

100 Mile House Silviculture Type II Analyses: Development of An Index of Log Quality¹

Introduction

The purpose of this report are to outline the rationale for developing an index that can be used to rate different forest stand conditions in terms of their relative values. This index is to be used to assess the impacts of alternative silviculture practices on future stand values.

Background

This report focuses on the 100 Mile House Timber Supply Area (TSA) in the central interior of British Columbia. The dominant tree species are Interior Douglas-fir (low elevation), lodgepole pine (mid elevation) and interior spruce and subalpine fir (mid to upper elevation). It is also part of completing a Silviculture Type II Analyses, this being directed toward evaluating the potential impacts of silviculture treatments on the quantity and quality of future timber supplies. This kind of analyses is generally conducted using stand level growth and yield projections that provide information on the volume of wood being produced, and also requires that the issue of wood quality be addressed. In particular the process is designed to provide some indication of the future availability of timber volumes in the form of large, high quality logs, these being important to the production of wood specialty products such as log houses, post and beam construction, etc. The key challenge to met in dealing with this question is that while the size of timber is important for these kinds of products, so too are other factors. These are discussed below, before recommending an index of wood quality. This index is to be applied to assessing the amount of high quality wood flowing from current and future managed stands.

Rationale

Silviculture involves manipulating tree species and associated genetic characteristics, the numbers and sizes of trees, and their spatial distributions within a stand, and it involves influencing the growth and survival rates of trees by use of other kinds of treatments such as fertilization, site preparation techniques, controlling the presence and distribution of non-crop tree vegetation, and undertaking various activities to reduce or eliminate the potential impacts of naturally occurring damaging agents. In turn all of these kinds of interventions influence wood quality characteristics, and it can be observed that in general as stands increases in average tree size and density the quality of the wood for use in timber products increases (see Figure 1 and Table 1), and thus so too does the value.

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Unfortunately however there is trade-off involved, such that as stand density increases the average tree size decreases giving rise to the idea that total stand value can be maximized through application of a series of treatments, notwithstanding that stand characteristics also influence other values such as those important for habitat, water quality yield, prevention of fire risk, etc. The existence of such a tradeoff between log size and quality characteristics has long been recognized in log grading rules, such that large logs are preferred over small ones (these being produced more quickly in less dense stands), but logs that are straight and have low taper with few or preferably no large knots, and with a large number of rings per radial cm (these characteristics being enhanced by conditions found in more dense stands). As a result, it was decided that the distribution of log grades within a stand would provide a useful index of timber quality, with an emphasis on the H-grade as an indicator of high quality, large logs.

Fortunately the use of log grades has had a long history in Coastal British Columbia and for planning purposes they are available for application to interior managed stand conditions through TIPSy (v 4.1c). Log grades are preferred over other metrics, such as average piece size (volume per tree) or mean tree diameter because they reflect both wood quality and log size distributions.

Recommendation

Of the log grades available for characterization of interior stands (Table 2), the “H” grade was selected as one that is the largest in size and of highest quality. The “H” and “I” letter grades represent larger log sizes. Figure 3 illustrates the H-Grade volumes per hectare by analysis unit for existing managed stands.

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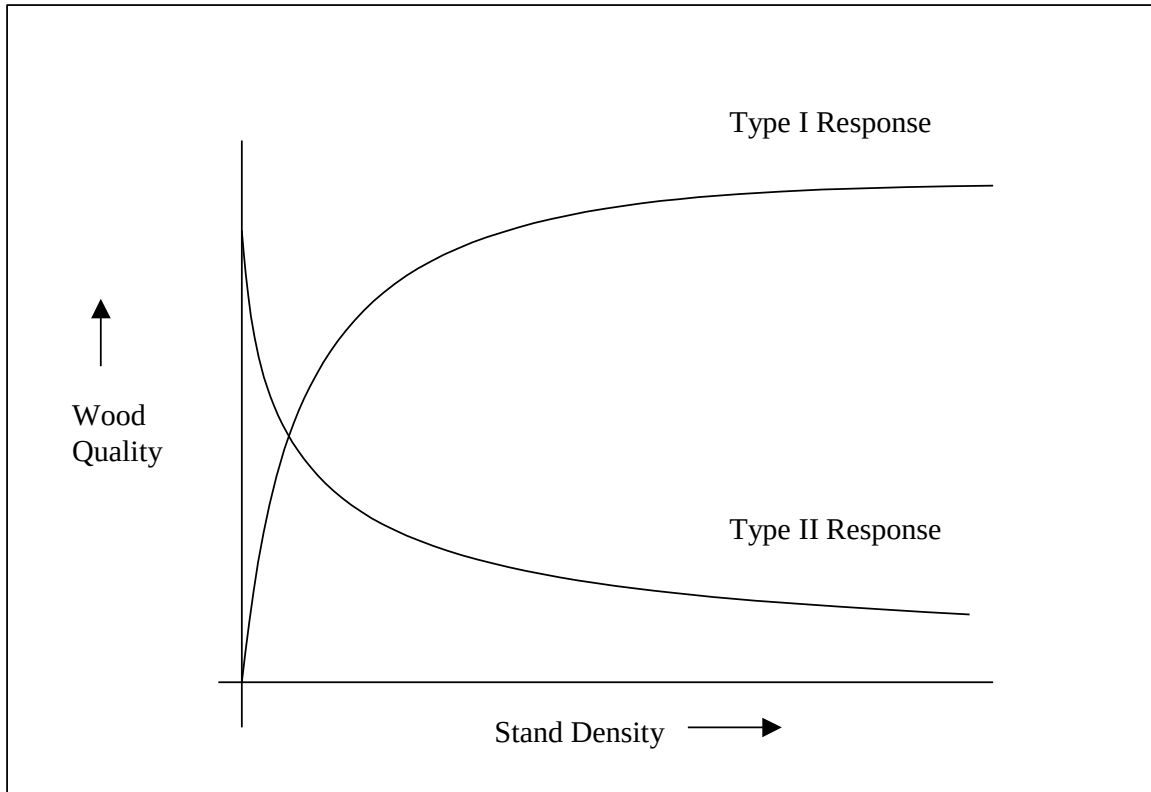


Figure 1. Generalized types of responses in terms of wood quality and value (y-axis) versus increases in stand density.

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Table 1. A schematic diagram of trends in certain wood quality characteristics relative to increases in stand density, characterized according to the response types illustrated in Table 1, and associated impacts on wood value. Tree species and genotype also have a profound effect on wood quality characteristics.

Item	Wood / Log Quality Characteristic For Conifers	Response Type	Trend in wood value vs. ↑ in stand density
1.	Juvenile Wood (JW) <ul style="list-style-type: none"> • ↓ specific gravity ↑ JW • ↑ fibril angle ↑ JW • ↓ fibre length ↑ JW 	1	+
2.	Specific Gravity (SG) <ul style="list-style-type: none"> • wood strength ↑↑ with ↑ SG • pulp yields ↑ with ↑ SG 	2	+
3.	Compression Wood <ul style="list-style-type: none"> • ↑ Lignun (↓ pulp yield) • ↑ fibril angle 	1	+
4.	Fibril angle (FA) <ul style="list-style-type: none"> • ↑ warping ↑ FA • ↓ strength ↑ FA 	2	+
5.	Branch persistence and knot size	1	+
6.	Fibre stiffness (FS) <ul style="list-style-type: none"> • ↑ in paper bursting & tensile strength ↑ FS, but • ↑ in paper roughness 	2	+/-
7.	Proportion of latewood	2	+
8.	Stand volume	2	+
9.	Average piece size (tree diameter) <ul style="list-style-type: none"> • log volume / unit length • ↓ taper • ↑ in lumber recovery • ↑↑ in handling costs 	1	-
10	Bole straightness and absence of defects (forks and crooks) <ul style="list-style-type: none"> • ↑ in volume recovery 	1	+
11	Rings per unit radius <ul style="list-style-type: none"> • but in some species may be a ↓ stand-level productivity due to height repression. 	1	+

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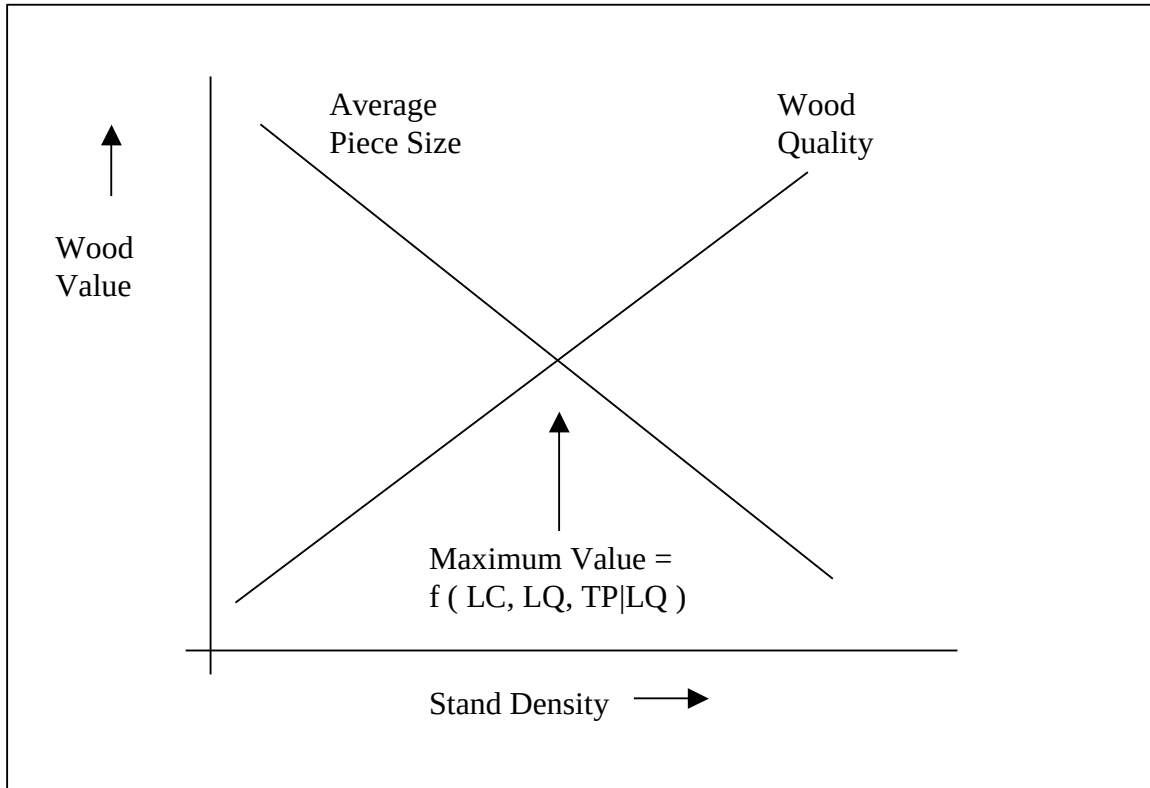


Figure 2. Wood value versus stand density as affected by average piece size and most wood quality characteristics. The maximum stand value is illustrated for a point in time during the course of stand development. This is a function of logging costs (LC; these increase with stand density), log quality (LQ or log grade that involves consideration of both size and wood quality), and timber prices given different grades of logs (TP|LQ).

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Table 2. Summary of log grades available in TIPSy (v4.1c) for characterization of interior stands.

Log Grade	End Product	Min Top Diameter (cm)	Min Length (m)	Min # Rings Per 2 cm	Max Knot Size (cm)
H	lumber	38	5.0 (Sx: 4.0)	5	4 to 5
I	lumber	38	3.8 (Sx: 4.0)	0	8 to 10
J	lumber	16	5.0 (Sx: 4.0)	0	4 to 6
U	lumber	10 (or 16)	5.0 (Sx: 3.8)	0	4 to 14
X	lumber	10	3.0	0	4 to 14
Y	pulp	0	0	0	999

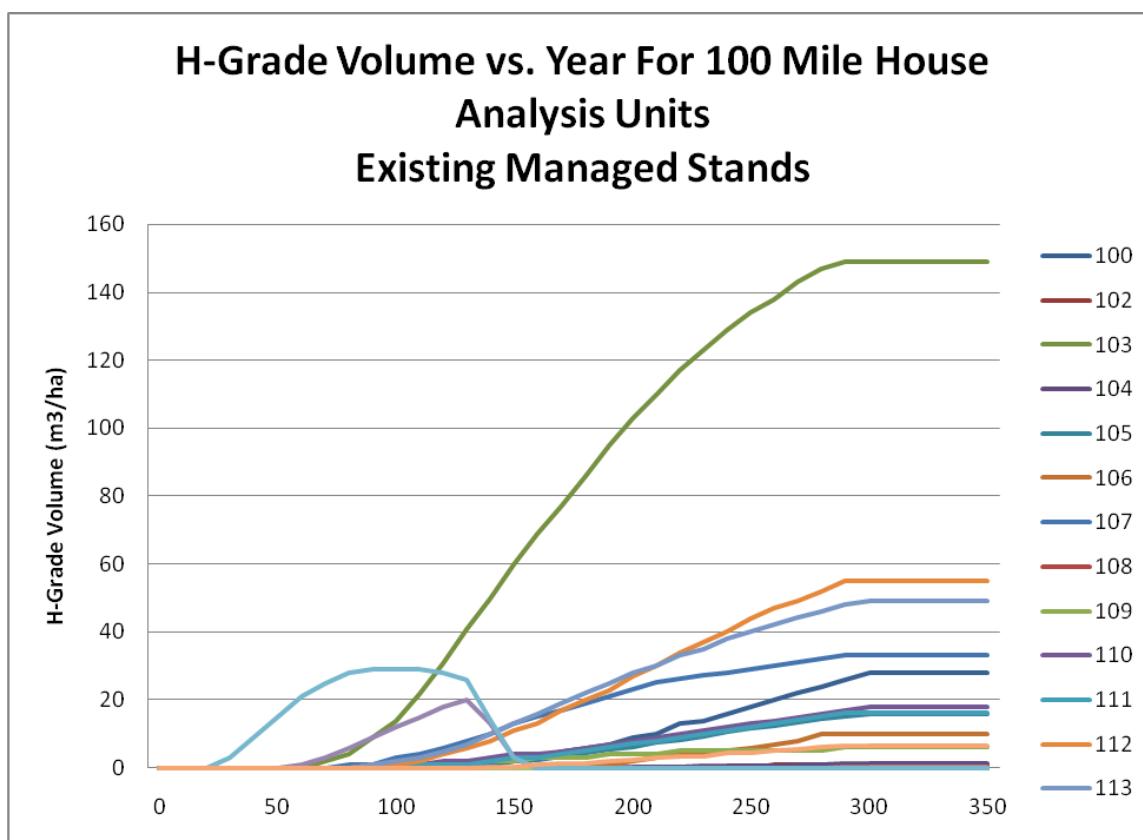


Figure 3. The estimated average volumes per hectare of H-grade logs in different analyses units within the 100-Mile TSA (derived from TIPSy v 4.1c for managed stands and compiled to produce area weighted averages for each analysis unit).