

BCTS CARIBOO-CHILCOTIN

FIELD GUIDE
TO
WILDLIFE HABITAT
MANAGEMENT



BCTS Cariboo-Chilcotin Field Guide to Wildlife Habitat Management

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May 2009

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This book summarizes the wildlife management recommendations that were developed for individual species in “Guppy, C.S. 2009. *Species of Management Concern for BC Timber Sales Cariboo-Chilcotin Business Area*. Unpublished report prepared for the BC Timber Sales, Williams Lake, BC.” These management recommendations, if followed in full, should adequately mitigate the potential impacts of BCTS forest operations to wildlife species of management concern, including species at risk.

Species at Risk Conservation Status

Species of provincial conservation concern are grouped into the “red list” (endangered or threatened) and “blue list” (special concern) lists. The species may not be of national conservation concern, and frequently are not of global conservation concern. However we have a responsibility to manage for these species, as part of maintaining the biodiversity of British Columbia.

RED LIST: Includes any indigenous species, subspecies or ecological community (= “element”) that is *Extirpated*, *Endangered*, or *Threatened* in British Columbia.

BLUE LIST: Includes any indigenous species, subspecies or community considered to be *Vulnerable* (= *Special Concern*) in British Columbia.

Table 1. Conservation Status Ranking Codes

S	Subnational level (status in a province, <i>i.e.</i> , British Columbia)
G	Global level (status throughout its global range)
S1 or G1	Critically imperilled due to extreme rarity (5 or fewer occurrences)
S2 or G2	Imperilled because of rarity (6 to 20 occurrences)
S3 or G3	Rare or uncommon (21 to 100 occurrences)
S4 or G4	Apparently secure, with many occurrences
S5 or G5	Abundant and secure, with many occurrences

Table 2. Conservation Status Ranks included in Red and Blue Lists

	Red List	Blue List
Animals	SX, SH, S1, S1S2, S2, S2?, S1S3	S2S3, S3, S3?, S3S4
Plants	SX, SH, S1, S1S2, S2	S2S3, S3
Plant Communities	SX, SH, S1, S1S2, S2	S2S3, S3

Species listed under the national *Species at Risk Act* (SARA) are ranked as:

- NAR (Not at Risk) – the species has been determined to be not of conservation concern.
- SC (Special Concern) – species may become threatened or endangered because of biological factors and identified threats.
- T (Threatened) – species may become endangered if limiting factors are not reversed.
- E (Endangered) – species is facing imminent extinction or extirpation.
- DD (Data Deficient) – species that lack sufficient data to determine a conservation status. These species are usually very rare.

Listing of a species under SARA confers protection of the species and its habitat *only* if the species is on federally owned land (mostly national parks, military reserves, Indian Reserves) or is a migratory bird under the *Migratory Birds Convention Act* or is a fish or marine mammal managed under the *Fisheries Act*. All other species fall under provincial jurisdiction, and the province has chosen to provide very little protection for species at risk to this time.

WILDLIFE HABITAT MANAGEMENT

The report *Species of Management Concern for BC Timber Sales Cariboo-Chilcotin Business Area* (Guppy 2009) developed management objectives and strategies for species determined to have interactions with forest operations. This *Field Guide* consolidates the management strategies for each individual species and community.

All of the management recommendations for individual species, as well as for wildlife habitat features, are included in the *Field Guide*. Some consolidated management strategies address many species, with the species addressed by each management strategy noted so that the *Office Manual* can be consulted where required.

These *Field Guide* management strategies, if followed in full, should adequately mitigate the potential impacts of BCTS forest operations to wildlife species of management concern, to the level of information available at this time.

INVENTORY AND ADDITIONAL INFORMATION

Specific inventory and additional information needs are:

- General inventories over a large part of the CCBA are needed for the Magnum Mantleslug and for the three moonwort species, to allow effective management.
- Grizzly Bear habitat capabilities determined during TEM projects should be added to the 1:250,000 scale data used in the Office Manual map.
- MoE (Williams Lake) may have information regarding water bodies in the CCBA that are not WHAs but that have significant use by pelicans.
- Wallows and mineral licks should be inventoried and mapped for the entire CCBA. MoE (Williams Lake) may have a partial map available.
- MFR or MoE (Williams Lake) may have a map of Flammulated Owl nest sites and habitat suitability.
- Terrestrial Ecosystem Maps and Predictive Ecosystem Maps should be consolidated for use in identifying known locations of rare communities.
- Inventory for a rare plant species when developing harvest and road construction plans within a 2 km radius of a known site.

FIELD CREW OBSERVATIONS

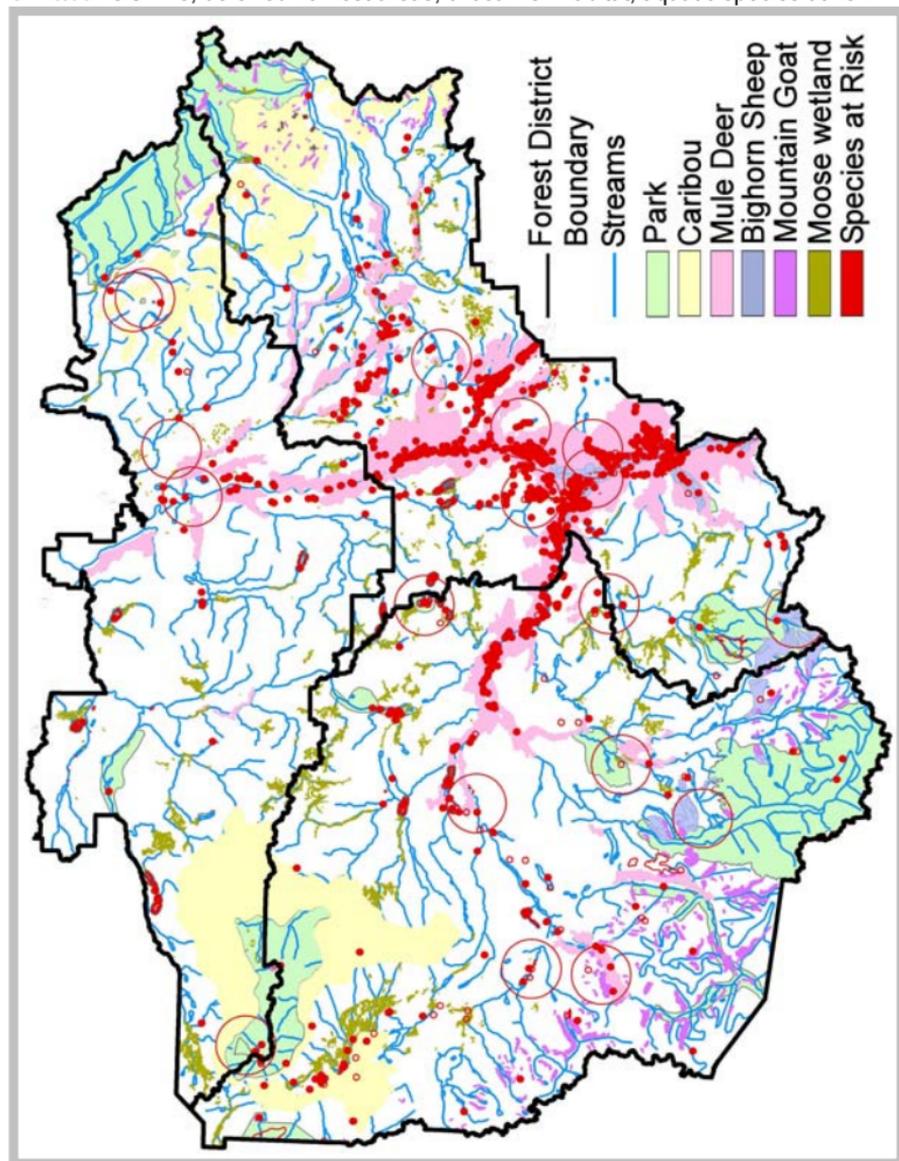
Field crews should document sightings of

- Western Painted Turtles (= any turtle).
- Large stick nests (Bald Eagle, Osprey, Great Blue Heron).
- Cliff-nesting swallows (= possible Barn Swallows).
- Raptors that may be goshawks, or their stick nests, below canopy level of older, closed canopy conifer stands.
- Double-crested Cormorants (= any cormorant), especially if nesting.
- Sharp-tailed Grouse leks in the “lekking” season of April and May (= any grouse lek).
- Moonworts – experts can identify the species later.

Field crews should identify rare forested and non-forested communities, and watch for the above species, within 100 m of proposed operations.

MAP OF KNOWN SPECIES LOCATIONS

Omitted: OGMA's, deferred harvest areas, critical fish habitat, aquatic species at risk.



MAPPED CRITICAL HABITATS

Northern Caribou	Moose	Grizzly Bear
Mountain Caribou	Mountain Goat	American White Pelican
Mule Deer	Bighorn Sheep	

- Maps of critical habitats are available for these species.

AMERICAN WHITE PELICAN

- Manage American White Pelican Wildlife Habitat Areas (established 15 January 2003) as per Identified Wildlife Management Strategy (2004) as modified for specific lakes by the MWLAP direction of 10 February 2003.
- West of the Fraser River, avoid establishing new permanent access within 1 km of any water body that MoE has identified as having significant use. Avoid vehicle and machinery use during the breeding season within 1 km of such water bodies (1 April to 15 September). Should this not be possible, consult a biologist regarding mitigation measures to minimize disturbance.
- The key issue in access management is closure of public access. Actual road deactivation is not required if public access can be prevented without deactivation/rehabilitation.
- Field crews should watch for and report to BCTS the use of water bodies by American White Pelicans.

BIGHORN SHEEP CRITICAL HABITAT

- Minimize road and aircraft disturbance of Bighorn Sheep.
 - Minimize road developments that provide access to Bighorn Sheep habitat.
 - Avoid development of roads near escape terrain or mineral licks.
 - Avoid development of roads that cross regularly used Bighorn Sheep trails, especially those between mineral licks and summer forage areas.
 - Position roads such that they do not provide direct lines of sight onto Bighorn Sheep habitats.
 - Mitigate aircraft disturbance to Bighorn Sheep rutting and lambing areas, winter range, mineral licks, and watering holes by following established (MoE) avoidance procedures (in general, a 2 km no-fly zone adjacent to key habitat).
 - Maintain forested buffers around mineral licks to provide screening and thermal cover.
 - Avoid machine and human disturbance during critical times for critical habitats
 - Mineral licks – May to August
 - Natal/Rearing areas – 1 April to 15 July
 - Rutting areas – October to November
- When operations are proposed within 1 km of critical habitat, determine the locations of mineral licks and major trails. This may require a biologist.
- Reduce stocking levels to promote understory shrub and herb development when regenerating forest adjacent to key habitats (consult with MoE).
- Minimize weed introduction by seeding disturbed soils with a native plant seed mix.

- Avoid use of sheep for vegetation management within 16 km of Bighorn Sheep habitat, to minimize the risk of disease transmission.

GRIZZLY BEAR IMPORTANT HABITAT

- Manage designated Grizzly Bear Wildlife Habitat Areas according the associated “Orders”.
- Manage Grizzly Bear dens as described in the “Dens” section of this Guide.
- If Regional MoE (Williams Lake) specifies important Grizzly Bear foraging sites (for fish, major berry crops, herbaceous meadows), plan road construction and harvesting within 500 m in consultation with a biologist, to minimize potential disturbance to the bears and human-grizzly interactions.
- When operations are proposed within 300 m of areas mapped as having **Very High Capability** (entire CCBA) or **High Capability** (west of the Fraser River only), a biologist should determine in the field whether habitat of that value actually occurs, GPS/ribbon the actual boundary, and recommend site-specific management. In general terms
 - Avoid building roads, landings, and trails within the area, or within 250 m of the area, except if there is no other option.
 - Deactivate, including re-contouring and seeding, as soon as possible any road that must be built in the area or near the area.
 - Establish timing restrictions on operations within the area, to minimize disturbance during critical denning or feeding periods.
 - Develop a Grizzly Bear habitat management plan in conjunction with the site plan.
 - Avoid broadcast herbiciding within the area.
- When operations are proposed in **High Capability** (east of the Fraser River) or **Moderate Capability** habitat (entire CCBA):
 - Plan forest development to occur on one side of a watershed at a time *where practical* to allow Grizzly Bears to avoid operational areas during daily movements.
 - Minimize road access in both the number of km and length of time active.
 - Maintain seasonal foraging areas by maintaining a variety of structural stages of forest throughout a watershed, particularly near mature and old forest structural stages that provide thermal and security cover.
 - Maintain mature/old forest connectivity within and between watersheds to allow for large home ranges and dispersal among areas by juveniles and males; do not establish permanent roads through connectivity corridors.
 - Riparian areas in valley bottoms dominated by older forests are important movement corridors.
 - Corridors where contiguous forest exists across a valley without any roads are among the highest value habitats for grizzly.
 - Leave buffer strips of forested habitat adjacent to known important foraging areas (e.g., avalanche chutes, wet meadows, streams/wetlands, skunk cabbage swamps, seeps and alder swales), to provide security cover and bedding areas. These areas will often provide additional habitat elements such as mark trees and mark trails, as well as connectivity and escape cover.
 - See the “Snow Avalanche Tracks/Chutes” and “Lakes, Ponds, Wetlands, and Wet Meadows” sections of this Guide for management of those features.

- Do not use seed mixtures that include clover when near all-season roads (<500 m) so that these areas are less attractive to grizzlies for foraging.
- Where feasible, provide windfirm visual screening along all-season permanent roads to provide security cover; the best security areas are >1 km away from active roads.
- If roads have been previously located near areas important for bear foraging, then permanently deactivate these roads when they are no longer required for access.
- Avoid intensive silviculture treatments to address low stocked sites. This will result in a “patchy” stocking density that facilitates production of berry producing shrub species.
- Complete brushing activities within 5 years of initial establishment. If brushing is required after that time, use crop-tree centered brush treatments to maintain important forage species.
- When operations are in Low, Very Low, and Nil Capability habitats, manage only specific sites that have been identified by MoE as important habitat for Grizzly Bear.

MOOSE HIGH VALUE WETLAND HABITAT

- Establish a 1 km wide “access management zone” around each moose high value wetland or complex.
 - Adjust the width to a logical boundary, in response to constraints such as large parcels of private land, existing roads that are regularly snowploughed in the winter, and major topographic features that are likely to impede moose winter movements (S1 rivers, cliffs, etc.).
 - Close roads within the area upon completion of forest harvesting activities.
 - Avoid constructing roads between moose high value wetlands that are within 1 km of each other.
 - Maintain visual screening along roads to provide security.
- Establish a 200 m wide “timber management zone” of mature/old coniferous forest entirely around each moose high value wetland or complex.
 - Adjust the width to a logical boundary, in response to constraints such as large parcels of private land, existing roads that are regularly snowploughed in the winter, and major topographic features that are likely to impede moose winter movements (S1 rivers, etc.).
 - Harvest to a target of a 40/30/30 ratio of forage/hiding/thermal cover, where forage cover is < 3 m live conifer, hiding cover is ≥ 3 m live conifer, and thermal cover is ≥ 19 m live conifer. Less than 40% forage is acceptable, but it may limit harvesting opportunities in the next pass.
 - Dead conifers are of little value; extensive tree mortality may result in less than the desired amount of hiding and thermal cover.
 - Well stocked advanced natural regeneration may contribute towards hiding and thermal cover; protection of such regeneration during harvesting may assist in achieving the target amounts.
 - Minimize broadcast herbicide treatments where high moose browsing is present.
- Manage wetland or riparian sites that have not been identified as moose high value habitat, but that have obvious signs of heavy moose browsing on shrubs to minimize (as above) permanent road access, and maintain hiding and thermal cover. Heavy

moose winter browsing is demonstrated by most new growth on shrubs being eaten each winter, resulting in dwarfed, densely branched shrubs.

MOUNTAIN GOAT CRITICAL HABITAT

- Minimize road and aircraft disturbance of Mountain Goats.
 - Minimize road developments that provide access to Mountain Goat habitat.
 - Avoid development of roads near escape terrain or mineral licks.
 - Avoid development of roads that cross regularly used Mountain Goat trails, especially those between mineral licks and summer forage areas.
 - Position roads such that they do not provide direct lines of sight onto goat habitats.
 - Mitigate aircraft disturbance to mountain goat winter range or natal areas by following established avoidance procedures.
- Maintain forest cover for hiding cover, thermal cover, and snow interception adjacent to escape terrain.
 - Escape terrain is steep, rocky slopes and cliffs with adjacent forest cover.
 - Within a 200 m escape terrain buffer, maintain $\geq 50\%$ basal area of forested habitat as mature and old stems, and $\leq 33\%$ forested habitat as early seral stage.
 - Maintain forested buffers around mineral licks to provide screening and thermal cover.
 - Maintain wind-firm forested buffers on both sides of major trails to ensure connectivity for goats between summer and winter ranges.
 - Avoid machine and human disturbance during critical times at critical habitats
 - Mineral licks – May to August
 - Winter range – November to April
 - Natal/Rearing areas - May to July
- When operations are proposed within 1 km of natal or winter habitat, determine the locations of mineral licks and major trails. This may require a biologist.

MULE DEER WINTER RANGE

- Implement the CCLUP Mule Deer Winter Range Strategy, as specified in the Section 9 Notices #2 and #3.
- Elk and White-tailed Deer, although present in the CCBA, do not presently have management requirements. Management for Mule Deer will partially manage for them.

MOUNTAIN CARIBOU CRITICAL HABITAT

- Implement the latest updates of the CCLUP Mountain Caribou Strategy, and the February 2009 WHA Orders, when operating in Mountain Caribou habitat.
- A national Recover Strategy and a national Recovery Plan are under development, and eventually will provide the direction for management of this species.

NORTHERN CARIBOU CRITICAL HABITAT

- Implement the latest updates of the CCLUP Northern Caribou Strategy, and the WHA Orders, when operating in Northern Caribou habitat.

WILDLIFE HABITAT AREAS

Identified Wildlife (listed below) should have Wildlife Habitat areas established for critical sites. Those species with WHAs currently (May 2009) established in the CCBA are in **bold red**.

<u>Amphibians, Reptiles, Fish, and Mammals</u>	<u>Birds</u>	<u>Plant Communities</u>
Great Basin Spadefoot	American White Pelican	Douglas-fir / common juniper / clad lichens
Gopher Snake	Brewer's Sparrow	hybrid white spruce / ostrich fern
Racer	Burrowing Owl	western redcedar - Douglas-fir / vine maple
Bull Trout	Flammulated Owl	western redcedar / devil's club
Badger	Great Blue Heron	Vasey's big sagebrush / pinegrass
Bighorn Sheep	Lewis's Woodpecker	water birch / roses
Northern Caribou	Long-billed Curlew	
Mountain Caribou	Prairie Falcon	
Fisher	Sandhill Crane	
Fringed Myotis	Sharp-tailed Grouse	
Grizzly Bear	Short-eared Owl	
Spotted Bat	Yellow-breasted Chat	
Wolverine		

- Some of these species have mapped Wildlife Habitat Areas, which should be managed according to the associated "Orders". At this time (May 2009) in the CCBA there are only Sections 7 Notices establishing WHAs for Grizzly Bear (Quesnel Lake area), Northern Caribou, Mountain Caribou, American White Pelican, Great Blue Heron, and Prairie Falcon. Additional WHAs are under consideration for Fisher and Grizzly Bear.
- Where there is a known site for an Identified Wildlife species, but the site is not a WHA, manage the site as a WHA. Formal designation of WHAs is a very slow process, which is unlikely to ever be completed for most species; hence effective species management requires proactive consideration as a WHA.
- Implementation of the landscape level planning recommended by the Identified Wildlife Management Strategy (2004) for some of these species will depend upon cooperative planning between government agencies and industry.

AQUATIC FEATURES

Magnum Mantleslug	American Beaver	Northern River Otter
Bull Trout	American Marten	Moose
Dolly Varden	American Mink	Weasels (3 species)
Coho Salmon	American Black Bear	Rusty Blackbird
Goldeye	Fisher	Yellow-breasted Chat
Other Fish	Grizzly Bear	

FISH HABITAT

- A *fisheries sensitive feature* (FSF) is:
 - a) the seasonally flooded (littoral) zone of a lake; or
 - b) a flooded depression, pond or swamp that is not a stream, wetland or lake, that either perennially or seasonally contains water, and is seasonally occupied by a species of fish referred to in the FRPA definition of a fish stream.

A fisheries sensitive feature is fish habitat, and therefore must be managed similar to a fish stream. In the absence of inventory, it should be assumed that *any* area that is seasonally flooded and is connected to fish habitat is an FSF.

- Manage fish habitat (streams, lakes, FSZs) to ensure that harvesting and other operations do not result in harmful alteration, disruption or destruction (HADD) of the fish habitat of the fisheries sensitive feature including the adjacent area that is part of the fish habitat. This includes no entry of deleterious substances [sediment, oil, etc.] into waters frequented by fish. HADD should be avoided wherever possible; if HADD will occur, then a DFO permit is required. A 15-30 m no-development strip along a fish bearing feature is generally sufficient to mitigate the direct impact of development activities on fish habitat, with the wider widths needed for higher intensity/impact developments.
- Avoid operating in mapped *Critical Fish* habitat.

STREAM CROSSING STRUCTURES

- Use bridges wherever possible for permanent fish stream crossings; if an open-bottom arch or an embedded culvert is used, ensure that the width is *considerably wider* than the stream channel (this exceeds the recommendations in the *Fish Stream Crossing Guidebook*, based on local experience) to minimize the risk of streambed instability, beaver plugging, debris jams, bedload deposition, or excessive current speeds. Oversize (≥ 3 m height and width, and at least 1 m wider than the channel width) open-bottom arches are a less preferred option that can also work.
 - Gravel the surface of road approaches to all stream crossings that will be used by any vehicles in unfrozen conditions, and armour all ditches that empty into streams.
- Consider having a trained Environmental Monitor develop an Environmental Management Plan and monitor the on-site work for installation or removal of all fish stream crossing structures.
- Wherever possible remove pre-FPC culverts from fish streams.

BEAVER MANAGEMENT AT STREAM CROSSINGS

- Consider installing “beaver stops” on the inlets of existing culverts where beaver activity is present; however in the CCBA these are frequently crushed in the winter, even along unplowed roads. Apparently ice builds up on them, and they collapse from the weight. Beaver stops should not be used on culverts larger than about 1600 mm, cannot be used on streams with debris or bedload movement, and always require constant monitoring and maintenance to remove debris.
 - The culvert length should extend at least 1 m upstream from the roadbed; the cage is then fixed to the end. The cage should be sized to fit the culvert

- The cage should be constructed of a durable material that will provide service for a period not less than that expected for the culvert. “Homebuilt” cages can be made from steel reinforcing mesh used in concrete work.
 - The wire mesh should have openings ≥ 15 cm to allow fish passage, if it is a fish stream.
 - The culvert and mesh assembly must be sized to allow fish passage, if it is a fish stream.
 - Where there is a pond upstream from the road, the cage should be suspended (from rebar stakes) at least 0.5 m above the pond floor to deter anchoring of dam materials to the bed of the pond by the beaver.
 - When installing new stream crossing structures in beaver areas:
 - Consider installing a 20 cm high rock weir about 2 metres upstream of the crossing structure inlet, to encourage beaver dam construction away from the inlet. *This should only be done if it will not result in the stream flooding over its banks during high water, and only if fish passage will not be impeded and fish habitat will not be damaged.*
 - If the stream channel is being reconstructed during structure installation, the surface of the new stream channel should be carried to the top of the weir, resulting in a shallow pool above the upstream end of the new channel.
- Beavers may choose to construct their dam on the top of the weir, back from the crossing structure inlet, reducing the chance that the crossing structure itself will be dammed. In addition, beavers use mud from the stream/pond bottom and sides for the bulk of the dam; if the channel bottom and sides are rocky upstream from the crossing structure, they will tend to prefer to build their dam upstream where there is mud present. This effect will be enhanced if the constructed stream channel has a measurable gradient, because beavers prefer to pond low gradient sites, although this may not be possible to achieve at low gradient crossings.

RIPARIAN AREA MANAGEMENT (AQUATIC VALUES)

- Minimize the risk of changes in stream water quality and flow patterns, especially small streams
 - Maintain the quality and flow patterns of surface water flowing into streams, when harvesting and or constructing roads.
 - Avoid broadcast herbicide applications within the entire Riparian Management Area, to maintain a healthy shrub layer (spot applications are acceptable).
- If operating over 30 m from a fish stream, lake or FSF,
 - Prevent water contaminated by sediment, petroleum products, or chemicals from entering the feature from ditches, non-classified drainages, overland flow from harvested areas or bladed access structures.
 - Minimize the risk of windthrow in unharvested areas near the feature.
 - Maintain natural surface and subsurface water flows into and out of the feature; ensure that road cuts do not disrupt subsurface flow patterns – the water temperature and volume of small streams and FSZs may be dependent on such flows.
- If operating within 15-30 m from a fish stream, lake or FSF, implement additional mitigation measures:

- Avoid building permanent roads; if a permanent road must be constructed consult with a qualified fish habitat biologist and/or DFO to prevent HADD from occurring.
- Minimize the construction of temporary roads and other bladed structures, and after harvesting, re-contour them, seed, and plant with trees. Control sediment production until revegetation is complete.
- For S4 streams and FSZs with moderate to high quality fish habitat, ensure retention of a high proportion of the existing trees and shrubs. This will minimize changes in water temperature, shade, sediment, flow patterns, and food and nutrient inputs; this may require further tree retention to reduce windthrow risk adjacent to the streams.
- For S4 streams and FSZs with marginal fish habitat, and S5 and S6 streams and NCDs that flow directly into moderate to high quality fish habitat, maintain high shrub and residual tree retention in the Riparian Management Area (within a 10 m width for NCDs), to maintain water quality (temperature, sediment, flow patterns). If abundant shrubs and residual trees are not present, retention of mature trees may be required to prevent harmful alteration, disruption, or destruction of fish habitat.
- Avoid soil-disturbing site preparation (other than hand screefing) prior to planting, to minimize the risk of sediment entering the feature and to maintain the natural herbaceous and shrub plant species.
- If operating within 0-15 m of a fish stream, lake or FSF, implement additional mitigation measures.
 - Time operations so as to minimize potential effects on the feature (i.e., during the dry season or when the ground is frozen).
 - Preferably prescribe partial cutting; maintain a 5-m machine-free zone to minimize the risk of damage to banks or soil disturbance that will produce sediment.
 - Obtain the advice of a qualified Professional as to whether HADD may occur through the proposed operations.
- Manage both Bull Trout and Dolly Varden concentration sites that are not WHAs
 - Determine the location of concentration sites by annually requesting the information from Regional MoE (this is confidential information).
 - Minimize bladed structures near the stream or immediate tributaries.
 - Retain sufficient windfirm streamside trees to contribute a long-term supply of large woody debris, and to meet the fish habitat requirements discussed above for S4 streams. Design tree retention to minimize the windthrow risk along the stream banks; one option is to use wider patches rather than a thin continuous strip.
- Minimize public access to concentration sites, by not building permanent roads within 500 m and by promptly deactivating temporary roads within 500 m.

RIPARIAN AREA MANAGEMENT (OTHER VALUES)

- Minimize disturbance of wet meadows, wetlands, ponds, and lakes.
- Maintain a forested buffer of natural vegetation for visual screening, and keeping roads as far back as possible.
 - Wet meadows are “grassy” wet areas dominated by sedges or grasses, and frequently a wide range of other herbaceous plants, they include willow/birch shrub areas that have abundant herbaceous plants.

- The species most sensitive to disturbance in these habitats are American Black Bear, Grizzly Bear, Moose, and waterfowl.
- Maintain as much mature and old forest adjacent to riparian features as possible, not just a minimum relatively low-value 10 m reserve zone.
- Maintain mature and old trees and large diameter CWD along riparian and riparian-associated habitats.
- During silvicultural vegetation management, maintain a supply of shrubs and deciduous regeneration within 50 m of an active beaver pond. Avoid broadcast herbiciding; use spot treatments – in many cases the beavers will provide adequate vegetation management.

WILDLIFE TREES, COARSE WOODY DEBRIS, BRUSH, AND RESIDUALS

WILDLIFE TREES

Table 1. Wildlife Tree Wildlife Species and Values

Species	Wildlife Tree Value	Species	Wildlife Tree Value
Bald Eagle	Stick nest platforms, perches	American Black Bear	Hollow trunks used for winter sleep sites (bear) and dens (marten, fisher)
Osprey		American Marten	
Great Blue Heron		Fisher	
Northern Goshawk			
Olive-sided Flycatcher	Perches	Fringed Myotis	maternity and day roosts under loose bark
Flammulated Owl	Nest cavities	Northern Myotis	
Lewis's Woodpecker		Western Small-footed Myotis	
Northern Flying Squirrel	Nest in witch's brooms, cones for food	Townsend's Big-eared Bat	maternity and day roosts
Red Squirrel			maternity and day roosts

- A wildlife tree is a standing dead or living tree with special characteristics, as given in Table 2, that provide critical habitat for the conservation or enhancement of wildlife.
- Maintain high and moderate value wildlife trees over all parts of the landscape.
 - Avoid falling individual high value wildlife trees, including establishing no-work zones and/or retention areas as necessary around danger trees. Pay particular attention to retention of medium to large diameter trees:
 - that have loose bark or will likely develop loose bark in the future (especially Douglas-fir and Ponderosa Pine in dry open-growing stands), and/or
 - that are mature, old, and decadent aspen, cottonwood, Douglas-fir, spruce, and red cedar, and/or
 - that are adjacent to water features of all sizes (wetlands, ponds, lakes and streams).
 - Include groups of moderate value wildlife trees in wildlife tree patches and other retention areas.
 - When salvaging windthrown, insect damaged, or fire damaged trees, include some damaged but standing trees in retention areas.

Table 2. Relative Wildlife Tree Value

Wildlife Tree Value	Characteristics
High	<p>Two or more of the following characteristics present:</p> <ul style="list-style-type: none"> • Internal decay (heartrot or natural/excavated cavities present) • A sound, firm trunk shell • Crevices present (loose bark or cracks suitable for bats) • Large brooms present • Active or recent wildlife use (feeding, nesting, denning) • Tree structure suitable for wildlife use – large nest, hunting perch sites, bear den, etc. • Largest trees for site (height and/or diameter) and veteran trees • Locally important wildlife tree species (cottonwood, aspen, western red cedar, Douglas-fir, whitebark pine) • Favourably located for use by wildlife
Medium	<ul style="list-style-type: none"> • Large stable trees that will likely develop two or more of the above characteristics
Low	<ul style="list-style-type: none"> • Trees not covered by the high or medium categories

- Retain large diameter stubs (as tall as possible) in harvest areas. Small diameter stubs are of little value beyond acting as bird perch sites.
- Maintain large, stable veteran trees as potential sites for large stick nests, especially those within 200 m of the shoreline of a lake or S1/S2 river, to serve as eagle/osprey/heron nest and perch sites.
- Designate WTPs and deferred harvest areas focussed on forest that has high structural complexity, including high amounts of standing and downed coarse woody debris (CWD). Attributes of a high-value retention area include:
 - Black cottonwood ≥ 90 cm dbh.
 - Spruce ≥ 40 cm dbh with rust brooms.
 - Lodgepole pine ≥ 30 cm dbh, Douglas-fir ≥ 50 cm dbh, and/or aspen ≥ 50 cm dbh with obvious cavities, conks or blind conks (signs of internal decay).
 - Lodgepole pine with mistletoe; witches brooms provide habitat for many species.
 - Over 30% cover of high shrubs (2 - 10 m stratum).
 - Pieces of CWD > 20 cm diameter, elevated off the ground.
 - Squirrel middens.
- Maintain individual high value wildlife trees, for current use and as a source of high-value CWD in the future, especially along riparian and riparian-associated habitats.
 - Target 5 such trees per ha, preferably over the entire harvest area but, if not available over the entire harvest area, then increase the density in areas where they are present. These will form future reproductive dens or rest sites.
 - Avoid falling, as danger trees, retained high value trees during post-harvest silviculture treatments.

COARSE WOODY DEBRIS, BRUSH, AND RESIDUALS

American Marten	Northern Flying Squirrel	Ermine
American Mink	Red Squirrel	Fisher
American Black Bear	Red Fox	Least Weasel
Striped Skunk	Striped Skunks	Long-Tailed Weasel

- Maintain/protect existing patches of structure, such as shrubby areas, high CWD accumulations, or advanced regeneration.
 - CWD accumulations should be protected (using stubs or no-machine reserves) so that skidders do not run over logs, break them up, and flatten the pile.
 - Maintain advanced regeneration and shrub cover where feasible, especially in association with riparian areas, WTPs, stubs, and no-machine reserves, as foraging areas for Fisher as the stand reaches the free-to-grow stage.
 - Retention of 25% shrub cover in a cutblock, if feasible, significantly increases Fisher use of the regenerating stand compared to a block without shrub cover.
- Retain elevated coarse woody debris as piles (preferred) and single pieces, during and after harvesting, for weasel/marten/fisher and prey species.
 - Small cull piles of medium-sized coarse woody debris (CWD) should be left throughout the cutblock, but especially near riparian areas, with a target of 5 piles per ha. Piles provide shelter for many species of weasel/marten/fisher prey, and hence hunting opportunities for the furbearers.
 - Elevated CWD at $\geq 25 \text{ m}^3/\text{ha}$ composed of logs $>20 \text{ cm}$ diameter, piled to 0.5 – 2 m from the ground so that it will stick up through the snow and provide access to spaces below the snow for foraging and cold-weather denning. Stump piles from roads are also effective. This can increase the use of a cutblock by Fisher by 35% compared to a block with no elevated large CWD.
 - The preferred cull pile dimensions are 4m wide by 5m long by 2m high.
 - CWD that is not elevated and lays flat on the ground has no winter habitat value, because it is not accessible to furbearers under the snow.
 - “Weasel huts” should be left scattered across blocks, especially if small cull piles are not feasible.
 - Target > 10 per ha unless other forms of elevated CWD are retained in the block; equate 2 weasel huts to 1 small cull pile in terms of furbearer value.
 - Weasel huts consist of 3 or more waste trees or existing CWD (including deciduous) laid down together by the feller-buncher, so that the trunks are criss-crossed but more or less parallel and oriented along the direction that disc-trenching will occur. They can be associated with stubs and leave trees; they should not touch living trees to minimize decay. This results in elevated CWD.
 - Skidding needs to avoid weasel huts; this may require advance planning of skidder routes, or instruction to the skidder operator to avoid weasel huts.
 - Disc trenchers need to pass between the weasel huts; this requires advance planning of the orientation of disc trenching.
 - These are used primarily by the smaller weasels, because they are smaller than the size used by the relatively large Fisher.
- Maintain patches of dense brush during vegetation management, especially in moist habitats that are favoured by insects and other food species.

OLD AND ANTIQUE FOREST

Fringed Myotis	Fisher	Northern Flying Squirrel
Northern Myotis	American Marten	Olive-sided Flycatcher
Spotted Bat	American Black Bear	Rusty Blackbird
Townsend's Big-eared Bat	Grizzly Bear	Moonworts (3 species)
Western Small-footed Myotis	Red Squirrel	

- Multi-stakeholder cooperation is required for effective implementation of many of these strategies.
 - Implement as much as possible at the stand level through WTPs, temporary deferred harvest areas, and retention of standing and piled CWD.
- Maintain connectivity of mature and old forest between riparian and upland habitats, and elsewhere on the landscape.
- Retain old forest patches that have high structural complexity including high amounts of CWD, through WTPs, OGMA, or temporary deferred harvest areas.
- Maintain a high component of antique forest as old growth management areas.
 - Antique forests are very old growth forests, far beyond the minimum age definition of "old growth".
 - Plan for the maturation of some old growth forest into antique forest, to replace the inevitable loss of some antique forest over time.
- Harvest patch size distribution should be as in the Biodiversity Guidebook.

SPECIAL WILDLIFE FEATURES

WALLOWS AND MINERAL LICKS

American Black Bear	Mountain Goat
Grizzly Bear	Bighorn Sheep
Moose	Mule Deer

Wallows and mineral licks are typically used regularly and repeatedly during the summer by one or more of the above species, and are critical wildlife features.

- DEFINITIONS:
 - A **wallow** is a shallow depression or pit in the ground used by bears or ungulates such as moose or mountain goat for regular digging, trampling or rolling.
 - A **mineral lick** is a *natural* area habitually used by ungulates to obtain dietary macro minerals (sodium, calcium and phosphorous) as well as *trace* minerals such as manganese, copper and selenium. Licks are regionally rare on the landscape and are usually regularly used by more than one species, and may be used by a large proportion of individuals within a population. Mineral licks created by road construction are not managed for, because of risk of vehicle collisions with wildlife.
- Maintain 200 m of unroaded mature forest cover adjacent to wallows and mineral licks, and 100 m on either side of associated major trails, to provide security and thermal cover.
- Render impassable to traffic all roads within 500 m, where feasible.
- Do not build permanent roads within 1000 m, where feasible.

- Do not build permanent roads across associated major trails, to minimize disturbance and vehicle mortality.
- Locate roads and design cutblocks to prevent direct lines of sight onto wallows and mineral licks.
- Avoid mechanized activity within 500 m during the summer high use period.
- Maintain a helicopter no-fly zone within 2 km of wallows and mineral licks, and associated trails, during the summer use period.

Factors such as existing permanent roads or topographic features (ridges, slope breaks, rivers) may allow reductions in the distances given above that will not significantly increase the level of disturbance or reduce usable security or thermal cover. Topography may also make it impossible or unreasonable to place roads or cutblock boundaries as far away from a wallow or mineral lick as desirable.

CALCAREOUS, ALKALINE OR SALINE LAKES, PONDS, WETLANDS, AND DRY FLATS

Great Basin Spadefoot	Sheathing pondweed	Hudson Bay clubrush / rusty
Western Toad	Silvery orache	hook-moss
American Avocet	Wedgescale orache	Nuttall's alkaligrass – foxtail
Alkaline wing-nerved moss	Whitish rush	barley
marsh muhly	awned sedge Fen – Marsh	purple reedgrass
Rusty cord-moss	Baltic rush – field sedge	Herbaceous Vegetation
Short-beaked fen sedge	big sagebrush / bluebunch wheatgrass	seaside arrow-grass Marsh

- All lakes, ponds, wetlands, and dry flats that are calcareous, alkaline and/or saline should be protected from development impacts. These are rare habitats used by many amphibian, plant, nesting bird, and rare community species at risk.
 - Provide a ≥ 30 m no-development reserve around the habitat, to minimize risks from road dust, ditch water, road maintenance, weed introductions from roads and harvesting, changes in surface hydrology from roads and harvesting, changes in microclimate, etc.
 - Prevent water and sediment inputs from ditches; avoid concentrating and/or diverting subsurface or surface water flows into or away from the area inhabited by the plants.
 - If impacts to any of the features or the 30 m buffer are required, a rare species inventory should be completed first so that mitigation measures can be developed.
 - Treat all islands in alkaline lakes as being American Avocet nest sites – see the species account above.

CLIFFS, CAVES, AND TALUS SLOPES

<u>CLIFFS</u>	<u>CAVES</u>	<u>TALUS SLOPES</u>
Barn Swallow	Fringed Myotis	Magnum Mantleslug
Peregrine Falcon	Northern Myotis	Great Basin Gopher Snake
Prairie Falcon	Spotted Bat	Racer
Spotted Bat	Townsend's Big-eared Bat	Rubber Boa
	Western Small-footed Myotis	

- **DEFINITIONS:**
 - A cliff is a significant (> 8 m high)¹ vertical, or near vertical, rock exposure.
 - A cave is a naturally formed subterranean chamber, generally formed by dissolving of carbonate bedrock by water, or in basalt flows as lava tubes.
 - A talus slope is usually steep, 45 degrees or more, composed of rocky boulders that accumulate at the foot of a cliff, typically by the weathering process of frost-wedging. In contrast, a scree slope is usually over 30 degrees and composed of small rocks and gravel that have broken away from the cliffs above.
- **Cliffs in the BG, IDF, MS, and SBS**
 - Avoid, as a default measure, permanent road construction ≤ 300 m from a cliff face, or ≤ 100 m¹ back from the top edge. Otherwise, inventory for nesting by peregrine falcons and prairie falcons. Protect known falcon nest sites from disturbance.
 - Construct roads ≥ 200 m (Peregrine Falcon) or ≥ 300 m (Prairie Falcon) from the cliff base.
 - Maintain ≥ 200 m (Peregrine Falcon) or ≥ 300 m (Prairie Falcon) from the base of the nest cliff free of loud noises and other human disturbances during the breeding season (mid-March through July).
- **Cliffs made of limestone in the BG, IDF, MS, SBPS, ICH, and SBS**
 - If planning operations within 100 m of the base of such a cliff, inventory for caves >100 m in length that may be used as winter hibernation sites (hibernacula) by myotis and bats.
 - Protect known or potential bat and myotis hibernation sites from disturbance, by placing a 100 m no-harvest reserve around the cliff near the cave opening.
- **Cliffs in the BGxh3, BGxw2, and IDFdk3**
 - Inventory for Spotted Bat summer maternity and roosting sites, if a road will be built ≤ 100 m of the cliff face.
 - Protect known Spotted Bat summer maternity and roosting sites from disturbance, by placing a 100 m no-harvest reserve around the cliff.
- **Cliffs/banks with known Barn Swallow nesting**
 - Avoid constructing roads within 100 m, to minimize interactions (disturbance, mortality) between the nesting swallows and traffic.
 - Protect known or potential Barn Swallow nest sites from disturbance, by avoiding harvesting and large machine use within 100 m during the nesting season (April to August).
 - Field crews should report the presence of swallow nest sites when noted during field work.
- **Talus slope in the IDFxm, BGxh, or BGxw (southeast to southwest aspect)**
 - Default such slopes to being a snake winter hibernation site (hibernaculum).
 - Establish a snake management zone (SMZ) of 250 m width

¹An 8 m height of significant cliffs corresponds to known minimum falcon nesting height. The 100 m distance back from the top of the cliff is selected for this document as a “reasonable” distance; there does not seem to be any existing guidance.

- Harvesting in the SMZ should be a partial cut resulting in a moderate-crown closure forest with shade, deep litter, and woody debris, with gaps in the canopy.
 - Minimize disturbance to the forest floor, to minimize adult mortality.
 - Retain as much coarse woody debris on the ground as possible, as terrestrial cover for adults.
 - Retain as many larger diameter, dead or dying trees or tall stubs as possible, for future recruitment as coarse woody debris. Leave felled danger trees on the ground.
 - Avoid compaction of loose sandy soils, for snake egg-laying sites.
- Silviculture in the SMZ should minimize soil disturbance and minimize loss of coarse woody debris.
 - Avoiding disc trenching and drag scarifying.
 - Re-stock to natural densities or lower; maintain natural open forest characteristics with clearings.
- Road construction in the SMZ should be avoided; however, if roads must be built
 - Permanent roads should include installation of snake fencing and crossing structures; a biologist should be consulted to develop the design details.
 - Temporary roads or bladed trails should be deactivated and rehabilitated as soon as possible to minimize road mortality and restore the forest habitat.
- Avoid most forest operations in the SMZ between April 1 and October 31 to minimize adult mortality during the non-hibernation period.
 - Harvest only in the winter, on snow when the ground is frozen; it may also be possible to harvest during very dry soil conditions in August (only) – under these conditions amphibians are deeply under cover, and soil compaction will be minimized. Do not harvest when the soil is moist or wet.
 - Spring or fall tree planting can occur, but vehicle (pickups, ATVs) use should not occur within the SMZ, to minimize adult mortality. Planting preferably should occur on warm dry days, when amphibians are under cover, to minimize the risk of them being stepped on.
- Where migration routes from winter hibernacula to summer den areas (if known) have been bisected by roads consider installing drift fences, embedded culverts or seasonal road restrictions to allow safe passage of snakes.
- Talus slope in the ESSF, ICH, IDF, and MS
 - Inventory for Magnum Mantleslugs prior to constructing roads or quarries that directly impact the talus.

SNOW AVALANCHE TRACKS/CHUTES

Mammal	Avalanche Chute Value	Plant	Avalanche Chute Value
Grizzly Bears	Spring feeding on carrion and roots; all summer feeding on herbaceous plants; fall feeding on berries, ground squirrels, marmots.	birdfoot buttercup Blunt-sepal'd starwort Brewer's monkey-flower diverse-leaved cinquefoil Enander's sedge five-leaved cinquefoil Hall's willowherb	Habitat
American Black Bears		Hudson Bay sedge	
Fisher	Feeding on carrion; preying on small mammals; denning in debris piles.	Iceland koenigia	
American Marten		Purple oniongrass	
Wolverine		Sheep cinquefoil	
Moose		Small-fruited willowherb	
Bighorn Sheep	Feeding on herbs and shrubs.	Tender sedge	
Caribou		Upswept moonwort	
Mountain Goat		Western hawksbeard	
Deer		Western Jacob's-ladder	
Bird		whitebark pine	
Olive-sided Flycatcher	Nest along edges	Whitish rush	
Bald Eagles	Feeding on carrion	Woody-branched rockcross	

- Avoid constructing permanent roads across or within 500 m of a snow avalanche track or chute.
 - Render temporary roads impassable to traffic as soon as possible.
- For higher wildlife value avalanche chutes (> 1 ha is herbaceous, or > 10% of area of chute through the forest matrix is herbaceous) maintain a 100+ m forested buffer on each side. Partial cutting may occur in the buffer on one or both sides; harvesting should meet an objective to retain abundant mature conifer forest cover for wildlife.
 - Use a default value of partial cutting being < 20% of total forest within 100 m of the chute; this may be modified due to topographic or other considerations.
- For lower wildlife value avalanche chutes (< 1 ha is herbaceous, or < 10% of area of chute through forest matrix is herbaceous) maintain a 50+ m forested buffer on each side. Partial cutting may occur in the buffer on one or both sides; harvesting should meet an objective to retain abundant mature conifer forest cover for wildlife.
 - Use a default value of partial cutting being < 20% of total forest within 50 m of the chute.
- Ensure that management of avalanche chutes is consistent with the Grizzly Bear Identified Wildlife (2004) and Section 7 Notices.

DENS – BEAR, WOLVERINE, AND BADGER

American Black Bear	Grizzly Bear	Wolverine	Badger
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- **Grizzly Bear den:** Determine if the den has been used in the last two years.
 - Survey for additional dens within 200 m of the area proposed for development.
 - If no dens are found that have been used in the last two years, proceed with development; the area is apparently relatively low importance as den habitat.

- If dens are found that have been used in the last two years, consult with a qualified Professional regarding how to manage the area within 200 m of a den.
- If possible deactivate all roads within 500 m of an area that has two or more recently used dens, to minimize future disturbance.
- **American Black Bear den:** If a den appears to have been used in the last two years, a WTP ≥ 1 ha should be focussed on the den; this site is proven suitable denning habitat.
 - Maintain potential bear den cavities in large, old trees through WTPs ≥ 1 ha in size and contain standing live trees > 1 m diameter and > 5 m height. Also,
 - Leave large structured piles of downed wood when harvesting to provide for denning opportunities, preferably within 30 m of mature forest.
- **Occupied Grizzly Bear or American Black Bear dens:** Do not disturb the bear during the winter hibernation period (while snow is present).
 - Place a ≥ 250 m no-machine “winter-only” reserve around the den if there will be low machine activity; at high levels of machine activity a reserve up to 500 m may be required. A bear forced to abandon its winter den will almost certainly die.
 - It may be possible to operate closer than 500 m if topography will reduce sound and ground vibration transmission, or if there is already on-going activity such as a major road closer than 500 m on the same side of the den.
- **Wolverine maternal den site:** Establish a draft Wildlife Habitat Feature boundary around the den (default – a 100 m radius) and treat as a no-harvest area. This site is proven suitable denning habitat.
 - If the den is occupied, place a ≥ 250 m no-machine “winter-only” reserve around the den if there will be low machine activity; at high levels of machine activity a reserve up to 500 m may be required.
- **Badger den site:** When operations occur near a known burrow site manage as a Wildlife Habitat Feature consistent with the Identified Wildlife (2004) strategy
 - Establish a 20 m radius machine-free or no-development zone around badger burrows, and around ground squirrel and marmot burrows (as badger prey). In any case, damage to such burrows may be contrary to the *Wildlife Act*.
 - Avoid road construction near a burrow; locate permanent roads as far as possible from burrows (especially high concentrations of burrows) to reduce road mortality.
 - Identify badger burrows along road-sides scheduled for ditch cleaning or re-contouring so they can be avoided.
 - Identify burrows in gravel pits before excavation so they can be avoided.
 - Leave abundant scattered CWD within cutblocks that have one or more burrows, to enhance populations of badger prey species.
 - Cutblocks with badger burrows should be regenerated with reduced stocking standards to produce an open forest suitable as badger habitat.
 - Refer to Hoodicoff (2005) page 29-30 for additional road management guidelines; p. 28 for silviculture management guidelines.
- Send GPS coordinates and photographs of badger burrows to Regional MoE, Williams Lake).

Magnum Mantleslug
Great Basin Spadefoot

Western Toad
Western Painted Turtle

MAGNUM MANTLESLUG

- Map patches of potential habitat (defined above) within the area proposed for development that are at or near a known Magnum Mantleslug site (none presently known, May 2009).

Option 1: Reserve areas of potential habitat from development, with a 100 – 200 m buffer to minimize the loss of interior forest condition.

Option 2: Inventory the patches of potential habitat to determine which are actually used by the slug. Develop a management strategy for the development area in consultation with a biologist.

GREAT BASIN SPADEFOOT

- Manage for Great Basin Spadefoots in the BGxh, BGxw, IDfdk3, and IDfxm east of the Fraser River and south of Williams Lake.

Option 1: Inventory all vernal or permanent non-fish bearing ponds within 300 m of operations in the spring for spadefoots, through surveys using RISC standards.

Option 2: Survey within 300 m of proposed operations for all vernal or permanent non-fish bearing ponds in grasslands or open dry forest (crown closure < 40%); manage such ponds by default as spadefoot habitat.

- The pond high-water mark can be identified by the presence of water-or silt-stained leaves, debris deposited along the high waterline, a clear change in topography from the pond depression to the adjacent upland, and/or the level of a seasonal drainage from the pond.
- Designate an *Spadefoot Pond Management Area (PMA)* 300 m wide, measured from the pond high water mark, composed of an inner 30 m wide (from the high water mark) *Spadefoot Pond Reserve Zone (PRZ)* and an outer 270 metres wide *Spadefoot Pond Management Zone (PMZ)*.
- *Spadefoot Pond Reserve Zone*
 - Provides protection to the pond and critical immediately adjacent habitat.
 - Apply fish stream Riparian Reserve Zone management strategies – in general no development, other than danger tree felling (leave on site as CWD).
 - Prevent sediment from entering the pond.
- *Spadefoot Pond Management Zone*
 - Provides living habitat for adults near the pond, connectivity to suitable upland habitat, and migration corridors.
 - Harvesting should be a partial cut resulting in a moderate-crown closure forest that offers shade, deep litter, and woody debris around the pond, with gaps in the canopy (MDWR fir harvesting strategies may be suitable).
 - Minimize disturbance to the forest floor, to minimize adult mortality.
 - Retain as much coarse woody debris on the ground as possible, as terrestrial cover for adults.
 - Retain as many larger diameter, dead or dying trees or tall stubs as

- possible, for future recruitment as coarse woody debris. Leave felled danger trees on the ground.
- Avoid all compaction of loose, sandy soils, for construction of underground retreats.
- Silviculture should minimize soil disturbance, avoid creating trenches that trap adults, and minimize loss of coarse woody debris.
 - Avoiding disc trenching and drag scarifying.
 - Re-stock to natural densities or lower; maintain natural open forest characteristics with clearings.
 - Avoid herbicide applications; the surfactants in herbicides adversely affect the “breathability” of amphibian skins.
- Road construction should be avoided; however, if roads or bladed trails must be built
 - Permanent roads should include installation of amphibian fencing and crossing structures; a biologist should be consulted to develop the design details.
 - Temporary roads or bladed trails should be deactivated and rehabilitated as soon as possible to minimize road mortality and restore the forest habitat.
- Avoid most forest operations between March 15 and October 31 to minimize adult mortality during breeding and seasonal amphibian migration periods.
 - Harvest only in the winter, on snow when the ground is frozen; it may also be possible to harvest during very dry soil conditions in August (only) – under these conditions amphibians are deeply under cover, and soil compaction will be minimized. Do not harvest when the soil is moist or wet.
 - Spring or fall tree planting can occur, but vehicle (pickups, ATVs) use should not occur within the zone, to minimize adult mortality. Planting preferably should occur on warm dry days, when amphibians are under cover, to minimize the risk of them being stepped on.
- Avoid altering natural patterns of flooding and drying of ponds; avoid siltation of adjacent stream and NCD habitats.
- Where there is a cluster of ponds less than 400 m apart, maintain a moderate-crown closure forest between ponds; establish the *Spadefoot Pond Management Zone* around the cluster, rather than around each individual pond.

WESTERN TOADS

- Manage for Western Toads in all the BG, IDF, ICH and SBS by preserving, where possible, small permanent and vernal (wet in spring only) wetlands, ponds, and streams.
 - Where possible, manage shallow water and wetland areas as amphibian habitat.
 - Priority 1: wetland area > 500 m² and <10% covered by shrubs or tree canopy.
 - Priority 2a: wetland area > 500 m² and >10% covered by shrubs or tree canopy.
 - Priority 2b: wetland area 100-500 m²; and < 40% overhead canopy and >20-50% emergent herb cover, and < 10% woody debris cover.
 - Priority 3: other wetlands (generally small hardhack shrub or forested swamps).
 - Avoid altering natural patterns of flooding and drying of wetlands; avoid directing sedimented ditch water into streams, NCDs, ponds and wetlands.

- Maintain existing downed logs and chunks of bark, especially large pieces, near these aquatic features; downed wood provides important shelter.
- Avoid constructing permanent roads near ponds, wetlands, and wet meadows, to minimize road mortality and disturbance.
- Avoid using herbicides near ponds/wetlands – surfactants in herbicides adversely affect the “breathability” of amphibian skins.
- “Near” is within 30-50 m, depending on the size of the pond or wetland; where possible the distance should be increased.

WESTERN PAINTED TURTLES

- Manage for known populations of Western Painted Turtles
 - Maintain a 50 m no-harvest reserve adjacent to the aquatic feature that supports a known population of the turtles.
 - Avoid any level of compaction of loose, sandy soils within 250 m of a seasonal and permanent pond that supports a known population of the turtles, for construction of underground retreats.
 - Construct *permanent* roads as far as possible (preferably > 250 m) from the pond, lake, or other aquatic habitat that supports a known turtle population; deactivate all roads that are < 250 m distance to minimize road mortality.
 - Consult with a biologist for addition management measures.
 - Field crews should report sightings of turtles, with photographs if possible.

BIRD NEST SITES

Individual Management Strategies

American Avocet	Flammulated Owl	Olive-sided Flycatcher
Burrowing Owl	Great Blue Heron	Sandhill Crane
Bald Eagle	Lewis’s Woodpecker	Sharp-tailed Grouse
Osprey	Northern Goshawk	Yellow-breasted Chat
Double-crested Cormorant		

AMERICAN AVOCET

- Treat all islands in alkaline lakes as being American Avocet nest sites. The existence of an island should be based on maximum high water level for a lake, since some are connected to land at lower water levels.
 - If restrictions on operational timing or road location are unduly constraining for a specific lake, a skilled “birder” should inventory the lake in May, using a spotting scope, to determine actual avocet presence during the proposed year of operations.
 - No operations, including field layout or cruising, should occur near a nest site (within sight or hearing) during breeding season (April to July). Permanent roads should not be constructed near (within sight or hearing) an avocet breeding lake, to avoid long-term disturbance; if a temporary road will still be present during a breeding season it should be closed to traffic for that period.

BURROWING OWL

- For management of a Burrowing Owl nest site, consult with MoE.

BALD EAGLE AND OSPREY

- A tree with a stick nest of a bird is a high value wildlife tree.
- Do not harvest or otherwise disturb
 - Trees with Bald Eagle or Osprey nests (legal requirement), including presently unoccupied trees that have been used in the past if they still appear suitable for nesting.
 - Trees that Bald Eagles or Ospreys regularly use for roosting, perching or feeding.
- Maintain no-development buffers
 - Maintain a 200 m no-harvest and no-road reserve around a Bald Eagle or Osprey nest tree.
 - Maintain a 300 m buffer free of heavy machinery activity around an occupied Bald Eagle or Osprey nest in the period February through August.
 - Locate new roads at least 300 m away from Bald Eagle or Osprey nesting, roosting and foraging areas.
 - These distances may be reduced where there is an existing high use road or other active industrial area already present closer to the site.
- Field crews should watch for and report the presence of any trees with large stick nests that may be of Bald Eagles or Ospreys. The two nest types are managed the same; hence they do not need to be distinguished.

DOUBLE-CRESTED CORMORANT

- Manage Double-crested Cormorant in a manner similar to management for American White Pelicans.
 - Should a nesting lake be found, avoid disturbance to the site during the breeding season (1 April to 31 August).
 - Avoid constructing permanent roads within 1 km of the lake.
 - Consult a biologist regarding mitigation measures to minimize disturbance.
- Should feeding lakes associated with nesting be found, manage them to avoid disturbance to the site during the breeding season of April to August.
 - Consult a biologist regarding mitigation measures to minimize disturbance.
 - Field crews should watch for and report to BCTS the use of water bodies by Cormorants.

FLAMMULATED OWL

- Manage established WHAs by following the Identified Wildlife Management Strategy, and the associated Order.
- When harvesting is considered in the vicinity of a known nest site that is not a WHA, draft a WHA boundary and manage as a WHA.
 - The draft WHA core area should be 7 – 12 ha, centered on the nest site. This should be surrounded by a 100 m management zone. Manage as specified in Identified Wildlife Management Strategy.
 - Where a known Flammulated Owl nest tree is an isolated tree or in a small

patch within an existing open area (i.e., meadow, clearing or cutblock), maintain as much vegetation cover as possible around the nest tree to provide additional security cover, perching and roosting sites.

- Consider placing a “*Wildlife Tree Sign*” (obtain from MoE) on nest trees in order to educate the public and others about their high ecological value.
- Manage for Flammulated Owl nesting habitat within Mule Deer Winter Ranges; almost all known nesting occurs there. Mule Deer Winter Range management will address most of the habitat requirements of Flammulated Owl.
 - Avoid felling of standing dead/dying Douglas-fir, aspen, and cottonwood ≥ 35 cm dbh in stands that are suitable as Flammulated Owl nesting habitat, except where required to prevent the spread of a forest health agent. If necessary, install no work zones around such trees in order to buffer them as required to meet WCB safety requirements.
 - Minimize application of insecticides (including Btk) to stands that are suitable habitat – the insecticides will reduce the total population of moths, on which the owls feed. If insecticides must be used, apply in a manner designed to leave numerous patches of forest with abundant insect (especially budworm) larvae.
 - Avoid road construction, timber harvesting, and silviculture activities during the breeding season (late April through August).

GREAT BLUE HERON

- Manage established Great Blue Heron WHAs by following to the associated Order.
- Manage Great Blue Heron nest sites that are not WHAs by drafting a WHA boundary 500 m around it, and manage following the Identified Wildlife (2004) WHA strategy.
- Locate new roads away from known nest sites.
- Field crews should watch for and report the presence of any trees with large stick nests that may be of Great Blue Herons. The primary confusion will be with Bald Eagle and Osprey nests, which also need management.

LEWIS'S WOODPECKER

- Manage established WHAs by following the Identified Wildlife Management Strategy, and the associated Order.
- For known nest sites that are not WHAs, establish a WTP of at least 5 ha focussed on the nest site and other veteran trees, and manage as a WHA.
 - The Identified Wildlife Management Strategy suggests only establishing WHAs where there are 3 or more nests; however determining the number and distribution of nests in an area may require considerable work, hence management of single nest sites using WTPs may be more feasible.
- Assess proposed harvest areas within the range of Lewis's Woodpecker (mapped in Identified Wildlife 2004) as potential habitat. A GIS computer analysis should be sufficient to identify stands that are potentially suitable (see Identified Wildlife 2004 for details). Within areas with potential habitat:
 - Maintain a component of medium to large diameter trees, especially decadent deciduous and Douglas-fir, for nesting sites through the forest rotation by including them in wildlife tree patches and other retention areas.

- Maintain at least 6 standing dead trees per hectare; ideally these should be trees >45 cm dbh. Where this size class is not available, use the largest available on site. The highest practical density of snags is preferred (i.e., considering operability and worker safety). In most situations, snags considered for retention should be included within a safe buffer area (i.e., a WTP).
- Where possible, use partial cutting similar to Mule Deer Winter Range management strategies.
- Minimize the use of insecticides, to maintain food abundance.

NORTHERN GOSHAWK NESTS

- Establish a Goshawk Habitat Area (a reserve) around the nest or group of nests that will maintain nesting and post-fledging habitat, to support future use and reproduction in the area:
 - The size should be about 24 ha, which is large enough to include and buffer the normal distribution of alternative nests, roosts, plucking perches and juvenile post-fledging area movements. There should be at least a 100 m buffer on all sides of each individual nest site.
 - The shape and location of the boundary should maximize the value of the area in maintaining nest area occupancy and breeding success. The primary basis for that determination should be the location of alternative nests, plucking posts, roosts, and observations of adult and juvenile movements. The amount of high quality nest area habitat should be maximized – maximize forest age and canopy closure, while ensuring an open understory. Consult a biologist.
 - Connectivity to adjacent mature forest habitat should be maintained, along at least 30% of its edge.
 - The reserve can be reassessed after 10-20 years to determine whether goshawks are still actively using it.
- No mechanized or other noisy activity should occur within 500m, and no human activity within 200 m, of an active nest area February 15 – August 15.
- Field crews should watch for raptors that may be goshawks, below canopy level of older, closed canopy conifer stands; this restriction will eliminate most sightings of other raptors.
 - A nesting occurrence should be assumed when Northern Goshawks are encountered that do not leave the area when disturbed. They generally scream at the intruder, behave in an agitated manner; and may dive on the intruder's head. In contrast, goshawks disturbed away from nesting sites simply fly away, with or without calling. Goshawk nests are made from small sticks and are located on a side branch of a tree, below the tree canopy; other hawk nests are generally located on isolated trees or near the top of the canopy.

OLIVE-SIDED FLYCATCHER

- Establish a 500 m radius management zone (78 ha) around a nest site.
 - Establish a large (≥ 5 ha) no-harvest reserve (WTP) around the nest site, sized and shaped to maximize the amount of old (preferred) and mature forest included in the WTP.
 - Harvest in the remaining area of the management zone using patch cuts or very

small clearcuts to maintain a high component of snags, older trees, and small openings throughout the area.

- Avoid constructing new permanent roads within the management zone.
- Avoid operations within the management zone during the breeding season.

SANDHILL CRANE

- Manage established WHAs by following the Identified Wildlife Management Strategy, and the associated Order.
- For known nest sites that are not WHAs, define a management area of about 50 m radius adjacent to the wetland, and manage as a WHA.
 - Consider establishing the boundary at the upper edge of a slope break or another logical feature, rather than exactly at 50 m.
 - Maintain $\geq 40\%$ of the mature trees within the management zone, through single tree and/or group selection harvest (not clearcut).
 - Where $< 40\%$ of the mature trees are alive, leave $< 40\%$ of trees if removal of additional dead trees can be done without removing additional live trees.
 - Keep roads as far away as possible.
 - Do not operate machinery within 200 m of the site April 1 to August 15, to prevent disturbance during the nesting period.
- Where planning and harvest timing permits, open wetlands (dominated by sedges or grasses, not shrubs or trees) within 200 m of development should be examined for the presence of nesting Sandhill Cranes in May to July (the peak nesting period).
 - A nesting occurrence is likely to have been found when Sandhill Cranes remain in the area when disturbed. They may or may not fly up; if they fly up, they circle back and land again. They usually scream at the intruder, behave in an agitated manner; and may run on the ground to take cover in adjacent forest. In contrast, Sandhill Cranes disturbed away from nesting sites simply fly away, with or without calling.

SHARP-TAILED GROUSE

- Manage established WHAs by following the Identified Wildlife Management Strategy, and the associated Order.
 - For known lek sites in native grassland that are not WHAs, establish a 1.5 km management zone over all habitats around the site and manage as a WHA.
 - Avoid all access during April and May, when females are present for breeding.
 - During this period close roads passing within 100 m of an active lek..
 - Permanently deactivate or rehabilitate all roads after use.
 - Maintain deciduous shrub and tree components in riparian areas within the management zone.
 - Avoid deep trenching (>20 cm) and other mechanical site preparations that result in depressions and loss of deciduous species within the management zone.
 - Minimize use of pesticides within the management zone.
 - Where a lek site in a clearcut is identified, manage so as to minimize disturbance (as above) but full WHA management is not required because the lek will be lost as the forest regenerates.
- 30 • Native grasslands within or adjacent to proposed operations (harvesting, road

construction or silviculture) should be examined for the presence of Sharp-tailed Grouse leks in the “lekking” season of April and May. Normal forestry field crews should be able to do this, because the male displays and calls are very obvious.

- Breeding males congregate at specific areas (leks) to display and attract females – the male calls (drumming) can be heard up to 1.5 km away. Leks are often located on ridge tops or elevated ground but not necessarily the highest ground available.

YELLOW-BREASTED CHAT

- Manage established WHAs by following the Identified Wildlife Management Strategy, and the associated Order.
- For known nest sites that are not WHAs, define a management area of 100 m radius around the nest – extend it further parallel to the riparian area if habitat suitable for nesting extends further, and manage as a WHA.
 - Maintain the riparian thicket habitat.
 - Do not build new roads and stream crossings within the management area.
 - Do not use pesticides.
- Do not operate machinery within 300 m of the site May through July, to prevent disturbance during the nesting period. They apparently tolerate low levels of noise.

OTHER BIRD NESTS

Bird Species	Nesting Season	Bird Species	Nesting Season
American Bittern*	April – July	Lark Sparrow*	May – July
Bobolink*	May – July	Long-billed Curlew*	April – July
Brewer’s Sparrow*	April – July	Rusty Blackbird	April – July
Common Nighthawk	June – August	Short-eared Owl*	April – August
Horned Lark*	May – July	Upland Sandpiper*	April – July

*Re-use nest areas for many years.

- Protect known nest sites of the species listed above from noise disturbance during the current breeding season, and permanently protect from disturbance where the species is known to re-use a nest area for many years.
 - No heavy machinery operation should occur within hearing (generally ≥ 500 m) of a nest site during breeding season.
 - Avoid constructing permanent roads within hearing of truck noise (generally ≥ 500 m) of known breeding sites, except for Common Nighthawk and Rusty Blackbird.
 - Minimize road construction across grassland and big sagebrush areas in the BG and IDF. This may require a longer route and/or routing the road through a forested area.
 - In the BG, if road construction is scheduled for the songbird breeding season of April – July, complete a rare bird inventory to minimize the risk of disturbance to red-list birds.

BAT AND MYOTIS SITES

Fringed Myotis	Townsend's Big-eared Bat
Northern Myotis	Western Small-footed Myotis
Spotted Bat	

- A tree with known bat/myotis use is a **high value** wildlife tree.
- Do not disturb known bat and myotis roosting and maternity sites (wildlife trees, rock outcrops, or cliffs), or hibernation sites (caves).
 - Designate a bat/myotis management area around the site; the size should be about 12 ha.
 - The bat/myotis management area should be composed of a 100 m radius core no-development area, plus a 100 m radius management zone.
 - Manage the bat/myotis management area as specified for an Identified Wildlife Habitat Area for Fringed Myotis.
 - Avoid disturbance to females and young during the breeding season (April to October).
 - Avoid disturbance to a hibernation site during the hibernation season (October – April).
- Avoid use of insecticides, including Btk, around roosts and potential foraging areas to maintain moths and other insects for prey.

RED-LISTED PLANTS

<u>G2G3 S2S3 Species</u>	<u>S1 Species</u>	<u>S1 Species (cont.)</u>
Gastony's cliff-brake	rusty cord-moss	sickle-pod rockcress
	Carolina draba	silvery orache
<u>S2 Species</u>	low hawksbeard	slender hawksbeard
alkaline wing-nerved moss	mutton grass	Sprengel's sedge
porcupinegrass	riverbank anemone	wedgescale orache
rivergrass	short-flowered evening-primrose	western hawksbeard
stalked moonwort		
upswept moonwort		

- **Overall Objective:** Manage 100% of the area occupied by each red-listed plant species to maintain the suitability of the habitat for the existing plants and for the regeneration of new plants. Each loss of part or all of an occurrence of each of these species will worsen their conservation status.
 - The blue-listed Gastony's cliff-brake should be managed as red-listed, because it is both globally and provincially uncommon and most of the world's population occurs in BC.
 - Management of the species ranked S1 (most of the species) is especially critical, because of their extreme rarity.
 - Maintenance of natural forest, shrub area, and meadow conditions is especially critical for the habitat of stalked moonwort and upswept moonwort.
 - Minimization of ditch-water inputs and road dust is especially critical for the habitat of alkaline wing-nerved moss and rusty cord-moss.
 - Prevention of weed invasion is especially critical for all plants with dry open forest or grassland habitat.
- Roads, harvesting and silviculture should never encroach on the habitat of a known red-listed plant occurrence.

- If the habitat is forested, provide a ≥ 100 m no-development reserve around the habitat to maintain interior forest conditions.
- If the habitat has scattered trees, provide a ≥ 50 m no-development reserve around the habitat to minimize windthrow risk.
- If the habitat is non-forested, provide a ≥ 30 m no-development reserve around the habitat, to minimize risks from road dust, ditch water, road maintenance, weed introductions from roads and harvesting, changes in surface hydrology from roads and harvesting, changes in microclimate, etc.
- Prevent water and sediment inputs from ditches; avoid concentrating and/or diverting subsurface or surface water flows into or away from the area inhabited by the plants.
- Maintain the area occupied by the red-listed plants as an herbicide-free zone.
- A biologist should determine the exact boundaries of each occurrence, and details of mitigation measures.
- A biologist experienced in field inventory of rare plant species should survey for the species when developing harvest and road construction plans within a 2 km radius of known sites.
- Forestry field crews should be aware of the appearance of moonworts (with identification to species by an expert from specimens), and watch for them during normal layout (etc.) work in the summer within a 10 km radius of known sites.
- Provide the Conservation Data Centre (Victoria) with maps, photographs, specimen sample (if appropriate) or descriptions, and GPS coordinates for locations of any red- or blue-listed species that are found, so that their abundance and locations can be tracked.

BLUE-LISTED PLANTS AND INVERTEBRATES

S2S3 Species

Columbian carpet moss
 American chamaerhodos
 American sweet-flag
 Autumn willow
 Back's sedge
 Birdfoot buttercup
 Blunt-sepaed starwort
 Booth's willow
 Brewer's monkey-flower
 Chamisso's montia
 diverse-leaved cinquefoil
 Enander's sedge
 five-leaved cinquefoil
 [Gastony's cliff-brake – see
 next section]
 Geyer's onion
 Hall's willowherb

S2S3 Species (cont.)

Holboell's rockcress
 Hudson Bay sedge
 Iceland koenigia
 Kellogg's knotweed
 Kruckeberg's holly fern
 least moonwort
 many-headed sedge
 meadow arnica
 Montana larkspur
 plains butterweed
 porcupine sedge
 purple oniongrass
 purple-leaved willowherb
 sheep cinquefoil
 short-beaked fen sedge
 slender mannagrass
 tender sedge

S2S3 Species (cont.)

western dogbane
 western Jacob's-ladder
 white wintergreen
 whitish rush
 woody-branched rockcress
 Forcipate Emerald
 Magnum Mantleslug

S3 Species
 Drummond's campion
 Dwarf clubrush
 marsh muhly
 small-flowered lousewort
 small-fruited willowherb
 whitebark pine
 Hagen's Bluet

- **Overall Objective:** Retain $\geq 70\%$ of the area occupied by each blue-listed plant and invertebrate species to maintain, and preferably enhance, the suitability of the 33

habitat for the existing species. Each loss of part or all of an occurrence of blue-listed species will incrementally worsen their conservation status. This objective cannot be fully monitored, because there will never be a complete inventory of occurrences of the species. The objective provides general direction for management strategies, rather than for monitoring.

- Management of the species ranked S2S3 (most of the species) is especially critical, because they are at the “more rare” end of the blue-list spectrum. Gastony’s cliff-brake is addressed under red-listed plants.
- Roads and bladed trails will usually permanently destroy the plants and habitat.
- Harvesting and silviculture may or may not destroy the plants and/or their habitat, depending on the species, season of year of operations, and amount of soil disturbance.
- Harvesting and/or silviculture impacts may be especially significant for Kruckeberg’s holly fern, least moonwort, and white wintergreen; *if there is minimal soil disturbance* most other blue-listed plant species *may* survive harvesting and silviculture.
- Road design and construction should minimize encroachment on the habitat of a known blue-listed plant occurrence.
 - Establish a ≥ 30 m buffer between the edge of the bladed road right-of-way and the edge of the plant population, to minimize the effects of dust, ditch water, road right-of-way clearance, and road maintenance activities.
 - Prevent water and sediment inputs from ditches.
 - It may be possible to provide suitable non-forested and open forest habitat for some species in road right of ways and ditches, with minor or no changes to standard road construction practices.
 - If necessary, consult a biologist regarding the exact boundaries of the occurrence, and details of mitigation measures.
- For harvesting and silvicultural site preparation, protect most individual plants and/or most of the habitat of known blue-listed plant populations; using no-harvest reserves such as wildlife tree patches. If this is not possible
 - Harvesting with minimal ground disturbance, followed by silviculture with minimal ground disturbance and no herbicide use, *may* minimize adverse impacts (consult the specific species accounts in the office Manual).
- For whitebark pine, protect habitat that has live or dead whitebark pine (new pine is likely to naturally regenerate) when it outside areas of merchantable timber, or on rocky outcrops within otherwise merchantable areas; protect live individual whitebark pine of any age as much as possible during harvesting, road construction, and silviculture.
 - There are areas south of Charlotte Lake and west of Taseko Lakes where whitebark pine is growing in productive forests of lodgepole pine at relatively low elevations – probably due to Clarke’s Nutcrackers planting cones/seeds shortly after a burn. In areas such as this, harvesting of beetle-killed whitebark pine will occur with the Lodgepole pine, but *the area should be regenerated with a similar or greater amount of whitebark pine as originally occurred.*
 - Ensure that the occurrence and location of all whitebark pine (individual trees or as a component of the stand) is noted during block and road layout.

- Avoid concentrating and/or diverting subsurface or surface water flows into or away from areas inhabited by the plants.
- Maintain the area of the blue-listed plants as an herbicide-free zone, other than for whitebark pine.
- Consider reduced stocking or clumped stocking to provide an open canopy for some species (see office Manual for specific species).
- Provide the Conservation Data Centre (Victoria) with maps, photographs, specimen sample (if appropriate) or descriptions, and GPS coordinates for locations of any red- or blue-listed species that are found, so that their abundance and locations can be tracked.

RED-LISTED COMMUNITIES – FORESTED

S2 Rank

- (balsam poplar, black cottonwood) – spruces / red-osier dogwood
- Douglas-fir – western redcedar / wavy-leaved moss
- Douglas-fir – western redcedar / wavy-leaved moss
- Douglas-fir / Douglas maple / step moss
- Douglas-fir / prickly rose / wild sarsaparilla
- Douglas-fir – Rocky Mountain juniper / kinnikinnick
- hybrid white spruce / ostrich fern
- hybrid white spruce / prickly rose / palmate coltsfoot
- lodgepole pine / trapper's tea / crowberry

S2 Rank (cont.)

- trembling aspen / spreading needlegrass – old man's whiskers
- Douglas-fir – lodgepole pine / kinnikinnick Dry Subaritime
- Douglas-fir / Douglas maple / Hooker's fairybells
- western hemlock – Douglas-fir / electrified cat's-tail moss Dry Subaritime 1
- western hemlock / queen's cup
- western redcedar - Douglas-fir / vine maple
- western redcedar / devil's club

S1 Rank

- lodgepole pine / Kruckeberg's holly fern – Indian's-dream

- **Overall Objective:** Retain 100% of the area of each red-listed community in natural mature/old seral condition – the same tree (both conifer and deciduous) and understory species composition, physical structure, ecological processes, degree of canopy closure and tree density, large old trees, range of tree sizes, large snags, downed logs, surface litter, microbiotic crust, soil structure, absence of invasive species, interior forest conditions, etc. Each loss of part or all of an occurrence of a red-listed community will significantly worsen its conservation status.

- Management of the one forested community ranked S1 (lodgepole pine / Kruckeberg's holly fern – Indian's-dream) is especially critical, because of its extreme rarity.
- Maintenance of upslope seepage with minimization of ditch-water inputs is especially critical for Douglas-fir / prickly rose / wild sarsaparilla, hybrid white spruce / devil's club / step moss, hybrid white spruce / ostrich fern, hybrid white spruce / prickly rose / palmate coltsfoot, trembling aspen / spreading

- needlegrass – old man's whiskers, western redcedar / devil's club, and western redcedar – Douglas-fir / vine maple communities.
 - Maintenance of floodplain water flows when constructing stream crossings is especially critical for (balsam poplar, black cottonwood) – spruces / red-osier dogwood, and hybrid white spruce / ostrich fern communities.
 - Prevention of weed invasion is especially critical for dry open forest ecosystems – Douglas-fir / common juniper / clad lichens, Douglas-fir / Rocky Mountain juniper / kinnikinnick, lodgepole pine / trapper's tea / crowberry, and trembling aspen / spreading needlegrass – old man's whiskers communities.
- Prevent all development impacts to the community, to meet the overall objective.
 - Locate all harvesting, removal of non-timber forest products, roads, landings, and bladed trails outside a 100 m buffer around an occurrence of the community. The full buffer width is important to minimize weed invasions and to maintain wildlife use of the community.
 - The buffer distance should be modified to use logical topographic features such as streams or ridges, or man-made boundaries such as roads or rights of way.
 - If the occurrence is narrow, such as a ridgeline or stream margin, increase the buffer width up to another 100 m to provide an approximation of interior forest conditions.
 - Focus wildlife tree patches and deferred harvest areas on the community and its buffer.
 - If the trees of the community are dead (beetle-kill, etc.), leave the community to regenerate naturally. Consult a biologist if natural regeneration is unlikely to occur.
 - If road development is required to impact the community or the buffer, because there is no alternative route, consult a biologist and develop management strategies that will best meet the overall objective for as much of the community as possible.
- Maintain the community as a pesticide-free zone.
- Avoid impacts to vegetation, soils, and hydrology when operating in adjacent areas, particularly during land clearing, and road location, construction, and maintenance.
- Avoid concentrating and/or diverting subsurface or surface water flows into or away from the community.
- Determine the community types within 100 m of proposed development.
- Provide the Conservation Data Centre (Victoria) with a map, photographs, description, and GPS coordinates for the location of any red- or blue-listed ecological community that is found, so that the abundance and locations of the community can be tracked.

S3 Rank

- black cottonwood – red alder / salmonberry
- Douglas-fir – hybrid white spruce / electrified cat's-tail moss
- Douglas-fir – hybrid white spruce / falsebox
- Douglas-fir – hybrid white spruce / knight's plume
- Douglas-fir – hybrid white spruce / thimbleberry
- Douglas-fir – lodgepole pine / clad lichens
- Douglas-fir – subalpine fir / black huckleberry
- Douglas-fir – western hemlock / falsebox
- Douglas-fir – western redcedar / beaked hazelnut
- Douglas-fir / bluebunch wheatgrass – pinegrass
- Douglas-fir / bluebunch wheatgrass – stiff needlegrass
- Douglas-fir / red-stemmed feathermoss – step moss
- Douglas-fir / Rocky Mountain juniper / prairie sagewort
- Douglas-fir / Rocky Mountain juniper / shrubby penstemon
- western hemlock / vine maple – falsebox
- hybrid white spruce – paper birch / devil's club
- hybrid white spruce / black gooseberry
- hybrid white spruce / hardhack
- hybrid white spruce / hardhack / oak fern

S3 Rank (cont.)

- hybrid white spruce / horsetails – western meadowrue
- hybrid white spruce / horsetails / leafy mosses
- hybrid white spruce / pinegrass / step moss
- hybrid white spruce / prickly rose / low northern sedge
- hybrid white spruce / prickly rose / wild sarsaparilla
- hybrid white spruce / red-stemmed feathermoss – ragged-mosses
- lodgepole pine – black spruce / red-stemmed feathermoss
- lodgepole pine / Altai fescue / foam lichens
- lodgepole pine / black huckleberry – velvet-leaved blueberry
- lodgepole pine / black huckleberry / reindeer lichens
- lodgepole pine / common juniper / rough-leaved ricegrass
- western hemlock / common juniper – falsebox
- western hemlock – western redcedar / clad lichens
- western redcedar – Sitka spruce / skunk cabbage
- western redcedar / falsebox
- western redcedar / oak fern / electrified cat's-tail moss

S2S3 Rank

- black cottonwood / willows Dry Submaritime
- lodgepole pine / clad lichens – juniper haircap moss

- **Overall Objective:** Retain $\geq 70\%$ of the area (at a landscape unit or large watershed level) of each type of blue-listed community in natural mature/old seral condition – the same tree (both conifer and deciduous) and understory species composition, physical structure, ecological processes, degree of canopy closure and tree density, large old trees, range of tree sizes, large snags, downed logs, surface litter, microbiotic

crust, soil structure, absence of invasive species, interior forest conditions, etc. Each loss of part or all of an occurrence of a blue-listed community will incrementally worsen its conservation status.

- Management of the two forested communities ranked S2S3 is especially critical (target 85% mature/old condition), because they are at the “more rare” end of the blue-list spectrum.
- Maintaining upslope seepage while minimizing ditch-water input is critical for Douglas-fir – hybrid white spruce / thimbleberry, hybrid white spruce – paper birch / devil’s club, hybrid white spruce / black gooseberry, hybrid white spruce / horsetails – western meadowrue, hybrid white spruce / horsetails / leafy mosses, hybrid white spruce / prickly rose / wild sarsaparilla, and western redcedar / oak fern / electrified cat’s-tail moss communities.
- Minimizing weed invasion is critical for dry open forests – Douglas-fir / bluebunch wheatgrass – pinegrass, Douglas-fir / bluebunch wheatgrass – stiff needlegrass, Douglas-fir / Rocky Mountain juniper / prairie sagewort, Douglas-fir / Rocky Mountain juniper / shrubby penstemon, and lodgepole pine / Altai fescue / foam lichens communities.
- **Minimize immediate loss of community area by harvesting these communities at a lower rate than more common communities:**
 - Focus wildlife tree patches, old growth management areas, and deferred harvest areas on occurrences of the community.
 - Where the community occurs as a large patch, or a group of patches that are close together, harvest only part of the total area.
- **Minimize degradation of community area adjacent to harvest areas**
 - Where possible, locate harvesting and bladed structures outside a 100 m buffer around an occurrence of the community.
 - Implement measures to reduce the windthrow risk of a community where windthrow risk is moderate to high. The windfirming measures can be within the community, subject to the other strategies.
 - Avoid concentrating and/or diverting subsurface or surface water flows into or away from the community.
- **Minimize long-term loss of community area:**
 - Locate roads, landings, and bladed trails outside the community, and outside a 100 m buffer where upslope hydrology is critical.
 - If bladed structures must be located within the community area, minimize the clearing width and amount of disturbed soil. Where possible, rehabilitate and replant roads, landings and bladed trails to regenerate as similar to the original community as possible.
 - Bladed structures should be especially avoided in communities for which minimizing weed invasion is critical; disturbed soil promotes weed invasion.
 - Minimize use of vegetation management practices that modify soil structure or hydrology, such as disk trenching, ditching, or mounding.
 - Wet, rich soil forest ecosystems may be difficult to regenerate without such actions; hence carefully consider site preparation requirements when deciding whether and how to harvest such areas while conserving rare communities.

- Minimize the recovery time of harvested community area
 - Use natural regeneration where possible/reasonable; alternatively plant a mix of conifer and deciduous tree species in proportions that will result in a new mature stand similar to the harvested stand, including expected natural ingress.
 - Avoid use of vegetation management practices that may alter the entire vegetation community, such as broadcast herbicide application or stand tending that removes less economically desirable species of trees that are a natural component of the ecosystem.
 - Minimize introduction of alien plant species by only using quality seed mixes that have low occurrence of weed seeds, when revegetating disturbed soil areas such as roads, landings and bladed trails. Avoid seeding in communities for which minimizing weed invasion is critical; normal commercial seed mixes consist entirely of alien species of grasses and clovers (= weeds).
- Determine the community types impacted by, or within 100 m, of a proposed road or harvesting.
- Provide the Conservation Data Centre (Victoria) with a map, photographs, description, and GPS coordinates for the location of any red/blue-list community that is found, so that the abundance and locations of the community can be tracked.

RED-LISTED COMMUNITIES – NON-FORESTED

S2 Rank

- big sagebrush / bluebunch wheatgrass
- bluebunch wheatgrass – arrowleaf balsamroot
- bluebunch wheatgrass – junegrass
- northern wormwood / short-awned porcupinegrass
- sand dropseed – needle-and-thread grass
- saskatoon / slender wheatgrass
- awned sedge Fen – Marsh

S2 Rank (cont.)

- few-flowered spike-rush / hook-mosses
- Nuttall's alkaligrass – foxtail barley
- scrub birch / sedges / peat-mosses
- seaside arrow-grass Marsh

S1 Rank

- Vasey's big sagebrush / pinegrass
- water birch / roses
- Sandberg's bluegrass – slender wheatgrass

- **Overall Objective:** Retain 100% of the area of each red-listed community in natural mature/old seral condition – the natural species composition, physical structure, ecological processes, soil structure, absence of invasive species, etc. Each loss of part or all of an occurrence of a red-listed community will significantly worsen its conservation status.
 - Management of the three non-forested communities ranked S1 is especially critical, because they are extremely rare.
 - Maintenance of upslope seepage with minimization of ditch-water inputs is especially critical for water birch / roses, awned sedge Fen – Marsh, few-flowered spike-rush / hook-mosses, and scrub birch / sedges / peat-mosses ecological communities.
 - Maintenance of floodplain water flows when constructing stream crossings is especially critical for water birch / roses ecological community.

- Prevention of ditch-water inputs is especially critical for awned sedge Fen – Marsh, few-flowered spike-rush / hook-mosses, Nuttall's alkaligrass – foxtail barley, and seaside arrow-grass Marsh ecological communities.
- Prevention of weed invasion is especially critical for dry grassland ecosystems – big sagebrush / bluebunch wheatgrass, Vasey's big sagebrush / pinegrass, bluebunch wheatgrass – arrowleaf balsamroot, bluebunch wheatgrass – junegrass, northern wormwood / short-awned porcupinegrass, sand dropseed – needle-and-thread, Sandberg's bluegrass – slender wheatgrass, and saskatoon / slender wheatgrass ecological communities.
- Prevent all development impacts to the community, to meet the overall objective.
 - Locate all harvesting, roads, landings, and bladed trails outside a 100 m buffer around an occurrence of the community. The full buffer width is important to minimize weed invasions and to maintain wildlife use of the community.
 - The buffer distance can be modified to use logical topographic boundaries such as streams or ridges, or man-made boundaries such as roads or rights of way.
 - Focus wildlife tree patches and deferred harvest areas on the buffer.
 - Maintaining the full buffer width is especially important upslope to maintain hydrology and minimize ditch-water and dust inputs, but the full width is also important to minimize weed invasions and to maintain wildlife use of the community.
 - If the trees of the buffer are dead (beetle-kill, etc.), harvesting may occur (other than normal riparian reserves) with low soil disturbance, no roads or bladed trails, no seeding, and minimal site preparation. Consult a biologist to ensure impacts to the community are minimized.
 - Focus wildlife tree patches and deferred harvest areas on forest adjacent to occurrences of the ecological community.
 - If road development must impact the community or the buffer, because there is no alternative route, consult a biologist and develop management strategies that will best meet the overall objective for as much of the community as possible.
- Maintain the community as a pesticide-free zone.
- Avoid impacts to vegetation, soils, and hydrology when operating in adjacent areas, particularly during land clearing, and road location, construction, and maintenance.
- Avoid concentrating and/or diverting subsurface or surface water flows into or away from the community.
- Determine the non-forested community types within 100 m of proposed development.
- Provide the Conservation Data Centre (Victoria) with a map, photographs, description, and GPS coordinates for the location of any red- or blue-listed ecological community that is found, so that the abundance and locations of the community can be tracked.

S3 Rank

- mountain alder / common horsetail
- mountain alder / red-osier dogwood / lady fern
- spreading needlegrass Herbaceous Vegetation
- Baltic rush – field sedge
- Bebb's willow / bluejoint reedgrass
- common cattail Marsh
- lodgepole pine / water sedge / peat-mosses
- MacCalla's willow / beaked sedge
- northern mannagrass Fen

S3 Rank (cont.)

- Sitka willow / Sitka sedge
- tall willows / Sartwell's sedge
- tufted hairgrass Community

S2S3 Rank

- Drummond's willow / bluejoint reedgrass
- lodgepole pine / few-flowered sedge / peat-mosses
- tufted clubrush / golden star-moss

- **Overall Objective:** Retain $\geq 70\%$ of the area (at a landscape unit or large watershed level) of each type of blue-listed ecological community in natural mature/old seral condition – the same shrub, herbaceous, and moss/lichen species composition, physical structure, ecological processes, hydrology, surface litter, microbiotic crust, soil structure, absence of invasive species, etc.. Each loss of part or all of an occurrence of a blue-listed community will incrementally worsen its conservation status.
 - Management of the three non-forested communities ranked S2S3 is especially critical (target 85% mature/old condition), because they are at the “more rare” end of the blue-list spectrum.
 - Maintenance of upslope seepage with minimization of ditch-water inputs is especially critical for tufted hairgrass Community and tufted clubrush / golden star-moss community.
 - Maintenance of floodplain water flows when constructing stream crossings is critical for Drummond's willow / bluejoint reedgrass, mountain alder / common horsetail, mountain alder / red-osier dogwood / lady fern, MacCalla's willow / beaked sedge and Sitka willow / Sitka sedge communities.
 - Prevention of ditch-water inputs is especially critical for Baltic rush – field sedge, common cattail Marsh, lodgepole pine / few-flowered sedge / peat-mosses, and lodgepole pine / water sedge / peat-mosses communities.
 - Prevention of weed invasion is especially critical for the spreading needlegrass Herbaceous Vegetation community.
- Minimize immediate loss of community area, where possible
 - Minimize loss of the *wetland* communities that support lodgepole pine by reserving them from harvest, even if beetle-killed; the trees are small and the stand open enough that the windthrow hazard will usually not be high. Do not convert these sites to productive forest.
 - Focus wildlife tree patches and deferred harvest areas on forest adjacent to occurrences of the ecological community.

- **Minimize degradation of community area adjacent to harvest areas**
 - Locate harvesting, roads, landings, and bladed trails outside a 50 – 100 m buffer around an occurrence of the community, to maintain hydrology, minimize ditch-water and dust inputs, and minimize weed invasion.
 - Avoid concentrating and/or diverting subsurface or surface water flows into or away from the community, and minimize windthrow into the community.
 - Minimize introduction of alien plant species by only using quality seed mixes that have low occurrence of weed seeds, when revegetating disturbed soil areas in the buffer.
- Determine the community types impacted by, or within 100 m, of a proposed road or harvesting.
- Provide the Conservation Data Centre (Victoria) with a map, photographs, description, and GPS coordinates for the location of any red/blue-list community that is found, so that the abundance and locations of the community can be tracked.