2013 Nadina District
Timber (Stand Development Monitoring) Report

Stand Development Monitoring (SDM) assessments help determine the health and productivity of young stands. The protocol is used on stands between the ages of 15 and 40 years. SDM data can be used for a variety of purposes in tracking how stand attributes change in managed stands.

This report summarizes key findings and provides recommendations to improve on-the-ground resource management practices and decision making.

Key Findings:

- **31** samples were collected between 2010 and 2012 (15 in the Lakes TSA and 16 in the Morice)
- The mean establishment planting density of these stands was **1325** ± 70 SE 35, range of 905-1590 sph.
- Mean age of sample stands at time of free-growing declaration was **15** and is now **26** years (SDM survey).
- Total stand density decreased by **8%**; free-growing density decreased by **7%;** well-spaced density decreased by **15%**
- **48%** (15/31) stands had free-growing density of >1000 sph; **45%** (14/31) stands had a free-growing density of 700 to 1000 sph
- **6%** (2/31) of stands had a free-growing density of <700 sph, falling below the minimum free-growing stems per hectare
- **Pine** was the leading species on 24 of 31 cutblocks and the average percent pine on the pine-leading stands was **79%**
- There was **no change** in leading species on any cutblock
- **Hard pine rust** (western gall rust, commandra and stalactiform) was the most common forest health agent; Unacceptable forks ranked second, followed by vegetation competition.

Research staff compared SDM data to TIPSY projections of current stand conditions using silviculture survey data from the prior survey (WS density), the planted spatial distribution, SDM measured Site Index and default OAFs.

Preliminary Findings:

- SDM matches TIPSY for the number of largest trees in pine leading stands (> 12.5 cm dbh) (524 vs 573 sph) but there are **more trees** 7.5-12.5 cm dbh in pine leading stands than TIPSY predicts (725 vs 324).
- SDM top height for lodgepole pine-leading stands is **significantly lower** than TIPSY (8.8 vs 10.4 m)
- SDM measured Basal Area in lodgepole pine leading stands matches that projected by TIPSY if forest health agents are <u>not</u> taken into account, but when forest health agents <u>are</u> taken into account, the Basal Area is **26% less than TIPSY projects** (TIPSY 15.9 vs 11.7 square meters of healthy pine Basal Area).
- Well-spaced density at prior survey was 1109 ± 38, SE 25 and is now 942 ± 50, SE 25 (Range 660-1220) (to be consistent with TSR assumptions, **well-spaced densities should be 100-200 sph higher at age 25**).

Recommendations for Continued Improvement of Timber (Managed Stand) Resource Management:

- Consider climate change adaptation and account for local forest health and site conditions, and their anticipated long-term impacts in the following ways:
  - Plant a mixture of species, utilizing a mixed bag planting strategy
  - Plant a higher density at crop establishment
  - Use the most current stand development monitoring data to assist in the development of forest stewardship plan stocking standards
  - Consider partnering with the government in establishment of species trials

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Stand Age

The average stand age at the time of Nadina surveys varied from 19 to 36 years with overall age of 26. Nadina surveys were conducted 4-14 years after the free growing survey, with an average interval between FG assessment and SDM assessment of 11 years.

Forest Health

Various forest health agents were observed throughout the sampled stands. To simplify analyses and reporting, these were grouped into common pest damage associations. Hard pine rust damage was the most widely distributed damaging agent, occurring in 80% of the sampled stands. Unacceptable forks primarily contributed to the biotic-caused deformities which occurred on 67% sampled stands. Suppressed trees (with height to diameter ratio>100) mainly contributed to vegetative competition that occurred on 52% of the stands. (Figure 1)

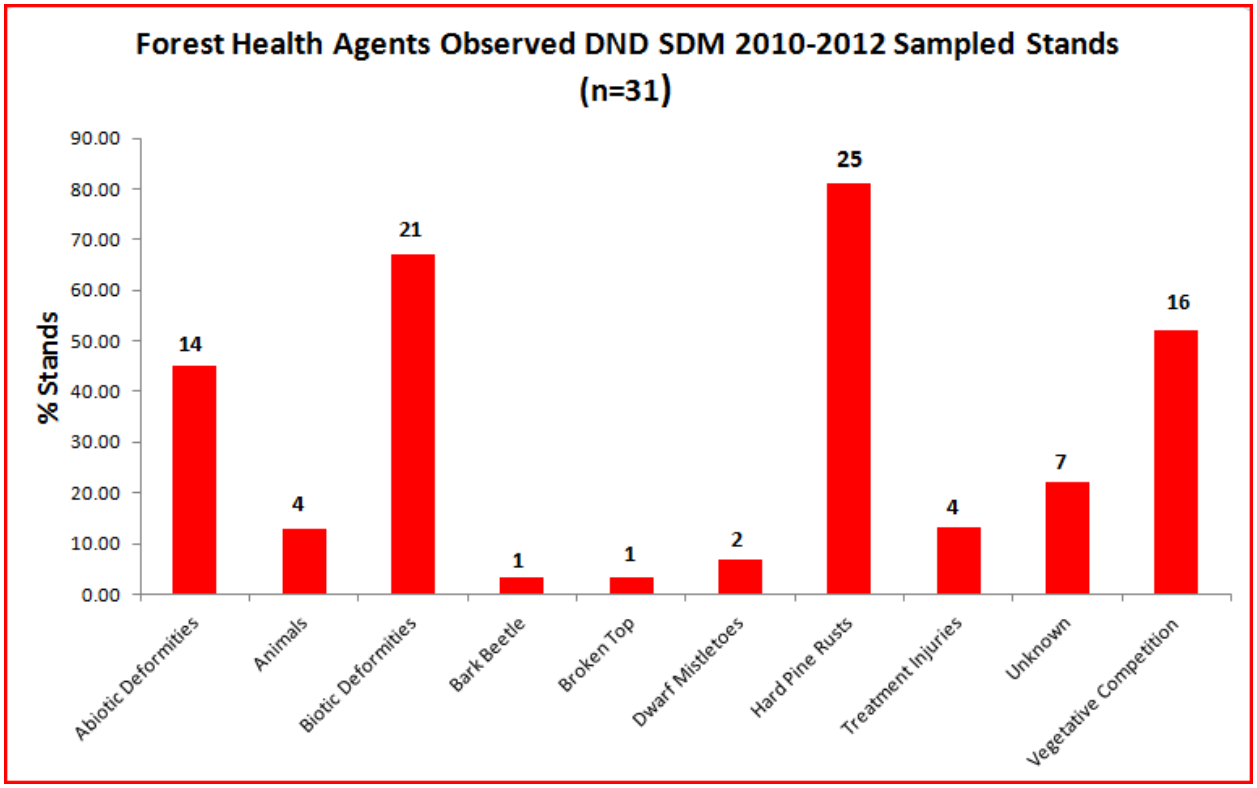

Figure 1. Proportion of the sampled stands over the Nadina district affected by forest health agents grouped on the basis of similarity and severity of damage

Stands were divided into four damage agent incidence groups: (1) not present, (2) low, (3) moderate and (4) high levels of the damage agent (Table 1). For ease of comparison, the same thresholds (ie. <10%, 10-20% and >20%) were used for all damage agents. If an individual tree had more than one damaging agent, only the most severe damage was recorded; the damage agent associated with a high probability of causing mortality took precedence.

Observed forest Health Damage Nadina SDM 2010-2012								
	Not present	Low		Moderate		High		
Damage agent group	Number of Stands	Number of Stands	Threshold range(%)	Number of Stands	Threshold range(%)	Number of Stands	Threshold range(%)	Highest Incidence (%)
Abiotic Deformities	17	13	<10	1	10 to 20			14
Animals	27	4	<10					1
Biotic Deformities	11	21	<10					8.9
Bark Beetle	29	1	<10					<1
Broken Top	29	1	<10					<1
Dwarf Mistletoes	28	2	<10					3
Hard Pine Rusts	6	13	<10	8	10 to 20	4	>20	39.5
Treatment Injuries	26	4	<10					<1
Unknown	24	7	<10					7
Vegetative Competition	15	14	<10	1	10 to 20	1	>20	29

Table 1. *Number of Stands affected by forest health damage agent groups by incidence class across 31 sampled stands in Nadina District; data include the highest incidence values observed and the tally of stands where damage groups were not observed.*

Stands were rarely found to be completely free of unacceptably damaged trees (only one of the 31 stands surveyed) (Figure 2). In at least half of stands surveyed (54%), less than 20% of total conifers were damaged by forest health agents. In 13% of assessed stands, 40% or more of total conifer trees were damaged to a degree that would make them unacceptable.

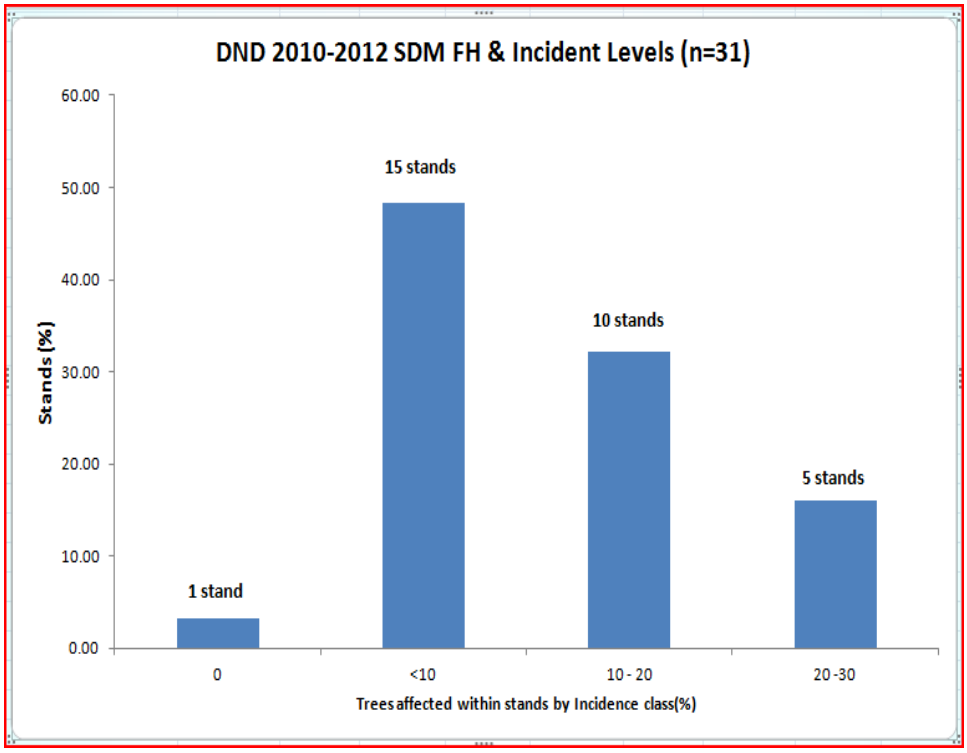

Figure 2 Percent of the total surveyed stands affected by combined damage agents grouped into 10% incidence classes. Only the most severe damaging agent was recorded per tree, allowing for a summation of

Within the Nadina District, as per *Figure 1,* the most prevalent forest health agent observed, are hard pine stem rusts. From 31 stands sampled, 25 have rust present (80% stands); 39% of these stands have either a moderate or high rust incidence level (Figure 4). The extensive range of rust levels observed for Western Gall rust (DSG), Comandra Blister rust (DSC) and Stalactiform Blister rust (DSS) are shown in Figure 5.

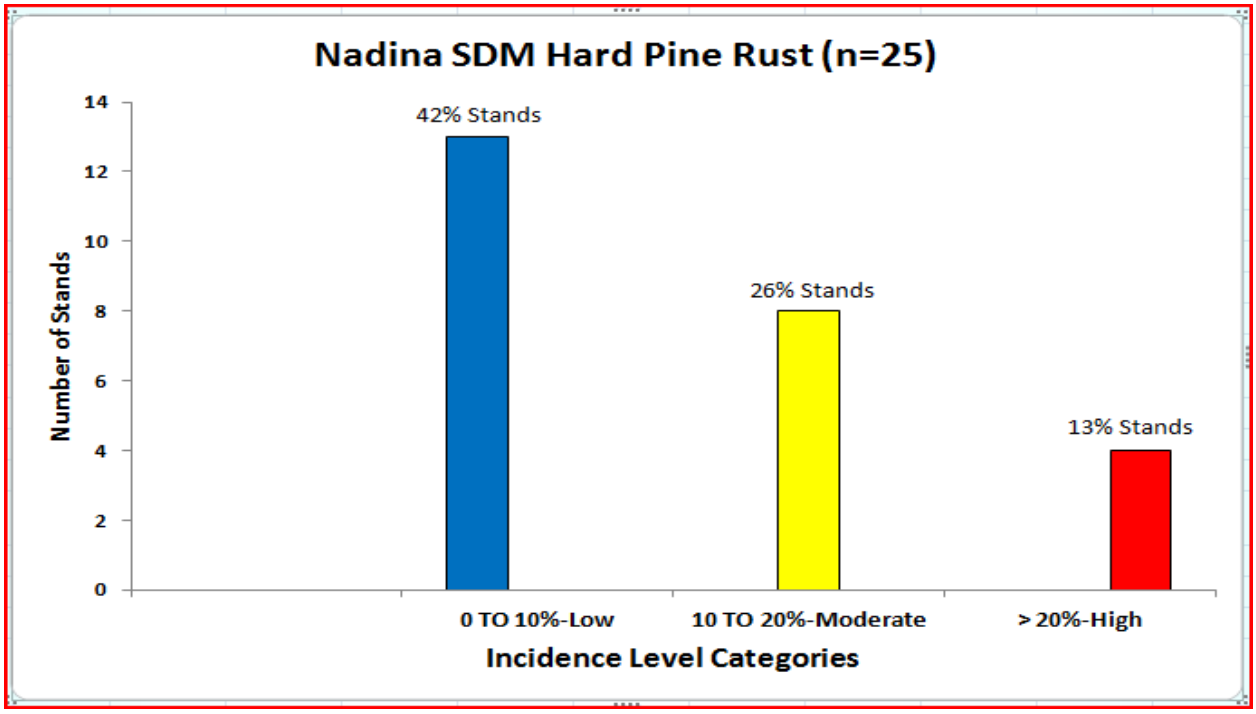

Figure 4 Rust level incidence classes of Low, Moderate and High

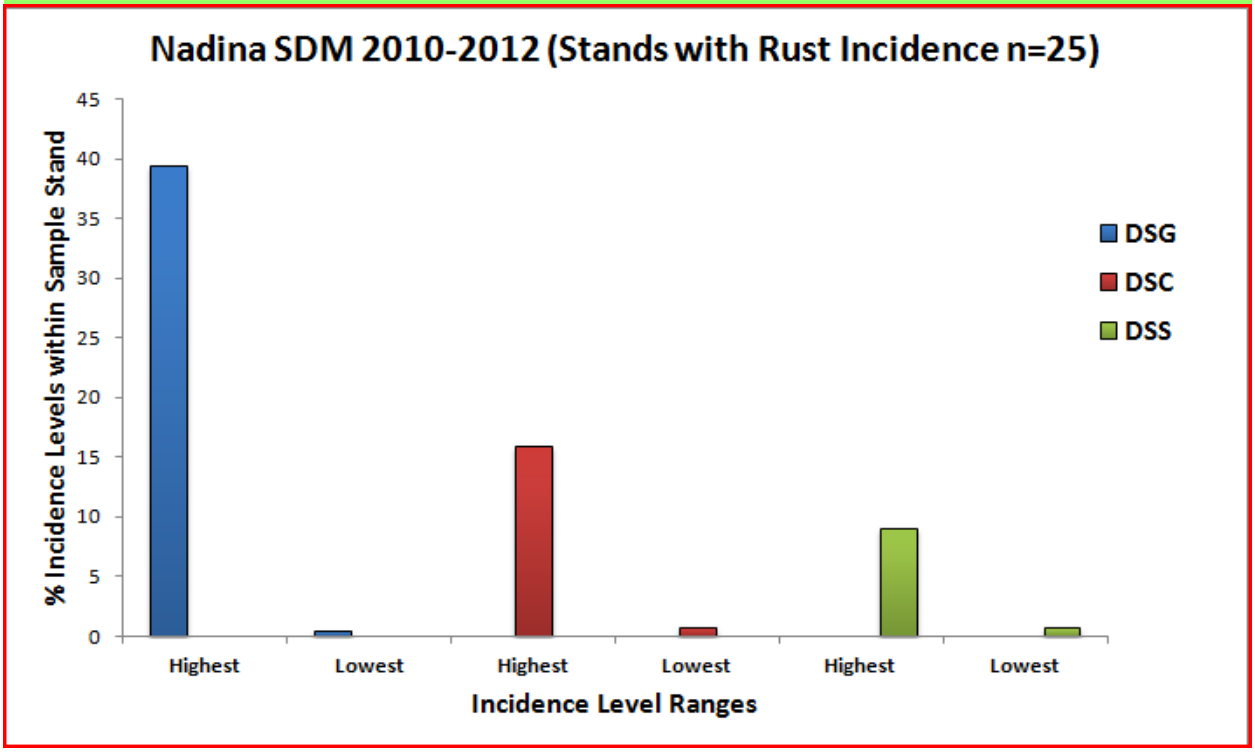

Figure 5

80% of all stands (25 of 31) have Western Gall rust Incidence, 48% of all stands (15 of 31) have Comandra Blister rust Incidence and 17% of all stands (16 of 31) have Stalactiform Blister rust Incidence.

Stand Density

Total density at the time of SDM assessment, which includes all trees > 1.3 metres in height, is shown in Figure 6. From 31 stands, 13 stands (42%) contained < 2000 stems per hectare and all of the stands contained > 1200 stems per hectare.

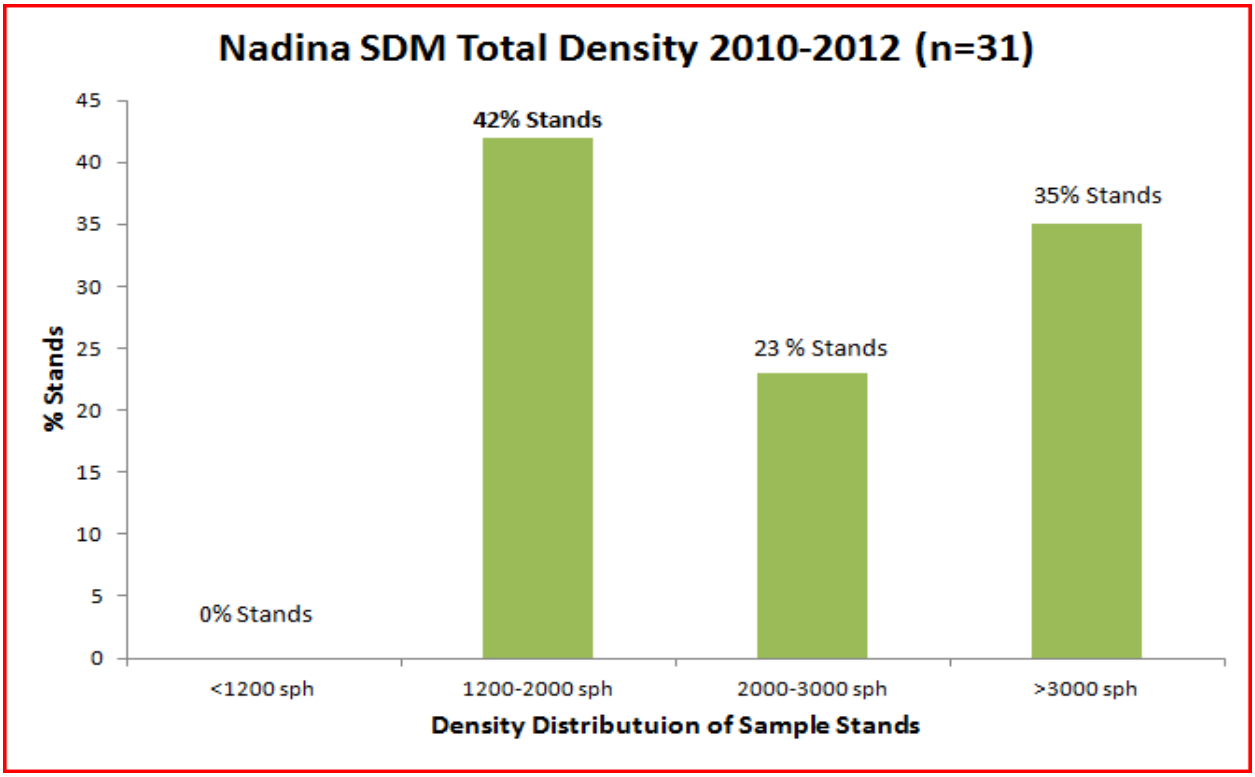

Figure 6 *Total Density distribution*

Stand Basal Area

SDM evaluations provides data on dbh of all trees 7.5 cm and greater including live, dead, healthy and unhealthy . Figure 6a shows total Pl basal area from SDM data, basic TIPSY runs with typical regeneration assumptions used in TSR. Note the **differences** from healthy basal area chart in figure 7a.

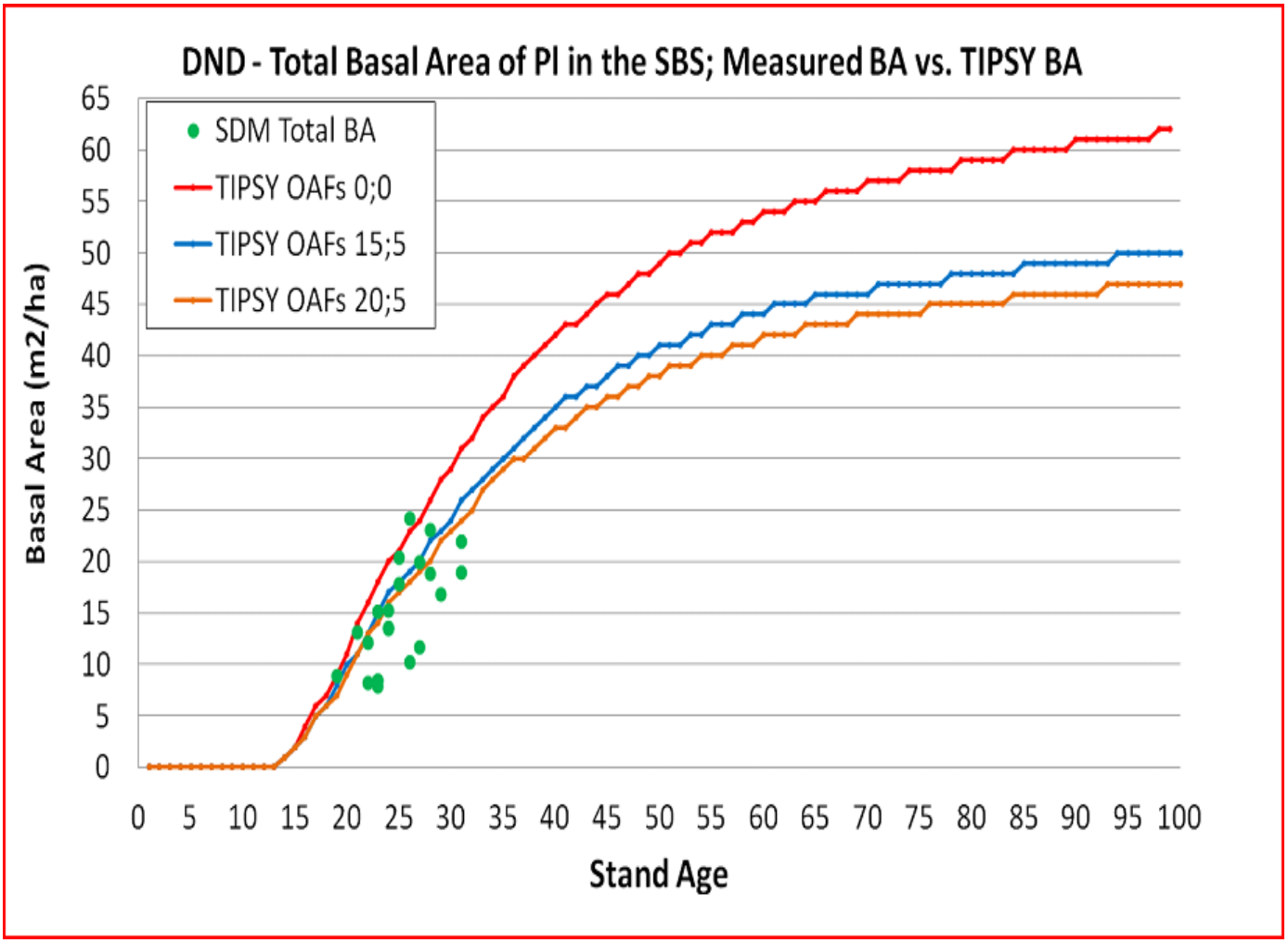

Figure 6a
SDM total Pl basal area (includes all trees>7.5 dbh)
Basic TIPSY projections depicting projected growth trajectory from 15 years of age

Healthy Density & Basal Area

The average healthy tree density (trees unaffected by forest health agents) **differs** from the total density. Of 31 stands, 19 stands (61%) have < 2000 healthy stems per hectare. Six of these stands (19%) have <1200 healthy stems per hectare (Figure 7). *Healthy density shown in Figure 7 and 7a depicts random and/or clumped & heterogeneous spatial distributions and is **not well-spaced**, regular homogenous spatial distribution.*

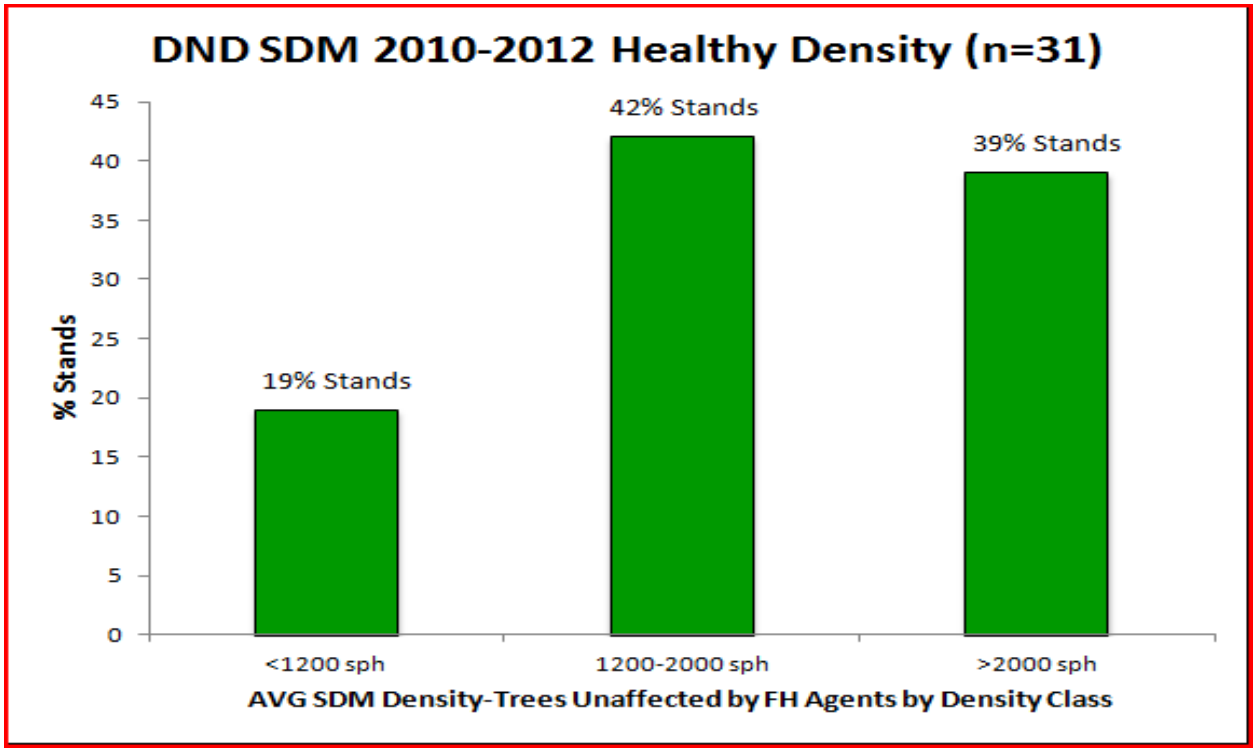

Figure 7 *Average **Healthy** density distribution (by density class)*

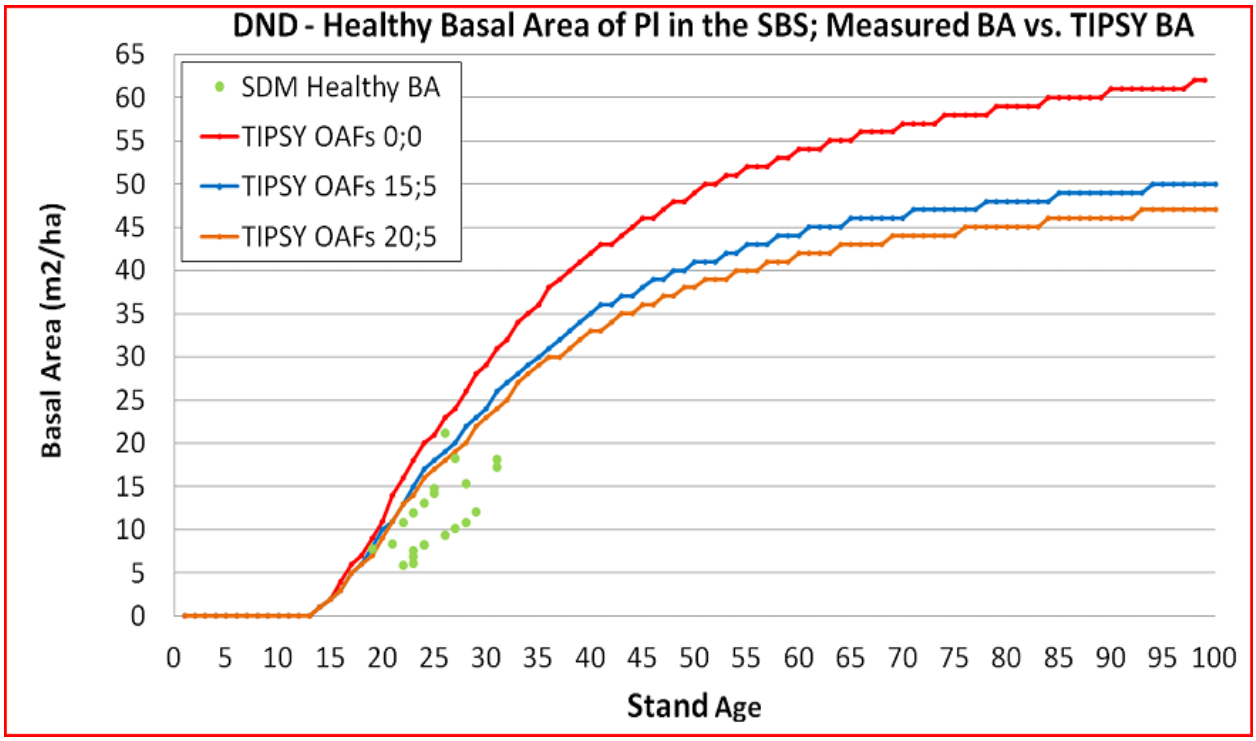

Figure 7a

Nadina SDM Healthy Pl basal area, trees that pass SDM damage criteria & unaffected by FH Agents

Stocking Density

The Well Spaced stocking density of all the stands is shown in Figure 8. SDM Well Spaced densities range from 660 stems per hectare to 1220 stems per hectare. Overall the stocking density level has decreased, with a range from 3% to 42%. For the optimum stocking density of 1200 stems per hectare (depicts full site occupancy), **one stand** out of 31 contains >1200 well spaced stems per hectare an average of 11 years after declaration.

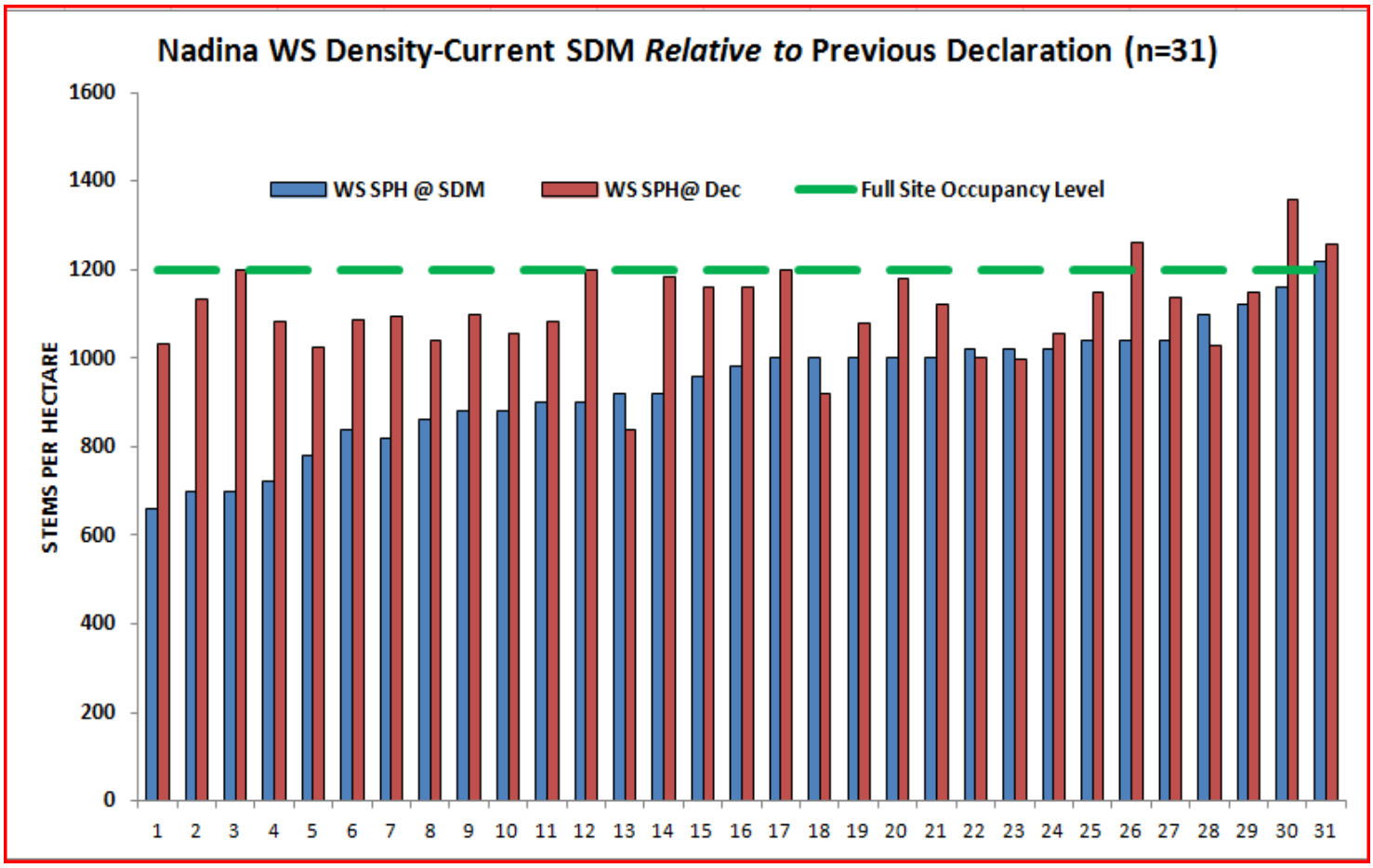

Figure 8 *WS Stocking Densities*
***84% STANDS** (26 of 31) have **decreased** Stocking Levels*
*Overall Avg Stocking density variation is **15% decrease** (declaration year to SDM year)*
***1 Stand** of 31 Stands is currently at Full Site Occupancy*

NADINA STAND DEVELOPMENT MONITORING REPORT

This report provides important information on the condition of post free-growing stands within the Nadina District.

One of the key components of forest policy related to the timber resource value is the free-growing milestone. The policy and practices associated with this milestone influence the initial stand conditions and thus have a significant influence on preferred species composition, stand density and stocking, stand structure, and health over the life of a stand. The free-growing milestone is used to ensure that young stands are fully stocked with healthy trees of ecologically suitable species. Forest management in British Columbia is based on the fundamental assumption that once the free growing milestone is reached **stands will continue on a projected growth trajectory** and provide a merchantable volume of timber at harvest (as per Figure 6a).

Stand development monitoring assessments *are one of the tools* that will help guide forest health and reforestation management decisions and facilitate discussion and action to address reforestation outcomes.

This report summarizes key stand level attributes (forest health and stand density) from randomly selected post free growing stands across the Nadina District.

This report was a collective effort by Ministry of Forests, Lands and Natural Resource Operations- Nadina Resource District and Skeena Regional Forest Health staff.

NADINA STAND DEVELOPMENT MONITORING REPORT