in one cutting. Regeneration is obtained by planting, or by natural seeding from adjacent stands and cones shed from trees cut in the logging operation (Smith 1986). In concept, clearcutting is the simplest way of harvesting and replacing mature stands. It can mimic some of the conditions created by catastrophic disturbances. These conditions are responsible for regenerating certain species, particularly shade-intolerant and exposure-tolerant species. In some instances, catastrophic or rapidly deteriorating conditions in natural stands caused by insect epidemic, disease, fire, or very heavy incidence of rots or mistletoes will dictate the use of clearcutting.

Open area dominates and edge situations are minimal in a clearcut (Daniel *et al.* 1979). Clearcutting as a technical term should not be used to refer to heavy overstory removal cuttings that release new stands already established beneath them as advance growth. These types of cuttings are more appropriately referred to as one-cut (natural) shelterwoods and/or shelterwood overstory removals. The distinction is particularly important where site exposure after true clearcutting would greatly inhibit establishment of new seedlings. On such sites, preservation of pre-established advance growth can be a distinct silvicultural advantage.

Silvicultural Objectives: Regeneration after clearcutting can be achieved by natural regeneration, planting, or a combination of both. Under appropriate conditions, natural regeneration of conifers can occur by seeding from the stand edges adjacent to clearcuts, or, in the case of lodgepole pine, by lopping and scattering of serotinous cones during harvest operations. The clearcut system can have a number of advantages. Clearcutting is an efficient means of harvesting timber and completely clearing the site for (possible) intensive site preparation and planting of nursery-grown seedlings. Planting and even-aged plantation management can allow better control over a stand's species and genetic composition than natural regeneration. Plantations can potentially allow establishment of more uniform and evenly stocked stands, provide prompt occupation of the site by trees where competing vegetation is a problem, and reduce natural regeneration delays. The disadvantages of clearcutting with planting include: high planting costs; risks of plantation failure; long-term costs of plantation maintenance (brushing, weeding, and thinning); and possible reduction of stand-level biodiversity in the absence of natural regeneration or retention of larger residual trees and organic debris.

Clearcutting methods are the simplest silvicultural systems to plan and harvest. By definition, clearcuts remove all of the original stand and advance regeneration is not specifically protected. Typically, site series, soil type, and terrain are the only determinants of logging method, desired species, stocking standards, and site preparation method. However, in extreme environments such as high-elevation sites, frost pockets, heavy snow zones, brush-prone areas, or areas with high sensitivity to mass wasting, the silvicultural benefits and costs of clearcutting systems should be assessed carefully. Because of undesirable aesthetic impacts, clearcutting should be used with discretion and in conjunction with careful planning in high-use recreational areas and highway scenic corridors. In particular, cutblock

size, shape, and orientation may need to be modified to mitigate impacts.

Refer to Tables 11 and 12 to compare clearcutting systems with other silvicultural systems.

5.1.4.2 Seed-tree methods

Background: The seed-tree method is applied with the objective of naturally regenerating even-aged stands. A limited number of the best, most thrifty and windfirm trees or tree groups from the original stand are retained (10-75 sph) to provide a seed source for natural regeneration. Species and genotype of resulting natural regeneration can be influenced by selecting seed-trees of desirable species and form. Site preparation to expose mineral seedbeds may be necessary to stimulate natural regeneration establishment and reduce established brush competition. Seed-trees may be harvested when regeneration is obtained, or they may be retained through to the next rotation in order to meet wildlife, biodiversity, aesthetic, or future increment objectives.

Silviculture Objectives: Leave windfirm co-dominant and dominant trees that have the best ability to produce seed to the site. This ensures that regeneration objectives can be met wholly or in part by natural regeneration. Identified seed-trees must be conspicuously marked-to-leave with blue paint on all sides of the tree. Leave-trees should be healthy and have at least 40% live crown ratio (J. Revel, pers. comm., 1990). A sufficient number of trees should be left on windfirm areas to provide seed to the entire area for which natural regeneration is sought. This is commonly 10-75 sph (< 10 m^2/ha). In the Prince George Forest Region, this is an appropriate system for Fd regeneration only. Bl, Hw, Cw and Sx are not consistently windfirm enough for exposure of single trees or small groups. On coarser-textured soils, or those with thin litter layers, summer logging activities may provide sufficient mineral soil exposure to stimulate Fd regeneration. On other areas, careful ground scarification (mineral soil exposure) will generally be necessary. Five to ten years will likely be required to achieve acceptable stocking of natural regeneration on seedbeds. This time frame is contingent on natural factors such as cone crop timing or vegetation competition. Conventional ground-based skidding or feller-bunchers can be used as long as root systems of leave-trees are not disturbed.

Refer to Tables 11 and 12 to compare seed-tree systems with other silvicultural systems.

5.1.4.3 Shelterwood methods

Background: Shelterwood methods are even-aged management techniques in which a stand of timber is gradually removed in a series of cuts. These cuts extend over a relatively short portion of the rotation and are intended to facilitate understory regeneration and development. Regeneration is established by natural seedfall or supplemented by under-planting, and growth occurs under the overhead or lateral shelter of an existing overstory. Preparatory shelterwood cuttings may be uniformly dispersed throughout the stand (uniform shelterwood), or they may take place as a series of edge cuttings in patches or strips

that are less than two tree heights wide (group or strip shelterwood). A portion of the stand in a group shelterwood may be reserved until later in the rotation creating a series of small, even-aged patches. In stands where an understory of acceptable natural regeneration already exists, one-cut shelterwoods, which completely remove overstory trees while protecting existing regeneration, are an option if the regeneration is tolerant of sudden exposure. Although the classical intent of a shelterwood is to eventually remove all of the overstory, modern variations may call for retention of part of the overstory in order to meet wildlife, biodiversity, aesthetic, or increment objectives.

Silviculture Objectives: For a preparatory shelterwood cut, leave at least 50% of the main tree canopy (C1 crown class) intact (75-200 sph or 10-30 m^2/ha basal area). This will help maintain windfirmness, provide protection to young advance regeneration and new seedlings, and reduce understory vegetation competition. The trees will also serve, for a number of years, as an ongoing seed supply for natural regeneration. Many of the most thrifty and windfirm trees and tree groups are retained. Species and genotype of resulting regeneration under the shelterwood can be influenced by selection of shelterwood leave-trees of desirable species and form. Identified overstory leave-trees must be marked-to-leave on all four sides of the tree with conspicuous blue paint. Shelterwood preparatory cuts involve one or several overstory partial harvests. These are designed to gradually open up the canopy, simulate regeneration establishment and vigour, and create the desired stand structure in preparation for final overstory removal and regeneration release. This process will generally be completed 5-25 years after the first cut. Careful seedbed scarification (mineral soil exposure) is necessary for Fd and Sx regeneration establishment, and desirable for prompt establishment of Bl, Hw, and Cw. Conventional ground-based skidding or feller-bunchers can be used in summer (for Fd) or winter (for Sx, Hw, Cw, and Bl). It must be ensured that root systems of leave-trees are not disturbed. In some natural stands and old partial cuts, past light disturbances or other favourable conditions have stimulated the establishment of a vigorous, well-stocked advance regeneration layer. In such stands, preparatory cuts may be unnecessary, and one-cut (natural) shelterwoods with complete overstory removal may be feasible. Careful pre-harvest skid trail layout, appropriate logging machinery (ie., small tracked skidders), skilled operators, and intensive supervision are all important factors for ensuring the protection of existing regeneration. Post-harvest sanitation thinning will be necessary to remove badly scarred and broken stems of advance regeneration, especially those of subalpine fir.

Refer to Tables 11 and 12 to compare shelterwood systems with other silvicultural systems.

5.1.4.4 Selection methods

Background: Selection methods refer to a series of planned treatments and partial harvests designed to create or maintain managed, uneven-aged stands. An uneven-aged stand contains at least three well-defined, intermingled age classes (not just size classes). In single-tree selection, the management unit of interest is the individual tree, or very small clumps of trees less than one-half of canopy tree height in width. Group

selection involves the management of discrete even-aged groups of trees. Under the group selection system, even-aged aggregations of trees in the stand are small by definition and have a width less than twice the height of the tallest trees. A single-tree selection system prescription must include regulation of cut by basal area and diameter distribution (q-value). Post-harvest maximum residual diameter of trees to be left should also be specified. Pre-harvest marking of trees to cut is strongly recommended as the means to achieve desired stand objectives. Group selection prescriptions include regulation of cut by the percentage of area harvested per stand entry. This is usually < 33%. Location of selected groups and access skid trails should be determined prior to harvest, and be designed to accommodate future volume removals. Regeneration is continuous from natural seedfall and may be supplemented by under-planting. Continuous forest cover is maintained. Variations upon the selection system can be complex and numerous. Further discussion can be found in Smith (1986), Daniel *et al.* (1979), Matthews (1989), or the Silviculture Interpretations Working Group (1992).

Silviculture Objectives: Leave as complete a distribution of age and size classes as possible while improving stand vigour and quality. A residual basal area of at least 20 to 25 m^2/ha and 50% of the pre-harvest stand basal area must be protected and retained during harvest. Maximum residual diameter and diameter distribution (specified q-value) of stems in each diameter class must be determined for the PHSP and approximated operationally. The cutting cycle, or period of years between selection harvests, should be specified. A detailed inventory of all tree size classes, vigour, and pathological condition should be conducted (as per section 5.1.2). This assists in determining stand suitability and planning tree marking. Trees to be harvested should be marked-to-cut with conspicuous red paint on all sides of the tree or, conversely, acceptable trees marked-to-leave with blue paint.

As with shelterwood systems, important factors for achieving a successful selection stand entry are: careful and knowledgeable skid road and landing layout; appropriate logging machinery (ie., small tracked skidders); skilled operators; and rigorous harvest supervision. Winter logging on a compressible snowpack of 1 m is recommended to protect small advance regeneration from damage during stand entries. Post-harvest seedbed preparation may be necessary to create mineral soil seedbeds for Fd or Sx. Post-harvest sanitation thinning will be necessary to remove badly scarred and broken residual stems, especially those of subalpine fir.

Refer to Tables 11 and 12 to compare selection systems with other silvicultural systems.

5.2 Site Preparation Keys

The keys provided in this section are intended to provide the user with a variety of site preparation treatment options based on the characteristics of the site for which treatments are prescribed. Two publications, *Mechanical Site Preparation Equipment in North Central British Columbia* (Coates and Haeussler 1987) and *Site Preparation Strategies to Manage Soil Disturbance* (Curran *et al.* 1990), were used extensively in preparing these keys. The keys are not meant to replace these documents and they should be consulted before making a final site preparation decision. Another useful reference is Chapters 11 and 12 in *Regenerating British Columbia's Forests* (Lavender *et al.* 1990). Before using the site preparation keys, site and soil information should have been collected and the site unit identified. The following steps should then be followed.

Step 1

Using Table 13, identify the appropriate soil grouping for the site unit using coarse fragment content and soil texture information previously collected.

Step 2

Using Table 14, identify the appropriate site group for the site unit you have previously identified.

Step 3

Proceed to appropriate site group key and, using site and soil information, advance step by step through the key until a site preparation code box is reached.

Step 4

Refer to site preparation code descriptions and decide which site preparation alternative best suits the site limitations and management objectives for the site.

TABLE 13. Soil grouping for all combinations of coarse fragment content and soil texture (from Curran *et al.* 1990)

Texture	Coarse Fragment Content		
	< 30%	30 - 70%	> 70%
S, LS, SL	Coarse	Very Coarse	Very Coarse
vfSL, Loam	Medium	Coarse	Very Coarse
SiL, Si	Medium	Medium	Coarse
SC, SiC, SCL	Fine	Medium	Medium
SiCL, CL, C	Fine	Medium	Medium

S = sand, sandy C = clay, clayey vfSL = very fine sandy loam
Si = silt, silty L = loam, loamy

TABLE 14. Figure and page numbers for site preparation keys

Site Series	Site Group	Figure Number	Page Number
SBSdw2/01,05 **SBSdw3/01**	SxwFd - Pinegrass	27	258
SBSmc2/01,04 **SBSmc3/01** **SBSmk1/01**	Sxw - Huckleberry	27	258
SBSdw2/07 **SBSdw3/05** **SBSmc2/03** **SBSmc3/05,06** **SBSmk1/06** **SBPSmc/03**	Pl - Pinegrass - Feathermoss and SbBl - Feathermoss	27	258
SBSdk/01 **SBSdw2/08** **SBSdw3/06,07** **SBSmc2/07** **SBSmc3/07**	Sxw - Twinberry - Step moss	26	256
SBSdk/06 **SBSmc2/05**	Sxw - Thimbleberry - Dogwood	26	256
SBSdw3/08 **SBSmc2/06,08** **SBSmk1/07**	Sxw - Oak fern - Step moss	26	256
SBSdw2/09 **SBSmc2/09** **SBSmk1/08**	Sxw - Devil's club - Oak fern	26	256
SBSdk/07,08 **SBSdw2/10** **SBSmc2/10** **SBSmc3/08** **SBSmk1/09** **SBPSmc/05**	Sxw - Horsetail	28	259
SBSdw3/09 **SBSmc2/11** **SBPSmc/06**	Sxw - Horsetail - Glow moss	28	259
ESSFmv1/01	Bl - Rhododendron - Knight's plume	29	260
ESSFmv1/04	Bl - Huckleberry	29	260
ESSFmv1/05	Bl - Horsetail - Sphagnum	28	259

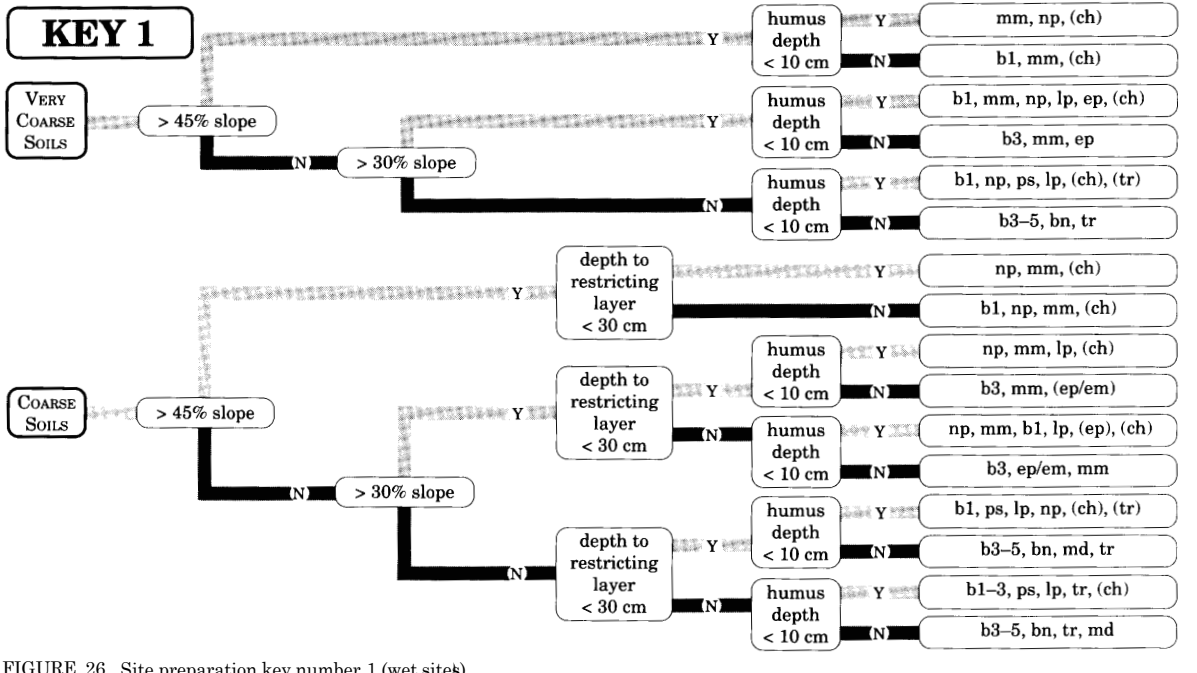
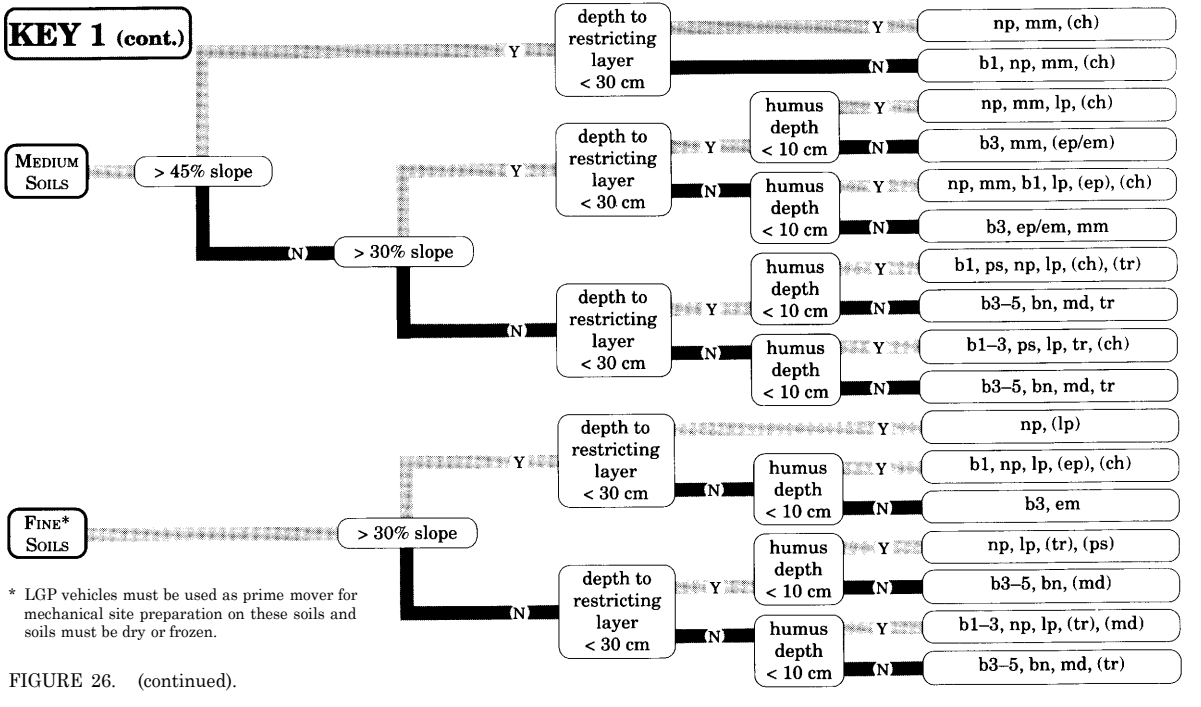
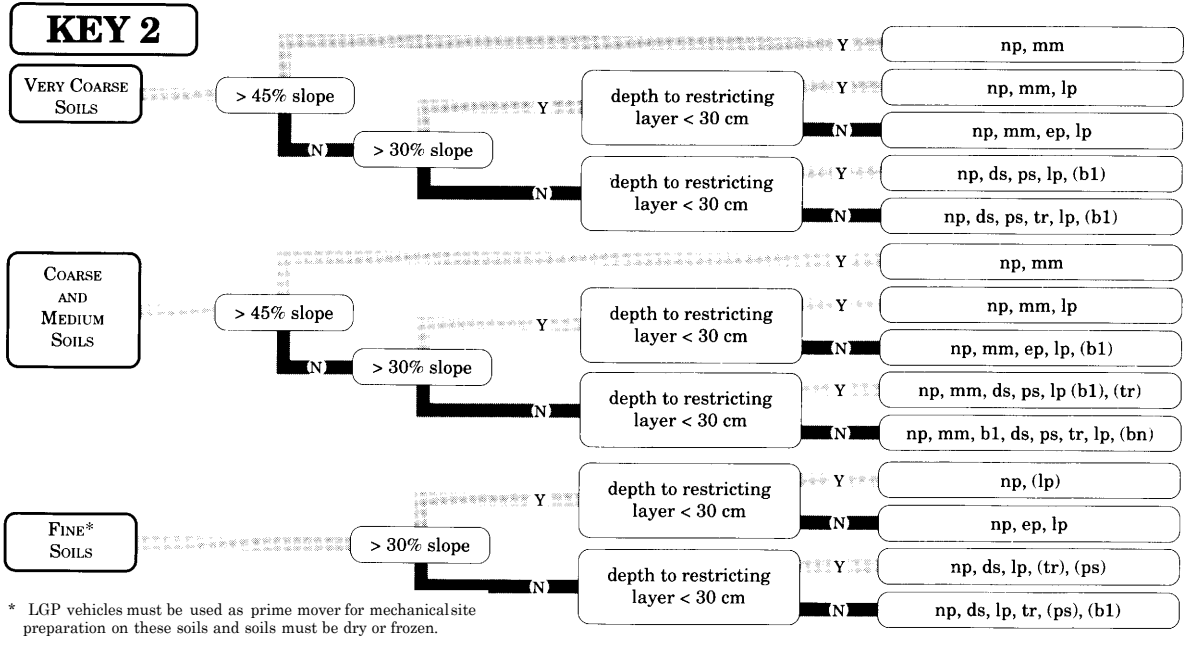


FIGURE 26. Site preparation key number 1 (wet sites).



* LGP vehicles must be used as prime mover for mechanical site preparation on these soils and soils must be dry or frozen.

FIGURE 26. (continued).



* LGP vehicles must be used as prime mover for mechanical site preparation on these soils and soils must be dry or frozen.

FIGURE 27. Site preparation key number 2 (moist sites).

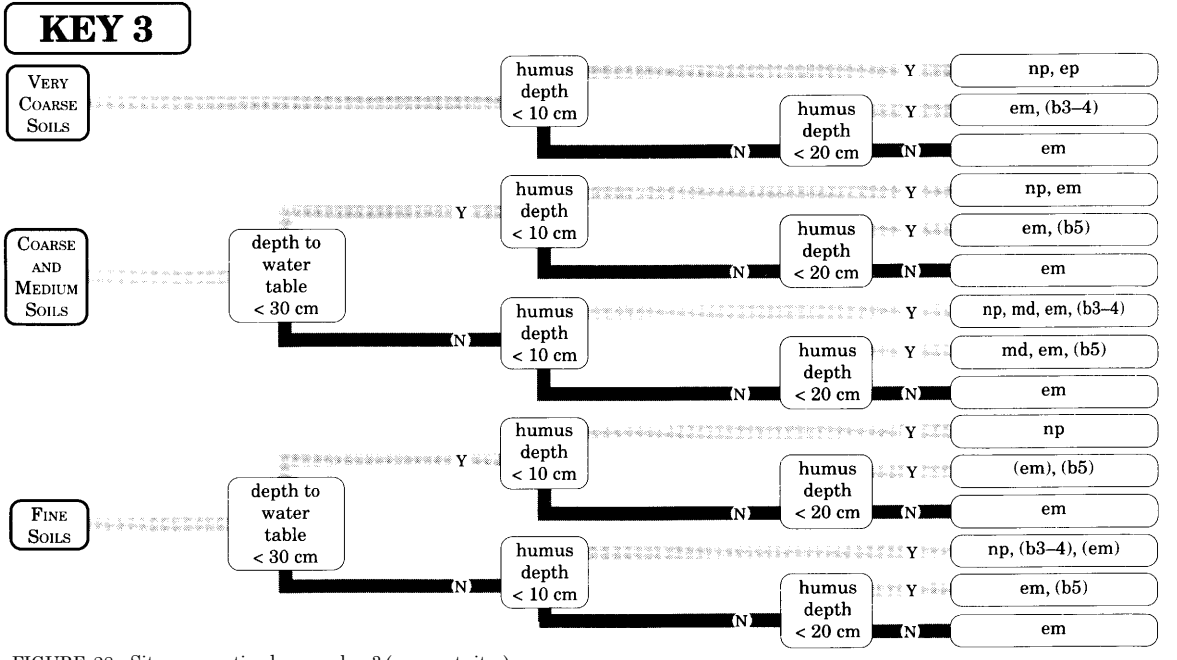
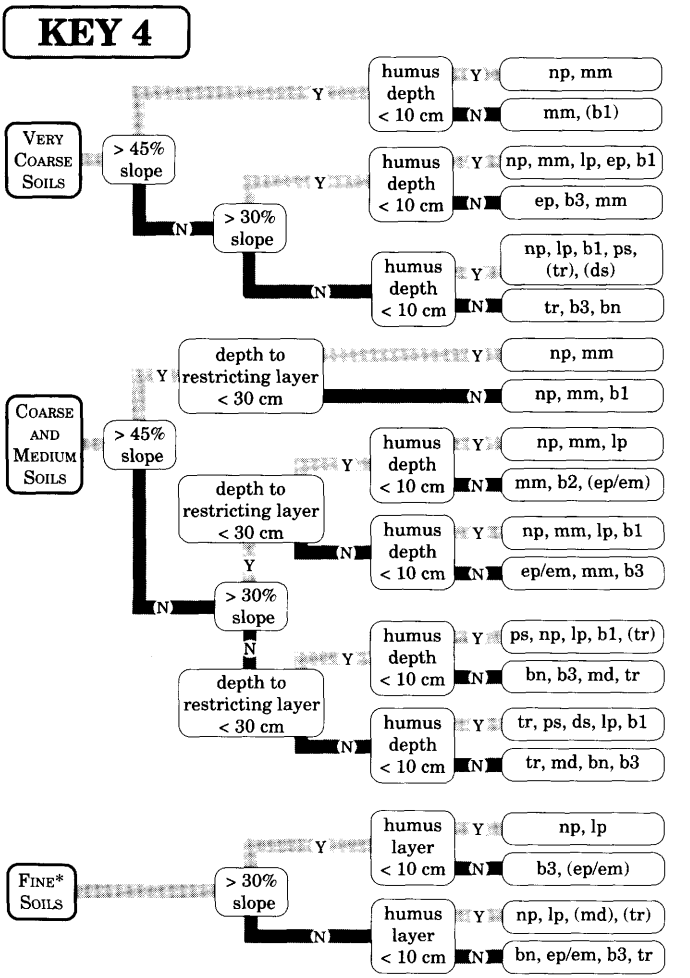


FIGURE 28. Site preparation key number 3 (very wet sites).



* LGP vehicles must be used as prime mover for mechanical site preparation on these soils and soils must be dry or frozen.

FIGURE 29. Site preparation key number 4 (high elevation sites).

SITE PREPARATION CODES

np: **No Site Preparation** - this option requires that slash reduction and alignment of slash become important components of the harvesting prescription (see Section 5.2.1). If brush hazard is high to extreme (see individual site unit interpretations), large sturdy stock should be planted in planter-prepared screefs. Areas receiving no site preparation should be monitored carefully to assess the need for brushing and weeding.

bn: **Brush Blading Normal** - this technique includes all equipment capable of blading on sites up to 30% slope. The intent of this treatment is to pile slash and remove a portion of the organic layer without removing mineral soil. Increasingly complex microtopography makes this treatment more difficult to perform. A skilled operator, small equipment, and close supervision are required for this treatment to be effective without damaging the site.

b#: **Broadcast Burning** - broadcast burning has been separated into severity classes based on Trowbridge *et al.* (1989) (see Table 15). Operational experience will be needed to meet the objectives stated in the tables. When prescribing a broadcast burn it is important to consider other units that may be included in the block to be harvested and are more sensitive to burning (eg., drier units with thinner humus layers or shallow soils). The probable impact of the treatment on these units will need to be determined. If the treatment is felt to be too severe for these other units, an attempt should be made to either exclude them from the block or guard these areas from the burn impact. Broadcast burning will generally stimulate species that regenerate from buried seed (eg., raspberry, currants, and gooseberries) or rhizomes (eg., thimbleberry). Brushing and weeding will be required if these types of species are present.

TABLE 15. Fuel consumption for different prescribed burning severities

Severity	Fuel Consumption		
		Slash (%)	
	Duff	<7 cm Diam.	>7 cm Diam.
1	moss/litter	40	15
2	1-2 cm	50	20
3	2-5 cm	60-70	30
4	5-8 cm	80	40
5	8-15 cm	90	50

ch: **Chemical or Biological** - this technique includes biological controls (eg., sheep) and any type of chemical or biological herbicide control. If prescribing this option, slash reduction and alignment of slash will become important components of the harvesting prescription (see Section 5.2.1). The Wildlife Interpretation section of this guide (Section 5.3) should be referred to when using this method so that important browse species for wildlife can be identified. Choose the treatment that best meets wildlife and site preparation objectives.

ds: **Drag Scarification** - drag scarification can be used to prepare sites for planting but is more generally used to enhance natural regeneration of lodgepole pine. It is important to include a cone survey in the prescription when implementing drag scarification for natural regeneration. A lop-and-scatter clause may also need to be included if the harvesting is to be done by feller-bunchers. On sites with moderate or higher brush hazard (see individual site unit interpretations), the site should be carefully monitored in case brushing and weeding are required.

em: **Excavator Mounding** - this option requires that slash reduction and alignment of slash become important components of the harvesting prescription (see Section 5.2.1). As slash loading increases on slopes, the productivity of the excavator decreases. Vegetation growth generally increases with amount of organic matter incorporated in the mound capping. Careful monitoring will determine if brushing and weeding are required on sites with thick organic layers.

ep: **Excavator Patch Scarification** - the intent of this treatment is to remove zero or a very limited amount of mineral soil during treatment. This option requires that slash reduction and alignment of slash become important components of the harvesting prescription (see Section 5.2.1). As slash loading increases on slopes, the productivity of the excavator decreases.

lp: **Light Piling** - this category includes any equipment capable of placing slash in piles without the use of a blade (eg., rake with retractable teeth excavator). This equipment should be capable of piling while causing very minimal disruption of the upper soil layers, including the humus. There will be minimal effect on competing vegetation and no increase in soil warming using this treatment.

md: **Mounding** - this category includes all site preparation equipment capable of producing well-distributed raised profiles of organic and/or mineral soil. On sites where heavy slash accumulations are expected, alignment of slash will become an important component of the harvesting prescription (see Section 5.2.1). Vegetation growth generally increases with amount of organic matter incorporated in the mound capping. Careful monitoring will determine if brushing and weeding are required on sites with thick organic layers. Soils that are fine and have blocky structure should not be mounded, especially on drier sites or in drier biogeoclimatic units.

mm: **Motor Manual** - this category includes brush saws and hand-held spot scarifiers. This option requires that slash reduction and alignment of slash become important components of the harvesting prescription (see

Section 5.2.1). On sites where potentially competing species are present and will be stimulated by the action of the treatment chosen (eg., thimbleberry if spot scarifying), large sturdy stock should be planted.

ps: **Patch Scarification** - this category includes all site preparation equipment capable of producing well-distributed patches of mineral soil for planting. The intent of this treatment is to remove the humus layer and a thin layer of mineral soil from the prepared patch. On sites where heavy slash accumulations are expected, alignment of slash will become an important component of the harvesting prescription (see Section 5.2.1). Patch scarification will generally stimulate species that regenerate from on-site seeding (eg., fireweed and grasses) or rhizomes (eg., thimbleberry). Brushing and weeding will be required if these types of species are present.

tr: **Trenching** - this category includes all site preparation equipment capable of producing shallow continuous trenches (eg., disc trencher). Trenches should be made by contouring the slope where slopes are > 15%. Trenching will generally stimulate species that regenerate from on-site seeding (eg., fireweed and grasses). Brushing and weeding will be required if these types of species are present. Trees should usually be planted high up on the hinge in the units covered by this guide. Trench depth should never exceed 2/3 of the effective rooting depth on the site (see Table 2).

5.2.1 Reducing slash during harvesting

Slash reduction to reduce fire and pest risks and improve planter access is often one of the reasons that site preparation is conducted. On ecologically sensitive sites, however, many site preparation techniques used to reduce slash may also damage the site. Slash can often be reduced during harvesting if the need is identified in the PHSP. There are several good references on the subject of reducing slash during harvesting. Two which should be referred to are *Treatment of Logging Residues: Alternatives to Prescribed Burning* (Hedin 1991) and *Alternatives to Prescribed Burning* (Burton 1991). Some of the techniques that can be used are slash alignment using feller-bunchers or grapples, increasing utilization, and on-site processing of residue (eg., chipping).

5.3 Wildlife Interpretations

This section is included to provide information on stand and vegetation characteristics important to key wildlife species or species groups. Section 5.3.1 contains information on important habitat characteristics for some major wildlife species. For each ecological grouping (site group) there is a table provided that lists seral stages, vegetation, and special habitat components important to the species or species groups listed. Within the tables, **bold text** indicates species or habitat attributes of particular importance, normal type indicates general concern, and bracketed species or habitat components are of lower incidence or concern. To determine which table to use refer to Table 17. Descriptions of the information found in the tables and how it might be applied are outlined in the following text.

Seral Stage(s): these are defined on the basis of several attributes that change over time, including stand age, vegetation physiognomy, stand structure, mortality/replacement relationships and stand diversity. Figure 30 offers a schematic representation of various seral stages. The wildlife tables list which seral stages are important for selected wildlife species. In certain instances where seral stage features are of critical importance (eg., old growth), retention during harvesting may be necessary. The importance, extent, and distribution of a certain ecological unit/seral stage combination within a management area (eg., watershed) will assist in determining if the unit should be deferred from harvesting. The following descriptions are intended to assist in the recognition and classification of seral stages.

SH: Shrub - Herb - this stage develops after a disturbance in which the forest canopy is completely or significantly removed (eg., after clearcut logging or a severe fire) and typically lasts up to 15 years, although it may persist much longer. The vegetation is characterized by the dominance of shrubs and herbs; young trees are also abundant, although not dominant. Establishment is the primary process; biomass increases rapidly and floristic diversity is often high.

PS: Pole - Sapling - this stage typically begins 5 to 15 years after a disturbance, when the young trees overtop the shrubby or herbaceous vegetation. It usually lasts for up to 30 years, but may persist indefinitely - as in the case of some lodgepole pine stands in the Interior. Trees at this stage are characterized by their vigorous growth and lack of dead lower branches. Stands are more or less even-aged, having been planted or established naturally within a relatively short time. Establishment remains the dominant process, with stand biomass continuing to increase. Understory biomass declines as the canopy closes in.

YF: Young Forest - this stage begins when self-thinning becomes evident. A second cycle of trees begin to show a significant presence in the ground layer by the end of this stage. Differentiation of the initial tree species into dominant, co-dominant, and suppressed layers, and self-thinning, low stand diversity, and increasing biomass through rapid height growth are characteristic of this stage. Understory development is often limited by the dense forest canopy. This stage usually starts about 30 years after a succession-initiating disturbance and lasts for up to fifty years. In open forests where self-thinning may not be evident and a second cycle of trees is lacking, this stage will be characterized more

Seral stage	Shrub-herb (SH)	Pole-sapling (PS)	Young forest (YF)	Mature forest (MF)	Old-growth (OG)
Seral plant association (common name)	$ Fireweed- Red raspberry	$PI- Thimbleberry		$PI- Western hemlock	CwHw- Oak fern
Site association	CwHw-Oakfern				

FIGURE 30. Example of forest structure associated with seral stages.

by the vigorous growth of the trees.

MF: Mature Forest - this stage extends until the initial trees mature, height growth slows, and some of the initial trees begin to die. A second cycle of trees may show a significant presence in the lower tree layers. In some cases, the first cycle of trees may begin to die from old age before significant development of a replacement layer begins; in other cases, the next cycle of trees may be well developed before significant mortality of the initial trees occurs. Generally, the even age distribution typical of early stages changes as new trees become established and older trees begin to die. Gap phase replacement may begin to be important at this stage. The understory re-develops as the canopy opens.

OG: Old-Growth - old-growth stands generally have an all-age class distribution. Growth slows and volume is lost through rot. Stands show structural heterogeneity as gaps develop in the canopy after trees fall. The understory biomass increases as light becomes available. The presence of dead wildlife trees and rotting logs scattered on the forest floor enhances the value of forests at this seral stage for wildlife. This stage often begins about 250 years after a succession-initiating disturbance.

Vegetation: this column within the tables indicates the species of vegetation important to the wildlife species listed for the site group. The species are generally listed by their scientific binomial, the first four letters indicating the genus and the second three letters indicating the species. Species presence and utilization is very important information to consider when choosing site preparation and brushing and weeding options. Information on how some vegetational species are affected by different treatments is provided in *A Preliminary Guide to the Response of Major Species of Competing Vegetation to Silvicultural Treatments* (Coates and Haeussler 1986). In certain cases (eg., *Bryoria* spp.) the species can only be retained by leaving older trees on the site.

Special Habitat Components: this column within the tables indicates which habitat components are important to the wildlife species being managed for. Many wildlife species are associated with a particular successional stage, usually the shrub - herb or the mature seral - old-growth stages. Timber management practices emphasize the pole - sapling and young forest stages, which are generally the least valuable for wildlife and have the lowest species diversity. However, management at the stand level can maintain some of the most important features of shrub - herb and old-growth forests, thereby increasing the stand's value to wildlife throughout the rotation. The habitat components included in the table are described in the following commentary.

WT: Wildlife Trees - otherwise known as snags, these are important for cavity dwellers such as woodpeckers, common and Barrow's goldeneye, marten and fisher. They also provide perching sites for owls and raptors and foraging substrates for insectivorous birds. Small wildlife trees are used only by small species; pileated woodpeckers, which excavate the larger cavities used by ducks and fisher, require wildlife trees of at least 26 cm dbh and preferably 40 cm.

CWD: Coarse Woody Debris - this includes sound and rotting logs and stumps and provides cover for small mammals and their predators. It is widely used by invertebrates and hence as a foraging substrate by

insectivorous birds. CWD provides nesting and denning sites for birds and larger mammals and can be important in courtship rituals. It provides a sheltered environment for reptiles and amphibians that cannot tolerate extremes of temperature or drought. CWD also provides subnivean access routes that are particularly important for marten. Wildlife trees and CWD have a limited lifespan, depending on their size and degree of decomposition, and isolated wildlife trees are of limited value to wildlife. A preferred option would be to leave groups of wildlife trees with some large green trees (future wildlife trees), possibly where harvesting would be difficult or uneconomical. Wildlife trees and CWD are vulnerable to destruction by prescribed fire. However, large-diameter wood is generally only charred, especially if fire is used in spring or after heavy rain when fine fuels have dried out but larger fuels have not. Although charred logs are made more durable by fire hardening, they also become less valuable to wildlife in the short term as loose bark is removed and they are made too hard to be utilized by wood-boring insects or by cavity-excavating birds.

DT: Deciduous Trees - this component is important to songbirds such as warblers, vireos and flycatchers as foraging and nesting areas. Many primary cavity nesters prefer aspen and cottonwood to conifers, probably because cavity excavation is easier. Living and dead cottonwood trees are particularly important because of their large size.

SP: Slash/Brush Piles - this structural feature provides snow interception and cover for small birds and mammals. Because this is such an important structural attribute for voles, predators such as marten, fox, coyote, and weasels will also benefit. Leaving small slash piles unburned could increase populations of voles and porcupines.

ED: Edges - these occur between vegetation types (such as mature timber - clearcut or forested wetland - mesic forest) and are important for species that utilize either area. Species using both areas often prefer the juxtaposition of habitat types. Edges also provide habitat for species that prefer the transition zone (ecotone) between them. Induced edge effects can be maximized by creating a few smaller clearcuts instead of one large one, by creating irregularly shaped clearcuts, and by extending the time between passes. Maximizing edge may be detrimental to species that require large tracts of undisturbed habitat.

SA: South Aspects - this feature, because of increased solar radiation, is associated with reduced snow accumulation. This favours species such as mule deer, which do not tolerate deep snow. These areas are among the first sites to provide spring forage.

SU: Spring Use - occurs on those sites that provide important early season foraging opportunities. As such, it is closely related to southerly aspect and early disappearance of snow cover. These areas are important for hibernating species and for those that do not tolerate deep snow.

SL: Shelter - provides thermal and hiding cover for all wildlife species. It is particularly important for big game species during hunting and calving seasons. In winter, tree canopies intercept snowfall and minimize the energy expended in movement.

OH: Open Habitats - these areas are important for production of *Cladonia* and *Cladina* lichens that constitute a critical food source for caribou in dry, pine-dominated stands.

LGS: Low-Gradient Streams - as one component of riparian habitats, these areas are extremely important for fish and wildlife. These areas provide a water source for many organisms and create a more moderate microclimate than is found in more upland forests. Streams may also function as corridors that facilitate genetic interchange, daily and seasonal movements, and range extension. Beaver prefer streams with gradients < 6%.

WE: Wetlands - these areas are found adjacent to the normal high water line around lakes, ponds, rivers, and streams. These habitats provide abundant vegetation for forage and cover, horizontal and vertical diversity, large invertebrate populations, water sources for drinking, and a more stable microclimate than the surrounding upland forests. Because of their high productivity, many wildlife species reach their highest densities in riparian habitats, especially in those adjacent to old-growth forests.

5.3.1 Habitat characteristics for species of management concern

Grizzly bear - early seral stages provide berries, especially huckleberries, soapberries, raspberries, and many others. Bears must have a variety of berry-bearing shrubs so that fruit is available throughout the summer. Protein-rich succulent herbs (horsetail, sedges, and cow parsnip) in riparian and seepage areas are particularly important in spring. Access to salmon streams is essential.

Beaver - use aspen/willow shrubs <10 cm dbh, near water; also riparian herbs in spring; preferred stream gradient is < 6%.

Red squirrel - population fluctuates with cone crop, primarily spruce; use groups of large conifers for nesting, coarse woody debris for food cache.

Coyote - use mostly early seral stages through young forest; often associated with edges/ecotones.

Gray wolf - depends on prey (beaver-sized or larger); no particular habitat requirements.

Red fox - use mostly early seral stages through young forest; often associated with edges/ecotones.

Cougar - depends on ungulate (chiefly deer) prey; no particular habitat requirements.

Lynx - dependent on snowshoe hare (found chiefly in shrubby stands or overstocked pine plantations 15-25 years old); den in blowdown in old growth.

Wolverine - dependent on ungulate carrion; no particular habitat requirements although generally prefers upland coniferous forest; does not tolerate disturbance.

River otter - aquatic and riparian; often associated with beaver activity; uses logjams, coarse woody debris, and dense riparian shrubs and herbs.

Marten - uses mature forest and old growth, most common in productive forest with large down logs; highly dependent on coarse woody debris. Wildlife trees and brush piles are also used as den sites and access routes to subnivean hunting grounds.

Fisher - uses pole - sapling and young mixed forest in summer, mature forest and old growth in winter, possibly for snow interception; requires >50% crown closure; natal dens in large tree cavities; also uses coarse woody debris, slash piles, and edges/ecotones.

Striped skunk - opportunistic omnivore; prefers open forest and forest edge.

Ermine - dependent on small mammals, chiefly voles; most common in early seral stages.

Long-tailed weasel - dependent on small mammals (chiefly voles) but also takes hares; most common in fairly early seral stages.

Least weasel - hunts mostly small voles and mice; prefers open areas, especially aspen parkland.

Mink - wetlands, riparian; dependent on emergent vegetation and riparian thickets; also uses brush piles, coarse woody debris, and logjams.

Black bear - uses wetland and seepage areas for grasses and sedges in early spring; early seral stages for berries in summer, especially raspberries, huckleberries, strawberries, and saskatoon; dens under tree roots, fallen logs, slash piles, and rock crevices.

Moose - uses wetland edges and areas of dense cover in summer; requires adequate densities of browse plants, chiefly willow and red-osier dogwood, in areas of reduced snow accumulation in winter. May move to mature or old-growth forest for protection from cold stress and in late winter for snow interception. Young aspen bark is important in spring.

Mule deer - uses old-growth coniferous forest, preferably on southerly aspects, with arboreal lichen and litterfall in winter, and dry, south-facing juniper slopes in early spring.

TABLE 16. Bird species groups considered in the wildlife tables

Species Group	Description	Representative Species
A	primary cavity-nesters, mainly in conifers.	black-backed woodpecker, three-toed woodpecker
B	primary cavity-nesters, mainly in deciduous trees or wildlife trees.	red-breasted sapsucker, northern flicker, downy woodpecker, hairy woodpecker, pileated woodpecker.
C	secondary cavity-nesters.	Barrow's goldeneye, common goldeneye, bufflehead, hooded merganser, common merganser, northern hawk owl, boreal owl, northern saw-whet owl, Vaux swift, many passerines; also bats.
D	ground-nesters near water.	eared grebe, Canada goose, green-winged teal, mallard, northern pintail, blue-winged teal, cinnamon teal, American wigeon, ring-necked duck, lesser scaup, white-winged scoter.
E	deciduous tree and thicket dwellers.	warblers, vireos, flycatchers, thrushes; other migrating passerines.
F	mature coniferous forest dwellers.	northern goshawk, red-breasted nuthatch, brown creeper, Townsend's warbler, red crossbill.

TABLE 17. Table and page numbers for wildlife tables

Site Series		Site Group	Table Number	Page Number
SBSdk				
01	Sxw - Spirea - Purple peavine	Sxw - Twinberry - Step moss	22	278
02	Pl - Juniper - Ricegrass	Pl- Cladonia	18	274
81	Saskatoon - Slender wheatgrass	not assigned yet	not assigned	not assigned
03	Pl - Feathermoss - Cladina	Pl - Kinnikinnick - Feathermoss	18	274
04	Fd - Soopolallie - Feathermoss	Fd - Pinegrass - Feathermoss	19	275
82	Bluegrass- Slender wheatgrass	not assigned yet	not assigned	not assigned
05	Sxw - Spirea - Feathermoss	Sxw - Twinberry - Step moss	22	278
06	Sxw - Twinberry - Coltsfoot	Sxw - Thimbleberry - Dogwood	22	278
07	Sxw - Horsetail	Sxw - Horsetail	23	279
08	Act - Dogwood - Prickly rose	not assigned yet	23	279
09	Sb - Creeping snowberry - Sphagnum	Sb - Sedge - Sphagnum	25	281
10	Sb - Soft-leaved sedge - Sphagnum	Sb - Sedge - Sphagnum	25	281
SBSdw2				
01	SxwFd - Pinegrass	SxwFd - Pinegrass	20	276
02	FdPl - Cladonia	FdPl - Pinegrass - Feathermoss	19	275
03	Pl - Kinnikinnick - Wavy-leaved moss	Pl - Kinnikinnick - Feathermoss	18	274
04	Fd - Pinegrass - Aster	Fd - Juniper - Pinegrass	19	275
05	SxwFd - Cat's-tail moss	SxwFd - Pinegrass	20	276
06	Pl - Pinegrass - Feathermoss	Pl - Pinegrass - Feathermoss	18	274
07	PlSb - Feathermoss	Pl - Pinegrass - Feathermoss	18	274
08	Sxw - Twinberry	Sxw - Twinberry - Step moss	22	278
09	Sxw - Devil's club - Knight's plume	Sxw - Devil's club - Oak fern	22	278
10	Sxw - Horsetail	Sxw - Horsetail	23	279
11	Sb - Soft-leaved sedge - Sphagnum	Sb - Sedge - Sphagnum	25	281
SBSdw3				
01	SxwFd - Pinegrass	SxwFd - Pinegrass	20	276
02	FdPl - Cladonia	FdPl - Pinegrass - Feathermoss	19	275

TABLE 17. (Continued)

Site Series		Site Group	Table Number	Page Number
SBSdw3 (cont.)				
03	Pl - Feathermoss - Cladina	Pl - Kinnikinnick - Feathermoss	18	274
04	SxwFd - Ricegrass	SxwFd - Feathermoss	20	276
05	PlSb - Feathermoss	Pl - Pinegrass - Feathermoss	18	274
06	Sxw - Pink spirea - Prickly rose	Sxw - Twinberry - Step moss	22	278
07	Sxw -Twinberry	Sxw - Twinberry - Step moss	22	278
08	Sxw-oak fern	Sxw - Oak fern - Step moss	22	278
09	Sxw - Horsetail - Glow moss	Sxw - Horsetail - Glow moss	23	279
10	Sb - Soft-leaved sedge - Sphagnum	Sb - Sedge - Sphagnum	25	281
SBSmc2				
01	Sxw - Huckleberry	Sxw - Huckleberry	21	277
02	Pl - Huckleberry - Cladonia	Pl - Cladonia	18	274
03	SbPl - Feathermoss	SbBl - Feathermoss	18	274
04	Sxw - Huckleberry - Dwarf blueberry	Sxw - Huckleberry	21	277
05	Sxw - Twinberry - Coltsfoot	Sxw - Thimbleberry - Dogwood	22	278
06	Sxw - Oak fern	Sxw - Oak fern - Step moss	22	278
07	Sxw - Scrub birch - Feathermoss	Sxw - Twinberry - Step moss	22	278
08	Sxw - Twinberry - Oak fern	Sxw - Oak fern - Step moss	22	278
09	Sxw - Devil's club	Sxw - Devil's club - Oak fern	22	278
10	Sxw - Horsetail	Sxw - Horsetail	23	279
11	Sxw - Horsetail - Glow moss	Sxw - Horsetail - Glow moss	23	279
12	SbSxw - Scrub birch - Sedge	Sb - Sedge - Sphagnum	25	281
SBSmc3				
01	Sxw - Huckleberry	Sxw - Huckleberry	21	277
02	Pl - Juniper - Dwarf blueberry	Pl - Kinnikinnick - Feathermoss	18	274
03	Pl - Feathermoss - Cladina	Pl - Kinnikinnick - Feathermoss	18	274
04	Sxw - Huckleberry - Soopolallie	Sxw - Huckleberry	21	277
05	Sb - Huckleberry - Spirea	SbBl - Feathermoss	18	274

TABLE 17. (Continued)

Site Series		Site Group	Table Number	Page Number
SBSmc3 (cont.)				
06	SbPl - Feathermoss	SbBl - Feathermoss	18	274
07	Sxw -Twinberry	Sxw - Twinberry - Step moss	22	278
08	Sxw - Horsetail	Sxw - Horsetail	23	279
09	SbSxw - Scrub birch - Sedge	Sb - Sedge - Sphagnum	25	281
SBSmk1				
01	Sxw - Huckleberry - Highbush-cranberry	Sxw - Huckleberry	21	277
02	Pl- Cladina - Step moss	Pl - Cladonia	18	274
03	Pl - Feathermoss - Cladina	Pl - Kinnikinnick - Feathermoss	18	274
04	SxwFd - Knight's plume	SxwFd - Feathermoss	20	276
05	SxwFd - Toad-flax	SxwFd - Feathermoss	20	276
06	Sb - Huckleberry - Spirea	SbBl - Feathermoss	18	274
07	Sxw - Oak fern	Sxw - Oak fern - Step moss	22	278
08	Sxw - Devil's club	Sxw - Devil's club - Oak fern	22	278
09	Sxw - Horsetail	Sxw - Horsetail	23	279
10	Sb - Scrub birch - Sedge	Sb - Sedge - Sphagnum	25	281
SBPSmc				
01	Pl - Feathermoss - Cladina	Pl - Kinnikinnick - Feathermoss	18	274
02	Pl - Kinnikinnick - Cladonia	Pl - Cladonia	18	274
03	SbPl - Feathermoss	Pl - Huckleberry - Cladonia	18	274
04	Sxw - Sxw birch - Feathermoss	Sxw - Twinberry - Step moss	22	278
05	Sxw - Horsetail	Sxw - Horsetail	23	279
06	Sxw - Horsetail - Glow moss	Sxw - Horsetail - Glow moss	23	279
07	SbSxw - Scrub birch - Sedge	Sb - Sedge - Sphagnum	25	281
ESSFmv1				
01	Bl - Rhododendron - Feathermoss	Bl - Rhododendron - Knight's plume	24	280
02	Pl - Huckleberry - Cladonia	Pl - Cladonia	18	274
03	Bl - Huckleberry - Feathermoss	Bl - Huckleberry	24	280
04	Bl - Huckleberry - Gooseberry	Bl - Huckleberry	24	280
05	Bl - Horsetail - Glow moss	Bl - Horsetail - Sphagnum	23	279

TABLE 18. Information for wildlife species of management concern for dry lodgepole pine site groups[a]

Species	Successional Stage[b]	Important Forage Species	Special Habitat Components[c]
(grizzly bear)	SH MF OG (PS YF)	*Shepcan Calarub Rosa aci Spir bet Rubu par*	
caribou	MF OG (YF)	*Alec* spp. *Cladina Bryo* spp. *Cladonia*	OH
(black bear)	(ALL)	grasses cambium	SU, SA, ED
coyote	ALL		SP, ED
ermine	SH (ALL)		SP, CWD
(gray wolf)	(ALL)		
lynx	SH PS YF of Pl		CWD, SP
(moose)	MF OG (SH)	*Corn sto Abie las Amel aln Epil ang Rosa* spp. *Cala rub Popu* spp. *Vacc* spp. *Pseu men Betu pap*	SL, ED, DT
(red fox)	SH PS		ED, SP
red squirrel	(PS) YF MF OG		WT, CWD
(mule deer)	SH MF OG	*Alec* spp. *Bryo* spp. *Popu tre Amel aln Sali* spp. *Betu pap*	SL, ED
voles/mice	ALL		CWD, SP
chipmunks	ALL		CWD, SP
snowshoe hare	PS YF (SH MF)		SP, CWD
(porcupine)	PS YF		SP
(Group B)	MF OG		WT, DT
(Group C)	MF OG		WT, DT
Group E	ALL	*Vibu edu Ribe* spp.	DT, CWD
Group F	ALL		DT

[a] Site groups included are: Pl - Kinnikinnick - Feathermoss, Pl - Cladonia, Pl - Huckleberry - Cladonia, Pl - Pinegrass - Feathermoss, and SbBl - Feathermoss.

[b] SH - shrub - herb, PS - pole - sapling, YF - young forest, MF - mature forest, OG - old growth.

[c] OH - open habitats, SU - spring use, SA - south aspect, ED - edges, SP - slash/brush piles, CWD - coarse woody debris, SL - shelter, DT - deciduous trees, WT - wildlife trees.

TABLE 19. Information for wildlife species of management concern for dry Douglas-fir site groups [a]

Species	Successional Stage [b]	Important Forage Species	Special Habitat Components [c]
black bear	ALL	*Cala rub Spir bet Shep can Rosa aci Abie las*	SU, SA, ED
cougar	(ALL)		
coyote	ALL		SP, ED
ermine	ALL		SP, CWD
(fisher)			CWD
(gray wolf	(ALL)		
(lynx)	PS		CWD, SP
(marten)	MF OG		CWD, WT, SP
(moose)	ALL	*Amel aln Popu tre*	SL, ED, DT
mule deer	ALL	*Rosa aci Amel aln Cala rub Oryz* spp. *Fest* spp. *Pens fru Agro spi*	SA, ED
red fox	ALL		ED, SP
red squirrel	MF OG (PS YF)		WT, CWD
voles/mice	SH OG (PS YF MF)		CWD, SP
chipmunk	ALL		CWD, SP
(snowshoe hare)	PS (YF)		SP, CWD
(porcupine)	ALL		SP
Group A	MF OG		WT, DT
Group B	MF OG		WT, DT
Group C	MF OG		WT, DT
(Group E)	(ALL)		DT, CWD
Group F	MF OG		DT

[a] Site groups included are: Fd - Pinegrass - Feathermoss, Fd -Juniper- Pinegrass, and FdPl - Pinegrass - Feathermoss.

[b] SH - shrub - herb, PS - pole - sapling, YF - young forest, MF - mature forest, OG - old growth.

[c] SU - spring use, SA - south aspect, ED - edges, SP - slash/brush piles, CWD - coarse woody debris, WT - wildlife trees, SL - shelter, DT - deciduous trees.

TABLE 20. Information for wildlife species of management concern for moist Douglas-fir site groups [a]

Species	Successional Stage[b]	Important Forage Species	Special Habitat Components[c]
grizzly bear	SH MF OG (PS YF)	*Cala rub Spir bet Rubu par Rosa aci*	
black bear	ALL	*Cala rub Spir bet Rubu par Rosa aci*	SU, SA, ED
cougar	ALL		
coyote	ALL		SP, ED
ermine	SH (ALL)		SP, CWD
gray wolf	(ALL)		
(lynx)	ALL		CWD, SP
moose	SH PS MF OG (YF)	*Corn sto Abie las Amel aln Epil ang Rosa* spp. *Popu* spp. *Acer gla*	SL, ED, DT
red fox	ALL		ED, SP
red squirrel	MF OG PS YF		WT, CWD
mule deer	SH OG PS MF (YF)	*Pseu men Acer gla Rosa aci Abie las Paxi myr*	SA, ED
voles/mice	ALL (PS YF)		CWD, SP
chipmunks	ALL (PS YF)		CWD, SP
(snowshoe hare)	PS YF (SH MF)		SP, CWD
porcupine	PS YF MF		SP
Group A	MF OG		WT, DT
Group B	MF OG		WT, DT
Group C	MF OG		WT, DT
(Group D)			CWD
Group E	ALL	*Vibu edu Ribe* spp.	DT, CWD
Group F	MF OG		DT

[a]
[b] Site groups included are: SxwFd - Pinegrass and SxwFd - Feathermoss.
SH - shrub - herb, PS - pole - sapling, YF - young forest, MF - mature forest, OG - old growth.
[c] SU - spring use, SA - south aspect, ED - edges, SP - slash/brush piles, CWD - coarse woody debris, SL - shelter, DT - deciduous trees, WT - wildlife trees.

TABLE 21. Information for wildlife species of management concern for moist hybrid white spruce site groups[a]

Species	Successional Stage[b]	Important Forage Species	Special Habitat Components[c]
grizzly bear	ALL	***Spir bet Rosa aci Shep can Rubu par Equi arv***	
(beaver)	SH PS YF	***Popu bal Sali* spp.**	**LGS, WE, DT**
black bear	ALL	***Rubu par Vacc mem Epil ang***	**SU, SA, ED**
coyote	SH PS		**SP, ED**
ermine	SH PS OG		**SP, CWD**
(fisher)	PS YF MF OG		**CWD, DT**
gray wolf	(ALL)		
lynx	SH PS (YF MF OG)		**CWD, SP**
marten	MF OG (SH)		**CWD, WT, SP, ED**
moose	**SH** PS MF OG (YF)	***Popu* spp. *Acer gla Sali* spp. *Abie las Vibu edu Sorb sit Rubu par Epil ang Corn sto Vacc* spp.**	**SL, ED, DT**
red fox	SH PS		**ED, SP**
red squirrel	PS YF MF OG		**WT, CWD**
(mule deer)	(ALL)	***Alec* spp. *Bryo* spp. *Corn sto Rosa aci Pseu men***	**SL, ED**
(wolverine)	(ALL)		
voles/mice **red-backed vole**	SH OG (PS YF MF)		**CWD, WT, SP**
snowshoe hare	**PS** YF (SH MF OG)		**SP, CWD**
porcupine	(PS YF MF)		**SP**
Group A	MF OG (YF)		**WT, DT**
Group B	OG YF MF		**WT, DT**
Group C	OG MF		**WT, DT**
(Group D)	MF OG		**CWD**
Group E	ALL	***Vacc* spp.**	**DT, CWD**
Group F	MF OG		**DT**

[a] Site group included is Sxw - Huckleberry.
[b] SH - shrub - herb, PS - pole - sapling, YF - young forest, MF - mature forest, OG - old growth.
[c] LGS - low-gradient streams, WE - wetlands, DT - deciduous trees, SU - spring use, SA - south aspect, ED - edges, SP - slash/brush piles, CWD - coarse woody debris, WT - wildlife trees, SL - shelter.

TABLE 22. Information for wildlife species of management concern for wet hybrid white spruce site groups [a]

Species	Successional Stage [b]	Important Forage Species	Special Habitat Components [c]
grizzly bear	**SH** MF OG (PS YF)	***Vacc mem Rubu* par *Epil ang Equi* spp. *Athy fil Hera lan***	
beaver	SH PS YF	***Popu tre Sali* spp.**	**LGS, WE, DT**
black bear	**SH** MF OG (PS YF)	***Rubu par Vacc mem Epil ang***	**ED**
coyote	SH		**SP, ED**
ermine	SH (ALL)		**SP, CWD**
fisher	YF MF OG (PS)		**WT, DT, CWD**
gray wolf	(ALL)		
lynx	SH PS OG (YF)		**CWD, SP**
marten	MF OG (SH)		**CWD, WT, SP, ED**
moose	**SH** PS MF OG (YF)	***Popu* spp. *Corn sto Sali* spp. *Abie Las Epil ang Ribe* spp. *Vibu edu Vacc* spp.**	**SL, ED, DT**
red fox	SH PS		**ED, SP**
red squirrel	MF OG (PS YF)		**WT, CWD**
(mule deer)	(ALL)	***Alec* spp. *Bryo* spp. *Rosa aci Abie las***	**SL, ED**
(wolverine)	(ALL)		
voles/mice red-backed vole	SH OG (PS YF MF)		**CWD, WT, SP**
snowshoe hare	**PS** SH (YF OG)		**SP, CWD**
porcupine	PS YF MF		**SP**
Group A	MF OG (YF)		**WT, DT**
Group B	OG YF MF		**WT, DT**
Group C	**OG** MF		**WT, DT**
(Group D)	MF OG		**CWD**
Group E	SH PS YF MF (OG)		**DT, CWD**
Group F	MF OG	***Vacc* spp.**	**DT**

[a] Site groups included are: Sxw - Twinberry - Step moss, Sxw - Thimbleberry - Dogwood, Sxw - Oak fern - Step moss, and Sxw - Devil's club - Oak fern.

[b] SH - shrub - herb, PS - pole - sapling, YF - young forest, MF - mature forest, OG - old growth.

[c] LGS - low-gradient streams, WE - wetlands, DT - deciduous trees, ED - edges, SP - slash/brush piles, CWD - coarse woody debris, WT - wildlife trees, SL - shelter.

TABLE 23. Information for wildlife species of management concern for very wet hybrid white spruce - subalpine fir site groups [a]

Species	Successional Stage[b]	Important Forage Species	Special Habitat Components[c]
grizzly bear	ALL	***Equi* spp. *Hera lan* *Ribe* spp. *Rosa aci* *Rubu* spp. *Gymn dry* *Athy fil***	
beaver	SH PS YF	***Sali* spp. *Popu* spp.**	**LGS, WE, DT**
black bear	ALL	***Equi* spp. *Hera lan***	**ED**
(cougar)	(ALL)		
coyote	SH PS YF		**SP, ED**
ermine	SH (ALL)		**SP, CWD**
(fisher)	PS YF MF OG		**WT, CWD, SP ED, DT**
gray wolf	(ALL)		
lynx	SH PS (OG YF)		**CWD, SP**
marten	MF OG **(SH)**		**WT, CWD, SP, ED**
moose	**SH** OG (PS YF MF)	***Sali* spp. *Equi* spp. *Corn sto* *Popu bal* *Abie las* *Urti dio* *Epil ang* *Ribe* spp. *Loni inv* *Vibu edu***	**ED, SL**
(red fox)	SH (PS YF)		**ED, SP**
red squirrel	MF OG (PS YF)		**WT, CWD**
(mule deer)	(ALL)	***Corn sto* *Sali* spp. *Ribe* spp. *Rosa aci***	**ED, SL**
voles/mice	SH OG (PS YF MF)		**CWD, WT, SP**
(snowshoe hare)	**PS** YF (SH MF OG)		**SP, CWD**
Group A	MF OG		**WT**
Group B	MF **OG**		**WT, DT**
Group C	MF **OG**		**WT, DT**
Group E	SH PS YF MF (OG)	***Vibu edu* *Ribe* spp.**	**DT**
Group F	MF OG		**DT**

[a] Site groups included are: Sxw - Horsetail, Sxw - Horsetail - Glow moss, and Bl - Horsetail - Sphagnum.

[b] SH - shrub - herb, PS - pole - sapling, YF - young forest, MF - mature forest, OG - old growth.

[c] LGS - low-gradient streams, WE - wetlands, DT - deciduous trees, ED - edges, SP - slash/brush piles, CWD - coarse woody debris, WT - wildlife trees, SL - shelter.

TABLE 24. Information for wildlife species of management concern for moist subalpine fir site groups[a]

Species	Successional Stage[b]	Important Forage Species	Special Habitat Components[c]
grizzly bear	SH MF OG (PS YF)	***Equi* spp. *Hera lan***	
(caribou)	MF OG	***Alec* spp. *Bryo* spp.**	
(black bear)	ALL	***Equi* spp. *Hera lan***	**ED**
(coyote)	SH		**SP, ED**
ermine	SH (ALL)		**SP, CWD**
gray wolf	(ALL)		
(lynx)	(ALL)		**CWD, SP**
marten	MF OG (SH)		**WT, SP, CWD, ED**
moose	SH MF OG (PS YF)	***Vacc* spp. *Samb rac* *Rubu par* *Care* spp. Forbs**	**SL, ED**
red squirrel	MF OG (PS YF)		**WT, CWD**
voles/mice red-backed vole	SH OG (PS YF MF)		**CWD, SP, WT**
(snowshoe hare)	PS YF (SH MF OG)		SP, **CWD**
(Group A)	MF OG		**WT**
(Group C)	MF OG		**WT, DT**
Group E	SH PS YF	***Vibu edu* *Ribe* spp.**	**DT**
Group F	MF OG		**DT**

[a] Site groups included are Bl - Huckleberry and Bl - Rhododendron - Knight's plume.
[b] SH - shrub - herb, PS - pole - sapling, YF - young forest, MF - mature forest, OG - old growth.
[c] ED - edges, SP - slash/brush piles, CWD - coarse woody debris, WT - wildlife trees, SL - shelter, DT - deciduous trees.

TABLE 25. Information for wildlife species of management concern for very wet black spruce site groups [a]

Species	Successional stage[b]	Important Forage Species	Special Habitat Components[c]
grizzly bear	SH MF OG (PS YF)	*Equi* spp. *Care* spp.	SU
(beaver)	SH PS YF	*Sali* spp. *Betu gla*	DT
black bear	(ALL)	*Equi* spp. *Care* spp.	SU, ED
coyote	SH		SP, ED
ermine	SH (ALL)		SP, CWD
(fisher)	PS YF MF OG		SP, WT, CWD, ED, DT
gray wolf	(ALL)		
long-tailed weasel	PS SH (ALL)		SP, ED
lynx	SH PS YF		CWD, SP
(marten)	MF OG		WT, CWD, SP
mink	(ALL)		CWD, SP
moose	ALL SH OG	*Sali* spp. *Betu gla* *Loni inv*	SL, ED, DT
(mule deer)	(ALL) SH OG		SL, ED
(red squirrel)	MF OG PS YF		WT, CWD
striped skunk	ALL		ED
(wolverine)	(ALL)		
voles/mice	(ALL) SH OG	*Loni inv* *Vibu edu*	CWD, SP
chipmunks	ALL	*Corn can*	CWD, SP
(snowshoe hare)	PS YF (SH MF OG)		SP, CWD
porcupine	(PS YF MF)		SP
(Group D)	SH YF MF OG		ED
(Group E)	ALL		DT, CWD, SP
(Group F)	MF OG		DT, WT

[a] Site group included is Sb - Sedge - Sphagnum.
[b] SH - shrub - herb, PS - pole - sapling, YF - young forest, MF - mature forest, OG - old growth.
[c] SU - spring use, DT - deciduous trees, ED - edges, SP - slash/brush piles, CWD - coarse woody debris, WT - wildlife trees, SL - shelter.

APPENDIX 1. New names for biogeoclimatic and site units in the southwest portion of the Prince George Forest Region

Old Biogeoclimatic Units and Ecosystem Associations	New Biogeoclimatic Units and Site Series
SBSd	**SBSdk**
01 Mesic Rose - Peavine - Moss	01 Sxw - Spirea - Purple peavine
02 Pine - Lichen	02 Pl -Juniper - Ricegrass
03 Pine - Lichen - Moss	03 Pl - Feathermoss - Cladina
04 Saskatoon - Wheatgrass Scrub/Steppe	81 Saskatoon - Slender wheatgrass
05 Grasslands	82 Bluegrass - Slender wheatgrass
06 Douglas-fir - Soopolallie	04 Fd - Soopolallie - Feathermoss
07 Submesic Bunchberry - Moss	05 Sxw - Spirea - Feathermoss
08 Moist Shrub - Forb	06 Sxw - Twinberry - Coltsfoot
09 Spruce - Horsetail	07 Sxw - Horsetail
10 Cottonwood Bottomland	08 Act - Dogwood - Prickly rose
11 Spruce Swamps	10 Sb - Soft-leaved sedge - Sphagnum
12 Black Spruce Bogs	09 Sb - Creeping snowberry - Sphagnum
SBSk2	**SBSdw2**
01 Prickly rose - Bunchberry	01 SxwFd - Pinegrass
02 Douglas-fir - Lichen	02 FdPl - Cladonia
03 Pine - Velvet-leaved blueberry	03 Pl - Kinnikinnick - Wavy-leaved moss
04 Douglas-fir - Pinegrass	04 Fd - Pinegrass - Aster
05 Douglas-fir - Moss	05 SxwFd - Cat's-tail moss
06 Pinegrass - Moss	06 Pl - Pinegrass - Feathermoss
07 Pine - Black spruce	07 PlSb - Feathermoss
08 Black twinberry - Coltsfoot	08 Sxw - Twinberry
09 Devil's club - Oak fern	09 Sxw - Devil's club - Knight's plume
10 Spruce - Horsetail	10 Sxw - Horsetail
11 Bog Ecosystems	11 Sb - Soft-leaved sedge - Sphagnum
SBSk3	**SBSdw3**
01 Prickly rose - Queen's cup	01 SxwFd - Pinegrass
02 Douglas-fir - Kinnikinnick	02 FdPl - Cladonia
03 Pine - Soopolallie - Moss	03 Pl - Feathermoss - Cladina
04 Wild Sarsaparilla - Prince's pine	04 SxwFd - Ricegrass
05 Pine - Black spruce	05 PlSb - Feathermoss
No previous unit	06 Sxw - Pink spirea - Prickly rose
06 Black twinberry - Coltsfoot	07 Sxw - Twinberry
07 Black twinberry - Oak fern	08 Sxw - Oak fern
08 Spruce - Horsetail	09 Sxw - Horsetail - Glow moss
09 Bogs	10 Sb - Soft-leaved sedge - Sphagnum

APPENDIX 1. (cont.)

Old Biogeoclimatic Units and Ecosystem Associations	New Biogeoclimatic Units and Site Series
SBSe1	**SBSmc2**
01 Mesic Bunchberry - Moss	01 Sxw - Huckleberry
02 Pine - Lichen	02 Pl - Huckleberry - Cladonia
03 Pine - Lichen - Moss	02 Pl - Huckleberry - Cladonia
04 Submesic Bunchberry - Moss	01 Sxw - Huckleberry
05 Pine - Black spruce	03 SbPl - Feathermoss
05 Huckleberry - Dwarf blueberry (Cariboo Region)	04 Sxw - Huckleberry - Dwarf blueberry
06 Moist Thimbleberry - Forb	05 Sxw - Twinberry - Coltsfoot
07 Oak fern	06 Sxw - Oak fern
08 Twinberry - Oak fern (Cariboo Region)	08 Sxw - Twinberry - Oak fern
08 Devil's club	09 Sxw - Devil's club
09 Horsetail Flat	10 Sxw - Horsetail
10 Moist Poor Spruce - Glow moss	07 Sxw - Scrub birch - Feathermoss
11 Horsetail - Glow moss (Cariboo Region)	11 Sxw - Horsetail - Glow moss
11 Fen and Swamp Ecosystem	12 SbSxw - Scrub birch - Sedge
SBSi	**SBSmc3**
01 Prickly rose - Coltsfoot	01 Sxw - Huckleberry
02 Pine - Juniper	02 Pl - Juniper - Dwarf blueberry
03 Pine - Soopolallie	03 Pl - Feathermoss - Cladina
04 Soopolallie - Showy aster	04 Sxw - Huckleberry - Soopolallie
05 Prickly rose - Crowberry	05 Sb - Huckleberry - Spirea
06 Black twinberry - Crowberry	06 SbPl - Feathermoss
07 Black twinberry - Trailing raspberry	07 Sxw - Twinberry
08 Spruce - Horsetail	08 Sxw - Horsetail
not described	09 SbSxw - Scrub birch - Sedge
SBSe2	**SBSmk1**
01 Bunchberry - Moss	01 Sxw - Huckleberry - Highbush-cranberry
02 Soopolallie - Lichen	02 Pl - Cladina - Step moss
03 Kinnikinnick - Feathermoss	03 Pl - Feathermoss - Cladina
04 Douglas-fir - Subalpine fir	04 SxwFd - Knight's plume
05 Ricegrass - Moss	05 SxwFd - Toad-flax
06 Pine - Black spruce	06 Sb - Huckleberry - Spirea
07 Highbush-cranberry - Oak fern	07 Sxw - Oak fern
08 Devil's club - Lady fern	08 Sxw - Devil's club

APPENDIX 1. (cont.)

Old Biogeoclimatic Units and Ecosystem Associations	New Biogeoclimatic Units and Site Series
SBSe2 (cont.)	**SBSmk1 (cont.)**
09 Spruce - Horsetail	09 Sxw - Horsetail
10 Bogs	10 Sb - Scrub birch - Sedge
SBSa2	**SBPSmc**
01 Zonal Pine - White Spruce - Moss	01 Pl - Feathermoss - Cladina
02 Pine - Lichen	02 Pl - Kinnikinnick - Cladonia
03 Submesic Pine - Lichen - Moss	01 PI - Feathermoss - Cladina
04 Pine - Black spruce - Labrador tea	03 SbPl - Feathermoss
05 Moist Poor Pine - Spruce - Glow moss	04 Sxw - Scrub birch - Feathermoss
06 Moist Rich White Spruce - Black twinberry - Feathermoss	05 Sxw - Horsetail
07 Wet White spruce - Mountain alder - Horsetail - Leafy mosses	06 Sxw - Horsetail - Glow moss
08 Black Spruce Bogs	07 SbSxw - Scrub birch - Sedge
ESSFmv1	**ESSFmv1**
01 Bl - Rhododendron - Feathermoss	same
02 Pl - Huckleberry - Cladonia	same
03 Bl - Huckleberry - Feathermoss - Blueberry	03 Bl - Huckleberry - Feathermoss
04 Bl - Huckleberry - Feathermoss - Currant	04 Bl - Huckleberry - Gooseberry
05 Bl - Horsetail - Glow moss	same

APPENDIX 2. Selected references for ecosystem description and interpretation, soils, vegetation, wildlife, and silvicultural systems for the southwest portion of the Prince George Forest Region

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