**SBSwk3/01**

**Sxw - OAK FERN**

**VEGETATION**

Tree Layer: 45% cover
- Hybrid white spruce, lodgepole pine, subalpine fir

Shrub Layer: 45% cover
- *Lonicera involucrata* (black twinberry)
- *Ribes lacustre* (black gooseberry)
- *Vaccinium membranaceum* (black huckleberry)
- *Viburnum edule* (highbush-cranberry)
- *Rubus parviflorus* (thimbleberry)
- *Sorbus scopulina* (western mountain-ash)

Herb Layer: 80% cover
- *Lonicera involucrata* (oak fern)
- *Gymnocarpium dryopteris* (five-leaved bramble)
- *Rubus pedatus* (bunchberry)
- *Cornus canadensis* (stiff clubmoss)
- *Lycopodium annotinum* (palmate coltsfoot)
- *Petasites palmatus* (twinflower)
- *Linnaea borealis* (one-sided wintergreen)
- *Orthilia secunda* (false Solomon’s-seal)
- *Smilacina racemosa* (red-stemmed feathermoss)

Moss Layer: 75% cover
- *Pleurozium schreberi* (knights plume)
- *Ptilium crista-castrensis* (step moss)
- *Hylocomium splendens* (common leafy liverwort)
- *Barbilophozia lycopodioides* (false clubmoss)

**SOIL AND SITE**

- Moisture Regime: mesic
- Nutrient Regime: medium
- Slope Gradient (%): 13 (0-35; usually less than 20)
- Slope Position: mid (lower to upper)
- Parent Material: (glacio)fluvial or morainal
- Soil Texture: usually medium to moderately coarse
- Coarse Fragments (%): 40 (13-61)
- Site Index: BI 24 (23-28)
- Pl 26 (17-32)
- Sx 27 (24-32)

**DISTRIBUTION:** common

*Gymnocarpium dryopteris*
INTERPRETATIONS

Logging: - clearcut (winter); layout and logging methods should facilitate burning

Site preparation:
Objective - reduce debris; prepare planting spots; minimize future brush competition; improve planter access; increase soil temperature

Mechanical - patch scarify; mix humus with mineral

Prescribed fire - broadcast burn* (remove L horizon)
- windrow and burn
- short burning windows will likely necessitate burning in the summer

Species choice:
Preferred - Pl, Sx
Acceptable

Brush hazard: - high (trembling aspen, thimbleberry, fireweed, black twinberry)
- brush competition will require post-planting inspections of harvested sites, particularly if sites mechanically treated; these inspections may indicate the need for control of vegetation competition
- pre-harvesting control of aspen should be done at least 2 years prior to harvest
- aspen suckering can be a serious problem on these sites

Reforestation: - vigorous stock should be planted immediately after site preparation

Concerns: - root rot (if managing for Sx)
- windthrow
SBSwk3/02

SxwFd - PURPLE PEAVINE

VEGETATION

Tree Layer: 80% cover
Douglas-fir, (hybrid white spruce)

Shrub Layer: 20% cover
Amelanchier alnifolia (saskatoon)
Spiraea betulifolia (birch-leaved spirea)
Cornus sericea (red-osier dogwood)
Ribes lacustre (black gooseberry)
Acer glabrum (Douglas maple)
subalpine fir

Herb Layer: 35% cover
Lathyrus nevadensis (purple peavine)
Aralia nudicaulis (wild sarsaparilla)
Clintonia uniflora (queen’s cup)
Thalictrum occidentale (western meadowrue)
Orthilia secunda (one-sided wintergreen)
Aster conspicuus (showy aster)
Smilacina racemosa (false Solomon’s-seal)
Goodvera oblongifolia (rattlesnake-plantain)
Disporum hookeri (Hooker’s fairybells)

Moss Layer: 30% cover
Pleurozium schreberi (red-stemmed feathermoss)
Hylocomium splendens (step moss)
Ptilium cristacastrensis (knight’s plume)

SOIL AND SITE

Amelanchier alnifolia
Nutrient Regime: poor - medium
Slope Gradient (%): 21 (2-40)
* Slope Position: upper or level
* Parent Material: morainal or colluvial
* Soil Texture: coarse
Coarse Fragments (%): 55 (50-59)
Site Index: Fd 27
Pl 23 (16-30)

DISTRIBUTION: uncommon, and usually small in size
Management objectives: - every effort should be made to not harvest these areas because they represent the northernmost extent of Douglas-fir and they represent a unique ecosystem that should be preserved for research.
**Sxw - HUCKLEBERRY - HIGHBUSH-CRANBERRY**

**VEGETATION**

Tree Layer: 40% cover
Lodgepole pine, hybrid white spruce, subalpine fir

Shrub Layer: 35% cover
- *Vaccinium membranaceum* (black huckleberry)
- *Viburnum edule* (highbush-cranberry)
- *Ribes lacustre* (black gooseberry)
- *Spiraea betulifolia* (birch-leaved spirea)
- subalpine fir

Herb Layer: 25% cover
- *Smilacina racemosa* (false Solomon's-seal)
- *Linnaea borealis* (twinflower)
- *Orthilia secunda* (one-sided wintergreen)
- *Cornus canadensis* (bunchberry)
- *Clintonia uniflora* (queen's cup)
- *Arnica cordifolia* (heart-leaved arnica)
- *Epilobium angustifolium* (fireweed)

Moss Layer: 90% cover
- *Pleurozium schreberi* (red-stemmed feathermoss)
- *Ptilium crista-castrensis* (knight's plume)
- *Hylocomium splendens* (step moss)

**SOIL AND SITE**

Moisture Regime: submesic - (mesic)
Nutrient Regime: poor - medium
Slope Gradient (%): 11 (4-20)
Slope Position: variable
Parent Material: morainal or (glacio)

* Soil Texture: coarse - (medium)
* Coarse Fragments (%): 43 (8-85; usually more than 30)

Site Index:
- BI 23 (17-28)
- PI 28 (26-31)
- SX 27 (24-29)

**DISTRIBUTION:** fairly common
INTERPRETATIONS

Logging:
- clearcut
- full tree harvesting may seriously reduce cones on a site; good cone distribution must be ensured if managing for naturals

Site preparation:
Objective: enhance natural regeneration; reduce debris; prepare planting spots; improve moisture status; improve planter access; protect thin humus forms

Mechanical:
- drag scarify*; patch scarify; disc trench

Prescribed fire:
- light broadcast burn (remove L horizon)
- avoid burning sites with a thin humus layer (less than 6 cm)

Species choice:
Preferred: Pi
Acceptable: Sx

Brush hazard:
- moderate (fireweed, trembling aspen, highbush-cranberry)
- brush competition will likely occur within 3 years of harvesting; sites should be inspected at 3 years to determine if any further treatment is required
- pre-harvesting control of aspen should be done at least 2 years prior to harvest
- aspen suckering can be a serious problem on these sites

Reforestation:
Concerns:
- drought
- windthrow
VEGETATION

Tree Layer: 15% cover
Black spruce, lodgepole pine

Shrub Layer: 45% cover
Salix spp. (willows)
Lonicera involucrata (black twinberry)
Vaccinium membranaceum (black huckleberry)
Viburnum edule (highbush cranberry)

Herb Layer: 95% cover
Equisetum arvense (common horsetail)
Rubus pubescens (trailing raspberry)
Fragaria virginiana (wild strawberry)
Elymus glaucus (blue wildrye)
Galium boreale (northern bedstraw)

Moss Layer: 15% cover
Pleurozium schreberi (red-stemmed feathermoss)
Hylocomium splendens (step moss)
Aulacomnium palustre (glow moss)

SOIL AND SITE

Moisture Regime: submesic - subhygric
Nutrient Regime: very poor - poor
* Aspect: northerly or flat
* Slope Gradient (%): usually less than 10
* Slope Position: mid to lower or level
* Parent Material: glaciofluvial
* Soil Texture: medium to coarse
Coarse Fragments (%): 0-40
Site Index: PI 20
Sx 23

COMMENTS: Often associated with compact soils.

DISTRIBUTION: rare
SB - LABRADOR TEA (SBSwk3/04)

INTERPRETATIONS

Logging:
- clearcut
- full tree harvesting may seriously reduce cones on a site; good cone distribution must be ensured if managing for naturals
- only harvest in the winter or dry part of summer

Site preparation:

Objective
- increase soil temperatures; enhance natural regeneration; reduce debris; improve planter access

Mechanical
- light drag scarify*; mix humus with mineral soil; spot mounding
- a slightly raised microsite may improve growth on areas which are subhygric

Prescribed fire
- light broadcast burn (remove L horizon)

Species choice:

Preferred
- PI

Acceptable
- -

Brush hazard:
- moderate (trembling aspen, fireweed, willows, black twinberry)
- brush competition will likely occur within 3 years of harvesting; sites should be inspected at 3 years to determine if any further treatments are required

Reforestation:

Concerns:
- compact till
- windthrow
- perched water table
- trafficability problems
- mistletoe, gall rust
**Vegetation**

**Tree Layer: 35% cover**
- Hybrid white spruce, subalpine fir, (trembling aspen)

**Shrub Layer: 25% cover**
- Lonicera involucrata (black twinberry)
- Ribes lacustre (black gooseberry)
- Viburnum edule (highbush-cranberry)
- Rubus parviflorus (thimbleberry)
- Rosa acicularis (prickly rose)
- [Cornus sericea (red-osier dogwood)]
- subalpine fir
- hybrid white spruce

**Herb Layer: 30% cover**
- Cornus canadensis (bunchberry)
- Rubus pubescens (trailing raspberry)
- Linnaea borealis (twinflower)
- Thalictrum occidentale (western meadowrue)
- Smilacina racemosa (false Solomon's-seal)
- Petasites palma tus (palmate coltsfoot)
- Mitella nuda (common mitrewort)
- Osmorhiza chilensis (sweet-cicely)
- Pyrola asarifolia (rosy wintergreen)

**Moss Layer: 85% cover**
- Pleurozium schreberi (red-stemmed feathermoss)
- Ptilium crista-castrensis (knight's plume)
- Hylocomium splendens (step moss)
- Rhytidiadelphus triquetrus (electrified cat's-tail moss)

**Soil and Site**

- Moisture Regime: (mesic) - subhygric
- Nutrient Regime: poor - medium
- Aspect: generally not northerly
- Slope Gradient (%): 15 (2-30)
- Slope Position: mid (upper to lower)
- Parent Material: glaciofluvial (and morainal)
- Soil Texture: moderately coarse to medium
- Coarse Fragments (%): 36 (24-66)
- Site Index: Bl 17 (14-24) PI 20 (14-26) Sx 27 (23-36)

**Distribution:** uncommon
Logging: - clearcut

Site preparation:

Objective - reduce debris; prepare planting spots; minimize future brush competition; improve planter access; protect thin humus forms

Mechanical - patch scarify; mix humus with mineral

Prescribed fire - broadcast burn* (remove L horizon)
- windrow and burn
- avoid burning sites with a thin humus layer (less than 6 cm)

Species choice:

Preferred - Sx, Pl
Acceptable

Brush hazard: - high (aspen, fireweed, thimbleberry, black twinberry)
- post-planting inspections of harvested sites should be carried out to determine the need for vegetation control
- pre-harvesting control of aspen should be done at least 2 years prior to harvest
- aspen suckering may be a problem on these sites

Reforestation: - vigorous stock should be planted immediately after site preparation

Concerns: - root rot (if managing for Sx)
- windthrow
SxBwk3/06

Sxw - DEVIL'S CLUB

VEGETATION

Tree Layer: 35% cover
Hybrid white spruce, subalpine fir, (lodgepole pine)

Shrub Layer: 60% cover
Oplopanax horridus (devil’s club)
Ribes lacustre (black gooseberry)
Rubus parviflorus (thimbleberry)
Viburnum edule (highbush-cranberry)
Vaccinium membranaceum (black huckleberry)
Lonicera involucrata (black twinberry)
subalpine fir

Herb Layer: 30% cover
Oplopanax horridus
Gymnocarpium dryopteris (oak fern)
Streptopus amplexifolius (clasping twistedstalk)
Actaea rubra (baneberry)
Rubus pedatus (five-leaved bramble)
Cornus canadensis (bunchberry)
Galium triflorum (sweet-scented bedstraw)
Tiarella trifoliata (three-leaved foamflower)
Dryopteris assimilis (spiny wood fern)
Lycopodium annotinum (stiff clubmoss)

Moss Layer: 65% cover
Pleurozium schreberi (red-stemmed feather moss)
Ptilium crista-castrensis (knight’s plume)
Hylocomium splendens (step moss)
[Mnium spp. (leafy mosses)]

SOIL AND SITE

Moisture Regime: (mesic) - hygric
Nutrient Regime: medium - rich
Slope Gradient (%): 26 (5-49)
* Slope Position: usually mid to lower; may be upper on north aspects
Parent Material: morainal or (glacio)fluvial
Soil Texture: variable
Coarse Fragments (%): 34 (18-66)
Site Index:
BI 26 (23-31)
Pl 25 (21-31)
Sx 28 (25-34)

DISTRIBUTION: fairly common
INTERPRETATIONS

Logging:  
- clearcut (winter); layout and logging methods should facilitate burning  
- inspect the site to determine if there is a fine textured soil, in which case the use of low ground pressure vehicles to prevent compaction is recommended

Site preparation:  
Objective  
- reduce debris; prepare planting spots; minimize future brush competition; improve planter access; increase soil temperature

Mechanical  
- patch scarify; mound*; plow  
- natural raised microsites provide the best planting spots on these sites

Prescribed fire  
- broadcast burn*  
- short burning windows will likely necessitate burning in the summer  
- a secondary treatment such as mounding may be required after burning to meet site preparation objectives

Species choice:  
Preferred  
- Sx

Acceptable  
- BI

Brush hazard:  
- very high (fireweed, thimbleberry, black twinberry)

- post-planting inspections of harvested sites should be carried out to determine the need for vegetation control

Reforestation:  
- use large vigorous planting stock

Concerns:  
- windthrow
- root rot
SBSwk3/07

Sxw - HORSE TAIL

VEGETATION

Tree Layer:  25% cover
Hybrid white spruce, (subalpine fir, black spruce)

Shrub Layer:  35% cover
- **Viburnum edule** (highbush cranberry)
- **Lonicera involucrata** (black twinberry)
- **Rosa acicularis** (prickly rose)
- **Ribes lacustre** (black gooseberry)
- **Salix** spp. (willows)
- **Rubus idaeus** (red raspberry)
- **Vaccinium membranaceum** (black huckleberry)

Herb Layer:  60% cover
- **Equisetum** spp. (arvense, sylvaticum) (horsetails)
- **Cornus canadensis** (bunchberry)
- **Petasites palmatus** (palmate coltsfoot)
- **Mitella nuda** (common mitrewort)
- **Galium boreale** (northern bedstraw)
- **Rubus pubescens** (trailing raspberry)
- **Linnaea borealis** (twinflower)
- **Rubus pedatus** (five-leaved bramble)

Moss Layer:  50% cover
- **Ptilium crista-castrensis** (knight’s plume)
- **Hylocomium splendens** (step moss)
- **Pleurozium schreberi** (red-stemmed feathermoss)
- **[Mnium** spp. (leafy mosses)]

SOIL AND SITE

- Moisture Regime:  hygric
- Nutrient Regime:  medium - rich
- Slope Gradient (%):  2 (0-5)
- Slope Position:  level or depression
- Parent Material:  fluvial or lacustrine
- Soil Texture:  coarse to fine
- Coarse Fragments (%):  variable
- Site Index:

DISTRIBUTION:  common but generally small in size
Logging:
- clearcut
- trafficability will be a problem on this site during the summer

Site preparation:
Objective
- reduce debris; prepare raised planting spots; minimize future brush competition; improve planter access; increase soil temperature

Mechanical
- mound*

Prescribed fire
- broadcast burn

Species choice:
Preferred
- Sx

Acceptable

Brush hazard:
- very high (black twinberry, fireweed, willows, bluejoint)
- post-planting inspections of harvested sites should be carried out to determine the need for vegetation control

Reforestation:
- plant after water table drops below ground level and plant on drier microsites
- use large vigorous planting stock

Concerns:
- windthrow
- root rot
- compaction
- this association is critical to the control of runoff and stream flow
- water table will likely rise above the ground surface in the spring causing seedling mortality
- herbicide use to control brush competition may conflict with fish and wildlife needs
7 THE ESSFmv3 VARIANT

ESSFmv3 Omineca ESSFmv

Soil Nutrient Regime

A B C D E
very poor poor medium rich very rich

1 xeric
2 subxeric 02
3 submesic
4 mesic 01 04
5 subhygric 05
6 hygic 06 07
7 subhydric

Site Series

01 Bl· Rhododendron - Feathermoss
02 BIPl· Crowberry - Cladina
03 BlSb· Labrador tea
04 Bl· Oak fern - Knight's plume
05 Bl· Devil's club - Rhododendron
06 Sxw· Huckleberry - Highbush-cranberry
07 Bl· Horsetail - Feathermoss

FIGURE 5. Edatopic grid displaying site series in the ESSFmv3 variant.
KEY TO SITE UNITS OF THE ESSFmv3

1a Canopy dominated by black spruce and lodgepole pine; sites level

1b Canopy dominated by lodgepole pine or Engelmann spruce, black spruce minor or absent

   2a Canopy dominated by lodgepole pine, Engelmann spruce low cover (>5% of canopy) or absent

   2b Canopy dominated by Engelmann spruce or subalpine fir, lodgepole pine low cover (5% of canopy) or absent

   3a Site level or nearly so (slope 0-5%); water table near surface; horsetails (Equisetum spp., p. 24) 12 moderately abundant (>10%)

   3b Site level or sloping; water table usually below 50 cm; horestails low cover (<2%) or absent

   4a Soils organic rather than mineral; usually lower slope; Oplopanax horridus (p. 10) lower cover (<2%) or absent

   4b Soils mineral; slope position variable; Oplopanax horridus cover variable

      5a Usually lower slope or level; Oplopanax horridus low to moderate cover (>5%)

      5b Upper to lower slope; Oplopanax horridus very low cover (<1%) or absent

      6a Mid to lower slope; Gymnocarpium dryopteris (p. 26) moderate cover (>15%)

      6b Mid to upper slope; Gymnocarpium dryopteris low cover (<1%) or absent

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12 Page numbers refer to the publication "Some Common Plants of the Sub-Boreal Spruce Zone" (Pojar et al., 1982).
**B1- RHODODENDRON - FEATHERMOSS**

**VEGETATION**

Tree Layer: 30% cover  
Engelmann spruce, subalpine fir

Shrub Layer: 45% cover  
*Vaccinium membranaceum* (black huckleberry)  
*Rhododendron albiflorum* (white-flowered rhododendron)  
*Ribes lacustre* (black gooseberry)  
*Sorbus scopulina* (western mountain-ash)  
*[Alnus viridis ssp. sinuata* (Sitka alder)]  
*[Vaccinium ovalifolium* (oval-leaved blueberry)]

Herb Layer: 25% cover  
*Cornus canadensis* (bunchberry)  
*Orthilia secunda* (one-sided wintergreen)  
*Lycopodium annotinum* (stiff clubmoss)  
*Arnica cordifolia* (heart-leaved arnica)  
*Rubus pedatus* (five-leaved bramble)  
*Linnaea borealis* (twinflower)  
*Streptopus amplexifolius* (clasping twisted stalk)

Moss Layer: 90% cover  
*Pleurozium schreberi* (red-stemmed feathermoss)  
*Ptilium crista-castrensis* (knight's plume)  
*Peltigera aphthosa*  
*Hylocomium splendens* (step moss)  
*subalpine fir*

**SOIL AND SITE**

*Rhododendron albiflorum*  
Moisture Regime: (submesic-) mesic (-subhygric)  
Nutrient Regime: medium (-rich)  
Slope Gradient (%): 26 (2-60)  
*Slope Position: (lower-) mid (-upper)  
Parent Material: usually morainal or glaciofluvial occ. colluvial

Soil Texture: variable; usually medium  
Coarse Fragments (%): 32 (3-77)  
Site Index: Se 25 (17-33)  
P1 25 (17-32)  
Bl 23 (15-33)

**DISTRIBUTION:** common and widespread

*Sorbus scopulina*
BL - RHODODENDRON - FEATHERMOSS (ESSFm3/01)

INTERPRETATIONS

Logging:  
- clearcut (winter); log on firm deep snowpack if considering use of advanced regeneration

Site preparation:

Objective  
- reduce debris; prepare planting spots; minimize future brush competition; improve planter access; increase soil temperature

Mechanical  
- patch scarify; piling
- low ground pressure vehicles should be considered if mechanical site preparation is conducted on medium- to fine-textured soils

Prescribed fire  
- broadcast burn* (remove L horizon) or windrow and burn
- short burning windows will likely necessitate burning in the summer
- beware of burning sites with humus depths less than 7 cm

Species choice:

Preferred  
- Se

Acceptable  
- Bl

Brush hazard:  
- high (white-flowered rhododendron, fireweed)
- post-planting inspections of harvested sites should be carried out to determine the need for vegetation control

Reforestation:  
- use of advanced Se and Bl regeneration less than 1 m tall should be considered if it is abundant and well distributed. Advanced regeneration greater than 1 m tall will be difficult to protect and should be removed during logging.
- plant large stock in summer
- avoid planting in depressions and frost pockets

Concerns:  
- windthrow
- heavy snowpack
- frost
- snowmold
BIPI - CROWBERRY - CLADINA

VEGETATION

Tree Layer: 25% cover
Lodgepole pine, (Engelmann spruce)

Shrub Layer: 35% cover
- Vaccinium membranaceum (black huckleberry)
- Rhododendron albiflorum (white-flowered rhododendron)
- Alnus viridis ssp. sinuata (Sitka alder)
- Subalpine fir

Herb Layer: 40% cover
- Empetrum nigrum (crowberry)
- Lycopodium ssp. (annotinum, complanatun)
- Cornus canadensis (bunchberry)
- Epilobium angustifolium (fireweed)
- Orthilia secunda (one-sided wintergreen)
- Chimaphila umbellata (prince’s pine)

Moss Layer: 75% cover
- Pleurozium schreberi (red-stemmed feathermoss)
- Polytrichum juniperinum (juniper haircap moss)
- Cladina spp.
- Cladonia spp.

SOIL AND SITE

- Moisture Regime: subxeric - submesic
- Nutrient Regime: poor
- Slope Gradient (%): 17 (8-33)
- * Slope Position: mid to upper (or level)
- Parent Material: variable
- * Soil Texture: moderately coarse to coarse
- Coarse Fragments (%): 33 (23-50)
- Site Index: PI 24 (18-31)

DISTRIBUTION: rare
Logging:  
- clearcut  
- attempt to reduce slash accumulations when logging to help meet site preparation objectives  
- full tree harvesting may seriously reduce cones on a site; good cone distribution must be ensured if managing for naturals

Site preparation:  
Objective  
- enhance natural regeneration; reduce debris; improve planter access; protect thin humus forms

Mechanical  
- light drag scarify*; mix humus with mineral soil

Prescribed fire  
- do not burn

Species choice:  
Preferred  
- PI

Acceptable

Brush hazard:  
- low

Reforestation:  
- conduct a PI cone survey. If cones are insufficient and competition is low, plant PI stock without site preparation.

Concerns:  
- drought
- heavy snowpack
- large silviculture expenditures on these sites may be difficult to justify because of their low productivity, and management must ensure that productivity is not further reduced
ESSFmv3/03

B1Sb • LABRADOR TEA

VEGETATION

Tree Layer: % cover
Lodgepole pine, black spruce

Shrub Layer: % cover
Shepherdia canadensis (soopolallie)
Ledum groenlandicum (Labrador tea)
Rhododendron albiflorum (white-flowered rhododendron)
black spruce
Engelmann spruce
subalpine fir

Herb Layer: % cover
Cornus canadensis (bunchberry)
Arnica cordifolia (heart-leaved arnica)
Linnaea borealis (twinflower)
Vaccinium vitis-idaea (lingonberry)
Vaccinium caespitosum (dwarf blueberry)
Gaultheria hispidula (creeping-snowberry)
Empetrum nigrum (crowberry)

Moss Layer: % cover
Pleurozium schreberi (red-stemmed feathermoss)
Ptilium cristat-castrensis (knight’s plume)
Hylocomium splendens (step moss)

SOIL AND SITE

Moisture Regime: submesic - subhygric
Nutrient Regime: poor
* Slope Gradient (%): 0
* Slope Position: level
* Parent Material: morainal
Soil Texture: variable
Coarse Fragments (%): 51 (24-78)
Site Index:
SI 23 (on limited data)
Sb 19 (on limited data)
Se 17 (on limited data)

COMMENTS: Seepage water may be present; rooting usually shallow.

DISTRIBUTION: rare

Ledum groenlandicum
BLSB - LABRADOR TEA (ESSFmv3/03)

INTERPRETATIONS

Logging:
- clearcut
- attempt to reduce slash accumulations when logging to help meet site preparation objectives
- full tree harvesting may seriously reduce cones on a site; good cone distribution must be ensured if managing for naturals

Site preparation:
Objective - reduce debris; prepare planting spots; minimize future brush competition; improve planter access; increase soil temperature; enhance natural regeneration; protect thin humus forms

Mechanical - drag scarify; patch scarify; piling

Prescribed fire - windrow and burn

Species choice:
Preferred - Pl
Acceptable - Sx

Brush hazard: - low to moderate (white-flowered rhododendron, fireweed)

Reforestation: - conduct a Pl cone survey. If cones are insufficient and competition low, plant Pl stock without site preparation.
- Pl may suffer snow press damage in areas of high snow accumulation

Concerns: - windthrow
- heavy snowpack
- frost
- large silviculture expenditures on these sites may be difficult to justify because of their low productivity, and management must ensure that productivity is not further reduced
BI - OAK FERN - KNIGHT'S PLUME

VEGETATION

Tree Layer: 35% cover
- Subalpine fir, Engelmann spruce

Shrub Layer: 45% cover
- Rhododendron albiflorum (white flowered rhododendron)
- Vaccinium membranaceum (black huckleberry)
- Ribes lacustre (black gooseberry)
- Vaccinium ovalifolium (oval-leaved blueberry)
- [Lonicera involucrata (black twinberry)]
- Lonicera involucrata (black twinberry)
- Gymnocarpium dryopteris (oak fern)
- Ribes pedatus (five-leaved bramble)
- Orthilia secunda (one-sided wintergreen)
- Streptopus amplexifolius (clasping twisted stalk)
- Lycopodium annotinum (stiff clubmoss)
- Cornus canadensis (bunchberry)
- Valeriana sitchensis (Sitka valerian)
- Tiarella trifoliata (three-leaved foamflower)
- Veratrum viride (Indian hellebore)

Herb Layer: 45% cover
- Gymnocarpium dryopteris (oak fern)
- Rubus pedatus (five-leaved bramble)
- Orthilia secunda (one-sided wintergreen)
- Streptopus amplexifolius (clasping twisted stalk)
- Lycopodium annotinum (stiff clubmoss)
- Cornus canadensis (bunchberry)
- Valeriana sitchensis (Sitka valerian)
- Tiarella trifoliata (three-leaved foamflower)
- Veratrum viride (Indian hellebore)

Moss Layer: 95% cover
- Pleurozium schreberi (red-stemmed feathermoss)
- Ptilium crista-castrensis (knight's plume)
- Hylocomium splendens (step moss)
- Barbilophozia lycopodioides (common leafy liverwort)
- Peltigera aphthosa

SOIL AND SITE

- Moisture Regime: mesic - subhygric
- Nutrient Regime: medium - rich
- * Slope Gradient (%): 18 (0-38)
- * Slope Position: usually mid to lower
- Parent Material: variable (often morainal)
- Soil Texture: variable
- Coarse Fragments (%): 23 (5-48)
- Site Index:
  - Se 26 (19-30)
  - PI 30 (on limited data)
  - Bl 22 (16-33)

DISTRIBUTION: fairly common
BL - OAK FERN - KNIGHT’S PLUME (ESSFmv3/04)

INTERPRETATIONS

Logging: - clearcut (winter); log on firm, deep snowpack if considering use of advanced regeneration

Site preparation:

Objective - reduce debris; prepare planting spots; minimize future brush competition; improve planter access; increase soil temperature

Mechanical - patch scarify; piling
- low ground pressure vehicles should be considered if mechanical site preparation is conducted on medium- to fine-textured soils

Prescribed fire - broadcast burn* (remove L horizon) or windrow and burn
- short burning windows will likely necessitate burning in the summer

Species choice:

Preferred - Se
Acceptable - Bl

Brush hazard: - very high (white flowered rhododendron, black twinberry, fireweed)
- post-planting inspections of harvested sites should be carried out to determine the need for vegetation control

Reforestation: - use of advanced Se and Bl regeneration less than 1 m tall should be considered if it is abundant and well distributed. Advanced regeneration greater than 1 m tall will be difficult to protect and should be removed during logging.
- plant large stock in summer
- avoid planting in depressions and frost pockets

Concerns: - windthrow
- heavy snowpack
- frost
- snowmold
ESSFmv3/05

B1 - DEVIL'S CLUB - RHODODENDRON

VEGETATION

Tree Layer: 40% cover
Engelmann spruce, subalpine fir

Shrub Layer: 30% cover
Rhododendron albiflorum (white-flowered rhododendron)
Oplopanax horridus (devil's club)
Ribes lacustre (black gooseberry)
Vaccinium membranaceum (black huckleberry)
Viburnum edule (highbush cranberry)
Alnus viridis ssp. sinuata (Sitka alder)
Sorbus scopulina, subalpine fir

Herb Layer: 50% cover
Gymnocarpium dryopteris (oak fern)
Rubus pedatus (five-leaved bramble)
Cornus canadensis (bunchberry)
Tiarella trifoliata (three-leaved foamflower)
Lycopodium annotinum (stiff clubmoss)
Streptopus amplexifolius (clasping twisted stalk)
Orthilia secunda (one-sided wintergreen)

Moss Layer: 65% cover
Pleurozium schreberi (red-stemmed feather moss)
Ptilium crista-castrensis (knight’s plume)
Hylocomium splendens (step moss)
[Mnium ssp. (leafy mosses)]

SOIL AND SITE

Oplopanax horridus
Moisture Regime: (mesic-) subhygric
Nutrient Regime: (medium-) rich
* Slope Gradient (%): 13 (0-25)
* Slope Position: (mid-) lower - level
Parent Material: morainal or glaciofluvial
* Soil Texture: variable (usually moderately fine)
* Coarse Fragments (%): 25 (16-39)
* Seepage Water: often present
Site Index:
Se 26 (24-29)
Pl 25 (on limited data)
Bl 26 (23-29)

DISTRIBUTION: uncommon

Gymnocarpium dryopteris
BL - DEVIL'S CLUB - RHODODENDRON (ESSFmv3/05)

INTERPRETATIONS

Logging: - clearcut (winter); log on firm deep snowpack if considering use of advanced regeneration

Site preparation:

Objective - reduce debris; prepare planting spots; minimize future brush competition; improve planter access; increase soil temperature

Mechanical - patch scarify; piling
- low ground pressure vehicles should be considered if mechanical site preparation is conducted

Prescribed fire - broadcast burn* (remove L horizon) or windrow and burn
- short burning windows will likely necessitate burning in the summer

Species choice:

Preferred - Se
Acceptable - Bl

Brush hazard: - very high (white-flowered rhododendron, fireweed, highbush-cranberry, Sitka alder)
- post-planting inspections of harvested sites should be carried out to determine the need for vegetation control

Reforestation: - use of advanced Se and Bl regeneration less than 1 m tall should be considered if it is abundant and well distributed. Advanced regeneration greater than 1 m tall will be difficult to protect and should be removed during logging.
- plant large stock in summer
- natural raised microsites provide the best planting spots on these sites; avoid planting in depressions and frost pockets

Concerns: - windthrow
- heavy snowpack
- frost
- snowmold
**ESSFmv3/06**

**Sxw - HUCKLEBERRY - HIGHBUSH-CRANBERRY**

**VEGETATION**

**Tree Layer:** 20% cover
- Engelmann spruce, subalpine fir

**Shrub Layer:** 30% cover
- *Ribes lacustre* (black gooseberry)
- *Viburnum edule* (black huckleberry)
- *Lonicera involucrata* (highbush-crabana)
- *Vaccinium membranaceum* (black huckleberry)
- *Alnus viridis ssp. sinuata* (Sitka alder)
- *Rosa acicularis* (prickly rose)
- *Sorbus scopulina* (western mountain-ash)

**Herb Layer:** 15% cover
- *Linnaea borealis* (twinflower)
- *Cornus canadensis* (bunchberry)
- *Rubus pubescens* (five-leaved bramble)
- *Mertensia paniculata* (tall bluebells)
- *Lycopodium annotinum* (stiff clubmoss)
- *Petasites galamatus* (palmate colt’s-foot)
- *Arnica cordifolia* (heart-leaved arnica)
- *Orthilia secunda* (one-sided wintergreen)
- *Listera cordata* (heart-leaved twayblade)

**Moss Layer:** 95% cover
- *Pleurozium schreberi* (red-stemmed feathermoss)
- *Ptilium crista-castrensis* (knight’s plume)
- *Hylocomium splendens* (step moss)
- *Barbilophozia lycopodioides* (common leafy liverwort)

**SOIL AND SITE**

- **Moisture Regime:** subhygic - hygric
- **Nutrient Regime:** (medium-) rich
- **Slope Gradient (%):** 13 (3-20)
- **Slope Position:** (mid-) lower
- **Parent Material:** organic
- **Coarse Fragments (%):** 13 (5-23)
- **Site Index:** Se 25 (20-30)
- **Pl 36** (on limited data)
- **Bl 30** (on limited data)

**DISTRIBUTION:** uncommon
INTERPRETATIONS

Logging:
- clearcut or selective log
- if age distribution allows, selective log the stand protecting the advance Se regeneration with the aid of a good snowpack
- use a designated skidroad layout

Site Preparation:
Objective
- reduce debris; prepare planting spots; minimize future brush competition; improve planter access; increase soil temperature

Mechanical
- patch scarify; piling
- low ground pressure vehicles should be considered if mechanical site preparation is conducted

Prescribed fire
- broadcast burn or windrow and burn
- short burning windows will likely necessitate burning in the summer

Species choice:
Preferred
- Se
Acceptable
- Bl

Brush hazard:
- very high (black twinberry, Sitka alder, fireweed)
- post-planting inspections of harvested sites should be carried out to determine the need for vegetation control

Reforestation:
- plant in summer
- natural raised microsites provide the best planting spots on these sites; avoid planting in depressions and frost pockets

Concerns:
- windthrow
- root rot
- herbicide use to control brush competition may conflict with wildlife needs
**Bl-HORSETAIL-FEATHERMOSS**

**VEGETATION**

Tree Layer: 20% cover  
Engelmann spruce, lodgepole pine

Shrub Layer: 35% cover  
* Ribes lacustre  (black gooseberry)
* Viburnum edule  (highbush-cranberry)
* Lonicera involucrata  (black twinberry)
* Rosa acicularis  (prickly rose)
* Alnus viridis ssp. sinuata  (Sitka alder)

Herb Layer: 80% cover  
* Equisetum spp. (arvense, sylvaticum)  (horsetails)
* Galium spp. (boreale, triflorum)  (bedstraws)
* Rubus pubescens  (trailing raspberry)
* Cornus canadensis  (bunchberry)
* Mertensia paniculata  (tall bluebells)
* Linnaea borealis  (twinflower)
* Petasites palmaus  (palmate colt’s-foot)
* Epilobium anagallidifolium  (alpine willowherb)
* Mitella nuda  (common mitrewort)

Moss Layer: 70% cover  
* Pleurozium schreberi  (red-stemmed feathermoss)
* Ptilium crista-gastraensis  (knight’s plume)
* Hylomium splendens  (step moss)

**SOIL AND SITE**

Moisture Regime: subhygric - hygric
Nutrient Regime: medium
* Slope Gradient (%): 4 (2-6)
* Slope Position: level or depression
Parent Material: variable
Soil Texture: usually coarse
Coarse Fragments (%): 30 (3-45)
* Seepage Water: generally present
Site Index: Se 24 (on limited data)
Pl 28 (on limited data)

**COMMENTS:** Water table at or near surface.

**DISTRIBUTION:** uncommon
INTERPRETATIONS

Logging:
- clearcut
- trafficability will be a problem on this site during the summer

Site preparation:
Objective - reduce debris; prepare raised planting spots; minimize future brush competition; improve planter access; increase soil temperature

Mechanical - mound

Prescribed fire - broadcast burn

Species choice:
Preferred
- Sx
Acceptable

Brush hazard:
- very high (black twinberry, Sitka alder, willows)
- post-planting inspections of harvested sites should be carried out to determine the need for vegetation control

Reforestation:
- plant after water table drops below ground level and plant on drier microsites
- use large vigorous planting stock

Concerns:
- windthrow
- root rot
- compaction
- this association is critical to the control of runoff and stream flow
- water table will likely rise above the ground surface in the spring causing seedling mortality
- herbicide use to control brush competition may conflict with fish and wildlife needs
FIGURE 6. Edatopic grid displaying site series in the BWBSdk1 variant.
SIMPLIFIED KEY TO ECOSYSTEM UNITS OF BWBSdk1

1a Canopy dominated by black spruce; lower slope to toe or depression

2a Usually organic soils; moss layer dominated by *Sphagnum* spp. (p.63)\(^{13}\)  

BWBSdk1/08

2b Usually mineral soils; moss layer dominated by feather mosses  

BWBSdk1/06

1b Black spruce, if present in canopy, with lodgepole pine; slope position variable

3a Canopy dominated by white spruce

4a Lower slope to toe, or level; *Ledum groenlandicum* (p. 9) or *Equisetum* spp. (p. 24) moderate to high cover (>5%)  

5a Level; soils fluvial; black spruce absent from canopy; *Ledum groenlandicum* absent, *Alnus incana* (p. 7) present  

BWBSdk1/07

5b Lower slope to toe; soils variable but usually not fluvial; black spruce present in canopy; *Ledum groenlandicum* present, *Alnus incana* absent  

BWBSdk1/06

4b Slope position variable; *Ledum groenlandicum* and *Equisetum* spp. low cover (<1%) or absent  

6a Mid to lower slope; fine- to medium-textured soils; poorly developed shrub and herb layers  

BWBSdk1/05

6b Slope position variable but often mid; medium- to coarse-textured soils; fairly well-developed shrub and herb layer  

BWBSdk1/01

3b Canopy dominated by lodgepole pine or lodgepole pine - black spruce

\(^{13}\) Page numbers refer to the publication "Some Common Plants of the Sub-boreal Spruce Zone" (Pojar et al. 1982).
7a Black spruce moderate to high cover (>5%) in tree or shrub layer; *Ledum groenlandicum* present and often abundant (>5% cover)

8a Mid-slope to crest or level; seepage water usually absent

8b Lower slope to toe; seepage water usually present

7b Black spruce low cover (<5%) or absent in tree or shrub layer; *Ledum groenlandicum* low cover (<1%) or absent

9a Coarse-textured fluvial soils or shallow soils over bedrock; *Viburnum edule* (p. 15) absent, *Cladina* spp. (p. 55) moderate to high cover (>5%)

9b Soils variable but never shallow over bedrock; *Viburnum edule* usually present, *Cladina* spp. low cover (<1%) or absent

10a Mid-slope to crest; soils often coarse; *Elymus innovatus* (fuzzy-spiked wild rye) often abundant (>5%)

10b Slope position variable but often mid; soils variable; *Elymus innovatus* usually low cover (<5%) or absent
VEGETATION

Tree Layer: 60% cover
  White spruce, lodgepole pine

- Shrub Layer: 50% cover
  Viburnum edule (highbush-cranberry)
  Rosa acicularis (prickly rose)
  Shepherdia canadensis (soopolallie)
  white spruce
  subalpine fir

Herb Layer: 25% cover
  Orthilia secunda (one-sided wintergreen)
  Linnaea borealis (twinflower)
  Cornus canadensis (bunchberry)
  Epilobium angustifolium (fireweed)
  Petasites palmatus (palmate coltsfoot)
  Mertensia paniculata (tall bluebells)
  Pyrola asarifolia (rosy wintergreen)

Moss Layer: 90% cover
  Pleurozium schreberi (red-stemmed feathermoss)
  Hylocomium splendens (step moss)
  Ptilium crista-castrensis (knight’s plume)
  Peltigera spp.

SOIL AND SITE

Moisture Regime: submesic - subhygric
Nutrient Regime: poor - medium (-rich)
Slope Gradient (%): 0-85, usually less than 30
Slope Position: upper - lower or level
Parent Material: variable but usually
  morainal or
  glaciofluvial

* Soil Texture: medium-coarse
  Coarse Fragments (%): 0-75
  Site Index:
  Pl 24 (16-33)
  Sw 25 (13-34)

DISTRIBUTION: very common
Logging:
- clearcut
- full tree harvesting may seriously reduce cones on a site; good cone distribution must be ensured if managing for naturals
- harvest fine-textured moraines during the dry part of summer or in winter
- trafficability may be a problem if long durations of heavy rainfall occurs

Site preparation:
Objective
- reduce debris; prepare planting spots; minimize future brush competition; improve planter access; increase soil temperature; enhance natural regeneration

Mechanical
- drag scarify*; disc trench; C & H plow; piling; mix humus with mineral

Prescribed fire
- light broadcast burn on south aspect; higher intensity burn on north aspect

Species choice:
Preferred
- Sw, Pl
Acceptable

Brush hazard:
- moderate (fireweed, highbush -cranberry, prickly rose)

Reforestation:
- conduct a Pl cone survey to determine if enough seed is present to establish a natural Pl stand. If so, drag scarify the site.
- plant Pl on south aspect, plant Sw on north aspect
- plant as soon as the frost is out of the ground

Concerns:
- aspect is one of the most important factors affecting site productivity on this ecosystem. Managers should tailor their prescriptions accordingly.
BWBSdk1/02

PI - LINGONBERRY - FEATHERMOSS

VEGETATION

Tree Layer: 20% cover
Lodgepole pine, white spruce

Shrub Layer: 20% cover
Shepherdia canadensis (soopolallie)
white spruce
subalpine fir

Herb Layer: 10% cover
Linnaea borealis (twinflower)
Vaccinium vitis-idaea (lingonberry)
Arctostaphylos uva-ursi (kinnikinnick)
Vaccinium caespitosum (dwarf blueberry)
Cornus canadensis (bunchberry)

Moss Layer: 70% cover
Cladonia spp. (red-stemmed feathermoss)
Pleurozium schreberi
Cladonia spp.
Peltigera aphthosa
Stereocaulon tomentosum
Polytrichum juniperinum (juniper haircap moss)

SOIL AND SITE

Moisture Regime: xeric - subxeric
Nutrient Regime: very poor - poor
Slope Gradient (%): 0-30
Slope Position: variable
* Parent Material: glaciofluvial or colluvium over rock
* Soil Texture: coarse - medium
Coarse Fragments (%): 30-80
Site Index: PI 19 11-26

COMMENTS:
Moss layer can be dominated by feathermoss or lichens.

DISTRIBUTION: uncommon

Vaccinium vitis-idaea
Logging:
- clearcut
- full tree harvesting may seriously reduce cones on a site; good cone distribution must be ensured if managing for naturals

Site preparation:
Objective
- enhance natural regeneration; reduce debris; prepare planting spots; improve moisture status; improve planter access

Mechanical
- drag scarify*; disc trench

Prescribed fire
- do not burn

Species choice:
Preferred
- PL
Acceptable

Brush hazard:
- low

Reforestation:
- conduct a PL cone survey to see if enough seed is present to have a natural PL stand established. If cone survey results indicate little seed then plant PL, but expect heavy mortality due to droughty conditions.

Concerns:
- severe drought period
- mistletoe
- expect stocking levels to take 10 years to achieve
- because these sites are marginal for timber production, silvicultural investment may be difficult to justify, and management must ensure that productivity is not further reduced
Sw - WILDRYE - TOAD-FLAX

VEGETATION

Tree Layer: 35% cover
  Lodgepole pine, white spruce

Shrub Layer: 30% cover
  Rosa acicularis (prickly rose)
  Viburnum edule (highbush-cranberry)
  Shepherdia canadensis (soopollie)
  white spruce

Herb Layer: 20% cover
  Linnaea borealis (twinflower)
  Cornus canadensis (bunchberry)
  Orthilia secunda (one-sided wintergreen)
  Epilobium angustifolium (fireweed)
  Elymus innovatus (fuzzy-spiked wildrye)
  Mertensia paniculata (tall bluebells)

Moss Layer: 80% cover
  Pleurozium schreberi (red-stemmed feathermoss)
  Hylocomium splendens (step moss)
  Ptilium crista-castrensis (knight’s plume)

SOIL AND SITE

  Moisture Regime: submesic - mesic
  Nutrient Regime: poor - (medium)
  * Slope Gradient (%): 5-90 usually less than 30
  * Slope Position: mid to crest or level
  Parent Material: glaciofluvial or morainal
  * Soil Texture: coarse to medium
  Coarse Fragments (%): 0-75
  Site Index:
    Pl 23 (18-31)
    Sw 21 (12-28)

DISTRIBUTION: common
SW - WILDRYE - TOAD-FLAX (BWBSdk1/03)

INTERPRETATIONS

Logging:  
- clearcut
- full tree harvesting may seriously reduce cones on a site; good cone distribution must be ensured if managing for naturals

Site preparation:  
Objective  
- enhance natural regeneration; reduce debris; prepare planting spots; improve moisture status; improve planter access

Mechanical  
- drag scarify*; disc trench

Prescribed fire  
- light broadcast burn on deeper humus

Species choice:  
Preferred  
- PI

Acceptable

Brush hazard:  
- low
- grass competition is possible

Reforestation:  
- conduct a PI cone survey to see if enough seed is present to have a natural PI stand established and to see if drag scarification is required. If cone survey results indicate little seed, then plant PI, but expect mortality due to droughty conditions.

Concerns:  
- drought
- mistletoe
Sb - LINGONBERRY - KNIGHT'S PLUME

VEGETATION

Tree Layer: 35% cover
Lodgepole pine, white spruce, black spruce

Shrub Layer: 35% cover
Ledum groenlandicum (Labrador tea)
Shepherdia canadensis (soopolallie)
black spruce

Herb Layer: 15% cover
Vaccinium vitis-idaea (lingon berry)
Cornus canadensis (bunchberry)
Linnaea borealis (twinflower)
Empetrum nigrum (crowberry)
Elymus innovatus (fuzzy-spiked wildrye)

Moss Layer: 90% cover
Pleurozium schreberi (red-stemmed feathermoss)
Hylocomium splendens (step moss)
Peltigera aphthosa
Ptiiium cristaxc castrensis (knight's plume)

SOIL AND SITE

Moisture Regime: subxeric - submesic (-mesic)
Nutrient Regime: (very poor) - poor
Slope Gradient (%): 0-45
* Aspect: usually north if sloping
* Slope Position: mid to crest or level
Parent Material: glaciofluvial or morainal
Soil Texture: medium to coarse
Coarse Fragments (%): 0-80
Site Index:
Pl 20 (16-23)
Sw 21 (18-25)

DISTRIBUTION: uncommon

Vaccinium vitis-idaea
SB - LINGONBERRY - KNIGHT’S PLUME (BWBSdk1/04)

INTERPRETATIONS

Logging:
- clearcut
- full tree harvesting may seriously reduce cones on a site; good cone distribution must be ensured if managing for naturals

Site preparation:

Objective
- enhance natural regeneration; reduce debris; prepare planting spots; improve moisture status; improve planter access

Mechanical
- drag scarify*

Prescribed fire
- do not burn

Species choice:

Preferred
- PI

Acceptable

Brush hazard:
- low

Reforestation:
- conduct a PI cone survey to see if enough seed is present to have a natural PI stand established. If cone survey results indicate little seed, then plant PI, but expect heavy mortality due to droughty conditions.

Concerns:
- drought
- mistletoe
- expect stocking levels to take 10 years to achieve
- because these sites are marginal for timber production, silvicultural investment may be difficult to justify, and management must ensure that productivity is not further reduced
**VEGETATION**

**Tree Layer:** 60% cover
- *Lodgepole pine*

**Shrub Layer:** 45% cover
- *Shepherdia canadensis* (soopolallie)
- *Rosa acicularis* (prickly rose)
- *Viburnum edule* (highbush-cranberry)
- *Lodgepole pine*

**Herb Layer:** 70% cover
- *Linnaea borealis* (twinflower)
- *Arctostaphylos uva-ursi* (kinnikinnick)
- *Geocaulon lividum* (bastard toad-flax)
- *Arnica cordifolia* (heart-leaved arnica)
- *Cornus canadensis* (bunchberry)

**Moss Layer:** 20% cover
- *Polytrichum spp.*
- *Pleurozium schreberi* (red-stemmed feathermoss)

**SOIL AND SITE**

- **Moisture Regime:** submesic (-mesic)
- **Nutrient Regime:** medium-rich
- **Slope Gradient (%):** 0-5
- **Aspect:** N/A
- **Slope Position:** level
- **Parent Material:** (glacio-) fluvial
- **Soil Texture:** medium - moderately coarse
- **Coarse Fragments (%):** variable

**DISTRIBUTION:** uncommon
SW - SOOPOLALLIE - TWINFLOWER (BWBSdk1/05)

INTERPRETATIONS

Logging:
- clearcut
- full tree harvesting may seriously reduce cones on a site; good cone distribution must be ensured if managing for naturals
- harvest fine-textured moraines during the dry part of summer or in winter
- trafficability may be a problem if long durations of heavy rainfall occurs

Site preparation:

Objective
- reduce debris; prepare planting spots; improve planter access; increase soil temperature; enhance natural regeneration

Mechanical
- drag scarify*; piling; mix humus with mineral

Prescribed fire
- light broadcast burn

Species choice:
Preferred
- Pl, (Sw)

Acceptable

Brush hazard:
- low (fireweed, highbush-cranberry, prickly rose)

Reforestation:
- conduct a Pl cone survey to determine if enough seed is present to establish a natural Pl stand.
  If so, drag scarify the site.
- plant as soon as the frost is out of the ground

Concerns:
**VEGETATION**

**Tree Layer:** 40% cover
- White spruce

**Shrub Layer:** 10% cover
- White spruce

**Herb Layer:** 7% cover
- Linnaea borealis (twinflower)
- Arctostaphylos rubra (red bearberry)
- Equisetum scirpoides (dwarf scouring-rush)
- Festuca altaica (Altai fescue)
- Empetrum nigrum (crowberry)
- [Vaccinium vitis-idaea (lingonberry)]

**Moss Layer:** 90% cover
- Hylocomium splendens (step moss)
- Peltigera spp.
- Pleurozium schreberi (red-stemmed feathermoss)

**SOIL AND SITE**

- **Moisture Regime:** subhygic
- **Nutrient Regime:** medium - rich
- **Slope Gradient (%):** 5-15
- **Slope Position:** lower to mid
- **Parent Material:** variable
- **Soil Texture:** fine to medium
- **Coarse Fragments (%):** 0-75
- **Site Index:**
  - Sw 26 (21-32)
  - Pl 26 (21-33)

**DISTRIBUTION:** uncommon
SW - SCOURING-RUSH - STEPMOSS (BWBSdk1/06)

**INTERPRETATIONS**

**Logging:**
- clearcut

**Site preparation:**

- **Objective**
  - reduce debris; prepare planting spots; minimize future brush competition; improve planter access; increase soil temperature; enhance natural regeneration

- **Mechanical**
  - patch scarify; mix humus with mineral soil

- **Prescribed fire**
  - light broadcast burn*; pile and burn

**Species choice:**

- **Preferred**
  - PI, Sw

- **Acceptable**

**Brush hazard:**

- moderate (trembling aspen, fireweed)
- brush competition will likely occur within 3 years of harvesting; sites should be inspected at 3 years to determine if any further treatment is required
- pre-harvesting hack-and-squirt should be done at least 2 years prior to harvest
- aspen suckering can be a problem on these sites

**Reforestation:**

- vigorous stock should be planted immediately after site preparation

**Concerns:**

- aspen competition
**BWBSdk1/07**

**Sb - LINGONBERRY - COLTSFOOT**

**VEGETATION**

Tree Layer: 30% cover
- Lodgepole pine, white spruce, black spruce

Shrub Layer: 30% cover
- *Ledum groenlandicum* (Labrador tea)
- *Rosa acicularis* (prickly rose)
- *Salix* spp. (willows)
- black spruce

Herb Layer: 15% cover
- *Vaccinium vitis-idaea* (lingonberry)
- *Cornus canadensis* (bunchberry)
- *Linnaea borealis* (twinflower)
- *Mertensia paniculata* (tall bluebells)
- *Equisetum scirpoides* (dwarf scouring-rush)
- *Orthilia secunda* (one-sided wintergreen)
- *Petasites palustri* (palmate coltsfoot)
- *Pyrola asarifolia* (rosy wintergreen)

Moss Layer: 95% cover
- *Hylocomium splendens* (step moss)
- *Pleurozium schreberi* (red-stemmed feathermoss)
- *Cladina* spp.
- *Peltigera aphthosa* (one-sided wintergreen)

**SOIL AND SITE**

- Moisture Regime: subhygric - hygric
- Nutrient Regime: poor - medium
- Slope Gradient (%): 0-45
- Slope Position: lower - toe, occasionally mid
- Parent Material: morainal, fluvial or organic
- Soil Texture: medium to coarse
- Coarse Fragments (%): 0-80
- Site Index: Pl 23 (22-24), Sw 20 (17-23)

**DISTRIBUTION:** uncommon

- *Ledum groenlandicum* *
- *Vaccinium vitis-idaea*
SB - LINGONBERRY - COLTSFOOT (BWBSdk1/07)

INTERPRETATIONS

**Logging:**
- clearcut
- trafficability will be a problem on these sites during the summer

**Site preparation:**
- Objective: reduce debris; prepare planting spots; minimize future brush competition; improve planter access; increase soil temperature; prepare raised planting sites
- Mechanical: plow; mound*
- Prescribed fire: broadcast burn

**Species choice:**
- Preferred: Sw
- Acceptable: Pl

**Brush hazard:**
- high (willows, prickly rose, fireweed)
- post-planting inspections of harvested sites should be carried out to determine the need for vegetation control

**Reforestation:**
- plant after water table drops below ground level and plant on drier microsites
- use large planting stock

**Concerns:**
- root rot (if managing for Sw)
- compaction
- windthrow hazard is extreme
- this association is critical to the control of runoff and stream flow
- water table on level sites will likely rise above the ground surface in the spring causing seedling mortality
- herbicide use to control brush competition may conflict with wildlife needs
**Sw - CURRANT - HORSETAIL**

**VEGETATION**

**Tree Layer:** 40% cover
- White spruce

**Shrub Layer:** 25% cover
- *Alnus incana* ssp. *tenuifolia* (mountain alder)
- *Ribes triste* (red swamp currant)
- *Rosa acicularis* (prickly rose)
- *Ribes lacustre* (black gooseberry)
- *Viburnum edule* (highbush-cranberry)
- *Viburnum edule*
- *Rosa acicularis*
- *Ribes triste* (mountain alder)

**Herb Layer:** 60% cover
- *Equisetum* spp. (pratense, arvense, horsetails)
- *Cornus canadensis* (bunchberry)
- *Linnaea borealis* (twinflower)
- *Mertensia paniculata* (tall bluebells)
- *Mitella nuda* (common mitrewort)
- *Rubus pubescens* (trailing raspberry)
- *Orthilia secunda* (one-sided wintergreen)

**Moss Layer:** 95% cover
- *Hylocomium splendens* (step moss)
- *Pleurozium schreberi* (red-stemmed feathermoss)
- *Ptilium crista-castrensis* (knight’s plume)
- *Minium* spp. (leafy mosses)

**SOIL AND SITE**

- **Moisture Regime:** subhygric - hygric
- **Nutrient Regime:** rich
- **Slope Gradient (%):** 0-3
- **Slope Position:** level or toe
- **Parent Material:** fluvial or organic
- **Soil Texture:** medium to coarse
- **Coarse Fragments (%):** 0
- **Site Index:** Sw 28 (26-31)

**DISTRIBUTION:** rare
Logging:
- clearcut
- trafficability will be a problem on these sites during the summer

Site preparation:
Objective
- reduce debris; prepare planting spots; minimize future brush competition; improve planter access; increase soil temperature; prepare raised planting sites

Mechanical
- plow; mound*

Prescribed fire
- broadcast burn

Species choice:
Preferred
- Sw

Acceptable

Brush hazard:
- very high (mountain alder, prickly rose, fireweed)
- post-planting inspections of harvested sites should be carried out to determine the need for vegetation control

Reforestation:
- plant as soon as frost is out of the ground
- use large planting stock

Concerns:
- herbicide use to control brush competition may conflict with wildlife needs
- windthrow
- root rot
- compaction
- this association is critical to the control of runoff and stream flow
- water table will likely rise above the ground surface in the spring causing seedling mortality
Sb - HORSETAIL - SPHAGNUM

VEGETATION

Tree Layer:  15% cover
  Black spruce

Shrub Layer:  70% cover
  Ledum groenlandicum
  Salix spp.
  black spruce

Herb Layer:  70% cover
  Equisetum spp. (arvense, scirpoides)
  Carex spp.
  Vaccinium spp. (vitis-idaea, oxyccocus)
  (Labrador tea)
  (willows)
  (horsetails)
  (willows)
  (horsetails)
  (lingonberry, bog cranberry)

Moss Layer:  90% cover
  Sphagnum spp.
  Hylocomium splendens
  Aulacomnium palustre
  (sphagnum mosses)
  (step moss)
  (glow moss)

SOIL AND SITE

Moisture Regime: hygric - subhydric
Nutrient Regime: poor - medium
* Slope Gradient (%): 0-12 (usually less than 5)
* Slope Position: level, toe or depression
* Parent Material: organic
  Soil Texture: fibri c or humic
  Coarse Fragments (%): 0
  Site Index: Sb 15

DISTRIBUTION: common

Sphagnum spp.
Management objectives: - non-commercial at this time
9 LITERATURE CITED


APPENDIX 1. Meso slope position diagram

a. **Crest** - the generally convex uppermost portion of a hill (meso scale); it is usually convex in all directions; no distinct aspect.
b. **Upper Slope** - the generally convex upper portion of the slope of a hill (meso scale) immediately below the crest; it has a convex surface profile with a specific aspect.
c. **Middle Slope** - the area of the slope of a hill between the upper slope and the lower slope, where the slope profile is not generally concave or convex; it has a straight or somewhat sigmoid surface profile with a specific aspect.
d. **Lower Slope** - the area toward the base of the slope of the hill. It generally has a concave surface profile with a specific aspect.
e. **Toe** - area defined by extent of homogeneous site of slight slope; clearly demarcated by an abrupt decrease in the slope (below and adjacent to the lower slope).
f. **Depression** - any area that is concave in all directions; generally at the foot of a meso scale hill or in generally level area.
g. **Level** - any level meso scale area not adjacent to a meso scale hill. The surface profile is generally horizontal with no significant aspect.
APPENDIX 2. Hand texturing field guide

Soil texture refers to the relative proportions of the sand, silt, and clay separates within a soil. These separates have their own distinctive properties of "feel", allowing one to estimate their proportions in a sample of soil by hand texturing. Texture can be estimated very roughly from a dry sample. Clayey materials are very hard, loamy and silty materials are slightly hard to soft, and sandy materials are loose grained. To be more precise, hand texturing should be done using the wet sample procedure given below.

Step 1
Obtain a small handful of soil, crush it in the hand, and remove coarse fragments (particles greater than 2 mm in diameter).

Step 2
Gradually add water to the soil and work it into a moist putty with a soil knife or fingers. The correct moisture content is important. If the putty flows with the force of gravity, then it is too wet. If it crumbles when rolled, then it is too dry. It should have the consistency of a filler putty.

Step 3
Determine stickiness of the soil putty by working it between the thumb and forefinger, pressing and then separating the fingers. An estimate of clay content can be made in this way. (Clay limits below are approximate.)

NONSTICKY: practically no soil material adheres to the thumb and forefinger (less than 10% clay).

SLIGHTLY STICKY: soil material adheres only to one of the fingers and comes off the other rather cleanly. The soil does not stretch appreciably when fingers are separated (less than 25% clay).

STICKY: soil material adheres to both fingers and stretches slightly before breaking when fingers are pulled apart (25-40% clay).

VERY STICKY: soil putty adheres strongly to both fingers and stretches distinctly before breaking (greater than 40% clay).
Step 4

Determine the grittiness of the soil putty by rubbing it between thumb and forefinger. An estimate of sand content can be made in this way. (Sand limits below are approximate.)

NONGRITTY: Little or no grit can be felt (less than 20% sand).

SLIGHTLY GRITTY: Some grit is felt but non gritty material (silt and clay) is dominant (20-50% sand).

GRITTY: Sand is felt as the dominant material. Some non gritty material can be felt between sand grains (50-80% sand).

VERY GRITTY: Sand is the only material that is felt. Little or no non gritty material present (greater than 80% sand).

Step 5

After stickiness and grittiness have been determined, the hand texturing table can be used as an approximate guide to the textural class of the soil. The textural triangle (Figure 14) can be used for a more accurate determination of the textural class.

<table>
<thead>
<tr>
<th></th>
<th>NONGRITTY (&lt;20% sand)</th>
<th>SLIGHTLY GRITTY (20-50% sand)</th>
<th>GRITTY (50-80% sand)</th>
<th>VERY GRITTY (&gt;80% sand)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VERY STICKY (&gt;40% clay)</td>
<td>SILTY CLAY</td>
<td>CLAY</td>
<td>SANDY CLAY</td>
<td>-</td>
</tr>
<tr>
<td>STICKY (25-40% clay)</td>
<td>SILTY CLAY</td>
<td>CLAY LOAM</td>
<td>SANDY CLAY</td>
<td>-</td>
</tr>
<tr>
<td>SLIGHTLY STICKY (10-25% clay)</td>
<td>SILT LOAM</td>
<td>LOAMb</td>
<td>SANDY LOAM</td>
<td>-</td>
</tr>
<tr>
<td>NON STICKY (&lt;10% clay)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>LOAMY SAND or SAND</td>
</tr>
</tbody>
</table>

a Sand and clay limits are approximate.

b A loam is a textural class exhibiting physical properties intermediate between those of sand, silt, and clay.
Soil textural triangle.
APPENDIX 3. Identification of upland humus forms

| Mors:          | matted F horizon<sup>a</sup>                                      |
|               | - common fungal mycelium (white or yellow)                        |
|               | - little or no intermixing of organic and mineral materials       |
|               | - abrupt boundary between organic and mineral horizons            |
| Moders:       | loosely arranged F horizon<sup>a</sup>                           |
|               | - friable                                                          |
|               | - insect droppings                                                |
|               | - fungal mycelium and soil organisms (arthropods and occasional earthworms) |
|               | - intermixing of organic and mineral horizons                     |
|               | - gradual transition between mineral and organic horizons         |
| Mulls:        | often no F<sup>a</sup> or H horizons (thin if present)             |
|               | - insect droppings abundant                                       |
|               | - usually many soil organisms but may form from                 |
|               | - decomposition of a dense network of roots (usually abundant earthworms) |
|               | - considerable intermixing of mineral and organic layers,        |
|               | - with incorporation of organic matter into surface mineral soil (Ah horizon) |

<sup>a</sup>F horizon: horizon in which partial (rather than entire), macroscopically recognizable vegetative structures are dominant (i.e., the horizon is partially decomposed).
APPENDIX 4. Key to the identification of potential moisture regime (part 1)  
(from Green et al. 1984)

This key was devised to aid field staff in identifying potential moisture regimes using readily observable environmental features. It should be applied with caution on ridge crests, upper slopes, and middle slopes which have soils with thick (>20 cm) organic layers. Moisture regime in these cases will generally be higher than indicated. The table below provides definitions for the categories used in the key.

<table>
<thead>
<tr>
<th>Category</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ridge crest</td>
<td>height of land; usually convex slope shape.</td>
</tr>
<tr>
<td>Upper slope</td>
<td>the generally convex shaped, upper portion of a slope.</td>
</tr>
<tr>
<td>Middle slope</td>
<td>the portion of a slope between the upper and lower slopes; the slope shape is usually straight.</td>
</tr>
<tr>
<td>Lower slope</td>
<td>the area towards the base of a slope; the slope shape is usually concave. It includes toe slopes which are generally level areas located directly below and adjacent to the lower slope.</td>
</tr>
<tr>
<td>Flat</td>
<td>any level area (excluding toe slopes); the surface shape is generally horizontal with no significant aspect.</td>
</tr>
<tr>
<td>Alluvium</td>
<td>post-glacial, active floodplain deposits along rivers and streams in valley bottoms; usually a series of low benches and channels.</td>
</tr>
<tr>
<td>Depression</td>
<td>any area that is concave in all directions; usually at the foot of a slope or in flat topography.</td>
</tr>
<tr>
<td>Soil depth</td>
<td>depth from the mineral soil surface to a restricting layer such as bedrock, strongly compacted, or strongly cemented materials (e.g. &quot;hardpan&quot;).</td>
</tr>
<tr>
<td>Gleyed</td>
<td>soils that have orange coloured mottles indicative of a fluctuating water table. Permanently gleyed soils are dull yellowish, blue, or olive in colour.</td>
</tr>
<tr>
<td>Soil particle</td>
<td>sandy\textsuperscript{a} with &gt; 35% volume of coarse fragments, or loamy\textsuperscript{a} with &gt; 70% volume of coarse fragments.</td>
</tr>
<tr>
<td>size coarse</td>
<td></td>
</tr>
<tr>
<td>Fine texture</td>
<td>silty\textsuperscript{a} or clayey\textsuperscript{a} with a low coarse fragment volume.</td>
</tr>
</tbody>
</table>

\textsuperscript{a} Sandy - LS, S; loamy - SL, L, SCL; clayey - SiCL, CL, SC, SiC, C; silty - SiL, Si.
Appendix 4. Key to the identification of potential moisture regime (part 2)
APPENDIX 5.  Key to the identification of soil nutrient regime

1a Coarse-textured
   2a Very high coarse fragments (>50%) or very shallow (<30 cm) soil.
      3a Mor humus form  Very Poor
      3b Moder humus form  Poor - Medium

2b Low or zero coarse fragments, deep soil
   4a Mor humus form  Poor
   4b Moder humus form  Medium
   4c Mull humus form  Rich - Very Rich

1b Moderately coarse- and medium-textured
   5a Very high coarse fragments (>50%); or very shallow soil (<30 cm); or
      shallow rooting depth
      6a Mor humus form  Poor
      6b Moder  Medium

5b Low or zero coarse fragments without restricted rooting depth

________________________

a The presence of base-rich parent materials (limestone, shales, basalt) may
improve the nutrient status.
7a Mor humus form

7b Moder humus form

7c Mull humus form

1c Moderately fine- and fine-textured

8a Very high coarse fragments (rare); or very shallow soil; or shallow rooting depth (<15 cm)

9a Mor humus form

9b Moder humus form

9c Mull humus form

8b Low or zero coarse fragments, with good rooting depth (>20 cm)

10a Mor humus form

10b Moder humus form

10c Mull humus form