

Inc-IRR (Incremental Internal Rate of Return)

Internal rate of return (IRR) is the interest rate at which the net present value of all the cash flows (both positive and negative) from a project or investment equal zero.

Incremental internal rate of return (Inc-IRR) is an analysis of the financial return to an investor or entity where there are two competing investment opportunities involving different amounts of investment. The analysis is applied to the difference between the costs and revenues of the two investments. Note: It is not simply the difference in their individual IRRs.

ROI vs. Inc-IRR

- ROI (return on investment) = $\text{Net Profit} / \text{Total Investment} * 100$
ROI does not compare two different regimes
- Inc-IRR = incremental internal rate of return over and above the base case (do nothing) over equal investment periods. Sunk costs are ignored.
Inc-IRR compares two different regimes. Do nothing or do silviculture.

Try avoiding the using the term ROI. ROI of 2% is rarely met in the interior. Silviculture investments on SI sites in the mid-20s or greater on the coast can make an ROI of 2% or better.

Why 2%?

- 2% was not pulled out of the air and contrary to rumor it does not represent inflation. It came from several sources:
 - Sweden created a tool for woodlot owners that used 2%
 - Weyerhaeuser presented data in different interior regions which was around 2%
 - An academic study on social discount rates for long term intergenerational public investments came out to around 2%
 - Paper by Craig Farnden and Ian Moss looked at discount rates for FFT investments – 2% was considered reasonable.

Exceptions

- Where investments in the timber harvesting land base (THLB) do not achieve an incremental internal rate of return (Inc-IRR) of 2% or greater, based on a stand-level calculation, there is (was*) an opportunity for FFT managers to approve the expenditure based on benefits to non-timber resource values.
- This is done through the use of

Multiple Accounts Decision Analysis (MADA)

http://www2.gov.bc.ca/assets/gov/environment/natural-resource-stewardship/land-based-investment/forests-for-tomorrow/fft_maa_framework_v2_dec_09.pdf

*Note: Prior to other funding pots (i.e. Forest Enhancement Society of BC) FFT was the only funding source for silviculture investments for non-timber resource values. Although these exceptions are still on the books there may be policy changes in light of new funding sources so run these by Neil Hughes before proceeding.

Table 4. FFT Treatment Decision Matrix for Areas with <2% IRR and Specific Non Timber Values

Non Timber Value	Treatment Decision*		
	THLB: IRR <0%	THLB: IRR 0-1%	THLB: IRR >1-2%
First Nations Concerns (spiritual, archeological, etc)	No	No	No
Rare Ecosystems / WHAs ²²	No	No	No
High Value Grizzly Bear Habitat (Mapped forage sites)	No	No	No
Fire Maintained Ecosystems [Open Range or Open Forest] ²³	No	No	No
Reforestation of important impacted watersheds ²⁴ (with a net hydrological benefit).	-	Yes	Yes
Reforestation of impacted riparian areas associated with high value fish streams or species at risk habitat (fish and tailed frog). Includes logical block areas surrounding riparian area.	-	Yes	Yes
In a Community Interface Area and treatment will contribute to a reduction in fire hazard (reforestation treatments only).	- ²⁵	Yes	Yes
First Nations Non Timber Priorities (identified geographic areas)	-	Yes	Yes
Recreation Values (impacted areas adjacent to rec sites and trails)	-	-	Yes
Impacted (>15%) Visually Sensitive Areas (Preservation, Retention, or Partial Retention VQO's)	-	-	Yes
OGMAs (supported by local MoE)	-	Yes	Yes
Spotted Owl Habitat	-	Yes	Yes
High Value Caribou habitat with large contiguous disturbances (supported by MoE).	-	Yes	Yes
Deer Winter Range area (wetter ecosystems – mod or deep snowpack where cover habitat is deficient)	-	Yes	Yes
Important Moose Habitat adjacent to wetlands with substantial amount of cover removed.	-	Yes	Yes
SARA species not mentioned in this table if supported by MoE	-	Yes	Yes
Unstable terrain where reforestation activities will incrementally reduce risk of landslides. – consultation with engineer.	Yes ²⁶	Yes	Yes
A Type 2 analysis has shown treatment of a particular set of stands to be useful in mitigating timber supply impacts, eg, by reducing regen delay, or reducing constraints to harvesting.	-	Yes	Yes
Areas adjacent/ in close proximity to an approved FFT site where economy of scale can be achieved	Yes	Yes	Yes
Terrain with high potential for scouring/ soil erosion over time that will	-	Yes	Yes
have a significant impact on critical non timber values (identified by hydrologist, geoscientist or soil scientist) ²⁷			

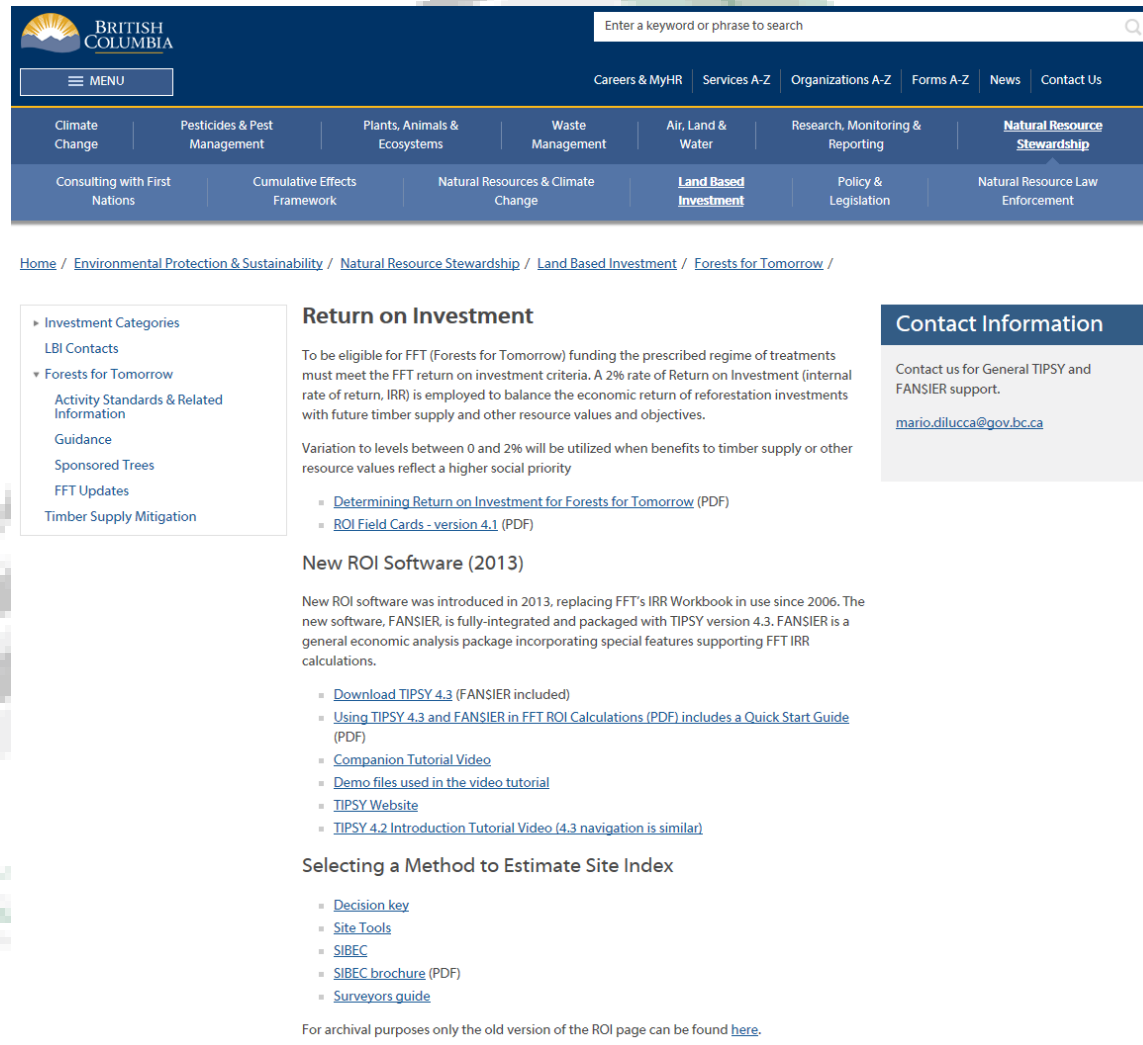
"No" = treatment not desired (ineligible) and overrides all other non timber values

"-" = treatment not fundable based on only this value, others values must exist to make area eligible

"Yes" = Treatment eligible as long as no other values exist on the site with a "No"

Where to find information on FFT 2% policy and tools

<http://www2.gov.bc.ca/gov/content/environment/natural-resource-stewardship/land-based-investment/forests-for-tomorrow/return-on-investment>



The screenshot shows the British Columbia government website. The header includes the BC logo, a search bar, and navigation links for 'Careers & MyHR', 'Services A-Z', 'Organizations A-Z', 'Forms A-Z', 'News', and 'Contact Us'. A secondary navigation bar lists various environmental topics, with 'Natural Resource Stewardship' and 'Land Based Investment' highlighted. The breadcrumb trail reads: Home / Environmental Protection & Sustainability / Natural Resource Stewardship / Land Based Investment / Forests for Tomorrow /.

Investment Categories

- LBI Contacts
- Forests for Tomorrow
 - Activity Standards & Related Information
 - Guidance
 - Sponsored Trees
 - FFT Updates
 - Timber Supply Mitigation

Return on Investment

To be eligible for FFT (Forests for Tomorrow) funding the prescribed regime of treatments must meet the FFT return on investment criteria. A 2% rate of Return on Investment (internal rate of return, IRR) is employed to balance the economic return of reforestation investments with future timber supply and other resource values and objectives.

Variation to levels between 0 and 2% will be utilized when benefits to timber supply or other resource values reflect a higher social priority

- [Determining Return on Investment for Forests for Tomorrow \(PDF\)](#)
- [ROI Field Cards - version 4.1 \(PDF\)](#)

New ROI Software (2013)

New ROI software was introduced in 2013, replacing FFT's IRR Workbook in use since 2006. The new software, FANSIER, is fully-integrated and packaged with TIPSy version 4.3. FANSIER is a general economic analysis package incorporating special features supporting FFT IRR calculations.

- [Download TIPSy 4.3 \(FANSIER included\)](#)
- [Using TIPSy 4.3 and FANSIER in FFT ROI Calculations \(PDF\) includes a Quick Start Guide \(PDF\)](#)
- [Companion Tutorial Video](#)
- [Demo files used in the video tutorial](#)
- [TIPSy Website](#)
- [TIPSy 4.2 Introduction Tutorial Video \(4.3 navigation is similar\)](#)

Selecting a Method to Estimate Site Index

- [Decision key](#)
- [Site Tools](#)
- [SIBEC](#)
- [SIBEC brochure \(PDF\)](#)
- [Surveyors guide](#)

For archival purposes only the old version of the ROI page can be found [here](#).

Contact Information

Contact us for General TIPSy and FANSIER support.

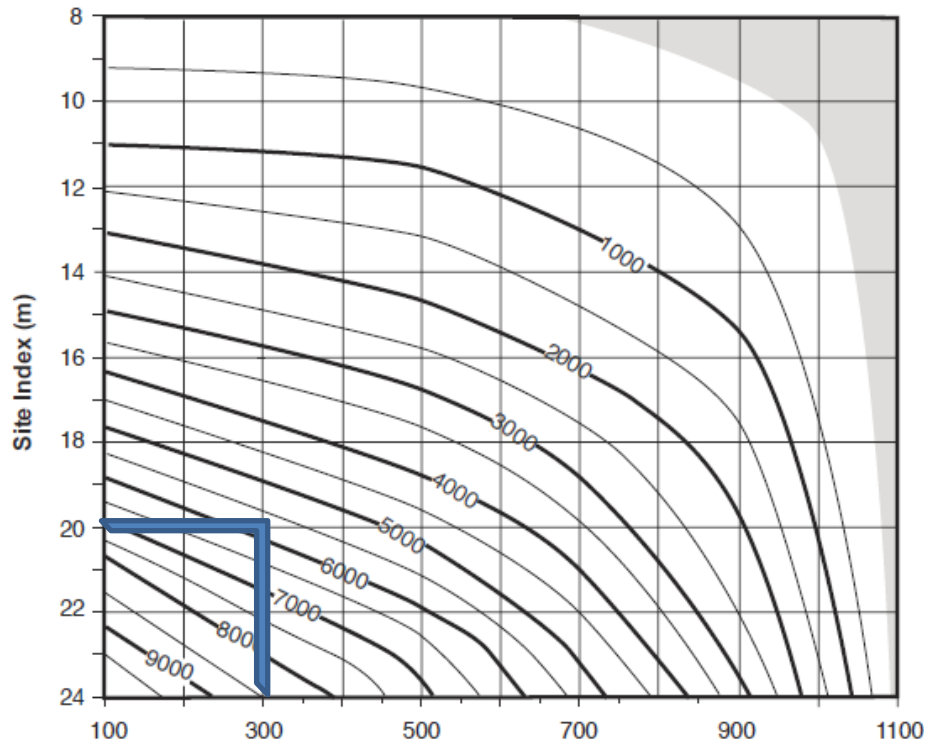
mario.dilucca@gov.bc.ca

Ways to determine if an investment will meet or exceed an Inc-IRR of 2%

- “ROI” Field Cards
- BCTS_FFT Innovative Timber Sale Licences (ITSL) Stand Selection Policy - Table 1: Estimated Maximum Silviculture Expenditure by Site Index.
- TIPSy and FAN\$IER working together to calculate Inc-IRR

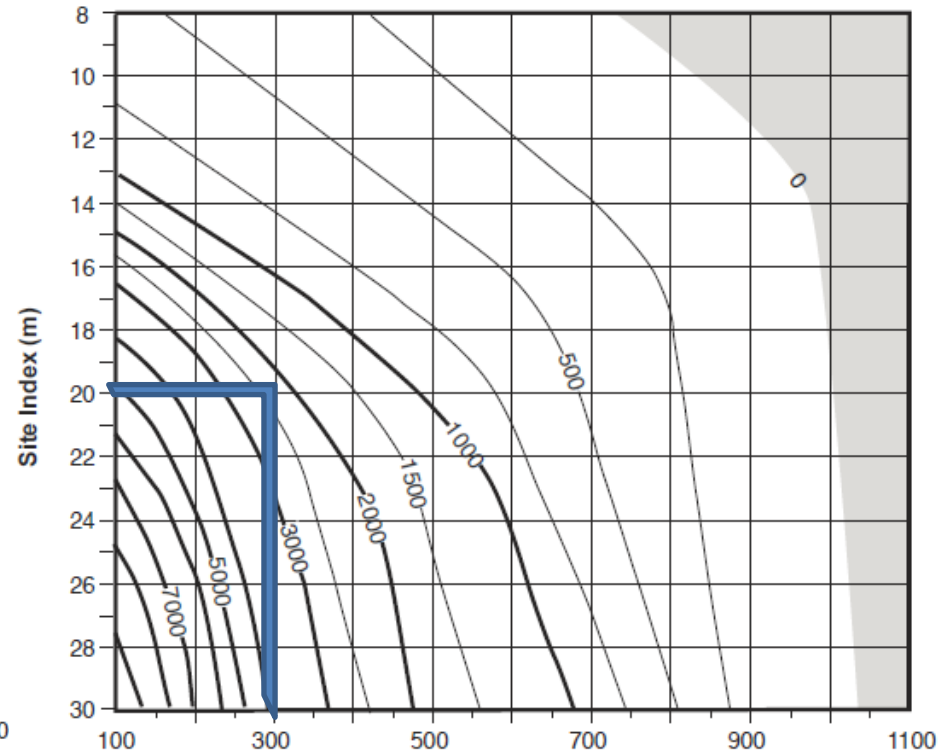
“ROI” Field Cards

Existing Predominant Species is
Lodgepole Pine



Expected Well Spaced Stocking at Free Growing (Untreated)
- include all conifer species regardless of acceptability⁵ -

Existing Predominant Species is
Douglas-fir or Western Larch



Expected Well Spaced Stocking at Free Growing (Untreated)
- include all conifer species regardless of acceptability⁵ -

The power of compounding interest allows less silviculture expenditure on longer rotation species even though they have a higher value.

BCTS_FFT Innovative Timber Sale Licences (ITSL) Stand Selection Policy - Table 1: Estimated Maximum Silviculture Expenditure by Site Index

4. For ITSL cut blocks where at least 80% of the area is NSR, the current ROI process is based on established maximum silviculture expenditure limits per hectare, by site index, that are expected to provide a 2% return on the silviculture investment. The following table is a guideline for maximum silviculture expenditures by site index that should provide a 2% ROI.

Table 1: Estimated Maximum Silviculture Expenditure by Site Index

Site Index	Maximum Silviculture Expenditure / Hectare
12	\$1000/ha
14	\$1500/ha
16	\$2000/ha
18	\$3000/ha
20	\$4000/ha
22	\$5000/ha

Comparing Card option and TIPSY-FAN\$IER to calculate inc-IRR

- Using data from Opening No. 93G063-580 (RESULTS ID 1673440)

Labels

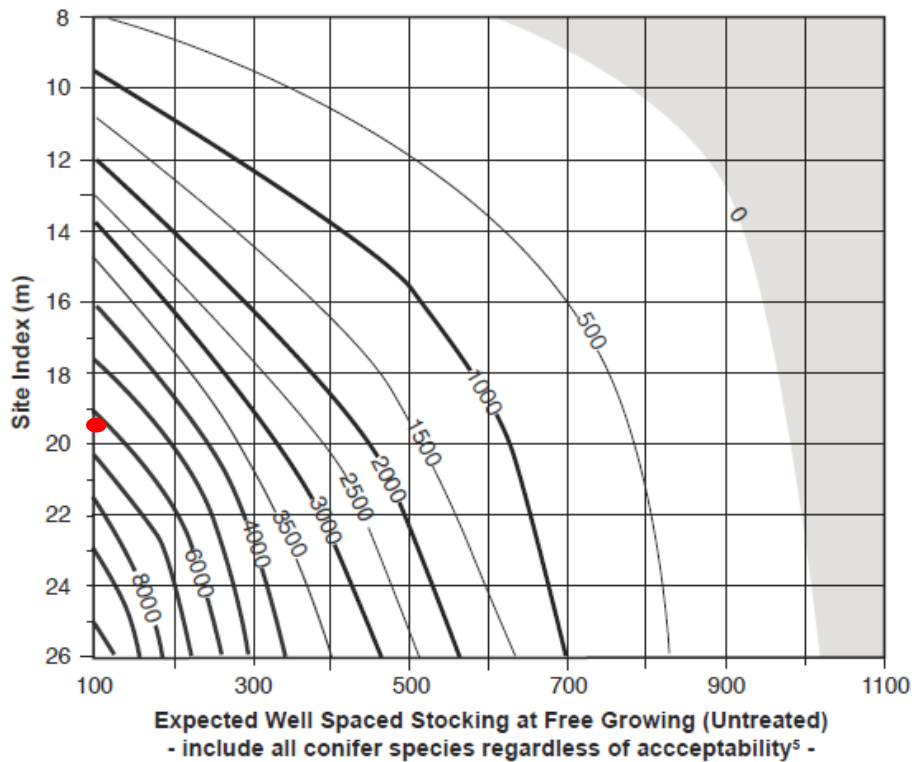
<i>OVERSTORY INVENTORY LABEL:</i>	N/A
<i>UNDERSTORY INVENTORY LABEL:</i>	At50Pli30Sx20 - 1/15 - 0.7/3.6 - 19.5/M - 2 - 450(16)
<i>SILVICULTURE LABEL:</i>	NSR - Sx50Pli50 - 13/11 - 2.4/1.8 - 18.8/E - 100(16)

*Site indices from SIBEC 2013

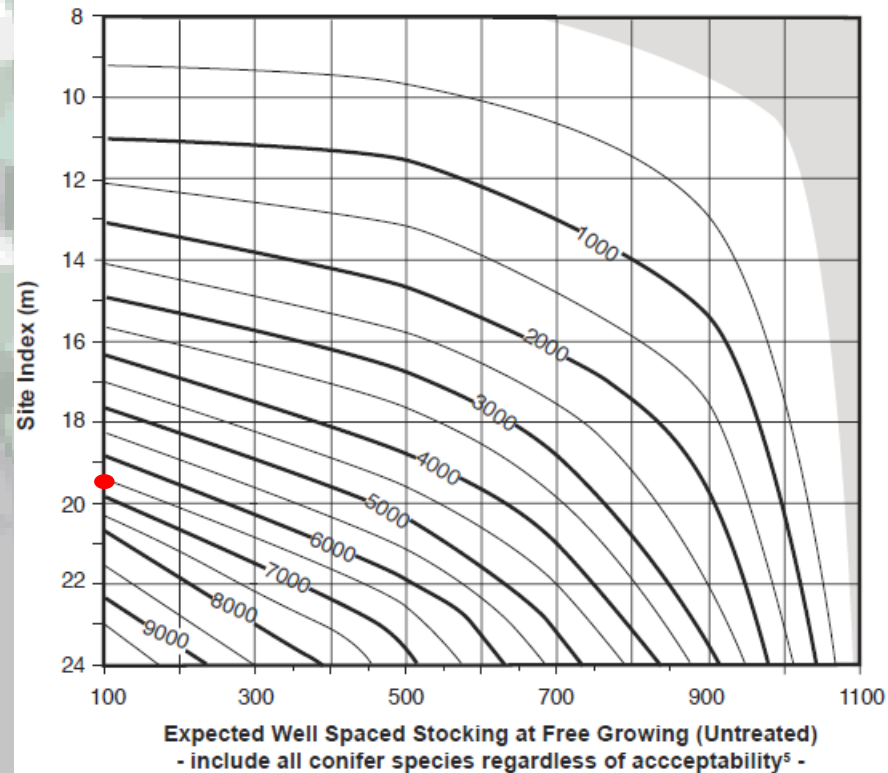
According to the silviculture label the area is not sufficiently stocked. The leading species is spruce, there is 50% spruce and 50% pine. The average age spruce is 13 years old and the pine average is 11 years old. The average height of spruce is 2.4 meters and the average height of pine is 1.8 meters. The site index of spruce is 18.8 (meters at 50 years) estimating (E) based on SIBEC. The total number of well spaced trees is 100 per hectare which was surveyed in 2016.

According to the inventory label the site index of Pine is 19.5 (meters at 50 years) using measured (M) method. Crown closure of all the commercial tree species is 19 percent and the total number of trees is 450 trees per hectare.

Existing Predominant Species is White Spruce or Subalpine Fir



Existing Predominant Species is Lodgepole Pine



The SI for spruce is 18.8 with 100 well spaced trees which intersects on \$6250 that can be invested to bring it to full stocking. The SI for pine is 19.5 with 100 well spaced trees which intersects on \$6,500 that can be invested to bring it to full stocking. So providing you spend $(\$6,250 + \$6,500)/2 = \$6,375$ or less you will meet a 2% return on investment.

Using ITSL table

Table 1: Estimated Maximum Silviculture Expenditure by Site Index

Site Index	Maximum Silviculture Expenditure / Hectare
12	\$1000/ha
14	\$1500/ha
16	\$2000/ha
18	\$3000/ha
	\$3,500
20	\$4000/ha
22	\$5000/ha

Note that this table assumes the site will have zero well spaced trees

TIPSY-FANŞIER to calculate inc-IRR

- Steve Stearns-Smith will be going over this example when he goes into detail of using TIPSY-FANŞIER.
 - assumed the live trees are isolated in unburned clumps and applied a Custom OAF1 of 0.15 to the base case
 - base case uses the “average” fill-plant species composition Sx80Pl20 resulting in planting density of 1600

- The result was:

$$\text{inc-IRR} = 3.7\%$$

Using the max cost derived in the field card method \$6,375(vs. \$2620).

Inc-IRR came back at 2.4% (vs. 3.7%).

Conclusion

- Cards - \$6.3K
- Table - \$3.5 K
- Fan\$ier - >\$6.3K

Determining if FFT meets 2% or greater Inc-IRR may vary between methods therefore it comes down to Professional Judgement.

Review

Method	Pro's	Con's
Cards	<ul style="list-style-type: none">• Use on fire or bare ground• Quick	<ul style="list-style-type: none">• Very coarse i.e. not very accurate• Do not use on advanced regen stands Regen less than 1 m and less than or equal to 6 years• Limited Species lodgepole pine, interior or Engelmann spruce, subalpine fir, Douglas-fir and/or western larch• Cannot use for multi-layered stands
Table	<ul style="list-style-type: none">• Meant for ITSL blocks• Quick	<ul style="list-style-type: none">• Used for after logging• Conservative i.e. not very accurate• Cannot use for multi-layered stands
Fan\$ier	<ul style="list-style-type: none">• Used for any situation• Most accurate• All species	<ul style="list-style-type: none">• Time consuming• Limited use for multi-layered stands need to merge/ignore down to a single layer