Procedures for Factoring Visual Resources into Timber Supply Analyses

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1.0 PURPOSE

The purpose of these procedures is to enable visual resources, to be incorporated into the timber supply analyses of Crown forest lands. These procedures will provide guidance to TFL licensees who are responsible for timber supply analyses of Tree Farm Licenses and to the ministry staff completing timber supply analyses for Timber Supply Areas. These procedures draw upon the most recent visual research results and developments in provincial visual resource management guidelines. They have been developed in co-operation with Timber Supply Branch to ensure that they meet the needs and requirements of current timber supply analysis models and procedures.

2.0 GENERAL ADMINISTRATIVE PROCEDURES

To incorporate visual resources into timber supply analyses, recreation/visual landscape staff should be aware of the Timber Supply Analysis Schedule. The Timber Supply Analysis Schedule identifies the start and completion dates of each analysis and the timber supply analyst assigned to each Timber Supply Area (TSA). The most recent schedule can be found on the Timber Supply Branch web site or for Ministry of Forests Staff on the Timber Supply Branch ftp site.

It is important that recreation and visual landscape staff provide input into the Timber Supply Analysis data package regarding requirements for the management of visual resources. In this regard it is important that district, region and branch recreation and visual landscape staff apprise each other at the earliest possible stage of any concerns regarding the development of the data package. Staff should then make every effort to assist each other in dealing with such concerns.

The data package for each TSA includes sections on “Current Forest Management Assumptions, Integrated resource management” and an Inventories, background information section. These sections of the data package establish the data and manner in which visual resources will be incorporated into a particular timber supply analysis.

3.0 ISSUES IDENTIFIED AS A RESULT OF TSR I

A review of forest management issues identified through TSR I specifically outlined several issues with regards to visual resources which District Managers should be aware of when approving data packages for TSR II.

- there were some uncertainties as to what areas should be modelled for visual resources.
- visual landscape inventories were incomplete in some TSA's and TFL's consequently not all visual resources being managed, were accounted for.
- inventory information was often used as the basis for modelling which may not have completely and accurately reflected current on the ground management.
- alternative silvicultural systems were modelled using values other than table 1.
- Districts were not consistent in their approach to assigning forest cover requirements in VQO zones.
- there was a significant variance in VEG height.

This document, upgrades and rewrites the procedures for factoring visual resources into timber supply analyses to help over come some of the noted shortcomings and to reflect new innovations in the timber supply simulation model.

4.0 DETAILED TECHNICAL PROCEDURES

STEP 1: DETERMINE CURRENT MANAGEMENT

In order to ensure provincial consistency in approach for TSR II, current management must be appropriately defined. The Code has made this task easier than in the past. The Forest Practices Code provides statutory decision makers (district managers) with full discretion in terms of managing visual values. A District Manager can choose to use his/her own authority to manage visual resources, (enact scenic area and VQO provisions) or can utilise planning processes to establish objectives. Whatever option is pursued it is imperative that the results of such decisions are implemented operationally. Furthermore, it is imperative that the statutory decision maker ensure current management as practised in the field, is accurately communicated to the TSR timber supply analyst

Scenarios

Three possible visual landscape management scenarios/situations are recognized under the Forest Practices Code.
These are:
- *Known* Scenic Areas with established VQOs
- *Known* Scenic Areas without established VQOs and
- Inventoried Areas.

Definition of "known" per Section 1(3) of the Operational Planning Regulation
A feature, objective or other thing referred to in this regulation as a "known" feature, objective or thing means a feature, objective or thing that is

(a) contained in a higher level plan, or

(b) otherwise made available by the government at least 4 months before the operational plan is submitted.

The above definition does not specifically address information provided before the Code came into effect, but neither does it specifically preclude such information. It is silent on this matter. In this context, districts have a reasonable argument that anything they made available to licensees prior to the Code is "*known*".

Known Scenic Areas with established VQOs:
Where scenic areas with established VQOs have been made *known* by the DM or a Planning process, the TSR shall reflect the established VQOs as current management. The operational planning regulation (OPR) requires that established objectives be achieved. Approval of operational practices other than stated objectives would contravene Section 10 (c) II of the act and section 27 of the OPR.

Scenic Areas without established VQOs:
Where scenic areas have been identified and made *known* by the DM or planning process, determine what the actual on the ground operational approach/practice is within the scenic areas. For example, has the district manager provided guidance to licensees stating that new recommended visual quality classes (RVQC's) or existing recommended visual quality objectives, be used when planning how to manage and conserve the resource? If yes then operational approvals should be based on this assumption, therefore use RVQC's or RVQO's to represent current management.
If a district manager is not using RVQC's/RVQO's to gauge what is appropriate to manage and conserve the resource, determine what direction the district manager has provided to licensees. In these situations the district manager will have to determine what forest cover requirements can best represent current management in the scenic area.

Inventoried Areas.
Scenic Areas and provisions for establishing VQOs are the two principle tools used to *enable* visual resource management under the Forest Practices Code.
Visual Landscape Inventory information **should not** be modelled in TSR II unless it has been enabled (made *known*) under the code or represents current on the ground management.

However, the Code does make provision for managing visual resources in emergency situations. Some districts rather than making scenic areas *known*, are invoking section 41(2) or section 51 (2) of the Code Act to manage visual values. In these situations the district manager will have to determine what forest cover requirements can best represent current management in the visual area.

STEP 2: DETERMINE THE SILVICULTURAL SYSTEM TO BE MODELLED FOR EACH VISUAL AREA

Once current management has been defined, the next step is to identify which silvicultural system is being practised in each visual area[1] If a selection harvest system is being used see Step 3 below; if a clear-cut harvest system is being used see Steps 4 through 6.

STEP 3: PARTIAL CUTTING

It has been necessary to derive planimetric figures for modelling partial cutting operations within each visual sensitivity unit/visual zone. The *Visual Impacts of Partial Cutting* report (B. C. Ministry of Forests 1997) presents two tables that may be used to estimate how much wood can be removed from a visual area and still achieve the VQC. These tables are presented below.

Table 1. Predicting VQCs using even distribution leave tree Partial Cut Silvicultural Systems.

Volume (Stems) Removed in %	Tree Height (Meters)									
	5	10	15	20	25	30	35	40	45	50
10	R	R	R	R	R	R	R	R	PR	PR
20	R	R	R	R	R	R	PR	PR	PR	PR
30	R	R	R	R	PR	PR	PR	PR	PR	PR
40	R	R	PR	PR	PR	PR	PR	PR	PR	M
50	PR	PR	PR	PR	PR	PR	PR	M	M	M
60	PR	PR	PR	PR	PR	M	M	M	M	M
70	PR	PR	PR	M	M	M	M	M	M	M
80	PR	PR	M	M	M	M	M	M	M	M
90	M	M	M	M	M	M	M	M	M	M

If using table 1 it is recommended that the mid point for each visual quality class be used as timber supply analyses require a single removal figure for partial cutting per visual area. Example: If you are trying to achieve a Partial Retention visual quality class in a 30 meter tree height the appropriate volume removal to be modelled would be 40%.

[1] A Visual Area is the aggregation of visual quality class areas within a landscape unit.

Table 2. ***Most probable classes for partial cuts with % basal area removed per hectare.***

Basal Area Removed %	Most Probable VQC/EVC	Probability of Achievement %
5	R	99.7
10	R	99.5
15	R	99.1
20	R	98.4
25	R	97.1
30	R	94.7
35	R	90.6
40	R	83.9
45	R	73.8
50	R	60.3
55	PR	52.0
60	PR	63.9
65	PR	71.3
70	PR	72.5
75	PR	67.3
80	PR	56.8
85	M	54.7
90	M	69.1
95	M	80.5

Where table 2 is used to model the impact of partial cutting on timber supply, the timber supply analyst in consultation with the visual resource specialist will have to choose an appropriate basal area removal number according to visual quality class. To ensure the VQC is achieved it is recommended that figures with a probability of less than 70% not be used.

STEP 4: CLEAR CUT HARVEST SYSTEM

Once a decision has been made that a clear-cut system will be represented, the next step is to determine the denudation value that would most accurately reflect what is being practised operationally. Visual Quality Classes are recommended at the time a visual landscape inventory and analysis is completed and describe the level of alteration that would be appropriate for a visual sensitivity unit in perspective view. Each VQC is defined by a range of percent alteration in perspective where clearcuts are proposed (See *Clear Cutting and Visual Quality* report, B.C. Ministry of Forests 1996).

a.) ESTABLISH A PERCENT DENUDATION/VOLUME REMOVAL FIGURE FOR EACH VISUAL AREA UNDER CLEAR-CUT HARVESTING SYSTEM

The objective of TSR is to model what is practised in the field as accurately as possible. To do this, it has been necessary to derive planimetric percent denudation numbers for VQC's for modelling clearcutting operations. These ranges are shown in Table 3.

Table 3: Percent Denudation Range for each Visual Quality Class where clear cutting is employed.

VQC	% denudation range for use in timber supply analyses only
Preservation	0-1
Retention	1.1-5
Partial Retention	5.1-15
Modification	15.1-25
Maximum Modification	25.1-40

The ranges in Table 3 apply to the total forested or "green" area of the landscape and should be applied planimetrically.

Timber supply analyses require a single percent denudation figure per visual sensitivity unit/visual area for clearcutting. Visual landscape staff in consultation with the timber supply analyst and other members of the district TSR team should select a VQC and a denudation value for each visual sensitivity unit/area that reflects current management practices. Where a full visual landscape inventory and analysis is lacking, it is recommended that the mid -point of each visual quality class percent denudation range be used. Where visual landscape design is actively practised a greater percent denudation value for clearcutting in each visual quality class may be used. This would more accurately reflect the potential wood supply gained through design.

Where a full visual landscape inventory and analysis have been completed, the visual absorption capability (VAC) rating should be used to refine the percent denudation figure as shown in Table 4. VAC is a measure of the visual sensitivity unit's physical capacity to absorb alterations and still maintain its visual integrity. That is, a low VAC would support less denudation of forest cover than a higher VAC for a given VQC.

Table 4: Percent denudation figures by VQC and VAC

VQC	VAC		
	Low	**Medium**	**High**
Preservation	0	0.5	1
Retention	1.1	3.0	5
Partial Retention	5.1	10.0	15
Modification	15.1	20.0	25
Maximum Modification	25.1	32.5	40

For summary analysis the area in each VQC may be amalgamated and the percent denudation figure for each VQC may be weighted by the proportion of the area in each VAC category. An example of the effect of VAC weighting on percent denudation in each VQO class, where 20% of the area is high VAC, 40% is medium VAC and 40% is low VAC is shown in Table 5.

Table 5: An example of percent denudation by VQC and VAC weighted by the proportion of area in each VAC category.

VQC	VAC			Weighted Average
	40% Area Low	**40% Area Medium**	**20% Area High**	
Preservation	0	0.5	1	0.4
Retention	1.1	3.0	5	2.6
Partial Retention	5.1	10.0	15	9.0
Modification	15.1	20.0	25	19.0
Maximum Modification	25.1	32.5	40	31.0

b.) DETERMINE THE FINAL TIMBER SUPPLY ANALYSIS PERCENT DENUDATION FIGURE FOR EACH VISUAL QUALITY CLASS/OBJECTIVE

Visual landscape management applies a percent denudation figure to the total green (forested) portion of the visual landscape, whether the area is available for harvest or not. Current innovations in the forest service timber supply computer simulation model allows the application of the percent denudation to the total forested area. Therefore it is no longer necessary to apply the ratio of total green (G) to operable (O) to the percent denudation before application in the timber supply analysis. In addition, the assignment of VAC now incorporates the factors previously dealt with through the dispersion portion of the calculation so dispersion is no longer necessary.

If however, the timber supply model being used does not have the capability of applying the percent denudation to the entire forested area it is still possible to adjust the constraints for application to the timber harvesting land base (the portion of the productive forest where harvesting is expected to occur). If the percent denudation, is only being applied to the timber harvesting land base the ratio of total green (G) to operable (O) should be applied as shown below. The application of the G/O ratio increases the percent denudation figure, often beyond the range shown in Tables 3 and 4. For example, assuming a G/O ratio of 2 to 1 and using a VAC weighted percent denudation figure for partial retention of 9.4% from Table 5, the G/O adjusted percent denudation figure for application to the timber harvesting land base would be (2/1) x 9.4 = 18.8%.

Note: Partial harvest systems are based on changing stand structure characteristics, not on percent denudation criteria. Consequently, green to operable corrections are not applied to partial cut zones.

STEP 5: DETERMINE VISUALLY EFFECTIVE GREEN-UP TREE HEIGHT

Visually Effective Green-up (VEG) is the stage at which regeneration is perceived by the public as newly established forest. When VEG is achieved, renewed forest cover generally blocks views of site disturbances such as stumps, slash, road cuts exposed rock and soils.

Preliminary studies indicate that stand height is the best biophysical variable for predicting VEG. In TSR I many districts applied a regional or provincial average VEG height of 5 - 6 meters in their visual zones. Operationally, VEG tree height will vary depending on the biophysical conditions present within a specific zone..

Research has found that the tree height required to achieve VEG is very dependent on the slope of the land. On flat ground VEG may be achieved with 3 meter trees, while it may take a 8.5 meter tree to achieve VEG on a 60% slope.
Table 6 indicates the approximate top tree heights that would result in VEG being achieved for a given range of slope class, assuming:

- a well stocked stand,
- there is little site disturbance;
- a middle ground viewing situation; and
- a vertical viewing angle that does not exceeding 20%.

Table 6. Tree height required to meet VEG by percent slope for well stocked stands

Slope Class %	0-5	6-10	11-15	16-20	21-25	26-30	31-35	36-45	46-50	51-55	56-60	60+
Tree Height	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5

To determine the most appropriate VEG tree height, first determine how many hectares of each slope class exists in each visual area. This process can be automated by having the district GIS specialist or a contractor plot out a detailed slope class map for each visual zone using the trim topographic data and the Microstation/Maps 3D (SEA-3D) function. Add up total hectares of each slope class, within all visual areas. Convert hectares of slope class to hectares of VEG tree height. For example 5,000 ha @ 3 meters, 2,000 ha @ 5 Meters and 3,000 ha @ 7 Meters.

Given these values, each class could be modelled independently or an area weighted average tree height could be determined as follows.:

$$\frac{(X1*Y1) + (X2*Y2)+\ldots}{\text{Total Area}} = \text{Mean Tree Height}$$

X = Area
Y = VEG Tree Height

Using the example numbers in the above formula the average VEG height is 4.6 meters.

5.0 REFERENCES

British Columbia Ministry of Forests 1993. *Procedures for Factoring Recreation Resources into Timber Suppy Analyses.* Recreation Branch Technical Report 1993:1 Victoria, B.C.

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British Columbia Ministry of Forests 1997 . *Visual Impacts of Partial Cutting Procedures.* Recreation Branch Technical Report 1993:1 Victoria, B.C.

Additional Copies of these procedures may be obtained from:

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