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Non-Detriment Report under the Convention on International Trade in Endangered Species of Wild Fauna and Flora Regarding the Export of Grizzly Bears (*Ursus arctos*) from British Columbia, Canada

Legal Context

Grizzly bears in Canada are listed under Appendix II of CITES because their parts resemble parts of Appendix I bears from other countries. The national Committee on the Status of Endangered Wildlife in Canada (COSEWIC), and the BC Conservation Data Centre (CDC), have both determined that BC grizzly bears are not threatened or endangered. COSEWIC has listed grizzly bears as a "Species of Special Concern" nationally and the CDC has placed grizzly bears in BC on the equivalent "Blue list". Information on the processes used to determine the status of grizzly bears in Canada and in BC is available at the COSEWIC website: http://www.cosewic.gc.ca/ as well as the CDC website: http://srmwww.gov.bc.ca/rib/wis/cdc/.

Grizzly bears are listed as Big Game under the provincial *Wildlife Act.* All grizzly bear hunting is regulated through Limited Entry Hunting (LEH) for residents and Guide Outfitter Quotas (GOQs) for non-residents. This system allows wildlife biologists to carefully regulate harvest levels in each area where grizzly bear hunting is allowed by limiting the number of resident hunters and issuing quotas to Guide Outfitters that limit the number of animals that can be taken by their clients (normally non-resident hunters although resident hunters can also hunt under a Guide Outfitter's quota).

The bag limit for grizzly bears is 1/year. A resident hunter can only hunt a grizzly bear either 1) in a specific area if they have received, through a random draw, one of a limited number of LEH authorizations available for that area. The number of LEH authorizations available for each area is determined by the Director of the Wildlife Branch based on the technical input of provincial wildlife biologists or 2) under the same conditions that apply to non-residents. Non-resident hunters can only hunt a grizzly bear if they are accompanied by a licensed Guide Outfitter or assistant guide. A guide may only accompany a hunter if the guide has a balance remaining on their quota. Quotas set the maximum number of grizzly bears a Guide Outfitter's clients may take within their Guide Outfitter Area and are determined by the Regional Fish & Wildlife Manager or the Director of the Wildlife Branch, again, based on the technical input of provincial wildlife biologists.

In BC it is illegal to kill a bear <2 years old or any bear in its company (usually its mother). It is also illegal to possess bear gall bladders or to possess bear genitalia separated from the carcass or hide or to traffic in, import or export bear paws separated from the carcass or hide. It is illegal for a hunter to kill a grizzly bear and fail to remove the hide. It is illegal to hunt a grizzly bear by placing bait or using a dead animal or a part of it as bait. The maximum fine for poaching a grizzly bear is $100,000 and six months in jail.

Any grizzly bear killed by a hunter must be submitted to an office of the provincial government for a compulsory inspection within 15 days of the kill for unguided hunters (extensions of this

time limit are available based on prior requests for a written approval) or the end of the hunting season for guided hunters. This inspection includes confirmation of sex, extraction of a tooth for ageing and recording the date and location of the kill as well as the hunter's name. In some cases tissue or hair samples are also taken for DNA analysis.

Ecology

Grizzly bears have been one of the most intensively studied large mammal species in North America and a large body of literature exists on their ecology and natural history. For information on grizzly bear population dynamics, habitat associations, movements, sensitivity to human impacts please refer to LeFranc *et al*. (1987), Craighead *et al*. 1995 and Pasitschniak-Arts and Messier (2000).

Range

Grizzly bears currently occupy approximately 84% of British Columbia and 89% of their historic range (Figure 1). The current range is approximately 790,000 km^2 – an area that exceeds the combined landmass of Germany, the United Kingdom, Switzerland and Greece. There are 60 Grizzly Bear Population Units (GBPUs) recognized within the current range of grizzly bears in BC. Of these populations, 11 have been designated as being in need of recovery and 49 are designated as being viable and capable of withstanding a conservative harvest. Within the occupied range of grizzly bears in BC, >106,000 km^2 or 13.4% is protected – an area larger than the landmass of Hungary.

GBPU boundaries have been established based on behavioural ecotypes and sub-populations of bears. In the southern areas of the province, GBPU boundaries follow natural (e.g. large lakes) and human-caused (e.g. high traffic volume highways) partial barriers to grizzly bear movements (Apps 1997). There appears to be some degree of genetic isolation among these units (M. Procter, pers. comm.). In northern and coastal British Columbia, GBPU boundaries follow natural and ecological boundaries or transition areas (primarily heights of land between watersheds) and less frequently represent significant barriers to grizzly bear movement.

There is no hunting permitted in the 11% of grizzly bear historic range in which the species has been extirpated nor in the 9% of historic range represented by the 11 populations in need of recovery. In addition, a substantial number of other areas – including protected and other areas with healthy grizzly bear populations – are closed to grizzly bear hunting (Figure 2). The areas grizzly bears have been extirpated from overlap the portions of the province with the highest human densities and levels of habitat loss, alteration and fragmentation. These areas have been closed to grizzly bear hunting for decades. In most cases habitat impacts and risks of non-hunting related mortality are the factors limiting the ability of these areas to sustain grizzly bears over the long-term.

There has been no significant contraction of grizzly bear range in BC over the last 30 years (Figure 3). In fact, the prevalence of sightings, radio-telemetry locations of instrumented animals and reports to Conservation Officers regarding grizzly bears within some of the areas

that are considered not to be permanently occupied has increased in recent years (e.g. the Okanagan valley and the area surrounding the city of Prince George).

Population Estimates and Inventory

Much of the controversy surrounding grizzly bear hunting in BC focuses on the population estimates that serve as the foundation of the harvest management system. It is well understood that due to the generally solitary nature of grizzly bears, their relatively low densities and use of forested habitats (particularly in BC as compared to more northern jurisdictions) that it is very difficult to inventory their populations (Miller *et al*. 1997).

Critics have suggested that grizzly bear harvest in BC should not occur in the absence of an "accurate" population count, however, given that the exact number of grizzly bears in BC will never be known, this is clearly impossible as well as impractical. This idea is also contrary to a fundamental principle of wildlife management in that "perfect" information is not required in order to manage harvests sustainably. In fact, grizzly bear harvests are managed in all of the jurisdictions that allow grizzly bear hunting without knowing the exact number of bears. The approach taken in BC is to "err on the side of caution" by managing hunting based on minimum population estimates in order to address the inherent uncertainty in counting or estimating grizzly bear population size.

The fact that grizzly bears have been hunted in BC for decades at levels generally higher than in recent years and have only been extirpated from areas where grizzly bear hunting is closed and high levels of habitat impacts have occurred, is direct evidence that "perfect" information is not required for conservative management. There are very few examples of species for which jurisdictions would be able to meet the unreasonable and unnecessary standard of having an "accurate" population count. As an example, Wade (1998) has developed a system for calculating allowable human-caused mortality limits for cetaceans and pinnipeds based on the use of minimum population estimates.

It is estimated that there are over 13,000 grizzly bears in BC (Table 1, Hamilton and Austin, in prep.). This estimate is derived from a combination of inventory results for specific areas and extrapolation to other areas on the basis of current habitat potential combined with an assessment of human impacts (Fuhr and Demarchi 1990).

Although the method of estimating grizzly bear populations in BC has been criticized by a small number of individuals, the concept of using a habitat model to estimate population attributes including density or abundance is a fundamental wildlife management technique (Cooperrider 1986; Anderson and Gutzwiller 1996). This approach has been applied by numerous authors to the estimation of grizzly/brown bear abundance or potential abundance (Zunino and Herrero 1972; Pearson 1975; Reynolds and Hechtel 1980; Miller and Ballard 1982, Boyce and McDonald 1999, Boyce and Waller 2000). The grizzly bear population estimates that are used for harvest management in Alberta and the Yukon Territory are based on similar techniques (Nagy and Gunson 1990; D. Larsen pers. comm.). In Alaska population estimates have been developed by subjective extrapolations from areas of known density, although this was not directly related to habitat mapping (Miller and Schoen 1999).

The habitat based extrapolation work done in BC is based on Biogeoclimatic Ecosystem Classification (BEC) system mapping at the variant level combined with the Ecoregion Classification System mapping at the ecosection level (Meidinger and Pojar 1991; Demarchi *et al*. 1990). More information on BEC and Ecoregion Classification System mapping is available on the following websites: http://www.for.gov.bc.ca/research/becweb/becinfo/index.htm and http://srmwww.gov.bc.ca/rib/wis/eco/index.htm. When these two systems are combined the resulting habitat mapping is sophisticated and complex. In the specific example of grizzly bears 648 unique combinations have been rated for their ability to support grizzly bears in habitat polygons that have a minimum size of <1km^2.

The calculation of current habitat potential is based a model that assigns densities to various habitat types by using classes that are scaled against a benchmark density derived from known areas through research using radio-telemetry (Figure 4, Table 2, McLellan 1989; MacHutchon *et al*. 1993). Information on grizzly bear density from neighbouring jurisdictions such as Alaska is also considered where relevant (Miller *et al*. 1997). The estimated impacts of habitat loss, alteration, displacement and fragmentation as well as historic human-caused mortality are then deducted from the habitat potential starting point to arrive at a "stepped-down" population estimate range that includes both a minimum and a maximum value.

The DNA mark/recapture technique for conducting inventories of grizzly bear populations was pioneered in BC (Woods *et al*. 1999) and has been applied in numerous areas across the province covering a total of >52,000 km^2 – an area larger than Denmark (Figure 5). Boulanger and Hamilton (in prep., Appendix 1) have reviewed the results from these inventories and found no significant difference between the estimates produced and those derived using the habitat based system for the same areas.

It is important to note that when only the inventory projects that used five sampling sessions (as opposed to only four) are considered and the Central Selkirks and Granby-Kettle projects are excluded, (the first due to non-independence of the estimates and the second because it is not relevant to this discussion since it is a small, unhunted population for which the habitat based method may be less effective given the potentially large proportional impact of historic human-caused mortality), the degree of consistency between the inventory results of the four remaining projects and the habitat based method is even greater than indicated by Boulager and Hamilton (in prep.).

Harvest Management

Under the Grizzly Bear Conservation Strategy (GBCS) all grizzly bear hunting in British Columbia has been placed under management by Limited Entry Hunting (LEH) for residents and Guide Outfitter Quotas (GOQ) for non-residents as of fall, 1996 (Ministry of Environment, Lands and Parks 1995). This change only affected northern British Columbia as southern areas of the province had already been managed on this basis for, in some cases, in excess of 20 years. The process of determining sustainable harvest levels for grizzly bears is outlined in the Grizzly Bear Harvest Management Procedure (Appendix 2) and begins with the development of a population estimate for the LEH Zone(s) and Grizzly Bear Population Unit (GBPU) in question. GBPUs are groupings of LEH Zones that constitute a reasonably distinct population or sub-

population of grizzly bears and serve as the foundation for grizzly bear conservation and management.

Population estimates are derived either directly from population inventories or indirectly through the Fuhr-Demarchi method (see above). For harvest purposes the minimum end of the Fuhr-Demarchi range is normally used (with an adequate rationale a higher value within the range can be used but this is unusual) and for sound inventories the population estimate minus the standard deviation of the estimate is used. Populations that are <50% of the estimated habitat capability for the GBPU are designated as being in need of recovery and are closed to grizzly bear hunting. Any areas >100 km^2 within an open LEH Zone that are closed to grizzly bear hunting (e.g. national parks) are excluded from harvest calculations and do not contribute to the area's population estimate for harvest purposes.

Once a population estimate has been prepared the maximum annual allowable total human caused mortality rate is determined. This is based on a sliding scale between 3% and 6% and is linked directly to the average habitat capability of the contributing habitats (i.e. the habitats that are assigned ratings of capability densities >0 bears/1,000 km^2) within the LEH Zone (Figure 6). The maximum end of the scale (6%) is consistent with the available literature on sustainable levels of human-caused mortality (Bunnell and Tait 1981, Harris 1986, Miller 1990, Hovey and McLellan 1996). The sliding scale is based on the principle that the lower the average habitat capability, the lower the productivity of the area and therefore the lower the rate of human mortality that the population is capable of sustaining (Eberhardt 1990, McLellan 1994).

In order to address the issue of unknown human caused mortality (e.g. undetected poaching, crippling loss during legal hunting, unreported road and train kills or grizzly-bear human conflicts, etc.), an estimate of the annual rate of loss to these unknown human causes is deducted from the total allowable human caused mortality to arrive at the maximum annual known human caused mortality rate. Estimates for unreported human-caused mortality rates normally used range from 1% – 2% of the population annually based on a recent review of grizzly bear mortality (McLellan *et al*. 1999). The rate estimated for each area is then multiplied against the population estimate to determine the actual number of grizzly bears that can be lost to all known human causes (hunting and non-hunting) in any given year. Translocations of grizzly bears outside of a GBPU are also treated as mortalities since these animals are lost from these populations.

In some areas with a history of known non-hunting human caused mortality (e.g. grizzly bear-human conflicts) an estimate of the future rate of loss from this source can also be made and incorporated into the process. This estimate will usually be based on an average of the actual annual mortalities from this source.

Before the harvest available in the current allocation period (usually a three year period over which harvest levels are managed) can be established an analysis of the known human caused mortality for the previous allocation period must be conducted to resolve whether or not there was an overkill of either total grizzly bears or females. This determination is reached by deducting the actual known human caused total and female mortality from the allowable levels. Any negative balances are carried forward and deducted from what would otherwise be available

during the current allocation period. Note that overkills are not normally carried forward unless they have occurred for the GBPU as a whole and that only the net overkill for the GBPU is carried forward. Surplus harvest balances are not carried forward between allocation periods.

Allowable female mortality is calculated and tracked separately because limiting human caused female mortality is critical to the long-term viability of grizzly bear populations. The maximum level specifically for known human caused female mortality is set at 30% of the maximum known human-caused mortality level for both sexes combined (Harris 1986).

The calculation of the known human-caused mortality balance that is available for harvest during the current allocation period follows the same general process as described for the previous allocation period. One exception is that if an estimate of known non-hunting human caused mortality has been made, this annual rate is multiplied by the length of the allocation period (usually 3 years) and that value in turn is multiplied against the population estimate of the LEH Zone to determine the estimated number of grizzly bears that will be lost to these non-hunting human causes during the current allocation period. This estimate is deducted from the maximum allowable known human caused mortality for the current allocation period to arrive at the maximum allowable harvest.

The advantage of including an estimate of known non-hunting human caused mortality for areas where such losses are likely to occur is that it avoids the risk that the occurrence of these mortalities will force managers to restrict hunting opportunities during the allocation period in order to avoid exceeding the maximum allowable known human caused mortality level. If known non-hunting human caused mortalities are lower than estimated, increased hunting opportunities can be provided toward the end of the allocation period.

Once the allowable harvest balance and known human-caused female mortality balance for the current allocation period have been calculated, the unused allocations for non-residents and First Nations are calculated in order to determine what portion of the harvest balance is available for residents. This involves deducting the unused portion of any allocations to non-residents and First Nations from the harvest balance to arrive at the allowable harvest balance available for residents for the current allocation period. A portion of this balance is then allocated to the specific hunting season in question based primarily on the remaining number of hunting seasons (e.g. if there are two hunting seasons remaining during the current allocation period the resident allocation for the next season might be half of the allowable harvest balance for residents).

The number of LEH authorizations available in a given area is calculated based on the desired harvest by residents for the hunting season in question. Since only a fraction of resident hunters that are drawn to hunt grizzly bears are successful, the desired resident harvest is divided by the proportion of hunters that are successful in the specific area in question based on the average over the previous three years. In order to minimize the risk of a dramatic change in success rates unduly impacting mortality levels, a minimum success rate of 10% has been set for LEH. As a result, no more than 10 LEH authorizations will be issued for each animal to be harvested (this is despite the fact that in some areas actual success rates are below 10%).

The last step in this process is for the wildlife managers involved to formally recommend the number of LEH authorizations that they believe should be issued. This number may vary considerably from the number calculated simply by dividing the desired resident harvest by the success rate (almost always lower) due to professional opinion based on concerns over female mortality levels, anecdotal or inventory information on population trends etc.

In the event that allowable levels of either total or female mortality are exceeded and can not be adjusted for within two years by reducing harvests to minimal levels, hunting seasons are temporarily closed to avoid impacting populations. When mortality issues have been resolved hunting seasons are re-opened.

The above description is based on the assumption that the population objectives for the GBPUs for which allowable mortality and harvest levels are being calculated, are to maintain the current population. This is the default population objective currently used for all hunted grizzly bear populations in BC. While the procedure used to manage grizzly bear hunting in BC does allow for objectives that seek to reduce the size of population, or to allow them to decline to a given level, such an objective has not been adopted for any population in the province.

No population objective will be set that would allow a population to reach the point of being in need of recovery (defined as <50% of habitat capability). An objective that allows for a population decline will normally only be set for areas where there is a history of (chronic) high levels of grizzly bear-human conflicts and where it has been established that these conflicts are linked to size of the grizzly bear population as opposed to human factors such as poor management of attractants.

Harvest Analysis

Since 1976, there has been a requirement in British Columbia for hunters to bring any grizzly bear they harvest to a provincial government office for inspection. All non-hunting mortalities including illegal kills, animal control kills, roadkills etc. have also been tracked through the same system. A premolar is removed from inspected animals for ageing (Stoneberg and Jonkel 1966, Craighead *et al*. 1970). As a result, there is detailed information available on mortality levels, hunter effort and success, the age and sex of animals killed, kill location and kill type for the period since 1978. The quality of the data for the first two years of Compulsory Inspection (1976 – 1977) are believed to be poor and have been excluded from this analysis.

Grizzly bear hunting in British Columbia is not managed on the basis of any trends or desired harvest characteristics (aside from mortality levels) in the age/sex of the animals killed as these indicators are not considered to be sufficiently reliable as a basis for management (Harris and Metzgar 1987). In many cases the same trend can be used to suggest that a population is increasing or declining as a result of overharvest (Caughley 1974). Instead of relying on harvest trends that may provide a false sense of security, this information is only used on an ad hoc basis to identify areas where trends in the age and/or sex of animals harvested may indicate excessive mortality. Most commonly action is taken to reduce hunting opportunities in response to conservation concerns without regard to these indicators.

Mortality and harvest analysis at the provincial level that combines mortality from the 60 GBPUs in the province and different management regimes (i.e. areas with spring only seasons as well as those with both spring and fall hunts) is particularly problematic. Analyses for individual populations or groups of populations is more appropriate for detecting potential conservation issues. The following analysis, however, demonstrates that there are no trends in the available harvest data that suggest a province-wide grizzly bear population decline. Emphasis is placed on comparing the four years prior to the implementation of province wide LEH in the fall of 1996 (1992 – 1995) with the four years following (1997 – 2000).

Total Known Mortality and Kill Types

Human-caused grizzly bear mortalities are categorized into four kill types: Hunting, Animal Control, Illegal and Pick-up. Pick-up kills include road and train kills as well as any grizzly bears found dead of unknown causes (in some cases these may be natural mortalities). For the 23 year period from 1978 – 2000 there were a total of 8,185 grizzly bears recorded killed by all kill types (Table 3, Figure 7). An average of 356 grizzly bear mortalities have been recorded annually through the Compulsory Inspection system ranging from 254 (in 1998) to 413 (in 1996). Of those mortalities, 89% were from hunting, 8% from animal control, 1% from pick-up and 2% from illegal kills.

Hunter harvest averaged 336 grizzly bears annually for 1978 – 1996 compared to 236 for 1997 – 2000. For 1992 – 1995, the four years prior to the transition year in 1996 when province wide LEH was implemented for the fall, the average hunter harvest was 292 grizzly bears annually. It should be noted that a number of areas have been closed either indefinitely or temporarily to grizzly bear hunting during the 1997 – 2000 period which partially accounts for any changes in the hunter harvest.

Animal control kills have averaged 28 grizzly bears annually for 1978 – 2000, ranging from six (in 1978) to 83 (in 1995). It is suspected that the low level of animal control kills in the late 1970s and early 1980s may reflect problems with reporting. For the four years prior to the implementation of province wide LEH (1992 – 1995) the average annual animal control kill was 46 grizzly bears compared to 55 for 1997 – 2000. Increases in animal control kills in the mid-1990s can be linked directly to electro-fencing of landfills around the province to deny bears access to garbage and to thereby reduce bear/human conflicts over the long term (Ciarniello 1997).

Average Age by Sex

Of the 7,320 grizzly bears taken by hunters from 1978 – 2000, age is available for 6,569 or 90%. The average age of female and male grizzly bears in the hunter harvest was 7.0 and 7.5 years respectively for 1992 – 1995 and 6.6 and 7.5 respectively for 1997 – 2000 following the implementation of province wide LEH (Table 4). There are no trends evident in the average age of hunter harvested grizzly bears from 1978 – 2000 aside from a small potential drop in the average age of females that coincided with the implementation of province wide LEH (Figure 8).

Hunter Harvest of Females

The sex of grizzly bears taken by hunters from 1978 – 2000 is available for 7,256 of the total of 7,320 grizzly bears harvested or 99% (Table 5). The proportion of females in the hunter harvest averaged 34.3% for 1992 – 1995 and 32.8% for 1997 – 2000 following the implementation of province wide LEH. There are no trends evident in the proportion by sex of hunter harvested grizzly bears from 1978 – 2000 aside from the small apparent change that coincided with the implementation of province wide LEH (Figure 9). With the exception of 1978 in which the data on the sex of harvested grizzly bears is considered less reliable, the hunter harvest has consistently exceeded 30% female.

During the period from 1978 – 2000, the break-down of the female grizzly bear hunter harvest by year has followed a relatively consistent trend where the level of harvest increased through the first three age classes (0-2, 3-4 and 5-9 years old) and then declined through the last two age classes (10-14 and 15+ years old) (Table 6, Figure10).

There were eight years that varied slightly from that general trend: 1982, 1983, 1992 – 1994 and 1997 – 1999. In five of these eight years (1982, 1992, 1994, 1998 and 1999) more female grizzly bears were harvested from the fifth age class (15+ years old) than from the fourth age class (10 – 14 years old). In three of the years (1983, 1992 and 1997) the number of female grizzly bears harvested in the second age class (3-4 years old) exceeded the number harvested in the third age class (5-9 years old). In one year (1993) the number of female grizzly bears harvested in the first age class (0-2 years old) equalled the number harvested in the second age class (3-4 years old).

The proportion of the female component of the grizzly bear harvest that has come from each of the five age classes has changed in recent years (Table 7, Figure 11). For the four years (1992 – 1995) prior to the implementation of province wide LEH in 1996, the hunter harvest of females averaged 14% from age class 1 (0-2 years old) compared to 10% for 1997 – 2000. For age class 2 (3-4 years old) and 3 (5-9 years old) combined, the proportion of the female harvest averaged 61% from 1992 – 1995 compared to 71% for 1997 – 2000. The proportion of female grizzly bear harvest from age class four (10-14 years old) and five (15+ years old) combined averaged 25% from 1992 – 1995 compared to 19% for 1997 – 2000. The net result of this is that a greater proportion of the female harvest came from age class two and three and lower proportions from the other three age classes in 1997 – 2000 following the implementation of province wide LEH. Aside from this shift, there are no obvious trends in the proportion of females harvested by age class.

Of hunter harvested grizzly bears, the proportion of females within each age class has shown considerable variation (Table 8, Figure 12). For 1992 – 1995, the proportion of females in age class 1-5 averaged 37%, 35%, 34%, 34% and 31% respectively – a declining proportion of females in older age classes. In comparison, for 1997 – 2000, the proportion of females in age class 1-5 averaged 30%, 40%, 33%, 21% and 30% respectively – a lower proportion of females in age class 1 and 4 and a higher proportion in age class 2.

Hunter Harvest of Males

As with females, the hunter harvest of male grizzly bears from 1978 – 2000 has also followed a general trend in which the level of harvest increased through the first three age classes (0-2, 3-4 and 5-9 years old) and then declined through the last two age classes (10-14 and 15+ years old) (Table 9, Figure 13).

There were twelve years that varied from this general trend: 1978, 1980, 1983, 1988, 1989, 1991 – 1993, 1995, 1997, 1998 and 2000. In six years (1983, 1992, 1993, 1995 and 1997) age class 5 (15+ years old) equalled or exceeded age class four (10-14 years old). In six years (1978, 1980, 1988, 1989, 1991 and 1998) age class two (3-4 years old) equalled or exceeded age class three (5-9 years old). In one year (2000) age class 1 (0-2 years old) exceeded age class 2 (3-4 years old). Note that 1978 was the only year that varied from the general trend for two of the above reasons.

The proportion of male grizzly bear harvest that has come from each of the five age classes has changed in recent years (Table 10, Figure 14). For the four years (1992 – 1995) prior to the implementation of province wide LEH in 1996 the hunter harvest of males averaged 12%, 27%, 34%, 13% and 14% for age class 1-5 respectively. For the four years (1997 – 2000) following the implementation of province wide LEH the hunter harvest of males averaged 11%, 24%, 37%, 18% and 11% for age class 1-5 respectively. In a similar fashion as with females, the implementation of province wide LEH coincided with a greater proportion of harvested males being from age class 3 and 4 and lower proportions from the other three age classes. Aside from this small shift, there are no obvious trends in the proportion of males harvested by age class.

Hunter Harvest by Residency Group

The proportion of harvested grizzly bears taken by resident hunters has increased during the 1978 – 2000 period (Table 11, Figure 15). Resident hunters accounted for 53% of the grizzly bear harvest from 1978 – 1981 compared to 58% from 1997 – 2000. This reflects changes in the allocation of hunting opportunities to resident and non-resident hunters during this time.

Resident harvest of grizzly bears from 1978 – 2000 has ranged from 122 (in 1993) to 228 (in 1992) (Table 12). In the four years following the implementation of province wide LEH the resident harvest has averaged 137/year. This was the lowest four year average for this 23 year period. Non-resident grizzly bear harvest has ranged from 81 (in 1998) to 192 (in 1987). Non-resident hunter harvest averaged of 98/year for 1997 – 2000. As with resident hunters, this was also the lowest four year average for this 23 year period.

Aside from 1978 when the data on the sex of harvested grizzly bears is believed to be less reliable, the percentage of female grizzly bears in the resident hunter harvest has varied between 30% (in 1993) and 40% (in 1996) (Table 13). The average percentage of female grizzly bears in the resident harvest for the four years prior to the implementation of province wide LEH (1992 – 1995) was 33% and was 36% for 1997 – 2000. There are no obvious trends in the sex ratio of resident grizzly bear harvest aside from a possible small increase in the percentage of females that coincided with the implementation of provide wide LEH (Figure 16).

The percentage of female grizzly bears in the non-resident hunter harvest has varied between 23% (in 1997 and 1998) and 41% (in 1985) (Table 14). The average percentage of female grizzly bears in the non-resident harvest for the four years prior to the implementation of province wide LEH (1992 – 1995) was 36% and declined to 28% for 1997 – 2000. Three of the four years in which less than 30% of the non-resident harvest was comprised of females occurred within the four years following the implementation of province wide LEH. Aside from the reduction in the proportion of females that coincided with the implementation of province wide LEH, there are no obvious trends in the sex ratio of the non-resident grizzly bear harvest.

Hunter Success

The average number of days hunted for each grizzly bear harvested by resident hunters from 1982 – 2000 has ranged between 26 (in 1999) and 57 (in 1993) and has consistently been higher than that of non-resident hunters (Table 15, Figure 17). The average number of days/kill for residents was 46 for 1992 – 1995 and fell to 32 for 1997 – 2000.

A similar pattern is seen for non-resident hunters where, for the period from 1982 – 2000, the average number of days hunted for each grizzly bear harvested has ranged between 16 (in 1999) and 36 in 1989. The average number of days/kill was 23 for 1992 – 1995 and fell to 20 in 1997 – 2000.

Resident hunter success rate from 1981 – 2000 has ranged from 14% (in 1993) to 32% (in 1999) (Table 16, Figure 18). The average resident success rate for 1992 – 1995 was 18% compared to 26% for 1997 – 2000. Non-resident hunter success has ranged from 25% (in 1981) to 44% in 1996. The average non-resident success rate for 1992 – 1995 was 34% compared to 36% for 1997 – 2000.

CITES Criteria for Non-Detriment

An overview of the grizzly bear harvest management system has been prepared using the draft format for CITES (Table 17). The radar diagram that has been proposed as a visual representation of the issues related to a non-detriment finding under CITES has also been prepared (Figure 19, IUCN 2000). The only factor of significant concern is “human tolerance” which is rated as a “4” based on the five class scale. This is a biological factor inherent to the species as opposed to a management deficiency. Initiatives under the GBCS are intended to ensure that the sensitivity of grizzly bears to human activities is adequately incorporated into all relevant management activities. More information on the GBCS, including the text of the

strategy itself, can be found at the following website: http://wlapwww.gov.bc.ca/wld/grzz/index.htm.

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Appendix 1. A comparison of DNA mark-recapture and Fuhr-Demarchi / stepdown population and density estimates for grizzly bears in British Columbia
by John Boulanger, A.N. Hamilton

Appendix 2. Grizzly Bear Harvest Management Procedure - September 1999