2016 Pre-Harvest Survey Procedure Manual

April 18th, 2016

TABLE OF CONTENTS

LIST OF FIGURES

1. INTRODUCTION

LP Canada Ltd. - Forest Resources Division (FRD) Swan Valley Manitoba has committed itself to the development and implementation of a process of site-specific, ecologically based operational planning.   In accordance with Manitoba Environment Act License No. 2191E, LP / MFSRC performs site-specific investigations of all potential harvest sites. "**Pre-harvest survey**" means a site specific investigation of a potential harvest site, to document the stand characteristics and any non-timber values that may need to be protected, and to determine appropriate harvest and renewal treatments.

Section 4 of LP's Environment Act License No. 2191E dated December 11, 1996 states that the Licensee [LP] shall:

> *The Licencee shall, on a permanent basis, employ, or contract the services of, a field biologist, with expertise in forest ecosystem studies, to oversee the collection of flora and fauna information in the course of pre-harvest surveys, road construction planning and forest ecosystem monitoring and research.*

Section 11 of LP's Environment Act License No. 2191E dated December 11, 1996 states that the Licensee [LP] shall:

> *11 i) conduct pre-harvest surveys for all proposed timber harvest blocks according to the procedures outlined in the Standard Operating Procedures (Section 9 of the [1996] Forest Management Plan), or in revised the Standard Operating Procedures, that may be developed in consultation with the Stakeholders Advisory Committee, and approved by the director and the I.R.M.T.;*

> *11 ii) determine, in consideration of the parameters being monitored in the pre-harvest surveys, and in consultation with the Director and the I.R.M.T., the level of training to be provided to pre-harvest survey staff, and ensure the required training occurs; and*

> *11 iii) use the information collected by the pre-harvest surveys, to determine the harvest and renewal prescription for each harvest site.*

Since 1995, LP's forestry staff has worked towards the development of the Pre-Harvest Survey manual. The manual presented here is the result of countless hours of discussion and constructive debate among Forest planners, Silviculture foresters, and Operation supervisors. Successive versions of this manual will build on this foundation and add to its improvement over time. Development in consultation with Company contractors, the Stakeholder Advisory Committee (SAC) and Manitoba Conservation has also occurred.

The original 1997 PHS manual was developed from an extensive review of pre-harvest survey procedures from the provinces of British Columbia, Alberta, Saskatchewan, and Ontario. The PHS manual is continuously improved each year.

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1.1 DEFINITION

A Pre-Harvest Survey (PHS) is a site-specific assessment of a harvest area prior to logging. The assessment information is then developed into a site-specific integrated plan which addresses timber and non-timber resource concerns.

LP has developed a two-phase process:

(i)   Ecological assessment and classification of the site (PHS)

(ii)   Development of the Pre-Harvest Silviculture Prescription (PHSP).

1.2 OBJECTIVES

The operational objectives of a PHS are to:

- Ecologically classify all sites in order to provide data to help prescribe the appropriate Silviculture/Harvesting System

- Identify operational site limitations and potential constraints such as compactable soil types or the presence of competitive plant species

- Incorporate non-timber values into the planning process including exceptional features such as mineral licks, in-block streams or active trap lines.

- Accurately evaluate the timber values, volumes, and operational net-down deductions such as rot.

Although the primary purpose of the PHS is to collect operational data for the short-term annual planning process, a properly designed survey can provide data for numerous long-term planning applications. All MFSRC's PHS plots are geo-referenced in a Geographical Information System (GIS). Although the surveyed area will in most instances be harvested, the data collected acts as a snapshot in time. PHS's are actually temporary sample plots (TSP), and although not as valuable as Permanent Sample Plot (PSP) for projecting future trends, they still have tremendous value. The PHS database accumulates more data each year, and contains a vast array of data, such as:

- Soils data that can be used to create local soil maps;

- Forest Ecosystem Classification (FEC) V-types and S-types;

- Critical wildlife habitat and features that can be used to develop long-term Wildlife Management Plans;

- Forest Health data that may help project future insect and disease trends; and

- Mensurational data that can be used to develop yield curves.

1.3 SCHEDULING AND TIMING

The field season for performing a PHS is in the late spring, summer and early fall during leaf-out. During this time, the soil is not frozen, and the ecosystems can be correctly classified. Performing a PHS before 'leaf-out' in the spring or after 'leaf-off' in the fall and winter is not recommended.

It is LP / MFSRC's goal to PHS all proposed harvest sites one year in advance of harvesting. Therefore, during the 2012 field season, cutblocks planned for harvest in 2012 and 2013 will receive a PHS. Performing PHS's shortly before logging may not provide enough time to address any potential conflicts or concerns. Planners also may need time to modify cutblocks based on the PHS data. Performing PHS's too far in advance (*e.g.* > 5 years) can prove to be inefficient due to potential changes on the landscape, forest practices and management objectives.

1.4 IMPORTANCE OF DATA

The PHS data is the most crucial component in LP / MFSRC's short-term planning process. Therefore it cannot be stressed enough, how important it is for each surveyor to follow the protocol in this manual! The surveyor must realize that they are the "eyes and ears" for LP's planning team and are the key to the success of each cut-block prescription. Since the data will also be used for long-term planning, an error may have repercussions for many years into the future. A simple error in the timber cruise will result in an incorrect cutblock volume, which in turn may increase the time, effort and money LP / MFSRC's operational staff and independent contractors will have to spend during it's harvest. If a critical wildlife feature, such as a mineral lick or a raptor nest, is missed by a surveyor, it will have serious repercussions to LP / MFSRC under Manitoba's regulations, and may result in that feature being lost from the landscape. Surveyors must remember how important their work is, each and every day.

1.5 SAFETY

Every employee has the right to a safe and healthy working environment. MFSRC provides safety training to all employees and they all must read and follow the SPL Safety Policy Manual. This safety training will provide an employee with knowledge of the safety polices and minimize the risk of accidents.

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2. PHS METHODOLOGY AND PROCEDURES

2.1 PRE-FIELD SEASON PREPARATION

1. The planner draws the cut block boundaries using aerial imagery or photography. Proposed cutblock boundaries are input into the Geographic Information System.

2. The PHS supervisor uses the GIS to generate a PHS grid on each block to be surveyed. Once a PHS grid is established on a block, two maps are be created and printed; one with an ortho-photography background and one plain grid map. Both these maps show the block number, and plot numbers

3. The plot UTM coordinates for each block must also be printed out.

4. The aerial photographs, grid maps and UTM coordinates are then filed in the "Blocks to be completed" area of the PHS file cabinet.

5. The planners develop a PHS priority list. From that list a detailed survey schedule is developed taking into consideration block access, ATV availability, proximity of other blocks etc. This schedule must be produced well in advance of the survey to have efficient mission planning.

2.2 PRE-FIELD ORGANIZATION

1. Retrieve the appropriate block package containing the photo, grid map, and UTM coordinates from the PHS supervisor, or found in the PHS file cabinet.

2. Ask the appropriate planner or the PHS supervisor about the area to be surveyed to learn about features of interest you may encounter, the best access route, or if there is any active logging or stakeholder activity in the area.

3. Confirm compass declination and prepare field equipment (Appendix I).

4. Field equipment and supplies required:

   - Cruise vest, tally book and bubble cards, GPS unit, UTM coordinates, maps, FEC field guide, and plant ID book

   - Pink candy striped flagging, and hip chain with extra string

   - Spade and trowel

   - Rulers, pencils, black marker, 2.0 Basal Area Factor prism, increment borer, compass, Suunto clinometer, 30 m tape, and DBH tape

   - first-aid kit, hard-hat, eye-protection, bear-repellent, rain-gear, toilet paper, and bottle of water

5. Mark your destination (block number) on the sign-out board, and whom you are working with.

2.3 PHS DATA COLLECTION

The field assessment is the most crucial part of the PHS process. Surveyors will adhere to the PHS protocol listed below.

2.3.1 PHS plot location and establishment procedure

1. Review aerial photos and grid map, divide up the block, and proceed to your first plot.

2. At the first plot,

   - Check the location of the plot using the GPS and plot coordinates.

   - Tie two (2) candy-striped pink ribbons to represent the plot center.

   - Write the block and plot number on both of the ribbons.

3. Continue to hang two (2) pink candy-striped ribbons at every plot, and check the GPS coordinates on at least 30% of the plots within the block. Double tie all ribbons to ensure they remain for a couple years, as they are used by contractors when harvesting the cutblock.

4. Visit and mark all plots that fall outside of the block even though most of these plots will not require a survey. At plots that fall within the block and are close to the block boundary, you must proceed 50 meters beyond the boundary and document your findings on the grid map.

2.3.2 PHS Tally Cards (Bubble Cards)

All PHS data is recorded on "Bubble Cards", except for field sketch maps. This system allows the large amount of PHS data to be scanned directly into the master database for planning purposes. This is valuable to the planning process because the planners write a PHSP (pre-harvest site prescription) as soon as the PHS data is available.

There are three bubble cards (two-sided) for each plot:

1	Timber Cruise (purple)
2	Veg & Wildlife (blue)
3	Ecosystem Summary (red)

As with any data collected in the field, it is imperative that it is recorded as clear and concise as possible. This is especially true when using the bubble cards. The bubble cards must be clean and unwrinkled to successfully go through the scan machine.

- All applicable bubbles must be <u>completely</u> colored in.

- There should be no marks on the black bar codes on the sides of the cards.

- If a card has gotten wet or is bent, or crumpled, it will need to be recopied.

- There must be 3 cards (Timber Cruise, Veg & Wildlife, and Ecosystem Summary cards) completed for <u>every</u> plot within the block boundaries, even if nothing appears in the Timber cruise. This situation should be noted on the grid map.

3. TIMBER CRUISE

Timber Cruise — LP Canada Ltd

Operating Area — rows A B C D E F G H I J K L M N O P R S T U V W Y

Plot

Block Number — 0 1 2 3 4 5 6 7 8 9

Cruiser — 0 1 2 3 4 5 6 7 8 9

Exceptional Features
- Mineral Lick
- Den
- Nest
- RTE Spp
- Heritage Site
- Other

PAST LOGGING H S B

Timber 1 Species — TA | DBH | Height | Age | Count | CP
(BA WB WS BS JP EL AS TL BF MM)

Timber 2 Species — TA | DBH | Height | Age | Count | CP

Timber 3 Species — TA | DBH | Height | Age | Count | CP

Timber 4 Species — TA | DBH | Height | Age | Count | CP

Timber 5 Species

TA	DBH		Height			Age			Count		CP
BA	0	0	0	0	0	0	0	0	0	0	
WB	1	2	1	1	5	1	1	1	1	1	1
WS	2	4	2	2		2	2	2	2	2	2
BS	3	6	3	3		3	3	3	3	3	3
JP	4	8		4		4	4	4	4	4	4
EL	5			5		5	5	5	5	5	5
AS	6			6		6	6	6	6	6	6
TL	7			7		7	7	7	7	7	7
BF	8			8		8	8	8	8	8	8
MM	9			9		9	9	9	9	9	9

Timber 6 Species

TA	DBH		Height			Age			Count		CP
BA	0	0	0	0	0	0	0	0	0	0	
WB	1	2	1	1	5	1	1	1	1	1	1
WS	2	4	2	2		2	2	2	2	2	2
BS	3	6	3	3		3	3	3	3	3	3
JP	4	8		4		4	4	4	4	4	4
EL	5			5		5	5	5	5	5	5
AS	6			6		6	6	6	6	6	6
TL	7			7		7	7	7	7	7	7
BF	8			8		8	8	8	8	8	8
MM	9			9		9	9	9	9	9	9

Timber 7 Species

TA	DBH		Height			Age			Count		CP
BA	0	0	0	0	0	0	0	0	0	0	
WB	1	2	1	1	5	1	1	1	1	1	1
WS	2	4	2	2		2	2	2	2	2	2
BS	3	6	3	3		3	3	3	3	3	3
JP	4	8		4		4	4	4	4	4	4
EL	5			5		5	5	5	5	5	5
AS	6			6		6	6	6	6	6	6
TL	7			7		7	7	7	7	7	7
BF	8			8		8	8	8	8	8	8
MM	9			9		9	9	9	9	9	9

Timber 8 Species

TA	DBH		Height			Age			Count		CP
BA	0	0	0	0	0	0	0	0	0	0	
WB	1	2	1	1	5	1	1	1	1	1	1
WS	2	4	2	2		2	2	2	2	2	2
BS	3	6	3	3		3	3	3	3	3	3
JP	4	8		4		4	4	4	4	4	4
EL	5			5		5	5	5	5	5	5
AS	6			6		6	6	6	6	6	6
TL	7			7		7	7	7	7	7	7
BF	8			8		8	8	8	8	8	8
MM	9			9		9	9	9	9	9	9

GENERAL FOREST HEALTH

Pest		TA	#Aff		BP	Pest		TA	#Aff		BP	Pest		TA	#Aff		BP
0	0	BA	0	0	NL	0	0	BA	0	0	NL	0	0	BA	0	0	NL
1	1	WB	1	1	L	1	1	WB	1	1	L	1	1	WB	1	1	L
2	2	WS	2	2	M	2	2	WS	2	2	M	2	2	WS	2	2	M
3	3	BS	3	3	S	3	3	BS	3	3	S	3	3	BS	3	3	S
4	4	JP	4	4		4	4	JP	4	4		4	4	JP	4	4	
5	5	EL	5	5		5	5	EL	5	5		5	5	EL	5	5	
6	6	AS	6	6		6	6	AS	6	6		6	6	AS	6	6	
7	7	TL	7	7		7	7	TL	7	7		7	7	TL	7	7	
8	8	BF	8	8		8	8	BF	8	8		8	8	BF	8	8	
9	9	MM	9	9		9	9	MM	9	9		9	9	MM	9	9	

3.1 TIMBER CRUISE HEADER

The top one-third of the timber cruise bubble card sheet contains bubbles for header information on:

- Operating Area
- Plot Number
- Block Number
- Cruiser #

Use the following for cruiser numbers:

51 – Ryan Cable

52 – Korbin Proctor

53 – Jackie Twilley

54 – Kirsten Eggie

55 - Tayler Fleming

3.2 EXCEPTIONAL FEATURES

Record any exceptional features that you come across throughout the block. These include Mineral Licks, Wolf dens, major stick nests, Rare, Threatened, or Endangered (RTE) plants, heritage sites, or any other significant or exceptional features. This information should be recorded on the grid map and inform your supervisor.

If you encounter a RTE plant, you should take note of the surrounding area, the abundance of the plant, record the GPS coordinates, and complete a Manitoba Conservation RTE Plant form in the Appendices.

3.3 PAST LOGGING

If there are old stumps or other evidence of past logging, record this on the bubble cards as:

(H) hardwood;

(S) softwood; or

(B) both.

Only one bubble may be filled per card for this section. Map logged areas on your grid map.

3.4 TIMBER

3.4.1 Species
Species abbreviations are listed below.

Hardwoods (deciduous)	Softwoods (coniferous)
TA – trembling aspen	**WS** - white spruce
BA – balsam poplar	**BS** – black spruce
WB – white birch	**JP** – jack pine
AS – green ash	**TL** – tamarack / larch
EL – white elm	**BF** – balsam fir
MM – Manitoba maple	

3.4.2 DBH

Using a diameter tape, determine the <u>average</u> diameter class (in 2 cm increments) for each <u>canopy layer</u> of trees counted 'in' by the prism sweep, for each trees species.

Example 1: if a PHS plot has both uniform TA and WS in the prism sweep, then choose one TA of average DBH and measure it. Then chose one WS of average DBH and measure the WS (and flag them both).

Example 2: if a PHS plot has all TA but there are obviously <u>two different height classes</u>, provide an average DBH for each TA height class.
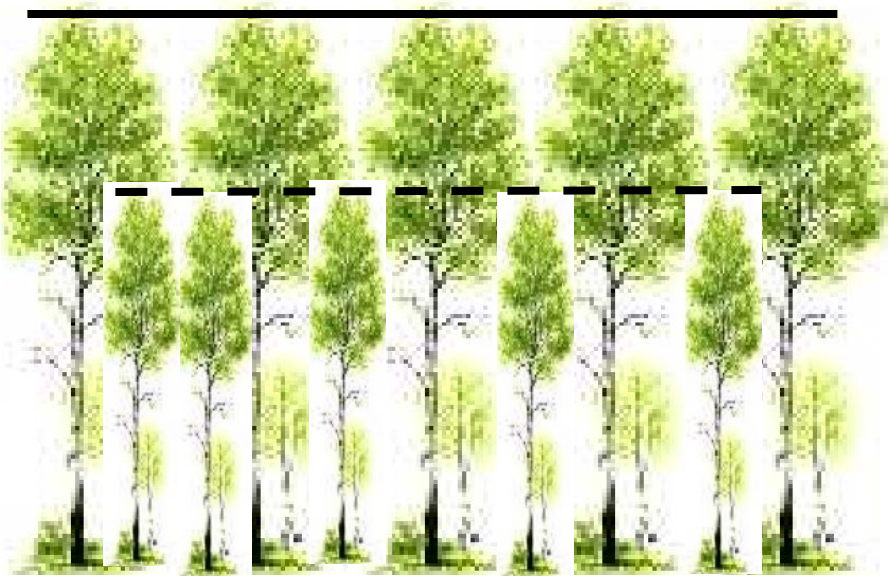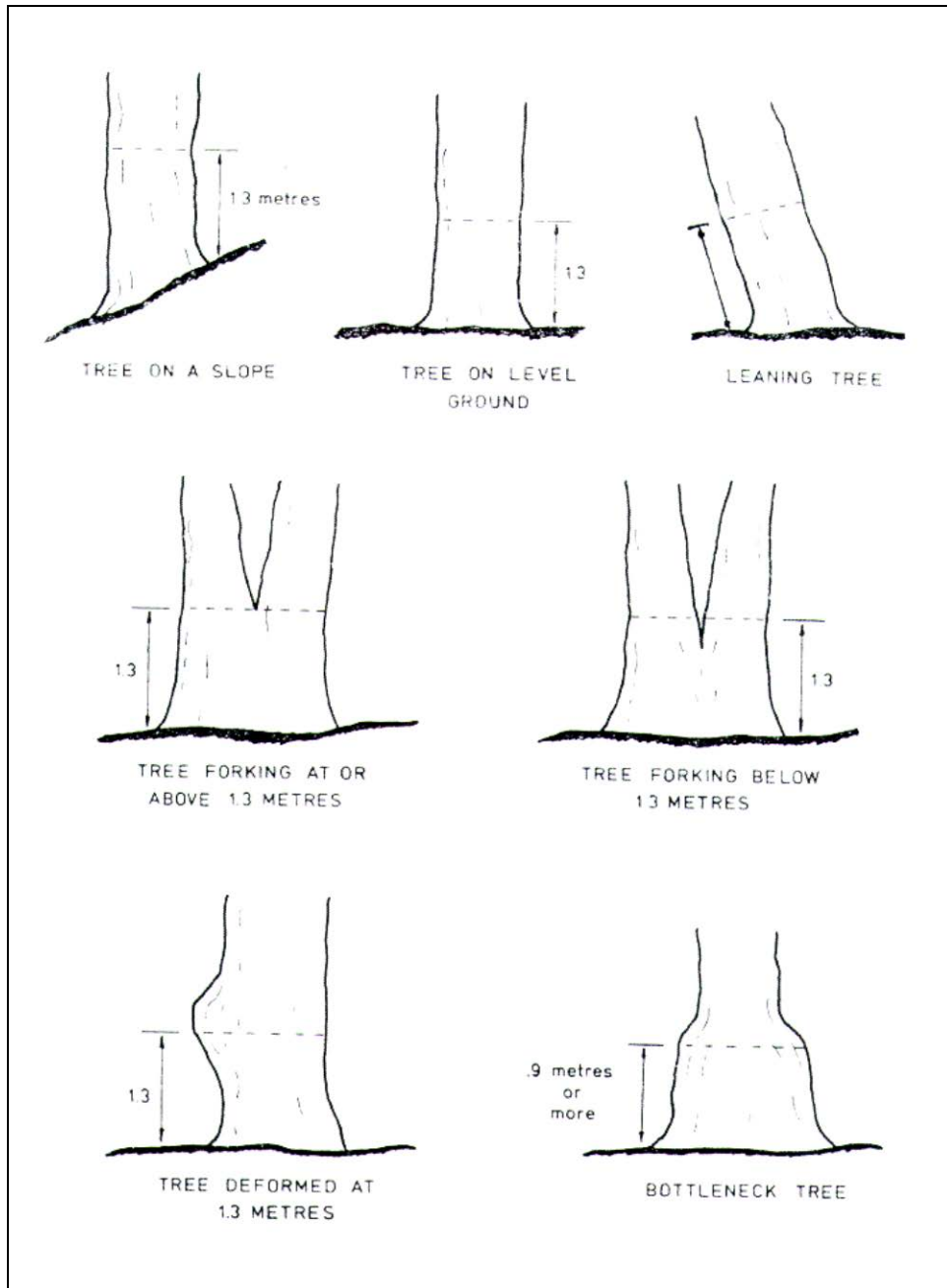
Figure 3.1   Proper height of dbh measurements.

3.4.3 Height
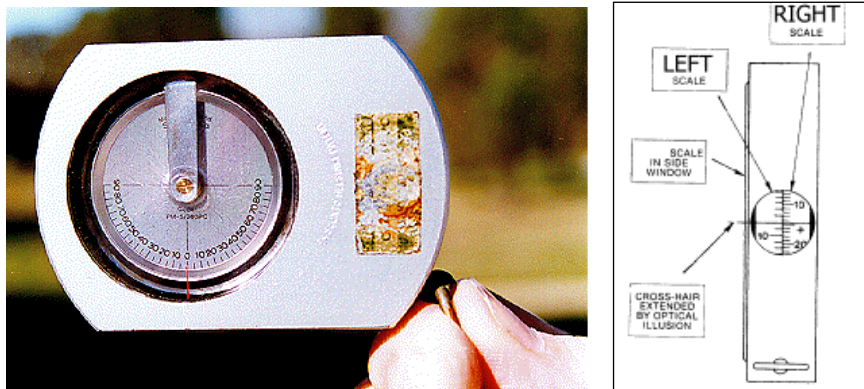
Using a Suunto clinometer, measure the height of a representative tree for each species and dbh class.

1. Measure the horizontal distance from the base of the tree (or the position directly beneath the required point) to a position where the required point on the tree (e.g. tree tip) can be seen.
2. Sight at the required point on the tree:
   - Using one eye: Close one eye and simultaneously look through the Suunto at the scale and 'beside' the Suunto at the tree. Judge where the horizontal line on the Suunto scale would cross the tree.
   - Both eyes: With one eye looking at the Suunto scale and the other looking at the tree, allow the images to appear to be superimposed on each other. Note: If you suffer from astigmatism, use the one eye approach.
3. Read from the percent scale and multiply this percentage by the horizontal distance measured in step 1.
4. Site to the base of the tree and repeat steps 2 - 3.
5. Combine the heights from steps 3 and 4 to determine total tree height:
   - Add the 2 heights together if you looked up to the required point in step 2 and down to the base of the tree in step 4.
   - Subtract the height to the base of the tree from the height to the required point if you are on sloping ground and had to look up to **both** the required point and the base of the tree.
6. Check all readings and calculations.

Reading the Suunto clinometer.

SUUNTO clinometer - 20 scale
BASE OF TREE READINGS

SUUNTO clinometer - 20 scale
TOP OF TREE READINGS
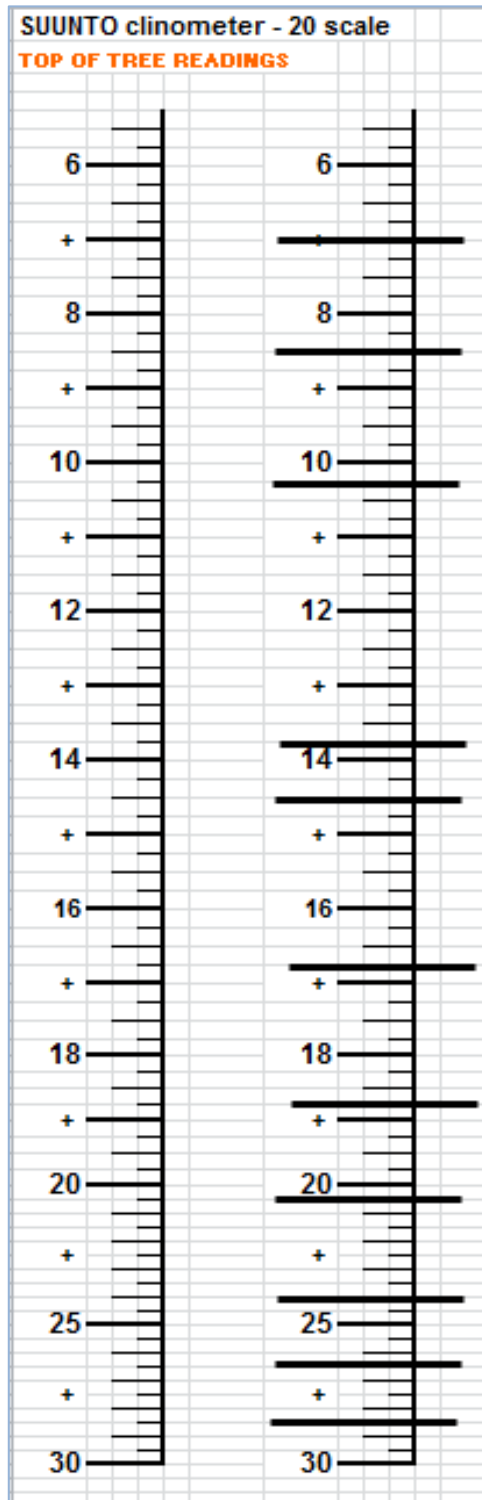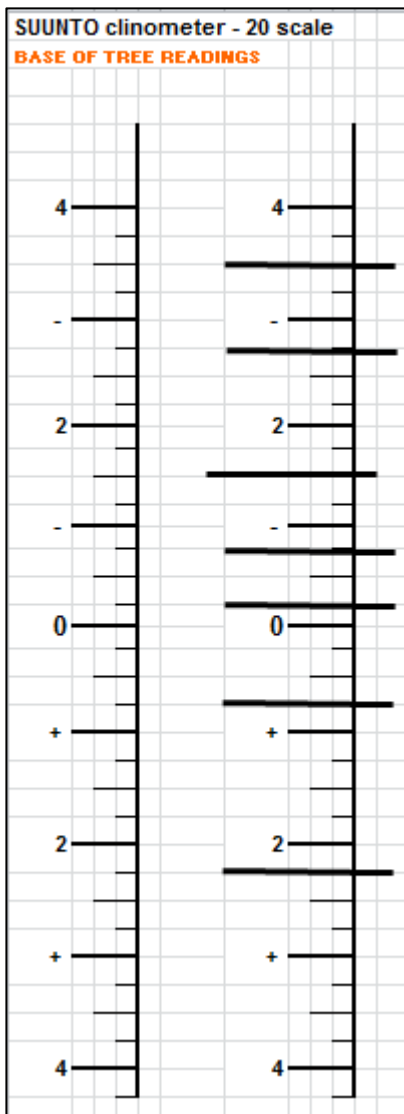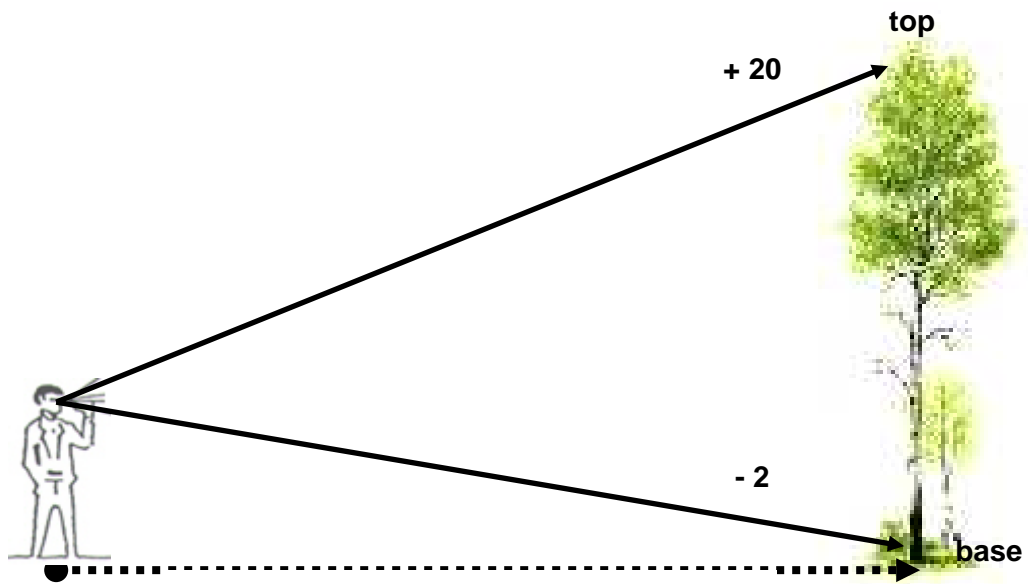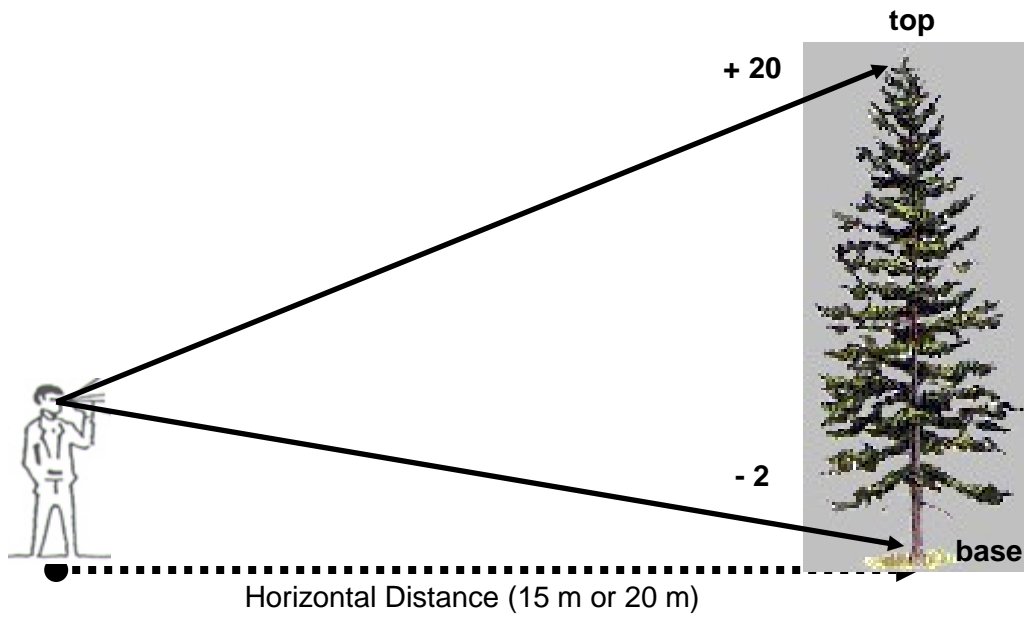
Figure 3.2   Proper tree height measuring techniques

In the example height readings above, the:

    top measurement   = + 20

    base measurement = - 2

Therefore using the formula: (Top minus base)

               + 20 minus − 2

               = 22 m tall tree
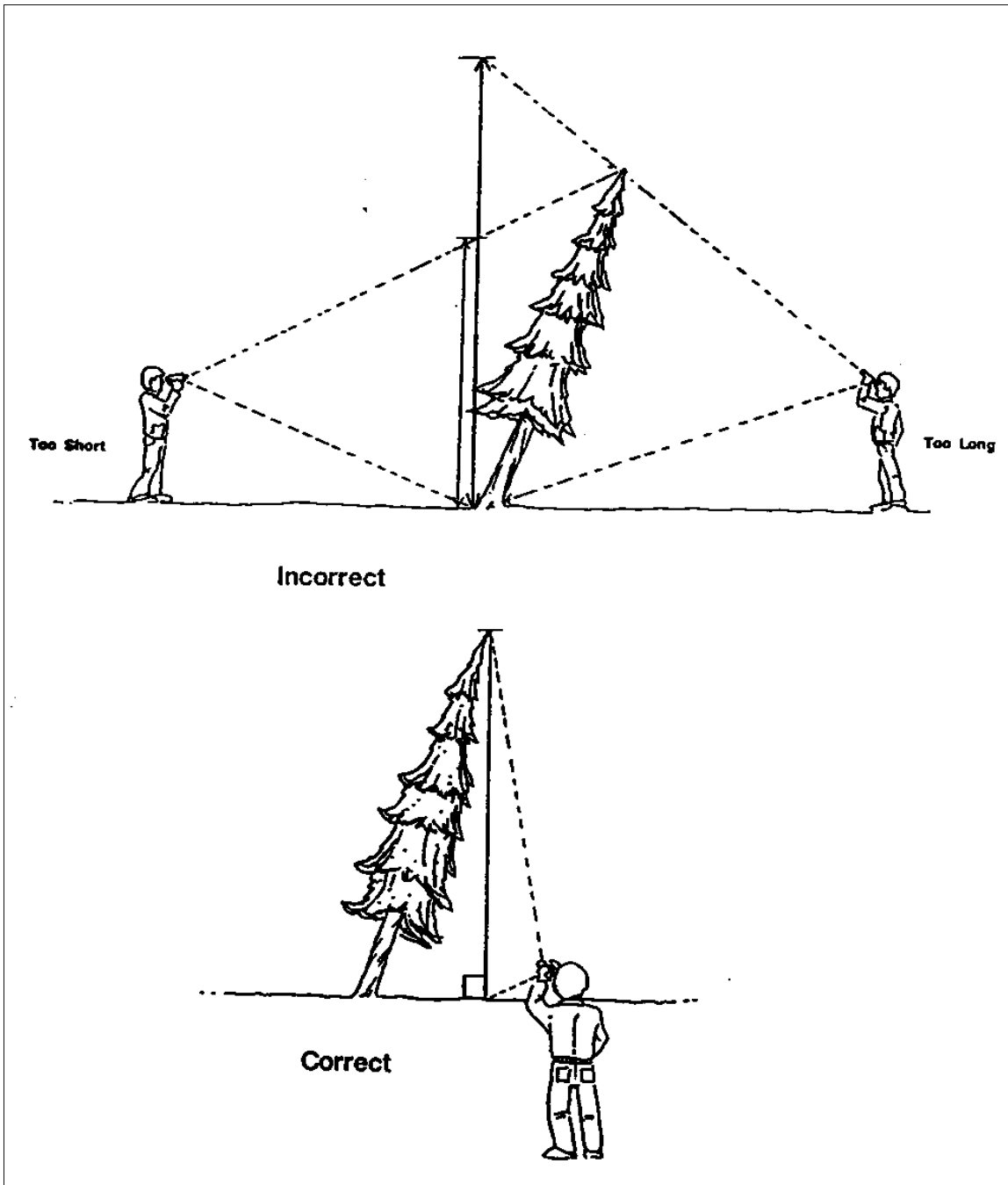
Figure 3.3 Proper tree height measuring techniques for leaning trees.

3.4.4 Age

Using the increment borer, determine the age of a characteristic tree for each dbh class and species, at breast height (1.3 m above ground), and record the number of rings that you count. Do not add an age correction factor. If the tree contains excessive rot, do not attempt to estimate the age, instead, bore another characteristic tree. Ensure ages are taken on large diameter trees and some smaller classes as well.

3.4.5 Count

Using the prism, record the number of 'in' trees that are 12 cm or larger, by species. The tree's dbh must be at least 12 cm to be considered in.

Using a 2.0 m^2/ha Basal Area Factor (BAF) prism, stand directly over the plot center and do a prism sweep. It is very important to hold the prism at exactly 1.3 m in height **and** keep the prism over plot centre (*i.e.* you rotate around the prism). Close your left eye, and look through the prism with your right eye.

The number of trees counted 'in' from the prism sweep is a very critical and sensitive number. Each tree counted 'in' is about 20 m^3/ha or 10-15% of the total volume.

NO TALLY
'OUT'

TALLY
'IN'

BORDERLINE
'?'

Tree image through the wedge prism.
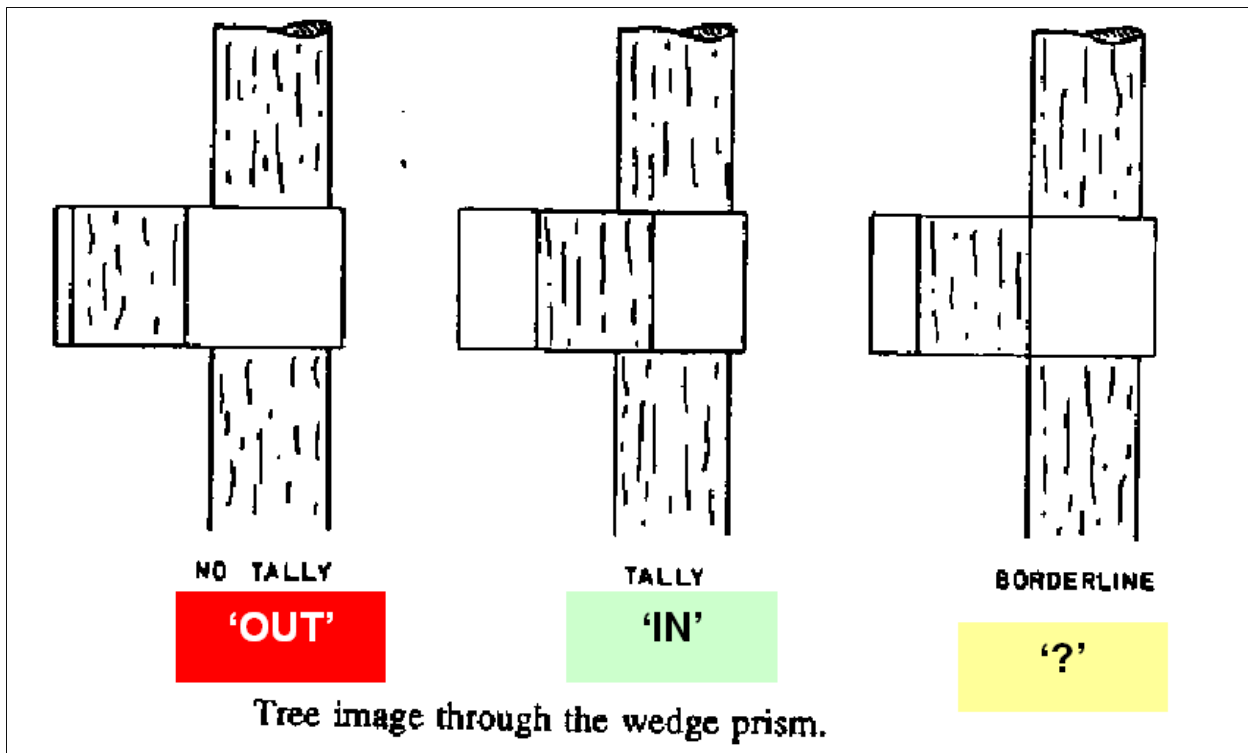
Figure 3.3   Wedge prism tallying technique.

prism held correctly

prism tilted

prism tipped in vertical plane

Prism tipped in the vertical and horizontal planes.
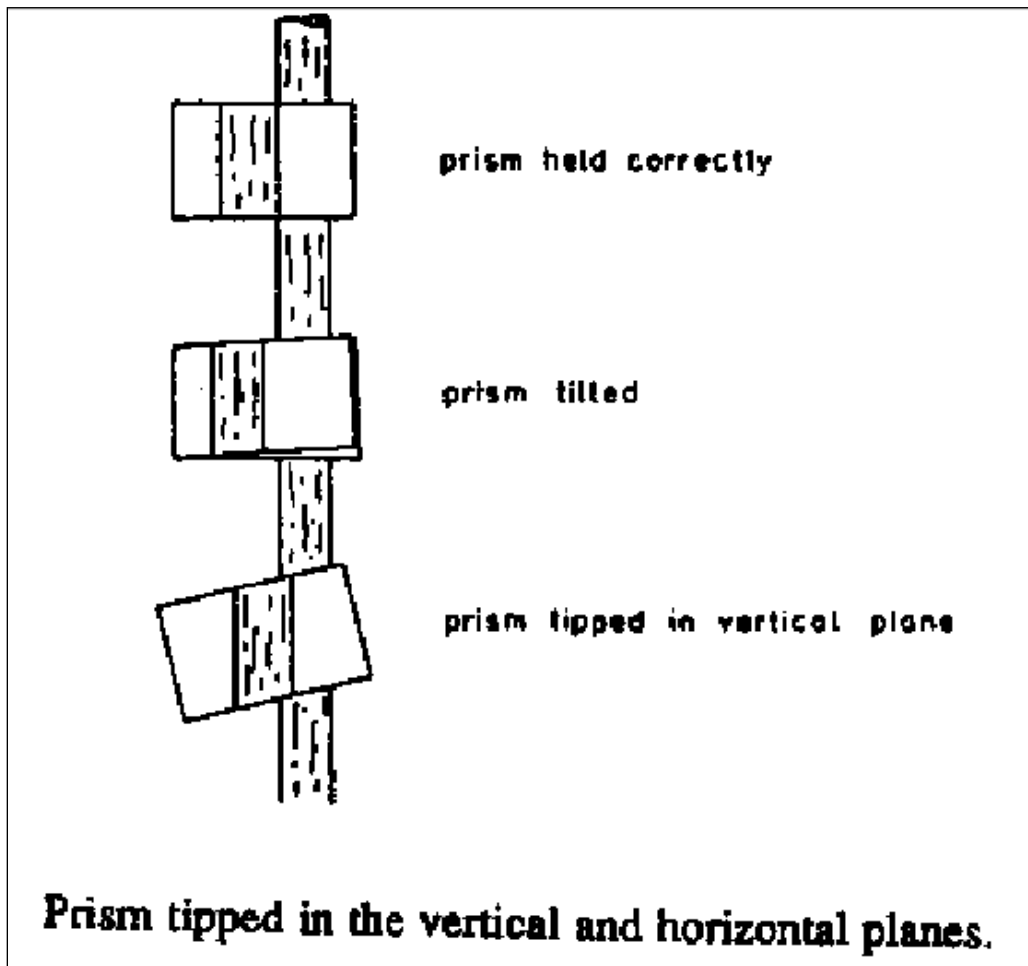
Figure 3.4   Prism proper usage.

3.4.6 Crown Percent – CP

Determine the crown percent on <u>conifer trees only</u> to the nearest 10% (i.e. 10%, 20%, 30%…). This information is used to determine windfirmness of any conifer wildlife trees left behind.

Only record crown percent on conifer trees that are **<u>shorter</u>** than the main canopy. For example, in a mixedwood stand of 22 m aspen and 15 m white spruce, the spruce is shorter than the main canopy and would get a crown percentage. Example 2 – 22 m aspen with 22 m white spruce, <u>don't</u> record crown percentage since the conifer is part of the main canopy.

3.5 GENERAL FOREST HEALTH

The forest health data is recorded as outlined by Manitoba Conservation in "The Forest Health Requirements for the Pre-harvest Assessment Guidelines". Refer to supplemental forest health cards in the PHS field binder.

Record all forest health problems at each plot. At the plot, record the pest, tree species affected, and number of trees that are infected within your 5.64 m radius plot. Also record the presence of that forest health problem from your present plot to the next plot.

3.5.1 Pest Codes

Code	Code	
01 - Dwarf Mistletoe	**05 -** Armillaria Root Rot	**09 -** Yellow Stringy Rot
02 - Western Gall Rust	**06 -** Brown Cubical Rot	**10-** Budworm

03 - Hypoxylon Canker	07 - Hardwood Stem Decay	11 - Poplar Borer
04 - Stem Canker	08 - White Pocket Rot	12 - Root Collar Weevil

3.5.2 Tree Species Affected

Record the tree species affected by the pest (*e.g.* TA, BA, WB, WS…).

3.5.3 Number Trees Affected

Record the number of trees affected (*e.g.* 01, 02, 03 …) within the 100 m^2 plot.

3.5.4 BP (Between Plots) Severity Level

Use the following severity guide for between plots only.

NL	No evidence of forest health problems
L (Low)	One to 5 stems affected between plots, rarely or infrequently seen
M (Moderate)	Six to 20 stems affected between plots, occasionally seen; possibly some openings developing
S (Severe)	More than 21 stems affected; frequently seen throughout the stand; possibly some noticeable large openings formed.

4. VEG AND WILDLIFE

Wildlife 1

Group	Species	Activity	Use
① ⑪	⓪ ⓪	⓪ ⓪	
② ⑫	① ①	① ①	Ⓛ
③ ⑬	② ②	② ②	
④ ⑭	③ ③	③ ③	Ⓜ
⑤ ⑮	④ ④	④ ④	
⑥ ⑯	⑤ ⑤	⑤ ⑤	Ⓗ
⑦ ⑰	⑥ ⑥	⑥ ⑥	
⑧ ⑱	⑦ ⑦	⑦ ⑦	
⑨ ⑲	⑧ ⑧	⑧ ⑧	
⑩ ⑳	⑨ ⑨	⑨ ⑨	

Wildlife 2

Group	Species	Activity	Use
① ⑪	⓪ ⓪	⓪ ⓪	
② ⑫	① ①	① ①	Ⓛ
③ ⑬	② ②	② ②	
④ ⑭	③ ③	③ ③	Ⓜ
⑤ ⑮	④ ④	④ ④	
⑥ ⑯	⑤ ⑤	⑤ ⑤	Ⓗ
⑦ ⑰	⑥ ⑥	⑥ ⑥	
⑧ ⑱	⑦ ⑦	⑦ ⑦	
⑨ ⑲	⑧ ⑧	⑧ ⑧	
⑩ ⑳	⑨ ⑨	⑨ ⑨	

Wildlife 3

Group	Species	Activity	Use
① ⑪	⓪ ⓪	⓪ ⓪	
② ⑫	① ①	① ①	Ⓛ
③ ⑬	② ②	② ②	
④ ⑭	③ ③	③ ③	Ⓜ
⑤ ⑮	④ ④	④ ④	
⑥ ⑯	⑤ ⑤	⑤ ⑤	Ⓗ
⑦ ⑰	⑥ ⑥	⑥ ⑥	
⑧ ⑱	⑦ ⑦	⑦ ⑦	
⑨ ⑲	⑧ ⑧	⑧ ⑧	
⑩ ⑳	⑨ ⑨	⑨ ⑨	

Wildlife 4

Group	Species	Activity	Use
① ⑪	⓪ ⓪	⓪ ⓪	
② ⑫	① ①	① ①	Ⓛ
③ ⑬	② ②	② ②	
④ ⑭	③ ③	③ ③	Ⓜ
⑤ ⑮	④ ④	④ ④	
⑥ ⑯	⑤ ⑤	⑤ ⑤	Ⓗ
⑦ ⑰	⑥ ⑥	⑥ ⑥	
⑧ ⑱	⑦ ⑦	⑦ ⑦	
⑨ ⑲	⑧ ⑧	⑧ ⑧	
⑩ ⑳	⑨ ⑨	⑨ ⑨	

Wildlife 5

Group	Species	Activity	Use
① ⑪	⓪ ⓪	⓪ ⓪	
② ⑫	① ①	① ①	Ⓛ
③ ⑬	② ②	② ②	
④ ⑭	③ ③	③ ③	Ⓜ
⑤ ⑮	④ ④	④ ④	
⑥ ⑯	⑤ ⑤	⑤ ⑤	Ⓗ
⑦ ⑰	⑥ ⑥	⑥ ⑥	
⑧ ⑱	⑦ ⑦	⑦ ⑦	
⑨ ⑲	⑧ ⑧	⑧ ⑧	
⑩ ⑳	⑨ ⑨	⑨ ⑨	

Wildlife 6

Group	Species	Activity	Use
① ⑪	⓪ ⓪	⓪ ⓪	
② ⑫	① ①	① ①	Ⓛ
③ ⑬	② ②	② ②	
④ ⑭	③ ③	③ ③	Ⓜ
⑤ ⑮	④ ④	④ ④	
⑥ ⑯	⑤ ⑤	⑤ ⑤	Ⓗ
⑦ ⑰	⑥ ⑥	⑥ ⑥	
⑧ ⑱	⑦ ⑦	⑦ ⑦	
⑨ ⑲	⑧ ⑧	⑧ ⑧	
⑩ ⑳	⑨ ⑨	⑨ ⑨	

Watercourse

Type	Width	Bank	Sub 1	Sub 2	Sub 3	Fish
		⓪ ⓪				
①	①	① ① ①	①	①	①	
②	②	② ② ②	②	②	②	
③	③	③ ③ ③	③	③	③	
④	④	④ ④ ④	④	④		
	⑤	⑤ ⑤ ⑤	⑤	⑤		
	⑥	⑥ ⑥ ⑥	⑥	⑥		
	⑦	⑦ ⑦				
	⑧	⑧ ⑧				
	⑨	⑨ ⑨				

DWM

Class	% Cover
①	① ② ③ ④ ⑤ ⑥
②	① ② ③ ④ ⑤ ⑥
③	① ② ③ ④ ⑤ ⑥
④	① ② ③ ④ ⑤ ⑥
⑤	① ② ③ ④ ⑤ ⑥

4.1 VEG AND WILDLIFE HEADER

The top one-third of the Veg and Wildlife bubble card sheet contains bubbles for header information:

- Operating Area
- Plot
- Block Number
- Cruiser
- Date

4.2 UNDERSTORY

The understory data is collected in the 5.64-meter radius circular plot (100 m^2). Up to six occurrences of understory can be recorded on the bubble card.

Conifer understory trees have:

- a height that is less than 10.1 meters tall
- a height that is greater than 0.25 m

Hardwood understory trees are not tallied if their dbh >12 cm.

4.2.1 Understory Species
Each species and height class group must be recorded, both hardwood and softwood. Again, hardwood understory trees are not tallied if their dbh >12 cm.

4.2.2 Understory Height Class Code (HT CL)
1 6-10 meters

2 2-6 meters

3 0.25-2 meters

4.2.3 Understory Count
The number of understory trees in the 100 m^2 plot. Please fill in both bubbles (*e.g.* one tree is recorded as '01', not just '1').

4.3 SNAGS

Snag data must be collected in the 5.64-meter radius plot (100 m^2) for all snags <u>greater than 1 meter</u> in height:

4.3.1 Snag Class (CL)
Classify snags using height and branch form of each individual tree using snag decay classes 1 to 5. If there are no snags, use the NL (nil) bubble.
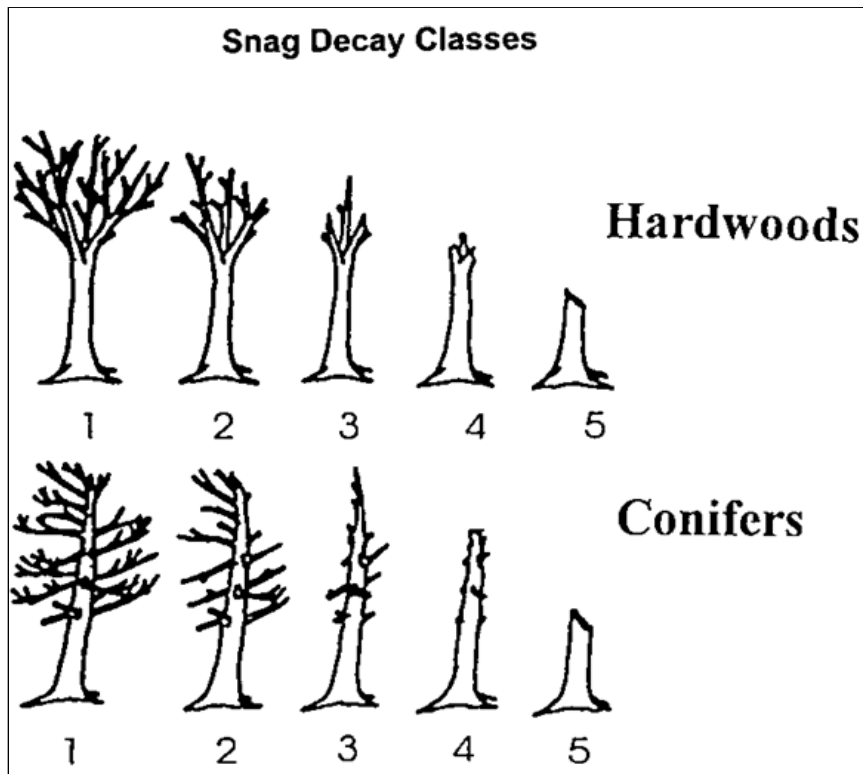
Figure 4.1   Snag decay classes.

	Tree Top	Branches	Bark
Decay Class **1** *(recently dead)*	intact	most fine branches still present	intact
Decay Class **2**	intact	most fine branches have dropped	bark loosening
Decay Class **3**	intact	fewer than 50% of coarse branches are left	may or may not have sloughed off (WB holds bark longer)
Decay Class **4** *(height at least 6m)*	broken	no coarse branches are left	may or may not have sloughed off
Decay Class **5** *(height less than 6m)*	stub	no coarse branches are left	may or may not have sloughed off

note: trees that have died before attaining a height of 6 m should be assessed using the diagrams (they are not automatically Decay Class 5). Similarly, if the tree has never attained a height of 6 m, it cannot be coded as Decay Class 4.

4.3.2 Snag DBH Class

Record groups of snags of the same DBH, species and snag decay class. If any of the snag characteristics (DBH, Species, and class) differ, record it as another group of snag(s).

The snag DBH codes are:

Code	DBH
1	<10 cm
2	10 cm-15 cm
3	15 cm-25 cm
4	25 cm-30 cm
5	>30 cm

4.3.3 Snag Species (Sp.)

Choose either hardwood (HW) or softwood (SW).

4.3.4 Snag Count

Count the **number** of both hardwood and softwood snags.

4.4 WILDLIFE ACTIVITY

Wildlife 1			
Group	Species	Activity	Use
① ⑪	⓪ ⓪	⓪ ⓪	
② ⑫	① ①	① ①	Ⓛ
③ ⑬	② ②	② ②	
④ ⑭	③ ③	③ ③	Ⓜ
⑤ ⑮	④ ④	④ ④	
⑥ ⑯	⑤ ⑤	⑤ ⑤	Ⓗ
⑦ ⑰	⑥ ⑥	⑥ ⑥	
⑧ ⑱	⑦ ⑦	⑦ ⑦	
⑨ ⑲	⑧ ⑧	⑧ ⑧	
⑩ ⑳	⑨ ⑨	⑨ ⑨	

The wildlife data is collected within the 100 m2 (5.64 m radius circular plot) established at the center of the plot. Within the circular plot assess the following wildlife activity:

4.4.1 Wildlife (Species) Group
Groups of species are shown below.

1) Carnivores	2) Grouse	3) Rodents & Lagomorphs	7) Ungulates

4.4.2 Wildlife Species

The wildlife species is very important but may not always be determinable (*e.g.* moose browse *vs*. elk browse). If the species cannot be identified, leave the bubbles blank.

1) Carnivores	2) Grouse	3) Rodents & Lagomorphs	7) Ungulates
01) black bear	01) Ruffed Grouse	01) Mice	01) Caribou
02) Coyote	02) Sharptail Grouse	02) Shrews	02) Elk
03) Ermine	03) Spruce Grouse	03) Snowshoe Hare	03) Deer
04) Fisher		04) Squirrel	04) Moose
05) Fox	XX) woodpeckers (new for 2009+)	05) Vole	
06) Lynx		06) Woodchuck	
07) Marten		07) Beaver	
08) Skunk		08) Porcupine	
09) Wolf			
10) Mink			

4.4.3 Wildlife Activity

Wildlife activity codes are:

02 –Browse

06 – Scat

09 – Tracks or trails

Browse - look for the presence of preferred browse species such as red osier dogwood, birch, aspen, poplar, mountain maple, and willow. Locate up to a maximum of 10 plants of the top 3 species present. Assign percent browsed by determining the number of shrubs browsed over those available and assign browsing pressure.

4.4.4 Wildlife Use

L - low	M - Medium	H - High
1-3 plants browsed	4-6 plants browsed	7-10 plants browsed
1-2 pellet groups	3-4 pellet groups	5+ pellet groups

4.5 WATERCOURSE

All watercourses encountered must be mapped and classified. When crossing a watercourse record the following information:

4.5.1 Watercourse Type

<u>1- Permanent</u> Channels that are characterized by water flowing continuously throughout the year. These channels also possess continuous definable banks. 	**<u>2) In-block swale</u>** Channels that <u>do not</u> possess continuous definable banks and flow only at certain times of the year (*e.g.* spring melt, heavy precipitation events).
<u>3- Beaver Flood</u> Channel flooding occurring as a result of dam construction by beavers. Can be found along stream channels or in wetland environments. 	**<u>4 - Seasonal</u>** Channels that flow briefly in response to precipitation events and possess continuous definable banks.

4.5.2 Watercourse Width

Watercourse width is the bank-to-bank channel width. Codes are:

1 <0.5 meters

2 0.5 to 1.0 meters

3 1.0 to 2.0 meters

4 > 2 meters

Write estimated channel width on PHS grid map if class 4 (greater than 2 meters).

4.5.3 Watercourse Bank Height

Measure stream bank height in meters to 1 decimal (*e.g.* 0.9 m, 1.1 m, 1.2 m).

4.5.4 Substrate 1, 2 & 3

Up to three types of substrate (stream bottom type) can be recorded on the bubble card (Sub1, Sub2, and Sub3). List the most dominant substrate type first.

	Substrate Type	Description	
<u>1</u>	<u>**Rubble/**</u> **Cobble**	rocks with a maximum length of 64 -256 mm	
2	**Gravel**	rocks with a maximum length 2 - 64 mm	
3	**Sand**	inorganic particles - maximum length .062 - 2 mm	
4	**Silt**	fine inorganic particles - maximum length .004 -.062 mm	
5	**Clay**	Very fine particles – texture is gummy and sticky; maximum length .004 mm.	
6	**Muck**	soft material largely of organic origin without sand or gravel intermixed but composed of silt and clay	

4.5.5 Fish Presence

Choose one of the three possibilities:

1 Fish - visually observed (even minnows);

2 No Fish – use if no defined channel (*e.g.* alder swale, small wetland); or

3 Unknown – use if defined channel and no fish observed.

4.5.6 Watercourse Mapping

Ensure that all watercourses are mapped on the PHS sketch map and an <u>arrow defines direction of flow</u>. Where possible, map the whole reach of the watercourse that falls within the proposed harvest block. Also indicate whether the stream has FLOW (F) or whether it is DRY (D) on the map.
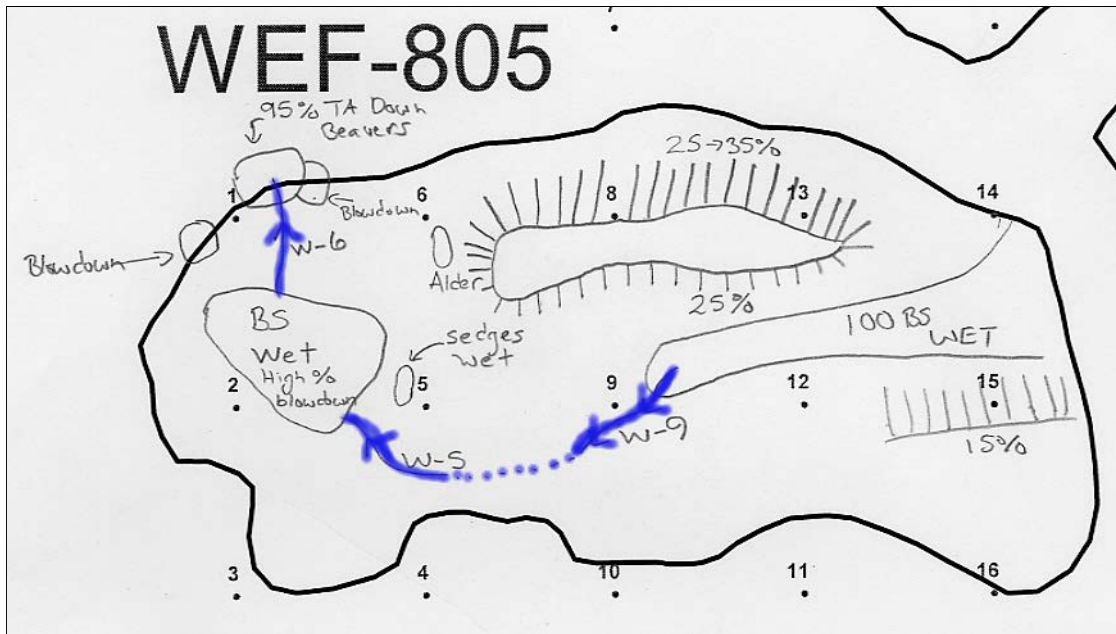
Figure 4.2   Well-mapped watercourses on a PHS sketch map.

All watercourses are numbered according to the plot number it follows. In the WEF-805 sketch map above, a watercourse was discovered on the way to plot 9 (from plot 12). Therefore, the watercourse is labeled W-9, and the field card in which to enter data on would be for plot 9.
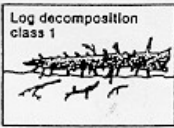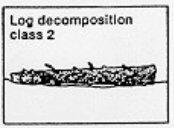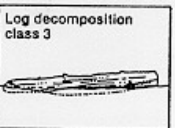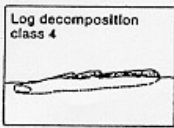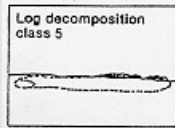
4.6 DOWNED WOODY MATERIAL

Within the 5.64-meter radius circular plot (100 m^2), determine the percent cover for each of the five DWM Classes (not all five may be present).

4.6.1 Decomposition Class

There are five classes are based on level of decomposition. Class 1 is recently fallen while class 5 is very decomposed.

Log Attributes	Log Decomposition Class				
	Log decomposition class 1	Log decomposition class 2	Log decomposition class 3	Log decomposition class 4	Log decomposition class 5
	1	**2**	**3**	**4**	**5**
Bark	intact	intact	trace	absent	absent
Twigs < 3 cm	present	absent	absent	absent	absent
Texture	intact	intact to partly soft	hard, large pieces	small, soft, blocky pieces	soft and powdery
Shape	round	round	round	round to oval	oval
Colour of Wood	original colour	original colour	original colour faded	light brown to faded brown or yellowish	faded to light yellow or gray
Portion of Log on Ground	log elevated on support points	log elevated on support points, but sagging slightly	log is sagging near ground	all of log on ground	all of log on ground

4.6.2 Percent Cover

The percent cover classes of DWM are:

Code	Cover %
1	<1%
2	1-10%
3	11-25%
4	26-50%
5	51-75%
6	76-100%

5. ECOSYSTEM SUMMARY

Ecosystem Summary
LP Canada Ltd.

Operating Area
Plot

A B C D E F G H I J K L M N O P R S T U V W Y   0 0 0
A B C D E F G H I J K L M N O P R S T U V W Y   1 1 1
A B C D E F G H I J K L M N O P R S T U V W Y   2 2 2

Block Number
Ecosite

0 1 2 3 4 5 6 7 8 9   0 1 2 3 4 5 6 7 8 9   3 3 3
0 1 2 3 4 5 6 7 8 9   0 1 2 3 4 5 6 7 8 9   4 4 4
0 1 2 3 4 5 6 7 8 9   5 5 5

V-Type
0 1 2 3   6 6 6

Cruiser
0 1 2 3 4 5 6 7 8 9   0 1 2 3 4 5 6 7 8 9   7 7 7
0 1 2 3 4 5 6 7 8 9   8 8 8

Site Position
1 2 3 4 5 6 7   9 9 9

OVERSTOREY Cover

SppA%	SppB%	SppC%	CC
TA 1	TA 1	TA 1	0 0
BA 2	BA 2	BA 2	1 5
WB 3	WB 3	WB 3	2
WS 4	WS 4	WS 4	3
BS	BS	BS	4
JP	JP	JP	5
EL	EL	EL	6
AS	AS	AS	7
TL	TL	TL	8
BF	BF	BF	9
MM	MM	MM	

SHRUBS Cover

Comp	SppB %	SppC %
0 0 1	0 0 1	0 0 1
1 1 2	1 1 2	1 1 2
2 2 3	2 2 3	2 2 3
3 3 4	3 3 4	3 3 4
4 4	4 4	4 4
5 5	5 5	5 5
6 6	6 6	6 6
7 7	7 7	7 7
8 8	8 8	8 8
9 9	9 9	9 9

INDICATORS

Spp 1	Spp 2
0 0 0	0 0 0
1 1 1	1 1 1
2 2 2	2 2 2
3 3 3	3 3 3
4 4 4	4 4 4
5 5 5	5 5 5
6 6 6	6 6 6
7 7 7	7 7 7
8 8 8	8 8 8
9 9 9	9 9 9

HERBS Cover

Comp	SppB %	SppC %
0 0 1	0 0 1	0 0 1
1 1 2	1 1 2	1 1 2
2 2 3	2 2 3	2 2 3
3 3 4	3 3 4	3 3 4
4 4	4 4	4 4
5 5	5 5	5 5
6 6	6 6	6 6
7 7	7 7	7 7
8 8	8 8	8 8
9 9	9 9	9 9

MOSS Cover

SppA %	SppB %	SppC %
0 0 1	0 0 1	0 0 1
1 1 2	1 1 2	1 1 2
2 2 3	2 2 3	2 2 3
3 3 4	3 3 4	3 3 4
4 4	4 4	4 4
5 5	5 5	5 5
6 6	6 6	6 6
7 7	7 7	7 7
8 8	8 8	8 8
9 9	9 9	9 9

SOILS

HORIZONS

Thickness(cms)	⓪ ① ② ③ ④
L,F,H	⓪ ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

A1	Thickness (cms)
Ⓐⓗ Ⓐⓔ	⓪ ① ② ③ ④
ⒶⒷ Ⓝ/Ⓐ	⓪ ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

A2	Thickness (cms)
Ⓐⓗ Ⓐⓔ	⓪ ① ② ③ ④
ⒶⒷ	⓪ ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

B1	Thickness (cms)
Ⓑⓝ Ⓑⓕ Ⓑⓗ	⓪ ① ② ③ ④ ⑤ ⑥
ⒷⒸ Ⓝ/Ⓐ	⓪ ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨
Modifier	⓰ ① Ⓚ

B2	Thickness (cms)
Ⓑⓝ Ⓑⓕ Ⓑⓗ	⓪ ① ② ③ ④ ⑤ ⑥
ⒷⒸ	⓪ ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨
Modifier	⓰ ① Ⓚ

B3	Thickness (cms)
Ⓑⓝ Ⓑⓕ Ⓑⓗ	⓪ ① ② ③ ④ ⑤ ⑥
ⒷⒸ	⓪ ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨
Modifier	⓰ ① Ⓚ

C1	Ⓨ Ⓝ
Modifier	⓰ ① Ⓚ Ⓧ

MOTTLES	Ⓨ Ⓝ
Depth to	⓪ ①
Mottles	⓪ ① ② ③ ④ ⑤
(cms)	⓪ ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨
Thickness of	⓪ ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨
Mottles (cms)	⓪ ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

TEXTURE

Surface	⓪ ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨
0 - 20 cm	⓪ ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨
C	⓪ ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨
	⓪ ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

Coarse Fragments

Gravelly	Cobbly	Stoney
0.2 - 7.5cm	7.5 - 25cm	25 - 60cm
①	②	③

Soil Moisture Regime

⊖① ⓪ ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

Drainage Class

ⓋⓅ Ⓟ Ⓘ ⓂⓌ Ⓦ Ⓡ ⓋⓇ

Ecological Moisture Regime

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

Soil Nutrient Regime

ⓋⓅ Ⓟ Ⓜ Ⓡ ⓋⓇ

S-Type

Ⓢ ⓈⓈ ⓈⓉ

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

⑩ ⑪ ⑫ ⑫Ⓢ ⑫Ⓑ

5.1 ECOSYSTEM SUMMARY HEADER

The top one-third of the Ecosystem Summary bubble card sheet contains bubbles for header information:

- o Operating Area
- o Plot
- o Block Number
- o Cruiser

5.2 ECOSITE

Ecosites can only be keyed out on PHS plots that have a soil pit. However, an ecosite applies to an entire stand. Ecosites are unique and distinct combinations of soil moisture, 'C' horizon soil texture and vegetation, as shown in the table below.

Ecosites are at the stand-level scale, while FEC V-types are at the sub-stand (100 m^2) or ecoelement scale.

Ecosite field keys are shown below.

PROPOSED SCHEMATIC KEY TO PHOTO INTERPRETATION OF NON-FORESTED WETLAND ECOSITES - DUCK MOUNTAIN AREA
DRAFT - December 21, 2000

START

1 Is the site treed (> 6% cover) — Yes → Assign Primary Ecosite Attributes to polygon

No ↓

2 IS THE AREA WETLAND?

N → Use AVI classes for natural non-vegetated features, e.g.,
- Exposed sand (beach ridges)
- Steep bluff
- Eroded cut bank
- Grassland/prairie

Y ↓

3 SITE DOMINATED BY TALL SHRUBS (ALDER / WILLOW) cover ≥ 30%

N — **4** SITE IS SEASONALLY FLOODED BY LAKE OR STREAM OR HAS POOLS OF WATER ≥ 25% COVER

Y → WE4 Thicket Swamp

4 N → **5** HYDROLOGICALLY ISOLATED (without evidence of groundwater flow) Black spruce > Larch

4 Y → **7** Emergent vegetation cover is ≥ 25%

5 Y → WE1 Open Bog low shr

5 N → **6** EVIDENCE OF STRONG GROUNDWATER MOVEMENT, WELL-DEVELOPED STRING PATTERN OF WATER

6 N → WE2 Open Poor Fen low shr

6 Y → WE3 Open Rich Fen

7 Y → Emergent vegetation cover is > 80%

7 N → **10** SHORES SHELTERED

7 (emergent > 80%) Y → **8** Edge of wetland is sharply demarcated from open water, shrub dominated

7 (emergent > 80%) N → **9** SHORES SHELTERED

8 Y → WE5 Shore Fen

8 N → WE6 Meadow Marsh

9 Y → WE7 Sheltered Marsh

9 N → WE8 Exposed Marsh

10 Y → WE9 Open Water Marsh Floating-Leaved Peat Substrate

10 N → WE10 Open Water Marsh Submergent Mineral Substrate

Open Bogs	Isolated Fens with Groundwater Movement	Fens and Marshes Adjacent to Water Features	Open Water Marshes	Terrestrial Thicket Swamps

Field Key to Forested Ecosites of the Mid-Boreal Upland Ecoregion of Manitoba

Start

Polygon is mainly wet organic soil (peat depth is 40 cm or more) — Yes → Ⓐ

No

SMR θ, 0, 1, 2, or 3   **SMR 4, 5 or 6**   Go to Page 2

Soil moisture is mainly dry to fresh (mottles, if present, are below 60 cm of the mineral soil surface [Note: use 50 cm for vcS, cS, mS, LvcS, LcS, LmS]) — No (moisture regime is moist) → Ⓑ

Yes

Soil texture is Sandy (moist soil will not form a cast or ribbon) i.e. texture is vcS, cS, mS, fS, LvcS, LcS, LmS, LfS — No → Soil texture is Coarse Loamy to Silty (moist soil will form a cast or will form flakes, but will not ribbon) i.e texture is vfS, LvfS, SiS, SL, L, SiL, Si — No → Soil texture is Fine Loamy to Clayey (moist soil will form a ribbon at least 2.5 cm long) i.e. texture is SCL, SiCL, CL, SC, SiC, C

Yes

Canopy is mainly white birch (50-100%)

Yes — Canopy is mainly white birch (50-100%)

Yes — Soil texture is clayey, lacustrine (i.e. SiC or C, with no coarse fragments)

No

No   Yes   No — Canopy is pure hardwood (80-100%)   Yes — No — Canopy is pure hardwood (80-100%)

Yes   No   Yes   No

Canopy is pure hardwood (80-100%)   Conifer species are mainly WS and/or BF   Yes — Canopy is mainly hardwood (50-100%)

Yes   Yes   No   No

Hardwoods are 20-79% of canopy   Yes   No   Hardwoods are 20-49% of canopy

(Conifer species mainly JP and/or BS)   Yes   No

Yes   No   Conifer species mainly WS and/or BF

Yes   No

11 **12** **13**   **21** **22** **23** **24**   **31** **32** **33** **34** **35** **36**

Dry to Fresh Sandy Soils			Fresh Coarse Loamy to Silty Soils			Fresh Fine Loamy to Clayey Soils					
TA-BA hdwd	TA-JP mxwd	JP-BS	WB mxwd	TA hdwd	TA-WS mxwd	JP-BS mxwd	TA-BA mxwd	TA-BA hdwd	TA-BA mxwd	WS-BF mxwd	JP-BS mxwd	BS-JP-(WS-BF) Feathermoss

Field Key to Forested Ecosites of the Mid-Boreal Upland Ecoregion of Manitoba

Ⓐ —— (wet organic soil)

Ⓑ → Soil moisture is mainly moist (mottles or gley colors are present within 60 cm of mineral soil surface [Note: use 50 cm for vcS, cS, mS, LvcS, LcS, LmS])

↓ Yes

Soil texture is sandy to silty (moist soil will not form a ribbon) i.e. texture is any sand or loamy sand, SiS, SL, L, SiL, or Si —— No → Soil texture is Fine Loamy to Clayey (moist soil will form a ribbon at least 2.5 cm long) i.e. texture is CL, SiCL, SCL, SC, SIC, or C

Yes ↓

Other hardwoods (WE, GA, MM) are 25-100% of canopy —— Yes —— Yes

No

Canopy is pure hardwood (80-100%)

No

Conifer species mainly WS and/or BF

Yes / No

(Conifer species mainly JP and/or BS)

Yes ↓

Other hardwoods (WE, GA, MM) are 25-100% of canopy

No

Canopy is pure hardwood (80-100%)

No

Conifer species mainly WS and/or BF

Yes / No

(Conifer species mainly JP and/or BS)

Yes

Stand is unproductive (dominant height of mature trees is less than 10 m)

No / Yes

Larch is 25-100% of canopy

No / Yes

Speckled alder cover is 10-100%

No / Yes

Yes

41	42	43	44	51	52	53	61	62	63	64
Moist Sandy to Silty Soils				Moist Fine Loamy to Clayey Soils			Wet Organic Soils			
TA-BA hdwd	WS-BF mxwd	BS-JP Feathermoss	WE-GA-MM	TA-BA hdwd	TA-WS-JP mxwd	BS-(JP) Feathermoss	BS-(WS) Labrador-tea	BS Alder	TL-BS Sedge	BS-(JP) Sphagnum

5.3 VEGETATION TYPE (V-TYPE)

The Manitoba Forest Ecosystem Classification (FEC) field guide was developed by Zoladeski *et al.* 1995, and is a calibration of the North Western Ontario FEC (Sims *et al.* 1990). The Manitoba FEC classifies vegetation into 33 V-types (V1, V2, V3…V33) and soils into 22 S-Types. Separate field keys are provided for classifying vegetation and for classifying soils. Average conditions of V-types and S-types are described in factsheets.

Using the overstory cover, vegetation cover and timber cruise information, determine the V-type from the FEC V-type key. To determine the correct V-type, you must look around the area, not only at the area within the 100 m^2 PHS plot. If a plot falls within a large area that cannot be classified to an FEC V-type, the code 00 should be recorded (*i.e.* opening, beaver flood). A V-type of 00 would have nothing recorded in the timber cruise for that plot.

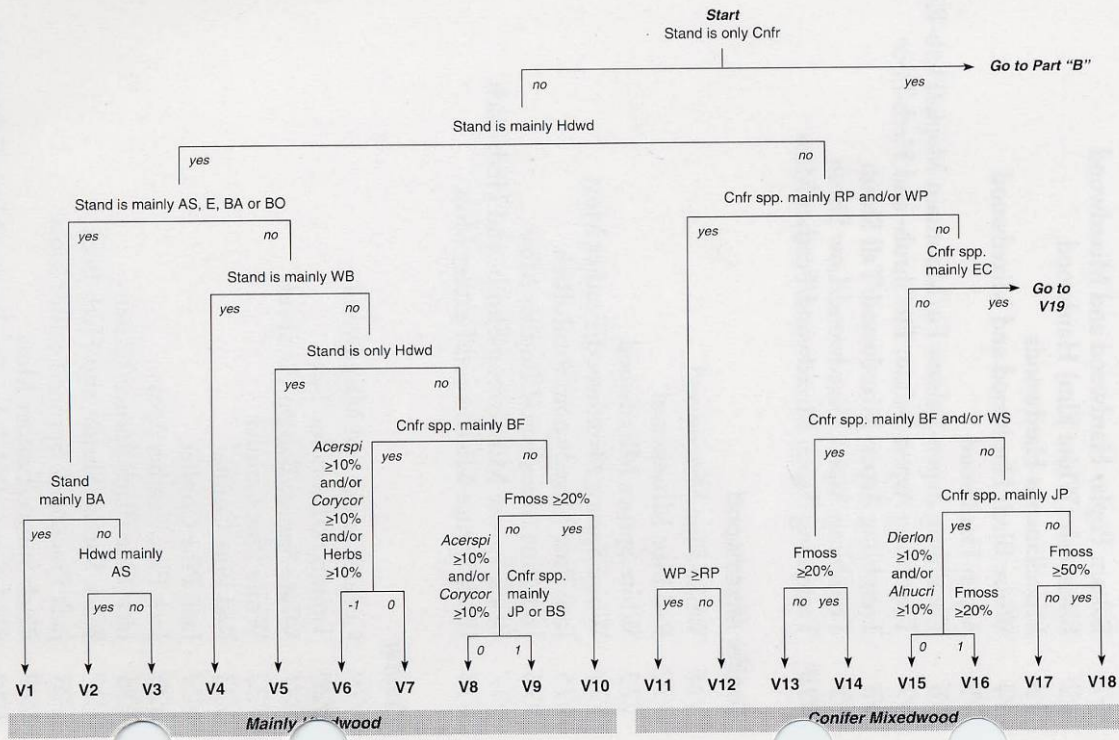|	Hardwood and hardwood mixedwood V-types		Conifer V-types	
V1	BA hardwood and mixedwood	V19	cedar conifer and mixedwood	
V2	black ash (WE) hardwood	V20	TL / lab tea	
V3	misc hardwoods	V21	WS/BF shrub	
V4	WB hardwood and mixedwood	V22	WP conifer	
V5	TA hardwood	V23	RP conifer	
V6	TA-BF mountain maple/herb-rich	V24	JP conifer	
V7	TA-BF shrub and herb-poor	V25	JP / Feather moss	
V8	TA mixedwood / tall shrub	V26	JP-BS / lichen	
V9	TA mixedwood / low shrub	V27	BS shrub & herb-poor	
V10	TA mixedwood / Feather moss	V28	JP-BS / Feather moss	
	Conifer Mixedwood V-types	V29	BS / Feather moss	
V11	WP mixedwood	V30	BS / lab tea / Feather moss (Sphagnum)	
V12	RP mixedwood	V31	BS / herb-rich / Sphagnum (Fmoss)	
V13	WS mixedwood	V32	BS / herb-poor / Sphagnum (Fmoss)	
V14	WS mixedwood / Feather moss	V33	BS / Sphagnum	
V15	JP mixedwood / shrub-rich			
V16	JP mixedwood / shrub & herb-rich			
V17	BS mixedwood / shrub & herb-rich			
V18	BS mixedwood / Feather moss			

shaded V-types do not occur or rarely occur in the Mountain Forest Section

Manitoba FEC Vegetation Key - Part A
(Scientific Names of Understory Species)

Start
Stand is only Cnfr

- no → Stand is mainly Hdwd
- yes → **Go to Part "B"**

Stand is mainly Hdwd
- yes → Stand is mainly AS, E, BA or BO
- no → Cnfr spp. mainly RP and/or WP

Stand is mainly AS, E, BA or BO
- yes → Stand mainly BA
- no → Stand is mainly WB

Stand is mainly WB
- yes
- no → Stand is only Hdwd

Stand is only Hdwd
- yes → Acerspi ≥10% and/or Corycor ≥10% and/or Herbs ≥10%
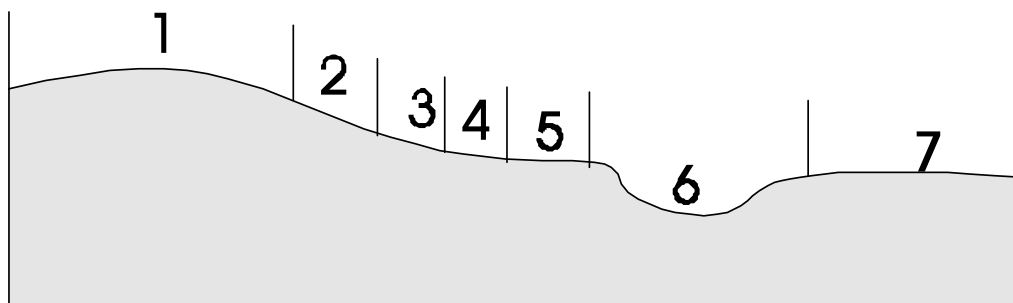- no → Cnfr spp. mainly BF

Stand mainly BA
- yes → V1
- no → Hdwd mainly AS
  - yes → V2
  - no → V3

V4

Acerspi ≥10% and/or Corycor ≥10% and/or Herbs ≥10%
- -1 → V5
- 0 → V6

Cnfr spp. mainly BF
- yes → Acerspi ≥10% and/or Corycor ≥10%
- no → Fmoss ≥20%

Acerspi ≥10% and/or Corycor ≥10% → V7

Fmoss ≥20%
- no → Cnfr spp. mainly JP or BS
  - 0 → V8
  - 1 → V9
- yes → V10

Cnfr spp. mainly RP and/or WP
- yes → WP ≥RP
  - yes → V11
  - no → V12
- no → Cnfr spp. mainly EC

Cnfr spp. mainly EC
- no → Cnfr spp. mainly BF and/or WS
- yes → **Go to V19**

Cnfr spp. mainly BF and/or WS
- yes → Fmoss ≥20%
  - no → V13
  - yes → V14
- no → Cnfr spp. mainly JP

Cnfr spp. mainly JP
- yes → Dierlon ≥10% and/or Alnucri ≥10%
  - 0 → V15
  - 1 → Fmoss ≥20%
    - no → V16
    - yes → V16
- no → Fmoss ≥50%
  - no → V17
  - yes → V18

V1 | V2 | V3 | V4 | V5 | V6 | V7 | V8 | V9 | V10 | V11 | V12 | V13 | V14 | V15 | V16 | V17 | V18

Mainly Hardwood | *Conifer Mixedwood*

Manitoba FEC Vegetation Key - Part B
(Scientific Names of Understory Species)

Start
Stand is only Cnfr

- yes → Stand is mainly TL or EC
- no → **Go to Part "A"**

Stand is mainly TL or EC
- yes → Stand is mainly EC
- no → Stand is mainly WS

Stand is mainly WS
- yes → WP ≥RP
- no → Stand is mainly RP and/or WP

Stand is mainly RP and/or WP
- yes
- no → WS BF BS / Arctuva
  - 0 → Lichen ≥20% and/or Bedrock ≥20%
  - 1 → Ratio Fmoss : Sphagnum ≥ 2 :1

Ratio Fmoss : Sphagnum ≥ 2 :1
- yes → Lichen ≥20% and/or Bedrock ≥20% / TL Vaccoxy Smiltri Ledugro ≥10% Alnurug ≥10% Sphag spp. ≥10%
- no → BS ave ht <10 m

Lichen ≥20% and/or Bedrock ≥20%
- no → Fmoss ≥50%
- yes

TL Vaccoxy Smiltri Ledugro ≥10% Alnurug ≥10% Sphag spp. ≥10%
- yes → Fmoss ≥50%
  - no
  - yes → JP ≥10%
- no
  - 0 → Fmoss ≥50%
  - 1

BS ave ht <10 m
- no → Herbs ≥10%
- yes

Stand is mainly EC
- yes → V19
- no → V20

V21

WP ≥RP
- yes → V22
- no → V23

Fmoss ≥50%
- no → V24
- yes → V25

V26

Fmoss ≥50%
- no → V27
- yes → JP ≥10%

JP ≥10%
- yes → V28
- no → V29

V30

Herbs ≥10%
- yes → V31
- no → V32

V33

V19 | V20 | V21 | V22 | V23 | V24 | V25 | V26 | V27 | V28 | V29 | V30 | V31 | V32 | V33

Conifer

5.4 SITE POSITION

Site position is to be recorded at each plot and is determined using the following table:

	1 **Crest**	2 **Upper slope**	3 **Middle slope**	4 **Lower slope**	5 **Toe**	6 **Depression**	7 **Level**
Description	The upper most portion of a slope, shape usually convex in all directions with no distinct aspect.	The upper portion of the slope immediately below the crest, slope shape usually convex with a specific aspect.	The area of the slope between the upper slope and the lower slope, where the slope is usually straight with a specific aspect.	The lower portion of the slope immediately above the toe, slope shape usually concave with a specific aspect.	The lower most portion of the slope immediately below and adjacent to the lower slope, slope shape concave grading rapidly to level with no distinct aspect.	Any area that is concave in all directions, usually at the toe of a slope or within level topography.	Any level area excluding toe slopes, generally horizontal with no distinct aspect.

5.5 OVERSTORY COVER (CC)

Dropped in spring 2009

5.6 SHRUBS COVER

Within the 100 m^2 circular plot (5.64 m radius), determine the top three (3) **shrub** species present (by abundance). Record the species code and the percent cover in the Comp (competitor) column. If there is no competitor shrub, leave the Comp column blank.

The six shrub species considered to be competitors are:

36 - Willows (any);

38 – Mountain Maple;

40 - Alder (speckled);

43 - Beaked Hazel;

52 - Prickly Rose; and

54 – Raspberry.

Beaked Hazel, mountain maple and willow are both competitor and indicator species.

SHRUBS - Competitor

36 – willows;   **38** – Mtn. maple; **40** – speckled alder

43 – beaked hazel;   **52** – prickly rose   **54** - raspberry;

In order of abundance, list competitor shrub species in the Spp B and Spp C columns and their percent cover in order of abundance.

SHRUBS - Sorted by common name (ascending). Competitor species are shaded in yellow.

SHRUBS			SHRUBS (continued)		
COMMON Name	**CODE**	**LATIN binomial name**	**COMMON Name**	**CODE**	**LATIN binomial name**
Alder (Green)	39	*Alnus viridus ssp. Crispa*	Juniper	23	*Juniperus communis*
Alder (Speckled)	40	*Alnus incana ssp Rugosa*	Labrador Tea	47	*Ledum Groenlandicum*
Alder-leaved Buckthorn	10	*Rhamnus alnifolie*	Leatherleaf	42	*Chamaedaphne calyculata*
Beaked Hazelnut	43	*Corylus cornuta*	Mooseberry (Squashberry)	60	*Viburnum edule*
Bearberry (Kinnikinnick)	41	*Actostaphylos uva-ursi*	Mountain Maple	38	*Acer spicatum Lam.*
Blueberry	56	*Vaccinium sp.*	Prickly Rose	52	*Rosa acicularis*
Bog-laurel	46	*Kalmia polifolia*	Prince's Pine	24	*Chimaphila umbellata*
Bog (mountain) Cranberry	59	*Vaccinium vitis-ideas*	Raspberry	54	*Rubus idaeus*
Buffalo berry	21	*Shepherdia canadensis*	Saskatoon	9	*Amelanchier alnifolia*
Cherry (Choke)	35	*Prunus pensylvanica*	Shrubby Cinquefoil	20	*Potentilla fruticosa*
Cherry (Pin)	49	*Prunus virginiana*	Small Bog Cranberry	58	*Oxycoccus microcarpus*
Cloudberry	53	*Rhubus chamaemorus*	Snowberry	25	*Symphoricarpus sp.*
Creeping Snowberry	45	*Gaultheria hispidula*	Spreading Dogbane	26	*Apocynum androsaemifolium*
Currant (Bristly Black)	19	*Ribes lacustre*	Twinflower	48	*Linnaea borealis*
Currant (Skunk)	50	*Ribes glandulosum*	Western Mountain Ash	14	*Sorbus scopulina*
Currant (Wild Red)	51	*Ribes triste*	Willow	36	Salix sp.
Dogwood (Red Osier)	33	*Cornus stolonifera*			
Dwarf Birch	37	*Betula pumila*			
Dwarf Raspberry	55	*Rubus pubescens*			
Gooseberry (Northern)	13	*Ribes oxyacanthoides*			
Honeysuckle (Bush)	44	*Diervilla lonicera*			
Honeysuckle (Fly)	1	*Lonicera villosa*			
Honeysuckle (Twining Red)	3	*Lonicera dioica*			

5.7 INDICATOR PLANTS

INDICATORS

| Spp 1 | Spp 2 |

Indicator plants can be shrubs, herbs, or mosses. Some plants indicate site characteristics. For example, black spruce - feathermoss stands are drier than stands of black spruce - Sphagnum moss stands. Another example is ferns in long corridors show us that there are localized wet areas present.

Within the 100 m² circular plot (5.64 m radius), record the presence of up to two **indicator plant species** present (shrub, herb, moss or lichen). Leave the first column blank, species are only 2 digits for indicators.

Shrubs		
Beaked Hazel	43	*Cornus cornuta*
Bearberry	41	*Arctostaphylos uva-ursi*
Blueberry	56	*Vaccinium sp.*
Mountain Cranberry	59	*Vaccinium vitis-ideas*
Mountain Maple	38	*Acer spicatum Lam.*
Red-Osier Dogwood	33	*Cornus stolonifera*

Herbs, Grasses & Ferns		
All Ferns	18	
Dwarf Enchanter's-Nightshade	12	*Circaea alpina L.*
All Horsetails	82	*Equisetum sp.*
Bedstraw	67	*Galium sp.*
Fireweed	65	*Epilobium angustifolium*
Pink Lady's Slipper	17	*Cypripedium acaule Ait.*

Lichens & Mosses	
All Feather mosses	95
All Lichens	88
All Sphagnum	94

INDICATOR Plants
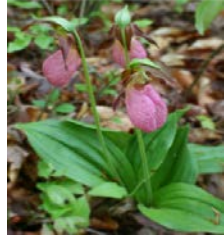
12 - Dwarf Enchanter's-Nightshade; **17** - Pink Lady's Slipper; **18** – all FERNS

33 - Red Osier Dogwood;   **36** – Willows**;**   **38** – Mtn. maple;   **41** - bearberry;

43 – beaked hazel;   **56** – blueberry;   **59** – bog cranberry;   **65** – fireweed

67 – bedstraws;   **82** – horsetails;

MOSSES & LICHENS – Indicator

88 – all lichens   **94** – Sphagnum mosses;   **95** – Feather mosses

5.8 HERBS COVER

For the HERBS Cover, only record the **competitor herb species** and its' percent cover class. If there is no competitor herb, leave the Comp column blank.

Herb competitor species are:

79 - blue-joint grass (*Calamagrostis spp*);

65 – fireweed; and

32 – Canada thistle (now an invasive species!)

Herb competitor cover classes:

1 - 1% to 25% cover

2 - 26% to 50% cover

3 - 51% to 75% cover

4 - 76% to 100% cover

SppB% and SppC% - dropped in spring 2009.

5.9 MOSS COVER

Dropped in spring 2009.

Note that groups of mosses are still indicator plants (Feathermoss and Sphagnum moss)

HERBS, GRAMINOIDS & FERNS - Sorted by common name (ascending). Competitor species are <mark>shaded in yellow</mark>. Note that Fireweed is both a competitor and an indicator plant.

HERBS, GRAMINOIDS & FERNS		
COMMON Name	CODE	LATIN binomial name
Bedstraw	67	*Galium spp.*
Bluebell (Northern)	70	*Mertensia paniculata*
Blue-Joint Grass	79	*Calamagrostis*
Bunchberry	64	*Cornus canadensis*
Canada Thistle	32	*Cirsium arvense*
Ciliolate Aster	62	*Asteraceae Family*
Club Moss	2	*Lycopodium annotinum*
Coltsfoot (Palmate)	72	*Petasites palmates*
Creamy Peavine	68	*Fabaceae family*
Dwarf Enchanter's Nightshade	12	*Circaea alpina*
Fairybells	11	*Disporum trachycarpum*
Fern (Lady)	97	*Athyrium filix-femina*
Fern (Ostrich)	99	*Matteuccia struthiopteris*
Fireweed	65	*Epilobium angustifolium*
Goldenrod (Canada)	22	*Solidago canadensis*
Ground-Cedar	85	*Lycopodium complanatum*
Horsetails	82	*Equisetum sp.*
Lily of the valley	69	*Maianthemum canadense*
Marsh marigold	98	*Caltha palustris*
Meadow Rue	16	*Thalictrum*
Mitrewort	71	*Mitella nuda*
Pyrola (Wintergreens)	73	*Pyrola sp.*
Rock polypody	86	*polypodium virginianum*

HERBS, GRAMINOIDS & FERNS (continued)		
COMMON Name	CODE	LATIN binomial name
Sarsaparilla (Wild)	61	*Aralia nudicaulis*
Solomon's-seal	75	*Smilacina trifolia*
Starflower	77	*Trientalis borealis Raf.*
Stinging nettle	15	*Urtica dioica*
Strawberry (Wild)	66	*Fragaria virginiana*
Sedges	80	*Carex sp.*
Twisted-stalk	76	*Streptopus rosus Michx.*
Violets	78	*Viola sp.*

LICHENS & MOSSES		
Lichens	88	*Cladina*
Broom Mosses	90	*Dicranum*
Plume Moss	93	*Ptilium cristacastrensis*
Schrebers Moss	92	*Pleurozium schreberi*
Stair-Step Moss	91	*Hylocomium splendens*
Sphagnum	94	*Sphagnum sp.*
Feathermosses	95	

5.10 SOILS

Establish one soil pit per block that is representative of the majority of the block. Soil types are described in the Manitoba FEC Field Guide (Zoladeski *et al.* 1995) as well as a section on soil description.

5.10.1 Soils Horizons

HORIZONS

| Thickness(cms) | ⓪ ① ② ③ ④ |
| L,F,H | ⓪ ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ |

Measure depth of the LFH (*e.g.* 01, 02, 03 …40 cm). The LFH are the upper organic horizons, consisting of leaves, needles, twigs and other organic matter.

A Horizons

A1	Thickness (cms)
Ⓐⓗ Ⓐⓔ	⓪ ① ② ③ ④
ⒶⒷ Ⓝ/Ⓐ	⓪ ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨
A2	**Thickness (cms)**
Ⓐⓗ Ⓐⓔ	⓪ ① ② ③ ④
ⒶⒷ	⓪ ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

Classify the 'A' soil horizon(s) as either:

> A**h** - humus;
>
> A**e -** elluviated;
>
> AB - transitional; or
>
> not applicable (if there is no 'A' soil horizon)

Measure the thickness (cm) of the 'A' soil horizon.

B Horizons

B1	Thickness (cms)									
⑬m ⑬t ⑬f	⓪ ① ② ③ ④ ⑤ ⑥									
⑬C ⑪/A	⓪ ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨									
Modifier	⑨ ⓘ ⓚ									

Classify the 'B' soil horizon(s) as either:

> B**m** - modified,
>
> B**t** - clayed added
>
> B**f** - ferrous (extra iron added)
>
> **BC** – transitional zone of B & C horizons; or
>
> not applicable (if there is no B horizon).

Add any modifiers (*i.e.* g - gleyed, k - carbonates (fizzes with acid), or j - juvenille).

Measure the thickness(es) of the 'B' soil horizon(s).

C Horizons

C1	Ⓨ Ⓝ
Modifier	⑨ ⓘ ⓚ ⓧ

Determine if you dug deep enough to expose a 'C' horizon (**Yes** or **No**).

Determine any modifiers of the 'C' soil horizon (if any):

> **C** - no modifiers to the parent material
>
> C**g** - gleyed; Cgj for gleyed (juvenile) or
>
> C**k** - carbonates (fizzes with acid); Ckj –barely fizzes with acid
>
> C**x** – frozen layer

Mottling

MOTTLES	Ⓨ Ⓝ									
Depth to	⓪ ①									
Mottles	⓪ ① ② ③ ④ ⑤									
(cms)	⓪ ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨									
Thickness of	⓪ ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨									
Mottles (cms)	⓪ ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨									

Determine if there is any mottling (**Yes** or **No**).

Examples of mottling in soil (photo: University of Saskatchewan)

If there is mottling and/or gleying, record the depth to mottles (cm). Also record the and thickness of the layer with mottles. If there is mottling or gley in the C horizon, ensure the C horizon is labeled as **Cg**. If there is mottling or gley in the B horizon, ensure the B horizon is labeled as **Bg**.

Examples of gley in soil (greyish-blue in colour).

5.10.2 Soils Horizons
Mineral Soil Texture

Determine the Surface Texture (0-20 cm depth) and the texture of the 'C' horizon .

TAKE A SOIL SAMPLE in a plastic bag and label it – LP will texture the bagged soils, and complete the remainder of the PHS soils bubble card.

Coarse Fragments

Record the presence of coarse fragments (anything > 0.2 cm in diameter), if present in substantial amounts (0 – 40 cm depth).

Coarse Fragment (class name)
Gravel (0.2 to 8 cm)
Cobbles (8 – 25 cm)
Stones (25 cm +)

The ortho field map will contain the block boundaries, block number, plot numbers, and any known exceptional features. The PHS plots are always based on a 150-meter plot grid. These ortho field maps are to be used to record site-specific features such as streams, slopes, forest health problems, beaver floods, trails, etc.
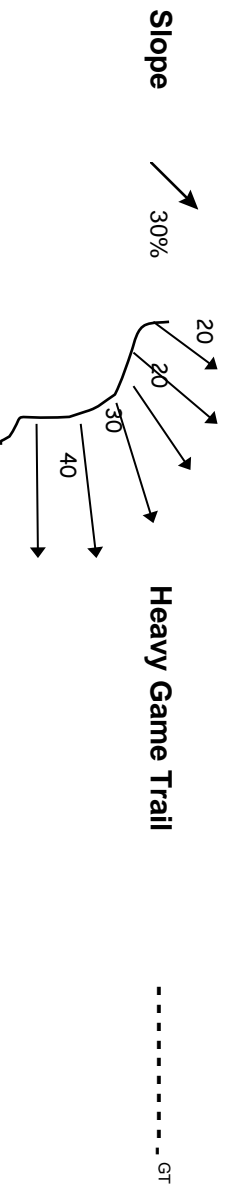
Slopes should be mapped as percentage slope only, starting at 20 % (or approx. 10 degrees). Only record slopes to the nearest 10 % (i.e. 20, 30, 40 up to 100%). Draw a line indicating the top of the slope, with the arrows always pointing down slope. If an area is too hummocky (small slopes everywhere) to accurately transfer the slope information from, it is acceptable to record the area on your field map as simply "Hummocky" or "Hilly".

Wetlands should be classified and mapped as accurately as possible. All watercourses in the block and within 50 m of the block must be classified and mapped. Direction of water flow for creeks should also be indicated.

After finishing PHSing a block, the information collected on the ortho field maps should be neatly transferred onto a blank PHS grid map and filed in the block folder. Additional comments may also be written on this map.

The information recorded on the PHS field maps is extremely important, therefore, when proceeding from plot to plot, be aware of everything around you. The following is a list of typical features that must be recorded:
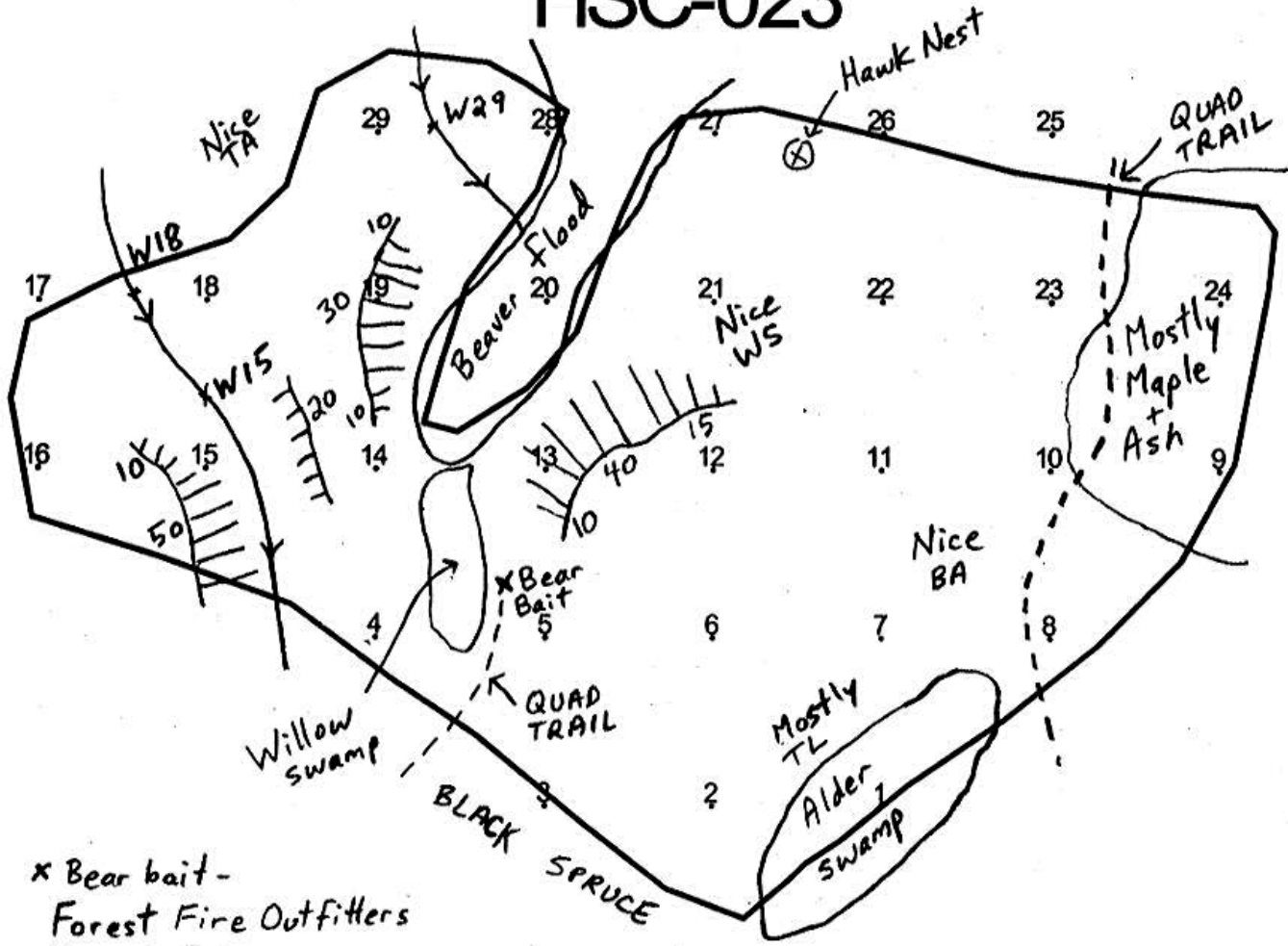
Wetland Features:

Beaver

Fen

Alder

Slope

30%

20
20
30
40

Heavy Game Trail

- - - - - - - - GT

Stream

Existing Trail   = = = = = = = E.T

Nest ⊗ Eagles Nest   **Mineral Lick** ⊗ Mineral lick

Den ●   **Heritage Site** ✝

HSC-023

An example of a completed field map

PHS Grid Map

1. Clean and Dry
2. Clear (no smudges), and large enough writing
3. Slopes in %
4. Entire creek with stream crossing numbers
5. Complete quad trail
6. Description of area outside block
7. Wildlife features identified
8. Non-merchantable areas within block identified
9. Forest health concerns identified

7. POST-FIELD PROCEDURES

7.1 DAY'S END

Field crews at the end of each day:

- Ensure all PHS information is complete:

  - All bubbles on tally cards are filled in correctly.

  - All information is transferred onto one neat PHS grid map.

- File all PHS data in the "Completed Blocks" area of the PHS file cabinet and check "PHS done" for the block on the PHS block tracking chart.

- Prepare for the following day.

- Ensure field equipment is placed out to dry (*i.e.* Increment borer, FEC book).

The scanning software (Cruiser) will detect errors on the bubble cards such as an uncolored bubble or an unacceptable value. If any errors are identified, they will have to be corrected. This process can sometimes become time consuming and hold things up; therefore it cannot be stressed enough how important it is to have clean, clear, concise and complete data!

7.2 END OF SHIFT

Field crews at the end of each shift or operating area:

- Must meet with the appropriate planner to discuss the previous shift or operating area. This discussion will include passing on as much information regarding the cut blocks as possible such as any exceptional features, access, timber volume, harvest season, or renewal concerns etc.

Note: LP's PHS data provides the planning team with a great deal of information, however, a verbal exchange between the planner and the field crews can be equally as beneficial as the tallied data.

7.3 PHS SUPERVISOR

- Review the current shifts submitted PHS data.

- Double check the "PHS done" box on the PHS block tracking chart.

- Scan PHS bubble cards and field maps regularly.

- Using the CRUISER program, fix any remaining errors in the data and load data into the database.

- Inform area planner of any exceptional features to be digitized into the appropriate GIS theme.

- Produce a forest health report for the most recently completed blocks and submit to MB Conservation Forestry branch in Winnipeg.

- Prepare for and accomplish check cruising of completed blocks.

8. CHECK CRUISE/AUDIT PROCEDURE

All aspects of the PHS must be collected in a consistent and accurate manner. As with most survey programs a check will be done of all cruisers to ensure the data is being collected properly without individual bias.

Ten percent of proposed cutblocks will be randomly chosen for check cruising. A minimum of two (2) plots per cutblock will be checked. However, the actual number of check plots within the randomly selected cutblock will be dependent upon the accuracy. For example, fewer plots will be checked of a surveyor who consistently scores well on the check survey. More plots will be checked if a surveyor is scoring low, in order to help correct problems before a great deal of data is collected improperly.

Each aspect of the survey will be checked including:

Compassing

- plot must be established within 10 meters of exact location

Ecosystem Summary

- V-type must be correct

- Shrub, Herb and Moss species identification must be correct

- Indicator species must be recorded and correct

Soil Classification

- There must be a soil pit dug in each V-type encountered, excluding small slivers or 'fingers' of different forest type

- LFH Thickness must be within ± 1 cm

Veg and Wildlife

- Understory species and height class must be correct.

- Understory count must be within one tree if under 10 trees, or reasonable if over 10 trees

- Snag class and DBH class must be correct

- Snag count must be within one tree if under 10 trees, or reasonable if over 10 trees

- Wildlife Group, Species, Activity and Use must be reasonable

- DWM class and cover must be within one class

- Watercourses measurements must be reasonable

Timber Cruise

- Tree species identification must be correct

- DBH classes must be reasonable

- Heights and Ages must be ±10%

- Prism sweep count of 'in' trees must be within one tree. However, if the prism sweep has more than 10 trees, the count of 'in' trees must be within two trees.

- Obvious forest health concerns must have been recorded on bubble cards and field map

Field Map

- Exceptional features mapped

- All Features must be mapped within 25 meters of actual location

- Slopes must be within 10%

9. REFERENCES

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