MPB Impacted Stand FFT Ground-Survey Procedures for Development of Treatment Plans

Scope of document:

These procedures are intended as a base and may need to be modified to meet localized conditions and objectives.

Procedures:

1. Stratification

All one (1) hectare or larger areas of an Opening which are significantly different from the surrounding area must be stratified into relatively homogeneous Strata based on:

a. previous Treatment Plan stratification;
b. standards unit;
c. stocking status;
d. inventory components;
e. previous and recommended treatments;
f. site series (ecosystem association), where the site series identified have different Stocking Standards;
g. harvesting and silviculture treatment history;
h. stand structure (e.g. even-aged vs. Multi-storey);
i. forest health factors; and
j. Free Growing status

2. Define understory tree acceptability criteria and select BAF

For each stratum determine understory tree acceptability criteria which may include limitations on tree species, health, brush encroachment, and height.

Select the lowest BAF (basal area factor of prism, m2/ha) that:

a. Will rarely select trees more than 10 m from the sample point, and
b. Will generally select less than 10 “in” trees
c. The same BAF should be used throughout the survey unit

3. Survey line and plot marking

As per the FFT Survey Standard document

4. Number of plots

In stratum smaller than 5 hectares establish 5 sample points. In strata larger than 5 hectares establish one sample point per hectare.

5. Plot location

Locate sample points on a grid that uniformly covers the stratum

6. Plot descriptor

At each plot location record:

a. Plot number
b. Brush condition
    i. HIGH - brush has encroached on some of the crop trees; control will be necessary
    ii. MED - brush will encroach on some of the crop trees, control may be necessary in the future
    iii. LOW - some brush present but no anticipated problem
    iv. NIL - no brush hazard present
c. Crown closure
d. Plot tally information

7. Plot measurements

At each plot

a. Tally the number of well spaced trees in a 3.99 m radius plot < 10 cm DBH that meet the tree acceptability criteria by species and record
    i. average height
    ii. general vigour
    iii. number of plantable/preparable spots

b. With the prism, tally the number of "in" trees $\geq$ 10 cm DBH and record
    i. species
    ii. diameter class
    iii. height estimate
    iv. live/dead status
    v. beetle attack code for Pl trees
        1) Green attack
        2) Red attack
        3) Grey (old) attack

If deemed beneficial to supporting the treatment decision making process, also calculate the following:

c. Record overstory basal area (m2/ha), understory tree count (acceptable, total well-spaced trees per plot), treatment gain (acceptable, total well-

spaced trees per plot plus plantable/preparable) and determine DFP and DFP gain from DFP table.

8. Data compilation

a. For 3.99m plots compile the information for each stratum as per the methods described in the *Stocking and Free growing Survey Procedures Manual*

b. For variable radius prism plots calculate average:

i. Diameter class
ii. height
iii. beetle attack code
iv. basal area/ha

for each stratum

c. Average DFP and average DFP gained from treatments of all plots in the stratum where used.

9. Survey and Treatment Maps

Survey and Treatment Maps must:

a. be submitted in accordance with the British Columbia Mapping Standards for use in RESULTS submissions.

In addition, Survey Maps must also show:

a. points of commencement and termination of the survey;
b. survey lines with numbers and direction traveled;
c. plot centres numbered at least every fifth plot;
d. the boundaries and name of each ecosystem site series;
e. Opening and Strata area;
f. the locations from which photos were taken and an arrow indicating the direction of the photo image from that location; and
g. the type of Survey.

In addition, Treatment Maps must also show:

a. treatment unit boundaries and identifiers;
b. Silviculture Treatment Recommendations;
c. the direction and distance to nearest town; and
d. gross and net treatment area.

10. Net Down

Treatment costs should be estimated based upon field inspections, sample plots, surveys and treatment plan/prescriptions developed. Cost estimates should factor in

the physical qualities and characteristics of the site, the accessibility, status of the regeneration, treatment regimes proposed, and the objectives of the FFT Program and the area. The following costs can be used when determining the ROI.

Cost Estimates

Activity	Cost / ha
Full Survey (regen & FG)	$20
Walk through survey	$10
Brushing	$400
Cabling	$300
Bunching & Burn	$425
Machine falling and crushing	$500
Planting	$1,000
Fill in planting	$600
Snag evaluation	$240
Snag falling (hand)	$300
Snag Falling for density control	$400
Lay out	$15
Access (example portable bridge)	

These are baseline costs, if you recommend a different cost than the ones listed above, support it with rational.

11. Return on Investment

Background

A key Forest's For Tomorrow eligibility criterion is that treatment expenditures must result in an incremental volume increase equal to or greater then an Return on Investment (ROI) of 2%. ROI is based upon the growth and yield of the site, treatments, costs and other parameters. Information gathered from the surveys is entered into a forests modelling program. The Ministry of Forests, Research Branch currently manages 8 such programs. Table Interpolation Program for Stand Yields (TIPSY) is one of the most commonly used models – for managed stands.

Depending upon the tree species expected to naturally regenerate and the species being prescribed for planting there are two different methods that can be used to estimate the ROI. The main method is the 'Modelling Method'. While this method requires that both TIPSY and the Stand Rehabilitation Financial Spread sheet to be run it is the more accurate of the two, and can be used in all circumstances. The 'Short Form' method is a one page field card based on modelling outputs. The field card method can only be used on a limited number of sites with specific criteria, as described below.

Other ROI Methods

Alternatively, other methods than the two described here can be used with approval from the appropriate MOFR personnel.

Modelling Method

TIPSY – is a growth and yield program used to predict the incremental volume gain attributed to silviculture expenditures. TIPSY retrieves and interpolates yield tables from its database, customizes the information and displays summaries and graphics for a specific site, species and management regime. Over 18 parameters that describe a treatment site may be entered.

Some of the key factors include:

(a) species and regeneration method,
(b) silvicultural treatments such as thinning, fertilizers
(c) stems per ha, year of disturbance (fire),
(d) operational adjustment factors that negatively affect site productivity
(e) genetic gain of planted stock,
(f) economic factors such as silvicultural costs for surveys, site preparation, planting and pre-commercial thinning, etc,
(g) harvesting costs, and
(h) site index

The TIPSY stand growth model should not be used to predict the yield of uneven-aged, or mixed species stands.

Further information on TIPSY is available at the Ministry of Forests, Research Branch website:
http://www.for.gov.bc.ca/hre/gymodels/TIPSY/features.htm#Overview

A step by step use of the TIPSY model is explained on the Ministry of Forests, Forest ForTomorrow website:
http://testwww.for.gov.bc.ca/hfp/fft/Return_on_investment/Documentation.doc

Short Form Method

As the application of the TIPSY model is time consuming, a short form application of TIPSY based information has been developed. This short form method can be applied to quickly determine the ROI, and maximum expenditures on sites dominated by Pli, Sx/Ba, or Fdi/Lx. These tables approximate the TIPSY model output for a specific set of site conditions. The tables use only two variables: site index and regeneration densities at free-growing that will achieve a 2% ROI.

The charts included with these tables are a *coarse screening aid* for determining whether or not stocking enhancements will generate a minimum 2% rate of return in young even-aged stands. They are primarily intended for use following wildfires in cases where natural regeneration is expected to produce less-than-desirable stocking. They should only be used if ***all*** of the following conditions are met:

- stand is predominantly even-aged, with little or no advance regeneration in excess of 1 m
- stand is ≤ 6 years old
- stand is currently comprised mainly of lodgepole pine, interior or Engelmann spruce, subalpine fir, Douglas-fir and/or western larch

Both of the inputs for this screening aid are subject to considerable uncertainty which can dramatically affect assessment outcomes:

- Considerable local knowledge of species response to disturbance, coupled with assessments of seed source and seed bed conditions, will be required to predict stocking that will occur without intervention
- Many sources of site index (SI) data for individual sites will underestimate site potential by 2 to 3 m or more. Of particular concern are inventory estimates of SI and estimates of SI from the first generation of SIBEC. The best sources will be from a) height/age or growth intercept measures on nearby stands with similar species and ecosystem parameters (site series, soil, slope, aspect), or b) second generation SIBEC estimates.

Users should be cognizant of the risk of uncertain inputs, and question how the results might be different if the inputs have a significant error. In all cases where results from these charts indicate a maximum expenditure that is close to the expected expenditure, it would be prudent test the scenario using the IRR worksheet. Such action will not reduce uncertainties related to stocking or SI inputs, but will avoid the simplifying assumptions required to build the screening charts.

The short form or table method, only approximates the model, and may underestimate the ROI where:

(a) the prescribed species is of equal or greater value then the regenerating species. For example, a site which is regenerating to Pli where the prescription is to plant Sx and Fdi.

b) Multiple species are regenerating and secondary species are of equal or greater value to the primary species. For example, predicted regeneration at free growing is 60% Pli and 40% Fdi.

(c) Where the expected regeneration at free growing is less then 300 stems per hectare.

Further information on the short form and caveats that apply to its use are found on FFT website:
http://testwww.for.gov.bc.ca/hfp/fft/Notes%20on%20applying%20the%20ROI.pdf

Other approved MOFR methods are acceptable.

2% Threshold

An ROI of 2%, is the threshold which FFT investments must generally meet. There are, however, exceptions where ROI of less than 2% will be considered. These considerations include:

(a) areas having a high public expectation for treatment
(b) areas that fulfil greater landscape objectives and purposes such as within community watersheds, critical habitat restoration, slope stability, and riparian
(c) areas where treatment would compliment and benefit others objectives, interests such as First Nations and community interests.

Note: Areas with an ROI of less than 2 but greater 1% can be treated if approved by an MoFR Regional FFT Forester.

Areas with an ROI of less than 1% can be treated if approved by the FFT Provincial Strategic Planning Committee.

12. RESULTS

Upon completing of the survey work and treatment plan, the information must be entered into the Reporting Silviculture Updates and Land status Tracking System (RESULTS) through the Electronic Submission Framework. An industry guide to preparation and submission of information in RESULTS is available at the following website: http://www.for.gov.bc.ca/his/results/

13.

Deviation from Potential Table (2nd Approximation)									
OS basal area (m2/ha)	Well-spaced trees in plot*								
	0	1	2	3	4	5	6	7	8
0	1.00	0.76	0.52	0.34	0.22	0.13	0.07	0.03	0.00
1	0.98	0.74	0.51	0.34	0.21	0.13	0.07	0.03	0.00
2	0.96	0.73	0.50	0.33	0.21	0.13	0.07	0.03	0.00
3	0.93	0.71	0.49	0.32	0.20	0.12	0.07	0.03	0.00
4	0.90	0.68	0.47	0.31	0.20	0.12	0.06	0.03	0.00
5	0.86	0.65	0.45	0.30	0.19	0.11	0.06	0.02	0.00
6	0.82	0.62	0.43	0.28	0.18	0.11	0.06	0.02	0.00
7	0.77	0.58	0.40	0.27	0.17	0.10	0.05	0.02	0.00
8	0.72	0.55	0.38	0.25	0.16	0.09	0.05	0.02	0.00
9	0.67	0.51	0.35	0.23	0.15	0.09	0.05	0.02	0.00
10	0.62	0.47	0.32	0.21	0.14	0.08	0.04	0.02	0.00
11	0.57	0.43	0.30	0.20	0.12	0.07	0.04	0.02	0.00
12	0.52	0.39	0.27	0.18	0.11	0.07	0.04	0.01	0.00
13	0.47	0.35	0.24	0.16	0.10	0.06	0.03	0.01	0.00
14	0.42	0.32	0.22	0.15	0.09	0.05	0.03	0.01	0.00
15	0.38	0.28	0.20	0.13	0.08	0.05	0.03	0.01	0.00
16	0.33	0.25	0.17	0.11	0.07	0.04	0.02	0.01	0.00
17	0.29	0.22	0.15	0.10	0.06	0.04	0.02	0.01	0.00
18	0.26	0.19	0.13	0.09	0.06	0.03	0.02	0.01	0.00
19	0.22	0.17	0.12	0.08	0.05	0.03	0.02	0.01	0.00
20	0.19	0.14	0.10	0.07	0.04	0.02	0.01	0.01	0.00
21	0.16	0.12	0.08	0.06	0.04	0.02	0.01	0.00	0.00
22	0.13	0.10	0.07	0.05	0.03	0.02	0.01	0.00	0.00
23	0.11	0.08	0.06	0.04	0.02	0.01	0.01	0.00	0.00
24	0.09	0.07	0.05	0.03	0.02	0.01	0.01	0.00	0.00
25	0.07	0.05	0.04	0.02	0.02	0.01	0.00	0.00	0.00
26	0.05	0.04	0.03	0.02	0.01	0.01	0.00	0.00	0.00
27	0.04	0.03	0.02	0.01	0.01	0.00	0.00	0.00	0.00
28	0.02	0.02	0.01	0.01	0.01	0.00	0.00	0.00	0.00
29	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

* total number of well-spaced trees in a 0.005 hectare plot at minimum inter-tree distances of 1.5 to 2.0 m.