

## 6.0 Silviculture



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Foothills Forest Products (FFP) is committed to an effective silviculture strategy in order to achieve sustainable forest management objectives in E8. Lodgepole pine (*Pinus Contorta*), White spruce (*Picea Glauca*) and Black Spruce (*Picea Mariana*) are the three primary species harvested and processed at the Grande Cache facility. Due to the recent Mountain Pine Beetle (MPB) infestation FFP has been harvesting primarily high susceptible pine as part of Alberta's Healthy Pine Strategy. This has provided Foothills with an opportunity to utilize natural regeneration strategies for pine. Within pine dominated stands there is still a variation of stand types and ecology requiring different silviculture techniques. The techniques used are determined on a site by site basis and include scarification, planting and the potential for other mechanical site preparation treatments.

Balsam Fir (*Abies Balsamea*) occurs naturally in most of the Forest Management Unit and has comprised about 5% of the volume used to produce SPF dimension lumber over the last three years at the FFP processing facility. One of the objectives in the TSA is that the amount of Balsam Fir is to stay constant over time. The ASRD Balsam Fir Directive (2001-01) will be adhered to for all harvest areas post May 1<sup>st</sup>, 2008.

Lodgepole pine dominated stands can be effectively regenerated naturally by using drag scarification. Drag scarification utilizes the available seed in cones and within the seed bed. Planting will be used on stand types where seed is inadequate or site conditions do not allow for natural regeneration.

FFP will plant sites dominated with White spruce and Black spruce as well as areas with steep slopes, highly productive sites, scattered with deciduous or too wet to allow for scarification. On certain slopes where pine comprises greater than 90% of the species composition, leave for natural (LFN) may be used to achieve regeneration. These areas will be monitored closely to ensure effective, prompt reforestation.

Vegetative competition is not seen as a significant issue within E8. Therefore, herbicide treatments are not likely to be used. FFP is aware that in some cases herbicide must be used to achieve the requirements set out in the Timber Management Regulation and the Forest Management Herbicide Reference Manual and will be followed when required.

Currently stand tending treatments such as spacing and thinning are not being used in E8 and there are no immediate plans to use these practices.

FFP will time the removal of watercourse crossings used for harvest operations to allow for improved access for silviculture operations. The timing of removal for watercourse crossing will be within the time limits defined in the Operating Ground Rules. Other long term crossings will be maintained as per the direction of this DFMP. This section provides details regarding the government reports, various silviculture programs, initiatives and activities undertaken for management of the forest resource within the E8 FMU.

## **Government Reporting**

Foothills Forest Products complies with all legislation, regulations and policies that require government reporting. The Company submits silviculture Annual Operating Plans, Final Harvest Plans, Fire Control Plans, and ARIS reports. The following section describes the government reporting with respect to silviculture and reforestation.

## **Silviculture Reporting**

The Timber Management Regulation states in subparagraph 143.2(2) that, “A Timber disposition holder responsible for carrying out reforestation shall, by May 15 of each year, submit to the Minister a written report summarizing the proceeding year’s reforestation program.” Foothills Forest Products reports reforestation activities three times a year; a silviculture submission with the Annual Operating Plan detailing the upcoming timber years planned activities and two Alberta Reforestation Information System (ARIS) submissions. The first ARIS submission (prior to May 15<sup>th</sup>) reports the company’s activities including all silviculture activities that were completed from October of the previous year up to May 15<sup>th</sup> of the current year. The second submission, which is not mandatory, is submitted in October. This submission reports all company activities including silviculture activities occurring between May 15<sup>th</sup> and October.

The Silviculture Annual Operating Plans are submitted as hard copy binders containing a series of tables and matrixes of the planned year’s activities, as well as, digitally burned onto CD’s. The ARIS submission is completed digitally using Data Information of Reforestation Technologies (DIRT) software. DIRT is setup to fit precisely the requirements of Alberta Sustainable Resource Development (SRD).

Every five years as part of the FHP or part of the Stewardship report, FFP will submit a series of tracking summaries for all silviculture activities (i.e. regeneration surveys, planting, site preparation, and other reforestation stage treatments). FFP is committed to clearly demonstrate that all the objectives and targets of this DFMP are met, as well as show continual improvement.

### The Foothills Forest Products Approach to Reforestation

Foothills Forest Products is committed to an effective and prompt reforestation strategy that ensures healthy forests into the future. An adaptive management system of monitoring and continuous improvement to ensure all harvested areas are being regenerated effectively is currently being used. Our goal is to maintain or enhance the productivity of the landscape and to ensure 100% compliance with the regulations and legislation.

#### Reforestation Goals and Philosophy:

- 100% compliance of the regulations
- Maintain or enhance the ecological integrity and productivity of the E8 FMU
- Use a thorough silviculture prescription process starting at the planning stage and continuing with pre-harvest assessments (PHA's), post harvest programs including post-harvest

prescriptions, year 4 or 5 walkthroughs and any required post harvest intervention, seeing each and every harvested block through until after they pass a performance survey.

- A natural regeneration strategy for Lodgepole pine by means of drag scarification; utilizing the available seed in the seedbed and cones scattered in harvest areas will ensure natural genetic diversity.
- Strategically planting Lodgepole pine, White Spruce and Black Spruce on areas that can not be scarified or naturally regenerated such as steep slopes, wet ground, areas with low seed availability and germination potential and stand types where the ecology requires planting (i.e. spruce types, areas with high vegetative competition, sensitive areas etc.)

On average, Foothills Forest Products conducts reforestation, surveying, site preparation and monitoring activities for approximately 8000ha across the FMU every year. The intensive management and monitoring in the establishment stages of seedlings will result in reforestation success.

### Pre-Harvest Assessment (PHA)

FFP conducts 90% of all the field work done in-house beginning with the reconnaissance of timber continuing through to post harvest assessments and site preparation supervision. As a result an intimate knowledge is developed for each harvest area. Detailed Pre Harvest Assessments are created forming the foundation of a successful reforestation program. The PHA identifies the ecological requirements of a specific site and the limiting factors to tree growth. The PHA also identifies any operational concerns we may face. For each planned block a detailed PHA is completed and used to implement the correct silvicultural strategy.

## **Historical Silviculture Guide**

Since August 2004, Foothills Forest Products has analyzed and reviewed many of the past strategies and techniques used over the past two decades in E8. This knowledge combined with over 20 years of silviculture experience gained from the pine forests of the Cariboo Forest (where the parent company C&C Wood Products is based) has helped shape its reforestation strategy. Using our database (DIRT), reports have been generated allowing silviculture staff to assess the success of various strategies used in E8. It has provided a useful tool in deciding which strategies might be successful in the future.

## Timber Supply Analysis and the Regeneration Strategy

According to the Timber Supply Analysis, E8 is predominantly a coniferous landscape (C). Mixedwoods and Deciduous strata (CD, DC, D) have a very small presence on the landscape but do occur (TSA, 2007).

A Mountain Pine Beetle (MPB) scenario (as per the Alberta Healthy Pine Strategy) reduces much of the mature pine stands in E8 over the next 20 years. Sequencing the highest susceptible stands to MPB first, theoretically should reduce the risk of infestation by the insect. FFP is now in the second year of implementing the Pine Strategy. The regeneration objective is to promptly regenerate all the pine stands as per the silviculture strategy. In terms of the TSA and assumptions of the future forest condition, the objective is to maintain the yield groups on the landscape by regenerating 100% of the harvested land base to their previous state. An exception will be in 'A' and 'B' density harvested stands where the regeneration standard requires higher densities in order to pass an Alberta regeneration survey. The ecological implications for meeting this objective will be near neutral as 'A' and 'B' density stands will occur naturally across the landscape. An acceptable target for maintaining the yield groups will be determined by Foothills with the direction of ASRD.

The regeneration strategy, as defined in Table 1, will be compared to planned and actual silviculture activities to ensure that targets are being met. If acceptable variance targets are not being met then regeneration strategies will be reevaluated and this DFMP revised. The Company and ASRD will work progressively to review information, identify issues and to provide for continual improvement.

## Site Preparation

Site preparation is a process of altering the ground cover, soil and microsite conditions in order to create an environment that is conducive to natural and/or artificial tree growth. Foothills Forest Products uses drag scarification with shark-fin barrels and chains as its primary source of site preparation. Drag scarification is currently the only form of site preparation used as the vast majority of area we harvest is on pine dominated sites. It has been proven historically to be an effective method as long as seed availability/viability, seed bed structure and growing conditions are conducive to tree growth. As harvesting shifts to areas with higher percentages of white and black spruce, other forms of site preparation such as ripper plows, disc-trenching, light mounds and hoe mounding will be considered as tools to help establish seedlings. Stands can be left for natural regeneration in pine dominated stands or by straight planting without the aid of site preparation.

Drag scarification is used to achieve the following objectives:

- Expose seed within the mineral soil to improve germination success;
- Create additional enhanced micro sites that facilitate planted tree establishment and performance;
- Evenly distribute coarse woody debris across the harvest block.
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The decision process of whether or not to use drag scarification is as follows:

- What are the limiting factors of this site and can they be mitigated by the use of drag scarification (i.e. germination potential, seed availability/viability, vegetative cover, soil moisture, winter desiccation of seedlings etc.);
- If the limiting factors can not be mitigated by drag scarification then is there a need for other forms of site preparation;
- If there is no need for other forms of site preparation then tree planting is used as a tree establishment tool.

As a member of the AFPA and through participation and observation of research initiatives, FFP stays current on new site preparation technologies. FFP also has close working relationships with adjacent forest companies; providing knowledge on effective strategies for the area.

## Drag Scarification (Shark-fin barrels and chains) Explained



Large chains and barrels with fins are pulled behind a prime mover such as a CAT or skidder. The intention is to expose mineral soil and the seed within the soil to help facilitate germination of seedlings.

## Planting

Foothills Forest Products has been planting trees since 2005. FFP's planting program has grown in size each year with approximately 2 million trees planted since inception. With the increase in harvest level, it is likely to increase even more in years to come.

FFP's program is divided into two types of treatments: raw planting and fill planting. Raw planting is defined as the planting that occurs after harvest but always within two years of the clock start date of a harvest block. Raw planting is used by itself as a treatment or in conjunction with drag scarification where it is necessary. Fill planting is a retreatment form of planting that is used on harvest blocks that did not successfully regenerate naturally from drag scarification, or artificially due to some sort of planting failure. The primary differences between the two forms of planting used by Foothills is that fill planting is used later in the establishment period than raw planting (i.e. 5-8 years after harvest) and that fill planting is usually completed at a lower density than raw planting (i.e. 800 stems per hectare vs. 1,400 stems per hectare for raw). So far, raw planting and fill planting have been used almost equally by Foothills as a mechanism to successfully establish seedlings.

## **Planting Window**

Based on research trials, it has been found that the most effective time to plant pine is after June 15<sup>th</sup>. It was found that spruce had a shorter window and was best planted in July. Because of these findings Foothills Forest Products relies predominantly on a summer plant (after June 15<sup>th</sup>). The use of spring trees has been limited to less than 20% of the total amount of seedlings planted each year.

## **Planting Stock**

Due to the thin LFH ‘duff’ layer and the very low occurrence of competing vegetation in E8, smaller stock (i.e. 310B and 410B) has been used as primary plug sizes. There are special circumstances such as a heavy grass mat, increased competing vegetation, thick duff layer, or the need for larger stock in a retreatment block on a situation by situation basis. The availability of Foothills staff to walk each and every harvest block post harvest has allowed for the ability to identify any ‘trouble areas’ prior to planting such that the planting program and our stock selection can be adjusted accordingly.

The ages of the seedlings primarily planted are 1 + 0 meaning that they are only one year old. These seedlings are characteristically quite short in height and narrow in root collar diameter when compared to a 2 + 0 seedling, of the same stock size, that is two years old. The so called ‘trouble areas’ mentioned earlier generally require taller, more resilient stock to ensure survivability.

## **Planting Microsite Selection**

A microsite is defined as an optimal place to plant a tree. According to supporting research, the best microsite for regions that are not deficient in water (drought) are the sites that are the highest possible and surrounded by litter to avoid drying of the soil and seedling. This allows the seedling the most sunlight and keeps it away from potential low frost pockets. There are many other criteria for an acceptable microsite. These criteria include but are not limited to, acceptable rooting medium, adequate soil depth, no overhead debris. See the Planting Quality Inspection FS 704 manual, BC Ministry of Forests and Range for further guidance on what our company uses as the standard for a quality microsite. The best depth we have found for planted seedlings is at the organic mineral soil interface.

## **Planting Roads and Seismic Lines**

FFP is committed to reforesting all in block roads within two years of harvest. Seismic lines will receive the same two year treatment as the adjacent block area receives. This strategy is above and beyond the current assumptions of the Timber Supply Analysis and reflects Foothills interest in regenerating linear disturbance areas and including them with the net landbase. Roads and seismic line planting will be tracked and submitted to SRD accordingly.

## **C, CD, DC, and D Strata**

E8 is a coniferous dominated FMU. Since 2004, Foothills Forest Products has harvested exclusively from the C strata land base. In some instances there has been a small component of deciduous in harvested blocks but nothing that poses a concern of reaching the 20% deciduous needed to be part of the CD strata. As a result we do not predict a need to balance strata in the future until CD, DC and/or D stands are harvested. In the case where excessive suckering of deciduous reaches the 20% deciduous level, silviculture tactics such as herbicide or brushing will be implemented in order to keep C designated strata as C.

## **Reforestation of Wildfires**

Since 2004 there have been two wildfires recorded of a sufficient enough size to reforest. The 52 Road burn (19.57 ha) and the Chicken Road burn (2.86 ha). As of April 16, 2008, approval has been requested to reforest these two burns under the Wildfire Reclamation Program (FRIAA). Foothills Forest Products is committed to reforesting all burns in the E8 FMU. Future burns will be documented and a proper silviculture strategy implemented in order to successfully regenerate these areas.

## **Seed collection**

Foothills Forest products goal is to pick the highest quality seed available. Lay out and silviculture foresters are trained to keep an eye out for sites with cones that appear to be genetically superior to adjacent stands. Cone collections for Lodgepole pine, White spruce and Black spruce are organized in the areas with superior genetic traits around abundant seed years or when seed inventories become deficient.

Currently FRIAA provides funding to increase the Lodgepole pine seed inventory. This is in anticipation of the imminent Mountain Pine Beetle infestation and is conducted in accordance with the Provincial Mountain Pine Beetle Mitigation strategy. FFP plans to utilize this funding to increase seed inventories, as well purchases seed from adjacent forest operators when available if it is found to be more cost effective than conducting an in-house collection program.

The objective is to have a minimum of five years of seed (for all species) stored at the Smokey Lake Nursery. Cone collections and purchases over the next few years will ensure this goal is met. Years afterward will be aimed at maintaining this five year inventory of superior seed. Currently FFP has enough Lodgepole pine seed for only one more planting season and a White spruce inventory of two years.

Seed collections within the E8 FMU will follow the procedures within the Standards for Tree Improvement in Alberta



## **Seedling Supply**

FFP currently has contracts with Pacific Regeneration Technologies (PRT) in Beaverlodge, Alberta in an attempt to grow as much stock locally. PRT has a proven track record and is considered a leader in the business providing exceptional quality and customer service. Planted properly, these seedlings stand a very good chance of surviving and growing into full size merchantable trees.

## **Natural Sub Region Map (Seedzones)**

There are 4 natural subregions within E8; Lower Foothills, Upper Foothills, Sub-Alpine and Montane.

## **Regeneration Surveys**

The Timber Regulations require the following:

- An Establishment Survey completed 4 to 8 years after harvesting in C, CD and DC cutblocks; and 3 to 5 years after harvesting in D cutblocks;
- A Performance Survey completed 8 to 14 years after harvesting in C, CD and DC cutblocks, and 10 to 14 years after harvesting in conditionally stocked D cutblocks.

The Establishment Survey measures stocking percent, density, height of crop seedlings and approximate amount of undersize seedlings. The Establishment survey will also show the approximate locations of SR and NSR areas larger than 4 ha. In the case of a large amount of undersize seedlings, a 'Let it Grow' prescription will be given with approval as a tool to reach performance specifications. Blocks deemed to be NSR without undersize seedlings will be prescribed a fill in planting treatment.

The Performance Survey will measure the same variables as the Establishment Survey, however, to different standards depending on natural sub-region. In addition, the survey will identify coniferous crop trees deemed to be free-to-grow, conditionally free to grow, as well as, crop trees that are competing with vegetation. Blocks that fail due to competition will be prescribed a brushing or herbicide treatment as needed.

In addition to the required establishment and performance surveys, Foothills Forest Products conducts in-house walk through assessments in year 4 or 5 after harvest to ensure the natural regeneration or planting has successfully established. If a block has not properly established, further planting will be completed to ensure the cutblocks meet the height and density requirements before the establishment survey.

Within the Annual Reporting to SRD, a summary and analysis of each years establishment and performance surveys will be included. Trends will be monitored to ensure consistency with the TSA assumptions.

## Regeneration Survey Quality Assurance Program

### Objective:

The objective of the Regeneration Survey Quality Assurance Program is to ensure that Foothills Forest Products and its contractors are meeting the legislated requirements of the '2000 Regeneration Standard'.

### Surveyor Certification

Contractors conducting surveys for Foothills Forest Products will be a) Alberta Regeneration survey certified or b) a Registered Professional Forester or Technologist (RPF or RPFT). Not all surveyors are required to be certified as long as at least one surveyor meets the criteria above and will be held liable for surveyors under his/her supervision. In the case of in-house surveys conducted by FFP, staff RPF's will ensure the standards of this QA/QC program and the Alberta Regeneration survey manual are met and signed off accordingly.

### Sample Density:

In order to get a representative sample of the completed regeneration plots, 8% of the total blocks surveyed in a given area (**by surveyor**) will be chosen at random and up to a maximum of 16 **plots** will be checked. At the start of the season one block of the first five blocks will be checked for each surveyor to ensure the surveyor is meeting requirements of the regulations and the company. The goal is to check a maximum of 16 plots per block, however if a checker exceeds the 4.0 demerit limit, the check can be considered complete and remedial action taken.

### Quality Standards:

Plots will be checked using a demerit system as outlined in the Alberta Regeneration survey manual. The following are basic guidelines and surveyors should refer to the Alberta Regeneration survey manual for further clarification.

### Plot location and establishment:

- The control line and plots must be laid out at a spacing interval that is determined by block area using either the formula or table in the Alberta Regeneration survey manual.
- The direction of the control line may be selected by the contractor / surveyor but shall be the line which is the longest across the block. POC (point of commencement) must be clearly labelled on the submitted block map and flagged in the field for audit purposes.
- A 10% variance in plot spacing will be tolerated for plot locations. If there are any discrepancies, refer to the Alberta Regeneration survey manual for clarification.
- All plots must be tied into the control line to ensure that this variance is being met.

- All plots must be clearly flagged and numbered in the field to allow for quality checking. The format line number followed by plot number written as L#, P# is preferred but any logical numbering system easily followed by a checker is acceptable.
- All control line plots must be double flagged with contrasting colors so they are easily identified in the field.
- Every block needs a POC which is clearly flagged in such a way that it will remain standing and be easily found in the future. POC information should include: Block Number, Surveyor initials, Contractor, Date, Survey grid spacing, Control line azimuth and directions to first plot. This information insures a checker can easily find plots and conduct a quality audit in a timely efficient manner.

### Number of plots required

- The number of plots required will be based on block area as outlined in the Alberta Regeneration survey manual in Reference Section 4.
- In the case that the block's stocking falls within the 73-79% range additional plots will be required. Refer to Reference Section 3 of the Alberta Regeneration survey manual for clarification as to how to add additional plots and the number required.

Summary of required number of plots as outlined in the Alberta Regeneration survey manual.

Blocks 0.1-1.9 ha	Require 12.4 plots/ha
Blocks 2.0 -4.0 ha	Require 41 plots initially and if stocking is 0-72% or 80-100%  If stocking falls between 73-79% 54 plots are needed.
Blocks 4.1 – 24.0 ha	Require 64 plots plots initially and if stocking is 0-72% or 80-100%  If stocking falls between 73-79% 84 plots are needed
Blocks over 24.0 ha	Require 2.77 plots/ha

### Height measurements

- Heights of trees measured shall be measured to the nearest cm and height must be within 2 cm or 10% of the actual height whichever is less.
- Trees over 300cm can be recorded as 300+ on the tally sheets

### Species identification

- The goal is to have 100% of plots with proper species identification
- Only 2% of plots measured for quality purposes shall contain wrong species identification

### Seedling Density counts

- The goal is to have as accurate density as possible.
- Variance of +/- 2 trees if the plot density is less than 10 trees or 10% if the plot density is greater than 10 trees is acceptable.

### Competition measurements (for performance surveys only)

- Only 2% of plots measured for quality purposes shall contain an error in competition measurements
- The goal is to have 100% of plots with proper competition measurements

### Demerits scoring for regeneration surveys

<b>Missed tree</b>	<b>1 demerit</b>
<b>Incorrect species</b>	<b>1 demerit</b>
<b>Un acceptable crop tree / incorrect selection</b>	<b>1 demerit</b>
<b>Tallying a tree outside the plot</b>	<b>1.5 demerits</b>
<b>Not tying into the control line</b>	<b>0.5 demerits</b>
<b>Incorrect plot and line numbering</b>	<b>0.5 demerits</b>
<b>Incorrect grid or map symbols</b>	<b>0.5 demerits</b>
<b>Incorrect marking of plots / POC in the field</b>	<b>0.5 demerits</b>
<b>Inaccurate density count</b>	<b>0.5 demerits</b>
<b>Inaccurate height</b>	<b>1 demerit</b>
<b>Incorrect competition measurements (Performance surveys only)</b>	<b>1 Demerit</b>

### Rejection of a survey and resurveying a block:

If after a quality control check is completed, it is found that the block receives more than 4.0 demerits the survey will be rejected and the contractor / surveyor will be required to resurvey the block. Depending on the severity of the failure the following action will be taken:

1. If the problem can be mitigated by discussing the issue with the surveyor then this will be the first course of action (i.e further training);

2. To ensure the problem is fixed the very next block a surveyor completes will be quality checked.

Paperwork (submission level audit)

All paperwork will be reviewed by qualified FFP staff to ensure that it meets the requirements of the Alberta Regeneration survey manual. If the paperwork submission is deemed to be unacceptable, the surveyor will be required to meet with FFP staff to go over and rectify the problem. Since most surveys are completed in-house unacceptable write ups can be rectified as the problem arises.

In the case of a contractor completing the write ups, a pre-work meeting and training period will be held, prior to contract start up, to ensure that surveyors are competent in completing paperwork properly. During the course of a contract, contractors will be asked to submit there at the end of every survey week or shift. Unacceptable write ups will be handled on a case by case basis. Write ups continuously not meeting the standard will result in termination of the survey contract.

*The accuracy and any follow up action of paper audits will be recorded on FFP Form 1.*

Form 1: Foothills Forest Products Regeneration survey QA/QC compilation



Opening Number	Date checked	Checked by	# of plots checked	# of demerits	Pass	Fail	Follow up action taken (none, train, resurvey, other)	Resurvey Pass/Fail	Comments

Note: Include all QA/QC tally sheets with survey submission  
Validation by certified surveyor or RPF required to ensure due diligence

Training

All surveyors will be expected to be fully trained and competent in the skills of completing a proper Alberta Regeneration survey. Further training and guidance will be given to surveyors who fail a block once to ensure that the overall survey program is successful and within the guidelines of this QA/QC program. Surveyors consistently not meeting the requirements of the Alberta Regeneration survey will no longer be able to survey for Foothills Forest Products. It will be recommended that these surveyors take the certification course or train with a certified surveyor or RPF until they are deemed fully competent and trained.

## Audit Compilation

A summary of the Quality Assurance program will be compiled and submitted to ASRD with a copy of the completed establishment and performance surveys using attached Form 1. The field quality issues will be resolved as they arise and recorded on Form 1. This will ensure the entire program will meet the objective of the program.