AN INDEPENDENT REVIEW OF THE ENVIRONMENTAL IMPACT DOCUMENTS FOR THE PROSPERITY MINE

[TERRESTRIAL/WILDLIFE COMPONENT]

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REVIEW OF TASEKO'S EIS CONCERNING GRIZZLY BEARS, OTHER WILDLIFE, PLUS COMMENTS ON EFFECTS MINE DEVELOPMENT ON WILD HORSES & ECOLOGICAL INTEGRITY OF PROTECTED AREAS

[Note: This draft review is a revised copy of the original draft submitted to the panel on April 16. Considerable information has been added and some revisions made. Methods & approach & relevant maps are included in my April 29 Powerpoint Presentation to the Federal Panel, a digital copy of which was provided to the panel and will not be included in this technical background document to my Powerpoint. Wayne McCrory, RPBio.]

COVENANT:

My review partly focuses on the impacts of access. At the April 29 hearing, I requested of Taseko documentation of the current vehicle use of the Taseko/Whitewater Road of 50 return trips (= 100 vpd) but they were unable to quantify this or name the source. As well, when asked as to what standards Taseko would be up-grading the Taseko/Whitewater road they were unable to provide any information other than to state that this would be left to the BC Ministry of Transportation. I requested of the Panel that they consider the Taseko EIS deficient in this regards until this information is forthcoming.

EXECUTIVE SUMMARY

My review, using extensive local knowledge and research on wildlife habitats, 40 years of grizzly bear/wildlife expertise combined with a conservation biology and cumulative effects literature review including mine-grizzly bear case history studies, concludes that the Taseko EIS for the proposed Prosperity Mine significantly undervalues the environmental impacts of the mine development on grizzly bears and other wildlife. Taseko used a scientifically narrow and misleading habitat area-based approach in order to conclude that their development will have no significant impact on grizzly bears and other wildlife over the life-span of their gold-copper open pit mine. However, there are a number of species within the mine area and its large Zone of Influence (ZOI) that are already in various stages of federal and provincial listings as at risk from cumulative impacts that include excess roading and clearcutting, habitat losses and mortality from human settlement, extensive mining exploration activities (Upper Taseko), over-grazing (e.g. sharptailed grouse), illegal killing, climate change and other factors. The provincial listing of the West Chilcotin grizzly bear as "threatened" is by definition a sound indicator of significant impacts, meaning that the species has already undergone significant adverse effects human development and associated activities.

By using a more comprehensive cumulative effects approach I concluded the opposite and that the mine development will have a significant impact on the threatened South Chilcotin Ranges grizzly bear population. Habitat fragmentation is probably the least understood but potentially the most devastating for grizzly bears and other large carnivores. The scientific literature indicates that the Taseko-Whitewater road is a partial barrier to movements of grizzly bears and other wildlife across the Chilcotin Plateau and impedes the ability of grizzlies to disperse naturally across their existing range. Such changes in movement patterns alter movements of grizzly bears within their home range and could effect fitness and survival as a result. The combined consequences from the mine of increased movement disruptions, loss of habitat effectiveness, habitat loss is a cumulative reduction of the ability of the West Chilcotin to support a viable grizzly bear population. These factors combined with an escalation of human caused mortality predicted from the mine will push the Chilcotin grizzly bears over the threshold of extinction.

The grizzly bear population in the West Chilcotin and South Chilcotin Ranges is the largest residual dryland population left in the Coastal Mountain foothills of western North America and is a salmon-eating bear that also feeds on whitebark pine nuts and wild potatoes. A recent conservation study showed that a large intact area larger than the Greater Yellowstone Grizzly recommends a recovery plan. The population in the South Chilcotin Grizzly Bear Population Unit (wherein lies Taseko's mine proposal) is considered threatened by the province and is down to about 100 animals. My partial review of mortality data for the South Chilcotin Ranges GBPU showed that during the 2001-2009 period at least seven grizzlies were reported killed, all conflict related. In recent years there was also an anonymous report of a mother and two young killed in a local food attractant/conflict situation. Using a ratio for unreported versus reported kills, I estimated that at least 17 grizzly bears have been killed by humans in the Chilcotin Ranges GBPU within nine year (2001-2009) This is a relatively high mortality rate when one considers that there were there females killed and an unreported number as well. In my opinion, this population cannot sustain further habitat losses or increases in human-induced mortality as I project will happen from the Prosperity Mine. A projected net loss of quality habitat areas resulting from climate change exacerbates the stress this relict grizzly bear population is now under.

With respect to the proposed mine development, I determined that cumulative effects on grizzly bears will result from a combination of the following direct and indirect mine-related causes:

- ❖ Direct losses of quality habitats from the mine development (and further exploration), including 405 ha of wetland and 352 ha of riparian.
- ❖ Increased displacement from a three-fold increase in vehicle traffic of the more wary grizzly bears from quality habitats and movement corridors in an associated broader Zone of Influence along the 50 km road corridor and mine site.
- ❖ Increase in direct mortality of grizzly bears from the vehicle collisions in the mine transportation corridor and mine areas, including subdominant bears that will habituate to these areas,
- ❖ Secondary displacement from quality habitats and movement corridors and associated illegal mortality resulting from an expanded motorized recreational backcountry use created by access improvements from the mine development, including the transmission line corridor and the Xeni Gwet'in Caretaker Area.

A review of other studies showed that most mitigation measures identified by the Taseko EIS will not be effective in reducing impacts on grizzly bears other than in small ways.

Other impacts will include increased mortality to wild horses, mule deer, moose and other wildlife along the proposed mine transportation corridor. Loss of moose and deer as an important traditional food source for First Nations will have be serious. Additionally, the impacts of the mine will reduce the ability of adjacent large protection areas to support viable populations of wide-ranging species. Collectively these aboriginal and provincial protection areas exceed 2 million acres in size and represent a significant investment by society to leave a natural and heritage legacy for future generations. The impact of the Prosperity Mine on wide-ranging wildlife such as grizzly bears that depend on these protection areas will serious erode the ecological integrity and protection that these legacies were meant to preserve for all time.

1.0 **REVIEW & DISCUSSION**

1.1. ***Grizzly bear background conservation review and use as an indicator species***

My review focuses primarily on grizzly bears and the potential impacts to grizzly bear populations from the proposed Prosperity mine project. I use a conservation biology approach that looks at all of the direct and indirect influences on the grizzly bear in the Taseko region. By its nature, this is a cumulative effects assessment since the regional bear population has undergone, and is continuing to undergo, numerous adverse effects from a variety of natural and manmade disturbances and encroachments into the region. The proposed transportation and transmission corridors and the mine development site will simply be one more additive effect in an otherwise compromised and shrinking viable habitat base for Chilcotin grizzlies.

The grizzly bear is a good indicator species. Paquet (pers. comm.) analyzed niche overlap for 410 terrestrial vertebrates in the Central Canadian Rockies and found that by protecting the habitat needs of the grizzly bear, Canada lynx, and grey wolf, additional species (98%) would also be protected. This means that if effective protective measures and good management are undertaken for this one species alone, almost all other wildlife populations in the same area are automatically taken care of. On the converse, whatever happens to grizzly habitat will almost assuredly affect in a negative way the majority of the other wildlife populations' habitat. This makes the grizzly tremendously useful to the Panel's understanding of wildlife habitat impacts from the Prosperity project.

The grizzly bear is one of North America's slowest reproducing mammals (a mother grizzly might contribute 4-5 offspring to the population if she lives long enough). This feature has made it vulnerable to population declines and extirpation, such as in the region 30 km or so to the north of the proposed Taseko Mine. 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.

Grizzly bear population estimates

The grizzly bear in the South Chilcotin Ranges Grizzly Bear Population Unit (GBPU), estimated by the Wildlife Branch to be down to 104 individuals (Hamilton 2008), is provincially listed as "threatened." This is loosely means that the estimated population is 50% or less below the habitat capability, which is the number of animals that could be supported under optimal conditions (Austin et al. 2004). Recent DNA studies detected 119 grizzlies in the combined Tatlayoko and upper Chilko River sections of the Xeni Gwet'in Caretaker Area (XGCA), which could suggest that the numbers of grizzly bears in the XGCA may be in better shape than expected (Mueller 2008). However, this may provide an artificial window on the overall status of the population since some of the grizzly bears are being drawn to salmon from a very large area, including from as far away as Gold Bridge to the south of the Taseko.

In the larger Chilcotin grizzly bear conservation area identified by a recent study by Craighead and McCrory (2010) that includes the South Chilcotin GBPU and two other GBPUs, 300 grizzly bears are estimated, all under threatened status. Grizzly bears generally cannot sustain mortality higher than 4%, if recovery is desired (Horejsi 1999). Even the loss of one breeding-age female can have serious consequences to maintaining a viable population. Studies using radio-collared grizzlies have demonstrated that female grizzly bears comprise a large proportion of the unreported mortality in BC.

Craighead – McCrory 2010 grizzly bear conservation overview for Chilcotin Ranges

Despite the historic decline in Chilcotin grizzly populations, a recent conservation study showed that an area of viable grizzly habitat larger than The Greater Yellowstone Grizzly Bear Population Conservation (GYPCA) still exists along the west side of the Coast Ranges, their foothills, and partially onto the Chilcotin Plateau from the head of the Taseko River to Tweedsmuir Park. The GYPCA is 2,387,115-hectares and is one of two grizzly bear populations in the continental U.S. that have the potential to be viable in the short term (100 years). The 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 study also showed that the West Chilcotin grizzly bear is the last potentially viable population of grizzlies left in the dryland-grassland ecotype along the eastern fringes of North America's Coastal Ranges and Cascade Mountains. This is a grizzly that feeds on salmon, but unlike its cousins in the adjacent coastal rainforests, also feeds on whitebark pine nuts, and digs for wild potatoes and bears-claw. This grassland grizzly ecotype is now totally extirpated from a vast area of the Cariboo Region on the east, extinct along the lee of the coastal mountains in the continental US with perhaps a few animals near the Canadian border, and down to an estimated 25 animals in the BC North Cascades GBPU (where a recovery program is being looked at). Just to the north of this GBPU, Austin et al. (2004) estimated the Stein-Nahatlatch GPPU has 61 grizzly bears. We would guess that perhaps half of the estimated 56 grizzlies left in the Squamish-Lillooet GBPU occur in the dryland eastern portion.

Some 46% of the Chilcotin grizzly bear conservation area is already protected through a network of provincial parks and the Xeni Gwet'in aboriginal/wild horse preserve declarations (Craighead and McCrory 2010). 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 areas of the province but the study recommends that more core areas need to be protected. This is based on a comprehensive review of the number of grizzly bears required in a population for long-term viability by a panel of independent bear scientists (Gilbert et al. 2004). They concluded that some 68% of the habitat base that must be protected, a percentage higher than previously expected. This Craighead-McCrory study recommended that a grizzly bear recovery plan be implemented for this area by the province.

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

A recent hair-snag and DNA study of grizzly bear abundance, distribution, connectivity and conservation across the Southern Coast Ranges of British Columbia, that included some information on the Chilcotin Ranges (Apps pers. comm.), found 272 individual grizzly bears in nine genetically discrete population clusters. The cluster arrangement indicated ancestral landscapes with little human access now separated by human activity and physiographic features that are likely to inhibit grizzly bear survival and movement. In the south, the North Cascades subpopulation of 23 grizzly bears was found to be isolated. For regional population recovery and conservation, their results and spatial outputs are focusing efforts to re-establish and maintain population core, peripheral and linkage landscapes. In particular, their study demonstrated the importance of secure source areas in population recovery and expansion to peripheral but connected landscapes.

Current threats

Although this population of dryland grizzlies is no longer hunted, unreported kills from defense-of-life, conflicts at native salmon harvest sites, ranches, mining exploration camps, hunting camps, poaching and road mortalities are on-going threats to this vulnerable population. The expansion of logging and mining activities into the foothills and mountain zones is another very serious threat.

1.2 ***Review of the Taseko EIS regarding grizzly bears and my own cumulative effects review of potential impacts to habitat and numbers***

1.2.2. *Effects of roads, transmission line and mine development*

<u>*Ecological/wildlife-social context of the industrial transportation corridor area*</u>

- The proposed mine transportation corridor will use the Taseko/Whitewater road from Hanceville to the junction of this road and what is called the “4500” road. Apparently the road south of Stone will be up-graded to avoid going through the village and adjacent ranch lands. The 4500 road will be up-graded for the approximately 5 km to Fish Lake. This total length of this main transportation corridor from Stone to Fish Lake appears to be about 50 km.

- Near the south end and junction with the “4500” Road, the Taseko/Whitewater Road enters the Elegesi Qiyus (Nemiah) Wild Horse Preserve (2002), marked by a large sign. This is also the 1989 Xeni Gwet’in Nendduwh Jid Guzit’in Aboriginal Preserve. They cover the same area and were established by aboriginal decree by the Xeni Gwet’in and they are approximately the same size as Banff National Park. This section of the Taseko/Whitewater Road, the 4500 Road, and the proposed mine are all in this Preserve area.

- The road crosses a largely lodgepole pine-meadow-wetland plateau that is somewhat fragmented and roaded from recent clearcut logging and a few old ranch roads. However, it appears to still be inhabited by all of the West Chilcotin wildlife species, including blue-listed grizzly bears and wolverine; although some negative effects are likely occurring. Some blue-listed sharptailed grouse likely occur, as we have been recording small numbers in the Brittany Triangle (McCrory 2005 and unpubl. field notes).

- Currently, and until the habitats in the large Brittany fire zones (2003 and 2009) in the aboriginal/wild horse preserve recover, wild horses and wildlife such as grizzly bears, lynx, and wolves displaced by these large wildfires appear to have moved into outlying habitats, including areas along the Taseko/Whitewater Road. For example, in fall 2003, what appeared to be several new herds of wild horses were observed moving into the Km 23 area of the Taseko/Whitewater Road as a result of displacement from the fire (Wild horse ranger, Harry Setah pers. comm.). Our studies of the 2003 Brittany Fire (McCrory 2005 and recent unpublished field surveys) indicate that while some animals, such as wild horses, have generally recovered, slow food resource recovery for some species (e.g., willows for moose, soapberry for bears, slow come-back of snowshoe hares for lynx, etc.) may mean another decade or so before capacity is recovered. The 2009 fire was even larger and crossed the east side of the Taseko to near the Taseko/Whitewater Road. If wildlife and wild horses are here in greater numbers because of this fire displacement effect, then this has implications for increased direct and indirect effects of the mine transportation road, including road kills.

- Many wildlife populations still apparently cross the existing road safely to utilize habitats that exist on the east and west side of the road. This is particularly true of the 300 + wild horses, but also moose, bears, and other species. Productive wetlands and grasslands on both sides of the current road access are biological hotspots and all are necessary for some of these animals to continue to survive over the long-term.

- The proposed mine transportation corridor, for all of its 40 - 50 km length, intersects a major migration corridor and spring-fall resident habitat for large numbers of mule deer that primarily winter eastward along the Fraser River.

- The road corridor also intersects what appears to be a wide dispersal corridor for grizzly bears traveling from the more dryland areas east to access major salmon runs along the Taseko and Chilko rivers. In one case, a grizzly bear was known to travel 113 km from Gold Bridge (in the south) to access the spawning salmon food resource in the Chilko (Mueller 2008). Meuller felt that grizzly bears in the region have much larger home ranges than in most other reported grizzly studies. We have observed grizzly bears utilizing pine forests north of the Chilko River towards Alexis Creek.

- The general Whitewater/Taseko Road and associated sub-roads are a communal hunting area of considerable importance for First Nations' harvest of mule deer and moose.

- Wildlife viewing values are fairly high compared to other roads in the Cariboo. Wild horse viewing and photography are some of the best in the province. The area is occasionally used for wild horse documentary filming (e.g., Discovery: Wild Horses/Unconquered People).

- I consider the wildlife and wild horse populations in this area to be highly vulnerable to mortality and displacement from a high volume industrial transportation corridor, such as that proposed by Taseko Mines.

Background information from Taseko EIS documents

Taseko EIS conclusion: "there is no significant effect on Grizzly Bear."

Taseko: "During the Project's construction phase, Project traffic consists of transporting material and persons to the construction site. There are no large units that will require special traffic management other than pilot car for wide loads. The composition of the traffic is about 60% trucks/trucks and 40% light vehicles. The largest increment to traffic is Year 1 of operations, which overlaps with construction, with an annual average daily traffic of about 250 vehicles. After that, the Project adds on average about 100 vehicle trips per day (i.e., 50 vehicles making round trip). Concentrate trucks would make about 15 trips per day on average over the mine life. When the mine closes, the traffic volume drops to a negligible value."

Taseko Mines Table 3-15, p. 3-38 of Vol 6 (social) Current Traffic and Project-Related Traffic Volumes (round trips per day)

	current traffic	construction	operations	closure	post-closure
	AADT	Yr-1AADT	typical year	Yr 20, AADT	Vehicles per wk
4500 Haul Road	5<	48	100	46	2
Taseko Lake/Whitewater roads	50	48	100	46	2
Hwy 20 Rural (Lee's Corner to Wms Lk)	1,600 to 1,800	48	100	46	2
Hwy 20 (Williams Lake to Hwy 97)	About 16,000	48	100	46	2
Hwy 97 (Wms Lk to Macalister load-out	2,900	-	32		
Note: * indicates will be upgraded					
Source: Taseko Mines, see Table 3-36 for annual values					

In my discussion, I have converted round trips per day to vehicles per day (vpd) by multiplying by 2.

Current status & impacts of the Whitewater/Taseko access road

<u>Special note</u>**: During my April 29 panel submission, I requested of Taseko documentation of the 100 vpd average use on today's access road. They were unable to provide information as to whether this was just an estimate or was based on traffic count information. I remain quite sceptical that the average annual traffic volumes would be this high as this is actually as high as the two paved southern transportation highways across southern BC by Horejsi (1999) in his conservation review of the endangered Granby grizzly bear. Additionally Taseko could not provide any details as to what industrial standards the road would be up-graded to. This lack of reliable information on the main access road has a strong bearing on my conclusions regarding the current road's impacts on grizzly bears.**

My observations after 8 years of travel to do wildlife research in the area is that the Whitewater/Taseko road currently is a "bush road" often with little traffic, even in the summer, and travel is slow. In my last 10 years of doing research in the area, I have never seen a road kill, although recently a horse was reported hit, and I have seen a wolf and a wild horse that were indiscriminately shot within 1/2 kilometre of the road. The current rough state of the road provides a natural type of speed control that limits collisions with wildlife and wild horses. My Xeni Gwet'in Access Management Plan (McCrory 2005) concluded that: "*current levels of access roads, such as in the Nemiah Valley, north end of Chilko Lake, Tsuniah Road, and Taseko Lake are likely not having any significant impacts on grizzly bears, although some habitats near these roads might not be used by grizzly bears at certain times of the year*."

Pending more accurate information on current traffic volumes for the Taseko/Whitewater road, it is difficult to measure what effects this road has had to date on grizzly bears. In one study in Montana, grizzly bears showed avoidance of roads at just 10 vpd, and at 60 vpd, the road helped define the border between two female grizzly bear home ranges (Mace et al. 1996). Assuming that 60 vpd is some sort of threshold that causes a fairly high avoidance of roads by grizzly bears, if the current road is at or above this level, then it already is having a major influence on displacement of grizzly bear habitat use and travel. If on the on the hand, levels of use are lower, then the effects would be lower.

<u>*Habitat loss, displacement & increased mortality*</u>

Various scientific studies demonstrate that roads can have significant behavioural and ecological consequences for grizzly bears, all of them negative (Horejsi 1994, 1999, 2000; Horejsi *et al.* 1998; Kasworm and Manley 1990). Besides causing direct losses of habitat, roads create a Zone of Influence that displaces grizzly bear use, even of high quality habitats. Roads can reduce the use of quality habitats within 1.6 km (Suring et al. 1998). In another case, a grizzly in Alaska restricted use to just 22% of its home range because of a road (Dau 1989). After four years of study, no radio-collared female grizzly bears were known to have crossed the Trans Canada Highway (Gibeau and Herrero 1998).

On the other hand, subdominant bears, especially females with young, will habituate to roadsides and become susceptible to being killed from traffic collisions, illegal hunting, and food/garbage related problems. In Yellowstone national Park humans killed habituated bears 3.1 times as often as non habituated bears. Habituated females paid a particularly heavy price; mortality was 3.8 times that of non habituated females (Mattson *et al.* 1987).

All around, roads, especially those with higher speeds and higher traffic volumes, are extremely dangerous to bears and can become both an ecological dead zone for warier bears, even along salmon streams, or a death zone for bears that habituate to roads and traffic.

Traffic volumes are one way to measure the effects of roadways on grizzly bears, including road kill levels and habitat displacement (Dr. L. Craighead pers. comm., Horejsi 1999). In a Montana ecosystem somewhat similar to the West Chilcotin, grizzly bears showed strong avoidance of roads with 11-60 vpd (Mace et al. 1996).

a). *Taseko/Whitewater Road. 40 km of plateau habitat*

Taseko's data indicated that the mine operation would triple the estimated traffic use of the Taseko/Whitewater road from 100 vpd to 300 vpd. The majority of Taseko's use will be trucks, including 15 concentrate trucks per day. In Year 1, when construction overlaps with operations, the total vpd will be 350. These figures do not account for the increased public/recreational use of the road that will occur as a result of road improvement.

Although Taseko's EIS provides no information as to the industrial standards the main access road will be up-graded to, I feel I am safe in assuming that significant improvements will be made to facilitate the projected high increase in mine traffic. This will also increase significantly the speed at which vehicles will be able to travel. This factor alone has serious implications for collision mortality with grizzly bears, other wildlife and wild horses.

Although the current Taseko-Whitewater road is causing some habitat displacement by warier grizzly bears, the greatly increased traffic and road up-grade for the Taseko mine will exacerbate this and **effectively create an almost total ecological blockage for grizzly bears and a mortality/sink area for the grizzly bears attempting to cross the road or that may habituate to the roadsides.**

b). *"4500" road & mine development. 15 km of partially disturbed and pristine landscape*

Taseko indicates that the current use is 10< vpd, which if true, would be having a lesser effect on grizzly bears. Turning this 5 km road into an industrial roadway will extend the blockage and loss of habitat use to grizzlies further into their hinterland. As well Taseko plans to build a new 2.8 km road from this logging road to the mine site. In the Fish Lake area, I estimate from maps than another 5 – 7 km of roads and industrial development will occur. This does not account for any exploration roads Taseko may have previously constructed.

Development to an industrial scale of this 15+ km road/mine corrido will effectively have a major impact on grizzly bears extending into the more or less pristine grizzly bear hinterland to the south (other than one recent logging road). If one considers a conservative 1/2 km zone of influence on either side of this 15 km corridor, significant habitat displacement will occur for warier bears along with expected mortality of habituated grizzly bears.

In terms of the access road and mine, this will effectively create an almost total ecological blockage for grizzly bears for 55 km of wildlife habitats and movement areas, and from a gene flow perspective effectively closing off any window any for the occasional grizzly movement across a road. This will have a profound negative effect on the grizzly bear population in the s.e. sector of the South Chilcotin GBPU.

c). *Access along the transmission line corridor*

The proposed transmission line corridor will also be a significant source of grizzly bear mortality and disturbance to habitat use. Although the route attempts to use existing roadways, it will establish an 80 km east-west linear corridor from Hwy 97 near the Fraser River to the Prosperity Mine site. The Taseko EIS underplays the impacts this will have on grizzly bears.

This 80 km long corridor will effectively improve access for motorized access into a mosaic of intact grizzly habitats and areas already impacted by logging and roading. The road will not be continuous as no crossings are anticipated at the 100+ water bodies intersected. Nonetheless, despite gating and other restrictions, motorized 4-wheel drive, ATV and snowmobile use are expected to increase considerably, **causing more displacement and illegal mortality of grizzly bears. Displacement along an 80 km lineal corridor could be significant. This will be additive to the both the reported and unreported grizzly bear mortality that I predict will be caused by the mine industrial access corridor and mine site itself.**

d)**.** *Cumulative impact of increased motorized backcountry recreation in grizzly habitat resulting from improved primary road & large influx of mine workers*

Another cumulative effect not identified by the Taseko EIS will be the high increase in backcountry motorized recreation (ATVs, snowmobiles) that will spin off from improved primary road access and a large influx of mine workers, and the effects these will have on grizzly bears and other wildlife. For grizzly bears this will mean more displacement from habitats and increased mortality, including poaching and defence of life kills.

As identified in my Xeni Gwet'in Proposed Access Management Plan (McCrory 2005), prior to 2003, mining and mining exploration activities in the upper Taseko watershed increased the amount of roads in the XGCA by 45% of all primitive roads and 24% of all roads, opening up a vast area of wilderness to motorized access. I also identified a significant increase in backcountry motorized recreational access in the XGCA from Fish Lake mine workers as a major concern. Backcountry use by ATVs and snowmobiles in the XGCA and surrounding areas is likely to increase dramatically, whether it is hunting or recreation, leading to further disturbances to grizzly bears and illegal kills. Certainly the number of illegal quad trails, already a growing problem, will also increase, particularly with recent cutbacks on Ministry of Forests staff that monitor and regulate such things.

Increased mortality from mine to current levels of grizzly bear mortality in the Chilcotin Grizzly Bear Population Unit

According to Horejsi (1999): "***understanding the impact of road access involves the recognition that the cumulative effects of incremental mortality and displacement events can quickly destabilize a bear population."***

Benn (1998) analyzed grizzly bear mortality data for the central Canadian Rockies ecosystem from 1971-1996. Human-related causes were the primary sources of recorded mortality (N = 627 of 639). Some 85% of 462 mortalities with accurate locations occurred within 500 m wide zones of influence (ZOI) around roads and front country developments and 200 m wide zones around trails and backcountry development. The author concluded that the spatial analysis showed that most grizzly bears died within a narrow zone along roads and trails, and around human settlements but despite this, roads and major developments continued to be constructed in the last unroaded areas. The author recommented:"*A commitment of no new roads into existing roadless, secure grizzly habitat is what is needed" combined with a program of decommissioning of some existing roads*."

There has not been a grizzly bear hunt in the Chilcotin area since 2004 (Tony Hamilton pers. comm.). The following reported grizzly bear kills were obtained from several sources. While the data is incomplete (for example I did not access hunter kills until 2004). During the 2001-2009 period a minimal of least seven grizzlies were reported killed, all conflict related.

2001: 3 grizzly bears destroyed at Alexis Creek for killing calves (Chris Schmidt, BC Wildlife Branch, Alexis Creek, BC. Pers. comm. to David Williams. See McCrory 2002).

2004-2009: 4 grizzlies (Tony Hamilton, pers. comm.) as follows:

- 2004. Conflict kill, female, MU 5-4, Mud Creek fields
- 2007. Conflict kill, male, Big Creek (livestock likely issue)
- 2007. Conflict kill, male, MU 5-4, on Chilko River
- 2009. Conflict kill, female, MU 5-05, Chilko Lake

If we loosely apply the telemetry findings of McLellan *et al*. (1999) of one grizzly reported killed to one grizzly killed but not reported, there would have been at least 14 grizzlies killed during this 10 year period. I also have confirmed information from an anonymous source that a grizzly and two young were killed about three years ago in the Nemiah Valley as a result of attractant & human safety issues and since there were more or less "reported" have taken the liberty of adding them to make a total of 17.

Thus, roughly over a 9-year period, an estimated 17 grizzly bears were killed, including at least 3 females. When you recognize that the death of two adult female grizzly bears out of a population of 100 bears can cause that population to decline, 3 documented female losses combined with unreported female losses constitutes a serious concerns for this threatened population to which projected bear mortality from the cumulative effects of the mine is a serious threat.

Grizzly bear road kills

For this section, I reviewed the map in my possession of provincial reported "bear kills" from 1990-1999 (BC Wildlife Branch-Research and Conservation Section). These were given to me by government biologist Matt Austin. Unfortunately, the maps do not separate black bear and grizzly bear kills. The data represents about 20% of the bears actually killed on the highway. The map tells us this is so because data is lost due to bear remains being removed by predators; covered by snow, ice, or vegetative debris; and data collection errors and omissions. There is no information for the Taseko/Whitewater Road, and the road between Williams Lake and Hanceville shows 3 bear kills between 1990-1999. This would actually equate to 15, and all are assumed to be black bears since the highway passes through the Cariboo grizzly bear zone of extirpation.

High volume transportation corridors in occupied grizzly habitat, such as Banff National Park, contribute to high mortality rates for grizzly bears that jeopardize even populations in large protected areas. Even with traffic volumes for two provincial highways crossing the Granby-Gladstone grizzly ecosystem at vpd levels 1/3 lower than the proposed Taseko mine road, Horejsi (1999) concluded that one traffic-related mortality of a female grizzly bear would jeopardize chances of recovery. One male grizzly apparently was injured on the highway and had to be destroyed by a conservation officer.

In my opinion, upgrading the Taseko-Whitewater "bush" Road into an industrial corridor will cause road-related grizzly bear mortality and injuries for less warier bears over time that, with other direct and indirect mortalities caused by the mine, will push this threatened population below the threshold required to sustain recovery of the population. By this point, the sliding to extirpation of this threatened and rare dryland grizzly population will be irreversible. The mine

road will become an ecological death trap. As noted elsewhere, the proposed Taseko grizzly bear mortality monitoring program will do little if anything to prevent projected mine-related grizzly bear mortality.

The case study evidence clearly does not support Taseko's conclusion that its industrial road will not have a significant effect on the Chilcotin grizzly bear population. Given that for most of its length, the Taseko/Whitewater Road passes not only through occupied grizzly habitat but also what is likely a major travel corridor between dryland areas on the east and the Taseko salmon river and associated quality habitats on the west, the evidence from past studies is that fragmentation of habitat, blockage of movements of warier bears, and road kills will likely have very significant and irreversible cumulative effects on this threatened grizzly population.

1.3 **Review of Taseko's proposed mitigation strategies for grizzly bears**

There is some merit in Taseko implementing a rigid food/garbage control program in the mine development area and certainly this needs to be done property and maintained over the life-span of the mine. While this has merit if implemented properly, given the scale of the development, because the site is in prime grizzly bear habitat and a broad movement corridor, some grizzly bears will habituate to people and the development. This will lead to bear-people conflicts, such as access to careless garbage containment or encounters with mine surveyors, with a high risk of problem bear mortality as a result. I predict that some grizzly bears will be killed during the construction phase and operation phase as a result of such habituation, despite precautions taken.

Thus while part of Taseko's proposed program will help mitigate grizzly bears from becoming food conditioned, overall mitigation measures for other situations created by the mine will be largely ineffective. For example, Taseko commits to speed controls, gating of some access roads (transmission line) and a "*Grizzly Bear Mortality Investigation Program*" implemented by MOE, and so on. These are simplistic comments and will be ineffective at preventing the impacts identified above.

According to Horejsi (1999), administrative road restrictions such as signs, gates, and regulations have little effect on controlling bear mortality, nor do they reduce the rate of habitat displacement (such as where secondary roads are gated to prevent motorized access).

Some examples include:

- In a study in the endangered Selkirk grizzly ecosystem in Idaho showed this low population of approximately 50 grizzly bears suffered 18 deaths between 1982 and 1996, 11 associated with open roads and 4 on closed roads (Wakkinen 1993, Wakkinen and Johnson 1997).

- In a National Forest in Idaho, of 10 roads administratively "closed" with gates by the U. S. Forest Service (USFS) for wildlife protection purposes, a spot check by the Idaho State Wildlife Department revealed 4 were not locked and were open to public use (Pollard 1991).

- In Montana, 53 road closure structures (all gates) were inventoried in grizzly bear habitat. 38% were ineffective in restricting passenger vehicle access to 44% of the road system. 25% of the failures were due to trails circumventing the closure and half due to failure to lock gates. 100% of the structures failed to control snowmachine or ATV access (Hammer 1986).

- In the Kootenai National Forest in Montana the USFS is charged with limiting access to protect threatened grizzly bear populations and their habitat. 281 closure structures were

> evaluated behind which were 1355 km of supposedly protected road. 21.4% failed to control vehicle access and a further 25.3% failed to control ATV access. 64% of the roads claimed to be protected were not. Of the 281 structures, 146 were gates - their failure rate was 65.6%, higher than the overall failure rate of control structures (Platt 1993).

As noted in my report on deactivation of fireguards from the Brittany 2003 fire, hunters and mushroom pickers built ATV access roads around all blockages (McCrory 2005). Illegal ATV access roads have also been built into Brittany Creek and portions of the upper Taseko for hunter access (McCrory 2009). At the Chilcotin-Fraser Junction protected area, BC Parks attempted to control access, but both the gate and the fence were removed by unauthorized people in short order (Glen Davidsen pers. comm.). In a study I did for the Wildlife Branch of legally closed, signed, and blocked/gated access roads in the Pasayten and North Cascades, motorized hunting groups violated all access points.

In addition, as has been widely acknowledged across the province for a decade or so, the BC MOE already has insufficient numbers of conservation officers to enforce current regulations. The fact that Taseko wants to have a grizzly bear mortality investigation program is an acknowledgement that some grizzly bears will die from their activities. They fail to acknowledge that for every grizzly bear reported as a road kill; there will be five more dead grizzlies that go unreported. Nor has Taseko made any attempt to link road mortalities to the threat they pose to the threatened Chilcotin grizzly bear population.

Taseko also relies for the mitigation of some wildlife impacts on government to implement certain programs or management activities. This is a huge mistake, for experience here shows all too clearly that provincial government commitments to wildlife management and protection are anything but reliable. Taseko has provided no data that supports robust engagement of provincial (or federal) government agencies to effectively carry out wildlife mitigation measures from industrial projects anywhere in BC. Budgetary cutbacks and relaxed attention to environmental issues are unarguably real trends in government, as they have been for some years now. The panel should not conclude that reliance on provincial programs to implement impact mitigation measures are a real and viable solution and, if left to industry with no oversight, will likely not be effective in reducing impacts to wildlife or their habitats.

As an example, in about 1975, I conducted an environmental impact assessment on waterfowl and furbearers for a consulting firm for the early stages of the Syncrude tarsands mine development. The property turned out to be on an important waterfowl migratory flyway and had important wildlife values. The assessment identified important concerns and made recommendations for monitoring and mitigation. The results, emerging decades later, have not been promising, including high mortality rates for black bears. The following is from the website of Greenpages Canada (http://thegreenpages.ca). In eight years (2000-2008), three (out of the many) companies working in the oilsands in northern Alberta (Syncrude, Albian Sands, and Suncor) reported a total of 164 NON-AVIAN animals killed as a result of their operations. Among the animals listed as killed were black bears (27), red foxes (31), coyotes (21), white-tailed/mule deer (67), and slightly lesser numbers of muskrat, beaver, red-backed vole, martens, weasels, moose, grey wolves, and little brown bats. All these are in addition to the "infamous dead ducks" incident that made the national news when over 1,600 migratory birds landed on a Syncrude oilsands tailings pond in April 2008, and all but a few died. Of the three operations, Syncrude was responsible for the majority of mortalities, including 43 deer, 20 red fox and eight black bears. Possible causes of mortality include euthanasia of problem wildlife, drowning or oiling from tailings, animals hitting infrastructure (e.g., buildings), or vehicles and electrocution. According to independent scientist Dr. Kevin Timoney, the numbers of dead animals reported to government underestimated true mortality because they were derived from ad hoc reporting by companies rather than from a scientifically valid and statistically robust sampling design.

As in British Columbia, the Alberta government has made significant cuts to its monitoring, enforcement, and reporting capacity.

1.4 **Case history studies on effects of mining & other developments on grizzly bears**

At my first submission on grizzly bear impacts to the Federal Panel on April 1 I was asked if I had reviewed the effects of grizzly bears at other mine developments. Following is documentation.

The following background all indicate **documented** negative influences on grizzly bears where mines and mining exploration or other developments occur. Although habitat, population, and geographic conditions vary between the different study areas and not directly analogous to the proposed Prosperity Mine situation, the effects measured on radio-collared grizzly bears are supportive of my cumulative effects review.

a). **Central Arctic & resource development**. Johnson et al. (2005) modeled bear telemetry locations from May 1995 to June 1999 across the central arctic in relation them to resource development. In late summer, mineral exploration sites had a moderate negative influence on habitat use to a distance of 23 km (keeping in mind that the study area that was essentially treeless, so open space/line-of-sight and sound were factors). In autumn monitored bears avoided mineral exploration sites, but wide confidence intervals suggested the relationship was statistically uncertain. The disturbance effects suggested habitat loss for grizzly bears was most extreme during late summer and autumn, where they measured 12 and 11% reduction in the total availability of high and good-quality habitats, respectively. The modeled response of bears to mineral exploration sites and outfitter camps suggested an even larger impact than did their assumptions about disturbance. The timing is a critical issue, given that this is the season of hyperphagia (the physiological state of rapid gain of body fats in preparation for hibernation). This translates directly, through body size, to reproductive success (fitness), so these are impacts with significant consequences.

b) **Admiralty Island mine**. Schoen and Beier (1990) studied grizzly bear habitat preferences and brown bear-logging and mining relationships in southeast Alaska. For a mine on Admiralty Island they found six radio-collared female bears denned within 4 km of the mine site in Upper Greens - Zinc Creek. The mine site included a road and intensive helicopter traffic. These bears denned a mean of 3.4 km from the mine site the first year of observation, but denned significantly further away from the mine – (mean of 11.7 km) the next year. They then compared the mean distance between den locations between the bears they thought might be impacted by the mine with that of 11 radio-collared females that denned outside the area of the mine influence. They found a significant difference; Mine- influenced bears denned a mean of 10.4 km from their Year One den sites, while bears outside the mine influence denned a mean of only 1.9 km away from Year One dens. They had limited evidence that bears altered their home range because of the mine and its road construction. Bears were attracted to a salmon stream alongside road construction. The first year (1986) after road construction (began fall 1985) two adult males (of 18 bears total) used other salmon streams within their home range which were not influenced by construction activity. The other bears continued to use the drainage but shifted away from road activity, then moved in closer to the road when activity was reduced. The authors felt that this happened because the dense forest shielded some bears, and the abundant spawning salmon resource attracted them.One female bear was monitored from before the mine (1982) to the spring 1989. Prior to 1986 she successfully weaned two litters of 2 cubs each. After that she lost two consecutive litters. The researchers had no direct evidence that development activities were implicated in her reproductive failure, but suggested the possibility that **displacement**

from her familiar feeding area along lower Zinc creek in 1987 may have reduced her reproductive effectiveness. They also surveyed grizzly day bed locations in a strip 1.6 km long x 120 m wide;in 1985 *prior* to road construction they identified 57 beds. In 1986, following major construction activities they found only 17 beds in the same area. These beds were a few metres closer to Zinc Creek Mine in the activity year (1986: x = 41m) than in the previous year (x = 52 m). The important point here is relative to impacts of the mine on grizzly bear distribution is the decline in the overall number of beds; the equal distance of beds from the stream indicates some bears will hold to their traditional home ranges, and these are the bears that are subjected to increased stress and mortality. Characteristic of bears that are less likely to be displaced, one subadult female bear did habituate to workers, and was later killed by a hunter. The authors concluded that with these results reflected short-term effects of development activities on bears and that **it would be premature to conclude that development of the Greens Creek Mine will have minimal impacts on the local brown bear population.**

c). **Cumulative effects of human developments including mines on grizzlies in Chugach National Forest**. Suring et al. (1998) studied the cumulative effects on brown bears on some 500,000 ha of the Chugach national Forest on the Kenai Peninsula, Southcentral Alaska. They applied their analysis to and considered mining operations, recreation sites accessible by motorized means, recreation trails, open roads and residential/townsite areas. Their simultaneous analysis of all known human activities showed a total cumulative reduction in habitat effectiveness (HE) of 71% for spring and 72% for summer. This is an important study in that it showed that a reduction of habitat values or HE from various impacts within a given area are cumulative. In other words you can't just pick the worst impact and conclude that that is it; all other impacts factor in to make the overall impact even greater.

d). **<u>Central BC and logging road mortality</u>**. Ciarnello et al. (2009) compared two study areas (SA) in central BC: The Plateau study area (Parsnip) had resource development, (12% logged) with an extensive road network while the Mountainous study area (Hart Mtns.) was relatively pristine (2% logged). Six of nine bears shot by hunters were within 100 m of a secondary or decommissioned logging road. Five grizzly bears were killed illegally in the more roaded Plateau and area (4 not reported to authorities) while there were no illegal kills detected in the less developed mountain study area.

e). **<u>Black bear avoidance of gravelled roads</u>**. Reynolds-Hogland et al. (2007) did a study was on 118 radio-collared black bears in the Pisgah Bear Sanctuary from 1981 to 2001. It is also significant because was not only done over the long term but also largely reflects responses to vehicles, people and roads without the complicating analysis factor of killing by hunting (although some bears were killed by hunters outside the sanctuary, there was some poaching within sanctuary and other wildlife species were hunted in the sanctuary). The researchers found that all bears avoided areas near gravel roads more than they avoided areas near paved roads during summer and fall, at the home range scale and, during summer, within home ranges. Avoidance at the home range scale indicates the selection of a home range to minimize the presence of gravel and paved roads. Within home ranges in the fall, adult females still avoided gravel roads more than they did paved roads. They found that overall, bears avoided areas within 800 m of gravel roads.

f). **<u>Proposed BC Greenville to Kincolith road and grizzly bears.</u>** According to Demarchi (2001) according to "wildlife biologist A. Hamilton (pers. comm. 1999) concerns about potential impacts of the Greenville to Kincolith project on grizzly bear habitat were superceded by concerns about mortality risk posed by construction and operation of the road. Biologists projected that of the 175-270 grizzly bears estimated to be within the Stewart Meziadin GBPU, the road could negatively affect 40-60. Most effects would be in the form of disturbance and displacement, but based on regional data, an annual mortality rate of 4-6 individuals was forecast as a result of the road. Assuming that 4-6 bears of a population of 175-270 were killed annually, the “safe” mortality limit of 3 percent is exceeded at the extremes of these parameters. There was already an average mortality of “2 per year from 1994-99 for the purposes of animal control, (G. Searing pers. Comm).

g). **Mining exploration in Arctic impacts on grizzly bear habitat use.** Johnson et al. (2005) modeled bear telemetry locations from May 1995 to June 1999 across the central arctic, tying to relate them to resource development. The study area that was essentially treeless, so is not directly comparable to the Taseko situation but nonetheless applicable.

> In late summer (1 Aug- 9 Sept) = mineral exploration sites had a moderate negative influence on habitat use to a distance of 23 km.

> In autumn (10 Sept – den period) = monitored bears avoided mineral exploration sites but wide confidence intervals suggested the relationship was statistically uncertain.

> Disturbance effects suggested habitat loss for grizzly bears was most extreme during late summer and autumn, where we measured 12 and 11% reduction in the total availability of high and good-quality habitats, respectively.
.
> Modeled response of bears to mineral exploration sites and outfitter camps suggested an even larger impact than did their assumptions about disturbance For autumn, they identified a 34% increase in the area of poor-quality habitats and a reduction of nearly 21% of high and good quality habitats to low and poor-quality habitats as a result of disturbance impact.

> During late summer, models suggested a nearly 18% decrease in total availability of good and high-quality habitats due to disturbance.

The timing is a critical issue, given that this is the season of hyperphagia, which translates directly, through body size, to reproductive success (fitness), so these are impacts with significant consequences. They did not observe much evidence for a relationship between bears and disturbance during spring and early summer”

1.5 **Review of Taseko EIS habitat model assessments**

[Note: My review was constrained by what appears to be a lack of information and maps on Taseko’s mineral tenure area surrounding the proposed mine development area, as well as associated exploration roads and other activities].

***“The practice, now common, of identifying “critical habitat” and classifying it into management situation categories is an approach that may help a few individual bears over the short-term, but, over the long-term, will surely violate the totality of resources and space necessary for population viability”* (Dr. J. Craighead 1995).**

Habitat losses

Taseko has concluded that their mine development will cause no significant impact on wildlife species (and Xeni Gwet’in plant gathering areas). In my opinion, they arrived at this conclusion partly through the utilization of an ecologically misleading formula that determined the relative size of each habitat type to be eliminated by the mine and then compared the loss to their regional study area (RSA). This is highly misleading since it does not take into account the differences in how wildlife species disproportionately utilize different seasonal habitats to a much higher degree than others. For example, there may be mineral licks for moose and deer in the area that draw many animals from a long distance. The mine site might have areas with root plants that grizzly bears excavate because of the looser soil structure, that make these prime seasonal sites for grizzly bears, versus areas with root plants that grizzlies do not dig because of compacted soils.

A prime example of Taseko's area-based ecological tape measure discounts the loss of 405 ha of wetlands and 352 ha or riparian areas. In Taseko (2009) under: Alpine and Parkland, Wetlands and Grasslands, they state:

"The changes in area of alpine and parkland, wetland and grassland ecosystems from baseline to maximum disturbance are presented in Table 15. No alpine or parkland ecosystems are affected by the Project. The loss of grassland ecosystems is small in both the Regional and Eastern Trapline Study Areas (<1 and 2.5% respectively). The Project-related loss of wetlands is small (<2%) in the context of the Regional Study Area but relatively large (14.6%) in the context of the Eastern Trapline Study Area."

This comparison to the regional study area (RSA) is misleading for several reasons. This number only looks at the losses from the actual footprint of the mine, not from within a conservative 0.5 km zone of displacement on either side of the mine site for warier grizzly bears. Worse, Taseko makes no attempt to address the issue of the disproportionate importance of different habitat types to grizzly bears. For example, a grizzly bear radio-telemetry study in southeast British Columbia (McLellan and Hovey 1993) demonstrated that grizzly bears made a much higher proportionate use of wetlands than their relative distribution over the landscape. Although wetland/riparian habitat comprised only 8.5% of the study area, 40% of the transmitter locations of 46 radio-collared grizzly bears between May 15 – July 22 (and located 10 or more times) were in wetland habitats. Some bears were located 85% of the time in this type of habitat during this period.

My Brittany ecological report (McCrory 2002) and subsequent field observations also indicate that riparian/wetland areas are very important to grizzly bears in spring/summer for grasses, sedges, and horsetails. Field surveys at Fish Lake and the meadow/riparian areas on May 8, 2008, and around the lake in July 2008, documented important grizzly bear wetland foods, including cow parsnip, another important grizzly bear spring/summer food. Two grizzly bear mark trees were documented, which is a good index of grizzly bear movements and feeding through the Fish Lake area. Therefore, the loss of 405 ha of wetland and 352 ha of riparian habitat is far more significant to grizzly bears than just losing a small percentage out of the landscape. Additionally, as noted in my section on climate change, wetland and riparian habitats are expected to diminish significantly from droughts, and particularly in this dryland ecosystem in the lee of the Coast Range.

This is not the only instance in which Taseko has undervalued the actual habitat potential of the mine site area. One of the background reports (Madrone 1999) used to determine seasonal habitat values is outdated, not apparently validated by any field testing, and relies too much on grizzly bear food habitat data from the Rockies, including a previous study I was involved in (McCrory and Herrero 1983). For another example, two key food sources for grizzlies in the Xeni Gwet'in Aboriginal/Wild Horse Preserve that are not mentioned in the Taseko grizzly report are whitebark pine nuts and salmon (Taseko River and some tributaries). There is no discussion of the proximity (5 – 10 km) of the mine development to important salmon areas along the Taseko River and the need for grizzly bears from the Fish Lake area to have access to the Taseko.

Another missing aspect is that we suspect that grizzly bears may also be feeding on spawning trout in the Tetzan Biny area, although this has not been studied. Feeding on spawning cutthroat trout is very important for grizzly bears in Yellowstone (L. Craighead pers. comm.). Although the Madrone report mentions over-wintered bearberries as a potential spring food, again this was not examined in the field (it is also an important late fall berry food for bears in the Chilcotin). In my assessment of bear scats (black and grizzly) in the Brittany Triangle (McCrory 2002), I found that bear scats from the spring were comprised of about 50% over-wintered bearberries and 50% grasses/sedges.

Some of the discrepancies in the Madrone report, and the lack of sufficient ground-truthed habitat-dietary information for the West Chilcotin, has contributed to some of the habitat values of the proposed mine site being under-valued, in my opinion, including, as already mentioned, the proximity of the proposed mine to the Taseko major grizzly bear salmon feeding areas. Regarding habitats in the mine development area, other specialized habitat besides wetlands likely occur that represent critical food sources for grizzly bears. These include spring rainbow trout spawning areas and grasslands/wetlands with diggable soils for grizzlies to excavate root foods such as wild potatoes, bear-claw, and silverweed. The destruction of these, along with critical wetlands lost, could have a serious impact on grizzly bears that rely on this area when combined with other losses already identified.

The loss of wetland and other viable grizzly habitats, combined with the loss of habitat use by warier bears within a 0.5 zone of influence, is therefore additive to the cumulative habitat displacement losses and mortality I have identified from the other aspects of this proposed mine development. When combined with the movement barrier created by the industrial road corridor, creates a significant fracture zone in a vulnerable grizzly bear ecosystem.
This by itself is a significant loss!

1.6 **Climate change will cause ecosystem stress, increased wildfires, and a net diminishment of grizzly bear habitat values**

Another major shortcoming of the Taseko's EIS is that it does not factor in climate changes that will result in significant alterations to wildlife habitat composition and abundance over the next 30-50 years and beyond. Instead, they assume a static habitat situation, which won't be the case at all.

The Xeni Gwet'in recently completed a draft climate change adaptation study (Lerner et al. 2010). I contributed a review of effects on wildlife, including habitat changes, a previous draft of which has been submitted to the Panel. As a result of further input to myself from another biologist, some changes have recently been made for my final text. For grizzly bears, it is expected that some important habitats and food sources will decrease in abundance and productivity, including wild potatoes, whitebark pine, wetlands/riparian areas, and wild Pacific salmon. Warming waters in rivers and streams will also likely have an effect on trout populations, since these, too, are cold-water fish. Increased berry production from wildfires will offset some of the fall habitat and food source losses for grizzly bears, such as whitebark pine and salmon. Losses of other seasonal food sources, such as wild potato and green plants in wetlands, are a major concern as these represent specialized habitats that grizzly bears would use disproportionately to their low occurrence in the ecosystem, and **represent a net loss of food resources apart from the mine development.** This is particularly true of wetlands/riparian areas as well wild potatoes and other root/corm foods, which are also only dug by grizzly bears where the soils are not compacted (McCrory and Herrero 1983).

Direct habitat losses from the mine, and losses from displacement from the mine, road, and transmission line zone of influence will, therefore, be cumulative to habitat reductions caused by climate change.

1.7 **Summary of McCrory Wildlife cumulative effects review on Chilcotin grizzly bears**

In the Journal of Animal Ecology, Bascompte and Sole (1996) refer to an “extinction threshold.” Because grizzly bear populations are highly sensitive to human-caused mortality, habitat losses and displacement, critical thresholds are reached that should not be exceeded if the population is to be expected to survive or recover over the long term. As this has already happened in the provincial “extirpated” grizzly bear zone over much of the Cariboo-Chilcotin plateau just 30 km to the north of the proposed mine, it is a good indication that the surviving 100 or so grizzlies are highly vulnerable to the same extinction process that has been expanding in this dryland ecosystem for the past 40 or 50 years.

The threatened status of the West Chilcotin grizzly population, meaning they are already down to half of their original estimated numbers, combined with increasing encroachment of habitat fragmentation from logging and now mining into their last wilderness enclaves, net loss of habitat values predicted from global warming, suggests that these grizzly bears are already “on the edge” and at the “extinction threshold” from which, if pressed further, they will continue to decline and go extinct. Certainly the status of much lower numbers in similar habitats in the more developed Lillooet area to the south of the Taseko supports this.

It is my conclusion that the impacts of the project, serious in their own right, are additive to the already existing layer of cumulative adverse effects to the grizzly population and its habitat and, because most of the negative effects cannot be mitigated, will push the grizzly population over the extinction threshold. Once the mine is developed, impacts such as road mortalities will not be reversible or adequately mitigated..

1.8 **Effects of mine development on mule deer, wild horses & other wildlife**

The mine transportation corridor will also cross some 50 km of that plateau bordering the large Xeni Gwet’in aboriginal preserve that extends to the east side of the Taseko. Despite fragmentation from clearcut logging, this area still has all Chilcotin wildlife, including grizzly bears, wolves, and 300+ wild horses. The horses were in the Chilcotin region before Europeans, indicating Spanish origin (we are now doing DNA tests on this in the Brittany Triangle). The horses are considered an alternate prey species for grizzly bears, wolves, mountain lions, and other predators (McCrory 2002). The plateau east of the Taseko is also a major movement corridor for mule deer that summer in the XGCA and then migrate to the Fraser River Valley for winter. The road corridor is not only a communal First Nations harvest area for mule deer and moose, but an excellent wildlife and wild horse viewing area. It is periodically used for film documentaries of wild horses.

I predict that development of the mine road will lead to relatively high mortality to mule deer, especially during spring and fall migration periods. Moose will also be affected. This has serious implications to the Fist Nations reliance on this important meat source.

Our map of wild horse distribution using Ministry of Forest Counts shows the highest number of horses in the region occur in the plateau area where the mine road will cross. My observations are such that only a small number of horse bands habituate to the Taseko/Whitewater road and that most bands avoid it. On one winter drive I counted where four separate bands had crossed the road after a snowstorm but did not frequent the road area. Also because wild horses travel in bands up of to 16 animals, and sometimes to cross the road just dash out of the forest and across oblivious to vehicles on the road, I predict the mine road will lead to a general slaughter of wild horses.

I predict that other species will also be subject to significantly increased road mortality. Some of the more wide-ranging carnivores, such as the blue-listed wolverine, likely will not be able to sustain mortality levels threatened by this road.

1.9 Effects of mine development on ecological integrity of protection areas and conservation implications

The ecological significance of roadless habitat on it's own and the role it plays in a broader landscape context as core and source habitat is so well established it seems trite to repeat it. The issue is well summarized by the Eastside Forest Scientific Society Panel(1994) who concluded that "**existing roadless regions have enormous ecological value**."[This was a panel of eight scientists representing the American Fisheries Society, American Ornithologists Union, Ecological Society of America, Sierra Biodiversity Institute, Society for Conservation Biology, and the Wildlife Society. They were addressing the coastal rainforests on National Forests in Oregon and Washington. These forests have experienced a long history of human impacts; the science team recognized the scale of importance relative to availability].

The proposed Taseko mine site and the upper section of the proposed industrial transportation corridor actually lie within the eastern boundaries of a very large protected area: the Xeni Gwet'in's aboriginal/wild horse preserve (1989 Xeni Gwet'in Nendduwh Jid Guzit'in and 2002 ?Elegesi Qiyus Wild Horse Preserve) totalling some 777,290 ha. To the east and southeast, and proximal to the proposed mine, lie two important provincially protected areas, Big Creek Park and Spruce Lake Protected Area, totalling some 137,329 ha. Just like Canada's system of national parks, these aboriginal and provincial protected areas (including four provincial protected areas that lie within the boundaries to the Xeni Gwet'in preserves) were created through intensive public land-use planning processes, with the intention of being lasting legacies for society by preserving biodiversity and high value core grizzly bear habitats and other wildlife.

All wide ranging carnivores in the region of the proposed mine would depend on habitats in these protected areas for part of much of their annual life cycle, including grizzly bears, wolves, wolverine and many others. Mine-related mortality will therefore effect protected area wildlife populations and in the case of grizzly bears erode the high value these protected areas have and will increasingly have in the survival of this threatened dryland grizzly bear.

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