



MINISTRY OF FORESTS SILVICULTURE SURVEY REFERENCE

The FS 660 is updated regularly.

Please make sure you are referencing the most recent version.

1. Steps to Completing Silviculture Surveys

- Office review
 - Stocking standards (e.g. MSS, MSSp, TSS, MITD, pref. & acc. species, regen delay, late free growing date)
 - Map showing standards unit (SU) boundaries
 - Treatment reports and history (e.g. harvest start date, planting date(s))
- Walk-through of each stratum
 - Strata boundaries within standards units
 - Ecological classification
 - Survey objectives, method and sampling intensity
 - Site descriptive items
 - Site index method and species
 - Inventory leading and second species
 - Basal area
 - Maximum density
 - Free growing method
 - Critical limiting factors and initial treatment recommendation
- Data gathering for each stratum
 - Sufficient to produce accurate results and inventory and silviculture labels
 - Ground Vegetation
 - Forest health factors
- Summary of each stratum
 - Mathematical analysis
 - Inventory and silviculture labels
 - Treatment recommendations
- Reporting of each stratum
 - Mapping
 - Data input to RESULTS (directly or via a corporate database)

2. Stratification

- The following changes constitute criteria for stratification:
 - standards units
 - stocking status
 - leading species
 - species composition >20%
 - crown closure >20%
 - age class (20 years or less*)
 - height class (10 m or less*)
 - site index (3 m)
 - treatment recommendations
- In the spring of 2007 strata size and distribution became specified in regulation.
 - Reserves and NP areas:0.25 hectares (mappable**)
 - SUs less than 1 ha:the entire SU

Milestone Surveys

- Post-harvest / regeneration / free growing 1 hectare
- Mappable Not Free-growing portion of an SU1 to 2 ha, max. of 5% of the SU NAR

* These are MoF inventory minimums. Licensees may choose a lower threshold.

**Mappable is defined as a polygon greater than 20 m throughout its length. Areas that do not meet the stocking obligations less than 20 m from the nearest NSR or NFG area are considered contiguous units.

3. Natural Resource Region and District Codes

COAST AREA		NORTH AREA		SOUTH AREA	
South Coast Region	RSC	Northeast Region	RNO	Cariboo Region	RCB
Sunshine Coast District	DSC	Fort Nelson District	DFN	100 Mile House District	DMH
Chilliwack District	DCK	Peace District	DPC	Quesnel District	DQU
Sea to Sky District	DSQ	Omenica Region	ROM	Cariboo-Chilcotin District	DCC
West Coast Region	RWC	Mackenzie District	DMK	Kootenay/Boundary Region	RKB
Haida Gwaii District	DQC	Stuart Nechako District	DSN	Rocky Mountain District	DRM
South Island District	DSI	Prince George District	DPG	Selkirk District	DSE
Campbell River District	DCR	Skeena Region	RSK	Thompson/Okanagan Region	RTO
North Island-Central Coast District	DNI	Nadina District	DND	Okanagan/Shuswap District	DOS
		Coast Mountains District	DKM	Thompson Rivers District	DKA
		Skeena-Stikine District	DSS	Cascades District	DCS

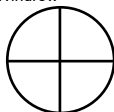
4. History Symbol

Stand Tending

F	Fertilization
H	Hack & squirt
J	Juvenile spacing
M	Mistletoe control
P	Pruning
R	Conifer release
S	Sanitation spacing
T	Commercial thinning
W	Brushing & weeding

Site Preparation

B	Broadcast burn
C	Chemical
G	Grass seeded
H	Hand preparation
RB	Range management burn
S	Spot burn
M	Mechanical
MS	Mechanical and spot burn
W	Windrow



Regeneration

P	Planting (full, most common)
PL	Plant
FP	Fill plant
RP	Replant
N	Natural

Disturbance

B	Wildfire
D	Disease
F	Flooding
I	Insect
K	Flume Kill
L	Logging
L%	Logging (10% increments)
R	Site rehabilitation
S	Slide
W	Windthrow

Add the last two digits of the year to the right of the history code.

For treatments completed in multiple years add a comma between the years.

For treatments roughly continuous over multiple years add a dash between the years.

5. Stocking and plot factors

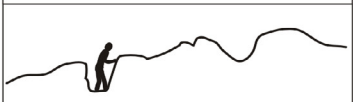
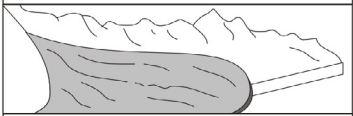
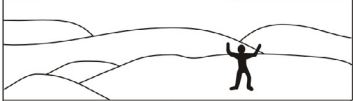
Trees/ha	Plot Radius (m)							Triangular spacing inter-tree distance ^a (m)
	1.78	2.52	2.82	3.99	5.64	7.98	11.28	
	Plot Area (m ²)							
	10	20	25	50	100	200	400	
	Plot Multiplier							
	1000	500	400	200	100	50	25	
	Trees Per Plot							
2500	2.5	5	6.25	12.5	25	50	125	2.15
2400	2.4	4.8	6	12	24	48	120	2.19
2300	2.3	4.6	5.75	11.5	23	46	115	2.24
2200	2.2	4.4	5.5	11	22	44	110	2.29
2100	2.1	4.2	5.25	10.5	21	42	105	2.34
2000	2.0	4	5	10	20	40	100	2.40
1900	1.9	3.8	4.75	9.5	19	38	95	2.47
1800	1.8	3.6	4.5	9	18	36	90	2.53
1700	1.7	3.4	4.25	8.5	17	34	85	2.61
1600	1.6	3.2	4	8	16	32	80	2.69
1500	1.5	3	3.75	7.5	15	30	75	2.77
1400	1.4	2.8	3.5	7	14	28	70	2.87
1300	1.3	2.6	3.25	6.5	13	26	65	2.98
1200	1.2	2.4	3	6	12	24	60	3.10
1100	1.1	2.2	2.75	5.5	11	22	55	3.24
1000	1.0	2	2.5	5	10	20	50	3.40
900	0.9	1.8	2.25	4.5	9	18	45	3.58
800	0.8	1.6	2	4	8	16	40	3.80
700	0.7	1.4	1.75	3.5	7	14	35	4.06
600	0.6	1.2	1.5	3	6	12	30	4.39
500	0.5	1.0	1.25	2.5	5	10	25	4.81
400	0.4	0.8	1	2	4	8	20	5.37
300	0.3	0.6	0.75	1.5	3	6	15	6.20
200	0.2	0.4	0.5	1	2	4	10	7.60
100	0.1	0.2	0.25	0.5	1	2	5	10.74

^a Inter-tree distance = $\sqrt{\frac{11\,547}{\text{trees/ha}}}$

6. RESULTS consistent tree species abbreviations

Common name of genus/species	Scientific name of genus/species	Species symbol
Poplar	<i>Populus balsamifera</i>	Ac
Balsam poplar	<i>Populus balsamifera</i> ssp. <i>balsamifera</i>	Acb
Black cottonwood	<i>Populus balsamifera</i> ssp. <i>trichocarpa</i>	Act
Aspen	<i>Populus tremuloides</i>	At
Poplar hybrid	<i>Populus</i> spp.	Ax
Amabilis fir	<i>Abies amabilis</i>	Ba
Balsam fir	<i>Abies balsamifera</i>	Bb
Grand fir	<i>Abies grandis</i>	Bg
Subalpine fir	<i>Abies lasiocarpa</i>	Bl
Noble fir	<i>Abies procera</i>	Bp
Western redcedar	<i>Thuja plicata</i>	Cw
Red alder	<i>Alnus rubra</i>	Dr
Alaska paper birch	<i>Betula neoalaskana</i>	Ea
Common paper birch	<i>Betula papyrifera</i>	Ep
Douglas-fir (coastal)	<i>Pseudotsuga menziesii</i> var. <i>menziesii</i>	Fdc
Douglas-fir (interior)	<i>Pseudotsuga menziesii</i> var. <i>glauca</i>	Fdi
Mountain hemlock	<i>Tsuga mertensiana</i>	Hm
Western hemlock	<i>Tsuga heterophylla</i>	Hw
Alpine larch	<i>Larix lyallii</i>	La
Siberian larch	<i>Larix sibirica</i>	Ls
Tamarack	<i>Larix laricina</i>	Lt
Western larch	<i>Larix occidentalis</i>	Lw
Bigleaf maple	<i>Acer macrophyllum</i>	Mb
Whitebark pine	<i>Pinus albicaulis</i>	Pa
Limber pine	<i>Pinus flexilis</i>	Pf
Jack pine	<i>Pinus banksiana</i>	Pj
Lodgepole pine (coastal)	<i>Pinus contorta</i> var. <i>contorta</i>	Plc
Lodgepole pine (interior)	<i>Pinus contorta</i> var. <i>latifolia</i>	Pli
Red pine	<i>Pinus radiata</i>	Pr
Western white pine	<i>Pinus monticola</i>	Pw
Yellow pine	<i>Pinus ponderosa</i>	Py
Norway spruce	<i>Picea</i> spp.	Sa
Black spruce	<i>Picea mariana</i>	Sb
Engelmann spruce	<i>Picea engelmannii</i>	Se
Sitka spruce	<i>Picea sitchensis</i>	Ss
White spruce	<i>Picea glauca</i>	Sw
Spruce hybrid	<i>Picea</i> spp.	Sx
White x black spruce	<i>Picea</i> spp.	Sxb
Engelmann x sitka	<i>Picea</i> spp.	Sxe
White x sitka spruce	<i>Picea</i> spp.	Sxl
Sitka x unknown spruce	<i>Picea</i> spp.	Sxs
White x engelmann spruce	<i>Picea</i> spp.	Sxw
White x engelmann x sitka spruce	<i>Picea</i> spp.	Sxx
Bitter cherry	<i>Prunus emarginata</i>	Vb
Yellow cedar	<i>Chamaecyparis nootkatensis</i>	Yc

7. Surface expression

Plain (P)		or		Slope <5%
Undulating (U)				5-25% Non-linear
Ridge(s) (R)				26-70%
Terraces (T)				Step-like
Cone (C)		>26%		
Depression (D)				>2 m
Fan (F)				0-25%
Hummock (H)				26-70%
Rolling (M)				5-25% Linear

8. Vegetation Resource Inventory consistent vegetation abbreviation system (optional)

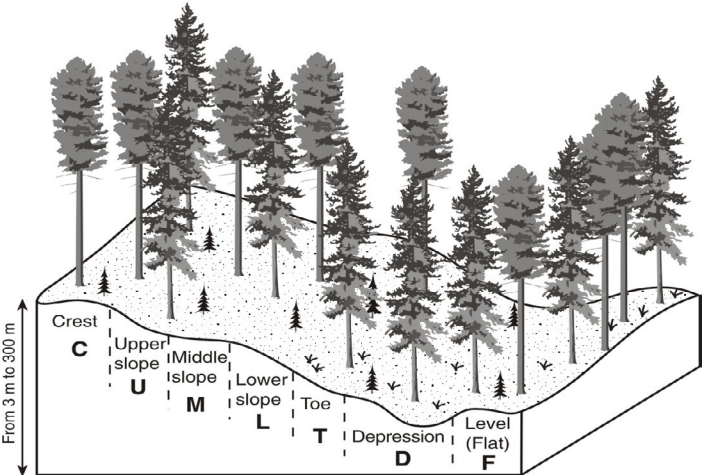
First 4 letters of the genus plus first 3 letters of the species plus a number for variant (if applicable)

aaaa bbb 1

If genus is known, but not species, all characters (up to 7) in the genus are used.

Common name	Latin name	Abbreviation
Palmate coltsfoot	Petasites palmatus	peta pal
White-flowered rhododendron	Rhododendron albiglorum	rhod alb
Scrub birch	Betula glandulosa var. glandulosa	betu gla 1
Willow	Salix	salix

9. Guide to slope position



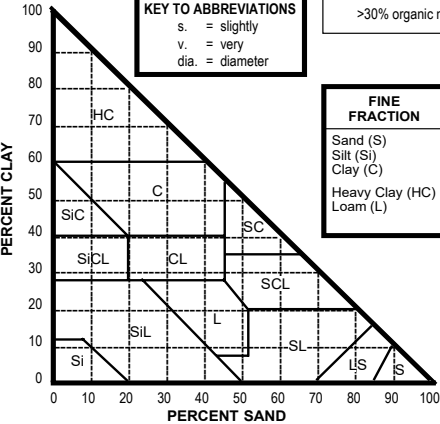
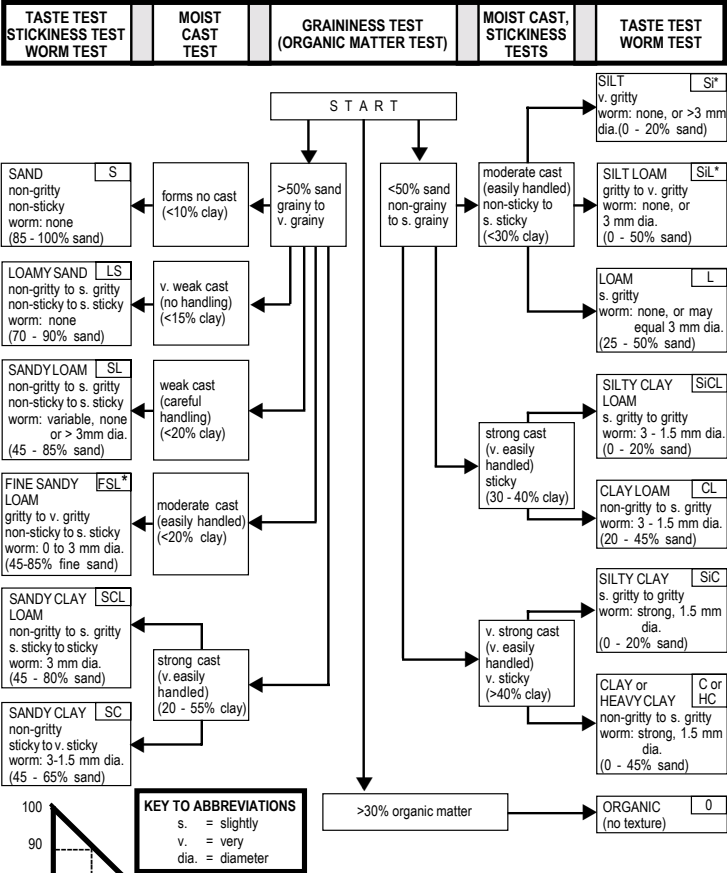
10. Planting difficulty rating

Site characteristics and points rating				
Vegetation	Infrequent grass, herbs and low shrubs	1	Frequent grass patches, herbs, low shrubs, infrequent naturals	3
Thickness of duff or litter	< 5 cm	1	5– 20 cm	3
Fine debris	Scattered branches and tops	1	Grouped branches and tops, <1 m high, loose arrangement	3
Coarse debris	Scattered logs	1	Frequent logs, some grouped and crossed, <1 m high	3
Stoniness	Infrequent stones or boulders	1	Frequent stone, boulders or coarse gravel	3
Compaction	Loose	1	Occasional compact areas, e.g., landings	3
Slope	10–30%	1	0–10%, 30–65%	3
Unplantable areas	Infrequent patches of surface water, bedrock, etc.	1	Frequent patches <0.2 ha	3
Circle one point rating in each of the eight factors.				
Total = _____ = Planting difficulty rating		Planting difficulty class:		
		Less than 10 points = easy		
		10–20 points = moderate		
		21–30 points = difficult		
		31+ points = severe		

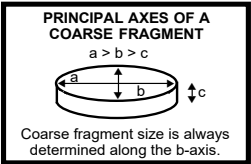
11. Humus form descriptions

Mor	• matted F horizon, abrupt transition from organic to mineral soil layers • (slower rate of decomposition)
Moder	• loosely structured F horizon, gradual transition from organic to mineral soil layers • (medium rate of decomposition)
Mull	• F and H horizons thin or absent, upper mineral soil layer rich with organics • (faster rate of decomposition)

12. Soil hand texturing key



FINE FRACTION	PARTICLE DIAMETER	COARSE FRAGMENTS	PARTICLE DIAMETER
Sand (S)	2 - .05 mm	Stones	>250 mm
Silt (Si)	.05 - .002 mm	Cobbles	250 - 75 mm
Clay (C)	<.002 mm	Gravels	75 - 2 mm
Heavy Clay (HC)	>60% clay		
Loam (L)	Mix of sand, silt and clay		



* Silt feels slippery or soapy when wet; fine sand feels stiffer, like grinding compound or fine sandpaper.

13. Soil compaction hazard key

Soil texture ^a (0–30 cm)	Hazard rating ^b moisture regime	
	Xeric–subhygric ^c (H horizons <20 cm)	Subhygric ^d –subhydric (H horizons ≥20 cm)
Fragmental (coarse fragments >70%)	L	M
Coarse fragments (<70%)		VH ^e
Sandy (S, LS)	L	
Sandy loam (SL, fSL)	M	
Silty/loamy (SiL, Si, L)	H	
Clayey (SCL, CL, SiCL, SC, SiC,C)	VH	

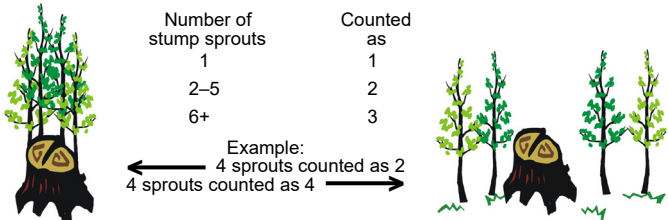
- ^a Use dominant soil texture and coarse fragment content of the upper 30 cm of mineral soil to assess compaction hazard. If a pronounced textural change occurs within the upper 30 cm (e.g., silty over sandy soil), then use the more limiting soil texture, providing it amounts to 5 cm of the top 30 cm.
- ^b L = Low; M = Moderate; H = High; VH = Very High.
- ^c Use this column for subhygric sites with forest floor H horizons < 20 cm thick.
- ^d Use this column for subhygric sites with forest floor H horizons ≥ 20 cm thick.
- ^e Organic soils composed of more than 40 cm of wet organic material, or forest floors >40 cm (including Folisols <40 cm), are susceptible to rutting because their very low load-bearing strength materials make them easy to displace.

14. Number of complete growing seasons suggested as a best management practice following a brushing treatment prior to a free growing survey.

Biogeoclimatic zone	Number of complete growing seasons
ICH, IDF, MS, PP, BG, SBPS, CWH, CDF, MH, and ESSF	2
SBS and BWBS	
• following herbicide treatment	2
• manually or otherwise treated	3

15. Post brushing treatment sprout counting

THIS IS NOT USED FOR TOTAL TREES. Following some vegetation management treatments, broadleaf tree species can sprout from the cut stump. Where this occurs, the multiple sprouts present are counted based on the table below. The application of this concept applies to all competitive broadleaf tree species that originate from cut stumps above ground. THIS ONLY APPLIES TO STRATA THAT HAVE HAD ONE OR MORE VEGETATION MANAGEMENT TREATMENTS.



16. Two Free Growing Methods

During the walk-through, it is the surveyor's responsibility to choose and record the free growing method on the FS 657 card. The surveyor should select the method that identifies the highest number of free growing stems. There are two approved methods to select from:

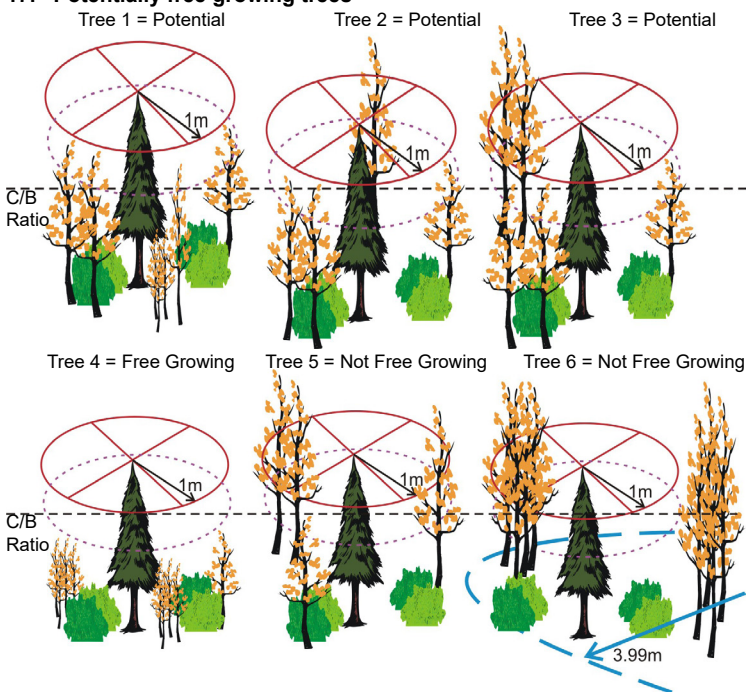
Site Plan or Silviculture Prescription

- complete the survey using the stocking standards as found in the site plan/silviculture prescription.

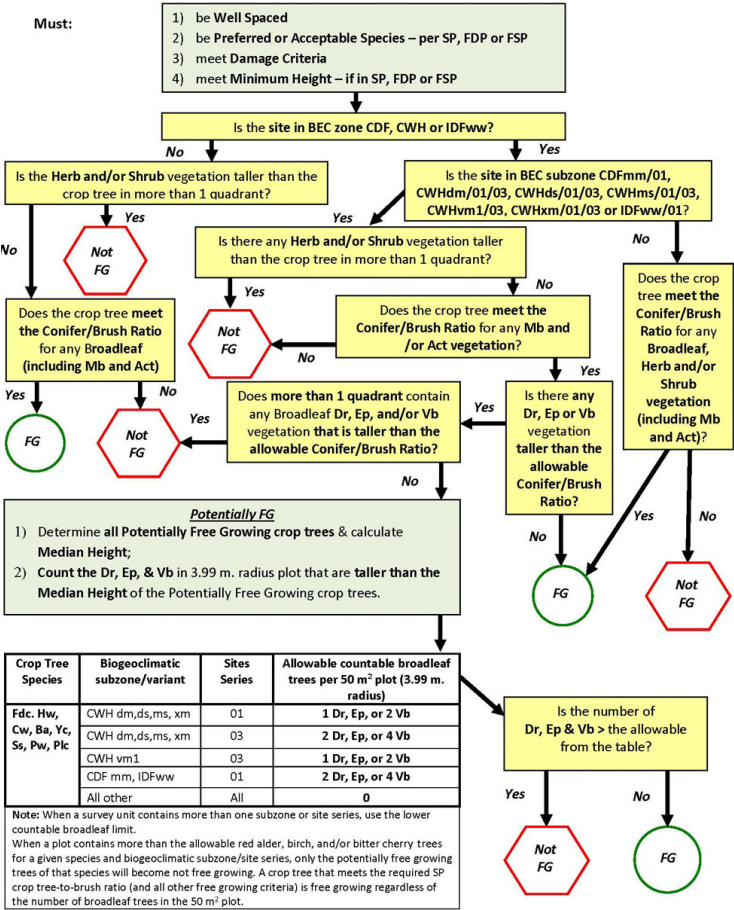
Local Geographic Competition Assessment Criteria*¹

- complete the survey using the free growing standards as found in the site plan. For assessment of competing vegetation, follow the Vegetation Competition Decision Key for the applicable region.

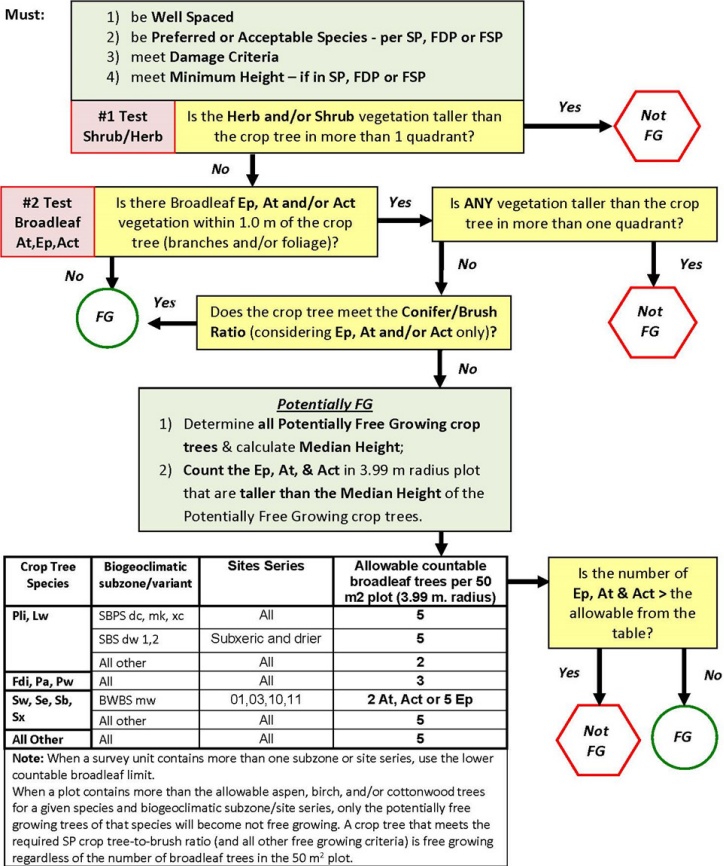
17. Potentially free growing trees



18A. COASTAL Vegetation Competition Decision Key for a Free Growing Crop Tree



18b. INTERIOR NORTH AREA (RNO, ROM, RSK)
Vegetation Competition Decision Key for a Free Growing Crop Tree

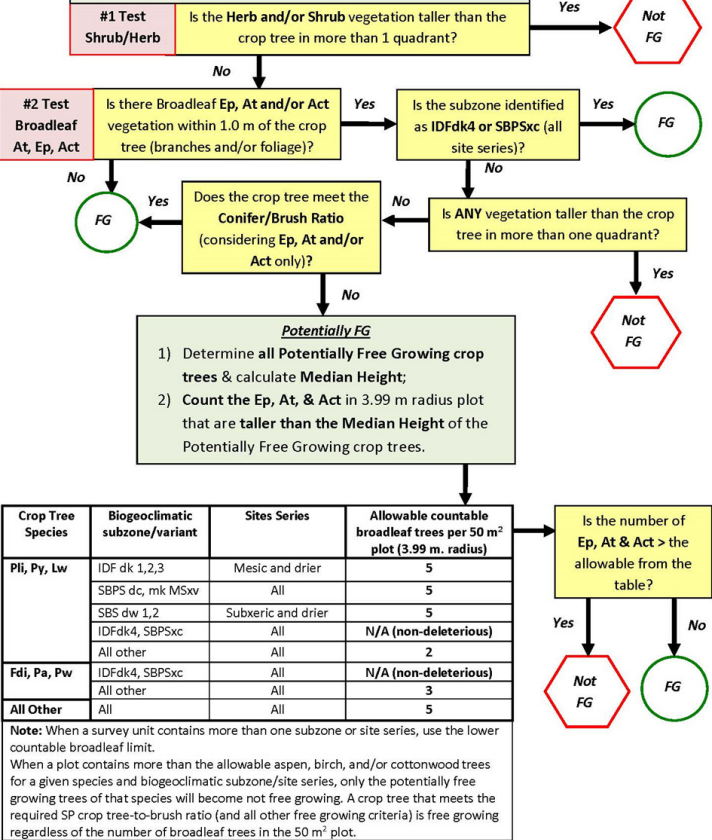


18c. INTERIOR SOUTH AREA (RCB, RKB, RTO)

Vegetation Competition Decision Key for a Free Growing Crop Tree

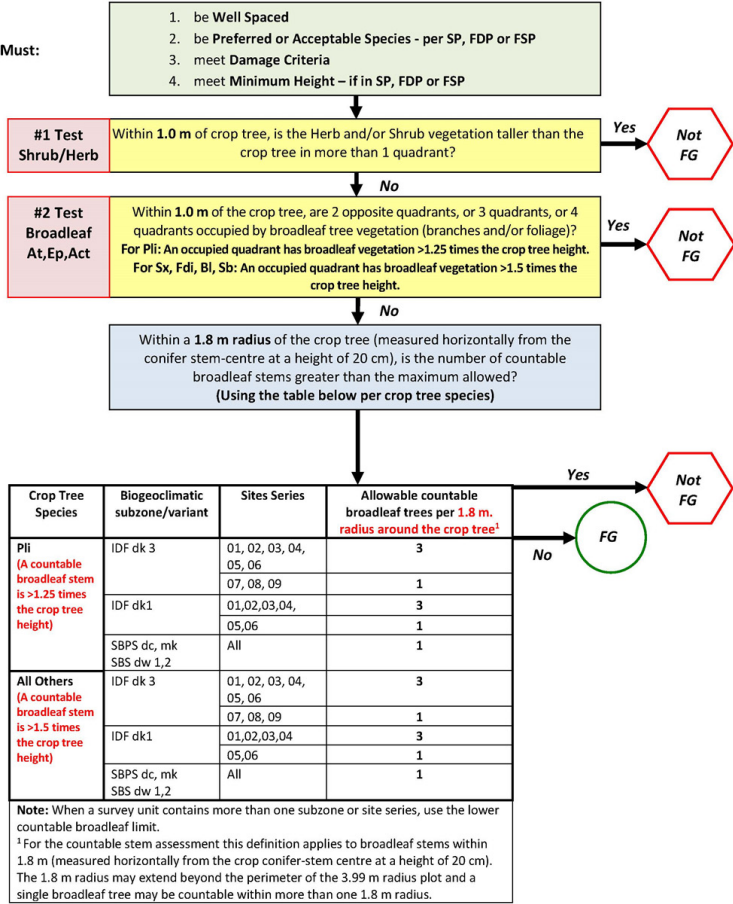
Must:

- 1) be Well Spaced
- 2) be Preferred or Acceptable Species - per SP, FDP or FSP
- 3) meet Damage Criteria
- 4) meet Minimum Height – if in SP, FDP or FSP



18d. INTERIOR SOUTH AREA (RCB, RKB, RTO) **ALTERNATE**

Vegetation Competition Decision Key for a Free Growing Crop Tree
The alternative guidelines only apply in the SBPSmk, SBPSdc, SBSdw1, SBSdw2, IDFdK3, and IDFdK1 for the Williams Lake, Quesnel, and 100 Mile TSA, on sites where there has been no previous brushing or broadleaf tree spacing activity.



19. Countable conifer principles

The number of countable conifers only needs to be assessed where a maximum density value is present in the stocking standards and the number of total trees per hectare exceeds the maximum density for the survey standards unit.

- a. All silviculture systems except single tree selection;
 - It is reassessed at each plot.
 - Determine the median (middle) height of the largest well spaced trees to a maximum of the M value.

Where the median height of the well spaced trees is;

- <2m, the countable height is 30% of the median well spaced height
- ≥2m, the countable height is 50% of the median well spaced height

- b. Single tree selection silviculture systems;
 - all layer 3 conifers are considered countable.

20. Free growing acceptability guidelines for layer 3 and 4 advanced regeneration

Species*	Ba, Bl	Cw** Hm, Yc	Hw		Sx, Se, Sw	Fdi, Lw	Pa, Pli, Py
BEC Zones	All***	CWH, CDF, MH, ICH	CWH, CDF, MH, ICH, (Pr. Rup.)	ICH (Other regions)	All*** (except BWBS)	All** *	All** *
Height at release	No height limit				<0.5m	No height limit	
Scars and damage	All species: No open (unhealed) injuries; no closed (healed) injuries with a width at the widest point(s), which is greater than 25% of the circumference of the tree at that point; no closed injuries that exceed 10% of the total length of the stem; no stem infection caused by a stem rust or dwarf mistle-toe; no other externally visible pathological indicators including broken top, frost crack, conk, extreme basal sweep or unacceptable forks and crooks (see 23b)						
Continuous live crown	All species: An acceptable tree has greater than 30% continuous live crown. Continuous live crown is the length of continuous green foliage on a tree expressed as a percentage of its total height. Continuous live crown refers to foliage on adjacent live green branches that forms the main part of the crown of a tree and extends over at least half of the circumference of the tree.						
Vigour	All species: Evidence of release (i.e., generally good post-harvest height increment) – Increased leader growth is not a requirement for trees in layer three and four in partial cut situations with low basal area removal where the trees remain heavily shaded by layer one and two trees.						

* For those species not listed here, the normal free growing acceptability criteria apply. At regeneration delay, consider whether naturals will meet these criteria by free growing. If western white pine (Pw) is to be considered, consult the Pine Stem Rust Management Guidebook.

** Beware of sun scald. If advance regeneration western redcedar is to be used, check for incidence of heart rot.

*** "All" refers to zones where these species are acceptable.

21a. Conifer damage agent and condition codes (FS 747 - 2022/03)

FIELD CODES	DESCRIPTION	FIELD CODES	DESCRIPTION	FIELD CODES	DESCRIPTION
A	ANIMAL DAMAGE BEAR CATTLE DEER ELK HARE or RABBIT MOOSE HORSE	AO AP AS AV AX AZ	PIKA PORCUPINE SQUIRREL VOLE BIRDS BEAVER	DF	FOLIAGE DISEASES Western pine aster rust <i>Coleosporium asterum</i> Delphinella tip blight <i>Delphinella</i> spp. Large-spored spruce-labrador tea rust <i>Chrysomyxa ledicola</i> Spruce needle cast <i>Luilia macrospora</i> Elytrodema disease <i>Elytrodema deformans</i> Larch needle blight <i>Hypodermella laridis</i> Phaeoseptoria needle cast <i>Phaeoseptoria contortifae</i> Pine needle cast <i>Lophodermella concolor</i> Larch needle cast <i>Rhabdocline laridis</i> Leptomelanconium needle blight <i>Leptomelanconium pinicola</i> Lophodermium needle cast <i>Lophodermium seditiosum</i> Fir-fireweed rust <i>Pucciniastrum epilobii</i> Douglas-fir needle cast <i>Rhabdocline</i> spp. Dothistroma (red band) needle blight <i>Mycosphaerella pini</i> Sirococcus tip blight <i>Sirococcus conigenus</i> Cedar leaf blight <i>Didymascella thujae</i> Swiss needle cast <i>Nothofractocryptopus geaumannii</i> Brown felt blight <i>Herpotrichia</i> spp. Hendersonia needle cast <i>Hendersonia pinicola</i> Rhizosphaera needle cast <i>Rhizosphaera kalkhoffii</i>
N	ABIOTIC INJURIES Avalanche or snow slide FIRE Post-burn mortality DECLINE Douglas-fir decline Yellow-cedar decline DROUGHT Drought - foliage loss or damage Drought - mortality CEDAR FLAGGING FLOODING FROST Frost crack Frost-heaved Shoot or bud frost kill	NH NL NN NR NS NW	HAIR LIGHTNING ROAD SALT REDBELT SLIDE WINDTHROW Windthrow - soil failure Windthrow - treatment or harvest-related WIND SCARRING or RUBBING SNOW OR ICE Snow or ice breakage Snow press SUNSCALD	DL DLC DLD DLF DLK DLP DLS	LEADER OR BRANCH DIEBACKS Lodgepole pine dieback <i>Cenangium ferruginosum</i> Dermecanker <i>Dermecia boycei</i> Red flag disease <i>Potentillomyces balsamicola</i> Conifer cytospora canker <i>Cytospora abietis</i> Phomopsis canker <i>Diaporthe lokoyae</i> Sclerophoma tip dieback <i>Sydowia polyspora</i>
D	DISEASES BROOM RUSTS Fir broom rust <i>Melampsorella caryophyllacearum</i> Spruce broom rust <i>Chrysomyxa arctostaphyli</i> STEM DECAYS White mottled rot <i>Ganoderma applanatum</i> Sulfur shelf fungus <i>Laeliporus sulphureus</i> Rust-red stringy rot <i>Echinodontium tinctorium</i> Brown crumbly rot <i>Fomitopsis pinicola</i> Cedar brown pocket rot <i>Postia sericeomellis</i> Red ring rot <i>Porodaedalea pini</i> Brown trunk rot <i>Fomitopsis officinalis</i> Red heart rot <i>Stereum sanguinolentum</i>	DDA DDD DDE DDF DDO DDP DDQ DDR	DM DMF DMH DML DMP DR DRA DRB DRC	DMISTLETOES Douglas-fir dwarf mistletoe <i>Arceuthobium douglasii</i> Hemlock dwarf mistletoe <i>Arceuthobium tsugense</i> Larch dwarf mistletoe <i>Arceuthobium laridis</i> Lodgepole pine dwarf mistletoe <i>Arceuthobium americanum</i> ROOT DISEASES Amillaria root disease <i>Amillaria ostryae</i> Blackstain root disease <i>Leptographium wagneri</i> Cedar laminated root and butt rot <i>Coniferiopsis weirii</i>	

21b. Conifer damage agent and condition codes (FS 747 - 2022/03)

FIELD CODES	DESCRIPTION	FIELD CODES	DESCRIPTION
DRL	Laminated root rot <i>Coniferiporia sulphurascens</i>	IDI	Pine needle sheath miner <i>Zelleria haimbachi</i>
DRN	Annosus root disease <i>Heterobasidion occidentale</i>	IDL	Western hemlock looper <i>Lambdina fuscilata lugubrosa</i>
DRR	Rhizina root disease <i>Rhizina undulata</i>	IDP	Larch sawfly <i>Pristiphora erichsonii</i>
DRS	Schweinitzii butt rot <i>Phaeolus schweinitzii</i>	IDS	Conifer sawflies <i>Neodiprion abietis</i>
DRT	Tomtentous root rot <i>Onnia tomentosa</i>	IDT	Douglas-fir tussock moth <i>Orygia pseudotsugata</i>
DS	STEM DISEASES (CANKERS OR RUSTS)	IDV	Variagated cutworm <i>Peridroma saucia</i>
DSA	Atropellis canker <i>Atropellis piniphila</i>	IDW	Western spruce budworm <i>Choristoneura freemani</i>
DSB	White pine blister rust <i>Cronartium ribicola</i>	IDZ	Western false hemlock looper <i>Nepytia freemani</i>
DSC	Comandra blister rust <i>Cronartium comandrae</i>	IS	SHOOT INSECTS
DSD	Western gall rust <i>Endocronartium harknessii</i>	ISB	Western cedar borer <i>Trachykele blondeli</i>
DSS	Stalactiform blister rust <i>Cronartium coleosporioides</i>	ISE	European pine shoot moth <i>Rhyacionia buoliana</i>
I	INSECTS	ISG	Gouty pitch midge <i>Cecidomyia pininopis</i>
IA	APHIDS OR ADELGIDS	ISP	Pitch nodule moths <i>Petrova</i> spp.
IAB	Balsam woolly adelgid <i>Adelges piceae</i>	ISQ	Sequoia pitch moth <i>Vesparimma sequoia</i>
IAC	Giant conifer aphid <i>Cinara</i> spp	ISS	Western pine shoot borer <i>Eucosma sonomana</i>
IAG	Cooley spruce gall adelgid <i>Adelges cooleyi</i>	IW	WEEVILS
IAL	Larch cone woolly aphid <i>Adelges lariciatus</i>	IWC	Conifer seedling weevil <i>Steremnius carinatus</i>
IAP	Pine needle scale <i>Chionaspis pinifoliae</i>	IWM	Magdalis spp.
IAS	Spruce aphid <i>Elatobium abietinum</i>	IWP	Lodgepole pine terminal weevil <i>Pissodes terminalis</i>
IB	BARK BEETLES	IWS	White pine weevil (on spruce) <i>Pissodes strobi</i>
IBB	Western balsam bark beetle <i>Dryocoetes confusus</i>	IWW	Warren's root collar weevil <i>Hylobius warreni</i>
IBD	Douglas-fir beetle <i>Dendroctonus pseudotsugae</i>	IWY	Cylindrociprurus weevil <i>Cylindrociprurus</i> spp.
IBE	Silver fir beetle <i>Pseudohylesinus sericeus</i>	IWZ	Yosemite bark weevil <i>Pissodes schwarzii</i>
IBF	Fir engraver beetle <i>Scolytus ventralis</i>	M	MITE DAMAGE (TRISETACUS SPECIES)
IBH	Hyliurgops beetle <i>Hyliurgops rugipennis</i>	P	FUNGAL PATHOGENS
IBI	Engraver beetles <i>Ips</i> spp.	PBC	Gray mold
IBL	Lodgepole pine beetle <i>Dendroctonus murrayanae</i>	PFX	Fusarium spp
IBM	Mountain pine beetle <i>Dendroctonus ponderosae</i>	T	TREATMENT INJURIES
IBP	Twip beetles <i>Pityogenes</i> , <i>Pityophthorus</i> spp	TC	CHEMICAL
IBS	Spruce beetle <i>Dendroctonus rufipennis</i>	TL	LOGGING
IBT	Red turpentine beetle <i>Dendroctonus valens</i>	TM	OTHER MECHANICAL DAMAGE (NON-LOGGING)
IBW	Western pine beetle <i>Dendroctonus brevicornis</i>	TP	PLANTING
ID	DEFOLIATING INSECTS	TPM	Planting — poor microsite
IDA	Black army cutworm <i>Actebia fennica</i>	TR	PRUNING
IDB	Two-year budworm <i>Choristoneura biennis</i>	TT	THINNING OR SPACING
IDC	Larch casebearer <i>Coleophora larcella</i>	V	VEGETATION PROBLEMS
IDD	Spruce budworm <i>Choristoneura fumiferana</i>	VH	HERBACEOUS COMPETITION
IDG	Green-striped forest looper <i>Melanophila imatata</i>	VP	VEGETATION PRESS
IDH	Western blackheaded budworm <i>Adetis gloverana</i>		VS SHRUB COMPETITION
			VT TREE COMPETITION

**21c. Deciduous damage agent and condition codes
(FS Deciduous 747 - 2022/03)**

FIELD CODES	DESCRIPTION	FIELD CODES	DESCRIPTION	FIELD CODES	DESCRIPTION	FIELD CODES	DESCRIPTION
A	ANIMAL DAMAGE			D			DISEASES
AB	BEAR	AO	PIKA	DD	STEM DECAYS		
AC	CATTLE	AP	PORCUPINE	DDA	White mottled rot Ganoderma applanatum		
AD	DEER	AS	SQUIRREL	DDB	White spongy trunk rot Fomes tomentarius		
AE	ELK	AV	VOLE	DDC	Brown cubical rot of birch Fomitopsis betulinus		
AH	HARE or RABBIT	AX	BIRDS	DDD	Sulfur shelf fungus Laeoporus sulphureus		
AM	MOOSE	AZ	BEAVER	DDF	Brown crumbly rot Fomitopsis pinicola		
AN	HORSE			DDG	Sterile conk trunk rot of birch Inonotus obliquus		
N	ABIOTIC INJURIES			DDH	Hardwood trunk rot Phellinus ignarius		
NAV	Avalanche or snow slide	NI	RED HEART	DDQ	Quinine conk rot Fomitopsis officinalis		
NB	FIRE	NK	FUMEKILL	DDT	Aspen trunk rot Phellinus tremulae		
NC	Post-burn mortality	NL	LIGHTNING	DF	FOLIAGE DISEASES		
	DECLINE	NN	ROAD SALT	DFF	Marssonina leaf blights Marssonina spp.		
NCA	Aspen Decline	NR	REDBELT	DFG	Cottonwood leaf rust Melampsora occidentalis		
NCB	Birch Decline	NS	SLIDE	DFI	Linospora leaf blotch Linospora tetraspora		
ND	DROUGHT	NW	WINDTHROW	DFK	Septoria leaf spot Sphaerulina populicola		
NDF	Drought – foliage loss or damage	NWS	Windthrow – soil failure	DFV	Leaf rust Melampsora spp.		
NDM	Drought – mortality	NWT	Windthrow – treatment or harvest-related				
NF	FLOODING	NX	WIND SCARRING or RUBBING	DL	DISEASE CAUSED DIEBACKS		
NG	FROST	NY	SNOW OR ICE	DLV	Aspen & poplar leaf and shoot blights Venturia spp.		
NGC	Frost crack	NYB	Snow or ice breakage				
NGH	Frost-heaved	NYP	Snow press	DR	ROOT DISEASES		
NGK	Shoot or bud frost kill	NZ	SUNSCALD		Armillaria root disease Armillaria ostoyae		
NH	HAIL						

21d. Deciduous amage agent and condition codes
(FS Deciduous 747 - 2022/03)

FIELD CODES	DESCRIPTION
ID5	Fall webworm Hyphantria cunea
ID6	Aspen leaf miner Phyllocnistis populiella
ID7	Woolly alder sawfly Eriocampa ovata
ID8	Aspen leaf roller Pseudexentera oregonana
ID9	Birch leaf skeletonizer Buccatrix spp.
IEA	Unidentified aspen defoliation
IEF	Cottonwood leaf skeletonizer Phyllonoryctes apparella
IEJ	Willow leafminer Micrurapteryx salicifoliella
IEK	Rusty tussock moth Orgyia antiqua
IS	SHOOT INSECTS
ISA	Bronze birch borer Agrilus anxius
ISC	Poplar borer Saperda calcarata
ISW	Poplar and willow borer Cryptorhynchus lapathi
M	MITE DAMAGE (TRISETACUS SPECIES)
T	TREATMENT INJURIES
TC	CHEMICAL
TL	LOGGING
TM	OTHER MECHANICAL DAMAGE (NON-LOGGING)
TP	PLANTING
TR	Planting – poor microsite
TT	PRUNING
	THINNING OR SPACING
V	VEGETATION PROBLEMS
VH	HERBACEOUS COMPETITION
VP	VEGETATION PRESS
VS	SHRUB COMPETITION
VT	TREE COMPETITION

FIELD CODES	DESCRIPTION
DS	STEM DISEASES (CANKERS OR RUSTS)
DSE	Sooty bark canker Encoelia pruinosa
DSH	Hypoxylon canker Entoleuca mammatum
DSM	Septoria canker Sphaerulina musiva
DSN	Aspen running canker Neodothiora populina
DSP	Cryptosphaeria canker Cryptosphaeria populina
DSR	Ceratobystis canker Ceratobystis fibrariata
DST	Target canker Neorectria galligena
DSY	Cytospora canker Cytospora chrysosperma
I	INSECTS
ID	DEFOLIATING INSECTS
IDA	Black army cutworm Actebia fennica
IDD	Western winter moth Erannis vancouverensis
IDF	Forest tent caterpillar Malacosoma disstria
IDJ	Gray forest looper Carpeta divisa
IDK	Northern tent caterpillar Malacosoma californicum
IDM	Lymantria (gypsy) moth Lymantria dispar
IDN	Lyoneia miner Lyoneia spp.
IDO	Filament bearer Nematocampa flamentaria
IDR	Alder sawfly Eriocampa ovata
IDU	Satin moth Leucoma salicis
IDV	Variegated cutworm Peridroma sauda
IDX	Large aspen tortrix Choristoneura confidiana
IDY	Birch-aspen leafroller Epinotia solandriana
ID1	Leaf beetles Chrysomela spp.
ID2	Bruce spanworm Operophtera bruceata
ID3	Winter moth Operophtera brumata
ID4	Cottonwood sawfly Nematus currani

22a. Free growing damage criteria for even-aged (age class 1) coniferous trees (pg. 1)

Location of Damage	Type of Damage	Tree being assessed is UNACCEPTABLE if:	Host species	Some possible causes	Comments
Stem	Wound (including sunscald and girdling)	- the tree has any wound which is greater than 33% of the stem circumference, or - the tree has a wound which is greater than 20% of the total length of the stem, or - the tree has a wound centred on an infection caused by a stem rust, canker, or dwarf mistletoe (See Note under Stem or Branch: Dwarf Mistletoe Infection). - The tree is enclosed within a seedling protector (added 2015) - Any amount of girdling or damage to the stem caused by seedling protectors (added 2015).	All	cattle AC, squirrel AS, beaver AZ, vole AV, porcupine AP, hare AH, Warrens root collar weevil IWW, sequoia pitch moth ISQ, fire NB, wind-throw NW, sunscald NZ, logging TL, mechanical TM.	A wound is defined as an injury in which the cambium is dead (e.g. sunscald) or completely removed from the tree exposing the sapwood. Measure the wound across the widest point of the exposed sapwood (or dead cambium when the tree is damaged by sunscald). Healed over wounds (=scars) are acceptable. See "Damage types." Girdling can be caused by seedling protectors.
Stem	Insect mining at root collar	the tree is currently attacked by a bark-mining insect such as a weevil or a beetle and exhibits symptoms such as foliage discoloration, thinning, and/ or reduced height growth increments	PI, Sx	Warren's root collar weevil IWW.	Only trees that are symptomatic should be checked for insect infestation or mining damage. Non-symptomatic trees are presumed to be unaffected by insect mining.
Stem	Deformation (including crook, sweep, fork, browse, and dead or broken top)	the pith is horizontally displaced more than 30 cm from the point of defect and originates above 30 cm from the point of germination.	For sweep, Cw and Hw	Defoliators ID, white pine (spruce) weevil IWS, lodgepole pine terminal weevil IWP, northern pitch twig moth ISP, cattle AC, deer AD, frost NG, hail NH, snow NY, drought ND, logging TL.	For horizontal displacement see "Damage types."
		- the tree leader has been killed three or more times in the last five years (weevil only). - the tree has two or more leaders with no dominance expressed after five years growth and the fork originates above 30cm from the point of germination. - the tree has a dead or broken top at a point that is >2 cm (>3 cm for the coast) in diameter.	Sx, Ss, PI All	White pine (spruce) weevil IWS, lodgepole pine terminal weevil IWP, terminal weevils (IWS, IWP), frost NG, animal damage A.	This criterion applies only for terminal weevil damage. Leader dominance occurs when the tallest leader is at least 5 cm taller than the second tallest leader. See "Damage types."

22b. Free growing damage criteria for even-aged (age class 1) coniferous trees (pg. 2)

Location of Damage	Type of Damage	Tree being assessed is UNACCEPTABLE if:	Host species	Some possible causes	Comments
Stem	Bark mining	Boring dust, pitch tubes, or bark sloughing is visible	Pl, Sx, Fd	Bark beetles (IB), mountain pine beetle (IBM), Ips pini (IBI), Pityogenes, Pityophthorus (IBP), comandra blister rust DSC, stactiform blister rust DSS, white pine blister rust DSB, western gall rust DSG.	The mountain pine beetle outbreak has caused unexpected mortality in young pine. Stressed trees are also susceptible to secondary bark and twig beetles.
Stem	Infection (including cankers and galls)	any infection occurs on the stem.	All	comandra blister rust DSC, stactiform blister rust DSS, white pine blister rust DSB, western gall rust DSG.	Note: To best identify pine rusts, surveys should be scheduled between May and July as a best management practice (Added 2020). Wounds caused by rodent feeding around rust cankers should have stem rust recorded as the causal agent.
Branch	Infection (cankers)	an infection occurs on a live branch less than 20 cm from the stem. (added 2015)	Pl, Py	comandra blister rust DSC	
Branch	Galls	a gall rust infection occurs on a live branch less than 5 cm from the stem.	Pw, Pl, Py	white pine blister rust DSB, stactiform blister rust DSS	
Branch	Gouting	any adelgid gouting occurs on a branch.	Ba, Bg, Bl	balsam woolly adelgid IAB.	Note: To best identify pine rusts, surveys should be scheduled between May and July as a best management practice (Added 2020).
Stem or Branch	Dwarf mistletoe infection	- any infection occurs on the stem or a live branch, or - a susceptible tree is located within 10 m of an overtopping tree, which is infected with dwarf mistletoe.	Hw, Pl, Lw, Fd	hemlock dwarf mistletoe DMH, Pl dwarf mistletoe DMP, larch dwarf mistletoe DML, Fd dwarf mistletoe DMF.	To confirm infection, the surveyor must observe mistletoe aerial shoots or basal cups on regeneration or on live or dead fallen brooms. Overtopping tree is a tree that is three or more times taller than the height of the tree being assessed.
Foliage	Defoliation	>50% of tree foliage has been removed by Dothistroma in ICH, CWH and SBS biogeoclimatic zones. (see 23d.) - Any defoliation, stunting, or red-brown discoloration in the top 1/3rd of the live crown due to Elytroderma in the IDFdk3, IDFdk4, SBPSmk or SBPSxc biogeoclimatic subzones (added 2020). >80% of tree foliage has been removed due to insects or disease.	B, F, P, S	Dothistroma needle blight, DFS	See "Defoliation for Determinate Growth Species."
			Pli	DFE, elytroderma needle and shoot disease	Note: After July 1st Elytroderma can be confirmed by the presence of black lines on the previous year's needles.
			All others	foliage diseases DF, ND drought.	

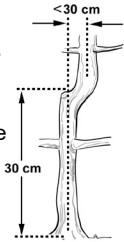
22c. Free growing damage criteria for even-aged (age class 1) coniferous trees (pg. 3)

Location of Damage	Type of Damage	Tree being assessed is UNACCEPTABLE if:	Host species	Some possible causes	Comments
Roots	Root disease	sign(s) or a definitive combination of symptoms of root disease are observed.	All	amillaria root disease DRA, laminated root rot DRL, tomentosus root rot DRT, annosus root disease DRN, blackstain root disease DRB.	Signs are direct evidence of the pathogenic fungus including fruiting bodies, distinctive mycelium or rhizomorphs. Symptoms include foliar chlorosis or thinning, pronounced resin flow near the root collar, reduced recent leader growth, a distress cone crop, and wood decay or stain. An individual symptom is not sufficient to identify a root disease.
Roots	Root disease (continued)	- infected tree found in plot. See comments for well-spaced tree net down calculation. The multiplier for DRA is two, except in BEC zones Ppdm1 and 2, IDFxh1, IDFdm1 and 2, MSdk1 and MSdm1 where the multiplier is one - except for Cw (in all BEC zones) the multiplier is one and only if the Cw is considered preferred or acceptable or species and is performing well within the polygon or stratum being assessed.	All	amillaria root disease DRA.	Note: All conifer species are considered susceptible. Broadleaf species are considered not susceptible for survey purposes only. Example: How to apply net down for root disease. If root disease-infected trees are found in the plot: 1. In the first sweep, determine the total number of healthy, well spaced trees using the prescribed minimum inter-tree distance (MITD) (e.g., 12 trees) ignoring the M-value; 2. In a second independent sweep, determine the number of infected trees (including the dead infected stumps for DRT) that are the MITD from each other (e.g., 4 infected trees or stumps); 3. Multiply the number from step 2 by the multiplier for the specific root disease and subtract this number from the number of susceptible healthy well-spaced trees found in step 1 (e.g., for DRA: 12-4x2 = 4). The result is the maximum number of free growing trees that may be tallied for the plot. Next consider competing vegetation.
		infected conifer found in plot. See comments for well-spaced tree net down calculation. The multiplier for DRL is four.	Fd, Sx, Se Lw, Ba, Bg	laminated root rot DRL.	Note: Bl, Cw, Pl, Pw, Py and broadleaf species are considered not susceptible for survey purposes only.
		infected conifer or stump found in plot. See comments for well-spaced tree net down calculation. The multiplier for DRT is two.	Se, Sx	tomentosus root rot DRT.	Note: Ba, Bl, Cw, Fd, Pl, Pw, Py and broadleaf species are considered not susceptible for survey purposes only.
		infected conifer found in plot. See comments for well-spaced tree net down calculation. The multiplier for DRN is two.	Ba, Hw, Ss	annosus root rot DRN.	Note: Bg, Bl, Cw, Cy, Fd, Hm, Pl, Pw, Py, Sx and broadleaf species are considered not susceptible for survey purposes only.

22d. Damage types

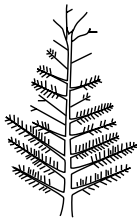
Crooks (old stems)

A crook is unacceptable if it is displaced more than 30 cm and originates above 30 cm.



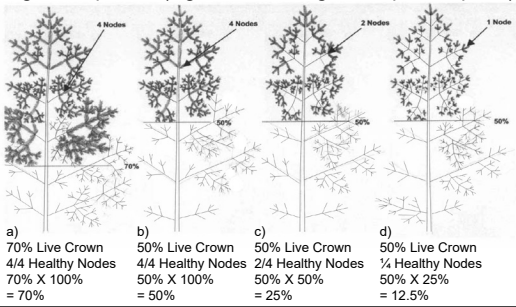
Defoliation, general

Defoliation is unacceptable if more than 80% of the needles are removed due to insects or disease.

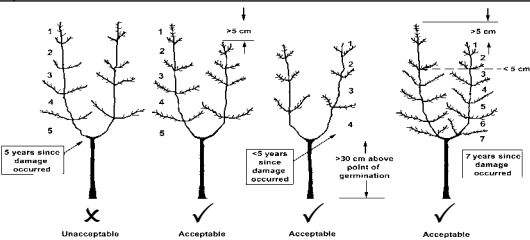


Defoliation, for determinate growth species, (e.g. true firs, Douglas fir, spruces, pines)

1. Determine the % live crown.
 2. Determine how many of the most recent 4 nodes have >50% of their foliage, express it as a %.
 3. Step 1% x Step 2%: The result is the percentage of foliage remaining on the tree.
- for Dothistroma, in ICH, CWH and SBS
 >50% = acceptable
 - all other causes and biogeoclimatic zones
 >20% = acceptable



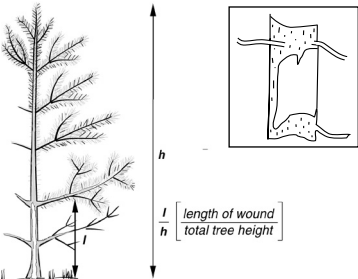
Forks



Wounds

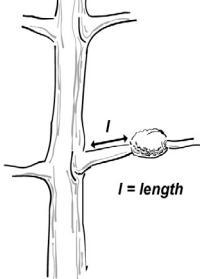
Damage to the cambium or deeper is unacceptable where it is:

- more than one-third the circumference, or
- more than 20% of the height of tree.



Gall and Canker

Distance measurement from point of infection by canker or gall to main stem (measured along the branch).



23. Broadleaf Forest Health Free Growing Damage Criteria

Unless otherwise stated in regulation or an approved FDP or FSP stocking standard, an acceptable hardwood crop tree must:

- not have a tree pith that is laterally displaced more than 30 cm from the location of the root-crown pith¹.
- not originate from a cut stump².
- have at least one dominant live leader³.
- not have a wound that is greater than 10% of the stem circumference nor is greater than 10% of the total length of the stem⁴.
- not have any fungal infections or insect infestations affecting tissues below the bark surface, visible without destructive sampling⁵.
- not be browsed so as to limit its ability to become a crop tree.

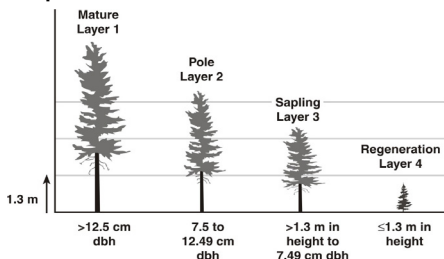
- 1 A requirement of the Establishment to Free Growing Guidebook, Prince George Forest Region, May 2000, Appendix 6, Boreal Broadleaf Stocking Guidelines, BWBS.
- 2 Stems originating from the sides or cut surface of stumps are very susceptible to breakage at the coppice point
- 3 The objective is that the tree has a single stem that will develop into a healthy crop tree. Accordingly, a healthy, free growing broadleaf tree must have an identifiable live leader. It is not important if a portion, but not all, of the leader is browsed or killed for example by venturia blight.
- 4 This criterion is modified from the conifer criterion, and threshold percent values are chosen subjectively. Research is needed to determine more exactly the size of an open wound at free growing assessment that is likely to limit the development of a healthy crop tree. A wound is defined as an injury in which the cambium is dead or completely removed from the tree exposing the sapwood. Measure the wound across the widest point of the exposed sapwood. Healed-over wounds (= scars) are acceptable. Fire or sunscald damage can also cause wounds. Injury of broadleaf stems is considered an important entry court for decay organisms.
- 5 Visible stem infections include cytospora canker or sooty-bark canker, and visible insect infestations, such as poplar borer. The significance of some diseases, such as armillaria root disease, to aspen is unknown or uncertain, and several cannot be feasibly identified by visual features during free growing surveys.

24. The Hawksworth six-class dwarf mistletoe rating system.

Instructions	Example
Step 1 Divide live crown into thirds.	If this third has no visible infections, its rating is (0).
Step 2 Rate each third separately. Each third should be given a rating of 0, 1, or 2 as described below: (0) no visible infections (1) light infection (1/2 or less of total number of branches in the third infected) (2) heavy infection (more than 1/2 total number of branches in the third infected).	If this third is lightly infected, its rating is (1). If this third is heavily infected, its rating is (2).
Step 3 Add ratings of thirds to obtain rating for total tree.	The tree in this example gets a rating of: $0 + 1 + 2 = 3$.



25a. Layer descriptions



Layer 1 basal area must be reported if it exceeds 5m²/ha or is specified in the stocking standards.

25b. Germinants

A germinant is a ≤5cm natural. Germinants are tallied separately from total trees. Germinants should be collected when they can impact the treatment recommendation.

Example 1: A 2-year-old Pli is 7cm. It is not a germinant because it is >5cm.

Example 2: A 1-year old Hw is 8cm. It is not a germinant because it is >5cm.

Example 3: A 2-year-old planted Fdc is 4cm due to elk browse. It is not a germinant because it was planted.

Example 4: A 1-year old Sx is 4cm. It is a germinant because it is naturally regenerated and ≤5cm.

Example 5: A 2-year-old BI is 5cm. It is a germinant because it is naturally regenerated and ≤5cm.

26a. Free growing damage criteria for multi-storied stands
(pg. 1 of 3)

Location of damage	Type of Damage	Tree being assessed is UNACCEPTABLE if:	Host species	Some possible causes	Comments
Stem	WOUND (including sunscald and girdling)	Refer to table X for layers 1-4.	All	squirrel AS, beaver AZ, vole AV, porcupine AP, hare AH, Warrens root collar weevil IWW, fire NB, windthrow NW, sunscald NZ, logging TL, various decay fungi DD.	A wound is defined as an injury in which the cambium is dead (e.g., sunscald) or completely removed from the tree exposing the sapwood. Measure the wound across the widest point of the exposed sapwood (or dead cambium when the tree is damaged by sunscald). Healed over wounds (=scars) are acceptable.
Stem	DECAY	Any pathological indicator(s) are present. This may include conk, blind conk, frost crack, or rotten branches.	All		
Stem	DEFORMATION (including crook, fork, and dead or broken top)	- These criteria apply to layer 1 & 2 trees only. For layers 3 & 4 use the even-aged damage criteria. - A crook displaces the portion of the stem above the defect by >50% from the line of growth formed by the stem below the point of defect in the bottom 2/3rds of the stem only. - A fork occurs above stump height in the bottom 2/3rds of the stem only. - A dead or broken top extends more than 20% of the stem length or the live crown is removed.	All	defoliators ID, white pine (spruce) weevil IWS, lodgepole pine terminal weevil IWP, cattle AC, deer AD, elk AE, moose AM, frost NG, hail NH, snow NY, drought ND, logging TL, mechanical TT, Dwarf mistletoes (see below).	
Stem	INFECTION (including cankers, and galls)	Any infection occurs on the stem.	All	comandra blister rust DSC, stalactiform blister rust DSS, white pine blister rust DSB, western gall rust DSG, atropellis canker DSA, exploding canker DSX, Dwarf mistletoes (see below).	Note: Wounds caused by rodent feeding around rust cankers should have stem rust recorded as the causal agent.
Branch	INFECTION (cankers)	These criteria apply to layer 2, 3 & 4 trees only. An infection occurs on a live branch less than 60 cm from the stem.	Pw, Pl, Py	white pine blister rust DSB, comandra blister rust DSC, stalactiform blister rust DSS.	Branch infections on layer 1 trees can be ignored.
Branch	GALLS	These criteria apply to layer 2, 3 & 4 trees only. A gall rust infection occurs on a live branch less than 5 cm from the stem.	Pl, Py	western gall rust DSG.	Branch infections on layer 1 trees can be ignored.

26b. Free growing damage criteria for multi-storied stands (pg. 2 of 3)

Location of Damage	Type of Damage	Tree being assessed is UNACCEPTABLE if:	Host species	Some possible causes	Comments
Foliage	DEFOLIATION	For defoliating insects: • > 80% of foliage has been removed, lost or damaged due to foliage disease. For foliar diseases: • > 50% of foliage has been removed, lost or damaged	All	defoliators ID, foliage diseases DF.	
Stem or Branch	ADELGID GOUTING	• Any adelgid gouting occurs on a stem or branch.	Ba, Bg, Bl	balsam woolly adelgid IAB.	Gouting is defined as excessive swelling on a branch or shoot caused by balsam woolly adelgid and is often accompanied by misshapen needles and buds. It is most common on branch tips and at nodes near the ends of branches. Consult a recent distribution map to identify the geographic extent of this pest.
Stem or Branch	DWARF MISTLETOE INFECTION	These criteria apply to layer 2, 3 & 4 trees: • Any infection occurs on the stem or a live branch, or • A susceptible tree is located within 10 m of a higher layer tree that is infected with dwarf mistletoe. These criteria apply to layer 1 trees: • Hawksworth rating >3, or severe stem infections (major swelling or deformity) present.	Hw, Pl, Lw, Fd	hemlock dwarf mistletoe DMH, lodgepole pine dwarf mistletoe DMP, larch dwarf mistletoe DML, Douglas-fir dwarf mistletoe DMF.	Note: To confirm infection, the surveyor must observe mistletoe aerial shoots or basal cups on regeneration or on live or dead fallen brooms. The Hawksworth rating system is described on page 23.

TABLE X. Tree wounding criteria for layers 1-4. Trees are unacceptable if any ONE criterion is met.					The stand management objective should be specified in the site plan. Where it is not, the criteria for uneven-aged management should be applied.
TREE SPECIES	SHORT TERM RETENTION ² (Layers 1 & 2)	LONG-TERM RETENTION ³ (Layers 1 & 2)	UNEVEN-AGED ⁴ (Layers 1 & 2)	LAYERS 3 & 4	
B, H, Lw, Ss and Cw <60 years	W>33%C., or MRW 1m, or G. 1 W>400cm ²	W>33%C., or MRW 1m, or G. 1 W>400cm ²	W>33%C., or MRW 1m, or G. 1 W>400cm ²	See table 21	² Where tree will be removed within 20 years. ³ Where tree will be removed in more than 20 years.
Cy, Sx and Cw >60 years	W>33%C., or MRW 1m, or G. 1 W>400cm ²	W>33%C., or MRW 1m, or G. 1 W>400cm ²	W>33%C., or MRW 1m, or G. 1 W>400cm ²		⁴ Where stand is managed in a true uneven state.
Fd, Pw	W>50% C.	W>33%C., or MRW 1m, or G.	W>33%C., or MRW 1m, or G. 1 W>400cm ²		⁵ A gouge involves a wound where penetration is into the sapwood or deeper.
Pl, Py	W>50% C.	W>50% C.	W>33%C., or MRW 1m, or G.		W. = Wound C.= Circumference G. = Gouge ⁵ MRW = Major Root Wound within 1 m of the stem.

26c. Free growing damage criteria for multi-storied stands
(pg. 3 of 3)

Location of Damage	Type of Damage	Tree being assessed is UNACCEPTABLE if:	Host species	Some possible causes	Comments																				
Roots	ROOT DISEASE	Sign(s) or definitive combinations of symptoms of root disease are observed.	All	armillaria root disease DRA, laminated root rot DRL, tomentous root rot DRT, annosus root disease DRN, blackstain root disease DRB.	Signs are direct evidence of the pathogenic fungus including fruiting bodies, distinctive mycelium or rhizomorphs. Symptoms include foliar thinning or chlorosis, pronounced resin flow near the root collar, reduced recent leader growth, a distress cone crop, and wood decay or stain. Symptoms alone are not usually sufficient to identify root disease. Both signs and symptoms may be detected from old stumps, root balls, or other post-harvest remains.																				
Infected conifer found in plot. See Table Y for well-spaced tree net down calculation by layer. Note: All conifer species are considered susceptible. Broadleaf species are considered not susceptible for survey purposes only. Example: How to apply net down for root disease. If root disease-infected trees are found in the plot: 1. Determine the number of healthy, well-spaced trees in each layer using the prescribed minimum inter-tree distance (MITD) (e. g., 3 layer 1, 3 layer 3 and 4 layer 4 = 10 healthy, well-spaced) ignoring the M-value; 2. Count the number of infected trees (e. g., 1 layer 1 tree and 1 layer 3 tree); 3. Working from the uppermost layer down, apply the multiplier in Table Y to each lower layer. Subtract the resultant from each layer in turn, for susceptible species only (e. g., if all trees are susceptible, 1 infected layer 1 tree removes 1 healthy, well-spaced layer 1 tree plus 3 layer 3 trees plus 4 layer 4 trees). Note the effects are cumulative, not exclusive and lower layers do not effect higher layers; 4. Calculate the remaining healthy, well-spaced trees once all removals due to infected trees are completed (e. g. 10 – 8 = 2). The maximum number of free growing trees that might be tallied is 2. Next consider competing vegetation.																									
Table Y Deductions from number of acceptable well spaced uninfected stems for trees infected by root disease in unevenaged stand layers. Infected trees or stumps Multiplier to determine number of trees to be deducted from: <table><tr><td>Layer 1</td><td>Layer 2</td><td>Layer 3</td><td>Layer 4</td></tr><tr><td>1</td><td>2</td><td>3</td><td>4</td></tr><tr><td>-</td><td>2</td><td>2</td><td>3</td></tr><tr><td>-</td><td>-</td><td>2</td><td>2</td></tr><tr><td>-</td><td>-</td><td>-</td><td>2</td></tr></table>						Layer 1	Layer 2	Layer 3	Layer 4	1	2	3	4	-	2	2	3	-	-	2	2	-	-	-	2
Layer 1	Layer 2	Layer 3	Layer 4																						
1	2	3	4																						
-	2	2	3																						
-	-	2	2																						
-	-	-	2																						
- Infected conifer found in plot. See Table Y for well-spaced tree net down calculation. - Infected conifer or stump found in plot. See Table Y for well-spaced tree net down calculation. <table><tr><td>Fd, Sx, Se Lw, Ba, Bg</td><td>laminated root rot DRL</td></tr><tr><td>Se, Sx, Pl</td><td>tomentosus root rot DRT.</td></tr><tr><td>Ba, Hw, Ss</td><td>annosus root rot DRN.</td></tr></table>						Fd, Sx, Se Lw, Ba, Bg	laminated root rot DRL	Se, Sx, Pl	tomentosus root rot DRT.	Ba, Hw, Ss	annosus root rot DRN.														
Fd, Sx, Se Lw, Ba, Bg	laminated root rot DRL																								
Se, Sx, Pl	tomentosus root rot DRT.																								
Ba, Hw, Ss	annosus root rot DRN.																								
Note: Bl, Cw, Pl, Pw, Py and broadleaf species are considered not susceptible for survey purposes only. Note: Ba, Bl, Cw, Fd, Pw, Py and broadleaf species are considered not susceptible for survey purposes only. Note: Bg, Bl, Cw, Cy, Fd, Hm, Pl, Pw, Py, Sx and broadleaf species are considered not susceptible for survey purposes only.																									

27a. Free Growing Damage Criteria for Layered, Interior DFP, and SEDRSS Managed Stands - Layer 1 (pg 1 of 2)

TABLE A - Layer 1 ≥ 12.5cm DBH, SEDRSS damage criteria

Note: Table A overrides all other damage criteria for SEDRSS managed stands

Location of Damage	Type of Damage	Tree being assessed is UNACCEPTABLE if:		Some possible causes	Comments
		Hw, Ba, Bg, Bl, Cy, Fd, Ss, Pw, Pl, Lw, Sx, Py	Cw		
Stem	Wound	- Wound girdles >33% stem circumference, or - One wound >400cm² on stem, or - Wound on a major root within 1m of the stem, or - Tree has gouge in stem.	No criteria	fire NB, windthrow NW, sunscald NZ, logging TL, mechanical TM	A wound is defined as an injury in which the cambium is dead (e.g. sunscald) or completely removed from the tree exposing the sapwood. Measure the wound across the widest point of the exposed sapwood (or dead cambium when the tree is damaged by sunscald). Healed over wound (=scars) are acceptable.
Stem	Decay	Any pathological indicator(s) are present. This may include conk, blind conk, frost crack or rotten branches.	This	various decay fungi DD	
Stem	Bark Mining	Any of the following signs are visible: pitch tubes, boring dust, exit holes on bark surface, galleries under the bark.	No criteria	Douglas fir beetle IBD, Ips pini IBI, Pityogenes & Pityophthorus IBP	Note: Pitch tubes can be associated with trees that have successfully repelled bark beetles, bark must be removed above pitch tube to confirm successful attack (successful galleries will be filled with frass and not pitch, contain adult beetles and or larval galleries). Stressed trees are susceptible to secondary bark and twig beetles.
Stem	Deformation (including crook, fork and dead or broken top)	- Any crook displaces the portion of the stem above the defect by >50% from the line of growth formed by the stem below the point of defect in the bottom 2/3 of the stem only. - A fork occurs above stump height in the bottom 2/3 of the stem only. - A dead or broken top extends more than 20% of the stem length or the live crown is removed.	- A dead tree with no live foliage - The stem is unable to produce ≥50% merchantable volume.	frost NG, hail NH, snow NY, drought ND, logging TL, mechanical TT, dwarf mistletoes (see below).	Cw: Unacceptable as a contributing Crop Tree if assessed as unable to produce > 50% Merchantable Volume in the first 10 m. log length – defined as either: 1. Utility Grade – At least a solid 8 inch shell – Shake and Shingle and /or 2. Higher Grade – Complete solid wood – Saw Logs Note: Field guidance procedures and photo examples for the estimation of merchantable Cw volume are identified in the SEDSRSS Implementation Guide.
Stem	Dwarf Mistletoe Infection	Hawksworth rating >3, or severe stem infections (major swelling or deformity) present.	No criteria	hemlock dwarf mistletoe DMH	The Hawksworth rating system is described in the FPC Dwarf Mistletoe Management Guidebook (or refer to Appendix AA of this document) For SEDRSS, this rating system will only apply to the tree/plot assessment level, and not at the stand level

27b. Free Growing Damage Criteria for Layered, Interior DFP, and SEDRSS Managed Stands - Layer 1 (pg 2 of 2)

TABLE A - Layer 1 ≥ 12.5cm DBH, SEDRSS damage criteria (cont'd)					Note: Table A overrides all other damage criteria for SEDRSS managed stands	
Location of Damage	Type of Damage	Tree being assessed is UNACCEPTABLE if:			Some possible causes	Comments
		Hw, Ba, Bg, Bl, Cy, Fd, Ss, Pw, Pl, Lw, Sx, Py	Cw			
Foliage	Defoliation	•For defoliating insects: > 80% of foliage removed, lost or damaged due to insect defoliation. For foliar diseases: > 50% of foliage removed, lost or damaged.		No criteria	defoliators ID, foliage diseases DF.	
Foliage	Live Crown Vigour	Stems < 17.5 cm dbh - < 30% live crown due to poor vigour. Stems ≥ 17.5 cm dbh - < 20% live crown due to poor vigour.		A dead tree with no live foliage.		Percent live crown is the length of continuous green foliage on a tree expressed as a percentage of its total height.
Roots	Root Disease	- Sign(s) or definitive combinations of symptoms of root disease are observed. - Infected conifer or stump found in plot. See Table Y for well-spaced tree net down calculation by layer.	For Cw, there is no criterion for net down calculation - considered not susceptible or low susceptibility.		armillaria root disease DRA, laminated root rot DRL, annosus root disease DRN.	Signs are direct evidence of the pathogenic fungus including fruiting bodies, distinctive mycelium or rhizomorphs. Symptoms include foliar thinning or chlorosis, pronounced resin flow near the root collar, reduced recent leader growth, a distress cone crop, and wood decay or stain. Symptoms alone are not usually sufficient to identify root disease. Both signs and symptoms may be detected from old stumps, root balls, or other post-harvest remains.
		TABLE Y: Deductions from numbers of acceptable well-spaced uninfected stems for trees infected by root disease in layered stands.		armillaria root disease DRA, laminated root rot DRL, annosus root disease DRN.		
Table Y Deductions from number of acceptable well spaced uninfected stems for trees infected by root disease in unevenaged stand layers.						
Infected trees or stumps		Multiplier to determine number of trees to be deducted from:				
	Layer 1	Layer 2	Layer 3	Layer 4		
	1	2	3	4		
	Layer 2	-	2	3		
	Layer 3	-	-	2		
	Layer 4	-	-	2		

28a. Free Growing Damage Criteria for Layered, Interior DFP, and SEDRSS Managed Stands- Layers 2, 3, and 4 (pg 1 of 3)

TABLE B - Layer 2, 3 & 4 <=12.5cm DBH, SEDRSS damage criteria						
Location of Damage	Type of Damage	Tree being assessed is UNACCEPTABLE if:			Some possible causes	Comments
		Hw, Ba, Bg, BI, Cy, Fd, Ss, Pw, PI, Lw, Sx, Py	Ow			
Stem	Wound	- Wound girdles > 25% stem circumference, or - One wound > 10% the length of stem.	All		fire NB, windthrow NW, sunscald NZ, logging TL, mechanical TM	A wound is defined as an injury in which the cambium is dead (e.g., sunscald) or completely removed from the tree exposing the sapwood. Measure the wound across the widest point of the exposed sapwood (or dead cambium when tree is damaged by sunscald). Healed over wounds (scars) are acceptable.
Stem	Decay	Any pathological indicator(s) are present. This may include conk, blind conk, frost crack or rotten branches.			various decay fungi DD	
Stem	Bark Mining	Any of the following signs are visible: pitch tubes, boring dust, exit holes on bark surface, galleries under the bark.	All		Douglas fir beetle IBD, Ips pini IBI, Pityogenes & Pityophthorus IBP	Note: Pitch tubes can be associated with trees that have successfully repelled bark beetles, bark must be removed above pitch tube to confirm successful attache (successful galleries will be filled with frass and not pitch, contain adult beetles and or larval galleries). Stresses trees are susceptible to secondary bark and twig beetles.
Stem	Deformation (including crook, fork, and dead or broken top)	The pith is horizontally displaced more than 30 cm from the point of defect and originates above 30 cm from the point of germination.	All		defoliators ID, white pine (spruce) weevil	This criterion applies only for terminal weevil damage.
		The tree leader has been killed three or more times in the last 5 years (weevil only).	Ss, Sx		IWS, lodgepole pine terminal weevil WWP, cattle AC, deer AD, elk AE, moose AM, frost NG, hail NH, snow NY, drought ND, logging TL, mechanical TT, Dwarf mistletoes (see below).	
Stem	Lean and Sweep	- The tree has two or more leaders with no dominance expressed after five years growth and the fork originates above 30 cm from the point of germination. - The tree has a dead or broken top at a point that is > 3cm in diameter. - The tree has a flat top (umbrella like) form and no distinct leader.	All			Leader dominance occurs when the tallest leader is at least 5 cm taller than the second tallest leader. See Appendix AA in Surveys Procedures Manual on Damage Types.
		The tree leans >30 degrees from the vertical with or without growth correction.	All		flooding NF, snow NY, slides NS, wind NW, mechanical TM	

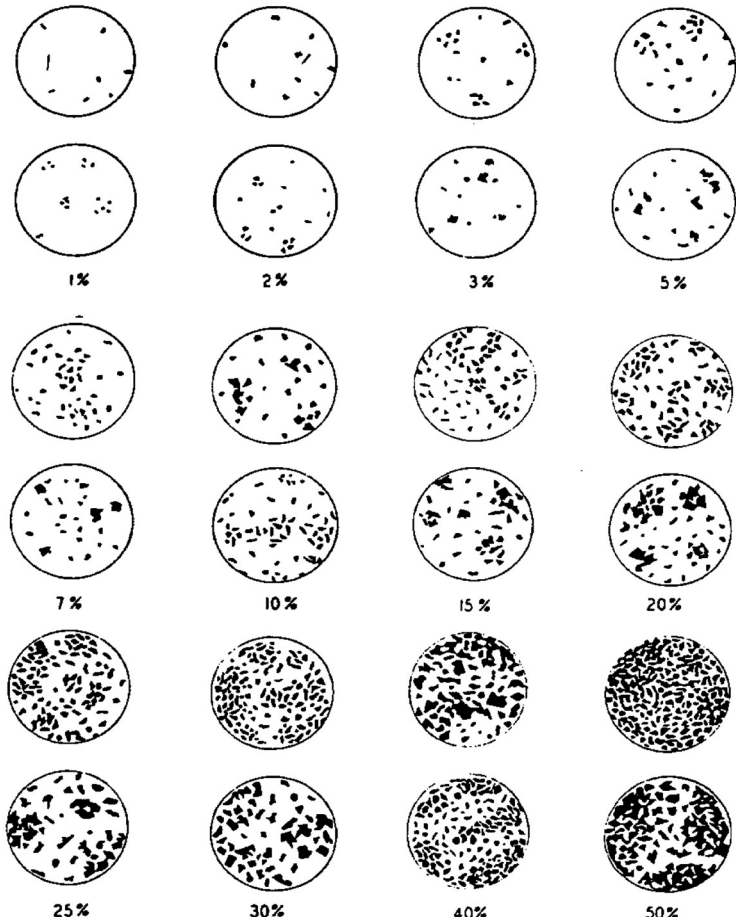
28b. Free Growing Damage Criteria for Layered, Interior DFP, and SEDRSS Managed Stands- Layers 2, 3, and 4 (pg 2 of 3)

TABLE B - Layer 2, 3 & 4 <=12.5cm DBH, SEDRSS damage criteria (cont'd)					Note: Table B overrides all other damage criteria for SEDRSS managed stands	
Location of Damage	Type of Damage	Tree being assessed is UNACCEPTABLE if:	Host Species	Some possible causes	Comments	
Stem	Infection (includes cankers and galls)	Any infection occurs on the stem.	All	white pine blister rust DSB, atropellis canker DSA, dwarf mistletoes (see below).	Note: Wounds caused by rodent feeding around rust cankers should have stem rust recorded as the causal agent.	
Branch	Infection (cankers)	An infection occurs on a live branch less than 60 cm from the stem.	Pw, Pl, Py	white pine blister rust DSB, comandra blister rust DSC, stalactiform blister rust DSS.		
Branch	Galls	A gall rust infection occurs on a live branch less than 5 cm from the stem.	Pl, Py	western gall rust DSG.		
Foliage	Defoliation	> 60% tree foliage has been removed by hemlock looper.	Hw	hemlock looper IDL.		
		> 80% of foliage has been removed, lost or damaged due to insect defoliation.	All Other	defoliators ID.		
		> 50% of foliage has been removed, lost or damaged due to insect defoliation.	All	foliage diseases DF.		
Foliage	Live Crown Vigour	< 30% live crown present due to poor vigour.			Percent live crown is the length of continuous green foliage on a tree expressed as a percentage of its total height.	
Stem or Branch	Adelgid Gouting	Any adelgid gouting occurs on a stem or branch.	Ba, Bg, Bl	balsam woolly adelgid IAB.	Gouting is defined as excessive swelling on a branch or shoot caused by balsam woolly adelgid, and is often accompanied by misshapen needles and buds. It is most common on branch tips and at nodes near the ends of branches. Consult a recent distribution map to identify the geographic extent of this pest.	
Stem or Branch	Dwarf Mistletoe Infection	- Any infection occurs on the stem or a live branch, or - A susceptible tree is located within 10 m of the bole of a higher layer tree that is infected with dwarf mistletoe.	Hw, Pl, Lw, Fd	hemlock dwarf mistletoe DMH, Pl dwarf mistletoe DMP, larch dwarf mistletoe DML, Fd dwarf mistletoe DMF.	Note: To confirm infection, the surveyor must observe mistletoe aerial shoots or basal cups on regeneration or on live or dead fallen brooms.	

28c. Free Growing Damage Criteria for Layered, Interior DFP, and SEDRSS Managed Stands- Layers 2, 3, and 4 (pg 3 of 3)

TABLE B - Layer 2, 3 & 4 <= 12.5cm DBH, SEDRSS damage criteria (cont'd)					Note: Table B overrides all other damage criteria for SEDRSS managed stands	
Location of Damage	Type of Damage	Tree being assessed is UNACCEPTABLE if:	Host Species	Some possible causes	Comments	
Roots	Root Disease	Sign(s) or definitive combinations of symptoms of root disease are observed.	All	armillaria root disease DRA, laminated root rot DRL, annosus root disease DRN.	Signs are direct evidence of the pathogenic fungus including fruiting bodies, distinctive mycelium or rhizomorphs. Symptoms include foliar thinning or chlorosis, pronounced resin flow near the root collar, reduced recent leader growth, a distress cone crop, and wood decay or stain. Symptoms alone are not usually sufficient to identify root disease. Both signs and symptoms may be detected from old stumps, root balls, or other post-harvest remains.	
		Infected conifer or stump found in plot. See Table Y for well-spaced tree net down calculation by layer.	All	armillaria root disease DRA.	Example: How to apply net down for root disease. If root disease-infected trees are found in the plot: 1. Determine the number of healthy, well-spaced trees in each layer using the prescribed minimum inter-tree distance (MITD) (e. g., 3 layer 1, 3 layer 3 and 4 layer 4 = 10 healthy, well-spaced) ignoring the M-value; 2. Count the number of infected trees (e. g., 1 layer 1 tree and 1 layer 3 tree); 3. Working from the uppermost layer down, apply the multiplier in Table Y to each lower layer. Subtract the resultant from each layer in turn, for susceptible species only (e. g., if all trees are susceptible, 1 infected layer 1 tree removes 1 healthy, well- spaced layer 1 tree plus 3 layer 3 trees plus 4 layer 4 trees). Note the effects are cumulative, not exclusive and lower layers do not affect higher layers; Calculate the remaining healthy, well-spaced trees once all removals due to infected trees are completed (e. g. 10 – 8 = 2). The maximum number of free growing trees that might be tallied is 2. Now consider competing vegetation. Note: Bl, Cw, Pl, Pw, and broadleaf species are considered not susceptible for survey purposes only.	
		Infected conifer or stump found in plot. See Table Y for well-spaced tree net down calculation by layer.	Fd, Ba, Bg	laminated root rot DRL.		
		Infected conifer or stump found in plot. See Table Y for well-spaced tree net down calculation by layer.	Ba, Hw, Ss	annosus root rot DRN.		Note: Bg, Bl, Cw, Cy, Fd, Hm, Pl, Pw, and broadleaf species are considered not susceptible for survey purposes only.

29a. Estimating Crown Closure via visual observation



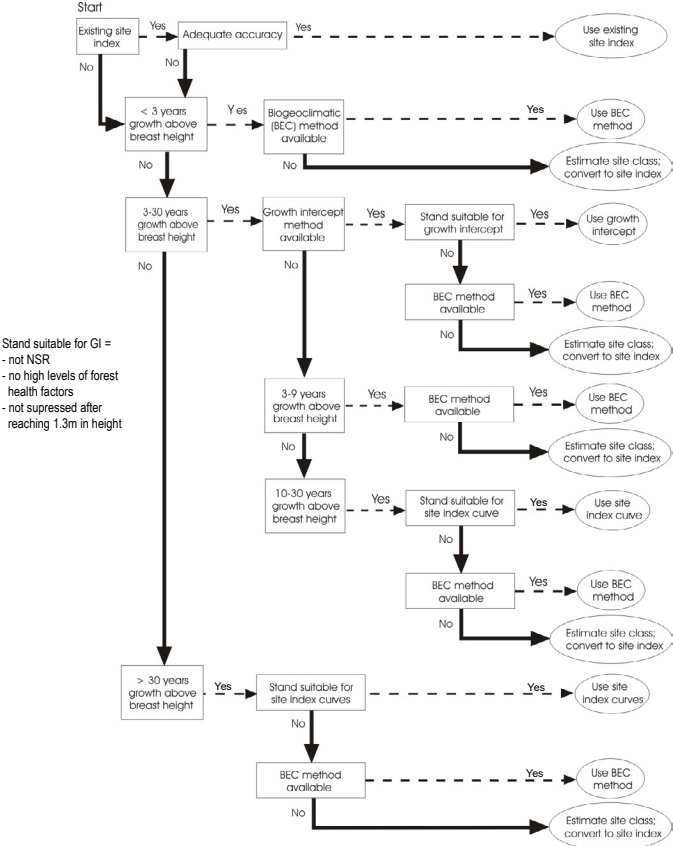
29b. Average crown radius, area, and number of trees equal to 6% crown closure

Average crown radius (m)	Area (m ²)	Number of trees/ha for 6% C/C
2.0	12.6	48
2.5	19.6	31
3.0	28.3	21
3.5	38.5	16
4.0	50.2	12
4.5	63.6	9
5.0	78.5	8

30. Steps to calculate confidence limits for silviculture surveys

t Value for n	n# of PLOTS	STEPS TO CALCULATE CONFIDENCE LIMITS The methods below may be applied equally for well spaced or free growing trees.
2.132	5	n = # of plots
2.015	6	x_i = # of well-spaced trees in plot
1.943	7	$\sum$ = summation of
1.895	8	pm = plot multiplier
1.860	9	$\bar{x}$ = average
		LCL = lower confidence limit
		MSS = minimum stocking standard
		'e' = desired precision level
1.833	10	
1.812	11	1. Calculate mean of well-spaced trees ($\bar{x}$).
1.796	12	2. Calculate standard deviation (S).
1.782	13	$S = \sqrt{\frac{\sum x_i^2 - (\sum x_i)^2 / n}{n - 1}}$
1.771	14	
1.761	15	3. Calculate standard error of mean
1.753	16	$s_{\bar{x}} = s / \sqrt{n}$
1.746	17	4. Find t value for 90% and n
		5. Multiply t value by $S_{\bar{x}}$ which equals the Confidence Interval (CI)
1.740	18	This can be expressed as average per plot or multiplied
1.734	19	by 200 (plot multiplier for 50m ² plots) to convert to
1.729	20	stems/ha.
1.725	21	6. Compare $\bar{x}$ and CI to the following decision rules:
		(a) If $\bar{x} - CI \geq MSS$, then the area is considered SR. No further plots are required.
1.721	22	(b) If $\bar{x} < MSS$, then the area is considered NSR. No further plots are required.
1.717	23	(c) If $\bar{x} > MSS$ and $\bar{x} - CI < MSS$, check e value (as outlined below). If the desired level of precision 'e' has not been met <u>or</u> maximum plots have already been established then no more plots required, and if $\bar{x} \geq MSS$, then the area is considered SR. Otherwise, determine the number of plots required.
1.714	24	
1.711	25	
1.708	26	'e' value = if $\bar{x} \geq 1,000$ tr/ha, $e = 0.1 \times \bar{x}$
1.706	27	(This $\pm 10\%$ of the average.)
1.703	28	if $\bar{x} < 1,000$ tr/ha for 50 m ² plots $e = 0.5$.
1.701	29	(This is $\pm$ half a tree per 3.99m plot).
1.699	30	
1.697	31	New n = $\left[\frac{t \times s}{e} \right]^2$
1.684	40	
1.671	60	The number of additional plots required equals,
1.658	120	New n - n,
1.645	∞	to a maximum of 1.5 x the stratum area in ha

31a. Selecting a method to estimate site index



31b. Site Index Source Codes

- A Site index from adjacent stand, (rarely used)
- I Site index growth intercept
- O Site index from the November 1998 SIBEC rollover, (not used by surveyors)
- C Site index from height age reference curves
- H Site index from stand before harvest, (rarely used)
- E Site index from SIBEC, biogeoclimatic classification
- M Site index converted from site class, ('last resort')
- S Site index assigned by District Silviculture. Section

31c. Site Class to Site Index Conversion for Broadleaf Tree Species

	Good	Medium	Poor	Low
	G	M	P	L
Ac	26	18	9	3
At	27	20	12	4
Dr	33	23	13	6
E, Ea, Ep	27	20	12	4
Mb	33	23	13	6

32. Average site index relationship¹ (for use with growth intercept only)

The species
that can be
predicted

Average site index (m) relationship

	When you know interior BI site index										
	10	12	14	16	18	20	22	24	26	28	30
Interior PI	10	13	15	17	19	21	23	26	28	30	32
Interior Sw	10	12	14	17	19	21	24	26	28	31	33

¹ Example: If you have data that were gathered by the growth intercept method on interior BI that indicates a site index of 22, this table can be used to predict the site index of interior white spruce as 24.

	When you know interior Fd site index										
	10	12	14	16	18	20	22	24	26	28	30
Interior PI	10	12	14	16	19	21	23	25	27	29	31
Interior Sx	7	10	13	15	18	21	23	26	29	32	34
Interior Hw	6	8	11	13	15	17	20	22	24	27	29
Interior Lw	11	13	15	17	19	21	23	25	27	29	31

	When you know interior Hw site index										
	10	12	14	16	18	20	22	24	26	28	30
Interior Fd	13	15	17	19	21	22	24	26	28	29	31

	When you know interior Lw site index										
	10	12	14	16	18	20	22	24	26	28	30
Interior PI	8	10	13	15	17	19	21	23	25	27	29
Interior Fd	9	11	13	15	17	19	21	23	25	27	29

	When you know interior Sx site index										
	10	12	14	16	18	20	22	24	26	28	30
Interior BI	10	12	14	15	17	19	21	22	24	26	27
Interior Fd	12	14	15	17	18	19	21	22	24	25	27
Interior PI	11	13	15	17	19	20	22	24	26	28	30

	When you know interior PI site index										
	10	12	14	16	18	20	22	24	26	28	30
Interior BI	10	12	13	15	17	19	21	23	24	26	28
Interior Fd	10	12	14	16	18	19	21	23	25	27	29
Interior Lw	12	13	15	17	19	21	23	25	27	29	31
Interior Sx	9	11	13	15	18	20	22	24	26	28	31

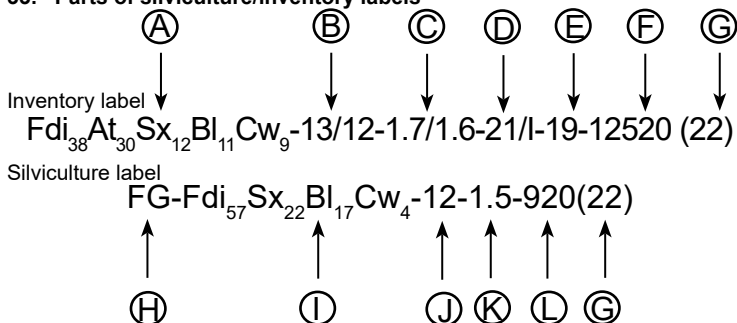
	When you know coastal Ba Site Index										
	15	18	21	24	27	30	33	36	39	42	
Coastal Hw	17	20	23	26	29	32	35	39	42	45	

	When you know coastal Fd site index										
	15	18	21	24	27	30	33	36	39	42	
Coastal Hw	13	16	18	21	24	27	29	32	35	37	

	When you know coastal Hw site index										
	15	18	21	24	27	30	33	36	39	42	
Coastal Ba	13	16	19	22	25	28	31	34	36	39	
Coastal Fd	17	20	24	27	30	34	37	40	44	47	
Coastal Ss	14	18	21	25	29	33	36	40	44	48	

	When you know coastal Ss site index										
	15	18	21	24	27	30	33	36	39	42	
Coastal Hw	16	18	21	23	26	28	30	33	35	38	

33. Parts of silviculture/inventory labels



These are the mandatory parts of a silviculture and inventory label, according to RESULTS Information Submission Specifications. If you feel the labels do not adequately describe the stratum, make note in your comments or recommendations.

- A Fdi38At30Sx12Bl11Cw9 = calculated species composition of all living commercial broadleaf and conifer trees per hectare, excluding germinants. The species are arranged in descending order and are recorded to the nearest 1%. *RESULTS permits a maximum of 10 species. Excess species should be lumped into the leading species.
- B 13 years/12 years = average of the inventory sample ages of the leading (Fdi = 13 year) and secondary species (At = 12 years). Sample ages are measured on the tallest trees of the desired species within the 3.99m plots.
- C 1.7m/1.6m = average of the inventory sample heights of the leading (Fdi = 1.7m) and secondary species (At = 1.6m). Sample heights are completed on the tallest trees of the desired species within the 3.99m plots and include in-season partial growth.
- D 21/I = site index of the leading species and the site index source. The site index of Fdi is 21m, and the site index source is growth intercept (I).
- E 19% = estimated crown closure by visual observation of the total living commercial and broadleaf trees.
- F 12520sph= average number of total living commercial broadleaf and conifer trees per hectare, excluding germinants.
- G 22 = last two digits of the survey year.
- H FG = status of the stratum. See * Note.
- I Fdi57Sx22Bl17Cw4 = calculated species composition of the total free growing trees, recorded to the nearest 1%.
- J 12 years = average of the free growing sample ages of the leading species (Fdi). See * Note.
- K 1.5m = average of the free growing sample heights of the leading species, including in-season partial growth (Fdi). See * Note.
- L 920sph = average number of free growing trees per hectare. See * Note.

* Note: When the results of a survey indicate that the stratum is not free growing, all of the components of the silviculture label describe well spaced trees instead of free growing trees.

34. Boring Height Age Correction

Add this number of years to the counted age when boring at 1.3m for the various site index ranges

Source: Excerpt from MFLRO Cruising Manual 2014

	20	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Act		All sites 2 years														
At, Ep								5	8	7	8-9	10-12	13-17	18-32	≥33	
Ba			≤12	13-14	15-17	18-19	20-21	22-24	25-26	27-29	30-31	≥32				
B rest		≤9	10-12	13-14	15-17	18-19	20-21	22-24	25-26	27-29	30-31	≥32				
Cw					≤10	11-16	17-22	23-28	29-35	36-41	42-47	≥48				
Dr												≤6	7-14	15-21	22-28	≥29
Fdc						≤16	17-22	23-28	29-35	36-41	42-47	≥48				
Fdi						≤16	17-22	23-28	29-35	36-41	42-47	≥48				
Hwi			≤11	12	-	13	14	15	16-17	18-19	20-21	22-24	25-29	≥30		
Hwc									10-13	14-20	21-27	28-34	35-42	≥43		
Lw		-	8	9	10	11-12	13-14	15-16	17-21	22-27	28-40	≥41				
Pli		-	6	-	7	8	10-11	10-11	12-14	15-17	18-21	22-26	27-36	≥37		
Pw		10	11	12-13	14-15	16-17	18-20	21-25	26-33	34-47	≥48					
Py			5	6	7	8	9-10	11-14	15-22	23-47	≥48					
Sb	7	14-17	18-24	25-41	≥42											
Se, Sw	9	16-17	18-20	21-25	26-33	34-37	≥48									
Ss							10-11	12-17	18-22	23-28	29-33	34-38	39-44	45-49	≥50	

Notes/Reminders/Recent Changes
