An Approach to Pre-Harvest Silviculture Prescriptions in Boreal Ontario

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Effective April 1, 1997, pre-harvest silvicultural prescriptions (PHSP) are required by law on Crown land in Ontario. Although PH used in other jurisdictions throughou America, they have never been adop a large scale in Ontario. There are valid ecological reasons to change this.

In this technical note, we discuss the rationale and benefits of doing PHSPs, and present a step–by–step approach for developing a comprehensive, site-specific reforestation plan. The sampling methodology we present has been used successfully in Ontario.

What is a Pre-harvest Silviculture Prescription?

A pre-harvest silviculture prescription is a site-specific, integrated plan developed prior to cut block lay-out (Archibald, 1992). These plans incorporate many site-related factors, and detail specific measures for achieving resource management objectives. PHSPs allow resource managers to develop and apply forest management practices that are more ecologically appropriate.

Why do PHSPs?

Effective April 1st, 1997, section 16 of the Crown Forest Sustainability Act for Ontario (1994) (CFSA) requires a forest operations prescription prior to harvest on Crown land.

This regulation and other more stringent regeneration standards and management policies were developed out of the Class Environmental Assessment for Timber Management on Crown Lands in Ontario (1994) rulings.

The forest operations' prescription required under the CFSA must be certified by a registered professional forester (RPF) and must include:

- a record of the current structure and condition of the forest
- a record of the harvesting, renewal and maintenance activities
- a description of the future structure and condition of the forest that are expected as a result of renewal activities
- a record of standards and guidelines used to develop the prescription

PHSPs provide significant benefits in forest management. The PHSP process allows us to:

- track site-specific treatment response
- identify forest values to reduce potential resource-use conflicts
- identify more appropriate and cost-effective harvest and treatment regimes
- build an historical database for future reference (e.g. in classifying ecosites using aerial photography)
- document the justification of selected treatments

PHSPs, Forest Ecosystem Classifications, and Modelling

PHSPs work well when applied with a forest ecosystem classification (FEC) system. Ontario has FEC systems in place for most of the productive boreal forest landbase (Sims *et al*. 1989 and McCarthy *et al*. 1995). These FEC systems are an excellent framework in which to accumulate and apply silviculture knowledge.

PHSPs also help us take advantage of recent advances in resource-supply-model technology. PHSPs provide information on forest structure and successional pathways for each site and treatment regime for these models.

An Approach to the PHSP Process

A three-step process for developing PHSPs has been tested and proven successful over a five-year period on the Timmins Crown Management Unit in northeastern Ontario. This process is based on PHSP systems developed by Sutton (1989), Weetman (1989) and Lavender *et al.* (1990). It meets the requirements of the CFSA, is designed to be flexible to the needs of the resource manager, and is relatively easy to use.

The nucleus of this process is the PHSP survey form presented in Figure 1. This survey form can be modified to suit local conditions, but, some information must be collected to develop an effective PHSP.

The following documented information is critical for an effective PHSP:

- accurate location details
- accurate pre-harvest conditions
- management objectives
- rationale for the treatments and alternatives prescribed

Figure 1: Sample PHSP Form

Site Inspection

Date:	Plot #:

Tenure

Region	District	Twp/Basemap/FRI map #		Management Unit
FMA/Licence #	Stand #	Licensee #	Approval #	Gross Area (ha.)

Management Objective

Species _____
Density _____
DBH _____
Rotation/age _____
Vol/ha. _____
Product _____

Other objectives:

Site and Stand Description

Landform | Terrain | Slope Pos. | Slope % | Aspect | Other (rock, frost, etc.)

Forest Ecosystem Classification		
Site Type		Observations
Vegetation Type		
Soil Type		

organic matter depth _____
humus form _____
depth to restrictive layer _____
moisture regime/drainage _____
depth to mottles/gley _____
soil texture class _____

Shrub Layer			Advance Regen.				Overstorey
Species	Cover %	Ht (m)	Species	Ht (m)	Density (sph)	Condition	Species 1 2 3 4
							DBH (cm)
							Ht (m)
							Age
							Density (sph)
							% live crown
							Site index
							Canopy position

Wildfire risk (lightening, recreation, industrial) & on-site hazards

Pest management (agent, % incidence, potential risks)

Stream & Lakes, RTE species (in and adjacent to site) & present downstream use — AOC numbers

Wildlife (plant & animal), fish habitat, RTE species — AOC numbers

Recreation/heritage (features/facilities, current use) — AOC numbers

Mining activities (claim lines, drill sites, gridlines, aggregate)

Silviculture Prescription

Harvesting Plan		
Harvest stand now? yes ☐ no ☐	Reasons for no harvest/deferral	
Start (season/year)	Finish (season/year)	Seasonal comments (if applicable)
Silvicultural System		Logging Method
Constraint(s)		Volume Expected
Costs		Special Conditions (reserves, etc.)
Utilized species	Leave Species	
Rationale		Access

Renewal Plan			
Preferred		Alternative	
Site Preparation Method		Site Preparation Method	
Year/Season		Year/Season	
Microsite objective		Microsite objective	
Constraint(s)	Cost $	Constraint(s)	Cost $
Rationale		Rationale	
Regeneration Method	Yr/Season/Spp/Stock Type	Regeneration Method	Yr/Season/Spp/Stock Type
Target densities	Cost $	Target densities	Cost $
Rationale		Rationale	
Tending Method	Yr(s)/Season	Tending Method	Yr(s)/Season
Objective(s)	Cost $	Objective(s)	Cost $
Constraint(s)		Constraint(s)	
Rationale		Rationale	

Monitoring
Survey Schedule (Type & Year)

Signature of person completing this prescription: _____

Signature of prescription approval (Licensee/Government RPF): _____

Step 1: Evaluating the Site

Collecting Preliminary Information:

Some information should be collected prior to on-site evaluation. This information comes from a variety of sources, such as forest management plans, aerial photography, and other resource inventory data.

Collect the following biological and physical site information from current management plans and from existing field sampling and inventory data:

- specific site location and tenure records
- management objectives from the current Forest Management Plan (FMP)
- areas-of-concern identified in the FMP
- applicable physical and biological background information (e.g. landform, terrain, FEC, soils, vegetation)

Stratification of Maps

Before performing a site inspection, stratify the (FRI) map using aerial photographs to determine differences within the cut blocks. Identify strata within cut block boundaries by determining those areas that might be treated differently (**Figure 2**)

Once the site map has been stratified, lay out cruise lines that adequately represent the variability within the strata. More variable areas require more plots. A minimum of three to five plots are recommended. Avoid roads and trails. Inclusions within a strata that are limiting or will change the way you will prescribe treatments must be sampled.

Tenure

Use the tenure section of the form to record the information required to locate the PHSP plot. This critical information allows us to track the treatments used on the site.

Management Objectives

Record the social, ecological and product oriented objectives from the approved forest management plan for the area.

State objectives in terms of volume of wood by quality class per hectare, browse per hectare, amount of biodiversity of ecosystem protected, etc. These measurable objectives provide the benchmarks we use to determine effectiveness of treatments.

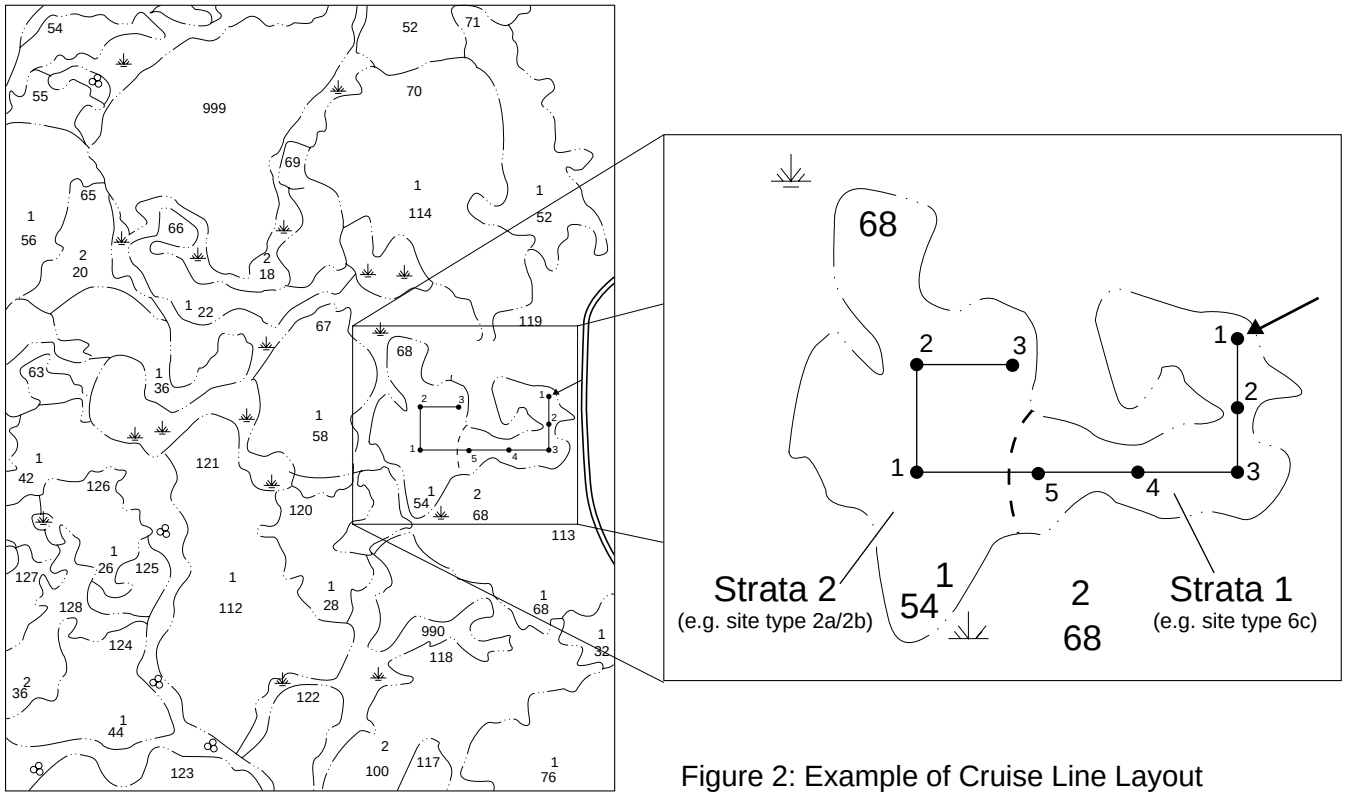

Figure 2: Example of Cruise Line Layout

Visiting the Site

An on-site evaluation is a critical part of the PHSP process. The sampling methods used in PHSP site evaluations are similar to those used in FEC sampling.

Equipment required for PHSP Sampling

- BAF 2 prism
- 50-meter tape
- diameter tape and/or calliper
- increment borer
- soil auger/shovel
- clinometer
- compass
- hip chain
- eye drop bottle with 10 percent HCL
- flagging tape
- trapper's axe
- FEC manual
- calculator
- clipboard with supply of PHSP forms
- Field Guide to Forest Plants

Use field sampling to:

- verify information collected on site and stand conditions
- verify areas-of-concern (AOC) noted in the FMP
- identify any additional AOCs not in the FMP.

Establish plots along a transect that were laid out before arriving in the field. Confirm the original strata and identify any new strata.

If there are any limiting factors that may change your treatment, such as a significant change in soils or vegetation characteristics, establish additional plots.

The recommended sampling plot size is 400 m^2 (20 m x 20 m). If required, include an advanced regeneration survey using a 3.99 m (50 m^2) circular plot.

Site and Stand Description

Record all observations and measurements on the site and stand description section of the form. Record the following:

- general landform and terrain information
- FEC type
- soils
- overstorey and understorey vegetation information
- values and risks not already noted in the FMP

The level of detail in which this information is collected is dependent upon the complexity of the site being surveyed. For example, a homogeneous jack pine flat would require less detail than a complex mixedwood site.

Step 2: Prescription Development

Use the information collected in your site inspection and your management objectives to develop a comprehensive PHSP with:

- a harvesting plan
- a preferred renewal plan
- an alternative renewal plan

Breaking the silviculture plan into sections allows the planner to assign costs for each prescribed treatment.

In cases where the site inspection results in no operations recommended for that site, record the decision and justification.

Setting alternative prescriptions allows the manager to be prepared for uncertainties such as:

- funding constraints
- weather problems
- availability of harvest or site preparation equipment
- availability of planting stock or seed

Step 3: Monitoring and Evaluating

Append your PHSP to your silvicultural records. This provides documentation of prescriptions that can be compared with actual results over time, which allows us to practice adaptive management (continuous learning from successes and failures).

Key Points

- A PHSP is a site-specific, integrated plan developed prior to harvesting.
- PHSPs allow us to:
  - track site specific treatment response
  - identify forest values and reduce potential resource-use conflicts
  - identify more appropriate and cost-effective harvest and treatment regimes
  - build an historical database for future reference (e.g. in classifying ecosites using aerial photography)
  - document the justification of selected treatments
- We present a 3-step PHSP process:
  1. evaluate the site
  2. develop a prescription
  3. monitor and evaluate results
- A sample of a PHSP tally sheet is included in this technical note.

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Appendix 1. Data Collection Attributes (from Maurer 1995)

Attributes	Data Collection	Results
Stand Description		
working group species composition height age stocking site class	Collect prism sweep and tally by species. Collect three working group trees per stand and record diameter, height, and age (DBH). Select sample from “in” trees only.	Resulting basal area sample defines working group, species composition, stocking. Working group sample (diameter-height-age) defines site class.
Stand volume		
diameter at 1.3 m total height age basal area per hectare total volume per hectare merchantable volume per hectare sawlog product per hectare	At each point measure the diameter of each “in” tree with a diameter 10 cm or greater. Height, age, and volume can be generated using available equations.	Use resulting diameter distribution with available height, age, volume, and product equations to generate desired attributes. Determines standing timber merchantable volume and potential product sizes as well as providing stand height and age attributes for stand description.
Advanced regeneration		
stems per hectare of advanced regeneration	At each point create a 50 m^2 plot (3.99 m radius) and count by species all trees considered advanced growth.	Results are stocking and density information for evaluating careful logging prescriptions prior to harvest.
Site Description		
FEC and associated site descriptions as per PHSP form	Site type, soil type, vegetation type, slope, aspect, landform	Ecological and operating characteristics for site prescription.

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