

*Proposed Cutting Permit 405 on the Salisbury Face, east side of Kootenay Lake:
Assessment of habitat and risks for mountain caribou and other wildlife*

Prepared by
Brenda Herbison, MSc. R.P.Bio.
Prepared for
Cooper Creek Cedar Limited
April 16, 2020

CONTENTS

LIMITATIONS	3
EXECUTIVE SUMMARY	4
1.0 INTRODUCTION.....	5
2.0 METHODS.....	6
3.0 RESULTS	8
3.1 HABITAT / SPECIES ASSESSMENTS	8
Caribou.....	8
Additional Species At Risk.....	14
‘Common’ Species and Overall Biological Diversity.....	18
3.2 RISK ASSESSMENTS AND RECOMMENDED MITIGATION	20
Caribou.....	20
Additional Species At Risk.....	28
‘Common’ species and overall biological diversity.....	35
5.0 SUMMARY OF RECOMMENDATIONS.....	40
6.0 CONCLUSIONS.....	43
7.0 CLOSURE.....	44
8.0 REFERENCES	45

FIGURES

Figure 1. Conceptual diagram: risk assessment process.....	7
Figure 2. Photo of Mountain Caribou Bull, Meadow Creek.2012	11
Figure 3a. Locations of Nakusp-Duncan caribou showing use of main-valley faces ..	47
Figure.3b.Potential home range area for caribou associated with upper Salisbury.....	47
Figure 4a. Coarse-filter habitat features within and around CP 405, Salisbury Face...	15
Figure 4b. CP 405: Nov 2019-April 2020 recommended mitigation measures.....	13
Figure 4c. Lower Salisbury UWR indicating pre and post-CP 405 forage / cover configuration	27
Figure 5 Model of risks for caribou, CP 405 Upper Salisbury	22
Figure 6 Age classes predicted to remain within lower Salisbury UWR after CP 405 has been harvested.....	32
Figure 7: Slope Classes Salisbury Face	48
Table 1. Stand –level threats for caribou associated with CP 405 and potential mitigation....	23

LIMITATIONS

Detailed information on wildlife is scarce for the landscape in and around CP 405 other than observations made in the context of this report and wildlife assessments conducted by the author in past years. If better information becomes available in the future the assessments and opinions could change from those recorded here.

Executive Summary

This reconnaissance-level assessment looked at the risks associated with Salisbury Face CP 405 for wildlife viewed from both a landscape and stand-level perspective. Mountain caribou and other Species at Risk (SAR) became the primary focus of the assessment after caribou use was observed in two of the originally proposed cutblocks on the upper face.

Assessments are accompanied by recommendations for mitigating potential impacts. There are no clear legal requirements for the licensee to retain habitat for caribou or other SAR on the Salisbury Face; thus all recommendations are considered within a timber development context. In brief, the recommendations include:

(1) For Mountain Caribou in the Block 7 area: Retain large habitat reserves and undertake partial cutting in a portion of the harvest area; prioritize caribou habitat attributes in retained features.

(2) For Mule Deer and Great Blue Heron in the Blocks 1 to 4 area: Alter block boundaries and concentrate zones of extra tree retention in locations identified on lower Salisbury Blocks 1-4 to provide travel connectivity, security sites and winter range cover (Mule Deer) and potential winter roost trees (Great Blue Heron).

(3) For the over 100 species of wildlife that use snags and down woody debris and for biodiversity generally: Retain habitat structural diversity (woody debris, snags and multi-layers live and dead) especially large-diameter (>50 cm) boles from the present stands to enrich the future new forest stands wherever possible within the constraints of wildfire hazard reduction requirements.

(4) For songbirds and other birds in compliance with the Migratory Birds Convention Act (2018): Avoid timber harvesting during the nesting through fledgling period from April through July (or more precise dates based on better information).

Cooper Creek Cedar has incorporated most of the above in the March 2020 CP 405 design and has expressed the intention to include the remainder in Site Plans.

An additional recommendation towards the conservation of all wildlife species on the Salisbury Face is to:

(5) Gate and control access to the Salisbury Face road network after timber harvesting has been completed, with the terms of use thereafter considering wildlife protection a high priority

The authority to manage road access lies largely with government (MFLNROD, possibly RDCK) and will only be successful if it also involves community discussion around the need for fire protection and other aspects.

While recognizing the many uncertainties and information gaps around the assumptions used in risk assessments, if the recommended mitigation measures above are applied and if a recovery period of many decades lies ahead, the direct risks expected to be associated with CP 405 for Species at Risk and Species of Regional Concern rank as moderate to low applying a broad, coarse filter assessment as described in this report. The upper Salisbury area is expected to remain capable of supporting occasional use by caribou after the initial disturbance of logging. In lower Salisbury, the primary travel and winter range functions for mule deer are likely to be provided and the potential for Great Blue Heron to roost in winter on the lower slopes will most likely remain. Impacts on small mammals and birds will be partially mitigated by the stand-level measures recommended. An important caveat, as said, is that with better information in the future the risk rankings could change.

Learning from efforts to consider the habitat needs of caribou and other wildlife in CP 405 can potentially contribute to improvements in wildlife habitat protection in timber harvesting contexts over the regional landscape. To this end, it is recommended that consistent, basic records be maintained of actions, results and effectiveness over the coming decade.

1.0 INTRODUCTION

The following report describes a reconnaissance-level assessment of wildlife habitat and potential risks for wildlife associated with Cutting Permit 405 on Salisbury Face as proposed by Cooper Creek Cedar (CCC) in March 2020. In Cutting Permit 405 CCC proposes to harvest a total of 90.6 (net) hectares on the Salisbury Face over a 1 to 3 year period. For details, see the CCC website.

Species at Risk have been the primary focus of the assessment, with particular attention to mountain caribou subsequent to finding caribou sign within two of the proposed cutblocks in upper Salisbury in May, 2019.

Salisbury Face is one of five hillside ‘face’ units between Hamill Creek and Fry Creek at the north end of Kootenay Lake (Figure 1). The hillsides span elevations from lake level to alpine and a range of biogeoclimatic variants from the warmest/driest ((ICHdw) to the coolest/highest (ESSFwmp). The diversity in elevations and topography supports a diversity of habitat functions for wildlife.

Species At Risk¹ in addition to *Mountain Caribou* that are known to use the hillsides include *Wolverine* and *Grizzly bear* associated with ICH-ESSF transition and ESSF forests, high elevation basins and creek drainages; *Great Blue Heron* that roost in winter in tall conifers on lower to mid slopes near Kootenay Lake; *Northern Goshawk* that nest and reside year – round on mid slopes and *Western Toad* that can be found at all elevations in suitable sites. SAR using habitats at high elevations above timberline include *Collared Pika* and *Mountain Goat*. A list of over a dozen bird species transient in the area are now classed as S.A.R., as are two bat species: *Little Brown Myotis* and *Northern Myotis*.

Mule deer, a species of regional concern due to population declines, are critically dependent on winter ranges at mid and low elevations on the hillsides along with white-tailed deer, elk, cougars, bobcat and many other species that cannot survive high-elevation winters.

There is extensive field evidence of travel by large mammals on the hillsides between Hamill and Fry Creek in north-south as well as east-west directions. There are numerous well-established routes present that have persisted over decades (author obs.). The existence of Kootenay Lake as a barrier on the west in combination with the location of the Duncan-Lardeau Flats at the head of Kootenay Lake linking the Purcells and Selkirks across the valley bottom may largely explain the north –south travel. Most trails at the north end of the hillside link directly on to the Flats. The east-west travel is largely seasonal, between elevations. The precise locations of the trails are largely explainable by topography and some of these locations are provided on

1 COSEWIC 2019 , B.C Red and Blue Lists and Species of Regional Concern

Figure A1 and 4a. There are significant sections of the Hamill –Fry hillsides that are too steep for travel by hoofed mammals and some outright cliffs that are barriers to travel for any terrestrial animals; these are also shown on Figure A1.

Elevations below roughly 1800 -2000 m. on the Hamill to Fry Creek hillsides are considered part of the forest land base, with 330 ha. at the north end occupied by Woodlot 491 and the remainder within Cooper Creek Cedar license area. Timber harvesting began in the 1980's in Woodlot 491 and has continued into recent years. Salisbury Face was the second area to be developed, with roughly 14 km of road and 90 ha logged by BC Timber Sales over an 8-year period between 1995 and 2002.

3.0 METHODS

The assessment first considered CP 405 in the context of the broad surrounding landscape, a necessity where wide-ranging animals are concerned. The objectives at this scale were to assess (1) the *relative significance* of wildlife habitats within CP 405 (rarity of type, or function) and (2) the *functional relationships*, for wildlife, between habitats within CP 405 and the adjacent habitats beyond it (for example, travel connectivity, seasonal roles). A number of previous inventories on the hillsides provided background for the landscape overview (Appendix A) as did the analysis of 'Lidar' imagery flown in 2018 and interpreted for slope, crown closure and other attributes.

This was followed by field reconnaissance to evaluate stand level wildlife habitat characteristics within and around CP 405. Criteria applied in assessing wildlife habitat suitability were consistent with BC standards for Wildlife Habitat Suitability Ranking (RISC 1999), and informed by direct observations of wildlife use and experience with patterns of wildlife use in other similar ecosystems. Habitat types were mapped when relevant to the assessment, as were trails/travel zones and any specific wildlife use features encountered, utilizing GPS locations with the app 'Avenza Maps'. During field reconnaissance the proposed harvesting plans were visualized in order to assess specific threats or 'mechanisms of potential harm' to specific features or conditions. This was a necessary step for later risk-ranking and for identifying potential mitigation measures.

The initial assessment of risks to wildlife were discussed with CCC and subsequent to that there were a number of design iterations considered for mitigating the impacts on wildlife. Most efforts were focused on caribou in the Block 7 area. The end result of this process is the January 2020 proposed CP 405 which is being assessed in this report.

Following landscape and stand-level assessments of the final proposed CP 405 design, the threats and risks represented for SAR were described then classified and ranked using a system modelled after the draft IUCN² standards for threat classification (IUCN 2017) and guided by a document on Species at Risk produced by the B.C College of Applied Biologists and the Association of B.C. Professional Foresters (CAB/ABCPF 2009) and BC MOE Guidance for Threat Assessments (2015)

Species at Risk are partially protected in British Columbia through a variety of legislative means, in some cases involving protection of mapped critical habitat. But in many areas, such as upper Salisbury, Species at Risk also occur outside protected areas where there is no protection and often very little information on species use. In these instances there is no legal requirement of the licensee, but an expectation that professionals involved will, at minimum, identify the risks to the species and identify mitigative measures where there are options (CAB/APBPF (2009)).

The present report considers the threats and the resulting risks represented by CP 405 for each species at three spatial scales:

- (1) the whole population (very large landscapes, for most large mammals)
- (2) the home-range area (varies by species, but larger than Salisbury face for most large mammals)
- (3) the seasonal ‘use unit’ (e.g. winter range), for most species this lies within face units

At each scale, the scope, severity, consequence and likelihood of the threats were evaluated in the process of developing an overall risk ranking. This process is depicted in the diagram (Figure 2) below.

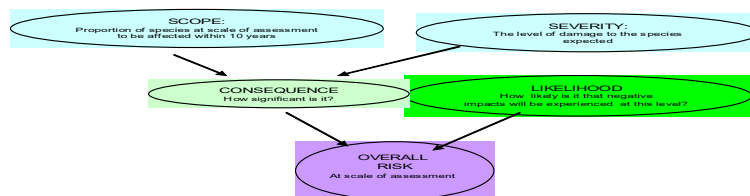


Figure 1. Conceptual diagram of risk assessment process

Out of this process, a simplistic risk assessment grid was developed to provide a standardized ranking system to compare between species or locations. In the grids Scope and Severity (above) above are incorporated in 'Consequence'.

An effort was made to consider both the direct threats associated with removing wood (habitat loss, direct disturbance stress) and the indirect threats that follow (species composition changes, ongoing human disturbance and hunting mortality).

A risk assessment process clearly involves *many assumptions* regarding species-habitat relationships, especially in situations such as this where no formal research has been undertaken (on any species). An effort is made in this report to identify the assumptions that have been applied under each species assessment and the basis for them. This transparency allows for future revisions as better information becomes available. In general, the assumptions are supported by research findings from other areas in the Pacific Northwest in similar ecosystems and by the professional opinion of the author based on 35 + years of experience in forest habitats of the Lardeau-Duncan and north end of Kootenay Lake.

3.0 RESULTS

3.1 Species habitat assessments

CARIBOU (*Rangifer tarandus caribou*)

The Population

Mountain caribou populations are well-known for being in severe decline in southern B.C. The 2018 population estimate in the Nakusp-Duncan Central Selkirk herd census area (Figure 3) was 31 caribou in 2018 (DeGroot & Reid,2018), representing an 86 % decline over the past 20 years. Caribou in the Purcell range south of Fry Creek have been considered functionally extirpated since 2018. Provincially, mountain caribou are red-listed (at risk of extinction or extirpation) by the BC Conservation Data Centre.

The reasons for caribou declines are numerous and cumulative and include valley bottom loss (reservoirs, settlements), forest loss, transportation corridor barriers/mortality, direct hunting mortality (<1980), motorized recreational impacts and predation by wolves and cougars (COSEWIC 2018, Johnson et al 2015). Predators have increased with prey species that thrive on fragmented/young forest conditions, e.g. deer. Caribou are often attracted to fragments of old forest where they are particularly vulnerable. Machine and human disturbance from winter recreation (heli-skiing, snowmobiling) have been the newest impacts within the Central Selkirk caribou range, escalating profoundly since its beginning in the mid 1990s. The expansive

landscapes in which caribou survival strategies evolved over thousands of years allowed for unpredictable movements and calving in solitary, broadly dispersed locations to foil predators and for shifting ranges in response to seasonal changes and drainage-scale disturbances such as wildfires. Such expansive conditions simply no longer exist in modern fragmented landscapes.

In 2009 the BC Government established several “Core” areas of critical caribou habitat in southern B.C. (GAR Order # U-4-012) in an effort to address the declines. A large Core habitat area was designated for the Central Selkirks Nakusp- upper Duncan caribou herd and one small high elevation Core area was established in the upper Salisbury Creek basin at the same time. Core areas are largely protected from timber harvesting, but they are not protected from wildfires or motorized winter recreation. The 2018 census observed that most of the Central Selkirks core area was being actively used by heliskiing operations and snowmobiling (DeGroot & Reid 2018). It is known that the stress and displacement from these activities are detrimental for caribou in a number of ways (COSEWIC 2018).

In the GAR 2009 system for caribou, the ‘Core’ areas are to be buffered by ‘Matrix’ habitat areas, in which the primary objective is to avoid creating conditions that inspire alternate prey (deer and elk) by minimizing openings that produce deciduous browse.³

The Home Range

Upon finding caribou sign on Salisbury Face in May 2019, one of the first questions to address was that of *significance*. The sizes and age of the caribou tracks observed in snow/ mud in 2019 in upper Salisbury (Figure 4a) indicated that an estimated 3 caribou had used the area between April and June, 2019. Was this a ‘fluke’ event, perhaps in response to the large wildfire in Carney Creek in 2018? Was it a new but potentially repeating event resulting from the fire(s)? Or did it reflect a semi-regular pattern of use that has previously been missed by incidental observations? A review of historic reports from the Hamill-Fry landscape and of all information available on habitat use by the Central Selkirks caribou in a somewhat similar landscape suggests the potential may exist for regular use of upper Salisbury and other Kootenay Lake face units by caribou.

Information on caribou in the Hamill-Fry landscape in the 1950’s and 1960’s was obtained from trappers S. Sawczuk and J. Macnicol (pers. com.) who reported regular caribou observations every winter, pre-January, on the ridge behind Argenta into Clint Creek, as well as frequent sightings of caribou in late fall in the Fry – Carney Creek drainage and in winter in the

³ Under GAR # U4012 if applied, Salisbury face would be considered Matrix habitat by virtue of its proximity to a Core area if it had no records of use by caribou (De Groot, pers comm.). In the interim, however, low- elevation slopes on the Salisbury face are legally managed with nearly opposite wildlife objectives under GAR Order U #-4-001: to maximize (enhance) conditions for mule deer .

upper Salisbury Creek and the Stanley Creek basins. In early April, 1975, an informal aerial census conducted by the Fish and Wildlife Branch observed caribou tracks in the upper Salisbury and Kootenay Joe basins (author records). Skiers in the 1980s and 1990s occasionally reported caribou tracks from the Kootenay Joe Creek basin and nearby slopes. A helicopter pilot, Doug Williams, reported seeing caribou in upper Carney Creek in late summer in 1994. The author noted a transient set of caribou tracks behind Argenta in winter 2008, which at the time was presumed to be an atypical occurrence resulting from the large fire in Clint Creek the previous summer. 2019 observations in addition to Salisbury include tracks photographed by Shaun Phoenix (October 2019) in Woodlot 491 on the saddle into Clint Creek.

Radio – collared caribou in the Nakusp-Duncan area utilize upper slopes on main valley face units on Trout Lake and Arrow Lake and along the Lardeau River in winter, in unconsolidated snow conditions. They use high elevations and large creek drainages in the remaining seasons (Figure 3a). Historic records collated by the author (1973) also repeatedly mentioned this pattern of use. It is possible that this pattern has also occurred (or does occur) on the Kootenay Lake Face units by caribou that use an area beyond Salisbury as a home range.⁴ The 2019 observations in upper Salisbury indicated end-of-winter/early spring use but did not rule out use earlier the same winter. The habitat is suitable for those conditions, as described in the next section.

In any seasonal use scenario, it can be assumed that caribou using Salisbury would also use a much larger home range area over an average year. One potential home range that could be used by the Salisbury caribou is identified on Figure 3b. This area includes Hamill and Fry Creeks and is roughly similar in size to home ranges used by the radio collared in the Nakusp-Duncan area. It appears to include habitat for a range of seasons with passable habitats between basins, creek bottoms, and face units some of which are shown on Figure 3b. It is more rugged than is typically considered ideal for caribou, but this may be balanced by the value of low human disturbance which is an increasingly rare attribute in the broader region.

The caribou using this home range are probably still linked genetically with the Central Selkirk herd along the lower Duncan – Lardeau valley bottom as well as through the Purcells via

⁴ Caribou classically exhibit a “double migration” pattern: low elevations in early winter, high elevation in late winter, low elevations again in spring break-up, high elevations and large creek drainages in summer, however there are annual variations in this pattern in response to snow conditions, other climate variables and disturbance. Caribou depend entirely on arboreal lichens in the winter months, obtained via blow down in low elevation forests and directly from trees at high elevations where they stand on deep snow packs. In fall and the earliest part of winter evergreen forest plants such as False box, Princes’ Pine and Wintergreen spp are important food sources. In early spring and summer caribou feed on succulent herbs that are generally associated with rich sites such as avalanche chutes and riparian meadows.

Glacier and Howser Creeks. Relatively recent incidental sightings suggest travel connectivity may still exist along the Lardeau-Duncan River bottom (Meadow Creek 2012 (Photo, Appendix B); lower Duncan River near Hamill Creek 2015 (Toporowski); Glacier Creek (De Groot unconfirmed report 2017). In previous decades (1960s), Howser Creek, especially the Tea Creek area, was reported to be well-used by caribou in early winter according to trapper Paul Matin pers.com. Caribou sightings were frequently reported in mid summer from near and on the Four Squatters Glacier north of Howser Creek and in the upper Omo Creek area throughout the 1980s and 1990s (Toporowski pers.com.)



Figure 2. Bull Caribou, October 2012, Meadow Creek. This caribou appeared to come from the north –west direction and travelled southeast along the Meadow Creek channel towards the Duncan River. Photo courtesy Sheila Haugan via Tracy Remple.

The Upper Salisbury Seasonal Use area

Figure 5a and the accompanying notes briefly describe habitat conditions within an area considered by this report to be a potential Seasonal Use Unit for caribou in Upper Salisbury. The locations of the caribou tracks observed in 2019 are mapped, as are trails/travel routes used by wildlife in general. The tracks indicated caribou had used the area at the end of winter/early spring (April - June), but did not rule out use earlier the same winter. The tracks were observed between 1350 m. and 1550 m. in the upper ICH/lower ESSF, in stands that generally support suitable habitat attributes for caribou in early winter or end of winter in unconsolidated snow conditions: abundant arboreal lichens, available through breakage and branch fall, sufficient coniferous crown closure to provide snow interception; moderate slopes (< 40 %) and relatively open eye-level visibility. There are also patches in the area that support an abundance of herbaceous annuals suitable as early spring forage for caribou and there are a few areas that support evergreen plants such as False Box used by caribou in fall. There are numerous 300+ yr. old larch “Vet “ trees concentrated towards the southern end of the upper face and these support an abundance of Bryoria (sp.), a black arboreal lichen that is preferred by caribou. Other stands in the area are too steep to provide good winter conditions for caribou (> 70 %) as indicated on Figure 5d (Appendix A)

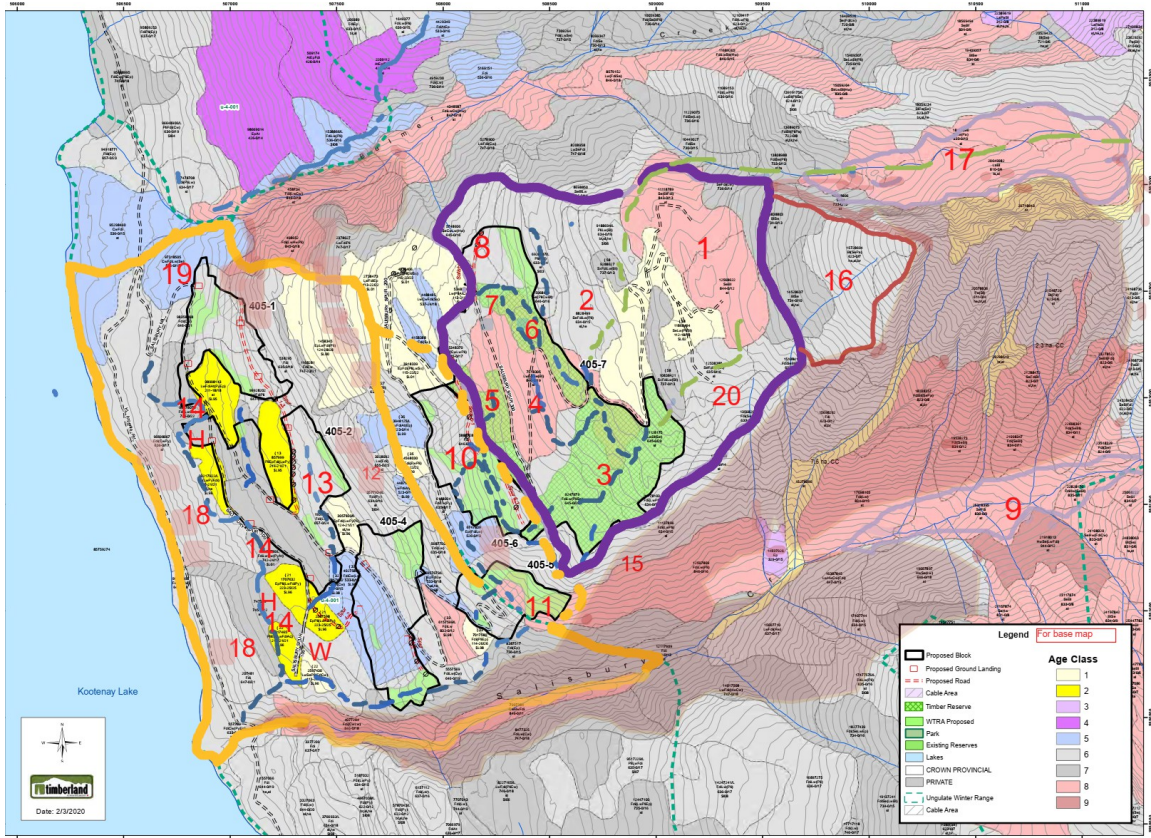


Figure 4a. Coarse-filter wildlife habitat features within and around CP 405

LEGEND

- Dark blue line: Potential Seasonal Use Area for caribou in Upper Salisbury
- C: Locations of caribou tracks 2019
- Light blue line: High-elevation valleys potentially suitable for summer/travel by caribou
- Red-brown line: Additional potential caribou habitat: high-elevation, steep, possibly useable in late winter
- Gold line: Mule Deer Winter Range as defined in GAR U-4-001
- Dashed gold line: Additional winter range used by mule deer in milder winters, or late fall/very early spring
- Blue dashed lines: Wildlife travel routes – *documented*
- Green dashed lines: Wildlife travel routes – *potential* (based on terrain); undocumented
- Grey transparent areas: Travel barriers and difficult terrain (cliffs on a very steep slopes)
- W: Wallow
- H: Great Blue Heron *potential* winter roost tree locations
- #s: Reference numbers for comments on specific locations or features (Details Appendix A)

ADDITIONAL SPECIES AT RISK

GRIZZLY BEAR (*Ursus arctos*)

Grizzly Bear populations are under threat throughout much of B.C. wherever they overlap with road networks, residential or agricultural area or intense recreational use. Grizzlies can be expected to use the upper Salisbury Face area occasionally, as they have been observed in adjacent high-elevation habitats. Many of the Larch stands in upper Salisbury and the logged openings above and below Blocks 6/7 support an abundance of Black Huckleberry that probably ripen earlier than in the other parts of grizzly bear range. There are areas in and near Block 7 that support Avalanche Lily and these are known to be a favourite food of Grizzlies in spring.

Ideal habitats for grizzly bears are large landscapes where encounters with humans are rare. Road networks are typically associated with high bear mortality (black and grizzly) for many reasons, including (historically) a vulnerability to hunting in spring when they are attracted to roadside greens alongside forest roads and to avalanche chutes that are often crossed by roads.

WOLVERINE (*Gulo gulo*)

Wolverines were reported to frequent the trap lines of Steve Sawczuk and Jim Macnicol along the creek valley bottoms of Hamill-Clint and Carney-Fry between the 1950s and 1970s. Stories were told of wolverine raiding traps and camps and only sometimes getting caught in the traps set for them. There have been no recent reports of wolverine in the Hamill-Fry landscape, but it is highly probable that they are still present and that forest stands in upper Salisbury are used occasionally as part of a much larger range. Wolverines are associated with old growth drainages in sub alpine areas as well as very open alpine areas. Their requirement for forest cover appears less of a key determinant of presence however than the availability of food (carrion of large ungulates) and avoidance of road networks and other forms of human disturbance (Lofroth & Krebs 2017).

FISHER (*Martes pennanti*)

There is a possibility that Fisher could use the Salisbury Face, at least transiently. Fisher tracks were observed once in lower Argenta in the early 1990 by the author; however their range is not normally expected to include the West Kootenay (Weir, 2003). Attributes required by Fisher are old trees and snags for den and birthing sites and complex configurations of coarse woody debris on the ground to supply opportunities for hunting small mammals (Weir 2003). They also utilize piles of coarse woody debris. A more common, slightly smaller species

requiring similar attributes is the American Marten (*Martes americana*) that is known to be present in upper Salisbury. Marten are sensitive to forest removal but can use stands that have been lightly partially cut as long as there are plenty of logs on the ground, snags and other diverse woody structures and connected patches of dense coniferous crown closure (OFRI 2018).

GREAT BLUE HERON (*Ardea herodias herodias*)

Great Blue Heron are a sensitive species whose survival is tenuous in the Kootenays (Machmer 2008). At the north end of Kootenay Lake,, herons are associated with wetlands on the Lardeau- Duncan Flats from spring through fall but in winter they roost during the day time in tall, full-crowned dominant/co-dominant conifers on lower slopes alongside the wetlands and above the shores of Kootenay Lake below and south of Argenta, at least as far south as Bulmer Creek. There have been no herons reported roosting on the lower slopes of the Salisbury Face but it is possible that suitable trees could be used there. In the 1970s a heron was observed by the author winter-roosting on Bulmer Creek point.

One documented threat to herons in the Kootenay region, currently, is predation by bald eagles (Machmer 2008 and direct local observations). It is possible that hiding from eagles may be driving the pattern of forest-roosting, since coniferous trees provide more hiding cover than the deciduous cottonwoods that dominate the DL flats. This may also be driving a trend towards roosting ever further upslope. This all suggests that roosting habitat may be quite critical.

Potentially suitable roost tree zones between Salisbury Creek and Argenta Creek are identified on Figure A1 and indicated for lower Salisbury on Figure 4a.

Forest requirements for heron are poorly understood, but it is evident that these birds are highly sensitive to “unexpected” disturbance, e.g., a human suddenly appearing on foot near a roost tree. Herons would very probably avoid areas where active machinery or crews were working.

NORTHERN GOSHAWK (*Accipiter gentilis*)

Goshawks are successful hunters in dense forests where they fly adeptly under the canopy to hunt small mammals and birds. They nest in older mature, dense and/or multilayered forests and have a high requirement for undisturbed areas around their nest trees. They show a high fidelity to the same nesting areas year after year but rotate actual nests within this area. In a recovery strategy document written for the coastal subspecies of goshawk (COSEWIC 2018) and a Kootenay guidance document (Smith et al, 2012) it is concluded that goshawks core nesting, breeding and fledgling rearing areas typically occupy 50–200 ha, with foraging areas over 3000

ha in size.. Goshawks are strongly territorial which, along with high area requirements, means there are typically very few nesting pairs in any landscape.

One goshawk nest was documented near Argenta Creek in 2018 (Figure 1). There was one nest documented behind Johnson's Landing south of Gar Creek in the early 2000s and it is very likely there is still a nest in that area.

Goshawks on the BC coast Goshawks are classed as Threatened but throughout the rest of B.C. they are considered of Regional Concern and the guidelines for habitat protection are variable between districts.

WESTERN TOAD (*Bufo boreas*)

Western Toads were once very common in the Kootenays but over the past 20 years their populations have dwindled for a many reasons including direct wetland habitat loss, highway mortality and loss of secure connectivity between wetlands (where they breed and spend egg through tadpole stages) and upland forests (where adults spend all other seasons).

Toads continue to be observed with moderate frequency in association with wetlands on the Duncan Lardeau flats and the lower slopes of northern Argenta . They may be limited on the Salisbury face due to the scarcity of small water bodies.

Key forest habitat attributes required by toads in forest habitats at all elevations are large woody debris in all stages of decay and other thermal shelter opportunities (for winter and summer) associated with diverse under stories and diverse micro-topography within proximity of less than 1 km (ideally < 500 m.) of a shallow wetland that is wet for at least 3 months from April to July (COSEWIC 2002). Radio-tagging studies of toads have found that they have high fidelity to their home ranges, breeding sites and forest sites, year after year (COSEWIC 2002).

SPECIES AT RISK in the broader area

There are over a dozen additional species classed At Risk by COSEWIC that are known to occur, or could potentially occur, within the Hamil-Fry landscape but are not expected within the Salisbury Face unit itself except in some cases transiently These include: Harlequin Duck (upper Fry Creek), Evening Grosbeak (transient), Western Grebe (Kootenay Lake), Western Painted turtle (DL flats and Kootenay Lake), Rubber Boa (one record only, DI flats edge) Black Swift (in area –rare, nests behind waterfalls): Red Crossbill (transient): Bank Swallow (in area) and Western Screech Owl (1 observation Argenta, 1970s). The list also includes Collared Pika and Mountain Goat, both of which are present in high-elevations habitats in the Hamill-Fry landscape, and east of Salisbury face.

MULE DEER (*Odocoileus hemionus*)

Mule deer Regional Context

Mule deer populations in many parts of North America have declined over the past 20 years although they are not classed as 'at risk'. Some of the known reasons for mule deer declines include over-hunting on new road networks, poor competitive abilities against white-tailed deer and elk in certain habitats, loss of survival traits in interbreeding with white-tailed deer intermittent predation imbalances and overall landscape conditions that favour white-tailed deer and elk over mule deer. Mule deer escape predators successfully and hold their own against competitors in steep, broken terrain where their spring-like 'stotting' habit provides an advantage. Fires were historically the rejuvenating disturbance in these steep habitats, (providing food), but fire suppression ended that, and forage has instead been created by timber harvesting or agriculture on gentler terrain, flats, benches, where white-tailed deer and elk are better adapted.

In late winter and early spring, steep, south and southwest aspects are critical habitats for mule deer, in which the ideal condition is a semi-open canopy of mature, full-crowned trees with deciduous browse and herbaceous forage available. In deep snow mid-winter conditions, in contrast, mule deer depend on dense, multilayered mature/old stands with coniferous crown closure of > 50 % where food supply may be less important than snow interception and thermal protection. Mule deer also require safe, forested travel/migration routes connecting lake level and high elevation habitats.

Mule Deer Hamill-Fry Landscape

Much of the Hamill-Fry hillside below roughly 1200 m. including lower Salisbury Face is regionally recognized high quality mule deer winter range and is legally subject to GAR Ungulate Winter Range (UWR) Regulations (GAR # U4-001)). The upper limit of GAR legal winter range is shown on Figures 4a to 4c. There is a zone above this used by mule deer extensively at either end of winter, or in mild winters, also indicated on Figure 4a.

Mule deer that use face units from Hamill to Fry in winter are presumed to use extensive home ranges that include high-elevation/creek drainage habitats from summer to fall.

Important Mule deer 'strongholds' on the Hamill-Fry hillsides include rocky bluffs and ridges north of Argenta (Figure A1) and along the north sides of Bulmer Creek and Salisbury Creeks (Figure A1).

Studies in other areas have determined that mule deer display a high degree of fidelity to their traditional seasonal ranges from year to year (Zalunardo, 1965; Kufeld et al 1989).

Mule Deer Lower Salisbury Face

The first logged openings in lower Salisbury in 1995 were designed with the intention of improving habitat for deer (5 ha or less in size, narrow (~ 100 m) aligned north–south). White-tailed, deer, elk and to some extent mule deer did in fact thrive in lower Salisbury area throughout the late 1990s and early 2000s, as a productive mix of forage and cover developed throughout this lower slope winter range as a result of those and subsequent cut blocks. The situation may have favoured WT deer and elk over mule deer.

Mule deer, WT deer and elk were consistently hunted along the roads of Salisbury on the Salisbury face in these years, but by ~ 2012 hunters (and the author) had observed a noticeable decline in the numbers of deer there. Winter 2018 reconnaissance for the present report in the vicinity of the old cutblocks noted use of the area by a few elk and fewer deer. Most of the deciduous browse shrubs /trees were ~ 3 metres tall, beyond a reachable height for deer. Tracks and scat of cougar and wolf were also notable at the time. The configuration of dense young stands alongside narrowing roadsides gave the appearance of one in which predators might be advantaged.

Overall, the supply of available deciduous forage for deer in lower Salisbury is poor, at present. Strips and patches of nature coniferous cover are located amidst a patchwork of thriving, dense, young forest stands in the old logged openings that do not yet provide snow interception or thermal cover. Contiguous stands of mature coniferous cover surround this patchwork on the bench, on all four sides.

The 2019 configuration of coniferous cover, forage, other age classes and topography within the legally defined UWR in lower Salisbury can be viewed on Figures 4a to 4c and proportions of each indicated - post CP 405- in the pie chart Figure 6. Forage is represented by age class 1(0-20) and cover by age class 5 + on this chart.

‘COMMON SPECIES’ AND OVERALL BIOLOGICAL DIVERSITY

Common species typically have little legal protection, worldwide, and are often ignored as resources are spent on rare and disappearing species; yet it is the common, plentiful species that critically drive ecosystems, and many “common” species are rapidly becoming uncommon (Gaston 2010). An ‘ecosystem –based’ approach is sometimes advised to address this problem, in which attributes serving both common and rare species are managed and the common species serve as indicators. Stand-level habitat structural diversity has been demonstrated world-wide to support wildlife species diversity (Thomas 1979, McCleary & Mowat 2002), so recognizing the

importance of habitat structural diversity in planning at all silvicultural stages including timber harvesting and wildfire fuel reduction treatments is a good place to start in conserving the myriads of common but vital species in local forests. Bird species diversity and abundance responds especially quickly to changes in live deciduous and/or coniferous tree and shrub layers as well as dead wood layers (Patton et al 1992).

In similar forests with similar wildlife communities over 100 species were found closely associated with snags and over 50 of these were completely dependent on tree (snag) cavities, with large sizes and advanced decay stages preferred (Thomas 1979). A partial list of snag-associated wildlife that could be present within the CP 405 blocks include Pileated Woodpecker, Northern Saw-whet Owl, Pygmy Owl, Northern Flying Squirrel, Northern Flicker, Brown Creeper, Western Bluebird, Tree and Violet Green Swallow, Yellow-bellied sapsucker, Mountain, Chestnut-backed and Black-capped Chickadee, American Marten, and Black Bear. The Pileated Woodpecker and other large birds and most mammals generally require snag diameters over 50 cm in diameter (Thomas 1979; Bull 1993)).

Well over 100 local species are expected to use woody debris on the ground if invertebrates are counted, and many of these (small mammals, invertebrates) are associated with colonization of new forests with mycorrhizae (Brown et al. 1985). A partial list of species associated with coarse woody debris (logs) on the ground that could be present on the Salisbury Faces includes: Northern Alligator Lizard, Northern Long-toed salamander, Western Toad, American Marten, Red Squirrel, Chipmunk and Ruffed Grouse. Larger animals such as black bears also rely on large, well-decayed woody debris for supplying ants and grubs.

B.C. government regulations that afford a degree of protection for common wildlife on Salisbury Face and throughout B.C. include the Migratory Birds Convention Act (2018) which prohibits harm to active nests or birds and the BC Hunting Regulations that sets limits on hunter mortality. There are also requirements under Section 11 (1) of GAR B.C. Reg. 582/2004 (FRPA) to protect specific use features ('Wildlife Habitat Features') (WHFs)) such as dens, wallows and mineral licks that are used by common and rare species alike.

To date, no WHFs have been identified within the proposed CP 405 cut blocks. The known WHFs on the Hamill-Fry hillside are shown on Figure A1 along with other key habitat features. It is expected that there are many WHF's yet undiscovered including bear dens, dens of numerous other species and potentially bat maternity roosts and hibernacula

While forest- dependent wildlife are the focus of this report, it needs to be noted that many species thrive on openings with full sunlight and other species are associated with each structural stage of succession thereafter. For example, over 20 species of local songbirds are

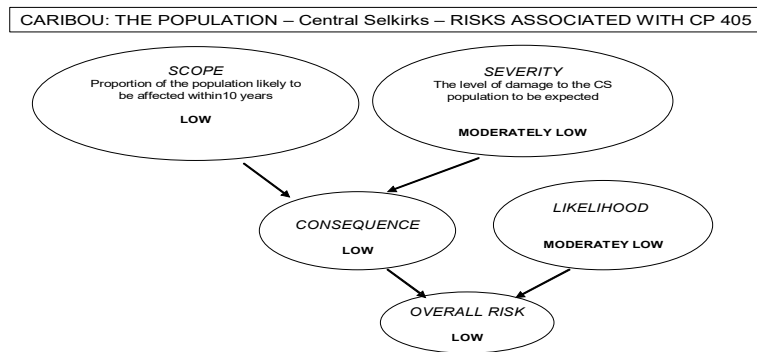
associated with early seral mixed-height mixed-species deciduous habitats typical of the first 20 <30 years after a disturbance (OFRI 2015) and snowshoe hare thrive in dense young ‘dog-hair’ conifer thickets typical of some 30-50 year-old stands.

3.2 RISK ASSESSMENTS and RECOMMENDED MITIGATION

CARIBOU

Risks from a population perspective

If viewed from the perspective of the entire Central Selkirk population range and the ongoing level of disturbance and change taking place at the population scale, CP 405 in itself - with the measures recommended report built in - is assessed to rank relatively low as a significant added risk factor. This is based largely on the fact that the habitat affected by CP 405 represents a very small percentage of the total type in the range area, likely less than 1 %).



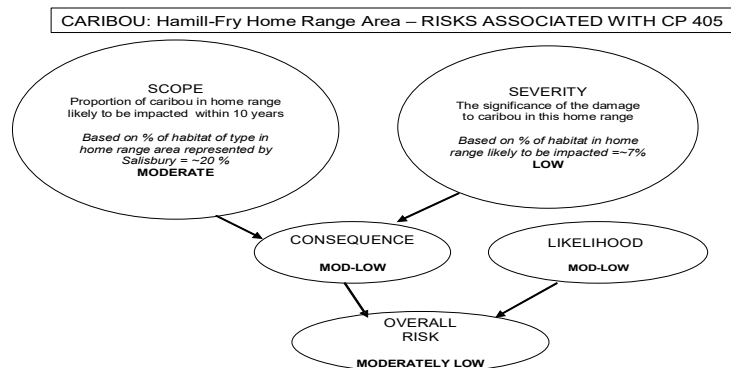
Risk Assessment - Caribou-Central Selkirks Population - CP 405

		Consequence				
		5	4	3	2	1
<i>High</i>		<i>High</i>	ModHigh	<i>Moderate</i>	Mod-Low	<i>Low</i>
<i>High</i>	5	<i>Very high</i>	High	<i>ModHigh</i>	Moderate	<i>Moderate</i>
ModHigh	4	<i>High</i>	ModHigh	<i>Moderate</i>	Moderate	<i>Moderate</i>
<i>Moderate</i>	3	<i>ModHigh</i>	Moderate	<i>Moderate</i>	ModLow	<i>Mod-Low</i>
Mod-Low	2	<i>Moderate</i>	Moderate	<i>ModLow</i>	ModLow	<i>Mod-Low</i>
<i>Low</i>	1	<i>Moderate</i>	Moderate	<i>ModLow</i>	Low	<i>Low</i>
Overall Ranking 3						

Caribou: Risks from a Home Range Area Perspective

Viewed from the perspective of the potential home range associated with upper Salisbury (Figure 3) the relative risks associated with CP 405 rank more highly. If a precautionary assumption is applied, i.e. that caribou use upper Salisbury and the other 4 Hamill-Fry upper hillside units on some regular basis, and if it is correct that upper Salisbury represents roughly 20 % of the face unit early winter early spring habitat within the Hamill-Fry home range (Figure A1 and Figure 4a) and if, as planned, CP 405 removes roughly 30 % of this type in upper Salisbury then it could be said that CP 405 represents a direct loss of around 7 % of the type within this home range.

If (A) the above assumptions are correct (the biggest weakness being lack of recent stand-level details on the other four upper face unit habitats) and (B) the mitigation measures recommended in the present report are applied (next section) and (C) this is the last harvesting in upper Salisbury for roughly 100 years, then the threat and resultant risk ranking of CP 405 for caribou within the Hamill –Fry home range ranks as low-moderate. As said, this assumes the five face units contribute equally to caribou for seasonal functions.



Risk Assessment - Caribou-Home Range Area - CP 405

		Consequence				
		5	4	3	2	1
Likelihood	High	5	Very high	High	Moderate	Low
	ModHigh	4	High	ModHigh	Moderate	Moderate
	Moderate	3	ModHigh	Moderate	Moderate	Mod-Low
	Mod-Low	2	Moderate	Moderate	ModLow	Mod-Low
	Low	1	Moderate	Moderate	ModLow	Low
Overall Ranking 5						

Caribou: Perspective within the Upper Salisbury Seasonal Use Area

Assessing the risk of impacts on caribou at the seasonal use area level required looking at the proportions and configurations of habitat to be impacted and the functions to be impacted in greater detail. A conceptual diagram was created to amalgamate considerations at all levels, (Figure 2), below. Identified stand level threats (mechanisms of potential impact) were then summarized/simplified in Table 2, with initial suggested measures for mitigation.

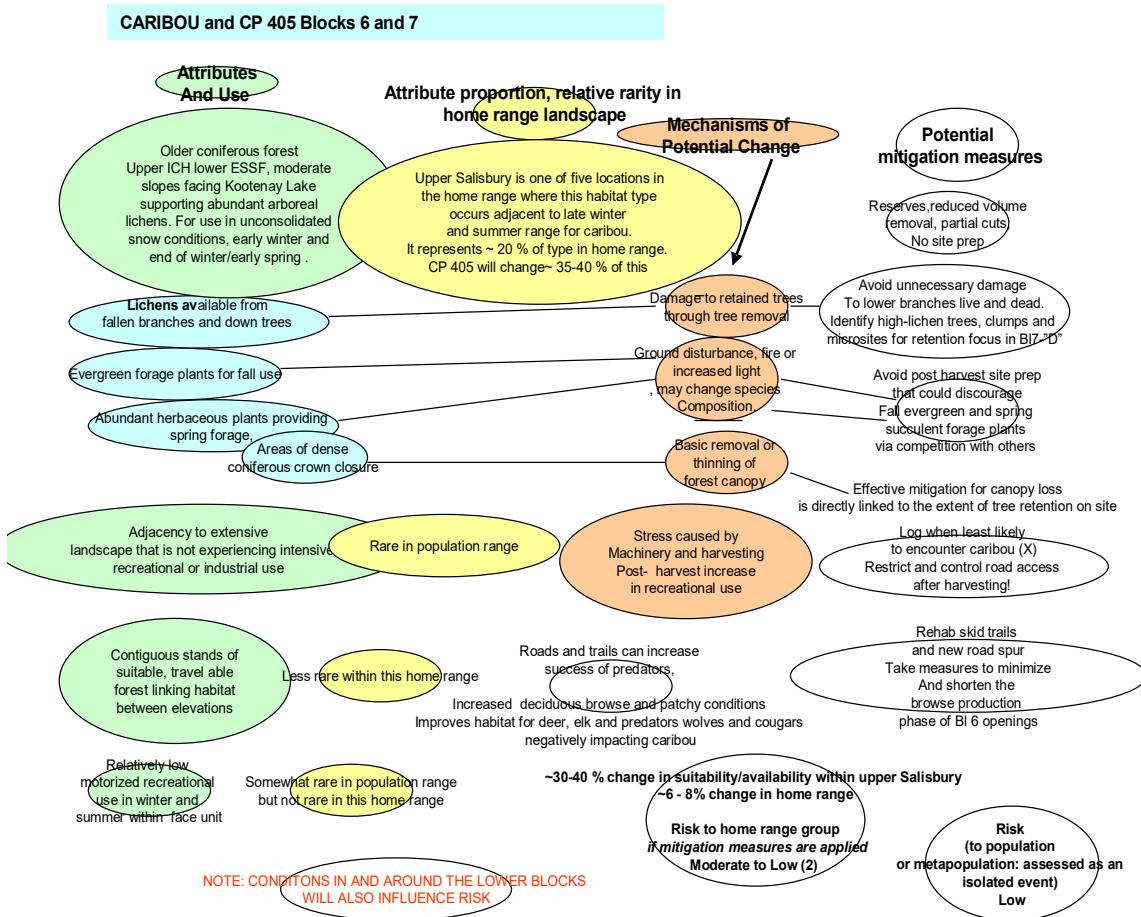
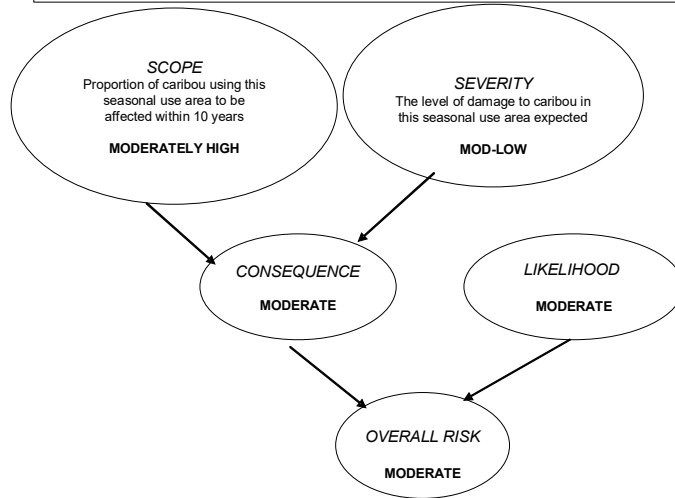


Figure 6. Model of risks for caribou in upper Salisbury

Table 2. . Potential stand-level threats for caribou associated with Upper Salisbury CP405 Blocks 6 and 7 with recommended mitigation measures

Mechanism (Threat)	Conditions Affected For Caribou	Mitigative Measures
Removal of tree canopy	Loss of Crown closure for snow interception and lichen supply	Reserves plus retention of trees in logged parts of Block 7
Removal of / damage to low branches, dead and live	Loss of lichens available w/in reach, limbs ,	Clump most of the retained attributes rather than spacing trees singly. See recommended attributes in Footnote . Encourage careful harvesting with on-site workers informed of objectives. Avoid site prep.
Removal of/ damage of advanced regen / B layer	Loss of lichens available w/in reach, limbs Loss of next generation of lichen-inoculated trees	Retain as much as possible of this layer most of which are non-merchantable. Another reason for clumping the retention. Encourage careful harvesting ; avoid site prep, as above..
Direct disturbance to animals during logging	Increased stress; altered habitat selection; both affect survival	Maintain areas with no development (reserves) Choose season of operation least likely to encounter, such as Aug-Sept
Exposure of mineral soil	Increase in deciduous browse spp., encouraging occupation by other ungulates and predators, deleterious for caribou	Avoid site prep Avoid soil disturbance
Increased light	Increase in deciduous browse spp. encouraging occupation by other ungulates and predators, deleterious for caribou	Partial retention.
Change in species balance; deer/ predators	Higher mortality from predation	Above recommendations to truncate the early seral stages
Linear features	May increase effectiveness of wolf predation and thus increase mortality for caribou	Diversify / restore skid trails and new road sections
Human disturbance after logging	Increased stress; altered habitat selection; both affect survival	Gate and limit access to road system. . .

CARIBOU: Upper Salisbury Seasonal Use Area: RISKS ASSOCIATED WITH CP 405



Risk Assessment - Caribou-Upper Salisbury Use Area - CP 405

		Consequence					
		5	4	3	2	1	
		<i>High</i>	ModHigh	Moderate	Mod-Low	<i>Low</i>	
Likelihood	<i>High</i>	5 <i>Very high</i>	High	ModHigh	Moderate	Moderate	
	ModHigh	4 <i>High</i>	ModHigh	Moderate	Moderate	Moderate	
	Moderate	3 <i>ModHigh</i>	Moderate	Moderate	ModLow	Mod-Low	
	Mod-Low	2 <i>Moderate</i>	Moderate	ModLow	ModLow	Mod-Low	
	<i>Low</i>	1 <i>Moderate</i>	Moderate	ModLow	Low	<i>Low</i>	
Overall Ranking		6					

Site-specific details for mitigative measures were developed over the course of the 2019 field season and provided to CCC. They have been incorporated in CP 405 as of April 1 2020 and/or CCC has committed to incorporating them in the Site Plans to be developed in 2020.

It is pertinent here to again point out that CCC has no legal obligation to reserve areas for caribou on the upper Salisbury face and that their intention is to harvest timber; therefore, that the recommendations in this report were provided to mitigate impacts on caribou within a timber development context.

In summary, the following recommendations are aimed at mitigating impacts for caribou within a 85- hectare area referred to by Cooper Creek Cedar as a Caribou Management Area (Figure 4b):

- Retain at least 70 % of the stand (Basal Area) as calculated within the defined caribou management area inclusive of Block 7 as shown on Figures 4a and 4b.
- Retain sizeable reserve areas in good caribou habitat that are contiguous with habitats outside Block 7 to provide travel connectivity and ongoing winter and spring functions.
- Select for caribou habitat attributes in leave-trees and clumps within the logged portions of Block 7: heavy loads of arboreal lichens on branches and trunks, reachable lower branches, breakage-prone tops and branches, vet trees. Generally, clumps are preferred over single trees as the retained features are more effectively protected.
- Rehabilitate linear skid roads/spur roads to diversify lines of sight (clumps of alder, roots, etc) after harvesting
- Confine harvesting operations largely to August, if possible, to avoid potential overlap with caribou use and to avoid disturbance to nesting birds. Stands along the bottom edge (Bl 6, lowest Bl 7) that are less suitable for caribou could be harvested in winter.
- Avoid post-harvest site-prep to avoid inspiring deciduous browse production and for the same reason minimize soil / forest floor disturbance during timber harvesting as much as possible.
- Determine final stand level details based on joint field inspections in key locations where questions remain (red dots Figure 4b).

The harvesting as proposed in CP 405 will remove 30 % of the basal area of trees within an 85- hectare area referred to by Cooper Creek Cedar as a Caribou Management Area (Figure 4b). Measured in area (hectares) the harvested area will represent roughly 45 % of the CMA (roughly 40 ha.). Half of the area to be harvested is proposed for tree retention levels of around 27 %, to include the full range in diameters occurring, at 145 stems per hectare in a mixture of single trees and clumps. The intention is to select for caribou habitat attributes in the retained trees/clumps and to include all ‘vet’ trees. Leave clumps/trees will be field-identified and marked in spring 2020.

The remainder of the CMA (55 %) (46 ha.) is proposed as a Timber Reserve with no harvesting. It is comprised of good caribou habitat that is contiguous with habitat outside the CMA as shown on Figure 4b.

The tree retention within Block 7 is expected to moderate the direct impact of harvesting on caribou habitat within that stand. The stand could potentially be used by caribou in certain conditions in the first 20 years after logging and it is expected to recover to a lichen-producing winter-suitable habitat state more quickly than if fully cleared. The large reserves and areas

identified in Figure 4b outside the reserves will contribute food supply, cover and connectivity and could potentially provide refuge during active logging (if necessary)⁵. It is expected that the potential will remain for caribou to continue using upper Salisbury after the initial disturbance if this is the last major disturbance that occurs for ~ 100 + years on the upper face.

Improvements in winter range for deer and elk from logging on Block 6 on the lower Salisbury Face could lead to secondary impacts on the upper Salisbury caribou by inspiring other ungulates, later snowshoe hare, and predators, cougars and wolves. The net improvement in range for deer and elk from CP 405 Blocks 1-5 is expected to be less than it was from previous harvest cycles, however. Range improvements for deer could be further reduced by shaded fuel-break treatments or 'thinning from below' within the presently proposed cut blocks which would inspire a minimal amount of deciduous forage and at the same time reduce cover.

5 If caribou or fresh sign are observed during operations, work should stop and discussion should be held

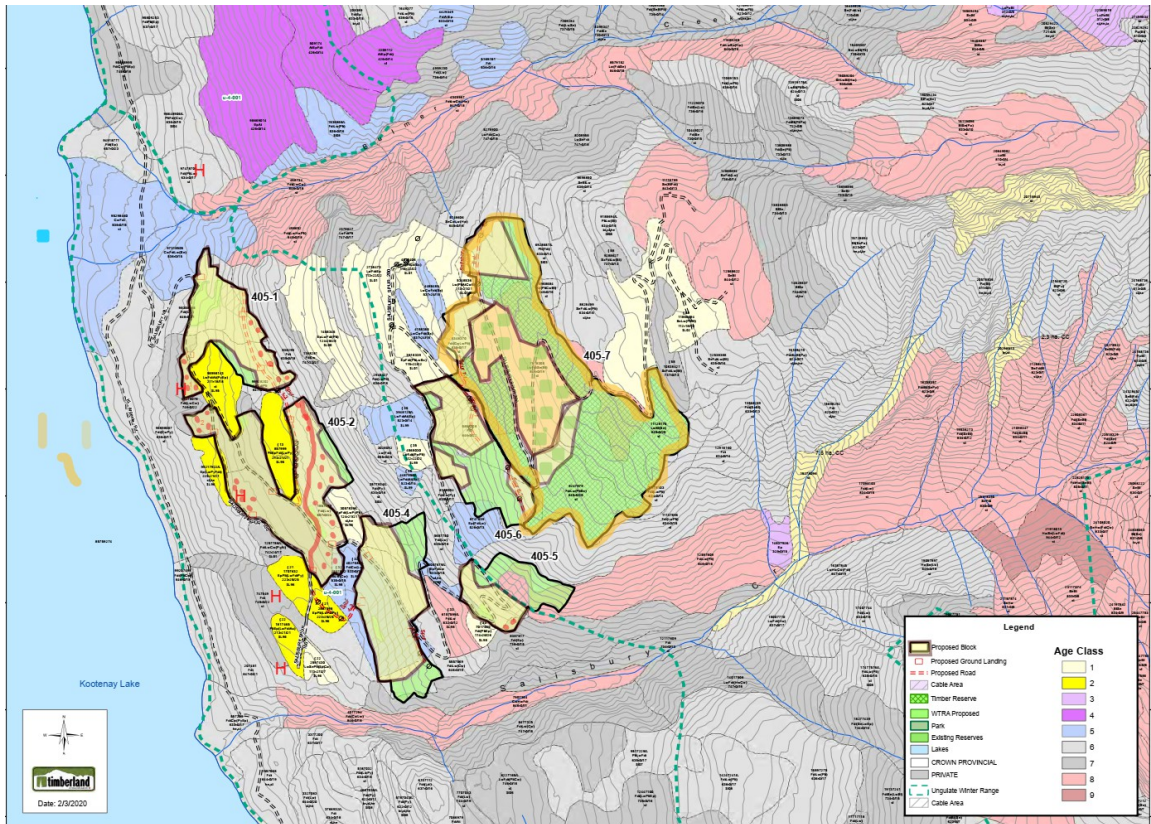


Figure 4b. CP 405: Locations of Nov 2019-April 2020 recommended mitigation measures

LEGEND

Red dots...Field-detail extra tree retention in these zones for meeting deer/other mammal top-of-slope security/cover requirements and for retaining potential Great Blue Heron roost trees (H)

Green solid marked: Long-term reserve for caribou/biodiversity

Green: WTPs

Green squares: within the CCC planned ~ 27 % retention (145sph), retain attributes meeting caribou criteria: lichen-bearing trees with branch/top breakage lichen-availability and lichens on lower branches and trunks, in groups with or near understory conifers that are or could be inoculated with lichens.

Wide gold line: Boundary of CCC's Caribou Management Area

ADDITIONAL SPECIES AT RISK

GRIZZLY BEAR

In terms of direct habitat loss, CP 405 ranks low for grizzlies as a risk as long as access to the Salisbury road network is limited and if the policy of no motorized recreation continues in the Purcell Wilderness Conservancy. Two additional recommendations are to retain and encourage the already prolific Black Huckleberry bushes within and around CP 405 and to prohibit commercial-scale/excessive human berry-picking in the area.

Risk Assessment - Grizzly Bear – CP 405

		Consequence					
		5	4	3	2	1	
Likelihood	High	5	High Very high	ModHigh	Moderate	Mod-Low	Low
	ModHigh	4	High	High	ModHigh	Moderate	Moderate
	Moderate	3	High	ModHigh	Moderate	Moderate	Moderate
	Mod-Low	2	ModHigh	Moderate	Moderate	ModLow	Mod-Low
	Low	1	Moderate	Moderate	Moderate	ModLow	ModLow
Overall Ranking 4							

WOLVERINE

CP 405 ranks low as a direct risk for wolverine if access to the Salisbury road network is limited and if the policy of no motorized recreation continues in the Purcell Wilderness Conservancy.

Risk Assessment - Wolverine - CP 405

		Consequence					
		5	4	3	2	1	
Likelihood	High	5	High	ModHigh	Moderate	Mod-Low	Low
	ModHigh	4	Very high	High	ModHigh	Moderate	Moderate
	Moderate	3	High	ModHigh	Moderate	Moderate	Moderate
	Mod-Low	2	ModHigh	Moderate	Moderate	ModLow	Mod-Low
	Low	1	Moderate	Moderate	Moderate	ModLow	Mod-Low
Overall Ranking 3							

FISHER

If Fisher occur in Salisbury, timber harvesting would constitute a threat to their habitat requirements which are large old trees and snags for dens, complex woody debris on the forest floor for hunting and forest canopy (coniferous) in winter. The occurrence of fisher has not been confirmed, as mentioned, so the likelihood of risk is low, however Marten, a ‘common’ local

species, have very similar habitat requirements and are suggested as a surrogate indicator of the same attributes/conditions. See Tables 2 and 3.

Risk Assessment - Fisher - CP 405

		Consequence					
		5	4	3	2	1	
Likelihood	High	5	Very high	High	Moderate	Mod-Low	Low
	ModHigh	4	High	ModHigh	Moderate	Moderate	Moderate
	Moderate	3	ModHigh	Moderate	Moderate	ModLow	Mod-Low
	Mod-Low	2	Moderate	Moderate	ModLow	ModLow	Mod-Low
	Low	1	Moderate	Moderate	ModLow	Low	Low
	Overall Ranking 4						

GREAT BLUE HERON

If Great Blue Heron roost in tall conifers on the lower Salisbury Face in winter as they do on slopes north of Bulmer Creek there could be a risk of impact from CP 405 if it is not mitigated. Viewed at the population level (Kootenay Lake) the risk could be said to be moderately low⁶, but if viewed at the level of a seasonal use area level (Figure 3), the potential risks associated with CP are more significant.

Hérons are often seen roosting in trees near abandoned clearing edges (author obs.) but are not seen using trees surrounded on all sides with open areas and thus roost tree options on block edges are a recommended focus of mitigation for heron in lower CP 405 Figure 4 indicates locations where suitable heron roost trees are recommended. The single trees retained within cut blocks could eventually serve heron as roost trees if they remain standing and grow full healthy crowns and once the surrounding stands develop, but that could take over 50 years.

Risk Assessment - Great Blue Heron - CP 405

		Consequence					
		5	4	3	2	1	
Likelihood	High	5	Very high	High	Moderate	Mod-Low	Low
	ModHigh	4	High	ModHigh	Moderate	Moderate	Moderate
	Moderate	3	ModHigh	Moderate	Moderate	ModLow	Mod-Low
	Mod-Low	2	Moderate	Moderate	ModLow	ModLow	Mod-Low
	Low	1	Moderate	Moderate	ModLow	Low	Low
	Overall Ranking 4						

⁶ Risk ranking at population level would increase greatly if nests discovered

The development of Bulmer Point may be impacting herons. Future heron impacts there will depend upon the level of human residence/use in winter months and on the number of full-crowned dominant Douglas fir and old cottonwood trees that are retained.

NORTHERN GOSHAWK

Salisbury Face lies within a potential hunting territory/home range for a pair of goshawks that nests near Argenta Creek (Figure A1). Goshawks can be expected to hunt over/in post-CP 405 openings and young forests as the stands regenerate and support snowshoe hare and other small mammals and birds. There are no known nests with the Salisbury Face unit, so the direct risks associated with CP 405 for goshawk would rank low⁷, but in view of their large area requirements and sparse distribution Goshawk will need to be considered at a broad landscape scale well in advance of future planned development of new face units especially the Bulmer-Argenta Face. Their forest retention needs should be integrated with protection for watersheds, terrain, old growth, caribou and other conservation values.

Risk Assessment - Northern Goshawk - CP 405

		Consequence				
		5	4	3	2	1
Likelihood	High	5 <i>High</i>	4 ModHigh	3 <i>Moderate</i>	2 Mod-Low	1 <i>Low</i>
	ModHigh	5 <i>Very high</i>	4 High	3 <i>ModHigh</i>	2 Moderate	1 <i>Moderate</i>
	Moderate	4 <i>High</i>	3 ModHigh	2 <i>Moderate</i>	1 Moderate	<i>Moderate</i>
	Mod-Low	3 <i>ModHigh</i>	2 Moderate	1 <i>Moderate</i>	<i>Moderate</i>	<i>Mod-Low</i>
	Low	2 <i>Moderate</i>	1 Moderate	<i>Moderate</i>	<i>ModLow</i>	<i>ModLow</i>
Overall Ranking		3				

WESTERN TOAD

Western Toads could potentially occur in habitat affected by CP 405, but none have been documented and there are no wetlands in or near the presently proposed CP 405 blocks. For this reason, no grid was created for toads.

The primary threat for toads from logging or wildfire fuel reduction treatments is the loss of large woody debris and other micro topographic and understory diversity which they depend on for thermal shelter, in winter and summer, and for supporting their invertebrate foods.

Wetlands (even ephemeral) of any kind in this otherwise dry landscape should be carefully protected, for toads, forest birds and all species.

⁷ Risk ranking for goshawk would increase greatly if a nest were discovered in the CP 405 vicinity

Toad observations anywhere on the hillside should be recorded by personnel on site and the toad(s) reasonably protected in situ (with microhabitat features, cover) due to their strong fidelity to home territories.

MULE DEER

The grid ranking system used for the SAR above is not designed well for species such as for Mule Deer for whom there are benefits from logging as well as risks. Mule deer can potentially benefit from the forage-producing aspects of logging, while potential risks include loss of coniferous cover and human disturbance/mortality associated with logging roads.

Risks at the Population and Home Range Level

From the perspective of the West Kootenay mule deer population the significance of CP 405 (positive or negative) in itself could be seen to rank low because Salisbury Face represents a small proportion of the West Kootenay population range. If the road network remains open to hunting the risks to the larger population would be higher (disproportionate to area).

If viewed from the perspective of a potential mule deer home range the significance of lower Salisbury as winter range is very high. Deer are dependent on suitable low-elevation winter ranges once snow depths are over 50 cm deep and temperatures are cold, and lower Salisbury is one of the most suitable winter ranges at the north end of Kootenay Lake. Mule deer evidently exhibit strong year to year fidelity to their winter ranges within a given home range area (Roberts, 2004)

As mentioned earlier, forage (food supply) is not abundant in lower Salisbury at present, as most of the forage produced in earlier logged openings in lower Salisbury has grown into young coniferous and deciduous trees out of reach of deer. At the same time, none of the 1990s-logged stands yet qualify as adequate cover.

In April 2019, recommendations were provided to CCC regarding the protection of several key features for mule deer, most of the same also serving a range of additional species. These recommendations included:

- Pull back block boundaries along the west edges of Blocks 1 and 2 and the south edges of Blocks 4, 5 and 7 to provide travel connectivity and top-of-slope/break security/rest habitat for deer and other mammals. This also retains forested connectivity with Kootenay Lake, a measure now particularly important in light of the adjacent Bulmer Point development

- Calculate and manage for mature coniferous cover proportions within a deer winter use unit rather than within the larger legal GAR UWR unit. This results in a higher proportion of cover than legally required.

The above recommendations were largely incorporated in the design as presented for CP 405 in spring 2020.

After the proposed CP 405 has been harvested, the age class breakdown will be as shown on the following pie chart (Figure 5). Age class 0-20 is a surrogate for forage and age classes over age class 6 (coniferous) are considered cover. Types dominated by deciduous species (Birch, Aspen) have been excluded from this calculation. Most of those types are also used by deer, some serving forage, some serving cover.

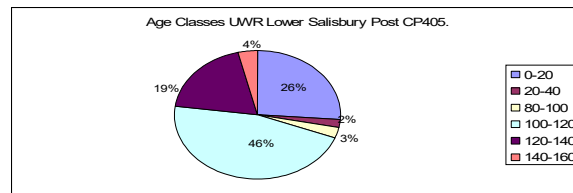


Figure 6. Age classes to remain post-CP 405 within lower Salisbury mule deer winter range

This indicates that after CP 405 46 % of the UWR will remain in forest over 100 yrs old and 26 % of the UWR will be in an open, forage-producing condition resulting from the 55 net logged hectares within UWR. This will probably be more forage than can be utilized by present ungulate populations before it grows out of reach in 20 years, but overall the forage will likely be beneficial for deer and elk.

Looking at slope classes and hill shade interpretations it appears that roughly half of the remaining mature cover after CP 405 will lie on slopes over 70 % and around one quarter of it over 100 % .i.e. virtual cliffs. Mule deer can utilize steep broken terrain, as earlier discussed, but not slopes over 100 %. Considering these factors it is estimated that roughly 34 % of the

Salisbury UWR area will be occupied by coniferous cover on slopes useable for deer after CP 405.

A commonly recommended ratio of cover: forage for mule deer winter range is 40:60 (Armelder 1986, Thomas 1979). By these definitions, the proportion of cover predicted after CP 405 qualifies reasonably well, even with slope taken into account. The *juxtaposition* of the mature coniferous in relation to forage will be less than ideal, post-CP 405, a largely inevitable pattern given the past harvesting patterns. It will be located largely around the edges of an open/young forest patchwork approximating 80 ha. in size, a broad area without snow interception/thermal cover in winter, and much of the cover on the upper (east) edges of the blocks lies on very steep rocky ground.

The planned retention of mature Douglas fir scattered throughout Blocks 1, 2, and 4 will speed up snow-melt in late winter/early spring which will benefit deer, but single trees are not likely to provide snow interception or thermal cover.

To moderate impacts on cover distribution somewhat it is recommended that further refinements in design / site-planning in lower Salisbury include to:

- Add to the protection of travel connectivity, winter cover and top-of-slope security sites along the west edges of Block 1 and 2 by retaining additional trees in areas identified (Figure 4b), with details to be determined on site.
- Retain a zone of heavier retention at the south end of Block 2 to provide some snow interception / thermal cover and travel connectivity for deer through the middle of the otherwise open /young area approximating 80 ha. that will result from past and planned harvesting as shown on Figure 4b⁸.
- Field check the eastern (top) boundaries of Blocks 1 and 2 to assess whether cover needs for deer and other animals on useable slopes at the base of the talus/cliff are met and if they are not, retain additional trees there, details to be site-determined.

⁸ It is difficult for deer to forage further than ~50 m. from forest edges in snow over 50 cm deep, as often occurs there.

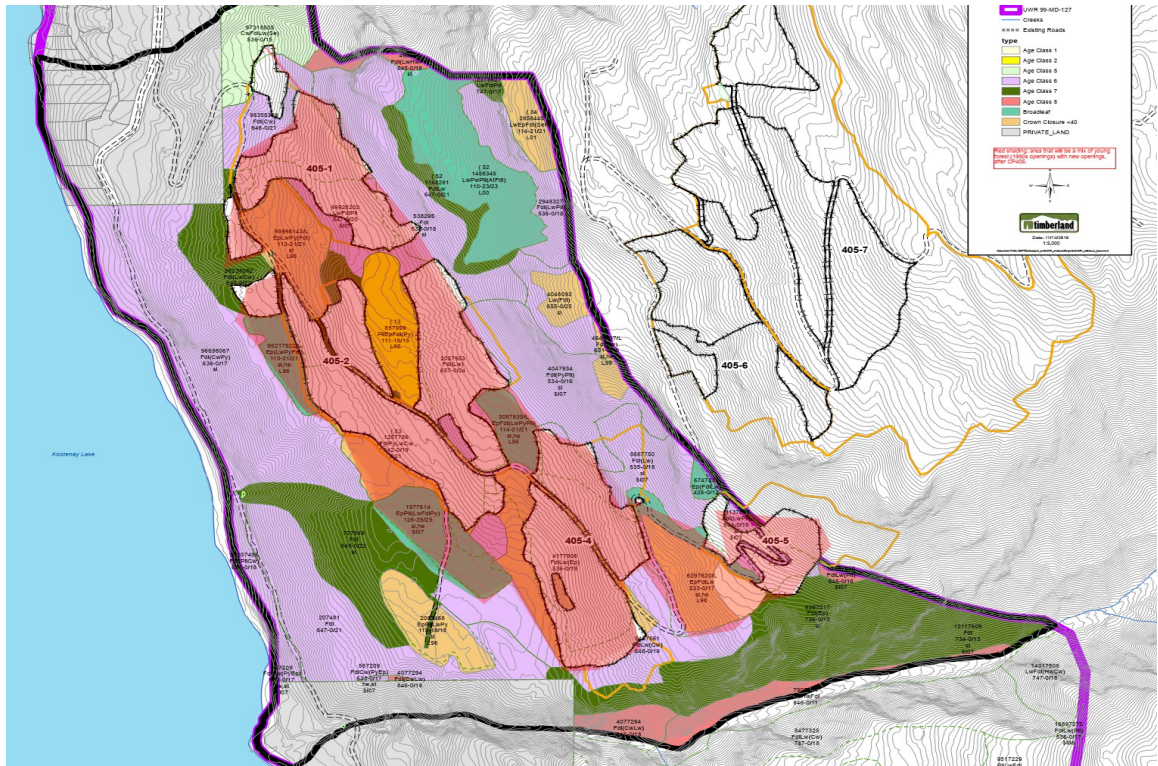


Figure 4c. Lower Salisbury Ungulate Winter Range indicating pre and post-CP 405 forage / cover configuration. Shaded center area will be largely young forest or open after CP 40, to be mitigated by zones of retention, Figure 5b.

Trees retained within Blocks 1-5 will generally be more effective for deer and other wildlife as clumps (small groups) than as single trees. And, as addressed later, in clumps, standing dead trees can be more safely retained, naturally-occurring woody debris can be retained and multi-layers encouraged, separated from the next clump by a cleaner forest floor if this is desired from a wildfire risk perspective. Leave-tree clumps within deer winter range should include dominant/co dominant Douglas fir, but Cedar, where it exists, of any size, is also a valuable species for deer as food and cover. Cedar can fill out quickly forming valuable cover trees when stands are opened around them, in suitable sites; they are good ‘anchor’ trees, cavity trees, den trees and songbird trees in addition to functioning for deer.

A final recommendation for Mule Deer on Salisbury Face is to gate and control the road access after CP 405 and to prioritize the needs of wildlife in schedules and policies. Ideally, for mule deer and all wildlife, the whole road network would be closed completely; however, given the public interest in this access a compromise might be to maintain key components of the road system for fire protection purposes and to allow access to alpine hiking for 1 or 2 months in late

summer; to be discussed. It is recognized that CCC does not have the authority to close access. Access restriction on Salisbury will require community/RDCK/MLFNROD engagement.

RISKS FOR ‘COMMON SPECIES’ AND OVERALL BIOLOGICAL DIVERSITY

Habitat change due to timber harvesting

There are inevitably many species of ‘common’ wildlife that will be adversely affected by CP 405. Any change in forest (habitat) structure - due to logging, wildfire fuel reduction treatments, thinning or brushing - results in some degree of change for wildlife, since virtually all forest structural attributes serve some habitat function, as earlier described.

At the same time, change is a part of any healthy ecosystem (Holling 2009; Drevor et al, 2006). Natural succession proceeds constantly, resulting in gradual, subtle change. Natural disturbances such as floods, fires, landslides, or insect die-offs can create sudden and radical changes, setting back succession to pioneer or early seral stages and in doing so these events supply young age classes to the landscape which are essential for ongoing biodiversity. While potentially beneficial at a landscape scale these events are destructive at a stand or microsite scale. The overall balance in a landscape (timing, area, patterns) is key in assessing the risks vs. benefits of a given disturbance to a species or system.

One framework used in B.C. forest for determining the most natural spatial scale and timing of disturbances in ecosystem restoration or timber harvest planning is to model objectives for age class, patch sizes and retained attributes on the evident fire history associated with biogeoclimatic units or Natural Disturbance Types. The Natural Disturbance Types concept (MOF 1995), placed low- elevation forests at the north end of Kootenay Lake in category NDT3, where moderately frequent to frequent “stand-initiating” wildfires are believed to have been the historic norm, resulting in a mosaic of age classes in medium sized patches and scattered concentrations of old forest attributes in ‘fire-skips’⁹ The more appropriate classification for *low-elevation southerly aspects* on Kootenay Lake hillsides may now be (or may soon be) NDT4 considering recent and predicted future climate changes. NDT 4 systems are said to be characterized by frequent stand-maintaining fires creating semi-open stands that are somewhat more homogeneous, with less *small* woody debris on the ground but occasional *very large*-diameter wood debris and snags.

If the NDT framework is applied in assessing present conditions on the Salisbury Face the existing patch sizes and age classes could be said to lie within the range of historic variability, i.e. conditions that might have existed in the past resulting from wildfires aside from the actual configuration of the patches and the presence of roads.

9 Vet trees; snags; concentrations of woody debris, multi-layered conifers.

The proposed CP 405 Blocks 1, 2 and 4 could somewhat mimic a historically natural wildfire if sufficient within stand structure is retained. Saab & Dudley (1998) found 81 snags per ha. present in high intensity burns in dry (Py/Fd) forest types that were well used by cavity nesting birds and found some species of cavity nesting birds used salvage-logged burns that retained ~ 43 snags per ha.

CCC proposes to retain 80 live mature trees per hectares within CP 405 Block 1 and 50 to 60 live trees per ha in Block 2. If these trees remain on site to grow and die they will potentially provide a similar number of snags to those found in the un-harvested and partially logged wildfire described above (Saab and Dudley 1998). The retention levels proposed in Block 4 are lower (10-12 sph) due to steep ground/cable operations and forest health concerns. Blocks 5 and 6 are sufficiently small that the proposed low retention levels (10 15 sph) are of low concern considering the snags supplied by adjacent stands. In Block 7 the attributes to be retained for caribou will also serve many smaller species including cavity-users.

The leave trees proposed in Blocks 1 and 2 will contribute significantly to wildlife requirements for vets/snag/logs within the *future* young stands. Requirements for *existing* snags, woody debris in the understory and down woody debris within the blocks remain unaddressed at this time, however.

It is unclear to what extent *existing* snags can be retained in these blocks from a worker-safety standpoint as is the case in many timber harvest settings. It is unclear to what extent structural diversity and woody debris on the ground can be retained while still meeting wildfire hazard reduction objectives.

Roughly 50 % of the Salisbury Face will remain un-harvested after CP 405 including Birch (Douglas fir)/ talus types and old growth Douglas fir (Py) on the north side of Salisbury canyon. These stands will contribute snag cavities and other biologically valuable functions to the ecosystem over the next several decades which can be expected to compensate to some extent for a lower-than-normal number of snags in the harvested / managed areas, but less well for the loss of woody debris.

While recognizing that the reduction of wildfire fuel loads needs to take precedence in many areas of lower Salisbury, the important of retaining existing and future woody debris on the ground cannot be overstated for wildlife and overall ecosystem health (Brown et al 1985). In addition to being used by dozens of wildlife species, down logs play important roles in nutrient storage and cycling, nitrogen fixation and as mycorrhizal hosts from which small mammals inoc-

ulate new stands and along/within which small mammals travel/reside to undertake this (Maser 1978).

It is thus recommended that CCC look for ways to integrate the retention of existing snags, woody debris and other forms of structural diversity with the planned retention of mature live trees within Blocks 1, 2 and 4 within the constraints dictated by wildfire hazard reduction requirements on these blocks. Important attributes to incorporate and retain as possible along with the leave trees proposed include:

- *all* (> 50 cm diameter trees, snags and logs and all 'Vet' trees;
- all snags within safety constraints
- all unburned *pre-harvest* woody debris (lower to ground if wildfire concern)
- newly-created 'waste' debris over 20 cm in diameter (assuming there will not be very much of it); unburned, close to the ground, and /or piled, if abundant; piles with green/soil/packed/far from roads so low fire hazard
- roughly 25 % of the newly created debris smaller than 20 cm. in diameter (final decisions on % to be made on site); formed into small piles and left unburned, preferably within the stand (block) itself with fuel-free areas in between to decrease fire risk
- a diversity of understory species and heights, where present, in association with at least some of the mature wind-firm leave trees Cedar, even very young cedar, around the base of mature Fir are especially valuable for wildlife. Fuel-free zones between clumps could mitigate fire hazard.
- Off-the-ground woody debris diversity in association with some of the retained trees.

Retaining the mature leave trees in small groups or clusters is likely to better facilitate the retention of added habitat structures than single trees. Tree groups are also preferred by most wildlife over single trees according to Saab and Dudley (1998) and Thomas (1979).

Direct risks for small terrestrial species with small home ranges/territories that reside within the proposed blocks as well as for nesting birds will remain high in the short term although they will be mitigated by the above recommended measures in the long term. To protect nesting birds and their young from direct harm in accordance with the Migratory Birds Convention Act (2018) it is also recommended that the licensee and other parties concerned

- Avoid cutting trees during the nesting through fledgling seasons from April through July. (More precise dates may be incorporated in Site Plans if better information becomes available.)

Climate change

To the extent that climate change represents a risk for wildlife/ biodiversity and considering that numerous unpredictable events could occur over the next 100-200 years, ecosystem *resilience* is logically a key attribute to try to retain. Efforts discussed above to retain structural diversity may help to support ecosystem resilience. Two additional recommendations that may contribute to resilience and aid wildlife in adapting to climate change include to:

- Maintain contiguous travel connectivity suitable for a variety of species groups to enable secure movement throughout each face unit and over the Hamill-Fry landscape in north-south directions, between elevations and in and out of creek draws and back and forth to Kootenay Lake¹⁰
- Identify and conserve/link up rare, exceptionally cool, wet microsites in the landscape as potential climate/fire refugia. (These sites might resemble fire-skips in a natural wildfire scenario).

Habitat change due to wildfire fuel hazard reduction treatments

As earlier implied, treatments designed to remove ladder fuels, ground fuels and to simplify stand structure to reduce wildfire hazard/risk have the potential to impact wildlife and biodiversity adversely, since the general objective of these tasks is to reduce structural diversity, to remove habitat structures. If treatments occur only in limited high wildfire risk zones (e.g., near residences) the significance of negative impacts could be minimal. If planned over large areas of the landscape there could be cause for concern.

A few examples of specific practices of concern include:

(1) Removal of under story/lower branches near roads which removes hiding cover. This can impact frequency of use (and survival) for many species, especially if the line of sight penetrates far into stands from roads and if the roads are active

¹⁰ For travel. ungulates and many large mammals appear to prefer convex landforms, topographic breaks and edges. Bears and many small mammals may prefer concave, sheltered landforms. Many species travel in riparian zones where terrain is feasible. As mentioned earlier the Hamill-Fry landscape appears to have regional importance for north-south and Purcell-Selkirk travel connectivity given its linkage with the Duncan- Lardeau flats.

(2) Removal of lower dead or live branches bearing arboreal lichens, reducing lichen availability within reach of caribou (also removes rest/feeding sites for squirrels and perch sites for small birds)

(3) Disturbance to Great Blue Heron winter roosting sites along lower slopes during winter fuel treatment work and

(4) Thinning (shaded fuel break treatments) in mature Douglas Fir stands in deer winter range which reduce a stand's suitability as winter cover (snow interception, thermal cover) by reducing crown closure below the 60 % crown closure typically required for the harsh mid winter period

There are many ways in which the needs of wildlife and the needs for wildfire hazard reduction can be compatible if planned carefully at a landscape and stand level, however, so it is recommended that an effort be made to do this. For mule deer, as an example, shaded fuel break treatments are compatible with late winter and spring range on south aspects even though not compatible with the need for dense cover in deep snow conditions. In locations where structural diversity within stands is desirable for wildlife while still reducing ground fuel hazard, clumping and or piling the debris/structure/retained trees may be part of the solution, as earlier described. Myriads of small mammals and birds utilize wood debris piles. Local examples include marten, fisher, weasel, Pacific wren, Dark-eyed junco, chipmunks and snowshoe hare.

There is much that could be said and done to integrate wildlife requirements with wildfire hazard reduction throughout the Kootenay but this subject lies beyond the scope of the present report.

Human and machine disturbance

Studies throughout North America have demonstrated that nearly all wildlife species are adversely affected by actively used roads (Thomas 1979, Fahrig & Rytwinski, 2009).

Observations worldwide of positive wildlife responses to reduced human presence are numerous and profound. It is clear that minimizing unnecessary machine or human disturbance to wildlife (maintaining large people-free areas) should be part of any effort to protect biological diversity.

There is a need to allow for secure, day –time hiding areas for wildlife in the temporal planning of all forms of machine and forest development disturbances in a given face unit or portions thereof (i.e. don't work everywhere at once).

At a landscape scale, wildlife need undeveloped habitats serving similar functions in the adjacent face units to function undisturbed while machine disturbances such as logging, fuel reduction treatments or road-building occur in others.

For wildlife, it would be ideal to completely close and re-contour the road system on the Salisbury face after the harvesting of CP 405; however, given the wildfire concerns and the recreational interest in the alpine above Salisbury a compromise recommended is to:

- gate and control road access to Salisbury Face after timber harvesting has been completed

There could potentially be an annual window such as August in which public access would be allowed on the main road as long as the road is driveable. Selected parts of the road system could be maintained for forest fire protection purposes. It is recognized that CCC does not have the authority to undertake road access management/closures and that this measure would need to involve MFLNROD, the RDCK (?) and much community discussion.

4.0 SUMMARY OF RECOMMENDATIONS

At the risk of being repetitive, the following list summarizes all the recommendations outlined in Section 3.2.

Caribou

For mitigating potential impacts Mountain Caribou on the upper Salisbury Face CP 405 Block 7 area, it is recommended that Cooper Creek Cedar:

- Retain at least 70 % of the forest stand basal area within the area mapped as Block 7 and referred to by CCC as a Caribou Management Area (CMA)
- Retain large, contiguous reserves of good quality caribou habitat lying within the CMA in an un-logged state as shown on Figure 4a, 4b. These are contiguous with good caribou habitat outside the CMA
- Within the logged portion of Block 7, where CCC proposes retention of 145 stem/ha. Select for caribou habitat attributes in leave-trees and clumps. This is to include: heavy lichen loads, good lichen availability (direct and via branchfall) and more than one size/layer/age class.
- After logging, re-contour/diversify and block lines of sight along all linear corridors such as skid trails and new road sections if any

Some of the above have been incorporated in the currently proposed CP design and CCC has stated the intention to incorporate the remainder in Site Plans.

Great Blue Heron

For mitigating potential impacts on Great Blue Heron on the lower Salisbury Face it is recommended that:

- Trees suitable for winter roosting along the lower edges of Blocks 1 and 2 be incorporated in concentrations of heavier tree retention, with details to be specified on site, locations shown on Figure 4b.

Mule Deer

. Recommendations for mule deer on the lower Salisbury Face most of which have been incorporated in the March 2020 CP 405 design include to:

- Pull back block boundaries along the west edges of Blocks 1 and 2 and along the south edges of Blocks 4, 5 and 7 to provide travel connectivity and top-of- slope/break security/rest habitat for deer and other mammals.
- Calculate and manage for mature forest cover proportions within a natural deer winter range use unit, i.e., lower Salisbury, rather than using the much larger calculation unit legally required under GAR U-4-001. This results in a higher proportion of cover than legally required.

Additional recommendations for mule deer in Blocks 1-5 that are outlined in the present report and shown on Figure 4b include to:

- Further refine the protection of travel connectivity, winter cover and top-of-slope security sites along the west edges of Block 1 and 2 by retaining additional trees, with details to be determined on site
- Retain a zone of heavier retention as shown at the south end of Block 2 to provide snow interception / thermal cover and travel connectivity for deer through the middle of the otherwise open /young area approximating 80 ha. that will result from past and planned harvesting
- Field check the eastern (top) boundaries of Blocks 1 and 2 to assess whether cover needs for deer and other animals on useable slopes are met and if not, retain additional trees there, details to be site-determined.

Small mammals, birds, biological diversity

For mitigating potential impacts on small mammals, birds, invertebrates and other species resident within the proposed cutblocks - *within the constraints of requirements to minimize wildfire hazards* - it is recommended that in addition to the mature trees planned for retention within Blocks 1 and 2, the following habitat attributes be retained:

- All possible tree boles over 50 cm dbh live, dead, standing or down, unburned, all species
- All possible pre-harvest woody debris, un-burned
- All safe snags
- Newly-created 'waste' debris over 20 cm in diameter, assuming this will be minimal, arranged within the blocks so fire hazard is minimal (Pile if very abundant)
- Roughly 25 % (?) of the newly created debris smaller than 20 cm. in diameter, in piles, arranged/structured to minimize fire risk
- A diversity of understory species and heights, where present, in association with at least some of the mature wind-firm leave trees
- Off-the-ground woody debris diversity in association with some of the retained trees.

To further mitigate potential impacts on resident and nesting birds, and in compliance with the Migratory Birds Convention Act (2018) which prohibits harm to birds and nests it is recommended that CCC and other forest operators:

- Avoid cutting trees during the nesting through fledgling season, from April through July, with more precise date windows to be incorporated in Site Plans if based on better information.

All wildlife

To benefit all forms of wildlife it is recommended that:

- Road access on Salisbury Face be gated and controlled after CP 405 is harvested, with wildlife protection a primary objective in developing schedules and policies.

It is recognized that the authority to control road access lies with government rather than with Cooper Creek Cedar. Significant community discussion will also need to be a part of this.

And considering the prospect of climate change as a threat for wildlife it is further recommended that:

- Secure travel (connectivity) habitat for a diversity of species groups be conserved within the Salisbury Face and surrounding hillsides to enable animals (and plants) to travel north –south; between elevations and in/out of creek draws to aid in adapting to temperature and moisture changes
- Climate ‘refugia’ be established in rare microsites that are atypically cool and moist to wet (northerly aspects, bowls, seepage sites, riparian zones) to potentially aid species that are especially sensitive to dry hot conditions

5.0 CONCLUSIONS

Viewed as the last, large-scale harvesting pass on this face unit in an 80 to 120 –year harvest cycle and with the mitigation measures applied and recommended, it is expected that the stands remaining in Salisbury after CP 405 will re-populate the harvested logged openings and that the face unit ecosystem as a whole will gradually recover, barring a major event such as a wildfire or an extremely rapid and radical shift in climate. The timber harvesting that occurred between 1995 and 2001 represented very roughly a 20 % change in forest cover over an 8– year period (90 ha./plus roads out of 550 ha). CP 405 will result on an additional roughly 20 % change, occurring over a 1 to 3 - year period.

On the upper Salisbury face, the risks for Mountain Caribou will be partially mitigated by establishing reserves in good quality caribou habitat and modifying the harvesting in 2/3 of the logged area to retain caribou habitat attributes. With the measures carried out as planned, the habitat conditions remaining in upper Salisbury after CP 405 are expected to allow for continued occasional use caribou as part of a larger home range. If the remainder of the Central Selkirk caribou subpopulation in the Nakusp-Duncan area can remain stable or increase and if connectivity between the larger herd and Hamill-Fry continues to exist, or is restored, then conceivably the expansive, though rugged, drainages in the Purcells including Hamill-Fry could contribute significantly to overall caribou recovery. Efforts towards harvest practices that retain caribou habitat attributes can perhaps contribute, if successful, to the development of a more dynamic and effective strategy for conserving caribou habitat across landscapes and regions in the future.

On the lower Salisbury face, the risks associated with CP 405 Blocks 1 to 5 for Mule deer will be mitigated by boundary changes and variations in retention recommend in certain locations to protect travel connectivity/ security zones and winter range cover, Potential risks for Great

Blue Heron are likely to be mitigated by leaving appropriate potential roost trees in the sites identified.

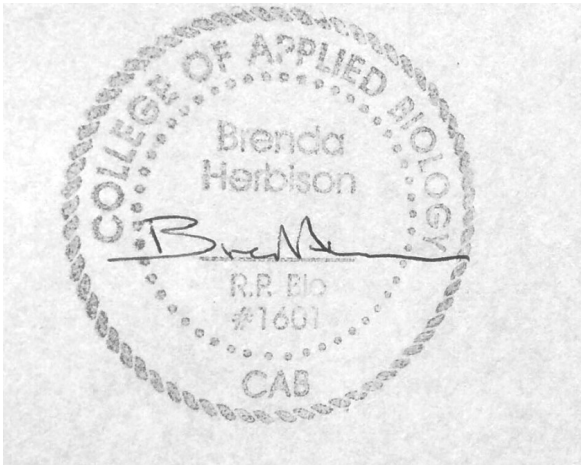
Nesting birds and small mammals with small home territories lying with cutblocks will be the most directly impacted by CP 405. In addition to retaining as much structural diversity as possible, measures to protect these species include avoidance of tree-cutting during nesting through fledgling season (April-July+) in accordance with the Migratory Birds Convention Act (2018).

Resilience for wildlife in the face of climate change will potentially be aided by the retention of stand habitat attributes and by the recommended face-level/landscape-level network of travel /connectivity zones to enable plants and animals to adapt to changes in temperature and moisture. If the recommended climate refugia are conserved in cool wet microsites this may also help to buffer the threat of climate change for wildlife.

6.0 CLOSURE

I trust that this report satisfies present requirement and that if there are comments I will be contacted.

Respectfully submitted by



Brenda Herbison, MSc., RPBio.

7.0 REFERENCES

- Armelder, Keisker, Dawson and Waterhouse. 1994. Winter habitat use by mule deer in central interior B.C. *Can. J. Zool.* 72:1721-1725
- BC MOE, 2015. B.C. Guide to recovery planning for species and ecosystems. Appendix 5. Guidance for threat assessments Version 2. BC Ministry of Environment, Victoria, B.C.
- Brown E.R. (ed.).1985. Management of Wildlife and Fish Habitats in Forests of Western Oregon and Washington . USDA Forest Service Pacific Northwest Research Station.
- Bull ,E and R. Holthausen.1993. Habitat use and management of Pileated Woodpeckers in north-eastern Oregon. *J. Wildl. Manage.* 57: 335-345
- AB/ABC PF 2009. Managing Species At Risk in British Columbia
- Coast Conservation Initiative, 2012. Maintaining the integrity of Northern Goshawk Nesting and Post-fledgling Areas in the Ecosystem Based Management Plan Area of Coastal British Columbia: Guidance for Forest Professionals (CFCI)
- COSEWIC 2018. Imminent Threats Analysis Southern Mountain Caribou: Committee on the Status of Endangered Wildlife in Canada, Ottawa.
- COSEWIC, 2002. Assessment and Status report for the Western Toad (*Bufo boreas*) in Canada: Committee on the Status of Endangered Wildlife in Canada, Ottawa.
- Drever, C. R. , G. Peterson, C. Messier, Y. Bergeron, & M. Flannigan 2006 Can forest management based on natural disturbances maintain ecological resilience? 2006. *Canadian Journal of Forest Research*, 2006, 36(9): 2285-2299, <https://doi.org/10.1139/x06-132>
- Fahrig, L. and T. Rytwinski, 2009. Effects of Roads on Animal Abundance: An Empirical Review and Synthesis. *Ecology and Society*, Vol.14, No.1
- Gaston, K.J. 2010. Valuing Common Species. *Science* 327(5942) 154-5. January 2010
- Government Action Regulations B.C Reg 582 /2004 Ungulate Winter Range # U-4 -001 Sections 9(2) and 12(1)
- Government Action Regulations B.C Reg 582 /2009 Ungulate Winter Range # U-4 -012

Government Action Regulations Section 11 (1) B.C. Reg. 582/2004 (FRPA) Wildlife Habitat Features

Government of Canada 2018. Recovery strategy for Northern Goshawk *laingi* subspecies

IUCN. 2017. Threats Classification Scheme (Version 3.2). (<http://www.iucnredlist.org/technical-documents/classification-schemes/threats-classification-scheme>)

Johnson, C. L.P. Ehlers and D. Seip. 2015. Witnessing extinction – Cumulative impacts across landscape and the future loss of an evolutionarily significant unit of woodland caribou in Canada. *Biological Conservation*. 186: 176-186

Lofroth, E.C and J. Krebs. 2007. The abundance and distribution of Wolverines in British Columbia. *J. Wildl. Mgmt* Vol. 71. No. 7

Machmer, M. 2008. Great Blue Heron and Bald Eagle Inventory and Stewardship in the Columbia Basin 2007-2008. Fish and Wildlife Compensation Program, Nelson.

Maser, C, J. Trappe and R. Nussbaum. 1978 Fungal-small mammal interrelationships with emphasis on Oregon coniferous forests. *Ecology* 59(6):799-809

McCleary, K and G. Mowat, 2002. Using forest structural diversity to inventory habitat diversity of forest-dwelling wildlife in the West Kootenay region of British Columbia.

B.C. Journal of Ecosystems and Management. Volume 2, Number 2.
<http://www.forrex.org/jem/2002/vol2/no2/art1.pdf>

Migratory Birds Convention Act. 1994 (amended 2018) Migratory Birds Regulations C.R.C. c.1035 . Government of Canada

Ministry of Forests. 1995. Natural Disturbance Types of B.C.

Ontario Ministry of Natural Resources. 1996. Forest Management Guidelines for the Provision of Marten Habitat. Version 1.0

Oregon Forest Research Institute. 2015. Early-Seral Associated Songbirds in Managed Forests. Portland OR.

Oregon Forest Research Institute. 2018. Fisher and Humbolt Marten in Managed Forests. . Portland OR.

Patton, D.R. 1992. Wildlife-habitat relationships in forested ecosystems. Northern Arizona University Dept of Forest Wildlife Ecology. Timber Press, Portland, Oregon.

Resource Inventory Committee. 1999. B.C. Wildlife Habitat Ratings Standards. Version 2.0 B.C
Ministry of Environment Lands and Parks

Roberts, A.M. 1884. Mule Deer Winter Habitat Model Development (Morice Lake IFPA).
Smither, B.C. .

Robinson, H. D. Katnik, J. Gwilliam, 2006. Habitat Selection by Mule Deer in Southeastern
B.C. . Columbia Basin Fish and Wildlife Compensation Program

Smith, K., W. Harrower, T. Mahon E. McLaren and F. Doyle, 2012. A scientific basis for
managing Northern Goshawk Breeding Areas in the Interior of British Columbia.
FORREX Series 29, Kamloops, B.C.

Thomas, J.W. (editor). 1979. Wildlife habitats in managed forests: the Blue Mountains of Oregon
and Washington. US Department of Agriculture, Forest Service Agricultural Handbook
553, Washington DC

Weir, R.D. 2003. Status of the Fisher in British Columbia. BC Ministry of Water Land and Air
Protection. Conservation Data Centre. Wildlife Bulletin B-105, 47 pp

APPENDIX A. SUPPLEMENTARY INFORMATION

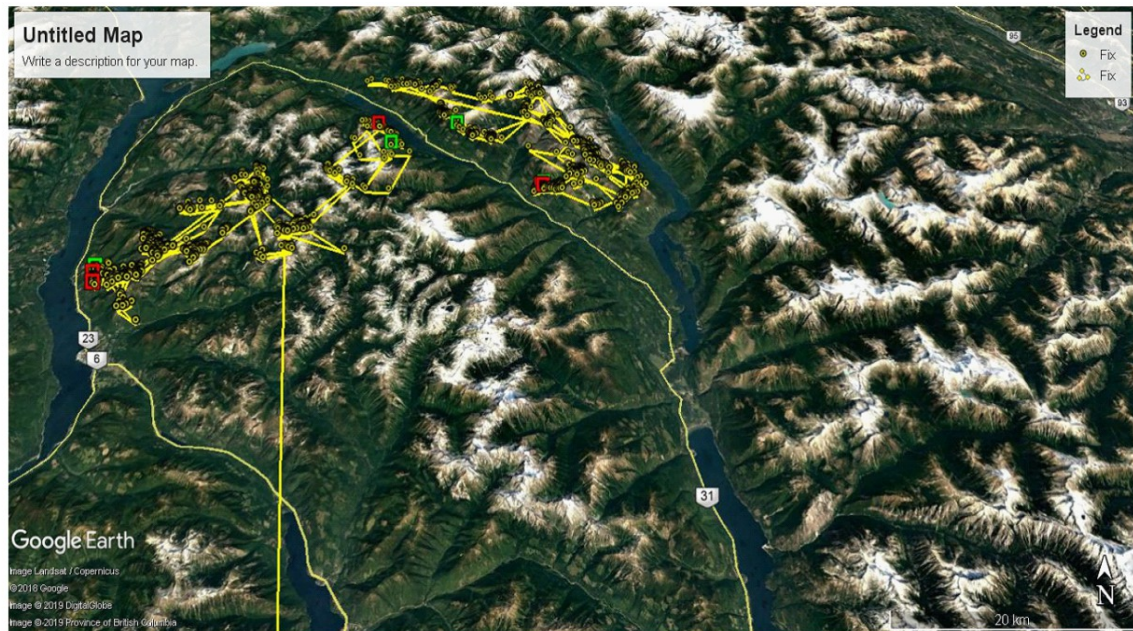


Figure 3a Radio-collar locations Central Selkirks Caribou 2018 showing use of main valley faces

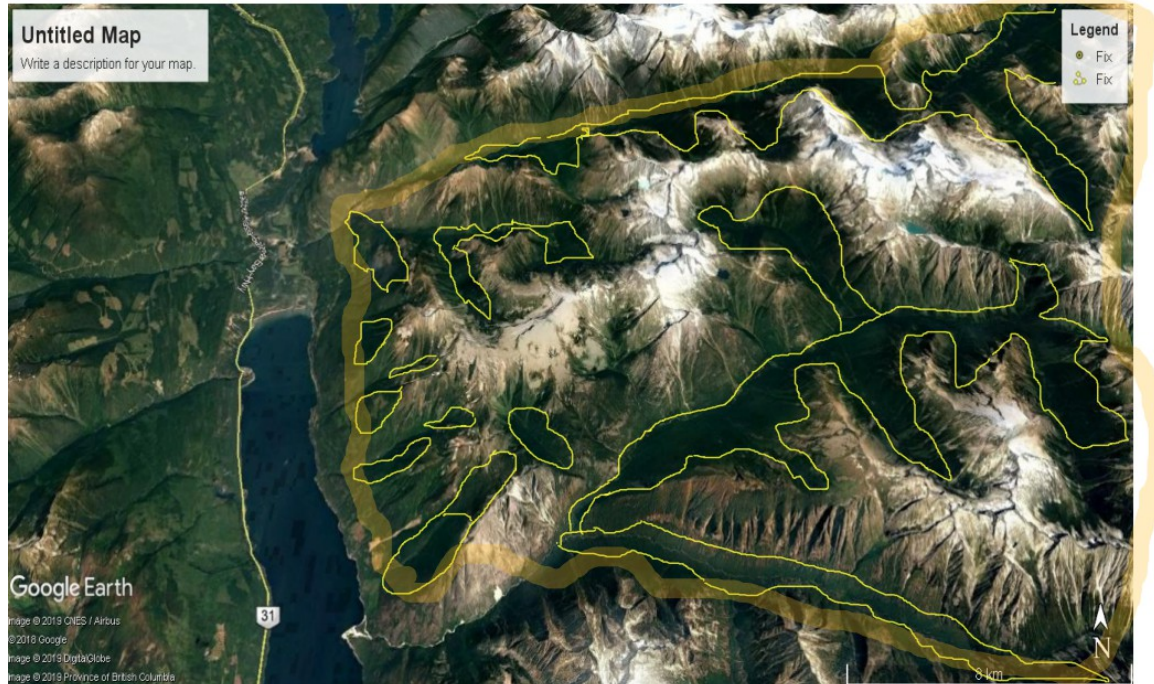


Figure 3b *Potential* home range area associated with caribou using the upper Salisbury Face

LEGEND: Thin yellow lines: basins and hillslopes that may be capable of contributing to caribou forest habitat requirements.

Fuzzy yellow line: Hypothetical outside boundary of home range

NOTES TO ACCOMPANY REFERENCE NUMBERS ON FIGURE 4a

- 1 Old Spruce/Subalpine fir forest on moderate slope with potential for caribou in late winter and transition seasons
- 2 Dying Pine/mixed stands providing abundant lichens for caribou at present
- 3Old Spruce-Larch forest, gentle slope, suitable for caribou in early winter and early spring.
- 4Old Spruce-Larch stands patchily suitable for caribou
- 5Larch –Spruce– mixed stands;variable suitability for caribou; many sections too steep
- 6 Concave, moist, rich site, old Spruce (Cedar); high biodiversity value/connectivity value
- 7 Hemlock -Cedar: good connectivity moderate lichen abundance
- 8Cool aspect, lower lichen abundance, younger stands not highly suitable at present for caribou
- 9Old forest along upper Salisbury creek; potential summer value for caribou as well as other ungulates/bears
- 10Important area for Mule Deer on either end of winter or in mild winters
- 11Part of the rocky, rugged mule deer 'stronghold' zone
- 12 Steep rocky/Talus/Birch
- 13Remnant cover alongside 1995 logged block, well-used by deer and elk
- 14Top-of-slope security sites and travel zone
- 15Part of mule deer stronghold as in 11 where slope steepness permits
- 16High-elevation, steep, potentially suitable for caribou in late winter
- 17One of the few obvious routes between Salisbury Face and high elevation habitats for caribou and other wildlife; Also the general route used by hikers to Hart Lake
- 18Slopes alongside Kootenay Lake used in critical periods of harsh winter by deer.
- 19Important habitat for small/large mammal and birds across Bulmer creek mouth to retain over time given private land developments downslope
- 20Likely important area for mule deer in late spring, fall and likely has caribou value, at least for connectivity. Not thoroughly covered.

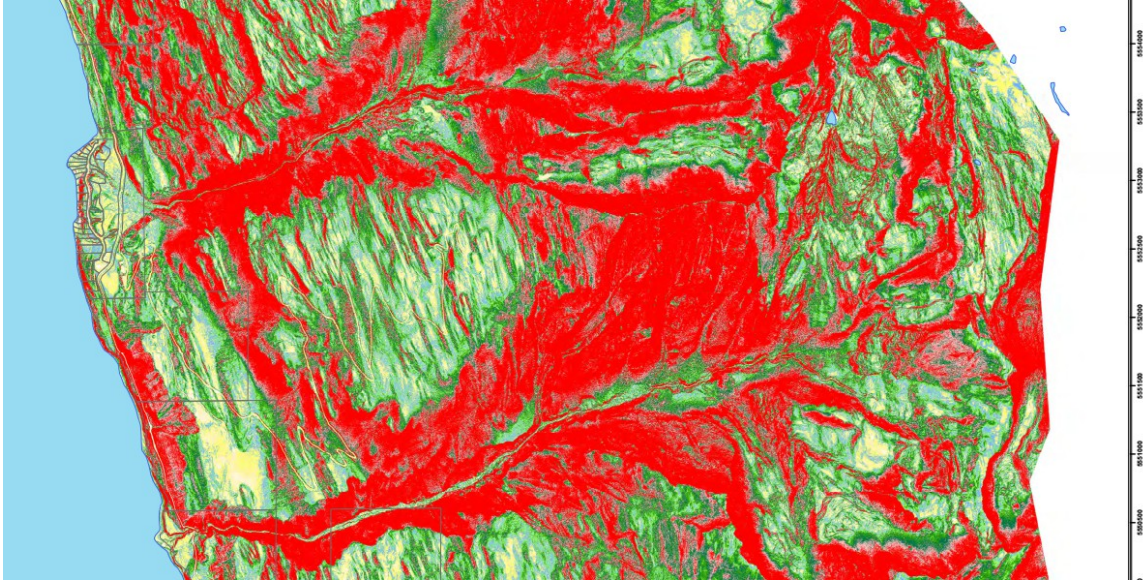


Figure 7. Slope Classes, Salisbury Face. Red is over 70 %

