

**MANITOBA
FREE TO GROW
SURVEY MANUAL
2010**

MANITOBA CONSERVATION
FORESTRY BRANCH
FOREST HEALTH AND RENEWAL

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1.0 INTRODUCTION

The goal of reforestation in Manitoba is to replace harvested lands with a forest similar to the original forest covertype. Free to grow surveys are the second survey regenerating softwood forests in Manitoba receive in order to ensure this goal is being achieved.

The free to grow survey is intended to assess the status of S and M regenerating sites approximately 14 years after disturbance. The majority of softwood trees on 14 year old softwood sites should be free to grow. Softwood trees that are more than 10 years old grow best and have a better chance of survival when they are free from competition and grow in full sunlight. Sites which are less than 10 years of age should receive a regeneration survey before free to grow surveys are considered.

All free to grow surveyors in Manitoba must be licensed by Manitoba Conservation, Forestry Branch. The Forestry Branch offers a training program that provides classroom and field instruction as well as tests that lead to the licensing of free to grow surveyors. This manual is intended to provide forest surveyors in Manitoba with instructions for collecting free to grow quantitative and qualitative data. All survey and data recording methods outlined in this manual should be strictly followed to ensure a consistent free to grow sampling procedure throughout Manitoba.

Free to grow surveys should be performed in late July and August after conifer shoot growth has been completed and deciduous leaves have fully developed. This timing coincides with the full seasonal development of most plants and makes the identification of competitor species and free to grow status easier. Sites tended with mechanical or chemical release must be allowed two full seasons of growth before free to grow surveys are performed.

Free to grow plots are a circular shape with a radius of 3.57 metres comprising an area of 40 square metres. They are established along a survey line at predetermined distances from one another in an effort to observe the status of forest regeneration in representative portions of the site.

There are six separate assessments conducted during each free to grow survey:

- 1) **stocking assessment**
 - all softwood trees > .20 metres tall and hardwood trees > 1.0 metres tall are counted
- 2) **well spaced tree assessment**
 - well established trees (eg. black spruce \geq 1.0 m) that are well spaced from one another are counted
- 3) **free to grow determination**
 - well established softwoods that are growing free from hardwood tree or shrub competition are counted
- 4) **assessment of forest health**
 - damage occurring on trees within each plot are recorded and pockets of damage observed between plots are mapped
- 5) **competition assessment**
 - tree and shrub competition is estimated
- 6) **assessment of residual trees**

- the species and size of residual trees within each plot are recorded

2.0 OBJECTIVES

The overall purpose is to document the existence of regeneration and confirm that there is a proper growing environment for trees to grow to maturity.

The other objectives of free to grow surveys in Manitoba are:

- a) To determine the success of forest renewal, and how well stocked a block is, by assessing the number of seedlings per hectare
- b) To determine the number of well spaced trees per ha.
- c) To determine the number of free to grow softwood trees per ha. By definition: well established softwoods that are well spaced from one another and growing free from hardwood and shrub competition.
- d) To provide information regarding the health of the regenerating forest.
- e) To provide an estimate of competition on a site that can be used when considering stand tending activities
- f) To record the species and number of residual trees in a block for possible harvesting or stand tending considerations
- g) To provide a process by which survey crew members can convey other observations regarding the block to field staff.
- h) To provide a measure of forest regeneration that can be compared to provincial standards to determine if blocks are free to grow.
- i) To compile provincial forest renewal statistics.

3.0 FREE TO GROW SURVEY PREPARATION

The surveyor is provided with a map or aerial photograph indicating the size, location, and shape of the survey block. Information regarding the covertype of the former stand, and silvicultural activities performed in the block are also provided.

Survey blocks should be kept under 60 hectares. Large survey areas, in excess of 60 hectares, should be partitioned into smaller logical units, using features that are clearly distinguishable in the field as boundaries (eg. roads, trails, streams, visible changes in vegetation). The pre-stratification of significantly different vegetation types within larger blocks to be surveyed helps increase the precision of the survey results.

3.1 EQUIPMENT

Standard forest survey equipment is required to conduct the free to grow survey accurately. The equipment should be kept in good repair and exhaustible items should be kept in good supply.

Other survey tools or instruments may be substituted for the recommended list below:

hip chain	Free To Grow Survey Manual
compass	maps, photos
five metre tape	protractor
tally book	calculator
flagging tape	pencils
plot center stake	felt pen marker
plot radius cord	flexible height rod
tree marking crayon/paint	

4.0 FIELD ORIENTATION

Forest stand maps and aerial photographs are used by surveyors to locate survey blocks and determine survey boundaries. The scale of most of the photos and maps provided will be 1:15840. At this scale four inches on the map equals one mile on the ground and one inch on the map equals 20 chains (400 m) on the ground. The edge of a Silva Ranger compass displays inches that are marked off in 20^{ths} of an inch. Each 1/20th of an inch graduation equals 20 metres or one chain. This 1/20th scale is useful for measuring distances on maps, to help locate survey blocks and for estimating the length of survey lines.

Once the start point for the survey block is determined, the surveyor will proceed to establish tie-points which clearly describe, through the use of bearings and distances, how to arrive at the start of the survey. The tie-points should be readily identifiable in the field and accurately located on a map or photo. Trail intersections and swamps make good tie-point references. The tie-point description for each survey is recorded on the reverse side of the field map sheet. Often it is more convenient and practical to establish the tie-points after the survey is completed.

5.0 BLOCKS LESS THAN 20 HECTARES

In blocks less than 20 hectares surveyors will plan a complete free to grow survey. Several survey lines, which form a "zig-zag" pattern, and an additional survey line, which returns the surveyor near the point of origin, will be traversed (see figure 1). Plots will be equally spaced along the survey lines at the rate of one plot per hectare, to a **maximum of 15 plots**. In other words, the number of plots to be established in blocks less than 15 hectares is equal to the size of the block (ie. a 14 hectare block requires 14 plots). On blocks between 15 and 20 hectares 15 plots would be established.

An example of how the interplot distance is calculated appears below. The example is for a 12 ha area with a route length of 980 metres including the "zig-zag" line and additional survey line.

Interplot distance* = route length / # plots

* always round down to the nearest 5 metres

example: 12 ha area = 12 plots to establish

980 m route / 12 plots = 82 m

distance between plots = 80 m

When small blocks are located close to one another they may be amalgamated, or combined with a larger Free To Grow survey block, to produce a larger survey area. This will permit the measurement of small blocks providing the amalgamated blocks are reasonably close to one another and the original stand characteristics were similar.

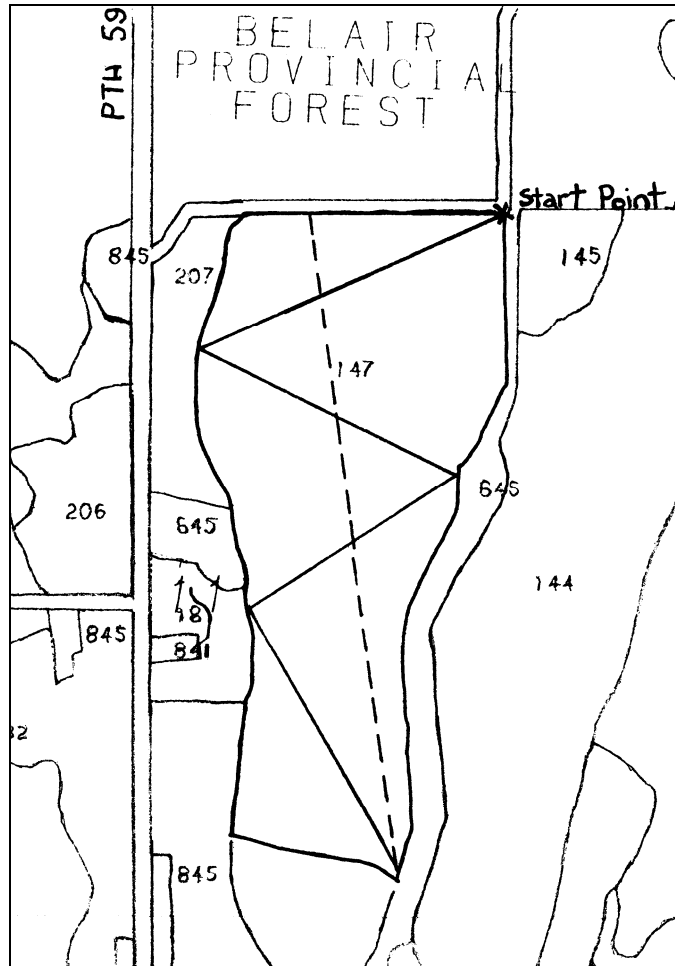
The amalgamation of small blocks is to be done prior to the survey and reflect the similar management intent of the blocks. In such a case the survey procedures to follow would depend upon the combined size of the survey blocks. It may be impossible to establish survey lines in the fashion previously described in this section. In cases like this, lines may have to be established in an irregular manner to ensure they cover most of the block.

6.0 BLOCKS 20 TO 60 HECTARES

The surveying of all blocks ≥ 20 hectares involves the initial establishment of a reconnaissance survey line and a calculation of either the number of free to grow stems or well spaced conifer stems per hectare.

The reconnaissance of a block involves traversing through the block along a number of survey lines arranged in a "zig-zag" pattern (Figure 1). The procedure involves drawing the intended route throughout the block on a map of known scale. The route should transect as much of the block as possible in a representative manner including different strata within the block, the block center, edge and changes in site type. To ensure adequate coverage of the block the difference between the bearing of each line of the reconnaissance survey should be approximately 45 degrees.

After the route is mapped and its length determined the inter plot spacing along the route is calculated by dividing the length of the reconnaissance line by the number of plots to be established. Plots are established along the reconnaissance survey line at an intensity of 1 plot for every 3 hectares with a **minimum of 15** and a **maximum of 25** plots. The interplot distance is always rounded down to the nearest 5 metres.



_____ reconnaissance line
 - - - - - additional survey line

FIGURE 1: FRI MAP AND FREE TO GROW SURVEY ROUTE

These plots should not be too close to one another, nor should they be too far apart. The free to grow survey should efficiently collect information and provide sufficient coverage of the block. If plots are less than 40 metres apart or greater than 150 metres apart the lines should be redrawn and a more reasonable interplot distance calculated if possible. The route and the approximate location of reconnaissance plots is marked on the stand map. The bearing of the line is determined using a protractor or compass.

The first reconnaissance plot is established at 1/2 the interplot distance from the start of the route. Each of the following plots is established at the calculated interplot distance along the route.

Upon completion of the reconnaissance a calculation is performed to determine if FTG standards have been achieved or if more plots must be established to determine the blocks status. If the block is obviously FTG or NFTG then no further action is required by the surveyor. If the decision is not obvious then the establishment of an additional survey line is required to confirm the Free To Grow status of the regeneration. See section 8 for application of FTG standards.

6.1 ADDITIONAL SURVEY LINE

If confidence of the survey results is inadequate after the reconnaissance survey an additional survey line is planned (ie. confidence is inadequate on "S" sites if the number of FTG stems per hectare is within ± 200 stems of the FTG - S standard and on "M" sites if the number of well spaced stems is within ± 300 stems of the FTG - M standard). The standard to be applied is dependant on the specie with the greatest number of FTG stems on softwood sites and the specie with the greatest number of well spaced conifer stems on mixedwood sites.

The additional survey line is most often a straight line through the middle of the block towards the surveys origin. The bearing and length of the new line is determined and the additional plots will be established evenly along it's course. The number of plots to be established along the additional survey line equals the maximum number of plots calculated for the block (see Table 1) minus the plots established during the reconnaissance survey.

TABLE 1: MULTIPLICATION FACTORS FOR FREE TO GROW PLOTS

Block Size (ha)	Plot Factor for complete FTG surveys
<20	1.0 (max. 15)
20 - 29	0.8
30 - 39	0.7
40 - 49	0.66
> 49	0.64

The process of laying out the Free To Grow survey for the 56 hectare example on page 5 is shown below. The calculation of the initial number of plots to be established along the reconnaissance survey lines is:

$$\begin{aligned} \text{Number of Plots to Establish} &= \text{number of hectares} / 3 \\ &= 56 \text{ ha} / 3 \\ &= 19 \text{ plots to establish} \end{aligned}$$

$$\begin{aligned} \text{Interplot distance} * &= \text{route length} / \# \text{ plots} \\ &= 2512 \text{ m route} / 19 \text{ plots} \\ &= 132 \text{ m} \\ &= 130 \text{ m} \end{aligned}$$

* always round down to the nearest 5 metres

If after the reconnaissance survey the confidence of the survey results is inadequate the additional survey line is planned.

The first step in determining the number of additional plots required is to calculate the maximum number of plots to establish in the block. For the 56 hectare example in Figure 1:

$$\begin{aligned} \text{Maximum number of plots} &= \text{Number of hectares} \times \text{corresponding factor} \\ \text{Maximum number of plots} &= 56 \times 0.64 \\ &= 36 \end{aligned}$$

The second step is to calculate the remaining number of plots to establish on the additional line.

$$\begin{aligned} \text{Number of plots to establish on additional line} &= \text{Maximum number of plots} - \text{Reconnaissance plots on "zig-zag" line} \\ \text{Number of plots to establish on second line} &= 36 - 19 \\ &= 17 \end{aligned}$$

The same procedure is used to determine interplot distance on the additional survey line (1424 m) as was used during the reconnaissance survey in Section 5.

$$\begin{aligned} \text{Interplot distance} * &= \text{Route length} / \# \text{ plots} \\ &= 1424 \text{ m} / 17 \text{ plots} \\ &= 84 \text{ m} \\ &= 80 \text{ m} \end{aligned}$$

* always round down to the nearest 5 metres

7.0 PLOT ESTABLISHMENT

At each plot location a center stake (with plot radius cord attached) is pushed firmly into the ground to establish plot center. This will enable the surveyor to determine the plot boundary accurately. The base of the stake will be the center from which the plot radius of 3.57 metres will be measured. Plot centers are marked in a semi-permanent manner using flagging tape tied to a stick. Trees selected as FTG are marked using tree marking paint or a lumber crayon to make check surveys possible.

Free to grow survey plots are to be established in representative parts of each block which most often, but not always, will be at the interplot distance along the survey line. It may be necessary to infrequently move a plot location slightly if the plot lands within a part of the block that is not representative of the whole area. For example plots should not be established in swamps, on trails, slash piles, or rock outcrops unless these are common, well distributed features within the block. If it was necessary to relocate a plot, surveyors should resume the survey from the predetermined plot location using the planned interplot spacing.

There is no minimum distance that a plot must be located from the block's edge; however, no portion of the plot itself is allowed to fall on the survey boundary.

There are six separate assessments to be conducted at each free to grow survey plot:

- 1) stocking assessment
- 2) well spaced tree assessment
- 3) free to grow determination
- 4) assessment of forest health
- 5) competition assessment
- 6) assessment of residual trees

7.1 STOCKING ASSESSMENT

After establishing plot center, the plot is thoroughly searched for the presence of established regeneration which (if present) is recorded on the tally sheet provided. Great care should be taken when the seedling is near the plot boundary to determine if it is within the plot. The search of each plot should be conducted in a systematic manner. Beginning at an easily distinguished point within the plot the surveyor moves around the plot searching for seedlings to include in the stocking assessment of the plot. All tree species are included in the stocking assessment if they meet the minimum height requirement of 0.2m for conifers and 1.0m for hardwoods.

TABLE 2: STOCKING HEIGHT REQUIREMENTS

Softwood Stocking Height (m)	Hardwood Stocking Height (m)
> 0.20	> 1.0

The seedlings of each species present in the plot are tallied independent of each other. A precise count of each species is required up to twenty seedlings. When more than twenty seedlings are found their number is estimated in multiples of ten (ie. 20, 30...90). The maximum number of seedlings of each species tallied will not exceed 90. The average height of each species is estimated on the first plot and every fifth plot thereafter. Heights are estimated to the nearest 0.1 metre for trees between 0 - 2 metres and to the nearest 0.5 metre for trees > 2 metres. It may be convenient to measure the height of one of the trees in the plot to help determine height estimates.

7.2 WELL SPACED TREE ASSESSMENT

The description of a 'Well Spaced' tree is a softwood tree taller than the minimum height requirement (Table 3) for well established trees of that species, that is at least 1.5 metres from another well spaced tree.

From within a group of trees the number of well spaced trees selected can be maximized by choosing a tree on each side of the group instead of one in the middle. Trees outside the plot boundary are not considered during the determination of the number of well spaced trees. Well spaced trees will be a subset of the trees recorded in the stocking assessment. These trees will usually, but not always, be selected from the dominant and co-dominant trees in the plot.

After the number of well spaced **softwood** trees is determined, any portion of the plot not containing well spaced softwood trees is checked for the presence of well spaced **hardwoods**. Hardwoods are considered well spaced if they are positioned at least 2.0 metres from other well spaced softwood or hardwood trees and are at least 2.0 metres tall.

Preference is given to certain species in the assignment of the "well spaced" and "free to grow" designation. If there is a choice between two or more species in the selection of a well spaced or free to grow tree always choose the more preferred species. Table 3 identifies the preference assigned to each species.

TABLE 3: HEIGHT REQUIREMENTS OF WELL ESTABLISHED TREES

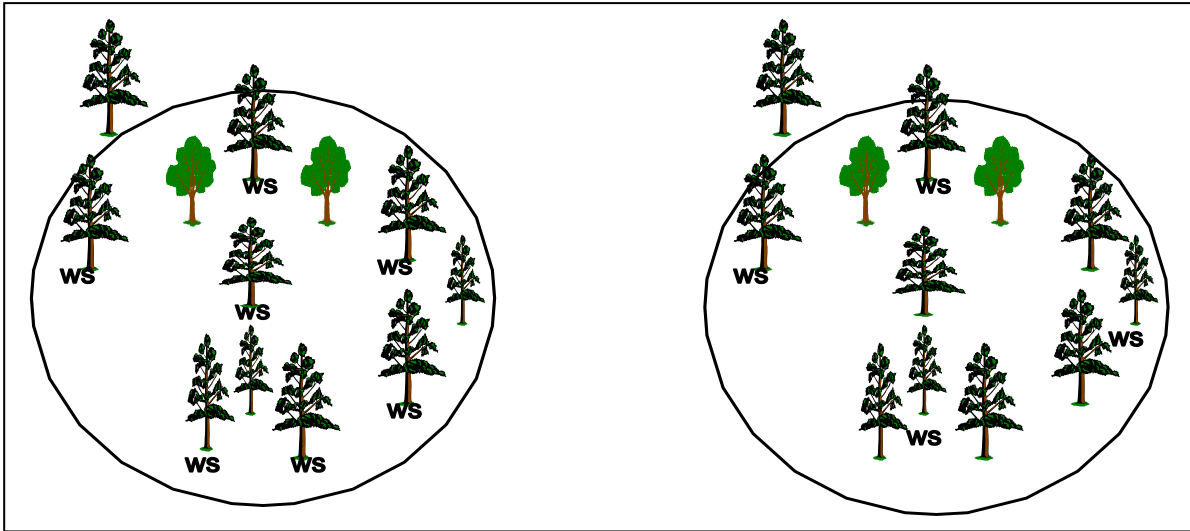
Species	Height requirements (metres)	Selection Preference
Softwoods		
White Spruce	1.0	1
Black Spruce	1.0	1
Jack Pine	2.0	2
Red, Scots, White Pine	1.5	3
Tamarack & Cedar	1.5	3
Balsam Fir	1.5	4
Hardwoods		
Aspen	2.0	5
Balsam Poplar	2.0	6
Other hardwoods	2.0	7

To help select well spaced trees, the surveyor could imagine that he or she has been asked to thin the trees on the block leaving well established conifer trees that are 1.5 meters from one another in the plot. The goal would be to maximize the number of trees remaining so they would be evenly distributed throughout the block and be able to utilize available growing space.

Two examples of how well spaced trees could be selected on the same plot appear in Figure 2. The examples on the left side of the page (1a & 2a) illustrate the maximum number of well spaced trees that could be chosen. The examples on the right side of the page (1b & 2b) illustrate a selection of well spaced trees that identifies fewer well spaced trees.

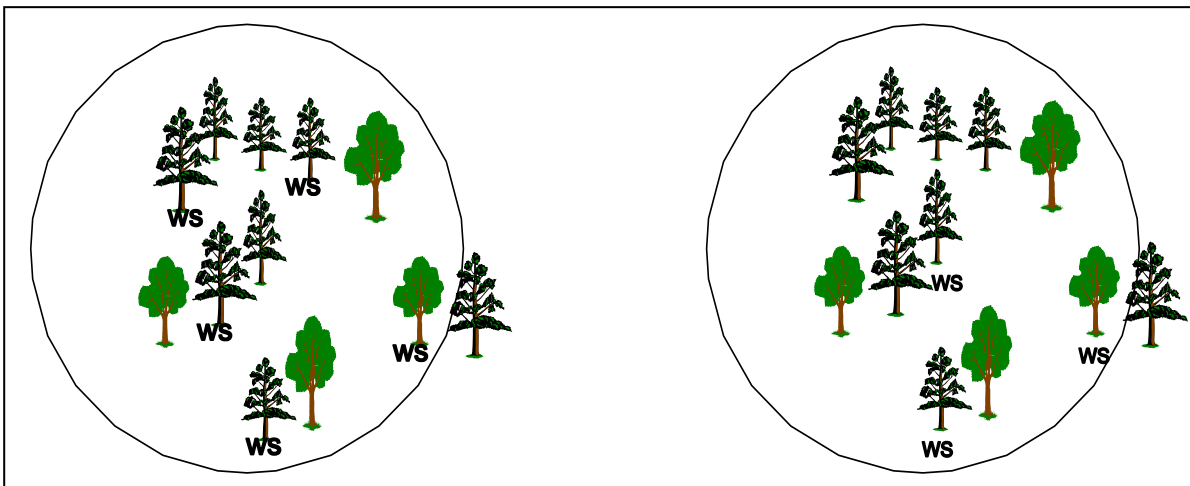
In plot 1a seven well spaced black spruce have been identified in the plot. The other spruce in the plot are too close (< 1.5 m) to the selected well spaced trees. The inefficient selection of trees in plot 1b resulted in only five well spaced trees being identified. Choosing a tree in the center of a group of trees could prevent other surrounding trees from being selected.

Plot 2a contains four well spaced black spruce and one well spaced trembling aspen. The remaining spruce in the plot are closer than the minimum 1.5m distance between well spaced trees. The hardwood can be chosen because it is more than 2m from the other well spaced trees. The inefficient selection of trees in plot 2b would result in only three well spaced trees being identified.



PLOT 1a MAXIMUM NUMBER OF
WELL SPACED TREES

PLOT 1b INEFFICIENT SELECTION
OF WELL SPACED TREES



PLOT 2a MAXIMUM NUMBER OF
WELL SPACED TREES

PLOT 2b INEFFICIENT SELECTION
OF WELL SPACED TREES

FIGURE 2: WELL SPACED TREE SELECTION (WS = well spaced tree)

7.3 FREE TO GROW TREE DETERMINATION

The description of a 'Free To Grow' tree, is a well established softwood tree that is free from hardwood competition and is at least 1.5 metres away from other free to grow trees.

A free to grow tree must not have any hardwood stems that are >66 percent the height of the free to grow tree within the competition threshold distance for that species. Research in Manitoba (MacIsaac 1995) has determined the threshold distance between hardwood competitor and softwood crop trees beyond which crop trees are free to grow is 1.0m for spruce and 1.25m for pine. Examples of free to grow and not free to grow trees are found in Figure 3. Competition threshold distances for each species are found in Table 4.

Hardwood trees outside the plot must be considered in the selection of free to grow trees. Hardwoods less than one metre tall (ie. not tallied in stocking assessment) may also render softwood trees not free to grow.

Surveyors may use their own discretion to classify some trees as 'Not Free To Grow' if shrubs within the plot, or branches from trees outside the competition threshold distance overtop the top third of the crop tree.

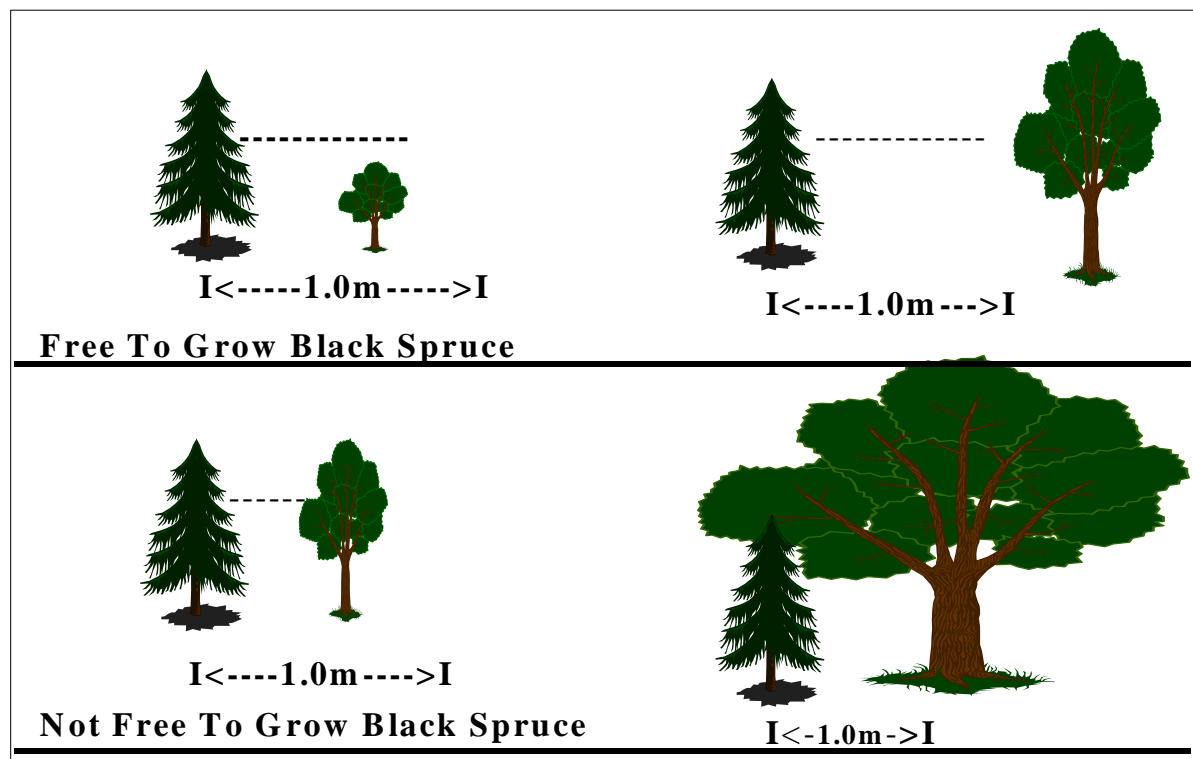


FIGURE 3: EXAMPLES OF FREE TO GROW AND NOT FREE TO GROW TREES

TABLE 4: FREE TO GROW COMPETITION THRESHOLD DISTANCE

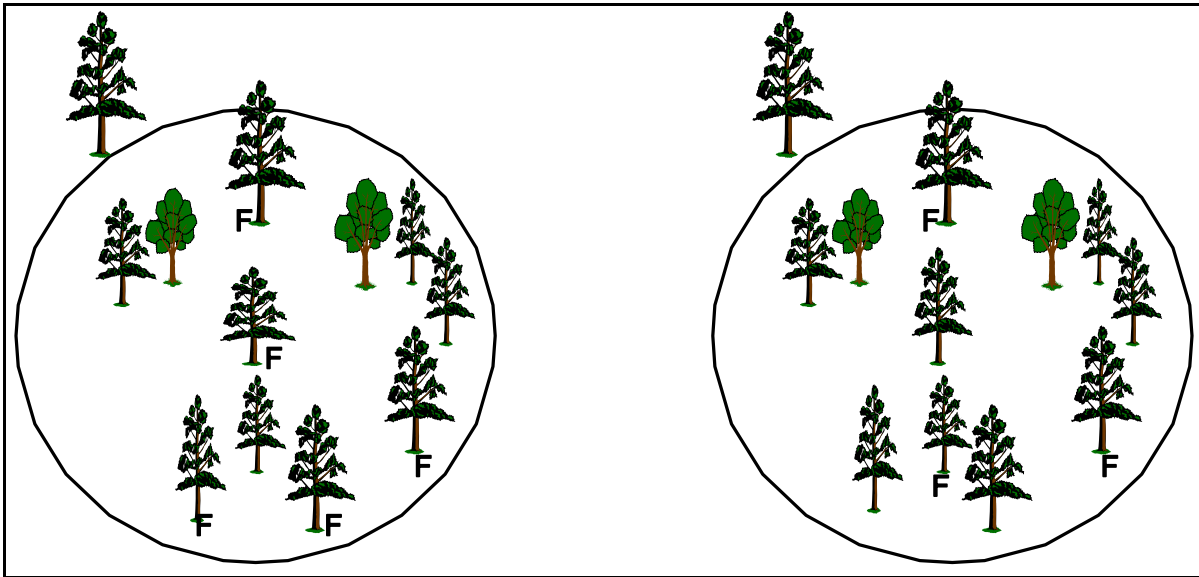
Conifer Tree Species	Competition Threshold Distance
White Spruce	1.0
Black Spruce	1.0
Jack Pine	1.25
Red, Scots, White Pine	1.0
Tamarack & Cedar	1.0
Balsam Fir	1.0

Free to grow trees will be a subset of the trees recorded in the stocking assessment and may or may not be trees which were selected as well spaced. The number of FTG trees identified at each plot should be maximized. By choosing a tree on each side of a group of trees instead of one in the middle the number of trees selected could be maximized.

Two examples of how free to grow trees could be selected on the same plot appear in Figure 4. The examples on the left side of the page (3a & 4a) illustrate the maximum number of free to grow trees that could be chosen. The examples on the right side of the page (3b & 4b) illustrate a selection of free to grow trees that identifies fewer free to grow trees.

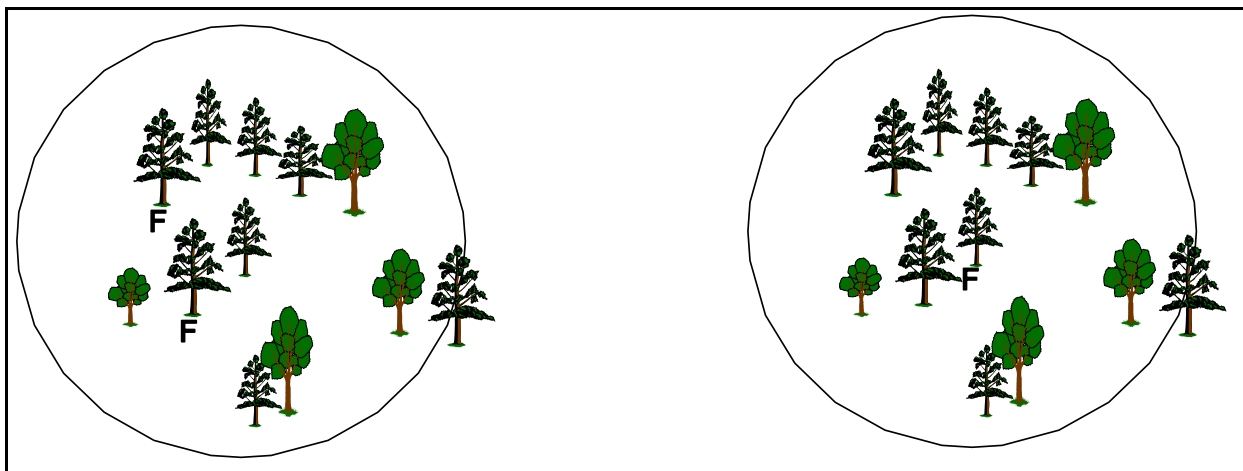
In plot 3a five FTG spruce have been identified in the plot. The other spruce in the plot are either closer than 1.0m to a hardwood $>2/3$ their height or closer than 1.5m to another FTG tree. Choosing a tree in the center of a group of trees could prevent other surrounding trees from being selected. The inefficient selection of trees in plot 3b resulted in only three free to grow trees being identified.

Plot 4a contains two FTG spruce trees. The remaining spruce in the plot are either closer than 1.0m to a hardwood $>2/3$ their height or closer than 1.5m to another FTG tree. The inefficient selection of trees in plot 4b would result in only one FTG tree being identified.



PLOT 3a MAXIMUM NUMBER
OF FTG TREES

PLOT 3b INEFFICIENT SELECTION
OF FTG TREES



PLOT 4a MAXIMUM NUMBER
OF FTG TREES

PLOT 4b INEFFICIENT SELECTION
OF FTG TREES

FIGURE 4: FREE TO GROW TREE SELECTION(F = free to grow tree)

7.4 FOREST HEALTH ASSESSMENT

The Free to Grow survey training course offered by Manitoba Conservation, Forestry Branch includes descriptions of unacceptable damage trees can suffer. This is explained in detail using sketches, photographs, and field samples in order to help surveyors accurately identify unacceptable forest health problems.

When trees with unacceptable pests or damage are observed in the plot surveyors indicate the tree species affected, the number of stems observed, and the appropriate forest health code describing unacceptable trees. For example "JP-1-SC" could be recorded in the Forest Health (Species & Code) box on the tally sheet indicating that one jack pine tree with an unacceptable stem canker was observed in the plot. Use the dead code if the cause of death can not be determined or is not covered by any other forest health code. Trees tallied in the stocking, well-spaced and free to grow assessments **can not** have unacceptable damage.

The following is a list of FTG Forest Health Codes for Unacceptable Trees

- | | |
|-----------------------------|------------------------------------|
| 1. DM - Dwarf Mistletoe | 7. WPW - White Pine Weevil |
| 2. SC - Stem Canker | 8. L - Lean (>45 degree angle) |
| 3. AR - Armillaria Root Rot | 9. GIR - Animal |
| 4. RCW | 10. BR - Browse |
| - Warren Root Collar Weevil | 11. F - Defoliation (Foliage Loss) |
| - Pine Root Collar Weevil | 12. HC - Hypoxylon Canker |
| 5. G - Western Gall Rust | 13. V - Poor Vigour |
| 6. TD - Tip dieback disease | 14. D - Dead |

Appendix IV lists each host species affected, what makes the tree unacceptable and the signs and symptoms to look for by each damage code. A colour pictorial guide showing each damage code is provided to each surveyor.

Surveyors should indicate the occurrence of the above damages if they occur outside a plot in the "nearby pest box". Record host (tree) species and damage. This would include observations of significant pest occurrence whether they be scattered or in distinct pockets. Record dwarf mistletoe infected residual trees (even if single occurrences) left scattered on the site or left along cutblock boundaries after harvesting by recording it in the closest plot's "nearby pests box". Record significant pest occurrences and very large openings on the field map.

General Forest Health Box - Immediately upon completion of a survey, record the presence of the above listed pests which were observed in the block by tree species affected. This is not a summary of observations recorded at all the plots, but is the surveyors impression of the general health of softwoods and hardwoods in the block. Indicate (-) for nil, L for light, M moderate, and S for severe for each pest category. This is not a plot tally! If a significant number of dead trees are noticed record in the comments section. **Note: the general information collected in this box is extremely important in selecting blocks that may need a return assessment.**

7.5 COMPETITION

At each plot the dominant hardwood species is recorded, along with the average height and percent cover of all hardwood trees. The height recorded should include all hardwood species recorded in other stages of assessment (stocking, well spaced).

Major shrub cover is also estimated if shrubs are over 1 metre tall or approximately the same height as the softwoods in the plot. At each plot the dominant shrub species is recorded, along with the average height of all shrub competition. The height recorded is not a mathematical average, but rather the typical height of the canopy of significant shrubs in the plot. Use tree and shrub species symbols listed in appendix III.

Heights are estimated to the nearest 0.1 metres for competition between 0 - 2 metres and to the nearest 0.5 metres for competition > 2 metres.

The percentage of tree and shrub cover is estimated and assigned one of three cover classes. Residual trees are included in the estimation of tree cover percentage. Species with less than 10% ground cover are not recorded.

TABLE 5: COMPETITION CLASSES

Competition Classes	NONE	1	2	3
Percent Competition Cover	< 10 %	10 -35 %	35 - 60 %	> 60 %

An example of a competition entry for trembling aspen that is approximately four metres tall and covers approximately 45 percent of the plot would be: **TA-4.0-2**.

7.6 RESIDUAL TREES

The presence of residual trees in a block may represent a significant volume of wood or may present an obstacle when considering stand tending treatments. The species, number of stems and average diameter class for each species is recorded at each plot in which residual stems are found. The size of residual trees is expressed in one of three diameter classes.

TABLE 6: RESIDUAL TREE DIAMETER CLASSES

Diameter Classes	1	2	3
Diameter	< 15 cm	15 - 30 cm	>30 cm

One BS residual with a diameter (DBH) of 25 cm would be recorded as BS-1-2.

7.7 FOREST MANAGEMENT RECOMMENDATIONS

At the completion of a free to grow survey, the surveyor is required to make recommendations concerning future management of the block. Any silvicultural treatments the surveyor believes are necessary or will become necessary in the future should be recorded on the header sheet in the space provided. This information will be very helpful to forest managers when planning stand tending activities.

The surveyor must consider many factors relating to on site conditions such as size and vigour of existing softwoods, amount of hardwood and shrub competition and number of large residual trees present. For example the surveyor may recommend the motor-manual release in a BS plantation when few spruce are free to grow because they are being out competed by young, vigorous aspen.

If in the surveyors opinion no treatment is needed, record this information in the space provided.

8.0 EXTENSIVE SURVEY METHODOLOGY

Some survey blocks will be identified as eligible for an extensive survey based on previous regeneration survey results. An extensive survey is essentially an abbreviated version of the FTG survey where a reduced number of plots are established while the surveyor walks through the block making observations on the composition of the regenerating forest. See Appendix VI for a description of Extensive vs. Intensive survey determination.

The extensive survey is appropriate to use on blocks that have a high probability of being FTG because of high softwood stocking and low hardwood stocking or being not FTG because of low softwood stocking or high hardwood stocking. They are best used on blocks with homogeneous forest cover.

The number of plots established in an extensive survey varies according to the size of the block. Two plots are established for the first 10 ha and another plot is required for each additional 10 ha or part there of. For example an 8 ha block would require 2 plots, a 12 ha block would require 3 plots and a 55 ha block would require 7 plots as shown in Table 7.

TABLE 7: NUMBER OF PLOTS IN EXTENSIVE FREE TO GROW SURVEY

Block Size (ha)	Number of Plots in Extensive FTG Survey
≤ 10	2
11 – 20	3
21 – 30	4
31 – 40	5
41 - 50	6
51 – 60	7

The surveyor's route through the block as well as the observations they make are critical to an effective survey that will produce meaningful results. The route should be long enough to ensure he/she has a good impression of the regeneration present on the site. The surveyor establishes the desired number of plots in locations that offer a reasonable representation of the regenerating forest cover.

At the completion of the extensive survey the results are summarized in the same manner as an intensive survey. Approximate plot locations are indicated on the FRI map or aerial photo and a GPS point should be taken at each plot. The surveyor's comments are also very important because of the reduced amount of data that is collected. Observations made while walking through the block should be documented in the comments section.

9.0 APPLICATION OF FREE TO GROW STANDARDS

The provincial FTG standards indicate the status of each block surveyed. The total number of trees per hectare may be much higher. Sites will be described in one of several classifications based upon the FTG survey results.

The reforestation goal for sites originally classified as softwood and sites planted to softwood is to achieve the FTG-S standard. The reforestation goal for sites originally classified as mixedwood is to achieve the FTG-M standard. If a site does not meet the appropriate FTG standard, the chart in table 7 is consulted to determine which standard best describes the site.

Free To Grow Softwood (FTG -S-spp)

- enough well spaced, black spruce, jack pine or white spruce, FTG stems to ensure the site will develop into a softwood forest

Free To Grow Mixedwood (FTG-M-spp)

- enough well spaced black spruce, jack pine or white spruce stems and total hardwood stems so that the site will develop into a predominantly coniferous mixedwood stand

Not Free To Grow Mixedwood (NFTG-M-spp)

- enough well spaced black spruce, jack pine or white spruce stems to meet the FTG-M standard but with enough hardwood stems so that the site will develop into a predominantly hardwood mixedwood stand

Not Free To Grow Softwood (NFTG-S-spp)

- enough well spaced black spruce, jack pine or white spruce stems worth releasing so that the site will develop into a softwood forest

Mixedwood N

- enough well spaced conifers (spruce or pine) and total hardwoods to ensure development to mixedwood forest

Hardwood

- enough hardwood to develop into hardwood forest

Softwood Regeneration (REGEN-spp)

- enough black spruce, jack pine or white spruce regeneration for a site to potentially develop into a mature softwood forest although there are not enough well established conifers to meet the Softwood or Mixedwood M FTG standards.

NSR

- insufficient hardwoods or softwoods to develop into fully stocked forest.

TABLE 8: APPLICATION OF FREE TO GROW STANDARDS

APPLICATION OF FREE TO GROW STANDARDS

Survey results will indicate appropriate site classification:

	SITE CLASSIFICATION
1. Does site meet BS, JP or WS Softwood FTG standard? _____ No ↓	Yes FTG - S - (spp)
2. Does site meet BS, JP or WS Mixedwood 'M' standard? _____ No ↓	Yes FTG - M - (spp)
3. Does site meet Mixedwood 'M' standard except for too many hardwoods? No ↓	Yes NFTG - M - (spp)
4. Are there enough well spaced conifers to meet 'S' FTG standard if released? No ↓	Yes NFTG - S - (spp)
5. Does site meet Spruce or Pine Mixedwood 'N' standard? _____ No ↓	Yes N (spp)
6. Does site meet Hardwood standard? _____ No ↓	Yes H
7. Is there sufficient conifer stocking to classify as regenerated? _____ No ↓	Yes Regen (spp)
8. Site is NSR .	

FREE TO GROW STANDARDS (11/21/96)

	<u>FTG - S</u>			<u>FTG - M</u>			<u>NFTG - M</u>			<u>NFTG - S</u>			<u>MIXEDWOOD 'N'</u>	<u>HARDWOOD</u>	<u>REGEN</u>		
	BS	JP	WS	BS	JP	WS	BS	JP	WS	BS	JP	WS	PINE/SPRUCE	H	BS	JP	WS
FTG Conifers	>800	>730	>510														
Well Spaced Conifers				>1120	>860	>850	>1120	>860	>850	>940	>850	>600	>510	<510			
Hardwood Stocking				2000-4000			>4000						>2970	>3730			
Softwood Stocking														>2750	>2260	>1660	

9.1 SOFTWOOD FREE TO GROW STANDARDS

The softwood free to grow standards indicate the minimum number of acceptable, well spaced, free growing softwood trees per hectare. It is expected that sites classified as softwood "S" by Manitoba's forest resource inventory prior to harvest or sites that have been planted to softwoods will meet the softwood FTG standard.

TABLE 9: SOFTWOOD FREE TO GROW STANDARDS

Site Description	Black Spruce	Pine	White Spruce
FRI Subtype code	13 - 17	01 - 06	10 - 11
# FTG stems per ha	800	730	510

After the initial reconnaissance survey has been performed the mean number of free to grow stems per hectare is calculated. If the number of free to grow stems per hectare is more than 200 stems **above** the minimum standard the site is considered "Free To Grow" to softwood and no more plots are required. If the number of free to grow stems per hectare is within ± 200 stems of the standard FTG status can not be confirmed and an additional survey line is necessary. If the number of free to grow stems per hectare is more than 200 stems **below** the Softwood Free To Grow standard check to see if the site is Mixedwood Free To Grow (see section 8.2).

The formula used to determine number of FTG stems/ha for an individual specie is as follows:

$$\text{FTG stems/ha} = \frac{\# \text{ FTG stems tallied by spp.} \times 250}{\text{total plots}}$$

9.2 MIXEDWOOD FREE TO GROW STANDARDS

The mixedwood free to grow standards indicate the minimum number of acceptable, well spaced softwood trees per hectare and total hardwood trees per hectare. It is expected that sites classified as mixedwood "M" by Manitoba's forest resource inventory prior to harvest will meet the mixedwood FTG standard. Mixedwood sites planted with the management intent of maintaining the softwood component on site, without converting to a softwood stand, can meet the mixedwood FTG standard.

After the initial reconnaissance survey has been performed the mean number of well spaced stems per hectare is calculated. If the number of well spaced softwood stems per hectare is more than 300 stems **above** the minimum standard and there is sufficient hardwood stocking the site is considered "Free To Grow" to mixedwood. If the number of well spaced stems per hectare is within ± 300 stems of the standard FTG mixedwood status can not be confirmed and an additional survey line is necessary. If the number of well spaced softwood stems per hectare is more than 300 stems **below** the standard no further plots are necessary. Classify the site according to the Free To Grow standards.

The formula used to determine number of well spaced stems/ha for an individual specie is as follows:

$$\text{well spaced stems/ha} = \frac{\# \text{ well spaced stems tallied by spp.} \times 250}{\text{total plots}}$$

TABLE 10: MIXEDWOOD FREE TO GROW STANDARDS

Site Description	Black Spruce	Pine	White Spruce
FRI Subtype code	53 – 58	41 - 49	50 – 51
# WS stems per ha	1120	860	850
# hardwood stems per ha	2000 - 4000	2000 - 4000	2000 - 4000

10.0 TALLY SHEETS

The FTG tally sheet is filled out as illustrated in figure five (header sheet shown). Only one header sheet is required per survey. The top line of the header sheet, form FTG 1/97, can be filled out before beginning the survey from information provided to the surveyor. A blank set of tally sheets appear in Appendix V along with a detailed description of information entered under each heading.

FREE TO GROW SURVEY FORM															Page <u>1</u> of <u>4</u>					
33-24-19-01		CLEAR CUT			80	DISC TRENCHER			81	HAND CONTAINER			81	BS						
BLOCK#		ACTIVITY			YR	ACTIVITY			YR	ACTIVITY			YR	SPP	ACTIVITY		YR	ACTIVITY		
		DEPLETION				SITE PREP				PLANTING					TENDING #1			TENDING #2		
13	—	149	13	18.0	06	07	96	XY	18	MANAGEMENT RECOMMENDATIONS										
SUBTYPE		V-TYPE	ECO-DISTRICT	FMU	AREA (ha)	DA	MO	YR	DATE	CREW	TOTAL PLOTS	REFILL					SIP & PLANT			
												<input type="checkbox"/>					<input checked="" type="checkbox"/>			
												<input type="checkbox"/>					<input type="checkbox"/>			
												THIN					RELEASE			
															COMMENTS: Release North 1/2 of block from Aspen competition.					
GENERAL FOREST HEALTH																				
SEVERITY		DM	SC	AR	RCW	G	TD	WPW	L	GIR	BR	F	HC	V	D					
HOST SPP.		—	—	—	—	L	—	—	—	—	—	—	—	—	—	—	—			
		—	—	—	—	JP	RP	—	—	—	—	—	—	—	—	—	—			
		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—			
LINE #	PLOT #	CONIFER STOCKING			HARDWOOD STOCKING			WELL SPAC. CONIFER			WELL SPAC. HARDWOOD			FTG CONIFER						
1	1	WS	BS	JP	TA	BA	WB	WS	BS	JP	TA	BA	WB	WS	BS	JP				
		—	7	2	—	15	5	2	—	—	7	1	—	—	2	—	—			
HT (m)		—	1.2	1.7	—	3.0	3.0	2.5	—	—	1.2	1.5	—	—	3.5	—	—			
FOREST HEALTH (SPP-#.CODE)		BS-1-4			JP-1-6			HW TA-3.0-3			SH AL-2.0-1			BS-1-1						
1	2	WS	BS	JP	TA	BA	WB	WS	BS	JP	TA	BA	WB	WS	BS	JP				
		—	10	2	—	20	3	—	—	9	—	—	—	—	1	—				
FOREST HEALTH (SPP-#.CODE)					HW TA-3.5-2			SH AL-1.5-1												
1	3	WS	BS	JP	TA	BA	WB	WS	BS	JP	TA	BA	WB	WS	BS	JP				
		—	8	—	7	2	2	—	—	7	—	—	—	—	4	—				
FOREST HEALTH (SPP-#.CODE)					HW TA-2.5-1			SH AL-1.5-1			BS-1-2									
Forest Health Codes:		L light			M moderate			S severe			Competition Cover Classes:			Residual Classes:						
											1 10 - 35%			1 < 15 cm						
											2 35 - 60%			2 15 - 30 cm						
											3 > 60%			3 > 30 cm						

FIGURE 5: COMPLETED FTG TALLY SHEET (Form FTG-1/97)

11.0 MAPPING

Surveyors will be provided a Forest Resource Inventory map of each survey block and will usually be supplied with a copy of the regeneration survey field map. Surveyors draw the intended survey route on the Forest Resource Inventory map and then determine the direction of each survey line, the length of each line and the interplot distances. The azimuth and length of each line should be recorded on the FRI map. The approximate location of each plot should also be mapped so surveyors can anticipate when to change directions, or when different conditions might be encountered.

Figure 6 shows an FRI map with the survey route and survey line azimuths.

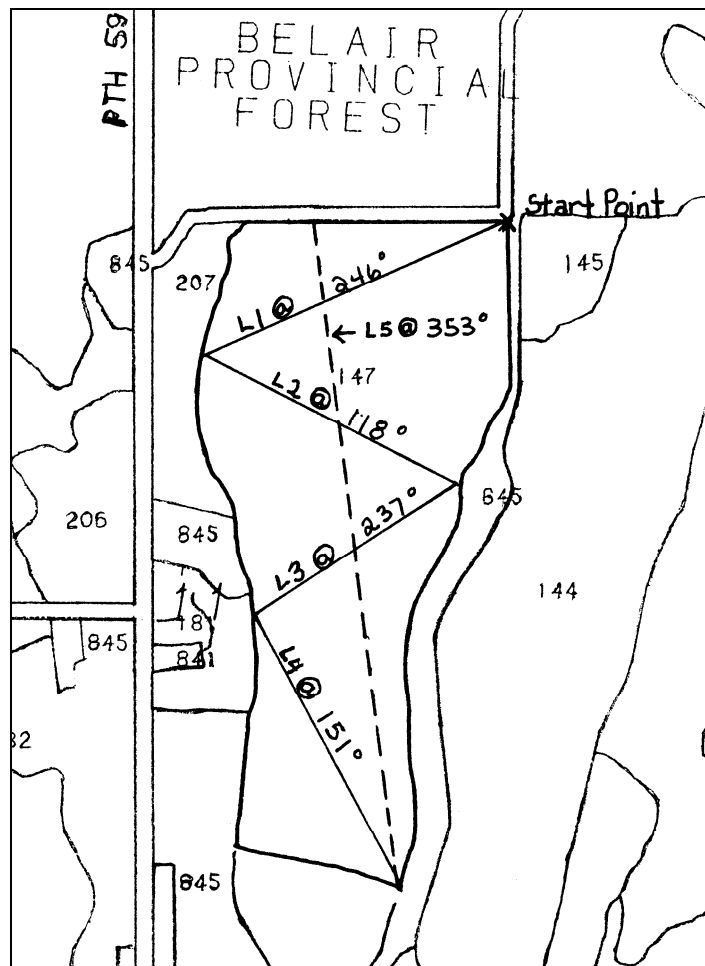


FIGURE 6: FREE TO GROW SURVEY MAP

11.1 FIELD MAPPING

As the surveyor proceeds along the predetermined survey line, he or she creates a field map on graph paper. Plot locations and physical features are indicated on the field map. A straight line mapping technique should be used. The lines travelled are drawn vertically on the graph paper and changes in bearings marked at turning points. Figure 7 shows an example of a FTG survey field map done using this technique. Bearings, distances and major forest health damage along the route are recorded on these sheets.

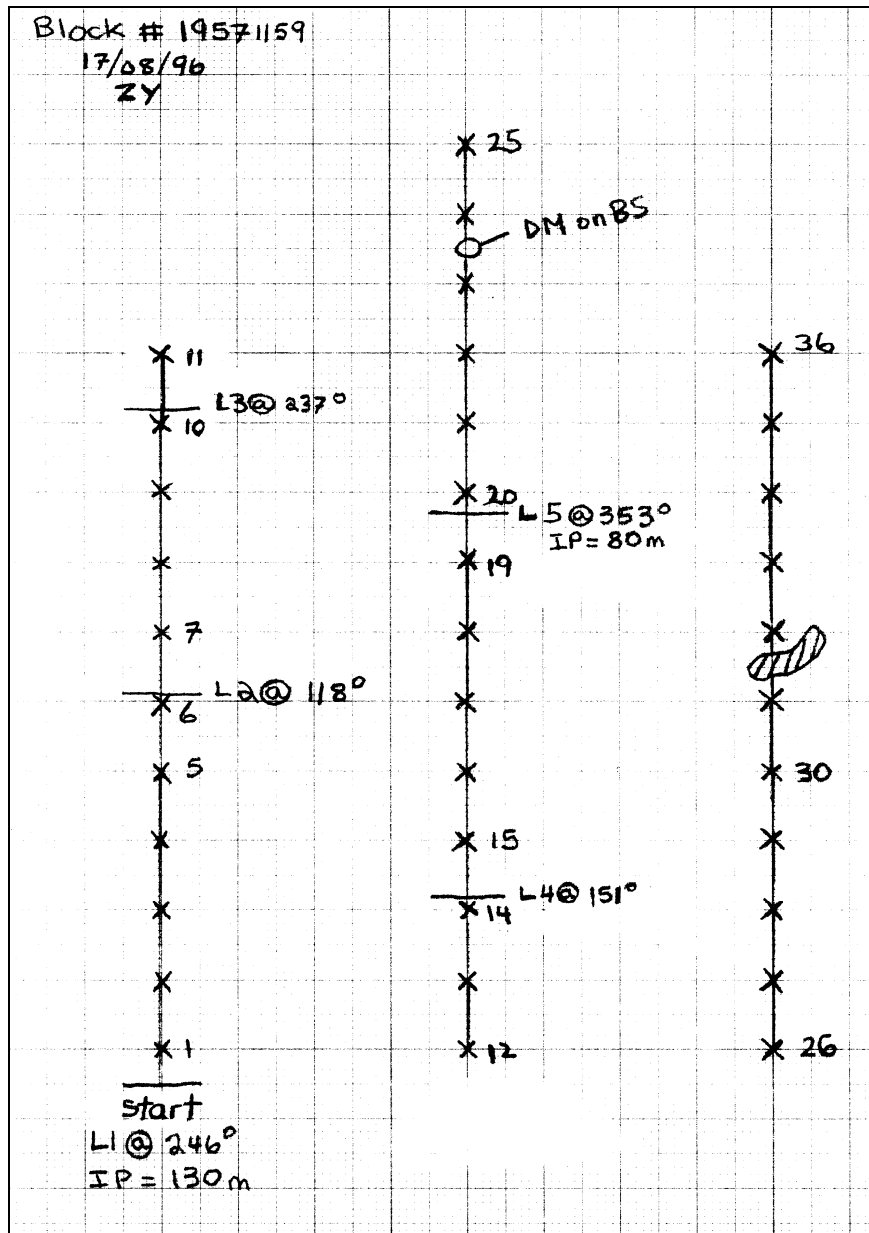


FIGURE 7: FIELD MAP EXAMPLE

12.0 FREE TO GROW SUMMARIES

After completing each free to grow survey the results will be summarized. The results can then be compared to the free to grow standard and those sites achieving the standard can be assigned free to grow status. Sites which fall short of the standard may require more time for development or stand tending before they will attain the standard. Recommendations in this regard will be provided.

The Forest Health Assessment staff of Manitoba Conservation, Forestry Branch will be informed of sites where significant damage has been identified. The Forest Health Assessment staff may conduct a closer inspection of these sites and will ultimately recommend a strategy for dealing with problem areas.

REFERENCES

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APPENDIX I

SILVICULTURE ACTIVITY CODES

		CODE
	RIPPER TOOTH	055
	CHOPPER/TRENCHER	056
	C & H PLOUGH	057
	BARRELS & CHAINS	058
	BRACKE	059
	TTS DISC TRENCHER	060
	BARRELS ONLY	061
MECHANICAL	ANCHOR CHAINS	062
TREATMENT	BLADE	063
	PLOUGH	064
	DRUM & CHOPPING	065
SITE	DRUM & BARREL	066
PREPARATION	DRUM & CHAIN	067
	DRUM & BLADE	068
	SHEAR BLADING	069
	BURN ONLY	071
NON-MECHANICAL	BURN & MECHANICAL	072
TREATMENT	BURN & CHEMICAL	073
	CHEMICAL ONLY	081
	CHEMICAL & MECH.	082
	BAREROOT STOCK	091
UNPREPARED SITE	CONTAINER STOCK	092
	REFILL CONTAINER	093
PREPARED SITE	BAREROOT STOCK	094
HAND	CONTAINER STOCK	095
PLANTING		
	WITH	
	SPOT SCALPING	
	BAREROOT	097
	CONTAINER	098
PREPARED SITE	REFILL BAREROOT	099
	REFILL CONTAINER	100
	UNPREPARED SITE	
	BAREROOT STOCK	101
MACHINE	CONTAINER STOCK	102
PLANTING		
	PREPARED SITE	
	BAREROOT STOCK	103
	CONTAINER STOCK	104
	CONE BEARING	
	SLASH	
NATURAL	ANCHOR CHAIN	131
REGENERATION	TTS DISC TRENCHER	132
	BARRELS & CHAINS	133
	UNPREPARED	134
	STANDING SEED	
	SOURCE	
	ANCHOR CHAIN	135
	BARRELS & CHAIN	136
	UNPREPARED	138

APPENDIX II

DEPLETION ACTIVITY CODES

		CODE
	ENTIRE STAND	001
	FRINGE	002
CLEAR	BLOCK	003
CUT	STRIP	004
	SINGLE SEED TREE	006
	SEED TREE PLOTS	007
DEPLETION ACTIVITY	PARTIAL CUT	005
	WIND LOSS	011
	DROUGHT	021
SALVAGE	FLOOD	031
	INSECT	041
	DISEASE	051
	FIRE	052
BURNED		053

APPENDIX III

TREE SPECIES SYMBOLS AND CODES

<u>SPECIES</u>	<u>SYMBOL</u>	<u>CODE</u>
JACK PINE	JP	04
RED PINE	RP	03
SCOTS PINE	SP	09
WHITE PINE	WP	02
BLACK SPRUCE	BS	11
WHITE SPRUCE	WS	13
BALSAM FIR	BF	21
TAMARACK	TL	31
EASTERN WHITE CEDAR	EC	41
TREMBLING ASPEN	TA	61
BALSAM POPLAR	BA	63
EASTERN COTTONWOOD	CO	64
WHITE BIRCH	WB	71
MANITOBA MAPLE	MM	85
BLACK ASH	AS	91
AMERICAN ELM	E	95
BUR OAK	BO	98

NOTE: Additional symbols and codes apply to other species, not considered in regeneration surveys.

SHRUB SPECIES SYMBOLS

<u>SPECIES</u>	<u>SYMBOL</u>
RASPBERRY	RA
BEAKED HAZEL	BH
WILLOW	WI
DWARF BIRCH	DB
ALDER	AL
ROSE	RO
CHOKE CHERRY	CC
PIN CHERRY	PC
RED-OSIER DOGWOOD	DW
SASKATOON	SA

APPENDIX IV

Pest/Damage & Host	FMUs where pests Occur:	Sample tree is unacceptable if:	symptoms
Dwarf Mistletoe - DM Jack Pine Black Spruce White Spruce Tamarack	Jack Pine DM not found in FMU 20 -otherwise, all FMUs	Any visible infection *Map and comment on data sheets if DM is on residual or bordering trees	Witches broom Branch or stem swelling Aerial shoots - greenish yellow, up to 10 cm in length on Jack Pine and green to brown up to 3 cm on spruce Basal cups remaining from dead aerial shoots
Stem Canker - SC Jack Pine Red Pine	Mostly found in FMU 20	Any main stem infection	Flattened often twisted dead area under bark up to 2 m in length Bark absent from canker, wood visible, callous tissue forms at edge
Armillaria Root Rot - AR All conifers	All FMUs	Any root disease symptoms	Basal resinosis Chlorosis Thinning crown Stunted shoot growth Distress cones White mycelial fans under bark at root collar Mushrooms at base of tree
Tip Dieback - TD Red Pine	Mostly found in FMU 20 and 23	Any infection	Dead shoots Loss of main stem dominance Low height to dbh ratio Prolific adventitious budding Topkill
Western Gall Rust - G Jack Pine Scots Pine	All FMUs	Main stem gall Branch gall within 10 cm of main stem Multiple laterals infected (≥ 10 branch galls)	Perennial globose galls on stem or branch Orange yellow spores on surface of galls in May to June

<p>Root Collar Weevils - RCW</p> <p>Jack Pine White Spruce Scots Pine Black Spruce Red Pine</p>	<p>Pine RCW is predominantly in FMU 20 and FMU 23 on JP and SP Warren RCW is common in the West, Northwest and Northeast Regions on JP, BS and WS</p>	<p>Any evidence of Root Collar attack</p>	<p>Basal resinosis Discoloured foliage (chlorotic, red or dull green) Larval girdling at root collar Creamy white, legless larvae with reddish brown head under bark at root collar Found in the bark and cambial area at or below the root collar</p>
<p>White Pine Weevil - WPW</p> <p>White Spruce Black Spruce Jack Pine* White Pine*</p>	<p>All FMUs</p> <p>*Only record in the General Forest Health Box (not in plot data) for JP and WP</p>	<p>Two or more attacks with dead terminal or laterals of 3 years growth or more</p>	<p>Adult feeding punctures in one year old growth on main stem White legless larvae with light brown head feeding in cambium Shepherds crook and browning of terminal late in the growing season</p>
<p>Lean - L</p> <p>All conifers</p>	<p>All FMUs</p>	<p>Lean greater than 45°</p>	<p>J shaped roots Leaning from snow loading or wind (Ensure tree base is located inside the plot)</p>
<p>Girdling - GIR</p> <p>All species</p>	<p>All FMUs</p>	<p>> 75% of circumference of bole or > one third of tree height</p>	<p>Stem debarking including cambium Includes yellow belly sapsucker damage</p>
<p>Browsing - BR</p> <p>All species</p>	<p>All FMUs</p>	<p>Extensive repeated browsing throughout crown of tree</p>	<p>Buds and shoots clipped off Adventitious budding Loss of main stem dominance</p>
<p>Defoliators - F</p> <p>All conifers</p>	<p>All FMUs</p>	<p>50% or more of foliage absent or dead, with terminal buds on leader and laterals dead or absent</p>	<p>Branch dieback Top kill</p>

Pest/Damage & Host	FMUs where pests occur:	Sample tree is unacceptable if:	Signs and symptoms
Hypoxylon Canker - HC Trembling Aspen Large Tooth Aspen	All FMUs	Any main stem infection	Orange-yellow discolouration of bark Conidial blisters Sexual fruiting bodies (perithecia)
Poor Vigour - V All species	All FMUs	Trees which are not vigorous, very suppressed or stunted. This category is only chosen if tree does not fit other unacceptable categories.	Thin crown, stunted shoot growth, dead shoots, low height, chlorotic foliage. Causes include extreme competition, flooding, repeated frost, etc.
Dead - D All conifers	All FMUs	Unknown cause of death.	Foliage on entire crown dead or missing Stem broken at base

HEADER INFORMATION:

BLOCK # - a ten digit number used to locate and identify survey sites. The first six digits indicate the township, range and section in which the survey is located. The last four digits are an identifier, used to distinguish between two surveys in the same township, range and section.

DEPLETION - enter depletion activity code from Appendix II and year of activity

SITE PREP - enter site preparation code from Appendix I and year of activity

PLANTED - enter planting activity code from Appendix I and year of activity

TENDING #1 - first tending treatment carried out on area and year of activity

TENDING # 2 - second tending treatment carried out on area and year of activity

SUBTYPE - enter subtype code if available

V - TYPE - Forest Ecosystem Classification V- type of preharvest stand

ECODISTRICT - ecodistrict in which survey block is located

FMU - enter the Forest Management Unit where the survey is located

AREA - enter the area surveyed in each stand (ha to one decimal place)

DATE - enter day, month and year of survey

CREW - enter initials of crew members performing survey

PLOT INFORMATION:

LNE # - enter survey line on which plot is located

PLT # - enter plot number

CONIFER STOCKING - enter density of each species on second line, below specie code

HARDWOOD STOCKING - enter density of each species on second line, below specie code

WELL SPACED CONIFER - enter number of well spaced conifers on second line, below specie code

WELL SPACED HARDWOOD - enter number of well spaced hardwoods on second line, below specie code

FREE TO GROW CONIFER - enter number of FTG conifers on second line, below specie code

HEIGHTS - enter average height of all species present, on the third line, in the first plot and every fifth plot after that

- The height is not a mathematical average, but rather the height of the average canopy present in the plot.

FOREST HEALTH - enter specie code, number of damaged trees and damage code for any damaged conifers or hardwoods (BS-2-SC)

COMPETITION - Hardwoods - enter dominant hardwood specie symbol, average height of all hardwood species present and percent cover (TA-3.0-3)

- Shrubs - enter dominant shrub specie symbol, average height of all shrub species present and percent cover (AL-2.0-1)

RESIDUALS - enter specie code, number of each specie present and diameter class code (BS-2-1)

NEARBY PESTS - take note of any forest health concerns noticed close to but outside plots or while walking between plots

HEADER INFORMATION FILLED OUT AT COMPLETION OF SURVEY:

TOTAL PLOTS - enter the total number of plots established in the survey

GENERAL FOREST HEALTH - under each damage code there is space to enter two host species and the severity of damage to each species. Severity codes are nil - , light - L, moderate - M and severe - S. Based on surveyor observations throughout the entire block, not a summary of plot tally.

MANAGEMENT RECOMMENDATIONS - record surveyor recommendations for future silvicultural treatments

- check off one of the boxes if appropriate, write comments to expand or recommend other treatments

Refill - refill all or part of an existing plantation

Sip & Plant - site prepare and plant all or part of survey area

Thin - reduce density of conifers on site to provide more growing space for remaining trees (ie. natural regeneration after fire)

Release - release conifers from hardwood competition

APPENDIX VI

Determination of the Survey Methods to Apply: Extensive vs. Intensive

Selection Criteria for Natural Blocks – Original Covertypes “S or M”

SOFTWOOD STOCKING	HARDWOOD STOCKING	PROBABLE STATUS	ASSESSMENT METHOD
≥ 50	≤ 25	FTG	extensive
≥ 50	> 25 and < 70	uncertain	intensive
≥ 50	≥ 70	NFTG	extensive
< 50		NFTG	extensive

Selection Criteria for Planted Blocks – Original Covertypes “S or M”

SOFTWOOD STOCKING	HARDWOOD STOCKING	PROBABLE STATUS	ASSESSMENT METHOD
≥ 60	≤ 50	FTG	extensive
≥ 60	> 50 and < 80	uncertain	intensive
≥ 60	≥ 80	NFTG	extensive
< 60		NFTG	extensive

After comparing previous regeneration survey results to the selection criteria there are six basic rules used to determine how much of the eligible area should be surveyed by extensive or intensive methods.

1. All sites where FTG status is uncertain will receive intensive ground surveys.
2. All sites that are obviously FTG or NFTG are eligible for extensive walk through surveys.
3. If a regeneration survey has not been performed then an intensive survey must be performed.
4. Blocks falling into the “uncertain” category based on regeneration survey results may be surveyed extensively if the block has received a successful herbicide treatment after the regeneration survey was completed.
5. A minimum of 50% of the area in one treatment type (planted or natural) should be surveyed intensively. Some of the sites identified as extensive may have to be

changed to intensive in order to meet this requirement.

6. The amount of area that may be extensively surveyed in a geographical area may be influenced by serious forest health problems or other considerations which would require a higher percentage of intensive surveys be completed.

An example of the application of these instructions is outlined below.

Step One: Plantations and naturally regenerating blocks are grouped separately.

Step Two: Apply the selection criteria for planted sites or natural sites as appropriate to determine if blocks require an intensive or extensive survey. The total softwood and hardwood stocking, as determined from the regeneration survey, is used

Step Three: Sum the total area to be intensively surveyed for each treatment type (planted or natural). If this number is <50% of the total for that treatment then enough sites identified as extensive must be changed to intensive to meet the 50% requirement.