

NET FACTOR PROCEDURES FOR LOSS INDICATORS

Rot Possibly Visible	Blind Conk	4m above top Conk	Y grade	N.F. = 50%			
		6m below bottom Conk					
	Conk (Heart Rot)	4m above top Conk	Y grade	N.F. = 50%			
		6m below bottom Conk					
Frost Crack*	Deduction length=Total frost crack lengths x 10% *Max N.F. Ded = 40%			Then (A)			
Root Rot (DRS) (rot NOT visible)	3 m log (if DRS conk on stem, then log extends 3 m above highest DRS conk)			X grade	N.F. = 81%		
Rot MUST be Visible	Broken Top	Deduction length = 1.0m always; or 1.0m below 'Y' grade N.F. = 0%			Then (A)		
	Butt Rot (Sounding)/ Catface (Conical)	(1)	[Diameter of rot] [DBH]	(2)	See Butt Rot Table	(3)	Then (A)
		Catface (Cylinder)	Deduction length = [Diameter of rot/Log diameter]2 x Rot Length		Then divide by 2 if starting with Δ vs \square ; Then (Butt Rot Guide)		Then (A)
	Dead Top/ Sap Rot	N.F. % = [Diameter of Core/Diameter of Log] ² x 100%					
	Fork / Crook	1.0m below 'Y' grade N.F. = 50%; or Deduction Length = 0.5m				Then (A)	
	Large Rotten Branch (Knots >10cm)	1.0m above and below 'Y' grade N.F. = 50%; or Deduction Length = 1.0m				Then (A)	
	Root Rot (rot VISIBLE)	N.F.% = 100% - [19%*[Decay length/Log Length]]					
	Scar (Measurable)/ Missing Wood	N.F.% = [Volume of Log - Volume of Decay/Volume of Log] x 100%; or Rot Diameter= [$\sqrt{\text{depth*width}/\pi}$]*2; Then (Butt Rot Guide)					
	Scar (Non-Measurable)	Deduction length = [Scar width/(6.3* diameter log)]* scar length				Then (A)	

Formula (A) N.F.% = $\frac{[\text{Log length}-\text{Deduction length}]}{[\text{Log length}]}$ x 100% Deduction Length = %Rot * Log Length

BAF	PRF _c	PRF _f
5	0.2236	0.2186
7	0.1890	0.1840
9	0.1667	0.1617
12	0.1443	0.1393
16	0.1250	0.1200
20	0.1118	0.1068
25	0.1000	0.0950

BANDS	BAF	PRF _c	PRF _f
2.25	5.06	0.2222	0.2172
2.50	6.25	0.2000	0.1950
3.00	9.00	0.1667	0.1617
3.50	12.25	0.1429	0.1379
4.00	16.00	0.1250	0.1200
4.50	20.25	0.1111	0.1061
5.00	25.00	0.1000	0.0950

RATIO = length of rot/DBH	LENGTH	Deduction Length
1/4 DIAMETER	1.8 - 2.4m	0.2m
2/4 DIAMETER	3.6 - 4.2m	0.4m
3/4 DIAMETER	5.4 - 6.0m	1.2m
4/4 DIAMETER	7.2m	2.4m

Broken tops, dead tops, forks and crooks only net factored if there is visible decay
SNG not necessary on trees with heart rot conks, DRS
Pinicola conks generally grow on dead wood and are not heart rot conks and do not have a 50% NF. Only treated as a heart rot conk if it is growing on live wood

To calculate the PRF_c of any BAF: $PRF_c = 0.5/\sqrt{BAF}$

PRF_c = Plot Radius Factor to Centre of Tree

PRF_f = Plot Radius Factor to the face of the tree

PRF_f = PRF_c - 0.005

BAF selection must be made prior to arriving at the reference pin

The same BAF must be used for all plots in the cluster

The final "IN" or "OUT" determination for all borderline trees will be made from the face of the tree, not the center

Table 5.1 - Formulas for calculating volume

Shape	Formula
Rectangular solid	Volume = L*W*D
Cylinder	Volume = $\pi r^2 * L$
Cone	Volume = $(1/3) \pi r^2 * L$
Units must be consistent (all cm or all m). $\pi = 3.1416$	

Crown Class Codes			
Crown Class Codes	Relationship vs Surrounding Trees	Tree and Crown Size	Crowding
D - Dominant	Extended above	Taller, well developed	Only somewhat
C - Co-dominant	Same level	Smaller than dominant	Crowded on sides
I - Intermediate	Below or extending into co-doms	Smaller, less developed	Quite crowded
S - Suppressed	Generally below co-dom crowns	Smallest, less developed	Overtopped

Split Plots			
Large tree count >10		or	Small tree count > 50
Sample #	Half		Quarter*
Even	East 1/2 of plot		Northwest 1/4 of plot
Odd	West half of plot		Southwest 1/4 of plot

* Quarter plots for fixed radius plots only

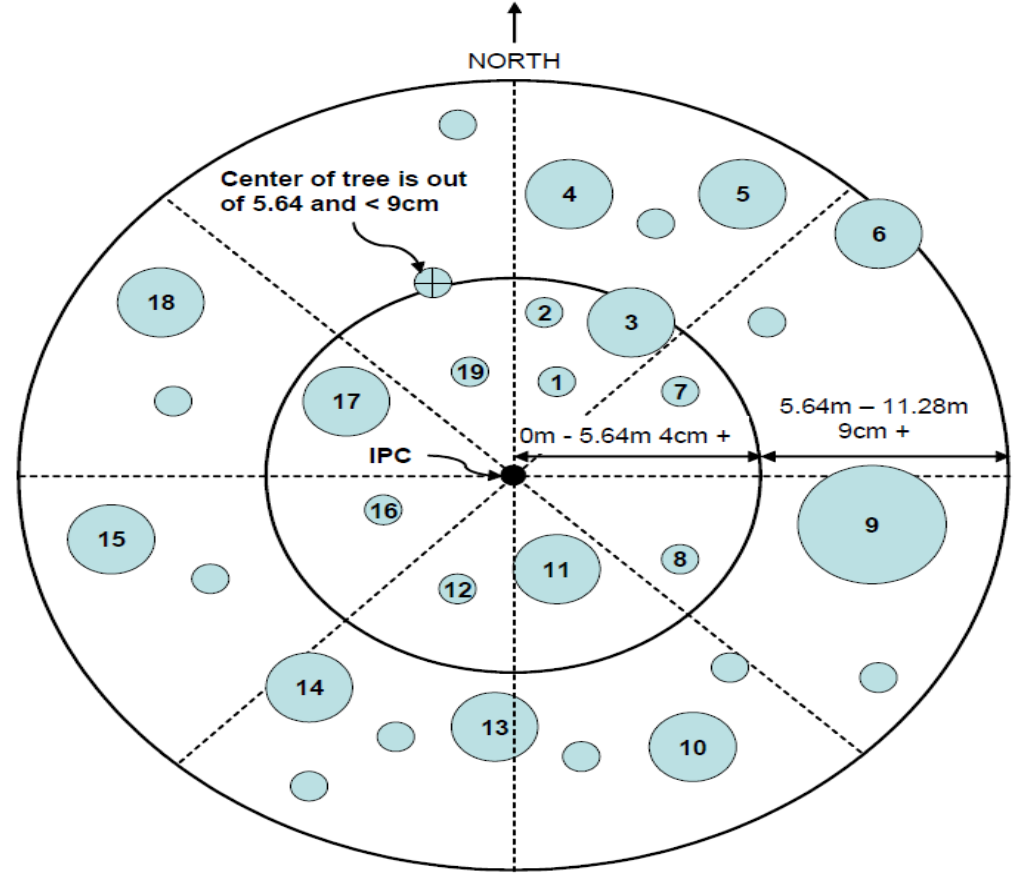
Age Measure Codes	
CRC	Cannot reach Center - Needs Prorate Length
NOP	Pith Missed - Needs Missed Years
OUT	Out of Plot tree
PRE	Age from Previous Measure
PTH	Pith Obtained
ROT	Rot in Center - Needs Prorate Length
WHO	Whorls above Breast Height
NOC	Core not collected

CMI Sample Tree Selection								
	Population Selection Criteria							Tree Selection Criterion
Type	Plot	Species	B.A.	L/D	C.C.	Age Suit.	Ht. Suit.	Only 1 Consideration
T	5.64 Plot			Live	D/C			Largest DBH
L	11.28 Quad	Leading		Live	D/C	Non-Resid.		Largest DBH
S	11.28 Quad	Second	>20%	Live	D/C	Non-Resid.		Largest DBH
O	11.28 Quad	Other	>20%	Live	D/C	Non-Resid.		Largest DBH
V	11.28 Plot			Live		Residual		Representative
X								Representative

VRI Sample Tree Selection							
	Population Selection Criteria						Tree Selection Criterion
Type	Plot	Species	L/D	C.C.	Age Suit.	Ht. Suit.	Only 1 Consideration
T	5.64 Plot		Live	D/C			Largest DBH
L	5.64 Plot	Leading	Live	D/C			Largest DBH
S	5.64 Plot	Second	Live	D/C			Largest DBH
O	5.64 Plot		Typically Live	Typically D/C	Typically "Y"	Typically "Y"	Subjective
X	Outside 5.64 Plot		Typically Live	Typically D/C	Typically "Y"	Typically "Y"	Subjective

Mode Description		
Code	Description	Attributes Required
D	Dropped - A previously measured tree that is to be dropped because it was outside of the plot.	Requires sector, species, DBH and stem map azimuth and distance
F	Forest Health - A tree in a Type- A (Early YSM- Forest Health) sample that is below the standard YSM tagging limits	Requires all attributes (may or may not have a DBH, depending on length)
H	Harvested - A previously measured tree that cannot be found and has obviously been harvested or cut	Only requires sector and species
M	Missed - A tree that was obviously missed at the previous measurement.	Requires all attributes
N	Not Found - A previously measured tree that cannot be found	Only requires sector and species
P	Planted, Too Small - A planted seedling identified and tagged in a Type-A (Early YSM - Planted) sample	Requires all attributes except DBH, CC and Ht to Live Crown
Z	Non Tally Sample Tree - A tree that is not tallied yet is a selected as a sample tree	Requires all attributes except Loss, Damage and Net Factor

Photo Descriptions			
Types with CWD (F, O, D, E, C)		Types without CWD (M, Y, L, PSP, Q, Z, T, B, N)	
Code	Description	Code	Description
PP	Plot Pin	PP	Plot Pin
T1S	Transect 1 Start	N	North
T2S	Transect 2 Start	E	East
T1M	Transect 1 Mirrored	S	South
T2M	Transect 2 Mirrored	W	West
T1E	Transect 1 End	-	-
T2E	Transect 2 End	-	-
REP	Representative	REP	Representative
CAN	Canopy (Vertical)	CAN	Canopy (Vertical)
SOIL	Soil Profile*	SOIL	Soil Profile*
OTH	Other**	OTH	Other**



CMI - 5.64m and 11.28m Fixed Radius Plot Layout

**Required only if a soil pit is dug*

***Optional, and multiple available to be added and named*

Definitions:

Start: From IPC looking out, along transect

Mirrored: From IPC looking out, 180 deg. from transect bearing

End: From end of transect looking in towards IPC

EFR Key Guide

MAIN SCREENS

F1	Form Commands/Tools	All	Leads to other options, shows F commands available, tools menu
F2	Inactive		
F3	Copy down	Any List	Copies down the data from the row above.
F4	Next section	Trees	Move to the next section on screen
F5	Toggle tree view	Trees	Toggles between Tree List and Tree Details screen
F6	Toggle tree lists	Tree List	Toggles between tree, loss, damage and grade
F7	Inactive		
F8	Inactive		
F9	Inactive		
F10	History view (remeasure, QA)	Most Forms	Toggles to 'previous' data for that screen
F11	Inactive		
F12	Comments	Most Forms	Add a comment to the current screen
[ESC]	Escape Screen	All	Return to previous screen
[ENTER]	Enter/activate cell	All	
[TAB]	Next cell	All	
[SPACE]	Drop-down lists	Any List	Opens box drop-down lists (e.g. L/S/D/F, M/E, CC)
[ZERO]	Edit alpha cells	Any List	Allows editing in alpha cells; cursor enters cell
CTRL-F5	Sample tree	Trees	Toggles between Sample Tree and Tree screen
CTRL-A	Stem Map Only	Tree List	Locks screen for azimuth and distance only
CTRL-G	"Go to"	Tree List	Search and go to a tree or sector
CTRL-L	Delete Row/Tree	Any List	Deletes the current row you are on
CTRL-N	Insert Row/Tree	Any List	Inserts a row after the current one you are on
CTRL-S	Save	All	Saves at any time without exiting the screen
CTRL-Z	Undo	Most Forms	Deletes the most recent change to data
CTRL- .	Hotkey	Trees	Press to select default values as follows:
			Live/Dead/Standing/Fallen = L/S,
			Measured/Estimated (DBH) = M, Measured/Estimated (ht) = M,
			Broken Top = No
			NF % = 100

TREE DETAILS SCREEN

Same as 'MAIN SCREEN' except			
F8 (SHIFT-F2)	Previous Tree	Details	Moves from current tree to previous in list
F9 (SHIFT-F3)	Next Tree	Details	Moves from current tree to next in list
F3	Add Tree	Details	Adds a tree, highest tree number +1

EFR Key Guide

SMALL TREE SCREEN			
F7	10-29cm column	Sm. Tree	Goes to 10-29cm column on current row
F8	30-130cm column	Sm. Tree	Goes to 30-130cm column on current row
F9	>130cm column	Sm. Tree	Goes to >130cm column on current row
F6	Toggles add/remove	Sm. Tree	F6 changes ENTER to subtract or add by 1
[ENTER]	Add Tree to Cell	Sm. Tree	Adds tree(s) to the current cell
ACCESS SCREEN			
F2	Reset row to 0	Access	Resets current row cum. and inter. distance to 0
F3	Insert Above	Access	Adds and enters a row above current row
F4	Next Section	Access	Skips to com
F5	Insert below	Access	Adds and enters a row below current row
F6	Delete	Access	Deletes current row
TREE SHRUB HERB MOSS			
F5	Toggle Screen	Tree Shrub	Toggles between Tree/Shrub and Herb/Moss screen
TRANSECTS			
F6	Toggle Screen	Transect	Toggles between transect 1 and 2

Loss Indicator Codes	
Code	Description
DD —	Unknown stem decay (conk)
	DDE is a known stem decay (<i>Echinodontium tinctorium</i>)
DR —	Unknown root decay
	DRA is a known root decay (<i>Armillaria ostoyae</i>)
BNK	Blind Conk
NGC	Frost Crack
SCA	Scar
FRK	Fork
CRO	Crook
LRB	Large Rotten Branch
DTP	Dead Top
BTP	Broken Top
SNG	Sounding
OTH	Other (cause is known, but no appropriate code)
DIR	Direct observation

Stand Disturbance Codes - CMI Header	
Code	Description
N	Non-biological/ abiotic injuries
NB	Fire
NW	Windthrow
DD	Heartrots
DF	Foliage diseases
DR	Root diseases
D	Unknown diseases
I	Unknown insects
IB	Bark beetles
ID	Insect defoliators
A	Animal
L	Logging, thinning, clearing, brushing and weeding - cut
X	Other known (add details in comments)
U	Other unknown
O	No significant damage

Loss Indicator Position Codes (PSPs ONLY)	
Code	Position on Tree
	(tree is divided into thirds)
1	Lower third
2	Middle third
3	Upper third
4	Lower and middle third
5	Middle and upper third
6	Lower and upper third
7	All thirds

Loss Indicator Position (PSPs ONLY)							
	1	2	3	4	5	6	7
Top			√		√	√	√
Middle		√		√	√		√
Bottom	√			√		√	√

Tree Species List

Code	Common Name	Latin Name
Coniferous		
Ba	Amabilis fir	<i>Abies amabilis</i>
Bg	Grand fir	<i>Abies grandis</i>
Bl	Subalpine fir	<i>Abies lasiocarpa</i>
Cw	Western red cedar	<i>Thuja plicata</i>
Fd	Douglas fir	<i>Pseudotsuga menziesii</i>
Fdi	interior Douglas fir	<i>Pseudotsuga menziesii</i> var. <i>glauca</i>
Fdc	coastal Douglas fir	<i>Pseudotsuga menziesii</i> var. <i>menziesii</i>
Hm	Mountain hemlock	<i>Tsuga mertensiana</i>
Hw	Western hemlock	<i>Tsuga heterophylla</i>
Hxm	Mountain x western hemlock	<i>Tsuga mertensiana</i> x <i>heterophylla</i>
Jr	Rocky Mtn. juniper	<i>Juniperus scopulorum</i>
Js	Seaside juniper	<i>Juniperus maritima</i>
La	Alpine larch	<i>Larix lyallii</i>
Lt	Tamarack	<i>Larix laricina</i>
Lw	Western larch	<i>Larix occidentalis</i>
Pa	Whitebark pine	<i>Pinus albicaulis</i>
Pf	Limber pine	<i>Pinus flexilis</i>
Pj	Jack pine	<i>Pinus banksiana</i>
Pl	Lodgepole pine	<i>Pinus contorta</i>
Pli	Lodgepole pine	<i>Pinus contorta</i> var. <i>latifolia</i>
Plc	Shore pine	<i>Pinus contorta</i> var. <i>contorta</i>
Pw	Western white pine	<i>Pinus monticola</i>
Py	Ponderosa pine	<i>Pinus ponderosa</i>
Pxj	Lodgepole x jack pine	<i>Pinus</i> x <i>murraybanksiana</i>
Sb	Black spruce	<i>Picea mariana</i>
Se	Engelmann Pruce	<i>Picea engelmannii</i>
Ss	Sitka spruce	<i>Picea sitchensis</i>
Sw	White spruce	<i>Picea glauca</i>
Sx	Spruce hybrid	<i>Picea cross</i>

Code	Common Name	Latin Name
Coniferous (cont'd)		
Sxw	Engelmann x white	<i>Picea engelmannii</i> x <i>glauca</i>
Sxl	Sitka x white	<i>Picea</i> x <i>lutzii</i>
Sxs	Sitka x unknown hybrid	<i>Picea sitchensis</i> x ?
Tw	Western yew	<i>Taxus brevifolia</i>
Yc	Yellow cedar	<i>Chamaecyparis nootkatensis</i>
Xc	Unknown conifer	
Zc	Other conifer	

Deciduous		
Ac	Poplar	<i>Populus balsamifera</i>
		<i>Populus balsamifera</i> ssp.
Acb	Balsam poplar	<i>Balsamifera</i>
		<i>Populus balsamifera</i> ssp.
Act	Black cottonwood	<i>Trichocarpa</i>
Ax	Hybrid poplars	<i>Populus</i> sp. x <i>sp.</i>
At	Tembling aspen	<i>Populus tremuloides</i>
Dr	Red alder	<i>Alnus rubra</i>
Ea	Alask paper birch	<i>Betula neoalaskana</i>
Exp	Alaska x paper birch hybrid	<i>Betula</i> x <i>winteri</i>
Ep	Paper birch	<i>Betula papyrifera</i>
Ew	Water birch	<i>Betula occidentalis</i>
Mb	Bigleaf maple	<i>Acer macrophyllum</i>
Mv	Vine maple	<i>Acer circinatum</i>
Qg	Garry oak	<i>Quercus garryana</i>
Vb	Bitter cherry	<i>Prunus emarginata</i>
Vy	Choke cherry	<i>Prunus virginiana</i>
Vp	Pin cherry	<i>Prunus pensylvanica</i>
Xh	Unknown hardwood	
Zh	Other hardwood	

Damage Agent Codes			
Field Codes		Common Name	
O	NO detectable abiotic or biotic damage		
U	UNKNOWN (Damage evident but causal agent unknown)		
*	UBT		Unknown Broken Top
*	UCR		Unknown Crook
*	UF		Unknown Fork
*	USW		Unknown Sweep
N	NON-BIOLOGICAL (ABIOTIC) INJURIES		
		NAV	Avalanche or Snow Slide
*	NB		Fire
*		NBP	Post Burn Mortality
*		NCA	Aspen (At) Decline
*		NCB	Birch (E) Decline
*		NCY	Yellow Cedar (Yc) Decline
	ND		Drought
	NF		Flooding
	NG		Frost
*		NGC	Frost Crack
		NGK	Shoot/Bud Frost Kill
	NH		Hail
	NL		Lightning
	NS		Slide
*	NW		Windthrow
*		NWS	Windthrow - Soil Failure
*		NWT	Windthrow - Treatment or Harvest-related
*	NX		Wind Scarring or Rubbing
	NY		Snow or Ice Damage
		NYB	Snow or Ice Breakage
		NYP	Snow Press
	NZ		Sunscald

Damage Agent Codes		
Field Codes		Common Name
T	TREATMENT INJURIES	
	TC	Chemical Injury
*	TH	Harvested or Cut
*	TL	Logging Wounds
	TM	Other Mechanical Damage (non-logging)
	TR	Pruning Wound
	TT	Thinning or Spacing Wound
V	PROBLEM VEGETATION	
	VS	Shrub Competition
*	VT	Tree Competition
A	ANIMAL DAMAGE	
	AB	Bear
	AD	Deer
	AE	Elk
	AH	Hare or Rabbit
*	AM	Moose
	AP	Porcupine
*	AS	Squirrel
	AX	Bird
	AZ	Beaver

* Denotes highest priority damage agents

Damage Agent Codes			
Field Codes		Common Name	Scientific Name
D	DISEASES		
	DB	Broom Rusts	
		DBF	Fir Broom Rust <i>Melampsorella caryophyllacearum</i>
		DBS	Spruce Broom Rust <i>Chrysomyxa arctostaphyli</i>
	DD	Stem Decay	
*		DDB	Birch Trunk Rot <i>Fomes fomentarius</i>
		DDC	Brown Cubical Rot of Birch <i>Piptoporus betulinus</i>
*		DDE	Rust Red Stringy Rot <i>Echindontium tinctorium</i>
*		DDF	Brown Crumbly Rot <i>Fomitopsis pinicola</i>
*		DDG	Sterile Conk Trunk Rot of Birch <i>Inonotus obliquus</i>
*		DDH	Hardwood Trunk Rot <i>Phellinus ignarius</i>
*		DDP	Red Ring Rot <i>Phellinus pini</i>
		DDQ	Quinine Conk Rot <i>Fomitopsis officinalis</i>
*		DDT	Aspen Trunk Rot <i>Phellinus tremulae</i>
	DF	Foliage Diseases	
		DFA	Western pine Aster Rust <i>Coleosporium asterum</i>
		DFB	Delphinella Tip Blight <i>Delphinella spp.</i>
		DFC	Large-spore Spruce-Labrador tea Rust <i>Chrysomyxa ledicola</i>
		DFD	Spruce Needle Cast <i>Lirula macrospora</i>
*		DFE	Elytroderma Needle Cast <i>Elytroderma deformans</i>
		DFE	Marssonina Leaf Blights <i>Marssonina spp.</i>
		DFG	Cottonwood Leaf Rust <i>Melampsora occidentalis</i>
		DFH	Larch Needle Blight <i>Hypodermella laricis</i>
		DFI	Linospora Leaf Blotch <i>Linospora tetraspora</i>
		DFK	Septoria Leaf Spot <i>Septoria populicola</i>
*		DFL	Pine Needle Cast <i>Lophodermella concolor</i>
		DFM	Larch Needle Cast <i>Meria laricis</i>
		DFP	Fir Fireweed Rust <i>Pucciniastrum epilobi</i>
		DFQ	Alpine Fir Needle Cast <i>Isthmiella quadrispora</i>
		DFR	Douglas-fir needle cast <i>Rhabdocline pseudotsugae</i>
*		DFS	Dothistroma Needle Blight <i>Dothistroma septosporum</i>
		DFU	Cedar Leaf Blight <i>Didymascella thujina</i>
		DFW	Swiss Needle Cast <i>Phaeocryptopus gaumanni</i>
		DFX	Brown Felt Blight <i>Herpotrichia spp.</i>

* Denotes highest priority damage agents

Damage Agent Codes			
Field Codes		Common Name	Scientific Name
D	DISEASES		
	DL	Disease Caused Dieback	
		DLV	Aspen-Poplar Twig Blight <i>Venturia spp.</i>
	DM	Dwarf Mistletoe	
		DMF	Douglas-fir Dwarf Mistletoe <i>Arceuthobium douglasii</i>
		DMH	Hemlock Dwarf Mistletoe <i>Arceuthobium tsugense</i>
		DML	Larch Dwarf Mistletoe <i>Arceuthobium laricis</i>
*		DMP	Lodgepole pine Dwarf Mistletoe <i>Arceuthobium americanum</i>
	DR	Root Disease	
*		DRA	Armillaria Root Disease <i>Armillaria ostoyae</i>
		DRB	Black Stain Root Disease <i>Leptographium wageneri</i>
*		DRL	Laminated Root Rot (Fd form) <i>Inonotus sulphurascens</i>
		DRN	Annosus Root Disease <i>Heterobasidion annosum</i>
*		DRS	Schweinitzii Butt Rot <i>Phaeolus schweinitzii</i>
*		DRT	Tomentosus Root Rot <i>Inonotus tomentosus</i>
	DS	Stem Diseases (Cankers and Rusts)	
*		DSA	Atropellis Canker (Lodgepole pine) <i>Atropellis piniphila</i>
		DSB	White pine Blister Rust <i>Cronartium ribicola</i>
*		DSC	Comandra Blister Rust <i>Cronartium comandrae</i>
		DSE	Sooty Bark Canker <i>Encoelia pruinosa</i>
*		DSG	Western Gall Rust <i>Endocronartium harknessii</i>
		DSH	Hypoxyylon Canker <i>Entoleuca Hypoxyylon mammatum</i>
		DSP	Cryptosphaeria Canker <i>Cryptosphaeria populina</i>
		DSR	Ceratocystis Canker <i>Ceratocystis fimbriata</i>
*		DSS	Stalactiform Blister Rust <i>Cronartium coleosporioides</i>
		DSY	Cytospora Canker <i>Cytospora chrysosperma</i>
I	INSECTS		
	IA	Aphids	
		IAB	Balsam Woolly Adelgid <i>Adelges piceae</i>
		IAG	Cooley Spruce Gall Adelgid <i>Adelges cooleyi</i>
		IAS	Green Spruce Aphid <i>Elatobium abietinum</i>
	IB	Bark Beetles	
		IBB	Western Balsam Bark Beetle <i>Dryocoetes confusus</i>
		IBD	Douglas-fir Beetle <i>Dendroctonus pseudotsugae</i>
		IBF	Fir Engraver Beetle <i>Scolytus ventralis</i>

Damage Agent Codes				
Field Codes		Common Name		Scientific Name
I	INSECTS			
	IB	Bark Beetles		
		IBH	Hylurgops Beetle	<i>Hylurgops rugipennis</i>
		IBI	Engraver Beetles	<i>Ips spp.</i>
*		IBM	Mountain Pine Beetle	<i>Dendroctonus ponderosae</i>
		IBP	Twig Beetles	<i>Pityogenes, Pityophthorus spp.</i>
		IBS	Spruce Beetle	<i>Dendroctonus rufipennis</i>
		IBW	Western Pine Beetle	<i>Dendroctonus brevicomis</i>
	ID	Defoliators		
		IDB	Two-year Budworm	<i>Choristoneura biennis</i>
		IDE	Eastern Spruce Budworm	<i>Choristoneura fumiferana</i>
*		IDF	Forest Tent Caterpillar	<i>Malacosoma disstria</i>
		IDI	Pine Needle Sheath Miner	<i>Zellaria haimbachi</i>
*		IDK	Northern Tent Caterpillar	<i>Malacosoma californicum</i>
*		IDL	Western Hemlock Looper	<i>Lambdina fiscellaria lugubrosa</i>
		IDN	Birch Leaf Miner	<i>Fenusa pusilla</i>
		IDP	Larch Sawfly	<i>Pristophora erichsoni</i>
		IDT	Douglas-fir Tussock Moth	<i>Orgyia pseudotsugata</i>
		IDU	Satin Moth	<i>Leucoma salicis</i>
*		IDW	Western Spruce Budworm	<i>Choristoneura occidentalis</i>
*		ID6	Aspen Leaf Miner	<i>Phyllocristis populiella</i>
		IEA	Unidentified Aspen Defoliation	
	IS	Shoot Insects		
		ISA	Bronze Birch Borer	<i>Agrilus anxius</i>
*		ISC	Poplar Borer	<i>Saperda calcarata</i>
		ISG	Gouty Pitch Midge	<i>Cecidomyia piniinopsis</i>
*		ISP	Pitch Nodule Moths	<i>Petrova spp.</i>
*		ISQ	Sequoia Pitch Moth	<i>Vespamima sequoiae</i>
		ISW	Poplar and Willow Borer	<i>Cryptorhynchus lapathi</i>
	IW	Weevils		
*		IWP	Lodgepole pine Terminal Weevil	<i>Pissodes terminalis</i>
*		IWS	White pine Weevil (on Spruce)	<i>Pissodes strobi</i>
		IWW	Warren's Root Collar Weevil	<i>Hylobius warreni</i>
		IWZ	Yosemite Bark Weevil	<i>Pissodes schwartzii</i>

* Denotes highest priority damage agents

Common Conifer Forest Health Factors by BEC Zone - For Stands >15 Years (Updated T9/T10)

Biogeoclimatic Zone																							
BWBS		CDF		CWH		ESSF		ICH		IDF		MH		MS		PP		SBPS		SBS		SWB	
IB*	m	DRL	m,g	DRL	m,g	IB*	m	IB*	m	IB*	m	DRL	m,g	IB*	m	IB*	m	IB*	m	IB*	m	IB*	m
IDE	g	DRA	m,g	DRA	m,g	NAV	m	DRA	m,g	NB	m,g	DMH	g,m	NB	m,g	IBW	m	NB	m,g,q	DRA*	m,g	DSG	m,g
IDB	g	NW	m	NW	m	NY	m,q	DRL	m,g	DRA	m,g	NCY	g,m	DRA	m,g	NB	m,g	DSC	m	DRL*	m,g	DRT	g,m
IWS	q	ND	m	DSB	m	DRA	m,g	AB	g,m	DRL	m,g	DDP	d	DRL	m,g	DRA	m,g	DSS	m,g	DRT	g,m	NY	q
DDP	d	DSB	m	ND	m	ND	g,m	DRT	g,m	DSB	m	DB	q	DRT	g,m	DSG	m,q	ND	m,g	NB	g,m	AP	q
DB	q	DMH	g,m	DRN	g,m	DSG	m,q	DSB	m	DSC	m	NY	g,q	DSB	m	IDW	g,m	DFE	g,m,q	DSC	m	DB	q
		DFU	g,m	DMH	g,m	DDP	d	DSC	m,g	DSS	m,g			DSC	m	DDP	d	DSG	m,q	DSB*	m	NG	q
		DFW	g	NCY	g,m	DDE	d	DSS	m,g	DSG	m,g			DSS	m,g			DMP	g,m,q	DSS	m,g		
		DDP	d	IDH	g	IWS	q	DSG	m,q	IDW	g,m			DSG	m,g			DSA	q,m	DSG	m,q		
				IWS	g	WS	g	IDL	g,m	DML	g,m			DMP	g,m			DFL	g	DMP	g,m		
				DFW	g	DB	q	IWS	g,q	DFE	g,m,q			IWS	g,q			IDI	g	IDB	g		
				DFU	g			DFS	g,m	DFL	g			DML	g,m			IWP	q	DFS	g		
				DDP	d			DML	g,m	IDI	g			IDI	g			ISP	q	NY	g		
				AB	g,q			DFL	g	DFH	g			DFL	g			DB	q	DFE	g		
				AE	q			DFH	g	DFM	g			DFH	g			AS	q	IWS	g,q		
								DFM	g	WS	g			DFM	g					DFL	g		
								DDE	d	DDP	d			WS	g					IDI	g		
								DDP	d	DDQ	d			DSA	q					IWP	q		
								DSA	q	DSA	q			DDP	d					DDP	d		
								ISP	q	ISP	q			IWP	q					DSA	q		
								DB	q	DB	q			ISP	q					ISP	q		
														DB	q					DB	q		

Notes:

- 1) The damage agent codes are listed by BEC zone in order of typically decreasing relative importance, but the order may vary depending on forest health factor severity and prevalence.
- 2) The two or three letter damage agent codes are followed by lower case "impact" qualifiers/descriptors:
 - **m** = mortality; **g** = growth reduction; **d** = decay; **q** = quality.
 - These are listed next to each damage agent in order of their primary effect on a host.
- 3) IB* indicates major bark beetle species only (IBB, IBD, IBM, and IBS).
- 4) ** denotes that the damage agent is restricted to the southern SBS only.


Damage Severity and Mortality Condition Codes and Standards		
Damage /condition or agent	Severity code	Code Description
Unknown Forks (UF) and Unknown Crooks (UCR)	M	Major fork or crook (** see below for key info)
	N	Minor fork or Crook (** see below for key info)
Bark Beetles	FA	Failed Attack
	GR	Current (Green) Attack
	RA	Red Attack
	GY	Grey Attack
Defoliators, needle rusts and blights (total crown rating scale; past and present attack)	% defoliated, discoloured, or infected	Enter % (1-100)
Defoliators - Western Spruce Budworm (current foliage only)	% of current year's foliage defoliated	Enter % (1-100)
Defoliators - Elytroderma Needle Cast	Codes: 1, 2, 3, 4, 5, 6	Hawksworth's 6-class rating system
Dwarf Mistletoes (for all species)	Codes: 1, 2, 3, 4, 5, 6	Hawksworth's 6-class rating system
Broom Rusts	Codes: 1, 2, 3, 4, 5, 6	Hawksworth's 6-class rating system
Terminal Weevils	Record:	
	C	Current attack only (no previous attack)
	O	Old attack (may also be current attack)
	and: below for 'O' only, if 'C' no further code allowed	
	M	Major crook
	N	Minor crook
	F	Forking
S	Staghead	
Stem rusts and cankers (see separate code table for YSM severities)	SC	Stem Canker(s)
	TK	Top-Kill
Root Rots	SC	Crown symptoms
	BR	Basal resinosis
	CS	Confirmatory symptoms (stain, decay, mycelia, rhizomorphs, or sporophores)
Mammals, birds and root collar weevil (girdlers)	% girdled	Enter % girdled at site of damage
Drought, Shoot/bud frost kill, Fumekill, Road salt, Red belt	% live crown affected	Enter % (1-100)
Wind scarring and Sunscald	% circumference	Enter % of circumference damaged
Lightning	% of length	Enter % of bole length damaged

** Severity Ratings for UF and UCR	
M (major):	offset from the main stem is $\geq 50\%$
N (minor):	offset from the main stem is $< 50\%$
NOTE: Any FRK or CRO that occurs in the portion of the main stem that is < 10 cm diameter is automatically an N (minor) severity	
NOTE: Select the severity that corresponds to the <u>most</u> severe occurrence of a UF and/or UCR	
Incidences to ignore: (Do NOT call a FRK or CRO loss indicator for the following)	
Potential FRK to be <i>ignored</i> : Spike branch with no to very little diameter loss or offset ($\sim < 10\%$)	
Potential CRO to be <i>ignored</i> : Very little diameter loss or offset ($\sim < 10\%$)	

Severity Codes for Rust and Canker Measurements (YSM only)			
Infection Height (1st digit)		%Encirclement (2nd digit)	
Severity Code	Height Range (m)	Severity Code	Encirclement (%)
0	0.0 - 0.5	0	1 - 5
1	0.6 - 1.5	1	5 - 15
2	1.6 - 2.5	2	16 - 25
3	2.6 - 3.5	3	26 - 35
4	3.6 - 4.5	4	36 - 35
5	4.6 - 5.5	5*	46 - 55
6	5.6 - 6.5	6	56 - 65
7	6.6 - 7.5	7	66 - 75
8	7.6 - 8.5	8	76 - 85
9	8.6 +	9	86 - 100

* significant break point

Severity Codes for Fire			
Wood Fibre Damage (1st digit)		% Foliar Scorch (2nd digit)	
Code	Description	Code	Description
A	Cambial damage (i.e., more than scorched bark, but less than charred wood of a significant depth)	0	0% (no foliar scorch)
		1	1 - 15%
		2	16 - 25%
B	Minor wood fibre damage (i.e., localized shallow charring)	3	26 - 35%
		4	36 - 45%
C	Major wood fibre damage (i.e., extensive shallow charring or localized or extensive deep charring)	5	46 - 55%
		6	56 - 65%
		7	66 - 75%
O	No cambial or wood fibre damage	8	76 - 85%
		9	86 - 100%

Hawksworth Scale for Elytroderma, Mistletoe Infection and Broom Rusts	
Step 1:	Divide live crown into thirds according to stem length
Step 2:	Rate each third separately. Give each third a rating of either as described below: (0) No visible infection (1) Light infection ($1/2$ or less of branches in the third infected) (2) Heavy infection (more than $1/2$ of branches in third infected)
Step 3:	<div style="display: flex; align-items: center;"> <div style="flex: 1;">  </div> <div style="flex: 2;"> <p style="text-align: center;">Example Example</p> <p>If this third has no visible infections, its rating is (0).</p> <hr style="width: 20px; margin: 10px auto;"/> <p>If this third is lightly infected, its rating is (1).</p> <hr style="width: 20px; margin: 10px auto;"/> <p>If this third is heavily infected, its rating is (2).</p> <p style="margin-top: 20px;">The tree in this example gets a rating of: $0 + 1 + 2 = 3$.</p> </div> </div>

Slope(%)	Factor
1	1
2	1
3	1
4	0.999
5	0.999
6	0.998
7	0.998
8	0.997
9	0.996
10	0.995
11	0.994
12	0.993
13	0.992
14	0.990
15	0.989
16	0.987
17	0.986
18	0.984
19	0.982
20	0.981
21	0.979
22	0.977
23	0.975
24	0.972
25	0.970
26	0.968
27	0.965
28	0.963
29	0.960
30	0.958
31	0.955
32	0.952
33	0.950

Slope(%)	Factor
34	0.947
35	0.944
36	0.941
37	0.938
38	0.935
39	0.932
40	0.928
41	0.925
42	0.922
43	0.919
44	0.915
45	0.912
46	0.908
47	0.905
48	0.902
49	0.898
50	0.894
51	0.891
52	0.887
53	0.884
54	0.880
55	0.876
56	0.873
57	0.869
58	0.865
59	0.861
60	0.857
61	0.854
62	0.850
63	0.846
64	0.842
65	0.838
66	0.835

Slope(%)	Factor
67	0.831
68	0.827
69	0.823
70	0.819
71	0.815
72	0.812
73	0.808
74	0.804
75	0.800
76	0.796
77	0.792
78	0.789
79	0.785
80	0.781
81	0.777
82	0.773
83	0.769
84	0.766
85	0.762
86	0.758
87	0.754
88	0.751
89	0.747
90	0.743
91	0.740
92	0.736
93	0.732
94	0.729
95	0.725
96	0.721
97	0.718
98	0.714
99	0.711

Slope(%)	Factor
100	0.707
101	0.704
102	0.700
103	0.697
104	0.693
105	0.690
106	0.686
107	0.683
108	0.679
109	0.676
110	0.673
111	0.669
112	0.666
113	0.663
114	0.659
115	0.656
116	0.653
117	0.650
118	0.647
119	0.643
120	0.640
121	0.637
122	0.634
123	0.631
124	0.628
125	0.625
126	0.622
127	0.619
128	0.616
129	0.613
130	0.609
131	0.607
132	0.604

Slope(%)	Factor
133	0.601
134	0.598
135	0.595
136	0.592
137	0.590
138	0.587
139	0.584
140	0.581
141	0.578
142	0.576
143	0.573
144	0.570
145	0.568
146	0.565
147	0.562
148	0.560
149	0.557
150	0.555

Calculating the slope correction factor:
 $\text{COS}[\text{TAN}^{-1}(\text{Slope\%/100})] = \text{factor}$

Seeds 1 to 50	Random Bearing	Random Bearing +90	Randomized numbers 1 - 20 (left to right)																				Randomized numbers from 1 to 100 (top to bottom)		↓
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	1	2	
1	23	113	14	12	18	8	20	7	19	3	10	15	11	13	16	5	1	17	6	2	9	4	58		
2	155	245	1	11	17	13	16	8	5	20	9	2	14	6	12	15	10	4	19	7	3	18	7		
3	350	80	4	5	7	19	17	20	2	9	11	14	18	3	6	10	1	8	12	13	15	16	38		
4	296	26	1	7	4	15	6	10	20	13	2	17	12	18	19	5	16	14	3	9	8	11	85		
5	8	98	17	1	5	19	8	11	9	15	4	13	6	12	10	7	3	18	20	2	16	14	36		
6	304	34	18	7	2	1	14	3	5	4	11	15	8	9	20	17	10	12	19	16	6	13	33		
7	351	81	10	6	1	13	9	8	11	17	19	3	16	20	5	4	15	18	2	12	7	14	53		
8	158	248	19	4	16	20	2	11	10	8	5	13	12	1	14	15	9	6	17	18	7	3	78		
9	139	229	14	11	5	2	18	7	19	16	13	1	20	3	4	6	9	17	12	10	8	15	40		
10	33	123	17	15	14	18	5	1	7	19	2	6	3	8	9	4	10	20	13	16	12	11	56		
11	264	354	15	3	11	20	1	10	19	4	12	5	16	7	18	6	14	2	17	8	9	13	32		
12	278	8	5	8	16	6	7	17	11	9	15	14	19	20	10	3	2	12	4	13	18	1	87		
13	137	227	2	10	5	15	12	20	17	4	1	13	14	18	9	16	19	8	11	3	6	7	83		
14	243	333	14	5	3	4	1	10	15	13	19	20	2	12	11	7	16	6	8	18	17	9	67		
15	176	266	15	7	19	11	9	6	8	3	12	10	14	1	2	4	18	5	16	13	17	20	18		
16	267	357	19	16	3	7	17	1	20	2	12	15	18	8	11	9	4	14	6	13	10	5	31		
17	214	304	6	7	12	14	3	16	8	13	1	20	19	2	5	9	10	15	18	11	4	17	75		
18	229	319	13	8	12	18	14	10	15	3	5	20	4	11	1	17	16	6	9	2	19	7	79		
19	257	347	17	5	19	12	8	18	3	2	15	16	4	6	20	14	9	10	13	11	7	1	89		
20	324	54	14	8	15	4	6	19	16	1	12	2	17	3	10	11	20	5	9	13	18	7	96		
21	98	188	10	16	19	15	1	8	18	14	9	11	4	2	12	7	13	17	5	6	20	3	12		
22	70	160	15	19	14	1	6	18	12	4	2	5	9	17	20	16	3	10	11	7	13	8	14		
23	161	251	9	10	14	18	17	15	4	2	11	16	7	12	6	8	20	1	19	13	5	3	6		
24	199	289	5	4	12	1	7	10	20	14	19	9	15	11	16	18	3	13	8	2	17	6	72		
25	329	59	14	9	7	3	17	15	18	1	4	16	6	10	12	20	19	2	5	8	13	11	63		
26	110	200	20	11	9	13	15	6	2	8	7	10	4	14	19	12	3	17	18	16	1	5	45		
27	127	217	5	4	9	15	18	2	19	16	17	11	1	20	8	13	3	12	10	6	7	14	41		
28	253	343	3	2	10	14	15	19	6	13	18	5	4	20	8	1	9	16	7	12	17	11	69		
29	314	44	5	3	18	14	1	6	2	13	10	20	4	8	15	9	16	19	11	17	12	7	66		
30	285	15	20	10	11	14	15	18	17	9	2	7	1	3	5	19	8	13	16	4	12	6	48		
31	87	177	5	6	13	7	12	1	20	4	2	14	11	15	9	3	16	17	19	8	18	10	27		
32	277	7	2	1	8	14	18	9	7	12	20	15	19	4	6	3	5	17	16	10	11	13	47		
33	109	199	14	5	20	2	10	4	18	15	13	9	16	19	1	11	3	17	12	6	7	8	26		
34	332	62	7	13	10	9	18	16	11	2	3	6	5	4	20	14	15	8	1	12	17	19	99		
35	67	157	3	10	11	15	2	14	7	8	19	18	16	5	17	13	12	6	1	4	20	9	74		
36	74	164	2	10	13	6	14	1	5	7	12	19	18	3	17	11	4	15	8	20	16	9	73		
37	283	13	16	13	19	14	1	15	12	18	6	7	5	20	9	17	2	3	4	8	10	11	10		
38	32	122	18	16	20	10	17	5	12	4	15	14	11	9	7	1	2	3	6	13	8	19	59		

HOW TO USE THIS TABLE: The last two digits of yr sample number is the seed number used to locate the random bearings for the transects and 20 randomized numbers for random and enhanced trees. If more than 20 numbers are required, proceed down the column on the far right from the row your seed number is located on. If more than 1 random number is required, continue across and down from previous selection.

Seeds 1 to 50	Random Bearing	Random Bearing +90	Randomized numbers 1 - 20 (left to right)															Randomized numbers from 1 to 100 (top to bottom)					↓													
			4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	1	2	3		4	5	6	7	8	9	10	11	12	13	14	15	16
39	270	0	5	12	19	20	11	7	10	2	15	3	14	17	4	6	8	16	13	9	18	1	77													
40	339	69	13	3	15	2	18	10	11	12	17	16	7	14	4	20	19	9	6	1	5	8	46													
41	300	30	10	16	1	12	17	4	19	8	15	20	5	18	14	13	6	7	3	2	11	9	57													
42	17	107	16	2	4	1	3	8	9	7	5	12	17	15	19	20	11	6	10	13	14	18	93													
43	144	234	6	2	20	19	17	15	12	5	3	18	14	4	9	8	16	1	13	7	11	10	16													
44	271	1	16	4	7	1	10	19	8	14	17	13	6	9	11	20	18	5	15	12	2	3	61													
45	248	338	20	13	19	5	15	2	10	16	6	12	18	1	3	14	17	8	11	4	7	9	68													
46	77	167	2	3	13	20	15	11	17	1	4	7	18	5	6	19	14	9	8	16	12	10	42													
47	43	133	11	2	14	12	10	17	18	20	13	15	5	8	4	7	19	3	9	1	16	6	37													
48	223	313	7	16	4	20	15	3	2	18	6	11	19	13	1	8	10	12	9	17	5	14	2													
49	122	212	10	1	5	7	9	3	16	18	8	13	11	17	19	12	15	20	2	6	14	4	50													
50	66	156	19	2	5	17	16	12	8	15	4	14	18	1	11	20	13	3	7	6	9	10	11													
51	45	135	14	17	12	1	10	7	20	16	15	3	6	4	5	13	11	9	8	18	19	2	91													
52	27	117	12	7	11	13	8	6	16	20	3	10	14	5	4	1	2	18	9	15	17	19	94													
53	13	103	19	12	18	8	5	3	15	10	20	16	1	17	7	2	6	14	4	9	13	11	39													
54	25	115	11	1	9	19	16	10	4	20	18	2	6	13	3	14	8	12	5	15	17	7	97													
55	49	139	9	6	7	17	15	11	18	5	3	2	8	19	14	4	13	10	16	1	20	12	23													
56	328	58	2	12	19	8	6	4	16	7	18	14	1	13	3	10	15	5	9	11	20	17	76													
57	247	337	19	16	14	7	17	9	4	6	15	20	3	12	11	13	10	1	18	2	8	5	82													
58	334	64	14	11	3	20	12	2	5	6	13	10	4	15	19	8	18	9	1	16	17	7	20													
59	21	111	20	12	11	1	14	4	19	7	9	18	15	5	8	16	6	17	13	2	10	3	49													
60	232	322	2	4	16	14	20	13	11	3	17	7	6	10	9	15	18	1	19	5	8	12	81													
61	125	215	13	16	5	9	14	7	17	2	15	18	3	8	12	6	10	4	1	19	20	11	1													
62	234	324	4	2	11	18	13	9	5	20	19	16	17	7	1	10	8	15	3	6	14	12	34													
63	180	270	20	19	18	3	1	9	15	5	14	2	17	6	10	7	16	11	12	8	4	13	86													
64	212	302	20	12	4	3	5	15	2	9	13	14	10	1	19	8	16	11	7	6	18	17	29													
65	141	231	4	7	18	14	3	9	16	20	2	5	8	19	13	11	15	12	6	10	17	1	55													
66	38	128	17	10	3	5	13	12	19	11	9	2	7	20	16	18	6	14	15	8	1	4	80													
67	249	339	7	19	18	13	17	5	16	20	1	4	15	12	3	11	10	8	9	14	6	2	30													
68	15	105	17	9	2	13	1	4	20	19	8	18	10	5	3	7	12	11	14	15	6	16	8													
69	317	47	8	7	12	14	16	4	17	15	18	10	3	19	11	13	5	2	20	6	9	1	88													
70	196	286	16	12	7	20	2	11	5	3	9	15	13	18	4	1	17	19	10	6	14	8	92													
71	337	67	17	18	14	5	15	7	19	20	3	13	2	10	11	9	1	12	16	4	6	8	28													
72	150	240	7	10	14	2	17	20	19	12	13	8	16	9	11	5	3	18	4	1	6	15	98													
73	305	35	5	8	4	3	2	16	9	10	7	15	6	1	19	20	13	11	14	12	18	17	70													
74	303	33	17	19	6	1	14	8	12	9	18	20	11	13	15	16	5	4	7	2	10	3	52													
75	208	298	6	5	10	1	18	16	3	9	12	19	13	15	2	14	11	17	4	7	20	8	60													
76	115	205	12	11	7	3	10	18	1	19	13	20	15	4	9	14	17	8	16	6	5	2	9													

HOW TO USE THIS TABLE: The last two digits of yr sample number is the seed number used to locate the random bearings for the transects and 20 randomized numbers for random and enhanced trees. If more than 20 numbers are required, proceed down the column on the far right from the row your seed number is located on. If more than 1 random number is required, continue across and down from previous selection.

Seeds 1 to 50	Random Bearing	Random Bearing +90	Randomized numbers 1 - 20 (left to right)																				Randomized numbers from 1 to 100 (top to bottom)		↓
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	1	2	
77	143	233	1	7	18	8	2	11	19	5	14	12	13	9	10	15	16	17	4	3	20	6	43		
78	37	127	15	11	1	8	10	20	9	14	18	17	5	6	4	13	2	16	12	7	19	3	5		
79	250	340	18	12	4	15	16	8	14	19	13	2	5	3	11	10	1	9	17	20	6	7	3		
80	356	86	10	15	8	19	14	17	4	16	13	9	18	1	11	2	7	6	3	5	20	12	64		
81	326	56	12	8	10	15	19	1	20	13	14	18	16	7	2	6	5	9	17	11	4	3	15		
82	162	252	2	4	12	17	3	10	1	15	5	18	6	8	19	16	20	11	13	9	14	7	19		
83	352	82	7	17	8	2	1	16	3	20	15	18	14	6	12	9	10	4	19	11	13	5	22		
84	266	356	6	15	12	17	7	16	8	19	13	4	10	18	14	11	5	1	2	20	3	9	84		
85	81	171	15	14	19	1	4	17	10	20	7	11	13	8	5	18	3	12	9	6	2	16	95		
86	235	325	9	5	12	19	3	16	14	15	2	20	10	1	7	6	17	18	13	8	11	4	4		
87	205	295	2	1	12	10	19	13	16	17	6	18	11	3	14	8	5	15	7	9	4	20	17		
88	335	65	5	19	2	14	8	6	13	3	15	12	16	18	4	9	11	17	1	20	10	7	21		
89	56	146	6	11	3	12	1	4	5	18	20	14	13	7	17	16	10	15	8	2	19	9	65		
90	308	38	13	19	7	18	10	1	4	11	17	12	9	3	5	16	15	8	2	14	20	6	54		
91	76	166	14	11	3	1	15	12	18	10	6	9	13	5	16	19	2	17	20	8	7	4	13		
92	36	126	13	15	14	19	10	12	1	8	11	4	5	17	18	2	20	9	7	3	16	6	62		
93	227	317	12	2	19	11	14	10	16	9	15	3	20	17	18	1	6	7	5	4	13	8	25		
94	342	72	20	4	19	11	6	8	9	10	15	16	5	13	7	12	2	14	17	1	18	3	35		
95	16	106	19	1	13	9	15	14	5	11	10	16	18	6	17	3	2	20	8	7	12	4	51		
96	204	294	13	9	5	7	1	10	17	14	11	8	20	15	18	4	12	16	19	2	3	6	24		
97	290	20	19	5	18	8	2	9	3	14	10	4	7	6	1	13	11	15	17	20	12	16	71		
98	239	329	11	12	17	13	10	1	14	20	15	6	2	19	8	16	4	9	3	7	18	5	100		
99	5	95	10	8	15	1	16	2	12	9	14	5	3	13	11	17	18	4	7	20	19	6	44		
100	181	271	1	12	8	14	3	10	6	11	19	20	7	16	2	9	15	4	5	13	18	17	90		

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