



Investing in Reforestation of Loblolly Pine in the Piedmont Based on Various Future Timber Price Scenarios

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Introduction

Often, tough economic times cause the common investor to question the worthiness of their past investment decisions and strengthen their portfolios for possible future downturns. Forest landowners are no different in that they have to make great decisions on whether to harvest, seek other forest revenue opportunities, replant, and whether or not timber is even a worthy investment option. Forests provide society with many benefits that are vital to our everyday lives, but the protection of our forests and those benefits has to start with a robust market and financial opportunities. Reforestation investments are generally low risk, long term, provide a multitude of benefits, and are an excellent source of revenue. The strength of these investments is tree growth. Regardless of changes in timber prices, trees continue to grow. This report serves to educate current landowners or potential forestland investors on a range of possible financial returns so that they can make sound forest management decisions.

Scenarios

This paper provides financial returns for a loblolly pine reforestation investment in the Piedmont region of Georgia using the SiMS2009 Growth and Yield modeling software. Different discount rates, site index levels, and stumpage rate scenarios were applied to the piedmont loblolly management regime so that the landowner can get a good range of financial returns that would best relate to their forest management portfolio and timber market conditions.

Discount Rate: The discount rate refers to the interest rate used in financial formulas that reflect what one could receive from an alternate investment of similar risks. Discount rates of 4% and 8% were used for this financial analysis. These rates were polarized to exemplify a range of possibilities from a forest investment.

Site Index Levels: Site index refers to the height of tree at full stocking conditions at a base age for a given soil type. Site index levels used for this analysis are a low of 50, medium of 65, and a high of 80, all at a base age of 25 years. The low and high site index levels are extreme cases and the majority of timberland will probably fall into the medium site index level.

Stumpage Rates: Stumpage rates are the timber prices, usually on a per ton basis, which a landowner may receive during a timber sale. Nine different stumpage situations were considered for this analysis ranging from a flat pulpwood/flat sawtimber price to an aggressive pulpwood/aggressive sawtimber price, as defined in Table 1.

Table 1. Stumpage rate scenarios used for this analysis.

Alternative Stumpage Scenarios	
<i>PW, CNS, ST per gr ton^a</i>	
Flat PW-Flat ST	\$8, \$16, \$26
Flat PW-Mod ST	\$8, \$18, \$32
Flat PW-Aggr ST	\$8, \$24, \$44
Mod PW-Flat ST	\$12, \$16, \$26
Mod PW-Mod ST	\$12, \$18, \$32
Mod PW-Aggr ST	\$12, \$24, \$44
Aggr PW-Flat ST	\$14, \$16, \$24
Aggr PW-Mod ST	\$14, \$18, \$32
Aggr PW-Aggr ST	\$14, \$24, \$44

^aPulpwood, chip-n-saw, & sawtimber

Results

Table 2 and Table 3 present the estimated returns on a reforestation investment for a medium site index level of 65 feet at 25 years. Net Present Value (NPV), Internal Rate of Return (IRR), and Annual Equivalent Value (AEV) were calculated for each alternate stumpage scenario, and discount rates of 4% and 8% were used for the calculations. Inflation was not factored into any of the following results.

Table 2. Estimated returns for piedmont loblolly pine at various stumpage rate scenarios. Discount Rate equals 4% and Site Index=65.

Piedmont Loblolly SI 65 @ 4% Discount Rate					
	Rotation Ages	Thinning Ages	NPV (\$/acre)	IRR (%)	AEV (\$/ac/yr)
Flat PW-Flat ST	41	15, 24, 35	\$842.69	9.07%	\$42.15
Flat PW-Mod ST	41	15, 24, 35	\$1,054.82	9.64%	\$52.76
Flat PW-Aggr ST	41	15, 24, 35	\$1,497.22	10.60%	\$74.89
Mod PW-Flat ST	41	15, 24, 35	\$965.39	9.89%	\$48.29
Mod PW-Mod ST	41	15, 24, 35	\$1,177.03	10.39%	\$58.87
Mod PW-Aggr ST	41	15, 24, 35	\$1,619.42	11.26%	\$81.00
Aggr PW-Flat ST	41	15, 24, 35	\$1,026.49	10.30%	\$51.34
Aggr PW-Mod ST	41	15, 24, 35	\$1,238.13	10.76%	\$61.93
Aggr PW-Aggr ST	41	15, 24, 35	\$1,680.53	11.59%	\$84.06

Table 3. Estimated returns for piedmont loblolly pine at various stumpage scenarios. Discount Rate equals 4% and Site Index=65.

Piedmont Loblolly SI 65 @ 8% Discount Rate					
	Rotation Ages	Thinning Ages	NPV (\$/acre)	IRR (%)	AEV (\$/ac/yr)
Flat PW-Flat ST	31	15, 24	\$97.89	9.44%	\$8.62
Flat PW-Mod ST	31	15, 24	\$153.28	10.06%	\$13.51
Flat PW-Aggr ST	31	15, 24	\$271.86	11.13%	\$23.95
Mod PW-Flat ST	30	15, 24	\$163.76	10.40%	\$14.55
Mod PW-Mod ST	31	15, 24	\$218.61	10.89%	\$19.26
Mod PW-Aggr ST	31	15, 24	\$337.19	11.84%	\$29.71
Aggr PW-Flat PW	30	15, 24	\$196.83	10.84%	\$17.48
Aggr PW-Mod ST	31	15, 24	\$251.27	11.29%	\$22.14
Aggr PW-Aggr ST	31	15, 24	\$369.86	12.19%	\$32.59

NPV for a Medium Site Index

On a medium site quality in the piedmont region of Georgia, a reforestation investment can have a favorable NPV range of \$842.69 to \$1,680.53 per acre when a 4% discount rate is assumed. A moderate stumpage scenario brings a positive NPV of \$1,177.03. The 4% discount rate results in a

longer rotation and an additional thinning, when maximizing NPV. An 8% discount rate provided positive returns with a range of \$97.89 to \$369.86 per acre. As the discount rate increases, much shorter rotations are required to maximize NPV.

IRR for Medium Site Index

Internal rate of return (IRR) for a medium quality site has a range of 9.07% to 11.59% when following the longer rotations prescribed by a discount rate of 4%. A moderate stumpage scenario has an IRR of 10.39%. As shorter rotations are used for the 8% discount rate, the IRR range for the alternate stumpage scenarios increases to 9.44% to 12.19% with a moderate stumpage scenario IRR of 10.89%. It should be noted that IRR should not be compared to investments of different rotation lengths, but are useful in comparisons with other investments with similar timeframes.

AEV for Medium Site Index

Annual Equivalent Value (AEV) is the expected dollars per acre per year that an investment will make for the life of the project. Managing the longer rotations prescribed by a 4% discount rate yields a range of estimated AEV of \$42.15-\$84.06/ac/yr, with the moderate stumpage scenario providing an AEV of \$58.87/ac/yr. Managing for shorter rotations prescribed by the 8% discount rate provides an AEV range for a medium site index of \$8.62-\$32.59/ac/yr, with the moderate stumpage scenario providing an AEV of \$19.26/ac/yr.

NPV for SI 80 and SI 50

Figure 1 presents the Net Present Values for a low, medium, and high site index level when using a 4% discount rate. NPV for a high quality site (SI80) can have a range of \$1,328.42-\$2,523.73 per acre. NPV for a low quality site (SI50) still has a positive NPV range of \$321.35-\$806.16 per acre.

Figure 1. Net Present Value for alternate stumpage scenarios and site index levels. Discount Rate equals 4%. Rotation lengths range from 40-46 years.

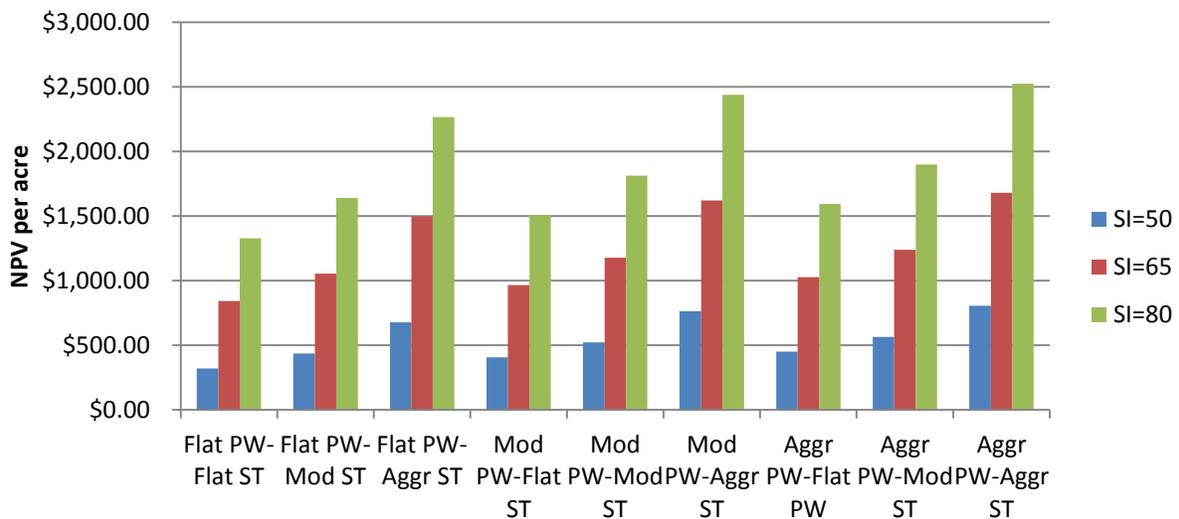
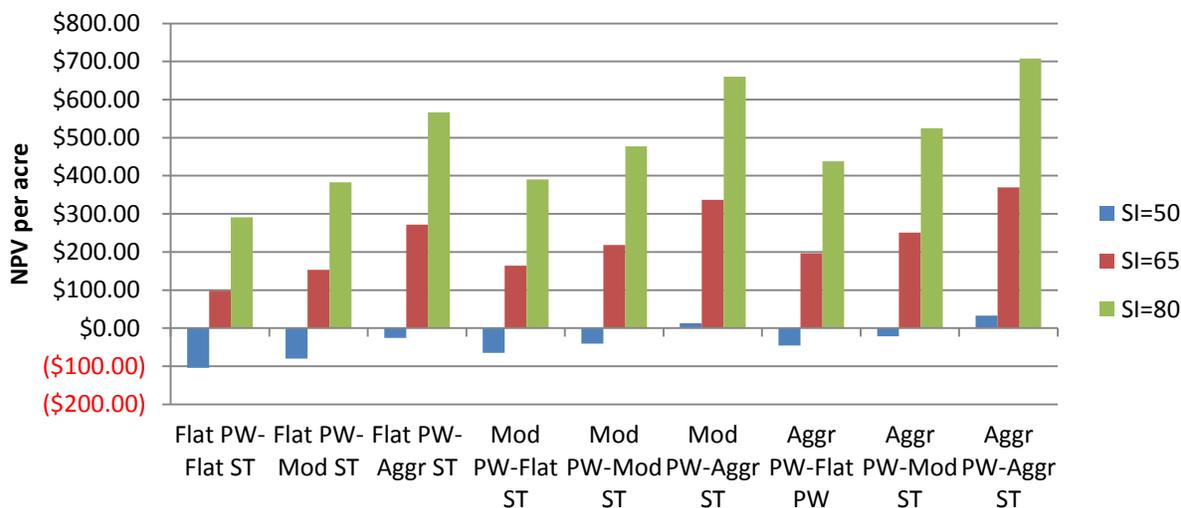


Figure 2 presents NPV's when utilizing an 8% discount rate. The high site quality (SI80) can achieve a NPV range of \$291.24-\$707.52/acre. A low site quality will yield a NPV range of -\$104.31 to \$32.50.

Figure 2. Estimated NPV for alternate stumpage scenarios and site index levels. Discount Rate equals 8%. Rotation lengths range from 28-37 years.



IRR for SI 80 and SI 50

Internal Rate of Return (IRR) can have a range of 11.12%-14.05% for a high quality site at the longer rotation management schemes examined and a range of 11.81%-14.74% for the shorter rotation management schemes prescribed on a high quality site. Moderate stumpage levels can achieve an IRR of 12.74% and 13.54% for the long and short rotation schemes, respectively. A low site index level has a range of 6.18% to 8.07% for the longer rotation alternative with an IRR of 7.17% on a moderate stumpage level. The short rotation alternatives and a low site index level can produce an IRR range of 6.24%-8.43% and an IRR of 7.38% for a moderate stumpage level.

AEV for SI 80 and SI 50

Annual Equivalent Value (AEV) for a high site index level can generate an excellent range of \$67.12/ac/yr to \$127.51/ac/yr with a moderate stumpage level AEV of \$91.56/ac/yr; both with a discount rate of 4%. An 8% discount rate can generate an average AEV range of \$26.35/ac/yr to \$62.85/ac/yr. A moderate stumpage level at an 8% discount rate can produce an AEV of \$43.21/ac/yr.

Annual Increments

Table 4 and Table 5 provide the annual increments by product class for the medium site index level at 4% and 8% discount rates. The annual increment for sawtimber production at a 4% discount rate is estimated at 3.88 tons/ac/yr and 2.8 tons/ac/yr for the 8% discount rate. The difference is a result of the addition of the third thinning and the longer rotation age with the lower discount rate. Both scenarios yield nearly 6.5 tons/ac/yr.

Table 4. Estimated average annual growth increments for piedmont loblolly pine on site index 65 lands by product class when maximizing net present value and using a discount rate of 4%

Piedmont Loblolly SI 65 Annual Increments @ 4% Discount Rate							
Product	Management	2nd				Total	Annual Increment
	Regime	1st Thin	Thin	3rd Thin	Final		
	<i>harvest yrs</i>	<i>green tons</i>					
Pulpwood	15, 24, 31, 41	45.17	11.21	8.88	10.12	75.38	1.83
Chip-N-Saw		0.3	25.41	2.89	0.15	28.75	0.7
Sawtimber		0	8.23	45.36	105.58	159.17	3.88
Totals		45.47	44.85	57.13	115.85	263.3	6.41

Table 5. Estimated average annual growth increments for piedmont loblolly pine on site index 65 lands by product class when maximizing net present value and using a discount rate of 8%

Piedmont Loblolly SI 65 Annual Increments @ 8% Discount Rate							
Product	Management	2nd				Total	Annual Increment
	Regime	1st Thin	Thin	3rd Thin	Final		
Pulpwood	15, 24, 31	45.17	11.21		21.86	75.24	2.43
Chip-N-Saw		0.3	25.41		7.31	33.02	1.07
Sawtimber		0	8.23		80.45	88.68	2.86
Totals		45.47	44.85	0	109.62	196.94	6.36

Discussion

Forest investments can produce attractive financial returns, even with low and stagnant stumpage prices. Landowners are paid on the volume of timber harvested, which continues to grow each year regardless of the stumpage price. In the case of a medium site index, the annual growth was nearly 6.5 tons per acre. Internal rate of return increased from 9.07% to 12.19% as stumpage rates increased from the flat scenarios to aggressive scenarios. Site fertility significantly influences financial returns. The IRR range of 6.18% to 14.05% corresponds with the range of site index from a low site index (50) to a high site index (80).

Forest landowners with medium to high site index levels can see excellent returns on their investments from traditional pine products across most stumpage price levels and discount rates. However, low site index levels may require additional opportunities such as cost-share funding, hunting leases, and pine straw leases to lower investment costs or generate additional revenue.

Assumptions

Management Regime

This financial analysis considered a loblolly pine plantation for the piedmont region of Georgia under three site index levels; low (50), medium (65), and high (80). Base age for the site index was 25 years. Initial planting density was assumed at 605 trees per acre (6'x12' spacing) with a 90% first-year survival rate.

First thinning was assumed at a basal area of 130 ft²/acre but no earlier than age 15. A second thinning was assumed when the basal area reached 120 ft²/acre and a third thinning was only used if the basal area reached 120 ft²/acre at least 5 years before the final harvest age. Residual basal area was 70 ft²/acre after each thinning. The rotation ages varied for all site index levels, stumpage scenarios, and discount rates and were determined by SiMS2009, basing it on maximizing the NPV criterion.

Site Preparation and Annual Costs

Site prep consisted of a chemical application (\$95/acre) and a prescribed burn (\$10/acre) for a site prep total of \$105/acre. 3rd generation loblolly pine seedlings (\$58/1000) were selected and machine planting (\$0.08/tree) was assumed for a total of \$83.49/acre. Annual property taxes were assumed at \$6/acre, annual management costs at \$2/acre, and annual protection costs at \$2/acre.

Harvesting Costs

Harvesting costs were assumed at 8% of the total sales revenue. Harvesting costs could apply to the assistance of a consulting forester during a timber sale and it was assumed that one was used to achieve the stumpage premiums. Local severance taxes were assumed at a millage rate of 25 or .025% of the total sales revenue. Due to varying individual tax liabilities, state and federal income taxes were not assumed for this financial analysis.

Pests, Diseases, and Fire

This analysis did not include risk factors associated with damaging agents, such as wildfire and southern pine beetle outbreaks. Landowners should consider these risks and implement mitigation practices, such as firebreaks, prescribed fire, and frequent monitoring of stand conditions. Although management and fire protection costs are included in the analysis, additional costs may be incurred to maintain stand health.

Disclaimer:

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