

Why are we here?

Under the Forest and Range Practices Act (FRPA), s 6(2), the Designated Decision Maker (DDM) recently approved an extension to both the Fraser Lake Sawmills and Houston Forest Products, Forest Stewardship Plans (FSP) located within the Lakes and Morice TSAs.

The term of these extensions was limited to 2 years from the 5 years originally proposed. It is felt that this reduction in term length is a direct response to guidance from the Nadina District FSP review team, who felt the FSP stocking standards currently do not meet FRPA, s 26(3), which requires stocking standards to address immediate and long-term forest health issues.

Why are we here? Con't

In making this extension determination, the DDM was to consider all the information provided to him, including, but not limited to;

- The Deputy Chief Forester's Guidance letter of June 21, 2012,
- Nadina Forest District Forest Health Strategy 2010-2011 and,
- Reviewing memos & supporting documents completed by the Nadina Forest District staff on background information and issues from relevant sections of the FSP.

What has West Fraser done to address the concerns of the DDM?

- evaluated how a free growing obligation has changed over time,
- reviewed the literature provided by the DDM in his determination as the basis for his determination, specifically FREP Report #13 and Project Y051207,
- surveyed openings at age 20 years to evaluate the condition of our stands at the end of the free growing period. Stand density and yields were then analyzed using TIPSYS v4.2,
- Analyzed FREP report #13 openings using TIPSYS,
- Contacted Forest Analysis & Inventory branch to help West Fraser better understand how stand density affects stand yields.
- Evaluated expected yields on Free Growing Survey data using TASS

Step 1: Evaluation of how a free growing obligation has changed over time.

Documents found on the MFLNRO website:

- *A Short History of the Control of Species Selection for Reforestation in BC.* By Kevin Astridge, RPF and Ralph Winter, RPF, Resource Practices Branch, March 2012
- *How the use of the term “free growing” in British Columbia is linked to harvest and assessment date.* By Allan Powelson, Regeneration Specialist, Resource Practices Branch, October, 2012

Key Highlights

Pre-1987: The Crown funded basic silviculture through section 88 of the Forest Act. Licensees made commitments to re-establish the site as part of their cutting rights as granted by the Crown, however, the concept of a free growing stand was not yet born. The Crown dictated if, when, how and with what stock an opening was planted. Licensee's carried out these activities with funds provided by the Crown.

In **1987**, s 129.2 of the Forest Act was created to impose basic silviculture obligations on those who harvested timber. Stands **harvested** after October 1, 1987 now generated a legal free growing obligation.

Step 2: Review of the literature
provided by the DDM as the basis
for his determination

Forest and Range Evaluation
Program, Report #13

FREP Report #13 - Purpose & Objectives

FREP Report #13 was published in May of 2008. The purpose of this report was to assess the effectiveness of the Free Growing declaration. In 2008 there were no monitoring procedures in place to determine if free growing stands were meeting expectations. FREP Report #13 examined whether the reliance that has been placed on this policy is supported by stand performance from a timber yield perspective.

FREP Report #13 - Purpose & Objectives

‘The current administrative milestone for ensuring effective reforestation is the free growing declaration. This licensee obligation to create a free growing stand is one of the few measurable results under the FRPA.’ (FREP Report #13, pg1)

As October 1987 was deemed to be the inception date of a Free Growing obligation (FREP Report #13, pg2), 1987 was a key date used to establish the population to sample.

West Fraser review of FREP report #13 findings

FREP Report #13 used the free growing declaration date to establish the population, which is inconsistent with the inception of a licensee held free growing obligation.

The inception of a licensee held free growing obligation was established in 1987, but was not retroactive; therefore, the harvest start date, not the declaration date should have been used to establish the population.

FREP Report #13 concludes 18.3% of openings declared free growing no longer meet the minimum stocking of 700sph.

West Fraser review of FREP report #13 found 100% of the openings that were included in FREP Report #13, which had a licensee held free growing obligation, had remained free growing in 2005.

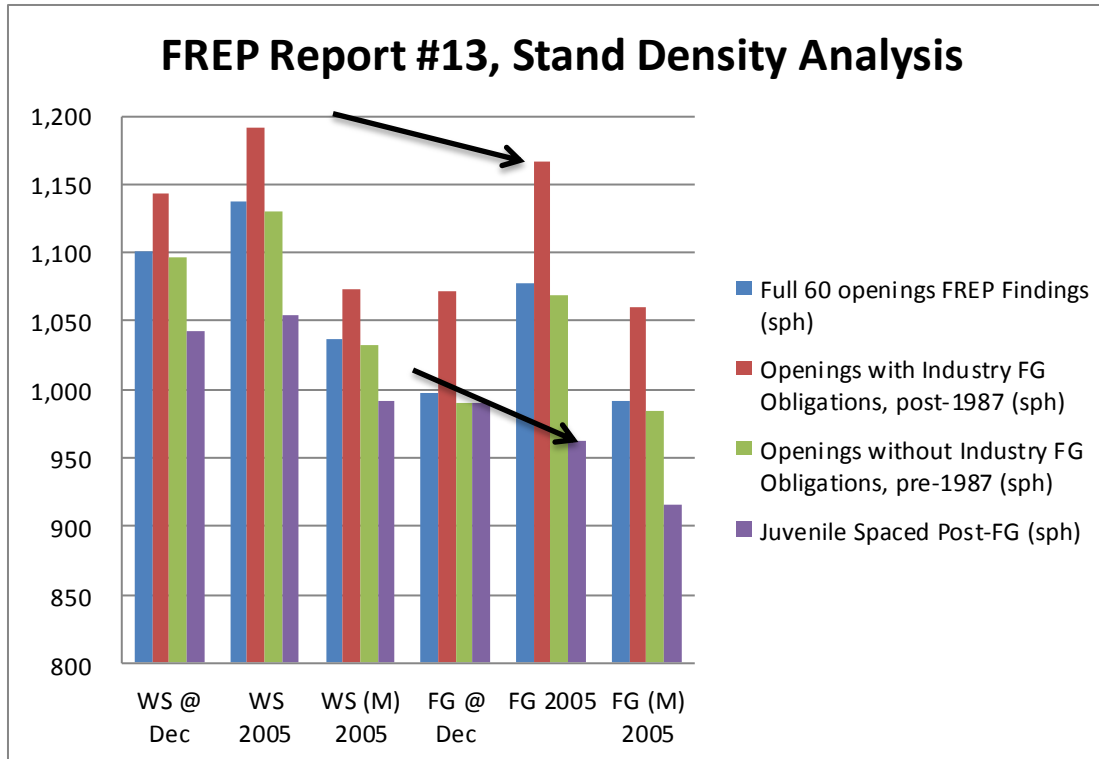
Inclusion of blocks which were juvenile spaced

14 of the 60 openings assessed in FREP Report #13 had a juvenile spacing treatment carried out. (source: RESULTS database)

West Fraser's concerns with including juvenile spaced openings into the population

FREP Report #13 is comparing densities at the time of the free growing survey and a measurement in 2005, so to include openings which had a juvenile spacing treatment carried out after the free growing survey is questioned.

Averaging block densities and volumes using TIPSYS/TASS when some of the blocks were juvenile spaced is questioned.



Openings with industry FG obligations have noticeably higher stocking levels than those that pre-date a free growing obligation and those which have a juvenile spacing activity identified in the RESULTS database.

Step 2: Review of the literature
provided by the DDM as the basis
for his determination

Project Number Y051207

A review of Predicted impacts of hard pine stem rusts on lodgepole pine dominated stands in central BC; Were our assumptions Valid?, FSP Project Number Y051207, author Alex Woods, RPF.

This project was referenced in FREP Report #13, so it too was reviewed in light of the critical findings uncovered in our FREP #13.

Project Y051207: Trial establishment and findings:

In 1997, 30 one hectare stem mapped plots were located in randomly selected juvenile lodgepole pine leading stands aged 15-20 years. The growth and Yield model TASS was then used to predict volume losses at rotation. **The average loss at rotation due to hard pine rusts in lodgepole pine dominated stands was estimated to be 7.2%...**

West Fraser review revealed 19 of the 30 blocks included in this trial also had a juvenile spacing treatment identified in the RESULTS database. TASS/TIPSY was never designed to lump treated and non-treated blocks.

Doing so would introduce significant bias. How much?

Openings that were juvenile spaced contained 41% fewer conifers than those stands which were not juvenile spaced.

There was a 40% reduction in healthy conifers per hectare in 2004, if the stands had a juvenile spacing treatment.

A significant reduction in stand density, like this is, will reduce expected yields at rotation age.

Step 3: West Fraser assessment of free growing blocks at 20 years post-harvest

Purpose

To assess stocking levels at the end of the free growing period, which is established under FRPPA as 20 years after the harvest commencement date.

Stocking and Yields projected to rotation age 80 years would then be evaluated using TIPSY v4.2 to see how they align with Timber Supply expected yields for these existing managed stands.

SPH and Volume projections using TIPSy v4.2 when analyzing blocks 20 years after harvest.

FL	CP	Blk	OAF1	OAF2	Pli %	Pli SI	Sx %	Sx SI	Bl %	Bl SI	Distribution	SPH Init.	FG SPH @ 20y	m3/ha @ 80 Years
A16826	158	1	0.8	0.95	89%	20	11%	19.6			Planted	1721	1248	328
A16826	158	3	0.8	0.95	88%	20	12%	19.6			Planted	1359	990	321
A16826	169	1	0.8	0.95	86%	20	5%	19.6	9%	18.82	Planted	1812	1314	326
A16826	169	3	0.8	0.95	88%	20	3%	19.6	9%	18.82	Planted	1868	1352	325

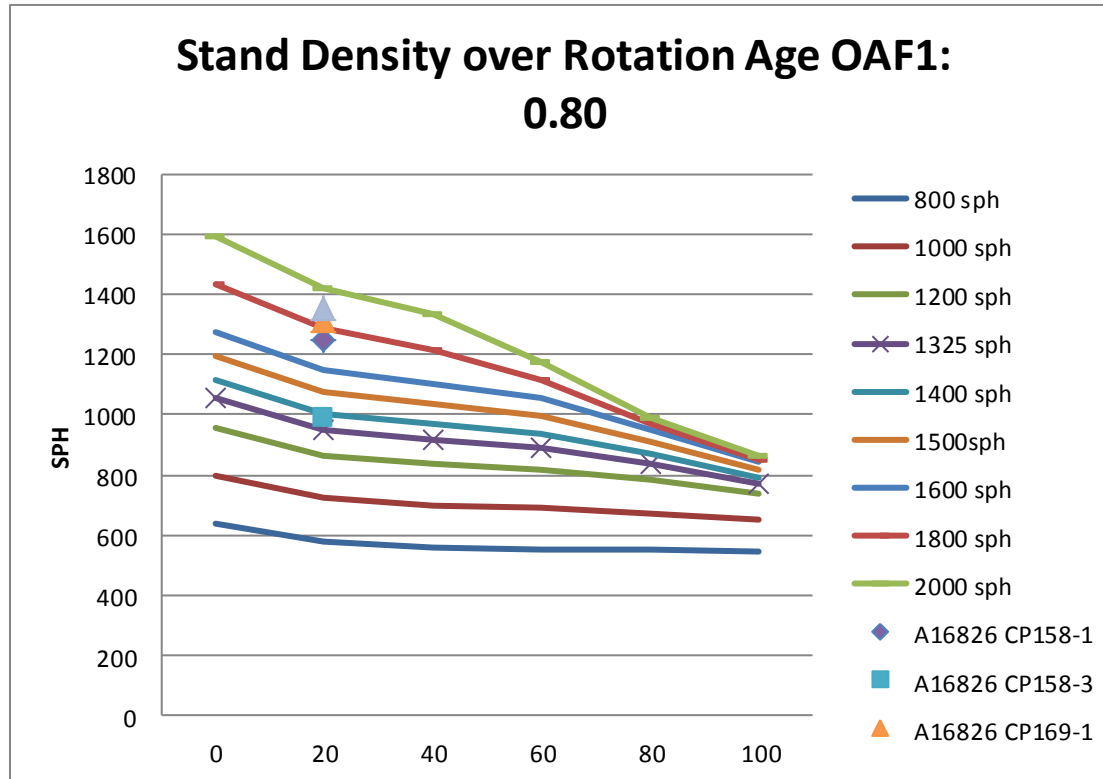
PHSP prescribed 1325sph, 100% pli

Future managed stand density used in 2013: 1500sph

Stand Age	Stand Initiation Density used in TIPSy (sph)								
	800 sph	1000 sph	1200 sph	1325 sph	1400 sph	1500sph	1600 sph	1800 sph	2000 sph
0	638	798	958	1057	1117	1197	1277	1436	1596
20	579	721	863	952	1005	1075	1146	1285	1424
40	560	698	834	918	968	1036	1103	1217	1332
60	554	690	817	891	936	995	1055	1117	1178
80	549	674	781	835	867	910	953	970	987

Actual free growing stems per hectare were used in TIPSy to project stand density.

*Using FG stems we know they are healthy and well spaced at age 20.



TIPSY density curves were developed, with stand establishment densities ranging from 800sph to 2000sph. Stand densities found on all four blocks surveyed were added to the graph. All blocks are well stocked. CP158-3 has noticeably lower stocking than the other three blocks. Will this significantly affect stand yields at rotation age?

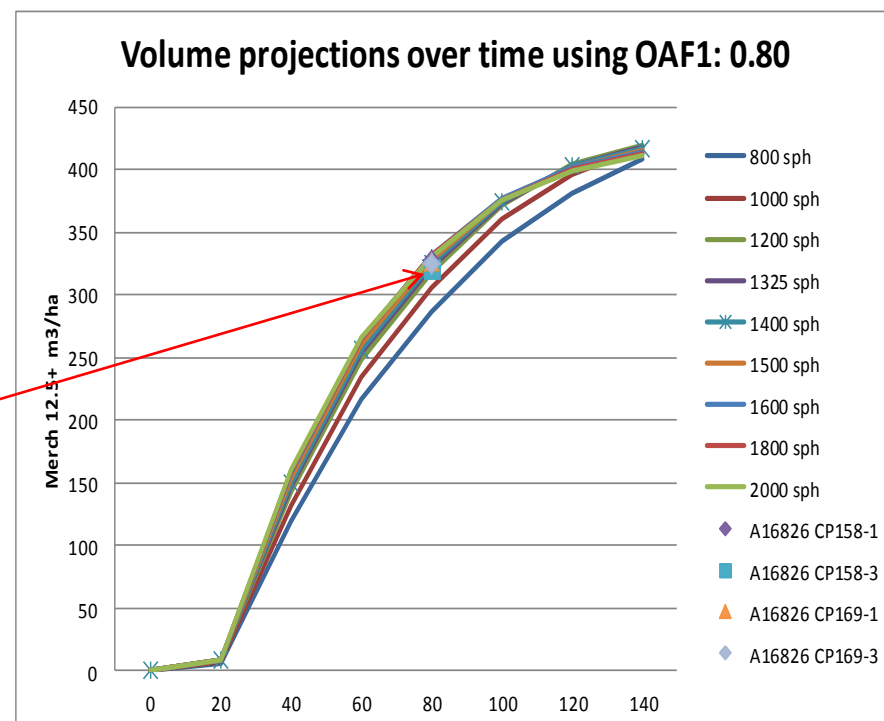
Actual Stand Density compared to Timber Supply expectations

****Actual stocking levels found in all plantations are higher than TIPSy projected density using the PHSP planting prescription density of 1325sph.**

****Most blocks actually had higher free growing densities than what we should expect using 1500sph density commonly used in TSR analysis for future managed stands.**

**How does stand density affect
stand yields at rotation age?**

Stand Age	Merch. vol. 12.5+ (m3/ha) OAF 0.80								
	800 sph	1000 sph	1200 sph	1325 sph	1400 sph	1500 sph	1600 sph	1800 sph	2000 sph
0	0	0	0	0	0	0	0	0	0
20	6	7	8	8	8	8	9	9	9
40	119	132	143	147	150	154	157	159	160
60	216	235	248	253	256	260	264	265	266
80	286	305	318	322	325	328	331	331	330
100	342	361	371	373	374	376	377	376	375
120	381	396	404	403	403	402	402	400	399
140	408	418	420	418	417	415	414	413	411
160	428	433	432	429	427	424	421	421	420
180	440	441	437	433	431	427	424	424	423
200	442	441	436	431	428	425	421	421	421



Higher initial densities may not translate into an increased density at rotation age. If a planting density of 1500sph was currently practiced, our predicted yield at age 80 would be 328m3/ha. If we increased our planting density to 2000sph, our predicted yield at age 80 would be 330m3/ha. An increase in planting density would only increase yields by 2m3/ha.

Key Observations

Stands established between 1200 sph and 2000 sph will have very similar yields at age 80 years. This is because TIPSy projected yields are sensitive to:

- change in Site Index,
- Site occupancy,
- species
- and to a lesser extent, stand density.

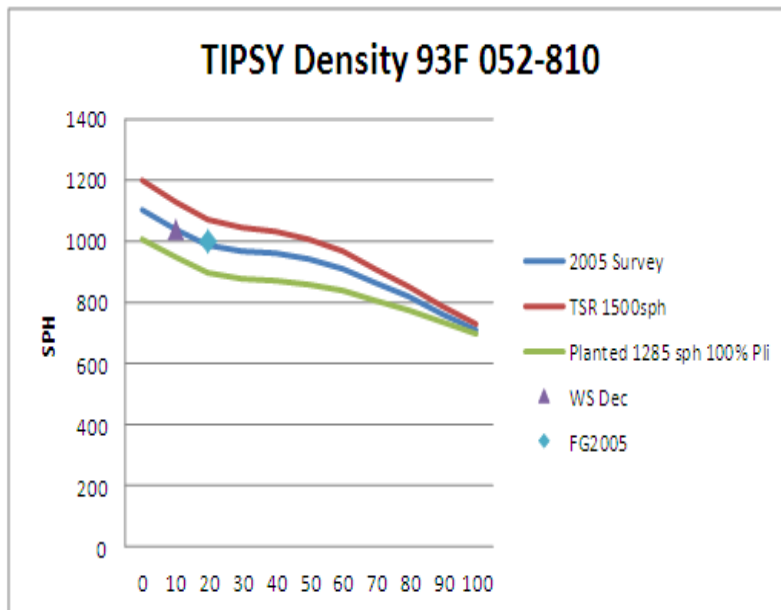
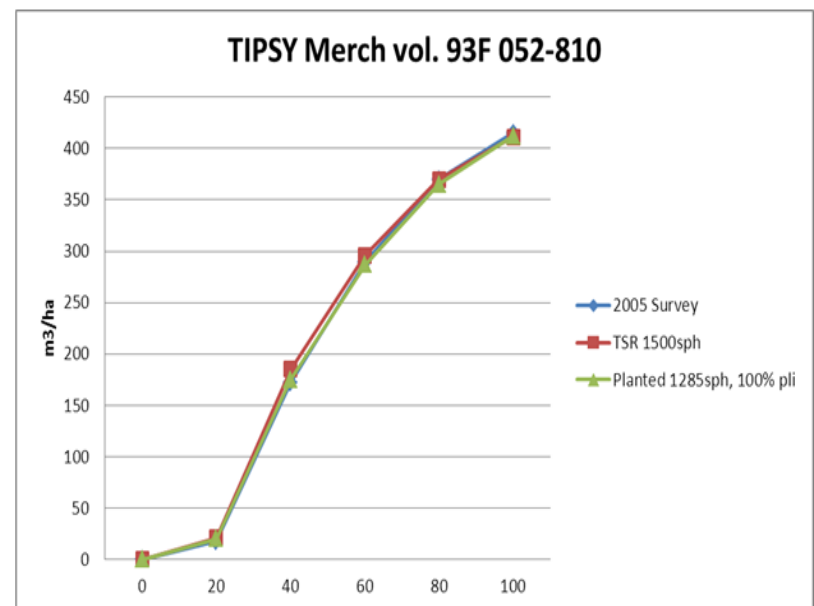
It appears in the first 20 years, TIPSy mortality curves in conjunction with a 20% OAF1 have overestimated the pine mortality on these four blocks aged 20 years post-harvest.

Step 4: Use TIPS Y to evaluate
FRE P Report 13 openings deemed
to have had a licensee free growing
obligation.

West Fraser ran TIPS Y stand density and yield curves using the survey data provided on the FREP website from 2005 and compared the results to a planted density of 1500sph, pli100% to simulate expected yields.

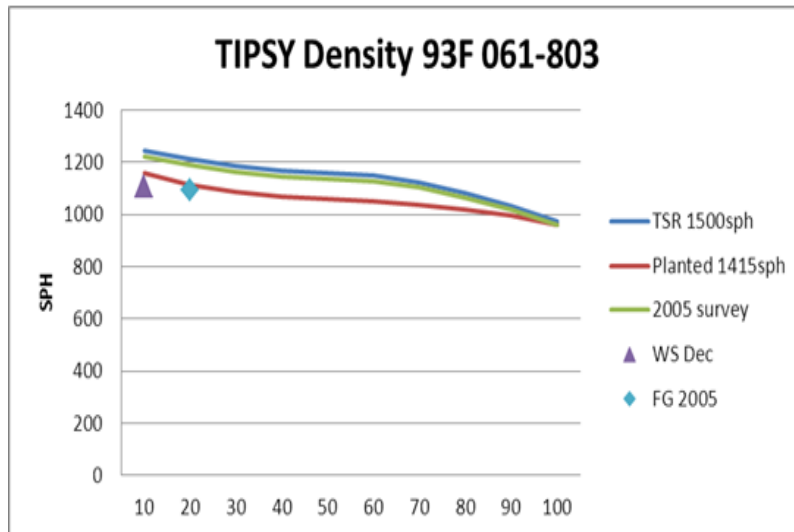
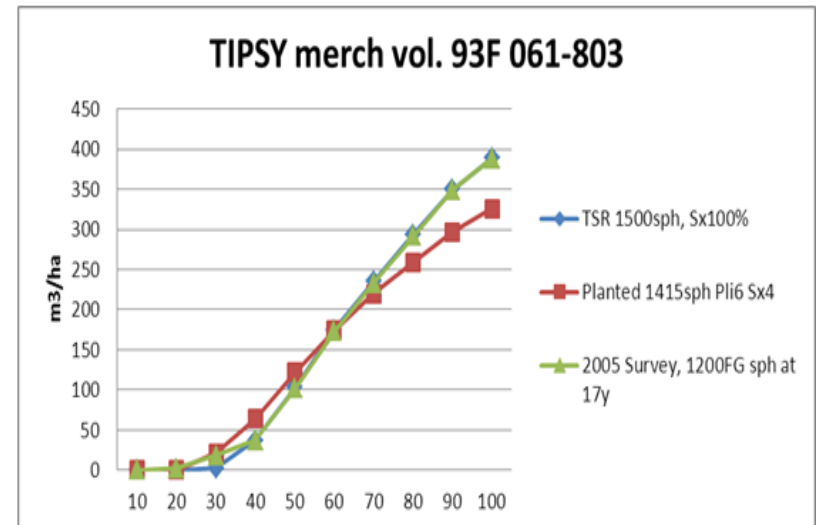
Actual planting densities from the predominant planting activity was also evaluated to assess stocking and projected yields based upon actual trees planted.

93F 052-810



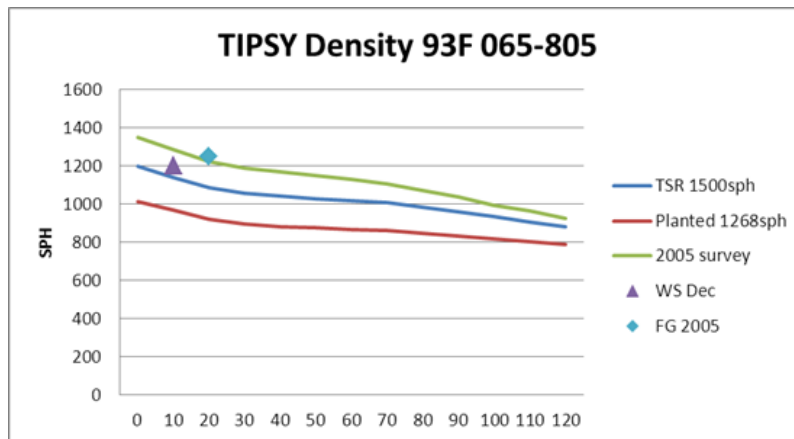
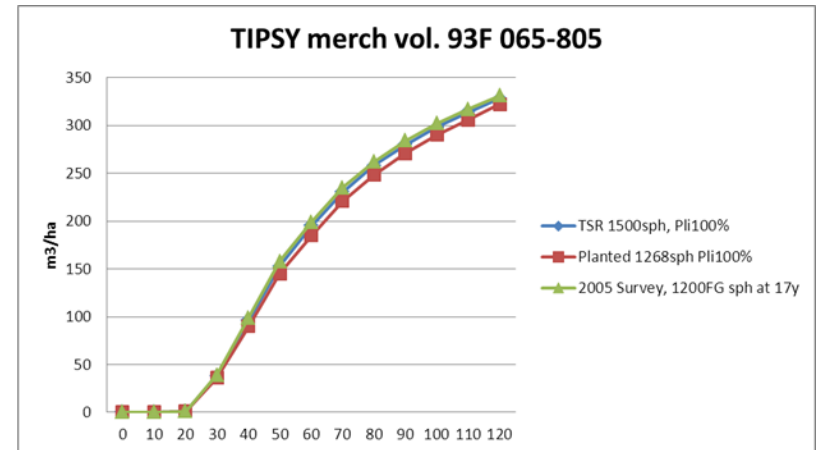
Exactly what you would expect. Stands with establishment densities above 1200sph are maximizing yields at rotation age. Stands established between 850sph and 1200sph have a minimal impact on stand yields at rotation age.

93F 061-803



- Lower expected ws density found at fg survey (age 10)
- Lower stocking levels found at age 20 has little to no effect on merch volume at rotation age.

93F 065-805



Higher than expected density at age 10 and again at age 20 did not result in meaningful volume gain at rotation age.

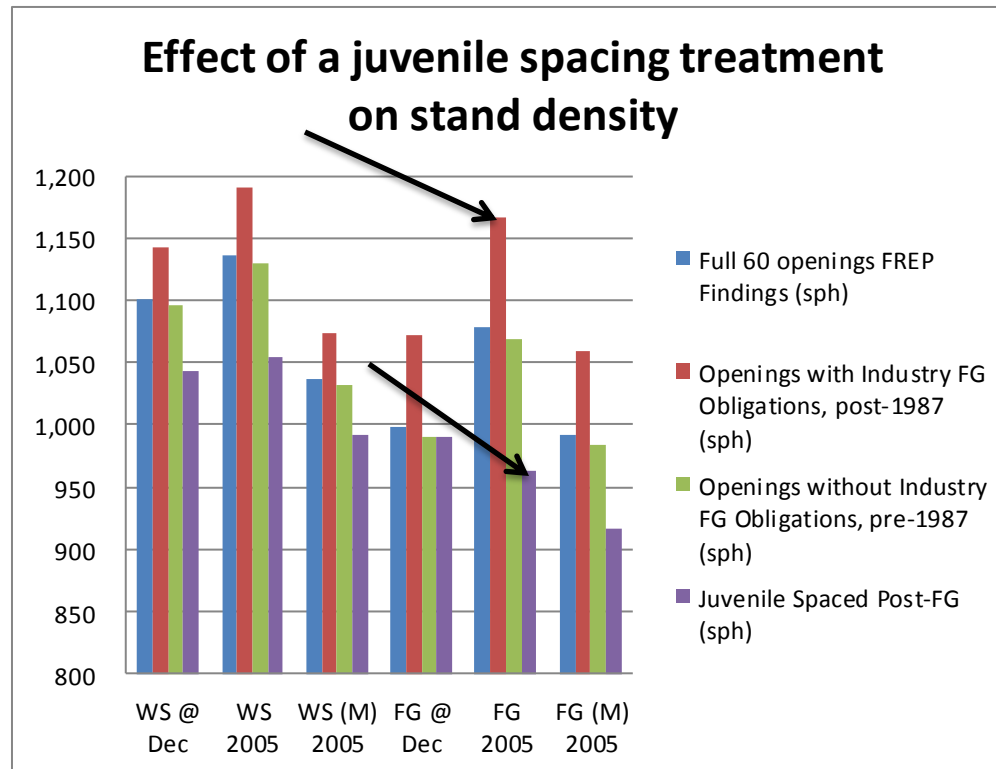
Forest Analysis & Inventory

There is a power point presentation prepared by Mario Di Lucca, Ken Polsson and Barry Snowdon, Forest Analysis & Inventory Branch, November 5th, 2013 which demonstrates what impacts stand yields in the TASS model. Their findings are consistent with what has been presented above.

- stand yields to rotation age are highly influenced by
 - Site Index,
 - Spatial distribution of the crop trees,
 - Species, and are to a lesser extent,
 - impacted by stand density.

*Stand densities become important to stand yields when the average establishment density drops below 850sph however, to maximize stand yields, establishment densities above 1200sph are needed.

* A juvenile spacing treatment could affect stand densities to the point stand yields are severely affected.



- Industry openings with no juvenile spacing contained 1197 ws fg sph in 2005.
- Openings which were juvenile spaced contained only 963 ws fg sph in 2005.

****Juvenile spacing will also affect crown closure, which will affect yields.**

Conclusion

Although our current FSPs are silent on addressing immediate and long-term forest health issues, West Fraser believes this analysis of FREP Report #13, Project Y051207, and assessment of blocks 20 years after harvest has provided a detailed look at how forest health factors are affecting plantations established by West Fraser within the Nadina Forest District.

The findings are conclusive in that all blocks assessed are meeting expected yields, regardless of hard pine stem rusts identified within the blocks. These findings are inconsistent with the reference material provided by the DDM.

