

Growth and Yield in Central and Northeastern BC: NIVMA Update

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Data Sources

- Repeatedly measured for up to 15 years
- USSM: individual planted seedlings and competing vegetation in 1.26 m radius
- TRENDS: individual planted seedlings and competing vegetation in 1.0 m radius; complete vegetation description; small tree sub-plots by species gives total sph and %cover; surveys
- Also used history, eco-classification, soils

Significant Models

- Actuary – Ian Moss & Mishtu Banerjee
- Threshold – Mishtu Banerjee
- Early stand simulation – Steve Smith

Actuary

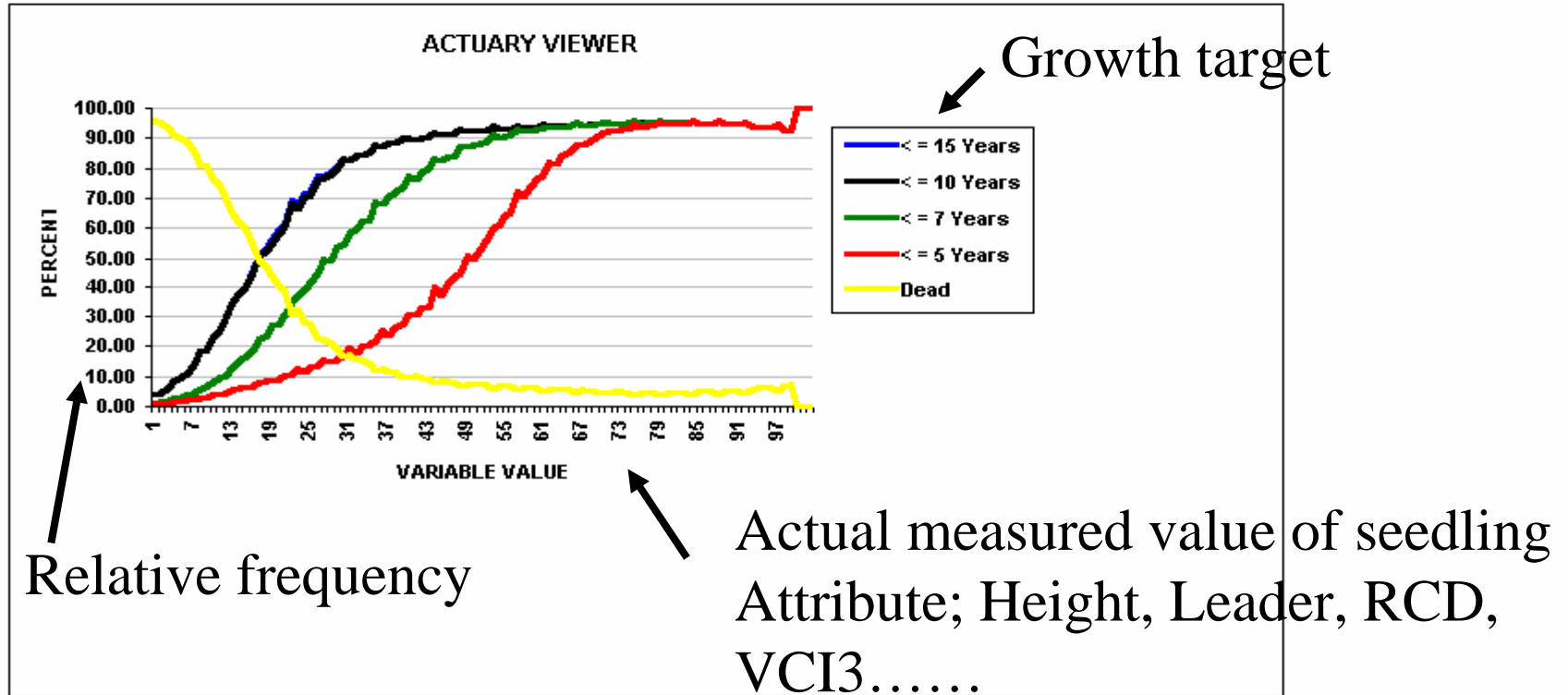
- Used USSM dataset to develop operationally focused risk management framework based on risk, costs/benefits, standards, thresholds and targets
- Individual tree analysis from entire dataset
- Intrinsically linked to survey data: predict performance of seedlings based on past performance of similar individuals

Actuary

- Determined distribution of individual variables, relationships among variable pairs, and which vegetation and seedling variables co varied with the 2 response variables: survival and years to free growing (MATLAB, Jones 1994)
- Created actuary tables based on a basic grid approach; functionally equivalent to the statistical techniques for “life table” construction (Norusis 1994, Chpt. 10)
- Tool presents results as a family of probability curves

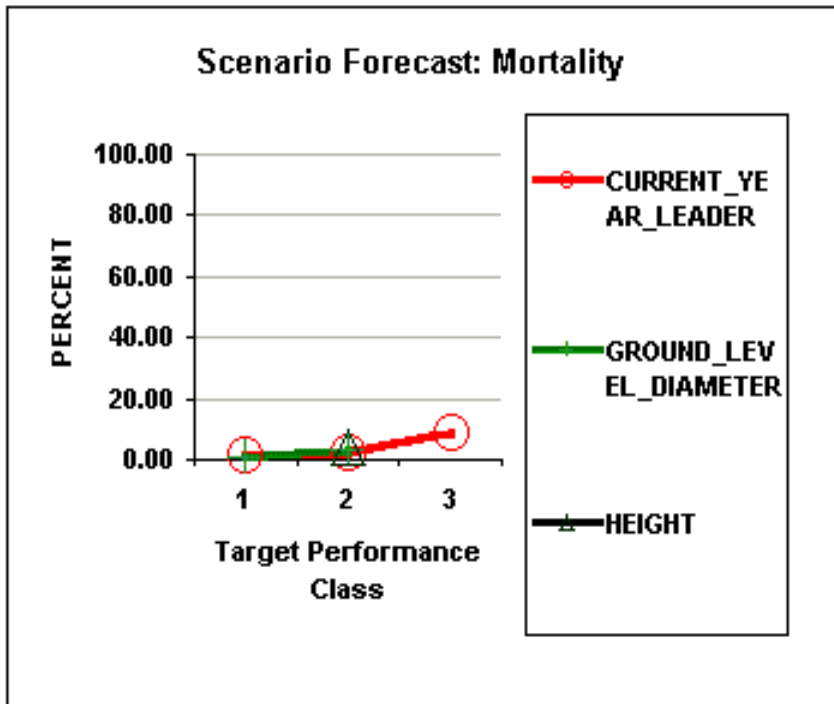
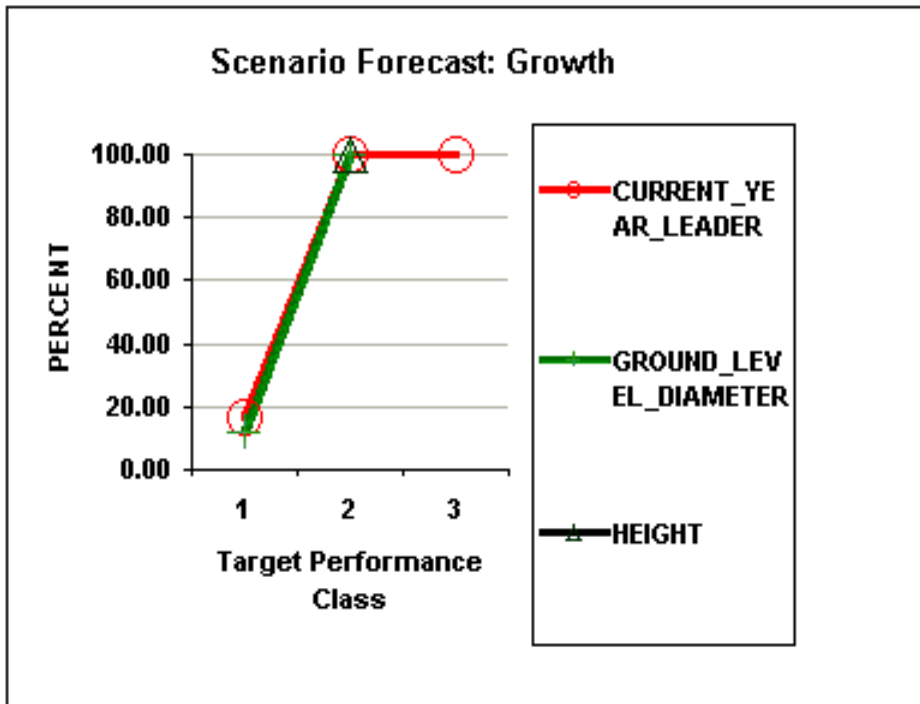
Planted spruce in the SBS, year 2, target 80 cm

VARIABLE: HEIGHT



Comparison of Survey and NIVMA data

SCENARIO: SXPGBSvkwkBROADEpiRubu T:HT=100

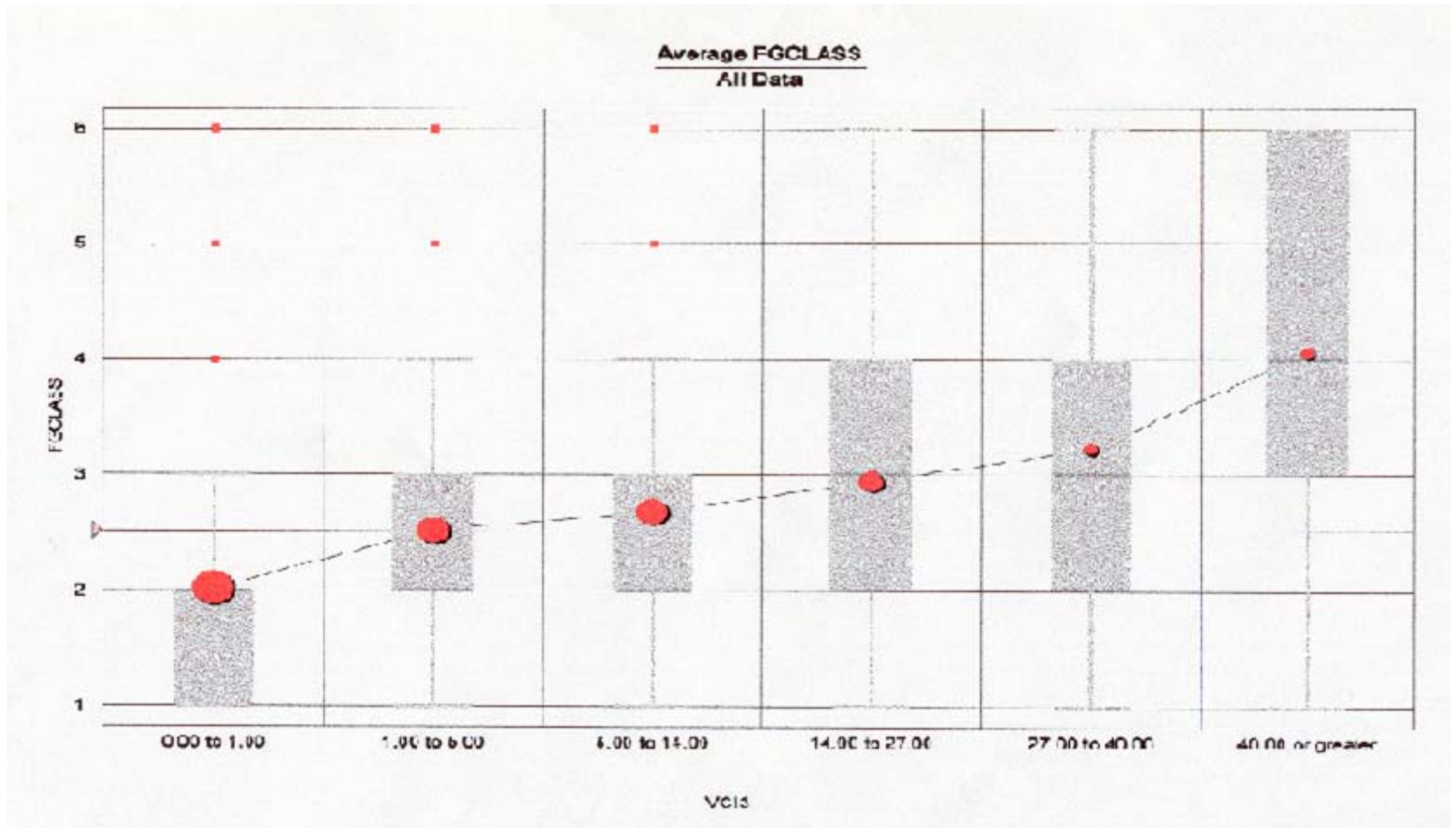


Thresholds determined from USSM dataset using Breakpoint Modeling, OLAP, and Actuary Analysis

Indicators of Injury	Measure	Threshold
Sturdiness	Seedling height/root collar diameter	Sx: 50 Pl: 40 Fd: 50 Bl: 40
Vigour	0 – dead 1 – moribund 2 – poor 3 – fair 4 – good	All Species: Vigour Class 3
Vegetation competition (VCI3)	Sum [%cover of spp ₁ X (height of spp ₁ – tree height)]	Sx: 15 Pl: 15 Fd: 15



From Table 1, Pest Management Plan #147-463-98/03 (Northwood Inc.)

Analysis Graph from Scenario®



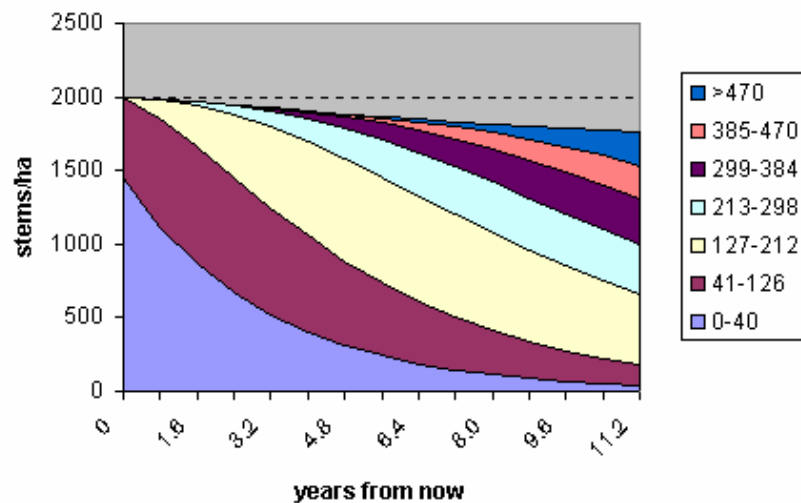
Early Stand Simulation

- Used TRENDS dataset to project growth of very young stands to expected stand structures 10-15 years after harvest
- Model includes 8 sub models representing growth in different ecosystems, levels of site productivity and growing space
- Uses transition matrices to simulate stand dynamics during initiation stage
- Output can then be used to initialize stand conditions for long term stand models like TIPSYS

Beta test model version 1.4										
NIVMA Starting Stand Description										
Species	Species %	Avg height(cm)	BH50 Site Index		Total age of stock	BEC Zone	Conifer Stems per ha	Depth to restricting layer (cm)	% small shrub, herbs, & mosses	
			Reference	Converted						
Sub alpine fir						sbs	2000			
Douglas fir										
Lodgepole pine	100	35	18	18.0	3					
Spruce				17.5						
Required								Optional		
Percent sum	100									
Species%	CORRECT									
Expected Ingrowth by year - stems per ha										
	1	2	3	4	5	6	7	8		
Sub alpine fir										
Douglas fir										
Lodgepole pine										
Spruce										
Free Growing Criteria										
Species	Height(m)	Stems per ha								
Sub alpine fir		1200								
Douglas fir										
Lodgepole pine	2									
Spruce										
Step 1: enter stand description										
Step 2: enter expected ingrowth										
Step 3: enter free growing criteria										
Step 4: your stand belongs to group <input type="text" value="1"/>										
Step 5: mouse-click on group tab number assigned in step 4										
 										
Stephen Smith & Associates Inc NIVMA										
START_HERE / 1 / Chart 1 / 2 / Chart 2 / 3 / Chart 3 / 4 / Chart 4 / 5 / Chart 5 / 6 / Chart 6 / 7 / Chart 7 / 8 / Chart 8 /										

Lodgepole pine component																Site index for yield projection is		18		
Lodgepole pine	Stock age	3.0	3.8	4.6	5.4	6.2	7.0	7.8	8.6	9.4	10.2	11.0	11.8	12.6	13.4	14.2				
	Avg Ht(cm)	35	53	70	86	102	118	133	147	159	171	182	192	203	213	223				
	Min ht(cm)	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20				
	Max ht(cm)	83	168	253	338	423	423	508	508	593	593	678	678	763	763	848				
	Top ht(cm)	83	168	185	227	273	303	352	378	414	455	481	519	553	581	620				
Ht class(cm)																			dbh(cm)	
0-40 Stems/ha	1445	1119	867	672	520	403	312	242	187	145	113	87	68	52	41	0.0				
41-126 Stems/ha	555	727	785	774	723	653	575	497	424	357	298	247	203	166	136	0.0				
127-212 Stems/ha	0	136	291	435	551	636	689	714	716	699	669	630	584	536	486	1.8				
213-298 Stems/ha	0	0	20	59	108	162	213	259	296	323	340	348	348	341	328	3.0				
299-384 Stems/ha	0	0	0	6	20	44	76	114	153	192	228	258	283	300	311	4.1				
385-470 Stems/ha	0	0	0	0	2	7	17	33	55	82	112	143	175	204	230	5.2				
>470 Stems/ha	0	0	0	0	0	0	2	7	16	31	53	84	123	170	226	6.3				
Total Stems/ha	2000	1982	1964	1945	1925	1905	1884	1865	1846	1828	1812	1797	1783	1770	1759					
# > FTG ht	0	0	20	64	130	213	308	412	519	627	732	833	928	1015	1096					
Spruce component																Site index for yield projection is		17		
Spruce	Stock age	0.0	0.9	1.9	2.8	3.8	4.7	5.7	6.6	7.6	8.5	9.5	10.4	11.4	12.3	13.3				
	Avg Ht(cm)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
	Min ht(cm)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
	Max ht(cm)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
	Top ht(cm)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Ht class(cm)																			dbh(cm)	
0-40 Stems/ha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0				
41-126 Stems/ha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0				
127-212 Stems/ha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.7				
213-298 Stems/ha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.3				
299-384 Stems/ha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4.9				
385-470 Stems/ha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6.5				
>470 Stems/ha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8.1				
Total Stems/ha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
# > FTG ht	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
Whole Stand																Site index for yield projection is		18 Pli		
Whole stand	Yrs from now	0	0.8	1.6	2.4	3.2	4.0	4.8	5.6	6.4	7.2	8.0	8.8	9.6	10.4	11.2				
	Stock age	2	2.8	3.6	4.4	5.2	6.0	6.8	7.6	8.4	9.2	10.0	10.8	11.6	12.4	13.2				

Whole stand stems by ht class



Whole Stand # trees above FTG ht

