FOREST RESEARCH REPORT

Nova Scotia Department of Natural Resources
Forest Management Planning

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Tolerant Hardwood Management Guide

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Introduction

Hardwoods are an important part of Nova Scotia's forest. Hardwood stands cover over 12% of the province's forested area and hardwood trees, in all stands, account for over 30% of the merchantable growing stock (Townsend, 2004). Tolerant hardwoods (yellow birch, sugar maple and white ash) account for 28% of the hardwood volume (39 million m^3). Part of this tolerant hardwood volume (4 %) has high value for sawlogs and veneer (Keys et al., 2007). Although the portion of hardwoods suitable for high value products is low at present, with proper management it can be increased. To accomplish this, silviculture practices must be compatible with production of quality sawlogs on appropriate sites. Clear cutting high quality young growing stock and high-grading the best logs, leaving poor quality stems, reduces the future potential for growing quality timber. Future supply of these logs has been and continues to be compromised by these activities, endangering the viability of the hardwood sawlog industry in Nova Scotia. Immature hardwood trees with potential for increased growth and higher value must be tended to improve the outlook for sawlog supply.

To increase the proportion of quality hardwood, progress needs to be made in (i) setting specific management goals to enhance quality hardwood growth, (ii) prescribing appropriate treatments after gathering required stand information, (iii) implementing these treatments effectively and in an economically feasible way and (iv) assessing the quality of treatments after completion. Items (ii) and (iv) are addressed in this document through decision keys, quality criteria and cruising methods to collect pre- and post-treatment data.

This guide was developed with reference to work in Ontario (OMNR, 1998), New England (Leak et al. 1987), results of Nova Scotia trials (McGrath, 2007) and operational use of preliminary versions.

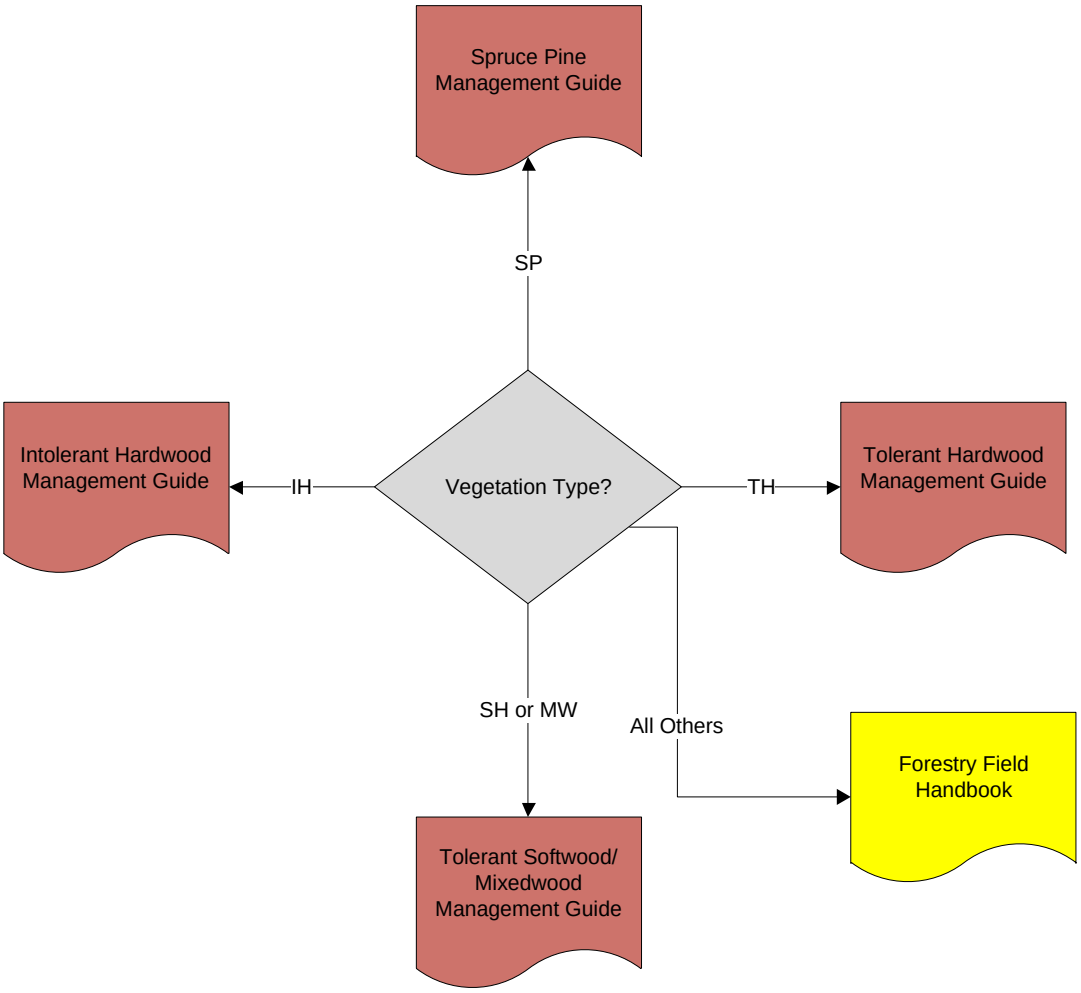
Use of the Keys

These keys were developed for Tolerant Hardwood Stands located in Nova Scotia. Tolerant Hardwood in this case is defined as a stand that is dominated by sugar maple (*Acer saccharum* Marsh.) and yellow birch (*Butula alleghaniensi* Britton) with lesser amounts of other species. The most common associates are beech (*Fagus grandifolia* Ehrh.), white ash (*Fraxinus americana* L.), and red maple (*Acer rubrum* L.). The keys are applicable to the Tolerant Hardwood Forest Group, specifically Sugar maple/Hay-scented fern (TH1), Sugar maple/New York fern-Northern beech fern (TH2), Sugar maple-White ash/Christmas fern (TH3) and Sugar maple-White ash/Silver spleenwort (TH4) vegetation types (Neily et al., 2011). The keys assume that growth of high quality and valuable tolerant hardwood (sugar maple, yellow birch, white ash) is the management objective. As such, the production of larger trees with clean boles is necessary. The tolerant softwood/mixedwood guide (McGrath, 2010) should be used when the Spruce Hemlock (SH) or Mixedwood Forest Group is encountered (Neily et al., 2011).

The Tolerant Hardwood Management Guide consists of 4 separate keys. Users start at the Main key (Key M) working their way through a series of questions concerning current stand conditions or management objectives to arrive at a recommended prescription. To reach a recommendation, the user may be referred to one of three sub-keys. The sub-keys include one for Selection (Sub-Key S), Tending (Sub-Key T), and Regeneration (Sub-Key R).

In the keys, any text outlined by a diamond and shaded in grey is a question that must be answered. Depending on the answer to these questions the designated path is followed until a rectangle is encountered. These rectangles refer either to a sub-key (shaded in yellow), a management prescription (shaded in green), or recommendation to wait and re-evaluate at a later time or referral to another guide (shaded in red). If a sub-key is indicated, it is followed until arriving at a prescription.

Management Guides by Vegetation Group
Key VT – Vegetation Types



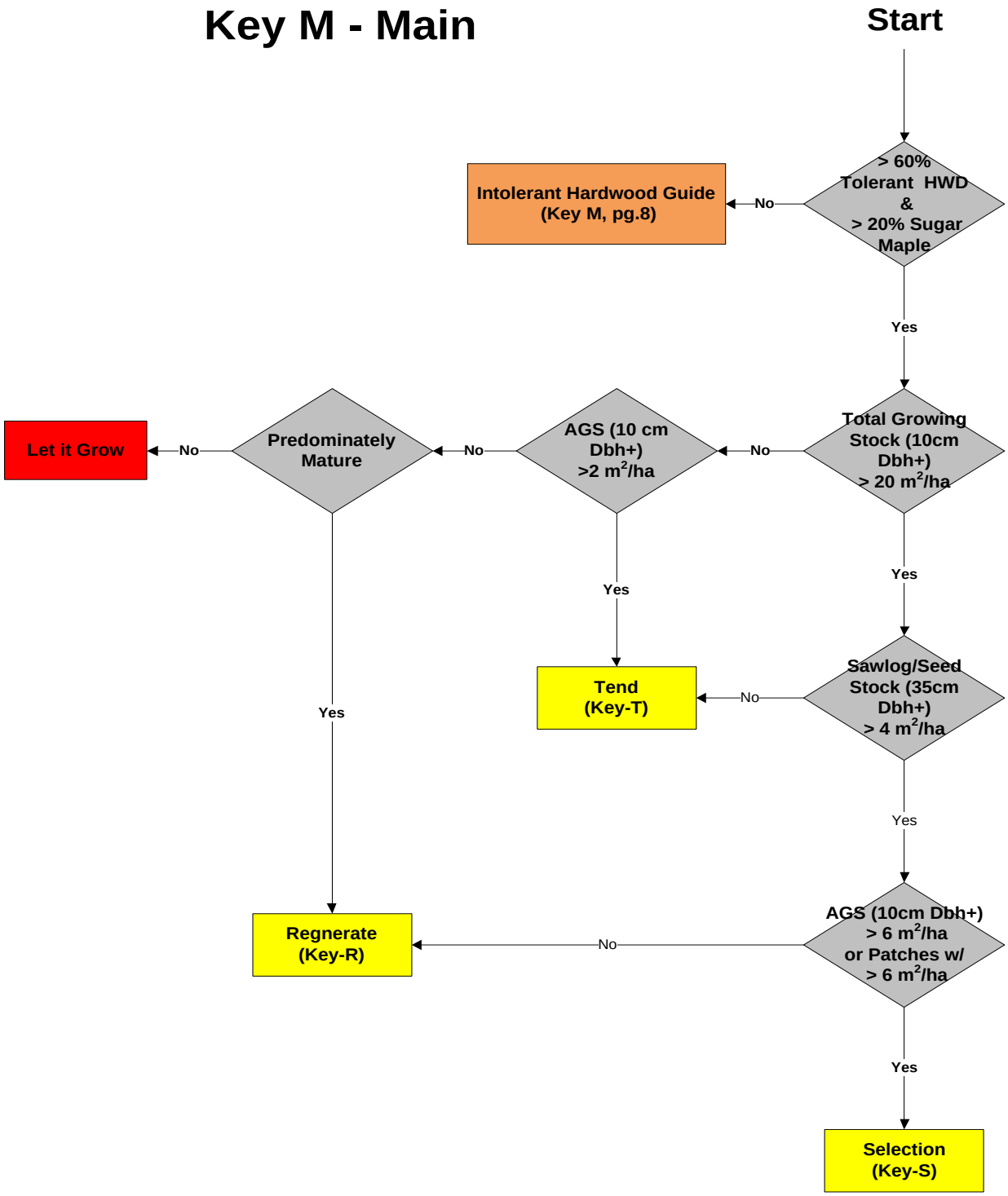
KEY - VT - Vegetation Types

Instructions and Definitions for:

Decision Diamond

Vegetation Type – What vegetation type (Neily *et al*., 2011) are you in? If in a Tolerant Hardwood **v**egetation type refer to this guide (McGrath 2007). If in a Spruce Hemlock (SH) or Mixedwood (MW) vegetation type refer to the Tolerant Softwood & Mixedwood Management Guide (McGrath, 2010). If in an Intolerant Hardwood (IH) vegetation type refer to McGrath *et al.* (2015). If in a Spruce-Pine Vegetation Type (SP) refer to Neily, Quigley and McGrath (2014). If in any other vegetation type refer to the Forestry Field Handbook (NSDNR, 1993).

Tolerant Hardwood Management Key
Key M - Main



KEY - M - Main

Instructions and Definitions for:

Decision Diamonds

- **> 60% Tolerant Hardwood & > 20% Sugar Maple** – Is the stand made up of more than 60% tolerant hardwood species, including sugar maple, yellow birch and white ash and is more than 20% of the stand's basal area sugar maple?
- **Total Growing Stock (10cm Dbh+) > 20 m^2/ha** – Is the total basal area of trees at least 10 cm (4 inches) in diameter at breast height greater than 20 m^2/ha (85 ft^2/acre)?
- **Predominately Mature** – Is the overstory predominately mature in terms of being able to produce adequate seed for regeneration and reaching best economic value (Mills and Lamson, 1999)?
- **Sawlog/Seed Stock (35cm Dbh+) > 4m^2/ha** – Is the stock of trees at least 35 cm (14 inches) in diameter at breast height and having sawlog quality greater than 4 m^2/ha (17 ft^2/acre)?
- **AGS** – **A**cceptable **G**rowing **S**tock - Trees that are either undersized now but have the quality and vigour to potentially grow into sawlogs (better than pallet quality[1]) or have sawlog quality and size now (better than pallet quality) and will not degrade into a lower quality sawlog or worse within 15 years.
- **AGS (10cm Dbh+) > 6 m^2/ha** – Is the basal area of trees at least 10 cm (4 inches) in diameter at breast height and judged to be Acceptable Growing Stock greater than 6 m^2/ha (25 ft^2/acre)?
- **Patchy w/ AGS (10cm Dbh+) > 6 m^2/ha** – Does the stand have patches of mature trees to be harvested intermixed with patches in different areas of smaller Acceptable Growing Stock worthy of tending? The amount of AGS at least 10 cm (4 inches) in diameter at breast height in the unharvested patches must amount to at least 6 m^2/ha (25 ft^2/acre).

Management Prescriptions

- **Let it grow** – Let the stand grow and re-evaluate the stand with the key after suitable time has elapsed

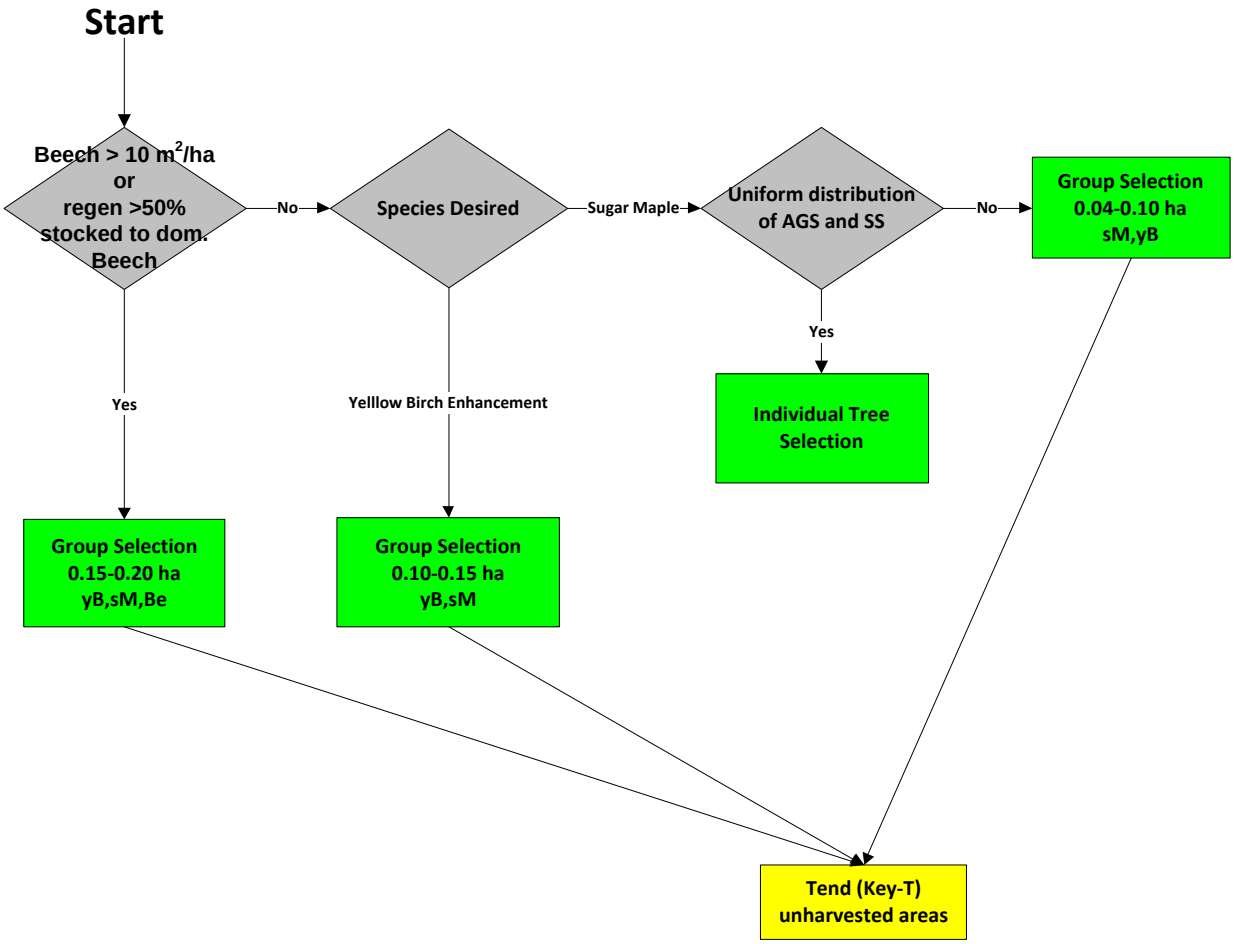
Reference to Management Guide

- **Intolerant Hardwood Guide (Key M, pg. 8)** – Go to Key M on page 8 of the Intolerant Hardwood Management Guide (McGrath, 2015).

[1] Trees must be a G-3 or better according to Calvert and Petro (1993) or a Growing Stock Grade – 3 or better according to Boyce and Carpenter (1968)

Tolerant Hardwood Management Key

Sub-Key S - Selection



SUB-KEY S - Selection

Instructions and Definitions for:

Decision Diamonds

- **Beech > 10m^2/ha or regen > 50% stocked to dom. Beech -** Is beech growing stock greater than 10 m^2/ha (44 ft^2/acre) or dominant regeneration stocking to Beech greater than 50%?
- **Yellow Birch Enhancement –** Is the management objective to enhance yellow birch regeneration over sugar maple by producing suitable light conditions?
- **Uniform distribution of AGS and SS –** Is the Acceptable Growing Stock and the **S**awlog /Seed **S**tock intermixed uniformly throughout the stand?

Management Prescriptions

- **Individual Tree Selection** – Individual Tree Selection involves a thinning across all size classes throughout the stand to create a diameter class distribution suitable for sustaining a periodic harvest of suitable trees over relatively short harvesting cycles (10-20 years). The objective is to create conditions suitable for regeneration of preferred species at each entry while also improving the growing stock by releasing the highest quality immature trees. Tolerant species regeneration such as beech and sugar maple are favored. Where the proportion of beech is high it will dominate sugar maple under high shade conditions.
- **Group Selection** – Group Selection involves identifying areas within the stand that are suitable for harvesting or regeneration because they are predominately mature or contain non-commercial trees. These areas are to be cleared to create conditions suitable for preferred regeneration. Areas predominately consisting of AGS are to be left. They can be tended using either pre-commercial thinning, commercial thinning or crop tree release methods (Lamson and Leak, 2000).
    - Where **Beech** is dominant the larger openings are prescribed (0.15 to 0.2 ha) . Yellow Birch, Sugar Maple and Beech will be favored in that order.
    - Where favoring **Yellow Birch** regeneration is desired and Beech is not dominant, 0.1 to 0.15 ha openings are prescribed. Mineral soil mixing with the forest floor is also desired. Yellow Birch and Sugar Maple will be favored in that order.
    - Where Beech is not dominant and **Sugar Maple** is desired the smaller opening size is prescribed (0.04-0.1 ha). Sugar Maple and Yellow Birch will be favored in that order.

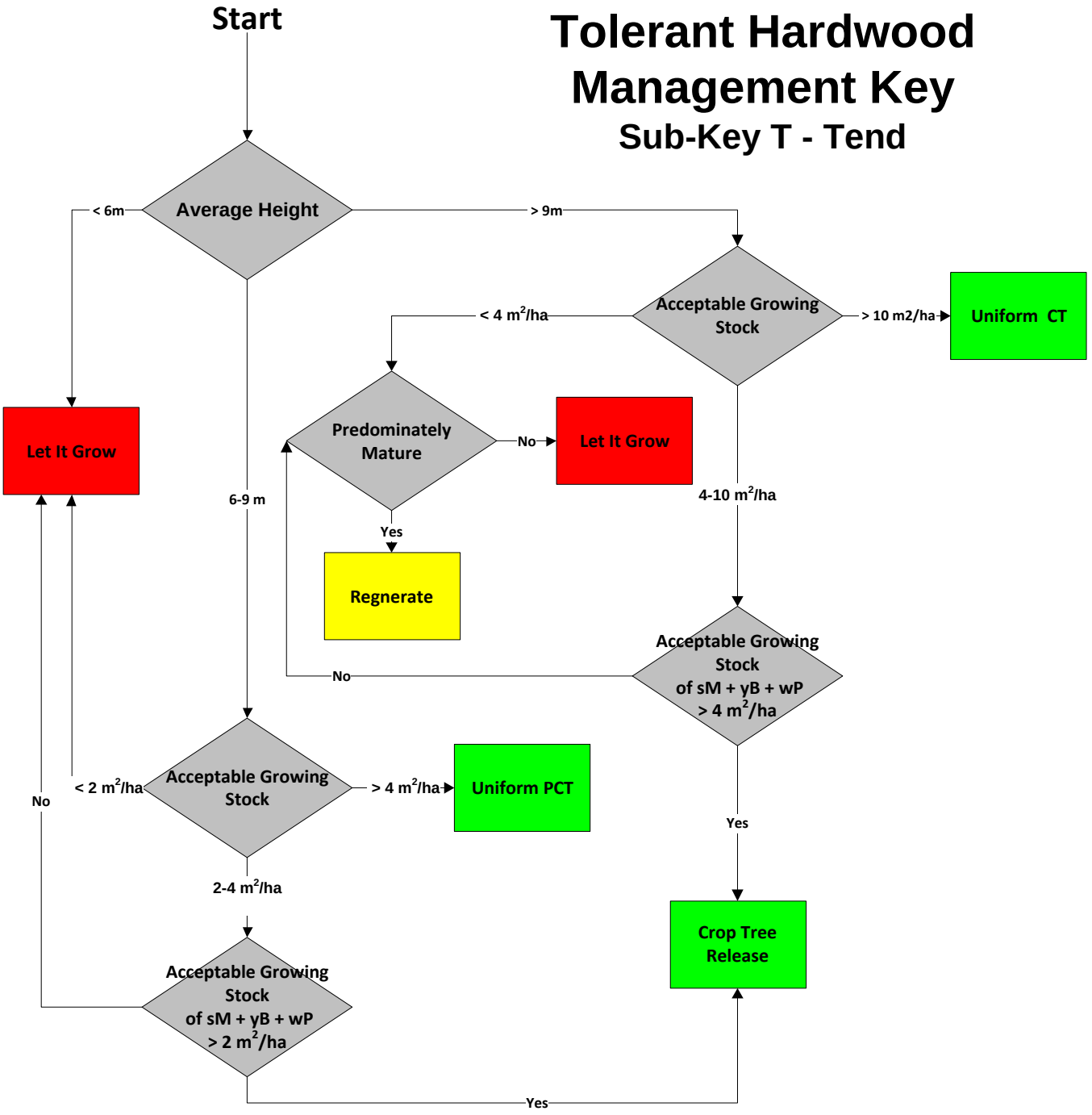
Harvest Patch Dimensions.					
Area		**Circular Radius**		**Square Length**	
(ha)	**(acre)**	**(m)**	**(ft)**	**(m)**	**(ft)**
0.04	**1/10**	**11**	**37**	**20**	**66**
0.10	**1/4**	**18**	**59**	**32**	**104**
0.15	**1/3**	**22**	**72**	**39**	**127**
0.20	**1/2**	**25**	**83**	**45**	**147**

Post Treatment Criteria

- Acceptable Growing Stock (of trees > 10 cm Dbh) must be greater than 5 m^2/ha following treatment
- 90% of residual stand basal area must not have damage to boles (trees with exposed cambium exceeding 100 cm^2 resulting from harvest) or crowns (greater than 1/3 of crown damaged by harvest activities).
- The Percent of Acceptable Growing Stock by basal area must be higher following harvest.

Tolerant Hardwood Management Key

Sub-Key T - Tend



SUB-KEY T - Tend

Instructions and Definitions for:

Decision Diamonds

- **Average Height –** What is the average height of the stand in metres?

- **Acceptable Growing Stock** – What is the basal area in m^2/ha of **A**cceptable **G**rowing **S**tock – AGS are trees that are either undersized that have the quality and vigour to potentially grow into sawlogs (better than pallet quality) or have sawlog quality and size now (better than pallet quality) and will not degrade into a lower quality sawlog or worse within 15 years.

- **Acceptable Growing Stock (AGS) of sM + yB + wP > 4 m^2/ha** – Is the basal area of Acceptable Growing Stock of sugar maple, yellow birch and white pine greater than 4 m^2/ha.

- **Acceptable Growing Stock (AGS) of sM + yB + wP > 2 m^2/ha** – Is the basal area of Acceptable Growing Stock of sugar maple, yellow birch and white pine greater than 2 m^2/ha.

- **Predominately Mature** – Is the overstory predominately mature in terms of being able to produce adequate seed for regeneration and reaching best economic value (Mills and Lamson, 1999)?

Management Prescriptions

- **Crop Tree Release –** Where moderate levels of sugar maple, yellow birch or white pine AGS exist, release trees on at least three sides so that no trees are touching or overtopping the crowns of the released trees. The released trees must be vigorous trees of good form and have high value potential. Trees must be self pruned for at least the length of one sawlog or be manually pruned. Released trees must be at least 10 m (30ft) apart. Only trees touching the crowns of crop trees are to be cut, remaining trees to be left standing.

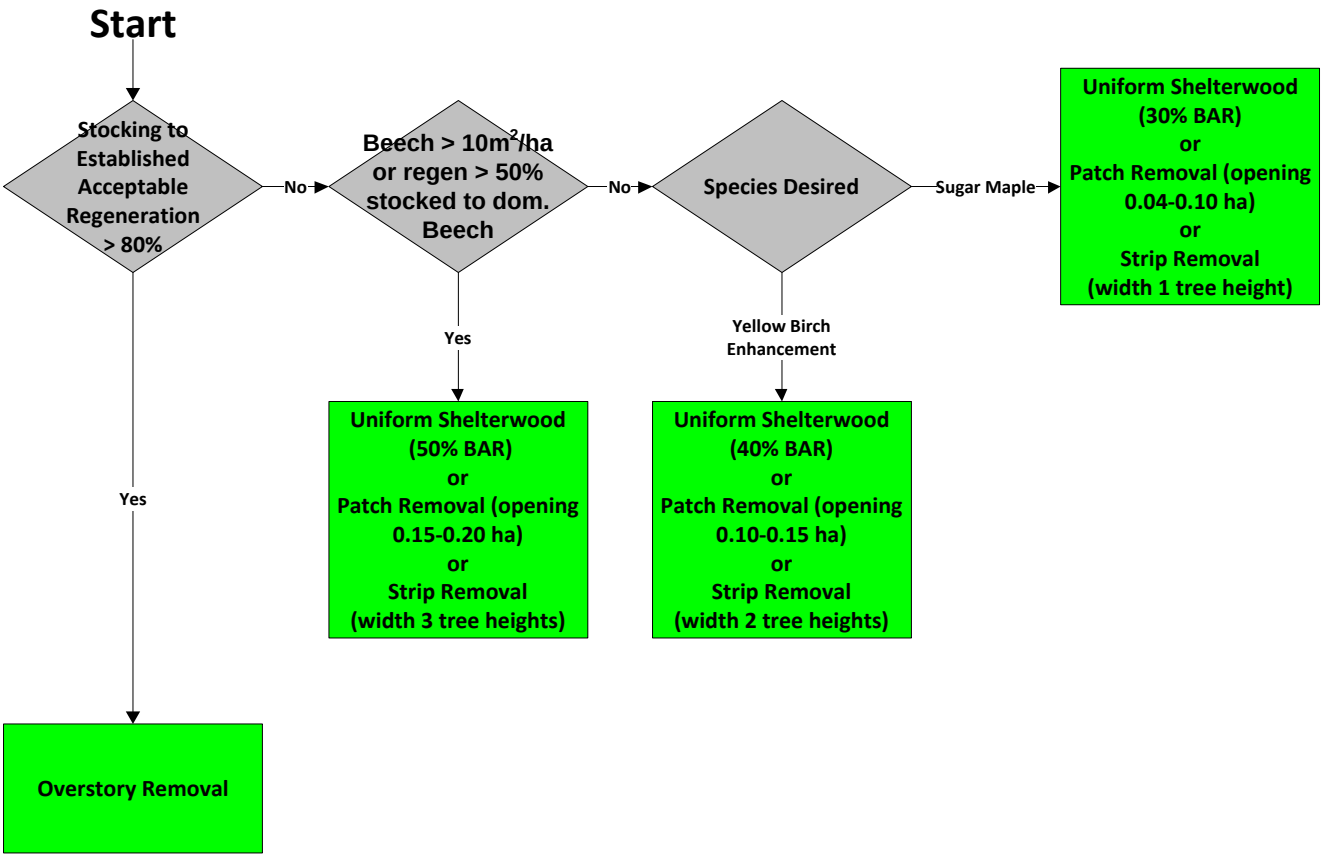
- **Pre-commercial Thinning (PCT) –** Where high levels of AGS exist uniformly distributed throughout the stand (on average at most every 3m (10ft)) a uniform pre-commercial thinning is appropriate.

- **Commercial Thinning (CT) –** Where the stand contains predominately merchantable trees of AGS uniformly distributed throughout the stand a uniform commercial thinning is prescribed. The objective of this treatment is not to regenerate the stand. It is intended to increase the growth of the trees with the highest potential value.

- **Let it grow** – Where low levels of AGS exist, let the stand grow and re-evaluate with the key after suitable time has elapsed.

Tolerant Hardwood Management Key

Sub Key R - Regenerate



SUB-KEY R - Regenerate

Instructions and definitions for:
Decision Diamonds

- **Stocking to Established Acceptable Regeneration > 80%** – Is the stocking to acceptable regeneration of commercial species[2] exceeding 0.3 m (1 ft) in height greater than 80%? Only include trees < 10 cm Dbh.
- **Beech > 10m^2/ha or regen > 50% stocked to dom. Beech** – Is beech growing stock greater than 10 m^2/ha (44 ft^2/acre) or dominant regeneration stocking to Beech greater than 50%?
- **Species Desired** – What regeneration species do you wish to favor if Beech does not exceed > 10m^2/ha or exceed a stocking to dominant regeneration of 50%?
- **Yellow Birch Enhancement –** Is the management objective to enhance yellow birch regeneration over sugar maple by producing suitable light conditions?

Management Prescriptions

- **Overstory Removal** – Release regeneration by removing overstory. Use methods that protect advanced regeneration.
- **Uniform Shelterwood** – Uniformly thin overstory to produce light conditions suited for desired species. The remaining overstory must be harvested when suitable regeneration is established to sufficient stocking.
    - Where **Beech** is dominant remove 50% of the basal area (BAR).
    - Where favoring **Yellow Birch** regeneration is desired (mineral soil mixing with the forest floor is also desired) and Beech is not dominant remove 40% of the basal area
    - Where Beech is not dominant and **Sugar Maple** is desired remove 30% of the basal area.
- **Systematic Patch Removal** – Small groups of trees are cut systematically throughout the stand without tending the unharvested areas, as there is not sufficient immature Acceptable Growing Stock. The main objective is to create the conditions to regenerate the desired species and to harvest the Sawlog Stock before it becomes overmature.
    - Where **Beech** is dominant the larger openings are prescribed (0.15 to 0.2 ha (1/3 – 1/2 acre). Yellow Birch, Sugar Maple and Beech will be favored in that order.
    - Where favoring **Yellow Birch** regeneration is desired and Beech is not dominant, 0.1 to 0.15 ha (1/4-1/3 acre) harvest groups are prescribed. Mineral soil mixing with the forest floor is also desired. Yellow Birch and Sugar Maple will be favored in that order.
    - Where Beech is not dominant and **Sugar Maple** is desired the smaller opening size is prescribed (0.04-0.1ha (1/10 – 1/4 acre)). Sugar Maple and Yellow Birch will be favored in that order.
- **Strip Removal** – Harvest strips to produce shade requirements necessary to regenerate desired species. Leave at least 2 strips unharvested between harvested strips.
    - Where **Beech** is dominant remove strips of 3 tree heights in width.
    - Where favoring **Yellow Birch** regeneration is desired (mineral soil mixing with the forest floor is also desired) and Beech is not dominant remove strips 2 tree heights in width.
    - Where Beech is not or will not be dominant and **Sugar Maple** is desired remove strips of 1 tree height in width.
- **Let it grow** – Let the stand grow and re-evaluate the stand with the key after suitable time has elapsed.

[2] red pine, white pine, jack pine, black spruce, white spruce, red spruce, balsam fir, eastern larch, eastern hemlock, trembling aspen, large-tooth aspen, yellow birch, white birch, read oak, sugar maple, red maple and white ash

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Pre-Treatment Assessment (PTA) procedures and tally sheets

To be able to use the Forest Management Guides information must be collected on the stands of interest. The required stand information includes:

- Species
- Size class
- Stem quality
- Patchiness of the stand (uniformity)
- Existing regeneration
- Exposure
- FEC Vegetation Type(s)
- FEC Soil Type(s)
- FEC Ecosite(s)
- Height
- Health issues
- Maturity
- Previous Treatments
- Existing Blowdown

Cruising Instructions

Take a minimum of 1 prism point every 2 hectares with a minimum of 3 prism points and a maximum of 50. Enough data must be collected to enable prescribing a unique prescription on 2 hectare portion of a block.

- Use a BAF 2 prism.
- Evenly distribute these points throughout the stand.
- Tally trees into at least three Dbh classes (< 10 cm, ≥ 10 cm and < 25 cm, ≥ 25cm for all Vegetation types except ≥ 35 cm for tolerant hardwoods). Where more refined estimates of volume and prescriptions are desired tallying in 2 or 5 cm DBH classes would be preferred.
- If volume estimates are required, take at least one height, from the tree of average basal area (average co-dominant tree), for each product class at each point (e.g. pulpwood, studwood, sawlog).
- The following information will be calculated from the pre-treatment assessment to use with management keys to determine a recommended prescription:
    - Growing Stock (Total Basal Area of trees ≥ 10 cm Dbh class)
    - Basal Area of **A**cceptable **G**rowing **S**tock (all trees)
    - Basal Area of Sawlog/Seed trees (≥ 25 cm Dbh,class – aall vegetation types except (≥35 cm Dbh class – TH stands)
    - Regeneration stocking in %
    - Windthrow Hazard (L, M or H)
    - Average height of stand (m)
    - Species composition (% by basal area)
    - FEC ecosite(s) (Neily et al., 2013)

Pre Treatment Tree Assessment Tally Sheet Date:_***June 25, 2008***__ Prism Factor:_***2***__ *************SAMPLE*************

Loc:_***Lynn Mtn***__Co:__Colchester_____ BL:__***1***___ST:__***1***___ # Plots:___12____ Cruiser:___***TM***_____ Page:_*1*__ of _*1*___

Sp	SM								YB								BE	RS								
TC	UU	AU	UP	AP	US2	AS2	US3	AS3	UU	AU	UP	AP	US2	AS2	US3	AS3	UU	UU	AU	UP	AP	US1	AS1			
Dbh																										
5	5																									
10	2		2	1					1								2									
15	1		5	9							1															
20			6	7								2														
25			6		1	4		10			2			3												
30			4		4	4		8						2									1			
35			1		1	4		2	1		1		2	1		2						1	1			
40			4		2	3		4	1				1			1							1			
45			1		2	3	1							1		3	1									
50			1		9	1		2					1		1	2										
55			1		7	2	2	3					1	1									1			
60			2		1	1	1						2			1										
65			2		4	1	1																1			
70					2		2																			
75			1		1		1																			

Pre-Treatment Site Assessment Tally Sheet. Loc:____Lynn Mtn._____ Co:___Cumberland_____Block:_CU068351_____Section:__A___

Plot	ST	VT	EX	BD	MAT	PT	WET	TF	WT	WF	Patch	Regeneration	Heights/age/notes
1	***8***	***TH1***	***M***	***0***	***M***	***N***	_	_	_	_	***U***	***70% (all) 30% (LL)***	
2	***8***	***TH1***	***M***	***0***	***M***	***N***	_	_	_	_	***P***	***60% (all) 40% (LL)***	***1***
3	***8***	***TH1***	***M***	***0***	***M***	***N***	_	_	_	_	***U***	***30% (all) 20% (LL)***	
4	***8***	***TH1***	***M***	***5***	***M***	***N***	_	_	_	_	***U***	***80% (all) 80% (LL)***	
5	***8***	***TH1***	***M***	***0***	***M***	***N***	_	_	_	_	***U***	***10% (all) 10% (LL)***	
6	***8***	***TH1***	***M***	***0***	***M***	***N***	_	_	_	_	***U***	***20% (all) 10% (LL)***	
7	***8***	***TH1***	***M***	***0***	***O***	***N***	_	_	_	_	***U***	***50% (all) 30% (LL)***	
8	***8***	***TH1***	***M***	***0***	***M***	***N***	_	_	_	_	***U***	***40% (all) 30% (LL)***	
9	***8***	***TH1***	***M***	***1***	***M***	***N***	_	_	_	_	***U***	***80% (all) 50% (LL)***	
10	***8***	***TH1***	***M***	***0***	***M***	***N***	_	_	_	_	***P***	***60% (all) 40% (LL)***	***2***
11	***8***	***TH1***	***M***	***0***	***M***	***N***	_	_	_	_	***U***	***90% (all) 60% (LL)***	
12	***8***	***TH1***	***M***	***0***	***M***	***N***	_	_	_	_	***P***	***40% (all) 30% (LL)***	***3***

Comments: ***1: Over-mature Patch 2: Immature Patch 3: Over-mature Patch***

Sample Cruise Summary & Prescription

Based on the sample cruise, the stand characteristics are as follows:

Vegetation Type……..***TH1*** – Sugar Maple / Hay-scented fern (100%)
Tolerant Hardwood……***96 %*** (Sugar Maple=79%, Yellow Birch =17%)
Sugar Maple……***79%***
Total Growing Stock (≥ 10cm Dbh)……...***33 m^2/ha***
Sawlog Stock (≥ 35 cm Dbh)……....***17 m^2/ha***
Acceptable Growing Stock (≥ 10cm Dbh)….***16 m^2/ha***
Windthrow Hazard……***Low*** (Moderate Wind Exposure, Soil Type = ST8, Rich Fresh, Medium to Coarse-Textured)
Uniform Distribution……..***75%***
Beech Component……...***0.3 m^2/ha***
Beech Regeneration Stocking…….***5%***

Recommended Stand Prescription per Tolerant Hardwood Guide based on cruise summary above:

Individual Tree Selection

Q ratio (the Ratio of trees in each smaller diameter class)……***1.4***
LDT (Largest Diameter Tree after harvest)……...***55 cm***
RBA (residual Basal Area)……***20 m^2/ha***
Cutting Ratio (for trees in the 15-55 Dbh classes)……..***1:3***

Pre-Treatment Tree Assessment Tally Sheet Date:_____ Prism Factor:_____ Page:___ of ____

Loc:_____Co:_____ BL:_____ST:_____ # Plots:_____Cruiser:_____

Sp																										
TC																										
Dbh																										

Pre-Treatment Tree Assessment Tally Sheet

Sp= Species, **Dbh=**Diameter (at breast height) classes

TC=Tree Codes**:** Depending on the information required from the PTA, a one letter Tree Code may be sufficient (U=UGS or A=AGS). When product information is desired, the second letter code can be used to calculate volume by product.

Softwoods:

1st letter U or A:

U- Unacceptable Growing Stock (UGS) - will not make a sawlog or studwood quality stem in the future, or has stud or sawlog quality stem now, but tree will degrade in quality within 15 years. If tree vigor is low due to reasons such as broken/dead top, insect/disease damage, small crown etc., (which make it a poor candidate to leave growing as a future crop tree) it should be called UGS.

A - Acceptable Growing Stock (AGS) - will make a studwood or sawlog quality stem in the future or is one now and will still have studwood or sawlog quality 15 years in the future.

2nd letter C, P or S:

C - Cull - Does not have any merchantable products in the stem at present, **P** - Pulp – Existing pulp log, **S1** – Softwood Sawlog – Existing Studwood or better

Hardwoods:

1st letter (U or A):

U- Unacceptable growing Stock (UGS) - will not make a sawlog quality stem in the future, or has sawlog quality stem now, but will degrade in quality within 15 years. If tree vigor is low due to reasons such as broken/dead top, insect/disease damage, small crown etc., (which make it a poor candidate to leave growing as a future crop tree) it should be called UGS.

A - Acceptable Growing Stock (AGS) - will make a sawlog quality stem in the future or is one now and will maintain or improve in quality by the next harvest.

2nd letter (C, P, L or H):

C - Cull - Does not have potential for any merchantable products, **P** - Pulp - Potential for Pulp log at best,

S2 - Low Grade Sawlog – Existing low grade sawlog (must have better than pallet log potential) – G 3

S3 - High Grade Sawlog – Existing high grade sawlog (high end sawlog or veneer log) – G2 or better

Examples

UC - Unacceptable growing stock without current merchantable products

AC – Acceptable growing stock without current merchantable products

UP - Unacceptable growing stock with current pulp product

AP – Acceptable growing stock with current pulp product

US2 - Unacceptable growing stock with current low grade hardwood sawlog quality stem now but will degrade by the next harvest.

US3 - Unacceptable growing stock with high grade hardwood sawlog quality stem now, but will degrade by the next harvest.

AS2 - Acceptable growing stock with existing low grade hardwood sawlog quality stem - will not degrade by the next harvest.

AS3 - Acceptable growing stock with existing high grade hardwood sawlog quality stem - will not degrade by the next harvest.

US1 - Unacceptable growing stock with studwood or sawlog quality softwood stem, but will degrade by the next harvest.

AS1 - Acceptable growing stock with studwood or sawlog quality softwood stem - will not degrade by the next harvest.

Pre-Treatment Site Assessment Tally Sheet. Loc:_____ Co:_____Block:_____Section:_____

Plot	ST	VT	EX	BD	MAT	PT	WET	TF	WT	WF	Patch	Regeneration	Heights/age/notes

Comments:

Pre-Treatment Site Assessment Tally Sheet:

Codes

ST- FEC soil type (Neily et al., 2013)
VT- FEC vegetation type (Neily et al., 2013)
EX – Exposure: **E** = Exposed; **ME** = Moderately Exposed; **M** = Moderate; **MS** = Moderately Sheltered; **S** = Sheltered
BD - % of Basal Area Blowndown
MAT – Maturity: **I =** Immature, **M** = Mature, **O** = Overmature
PT – Previously treated? PCT or Plantation or Commercial Thinning: **Y** = Yes, **N** = No
WET – Non mapped wetlands: **V** = Vernal Pools, **S**= Springs, **ST** = Streams
T.F. – Topographic Features: **K**=Karst, **R** = Ravine, **O** = Rock Outcrop/Boulder fields, **C**= Caves
W.T. – Wildlife Trees: **CT**=Cavity Trees (trees greater than 20 cm dbh with existing cavity of size suitable for nesting), **N**=Nests (raptors, heron colonies), **M**= Mast (oak, beech or witch hazel with mast)
W.F. – Wildlife Features: **D**=Deer Wintering Areas, **W**=Wildlife Concentrations, **SR**=Species at Risk/concern (http://www.gov.ns.ca/natr/wildlife/biodiversity/species-recovery.asp), **U**=Unique features (specify in comments).
Patch: - is the area around the sample plot dominated by **M** - mature to over mature trees, **I** - Immature AGS , **R**- Advanced regeneration of preferred species, or **U**- Uniform mix of all age classes
Regeneration: Species, Cover (%), Average Height (m) e.g.: rS/30/0.3 - red spruce, 30% cover, 30cm tall
Heights/ages: Heights for volume calculations (Tree of average basal area) and/or Land Capability determination (breast height age and height of Dominant free growing trees)

Post-Treatment Information Requirements – Selection

In order to meet quality specifications for Selection Harvest the following information must be collected:

- Basal area remaining after harvest
- Basal area of trees damaged during harvest activities with exposed cambium exceeding 100 cm^2 (4"x4") in area, or with damage to more than 1/3 of the crown
- Basal area of Acceptable Growing Stock (AGS) after harvest.

Instructions

- Take 1 prism point per hectare with a minimum of 5 prism points and a maximum of 50.
- Use a BAF 2 prism.
- Evenly distribute these points throughout the stand.
- When tallying basal area, do so by AGS, UGS and damaged trees (HD). If species specific information is necessary, also tally by species
- AGS - Acceptable Growing Stock
    - **Softwoods**: Trees that will make a studwood or sawlog quality stem in the future or has one now and will still have studwood or sawlog quality within 15 years. These trees must not have been scarred by harvesting activities with scars of exposed wood exceeding 100 cm^2 in area, or have greater than 1/3 of their live crowns damaged by harvesting activities.
    - **Hardwoods**: Trees that have the potential for producing sawlog quality logs of better than pallet quality and will not degrade within 15 years. These trees must not have been scarred by harvesting activities with scars of exposed wood exceeding 100 cm^2 in area or have greater than 1/3 of their crowns damaged by harvesting activities.
- UGS – Unacceptable Growing Stock
    - **Softwoods**: Trees that will not make studwood or sawlog quality stem in the future, or has stud or sawlog quality stem now but tree will degrade in quality within 15 years. If tree vigor is low due to reasons such as broken/dead tops, insect/disease damage, small crowns (< 1/3 live crown ratio) etc. which make it a poor candidate to leave growing as a future crop tree it should be called UGS.
    - **Hardwoods**: Trees that do not have the potential to produce a better than pallet quality sawlog or one with a sawlog now but that will degrade within 15 years. If tree vigor is low due to reasons such as broken/dead tops, insect/disease damage, small crowns (< 1/3 live crown ratio) etc. which make it a poor candidate to leave growing as a future crop tree it should be called UGS.
- HT = Average height in metres of the species tallied, only if required.
- HD = Trees with harvesting damage of exposed wood exceeding 100 cm^2 in area or crown damage exceeding 1/3 of the live crown
- Calculate the following: % and basal area of acceptable growing stock in m^2/ha, % and basal area that is damaged in m^2/ha

Selection Post Treatment Cruise (8/2010)					Location												
Cruiser		County		Stand #		Date Assessed		Treatment Year			Treatment Area						
		Species			Species			Species			Species			Species			
Line	Plot	AGS	UGS	HT	AGS	UGS	HT	AGS	UGS	HT	AGS	UGS	HT	AGS	UGS	HT	HD
Total (pg)																	
Total (all)																	
Average:																	
Comments:																	