

FOREST RESEARCH REPORT



Nova Scotia Department of Natural Resources

Pre-Treatment Assessment (PTA) Methods and Tools

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Background

In 2011, the government of Nova Scotia announced a natural resources strategy after comprehensive citizen, stakeholder and technical expert engagement (NSDNR, 2011). This strategy calls for “Apply(ing) the Code of Forest Practice (CFP) on publicly and privately owned woodlands”. Applying the CFP is one of the actions necessary to move towards an ecosystems approach to forest management (NSDNR, 2012).

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DRAFT

The **Code of Forest Practice** consists of three elements:

- The Framework Document that outlines the general principles of the code,
- Guidebooks that lists more detailed code guidelines, and
- Technical Manuals that provide tools for implementing the guidelines.

Some examples of technical manuals are:

- Forest Ecosystem Classification (FEC) for Nova Scotia (Neily et al., 2013)
- Tolerant Hardwood Management Guide (McGrath, 2007)
- Tolerant Softwood & Mixedwood Management Guide (McGrath, 2010)
- Intolerant Hardwood Management Guide (McGrath et al, 2015a)
- Spruce – Pine Management Guide (McGrath et al, 2015b)

Pre-Treatment Assessments

One of the key guidelines of the Code of Forest Practice (CFP) concerns Pre-treatment Assessments and states:

1.2.2 The provincial FEC, an extension of the ELC, will be the stand level operational guide for applying ecosystem-based management.

1.2.3 Areas planned for silviculture treatments, including timber harvest, will have a pre treatment assessment (PTA) prepared that describes site, and forest conditions.

1.2.3.1 The PTA will serve as a basis for stand level management plans.

1.2.3.2 Stand level management plans will be compatible with the eco district plan

As is stated in these guidelines, a PTA that includes FEC, site and forest condition information is a required element in implementing ecosystem-based management (EBM). Before a harvest operation is carried out, stand-level details on the site such as vegetation type, soils type, ecosite and windthrow hazard along with stand characteristics such as basal area, species, tree diameter, tree height, quality and existing regeneration must be collected. Information on special wildlife and geological features is also required. This information will enable prescribing appropriate treatments, specific to stand attributes and avoid a “one-size fits all” system of forest management.

To help meet the objectives of CFP Guideline 1.2.3, a system was developed to identify the required elements of pre-treatment assessments (PTA). This PTA system was first published as part of the Tolerant Management Guide (McGrath, 2007) to gather the information necessary to prescribe appropriate harvest treatments for specific ecosystems and stand conditions. This report introduces the tools to collect PTA and report PTA data for use in harvesting plans or in making claims for silviculture funding.

Methods

PTA data is required for planning harvests on crown land or to obtain funding for partial harvesting treatments under the private land program administered by the Association for Sustainable Forestry (ASF). Specific requirements for these programs can be found at:

Nova Scotia Crown Land – Standard Operating Procedures for Development and Approval of Crown Land Harvesting and Silviculture Plans (NSDNR, June 20, 2016)

ASF program - <http://www.asforestry.com/>

In general, the following procedures are followed:

- Stand, site and ecosystems data required (PTA data) to determine prescriptions in the Nova Scotia Forest Management Guides is collected. The Current NSDNR Guides cover 5 vegetation groups. Guides for the remaining vegetation groups are in development.
 - Tolerant Harwood Management Guide (TH)
<http://novascotia.ca/natr/library/forestry/reports/REPORT84.pdf>
 - Tolerant Softwood & Mixedwood Management Guide (TSM)
Includes the Spruce Hemlock (SH) and Mixedwood (MW) Vegetation groups
<http://novascotia.ca/natr/library/forestry/reports/REPORT91.pdf>
 - Intolerant Hardwood Management Guide (IH)
<http://novascotia.ca/natr/library/forestry/reports/REPORT95.pdf>
 - Spruce-Pine Management Guide (SP)
<http://novascotia.ca/natr/library/forestry/reports/REPORT96.pdf>
- The PTA detailed and summarized data is provided to approval agency along with prescriptions
- The PTA data and prescription is subject to review and audit as necessary by approving agency

The data needed to support a distinct prescription for as small as a two-hectare portion of a harvest block will be collected. At most this will require one sample point every hectare and at minimum 1 point every 2 hectares. Small stands will require a minimum of 3 points collected. The entire block must be walked to identify conditions within the block that require distinct treatments. The measurement locations (points) must be flagged and coordinates recorded using GPS. The PTA point locations and block/section boundaries are to be submitted as GIS shape files.

Cruising Instructions

- Take between 1 and 2 prism points every 2 hectares with a minimum of 3 points for small stands. Enough data must be collected to enable prescribing a unique prescription on a 2-hectare portion of a block.

- Evenly distribute these points throughout the stand.
- Use a BAF 2 prism.
- Flag location of PTA sample points and GPS locate position
- Tally trees into 5 cm Dbh classes by Species, AGS/UGS and product class (where the PTA program is being used to submit volume estimates). Where more refined estimates of volume and prescriptions are desired tallying in 2 cm DBH classes may be preferred.
- In the area surrounding the sample point, estimate the regeneration stocking to 2.4 m spacing to established (greater than 30 cm tall and less than 10 cm Dbh) and acceptable (trees flat topped, stunted or damaged to the point where they will not produce merchantable stems after release are considered not acceptable). Regeneration must be estimated for:
 - All commercial species combined (red pine, jack pine, white pine, balsam fir, red spruce, white spruce, black spruce eastern hemlock, sugar maple, red maple, yellow birch, white birch, white ash, red oak, aspen, eastern larch)
 - Long-Lived Intermediate to Tolerant Species combined (red spruce, eastern hemlock, white pine, sugar maple, yellow birch, white ash, red oak)
- Determine the ecosystem characteristics represented by the sampling point including vegetation type and soil type. Soil augers or soil pits do not need to be dug at every point. A soil auger sample or soil pit must be dug to verify soil type wherever stand conditions would indicate a change (e.g. soil moisture, rockiness etc). Soil type must be recorded at every sample point to verify whether it has changed or not and whether the soils have been examined using an auger or by digging a pit.
- Determine wind exposure represented by sample point.
- Determine height at each sample point
 - At least one tree height representing the tree of average basal area.
 - In addition, 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).
- After the entire stand has been cruised and PTA data collected, an estimate of the following items must be recorded.
 - Stand maturity
 - Patchiness of stand
 - Willingness to risk blowdown
 - Previously Treated?
 - In some situations:
 - Species of regeneration desired (TH)
 - AGS of leave patches (TH)
 - Beech regeneration stocking (TH)
 - Restoration desired (IH)
 - Stand age over 50 years old? (SP)
 - Seed source stocking of red pine, red oak and white pine (SP)

Summary Information Required for Prescription

The following information will be calculated and averaged for each section. This information is used in the forest management guides to determine recommended prescriptions. These data are calculated and presented in standard format by the PTA program. The PTA program summary includes the prescription obtained from the NSDNR Forest Management Guides.

- Block & Section Id
- Location
- Number of sample plots
- Area of stand
- FEC vegetation type [Forest Ecosystem Classification | novascotia.ca](http://www.gov.ns.ca/natr/library/forestry/reports/Forest-Ecosystem-Classification-novascotia.ca)
- Future FEC vegetation type
- FEC soil <http://www.gov.ns.ca/natr/library/forestry/reports/Soil-Types.pdf>
- Wind exposure, <http://www.gov.ns.ca/natr/library/forestry/reports/Soil-Types.pdf>
- Windthrow hazard <http://www.gov.ns.ca/natr/library/forestry/reports/REPORT91.pdf>
- Whether the stand was previously treated (PCT, Plantation, CT, Selection Harvest)
- Growing Stock - Total Basal Area (≥ 10 cm Dbh)
- Basal Area of Acceptable Growing Stock (all trees)
<http://www.gov.ns.ca/natr/library/forestry/reports/REPORT91.pdf>
- Species composition by basal area in %
- % Tolerant Species by basal area (rS, eH, sM)
- % Long-Lived Species by basal area (rS, eH, wP, sM, yB, wA, rO)
- Basal Area by Diameter class (Dbh). < 10 cm Dbh, 10-20 cm Dbh, ≥ 25 cm Dbh and ≥ 35 cm Dbh. Usually collected in 5 cm Dbh classes.
- Regeneration stocking at 2.4 m spacing for acceptable and established trees of all commercial species (rS, eH, wP, bF, eL, rP, jP, NS, bS, wS sM, yB, wA, rO, lA, tA, rM, wB) at least 0.3m tall and less than 10cm Dbh.
- Regeneration stocking at 2.4 m spacing for acceptable and established trees of Long-lived species (rS, eH, wP, sM, yB, wA, rO) at least 0.3m tall and less than 10 cm Dbh.
- Maturity (Immature, Mature, Overmature)
- Special Wildlife/Biological features
- Harvest/Silviculture Prescription
- Prescription details

Tools

PTA program

To help in the efficient collection, management, compilation and submission of required PTA data a software program called PTA has been developed. The PTA program allows required information to be submitted in standard formats. It also allows for easy sharing of PTA information between various organizations using common tools and terms. This program makes all compilations necessary and produces standard tables for Crown Harvest plan submissions.

Overview of PTA5 Program Capabilities

- Runs on any Windows® XP, 7, 8 or 10 computer or tablet with a minimum 5.6 Inch screen size with 1024x600 resolution.
- Provides template for entering required PTA data
- Provides compilations necessary for inclusion in crown harvest plans in standard format
- Includes File Management Utilities to organize data
- Includes ability to organize plot data into blocks and sections
- Determines recommended prescription per the Nova Scotia Forest Management Guides
- Compiles volumes by product using Honers Volume tables with the ability to tailor wood specifications
- Ability to read PTA data collected with previous versions of the PTA program by using the Pta4to5 utility

The PTA program can be found and downloaded at no cost from the Nova Scotia Provincial web site at the following link: <http://novascotia.ca/natr/forestry/programs/timberman/pta.asp>. Installation instructions are also found on this web site.

Tally Sheets

For those without access to field data collectors, PTA data can be collected on tally sheets (provided in Appendix II). The data collected on the tally sheets can be entered into any Windows office computer with the PTA program installed. Substantial time will be saved by eliminating the need for manual compilation and production of standard submissions.

In Appendix I a case study shows an example of PTA data collected and the resultant prescription and summary.

References

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Part I: Vegetation Types: <http://novascotia.ca/natr/forestry/veg-types/>
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- NSDNR.** Pre-Treatment Assessments. [Timber Management | novascotia.ca](http://novascotia.ca/timber-management/).

Appendix I.

Pre-Treatment Assessment (PTA) Case Study

Pre-Treatment Site Assessment Tally Sheet. Loc: Milton Co: Queens Block: QU0800012 Section: A

Plot	ST	VT	EX	BD	MAT	PT	WET	TF	WT	WF	Patch	Regeneration	Heights/age/notes
<i>1</i>	<i>2</i>	<i>SH3</i>	<i>M</i>	<i>2</i>	<i>M</i>	<i>N</i>	-	-	-	-	<i>U</i>	<i>50% (all) 5% (LL)</i>	
<i>2</i>	<i>2</i>	<i>SH3</i>	<i>M</i>	<i>0</i>	<i>M</i>	<i>N</i>	-	-	-	-	<i>M</i>	<i>50% (all) 50% (LL)</i>	<i>1</i>
<i>3</i>	<i>3</i>	<i>SH1</i>	<i>M</i>	<i>0</i>	<i>M</i>	<i>N</i>	-	-	-	-	<i>U</i>	<i>0 %</i>	<i>2</i>
<i>4</i>	<i>2</i>	<i>SH3</i>	<i>M</i>	<i>1</i>	<i>M</i>	<i>N</i>	-	-	-	-	<i>U</i>	<i>80% (all) 80% (LL)</i>	
<i>5</i>	<i>2</i>	<i>SH3</i>	<i>M</i>	<i>0</i>	<i>M</i>	<i>N</i>	-	-	-	-	<i>U</i>	<i>10% (all) 10% (LL)</i>	
<i>6</i>	<i>2</i>	<i>SH3</i>	<i>M</i>	<i>0</i>	<i>M</i>	<i>N</i>	-	-	-	-	<i>U</i>	<i>0%</i>	

Comments: *1: on Knoll 2: In Depression*

Sample Cruise Summary & Prescription

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

Vegetation Type.....	<u>SH3</u> – Red spruce-Hemlock/Wild lily-of the-valley (50%)
Long Lived Species.....	<u>97 %</u> (Eastern Hemlock=45%, White Pine = 36%, Red Spruce = 15%)
Tolerant Species.....	<u>61%</u> (Eastern Hemlock=45%, Red Spruce = 15%)
Total Growing Stock (≥ 10 cm Dbh).....	<u>48 m²/ha</u>
Sawlog Stock (≥ 25 cm Dbh).....	<u>38 m²/ha</u>
Acceptable Growing Stock (all trees)''''''.....	<u>37 m²/ha</u>
Windthrow Hazard.....	<u>Low</u> (Moderate Exposure, Soil Type = ST2, Fresh, Medium to Coarse-Textured)
Uniform Distribution.....	<u>83%</u>

Recommended Stand Prescription per Tolerant Softwood and Mixedwood Guide based on cruise summary above:

Individual Tree Selection

Figure 1. Sample output of PTA Computer Program.

06 February 2017 at 10:05

Harvest Plan Summary

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Block Location	Sec Plots	Area (ha)	VT %	Future VT %	ST %	EX %	WH %	Treat?	GS	AGS	ToI	LL %	Species %	DBH Size Class (cm)				Est/Acc Rgn %		Mature Wildlife/ Geology	FMG User	Notes	Road				Private Land	
														BA (m2/ha)				All	LL				Const	SMP	Sensitive Features			
														<10	10-20	>=25	>=35	LL	HW (m)									
QU080001 Milton	B	6 12.0	SH3	SH3	ST2	M	Low	No	48.0	36.7	61	97	44eH35wP17rS3rM	0	8	40	24	32	Mat	IS	1 L	217	438	584	0	0		No
			83		83	100	83										24				P	0	7	37	31			

Notes:

1. Favor AGS keepin windfirm Red Spruce for Seed Source.

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Column Headings (Left to Right): **VT**: FEC vegetation type **ST**: FEC soil type **EX**: Wind Exposure **WH**: Windthrow Hazard **Treat**: Previously treated (Plantation, PCT, CT) **GS**: Growing Stock (DBH>=10cm)
AGS: Basal area of Acceptable Growing Stock **Tol**: % Basal area of Tolerant species: RS,SM,EH **LL**: % Long Lived Species: RS,SM,EH,WP,YB,WA,RO **Species %**: Species % by basal area (top 8)
DBH Size Class: Basal area by diameter class (cm) **Est/Acc Regen**: Established/Acceptable regeneration stocking at 2.4 m spacing, >0.3 m tall and <10 cm Dbh class for (i) all commercial species and (ii) long-lived (LL) species
Mature: Mature: I=Immature, M=Mature, O=OverMature **WildLife/Geology**: Special wildlife and geological features by Category (specify location) **FMG**: Prescription from Forest Management Guide **User**: User-defined Prescription
Notes: Comment number, see footnotes. **Volume Removal**: Estimate of volume to be removed via proposed harvest method (tonnes), Classified by L-studwood/sawlogs or P-Pulp, and by Species group.
Sp/Bf: BF,BS,WS,RS **Pine**: WP,RP only (JP is included in Other SW) **OtherSW**: Other softwood not listed in Sp/Bf or Pine **HW**: Hardwood
Road Const: New road construction or significant road upgrade required. Indicate metres and include shapefile of proposed activity if road required. **SMP**: Special Management Plan required **Sensitive Features**: Within or adjacent to the Block
Private Land: Is access over private land required?

Codes:

Exposure: E=Exposed ME=Moderately exposed M=Moderate MS=Moderately exposed S=Sheltered	Wildlife/Geology: Special wildlife and biological features by category SP=Seepage C=Caves CT=Cavity trees (>20cm dbh with cavity of size suitable for nesting) S=Springs K=Karst M=Mast (oak, beech or witch hazel with mast) ST=Streams O=Rock outcrop/Boulder fields N=Nests (raptors, heron colonies) V=Vernal pools R=Ravine D=Deer wintering areas W=Wildlife concentrations U=Unique features SR=Species at risk/concern (http://www.novascotia.ca/natr/wildlife/biodiversity/species-recovery.asp)	Rx: Prescription CR=Crop tree release OW=Overstory rem & Weed CT=Commercial thinning PC=Precommercial thinning GS=Group selection SA=Salvage HB=Refer to Forestry Field Handbook SH=Shelterwood IS=Individual tree selection SP=Patch Shelterwood LG=Let it grow SS=Strip Shelterwood OP=Overstory removal & Plant SU=Uniform Shelterwood OR=Overstory removal ST=SeedTree	OT =Other OW=Overstory rem & Weed PC=Precommercial thinning SA=Salvage SH=Shelterwood SP=Patch Shelterwood SS=Strip Shelterwood SU=Uniform Shelterwood ST=SeedTree	SMP: AM=American Martin BEN=Bald Eagle Nest BFL=Boreal Felt Lichen CL=Canada Lynx DWA=Deer Wintering Areas HC=Heron Colonies MM=Mainland Moose WT=Wood Turtles	Sensitive Features: B=Boundary Lines C=Camps, Cabins, Dwellings H=Heritage or Cultural sites O=Old Forest features P=Power lines R=Research trials, PSPs S=Sensitive species habitat T=Trails, Portages W=Water course
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Appendix II

Blank Tally Sheets – Definitions Follow Tally Sheets

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:

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 Blowdown

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 cm² (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 1-2 prism points every 2 hectares with a minimum of 3 prism points and a maximum of 25.
- 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 cm² 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 cm² 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 cm² in area or crown damage exceeding 1/3 of the live crown
- Calculate the following: % and basal area of acceptable growing stock in m²/ha, % and basal area that is damaged in m²/ha

