2.8. HAIDA GWAII BLACK BEAR (URSUS AMERICANUS CARLOTTAE SUBSPECIES)

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INDICATOR RELEVANCE

There are three key reasons why the The Haida Gwaii black bear was selected as an indicator of environmental conditions:

- Haida Gwaii black bears are an endemic sub-species (*Ursus americanus carlottae*), unique to the Islands
- The isolated race is the largest native omnivore and is an 'umbrella' species with large area and highly diverse habitat requirements (by managing for effective habitat for black bears, the habitat requirements of other species may be addressed)
- Black bears are also considered a "keystone" species: their transport of salmon from spawning channels into adjacent forests is recognized as a critical component of nutrient transfer in some forest ecosystems.

BACKGROUND INFORMATION

The black bear is widely distributed throughout British Columbia, and is the most widely distributed bear found in North America. The subspecies found on HG /QCI is generally larger than its mainland counterparts with a huge skull and molars, and is only found as a black colour phase. These physical differences are thought to result from retaining characteristics after a long period of isolation during the last ice-age. Populations of black bears cannot sustain high kill rates by humans (greater than 6% per year). Roads (which bring people into black bear habitat) and conflicts over human food and garbage can create situations where bear mortality exceeds natural population growth. Black bears are considered to be secure in BC, and have been assessed but not listed by COSEWIC.

Black bears are a generalist species, classified as carnivores, but have a wide ranging diet that includes vegetation, making them "omnivorous". Bears feed on concentrated food sources to conserve energy. Consequently, they use a wide range of habitat types, often only avoiding high density human settlements. In spring and summer, post-hibernation, they eat primarily succulent vegetation (found in meadows, estuaries, grassy south-facing slopes and some clearcut areas) and in intertidal areas where they eat crabs, barnacles and amphipods (sand fleas). They also prey on newborn deer fawns. Throughout the summer and into fall they feed on insects and larvae, berries and carrion opportunistically as well as continuing to graze on succulent vegetation. Roadside margins are problematic: hydro-seeded areas can be very attractive forage sites but as a result may be associated with higher levels of human-caused mortality than other habitats. Closed canopy, second growth forests are typically avoided by bears because they lack productive understories, are little used by deer, and also lack adequate bedding habitat. Riparian (streamside) habitats are used across seasons for feeding and travel. High alpine grassy areas offer grazing opportunities that persist into the summer, as higher elevations green up later in the season. The importance of Pacific salmon to bears in Haida Gwaii has been well established (Reimchen 1998a, 1998b, 2000).

The lack of ability to digest coarse forage and the rigours of hibernation result in bears requiring high quality food sources to be accessible year round. The key unknown factor regarding forage on Haida Gwaii is the extent to which bears forage on Black-tailed deer. Work is underway to investigate the annual contribution deer make to the typical black bear diet on the Islands.

Black bears have relatively low reproductive rates. Females often don't breed until the age of 5 or 6, and males often don't mature until the age of 4 or 5. After delayed implantation, 1-3 cubs are born during hibernation in January or February, at which time they are hairless and helpless. They nurse until the mother leaves hibernation, and in that time gain 2.5 – 4.5 kg in weight. Hibernation usually lasts 3 – 5 months in southern coastal regions, and it is expected to be the same on Haida Gwaii. Cubs stay with their mothers for at least a full year, and often longer, only being chased from her home range when she is ready to breed again. Female cubs often remain in their natal home ranges, sharing the home range with their mothers and grandmothers.

Coastal black bears depend upon old-growth structures to provide winter denning sites (Davis 1996). Dens are usually found in large standing live or dead trees, or down dead trees, logs and stumps. Size of these features is usually greater than 1.4m diameter. Natal dens have been found up to 25m above ground level, and such sites may provide additional security from disturbance or predation from other bears. Den sites are most often found in large western red cedar (*Thuja plicata*) and yellow cedar (*Chamaecyparis nootkatensis*). Second growth forests may provide den sites in old growth stumps or logs for the short-term, but these structures are relatively rare, and will rot and will not be present in typical third growth stands.

Home ranges of bears are typically 2,500 to 15,000 ha for adult males and 500 to 2,500 ha for adult females. Individual bear behaviour is considerably influenced by interaction with other bears and proximity to human settlements (bear-human conflicts). Some bears are displaced from preferred habitat by vehicles and other machinery, but others will become habituated to such disturbances.

Factors which can increase bear mortality include: higher bear densities (from predatory interactions between individuals / usually males and cubs), higher road densities (hunting pressures + direct mortality), expansion of human settlements (interactions between bears and humans over human food and garbage usually result in bear mortality). Road density is included as a modifier in the model described below, as a reduction in habitat quality.

The BC population of black bears is estimated at between 120,000 - 160,000 animals, with higher densities found in areas with wetter climate and more lush vegetation than in dry regions. Coastal densities are also higher due to availability of high nutrient salmon stocks. Current density estimates for Haida Gwaii are between 1 bear per 100 ha to 1 bear per 500 ha for the Coastal Western Hemlock Zone.

For this process, a map of black bear residency on Haida Gwaii has been produced where "residency" is defined as year-round occupancy of adult female black bears. Occassional sightings of bears on small islands for short periods of time are insufficient evidence of year-round occupancy. Work is underway to determine the genetic diversity of Haida Gwaii Black bears. If sufficient diversity is present, it may be possible to conduct a population inventory using systematic hair collection from live animals, and DNA analysis of the hair samples.

MODEL APPROACH AND ASSUMPTIONS

Additional details are available in Chapter 4.9.

Watershed Model: This model uses Broad Ecosystem Inventory (BEI), an intermediate ecological land classification between Biogeoclimatic variants and Site Series. Broad Ecosystem Units (BEUs) subdivide variants into permanent areas of the landscape that support a distinct type of dominant vegetation cover, or distinct non-vegetated habitats such as lakes or outcrops. One of the advantages of using BEI is that each forested unit is defined as including potential (climax) vegetation and associated successional stages. The BEI for Haida Gwaii was subjectively ranked into 6 habitat suitability classes, according to estimated forage values. The habitat suitability ratings table of BEUs is provided in Chapter 4.9. Habitat suitability classes were weighted by BEU area and generalized to the level of watersheds.

The watershed model also uses estimates of salmon biomass, based on analysis of the escapement estimates for all species. Average escapements for 1992-2001 were linked to the 1:20,000 TRIM stream network for a spatial representation of the amount and distribution of salmon available to bears. The model creates an index of kilograms of salmon per hectare for each PTT watershed.

Current and future road mapping was used to explore the potential influence of roads on habitat suitability and mortality risk. Road mapping was analyzed using a specialized roving window approach that creates the equivalent of road contour mapping. The higher the road density, the more likely that bears will be displaced from preferred habitat by people and vehicles and the higher their mortality risk from being shot. As such, the road density mapping can be used to step-down *suitable* habitat to estimate the amount of *effective* habitat. Effective habitat is useable habitat that is rated not only for its underlying suitability, but also for the level of expected human influence on the area.

The model provides as output estimates of the availability of habitat of different qualities (Map 18).

Key limitations of the model include:

- Lack of understanding how deer may alter forage choice of bears, particularly in the spring and during the fall berry feeding periods (bears elsewhere in coastal BC are highly dependent on berries) – suitability ranks were based on expected vegetative forage value. Because these ranks are likely equivalent to deer habitat value, and deer may form a significant portion of black bear diets, model output may still be reliable.
- Scale of mapping: No Islands-wide ecological land classification was available other than Broad Ecosystem Inventory. Mapping of BEI is conducted at 1:250,000 scale. As such, small, important habitat units are not identified at this level of resolution.
- Lack of understanding of the population value of forage opportunities on shorelines
- Lack of understanding of the relative contribution among vegetative, shoreline, deer and salmon forage sources to both individual survivorship and population welfare

RESULTS: CURRENT CONDITION

Relative habitat value for black bear habitat for year 2000 is shown on Map 19 . Watersheds throughout the Islands differ in their current contribution to black bear habitat value, largely dependent on the availability of spawning salmon, the landscape dominance of closed canopy, coniferous second growth and road density.

The ten top salmon biomass producing streams in descending order are:

- Yakoun River
- Pallant Creek (although all of the enhanced escapement may not be available to foraging bears)
- Deena Creek
- Naden River
- Mathers Creek
- Davidson Creek
- Ain River
- Kaisun Creek
- Copper Creek
- Lagoon Creek
- Mamin River

Each of these streams produces and average of over 80,000 kg. annually. Other streams may have

higher escapement, but these watersheds reflect Chum distribution, rather than the smaller body sized Pink or Sockeye salmon.

The Broad Ecosystem Inventory, when weighted for area and presented at the watershed scale, suggests only limited variation in habitat suitability across Haida Gwaii. This is likely to reflect reality because higher habitat values tend to be associated with small patches of only a few habitats. For example, higher habitat values occur on estuaries, and along some shorelines where inter-tidal areas can be productive feeding sites. As well, some wetland areas also have higher habitat values, especially rich "fen" wetlands rather than the more common poor nutrient bogs. Similarly, riparian habitats (forested and non-forested), are important cross-seasonal habitats and are frequently used as travel corridors (e.g. Alder or Spruce forests on floodplains), but typically occur in patches of limited size. As a result, when habitat suitability is generalized to a larger area, the lower value / high area habitats 'wash out' the contribution of the high value units. Variation on the interpreted Broad Ecosystem Map is due to variation in the distribution of low value closed canopy second growth forests (which has a negative influence on value) and higher habitat diversity in mountainous terrain (which has a positive influence on value).

SUMMARY

Although a wide variety of factors influence the abundance and distribution of black bears on Haida Gwaii, the availability of Pacific salmon is perhaps the best index of relative habitat value. Bears, especially males, may travel some distance to take advantage of the available high quality food source, particularly important to over-winter survival. Cub production and survival is likewise strongly influenced by salmon fishing.

The second major influence is the distribution of closed canopy second growth, which is typically neither suitable black bear nor deer habitat. The availability and spatial distribution of smaller scale seasonally important habitats like estuaries, rich non-forested wetlands, riparian areas, beaches and intertidal areas, alpine grasslands, and berry patches also strongly influence bear habitat value (although at a scale not apparent in this modeling).

Finally, although the exact influence of open road density on black bears on Haida Gwaii is unknown, high road densities likely displace some bears from preferred habitat and put all bears at higher mortality risk.

PRIMARY INFORMATION SOURCES

Byun, S.A. 1997. North American black bear mtDNA phylogeography: implications for morphology and the Haida Gwaii glacial refugium controversy. *Evolution* 51(5): 1647 - 1653

Chi, D.K. and B.K. Gilbert. 1999. Habitat security for Alaskan black bears at key foraging sites: are there thresholds for human disturbance? *Ursus* 11: 225 – 238.

Collins, G.H., R.B. Weilgus, and G,M, Kuehler. 2002. Effects of sex and age of American black bear on confer damage and control. *Ursus* 13: 231 - 236

Davis, H. 1996. *Characteristics and Selection of Winter Dens by Black Bears in Coastal British Columbia.* Master's Thesis. Simon Fraser University. Burnaby, BC

Davis, H. and A.S. Harestad. 1996. Cannibalism by black bears in the Nimpkish Valley, British Columbia. *Northwest Science* 70:88-92

Jacoby, M.E., G.V. Hilderbrand, C. Servheen, C.C. Schwartz, S.M. Arthur, T.A. Hanley, C.T. Robbins, and R. Michener. 1999. Trophic relations of brown and black bears in several western North American ecosystems. *Journal of Wildlife Management* 63(3): 921 - 929

Kellner, M. 1993. *Black Bear Population Estimation Using Remote Cameras*. Ministry of Environment, Lands and Parks. Victoria, BC

MacHutchon, A.G., S. Himmer, H. Davis, and M. Gallagher. 1998.Temporal and spatial patterns among coastal bear populations. *Ursus* 10: 539 - 546

MacHutchon, A.G. 1999. *Black Bear Inventory, Clayoquot Sound, B.C. – Volume II: Population Inventory .* Ministry of Environment, Lands and Parks, Vancouver Island Region. Nanaimo, BC

Manning, Cooper and Associates. 2003. *2002 Black Bear Winter Den Inventory: TFL 37, North Vancouver Island, BC*. Canadian Forest Products, Ltd. Woss, BC

Marshall, H.D. and K. Ritland. 2002. Genetic diversity and differentiation of Kermode bear populations. Molecular Ecology 11(4): 685-697

Ministry of Water, Land and Air Protection. 2001. *Black Bears in British Columbia: Ecology, Conservation and Management*. Victoria, BC

Peacock, E. 2001. *Kuiu Island Black Bear Pilot Study: Population Estimation and Sexual Segregation.* Alaska Department of Fish and Game. Juneau, Alaska.

Reimchen , T.E. 1998a. Nocturnal foraging behaviour of black bears, *Ursus americanus*, on Moresby Island, British Columbia. *Canadian Field-Naturalist* 112 (3): 446 – 450

Reimchen , T.E. 1998b. Diurnal and nocturnal behaviour of black bears, *Ursus americanus*, on bear trails. *Canadian Field-Naturalist* 112 (4): 698 – 699

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

Reimchen, T.E., D.D. Mathewson, M.D. Hocking, J. Moran, and D. Harris. 2003. Isotopic evidence for enrichment of salmon-derived nutrients in vegetation, soil and insects in riparian zones in coastal British Columbia. *In* Nutrients in Salmonid Ecosystems: Sustaining Production and Biodiversity (J. Stockner, ed). Proceedings of the 2001 Nutrient Conference Restoring Nutrients to Salmonid Ecosystems held at Eugene, Oregon 24 – 26 April 2001.

Sullivan, T.P. 1993. Feeding damage by bears in managed forests of western hemlock – western red cedar in midcoastal British Columbia. *Canadian Journal of Forest Research* 23: 49 – 54

Ziegltrum, G.J. and D.L. Nolte. 2001. Black bear forest damage in Washington State, USA: economic, ecological, social aspects. *Ursus* 12: 169 – 172.