The Forestry Corp.

Polygon Update Protocol Field Manual

Manning Diversified Forest Management Agreement Area

Prepared for:

Manning Diversified Forest Products Ltd.

October 26, 2004
Revised August 15, 2005

Table of Contents

List of Tables and Figures

1. Background

1.1 Introduction

The Manning Diversified Forest Products Ltd. (Manning Diversified) Forest Management Agreement (FMA) area contains many blocks that were harvested under various dispositions prior to the receipt of their FMA. All blocks were established prior to the implementation of the free-to-grow standards. These are relatively young stands, and harvesting and silvicultural history is quite variable (*e.g.*, partial harvesting, clearcuts, leave for natural, planted, etc.).

A yield stratum assignment may be made subsequent to harvesting based on ground surveying (*e.g.*, post harvest assessment and regeneration surveys) or silvicultural treatments. However, because these blocks were harvested prior to Manning Diversified's receipt of the FMA, this information is not always readily available.

Since accurate stratum assignment is important for Timber Supply Analysis (TSA), Manning Diversified has elected to gather additional information in order to enhance yield stratum assignment. This is a voluntary program intended to improve the results of TSA by more accurately representing the existing condition (yield strata) of these blocks. These data are <u>not</u> intended to replace the existing Alberta Vegetation Inventory (AVI) for the FMA.

This manual addresses the ground sampling component of the Polygon Update Protocol field survey, and the responsibilities of the crews undertaking ground sampling. Compilation and analyses described in this manual cover only those portions of the work to be completed by the field crews. Further details are available in The Forestry Corp. (2004).

1.2 Overview of Survey Strategy

The approach for ground sampling draws on the Alberta Regeneration Survey Manual (Alberta SRD 2003), but tailors the process to allow for the fact that these surveys will be applied to stands that:

1. vary in age, but can be close to 40 years since harvesting; and
2. were established prior to the inception of free-to-grow requirements.

Ground surveying will be considered a "supplemental" survey for the purposes of TSA only. Failure to meet survey requirements (NS status) in no way indicates responsibility or liability on the part of MDFP beyond existing requirements.

Ground-based block-level calls will be made for each block or block group selected for sampling. Plot data to be collected must be sufficient to confirm or revise ground-based block-level calls. This includes:

1. Assignment of blocks to broad cover groups (C, CD, DC or D);
2. Identification of conifer or mixedwood understories;
3. For conifer broad cover groups, assignment of leading conifer species; and
4. Assignment of crown closure class.

These data will provide sufficient information for assigning TSA yield strata. Although yield strata have not yet been defined, a preliminary stratification has been developed (Table 1) (The Forestry Corp. 2003):

Table 1. Initial yield strata.

INITIAL YIELD STRATUM	LAYER 1 BROAD COVER	CONIFER UNDERSTORY PRESENT	LEADING SPECIES	CROWN CLOSURE CLASS	FOREST MANAGEMENT UNIT
C-PL-BCD-P6	C	N/A	PL	BCD	P6
C-PL-BCD-P9	C	N/A	PL	BCD	P9
C-SB-BCD-COMB	C	N/A	SB	BCD	N/A
C-SW-B-P6	C	N/A	SW	B	P6
C-SW-B-P9	C	N/A	SW	B	P9
C-SW-CD-P6	C	N/A	SW	CD	P6
C-SW-CD-P9	C	N/A	SW	CD	P9
MW-BCD-COMB	CD, DC	N	N/A	BCD	N/A
MW/U-B-COMB	CD, DC	Y	N/A	B	N/A
MW/U-CD-COMB	CD, DC	Y	N/A	CD	N/A
D/U-B-COMB	D	Y	N/A	B	N/A
D/U-CD-COMB	D	Y	N/A	CD	N/A
D-B-COMB	D	N	N/A	B	N/A
D-CD-COMB	D	N	N/A	CD	N/A

1.3 Overview of Ground Sampling Strategy

Plots will be 1.78 m in radius. The number of plots to be established in each block will be at ½ the intensity normally required under the Alberta Regeneration Survey Manual. Where blocks exceed 60 ha in size, intensity will be reduced to ¼ of the normal intensity. Sample size may be increased in specific circumstances (*e.g.*, where there is marginal stocking).

An exception to this rule will be MOF and L12/L19 blocks, which will be sampled using transects to establish plots, instead of a grid pattern; sampling intensity will be a minimum of 50 and 100 plots, respectively.

Plot design and data collection will be the same for both plot layouts. Within each plot, the following data will be collected:

- ✓ block data: for each layer, assign crown closure class, leading species, height (m), and percent composition by species
- ✓ plot data: assess density of conifer and deciduous stems by height class and species
    - o height classes: 0.3-1.1, 1.2-2.0, 2.1-4.0; 2 m intervals thereafter
    - o density: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, >10, >100

Blocks were harvested before free to grow standards were established, and are therefore not subject to free to grow assessment requirements. However, an assessment of the competitive status of blocks will be important, particularly in treated areas, in order to confirm the efficacy of treatment. Competition by deciduous species (*i.e.*, competition expected to persist into the canopy, rather than competition affecting early growth) can be assessed using data on deciduous species density and height class. This information can also be used to assess the presence of deciduous species above conifer layers, in order to confirm the presence of D/U, DC/U or CD/U stands.

Assessments will be made using post-hoc analysis following field sampling. These data will be compiled to the block level in order to provide (for stocked blocks) broad cover group, crown closure class and leading species for each forested layer. Methods for compilation will be derived in consultation with Alberta Sustainable Resource Development.

If any blocks are subdivided (based on observed characteristics during ground sampling), no subdivided areas are to be under 2 ha in size. Regardless of initial block size and concomitant sample size requirements, any areas that are partitioned must have at least ten plots, in order to provide sufficient data to support the subdivision.

2. Ground Sampling

2.1 Plot Calculations and Layout

Plots will be circular with a 1.78 m radius (10 m^2). Plots will be laid out in a square grid pattern. Steps for setting up the plot layout are as follows:

1. Calculate the initial number of plots required and the line and plot spacing, based upon Alberta Regeneration Survey manual standards.
2. Draw the plot locations on block maps.
3. Select sample plots (every second line for ½ intensity sample; every second line and every second plot for ¼ intensity sample).
4. Make sure the minimum number of plots will be achieved by adding additional plots if necessary.

2.1.1 Calculating Line and Plot Spacing

Within each block, parallel lines will be laid out, along which plots will be established. Normally, a square grid will be used to lay out plots, with the distance between lines equal to the distance between plots.

Determine the initial number of plots using:

$$Initial \ \ \#Plots \ = Area \ (ha) x 2.77$$

The initial number of plots is the number of plots that will be used to calculate line and plot spacing. The actual number of plots to be sampled will be selected based on rules outlined in Section 2.1.3.

Calculate plot and line spacing using:

$$Space\ (m) = \sqrt{\frac{Area\ (ha) \times 10{,}000\ (m^2 / ha)}{Initial\ \#\ Plots}}$$

Round the result to the nearest 0.1 m. For any stands greater than 24 ha, do not calculate spacing. A 60 x 60 m square grid is to be used.

2.1.2 Mapping

Prior to field sampling, the grid should be determined and the plot layout should be established. The following mapping procedure should be followed:

1. Obtain or draw a map of the block boundary. Include the scale (preferably 1:5000) and a north arrow.

2. Establish one control line, parallel to the long axis of the block, through the center of the block. Add additional control lines every 400 m on either side of the first control line (*e.g.*, if walking along a survey line, there should be a control line every 400 m). Reference the control line(s) to the block boundary, so that plot locations can be mapped accurately.

3. Determine an appropriate starting point and tie points and record the distances and bearings from these points to the beginning of the control line. Record this information under **Access Information**.

4. Lay out the grid based on the initial plot and line spacing. Starting from the edge of the block, move along the first control line to a distance equal to ½ the line spacing distance. Place the first survey line <u>perpendicular to the control line</u>, across the block boundary. Place each additional survey line parallel to the preceding survey line, at a distance equal to the line spacing from the previous survey line. Lines are to be labelled with L1, L2, L3, etc.

5. Place a plot where the first control line intersects with each survey line. This plot will be numbered plot 100. All other plots are to be placed along each survey line such that they are equal distances from each other (using the calculated plot spacing). Mark the location of each plot with a small 'x' or dot. From plot 100 moving to the right, number the plots increasing sequentially (*e.g.*, 101, 102, 103….). From plot 100 moving to the left, number the plots decreasing sequentially (*e.g.*, 99, 98, 97….).

An example is provided in Figure 1. Because not every plot will be sampled, crews may choose only to label those lines or plots that are selected for sampling. In this case, caution <u>must</u> be used: for example, if every second line is being selected, these must be labelled L1 L3 L5 and not L1 L2 L3.

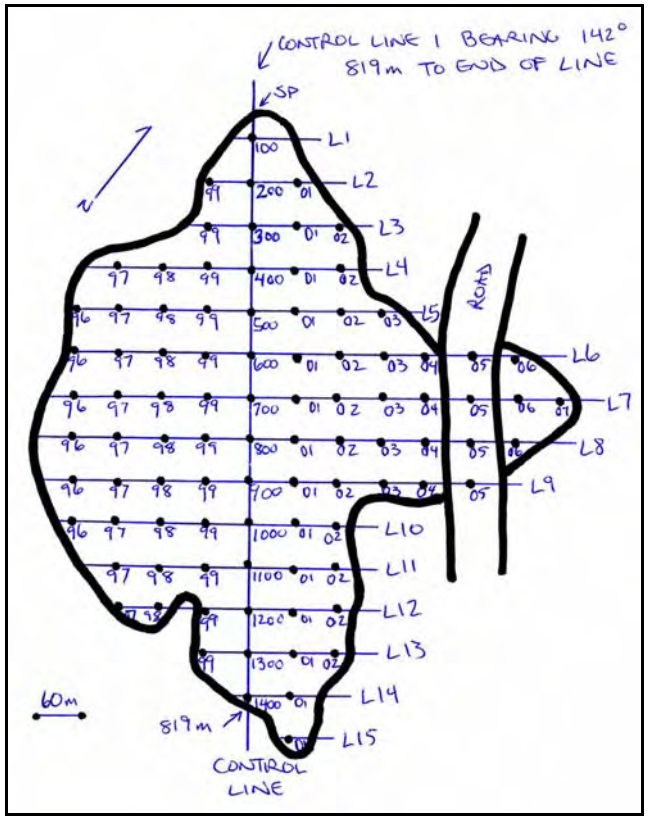

Figure 1. Sample plot layout based on initial plot numbers.

2.1.3 Selecting Sample Plots

For stands 2-60 ha in size, the number of plots to be established per stand will be at ½ the intensity normally required under the Alberta Regeneration Survey Manual. For stands > 60 ha, the number of plots to be established will be at ¼ the intensity. Sample plots are to be selected from the initial grid of sample points as follows:

1. For ½ intensity surveys (blocks 60 ha or less in size), flip a coin to select the starting line (L1 or L2). Using the starting line, select every second line for sampling (*e.g.*, L1, L3, L5 or L2, L4, or L6). Every plot along that line will be selected for sampling (Figure 2).

2. For ¼ intensity surveys, select every second line for sampling as outlined in step 1. However, only every second plot will be sampled. Sample even numbered plots (96, 98, 100, 102, 104, 106 etc.) so that the plots that intersect with the control line are sampled (Figure 3).

3. On the map, mark the lines to be sampled and whether the survey is ½ or ¼ intensity (sample every plot on the line or every second plot on the line).

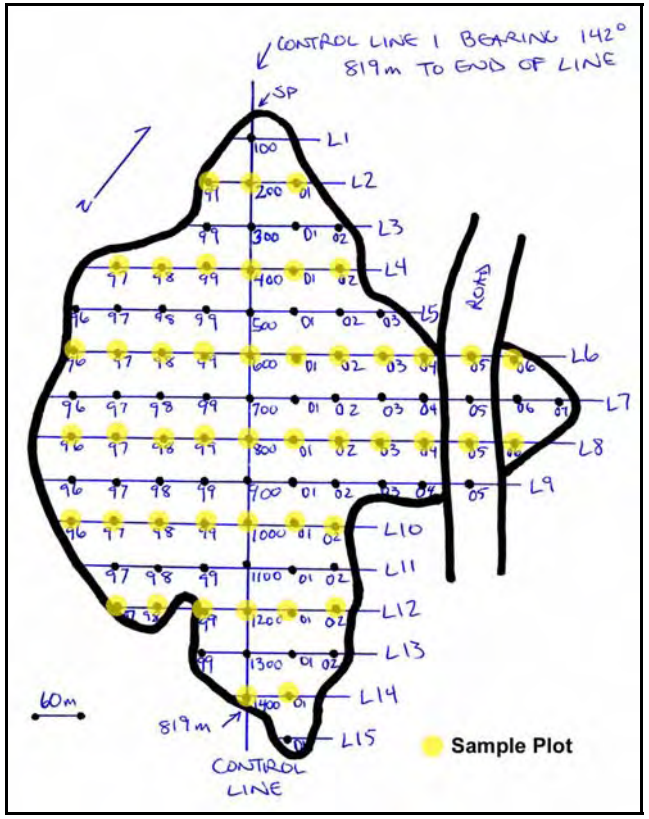

Figure 2. Sample map with grid and selected plots for half intensity survey.

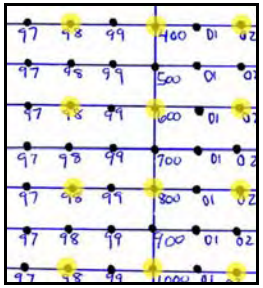

Figure 3. Selected plots for quarter intensity survey.

2.1.4 Determining Minimum Number of Plots

The minimum number of plots, based on these rules, is outlined in Table 2:

Table 2. Minimum number of plots based on block size.

Polygon Size (ha)	Number of Plots Required
2.0-4.0	minimum of 21 plots/polygon
4.1-24.0	minimum of 32 plots/polygon
24.1-60.0	1.39 plots per hectare (1.39 * areaha)
60.1+	0.70 plots per hectare (0.70 * areaha)

Count the number of plots to be sampled as laid out on the map. If the number of plots does not equal the minimum number, select additional plots as follows:

Begin with the first unsampled line (*e.g.*, if sampling L2, L4 and L6, start with L1). Using the original plot spacing (either every plot if ½ intensity or every second plot if ¼ intensity), add the required number of additional plots along the lines until enough plots have been established. Start with the first unsampled line (*e.g.* L1) and the lowest plot number (if sampling is ¼ intensity, recall that only odd numbered plots are sampled). Mark the location of added plots on the block map.

The number of plots may also be increased after sampling has been completed. If the calculation of percent stocking (following initial sampling) indicates that stocking is between 75 and 79 percent, the minimum number of plots for blocks 2.0-4.0 ha in size will be increased to 27, and the minimum number of plots for blocks 4.1-24.0 ha will be increased to 42. See Section 2.2.3 for more details.

2.2 Field Layout

2.2.1 Establishing the Plot Grid

In the field, the following procedures will be used:

1. Use starting points and tie points to locate the beginning of the control line.
2. Establish control line(s), marking the intersection with survey lines using flagging tape.
3. Beginning at the first survey line selected for sampling (L1 or L2), locate the individual plots. Mark each plot with a different colour flagging tape than that used to mark the intersection between control lines and survey lines. This means that plots located at an intersection between a survey line and a control line should be flagged with two different colours.

4. Mark plot centers with a stake firmly planted in the ground at plot center. Note the line and plot number on the flagging tape. Plot flagging should be secured to the plot center stake and marked with waterproof pens.

All distances are to be compassed and measured using a tape or string measuring device. All measured distances should be horizontal distances.

Once each plot has been established and marked, data collection can proceed (Section 2.5).

2.2.2 Offsetting Plots

Plots that are classified as "natural deletions" must not be sampled. These include:

- ✓ Water bodies (except ephemeral or intermittent streams)
- ✓ Miscellaneous leases (campsite, sand and gravel, etc)
- ✓ Pipelines
- ✓ Roads
- ✓ Well sites
- ✓ Permanent sample plots or other research sites
- ✓ Archaeological and historic sites
- ✓ Seismic lines

If a plot must be moved due to a disposition or unexpected deletion, move the plot ½ the distance towards the next plot. This will help avoid having to add extra plots later, which is more time consuming. If the plot still falls within the disposition/ deletion, move it to between the next two plots, and so on until the plot can be established.

If the deletion encompasses a large area, mark the plots within that area as deleted plots on the map, note the reason for deletion, and add these plots later on using the rules provided in the next section. Generally, plots are to be moved wherever possible, rather than adding replacement plots later on.

2.2.3 Adding New Plots

New plots are added under one of four scenarios:

1. Selection of lines and plots for sampling results in a sample size below the minimum outlined in Section 2.1.4.

   Add enough plots to achieve the minimum number (minimum-actual).

2. A large area of deletions or dispositions results in a number of deleted plots.

   Add enough plots to replace the deleted plots.

3. Stocking for the block is calculated after sampling and the stocking is between 75% and 79%.

   For blocks between 2.0 and 4.0 ha in size, increase the minimum number of plots to 27; for blocks between 4.1 and 24.0 ha, increase the minimum number of plots to 42.

In these three cases, in order to establish (add) these plots, use the unsampled lines (*e.g.*, if sampled lines L2, L4 and L6, use L1, L3 and L5 and so on). Using the original plot spacing (either every plot if ½ intensity or every second plot if ¼ intensity), add the required number of additional plots along the lines until enough plots have been established. Start with the first unsampled line (*e.g.* L1) and the lowest plot number (if sampling is ¼ intensity, recall that only odd numbered plots are sampled). Mark the location of added plots on the block map.

4. Block coverage was not achieved using the initial plot grid layout.

   This occurs when the block boundary or scale differs from what is provided to crews, resulting in contiguous areas without plots. Add enough plots to ensure full coverage of the entire block area.

In this case, use the same calculated grid spacing and extend across unsampled areas. Draw revised boundaries on the map, if boundaries are incorrect, and add the extra plots to the map. If the map scale is incorrect, note this problem on the tally sheets or map. Draw the extra plots on the map, and extend the boundary out as well as possible, to "increase" the scale.

2.3 MOF and L12/L19 Block Layout

MOF blocks will be sampled using two or more line transects in order to obtain a minimum of 50 plots. L12/L19 blocks will be sampled using three or more line transects in order to obtain a minimum of 100 plots. Layout rules are more flexible, but the following rules must be followed:

1. Under **Access Information**, record the bearings and distances to the point of commencement of the first line transect.

2. Obtain or draw a map of the block boundary, including the point of commencement of transect 1. Record the bearing and distance along transect 1. Map directions to the point of commencement of each subsequent transect, along with the bearing and distance along each transect. Ensure that line transects are not parallel. Label transect 1 as T1, transect 2 as T2, and so on.

3. Based upon block size and number of planned transects, determine plot spacing such that a minimum of 50/100 plots will be sampled.

$$Space\ (m) = \frac{Total\ \ Length\ \ of\ \ Lines\ \ (m)}{50}$$

4. Draw the plot locations on each transect. Label the plots as 01, 02, 03 along each transect, starting at 01 for each transect.

5. Follow the rules for offsetting plots as outlined in Section 2.2.2. If, due to large deletions, numerous plots need to be added, additional transects may be used to sample these additional plots.

6. Map the location and stocking status along the transects as described in Section 2.5.4.

2.4 Plot Data Requirements

Prior to commencing field sampling, crews should become familiar with the data collection requirements. It is important to know what defines an acceptable stem for sampling. The following sections should be read carefully.

2.4.1 Crop Trees

Only acceptable crop trees will be tallied within plots. The definition of an acceptable crop tree will follow the Alberta Regeneration Survey Manual. An acceptable crop tree:

1. Is an acceptable species; and

2. Has achieved the minimum height requirements; and

3. Is alive, shows good health and vigour, is undamaged; and

4. Has grown onsite for a minimum of three years; and

5. Has originated from seed, suckering or coppice but not from layering; and

6. Has a well defined stem with not more than two stems originating at the base (this does not apply to deciduous species that regenerate through coppice growth; in this case, each healthy stem is considered a crop tree).

2.4.2 Acceptable Species

Acceptable species follow the Alberta Regeneration Survey Manual, and are listed in Table 3.

Table 3. Acceptable species.

Coniferous Species		Deciduous Species	
common name	latin	common name	latin
white spruce	*Picea glauca*	trembling aspen	*Populus tremuloides*
Englemann spruce	*Picea engelmannii*	balsam poplar	*Populus balsamifera*
black spruce	*Picea mariana*	white birch	*Betula papyrifera*
lodgepole pine	*Pinus contorta*		
jack pine	*Pinus banksiana*		
whitebark pine	*Pinus albicaulis*		
limber pine	*Pinus flexilis*		
tamarack	*Larix laricina*		
western larch	*Larix occidentalis*		
alpine larch	*Larix lyallii*		
Douglas-fir	*Pseudotsuga menziesii*		

2.4.3 Minimum Height Requirements

The minimum height for acceptable crop trees will vary by species group. For coniferous species, the minimum height will be 30 cm, and for deciduous species, the minimum height will be 120 cm.

Height is measured from the base of the stem at the average ground level to the tallest reaching point of live matter. This does not have to be the main leader. Do not stretch the stem or move a leaning stem to vertical for height estimation.

2.5 Data Collection

Sample data sheets are provided in Appendix I.

2.5.1 Header Information

For each block or block grouping, record the following under **Block Header**:

Block: Harvest block identifier.

Disposition: Disposition identifier.

Twp: Township (*e.g.*, 102).

Rge: Range (*e.g.*, 08).

Mer: Meridian (*e.g.* , 06).

FMU: Forest management unit (P6 or P9).

Date: Measurement date in YYYY/MM/DD format.

Company: Fill in as much of the contracting company name as space permits.

Crew1: Initials of crew member 1. Fill in up to three initials.

Crew2: Initials of crew member 2. Fill in up to three initials.

2.5.2 Block Data

For each identified forest layer within the block or block grouping, record the following under **Block Data**:

Layer: The layer for which the data are being collected. To be defined as a separate forested layer, there must be at least a 3 m height difference between each layer. Layer 1 represents the tallest forested layer, layer 2 represents the next tallest, and layer 3 represents the third tallest. Up to 3 layers may be identified.

Crown Closure: Crown closure class for the layer. Use 10 percent classes as defined in Nesby (1997).

Height: The height for each identified layer to the nearest m, based on the height of the dominant and co-dominant trees in the layer.

Species: Species present in each layer. Identify up to five species for each layer, in order of abundance.

Species Percent: Percent composition by each species within the layer, converted to 10% classes (*e.g.*, 10% = 1, 20% = 2, etc.). Must total to 10 (100%).

For each block or block grouping, record the following under **Block Data**:

NS: Natural subregion.

Ecosite: Ecosite to ecosite phase. Refer to Beckingham and Archibald (1996).

Drain. Average drainage class for the block. See Beckingham and Archibald (1996), page 16-10 for a key to drainage classes. Record the alpha (character) code. Fill this in after sampling all plots, to get a "feel" for the average condition.

Line Spacing: Calculated line spacing to the nearest 0.1 m (see Section 2.1.1 for methods to calculate line spacing). Set to N/A for MOF or L12/L19 blocks.

Plot Spacing: Calculated plot spacing to the nearest 0.1 m (see Section 2.1.1 for methods to calculate plot spacing).

Area: The total area of the block to the nearest hectare.

2.5.3 Plot Data

For each plot, record the following under **Plot Data** (see sample data in Table 4):

Line Number. Line number for the plot (*e.g.*, 4).

Plot Number. Plot number (*e.g.*, 96, 97, 98, 99, 00, 01, 02 etc.).

Drain. Drainage class for the plot. See Beckingham and Archibald (1996), page 16-10 for a key to drainage classes. Record the alpha (character) code.

Species. Species code for each species present within the plot (crop trees only).

Density. The appropriate density for each species and height class. If between 11 and 100 stems, record >10; if more than 100 stems, record >100. Include only those stems that meet the minimum height requirements and the definition of a healthy tree and acceptable species. Do not include veteran trees.

Stat: Status of the plot. If at least one acceptable healthy stem is tallied within the plot, the plot is stocked. If only deciduous species are tallied, record SD. If only coniferous species are tallied, record SC. If both coniferous and deciduous species are tallied, record SB. If the plot is not stocked (no acceptable deciduous or coniferous stems tallied within the plot), record NS.

There may be multiple record lines because of multiple species in the plot, but record plot information, drainage and status on the first record line only (Table 4).

Lead: If the plot if stocked to both, record which is leading (based on the tallest tree in terms of height), conifer or deciduous. Mark with an "X".

Table 4. Sample plot data.

								HEIGHT CLASS (m)												LEAD	
LINE	PLOT		DRAIN		SPP		0.3-1.1	1.2-2.0	2.1-4	4.1-6	6.1-8	8.1-10	10.1-12	12.1-14	14.1-16	16.1-18	18.1-20	20+	STAT	D	C
3	9	8	M	W	S	W		1											S	C	
3	9	7	M	W	S	W			2										S	B	X
					A	W				1											
3	9	6		R	A	W						5							S	D	
					P	B					2										
3	9	5		R	A	W						1							S	B	X
					P	B					2										
					S	W						1									

2.5.4 Mapping

On the block map, mark each plot with a symbol indicating stocking status and whether it was sampled or not (Figure 4). Symbols are provided on the data sheets.

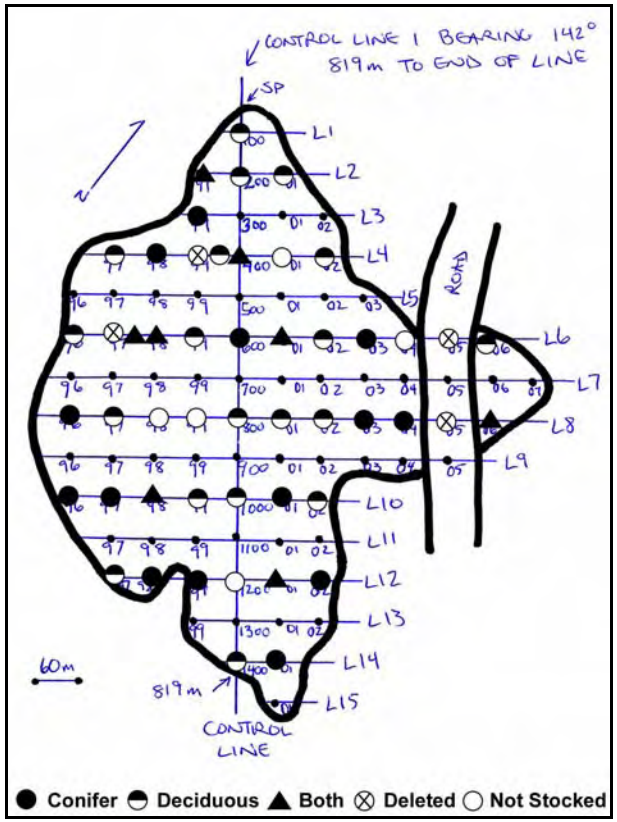

Figure 4. Sample map with symbols indicating plot status.

Note that for this example, two plots were moved because of the presence of a seismic line (L4-99 and L6-97). These were moved ½ plot distance towards the next plot.

Two plots were deleted because of the presence of a road, and because there was not sufficient space to move plots (moving half the plot distance results in plots still on the road area, and moving further results in hitting the end of the line). Plots were instead added using the methods described in Section 2.2.3.

Beginning with the first unsampled line, plot L1-100 is used as a replacement for L6-05. Moving on to the next unsampled line, plot L3-99 is used as a replacement for L8-05. Note that replacement plots are always selected from the lowest numbered unsampled line and lowest numbered unsampled plot available.

2.6 Data Compilation

2.6.1 Block Summary

Once all plots have been assessed, the block summary must be completed. Crews are to complete the **Block Summary** section as follows:

Sampling Summary

Original Number of Required Plots: The number of required plots, calculated based upon the area of the stand, and taking into account the required minimum number of plots.

Number of Added Plots: If preliminary calculations of percent stocking across the block indicated that stocking was between 75% and 79%, then additional plots may have been added. If full spatial coverage was not achieved, additional plots would also have been added. Record the number of additional plots, if required.

Total Number of Plots Established: The total number of plots established within the block.

Stocking Summary

Stocked Plots: The number of stocked plots is calculated by adding up the total number of stocked plots (SC+SD+SB).

Not Stocked Plots: The number of not stocked plots is calculated by adding up the total number of not stocked plots (NS).

Percent Stocked Plots: Percent stocked plots is simply the number of stocked plots divided by the total number of plots established * 100. Use the formula:

$$((SC + SD + SB)/(SC + SD + SB + NS)) * 100$$

Percent Not Stocked Plots: Percent not stocked plots is simply the number of not stocked plots divided by the total number of plots established * 100. Use the formula:

$$((NS)/(SC + SD + SB + NS)) * 100$$

Note: The percent stocked and not stocked plots should add to 100.

Stocking Status: If the percent of stocked plots is 80% or greater, the block is stocked (ST); if the percentage is below 80%, the block is not stocked (NS). Circle the applicable code. Note: if the percent stocking is between 75% and 79%, additional plots should be established as outlined in Section 2.2.3.

Assessment of Stocked Plots

This section should only be completed if the block has been assigned ST status (see Section 2.3.4). Determine the number of stocked plots that are stocked to deciduous, coniferous or both. The sum of these three should equal the total number of stocked plots identified in the previous section, and the total percentage should add to 100.

Stocked to Deciduous: The number of plots with "Stocked To" = SD.

Stocked to Coniferous: The number of plots with "Stocked To" = SC.

Stocked to Both: The number of plots with "Stocked To" = SB.

Percent Stocked to Deciduous: The percent stocked to deciduous is the total number of plots stocked to deciduous, divided by the total number of stocked plots (not the total number of plots established) * 100. Use the formula:

$$((SD)/(SC + SD + SB)) * 100$$

Percent Stocked to Coniferous: The percent stocked to coniferous is the total number of plots stocked to coniferous, divided by the total number of stocked plots (not the total number of plots established) * 100. Use the formula:

$$((SC)/(SC + SD + SB)) * 100$$

Percent Stocked to Both: The percent stocked to both is the total number of plots stocked to both, divided by the total number of stocked plots (not the total number of plots established) * 100. Use the formula:

$$((SB)/(SC + SD + SB)) * 100$$

Eligible Broad Cover Group: The block may meet multiple broad cover group requirements. This is because plots stocked to both may be counted as either conifer or deciduous plots. Therefore, the actual percent coniferous can range from (% coniferous) to (% coniferous + % both). To determine the eligible broad cover group, complete the following:

1. The % stocked to coniferous represents the minimum percent C stocking. Circle the eligible broad cover group that represents this percent coniferous.

2. Add together the % stocked to coniferous and the % stocked to both (SC+SB). This represents the maximum percent C stocking. Circle the eligible broad cover group that represents this percent coniferous.

3. Any eligible broad cover group with a percent coniferous within this range (between the minimum and maximum percent conifer stocking) is also a potential broad cover group and should be circled.

For example, percent stocked to D=20%, percent stocked to C=25% and percent stocked to B=55%.

The minimum % C is 25%. 25% C corresponds to a DC broad cover group, so this is circled. %C+%B is 80%, which corresponds to a C broad cover group, so this is also circled. The CD broad cover group should also be circled, since the % C stocking required is between 25% and 80%. Therefore, the block is eligible to be assigned to the C, CD or DC broad cover groups.

2.6.2 Mapping

Ensure that the field map is legible and complete. The final field map should show the following information:

- ✓ Block boundaries
- ✓ Scale (preferably 1:5000)
- ✓ North arrow
- ✓ Location of control lines
- ✓ Tie points for accessing control lines
- ✓ Location of survey lines. Numbering of lines from L1 onwards
- ✓ Location of plots. Numbering of plots (100, 200, 300, etc.) at intersection with control lines. Numbering of plots (97, 98, 99, 01, 02, 03) along survey lines.
- ✓ Note on sampled lines:
  - o Starting line for sampling (L1 or L2)
  - o Sampling intensity (½ or ¼ intensity)
- ✓ Annotation of plots with symbols indicating stocking or deletion status.

Ensure that a sketch and description of access (including location of tie point(s) and directions from the tie point(s) to the start of the first control line) is included under **Access Information** in the data sheets.

2.6.3 Submission and Final Assessment

Crews are to submit all data sheets with completed maps and plot information. Staple the block data sheet to the front of all plot data sheets.

The Forestry Corp. will complete the **Stand Summary** section following field sampling. Methods of analysis (*e.g.*, assigning crown closure class using ground data) will be determined in consultation with Alberta Sustainable Resource Development.

As well, any final subdivision of blocks or removal of NS areas will occur at this time. Methods for subdividing blocks will also be determined in consultation with Alberta Sustainable Resources Development.

3. References

Alberta Sustainable Resource Development. 2003. Alberta Regeneration Survey Manual. Forest Management Branch, Edmonton, AB.

Beckingham, J.D. and J.H. Archibald. 1996. Field Guide to Ecosites of Northern Alberta. Natural Resources Canada, Canadian Forest Service, Northwest Region, Northern Forestry Center, Edmonton, Alberta. Special Report 5.

Nesby, R. 1997. Alberta Vegetation Inventory Standards Manual Version 2.2. Alberta Environmental Protection, Edmonton, AB.

The Forestry Corp. 2003. Manning Diversified Forest Products Ltd. Volume Sampling Plan. Edmonton, AB.

The Forestry Corp. 2004. Manning Diversified Forest Products Ltd. Polygon Update Protocol. Edmonton, AB.

Appendix I Sample Data Sheets

BLOCK HEADER INFORMATION **Side 1**

BLOCK	DISPOSITION	TWP	RGE	MER	FMU	DATE (yyyy/mm/dd)	COMPANY	CREW1	CREW2
						/ /			

CODES AND CLASSES

SPECIES	CODE
LARCH	LT
JACK PINE	PJ
LODGEPOLE PINE	PL
BLACK SPRUCE	SB
WHITE SPRUCE	SW
TREMBLING ASPEN	AW
WHITE BIRCH	BW
BALSAM POPLAR	PB

% CROWN CLOSURE	CLASS
01 – 05	V
06 – 10	0
11 – 20	1
21 – 30	2
31 – 40	3
41 – 50	4
51 – 60	5
61 – 70	6
71 – 80	7
81 - 90	8
91 - 100	9

DRAINAGE	CLASS
VERY RAPID	VR
RAPID	R
WELL	W
MODERATELY WELL	MW
IMPERFECTLY	I
POOR	P
VERY POOR	VP

CODE	SYM
STOCKED C	●
STOCKED D	◓
STOCKED B	▲
NOT STOCKED	○
DELETED	⊗

BLOCK DATA

LAYER		CCHT (m)	SP1	SP1%	SP2	SP2%	SP3	SP3%	SP4	SP4%	SP5	SP5%
	1											
	2											
	3											

NS	
ECOSITE	.
DRAINAGE	
LINE SPACING (m)	.
PLOT SPACING (m)	.
AREA (ha)	

BLOCK SUMMARY

SAMPLING SUMMARY:

ORIGINAL NUMBER OF REQUIRED PLOTS:	
NUMBER OF ADDED PLOTS:	
TOTAL NUMBER OF PLOTS ESTABLISHED:	

* required number of plots based on calculations/min # plots
* where stocking was 75-79% or where added to get full coverage
* total number of plots sampled

STOCKING SUMMARY:

	TOTAL	%
STOCKED PLOTS (ST):		
NOT STOCKED PLOTS (NS):		

* percent=(total/total number of plots established)*100

STOCKING STATUS (CIRCLE ONE):

ST NS

* considered stocked if % ST is >=80%

ASSESSMENT OF STOCKED PLOTS (COMPLETE IF ST):

	TOTAL	%
STOCKED TO DECIDUOUS:		
STOCKED TO CONIFEROUS:		
STOCKED TO BOTH:		

* percent=(total/total number of stocked plots)*100

ELIGIBLE BROAD COVER GROUP (circle all that apply):

C D CD DC

* C = 80% C stocking or greater
* CD = 50-79% C stocking
* DC = 21-49% C stocking
* D = 20% C stocking or less

* stocked to both can be used as either C or D stocking

STAND SUMMARY (to be completed by The Forestry Corp):

BROAD COVER GROUP USED:	
LEADING SPECIES USED:	
CROWN CLOSURE CLASS:	

* select preferred broad cover group
* select for each conifer broad cover group
* based on percent stocking; to be determined in conjunction with SRD

ACCESS INFORMATION Side 2

NOTES

BLOCK HEADER INFORMATION Side 1

BLOCK	DISPOSITION	TWP	RGE	MER	FMU	DATE (yyyy/mm/dd)	COMPANY	CREW1	CREW2
						/ /			

PLOT DATA SHEET

					HEIGHT CLASS (m)													LEAD	
LINE	PLOT	DRAIN	SPP	0.3-1.1	1.2-2.0	2.1-4	4.1-6	6.1-8	8.1-10	10.1-12	12.1-14	14.1-16	16.1-18	18.1-20	20+	STAT	D	C

** do not record density for deciduous in height class 0.3-1.1 m

PAGE _____ OF _____

PLOT DATA SHEET **Side 2**

				HEIGHT CLASS (m)													LEAD	
LINE	PLOT	DRAIN	SPP	0.3-1.1	1.2-2.0	2.1-4	4.1-6	6.1-8	8.1-10	10.1-12	12.1-14	14.1-16	16.1-18	18.1-20	20+	STAT	D	C

For additional information, please contact:
The Forestry Corp.
Suite 101, 11710 Kingsway Avenue
Edmonton, AB
T5G 0X5
(780) 452-5878
www.forcorp.com

C:\Projects\p445 - MDFP volume sampling plan and field manual\Polygon Update Protocol\documents\field manual\polygon update protocol field manual 05_08_15.doc