closed canopy lodgepole pine overstorey and higher site productivity at lower elevations. Itcha-Ilgachuz animals exhibited associations that were strongly positive for old forests and strongly negative for young forests.

Perry (1999) summarized caribou habitat as determined from telemetry studies for the area: During winter, about 80% of caribou locations have been in old pine stands at mid elevations. They crater for ground lichens, and if the snow becomes too deep or the snow surface too crusty, they feed on arboreal lichens. Northeast and south of the Itcha Mountains:

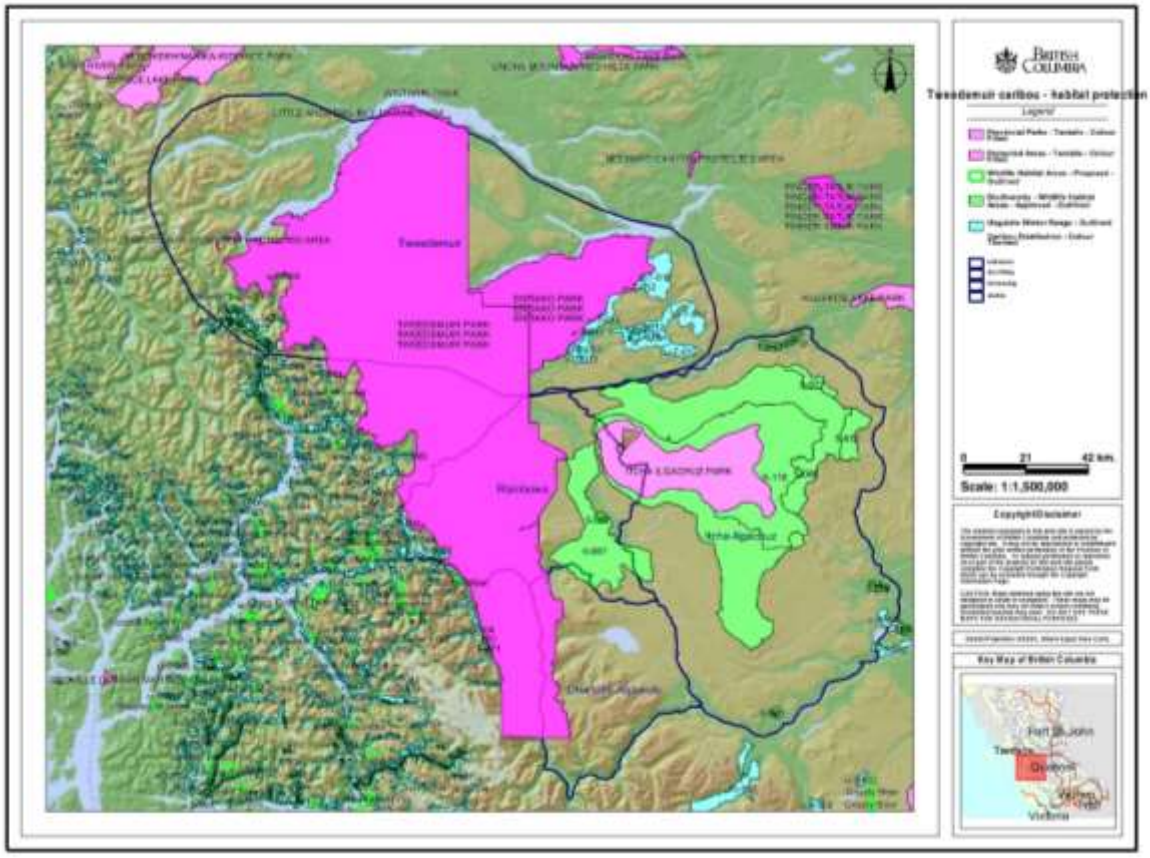
- These stands provide an abundance of terrestrial lichens.
- Stands are open enough that caribou can see approaching predators.

In terms of forested winter use by terrestrial lichen-feeding woodland caribou:

- 80-90% of stands are older than 80 years.
- Equal use of stands 80-140 years old and stands older than 140 years.
- Caribou are found occasionally in clearcuts, mostly in the spring or fall.

Conservation

Since the West Chilcotin woodland caribou ecotype was listed as threatened by COSEWIC in 2000, Environment Canada (Canadian Wildlife Service 2012) is now starting a recovery strategy for all of the “Southern Mountain Caribou in BC and Alberta, including the West Chilcotin. Alice William attended a strategy meeting in Williams Lake on December 4, 2012, and made a short PowerPoint presentation on behalf of the Xeni Gwet’in supporting a feasibility study of caribou recovery in the caretaker area, as recommended in the Xeni Gwet’in AFSAR species-at-risk study.



Map 17. Tweedsmuir-Itcha Ilgachuz woodland caribou protected areas: provincial parks (purple) and wildlife habitat areas (green)

Unfortunately, extensive clearcut logging, including salvage logging for pine-beetle kill areas, has taken its toll on any historic and potential older forest winter range for this species on much of the Chilcotin Plateau, where, historically, caribou appeared to thrive, including in the periphery of the Xeni caretaker area and extensive northern portions of the Yunesit'in caretaker area. However, that large core areas of potential intact old forest and alpine winter range for woodland caribou still appear to exist in the Dasiqox-Taseko study area and adjacent large provincial parks should be taken into account in future conservation management and planning. Since a woodland caribou habitat map model has been developed for the Chilcotin (Apps et al. 2001), it would be worthwhile doing a potential habitat model for our study area and adjacent parks.

The recently successful transplant at nearby Charlotte Lake suggests a positive prognosis for recovery in the Dasiqox-Taseko study area. According to Perry (1999), about 50 caribou were transported to the Charlotte Alplands by capture/helicopter from the Itcha-Ilgachuz in the mid to late 1980s. This herd appears to have remained fairly stable over the last 10 or so years, although an elder interviewed by Linda Smith (2014) suggested they are declining.

There is good but unsubstantiated reason to believe that the Dasiqox-Taseko study area, still largely intact, has large areas of potential alpine and old sub-boreal lodgepole pine forest wintering grounds with terrestrial lichens for woodland caribou. If these forests continue to be

logged as they are to the north and now into the Nabas area, the positive prognosis for reintroducing woodland caribou into the area and establishing viable, foundation herds is not good. I am recommending that the winter range model for Chilcotin woodland caribou developed by Apps et al. (2001) be used to develop a map of potential caribou winter range in the Dasiqox-Taseko in order to better understand the potential for a reintroduction program.

4.2.7 California Bighorn Sheep: *Debi*

California bighorns are a subspecies of desert bighorn. For thousands of years they provided sustenance to the Tsilhqot'in Nation and, although sheep numbers have declined considerably in recent times, the “debi” are as important today as they were in the past, and form part of the rich oral knowledge and tradition. Alice William attributes the presence of ancient villages comprised of the remains of numerous small and large underground winter lodges in Gunn Valley in the Dasiqox-Taseko study area to the village sites being strategically situated on a crossroads accessible to a great variety of annual food resources, including wild Pacific salmon, mountain goat, bighorn sheep, elk, caribou, mule deer, and many other sustaining plants and animals. The first written record of California bighorn sheep in Canada was made by Simon Fraser at the junction of the Chilcotin and Fraser rivers in 1808; the explorers for the Northwest Fur Company also ate wild sheep (Lamb 1960).

The California bighorn is on the British Columbia Blue List of terrestrial vertebrates that are considered vulnerable and “at risk.” Although not presently considered endangered or threatened in British Columbia, if factors affecting their vulnerability are not reversed they are likely to become so (Demarchi et al. 2000).

Because the bighorn was historically, and currently is, a very significant animal to the Tsilhqot'in Nation, it has been included as a cultural keystone species. We have also included the California bighorn as a conservation focal species in the Dasiqox-Taseko study area because of the presence of small numbers (outside of Tsy’los Park) on the west side of the Dasiqox-Taseko and a herd of about 40 that winters on the east side of Dasiqox-Taseko Lakes, and because the study area provides for critical core connectivity between different “protected” herds in provincial parks on the west and the Fraser River bighorn herds on the east.

Tsilhqot'in knowledge of exact sheep migration routes across the Dasiqox-Taseko headlands between the mountains on the west and the Fraser River on the east is too sensitive for public release. When Alice William grew up at Lower Dasiqox-Taseko Lake, her family ate bighorn sheep and mountain goats. She has observed them on the Mt. Vic migrating west above the road and believes they migrate through the area, crossing the Dasiqox-Taseko River at the outlet of lower Dasiqox-Taseko Lake, from ranges to the east along the Fraser River.

4.2.7.1 Tsilhqot'in cultural/heritage values

According to Linda Smith:

> *Bighorn Sheep are generally called “debi” and the adult male sheep is “shɨshan” in the Tsilhqot’in language. Sheep are featured in the Tsilhqot’in origin story, “The Woman and the Dog” (Lhindesch’oysh) during the period of the giant mammals. In 1989, Helena*

> *Myers described in some detail a traditional spindle or a spinning wheel, indicating that fleece may have been woven or used as batting for blankets before her time. Helena (born 1916) used a blanket with batting, the batting made from a woven rabbit skin during her early years while living with her great grandparents. Elders recall that sheep horns were made into spoons, ladles, and cambium scrapers. Although sheep skin was prone to shedding, according to Helena Myers, the skins were used as mats. Sheep products were also popular trade items. The image of sheep and goats were imbricated onto spruce root baskets and placed onto boulders and rock faces. Because sheep and goats are now an endangered species (?), the present generations of Tsilhqot'in have not had much exposure to the use of these mammals as food, and their products as household material or trade items, therefore important traditional knowledge is not being passed on. It is important that recovery of these species be the focus of future conservation projects so that significant Tsilhqot'in terms for these mammals and their uses can be revitalized and preserved.*

According to Norman William: *Mom made ground cover floor mats from the hides of Bighorn sheep and goat hides and moose hair for mattress and horse blankets*.

According to his sister Alice William: *Goat hides made the best blankets for warmth according to Martin Quilt from stories told to him from past elders*.

Demarchi et al. (2000), note that bighorn sheep were likely hunted as long as 7,000 years ago after the retreat of the last of the Pleistocene glaciers. Although salmon and mule deer were preferred food for First Nations people in British Columbia, the bighorn sheep has a high value, particularly as an emergency source of food:

> *First Nations used the meat, hides, bones, and horns from bighorn sheep. Drill handles, combs, and knives were made from bones, and large ceremonial spoons and handles for utensils were made from the horns (Banfield 1974). The horns of adult males were also fashioned into ladles and bowls after heating in hot water and allowing them to dry to a durability greater than clay or wood (Davidson 1991). In some cases, either the artifact or the raw horn was traded as far as the coast (Shackleton in Toweill and Geist 1999).*

4.2.7.2 Ecology, distribution, and numbers

A unique feature of California bighorns in the Xeni Gwet'in and Yunesit'in caretaker areas is that they represent the northern-most herds of California bighorn sheep in North America (Chilko Lake Study Team 1993. See also Regional Technical Working Group. 1993). There appear to be several somewhat separated sub-populations of wild sheep or "debi" that include the East Dasiqox-Taseko, West Dasiqox-Taseko –Yohetta (south of the Nemiah Valley) and the slightly more northern herds on Mounts Nemiah, Konni, and Tsuniah (north of the Nemiah Valley).

California bighorn sheep have three ecotypes in BC (Demarchi et al. 2000). The herds in the Dasiqox-Taseko study area appear to be of the ecotype that winters and summers on high-elevation, windswept, alpine ridges and mountains. The authors cite sheep herds in the Dasiqox-Taseko and Yohetta/Tatlow that fit this ecology. However, Raphael Williams (pers. comm.) believes some winter in mid-elevation bluffs on the northwest slopes of Mt. Nemiah above Chilko

Lake. Insofar as I am aware, we saw no evidence during field studies (McCrory 2002) of bighorns in the north end of the Brittany along the river "breaks" of the Dasiqox-Taseko and Chilko rivers, although some might be expected to travel here as an interchange between the canyon herds at the Fraser-Chilcotin Junction and the mountain herds.

Both the written records and observations by long-time residents Alice William and Tom Dillabough attest to considerable declines from former numbers.

4.2.7.3 Bighorn maps

Several maps are available that show the specialized habitat frequented by the various herds of wild sheep in the Xeni Gwet'in – Yunesit'in caretaker areas and Dasiqox-Taseko study area:

- Colour map of distribution of California, Rocky Mountain and desert bighorn sheep in British Columbia and the United States (March 1999). p. 13, Demarchi et al. (2000).
- Colour Map 6. Capability for ungulates and sockeye spawning. Based on Canada Land Inventory Information (1970s). In Chilko Lake Study Team (1993). Includes ungulate indicator species deer, mountain goat, moose, and mountain sheep winter range.
- Colour Map 5. Ungulate Winter Range. 2004. Shows sheep winter range. 1:901,393. (Ministry of Sustainable Resource Management 2004).
- Sopuck et al. (1997) cites a 1:143,000 scale map of winter and summer ranges of bighorn sheep in the Dasiqox-Taseko Management Area and they were also developing 1:50,000 habitat suitability maps. None of the Sopuck maps appear available today.

4.2.7.4 Historic and present numbers

The Chilko Lake Study Team (1993) describes the "core" area as having the capacity to support up to 50 sheep. Note that the "core area" (Map 2) covers most of the Chilko Lake and Dasiqox-Taseko lakes basins. This estimate would appear to be conservative. In a species review of the status of California bighorn sheep in BC, Demarchi et al. (2000, Table 6, p. 18) provide recent population estimates. In the Xeni Gwet'in Caretaker Area (XGCA), the following numbers for "herd winter range locations" are listed:

- Nemiah/Tsuniah: 1960 (60), 1985 (70), 1990 (150) and 1998 (60).
- Yohetta/Tatlow (W. Dasiqox-Taseko): 1970 (40), 1990 (50) and 1998 (30).
- Dasiqox-Taseko Lake (E. Dasiqox-Taseko): 1960 (75), 1970 (125), 1985 (250), 1990 (150) and 1998 (40).

This would indicate a total population in the XGCA that has varied over the past half century of between 130 and 450 animals, with the portions of the Yohetta-Buck Mountain herds and East Dasiqox-Taseko herd in the Dasiqox-Taseko study area making an important contribution.

The Dasiqox-Taseko study area contains what appears to be two groupings of California bighorns, including small numbers on the west side of the Dasiqox-Taseko River and to the east of Tsy'los Park in the Yohetta Valley, and on Buck Mountain. According to Sugden (1961), Mr. E. Collier counted 132 bighorns in 1939 in the Yohetta Lake region, with declines occurring in the 1940s. Demarchi et al. (2000) estimated the Yohetta/Tatlow herd at 30 animals in 1998. Long-time residents of Gunn Valley, Tom Dillabough and Alice William (pers. comm.), feel that bighorn

sheep have continued to experience significant declines in Yohetta Valley and on the East side of Dasiqox-Taseko Lake, which they attribute to the Wildlife Branch doing controlled burns on winter range in the fall in areas that all but obliterated available winter forage and caused a sheep die-off that has yet to recover. Alice William (pers. comm.) reports seeing up to 6-8 bighorns on Buck Mountain in Gunn Valley in recent times, as well as a small migrating herd near the road at the base of Mt. Vic near the outlet of lower Dasiqox-Taseko Lake.

Some numbers still apparently occur in the study area on the east side of Dasiqox-Taseko Lakes known as the Big Creek/East Dasiqox-Taseko herd or the East Dasiqox-Taseko herd. According to Sugden (1961), these sheep wintered on slopes and bluffs along the east side of Dasiqox-Taseko Lake north of Chita Creek. Some of these sheep may also winter in the headwaters of Big Creek, where a trapper observed 16 rams in 1948. Sugden felt that since these sheep wintered at elevations between 6,000-6,500 feet, they would experience severe winter conditions. Summer range includes some higher elevations encompassing the headwaters of Big Creek, Tyaughton Creek, Relay Creek, and the headwaters of the Dasiqox-Taseko River, with annual migrations of 30 miles or more or none at all (Sugden 1961). Two bighorn rams considered “surplus” were removed from the Riske Creek band in 1954 and released at Dasiqox-Taseko Lake.

According to Sugden (1961), information from guides hunting the East Dasiqox-Taseko indicated the herd has declined since the 1930s with a major decrease in the 1940s. He reported a game officer saw 128 there in 1908, and that in 1961 the estimated population was 75 animals. Demarchi et al. (2000) estimated the E. Taseko Lake group to have 250 animals in 1985, but only 40 in 1998.

Demarchi et al. (2000) provide a fairly comprehensive documentation of the significant decline of California bighorn sheep in BC since the last half of the 1800s. By 1960, the population in BC was only 1,235 animals. The authors also provide evidence of some wild sheep bands increasing in numbers in BC since 1900. They cite a number of early references to infer that initial declines of California bighorns in BC may have been caused by intensive market and sport hunting. By 1959, Sugden (1961) recorded that the herds west of the Fraser River were half of what the population was in the early 1900s. A variety of factors are listed, including predation and excessive and illegal hunting. Sugden (1961) felt the causes were more likely related to agriculture, including grazing by domestic sheep, cattle, and horses. Sugden (1961) notes that 4,000 domestic sheep were grazed on portions of bighorn sheep summer range west of the Fraser from 1937 to 1958, but I am unsure if this includes Big Creek Provincial Park or any of the Dasiqox-Taseko study area.

According to Alice William, in about the 1950s, her father (Jimmy Bulyan) was advised to fence off the area on the east side of Dasiqox-Taseko Lake where his cattle used to range in bighorn habitat. Although not in the Dasiqox-Taseko area, Alice William reported the following concern of Xeni Gwet’in elder Ben William: *I am concerned that the Bighorn Sheep range along the north Konni Lake and Nemiah Mountain hillside is impacted by horses and cows and should be fenced off.*

Wild horse competition with bighorn sheep on higher elevation ranges has also been raised as a concern by the BC Wildlife Branch (Chris Schmidt, pers. comm. to Dave Williams). Demarchi *et*

al. (2000) also indicate that competition with mountain goats can affect numbers of both species in the high elevation bighorn ecotype, such as is found in some of the XGCA. Demarchi *et al.* (2000) also cite disturbance to bighorns from access problems with commercial backcountry recreation.

Some of the scientific literature also indicates that bighorn sheep range productivity and numbers in the XGCA have also declined due to Europeans enacting wildfire control as a dominant forestry policy. This has caused forest encroachment on grassland ranges. As noted by Demarchi *et al.* (2000):

> *Bighorn sheep are dependent on early successional forest stages. Existing policies regarding forest fire prevention, detection, and suppression has changed the dynamics of ecosystems that evolved with fire to the detriment of many fire-dependent species, including bighorn sheep. Forest preservation for social and economic reasons can run counter to optimum bighorn habitat management. Wakelyn (1987) determined that forest succession significantly decreased bighorn range in Colorado, and Demarchi and Demarchi (1994) suggest that forest encroachment has severely reduced Rocky Mountain bighorn ranges throughout the East Kootenay….*

Recent habitat enhancement efforts by the BC Wildlife Branch are obviously a reflection of attempts to restore the ecological imbalance caused by long-term wildfire suppression. The Chilko Lake Study Team (1993) mentions habitat enhancement programs, including a recent burn on the north slopes of Yohetta Valley that removed pine and was projected to increase forage for deer and sheep. A second burn for bighorn sheep habitat enhancement took place in fall 1992 on the lower slopes east of Dasiqox-Taseko Lakes. However, as noted previously by Tom Dillabough and Alice William, who have spent a lot of time in the area, the controlled burn in Yohetta in the fall resulted in a long-term decrease in the sheep herd due to burning off critical winter forage and causing mass starvation.

Demarchi et al. (2000) concluded that California bighorn in BC occurred in one, or at most two, metapopulations before Europeans colonized BC. Today, they consider that, in addition to natural barriers, conifer invasion, habitat alienation, and loss of former grasslands to development, British Columbia's California bighorns may be configured as four separate metapopulations.

4.2.7.5 Conservation

Remaining sheep herds in the Dasiqox-Taseko study area represent some of the northernmost herds of California bighorn left in North America. They have high cultural/heritage significance to the Tsilhqot'in Nation. The study area also provides a largely intact landscape (with a few primitive road systems) that provides natural corridors for bighorns that move between the hinterland mountain ranges and the low-elevation sagebrush habitats along the Fraser River, enhancing long-term genetic health by interchanges instead of isolation and in-breeding depression. As a cultural keystone species and conservation focal species of high value, the bighorn herds provide another reason to protect the Dasiqox-Taseko for all time.

4.2.8 Mountain Goat: *Ŝebay*

4.2.8.1 Tsilhqot'in cultural/heritage values

Because the mountain goat was historically and currently is a very significant animal to the Tsilhqot'in Nation, it has been included as a cultural keystone species.

According to Linda Smith, there are five Tsilhqot'in terms for mountain goat: ŝebay (general term), ŝeyan (adult male), ŝebay-ad (adult female), gweshud (yearling), and shud (kid). Mountain goats were important to the Tsilhqot'in diet, their skins for blankets and mats, and generally, goat products were important to the Tsilhqot'in trade economy. Norman William mentioned that a herd of goats was seen last year crossing the creek near the Nemiah rodeo grounds.

According to interviews of elders done by Alice William, years ago in the 1950s and '60s, the game warden kept an eye on the Tsilhqot'in in Xeni and let them know that they weren't allowed to shoot bighorn sheep and mountain goat, so to this day, the elders still think that it's against the law to hunt them. Another elder, whose husband guided big game hunters in the '40s and '60s, she remembered that the Indian agent managed the game. The elder stated:

> *People didn't have guidelines. There weren't any meetings in those days. The roads were bad. Only the Indian agent used to look after the game, I think. Now the Indian agents aren't around anymore, maybe they were chased out. We heard they used Nenqayni senya (money); that's probably why they were chased out. It seems like they were very protective of the game years ago; people were afraid of them from other areas. The Indian agent governed the game and the game warden took meat away from the people if they were bad. When we were guiding hunters, they came here constantly.*

Alice William reports the following information from AFSAR and/or ecosystem-based plan interviews of elders:

Mabel Soloman and her family:

> *The mountain goat are just about all gone, and the goat population was extensive when the elders used to hunt them, now these people have passed on. The meat is good, but the dry meat was tasty. I think predators like cougar got them. Maria William and Christine Lulua were hunters and hunted in the mountains and camped for two weeks at a time. They haven't done so for the last six years (2008). They still butcher game when hunters of today are generous enough to give them some.*

Maria William: *Now the goat are gone, I hear that some have moved up on Konni Mountain. We used to eat mountain goat years ago; now I don't like the meat. People have their own spirit guides to help hunt and their own way of preparing for a hunt.* (Alice William explained: *After I told her that some people prepare themselves before hunting them and some sing before eating them, as the elders used to do for other game as well.*)

Christine Lulua: *Years ago, Francis William used to make tallow and saved the fried bits of fat and the children skewered them on a stick, roasted them on a stick and ate them.* (Alice William said, *'making tallow' was a method of rendering down animal fat from the intestines, the kidneys, the wall of the heart, the animal body. This was used in place of cooking oil or lard for roasting and frying game and fish*).

4.2.8.2 Ecology and numbers

The Chilko Lake Study Team (1993) describes the “core” area as likely supporting over 400 mountain goats. They describe the Tchaikazan Valley and adjacent peaks as particularly important and supporting about 150 goats. However, there is some evidence of a recent decline. According to Alice William, when her husband Tom’s dad Art Dillabough was around in the 1960s, he used to count 100 head of mountain goat between Falls Creek and the Tchaikazan Valley. In summer 2013, Tom Dillabough and Raphael William counted one mountain goat in the same area.

According to Norman William, when Eugene William was around in the 1990s, he viewed a herd of mountain goats and young kids in a basin below Tatlow Mountain.

There is a limited entry hunt (LEH) with about 10-15 goats hunted annually from the core area (Chilko Lake Study Team 1993). Numerous winter ranges for mountain goats are shown on Map 5 of Ungulate Winter Range (Ministry of Sustainable Resource Management 2004). Goats appear to be spread throughout the more rugged ranges in the Xeni Gwet’in and Yunesit’in caretaker areas. About 20 years ago, the BC Wildlife Branch introduced six goats on Tsuniah Mountain and six on Mount Nemiah. A small band of goats is resident on Vic Mountain opposite Dasiqox-Taseko Lake Lodge, but some were poached by outside hunters who were taken to court (S. Reuter, pers. comm. 2005). The numbers are believed to have gone from 13 to about six, but there is still a limited entry hunt. According to Alice William, they used to see about 11 mountain goats on Buck Mountain, but in 2013 they counted only two.

Alice William said many of the Xeni Gwet’in today still do not know that some hunting of mountain goats and bighorn sheep is allowed. She is concerned that their youth no longer know the taste of wild sheep and goats.

I have no idea how many goats range in the mountains on the east side of Dasiqox-Taseko Lakes and in the headwaters.

4.2.9 Incidental Mention: The Wild Horse: *Naŝlhiny*

Wild horses are included because of their high value as a keystone cultural species. Today there are three general wild horse areas left in the Xeni Gwet’in Caretaker Area (XGCA): Nemiah Valley, Whitewater access road between Stone and Dasiqox-Taseko Crossing (also in the Yunesit’in CA), and the Brittany Triangle (Tachelach’ed). The remotest bands left in western Canada are in the Brittany Triangle, where they number about 200. After a study of wild horses in the Brittany Triangle (McCrory 2002), the Xeni Gwet’in established their whole caretaker area as the Eagle Lake Henry Cayuse Wild Horse Preserve (Elegesi Qiyus [Nemiah] Wild Horse Preserve). In their rights and title case with the province (Tsilhqot’in Nation v. British Columbia, 2007 BCSC 1700 “Tsilhqot’in Nation”), the Tsilhqot'in won the right to capture and use horses for transportation and work.

Since the Dasiqox-Taseko study area is within this wild horse preserve, it is worth providing a bit more background even though wild horses no longer exist in that particular area.

First, although the wild horse would be considered a cultural keystone species, we don't consider its past occurrence in the Dasiqox-Taseko study area a priority species of conservation concern.

Historic documentation indicates that the Tsilhqot'in and Brittany horses most likely originated from horses of Spanish ancestry brought into the area by Tsilhqot'in people in about 1740 along ancient trade routes from Columbia Plateau grasslands to the south. However, a recent DNA study (Cothran and McCrory 2014) of the Brittany horses based on blood and hair samples found very little remaining Spanish ancestry. The origins were more from the Canadian Heritage Horse breed or its ancestors. The most intriguing result of the genetic study is the evidence that Yakut horses, an ancient horse of Russian heritage, also contributed to the origins of the Brittany horses. How these bloodlines got to the remote Chilcotin is a mystery, since the Russians only ever brought a small number of horses across the Pacific in the 1700s-1800s to their Pacific coast fur-trading posts. However, the relatively large-sized horses in the Brittany today look more like the Canadian Horse and Spanish Mustangs than the much smaller Yakut ancestor.

According to Alice and Norman William, there used to be many wild horses in the Dasiqox-Taseko study area, but they are all gone today. Alice remembers as a young girl in about 1959-1960 riding in the middle of her father's wagon (so she would not fall out) on their way back to Nabas or Yanah Biny and seeing the small strawberry roans, bays, pintos, buckskins, greys, and other coloured mustangs on the sides of the road above what was then White Water Lodge (Taseko Lake Lodge today). She feels that the mustangs were probably shot off around that same time because she doesn't remember seeing them again. There is no mention of wild horses in the Sopuck et al. (1997) wildlife study of the Dasiqox-Taseko Lakes area.

According to Raphael Williams (pers. comm.), some wild horses ranged in Beece Creek, but died off as the snow was too deep to over-winter. According to Norman William (pers. comm.), some of the horses died off because of the deeper snow winters in the middle and upper Dasiqox-Taseko, while the government killed the rest. He stated that you can still see the large piles of bones in the Anvil Mountain area where forestry shot off the horses in winter under the bounty system (that was started about 1924). In 1988, the Ministry of Forests paid for the last official "bounty" slaughter of about 80 wild horses along the Elkin Creek grasslands to the north of our Dasiqox-Taseko study area to make way for a cattle grazing allotment (McCrory 2002).

One intriguing aspect was that Norman William felt many of the horses in the Anvil Mountain area were small "Shetland" horses, although his sister Alice felt they were more the size of Arabians. If the horses were as small as Norman mentioned, could they have been some of the original Yakut horses that showed up strongly in the DNA of the Brittany Triangle horses to the north?

Literature Cited or Consulted for Section 4.2.4 To 4.2.9

Apps, C.D., T.A. Kinley, and J.A. Young. 2001. Multi-scale habitat modeling for woodland caribou in the Itcha-Ilgachuz and Rainbow Mountains of west-central British Columbia. Wildlife Section, Ministry of Water, Land and Air Protection, Williams Lake, British Columbia, Canada.

Baker, B.G. 1990. Winter habitat selection and use by moose in the West-Chilcotin region of British Columbia. M. Sc. Thesis. University of British Columbia. 100 pp.

Banfield, A.W.F. 1974. The mammals of Canada. Bighorn Sheep. Pages 413–416. Univ. Toronto Press, Toronto, ON.

Choate, C. 2001. A Fire Still Burns. A life of trail talk and contrary opinion. Heritage House Publishing.

Chilko Lake Study Team. 1993. Consensus report of the Chilko Lake Study Team. Report to BC Government. 116 pp.

Collier, Eric. 1959. Three Against the Wilderness. E.P. Dutton & Co., Inc. and Clarke, Irwin & Company Limited.

Cook, J.A., and S.O. MacDonald. 1999. The mammal fauna of Southeast Alaska. University of Alaska Museum. Fairbanks, AK.

Cowan, I. McT., and C.J. Guiget. 1978. The mammals of British Columbia. BC Provincial Museum. Handbook No. 11. Victoria.

Craighead, F.L., and B. Cross. 2005. Identifying Core Habitat and Connectivity for Focal Species in the Interior Cedar-Hemlock Forest of North America to Complete a Conservation Area Design. Proceedings of the 8th World Wilderness Congress, Anchorage AK.

Demarchi, R.A., C.L. Hartwig, and D.A. Demarchi. 2000. Status of California bighorn sheep in British Columbia. BC Min Envir, Lands and Parks, Wildl. Branch, Victoria, BC. Wildl. Bull. No. B-98. 53 pp.

Dixon, S.L., and R.L. Lyman. 1996. On the Holocene history of elk (*Cervus elaphus*) in Eastern Washington. Northwest Science 70(3): 262-73.

Environment Canada. 2012. Recovery Planning for Woodland Caribou, Southern Mountain Population (Southern Woodland Caribou).

Eycott, A., K. Watts, D. Moseley, and D. Ray. 2007. Evaluating biodiversity in fragmented landscapes: the use of focal species. Information note. Forestry Commission. Edinburgh. UK.

Garibaldi, A., and N. Turner. 2004. Cultural keystone species: implications for ecological conservation and restoration. Published by The Resilience Alliance in Ecology and Society 9(3): 1.

Harvey A., B. Robinson, and L. Wilcox. 1998. A sense of place – issues, attitudes and resources in the Yellowstone to Yukon Ecoregion.

Klein, D.R. 1965. Postglacial distribution patterns of mammals in the southern coastal region of Alaska. Arctic 18: 7–20.

Lamb, W.K. 1966. Simon Fraser Letter and Journals, 1806–1808. The MacMillan Company of Canada Ltd., Toronto.

McCrory, W.P. 1995. Environmental impacts of military training on an endangered grassland. Chilcotin Military Block - D.L. 7741, BC Report for the Tl'esqox (Toosey) Indian Band, Riske Creek, BC. 108 pp.

McCrory, W. 2002. Preliminary conservation assessment of the rain shadow wild horse ecosystem, Brittany Triangle, Chilcotin, British Columbia, Canada. A review of grizzly and black bears, other wildlife, feral horses, and wild salmon. Unpublished report. Friends of the Nemaiah Valley.

McNay, R.S., G.D. Sutherland, R.K. McCann, and V. Brumovsky. 2013. Evaluation of Moose Population Trends in the Cariboo Region 1985-2012. Report No. 449. Wildlife Infometrics Inc., Mackenzie, British Columbia, Canada.

Ministry of Sustainable Resource Management. 2004. Draft. Chilcotin Sustainable Resource Management Plan. 2004. Ministry of Sustainable Resource Management, Cariboo Region, Williams Lake. BC.

Perry, J. 1999. Moose, Mule Deer and Caribou: Sharing Current Knowledge. Southern Interior Forest Extension & Research Partnership. File Report 99-5. 41 pp. Jane Perry, ed.

Shackleton, D. 1999. Hoofed Mammals of British Columbia. UBC Press, Vancouver, British Columbia.

Sopuck, L., K. Ovaska, and R. Jakimchuk. 1997. Inventory of red- and blue-listed species, and identified wildlife in the Dasiqox-Taseko Management Zone, July–August, 1996 and February, 1997. Renewable Resources Consulting Services Ltd. Report to BC Min. of Env. Lands and Parks, Williams Lake, BC. 60 pp plus appendices.

Spalding, D.J. 2000. The early history of woodland caribou (*Rangifer tarandus caribou*) in British Columbia. BC Minist. Environ., Lands and Parks, Wildl. Branch, Victoria, BC. Wildl. Bull. No. 100. 61 pp.

Sugden, L.G. 1961. The California bighorn sheep in British Columbia with special reference to the Churn Creek herd. The Queen's Printer, Victoria, BC. 58 pp.

Toweill, D., and V. Geist. 1999. Return of Royalty. Boone and Crockett Club. Missoula, MT.

Trombulak, S.C. 2003. An Integrative Model of Landscape-scale Conservation in the 21st Century in B.A. Minteer, and R.E. Manning, editors. Reconstructing Conservation. Island Press, Washington, DC.

Wright. K. 2008. Identification of Rocky Mountain Mule deer (*Odocoileus hemionus hemionus*) migration routes and seasonal ranges within the St'at'imc Nation Territory and BC Hydro Footprint. BCRP Wildlife Project No. 07.W.BRG.01.

4.2.10 Wild Pacific Salmon

At least three species of anadromous salmon (sockeye *'ts'eman'*, coho *'dandzex'*, and chinook *'jaŝ'*) are known to spawn in waters of the mid-upper Dasiqox watershed from the outlet of Lower Dasiqox-Taseko Lake to an undetermined number of headwater areas and tributaries. Anadromous steelhead are also believed to use the system (Rick Holmes, Aug.10, 2011, email). These fish provide an important food resource for many wildlife species and, judging by the number of historic First Nations village sites such as in Gunn Valley, were a significant food resource for early First Peoples, although there is limited use today. The Xeni Gwet'in and others focus their annual harvest of wild salmon on the Upper Chilko system (Henry's Crossing), where salmon are far more abundant and easier to catch due to the waters being less turbid than the milky Dasiqox-Taseko River.

According to fisheries biologists Smith and Holmes (2010):

> *The territories of Xeni Gwet'in are relatively remote with road access to much of the area only built in the 1970s. To date, many of the drainages are only accessible by foot, horse, trail, or boat. Consequently, much of the territory has little documented fish distribution or*

> *habitat surveys and there is virtually no collection of genetic materials. Salmon distribution has not been widely researched and little is known beyond the fact that there are substantial runs of chinook and sockeye that spawn in the Chilko River and there is a sockeye run that shore spawns in Chilko Lake. The authors felt that the distribution of salmon species is much more widespread than these two examples and that there is a real need for identification of other salmon spawning and rearing locations. DFO has very little information on chinook and coho populations in the Dasiqox-Taseko due to the turbidity factors of the glacier-fed river* (Richard E. Bailey, Program Head, Chinook and Coho Assessment Fraser River Salmon Section, email dated July 15, 2013).

For these reasons, in 2010, a Xeni Gwet'in-sponsored fisheries crew surveyed six of the major tributaries of the Dasiqox-Taseko system: Lastman, Yohetta, and Chita creeks; and Upper Dasiqox-Taseko, Lord, and Tchaikazan rivers (Smith and Holmes 2010).

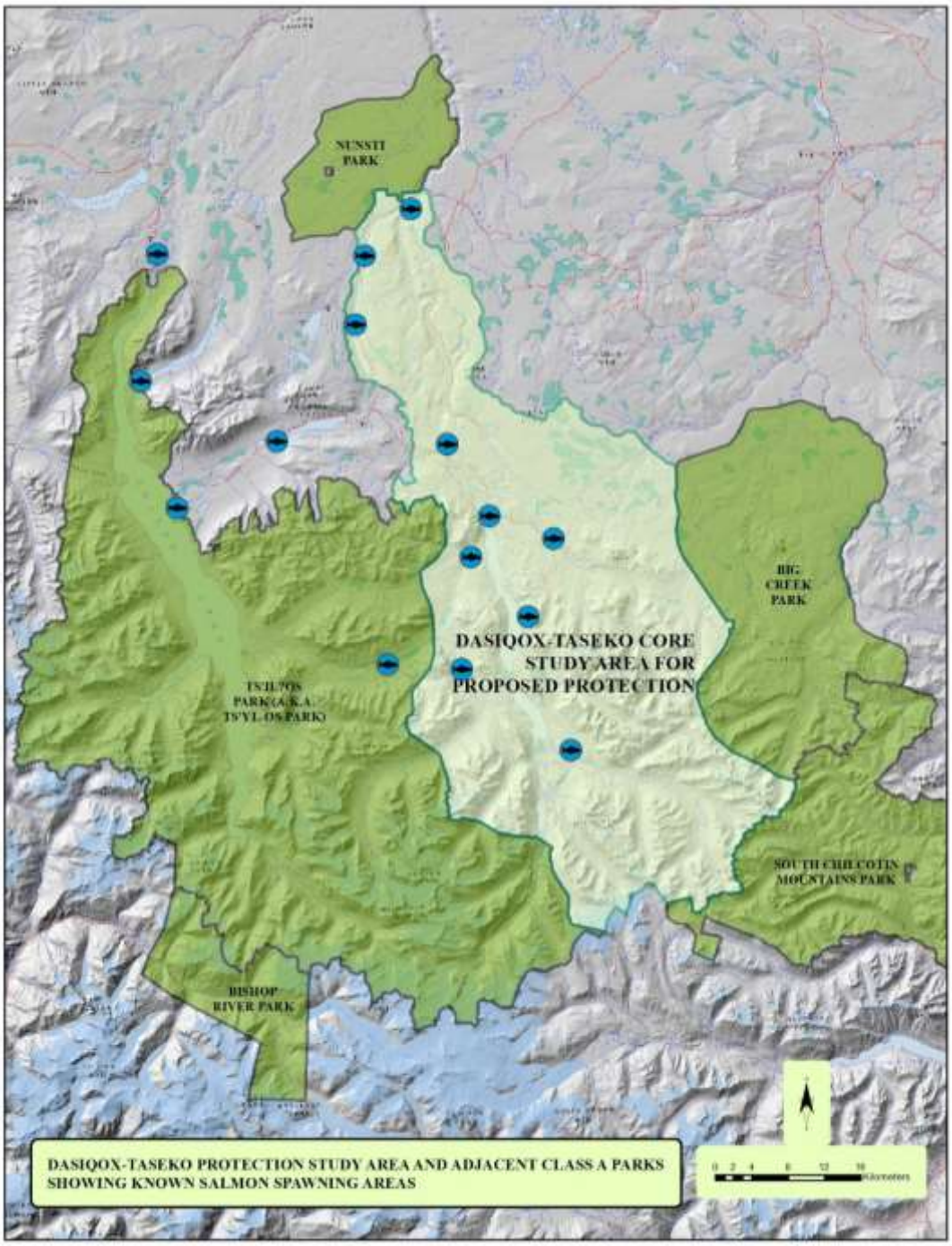
Map 18 shows the salmon spawning areas we identified in the Xeni Gwet'in Caretaker Area and Dasiqox watershed, where Chilcotin grizzly bears are known to feed on salmon in fall. The map does not include downstream carcass-feeding areas. As with other river systems, after spawning, some salmon carcasses would float down the Dasiqox-Taseko River and Chilko River systems, contributing an important biomass to bears that frequent the lower reaches of these river systems. In September 2010, I observed bear trails at the Dasiqox-Taseko-Chilko confluence where bears were descending to the river to search for salmon carcasses that had floated down from the spawning grounds far above.

4.2.10.1 Tsilhqot'in cultural/heritage values

Because wild Pacific salmon are extremely vital to the Tsilhqot'in Nation since time immemorial, the three species found in the Dasiqox-Taseko study area have been included as a cultural keystone species.

The following narrative was provided by Linda Smith:

> *'Raven Goes Fishing' and 'Salmon-Boy' are two well-known stories that portray salmon as having emotions and reacting to human oversights. In the first story, the salmon take offence to Raven cursing and they come back to life and go back into the water, leaving Raven to starve. In 'Salmon-Boy', the salmon are portrayed as being joyful travelers as they come up the river and becoming more excited when they come to a point where they can see Tiżlin (Mount Tullin). Tsilhqot'in know these details because one of their own youth traveled with the salmon and returned home to tell of his experiences.*
>
> *Three summer months are named after the salmon with July being 'Ts'eman-Za' (moon of the sockeye), August 'Dandzex-Iza' (moon of the coho, also locally known as humpback), and September 'Jaŝ-Sa' (moon of the chinook). There is one fish song called 'Tŝinen-Esqax' (Children-of-the-Rock-Cliff) and one of the verses from the song can be translated as 'children of the rock cliff are transforming into fish.' The second song is about Elhixidlin (Where-the-Rivers-Meet), which is a place where there is good salmon fishing and an abundance of Saskatoon berries.*



Map 18. Shows some of the areas in the Chilko and Dasiqox-Taseko watersheds where grizzly bears congregate to feed on salmon in fall.

During the summer months when there is lightning flashing, elders often make the comment that the flashing light represents the salmons' eyes as they are swimming up the river. The salmon, which are in poor condition near the spawning grounds, are called "ts'eman-tsi" ('grandparent salmon'). Tsilhqot'in fishermen use nets to catch chinook at the mouth of Dasiqox-Taseko Lake. At the north end of Chilko Lake at Henry's Crossing, fishermen use gaff hooks to fish for salmon and they often used to light a fire near the shore to attract the salmon. Salmon were formerly caught using fish traps and farther to the west, salmon are now caught using dipnets. Salmon are eaten fresh, dried, frozen, salted, and canned and dried salmon and salmon-head oil were popular trade items. Salmon oil was historically used as a dipping sauce and is now used to soften deer and moose skins.

There are numerous cultural restrictions and many ceremonies around harvesting salmon, and this may be due to its high significance to the Tsilhqot'in diet. The restrictions and ceremonies were put in place to safeguard this food source for future generations. Elders have commented that salmon have declined considerably since contact and with the continued contamination of land and water, the present generations of Tsilhqot'in may have to replace this very important food.

4.2.10.2 Ecological background and conservation values

Sockeye salmon: 'ts'eman'

For sockeye salmon, DFO counts using dead sockeye along Dasiqox-Taseko Lake from 1948-2009, show estimated numbers varied from year to year. There were over 30,000 in 1968, but numbers were down to very few salmon in 2008-2009. According to fisheries biologist Rick Holmes (Aug. 11 email), this dramatic decline in recent years is now a cause for great concern. According to Holmes:

Fisheries and Oceans Canada reports that the Dasiqox-Taseko escapement in 1963 was as high as 31,667, whereas in 2008, the escapement was reported as 60 spawners, and the 2009 data shows an escapement of 40. This once great run of sockeye salmon nourished Xeni Gwet'in villages and wildlife such as the grizzly bear in the Upper Dasiqox-Taseko River, and is in need of strict conservation measures to ensure its sustainability and indeed, its survival. The Xeni Gwet'in First Nation Government is committed to the management of the Dasiqox-Taseko River fishery resource and they have undertaken their own fish and fish habitat projects in the watershed.

Xeni Gwet'in fish surveys done in September 2010 showed a count of 148 spawning sockeye and 21 carcasses on September 1 in Yohetta Creek between Fishem Lake and the Tchaikazan River, and another 74 spawning sockeye were counted in the 200 m below Joyce Lake. In 2012, DFO estimated an escapement of 100 sockeye for the Dasiqox-Taseko. [On September 5, 2013, trapper Fritz Dieck observed four sockeye on spawning beds at the outlet of Joyce Lake.]

The 2010 crew found sockeye salmon fry in the Upper Dasiqox-Taseko River in the first reach above Upper Dasiqox-Taseko Lake. They also found some sockeye salmon fry in the lower Lord River. They considered the presence of a large number of sockeye fry in the area of Upper

Dasiqox-Taseko Lake significant as there is no known adjacent spawning population. They speculate that the sockeye originate from the Upper Dasiqox-Taseko River where a population is suspected, or they may come from a shore-spawning population within the Upper Dasiqox-Taseko Lake itself. Sockeye also run in Beece Creek (Norman William, Alice William, Mrs. Reuters – Dasiqox-Taseko Lodge, pers. comm.), but numbers are not known.

DFO considers some of the Dasiqox-Taseko sockeye as "Early Summer Run." This is comprised of several populations scattered throughout the Fraser River watershed in seven geographic areas. Historically, the sockeye that spawn along the Dasiqox-Taseko lakeshore are the only Fraser run identified in the Chilcotin considered in this category, although DFO notes that in 2013, sockeye were also observed spawning in Yohetta Creek. According to DFO:

> *Populations within this timing group enter the lower Fraser River from mid-July to mid-August and migrate immediately upstream to terminal spawning areas. Spawners begin arriving on spawning grounds in early August, with peak of spawning from late August to mid-September. Die-off is generally complete by late September.*

According to DFO's preliminary 2013 escapement estimates for early summer run sockeye for the Dasiqox-Taseko Conservation Unit (CU): *the 2013 escapement to this system (211) is much higher than the brood year (40) but only 45% of the recent (1997-2009) cycle year average (471)*. [David Reedman, Assistant Fisheries and Ocean Assistant Resource Manager, Williams Lake, BC. Email dated Dec. 2, 2013).

According to Rick Holmes (pers. comm.), the Dasiqox-Taseko River sockeye are one of only two genetic variances of this species to inhabit the Chilcotin River watershed. Numbers are now so low that he feels the Dasiqox-Taseko sockeye should be federally listed by COSEWIC, as with other genetically distinct reduced salmon runs. According to Holmes, the other "deme" is hosted by the Chilko River mainstem and has recently received significant acknowledgement as a "super fish" by researchers for their large hearts and robust cardio-respiratory systems. Smith and Holmes (2010) note that:

> *The importance of smaller spawning populations to genetic diversity within a larger population in a climate change situation, their contribution to total run size, and their timing and vulnerability to mixed stock fishing is lately becoming clear. Many of these populations are genetically distinct. The importance of this is outlined by Varnavskaya et al. in related research (1994).*

Coho salmon: 'dandzex'

Very little is known about the Dasiqox-Taseko coho fish population due to the turbid water conditions and the fact that Upper Fraser coho adults are known to migrate often in late November into December when travel and access to spawning sites is even more difficult. The Dasiqox-Taseko coho are part of what is known as the interior Fraser populations that are considered endangered by COSEWIC. In their surveys of the Dasiqox-Taseko, Smith and Holmes (2010) found no coho fry but felt some potential spawning habitat exists.

Chinook salmon: 'jaŝ'

There can be significant numbers of chinook spawning at the outlet of Lower Dasiqox-Taseko Lake. By using DNA analysis and the ratio of Chilko to Dasiqox-Taseko in the Albion test fishery, Department of Fisheries and Oceans (DFO) believes that there are 500-2000 chinook likely using the lake outlet to spawn, but they consider this estimate to be very subjective (Richard E. Bailey, Program Head, Chinook and Coho Assessment Fraser River Salmon Section, emails dated July 15, 2013). In the 2010 Xeni Gwet'in fish surveys, chinook fry were encountered only in lower Beece Creek. According to others, some chinook do migrate and spawn in Beece Creek (Norman, Alice William, Mrs. Reuters – Dasiqox-Taseko Lodge, pers. comm.).

Figure 16. Giant Jaŝ (Chinook or Spring salmon) harvested about 1981 during a traditional fall fisheries by the William family using a gill net across the Dasiqox (Dasiqox-Taseko) River at the outlet of Lower Dasiqox-Taseko Lake. Fish were captured by dipnet, hook and line, gaffing, and use of a gill net set across the river. According to Alice William (pers. comm.), the largest fish caught was about 92 pounds and sometimes a horse would be used to pull a gaffed chinook to shore. From left to right are Alex Lulua, Willard William, and Adam William. Alice William's parents previously owned Dasiqox-Taseko Lodge in this area. (Photo courtesy of Alice William)

As noted, grizzly bears in the study area are fortunate to have periodic seasonal access to nutrient-rich foods, including wild salmon and whitebark pine nuts in autumn, and rainbow trout at Fish Lake (Teztan Biny – Fish Lake) in spring.

For salmon, stable isotope studies have shown that grizzly bears with access to the salmon resource have heavier body weights, produce larger litters, and are found at higher population densities than grizzly bears that do not have access to salmon (Hilderbrand *et. al.* 1999).

Grizzlies are known to feed on dead salmon just below the outlet of Lower Dasiqox-Taseko Lake, possibly at the upper end of the same lake, as well as on spawned-out sockeye that wash up along the lakeshore. Other known grizzly-salmon activity centres are widespread, including the mid-upper Dasiqox-Dasiqox-Taseko, the "narrows" between the two lakes, Yohetta Creek, and possibly Beece Creek (Alice William, pers. comm.). There has been very little study to quantify grizzly bear use of salmon in the Dasiqox-Taseko system. Although coastal wolves and wolverine have been found to utilize salmon, there is no information on this for the study area.

Role of salmon and grizzly bears in transport of Marine Derived Nutrients (MDNs) to riparian ecosystems

According to a University of California field course study of the biota and nutrient transfer in the Chilko-Chilcotin Fraser Basin (Bush 2011), salmon and bears play a very important role:

> *Due to the influence of anadromous fishes, marine derived nutrients (MDN) are an intricate part of the nutrient cycle for the CCR watershed and provide important foraging opportunities for bird and mammalian species. The main dispersers of MDN in this area are the black bear (*Ursus americanus*) and grizzly bear (*Ursus arctos horribilis*), but smaller mammals as well as birds play an important role.*

According to Bush (2011):

> *The close relationship between salmon and bear fits the concept of keystone mutualism, or keystone species and mobile links. A keystone species is a species which exerts disproportional influence on an ecosystem; both bears and salmon are considered such species. When both species are considered together their influence is further magnified. The MDN arrive with the salmon, but the ecosystem benefits to a much greater extent by distribution of the salmon carcasses by the bears, which greatly increases the area of the riparian vegetation which is fertilized during the salmon run (Helfield & Naiman 2006). The sockeye salmon accounts for most of the biomass in the CCR system, spawning mostly at the mouth of the Chilko Lake. Some additional minor spawning grounds are located in other tributaries as the Taseko River. Other anadromous salmon use other sites in the CCR river system to spawn (see ch. 9, 10 & 11).*
>
> *The social hierarchy of the bears has been found to have a clear effect on the transport distance of the salmon carcass. Subdominant bears will catch fewer salmon as they defer to the more dominant bears, but then transport the carcass further from the river's edge to protect it from the competition. This extended transport ensures a greater area benefits from the MDN brought by the salmon but decreases the energy intake of socially subdominant bears (Gende and Quinn 2004). Salmon which were ripe, that is ready to spawn, were more often transported by the bears than spawned out carcasses. The largest male salmon were also preferentially transported and the most energy rich parts such as brain, gonads and dorsal musculature were eaten only or first (Quinn 2009, Reimchen 2000).*

4.2.10.3 Conservation

There is a general lack of inventory on the wild Pacific salmon for this area. The small run of sockeye in Yohetta Creek are genetically distinct and should be federally listed as a species-at-risk. More research is needed on cultural/heritage values and traditional use areas for salmon, as well as to ascertain use by grizzly bears, wolves, and wolverines.

Literature Cited or Consulted for the Salmon Section

Bush, E. 2011. Chapter 7. Mammals and birds of the Chilko-Chilcotin-Fraser River Basin. Field Course. University of California Davis. https://www.geology.ucdavis.edu/~shlemonc/trips/CCR_11/fieldguide.htm

Felicetti, L.A., C.C. Schwartz, R.O. Rye, M.A. Haroldson, K.A. Gunther, D.L. Phillips, and C.T. Robbins. 2012. Use of sulfur and nitrogen stable isotopes to determine the importance of whitebark pine nuts to Yellowstone grizzly bears. U.S. Geological Survey, Northern Rocky Mountain Science Center. gcmd.nasa.gov/records/GCMD_NRMSC_sulfurnitrogenstableisotopes.html. (Last accessed: December 3, 2013).

Gende, S.M., and T.P. Quinn. 2004. The relative importance of prey density and social dominance in determining energy intake by bears feeding on Pacific salmon. Canadian Journal of Zoology 82: 75-85.

Hilderbrand G.V., C.C. Schwartz, C.T. Robbins, M.E. Jacoby, T.A. Hanley, S.M. Arthur, and C. Servheen. 1999. The importance of meat, particularly salmon, to body size, populations productivity, and conservation of North American brown bears. Canadian Journal of Zoology. 77: 132-138.

Holmes, R., and G. Smith. 2006. The 2006 Fish and Fish Habitat Survey Training Program on Nemiah Creek. Report prepared for Xeni Gwet'in First Nations Government by Cariboo Envirotech Ltd. Likely, BC.

Holmes, R., and G. Smith. 2008. Crossing Assessment in the Brittany Triangle and Xeni Gwet'in Trapline Areas. Report prepared for Xeni Gwet'in First Nations Government by Cariboo Envirotech Ltd. Likely, BC.

Holmes, R., and G. Smith. 2008. The 2007 Xeni Gwet'in Caretaker Area Fisheries Assessment and Enhancement Planning Project. Report prepared for Xeni Gwet'in First Nations Government by Cariboo Envirotech Ltd. Likely, BC.

Holmes, R., and G. Smith. 2008. The Xeni Gwet'in Caretaker Area Fisheries Enhancement Projects. Report prepared for Xeni Gwet'in First Nations Government by Cariboo Envirotech Ltd. Likely, BC.

Ministry of Sustainable Resource Management. 2004. Chilcotin Sustainable Resource Management Plan. 2004. Draft. Ministry of Sustainable Resource Management, Cariboo Region, Williams Lake. BC.

McCrory, W.P. 2010. An independent & cumulative effects review of Dasiqox-Taseko Mine's environmental impact assessment documents: Proposed Prosperity Mine at Fish Lake [Terrestrial Wildlife Component]. CEAR reference number 09-05-44811.

McCrory, W.P. 2013. McCrory Wildlife Services Ltd. response to 2011 Terrestrial-Wildlife component of the Environmental Impact Statement (EIS) and associated documents regarding the proposed New Prosperity gold-copper mine project at Teztan Biny (Fish Lake) with specific reference to the grizzly bear (with added comments on northwestern toad & wild horses). Report for Friends of Nemaiah Valley (FONV). Final report submitted to New Prosperity CEAA Panel August 20, 2013.

Quinn, T.P., S.M. Carlson, S.M. Gende, and H.B. Rich Jr. 2009. Transportation of Pacific salmon carcasses from streams to riparian forests by bears. Canadian Journal of Zoology 87:195-203.

Reimchen, T.E. 2000. Some ecological and evolutionary aspects of bear–salmon interactions in coastal British Columbia. Canadian Journal of Zoology 78:448-457.

Smith, G., and R. Holmes. 2010. The Xeni Gwet'in Caretaker Area Fisheries Enhancement Projects. Report prepared for Xeni Gwet'in First Nations Government by Cariboo Envirotech Ltd. Likely, BC.

Varnavskaya, N.V., C.C. Wood, R.J. Everett, R.L. Wilmot, V.S. Varnasky, V.V. Midanaya, and T.P. Quinn. 1994. Genetic differentiation of subpopulations of Sockeye Salmon within Lakes of Alaska, British Columbia, and Kamchatka Russia. Canadian Journal of Fish and Aquatic Science. 51 Pp 147-157.

4.2.11 Whitebark Pine: Ets'i-Chen, Ets'igwel-Chen

4.2.11.1 Background

The Chilcotin is truly a pine tree landscape. Lodgepole pine (*Pinus contorta*), a wildfire-driven successional species, blankets the low elevation areas of the Dasiqox-Taseko study area, where it has not been beetle-killed or clearcut. Whitebark pine (*Pinus albicaulis*) prevails at higher elevations, often mixing with lodgepole pine and other tree species.

The following narrative is based on a background literature review; three reconnaissance-level field surveys of whitebark pine stands in the middle Dasiqox area (Sept. 2012 and 2013, and Oct. 2013); interviews by Alice William of some Xeni Gwet'in elders for the 2012 Xeni Gwet'in Aboriginal Funds for Species at Risk (AFSAR) study; and authoritative traditional use information on whitebark pine provided by Linda Smith (Yunesit'in) and Alice William (Xeni Gwet'in). Some background information was obtained from the website of the Whitebark Pine Ecosystem Foundation (www.whitebarkfound.org) and its Canadian director, biologist Randy Moody. Another good source of information is the US Northern Rocky Mountain Science Centre (www.nrmsc.usgs.gov/research/whitebark.htm).

An initial background review of the occurrence and status of whitebark pine for the 2012 Xeni Gwet'in AFSAR study suggested that the Xeni Gwet'in aboriginal/wild horse preserve, including higher elevation areas of the mid-upper Dasiqox-Taseko watershed, has perhaps some of the most extensive and healthiest stands of whitebark pine surviving in western Canada. Unlike the California bighorn sheep in the Xeni Gwet'in area that are at the northernmost extremity of the western range of distribution in North America, whitebark pine range extends for a considerable distance northward of the Xeni Gwet'in aboriginal/wild horse preserve. During the 2012 AFSAR study, it was also determined that whitebark pine is federally listed as endangered in Canada. It is

an important food for grizzly bears and a host of other wildlife, including the “pine crow,” or Clark’s nutcracker. Interviews of Xeni Gwet’in elders by Alice William and Norman William for the 2012 AFSAR project showed that pinenuts are also an important traditional First Nations food.

For all of these reasons, we felt that whitebark pine was an important cultural keystone and focal species to include in this study. Thus in September-October 2013, we spent some time in the field aging a number of very old-looking whitebark pine trees, photo-documenting some of the stands. and carrying out some field reconnaisance to better understand the role pinenuts play in grizzly bear foraging ecology during the fall salmon-feeding period. Authoritative researchers, Linda Smith (Yunesit’in) and Alice William (Xeni Gwet’in), provided a detailed description of the importance of whitebark pinenuts, both historic and present, to First Nations.

4.2.11.2 Occurrence and status of whitebark pine in the Dasiqox-Taseko study area

Preliminary map and field surveys show the unprotected lands in the Dasiqox-Taseko study area have extensive stands of whitebark pine that should be considered a priority focal and cultural keystone species for protection outside of the existing adjacent provincial parks, where it also occurs.

In the United States, major declines of whitebark pine from the alien white pine blister rust, mountain pine beetle, and wildfires have triggered a high level of conservation concern that includes recovery plans and much more detailed inventory and research than in Canada. (More information can be found at www.fs.usda.gov/detail/r1/plants-animals/?cid=stelprdb5341541).

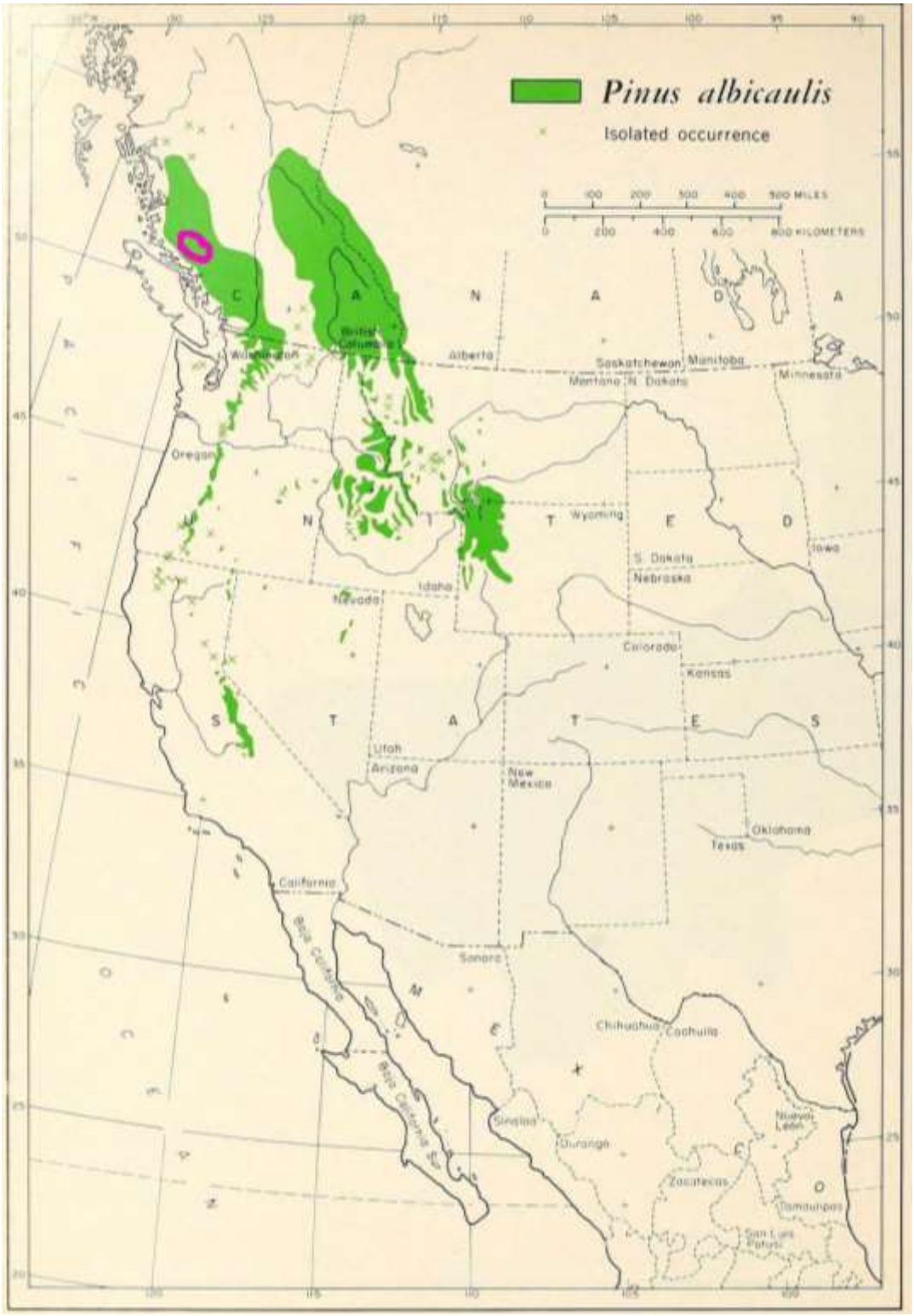
According to the Whitebark Pine Ecosystem Foundation, threats to the species in BC include white pine blister rust, seral replacement attributed to fire suppression, mountain pine beetle, and climate change. Because whitebark pine is in serious decline throughout much of its range, the species is listed as endangered on the IUCN Red List of Threatened Species (also known as the IUCN Red List or Red Data List). In Canada, it was federally elevated in 2010 on SARA Schedule 1 to endangered status by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2010), and blue-listed (vulnerable) by the province of BC. Currently, a proposed federal recovery strategy is under review and there is no provincial recovery strategy.

Figure 17. Ribbons of high elevation whitebark pine stands in rugged terrain at the head of Falls River, a tributary of the Dasiqox-Taseko River. This hardy member of the pine family is able to grow and survive in very rugged mountainous terrain. Many of these trees likely got their start from seeds cached by Clark's nutcrackers. This photo was taken on October 12, 2013, from the upper road to the Pellaire Mine, which was built through an extensive stand of whitebark pine. Here there were fresh tracks of at least two grizzly bears, along with a number of scats, all with the small broken shells of whitebark pinenuts.

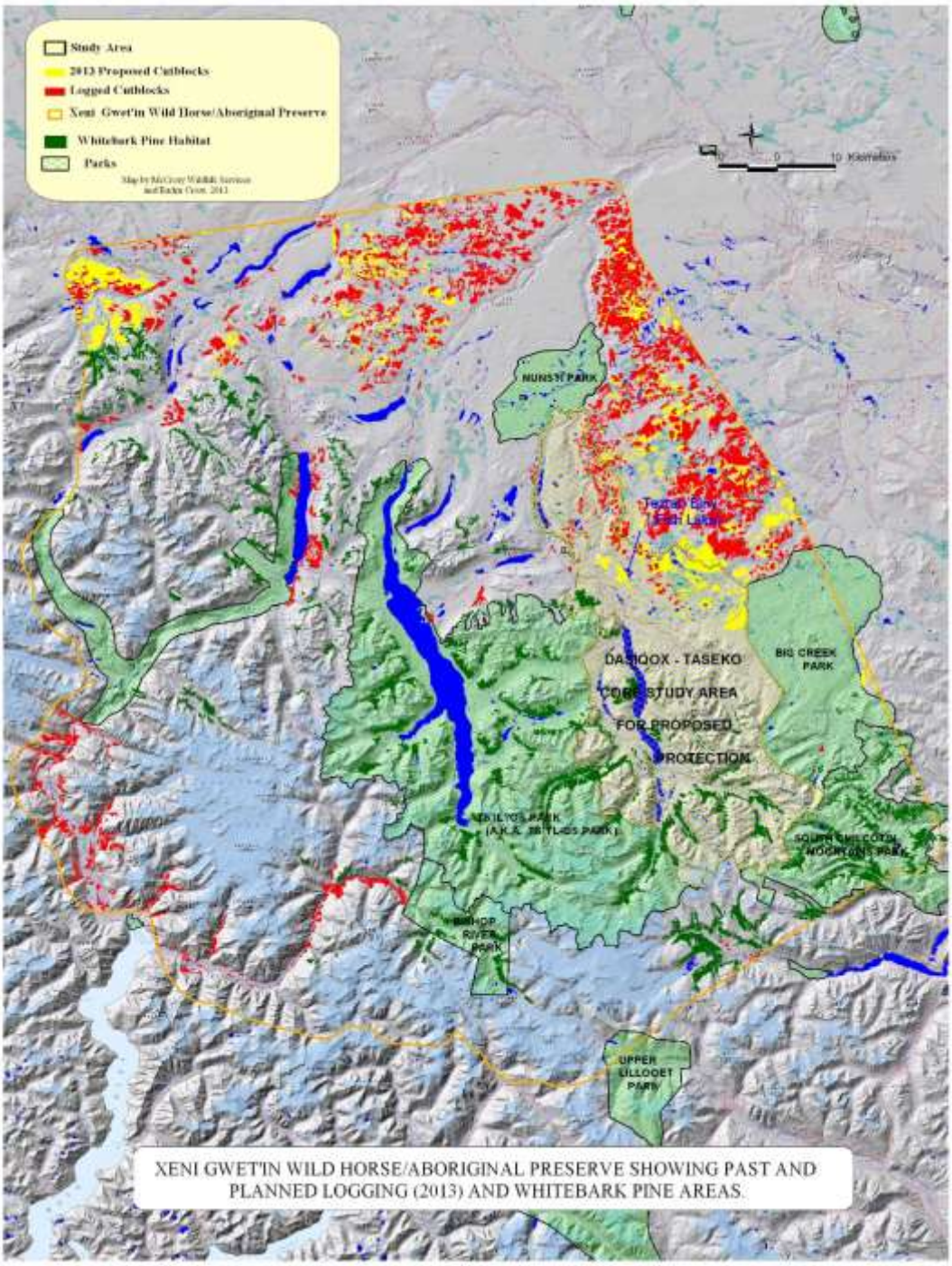
In its North American distribution, whitebark pine stands in the Dasiqox-Taseko occur in about the middle (pink) of the western range portion of the area "C" on Map 19.

Large areas of mountain forest with whitebark pine occur throughout the Xeni Gwet'in aboriginal/wild horse preserve (Map 20).

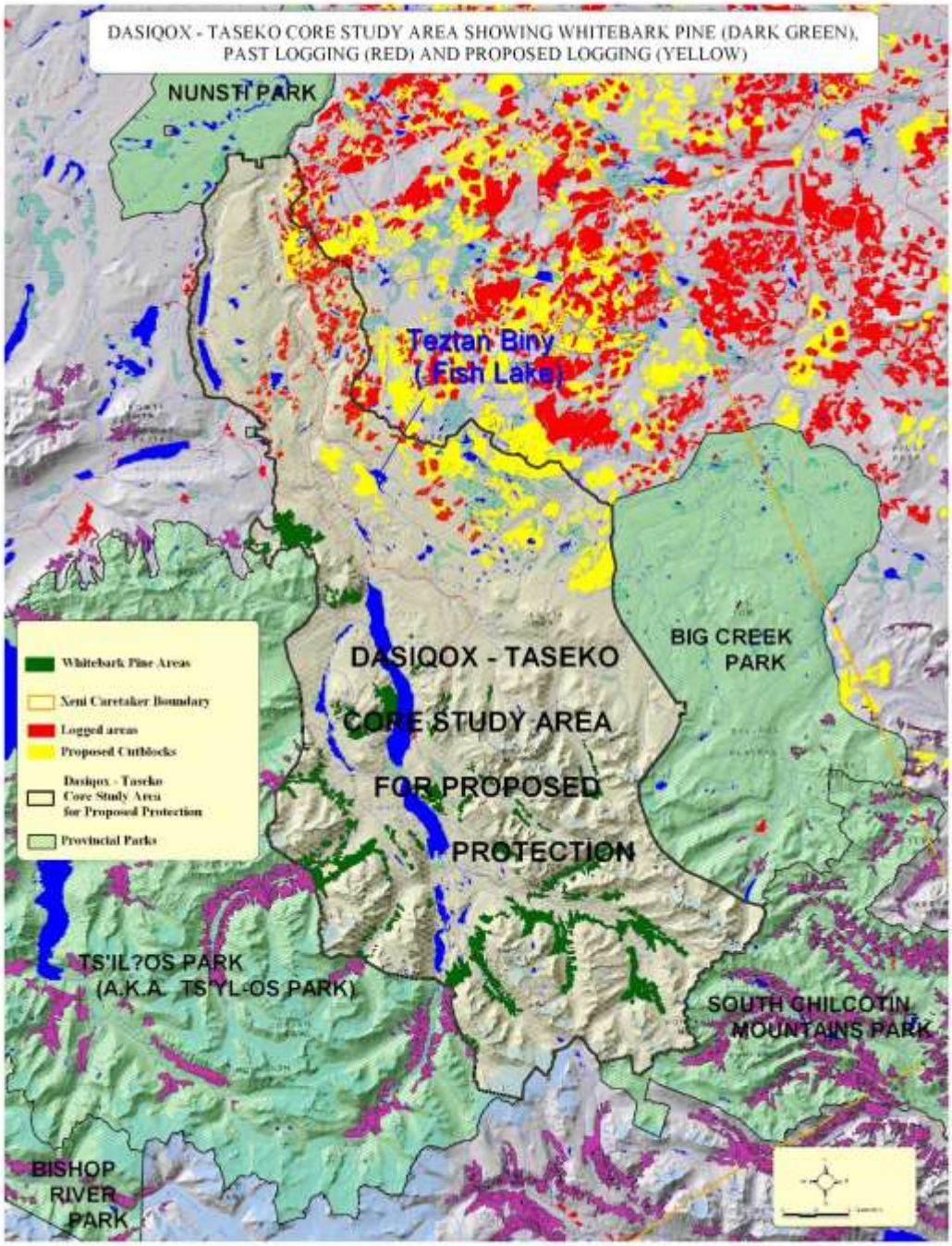
Despite the Xeni Gwet'in declaration of an aboriginal/wild horse preserve, the provincial government continues to allow clearcut logging that we estimate affects the ecological integrity of 16% of the total area of the preserve. Map 21 shows the incursions being made by clearcut logging.



Map 19. Pink area shows approximate location of Dasiqox-Taseko whitebark pine area in relation to distribution of the species in North America (green) (Critchfield and Little. 1966)



Map 20. Map showing the distribution of forest stands that include whitebark pine (dark green) within the Xeni Gwet'in aboriginal/wild horse preserve (yellowish line). According to Randy Moody (pers. comm.): based on observations made by foresters and biologists throughout BC, it is believed that some of the most intact and *functioning whitebark pine ecosystems are present in the Chilcotin Region in that the trees are generally healthy, large cone crops are still produced, and a large number of wildlife species still feed on these cones.*



Map 21. This overall map shows that past logging (red) and proposed logging (yellow) appear to have been limited around whitebark pine areas but proposed logging will start impacting more areas if allowed to proceed. Dark green shows the stands that include whitebark pine within the Dasiqox-Taseko study area while light purple shows stands that are protected in adjacent provincial parks. Nunsti Park has no whitebark pine while Big Creek Park has only a few small stands.

Amount of forests with whitebark pine as a component in the Xeni Gwet'in Aboriginal/Wild Horse Preserve or Caretaker Area (XGCA), Dasiqox-Taseko protection study area, and adjacent provincial parks

We used Map 20 to determine how much forest with whitebark pine is found in the area.

As we can see from Table 2, the Xeni Gwet'in wild horse/aboriginal preserve (1,471,020 ha) has an estimated 50,952 ha of forest that has whitebark. Of these stands there is only a small portion (748 ha) where whitebark is considered to the number one leading species. Of the overall 50,952 ha of forested areas with some component of whitebark pine in the wild horse/aboriginal preserve, some 67% is protected in four provincial parks while some 20% is in the Dasiqox-Taseko protection study area not currently protected by provincial legislation but rather by Xeni Gwet'in aboriginal decree.

Table 2. Forests with whitebark pine in the Xeni Gwet'in aboriginal/wild horse preserve, Dasiqox-Taseko core protection study area, and adjacent four provincial parks

Area	Total size (ha)	Stands with 100% whitebark pine (ha)	Mixed conifer stands with whitebark (ha)	Total stands with whitebark pine (ha)	Stands with whitebark pine as % of total in wild horse preserve
a). Xeni Wild horse/ aboriginal preserve	1,471,020	748	50,204	50,952	100%
b). Non-park areas in preserve					
Dasiqox-Taseko Core Study Area	184,794	22	10,113	10,135	20%
Other non-park areas	906,335	?	6,710?	6,710	13%
c). Class A provincial parks with whitebark pine					
Ts'yl-os Park	235,366	304	18,836	19,140	
Big Creek Park	67,972	0	365	365	
S. Chilcotin Mtn. Park	56,795	294	12,565	12,859	
Bishop River Park	19,758	0	1,743	1,743	
Total in Class A Parks	**379,891**	**598**	**33,509**	**34,107**	**67%**

4.2.11.3 Tsilhqot'in cultural/heritage values

Whitebark pinenuts throughout much of the North America range of the species is well known as an important food resource for First Nations. The following firsthand narratives were provided by Alice William from interviews of elders for the AFSAR study:

Norman William*: Sometimes they grow more and there are lots, just like strawberries, one year there are plenty and the following year there's none. The years that the whitebark pine cones don't grow back in abundance are probably because of drought and climate change. If there's deep snow, the cones will grow back more. Clark's nutcrackers are noisy when they have lots of cones and nuts to eat, and very quiet when there's very*

few. Sometimes the trees get very black when it's loaded with cones. I saw them like this one year on Nemiah Mountain in 2010. Mom and dad ate them fresh after it's picked. You can't store them because they dry up and split.

***Joanne William**: Our family called the whitebark pine cones "ets'imagwel", different than what others called them. We picked some around the hillsides of Dasiqox-Taseko Lake (Dadiyli-yex). We also picked them on the way from Dasiqox-Taseko Lake Lodge (Whitewater Lodge at that time). There are ets'imagwel-chen (whitebark pines) on the hillside before you get to the meadows. Dad would go hunting into the mountains and come back with bagfuls of them in late August before the seeds got too hard. The family would sit around the campfire waiting for the cones to cook. We ate the cones fresh right from the tree into hot ashes, or set them by a hot fire to cook. It was a treat for us, and just like candy, dad used to like saying about anything he liked.*

***Alice M. William**: I was 11 years old. I worked and helped my brothers, sisters, and my mom and dad to harvest hay in the summer and fall around Little Fish Lake (Yanah Biny). The weekend came along and tomorrow was Saturday. Dad told us 'Joanne and Alice you are coming with me up to Nabis'. Morning came early like it did every other morning. Dad didn't tolerate late sleep-ins for anyone, there were horses to look after. We rode to Nabis and dad said: 'This is an old ?esggidam trail.' Later on, I would come to realize that this trail branched off to Big Creek, to Lillooet, to Ashcroft, and to upper Dasiqox-Taseko. It was used for hunting hoary marmots, mountain goat, California bighorn sheep, big buck deer, berry picking, and some medicine plants that grow in the mountainous regions. These trails were also used for attending cultural events and gatherings. We rode the trail up to the top of Nabis. There is a creek that comes down from the top through a gully, which you can see from a distance. Dad left us and said 'I am leaving you here and you can pick est'imagwell.' We looked up at the big whitebark pine trees and the est'imagwell were too high for us to pick off. We proceeded to climb and try to pick them all the while breaking branches and falling back down, which we thought was hilarious. We climbed the big branches and were having a hard time getting the cones. We laughed, we screamed, we hollered, and dad came back. Dad said 'You are making so much racket that I can't find a deer to shoot,' although he had shot some hoary marmots. He took his .22 and shot the cones off the branches for us, and we filled our bags. We packed up and headed back down the trail. On the way, I spotted some deer in the trees and said, 'There's some deer over there!' Dad got off his horse and shot one deer. He cut them up into quarters and distributed them in packs on all the horses. It got dark before we got back to camp at the side of Wasp Lake. The next day was Sunday, and we enjoyed the roasted est'imagwell and fresh deer meat. I can't remember eating any marmot.*

***Mary Jane William**: We were careful not to eat too many, we were afraid after hearing all the stories from mom and dad about people getting constipated after they ate too much. Dad used to get bagfuls back during August and September. The nuts had a hard shell and were softer on the inside. We ate them right away roasted on top of hot ashes and covered with hot coals. It doesn't store well.*

Figure 18. Whitebark pine cones [Photo: Alice William]

4.2.11.4 Ecology of whitebark pine

Whitebark pine forests have a fascinating ecology. This tree species is far more important as a rich food resource to First Nations and a host of many wildlife species in the study area; more so than other species of coniferous trees primarily because this species produces very nutritious nuts of useable size. Leading pine seed researchers, Lorenz et al. (2008), consider this pine species to be a critical component and keystone species of subalpine ecosystems in western North America, where it contributes significantly to ecosystem function and biodiversity. Unlike other trees species, whitebark pine cones do not disintegrate or break off from the tree, nor do they release their seeds in fall on their own They are dependent on birds and mammals for seed dispersal. Clark's nutcracker, squirrels, and "scatter-hoarding rodents," such as deer mice, all influence the fate of whitebark pine seeds and the ability of this tree species to regenerate (Lorenz et al. 2008).

According to the same authors, the seeds of whitebark pine are larger than the seeds produced by most other conifers that occur within its range. Whitebark pines may not produces cones until they are 50-80 years old. Male cones are pinkish, turning yellow-brown, while female cones are of a deep red to purple colour. Whitebark pines are unusual in that they have heavy wingless seeds that do not open at maturity but remain on the tree for several years with ripened seeds inside. Whitebark pine seeds, because of their large size and high nutrition value, are highly valued as

food by many avian and mammalian granivores (animals that eat seeds). Seeds are rapidly harvested by animals from the cones in late summer and autumn.

Many species of pine, including whitebark, have evolved a process called “masting” in order to preclude widespread predation of seeds by animals. This means that populations of trees synchronize their reproductive activity such that in years of high seed production there are so many seeds that a proportion escapes being eaten by predators, while in years of low seed production, most seeds are predated and some seed-eating animals may not survive or have low reproductive success.

According to Lorenz et al. (2008), there are 11 species of birds and at least eight species of mammals known to utilize the nuts of whitebark pine in North America. Of these, the Clark’s nutcracker and some squirrel species, including the northern red squirrel, account for the majority of nut predation and dispersal. Of all of the species that eat pinenuts, the Clark’s nutcracker is the only species that is considered in the evolutionary scheme of things to be necessary for the effective dispersal of whitebark pine seeds. The bird has a number of special adaptations, including a de-curved and sharply pointed bill for chiselling into cones and extracting seeds, an expandable pouch below the tongue for carrying up to 150 seeds, and strong flight capabilities for locating seeds and taking them to near or distant caches. Nutcrackers start retrieving unripe seeds from cones in July, but only bother to cache them when the seeds start to ripen. Seeds are hidden in a variety of above- and below-ground caches. To cache seeds on the ground, nutcrackers either probe their bills directly into the earth or swipe their bills sideways back and forth on the ground until they have created a small depression. The birds then conceal the seed caches by brushing dirt over the seeds, or by placing twigs and other ground debris on top of the buried seeds.

According to the Whitebark Pine Ecosystem Foundation:

> *Clark's Nutcrackers each cache about 30,000 to 100,000 each year in small, widely scattered caches usually under 2 to 3 cm of soil or gravelly substrate. Nutcrackers retrieve these seed caches during times of food scarcity and to feed their young. Cache sites selected by nutcrackers are often favourable for germination of seeds and survival of seedlings. Those caches not retrieved by the time snow melts contribute to forest regeneration.*

Despite this important role played by Clark’s nutcrackers in helping whitebark pine forests regenerate, human intervention is still needed to help forests recover where serious declines are occurring (http://ecoshare.info/projects/whitebark-pine/).

According to Lorenz et al. (2008): *The central role of nutcrackers in the regeneration of whitebark pine populations cannot be overestimated: the harvest and scatter-hoarding behaviours of Clark’s nutcrackers provide the only mechanism of primary seed dispersal in whitebark pine.* However, despite the association of the evolutionary history of nutcrackers with whitebark pine, these birds can also live without pinenuts. Their range extends beyond habitats where whitebark pine is found. Extensive cone failures can cause migrations of the nutcracker to outside its range.

According to Lorenz et al. (2008) and others, squirrels have a different harvesting and caching system than nutcrackers in that they chew the cones off of the branches, sometimes en masse, and then cache the cones after they mature in late summer and fall. They usually hide whole cones. However, in some cases, they may remove seeds before storage. Squirrels usually store their cones and seeds at a specific site called a “midden.” This is typically an obvious cone storage area with cone debris in association with large live or downed trees, or in a more scattered pattern under piles of brush or logs, or within the cavities of trees.

Red squirrels in the Dasiqox-Taseko study area appear to be more numerous in mid-low elevation conifer forests where whitebark pine is mixed with other species, than at higher elevation where whitebark pine is more the dominant tree. This can be explained by the fact that in mixed stands with whitebark pine, squirrels have a survival advantage by having a variety of cones with seeds available, rather than relying on one tree species. In surveys of winter tracks of red squirrels in the Gunn Valley area, Sopuck et al. (1997) found whitebark pine forests accounted for 18% of total number of tracks counted, whitebark pine/subalpine fir forests showed 47% of the total tracks, and lodgepole pine/whitebark pine forests (in the ESSF biogeoclimatic zone) showed 30%.

Grizzly bears are dependent on these small red squirrels to bring the pine cones down to the ground to their caches, where the bears can feast on the nuts (Robbins et al. 2006). In Yellowstone, grizzly bears obtain nearly all (>90%) seeds by excavating middens of red squirrels (Kendall 1983, Mattson and Reinhart 1997).

The ecology of grizzly bears and whitebark pinenuts is discussed in greater detail further in this narrative. As will be noted, we found that grizzly bears make high use of whitebark pinenuts late in the fall in the Dasiqox-Taseko study area. Spring use has yet to be evaluated, but is likely important since grizzly bears den in the high country where whitebark pine stands can predominate.

The previously quoted observation by Xeni Gwet’in researcher Norman William that whitebark trees have poor cone years is similar to the observations of others. Randy Moody (pers. comm.) notes that in the Chilcotin there appears to be a high cone year followed by a low cone year. According to Kendall (1983), the production of whitebark pine cones and their use by bears varies from year to year in the Greater Yellowstone ecosystem.

4.2.11.5 Age of whitebark pine trees in study area

Despite their stunted nature, very old whitebark pine trees have been reported by the Xeni Gwet’in in their caretaker area. In September 2012, Alice William showed us a very old-appearing whitebark pine tree in a large talus area along the Pellaire Mine Road in Falls River (Figure 19). She also reported seeing other similar-sized large trees in other places. Jessica Setah (pers. comm.) reported very large whitebark trees on Chaunigan Mountain. During field surveys in October 2013, I found very large whitebark pines (>1 m diameter at breast height [dbh]) at high elevations on the mineral claims on the northeast side of the lower Tchaikazan Valley.

In September 2013, Wayne McCrory, VWS director Craig Pettitt, and Xeni Gwet’in researcher Alice William aged a number of large whitebark pines at the rockslide area along the Pellaire

mine road. The largest tree along the road had a diameter of 117.5 cm — by far the largest whitebark pine that we had ever seen during our many years of surveys in western BC ecosystems. Craig Pettitt tried using an increment borer, but the tree was found to have a thin shell with a hollow interior like many of the old western red cedars he has aged in other areas. Three other large whitebark pine trees above the road were then bored and proved to be solid. By using a microscope to count the barely definable growth rings from the core samples, a very slow average growth rate of 26.5 yr/cm was determined. Using this data, the large tree by the road with the hollow interior was estimated to be about 800 years old; several of the ones above the road were roughly 560 years old (Table 3).

Figure 19. Xeni Gwet'in researcher Alice William at 800-year old whitebark pine tree along the Pellaire Mine Road in Falls River. Apparently, the tree was partially bulldozed over during road construction and has now become more horizontal.

Figure 20. Forestry researcher Craig Pettitt boring the same tree with an increment borer.

Table 3. Locations and diameter specifics, and estimated ages of three whitebark pine trees along the Pellaire mine road, September 10, 2013.

Date	Tree #	Locality	Specific Area		Coordinates		Elevation	Diameter
Sept. 10/13	1 (A bore hole)	Pellaire Mine Rd. Falls River	Big Talus Slope lower edge of road		51°07'22.39"N 123°36'31.48"W		1685 m	117.5 cm
Sept. 10/13	1 (B bore hole)	Pellaire Mine Rd. Falls River	Big Talus Slope lower edge of road		51°07'22.39"N 123°36'31.48"W		1685 m	117.5 cm
Sept. 10/13	2	Pellaire Mine Rd. Falls River	Big Talus Slope 20 m above road		51°07'22.60"N 123°36'32.38"W		1695 m	98.5 cm
Sept. 10/13	3	Pellaire Mine Rd. Falls River	Big Talus Slope 20 m above road		51°07'22.74"N 123°36'32.50"W		1698 m	84 cm
Tree #	**Dist. from ground of borer**	**Core length**	**Bark width**	**Wood Core Length**	**age on core**	**Average yrs/cm**	**Growth rate last cm to pith yrs/cm**	**Potential Tree Age**
1 (A bore hole)	170 cm	9.25 cm	0.2 cm	9.05 cm	195 yrs	21.55	23	800 yrs
1 (B bore hole)	170 cm	6.8 cm	0.3 cm	6.5 cm	223 yrs	34.31	54	800 yrs
2	170 cm	33.2 cm	0.4 cm	32.8 cm	451 yrs	13.75	7	560 yrs
3	170 cm	29.3 cm	0.0 cm	29.3 cm	491 yrs	16.78	6	567 yrs

4.2.11.6 Black bear use of whitebark pinenuts

Black bears are present in the study area but numbers are not known. According to Alice and Norman William (pers. comm.), black bears also make some use of pinenuts where available. Raine and Kansas (1990) found that black bears in Banff National Park made use of high elevation whitebark pinenuts and bearberry (kinnikinnick) in the late fall. The average elevation at which collared black bears were detected was 1,818 m. Kendall (1983) reported that both black bears and grizzly bears use pinenuts in Yellowstone National Park and adjacent areas, and that they often used the same middens in the same areas. Kendall found no evidence that black bears climbed trees or broke off cone-bearing limbs to obtain cones.

4.2.11.7 Background on importance of whitebark pinenuts to the annual diet of grizzly bears

Our field surveys suggest that whitebark pines and pinenuts are as important to the diet and survival of grizzly bears in the study area as in Yellowstone National Park. Field surveys in Sept. 2012, Sept. 2013, and Oct. 2013 showed that grizzly bears used whitebark pine forests in the study area for bedding, mark/rub trees, feeding on cambium, and, in particular, searching out whitebark pine cones and seeds in red squirrel caches and eating the pine seeds. Although field time was limited and sample transects were small, our two September field trips suggested very limited grizzly bear use of pinenuts during the first two weeks of September in each year. This could be related to low cone production in 2012, the pinenuts possibly not being seasoned enough, and the bears at that time being more focused on salmon than pinenuts. Considerable more evidence of pinenut feeding by grizzly bears was observed in late October 2013. This high degree of bear use suggested a year of high cone production, but this was not quantified. While more study is needed, the preliminary field surveys indicate that pinenuts are very important to the diet of Chilcotin grizzly bears in the late fall in some years. Pinenuts are likely also very important during the post-denning period in the spring.

Background studies in Yellowstone National Park give us some strong clues as to how valuable pinenuts are to the well-being of Chilcotin grizzly bears. Over eons, grizzly bears in both North America and Europe have learned that whitebark pinenuts are high in fat and protein content, and can contribute a rich source of calories during fall, when bears are building up the layers of fat necessary for the long winter hibernation (Mattson and Reinhart 1994); as well, pinenuts can be an important food source in spring after denning (Kendall 1983). According to researchers in Yellowstone (Robbins et al. 2006):

> *Female bears that have fattened during the previous fall on good pinenut crops typically produce litters of three cubs, compared to twins or singletons after falls of few nuts. The link between increased cub production and great pinenut years occurs because fatter females produce more cubs that are born earlier in the winter den and grow faster because mom produces more milk. The average (290-lb) adult female grizzly bear in Yellowstone can gain as much five pounds/day when feeding on pinenuts, which are 28% fat. The amount of fat accumulated in a single day of feeding on abundant pinenuts in the fall can meet the needs of a hibernating adult female for five days if she has cubs, or for nine days if she does not.*

Researchers in Yellowstone National Park found that during years of abundant cone crops grizzly bears foraged almost exclusively on pine seeds (Mattson et al. 1992). As noted, grizzly bears obtained pinenuts mostly by raiding middens of red squirrels. No grizzly bears in Yellowstone were found to climb trees or break off limbs to get cones. In the Chilcotin, Randy Moody quotes Y. Patterson (pers. comm.) that there are indications that some grizzly bears climb trees to reach cones.

As noted elsewhere in my report, a stable isotope study of hair and blood samples collected from grizzly bears in the Greater Yellowstone Ecosystem (Felicetti et al. 2003, 2012) showed that grizzly bear survival is strongly linked to variations in availability of whitebark pinenuts. Using the distinctive sulphur-isotope signature for pinenuts (that is different from all other food items used by grizzly bears), the researchers found that during years of poor pinenut availability, 72% of the bears made minimal use of pinenuts. During abundant years, 8± 10% of the bears made minimal use of pinenuts, while 67± or 19% derived over 51% of their assimilated sulphur and nitrogen (i.e., protein) from pinenuts.

Today, the South Coastal Mountains of British Columbia are one of the few regions left in North America where grizzly bears still fatten in the autumn on a combination of whitebark pine, salmon, berries, and other food resources. Salmon and grizzly bears have been eliminated in many other areas of western North America where whitebark pine occurs. Chilcotin grizzly bears would have a major survival advantage by having access to both salmon and whitebark pine seeds during the fall pre-denning period of 30% weight gain.

4.2.11.8 Observations of grizzly bear use of whitebark pinenuts by grizzly bears in the Dasiqox-Taseko study area

The following is from three field surveys in September 2012, September 2013, and October 2013.

In the Gunn and Yohetta valleys in our study area, Normal William, Alice William, and Tom Dillabough (pers. comm.) have made long-term observations in the high country of sites where grizzly bears had dug out squirrel middens to get whitebark pinenuts. Sopuck et al. (1997) also observed where grizzly bears had dug out whitebark pinenuts cached in squirrel middens in the Gunn Valley area during their inventory of red- and blue-listed species and identified wildlife in the Dasiqox-Taseko Special Resource Management Zone.

During our fall field surveys in Gunn Valley and surrounding areas, we observed very little black bear sign; most bear use was consistently by grizzly bears, including that associated with scats containing pinenut residue. However, some of the scats observed on the roads could have been from black bears. For purposes of analysis, we assumed all scats were from grizzly bears.

Grizzly bear use of squirrel caches was inferred from the presence of scat, tracks, and hair on mark trees in the vicinity of cache sites that were dug out. Most of the caches were along the lower edge of mine roads where squirrels had been making their cone/seed caches in rock debris and logs pushed over the edge during road construction. Only a few short transects were done off-road in forests with whitebark pine.

During our September 2012 field surveys for the Xeni Gwet'in AFSAR study, the only whitebark pine reconnaissance survey was on September 12, 2012, along the Pellaire Mine road in Falls

River. Most of the survey involved photo-documentation of different whitebark pine stands for occurrence and evidence of disease (browning). We saw only a small number of dead or browned whitebark pine trees. Three fresh bear scats were observed on the road at this time, and inferred to be from grizzly bears. One scat was 100% crowberry, one was 10% soopolallie and 90% grass/sedge, and the other was 100% pinenut residue.

A similar survey on the same mine road a year later (September 10, 2013) revealed four summer scats comprised of green vegetation, but no fall scats with whitebark pinenut content. There was a fresh grizzly track and a scat comprised of bearberry/soopolallie at the Pellaire Mine camp. Surveys of all or most of the other roads in the Gunn Valley area at this time, including the road to whitebark pine stands on Mt. Vic, also showed no whitebark pinenut scats. One scat (assumed to be from a grizzly because it was in the alpine) was found on the goat trail above treeline on Mt. Vic and was all green plant matter.

Later, in fall 2013 (Oct. 12-19), road surveys in the study area showed more evidence of bear scats with whitebark pinenut content than the early September of both years, particularly at mid-high elevations. For example, on October 12, while doing a survey on the east side of Lower Dasiqox-Taseko Lake, we saw two grizzly bear scats on the abandoned mine road about ½ way between Beece Creek and Red Mountain; one was comprised of bearberry fruit and the other of whitebark pinenut shells.

In October 2013, more surveys were done of higher elevation whitebark pine stands on the west side of lower Dasiqox-Taseko Lake. During this period, I observed 21 different bear scats, most of which appeared to have been deposited during early October. Judging by tracks in the area, most scats had been deposited by grizzly bears. A total of 19 of the 21 scats were comprised of whitebark pinenut shells, while two contained green plant matter. This indicated that pinenuts were the dominant food for grizzly bears in these areas during the middle of October. Additional supporting evidence is that fresh and recent grizzly bear tracks were observed in the snow at all three of the higher elevation whitebark pine stands we surveyed on different mine roads on different mountains. Two adult grizzly bear tracks were observed in whitebark pine habitat on the mine road between the Pellaire mine camp and the upper mine site. One of these tracks was observed at treeline. Along mine roads in the lower Tchaikazan Valley, tracks indicated a large adult grizzly had been feeding on whitebark pine cones dug out of shallow squirrel caches under rocks and small dead logs near the lower road (1621 m) (Figures 21, 22). The lower road had whitebark mixed with sub-boreal lodgepole pine and spruce, and a red squirrel midden had cones from all three species. The different sizes of whitebark pine scats suggested a mother grizzly and cub had been feeding on whitebark pinenuts at squirrel caches along the upper (abandoned) mine road near treeline (1927 m) (Figure 23). Approximately eight fresh grizzly bear diggings were observed along about ½ km of this upper mine road, along with at least eight from the previous year. Most of these were small excavations into the spoil bank just below the road bed and associated with rocks and/or logs. At none of these did I observe whitebark pine cone scales or other cone debris. Similar digging activity was noted along the upper mine road on Mt. Vic, where it passes for 1.5 km through upland whitebark pine forest. Tracks of three grizzly bears (one adult and one female with subadult) bears were observed in whitebark pine areas high on the Mt. Vic access road.

All of the whitebark pine scats observed during our field surveys were comprised of nut shell fragments and, possibly, what appeared to be small amounts of pine scales. I saw no evidence that grizzly bears were eating the whole cone. I also did not observe any discarded cone central stalks. There were very few scale remains at any of the small number of excavations at what appeared to be red squirrel cone caches. Kendall (1983) reported on feeding trials of whitebark cones by four captive grizzly bears and three black bears. Both species used similar means of obtaining nuts from the cones by either biting or stepping on the cones. Cone debris was then spread around with a paw or muzzle and the nuts licked up. The bears retained the nuts in their mouth while expelling the cone scales from the side. Grizzly bears were found to eat the nuts from all whitebark pine cones given to them, and showed no preference between resinous cones of the year and old, often mouldy cones that had been cached in a midden for one year. Also, none of the scats collected from these feeding trials contained cone debris, but just the fragments of the shells of the nuts.

4.2.11.9 Grizzly bear use of whitebark pine for mark/rub trees

My long term observations of grizzly bear mark trees in many ecosystems is that the bears don't appear to select one conifer species over another, so it was not surprising to find they used whitebark pine along with sub-boreal lodgepole pine and white spruce in the Dasiqox-Taseko study area. During field surveys one grizzly bear whitebark pine mark/rub tree was found.

Figure 21. Fresh grizzly bear diggings for whitebark pine cones at squirrel caches near the lower mine road in the Tchaikazan Valley (1621 m). Here the caches were in a mixed forest with cones of Lodgepole pine, spruce and whitebark pine at squirrel middens.

Figure 22. Diggings by grizzly bears for what appear to be whitebark pine cone and nut caches by squirrels along the old mine road at high elevations in the lower Tchaikazan Valley (1927 m). October 2013.

Figure 23. Typical whitebark pine grizzly bear scat comprised mostly of the broken shells of pinenuts.

Figure 24. Family of grizzly bears in whitebark pine stand in autumn in Nemiah high country. The bears likely had moved up to feed on whitebark pinenuts after the local salmon runs were over. [Photo: Sam Zirnhelt]

The behavioural explanation for bears establishing and repeatedly using mark trees is not well understood. My long term research in Kakwa Provincial Park (McCrory 1993) suggested (from remote camera photos) that grizzly bears use specific trees as rubbing/scratching posts but also more likely as territorial marking posts where, when they leave their individual body scent behind on the tree trunk from the rubbing action, the next bear(s) that comes along can recognize what other bears have passed through. On a number of occasions, we recorded images from remote camera data of grizzly bears sniffing studiously at the mark tree before rubbing/marking themselves. Additionally, by limbing a tree in a trail-clearing project in the park, grizzly bears started a new mark tree by rubbing on the branch stubs.

4.2.11.10 Grizzly bear use of whitebark pine trees for cambium feeding

Although feeding on pinenuts is the primary use of this tree species, we also noted several whitebark pine trees that had their bark partially stripped near the base where bears had fed on cambium; normally such activity is done in the spring. Several whitebark trees at high elevations in the lower Tchaikazan valley also showed bark scarring typical of winter feeding by porcupines.

Figure 25. Large whitebark pine along Pellaire mine road in Falls River used by grizzly bears as a mark tree. Elevation: 1685 m. Hair collected from the tree in September 2012 was determined to be from an adult female grizzly bear not detected previously in the two major DNA studies in the region.

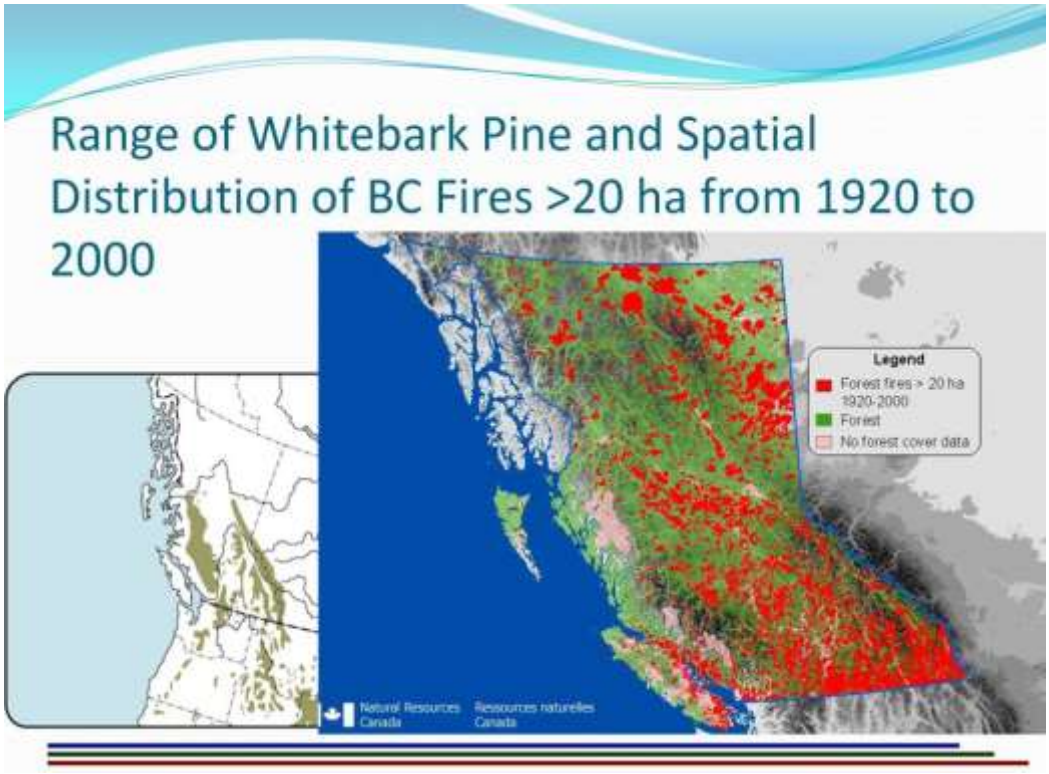
4.2.11.11 Whitebark pine and wildfires

Whitebark pine stands are susceptible to wildfires. One of the concerns is how fire suppression over the decades has affected their ecology. Large-scale wildfires in other regions of BC have burned into whitebark pine stands killing mature seed-producing trees. In order to balance seed production with recruitment needs, mixed-severity fires that burn off competition while retaining mature trees on site is most desired. It is important to ensure that whitebark pine stands are included in fire management plans so that they may be considered during wildfire suppression activities. The following map (Map 22) indicates there have been some natural fires in whitebark stands in BC.

Figure 26. Broken stubs on this small lodgepole pine tree used for marking by grizzly bears along abandoned mine road at high elevation in lower Tchaikazan Valley. N 51 10.921 W 123 39.766. Elevation: 1943 m.

4.2.11.12 Whitebark pine conservation

Obviously, a large proportion of forests with whitebark pine as one of the species in the Xeni Gwet'in aboriginal/wild horse preserve is already protected in the four BC provincial parks surrounding the Dasiqox-Taseko study area. So far, our whitebark pine map (Map 21, p. 102) for the study area shows that logging of lodgepole pine forests across the Chilcotin Plateau has hardly started to invade low-mid elevation areas where whitebark pine is mixed with commercial tree species, such as spruce and lodgepole pine. In my opinion, too little is known for forestry interests to consider that logging of whitebark pine stands be considered a surrogate for wildfires. The influence on whitebark pine stands of clearcutting large areas adjacent to them does not appear to be known. However, the influence of logging roads on grizzly bear use of whitebark stands should be considered a potentially negative threat.



Map 22. BC wildfire map showing extent of forest fires (red) from 1920-2000 that would have burned some whitebark pine forests (green areas on map insert, left). Map from Ed Korula 2013. BC MFLNRO Fire Management Planning. Whitebark Pine Recovery Planning Workshop.

The Genetic Conservation Technical Advisory Committee (Forest Genetics Council) for BC (2009) provides the following conservation overview:

> *For long-term population sustainability, it is important to preserve gene flow via population and habitat connectivity. This can be addressed simply for most whitebark pine populations by maintaining large, contiguous tracts of mountain parks that facilitate bird dispersal (Lanner 1982; Richardson et al. 2002), as long as populations do not decline to the point where birds relocate to other habitat types (McKinney and Tomback 2007). Ensuring available habitat to support population persistence and continued environmental adaptation under climate change will likely require both active and passive management. Active management may include controlled burns or thinning other species to free up sites for whitebark pine regeneration and stand development. Passive management includes a "let-burn" policy in high-elevation ecosystems where there is no danger to human life or livelihood.*
>
> *Given projected impacts of climatic change on these highly susceptible subalpine ecosystems (Hamann and Wang 2006), the current extent of whitebark pine ecosystems is expected to decline drastically over the medium to long term (Campbell 2008). Various community types and disturbance agents will be impacted differently by climate change. Identifying the expected impacts will identify the most vulnerable ecosystems and populations.*

The report recommends: Maintaining a large enough number of surviving individuals and populations from diverse habitats in protected areas is the best way to ensure that the genetic diversity of the species persists.

Obviously, protection of the Dasiqox-Taseko study areas would have a high conservation advantage by protecting another 10,000+ hectares of pristine forests with whitebark pine.

The main threats to whitebark pine require proactive management, or at least monitoring, to ensure that this area, which likely has some of the most intact whitebark pine stands in its entire range, remains in such a state. Establishing forest health monitoring plots while introducing restoration practices, such as seed collections and habitat restoration, are starting points to ensuring the future of whitebark pine in the region. Whitebark pine specialist Randy Moody (pers. comm.) has proposed a whitebark pine recovery program for the Xeni Gwet'in wild horse/aboriginal preserve area. To the south, the Fish and Wildlife Compensation Program is funding a project by the Lillooet Tribal Council for whitebark pine restoration in wildlife areas, including forage for grizzly bears. This involves replanting whitebark pine from seed collected in 2010. (http://www.bchydro.com/content/dam/BCHydro/customer-portal/documents/corporate/environment-sustainability/fwcp/coastal-project-list-2013.pdf).

Literature Cited or Consulted for Section on Whitebark Pine

Courmouzis, C., A. Hamann, A.D. Yanchuk, and S.N. Aitken. 2004. Forest tree genetic conservation status report 1: *In situ* conservation status of all indigenous BC. species. Co-published by UBC Centre for Forest Conservation Genetics, Forest Genetics Council, and BC Min. For. Range. BC Min. For. Range Tech. Rep. Victoria, BC. In review Forest Genetics Council of British Columbia [FGC]. Strategic plan.

Critchfield, W.B., and E.L. Little. 1966. Geographic distribution of pines of the world. Misc. pubn. no. 991. U.S. Department of Agriculture and Forest Service. http://commons.wikimedia.org/wiki/File:CL-05_Pinus_albicaulis_range_map.png. Last accessed Nov. 23, 2013.

Felicetti, L.A., C.C. Schwartz, R.O. Rye, M.A. Haroldson, K.A. Gunther, D.L. Phillips, and C.T. Robbins. 2003. Use of sulfur and nitrogen stable isotopes to determine the importance of whitebark pinenuts to Yellowstone grizzly bears. Can. J. Zool. 81: 763-770.

Felicetti, L.A., C.C. Schwartz, R.O. Rye, M.A. Haroldson, K.A. Gunther, D.L. Phillips, and C.T. Robbins. 2012. Use of sulfur and nitrogen stable isotopes to determine the importance of whitebark pinenuts to Yellowstone grizzly bears. US Geological Survey, Northern Rocky Mountain Science Center. gcmd.nasa.gov/records/GCMD_NRMSC_sulfurnitrogenstableisotopes.html. Accessed December 3, 2013.

Genetic Conservation Technical Advisory Committee (Forest Genetics Council). 2009. Genetic conservation strategy for whitebark pine in British Columbia.

Hilderbrand G.V., C.C. Schwartz, C.T. Robbins, M.E. Jacoby, T.A. Hanley, S.M. Arthur, and C. Servheen, 1999. The importance of meat, particularly salmon, to body size, populations productivity, and conservation of North American brown bears. Canadian Journal of Zoology, 77, 132-138.

Kendall, K.C. 1983. Use of pinenuts by grizzly and black bears in the Yellowstone area. International Conference on Bear Research and Management. International Bear Association, Madison, Wisconsin.

Kendall, K.C., and S.F. Arno. 1990. Whitebark pine - an important but endangered wildlife resource. Pages 264-273 In: W.C. Schmidt and K.J. MacDonald, compilers. Proceedings–Symposium on Whitebark Pine Ecosystems: Ecology and Management of a High-Mountain Resource. 29–31 Mar. 1989, Bozeman, Montana, USA. USDA Forest Service General Technical Report INT-270.

Kendall, K.C., and R.E. Keane. 2001. Whitebark pine decline: Infection, mortality, and population trends. In Tomback, D.F.; Arno, S.F.; Keane, R.E. Whitebark pine communities: ecology and restoration. Washington, DC.: Island Press. pp. 221–242.

Lee, I. 2002. The whitebark pine: keystone specie in peril. Final Paper ES 416 Ethnobotany. For Dr. Nancy Turner, University of Victoria, Victoria, BC.

Lorenz, T.J., C. Aubry, C. and R. Shoal. 2008. A review of the literature on seed fate in whitebark pine and the life history traits of Clark's nutcracker and pine squirrels. Gen. Tech. Rep. PNW-GTR-742. Portland, OR: US Department of Agriculture, Forest Service, Pacific Northwest Research Station. 62 pp. http://nrs.wsu.edu/research/ bear-center/doc/YS%20Bear%20Story.pdf. Accessed December 4, 2013.

Mattson, D.J., and C. Jonkel. 1990. Stone pines and bears. Pages 223-236 In W.C. Schmidt and K.J. MacDonald, compilers. Proceedings–Symposium on Whitebark Pine Ecosystems: Ecology and Management of a High-Mountain Resource. Bozeman, Montana, USA 29–31 March 1989. USDA Forest Service General Technical Report INT-270.

Mattson. D.J., B.M. Blanchard, and R.R. Knight. 1992 Yellowstone grizzly bear mortality, human habituation, and whitebark pine seed crops. J. Wildlife Management 56:432-442.

Mattson, D.J., and D.P. Reinhart. 1994. Bear use of whitebark pine seeds in North America. Pages 212-220 In W.C. Schmidt and F. K. Holtmeier, compilers. Proceedings-International workshop on subalpine stone pines and their environment: The status of our knowledge. USDA Forest Service, Intermountain Research Station, General Technical Report INT-309, Ogden, Utah.

Mattson, D.J., D.P. Reinhart, and B.M. Blanchard. 1994. Variation in production and bear use of whitebark pine seeds in the Yellowstone area. Pages 205-220 In D.G. Despain, editor. Plants and their environments: Proceedings of the first biennial scientific conference on the Greater Yellowstone Ecosystem. US National Park Service Technical Report NPS/NRYELL/NRTR, Denver, CO.

Mattson, D.J. 1998. Changes in the mortality of Yellowstone grizzly bears. *Ursus* 10:129-138.

Mattson, D.J., K. Barber, R. Maw, and R. Renkin. 1999. Coefficients of habitat productivity for Yellowstone's grizzly bear habitat. Technical Report. USGS Forest and Rangeland Ecosystem Science Center, Corvallis, OR.

Mattson, D.J. 2000. Causes and consequences of dietary differences among Yellowstone grizzly bears. Ph.D. Dissertation. University of Idaho, Moscow, ID.

McCrory, W.P. 2003. A bear hazard study of recreational facilities in a major grizzly bear travel corridor with management recommendations to minimize conflicts – A GIS Grizzly Bear Encounter Risk Model. Kakwa Provincial Park, BC. Report to BC Parks. 174 pp.

Raine, R.M., and J.L. Kansas. 1990. Black bear seasonal food habits and distribution by elevation in Banff National Park, Alberta. Bears: Their Biology and Management, Vol. 8, A Selection of Papers from the Eighth International Conference on Bear Research and Management, Victoria, BC, Canada, February 1989 (1990), pp. 297-304.

Reinhart, D.P., and D.J. Mattson. 1990. Red squirrels in the whitebark pine zone. Pages 256-263 In W.C. Schmidt and K. J. McDonald, compilers. Proceedings-Symposium on whitebark pine ecosystems: Ecology and management of a high-mountain resource. USDA Forest Service, Intermountain Research Station, General Technical Report INT-270, Ogden, Utah.

Robins, C.T., C.C. Schwartz, K.A. Gunther, and C. Servheen. 2006. Grizzly bear nutrition and ecology studies in Yellowstone National Park. Yellowstone Science. 2006. Volume 14:3.

Sopuck, L., K. Ovaska, and R. Jakimchuk. 1997. Inventory of red- and blue-listed species, and identified wildlife in the Dasiqox-Taseko Management Zone, July – August, 1996 and February, 1997. Renewable Resources Consulting Services Ltd. Report to BC Min. of Env., Lands and Parks, Williams Lake, BC. 60 pp plus appendices.

Tomback, D.F. 1978. Foraging strategies of Clark's Nutcracker. Living Bird 16:123-161.

Tomback, D.F. 1982. Dispersal of whitebark pine seeds by Clark's Nutcracker: a mutualism hypothesis. Journal of Animal Ecology 51:451-467.

Tomback, D.F., Arno, S.F., and Keane, R.E. 2001. Whitebark Pine Communities – Ecology and Restoration. Island Press. 440 pp.

4.3 LANDSCAPE CONNECTIVITY VALUES OF THE DASIQOX-TASEKO STUDY AREA - ECOLOGICAL AND CULTURAL/HERITAGE CONSIDERATIONS

From a human perspective, no information is usually taken to mean no problem. Yet to make such an inference in the absence of adequate procurement of information can be fallacious. In statistical inference, we refer to this as a type II error. That is, drawing a "no effect" conclusion when indeed there may be an effect. The way to guard against such error is to increase the power of the investigation by increasing the available information. In scientific experiments, this implies increasing experiment rigor, effort and sampling. (http://blog.oceanconservancy.org/2014/01/09/interview-dr-bill-montevecchi-on-oil-and-dispersant-effects-on-birds-wintering-in-the-gulf-of-mexico/)

4.3.1 Background

One of the glaring omissions in BC land use planning for resource development is the classic type II error of ignoring the need to adequately protect wildlife corridors between core habitats that are protected by provincial parks and other designations, and then assuming there is no problem.

One of the obvious conservation attributes of the unprotected Dasiqox-Taseko study area is its strategic landscape position as a major connection zone between five large provincial parks that are semi-isolated from each other. Some of these parks were created about 20 years ago as the outcome of negotiations by different stakeholders involved with the Cariboo-Chilcotin Land Use

Plan or CCLUP (BC Commission on Resources and Environment 1994). The CCLUP identified the need for a regional biodiversity conservation strategy to maintain ecosystem function and species diversity. Although the plan identified the need to identify and maintain linkage zones between protected areas through Forest Ecosystem Networks (FENs) and Special Resource Management Zones (SRMZs), guidelines to meet connectivity objectives were simply never done, including for the Dasiqox-Taseko SRMZ. This SRMZ included most of the west side of the upper Dasiqox-Taseko watershed (outside of Ts'il?os Park) and a portion of the very upper east side above Upper Dasiqox-Taseko Lake.

However, for part of the Dasiqox-Taseko SRMZ, the province did follow through with a study of red- and blue-listed species and "Identified Wildlife"[3] in the Dasiqox-Taseko SRMZ. The study recommended that riparian corridors in Gunn Valley and elsewhere be protected as Forest Ecosystem Networks (FENs) (Sopuck et al. 1997). However, this is as far as it went. At the time, no effort was made to provide large landscape linkage networks beyond the Dasiqox-Taseko SRMZ that would have provided a blueprint for wildlife connectivity between the different provincial parks.

A glance at Map 21 (p. 102) of the study area shows that past and planned roading and logging in the middle Dasiqox-Taseko landscape has continued unabated without the protection of adequate linkage zones, such as between the north end of Big Creek Provincial Park and Ts'il?os and Nunsti provincial parks. This steady incursion of extensive logging and roading increasingly threatens grizzly bear and other wide-ranging animal populations protected by Big Creek Provincial Park, resulting in species becoming more and more isolated from mainstream populations.

The failure by the province to ensure good wildlife connectivity between provincially protected areas is today becoming a commonly recognized land-use deficit and challenge that, if not addressed soon, will impact the ecological integrity of many major parks and conservancies. It is a conservation concern that was recognized by former Environment Minister Terry Lake (pers. comm. with Valhalla Wilderness Society, July 2011), who failed to take an action on the matter while at the helm of his ministry.

However, planning for adequate linkage networks between parks is not just about maintaining the ecological integrity of protected areas for wildlife, it is also about protection of ancient First Nations pathways, such as long-distance trade routes and trails used to access local hunting and food-gathering sites, burial and cremation grounds, traditional camping sites, villages, spiritual areas, and other societal needs. As noted by Xeni Gwet'in knowledge-keeper Alice William, who grew up at the outlet of Dasiqox-Taseko Lake: We rode to Nabis and dad said:

> *'This is an old ?esggidam trail.' Later on, I would come to realize that this trail branched off to Big Creek, to Lillooet, to Ashcroft, and to upper Dasiqox-Taseko. It was used for hunting hoary marmots, mountain goat, California bighorn sheep, big buck deer, berry*

[3] Identified wildlife. Under the BC Forest Practices Code, Ministry of Environment: For the most part, the species and plant communities listed in Identified Wildlife are considered to be at risk (endangered, threatened or vulnerable) and require special management of critical habitats in order to maintain or restore populations or distributions. Critical habitats include breeding, denning or feeding sites. http://www.env.gov.bc.ca/wld/frpa/iwms/strategy_docs/backgrnd.htm

picking, and some medicine plants that grow in the mountainous regions. These trails were also used for attending cultural events and gatherings.

Figure 27. Wholesale clearcut logging and roading incursions north of Big Creek Provincial Park threaten the ecological integrity of protected wildlife populations by destroying natural connectivity across the landscape and forcing some animals to travel through these impacted landscapes to be much more vulnerable to hunting and illegal mortality. (Photo Jeremy Williams)

There is a wholistic approach to wildlife and First Nations cultural/heritage connectivity planning and protection that today is still barely given consideration in resource planning, despite its obvious truth. Such significance actually became increasingly obvious at the two federal CEAA hearings (2010, 2013) convened to examine environmental and social impacts of the proposed open pit mine at Fish Lake (Teztan Biny), which is within the Dasiqox-Taseko study area. This was well expressed by Yunesit'in knowledge-keeper and researcher Linda Smith (2012) at the 2013 CEAA panel hearings:

Now, we must build upon these layers, and create new visions on the land. But, it is impossible to obliterate the horror on the landscapes and see past this, to the purity and the cultural wealth that was there before. How can a Tsilhqot'in create new life and new memories upon what was butchered, and bring new life upon what appears to be dying?...In my mind, everything is connected. We are Nenqayni, and Tsilhqot'in have been connected to their lands for many generations, and Tsilhqot'in elders would say this connection has been there since time began. The land is what makes us complete; it is an extension of our body and our soul; it is what gives us joy; it is what gives us security; it protects us; it feeds us; it comforts us; it heals us; it is Our Mother. We love our land and its life forms. Like an infant away from its mother, most Tsilhqot'in feel lost elsewhere, and we miss our landscapes.

Ancient First Nations travel routes for local uses and long-distance trade crisscross the Dasiqox-Taseko study area, some of them likely going back thousands of years if their age could ever be measured.

Figure 28. Spearhead found by Norman William along ancient First Nations and grizzly bear travel trail between Fish and Little Fish lakes.

Given its biological richness and varied topography, the Dasiqox-Taseko study area has many wildlife corridors and connectivity values in its more or less intact state for a whole host of species that need to be able to move freely about the landscape in order to survive, reproduce, and maintain viable populations. We barely understand the needs of many species in this regard. We also know that maintaining connectivity values in the Dasiqox-Taseko study area between the four surrounding provincial parks (Ts'il?os Nunsti, Big Creek, and South Chilcotin Mountains) is critical to maintaining their ecological integrity and should be a paramount consideration in any land use decisions now and for the future. We do know that some studies show that extensive networks of logging (and mining) roads would seriously impact the existing connectivity values for many species, including the grizzly bear and northwestern toad.

In just scratching the surface of connectivity values for the area, my 2013 review of cumulative effects of the proposed New Prosperity Mine (McCrory 2013) raised serious concerns about how the mine development, when combined with the already extensive and increasing number of logging roads to the north, would negatively affect grizzly bear movements across the plateau, which they need to do in order to access salmon resources. We also know from various DNA studies that the dryland grizzly bear, which has much larger home ranges than coastal grizzly bears, travels long distances, such as between Teztan Biny (Fish Lake) and Tatlayoko Valley and also between Fish Lake and the east side of Chilko Lake-Upper Chilko River. Another study revealed a grizzly bear that had made a long distance movement from the Bridge River area (to the south of our study area) to the Chilko River in the north (Sue Senger pers. comm.).

Additionally, my grizzly bear study showed that the riparian corridor between Teztan Biny (Fish Lake) and Yanah Biny (Little Fish Lake) was an important grizzly bear corridor for local and regional movements (McCrory 2013).

Take also, for example, the breeding and migratory needs of the northwestern toad, which is a federally listed species-at-risk in the area. Adults undergo long distance migrations in the spring from terrestrial habitats to lakes suitable for breeding, such as Teztan Biny (Fish Lake). After

breeding, the adults migrate back to their terrestrial habitats in late summer and fall. At that time, the young toadlets migrate by the tens of thousands from nursery lakes to terrestrial habitats. In some areas where they have to cross highways, the mortality is extremely high (see McCrory 2013).

Other important seasonal migrations in the study area involves some of the California bighorn sheep travelling between their main summer ranges in Ts'il?os Provincial Park to wintering grounds along the Fraser River, and back again in spring. Such movements provide for an important intermingling of different herds on the wintering grounds that helps to maintain the genetic health of the meta-population.

As noted elsewhere in my report, the two seasonal migrations by mule deer occur annually across the vastness of the Dasiqox-Taseko valley between the South Chilcotin Ranges and their wintering grounds at lower elevations along the Fraser River.

So far, there have been only two studies in the Dasiqox-Taseko area that have documented connectivity values and linkage corridors. Sopuck et al. (1997) reported that riparian areas in the Gunn Valley, including those along the Lastman, Tuzcha, and Fishem lakes and the floodplain of the lower Tchaikazan River, along Yohetta Creek and within the Lord River system, were identified as key wildlife habitats because of their relatively high productivity and species diversity, and because of their importance as travel corridors for a variety of wildlife. They also stated that most conflicts between wildlife and human activities, such as logging, were expected to occur in the relatively productive low-elevation areas. Key species identified in these areas were the grizzly bear, wolverine, fisher, and wetland species, such as waterfowl, songbirds, and amphibians. The report concluded that it was critical that habitat areas and travel corridors in the Gunn Valley, Lower Tchaikazan River, and Lord River valleys be maintained relatively intact.

Figure 29. Natural riparian corridors, such as Big Creek, along with Big Creek Provincial Park, provide linkage zones across the landscape for mule deer, grizzly bears, and other wide-ranging species. (Photo Jeremy Williams)

Figure30. Mule deer swimming across Dasiqox-Taseko Lake during annual fall migration to wintering grounds on the Fraser River. (Photo by Alice William)

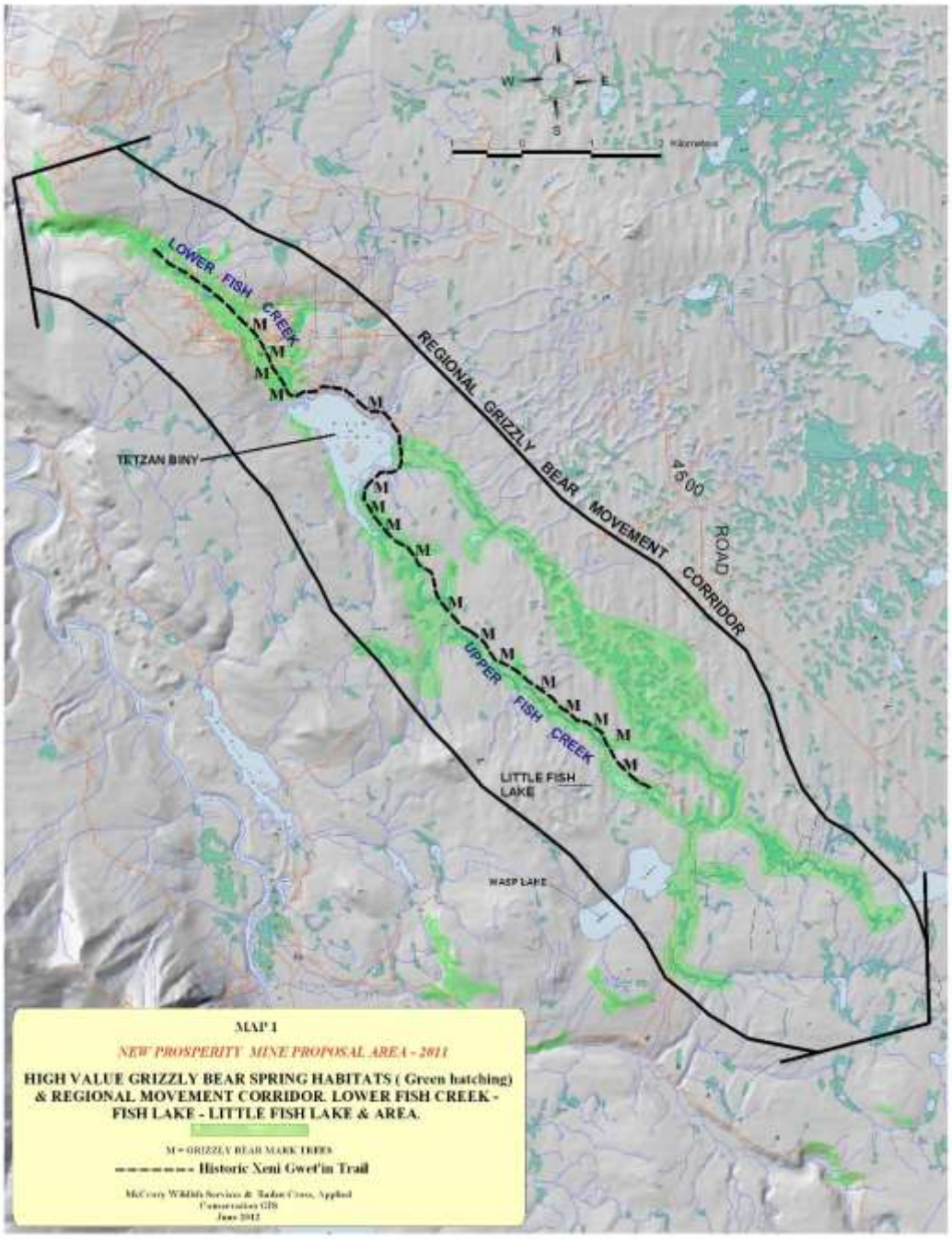
Based on field surveys with Alice and Norman William, McCrory (2013) identified the valley between Little Fish Lake (Yanah Biny) and Fish Lake (Teztan Biny) as an important local and regional travel corridor for grizzly bears (Map 23). This was based on a high number of grizzly bear mark/rub trees, tracks, and other sign along an ancient First Nations travel trail between the two lakes (see Figure 28, p. 125). Some of the bear travel values appeared to be related to grizzly bears concentrating their spring activities at Fish Lake to feed on a relatively high biomass of spawning rainbow trout. This trail was an excellent example of what I referred to earlier as a combined high wildlife corridor and First Nations ancestral travel route. Along the footpath, Norman William found a spearhead of unknown age; he also pointed out a gravesite of a native baby in the vicinity of Little Fish Lake that his mother had shown him.

4.3.2 Preliminary GIS Map of Cross-Valley Wildlife Corridors Between Existing Parks: Dr. Lance Craighead with the Assistance of Brent Brock (Craighead Institute) and Baden Cross (Applied Conservation GIS)

The existing five provincial parks, Nuntsi, Big Creek, South Chilcotin Mountains, Bishop River, and Ts'il?os, constitute secure core areas of wildlife habitat within a matrix of mostly unfragmented habitat. Although the study area between the parks is relatively intact, the northern area between Big Creek and Nuntsi parks has been heavily fragmented by industrial-scale clearcuts and roads. There is potential for other unprotected areas between the parks to be similarly fragmented. Conservation planning is needed to identify critical areas for wildlife movement and to protect these areas in order to keep effective wildlife linkages between the existing parks and to prevent them from becoming isolated. Recent studies have also shown that one of the best ways to protect biodiversity from climate change is to protect large interconnected intact areas. Linking the five provincial parks by a large protected area would also increase the ability of this ecosystem to adapt to climate change.

The preliminary wildlife corridor mapping project was envisaged to evaluate the role of the Dasiqox-Taseko protection proposal study area in linking together the five existing provincial parks. Bishop River Park was actually of less interest since it is a small park already attached to Ts'il?os Park. Grizzly bears were chosen as a focal species for wildlife corridor mapping because of their well-documented status as an umbrella species, and because some data on grizzly habitat, food sources, and habitat requirements was available. Craighead and McCrory (2010) used the grizzly bear as a focal and umbrella species for a broad-brush conservation overview of a much larger regional area, including the South Chilcotin Ranges. Ensuring connectivity for grizzly bears would ensure connectivity for the majority of other wildlife species and effectively increase the size of a protected intact natural ecosystem.

As noted in the methods section (3.4), two complementary GIS habitat/connectivity models – Cost-Distance and Circuitscape - were chosen to evaluate connectivity values of the Dasiqox-Taseko study area between the five parks.



Map 23. This important grizzly bear movement corridor is a good example of an important wildlife and First Nation cultural/heritage travel trail providing important connectivity across the plateau landscape. Besides a large number of grizzly bear mark trees along the ancient First Nations footpath, we found a spearhead and, beyond the trail area, the gravesite of a Xeni Gwet'in baby.

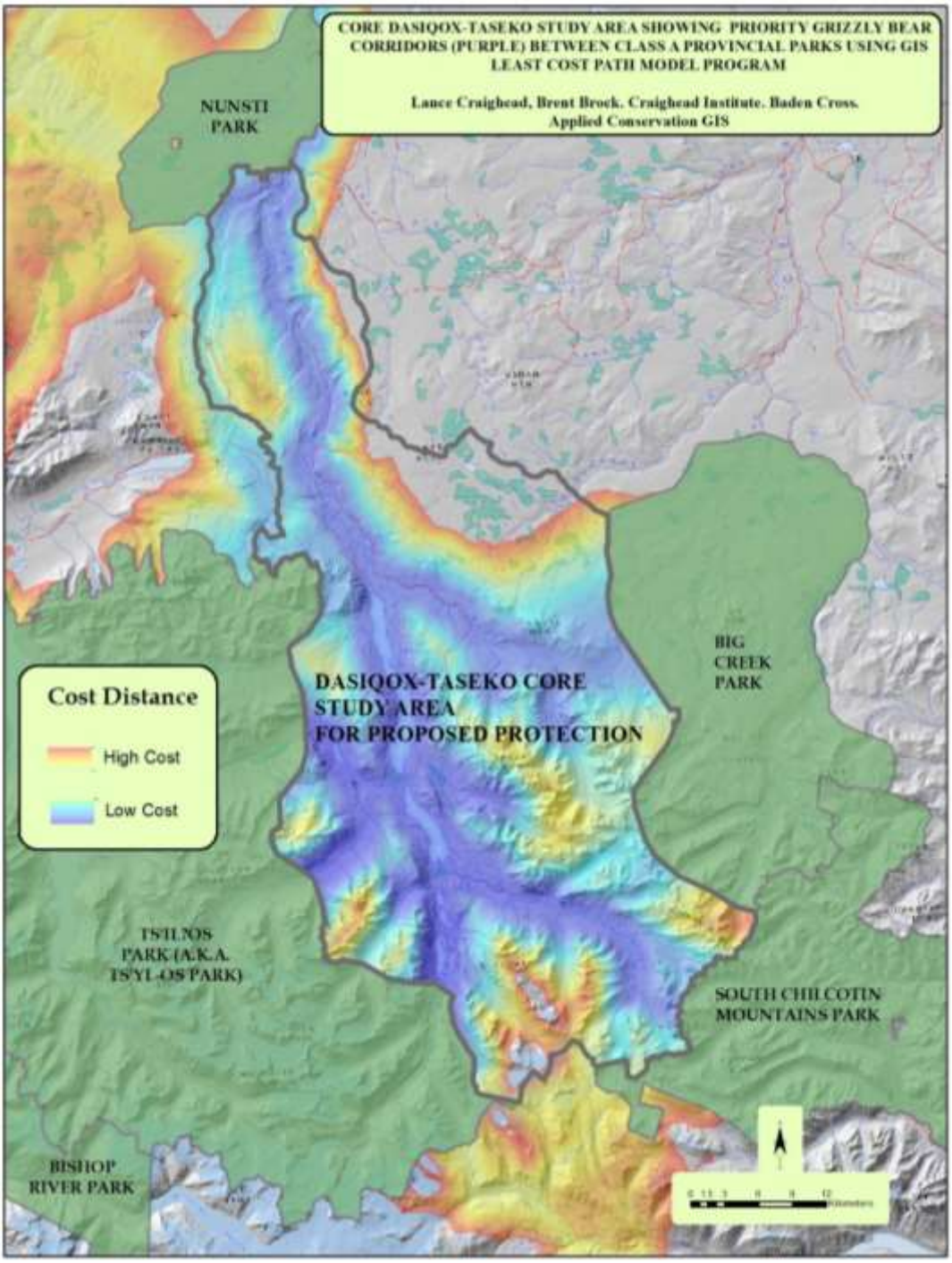
The two GIS models produced somewhat similar results (maps 24 and 25). Cost-distance models tend to highlight areas of easiest movement while circuit models emphasize areas where movement is likely to be concentrated or bottlenecked. Although a rigorous field validation of the model results was beyond the scope of this project, an informal evaluation was done using expert opinion based upon field experience in the region.

Both the GIS Cost-Distance and Circuitscape models chose the main riparian corridors between the three protected “cores” as the best connectivity habitat. This is borne out by our observations in the field; grizzly bears frequently travel along streamsides and valley bottom wetlands both during the salmon-spawning season and at other times of the year. This has occurred over millennia and, as a consequence, there are some areas with well-worn trails established along the stream banks. Riparian corridor protection is intuitively obvious, and corridor modeling was not needed to demonstrate this fact; however the fact that the modeling results agree with our knowledge of bear ecology provides confidence in other model results.

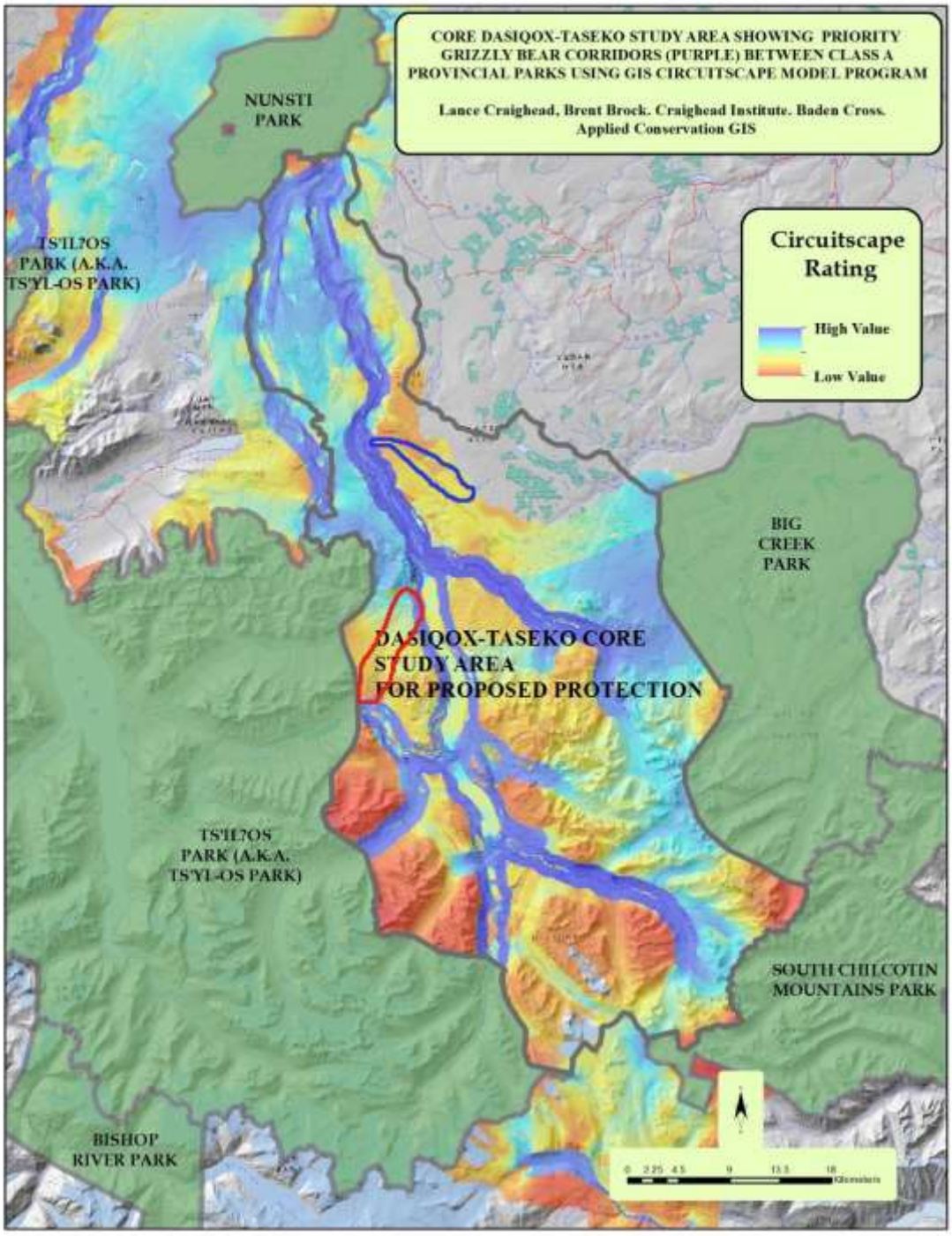
The two models also emphasize different aspects of the habitat parameters. Cost-Distance results (Map 24) identify the best habitat between two core areas, but are constrained to finding the shortest path through the best available habitat; the “cost” of the entire path is summed to determine relative connectivity. Thus, when we note that seemingly shorter paths between Nunsti Park and Ts’il?os/Bishop River parks to the west of the Dasiqox-Taseko River have poorer connectivity than the longer main path along the Dasiqox-Taseko River, we know that the “cost” of these paths is higher, even though they are shorter. This indicates that the habitat along these other streams to the west is not ranked as highly for grizzly bears, thus increasing the total cost-weighted distance. One of these lesser-valued model corridors follows Elkin Creek and the chain of Vedan and Elkin lakes, crossing Nemiah Valley.

Circuitscape results (Map 25), however, also estimate the “resistance” to movement along a cost-distance path and can identify areas of potential bottlenecks where the path becomes narrower in width and/or constrained by poorer habitat. The Circuitscape map indicates that these shorter corridors to the west may be equally effective, in terms of connectivity, as the longer main Dasiqox-Taseko corridor. Circuitscape results also indicate that there may be connectivity at the south and north ends of the study area connecting to lands outside the study area.

Taken together, the two models indicate four corridors between Nunsti Park and Ts’il?os/Bishop River parks (one of which, the Dasiqox-Taseko River corridor, branches into three smaller drainages near the south end of Ts’il?os park). There is one major corridor, Dasiqox-Taseko River (with three branches) between Nunsti and Big Creek/South Chilcotin Mountains provincial parks. Two of the four identified corridors are located within the Dasiqox-Taseko Wilderness Protection Proposal.



Map 24. Cost-distance connectivity model shows the lowest travel costs and best corridors for grizzly bears to be along the riparian areas (purple).



Map 25. The Circuitscape connectivity model shows, as with the cost-distance model, that the best travel corridors for grizzly bears are along the riparian areas (purple). Red shows Gunn Valley identified as low value for connectivity but it is actually high. Thus the model did not pick up on all of the important travel corridors.

All of the best connectivity between Nunsti Park and Big Creek/South Chilcotin Mountains Park lies along the Dasiqox-Taseko River and its tributaries and is contained within the Dasiqox-Taseko study area. To maintain connectivity for grizzly bears (and most other wildlife), this riparian corridor needs to be protected from further logging and roading.

Connectivity between Nunsti Park and Tsil?os/Bishop River parks has greater redundancy with three separate corridors identified. Only one of these corridors is contained within the Dasiqox-Taseko study area. However, the model results indicate that this corridor should function at least as well as the two corridors to the west, so that protection of this habitat could ensure that connectivity is maintained, even if the corridors to the west are compromised in the future.

The model results are consistent with our observations on the ground, with several exceptions. The northern portion of Gunn Valley was not picked up by the GIS models, but has been observed to be an important movement corridor for grizzly bears with fairly high habitat values, including wetlands and several salmon-spawning streams. It was also identified as an important wildlife corridor by a previous study (Sopuck et al. 1997). The models also did not pick up on an important regional grizzly bear corridor between Yanah Biny (Little Fish Lake) and Teztan Biny (Fish Lake) that was identified in field studies by Wayne McCrory and the Xeni Gwet'in (McCrory 2013). This valley corridor has excellent wetland riparian areas for grizzly bears, as well as important feeder streams around Fish Lake (Teztan Biny), where grizzly bears concentrate to feed on spawning rainbow trout in spring. Seventeen grizzly bear mark trees were found between the two lakes, far more than found on surveys in Beece Creek, which was identified by the GIS models as a higher value grizzly bear corridor.

The models preferred a longer route, perhaps because the habitat values along that route were rated higher enough to compensate for a longer pathway. A broad-scale regional analysis, such as this preliminary corridor analysis, can often smooth over areas of good habitat at finer scales. A finer scale model analysis, including better habitat data, such as salmon availability, whitebark pine, and updated human activities and land use, should result in a more complete and accurate picture of connectivity within each drainage.

The best scenario for maintaining this complex of parks as an interconnected ecosystem would be to protect the entire Dasiqox-Taseko Wilderness Study Area, and to also protect an area to the west and southwest of Nunsti Park that includes all of Elkin Creek.

These modeling approaches were intended as a broad-brush, first iteration approach that could help identify key habitat elements that are important for wildlife connectivity. They indicate that the Dasiqox-Taseko study area would be extremely beneficial for maintaining connectivity between the parks. The broad-brush approach assesses the overall habitat value and does not indicate whether or not some segments of the corridor are less effective than other segments. An examination of land use data for the area, however, indicates that the main corridor along the northern part of the Dasiqox-Taseko is already heavily impacted by cut blocks and roads along the east side of the valley. Movement habitat could be further protected by preventing further logging and roading within the Dasiqox-Taseko drainage. It is also likely that connectivity could be improved by reclamation activities at the north end, such as by road closures and re-plantings of existing cut blocks.

A more detailed analysis is recommended using finer-scale modeling tools and data to evaluate the effects of current and future developments and extractive activities. Whitebark pine habitats and additional salmon data could be incorporated to improve habitat models. Use of existing grizzly location data from a grizzly bear DNA study by Apps et. al. (2009) would help to refine core grizzly bear habitat areas. Structures and detailed road data could also improve habitat and connectivity model results. This could be conducted using "GIS WildPlanner" tools and could focus on the areas along the Dasiqox-Taseko where development/extraction has occurred and is planned to occur. This analysis could evaluate the effects of individual activities on overall connectivity and could prioritize areas that are most important. It could also assess the effects of alternate activities to determine less harmful options for development.

Literature Cited or Consulted for the Connectivity Section

Apps, C., D. Paetkau, S. Rochetta, B. McLellan, A. Hamilton, and B. Bateman. 2009. Grizzly bear population abundance, distribution, and connectivity across British Columbia's southern Coast Ranges. Version 1.1. Ministry of Environment, Victoria, British Columbia.

BC Commission on Resources and Environment. 1994. Cariboo-Chilcotin Land Use Plan. 237 pp.

Craighead, L., and W.P. McCrory. 2010. A preliminary core conservation review of the dryland grizzly bear of the Chilcotin Ranges in British Columbia. Report to Friends of Nemaiah Valley, Valhalla Wilderness Society and Xeni Gwet'in First Nation Government.

McCrory, W. 2005a. Background tourism feasibility study – wild species viewing & guidelines. Xeni Gwet'in First Nation, Chilcotin, BC. 80 pp.

McCrory, W.P. 2013. McCrory Wildlife Services Ltd. response to 2011 Terrestrial-Wildlife component of the Environmental Impact Statement (EIS) & associated documents regarding the proposed New Prosperity gold-copper mine project at Teztan Biny (Fish Lake) with specific reference to the grizzly bear (with added comments on northwestern toad & wild horses). Report for Friends of Nemaiah Valley (FONV). Final report submitted to New Prosperity CEAA Panel August 20, 2013.

Sopuck, L., K. Ovaska, and R. Jakimchuk. 1997. Inventory of red- and blue-listed species, and identified wildlife in the Dasiqox-Taseko Management Zone, July – August, 1996 and February, 1997. Renewable Resources Consulting Services Ltd. Report to BC Min. of Env. Lands and Parks, Williams Lake, BC. 60 pp plus appendices.

Smith, L.R. 2012. Nabas oral literature documentation. A collaboration research study with the Yunesit'in Government (Stone Band) and the Xeni Gwet'in Government (Nemiah Band). Final Report to Terralingua.

4.4 LOGGING AND MINING TENURES

4.4.1 Timber Tenures and Quotas

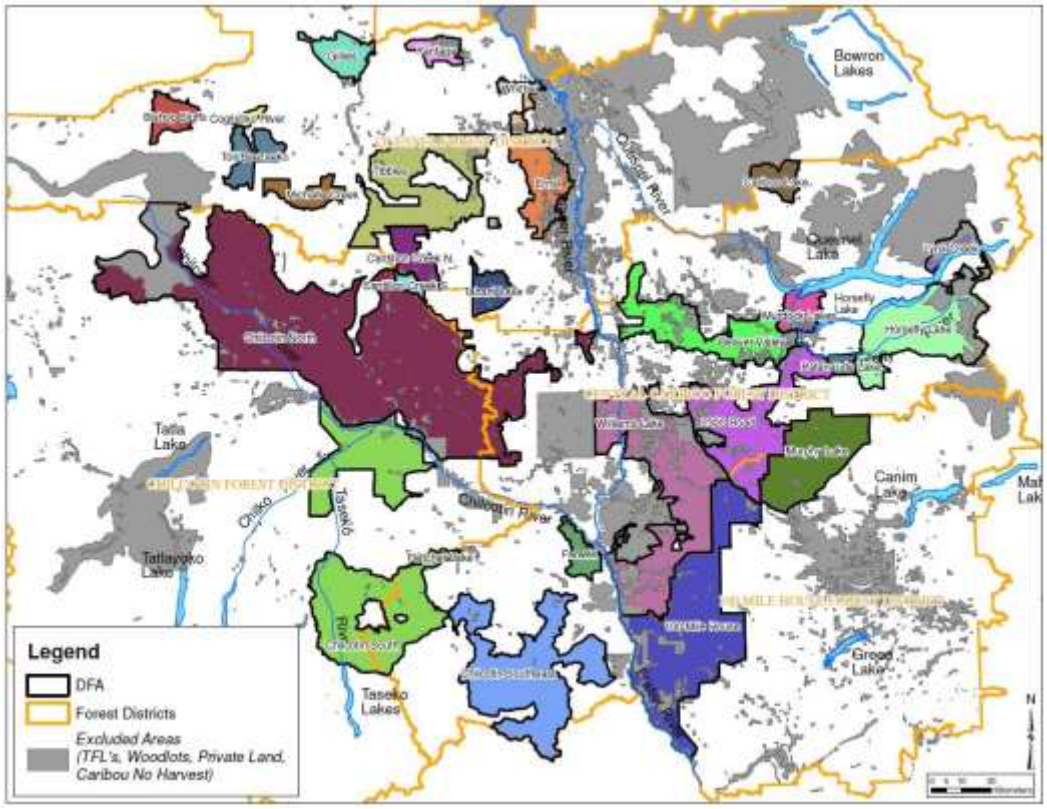
The study area is part of the Williams Lake Timber Supply Area (TSA), one of the largest in the province (4.93 million hectares). The Williams Lake TSA is administered by the Cariboo-Chilcotin Natural Resource District in Williams Lake. The current annual allowable cut (AAC) for the Williams Lake TSA is 5,770,000 cubic metres. This high volume was established in April 2007, one year before the peak of the mountain pine beetle infestation. At the time, this more than

doubled the AAC. The recent TSA review sought public input as the Ministry felt that the current rate of cut was unsustainable (MFLNRO 2014, http://www.for.gov.bc.ca/hts/tsa/tsa29/index.htm).

I did not have time to review all of the tenure holders, including BC Timber sales, but this should be done. Tolko Cariboo Woodlands appears to have the largest tenure that covers roughly the north half of the Dasiqox-Taseko study area (Chilcotin South block = lower left green polygon on Map 26). The total area of the Chilcotin South block is 189,798 ha, with 157,872 ha of net productive forest. Much of the area to the east of the Dasiqox-Taseko River has already been heavily logged, including recent logging in Groundhog Creek and the Teztan Biny (Fish Lake) area. I was unable to determine at the time of writing this report if areas to the south are also considered part of the operable forest.

The Yunesit'in are part of the 2013 Tsilhqot'in Framework Agreement (TFA) but as of March 2014, the Xeni Gwet'in had not signed on. The TFA is a strategic agreement between the Tsilhqot'in National Government and the province for shared decision-making respecting land and resource management.

Figure 31. Recent massive clearcutting by Tolko Cariboo Woodlands in the Big Creek area. This could hardly be called creating a benign landscape for any sensitive wildlife, like grizzly bear, wolverine, and Canada lynx, to survive in and foretells what will happen to the rest of the unlogged Dasiqox-Taseko study area if logging is not curtailed. (Photo by Jeremy Williams)



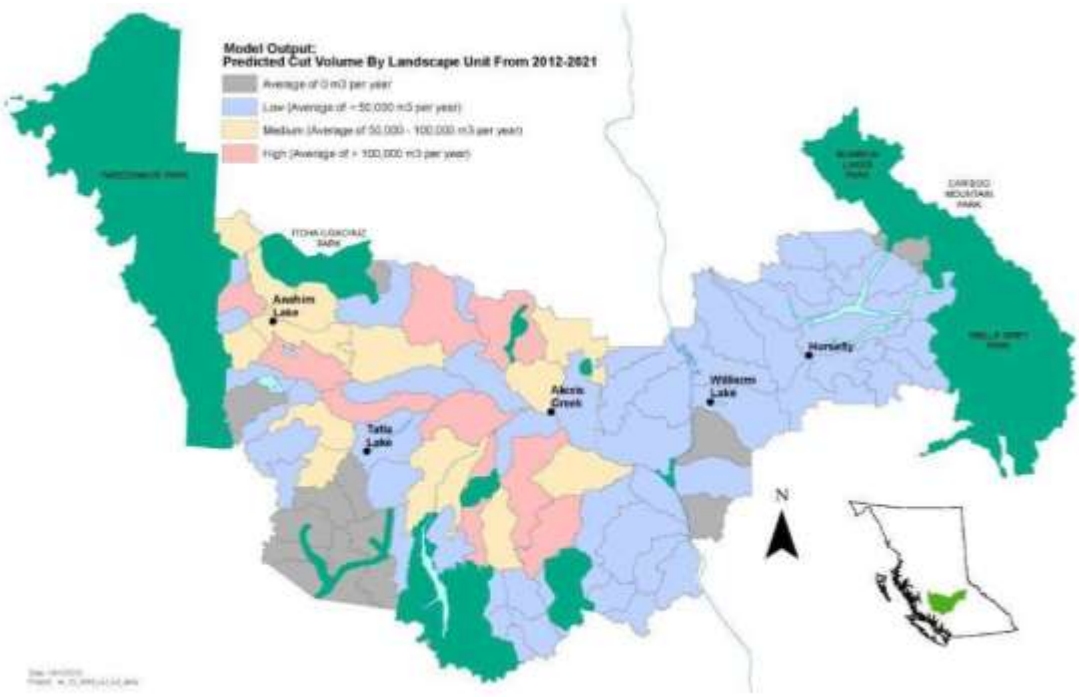
Map 26. Tolko Cariboo Woodlands Defined Forest Area (DFA), including green area in mid Dasiqox-Taseko study area. From Figure 3. Tolko Cariboo Woodlands Sustainable Forest Management Plan. July 2012. www.tolko.com/.../Tolko_Cariboo_Woodlands_SFMP_June_2012_final.

Table 4 shows all of the landscape units that include all or part of the Dasiqox-Taseko study area (data from Meisner Consulting, courtesy of Chief Roger William by e-mail. March 17, 2013).

The study area includes all of the Beece, Tchaikazan, Lord, and Gunn landscape units in the south, but only portions of the Tete Angela and Nunsti-Elkin landscape units in the north. As noted in the table and on Map 27, logging is planned to start within all of the landscape units in the study area this year.

Table 4. Planned logging in landscape units in the Dasiqox-Taseko study area

Landscape Unit	Clearcut volume (m3/year)			
	2012-2016	2017-2021	2022-2026	2027-2031
Beece Creek	16,951	26,921	2,245	1,030
Gunn Valley	3,444	4,810	3,453	5,009
Lord River	4,427	394	4,862	0
Nuntzi-Elkin	181,366	25,469	5,009	561
Tchaikazan	6,380	27,787	1,879	0
Taseko	1,238	9,281	1,915	1,270
Tete Angela	117,292	68,823	6,594	907



Map 27. Shows that that the province plans to log in all of the landscape units in the Dasiqox-Taseko study area over the next 20 years. These are the areas in light purple, light brown and light orange areas at the bottom end of the map between Tsyl'os, Nunsti and Big Creek Parks (dark green). Logging is planned to commence in some landscape units this year (MFLNRO) 2014).

4.4.2 Preliminary Review of Mining and Mineral Tenures

This was not intended to be a comprehensive review of mining exploration, development history, and mineral tenures in the Dasiqox-Taseko study area. So far, my research has revealed that the mid-upper Dasiqox-Taseko has a fairly long history of mineral exploration and intensive early development of a small number of small gold and other base metal ore bodies of questionable value that appear to have been mined-out (Taylor-Windfall), and/or have been partially mined but are currently inactive (Pellaire). The large proven gold-copper deposit underlying Teztan Biny (Fish Lake) appears to be an exception to the rule in terms of size of known mineral deposits that have been explored over the last century or so. As with the very controversial Windy-Craggy mine in northwest BC, which eventually became part of a provincial park because the environmental costs of mining the massive sulphide copper-gold-silver ore body would have been too high (Walters et al. 2007), so has the sulphide gold-copper ore body at Teztan Biny (Fish Lake) been proven by two CEAA Panels to have similar environmental (and First Nations cultural/heritage) costs that are too high. The Prosperity-New Prosperity mine proposals would have resulted in the largest open pit mine in Canada, as well as a huge tailings pond.

Figure 32. Early mine cabin at Pellaire Mine in Falls River, once considered the highest elevation gold mine in Canada. The main underground mine workings are in a high peak above treeline while ore concentrator and main mine camp is in the valley bottom. Despite a century of intensive mineral exploration in the Dasiqox-Taseko, little underground mine development of economic significance has taken place and the proposed open pit mine at Teztan Biny (Fish Lake) has proven to be not viable due to highly adverse environmental and cultural/heritage impacts.

Figure 33. The Pellaire gold mine camp in Falls River is the main developed underground mine in the Dasiqox-Taseko study area and has been mostly inactive since about 2008, despite high gold prices at the time. This is part of the mining camp in the valley bottom looking towards Ts'il?os Class A Provincial Park, which borders the mine and takes in the pristine headwaters beyond the mining camp, seen here.

Recommendations:

1. Additional research needs to be done to determine the status of the different mineral tenures in the study area.
2. Concerning areas of abandoned mine equipment, old trailers, drill core boxes, potential for the unmaintained Pellaire mine camp and tailings pond and ore storage piles to cause environmental damage (including the mine camp potentially being avalanched into Falls Creek), the Xeni Gwet'in should file a formal complaint with the Ministry of Mines and Energy as well as the Ministry of Forests, Land and Natural Resource Operations (MFLNRO) web site: Natural Resource Violation Reporting Line: www.for.gov.bc.ca/hen/nrv/
   Toll Free Number: 1-844-NRO-TIPS

4.4.2.1 Types of mineral tenures in BC

Mining in BC comes under two statutes: the Mineral Tenure Act and the Mines Act. Acquiring mineral tenure on public lands in BC has always been made easy. The Mineral Tenure Act provides that exploration activities in BC are permitted on any public lands (including private lands if the landowner does not hold subsurface rights) provided that a person has a valid "free miner" certificate. The cost is $25 for an individual and $500 for a company. The certificate lasts for one year and must be renewed. Then:

> *As a holder of a Free Miner Certificate, you have certain rights set out in the Mineral Tenure Act and Mineral Tenure Act Regulation. A free miner has the right to acquire and hold mineral tenure, which acquires the subsurface rights that are available at the time of acquisition and as defined in the Mineral Tenure Act.*

In previous times, a "free miner" had to stake a legal claim on the ground and mark it with claim posts and tags. Now, a person with a Free Miner's Certificate can stake claims online and pay a fee. Under Section 35 of the Mineral Act, a person holding a claim must do some assessment work annually or pay a fee to hold the claim.

Such a system fosters a high degree of speculation as nearly anyone can acquire a Free Miners Certificate and stake unclaimed ground for a small cost and then hold the mineral rights for a year before the assessment work is due.

Mineral claims also afford exclusive right to enter, explore, and develop the mineral potential of the claim, but do not confer mineral ownership. At this point, a person with a Free Miner's Certificate may continue exploration or grant an option to another company to acquire a partial or full interest in the claim. Option granting is relatively common in BC as large-scale exploration is usually costly. Once exploration demonstrates that full-scale production would be economically feasible, steps can be taken to obtain a mining lease from the Crown. Mining leases simultaneously grant the holder the right to enter upon the land and search for minerals and the right to any of the minerals that may be discovered.

The Mines Act applies to all stages of mining exploration, development, construction, production, closure reclamation, and abandonment. This statute mandates that a permit is required before any work can commence in, on or about a mine, including exploratory drilling.

Placer gold claims are in a different category. As part of an overall mineral tenure review, it would be useful to determine if any placer claims are held in the study area.

One type of very early tenure worth mentioning is called a Crown grant; this is still valid under BC statutes representing “fee simple” title. Crown grants gave owners exclusive mineral (subsurface) rights and sometimes also surface rights. The surveyed lots were of different sizes, but not more than about 40 acres.

With the 2007 Vickers BC Supreme Court ruling and in particular the Supreme Court of Canada 2014 ruling on Aboriginal Title, I suspect mineral tenures in the proposal area will come under legal scrutiny where they overlap with Xeni Gwet’in rights and title areas.

4.4.2.2 Current mineral tenures in the Dasiqox-Taseko study area

Although the metadata for the Mineral Tenures is available from a provincial website (https://apps.gov.bc.ca/pub/geometadata/home.do), I am grateful for the mineral tenure map (Map 28) provided by the Tsilhqot'in National Government (TNG). The map shows that most of the study area is blanketed with mineral claims of various tenure types.

It was beyond the scope of my study to do a detailed review of ownership of the various tenures but this should be done. However, even a partial review suggests that most of the tenures are mineral claims “staked” on-line for a small fee and held and promoted for speculation on the stock market. There also appears to be a few old Crown grants. In 2010, the province granted Taseko Mines Ltd. a long-term, renewable, 25-year mining lease for the Prosperity gold-copper project. The size of the lease is 3,500 ha or 35 km^2. The lease area includes Teztan Biny (Fish Lake), Yanah Biny (Little Fish Lake), and the surrounding area called Nabas. This lease is for rights to mine the ore body under Teztan Biny (Fish Lake) (Map 29).

4.4.2.3 Comments on mining exploration and development history in the study area

The Dasiqox-Taseko has a fairly long history of mining exploration, with some development of a few small gold mines that turned out to have small ore bodies of questionable economic value that have already been mined out in most instances. The large proven gold-copper deposit underlying Teztan Biny (Fish Lake) appears to be an exception to the rule in terms of size, but the application to develop the ore body with Canada’s largest open pit mine, an ore concentrator, and a vast tailings pond has now been turned down by the federal government for the third time due to environmental and other major concerns (the first was by DFO in 1996).

Much of the anecdotal early mining history of the Dasiqox-Taseko has been recorded in the well-known Chilcotin pioneer historic book by the Witte Sisters 1995 (pp. 383-393). At the time, local people referred to Taseko Lakes as Whitewater Lakes. The first bulldozer road into the area was actually built by the government in 1936, from Chilco Ranch to the outlet of lower Dasiqox-Taseko Lake, to provide road access for barging mine equipment to the Taylor-Windfall mine.

Some early mine exploration and developments include:

1. Taylor-Windfall gold mine on Iron Creek near the head of the Dasiqox-Taseko (Map 30). According to the Witte Sisters (1995), the gold claim was staked in 1920. During the period 1932-1953, 611 tons of ore were milled at this property. However, the mine had been closed down for

the past 50 years (to 1995 anyhow). In 2008, the mining claims were owned by Galore Resources Inc. from Vancouver, who were promoting it on the stock market in their prospectus. The company claims to have an extensive area of mineral claims in the Dasiqox-Taseko, including in the Tchaikazan area (Map 30).

2. Anvil Mountain. I am not sure of the date of the mine access road built from the lower Dasiqox-Taseko Lake outlet up Beece Creek to Anvil Mountain and to Lord Creek. Extensive trenching was done above treeline in the Anvil Mountain area.

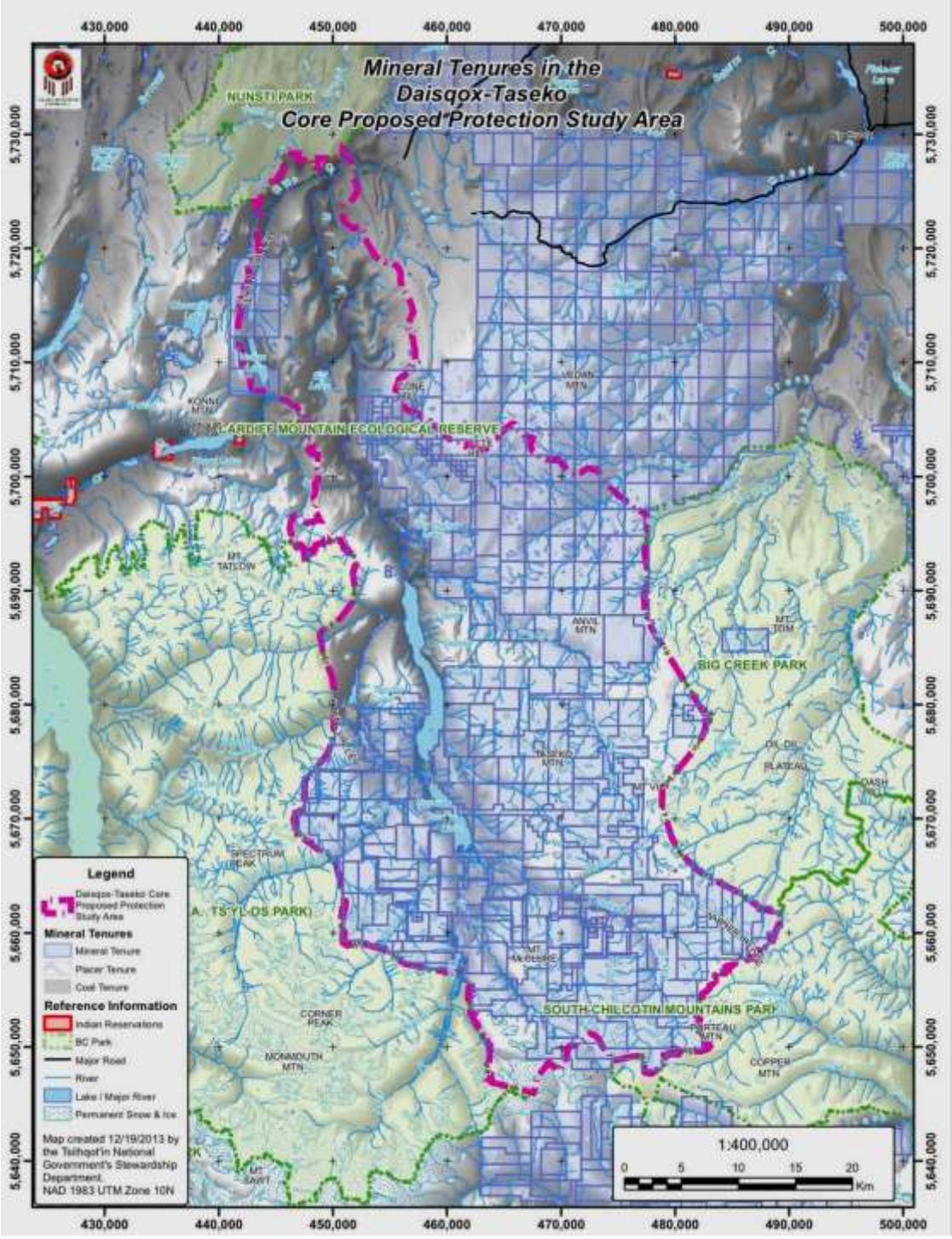
3. Mt Vic. There is a mine road to the alpine and considerable road building and unrehabilitated trenching on mountain goat summer and winter alpine range near the summit of Mt. Vic. The Witte Sisters (1995) provide information on a small mine tunnel (adit) lower down on the east side of Mt. Vic

4. Pellaire gold mine (Map 30). This gold property has had the most extensive development, including underground mining, a small ore concentrator, and a large mining camp in Falls River. It appears to have been inactive since 2008, despite claims to have a viable ore body ready to mine. According to the Witte Sisters (1995), this gold mine was staked in 1930. The mining camp was at 3,900 metres or 12,000 feet, considered the highest mine in Canada. The mine closed in 1947, but was opened up again with a better road in the 1970s by Lord River Gold Mines Ltd. Much of the history of the Pellaire gold mine has also been written up in a mining report by Pezzot (2005) who claims that:

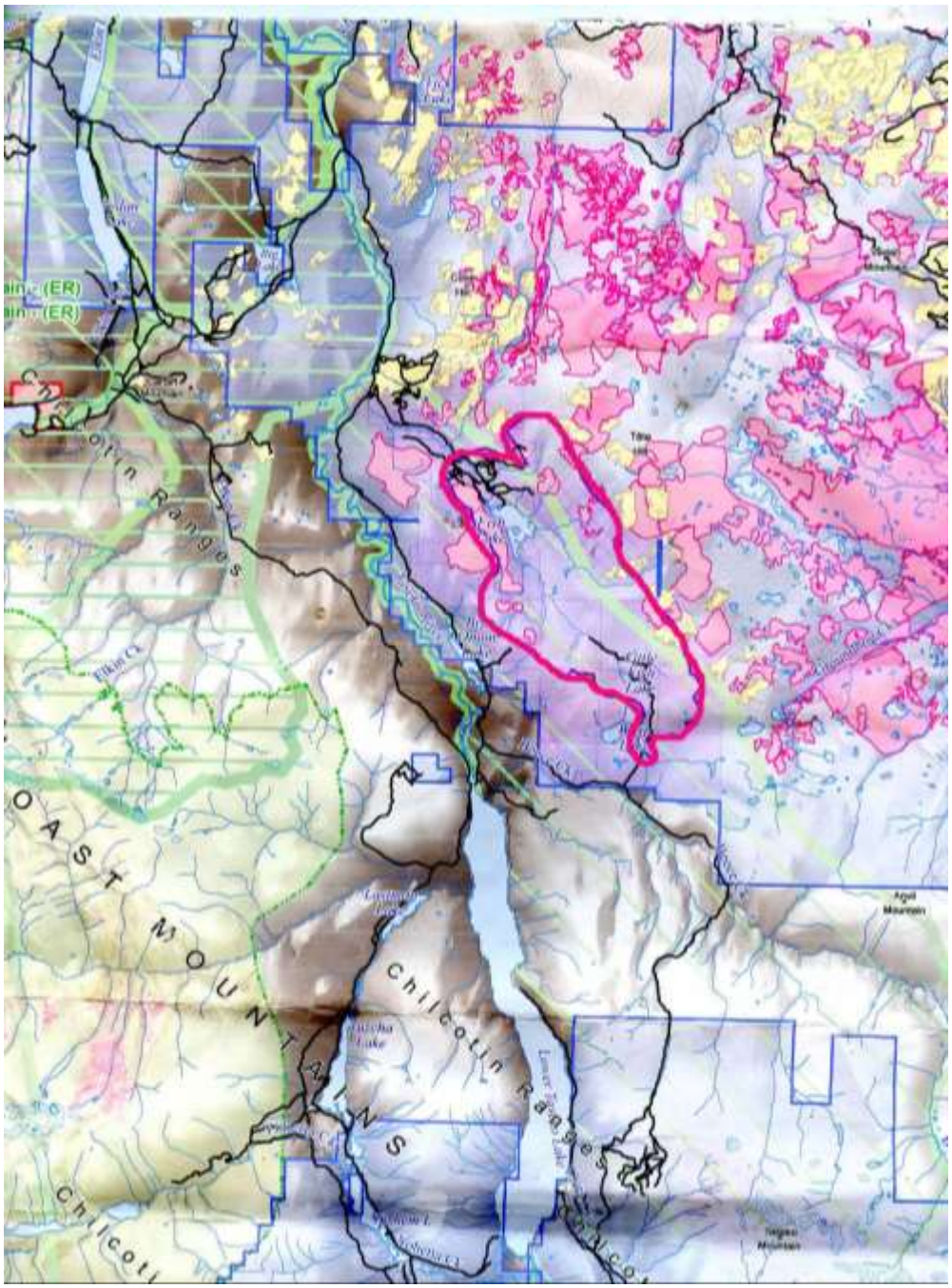
> *…since the original discovery of gold-silver-bearing quartz veins on the Pellaire property in 1936, the area immediately west of the Lord River and Upper Taseko Lake has been continuously prospected and explored for precious metal vein deposits up to the1950s and since that time for porphyry copper-molybdenum-gold deposits.*

Pezzot (2005) also noted that in 1946, a tractor road was put in to connect the mine to the Fishem Lake road, a camp was installed, and three adits totalling 180 m were started. In 1947, more underground work was done. In 1979, Silver Standard Mines Ltd. carried out a program of mapping, sampling, and claim-checking. The following year, an access road was completed and an airstrip was constructed. Then, during 1996, Pellaire Gold Mines Ltd. rehabilitated 73 kms of road with six steel bridges and more than 60 culverts. Considerable underground development was done with 1270 tons of ore extracted. About 848 tons of gold-silver ore were shipped to the Cominco smelter in Trail. In 1997, a program of mapping, sampling, bulldozer-trenching, soil sampling, and underground mining was carried out.

Some recent work is evident at the mining camp, including additions of a new trailer camp that appears to have been done in 2008. Currently, the mine equipment, extensive camp, and machinery appear to have been abandoned with no watchman. The mine camp is also located in the valley bottom at the base of two avalanche paths (Figures 34, 35, 36, 37, 38). Additionally, it looks as though the small tailings pond near Pellaire Creek has the potential to leach (and may be doing so) contaminants into the river; this could also be the situation with the various fuel tanks and mine milling chemical barrels left lying around. It appears that the BC Mines and Environment ministries have had little oversight in the situation.

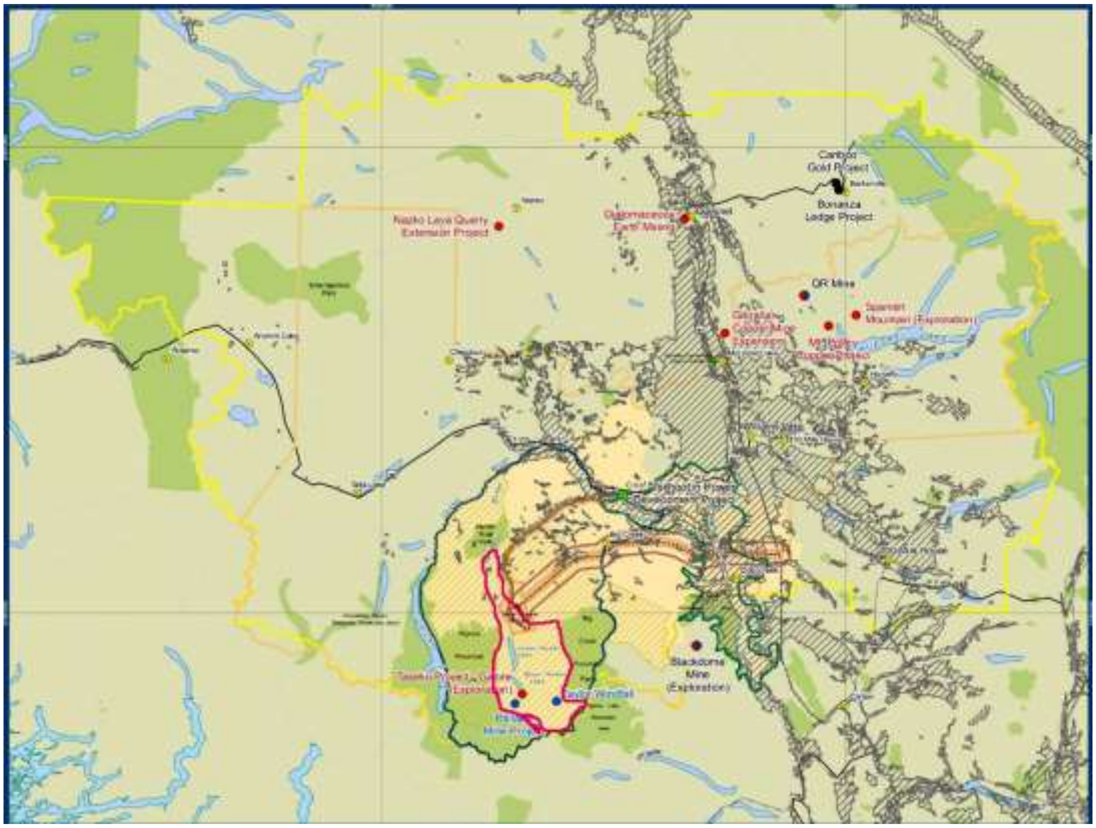


Map 28. Shows that in 2013, nearly all of the Dasiqox-Taseko study area (pink outline) has some form of mineral tenure (blue), much of it speculative. Now that the New Prosperity Mine has been turned down for the second time due to significant adverse environmental, cultural/heritage, and other impacts, it is very likely that speculative mining interest in the area will decrease. Although documentation of mineral tenures and ownership should be done, the majority of the blue area is likely provincial mineral claims that were acquired from the province at nominal cost and don't mean full-time ownership or perpetual mineral rights. (Map Courtesy of Tsilhqot'in National Government).



Map 29. Shows Taseko mine 25-year 3,500 ha mineral lease area (dark pink outline) granted by the province in 2010. (Map modified from TNG, 2011 version)

5. Lower Tchaikazan area. A search needs to be done for ownership. The mine workings include a main access road, an abandoned travel trailer, and large area of diamond drill core boxes (Figures 39, 40). Several bulldozer trails go up to the alpine on the lower west side of the valley.



Map 30. Shows existing mine sites (Pellaire, Galore Exploration, and Taylor-Windfall) where some historic development has taken place, all within the Dasiqox-Taseko proposal area (red). The proposed New Prosperity Mine at Teztan Biny (Fish Lake) within the wilderness proposal area (not clearly marked), which would have been the largest open pit mine in Canada, is no longer viable due to two CEAA Panel reviews determining significant adverse impacts. (Source. Taseko Mines Ltd. 2012. Environmental impact statement. New Prosperity. Figure 7. Section 2-7. P. 402. www. newprosperityproject.ca)

Figure 34. Small gold mine ore concentrator and tailings pond (foreground) at Pellaire mine camp, Falls Creek. The mine site is currently in a state of abandonment and the tailings pond may be leaching contaminants into a small creek that runs into Falls River. Fuel storage barrels and mine chemical barrels also have been left to the elements.

Figure 35. Part of mine concentrator at Pellaire mine camp. Note the abandoned equipment has been set up in the run-out zone of a large avalanche path, just visible behind. Figure 36 below also shows the abandoned mine camp situated in the same avalanche path.

Figure 36. Abandoned mine camp at Pellaire mine located at base of avalanche path.

Figure 37. Abandoned backhoe near large pile of oxidizing sulphide ore (right of photo) near treeline at Pellaire mine.

Figure 38. Large bulldozer that has been sitting abandoned at the airport a mining company built near the Pellaire mine bridge over the lower Tchaikazan. The airport construction may have destroyed part of a First Nations winter village and this machine has been sitting abandoned now for several decades (Norman William pers. comm.).

Figures 39, 40. Abandoned and deteriorated drill core boxes and trailer at a mining camp in the lower Tchaikazan area.

Literature Cited or Consulted for Sections on Logging and Mining

Ministry of Forests, Lands and Natural Resource Operations (MFLNRO). 2014. Williams Lake TSA Timber Supply Analysis Public Discussion Paper. Forest Analysis and Inventory Branch.

BC Ministry of Forests, Lands, and Natural Resource Operations. http://www.for.gov.bc.ca/hts/tsa/tsa29/index.htm

MINFILE Search page. Ministry of Energy, Mines and Petroleum Resources [cited June 20, 2006]; www.em.gov.bc.ca/mining/geolsurv/minfile/search

Ministry of Energy and Mines. https://apps.gov.bc.ca/pub/geometadata/home.do

Pezzot, E.T. 2005. Assessment report of the Pellaire Project. http://aris.empr.gov.bc.ca/ArisReports/28311.PDF Accessed October 28, 2013.

Taseko Mines Ltd. 2012. Environmental impact statement. New Prosperity. Figure 7. Section 2-7. P. 402. www. newprosperityproject.ca

Tolko Cariboo Woodlands Sustainable Forest Management Plan. July 2012. www.tolko.com/.../Tolko_Cariboo_Woodlands_SFMP_June_2012_final.

Walters, J., Hsu S., and G. Duncan. 2007. Case study: Windy Craggy: Mining in British Columbia. University of British Columbia Faculty of Law.

Witte Sisters. 1995. Chilcotin: Preserving Pioneer Memories. Heritage House Publishing Company.

4.5 CURRENT PROTECTION MEASURES AND RECOMMENDED FULL PROTECTION STRATEGY FOR THE DASIQOX-TASEKO STUDY AREA

The following review shows that the intention of the Xeni Gwet'in Aboriginal Wilderness and Wild Horse Preserve declarations is to offer full protection from industrial forestry, mining, and hydroelectric development at the same level as a fully protected provincial or national park. They do not (see explanation below). However, they do meet the international criteria for protection, including the International Union for Conservation of Nature's (IUCN) definition of a protected area and the 2003 World Congress definition of an Indigenous and Community Conserved Area (ICCA). Because the Xeni Gwet'in Aboriginal Wilderness and Wild Horse Preserve declarations have not been officially recognized by the provincial or federal governments, extractive industries have already degraded approximately 16% of these areas. In addition, a large proposed open pit mine has generated significant local, provincial, and national controversy. Existing protection allocated by the provincial government through the following—one small ecological reserve, one small (proposed) grizzly bear Wildlife Habitat Area (WHA), the Wilderness Tourism-Forest Sector Avoidance Area Strategy Agreement, potential (but not completed or put in place) species-at-risk recovery plans, and species protection guidelines under the Chilcotin Sustainable Resource Management Plan (SRMP)—are considered insufficient to sustain, for the long-term, the existing sensitive biota of the Dasiqox-Taseko study area. Nor are any of these partial—and in many cases, weak—measures capable of protecting the ecological characteristics the land provides to the Xeni Gwet'in that enable them to sustain their culture/heritage.

Recommendations are made for First Nations to develop a better strategy to protect the Dasiqox-Taseko study area in a manner that meets the mandate of the full protection decreed by the Xeni Gwet'in Aboriginal Wilderness in combination with their Wild Horse Preserve. Recognition of aboriginal rights and title over part of the study area only strengthens the ability of First Nations to protect the area in the face of an onslaught of clearcut logging and mining interests. However, time is of the essence. To quote one First Nations chief in the Chilcotin (Anon. 2012): By the time we negotiate a treaty or rights and title, there won't be anything left to protect. The Xeni Gwet'in have now been able to better position themselves to protect their land with the recent SCC ruling on aboriginal title over part of the study area.

4.5.1 Existing Protection

In the following discussion, I identify and evaluate a number of different types of provincial and First Nations initiatives for protection of the Dasiqox-Taseko study area.

4.5.1.1 First Nations: Xeni Gwet'in Aboriginal Wilderness and Wild Horse Preserve declarations

The Dasiqox-Taseko study area is an integral part of two protective decrees by the Xeni Gwet'in First Nation. For the Xeni Gwet'in Caretaker Area (XGCA), land use and community development issues are expressed in two declarations that specify no industrial logging, mining, or hydroelectric developments. Both overlay the whole tribal territory, an area larger than Banff, one of Canada's foremost national parks:

1. The 1989 Xeni Gwet'in Nendduwh Jid Guzit'in, or Aboriginal Wilderness Declaration.
2. The 2002 "?Elegesi Qayus Wild Horse Preserve," or Eagle Lake Henry Cayuse Wild Horse Preserve that covers the same area.

The Xeni Gwet'in preserves meet a number of international criteria for protection. First, they meet Article 29 of the United Nations Declaration on the Rights of Indigenous Peoples (http://daccess-dds-ny.un.org/doc/UNDOC/GEN/N06/512/07/PDF/N0651207.pdf?OpenElement):

> *Indigenous peoples have the right to the conservation and protection of the environment and the productive capacity of their lands or territories and resources.*

Secondly, the Xeni declarations meet the IUCN definition of a protected area (Dudley 2008) as follows:

> *A protected area is a clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long term conservation of nature with associated ecosystem services and cultural values.*

Thirdly, the Xeni Gwet'in Aboriginal/Wild Horse Preserve also meets the definition of an Indigenous and Community Conserved Area (ICCA), which is defined as follows (World Parks Congress, 2003):

> *[N]atural and modified ecosystems including significant biodiversity, ecological services and cultural values voluntarily conserved by indigenous and local communities through customary laws or other effective means.*

The aboriginal/wild horse declarations by the Xeni Gwet'in provide the highest protection possible for the Dasiqox-Taseko study area in terms of spirit and intent. In my opinion, the Xeni protection decrees provide protection at a level near or equivalent to that of a provincial Class A park or conservancy, or a national park reserve. Unfortunately, the Xeni have so far failed, politically, to achieve the high level of protection desired. This is through no fault of their own. Neither protection decree has been recognized by either the federal or provincial governments. This has resulted in extensive industrial-scale clearcut logging and roading causing considerable fragmentation of the peripheries of the aboriginal protected area since the 1989 logging blockade that led to its inception. I estimated that some 16% of the total area of the Aboriginal/Wild Horse Preserve has now been severely impacted by logging. As well, historic and recent provincial mining tenures blanket the study area. The open pit gold-copper mine proposed by Taseko Mines Limited (TML) within the boundaries of the Aboriginal/Wild Horse Preserve at Teztan Biny (Fish Lake) has generated huge local, provincial, and national conflict. Now that two federal Canadian Environmental Assessment Agency (CEAA) panels have concluded that the proposed mine would have significant, adverse effects on the environment and First Nations cultural/heritage values, and successive federal government Environment ministers have twice turned down the project, now is a good time for a growing impetus for protection reflecting the spirit and intent of the aboriginal/wild horse preserve declarations however that might be best achieved.

The failure of non-native governments to protect aboriginal "no-go" areas and instead allow them to be compromised by extractive industries is a global one of growing international concern. In 2013, the World Wilderness Congress passed Resolution No.12, which:

> *…urges governments to adopt, implement and enforce appropriate laws, policies and programmes - with the full and effective participation of communities and organizations concerned - for the protection of World Heritage Sites, Protected Areas, including in full ICCAs and Sacred Natural Sites and Territories, as 'No-Go Areas' for any kind of destructive industrial activity, especially mining and other extractive and destructive industries. ICCAs refer to indigenous community conserved areas.* (http://resolutions.wild10.org/wp-content/uploads/2013/10/Res12_Protected-Areas-and-Mining_final-draft.doc1.pdf).

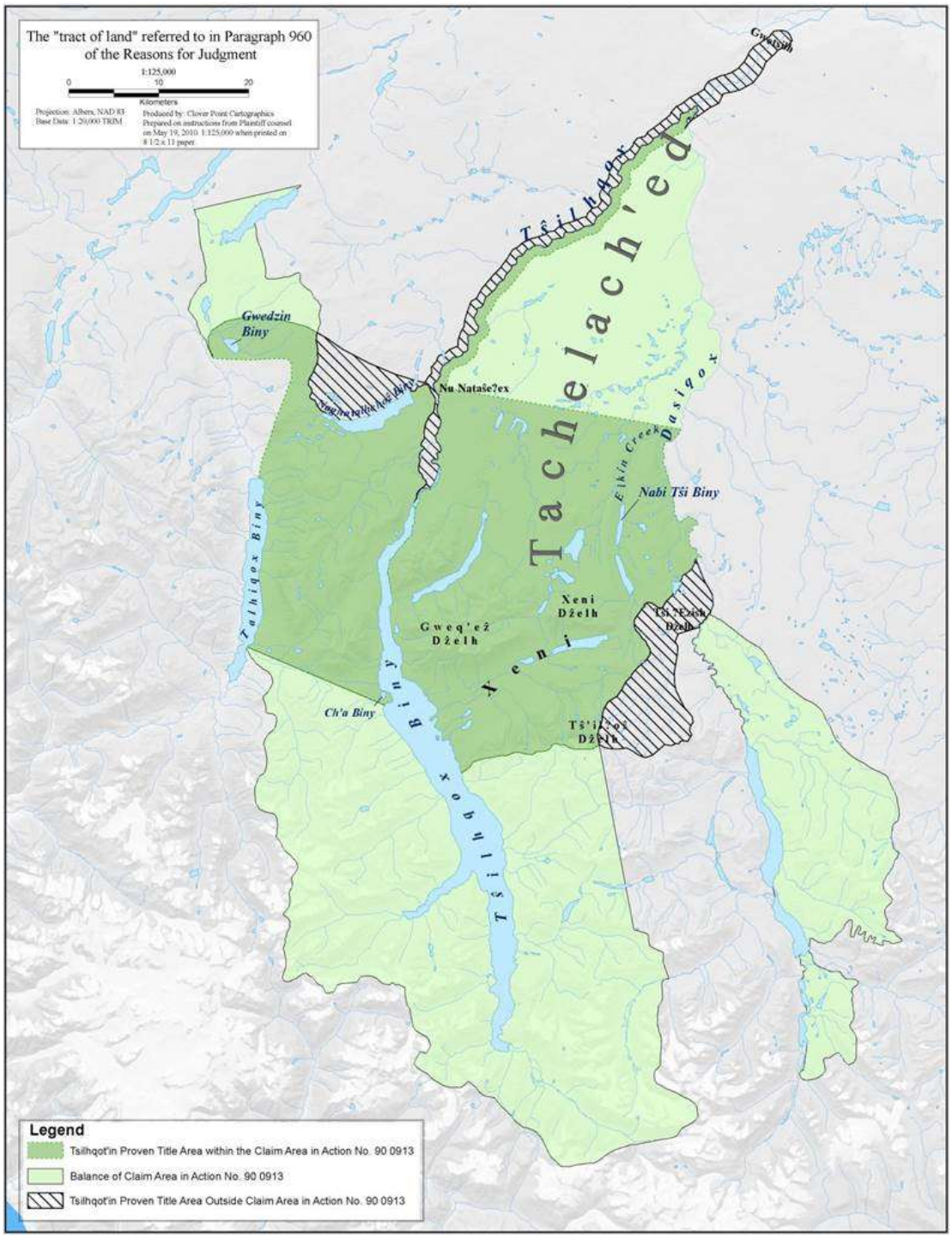
One report (Sibaud 2012) states that the problem is escalating:

> *The context of extractive industries, especially mining, has changed dramatically over the last decade. Global investments in extractive industries have rocketed, and the rising price of metals, minerals, and oil and gas have led to land-grabbing, the violation of community rights, the devastation of fragile ecosystems, water [contamination and] scarcity – including the surge in ever more extreme resource extraction techniques, such as hydraulic [fracturing] fracking, mountain-top removal, and deep-water drilling.*

In the meantime, it is important for First Nations communities to realize, after so much conflict with the mining industry over the proposed mine at Teztan Biny (Fish Lake) and growing concerns over industrial-scale logging into their caretaker areas, the need to adopt a much more proactive strategy to protect the Dasiqox-Taseko study area beyond the current limited political protection provided under the umbrella of the aboriginal/wild horse decrees.

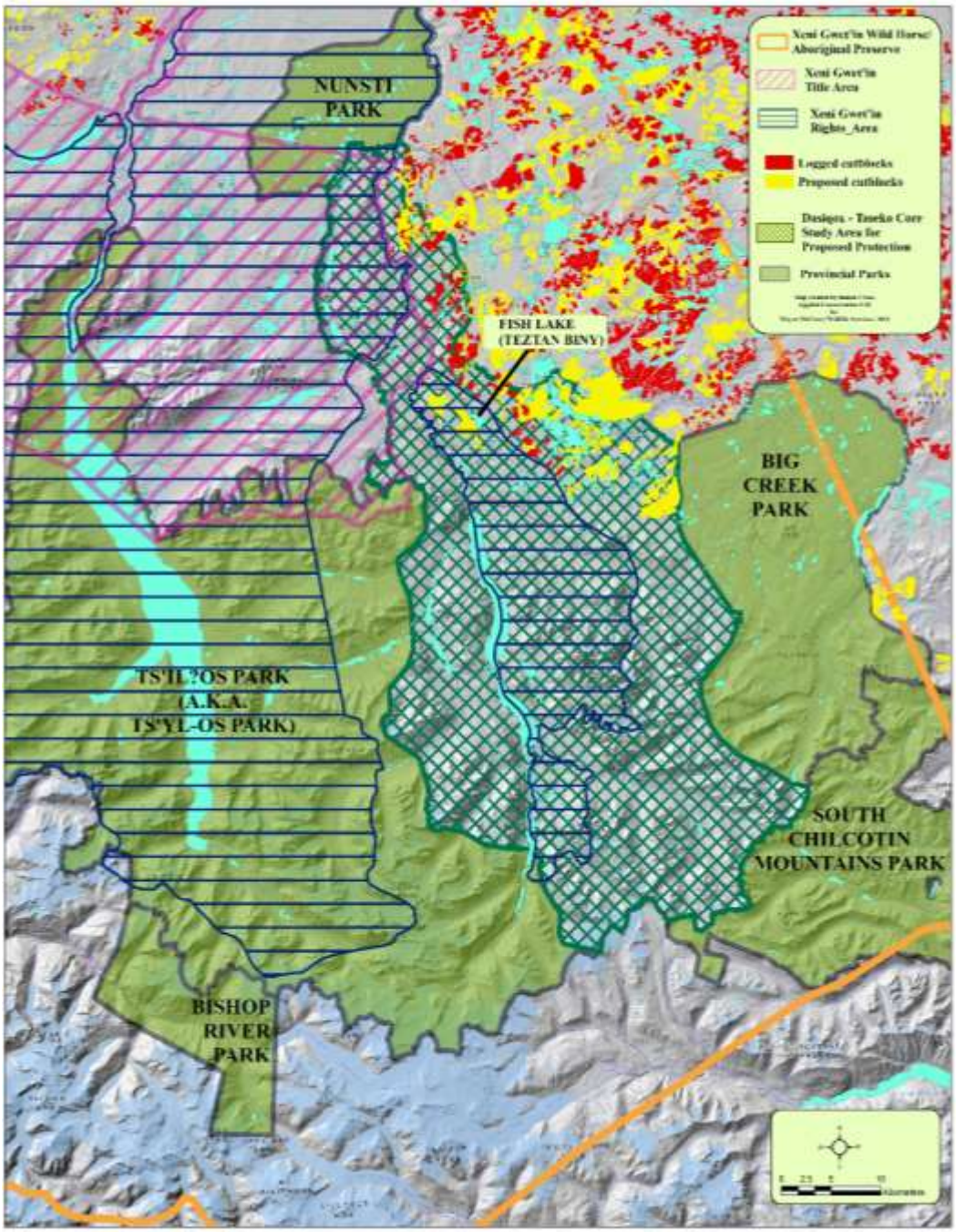
4.5.1.2 Implications of Xeni Gwet'in Rights and Title areas

In 2007, Tsilhqot'in Xeni Gwet'in met the test for aboriginal title over part of their caretaker area (map 31). The court 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 (Tachelach'ed) and the Xeni Gwet'in trapline (Vickers J, 2007). The rights areas are also shown on map 31. Both the Xeni Gwet'in and the province appealed Judge Vickers' ruling related to aboriginal title and the case went to the Supreme Court of Canada (SCC). On June 26, 2014, the Supreme Court in *Tsilhqot'in Nation v. British Columbia* granted the Xeni Gwet'in aboriginal title over their claim area (SCC. 2014) (http://scc-csc.lexum.com/scc-csc/scc-csc/en/item/14246/index.do).This included a northern section of the Dasiqox-Taseko protection proposal study area.



Map 31. Darker green shows Xeni Gwet'in title area recognized by the SCC on June 26, 2014 and lighter green shows the rights areas recognized in 2007 (Map from Appendix A. SCC. 2014. (http://scc-csc.lexum.com/scc-csc/scc-csc/en/item/14246/index.do).

Map 32 shows that the rights area covers some 31.6% of the Dasiqox-Taseko protection study area and the SCC recognized title area covers some 9.6%. These landmark legal rulings further strengthen the Xeni Gwet'in's community initiative to protect their whole caretaker area as an aboriginal and wild horse preserve.



Map 32. Xeni Gwet'in aboriginal title area (pink diagonals) and rights areas (blue lined) in relation to the Dasiqox-Taseko core study area for protection (green cross-hatching).

Although there are different legal and anecdotal interpretations of the Nemiah rights areas recognized by the BC Supreme Court (Vickers **J**. 2007) and the aboriginal title areas recognized by the Supreme Court of Canada (SCC 2014), both appear, in my opinion, to offer the Xeni Gwet'in First Nation a greater mandate to enforce the protection mandate of their Aboriginal/Wild Horse Preserve declarations in the face of strong ongoing industrial resource exploitation sanctioned on "Crown" land by the province. In the case of the SCC ruling, Aboriginal Title appears to infer an enhanced ownership beyond private land ownership in that: *The uses must be consistent with the group nature and the enjoyment of the land by future generations* (SCC 2014 unnumbered page 8). Additionally: *It is collective title held not only for the present generation but for all succeeding generations. It cannot be…..encumbered in ways that prevent future generations of the group from using and enjoying it. Nor can the land be developed or misused in a way that would substantially deprive future generations of the benefit of the land (SCC 2014 para 74).* The SCC also spelled out that: *Incursions on aboriginal title cannot be justified if they would substantially deprive future generations of the benefit of the land (SCC 2014 para 86)*.

The BC Supreme Court (Vickers J. 2007) spent considerable time reviewing the evidence related to the impacts to wildlife from clearcut logging under BC's forest policy with respect to aboriginal rights and title and concluded that: *forest harvesting activities, which include logging and all other silvicultural practices, reduce the number of different wildlife species (diversity) and the number of individuals within each species (abundance) in a landscape. Forest harvesting depletes species diversity and abundance through: 1) direct mortality; 2) the imposition of roads; and, 3) the destruction of habitat (*Vickers **J**. para 1276, p. 417*).* Vickers went on to conclude that: *Forest harvesting activities would injuriously affect the Tsilhquot'in right to hunt and trap in the claim area. The repercussions with respect to wildlife diversity and destruction of habitat are an unreasonable limitation of that right* (Vickers **J**. para 1288, p. 421). After previously reviewing the potential impacts on wildlife of the draft Chilcotin Sustainable Resource Management Plan (McCrory 2004), which includes the Dasiqox-Taseko protection study area, I would concur entirely. The inference of the Vickers (2007) ruling is clear, in my opinion, that clearcut logging under BC's forest policy and aboriginal rights to hunt and trap do not go hand in hand. Therefore, where the Xeni Gwet'in have recognized aboriginal rights, some protection measures go with it.

4.5.1.3 Provincial

Since the study area has been designated a resource allocation area by provincial agencies, there is very minimal protection of its high ecological and cultural/heritage values. In their totality, my review finds the protection measures advanced by the province to be grossly inadequate. If the fate of the study area were to be left entirely up to the provincial government, most of the area will end up being clearcut and mined with serious consequences to endemic wildlife populations.

Within the study area, there is one small ecological reserve (Mt. Cardiff) and a proposed provincial Wildlife Habitat Area (WHA) for grizzly bears at the outlet of Dasiqox-Taseko Lake. WHAs began in the late 1990s and early 2000s under the Forest Practices Code (FPC 1999) or as part of a higher level plan. *Identified Wildlife* is more or less defined as follows:

> *For the most part, the species and plant communities listed in Identified Wildlife are considered to be at risk (endangered, threatened or vulnerable) and require special*

management of critical habitats in order to maintain or restore populations or distributions. Critical habitats include breeding, denning or feeding sites (http://www.env.gov.bc.ca/wld/frpa/iwms/strategy_docs/backgrnd.htm).

Unfortunately, while WHAs were intended to protect critical habitat areas, their implementation has been remarkably slow, running into more than a decade, and secondly, their overall effect is severely constrained by being limited to less than 1% of the timber harvesting land-base (THLB).

Current resource use in the study area is being guided by the Ministry of Sustainable Resource Management (MSRM) 2004 Draft Chilcotin Sustainable Resource Management Plan (SRMP). In my Xeni Gwet'in access management plan (McCrory 2005), I identified industrial-scale logging and mining proposed or sanctioned by the province's Chilcotin SRMP as the largest and most serious threat to the ecological integrity, traditional lifestyle, and wilderness tourism values of the XGCA. Road densities from clearcut logging appear to far exceed those that can be tolerated by sensitive wildlife species, such as grizzly bear, Canada lynx, and other species. Logging not only fragments the wilderness character of the area, but introduce extensive road networks beyond which sensitive species can not survive over the long term. Proposed mining endorsed by the SRMP over 100% of the area outside of parks was considered another large threat.

4.5.1.4 Provincial and federal species-at-risk recovery plans

There aren't any species-at-risk recovery plans, even though they are required by legislation. The 2013 Xeni Gwet'in Aboriginal Funds for Species-at-Risk (AFSAR) project found that although there is a moderate number of species at risk in the XGCA, including the Dasiqox-Taseko study area, neither the federal or provincial governments have implemented any recovery plans. Although the South Chilcotin Ranges GBPU grizzly bear population is considered threatened, the province made it clear in a letter to the federal CEAA Panel on the proposed New Prosperity Mine that it had no commitment to implement a grizzly bear recovery plan for the South Chilcotin Ranges GBPU (CEAA Panel. June 14, 2013, Reference 103165).

4.5.1.5 BC Spaces for Nature: Wilderness Tourism-Forest Sector Avoidance Area Strategy Agreement

This agreement was an outgrowth of the Cariboo-Chilcotin Land Use Plan (CCLUP) in response to accelerated timber harvesting as a result of the mountain pine beetle epidemic. The agreement for avoidance areas for tourism was administered under the Cariboo-Chilcotin Beetle Action Coalition (CCBAC) policy. In 2005, CCBAC subsequently provided the funding for a wilderness tourism land base analysis in the region. A map was produced that shows avoidance areas in terms of harvest priority. The wilderness tourism-forest sector avoidance areas include the Nemaiah Valley, most of the Brittany Triangle, Gunn Valley in the Dasiqox-Taseko and some small areas along the east side of lower Dasiqox-Taseko Lake, and a large area on the east side of Big Creek Provincial Park. The agreements are not legally binding and expire in 2015 (Ric Careless, pers. comm.). While they do not offer long-term protection, they have nonetheless provided important interim protection from industrial-scale logging in the avoidance zones.

4.5.2 Recommendations

Based on its very high values, the study area should be fully protected. Its combined First Nation cultural/heritage and biodiversity values are superlative. Equally important, it is a primary linkage landscape that is absolutely critical to the ecological integrity of major provincial parks to the west, east, and north, each of which will suffer ecological isolation if current fragmentation by industrial-scale logging continues or if the New Prosperity Mine is eventually allowed to proceed.

Steps to get some form of reliable protection that overrides current mineral and logging tenures outside of the Xeni Gwet'in aboriginal title and rights areas, however, will be challenging and require further analysis and community consultation. Case studies of similar complex situations, such as the creation of the Alsek-Tatshenshini Provincial Park, which included the controversial Windy-Craggy proposed mine area, need to be carried out. Hopefully, the now recognized Xeni Gwet'in aboriginal title at the north end and overlying about 1/10 of the protection proposal, as well as the recognized rights that overlie about 1/3, will provide some greater leverage towards Xeni Gwet'in and Yunesit'in protection.

Obviously, other options need to be pursued that don't allow continued logging and mining to erode the superlative wilderness, wildlife, and cultural/heritage values of the Xeni Gwet'in Aboriginal/Wild Horse Preserve and that have a priority to protect the Dasiqox-Taseko area, which, in my opinion, would be equal to or surpass any national park or national park reserve in the western mountains of Canada.

Paquet (2013) reviewed various protection options for the Xeni Gwet'in First Nation ranging from national parks and national park reserves to provincial ecological reserves, different classes of provincial parks, provincial conservancies (a comparatively recent designation), tribal park declarations, and protection under the BC Environment and Land Use Act. Community input to date suggests both the Xeni Gwet'in and the Yunesit'in favour a Tribal Park designation (David Williams pers. comm.). However, according to Paquet (2013), *'Tribal park' is not a legally recognised designation, either provincially or federally.* The BC government has considered them to be Crown lands and will allow logging, mining, and other industrial uses of, and activities on, these lands. The one exception is the Stein Valley, which was initially declared a tribal park and subsequently protected as a Class A provincial park but still using the name reference to tribal park. Perhaps now that the SCC has recognized aboriginal title over part of the Dasiqox-Taseko protection proposal area, declaration of a tribal park may have more leverage in getting recognized protection..

As first actions, I recommend that the Xeni Gwet'in and Yunesit'in First Nations consider the following steps towards full protection of the Dasiqox-Taseko study area.

1. Since the study area boundaries I used were determined with limited community input, this needs to be completed.
2. A good next step would be to register the final community protection proposal for Dasiqox-Taseko study area (as well as the Xeni Gwet'in Aboriginal/Wild Horse Preserve) with the worldwide interactive ICCA registry www.iccaregistry.org.

3. Given existing circumstances, a Tribal Park designation by the Xeni Gwet'in and Yunesit'in should be considered as a further declaration of First Nations protection, reinforcing the 1989 Aboriginal Preserve declaration and the 2002 wild horse preserve protection designation over the same Xeni Gwet'in Caretaker area. Given the imminence of proposed logging plans and mining interests, declaration as a Tribal Park should be considered as quickly as possible.

4. Careful consideration should be given to having the province adding legislated protection to the Tribal Park as a conservancy or Class A park, similar to the final protection provided by the 1987 Nlaka'pamux (Stein Valley) Tribal Heritage Park agreed to by the St'at'imc First Nation and the BC government, which conferred provincial recognition as a Class A park. One of the apparent benefits of the phrase "tribal park" is that it publicly declares that the area is important to First Nations; one of the obvious benefits of adding Class A legislated protection to a Tribal Park is that it offers a more permanent and secure level of so that a Tribal Park is not left to the vagaries of band council elections.

Literature Cited or Consulted for this Section

BC Ministry of Environment, Environmental Stewardship Division. Identified Wildlife Management Strategy—Background. http://www.env.gov.bc.ca/wld/frpa/iwms/strategy_docs/backgrnd.htm; last accessed on 17 March 2014.

Dudley, N. (ed.) (2008) Guidelines for Appling Protected Areas Management Categories. IUCN: Gland, Switzerland. p.8-9. ww.unep-wcmc.org/about-protected-areas_163.html. Accessed March 16, 2014.

FPC; Forest Practices Code of British Columbia. 1999. Managing Identified Wildlife: Procedures and Measures guidebook. Victoria, BC.

McCrory, W. 2005. Proposed access management plan for Xeni Gwet'in First Nations Caretaker Area, Chilcotin, BC.

Ministry of Sustainable Resource Management (MSRM). 2004. Draft. Chilcotin Sustainable Resource Management Plan. 2004. Ministry of Sustainable Resource Management, Cariboo Region, Williams Lake, BC.

Paquet, M.P. 2013. Parks as mechanisms to protect cultural and biological diversity. Land use designations: definitions, descriptions, and legislation. Report to Friends of Nemaiah Valley (FONV). 15 pp.

Sibaud, P. 2012. The New Wave of Land Grabbing by the Extractive Industries and the Devastating Impact on Earth (2012). The Gaia Foundation. www.gaiafoundation.org/ opening-pandoras-box. Accessed March 16, 2014

United Nations General Assembly, Resolution adopted on 13 September 2007: 61/295. United Nations Declaration on the Rights of Indigenous Peoples, Article 29, sub-section 1. Accessed at http://daccess-dds-ny.un.org/doc/UNDOC/GEN/N06/ 512/07/PDF/N0651207.pdf?OpenElement on 17 March 2014.

Supreme Court of Canada. 2014. Judgments of the Supreme Court of Canada. Tsilhqot'in Nation v. British Columbia. Case number 34986. http://scc-csc.lexum.com/scc-csc/scc-csc/en/item/14246/index.do. July 12, 2014.

Vickers, **J**. Tsilhqot'in Nation v. British Columbia [2007] BCSC 1700. http://www.courts.gov.bc.ca/jdb-txt/sc/07/17/2007bcsc1700.pdf. Accessed 13 March 2014.

World Parks Congress. 2003. Recommendation v.26. http://cmsdata.iucn.org/downloads/ recommendation_en.pdf. Accessed March 14, 2014.