STAND DEVELOPMENT MONITORING

FRASER TSA DATA SUMMARY

THIS SUMMARY IS BASED ON DATA FROM LESS THAN 30 SURVEYED POLYGONS. THE RESULTS PRESENTED ARE CONSIDERED PRELIMINARY.

This summary is from polygons surveyed in the Fraser TSA in 2012. This summary is an example of the variety and depth of information that is possible to extract from SDM data.

Currently, SDM field survey data is entered into an EXCEL spreadsheet template. This template provides an individual polygon data summary for immediate use. These spreadsheets are then loaded into the SDM ACCESS database. The database can be queried to produce an aggregated data summary like this one that includes data from multiple polygons within a TSA. The queries can be adjusted to extract data in various combinations depending on the user's needs.

This summary is not an analysis; it provides limited interpretation of the data. Reports examining specific questions regarding productivity or that seek to explain trends and other behaviours can be constructed based on this data along with the use of other supporting tools or evidence.

Provincial and regional Forest Health and Silviculture staff can be asked to help with the interpretation of the information presented in the summaries and in the creation of more detailed reports.

Your input as comments and suggestions are needed to further develop these summaries. Please contact Harry.Kope@gov.bc.ca and provide your suggestions for improvement.

STAND DEVELOPMENT MONITORING - FRASER TSA Summary

Purpose and Audience *– Data summaries can help statutory decision makers and operational foresters make informed decisions on stand development, TSR data package inputs, FSP renewals, and FFT activity priorities. They provide information on the growth and health of managed stands. The Forest and Range Evaluation Program (FREP) in conjunction with the provincial forest health program have designed an evaluation protocol (Stand Development Monitoring - SDM) that assesses the condition of post-free-growing managed stands by measuring stand attributes and the impact of biotic and abiotic damaging factors on stand health to help determine whether these free-growing stands are meeting productivity expectations.*

NOTE – This report provides summary information obtained from surveyed polygons. Inferences from this summary should be made cautiously.

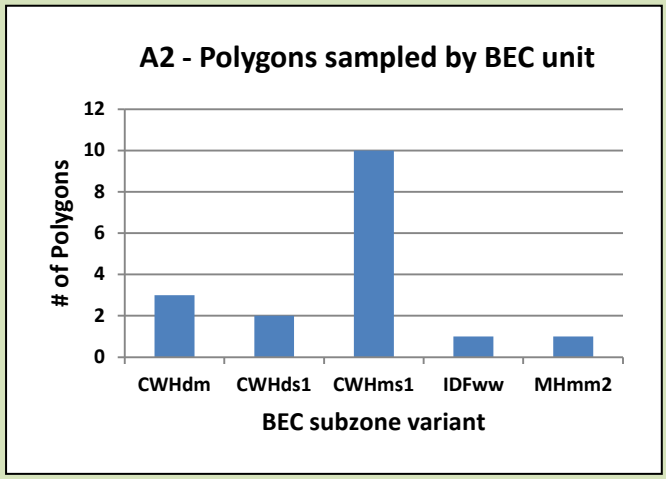
This summary includes data on: **SAMPLE SUMMARY** **FOREST HEALTH** **STAND DENSITY** **SPECIES COMPOSITION** **SITE INDEX**

SAMPLE SUMMARY

Polygon and polygon population attributes, and numbers and percentages of sampled live trees.

A1 – NUMBER OF POLYGONS SUMMARIZED

Survey year:	2012
Chilliwack	17



A3 - SAMPLED POLYGON ATTRIBUTES

Attribute	n[a]	Mean	SD[b]	Range
Polygon net area (ha)	17	13.1	12.2	5 - 45
Stand Age (yrs)	17	28.4	5.5	18 - 38
Harvest to Declaration (yrs)	14	14.6	3.8	8 - 21
Planting to Declaration (yrs)	7	10.1	4.5	1 - 15
Declaration to SDM (yrs)	14	13.1	3.4	7 - 16

[a]. Differing 'n' values indicate missing information for some polygons.

[b]. SD - Standard Deviation

A4 - SAMPLE POPULATION COVERAGE

TSA polygon population (n)	Total polygon population area (ha)	Number Polygons ≥5 ha (n)	Population polygon area ≥5 ha (ha)	Number of polygons sampled (n)	Sampling intensity by number of polygons	Area sampled (≥5 ha) (ha)	Sampling intensity by area
1919	20183	1153	18177	17	1.5%	222	1.2%

A5 - NUMBER AND PERCENTAGE OF SAMPLED TOTAL LIVE TREES

Tree species:	Act	Ba	Bg	Cwc	Dr	Ep	Fdc	Hm	Hwc	Mb	Plc	Pli	Se	Vb	Yc	Total
Number	4	833	1	351	44	12	353	41	455	4	3	3	82	2	16	2204
Percent	0	38	0	16	2	1	16	2	21	0	0	0	4	0	1	100

X1 - TREE SPECIES ABBREVIATIONS

Act - Poplar
Ba – Amabilis Fir
Bg – Grand Fir
Cwc – Western Redcedar
Dr – Red Alder
Ep – Common Paper Birch
Fdc – Douglas-fir (coastal)
Hm – Mountain Hemlock
Hwc – Western Hemlock (coastal)
Mb – Big Leaf Maple
Plc – Lodgepole Pine (coastal)
Pli - Lodgepole Pine (interior)
Se – Engelmann Spruce
Vb – Bitter Cherry
Yc – Yellow Cedar

FOREST HEALTH

Forest Health is assessed using the SDM damage criteria for mid-rotation stands (see Appendix 1). The damage criteria establish forest health threshold tolerances identifying unacceptable and damaged trees. In the Fraser TSA: the pathogen most recorded was Hemlock Dwarf Mistletoe (DMH); the insect was Western Pine Shoot Borer (ISS); and the abiotic damage was Snow and Ice damage (NY) and Tree Competition (VT).

B1 – MEAN STEMS PER HA BY FOREST HEALTH STATUS

Live Acceptable Trees (sph)	Live Unacceptable Trees (sph)	Dead Unacceptable Trees (sph)	Total Stems[a] (sph)
2136	456	160	2753

[a] For forest health purposes total stems equals all live trees plus all dead trees.

B2 - FOREST HEALTH FACTORS DETECTED

(Number of plots) with a specific forest health factor. Total plots =170.

Pathogen	DMH (4)	DRA (2)	DRL (2)			
Insect	ISS (1)					
Abiotic	NY (44)	VT (44);	USW (15)	UF (14)	UBT (7)	UCR (6)
	NW (2)	NX (1)	TL (1)			
Unknown	UNK (1)					

X2 – TREE LAYERS

Layer 1: >12.5 cm dbh

Layer 2: 7.5 to 12.5 cm dbh

Layer 3: >1.3 m in height to 7.49 cm dbh

X3 – FOREST HEALTH ABBREVIATIONS

DMH – Hemlock Dwarf Mistletoe
DRA – Armillaria Root Disease
DRL – Phellinus Root Disease
ISS – Western Pine Shoot Borer
NY – Snow or Ice
VT – Tree competition
U – Unknown
USW - Sweep
UF – Fork
UBT – Broken top
UCR – Crook
NW – Wind throw
NX – Wind Scarring or Rubbing
TL – Logging wounds

B3 - INCIDENCE OF FOREST HEALTH FACTOR BY BEC

BEC	Tree Layer	Total Stems	Acceptable Trees		Unacceptable Trees – Live		Unacceptable Trees – Dead		Percent incidence[c] of Forest Health Factor[d] for each tree layer													
			n	(%[b])	n	(%[b])	n	(%[b])	DMH	DRA	DRL	ISS	NY	VT	USW	UF	UBT	UCR	NW	NX	TL	U
CWHdm	1	97	77		17		3		1.0	-	3.1	-	2.1	-	-	10.3	-	-	3.1	-	1.0	-
	2	44	32		8		4		-	-	2.3	-	2.3	9.1	-	11.4	-	-	-	-	-	2.3
	3	172	77		51		44		-	-	-	-	1.2	53.5	-	0.6	-	-	-	-	-	-
		313	*186*	*(59.4)*	*76*	*(24.3)*	*51*	*(16.3)*	*0.3*	*0*	*1.3*	*0*	*1.6*	*30.7*	*0*	*5.1*	*0*	*0*	*1.0*	*0*	*0.3*	*0.3*
CWHds1	1	67	58		8		1		-	-	-	-	4.5	7.5	-	1.5	-	-	-	-	-	-
	2	23	14		5		4		-	-	-	-	-	34.8	-	4.3	-	-	-	-	-	-
	3	45	31		10		4		-	-	-	-	8.9	22.2	-	-	-	-	-	-	-	-
		135	*103*	*(76.3)*	*23*	*(17.0)*	*9*	*(6.7)*	*0*	*0*	*0*	*0*	*5.2*	*17.0*	*0*	*1.5*	*0*	*0*	*0*	*0*	*0*	*0*
CWHms1	1	262	229		31		2		3.4	-	-	-	5.7	0.4	1.1	0.4	0.8	0.4	-	-	-	-
	2	296	254		40		2		1.0	-	-	-	8.8	0.3	1.4	0.7	1.0	1.0	-	-	-	-
	3	1152	898		190		64		0.2	-	-	-	10.1	8.5	1.8	0.3	0.3	0.4	-	0.4	-	-
		1710	*1381*	*(80.8)*	*261*	*(15.3)*	*68*	*(4.0)*	*0.8*	*0*	*0*	*0*	*9.2*	*5.8*	*1.6*	*0.4*	*0.5*	*0.5*	*0*	*0.3*	*0*	*0*
IDFww	1	28	26		0		2		-	7.1	-	-	-	-	-	-	-	-	-	-	-	-
	2	12	5		5		2		-	16.7	-	16.7	8.3	-	-	-	16.7	-	-	-	-	-
	3	18	15		0		3		-	0.2	-	-	-	11.1	-	-	-	-	-	-	-	-
		58	*46*	*(79.3)*	*5*	*(8.6)*	*7*	*(12.1)*	*0*	*0.8*	*0*	*3.4*	*1.7*	*3.4*	*0*	*0*	*3.4*	*0*	*0*	*0*	*0*	*0*
MHmm2	1	14	13		1		0		-	-	-	-	7.1	-	-	-	-	-	-	-	-	-
	2	24	19		5		0		-	-	-	-	8.3	12.5	-	-	-	-	-	-	-	-
	3	85	68		17		0		-	-	-	-	2.4	17.6	-	-	-	-	-	-	-	-
		123	*100*	*(81.3)*	*23*	*(18.7)*	*0*	*(0.0)*	*0*	*0*	*0*	*0*	*7.5*	*14.6*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*

[b] Percent based on total stems (live and dead); [c] Percent incidence of the total stems by layer for each FHF; [d] Only the top FHF are listed, the Other column contains the minor FHF not listed.

B4 - INCIDENCE OF FOREST HEALTH FACTOR BY TREE SPECIES

Tree Species	Tree Layer	Total Stems	Acceptable Trees		Unacceptable Trees: Live		Unacceptable Trees: Dead		Percent incidence[c] of Forest Health Factor[d] for each tree layer													
			n	(%[b])	n	(%[b])	n	(%[b])	DMH	DRA	DRL	ISS	NY	VT	USW	UF	UBT	UCR	NW	NX	TL	U
Ba	1	98	92		5		1		-	-	-	-	2.0	-	2.0	-	1.0	-	-	-	-	-
	2	142	133		9		0		-	-	-	-	3.5	2.1	-	-	-	0.7	-	-	-	-
	3	599	559		35		5		-	-	-	-	1.7	2.3	1.3	0.5	0.3	0.5	-	-	-	-
		839	*784*	*(93.4)*	*49*	*(5.8)*	*6*	*(0.7)*	*0*	*0*	*0*	*0*	*2.0*	*2.0*	*0.4*	*0.5*	*0.4*	*0.5*	*0*	*0*	*0*	*0*
Cwc	1	73	57		16		0		-	-	-	-	9.6	-	-	9.6	-	-	2.7	-	-	-
	2	50	34		15		1		-	-	-	-	20.0	2.0	-	8.0	-	-	-	-	-	2.0
	3	247	133		96		18		-	-	-	-	19.4	23.9	1.6	0.4	-	0.4	-	0.4	-	-
		370	*224*	*(60.5)*	*127*	*(34.3)*	*19*	*(5.1)*	*0*	*0*	*0*	*0*	*17.6*	*1.1*	*1.1*	*3.2*	*0*	*0.3*	*0.5*	*0.3*	*0*	*0.3*
Dr	1	18	14		4		0		-	-	-	-	16.7	-	-	5.6	-	-	-	-	-	-
	2	17	16		0		1		-	-	-	-	-	5.9	-	-	-	-	-	-	-	-
	3	14	6		4		4		-	-	-	-	7.1	50.0	-	-	-	-	-	-	-	-
		49	*36*	*(73.5)*	*8*	*(16.3)*	*5*	*(10.2)*	*0*	*0*	*0*	*0*	*8.2*	*16.3*	*0*	*2.0*	*0*	*0*	*0*	*0*	*0*	*0*
Fdc	1	190	172		11		7		-	1.1	1.6	-	1.6	2.1	-	2.1	0.5	-	0.5	-	-	-
	2	75	51		14		10		-	2.7	1.3	-	8.0	12.0	-	2.7	5.3	-	-	-	-	-
	3	126	56		49		21		-	0.8	-	-	23.0	27.8	-	0.8	-	0.8	-	2.4	-	-
		391	*279*	*(71.4)*	*74*	*(18.9)*	*38*	*(9.7)*	*0*	*1.3*	*1.0*	*0*	*9.7*	*12.3*	*0*	*1.8*	*1.3*	*0.3*	*0.3*	*0.8*	*0*	*0*
Hm	1	4	3		1		0		-	-	-	-	25.0	-	-	-	-	-	-	-	-	-
	2	3	3		0		0		-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3	34	31		3		0		-	-	-	-	5.9	2.9	-	-	-	-	-	-	-	-
		41	*37*	*(90.2)*	*4*	*(9.8)*	*0*	*(0.0)*	*0*	*0*	*0*	*0*	*7.3*	*2.4*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Hwc	1	66	49		17		0		15.2	-	-	-	4.5	3.0	1.5	-	-	-	-	-	1.5	-
	2	72	56		16		0		4.2	-	-	-	11.1	2.8	2.8	-	-	1.4	-	-	-	-
	3	383	247		70		66		0.5	-	-	-	7.0	26.1	1.6	-	-	-	-	0.3	-	-
		521	*352*	*(67.6)*	*103*	*(19.8)*	*66*	*(12.7)*	*2.9*	*0*	*0*	*0*	*7.3*	*20.0*	*1.7*	*0*	*0*	*0.2*	*0*	*0.2*	*0.2*	*0*
Se	1	14	12		2		0		-	-	-	-	7.1	-	-	-	-	7.1	-	-	-	-
	2	27	22		5		0		-	-	-	-	-	-	7.4	3.7	3.7	3.7	-	-	-	-
	3	42	36		5		1		-	-	-	-	4.8	-	7.1	-	2.4		-	-	-	-
		83	*70*	*(84.3)*	*12*	*(14.5)*	*1*	*(1.2)*	*0*	*0*	*0*	*0*	*3.6*	*0*	*6.0*	*1.2*	*2.4*	*2.4*	*0*	*0*	*0*	*0*

[a] Percent based on total stems (live and dead); [b] Percent incidence of the total stems of a layer for each FHF; [c] Only the top FHF are listed, the Other column contains the minor FHF not listed.

STAND DENSITY

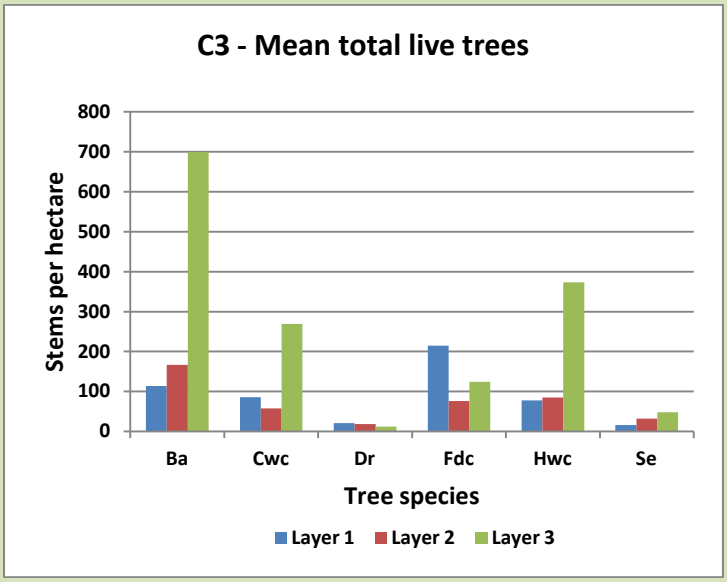
To produce a free-growing crop of trees a stand is managed to the target stocking level of well-spaced, preferred and acceptable species. Over time, changes in stand density may reflect tree competition, mortality due to pests, stand treatments, natural ingress or other influences.

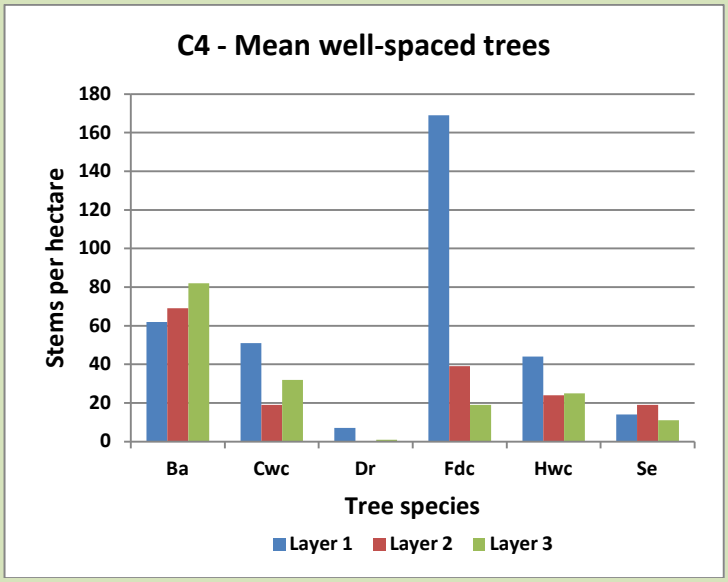
C1 - NUMBER OF POLYGONS WITH CHANGES TO STAND DENSITY

Change in Total Stand Density Total Trees (n= 17)		Change in Stocking Density Well-Spaced Trees (n= 17)	
Decreasing	7	Decreasing	8
Increasing	10	Increasing	8
		Unchanged	1

C2 - STAND DENSITY ATTRIBUTES BY BEC – PRE-SDM AND AT SDM

	CWHdm		CWHds1		CWHms1		IDFww		MHmm2		ALL	
	N	Mean (sph)	N	Mean (sph)	N	Mean (sph)	N	Mean (sph)	N	Mean (sph)	**N**	**Mean (sph)**
Total Density pre-SDM (sph)	3	1755	2	1507	10	2509	1	1280	1	1133	17	2105
Total Density at SDM (sph)	3	1747	2	1260	10	3284	1	1020	1	2460	17	2593
Change in Total Density (sph)	3	-8	2	-247	10	775	1	-260	1	1327	17	488
Change in Total Density (%)	*3*	*-0.5*	*2*	*-16.4*	*10*	*30.9*	*1*	*-20.3*	*1*	*117.0*	*17*	*23.2*
WS density pre-SDM (sph)	3	681	2	686	10	683	1	600	1	750	17	682
WS density at SDM (sph)	3	627	2	600	10	766	1	540	1	680	17	704
Change in WS density (sph)	3	-54	2	-86	10	83	1	-60	1	-70	17	22
Change in WS density (%)	*3*	*-7.9*	*2*	*-12.5*	*10*	*12.2*	*1*	*-10.0*	*1*	*-9.3*	*17*	*3.2*
FG density pre-SDM (sph)	3	504	2	472	10	641	1	600	1	692	17	598
FG density at SDM (sph)	3	553	2	590	10	698	1	540	1	680	17	649





SPECIES COMPOSITION

Inventory labels are condensed representations of several stand attributes that describe conditions at the time of assessment. These attributes include leading, secondary and minor tree species by percentage class (usually rounded to the nearest 10%), average age and height of the dominant and co-dominant trees, a site index estimate, an estimate of crown closure, and the total trees per hectare. Inventory labels provide inputs used by the TASS stand model and by timber supply analysts projecting future stand development for timber supply purposes.

D1 - CHANGE IN LEADING SPECIES BETWEEN PRE-SDM AND SDM ASSESSMENTS

	Pre-SDM																							
	CWHdm				CWHds1				CWHms1				IDFww				MHmm2				ALL			
At SDM	Ba	Cwc	Fdc	Hwc	Ba	Cwc	Fdc	Hwc	Ba	Cwc	Fdc	Hwc	Ba	Cwc	Fdc	Hwc	Ba	Cwc	Fdc	Hwc	Ba	Cwc	Fdc	Hwc
Ba	0	-	-	-	0	-	-	-	5	-	-	-	0	-	-	-	1	-	-	-	6	-	-	-
Cwc	-	1	-	-	-	0	-	-	-	0	-	-	-	0	-	-	-	0	-	-	-	1	-	-
Fdc	-	1	1	-	-	-	2	-	-	-	4	-	-	-	1	-	-	-	0	-	-	1	8	-
Hwc	-	-	-	0	-	-	-	0	-	1	-	0	-	-	-	0	-	-	-	0	-	1	-	0
Total	0	2	1	0	0	0	2	0	5	1	4	0	0	0	1	0	1	0	0	0	6	3	8	0

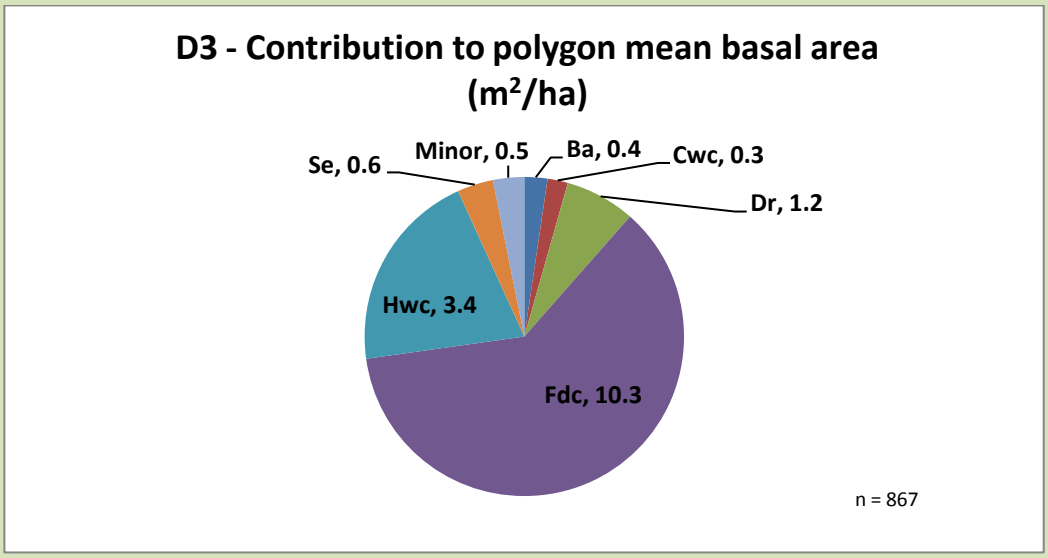
(Shaded values indicate those polygons where the leading species has NOT changed)

(In this TSA, no change in leading species was found in 15 (88%) of the 17 polygons sampled.)

D2 – NUMBER OF TREES, BY SPECIES AND LAYER, CONTRIBUTING TO MEAN BASAL AREA

Tree spp.	Number of Trees					Tree spp.	Mean Polygon BA (m^2/ha)				
	Layer 1		Layer 2		All		Layer 1		Layer 2		All
	Live	Dead	Live	Dead			Live	Dead	Live	Dead	
Ba	97	1	142		240	Ba	2.64	0.02	1.26		3.92
Cwc	73		47	1	121	Cwc	3.04		0.40	0.01	3.45
Dr	24		10	1	35	Dr	1.08		0.09	0.01	1.18
Fdc	183	8	66	9	266	Fdc	9.34	0.23	0.63	0.06	10.26
Hwc	69		70		139	Hwc	2.8		0.62		3.42
Se	14		27		41	Se	0.38		0.23		0.61
Minor spp.	10		15		25	Minor spp.	0.39		0.13		0.53
Total	470	9	377	11	867	Total	19.67	0.25	3.36	0.08	23.37
% within layer	98.1	1.9	97.2	2.8		% within layer	98.7	1.3	97.7	2.3	

(Minor spp. include: Act, Ep, Hm, Mb, Plc, Pli, Vb and Yc).

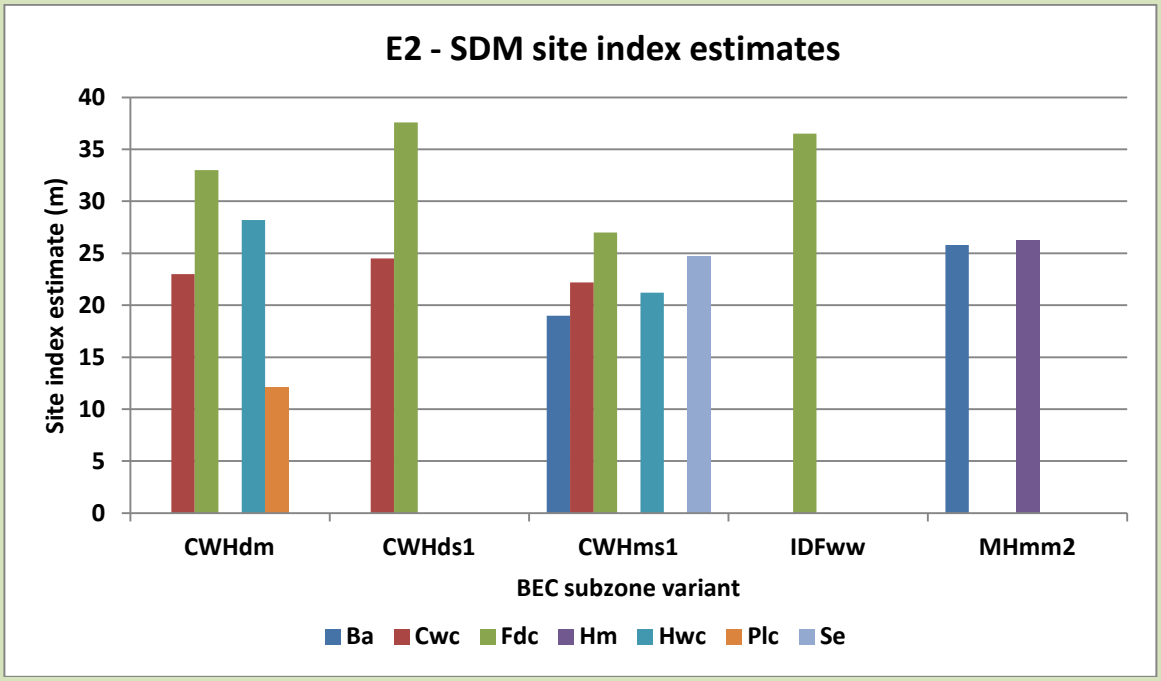


SITE INDEX

Site index is estimated using the growth intercept method. These estimates are the mean values of all available trees for that species in a BEC unit. Many stands do not have site index estimates recorded prior to the SDM survey.

E1 - MEAN SITE INDEX ESTIMATE FOR DOMINANT CONIFER SPECIES

	Ba		Cwc		Fdc		Hm		Hwc		Plc		Se		All
BEC	**N**	**Mean**	**N**	**Mean**	**N**	**Mean**	**N**	**Mean**	**N**	**Mean**	**N**	**Mean**	**N**	**Mean**	**N**
CWHdm	-	-	7	23.0	18	33.0	-	-	2	28.2	1	12.1	-	-	28
CWHds1	-	-	2	24.5	16	37.6	-	-	-	-	-	-	-	-	18
CWHms1	32	19.0	8	22.2	27	27.0	-	-	17	21.2	-	-	7	24.8	91
IDFww	-	-	-	-	10	36.5	-	-	-	-	-	-	-	-	10
MHmm2	5	25.8	-	-	-	-	3	26.3	-	-	-	-	-	-	8
	37	19.9	17	22.8	71	32.3	3	26.3	19	21.9	1	12.1	7	24.8	155



APPENDIX 1

BEC codes - http://www.for.gov.bc.ca/hre/becweb/index.html
Conifer pest codes - http://www.for.gov.bc.ca/hfp/health/fhdata/FS747%20conifer%2020111003.pdf
Conifer Tree Species codes http://www.for.gov.bc.ca/his/results/webhelp/index.htm
Deciduous pest codes - http://www.for.gov.bc.ca/hfp/health/fhdata/FS747%20deciduous%2020111003.pdf
SDM damage criteria - http://www.for.gov.bc.ca/hfp/silviculture/Surveys/SDM_Damage_Criteria_Feb_12_2010(2).pdf
SDM field cards - http://www.for.gov.bc.ca/ftp/HFP/external/!publish/FREP/indicators/FS%201357-SDMCard%20March%2012%2009.pdf
SDM survey protocol http://www.for.gov.bc.ca/ftp/HFP/external/!publish/FREP/Indicators/SDM%20Protocol%202011.pdf
Stocking Standards tables - http://www.for.gov.bc.ca/hfp/silviculture/stocking_stds.htm

APPENDIX 2

The complete list of openings, and polygons used in this report are listed here