



Spray Lake Sawmills

Detailed Forest Management Plan 2001 – 2026

Chapter 9 - Growth and Yield Program



December 15, 2006

Chapter 9 - Growth and Yield Program

9.1 Introduction

The establishment of a growth and yield program is both a requirement under the SLS Forest Management Agreement and a commitment within this DFMP. The FMA specifically states:

15(3) After May 1, 2006, the Company shall establish and implement a growth and yield program as part of the detailed forest management plan on lands within the forest management area.

15(4) The growth and yield program will include the establishment of a system of permanent sample plots which will be used to monitor the results of different silvicultural systems during the term of this Agreement so as to provide accurate information for the preparation of reliable yield tables.

This chapter of the DFMP provides guidance to the development and implementation of the program. Further details required for implementation will evolve through consultation with and approval by SRD.

9.2 Objectives

Monitoring forest growth and yield is an essential component of sustainable forest management. Implementation of a program is designed to provide an independent data set to validate and improve existing natural stand yield curves and to develop new natural stand and managed stand yield curves.

There is also a need to develop accurate relationships between regeneration performance and growth projections to validate and improve forest management and silviculture planning. At this point in time, growth and yield projections are based on current, basic forest management and silvicultural strategies. SLS has no plans for enhanced forest management within the scope of this DFMP.

Specifically the objectives are:

- Monitor the strata based yield estimates used in the existing Timber Supply Analysis and provide additional data for yield estimation in the next DFMP.
- Monitor forest growth across the Forest Management Agreement area.
- Monitor growth in regenerating harvested areas.

9.3 Existing Information

Currently SLS has Temporary Sample Plot data for 1012 plots across and adjacent to the FMA. The details in terms of plot location, sampling design and measurement procedures are detailed in Chapter 7 of the DFMP. The seven yield curves used to determine sustainable annual harvest levels in this DFMP were derived from this data set.

The current yield stratification is generalized, based on the limited existing local plot data. Future opportunities need to be investigated including the development and use of regional yield curves and further stratification based on variables such as density and natural subregions. The use of regional yield curves is consistent with the approved strategies undertaken by the Foothills Growth and Yield Association program.

The government of Alberta has established a network of monitoring plots throughout the Province. A digital file provided to SLS shows 113 plots within or immediately adjacent to the FMA area. Within the FMA are 40 plots (29 PSP, 7 SDS, 4 MP). The government is proposing to establish another 30 PSPs over the next ten years as part of the C5 Forest Management Plan. In addition, Sundre Forest Products (SFP) has established an extensive network of Permanent Sample Plots (PSP) across their FMA area, four which fall within the SLS FMA area.

9.4 Program Focus

SLS is committed to sampling and monitoring growth and yield in standing timber and in regenerating harvest blocks. SLS will use a combination of PSP and TSP installations. As stated above in the objectives, the focus of the growth and yield program will be on:

- monitoring yield against existing natural stand yield curves,
- developing new natural stand and managed stand yield curves, and
- monitoring growth in regenerating stands.

SLS will continue to either participate in or monitor growth modeling initiatives such as the research being conducted by the Foothills Growth and Yield Association and the Government GYPSY model. Therefore, modeling is not explicitly part of the SLS program.

SLS is pursuing a regional approach to a PSP program for standing timber. SLS will investigate integrating Government PSP data and Sundre Forest Products (SFP) PSP data into the program. SFP has already agreed-in-principle to sharing data with SLS. It has been brought to our attention there may be challenges associated with incorporating government PSP installations located within the FMA into the program because of biases associated with their locations. These plots do represent years of information and can provide valuable information on tree and stand growth. Opportunities will be explored further with ASRD on how the information can be brought into the program. It is believed the PSP data can be sufficiently defined or attributed to enable the aggregation of the data from all sources.

Protocols for PSP and TSP establishment in standing timber are well established. The challenge is in regenerating stands. SLS has based its PSP design on the Draft Provincial Monitoring Program – Plot Establishment Protocol (June 21, 2005) which standardizes PSP protocols for both standing timber and harvested areas. The details are in Appendix 1. This design is based on an 800m² circular tree plot¹ protected by a

¹ "Fixed area plots are usually circular or square. A circular plot is more commonly used, because the perimeter is less than that for a square plot of the same area. This means that fewer trees will be borderline trees, which are trees that lie on the boundary of the plot. Also, circular plots are generally easier to lay out on the ground, and it is easier to correct for horizontal distance on sloped areas. Occasionally, a rectangular shaped plot is used, if the stand that is being sampled is long and narrow in appearance. This occurs along water boundaries, and across sloped areas."

LeMay, V.M. and P.L. Marshall. 1990. *Forestry 238: Forest Mensuration*. 213 pp. UBC Access Guided Independent Studies, The University of British Columbia, Vancouver, BC, Canada.

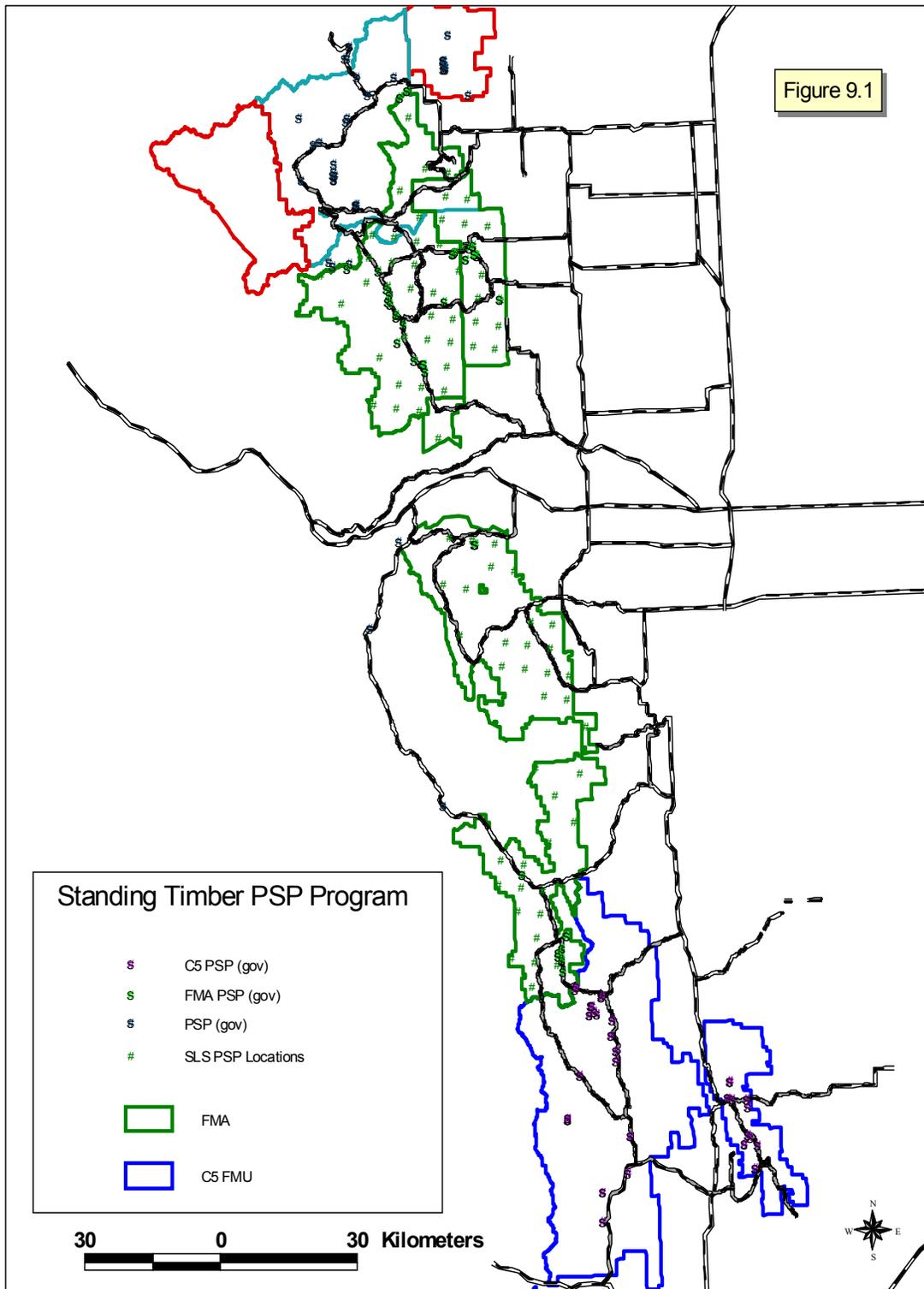
.81ha. buffer. SLS selected this approach in part because of the standardization of PSP plots (pre and post harvest) and because of the move to circular plots which are easier to install and less prone to errors.

For TSP installations, the intent is to use the regeneration survey system mandated under the Timber Management Regulation. Since the regeneration survey system was not designed to provide growth and yield information the surveys will be tested and evaluated to ensure the information meets the needs and rigor of the program. Otherwise, an alternative TSP system in post-harvest stands may have to be developed.

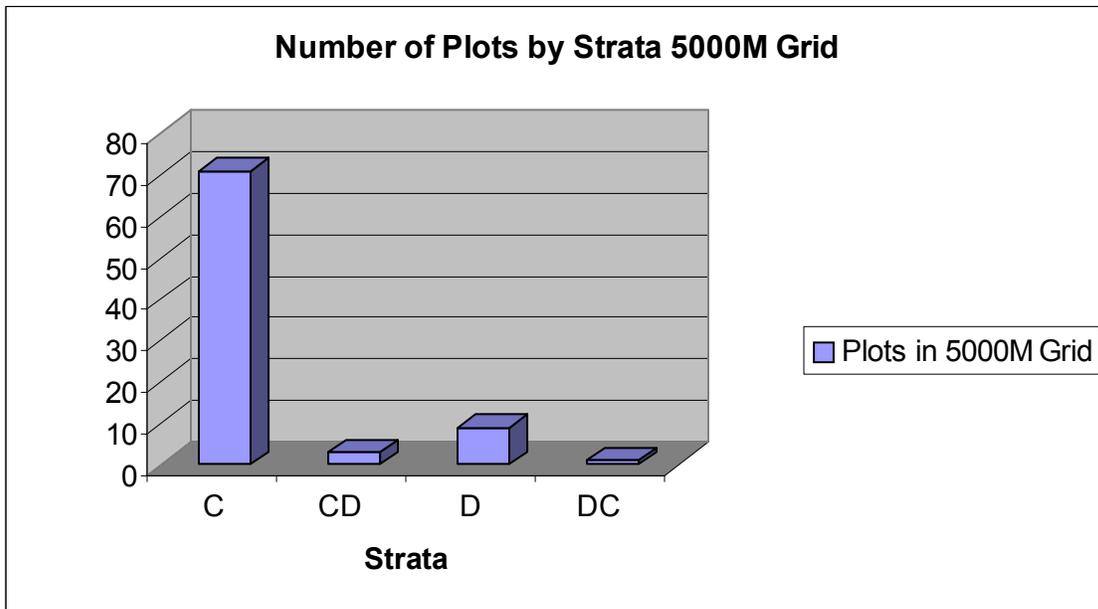
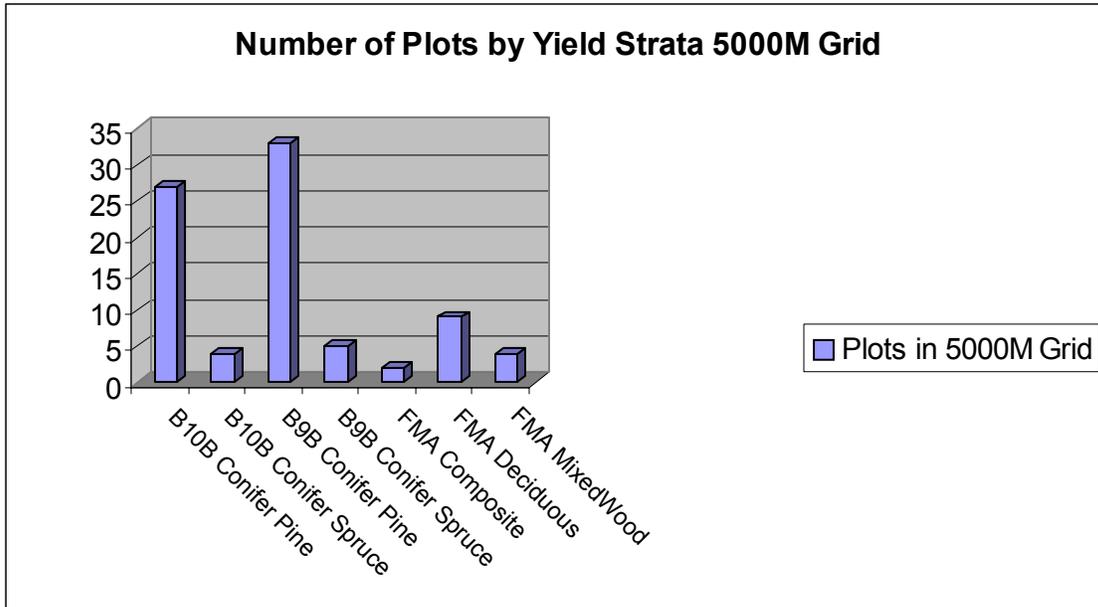
9.5 PSP Program

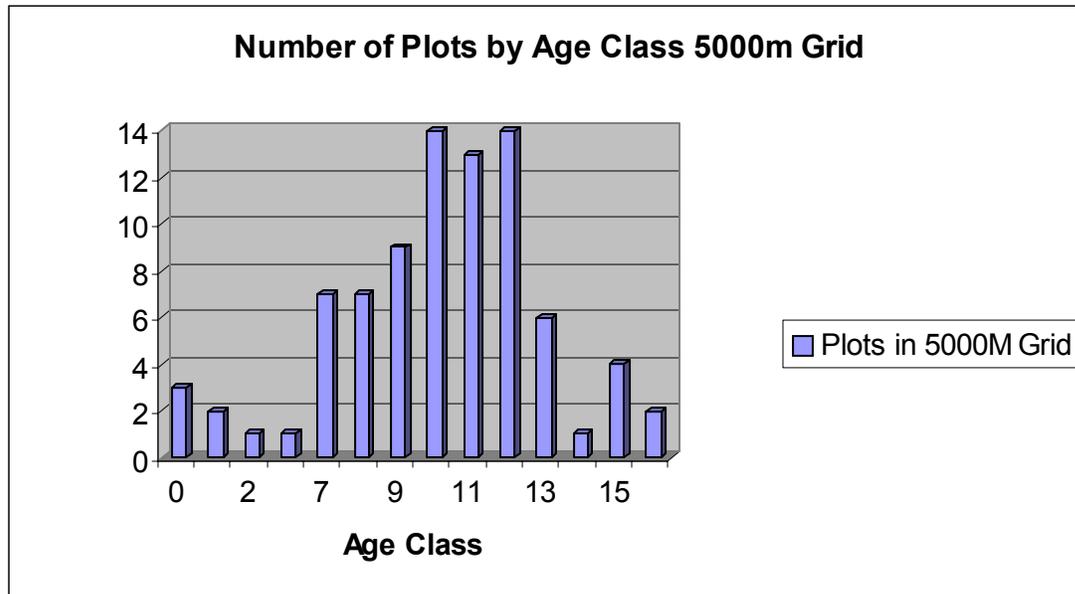
PSP installations provide data to assist in developing and validating growth and yield models, data on tree and stand growth and data on stand development (mortality and ingress). SLS is focusing on the growth monitoring component. A grid based system for PSP installations opens up opportunities for regional cooperation with Sundre Forest Products who has a system of plots to the west and north of the FMA and with ASRD who has a system of plots within the FMA and in the C5 Forest Management Unit. The grid system also provides for plots in both standing timber and in regenerating areas.

SLS is using a 5km by 5km grid nested within the 20km by 20km grid of the National Forest Inventory (NFI) for the PSP program in standing timber. This will link into the 10km by 10km nested grid ASRD is using in the C5 FMU for its PSP program. Figure 9.1 shows the distribution of plots across the FMA. It also shows the locations of the government monitoring plots.



Under this scenario, 135 plots would fall within the FMA of which 84 plots would fall within the net land base. Further analysis of the plots shows the following:

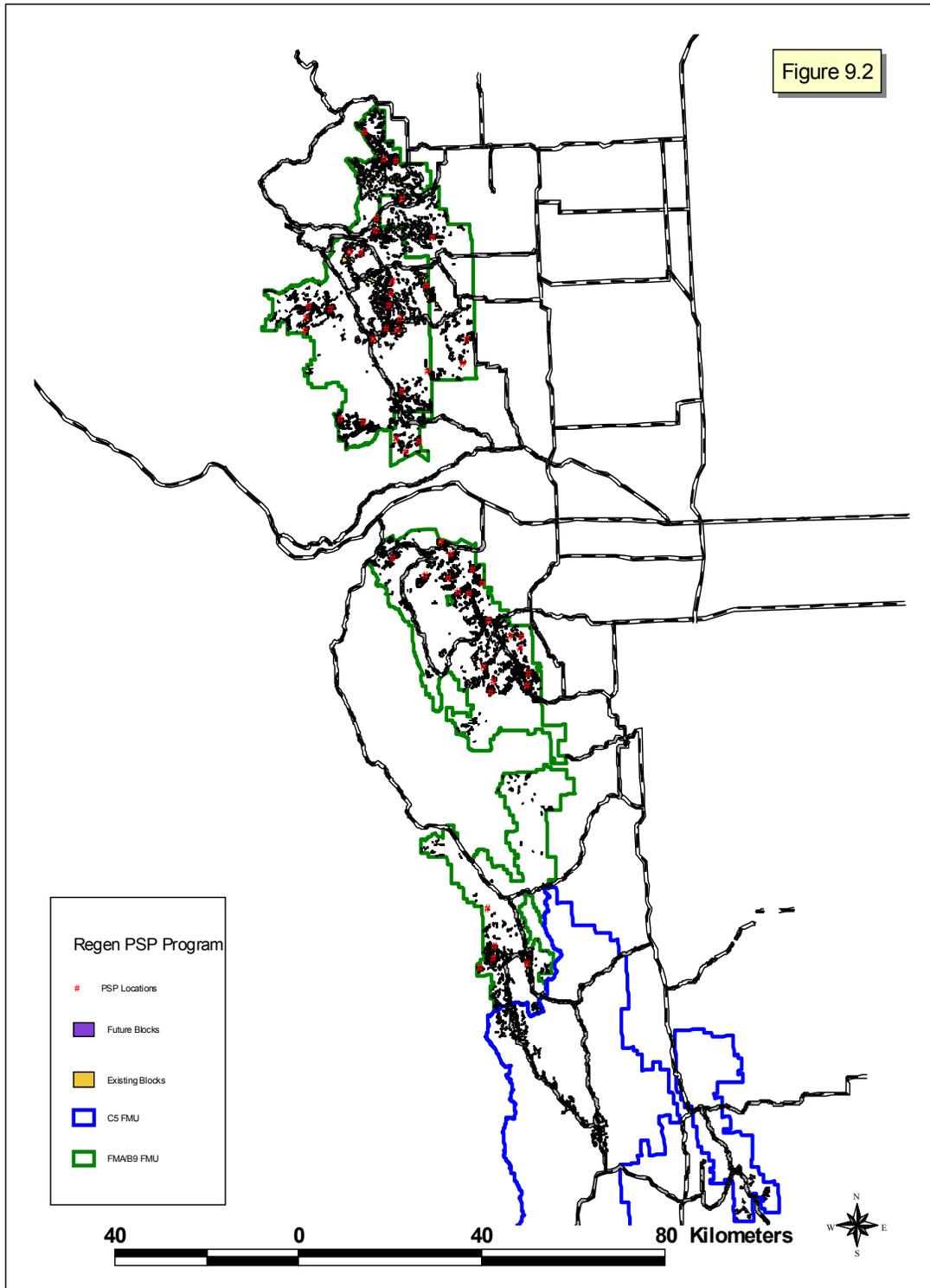




The yield strata chart is based on the current yield strata used in this DFMP. These yield strata may change from one DFMP to the next but use of the grid to fix plot location on the landscape should ensure representative distribution of PSPs across the FMA. The results for this DFMP are generally consistent with the landscape of the FMA in terms of species, strata and age class distribution.

In terms of a PSP system for regenerating harvest areas, the 5km by 5km grid was split into a 2.5km by 2.5km grid. This translates into 19 PSPs being established in areas harvested since 1991². When overlaid onto the Spatial Harvest Sequence of the Preferred Forest Management Strategy, a further 34 PSPs can be expected to be established in new harvest areas over the next ten year period. Figure 9.2 shows the distribution of plots across the FMA.

² Pre-1991 harvest areas are for the most part already reclassified in the AVI and may not reflect today's management activities. Some of these blocks may be picked up in the 5km by 5km grid for standing timber PSPs.



9.6 TSP Program

TSP installations provide data for use in developing yield strata and yield curves. The TSP program will be based on stratified random sampling starting with the D, DC, CD and C broad cover type level and the 10 Provincial base strata. The sampling design will be determined in conjunction with the AVI update program as approved by ASRD. SLS will establish another 800 TSP installations in standing timber in the FMA. This would essentially double the number of TSP measurements within the net land base. By broad cover group this translates to a stratified sample of:

Cover Group	Percentage of net land base	Number of plots targeted
Conifer	84%	672
Mixedwood	7%	56
Deciduous	9%	72

Yield strata for the next DFMP will be selected after a review of the data to determine which elements (e.g. species, density, natural subregion, etc.) are statistically significant. Based on our current yield strata, for illustrative purposes, the breakdown would be as follows:

FMU	Leading Species	Strata	Percentage of net land base	Number of plots targeted
B9	Pine	B9-C-PI	36%	288
B9	Spruce/fir	B9-C-Sw	8%	64
B10	Pine	B10-C-PI	30%	240
B10	Spruce/fir	B10-C-Sw	10%	80
FMA	n/a	FMA-MX-n/a	7%	56
FMA	n/a	FMA-D-n/a	9%	72

The Composite yield strata was not included in the analysis as it is our intent to evaluate all the harvested blocks that make up this strata for species and year of harvest in preparation for the next DFMP in 2016.

9.7 Program Implementation

Program implementation is scheduled for the summer of 2006 under the terms of the FMA. The following is to be completed prior to the submission of our next DFMP scheduled for September 2016.

Schedule (2006-2016)

Standing Timber:

- TSP – measure 800 plots (essentially doubling the existing number) using the volume sampling protocols contained in Chapter 7 – Appendix II with the permission of Sundre Forest Products. Timing will be linked to the AVI update. Target is the 2nd quadrant (2011 – 2016).
- TSP - investigate use of SFP TSP data (local validation) to supplement FMA specific data. (1st quadrant 2006 – 2011)

- PSP – investigate use of government PSP data in terms of plot information and plot location. (1st quadrant 2006 – 2011)
- PSP – continue investigating the opportunity of establishing a regional approach with SFP and ASRD.
- PSP – Establish and measure 84 plots using the Plot Establishment Protocol (Appendix 1). (Following Growth & Yield program approval 2006 – 2016) The intent is to even-flow plot establishment and measurement as per Table 9.(?). Re-measurement will occur:
 - Every 5 years for conifer leading stands <80 yrs. or > 130yrs.
 - Every 5 years for deciduous leading stands < 60 yrs. or > 100 yrs.
 - Every 10 years for conifer leading stands between 80 and 130 yrs.
 - Every 10 years for deciduous leading stands between 60 and 100 yrs.³

Regenerating Stands:

- FGYA - Evaluate components for applicable measurement data to supplement program. (Ongoing 2006 – 2016)
- TSP – Continue to conduct regeneration surveys as required by legislation and evaluate the regeneration survey system data for applicability.
- TSP - develop plot protocols for a TSP system and test if regeneration surveys are not applicable (subject to ASRD approval).
- PSP - establish and measure 53 plots using Plot Establishment Protocol (Appendix 1). Target for initiation is the first harvest season following Growth & Yield Program approval. Refer to Table 9.1.

Table 9.1

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
PSP establishment	8	9	8	9	8	9	8	9	8	8
PSP re-measurement						8	9	8	9	8
PSP 1991-2006 cutblocks	3	4	4	4	4					
PSP future cutblocks				As new blocks fall on the grid, to be established one year after initial reforestation treatment						→
PSP cutblock re-measurement						3	4	4	4	4

³ ASRD. Permanent Sample Plot (PSP) Field Procedures Manual. March 2005