eYield User's Manual 2023

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INTRODUCTION

eYield is a forest management simulation model aimed at small and medium sized private landowners in the eastern and southern United States. The eYield system offers a stand-level simulation of harvest activities and financial transactions that are reasonably defined and suitable for the seven natural forest simulators that it accommodates. These include natural loblolly pine (*Pinus taeda*), slash pine (*Pinus elliottii*), shortleaf pine (*Pinus echinata*), longleaf pine (*Pinus palustris*), eastern white pine (*Pinus strobus*), yellow-poplar (*Liriodendron tulipifera*), and oak-hickory (*Quercus* spp. - *Carya* spp.) forests.

Within eYield, one would first select the simulator of interest, then define the initial conditions of a forested stand of trees. These conditions include the size of the stand, the initial age of the stand, the current stocking of the stand (as usually expressed by basal area per acre[1]), and the site index[2] of the stand. Users of eYield can define a harvest regime by specifying the type of harvest entry and the amount of forest (as expressed by basal area) that will remain after the harvest activity has been modeled. The eYield system can also calculate a number of economic outcomes from the management of the stand. Therefore, the planning horizon will be defined, along with the appropriate tax and discount rates. Further, specific revenue and cost items that may occur during the simulation can be defined by a user of eYield.

A number of reports can be generated for each simulation conducted in eYield. These include bark beetle risk assessments for natural pine simulations, cash flow estimates for each financial transaction that is recognized during the planning horizon, cash flow estimates every year, and financial profitability metrics (net present value, etc.). A growth and harvest report presents stand conditions in each year where a harvest activity is assumed, providing estimates of harvested and residual (post-harvest) stand structure. A market conversion report presents detailed information concerning the products and values produced when harvests are scheduled, and a woodflow summary report provides a coarse summary of the amounts and values of different products produced during the scheduled harvest activities.

The User's Guide begins with an introduction to the main interface of the eYield system. The reports that can be generated from the eYield system are then described. Each major section (tab) of the system is then explored to help users understand the type of information that is required to develop a simulation of the management of a stand of trees.

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[1] Basal area in the southern and eastern United States is defined as the cross-sectional area of trees at 4.5 feet above ground. It is expressed in square feet per acre. Reasonable ranges for a basal area estimate are 0 (recently harvested) to 250 (mature forest) square feet per acre.

[2] Site index is the average height of the dominant and co-dominant trees in a stand at the assumed base age. A common base age for stands of trees in the southern and eastern United States is 25 or 50 years. Therefore, a site index of 75 and a base age of 25 years would suggest that the dominant and co-dominant trees in a stand are 75 feet tall when they are 25 years old. This also suggests that they are shorter than 75 feet tall prior to being 25 years old, and taller than 75 feet tall after being 25 years old.

Disclaimer

Information generated using the eYield model is made available as a public service and is to be used only for reference purposes. The University of Georgia and the Warnell School of Forestry and Natural Resources provide the results of the simulator AS IS, without warranty of any kind regarding accuracy, validity, completeness or fitness of use. The University of Georgia and the Warnell School of Forestry and Natural Resources accept no responsibility for damages alleged to have been suffered as a result of the use or misuse of the information derived by the eYield model.

SECTION 1. GETTING STARTED

To initiate a session of eYield, one should access the following Internet address on a personal computer, laptop, tablet, or cell phone.

eyield.uga.edu

eYield was developed using a responsive design, which suggests that the functionality of the model will adapt automatically to the device in which it is used. Given differences in screen sizes among computing devices, the eYield model may be presented slightly differently on different devices than the examples that are provided here. Rest assured, the functionality of the model is the same regardless of the device on which it is used. An initial encounter with eYield on a personal computer brings a user to the "Welcome" page (Figure 1).

Figure 1. The main page, or "Welcome to eYield" page of the eYield model.

Once initiated, through the top banner (*a* in Figure 1), users of eYield can access information about the forest simulator models (Figure 2), a glossary (Figure 3), a set of frequently asked questions (FAQs) (Figure 4), and some short videos (Figure 5) that were created to help explain how the model works.

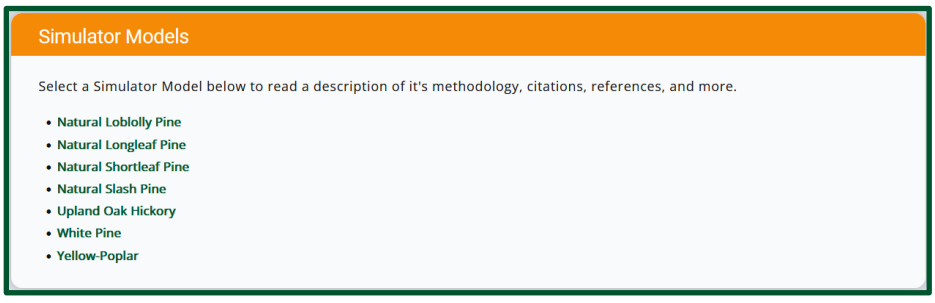


Figure 2. A list of simulator models, each designed to link users to more information regarding the model of interest.

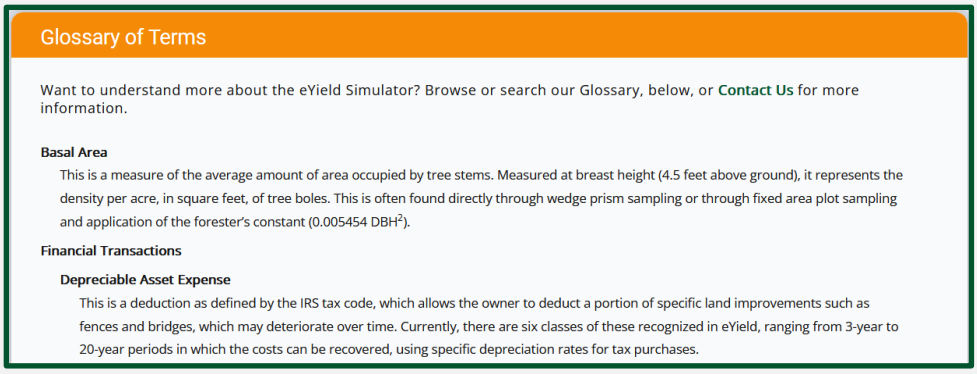


Figure 3. The eYield web page containing a glossary of terms used throughout the model.

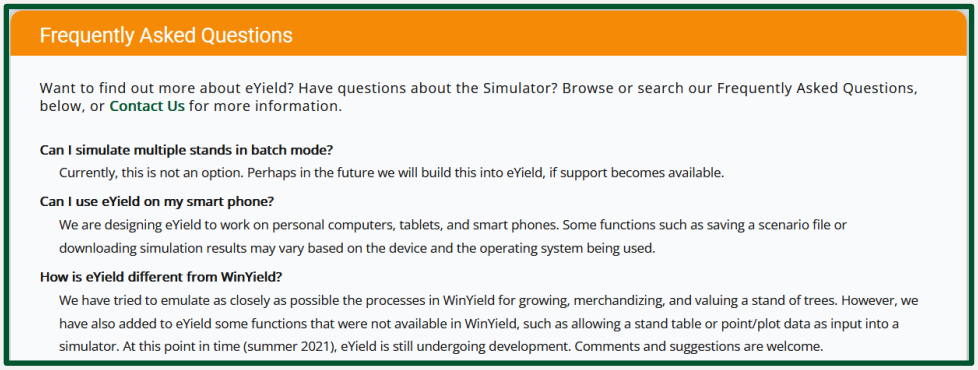


Figure 4. The FAQs page within the eYield model.

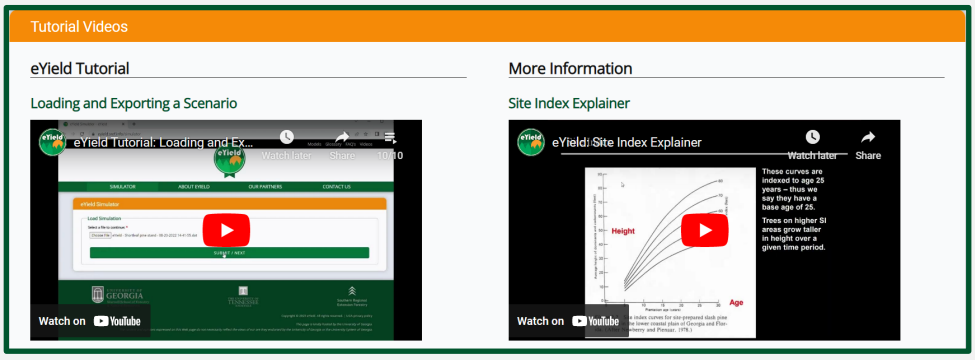


Figure 5. An example of what one might find on the tutorial videos webpage of the eYield model.

Below the eYield logo in Figure 1, a green, horizontal strip containing a menu (*b*) is presented to allow a user of eYield to contact the development team (Figure 6), to read about the partners who helped develop eYield (Figure 7), and to obtain some information about the motivation to develop the eYield model (Figure 8).

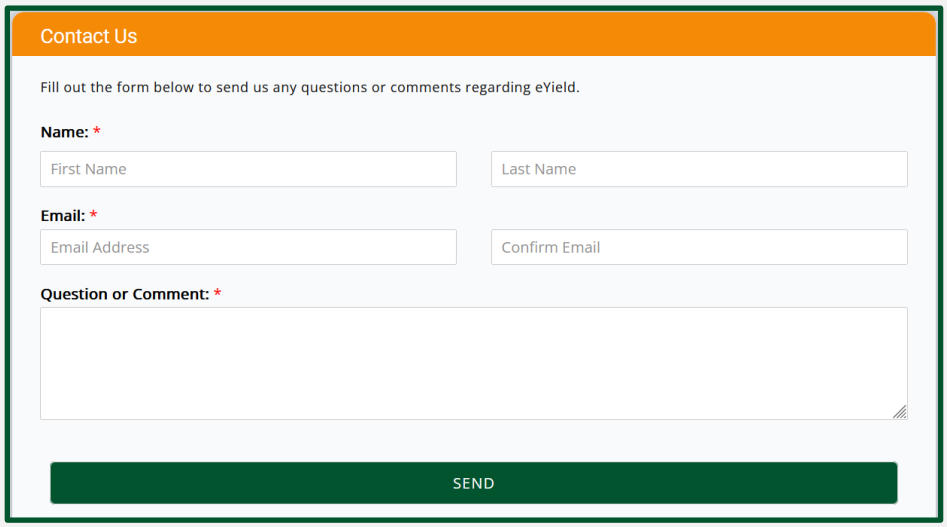


Figure 6. The form used in the eYield model to contact the developers.

Figure 7. A short summary of the partners involved in developing the eYield model.

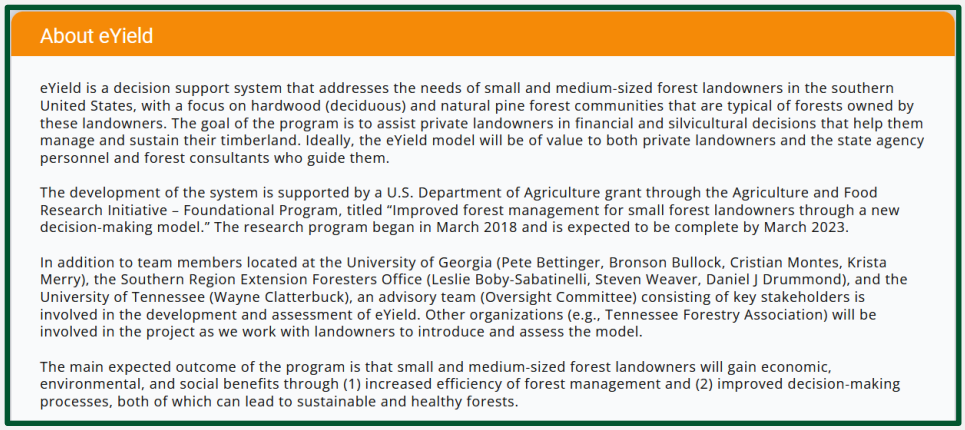


Figure 8. A brief explanation of the motivation to produce eYield.

Further, a user of eYield can initiate a new session by selecting the "simulator" option on the green, horizontal strip illustrated in Figure 1. The process for initiating a new session begins with the selection of reports that are desired (Figure 9). These reports are discussed in more detail in the next section of this User's Guide.

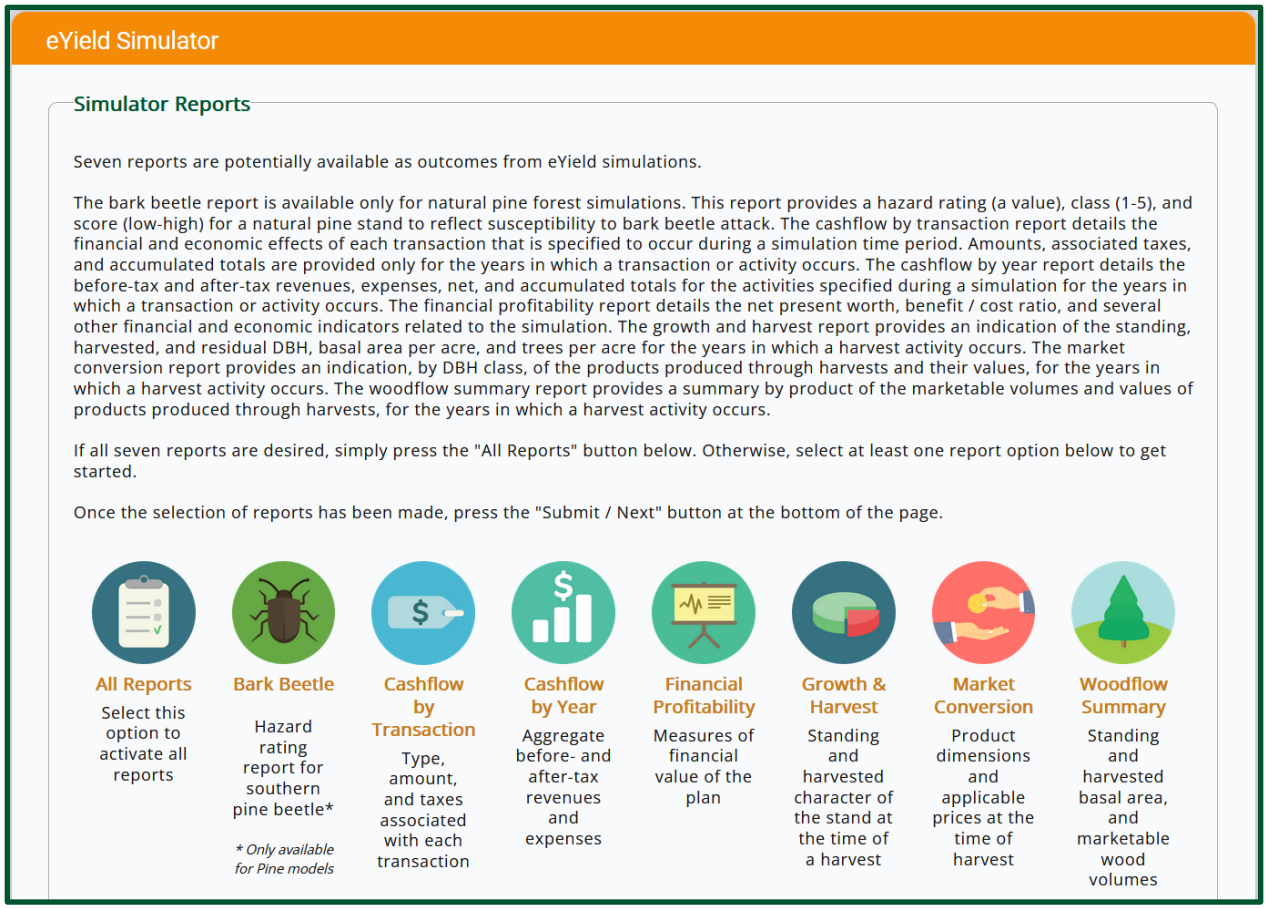


Figure 9. What a user of eYield encounters when initiating a new eYield session.

In the "Welcome to eYield" section (*c* in Figure 1), a brief summary of the capability of the model is again presented. Further, the image (poster) describing the eYield model can be selected (clicked) for closer examination (Figure 10).

Finally, located at the bottom of this section (*c* in Figure 1) are two buttons: *load scenario* and *new scenario*. The load scenario button allows one to search their computing device for a saved eYield scenario (likely a .DAT file), with the purpose of loading previously saved simulation assumptions back into the eYield model. The new scenario button allows one to initiate a new eYield session.

It is in this section of the eYield interface (*c* in Figure 1) that a user will enter information (data and assumptions) concerning a simulation of the management of a stand of trees, and it is here where the report(s) will be presented.

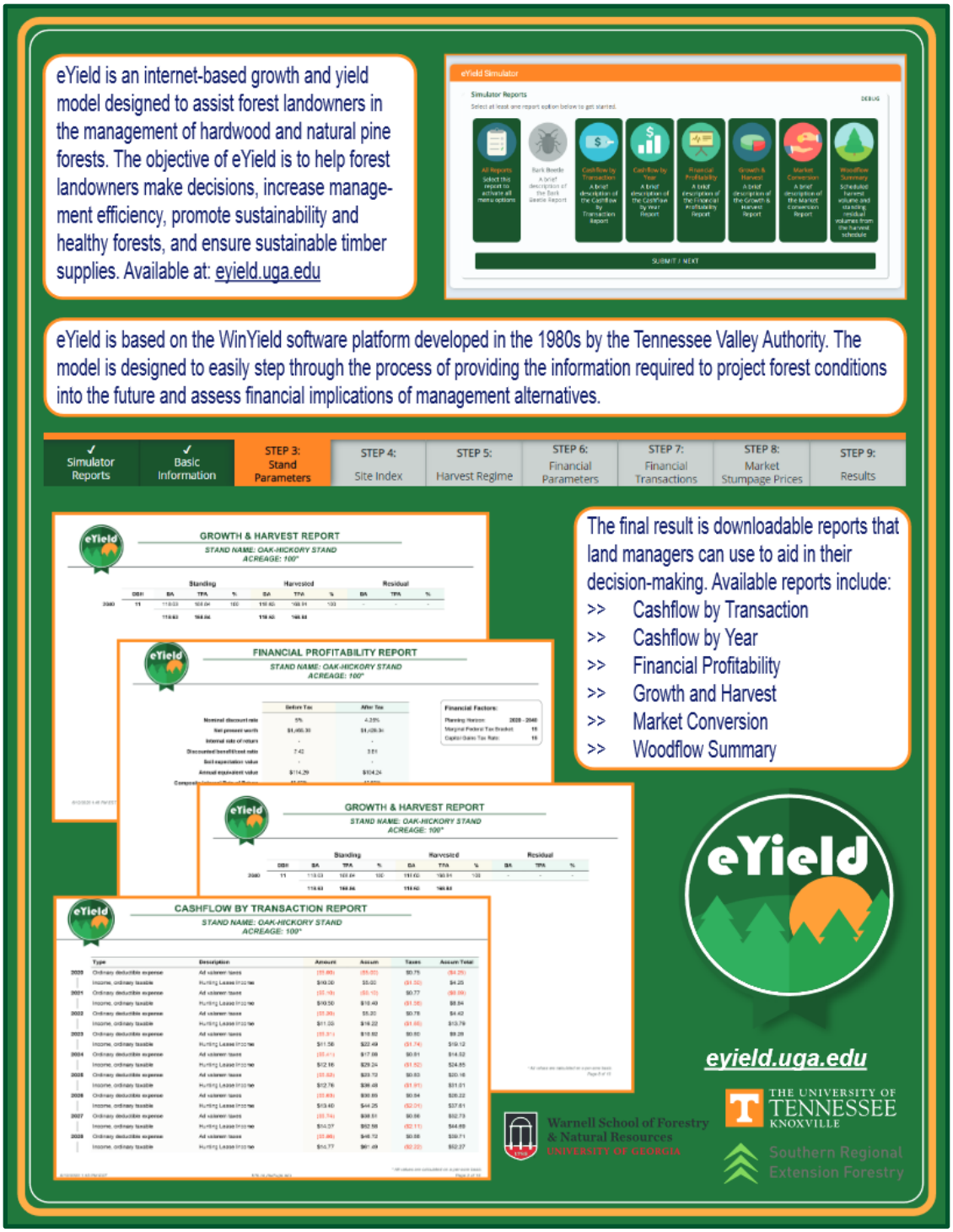


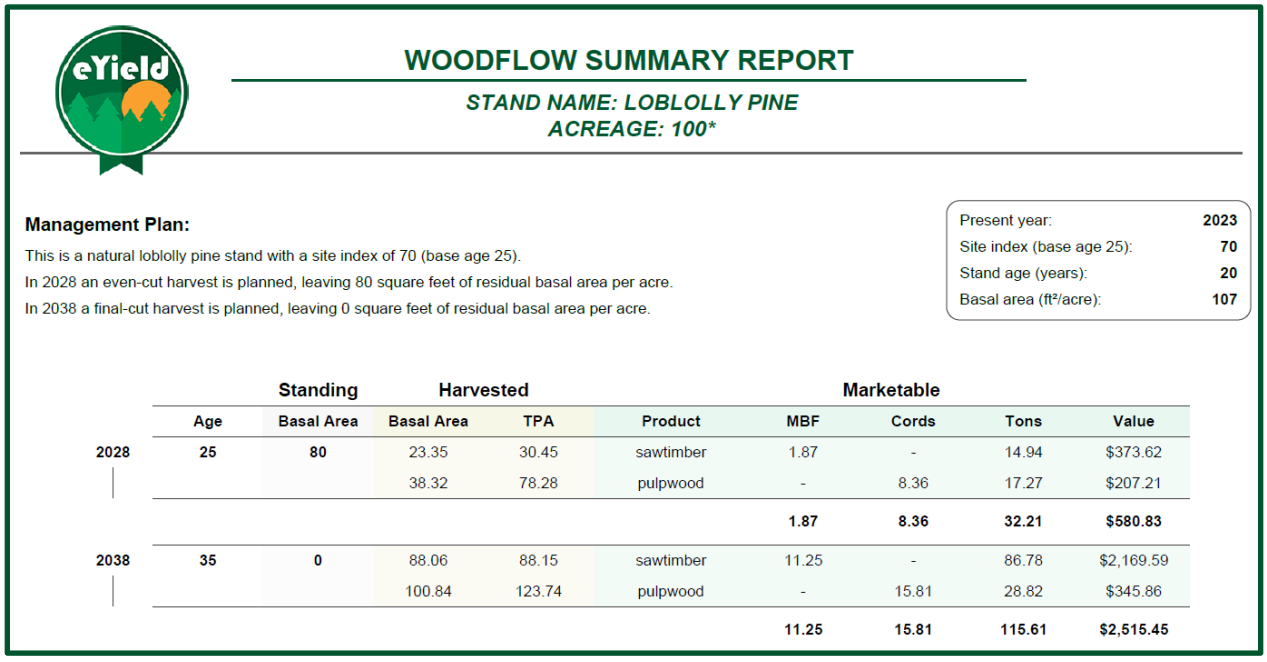
Figure 10. An overview poster of the capabilities of eYield.

SECTION 2. REPORTS

The eYield model can generate seven different reports that describe the outcomes of a simulation of management for a stand of trees.

A. Woodflow Summary Report

On a per-acre basis, the woodflow summary report provides information on scheduled harvests, in terms of basal area, trees, volumes, and weights of products (Figure 11).



WOODFLOW SUMMARY REPORT

STAND NAME: LOBLOLLY PINE
ACREAGE: 100*

Management Plan:

This is a natural loblolly pine stand with a site index of 70 (base age 25).
In 2028 an even-cut harvest is planned, leaving 80 square feet of residual basal area per acre.
In 2038 a final-cut harvest is planned, leaving 0 square feet of residual basal area per acre.

Present year:	2023
Site index (base age 25):	70
Stand age (years):	20
Basal area (ft²/acre):	107

		Standing	Harvested			Marketable			
	Age	Basal Area	Basal Area	TPA	Product	MBF	Cords	Tons	Value
2028	25	80	23.35	30.45	sawtimber	1.87	-	14.94	$373.62
			38.32	78.28	pulpwood	-	8.36	17.27	$207.21
						1.87	**8.36**	**32.21**	**$580.83**
2038	35	0	88.06	88.15	sawtimber	11.25	-	86.78	$2,169.59
			100.84	123.74	pulpwood	-	15.81	28.82	$345.86
						11.25	**15.81**	**115.61**	**$2,515.45**

Figure 11. An example of the Woodflow Summary report.

Some key elements of this report include:

- The *standing basal area* column of the report indicates how much basal area remains *after* a harvest has been simulated.
- The *harvested basal area and TPA* (trees per acre) columns of the report indicate the amount of basal area and the number of trees per acre that were removed *by product class* when a harvest was simulated.
- The *marketable MBF* column indicates the estimated sawtimber volume removed, in thousand board feet (MBF)[1] per acre, using the log rule selected within the "Stand Parameters" tab, when a harvest was simulated.
- The *marketable cords* column indicates the estimated pulpwood volume removed per acre, as

[1] One board foot is theoretically 1 inch thick, 12 inches wide, and 12 inches tall. Estimates of volume from tree boles can involve assessing how many board feet can be milled from a log of a certain diameter and length.

expressed in cords[2], when a harvest was simulated.

- The *marketable tons* column indicates the estimated weight of sawtimber and pulpwood products removed per acre, where one ton = 2,000 pounds (907 kilograms, 0.907 metric tons).
- The *marketable value* column indicates the per-acre potential value of the products harvested during the simulated harvest periods. These values are based on the stumpage prices, inflation of prices, and product bases (per ton, per MBF, per cord, etc.) defined within the "Market Stumpage Prices" tab.

B. Market Conversion Report

On a per-acre basis, the market conversion report provides information about the condition of the harvested trees during each year that a harvest was simulated (Figure 12).

MARKET CONVERSION REPORT

STAND NAME: LOBLOLLY PINE
ACREAGE: 100*

	Harvested			Dimensions			Product		
	DBH	Basal Area	TPA	Height	Volume	Weight	Name	Price	Total
2028	6	2.19	11.14	53.38	0.32 Cords	0.66 Tons	pulpwood	$12.00 / Ton	$7.95
	7	3.47	12.99	57.81	1.1 Cords	2.44 Tons	pulpwood	$12.00 / Ton	$29.24
	8	4.36	12.49	61.38	1.43 Cords	3.35 Tons	pulpwood	$12.00 / Ton	$40.26
	9	4.95	11.21	64.3	1.67 Cords	4.07 Tons	pulpwood	$12.00 / Ton	$48.86
	10	3.91	7.17	66.74	1.55 Cords	3.38 Tons	pulpwood	$12.00 / Ton	$40.55
	10	1.2	2.2	66.74	0.14 MBF	1.04 Tons	sawtimber	$25.00 / Ton	$25.90
	11	1.68	2.54	68.8	0.94 Cords	1.51 Tons	pulpwood	$12.00 / Ton	$18.11
	11	3.19	4.83	68.8	0.36 MBF	2.87 Tons	sawtimber	$25.00 / Ton	$71.64
	12	0.95	1.21	70.57	0.6 Cords	0.88 Tons	pulpwood	$12.00 / Ton	$10.61
	12	3.22	4.1	70.57	0.37 MBF	2.99 Tons	sawtimber	$25.00 / Ton	$74.82
	13	0.55	0.6	72.1	0.38 Cords	0.53 Tons	pulpwood	$12.00 / Ton	$6.30

Figure 12. An example of the Market Conversion report.

Some key elements of this report include:

- The *basal area* column of the report indicates how much basal area was removed, by DBH class, when a harvest was simulated.
- The *TPA* column of the report indicates how many trees were removed, by DBH class, when a harvest was simulated.

[2] A cord is a measure of stacked wood that is 4 feet wide, 4 feet tall, and 8 feet long. Theoretically, a cord contains 128 cubic feet of wood, but given air pockets between the pieces of stacked wood, more reasonably a cord might contain 80-100 cubic feet of solid wood, depending on the size and condition of the wood.

- The *Height* column of the report indicates the estimated height (feet) of the trees removed when a harvest was simulated, by DBH class.
- The *Volume* column of the report indicates the estimated traditional products (cords and thousand board feet (MBF)) removed when a harvest was simulated, by DBH class.
- The *Weight* column of the report indicates the estimated tons (where one ton = 2,000 pounds (907 kilograms, 0.907 metric tons)) removed when a harvest was simulated, by DBH class.
- The *Name* column of the report indicates the type of product removed when a harvest was simulated, by DBH class.
- The *Price* column of the report indicates the per-acre stumpage prices as defined within the "Market Stumpage Prices" tab.
- The *Value* column indicates the per-acre potential value of the products harvested during the simulated harvest periods. These values are based on the stumpage prices, inflation of prices, and product bases (per ton, per MBF, per cord, etc.) defined within the "Market Stumpage Prices" tab.

C. Growth and Harvest Report

On a per-acre basis, the growth and harvest report provides information about the condition of (a) the pre-harvest standing trees, (b) the harvested trees, and (c) the residual standing trees during each year that a harvest was simulated (Figure 13).

GROWTH & HARVEST REPORT

STAND NAME: LOBLOLLY PINE
ACREAGE: 100*

		Standing			Harvested			Residual		
	DBH	BA	TPA	%	BA	TPA	%	BA	TPA	%
2028	3	0.04	0.81	0.03	0.01	0.2	0.03	0.03	0.61	0.04
	4	0.51	5.84	0.43	0.17	1.95	0.43	0.34	3.9	0.43
	5	2.24	16.43	1.88	0.74	5.43	1.89	1.5	11	1.88
	6	6.64	33.82	5.57	2.19	11.15	5.58	4.46	22.72	5.58
	7	10.55	39.48	8.85	3.47	12.98	8.84	7.08	26.49	8.85
	8	13.25	37.96	11.11	4.36	12.49	11.11	8.89	25.47	11.11
	9	15.05	34.07	12.62	4.95	11.2	12.61	10.1	22.86	12.63
	10	15.52	28.46	13.02	5.11	9.37	13.02	10.41	19.09	13.01
	11	14.78	22.4	12.4	4.86	7.36	12.38	9.91	15.02	12.39
	12	12.68	16.15	10.63	4.17	5.31	10.63	8.51	10.84	10.64
	13	10.59	11.49	8.88	3.49	3.79	8.89	7.11	7.71	8.89

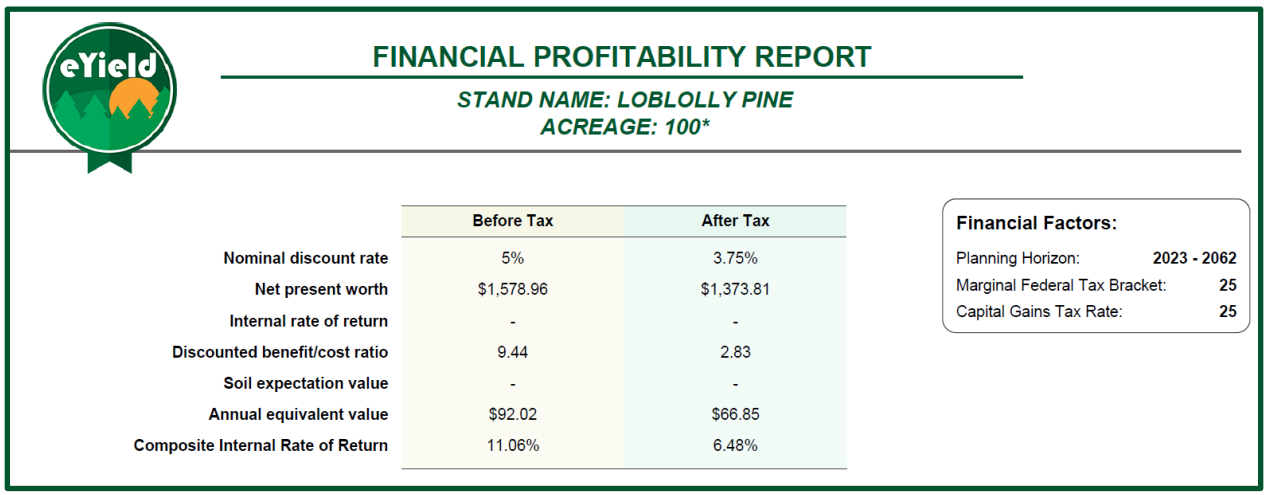
Figure 13. An example of the Growth & Harvest report.

- The *BA* column(s) of the report indicate the estimated basal area of the trees by DBH class (a) prior to the simulated harvest, (b) included in the harvested tree set, and (c) remaining standing after the simulated harvest.

- The *TPA* column(s) of the report indicate the estimated trees per acre by DBH class (a) prior to the simulated harvest, (b) included in the harvested tree set, and (c) remaining standing after the simulated harvest.
- The *%* column(s) of the report indicate the estimated percent of the forest resources, by basal area of the trees in each DBH class (a) prior to the simulated harvest, (b) included in the harvested tree set, and (c) remaining standing after the simulated harvest.
- Harvested BA + Residual BA = Standing BA. All units are per-acre.
- Harvested TPA + Residual TPA = Standing TPA. All units are per-acre.
- This report is much more expansive and informative when using the natural forest simulators that develop and simulate the growth of a stand table (loblolly pine and yellow-poplar). Other simulators may only provide the average DBH of trees during a simulated harvest, along with the standing, harvested, and residual conditions associated with the average DBH.

D. Financial Profitability Report

The financial profitability report includes common economic metrics used in the forestry practice for the activities that are planned within the planning horizon, given the prices, costs, and tax rates assumed.



FINANCIAL PROFITABILITY REPORT

STAND NAME: LOBLOLLY PINE
ACREAGE: 100*

	Before Tax	After Tax
Nominal discount rate	5%	3.75%
Net present worth	$1,578.96	$1,373.81
Internal rate of return	-	-
Discounted benefit/cost ratio	9.44	2.83
Soil expectation value	-	-
Annual equivalent value	$92.02	$66.85
Composite Internal Rate of Return	11.06%	6.48%

Financial Factors:

Planning Horizon:	**2023 - 2062**
Marginal Federal Tax Bracket:	**25**
Capital Gains Tax Rate:	**25**

Figure 14. An example of the Financial Profitability report.

Some key elements of this report include:

- The *Nominal discount rates* are defined by the user on the "Financial Parameters" tab.
- The *Net present worth* is the discounted value, in current dollars, of the management regime defined for the stand being simulated.
- The *Internal rate of return* is the discount rate that produces a $0 net present worth.
- The *Benefit cost ratio* is the discounted revenues divided by the discounted costs.

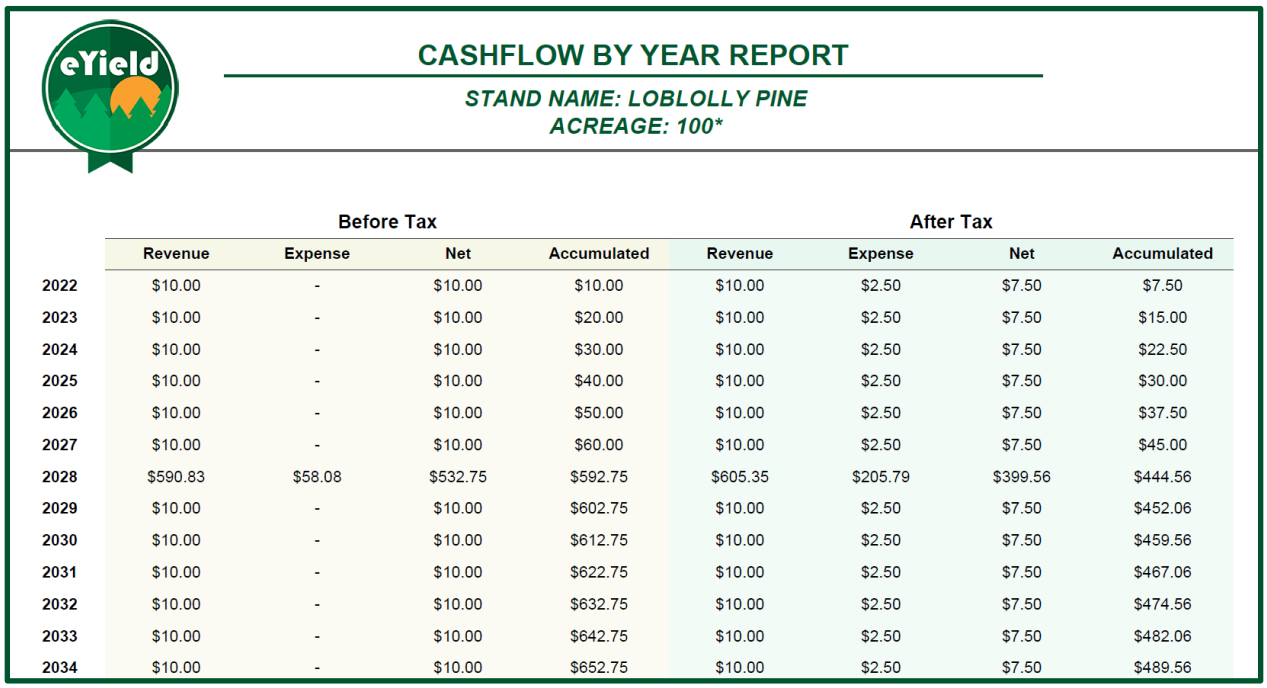
- The *Soil expectation value* is the present value of a repeated series of management actions defined by the user, into infinity.
- The *Annual equivalent value* is the net revenue (or cost) that can be obtained (or can incur) annually, over the life of an investment, given the discount rate that was applied. It can be calculated as follows,

$$\left(\frac{Net\ Present\ Worth * discount\ rate/100 * \ (1 + (discount\ rate\ /\ 100))^{number\ of\ years\ in\ the\ analysis}}{(1 + (discount\ rate/100))^{number\ of\ years\ in\ the\ analysis} - 1}\right)$$

- The *Composite internal rate of return* is the future value of revenues divided by the present value of the costs.

E. Cashflow by Year Report

The cashflow by year report (Figure 15) provides, for the length of the planning horizon (See *Financial Parameters* tab), the before-tax and after-tax (a) revenue, (b) expense, (c) net, and (d) accumulated amount of cashflows based on the simulated management scenario.



CASHFLOW BY YEAR REPORT

STAND NAME: LOBLOLLY PINE
ACREAGE: 100*

	Before Tax				After Tax			
	Revenue	Expense	Net	Accumulated	Revenue	Expense	Net	Accumulated
2022	$10.00	-	$10.00	$10.00	$10.00	$2.50	$7.50	$7.50
2023	$10.00	-	$10.00	$20.00	$10.00	$2.50	$7.50	$15.00
2024	$10.00	-	$10.00	$30.00	$10.00	$2.50	$7.50	$22.50
2025	$10.00	-	$10.00	$40.00	$10.00	$2.50	$7.50	$30.00
2026	$10.00	-	$10.00	$50.00	$10.00	$2.50	$7.50	$37.50
2027	$10.00	-	$10.00	$60.00	$10.00	$2.50	$7.50	$45.00
2028	$590.83	$58.08	$532.75	$592.75	$605.35	$205.79	$399.56	$444.56
2029	$10.00	-	$10.00	$602.75	$10.00	$2.50	$7.50	$452.06
2030	$10.00	-	$10.00	$612.75	$10.00	$2.50	$7.50	$459.56
2031	$10.00	-	$10.00	$622.75	$10.00	$2.50	$7.50	$467.06
2032	$10.00	-	$10.00	$632.75	$10.00	$2.50	$7.50	$474.56
2033	$10.00	-	$10.00	$642.75	$10.00	$2.50	$7.50	$482.06
2034	$10.00	-	$10.00	$652.75	$10.00	$2.50	$7.50	$489.56

Figure 15. An example of the Cashflow by Year report.

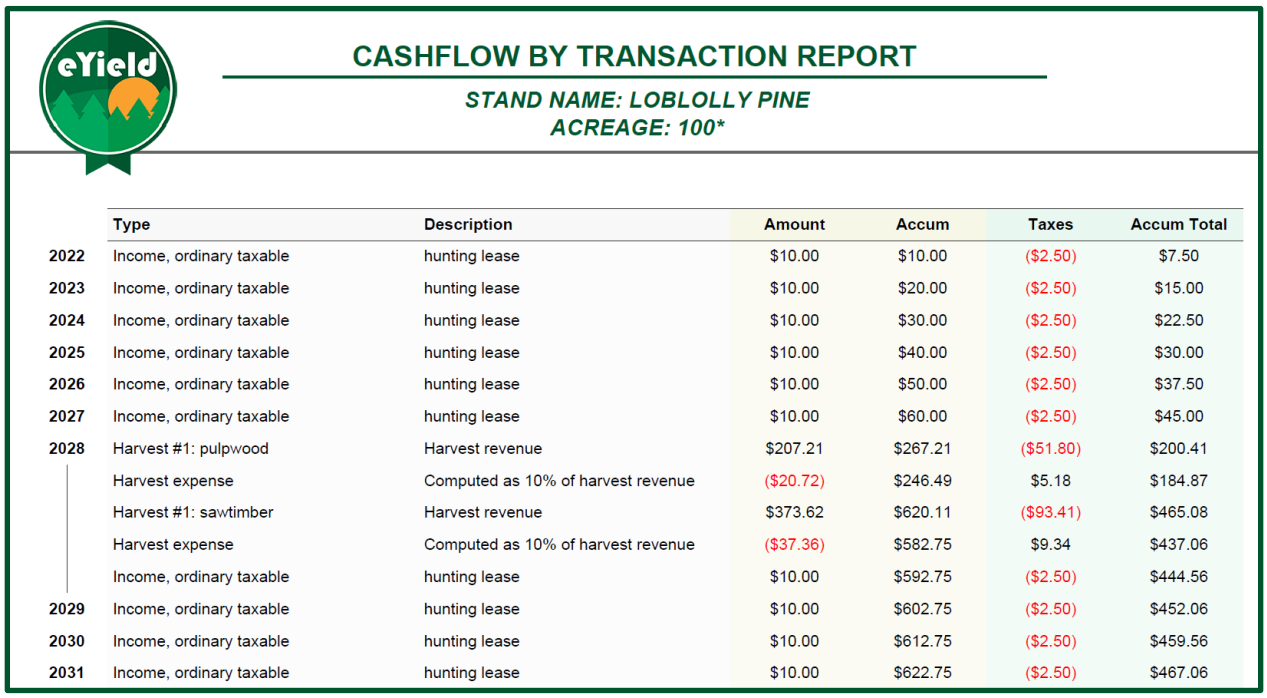
Some key elements of this report include:

- The cash flows are not discounted.
- The cash flows are aggregated for each year. For example, in Figure 15, year 2028, the revenues include a hunting lease payment and income from a timber sale.

- The cash flows are presented on a per-acre basis.

F. Cashflow by Transaction Report

The cashflow by transaction report (Figure 16) provides, for the length of the planning horizon (See *Financial Parameters* tab), the before-tax (a) revenue or cost, (b) the accumulated amount of cashflows, (c) the taxes, and (d) the accumulated total revenue or cost net of taxes.



CASHFLOW BY TRANSACTION REPORT

STAND NAME: LOBLOLLY PINE
ACREAGE: 100*

	Type	Description	Amount	Accum	Taxes	Accum Total
2022	Income, ordinary taxable	hunting lease	$10.00	$10.00	($2.50)	$7.50
2023	Income, ordinary taxable	hunting lease	$10.00	$20.00	($2.50)	$15.00
2024	Income, ordinary taxable	hunting lease	$10.00	$30.00	($2.50)	$22.50
2025	Income, ordinary taxable	hunting lease	$10.00	$40.00	($2.50)	$30.00
2026	Income, ordinary taxable	hunting lease	$10.00	$50.00	($2.50)	$37.50
2027	Income, ordinary taxable	hunting lease	$10.00	$60.00	($2.50)	$45.00
2028	Harvest #1: pulpwood	Harvest revenue	$207.21	$267.21	($51.80)	$200.41
	Harvest expense	Computed as 10% of harvest revenue	($20.72)	$246.49	$5.18	$184.87
	Harvest #1: sawtimber	Harvest revenue	$373.62	$620.11	($93.41)	$465.08
	Harvest expense	Computed as 10% of harvest revenue	($37.36)	$582.75	$9.34	$437.06
	Income, ordinary taxable	hunting lease	$10.00	$592.75	($2.50)	$444.56
2029	Income, ordinary taxable	hunting lease	$10.00	$602.75	($2.50)	$452.06
2030	Income, ordinary taxable	hunting lease	$10.00	$612.75	($2.50)	$459.56
2031	Income, ordinary taxable	hunting lease	$10.00	$622.75	($2.50)	$467.06

Figure 16. An example of the Cashflow by Year report.

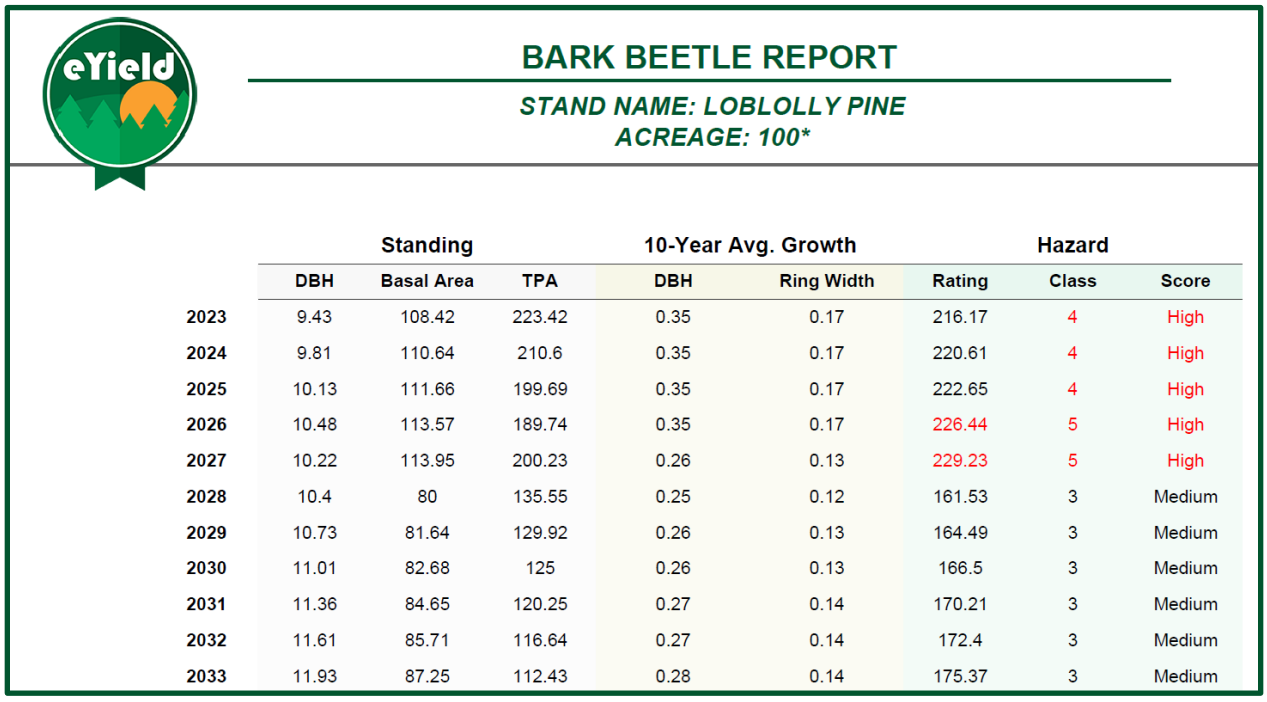
Some key elements of this report include:

- The cash flows are not discounted.
- The cash flows are presented individually for each transaction that occurred during each year. For example, in Figure 16, year 2028, there are five items (pulpwood revenue, pulpwood harvest expense, sawtimber revenue, sawtimber harvest expense, and hunting lease income).
- The cash flows are presented on a per-acre basis.

G. Bark Beetle Report

The bark beetle report (Figure 17) provides, for the length of the planning horizon, (a) some conditions of the stand being simulated (average tree diameter, basal area per acre, trees per acre), (b) an estimate of the 10-year growth rate of the stand being simulated, along with tree

ring width in inches, and (c) three forms of a hazard rating (a quantitative score, and two qualitative classes (a rating from 1 (low susceptibility) to 5 (high susceptibility) and an associated rating from "Low" to "High" susceptibility to bark beetle attack).



BARK BEETLE REPORT

STAND NAME: LOBLOLLY PINE
ACREAGE: 100*

	Standing			10-Year Avg. Growth		Hazard		
	DBH	Basal Area	TPA	DBH	Ring Width	Rating	Class	Score
2023	9.43	108.42	223.42	0.35	0.17	216.17	4	High
2024	9.81	110.64	210.6	0.35	0.17	220.61	4	High
2025	10.13	111.66	199.69	0.35	0.17	222.65	4	High
2026	10.48	113.57	189.74	0.35	0.17	226.44	5	High
2027	10.22	113.95	200.23	0.26	0.13	229.23	5	High
2028	10.4	80	135.55	0.25	0.12	161.53	3	Medium
2029	10.73	81.64	129.92	0.26	0.13	164.49	3	Medium
2030	11.01	82.68	125	0.26	0.13	166.5	3	Medium
2031	11.36	84.65	120.25	0.27	0.14	170.21	3	Medium
2032	11.61	85.71	116.64	0.27	0.14	172.4	3	Medium
2033	11.93	87.25	112.43	0.28	0.14	175.37	3	Medium

Figure 17. An example of the Bark Beetle report.

Some key elements of this report include:

- Two stand condition values (basal area and trees per acre) are presented on a per-acre basis.
- Diameters and tree ring widths are presented in inches.
- The hazard rating formula is: 6.92 + (2.004 × basal area per acre) - (46.4058 × ring width)
- The hazard classes for each year are ...

  IF (rating < 71) CLASS = 1
  IF (rating >= 71 AND rating < 109) CLASS = 2
  IF (rating >= 109 AND rating < 185) CLASS = 3
  IF (rating >= 185 AND rating < 223) CLASS = 4
  ELSE CLASS = 5
- Classes 1 and 2 are "Low" ratings for susceptibility.
- Class 3 is a "Medium" rating for susceptibility.
- Classes 4 and 5 are "High" ratings for susceptibility.

SECTION 3. BASIC INFORMATION

Within the *Basic Information* tab (Figure 18), the simulator that will be employed is selected. A tutorial video concerning this tab is available to watch (see right side of the form).

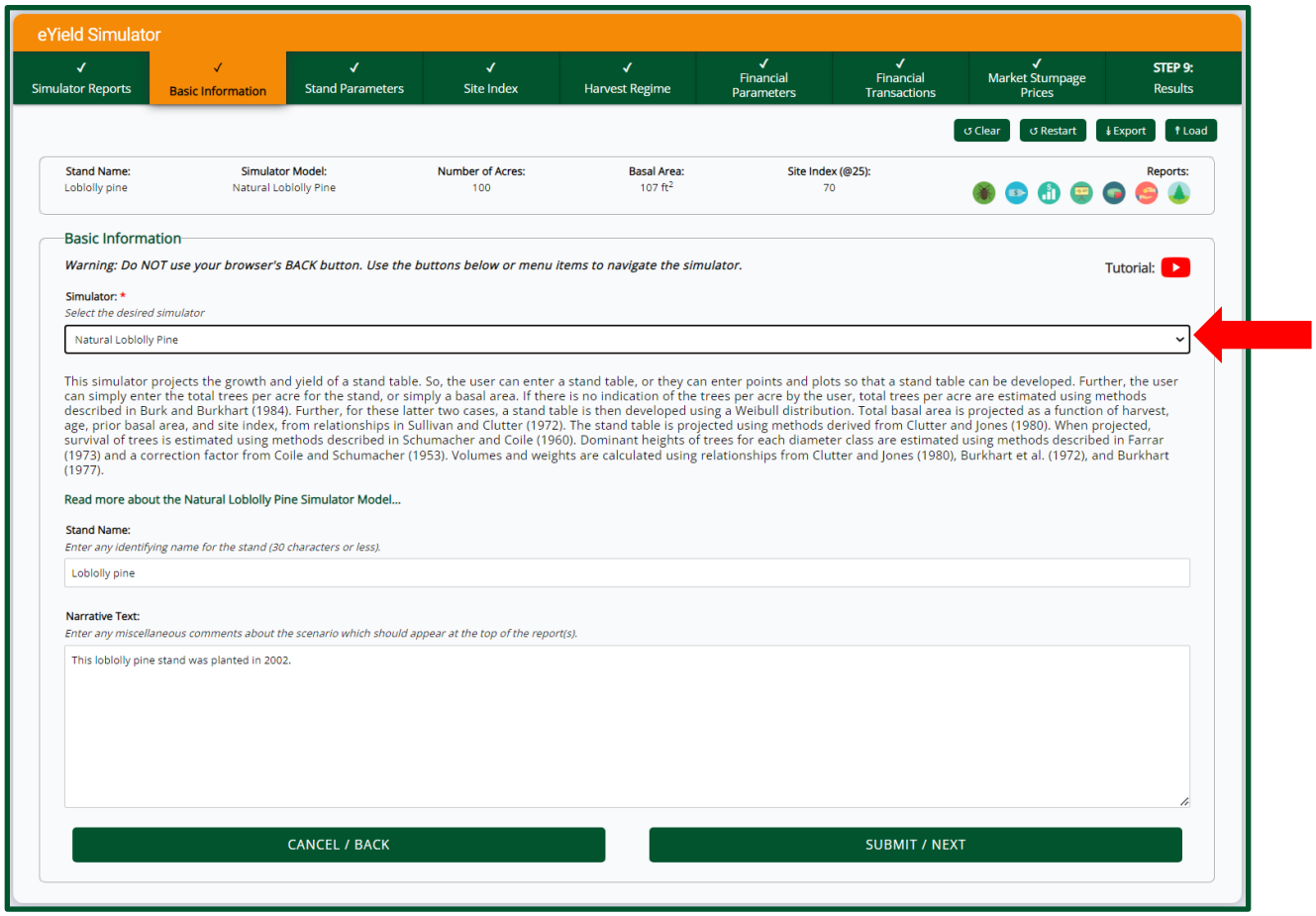


Figure 18. An example of the Basic Information tab in eYield.

Seven simulators were available in eYield in 2023:

- Natural loblolly pine
- Natural longleaf pine
- Natural shortleaf pine
- Natural slash pine
- Upland oak-hickory
- White pine
- Yellow-poplar

Once a simulator has been selected, a narrative regarding the sources of information used to simulate forest development are presented. If one is concerned about the science behind the growth and yield process, this information can be informative. By clicking the text "Read more

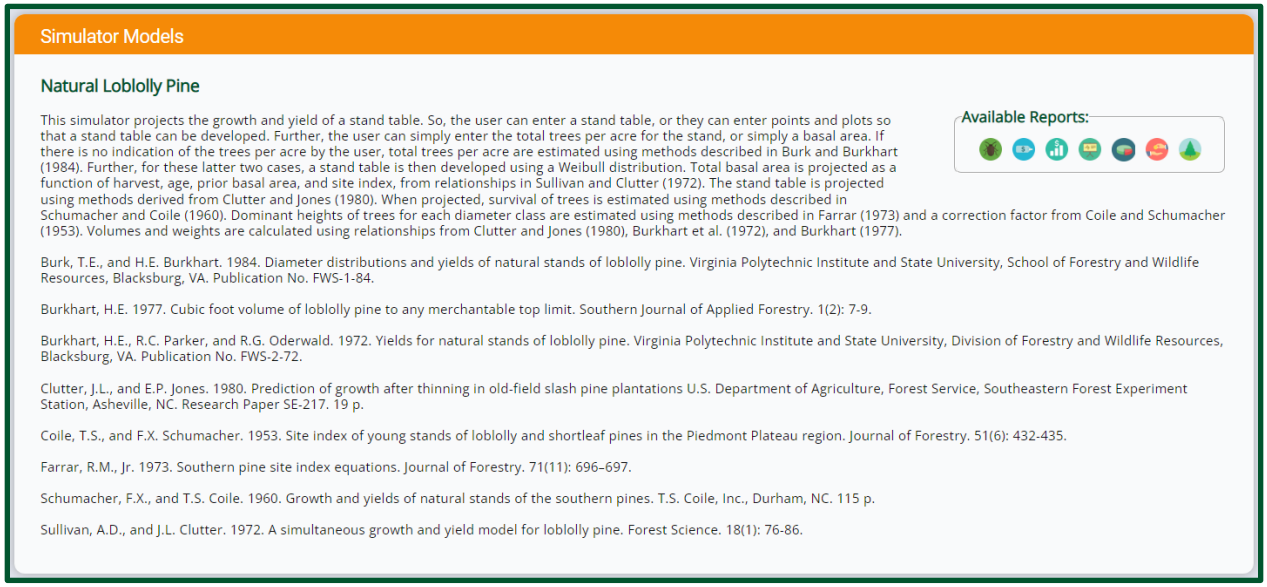


Figure 19. An example of the background information of the natural loblolly pine model.

about the Natural Loblolly Pine Simulator Model…" the references and text can be viewed in their entirety (Figure 19).

Stand Name

A stand name can be entered in the text box named "Stand Name" (Figure 18). A stand name is not required, but it may be of value to people simulating a number of different stands.

Narrative Text

The "Narrative Text" text box (Figure 18) offers an opportunity for eYield users to further elaborate on issues such as the history of the stand being simulated, or alternatively the motivation for the current eYield scenario.

Saving Selections

Press the *Submit / Next button* to save the selections (or changes). Without this action, the selections will not be saved.

SECTION 4. STAND PARAMETERS

Within the *Stand Parameters* tab (Figure 20), several pieces of information about the stand being simulated are needed. As with the previously described *Basic Information* tab, a tutorial video concerning this tab is available.

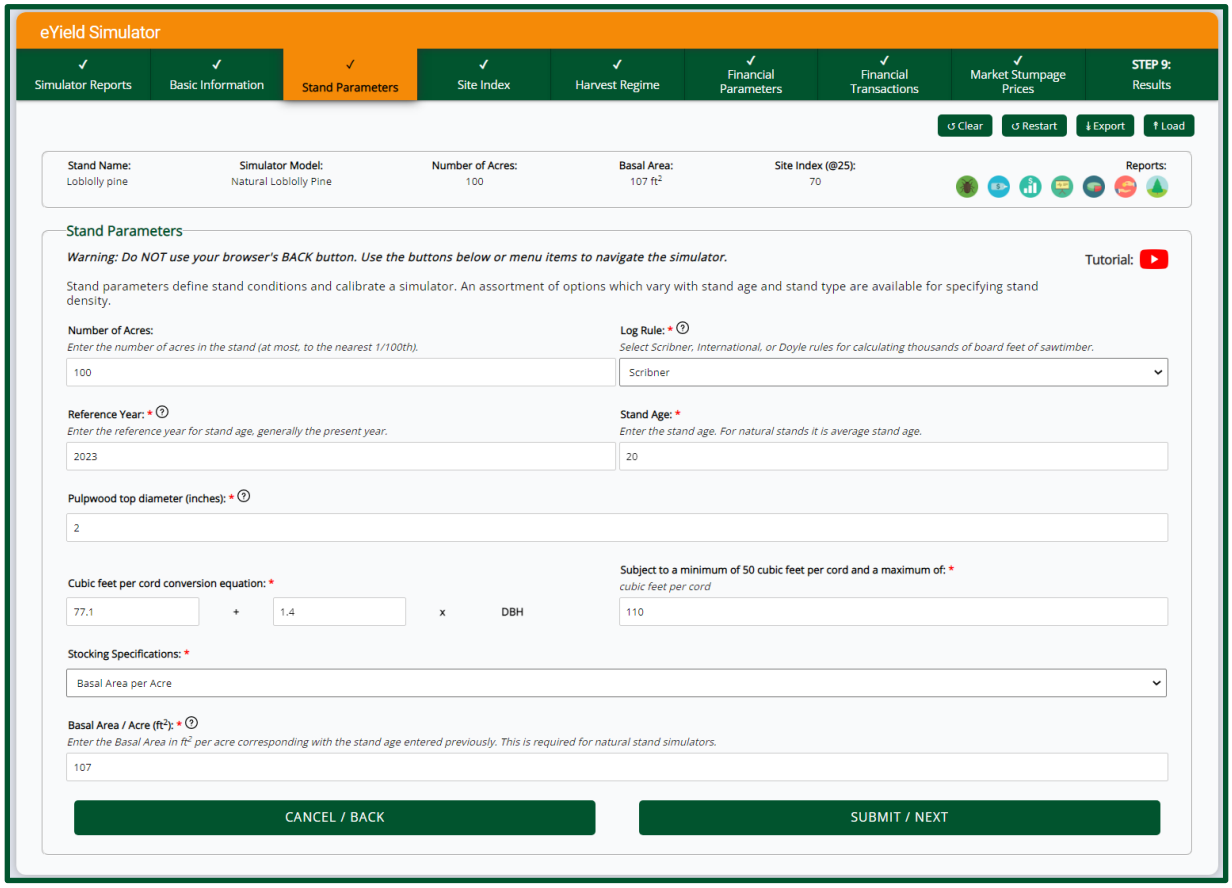


Figure 20. An example of the Stand Parameters tab in eYield.

There are a number of assumptions one needs to make regarding the characteristics and management of a stand of trees. This tab relates to the size, age, stocking, and rules for measuring wood volume grown in the stand.

Number of Acres

This is the size of an individual stand that will be simulated (not an entire forest).

Log Rule

Three log rules (Doyle, Scribner, International 1/4 inch) are available to describe the amount of sawtimber volume found within a stand of trees. A general video on log rules can also be located on the eYield YouTube channel.

Reference Year

The reference year is the first year of the planning horizon.

Stand Age

Stand age represents the average age of trees in a stand during the reference year.

Pulpwood Top Diameter

In inches, this assumption represents the point at which the bole of a tree is no longer merchantable.

Cubic Feet Per Cord Conversion Equation

The default conversion from cubic feet per acre to cords per acre is provided from the original WinYield model (77.1 cubic feet + (1.4 × average DBH)). If a more acceptable relationship is desired, one can enter the coefficients here. The relationship, however (constant + (coefficient × average DBH)) cannot be altered.

Subject to a Minimum of 50 Cubic Feet Per Acre and a Maximum of:

The minimum cubic feet per cord cannot be changed. The maximum might be changed based on local knowledge of cubic feet per cord. Keep in mind that at most, there are theoretically 128 cubic feet in a cord.

Stocking Specifications

In general, there are four ways to define the initial stocking of a stand of trees being simulated in eYield:

- Basal area per acre (square feet per acre)
- Stems per acre (trees per acre)
- Stems and basal area per acre (trees per acre and square feet of basal area per acre)
- A stand table (trees per acre by 1-inch diameter class)

However, depending on the simulator, some of these options may be unavailable (Table 1).

Table 1. Availability of stocking specifications for each simulator.

	Basal area	Stems	Stems and basal area	Stand table
Natural loblolly pine	✓		✓	✓
Natural longleaf pine	✓		✓	✓
Natural shortleaf pine	✓		✓	✓
Natural slash pine	✓		✓	✓
Upland oak-hickory	✓		✓	✓
White pine		✓		✓
Yellow-poplar	✓		✓	✓

Basal Area / Acre

If either the basal area per acre stocking specification was selected, or the stems & basal area per acre stocking specification was selected, an initial basal area (ft^2 per acre) is required. This is the basal area estimate at the *Stand Age* noted on this tab.

Stems / Acre

If either the stems per acre stocking specification was selected, or the stems & basal area per acre stocking specification was selected, an initial estimate of the stems per acre (trees per acre) is required. This is the trees per acre estimate at the *Stand Age* noted on this tab.

Stand Table

If the stand table method was selected to represent the stocking specification, the diameter class and the number of trees per diameter class (the components of a stand table) are required. In the example in Figure 21, the stand table contains trees that range in size from 6 inches to 14 inches in diameter (DBH). The number of trees per acre for the 10 inch class is 52. The trees per acre estimates would be derived from a field survey (plots or prism points) that is summarized and reported in this manner, where an estimate of tree density (trees per acre) is presented as a distribution of trees across the various diameter classes that were sampled in the field survey. This information represents the characteristics of a stand of trees at the beginning of a simulation. Once the stand table is submitted, the basal area per acre at the beginning of the simulation will be calculated. Depending on the simulator selected, the stand table may not be used any further within the time horizon of the simulation.

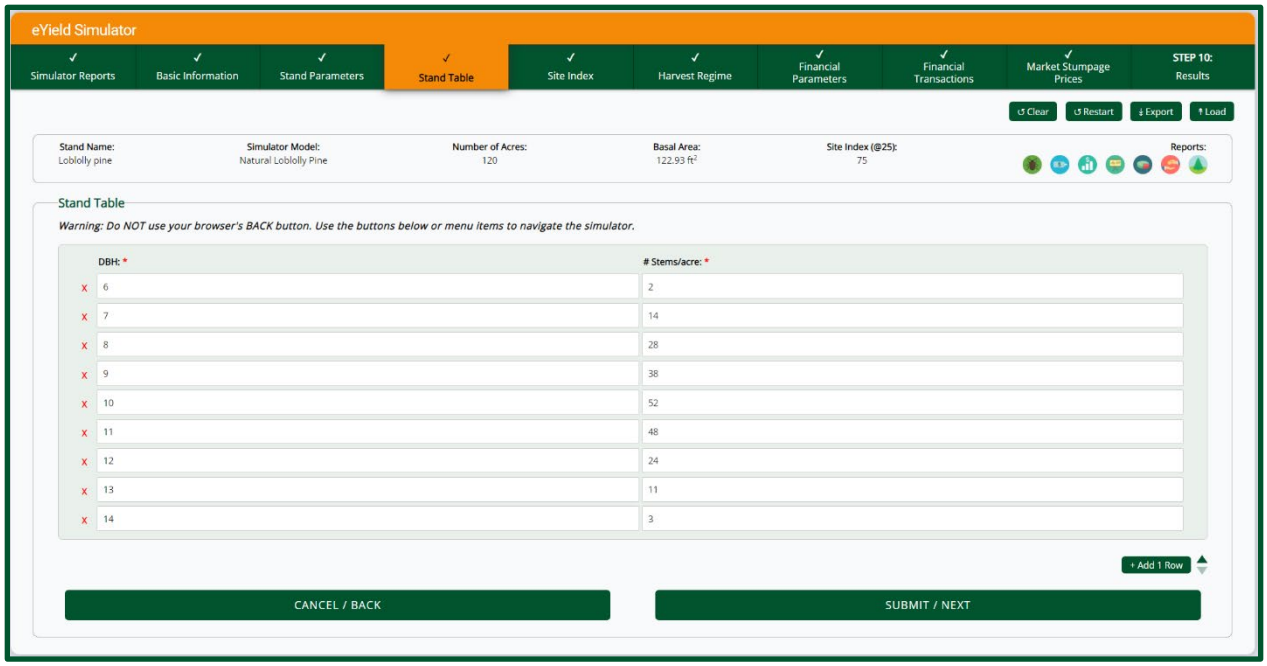


Figure 21. An example of a stand table entered in eYield.

Saving Selections

Press the *Submit / Next button* to save the selections (or changes). Without this action, the selections will not be saved.

SECTION 5. SITE INDEX

Within the *Site Index* tab (Figure 22), users of eYield can either enter the estimated site index directly, or provide an average age and average height, and let eYield estimate the site index value. If needed, a short YouTube video is available in the eYield collection of videos to describe the concept of site index.

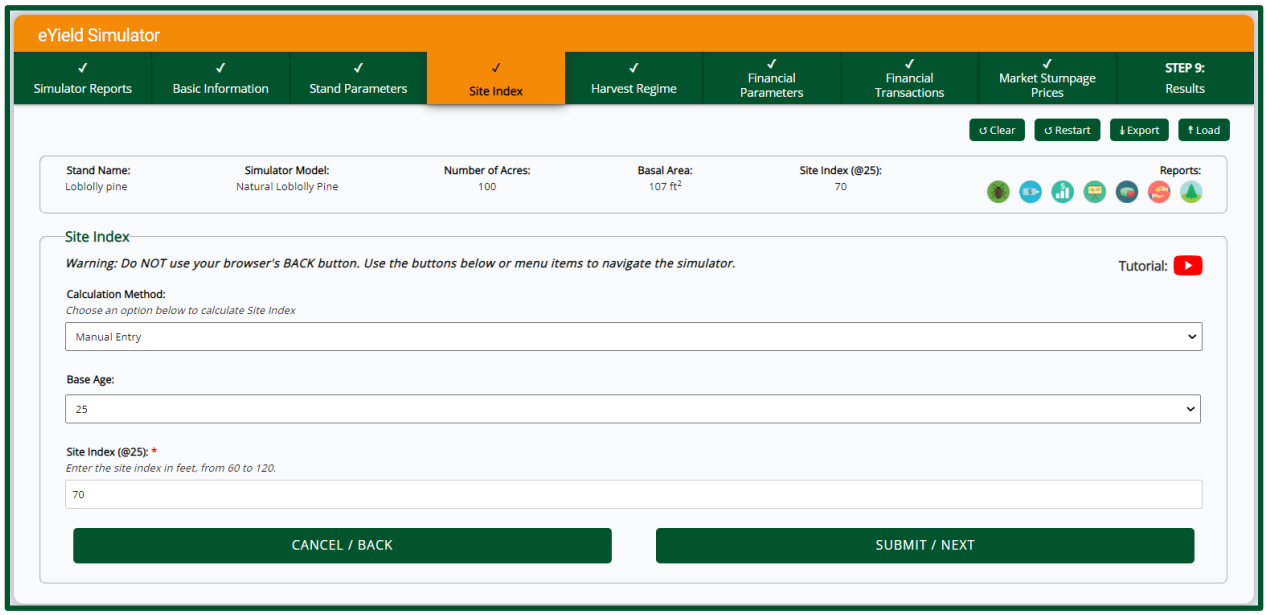


Figure 22. An example of the Site Index tab in eYield.

Calculation Method

If the *manual entry* method is selected, a user of eYield would select the base age (either 25 years or 50 years), and then enter the site index. A site index value represents the average height of the dominant and co-dominant trees in a stand at the assumed base age (again 25 or 50 years).

- A site index of 70 (for example) using a base age of 25 years is not equivalent to a site index of 70 using a base age of 50. One case (SI_{25} = 70) suggests that the dominant and co-dominant trees will be 70 feet tall when they are 25 years old, while the other case (SI_{50} = 70) suggests that the dominant and co-dominant trees will be 70 feet tall when they are 50 years old (hence the SI_{50} case actually represents a lower quality site given slow height growth relative to the SI_{25} case).
- While a base age of 100 years was once used (particularly in the western United States), a base age of 25 or 50 years is more commonly used today in the southern United States. Faster growing plantations often assume a 25-year base age, while natural stands often assume a 50-year base age.
- As one may find, there may be limits on the range of the site index that can be entered here.
- In some cases (Table 2) the base age assumption is limited to a single choice (50 years).

Table 2. Options for selecting a base age for each simulator.

	Manual method		Age & height method	
	25 years	50 years	25 years	50 years
Natural loblolly pine	✓	✓	✓	✓
Natural longleaf pine	✓	✓	✓	✓
Natural shortleaf pine		✓		✓
Natural slash pine		✓		✓
Upland oak-hickory		✓		✓
White pine		✓		✓
Yellow-poplar		✓		✓

If the *age & height* method is selected (Figure 23), a user of eYield would select the base age (either 25 years or 50 years), enter the current age of the stand, and provide an average height of the dominant and co-dominant trees in the stand. From the current age and the average height, a site index for the base age selected will be calculated.

• As users of eYield may find, there may be limits on the range of the current age that can be assumed.

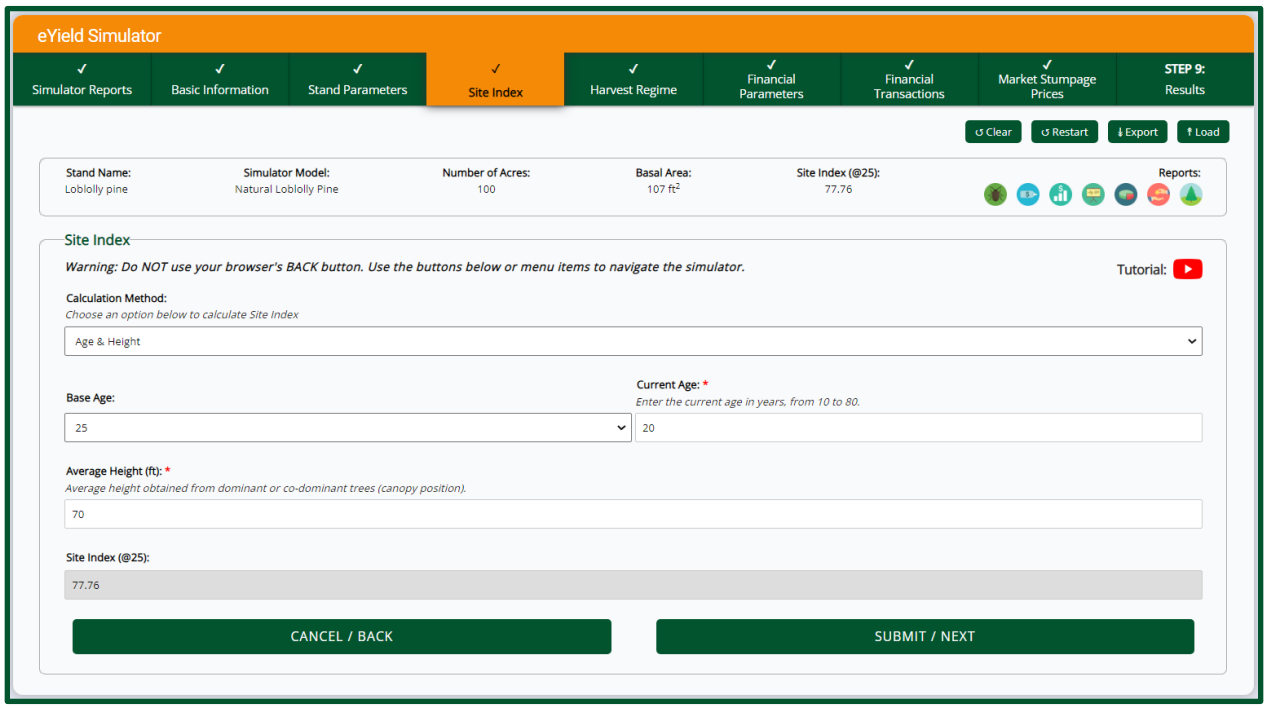


Figure 23. An example of the Site Index tab in eYield using the age & height calculation method.

Saving Selections

Press the *Submit / Next button* to save the selections (or changes). Without this action, the selections will not be saved.

SECTION 6. HARVEST REGIME

The *Harvest Regime* tab (Figure 24) allows a user of eYield to specify the timing, method, residual standing tree density, and the percent of harvest revenue that is related to the expense of conducting the harvest activity.

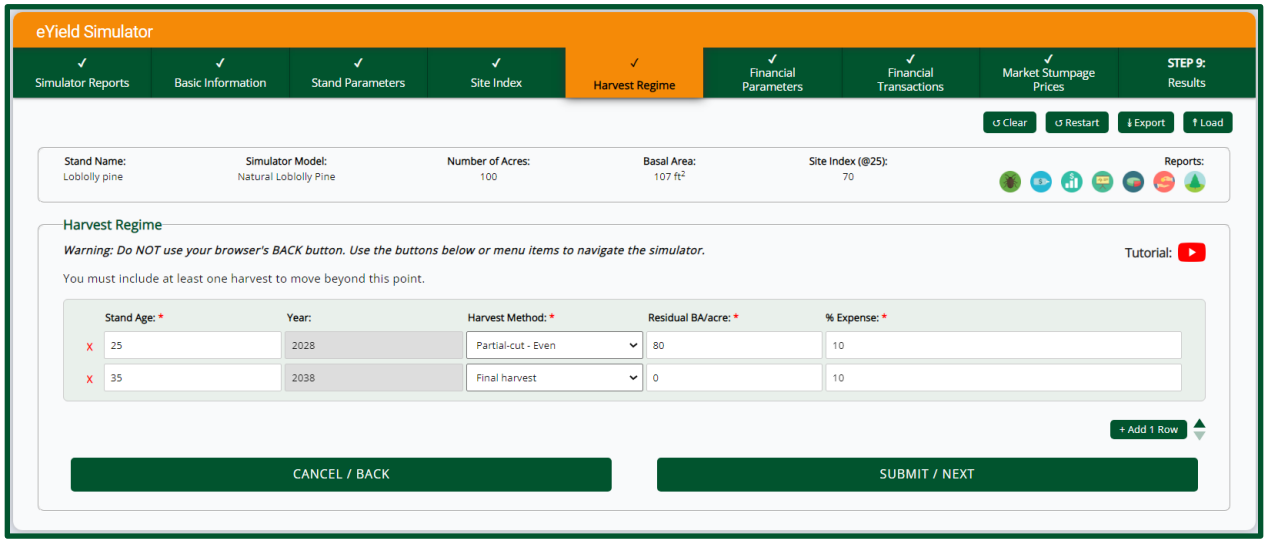


Figure 24. An example of the Harvest Regime tab in eYield.

Stand Age

This is the age at which the harvest activity described on a row of this form occurs, and it is directly related to the "stand age" that was provided on the *Stand Parameters* tab. The year of the activity will be determined by eYield based on the stand age at the time of harvest and the reference year that was provided on the *Stand Parameters* tab.

Harvest Method

Depending on the stand simulator that was chosen, final harvest and thinning activities may be available. When thinning activities are available in a simulator, only those simulators that construct a stand table will be able to simulate a thinning from above (largest diameter classes cut first, *Partial-cut-High*), a thinning from below (smallest diameter classes cut first, *Partial-cut-Low*), or a thinning that is proportional to the diameter distribution (*Partial-cut-Even*).

Residual BA / Acre

Reasonable assumptions regarding the standing (live) trees that remain (the residuals) after a harvest activity are made by a user of eYield. Some interesting caveats include:

- If the residual basal area per acre is larger than the standing basal area per acre when a harvest activity is desired, the harvest will not be simulated.

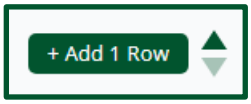
- There are no minimum harvest thresholds. If the standing basal area per acre is only slightly greater than the desired residual basal area per acre, a very small amount of harvest activity will still be simulated.
- For final harvest activities, it may be reasonable to assume that the residual basal area per acre is nearly (or exactly) zero (0).

% Expense

If a user desires to recognize the expenses related to the management of harvest activity, a value between 0 and 100 percent of the harvest revenue can be specified. These expenses will be evident in the *Cashflow by Transaction Report* and the *Cashflow by Year Report*. Further, they will be inherent in the *Financial Profitability Report* metrics.

Adding an Item

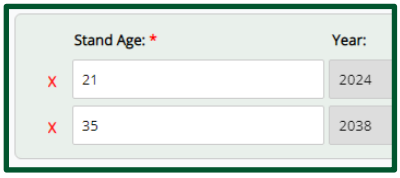
Additional harvest activities can be added to the harvest regime by pressing the "Add 1 Row" button that is located in the right-hand corner of the screen.



The up and down arrows positioned to the right of the button allow a user to add more than one row with one click of the button.

Deleting an Item

Clicking the red X that is positioned to the left of each row deletes the entire harvest activity. Please beware that there is no "undo" when this action is selected.



Saving Selections

Press the *Submit / Next button* to save the selections (or changes). Without this action, the selections will not be saved.

SECTION 7. FINANCIAL PARAMETERS

The *Financial Parameters* tab (Figure 25) allows a user of eYield to specify a number of values that are needed to calculate the financial returns concerning the management of a stand of trees.

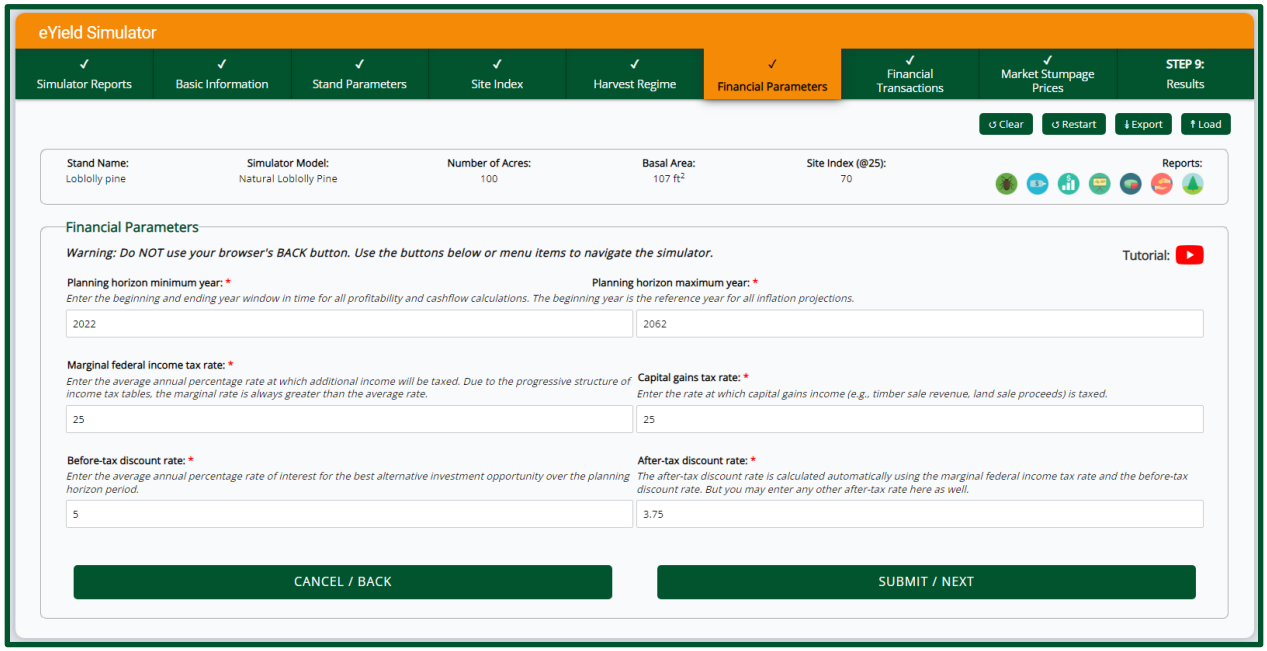


Figure 25. An example of the Financial Parameters tab in eYield.

Planning Horizon Minimum Year

The *Cashflow by Transaction Report* and the *Cashflow by Year Report* both require the starting and ending year of a planning horizon, within which various revenues and costs are provided. This is the starting year (as defined by the reference year from the *Stand Parameters* tab).

Planning Horizon Maximum Year

The *Cashflow by Transaction Report* and the *Cashflow by Year Report* both require the starting and ending year of a planning horizon, within which various revenues and costs are provided. This is the ending year.

Marginal Federal Income Tax Rate

The eYield model accounts for federal (national) taxes applied to various revenues realized during the simulation of the management of a stand of trees. Further, some costs act as deductions on the basis for which the tax is calculated. This value represents the marginal rate (the rate applied to the last dollar earned by an individual).

Capital Gains Tax Rate

The eYield model also accounts for federal (national) tax applied to income derived from investments that are deemed "capital investments." As of the writing of this manual, the U.S. tax law suggests that a person needs to hold an investment for one year before it can be deemed a capital investment. When the capital investment is sold (or trees are harvested) a different tax rate may be applied. Knowledge of current tax laws seems appropriate here.

Before-Tax Discount Rate

In the calculation of before-tax net present value and internal rate of return (as other financial profitability metrics), revenues and costs are discounted back to present time (as defined by the reference year from the *Stand Parameters* tab) using an assumption of the appropriate discount rate for the owner of the stand being simulated.

After-Tax Discount Rate

In the calculation of after-tax net present value and internal rate of return (as other financial profitability metrics), revenues and costs are discounted back to present time (as defined by the reference year from the *Stand Parameters* tab) using a discount rate that is defined by default as

$$(1 - \text{marginal federal income tax rate}) \times \text{before-tax discount rate}$$

- The after-tax discount rate is calculated automatically when the before-tax rate has been entered into eYield. However, if the result is not the desired after-tax rate, a user may enter a different rate into the after-tax discount rate textbox.

Saving Selections

Press the *Submit / Next button* to save the selections (or changes). Without this action, the selections will not be saved.

SECTION 8. FINANCIAL TRANSACTIONS

The *Financial Transactions* tab (Figure 26) within eYield allows a user to define revenues or costs associated with the management of a stand of trees that are not evident through the planned timber sales (and associated expenses).

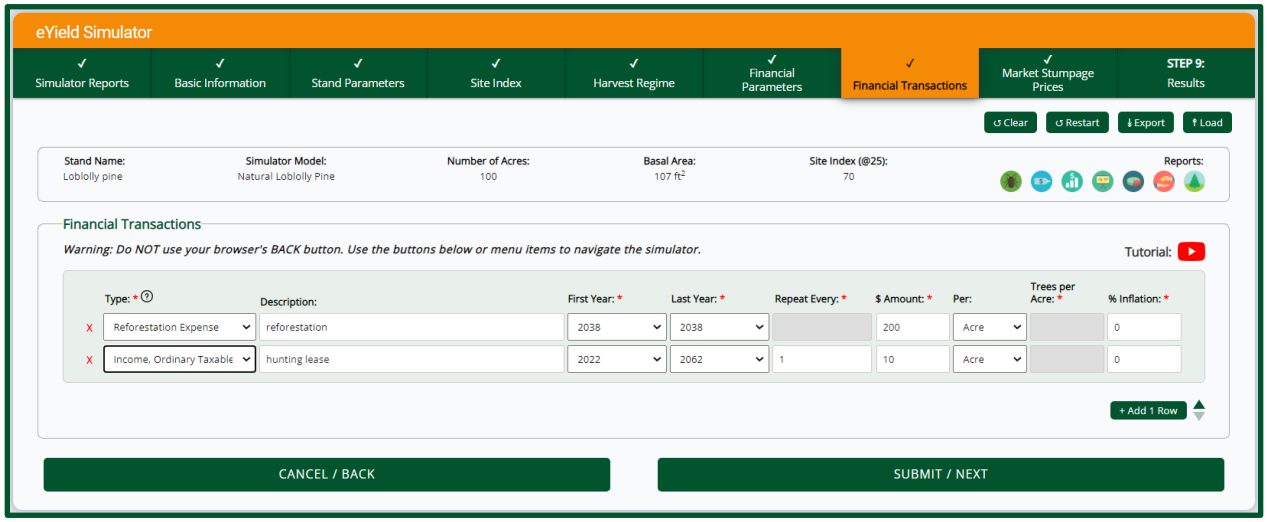


Figure 26. An example of the Financial Transactions tab in eYield.

Type

Five types of financial transaction groups can be recognized in eYield.

1. Depreciable Asset Expense

This is a deduction from taxable income, as defined by the U.S. Internal Revenue Service (IRS) tax code. It allows the landowner to deduct a portion of specific land improvements such as fences and bridges, which may deteriorate over time. Currently (2023), there are six classes of these recognized in eYield, ranging from 3-year to 20-year periods in which the costs can be recovered, using specific depreciation rates for tax purchases:

3-year: Over-the-road tractor.
5-year: Computer, light general-purpose (pickup) trucks, logging machinery, and equipment, portable sawmills, over-the-road trailers, office machinery (calculators, copiers).
7-year: Office furniture, any property that does not have a class life and has not been designated by law as being in any other class.
10-year: Single-purpose agricultural structure.
15-year: Land improvements, drainage culverts, fences, temporary roads, the surface of permanent roads, bridges.
20-year: Farm buildings.

2. Income, Ordinary Taxable

Besides the income that is computed through the sale of wood products (as defined by the information in the *Harvest Regime* and *Market Stumpage Prices* tabs), landowners may receive other forms of income from the management of their timberlands. These might include hunting lease income, pine straw income, carbon market income, or other types.

3. Land Depletion Account Capital Expense

For tax purposes, these costs are recognized in the year that they are incurred, and noted as a cost of business. In theory, they are accumulated into the land basis. No taxes apply in the year incurred unless the land is sold in that year. The costs are recovered as deductions on capital gains when a capital gains tax is computed upon a land sale.

4. Ordinary Deductible Expense

These are regular deductions from taxable income that are common and accepted within a trade or a business and allowed as deductions for tax purposes in the year that they were incurred.

5. Reforestation Expense

This is a deduction for the costs of qualifying reforestation expenses. The amount is recognized in the year that it was incurred. For U.S. federal tax purposes, a reforestation amortization amount is calculated for eight years (the current year and seven subsequent years) using specific rates (1/14 of the amount for the current and last year, and 1/7 for all other years).

Description

Here, a description of the type of transaction can be entered. There are no drop-down list choices. A user of eYield can enter any description that seems appropriate.

First Year

The selection here from a drop-down list of possible years (as defined by the planning horizon minimum and maximum years from the *Financial Parameters* tab), represents the first year that the revenue or cost occurs.

Last Year

The selection here from a drop-down list of possible years (as defined by the planning horizon minimum and maximum years from the *Financial Parameters* tab), represents the last year that

the revenue or cost occurs. The first year and the last year can be the same for a one-time revenue or cost. For depreciable asset expenses, the last year is already known. Therefore, the class of the expense (shown above) will be required.

Repeat Every

A revenue or cost might occur in more than one consecutive year. Therefore, here one can enter the number of years that pass before the same revenue or cost is repeated. When the first and last years are the same, this option is disabled.

$ Amount

The amount of the revenue or cost.

Per

In this case, the amount specified for the financial transaction might be per acre, or per 1,000 trees. This option is disabled for depreciable asset expenses.

Trees Per Acre

When the "Per" (above) is "per MTrees" (per 1,000 trees), an indication of the number of trees to which the cost applies is needed. The cost is then pro-rated to a per-1,000 tree cost. For example, if there are only 500 trees to which this cost applies, the per-1,000 value will be 0.5 (500 trees / 1,000 trees).

% Inflation

If inflation needs to be recognized, a whole number is used here to represent it. In other words, if 1% inflation in a hunting lease needs to be recognized, place a "1" in the "% Inflation" textbox on the hunting lease row.

Saving Selections

Press the *Submit / Next button* to save the selections (or changes). Without this action, the selections will not be saved.

SECTION 9. MARKET STUMPAGE PRICES

The *Market Stumpage Prices* tab (Figure 27) within eYield allows a user to define the stumpage prices and other relevant information related to the harvest of trees from the stand that is being simulated.

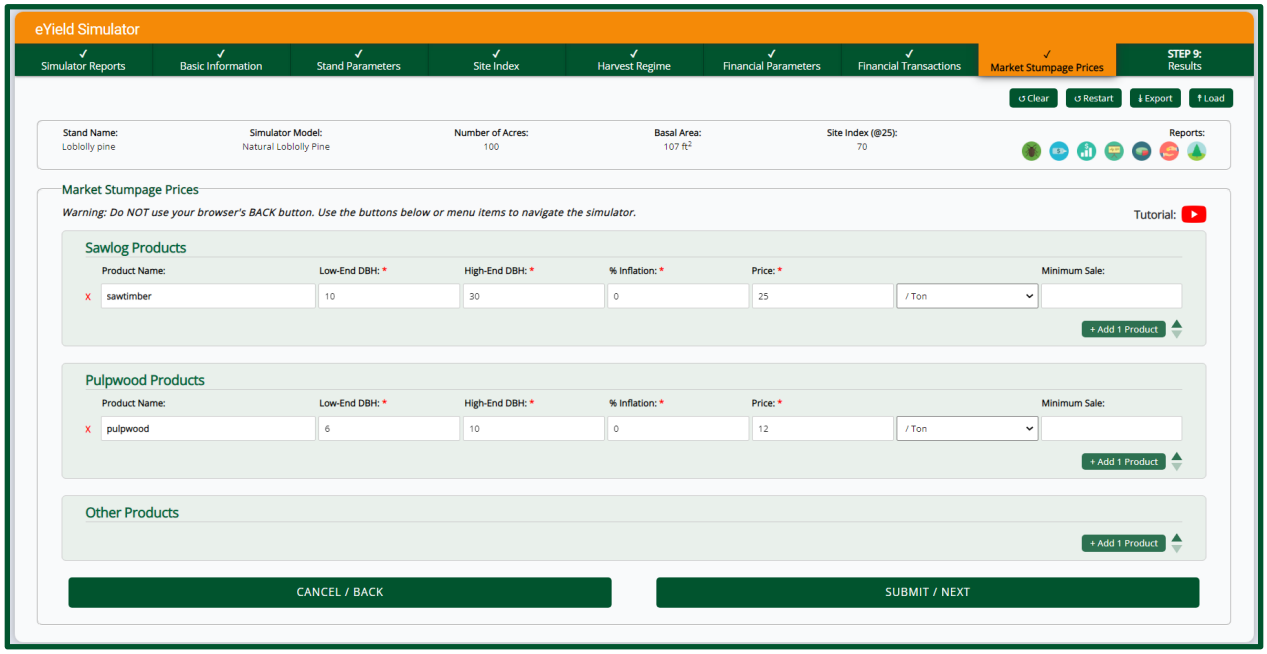


Figure 27. An example of the Market Stumpage Prices tab in eYield.

As illustrated in Figure 27, there are two general classes of products: sawtimber and pulpwood. A third class (Other Products) is available should a product not necessarily fit these descriptions. Within each class, multiple sub-products can be defined by pressing the "Add Product" button.

eYield defines a product using a range of DBHs. Unfortunately, eYield is unable to discriminate between products that may have the same diameter (DBH) ranges. Therefore, the ranges of different products cannot overlap. For some simulators that utilize (develop and grow) a diameter distribution, pulpwood products are also assumed to be captured within the tops and limbs of sawtimber products. No additional information is necessary in this case.

Product Name

Enter here the name of the product for which the stumpage price will apply. There are no pre-defined product names, so a user of eYield can enter their preferred product name.

Low-End DBH

This value defines the lower-end DBH for the product in question. Again, this value cannot be contained within, or overlap, the range of any other product.

High-End DBH

This value defines the upper-end DBH for the product in question. Again, this value cannot be contained within, or overlap, the range of any other product.

- If more than one product is noted in this tab, the High-End DBH of the smaller-sized product must match the Low-End DBH of the larger sized product. In the example in Figure 26, the High-End DBH for the pulpwood product in this scenario is 10 inches. This matches the Low-End DBH of the sawtimber product.

% Inflation

If inflation is to be assumed in the stumpage prices that are noted on this tab, it is entered here as a whole number. In other words, an assumption of 1% inflation will require a "1" to be placed in this textbox.

Price

This is the stumpage price. Next to this textbox is a drop-down list of the units to which the stumpage price applies. For sawtimber products, the price is assumed to be per MBF, per ton, or per tree. For pulpwood products, the price is assumed to be per cord, per ton, or per tree. For other products, the price is assumed to be per MBF, per ton, per cords, or per tree.

Minimum Sale

In this textbox, a user of eYield may constrain a harvest based on some minimum sale value (in US dollars). In this case, a value would be placed here. However, this assumption is optional.

- Although we have developed eYield for forests of the southern and eastern United States, and we have emphasized that the financial transactions and stumpage prices should be defined in US dollars, any type of currency can be used - as long as one is consistent. For example, if someone really wanted to define a financial transaction (for example a hunting lease) and suggest that the lessee will pay them in Turkish Lira, they can enter that value. However, eYield assumes all financial values use the same system. So, either the Turkish Lira would need to be converted to US dollars (by the user, before entering that value into eYield), or

every other financial value would need to be converted to Turkish Lira (again, by the user, before entering those values into eYield). In essence, eYield simply sees these values as generic numbers. For input and for reporting purposes, the user of eYield sees them as representing values from an assumed financial system.

Saving Selections

Press the *Submit / Next button* to save the selections (or changes). Without this action, the selections will not be saved.

SECTION 10. SIMULATOR DOCUMENTATION

1. Natural Loblolly Pine

The natural loblolly pine simulator projects the growth and yield of a stand table. So, the user can enter a stand table, or they can simply enter the total trees per acre for the stand, or simply a basal area. If there is no indication of the trees per acre by the user, total trees per acre are estimated using methods described in Burk and Burkhart (1984). Further, for these latter two cases, a stand table is then developed using a Weibull distribution. Total basal area is projected as a function of harvest, age, prior basal area, and site index, from relationships in Sullivan and Clutter (1972). The stand table is projected using methods derived from Clutter and Jones (1980). When projected, survival of trees is estimated using methods described in Schumacher and Coile (1960). Dominant heights of trees for each diameter class are estimated using methods described in Farrar (1973) and a correction factor from Coile and Schumacher (1953). Volumes and weights are calculated using relationships from Clutter and Jones (1980), Burkhart et al. (1972), and Burkhart (1977).

References

Burk, T.E., and H.E. Burkhart. 1984. Diameter distributions and yields of natural stands of loblolly pine. Virginia Polytechnic Institute and State University, School of Forestry and Wildlife Resources, Blacksburg, VA. Publication No. FWS-1-84.

Burkhart, H.E. 1977. Cubic foot volume of loblolly pine to any merchantable top limit. Southern Journal of Applied Forestry. 1(2): 7-9.

Burkhart, H.E., R.C. Parker, and R.G. Oderwald. 1972. Yields for natural stands of loblolly pine. Virginia Polytechnic Institute and State University, Division of Forestry and Wildlife Resources, Blacksburg, VA. Publication No. FWS-2-72.

Clutter, J.L., and E.P. Jones. 1980. Prediction of growth after thinning in old-field slash pine plantations U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station, Asheville, NC. Research Paper SE-217. 19 p.

Coile, T.S., and F.X. Schumacher. 1953. Site index of young stands of loblolly and shortleaf pines in the Piedmont Plateau region. Journal of Forestry. 51(6): 432-435.

Farrar, R.M., Jr. 1973. Southern pine site index equations. Journal of Forestry. 71(11): 696–697.

Schumacher, F.X., and T.S. Coile. 1960. Growth and yields of natural stands of the southern pines. T.S. Coile, Inc., Durham, NC. 115 p.

Sullivan, A.D., and J.L. Clutter. 1972. A simultaneous growth and yield model for loblolly pine. Forest Science. 18(1): 76-86.

2. Natural Longleaf Pine

Average height of dominant trees in the natural longleaf pine simulator is based on site index, age, and base age (50 years for natural stands). Four constants are necessary to estimate average height and are derived from (Farrar 1979). Average diameter at breast height (DBH) is based on stand age and site index. Basal area growth is based on current

basal area, initial stand age, and projected stand age. The volume and growth relationships for the natural longleaf pine simulator are based on Farrar (1979). Total cubic foot volume per acre is based on initial stand age, projected stand age, basal area, and site index. This value, along with site index, basal area, and age, is used to estimate cords per acre, board feet per acre, and weight per acre. The simulator then converts estimates of board feet per acre between board foot rules (Doyle, Scribner, International 1/4 rule).

Reference

Farrar, R.M. Jr. 1979. Growth and yield predictions for thinned stands of even-aged natural longleaf pine. U.S. Department of Agriculture, Southern Forest Experiment Station, New Orleans, LA. Research Paper SO-156. 78 p.

3. Natural Shortleaf Pine

In the natural shortleaf pine simulator, the average dominant tree height is estimated based on stand age and site index (base age 50 years). The projected basal area per acre is based on current basal area, current age, and projected age. The survival of trees per acre from one period to the next is based on current trees per acre, current and projected average heights, and current and projected basal areas. These growth relationships for the shortleaf pine simulator are based on the work of Schumacher and Coile (1960). The amount of sawtimber basal area per acre is based on a ratio of the merchantable basal area per acre. The total cubic feet per acre, pulpwood cubic feet per acre, sawtimber cubic feet per acre, and board feet per acre for the various log rules (International 1/4, Scribner, Doyle) are estimated using site index, age, and basal area relationships derived from Murphy and Beltz (1981). The weight per acre is based on the estimate of total cubic foot volume per acre.

References

Murphy, P.A., and R.C. Beltz. 1981. Growth and yield of shortleaf pine in the West Gulf region. U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station, New Orleans, LA. Research Paper SO-169. 15 p.

Schumacher, F.X., and T.S. Coile. 1960. Growth and yields of natural stands of the southern pines. T.S. Coile, Inc., Durham, NC. 115 p.

4. Natural Slash Pine

Within the natural slash pine simulator, the average diameter at breast height (DBH) is based on basal area and trees per acre. The initial trees per acre, if not specified, is based on age, basal area, and average height. The surviving trees per acre in future years are estimated using age, height, basal area, and previous TPA from Schumacher and Coile (1960). Trees per acre after a thinning are further adjusted using a factor supplied by the Region 8 (Atlanta) office of the U.S. Forest Service. Basal area growth, heights of dominant trees, International 1/4 rule board foot volumes, and cubic foot volumes are estimated using the relationships found in Bennett (1970). Conversions to

other log rules, to cords, and to weights are made using the information from Williams and Hopkins (1968).

References

Bennett, F.A. 1970. Variable-density yield tables for managed stands of natural slash pine. U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station, Asheville, NC. Research Note SE-141.

Schumacher, F.X., and T.S. Coile. 1960. Growth and yields of natural stands of the southern pines. T.S. Coile, Inc., Durham, NC. 115 p.

Williams, D.L., and W.C. Hopkins. 1968. Converting factors for southern pine products. Louisiana State University and Agricultural and Mechanical College, Agriculture Experiment Station, Baton Rouge, LA. Bulletin No. 626.

5. Upland Oak Hickory

For the upland oak-hickory simulator, the average diameter at breast height (DBH) is based on stand age and site index. The initial trees per acre, if not specified, is based on basal area and average DBH. Basal area growth is based on current basal area, site index, initial stand age, and projected stand age. Changes in trees per acre are based on estimates of ingrowth and mortality, which are a function of stand age, site index, and trees per acre. Beginning with a simulation of cubic foot volume, this simulator estimates cords per acre, board feet per acre (International 1/4 rule), and weight per acre (total weight and sawtimber weight), which are based on site index, age, average DBH, and basal area. The simulator then converts the estimate of board feet per acre to other board foot rules (Doyle, Scribner). The volume and growth relationships for the oak-hickory simulator are based on the works of Dale (1972) and Perkey (1985). In this simulator the height of trees is only used for reporting purposes. The dominant height computations are based on age and site index. The original source and the substitute equation for southeastern oaks types are Olsen (1959) and Schnur (1937).

References

Dale, M.E. 1972. Growth and yield predictions for upland oak stands, 10 years after initial thinning. U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station, Upper Darby, PA. Research Paper NE-241.

Olsen, D.J. Jr. 1959. Site index curves for upland oak in the southeast. U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station, Asheville, NC. Research Note Number 125.

Perkey, A.W. 1985. Computer corner: Groak (Grow Oak) on a computer. Northern Journal of Applied Forestry. 2(4): 99.

Schnur, G.L. 1937. Yield, stand, and volume tables for even-aged upland oak forests. U.S. Department of Agriculture, Washington, D.C. Technical Bulletin 560.

6. White Pine

In the white pine simulator, the average height is based on age and site index. The average basal area is based on age, height, and trees per acre. Cubic foot volumes are based on age, height, and trees per acre. These variables and average diameter are used to estimate board foot volume. Changes in trees per acre are based on age, site index, trees per acre, and elapsed time. The simulator converts estimates of board feet per acre between board foot rules (Doyle, Scribner, International 1/4 rule). The volume and growth relationships for the white pine simulator are based on Hepp et al. (2015).

Reference

Hepp, T.E., J.P. Vimmerstedt, G.W. Smalley, and W.H. McNab. 2015. Estimating yields of unthinned eastern white pine plantations from current stocking in the southern Appalachians. Forest Science. 61(1): 114-122.

7. Yellow-Poplar

The yellow-poplar simulation model projects a stand table through time. The total basal area per acre is input directly. A stand table is created based on age, site index, and basal area (Knoebel et al. 1986). All projections of the stand table are made using a modified version of the process from Clutter and Jones (1980). The average dominant tree height for the stand is based on age and site index (Beck and Della-Bianca 1975). Height by diameter class projected over time is based on the initial and projected ages, and the initial and projected average dominant tree height. The growth in basal area is based on the work of Knoebel et al. (1986). Volumes are estimated using the relationships found in Knoebel et al. (1984) and Beck and Della-Bianca (1970).

References

Beck, D.E., and L. Della-Bianca. 1970. Yield of unthinned yellow-poplar. U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station, Asheville, NC. Research Paper SE-58. 20 p.

Beck, D.E., and L. Della-Bianca. 1975. Board-foot and diameter growth of yellow-poplar after thinning. U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station, Asheville, NC. Research Paper SE-123. 20 p.

Clutter, J.L., and E.P. Jones Jr. 1980. Prediction of growth after thinning on old-field slash pine plantations. U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station, Asheville, NC. Research Paper SE-217. 19 p.

Knoebel, B.R., H.E. Burkhart, and D.E. Beck. 1986. A growth and yield model for thinned stands of yellow-poplar. Forest Science Monograph 27.

SECTION 11. SIMULATION EXAMPLE

Ty Lee recently purchased 120 acres of forest land in southeastern Arkansas. The area was clearcut 15 years prior to the purchase and had been reforested naturally with loblolly pine. Mr. Lee intends to manage the land as a forest investment with a long-term view (today through 35 years into the future). Mr. Lee estimates that his forest has a site index (base age 25) of 75, and that the current basal area is about 90 ft^2 per acre. The stand parameters tab in eYield might be populated with the information contained in Figure 28. The site index tab in eYield might be populated with the information contained in Figure 29.

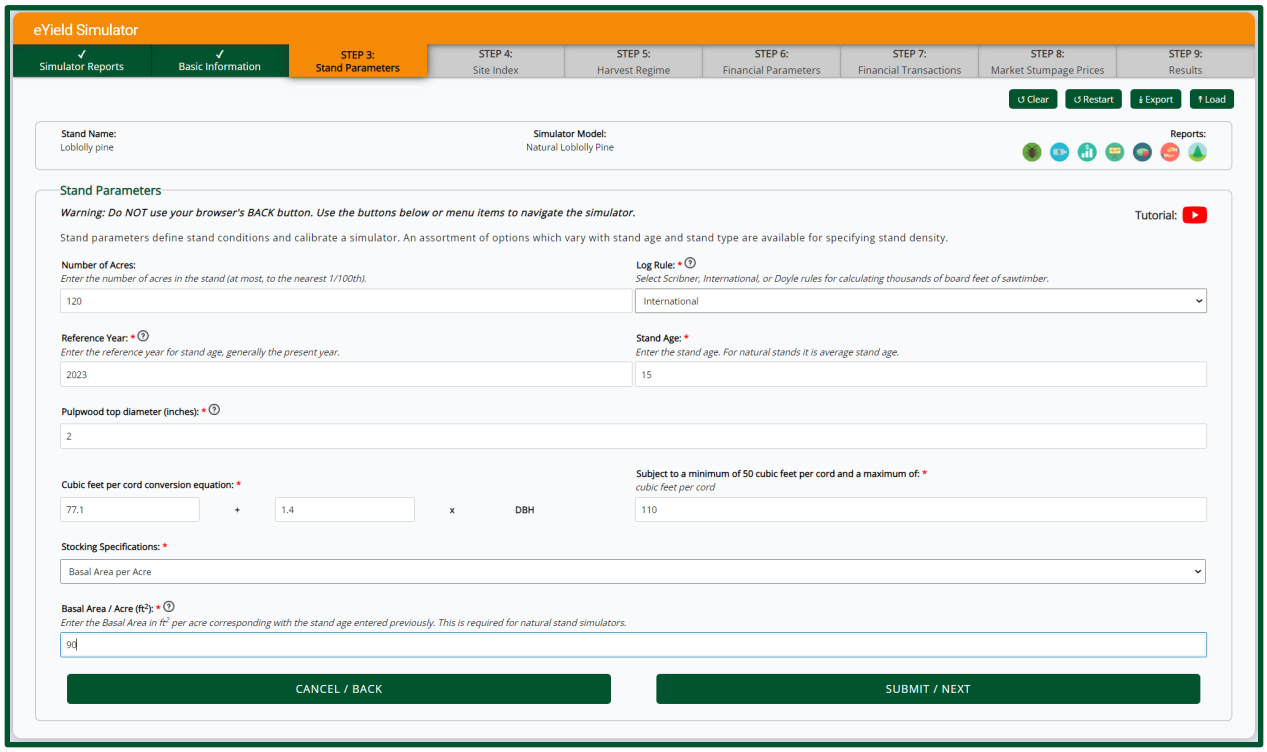


Figure 28. Ty Lee example - Stand Parameters tab in eYield.

As one alternative to the management of the forest, the following series of activities might be implemented:

Year 2	Development of a management plan by a consultant ($10 per acre, or $1,200)
Year 5 (Age 20)	Commercial thinning from below, to 70 ft^2 per acre basal area
Year 15 (Age 30)	Commercial thinning from below, to 70 ft^2 per acre basal area
Year 25 (Age 40)	Final harvest
Year 26	Chemical site preparation and prescribed fire ($130 per acre)
Year 26	Planting loblolly pine ($55 per acre)

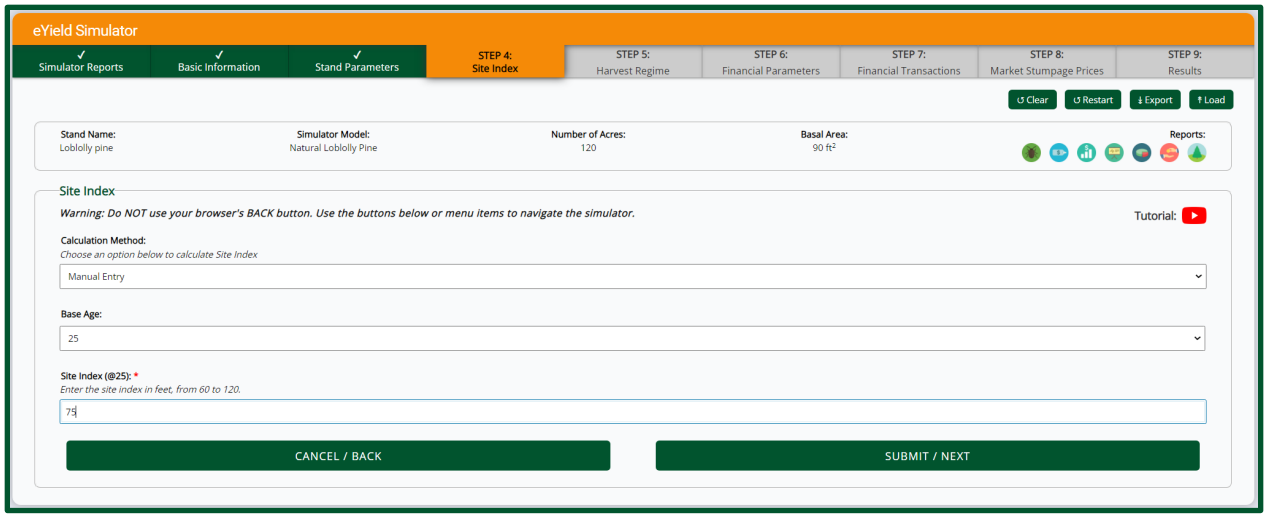


Figure 29. Ty Lee example - Site Index tab in eYield.

Mr. Lee also estimates that the expenses associated with the thinning and the final harvest might run around 10% of the harvest value. The harvest regime tab in eYield, using the information noted above, might be populated with the information contained in Figure 30.

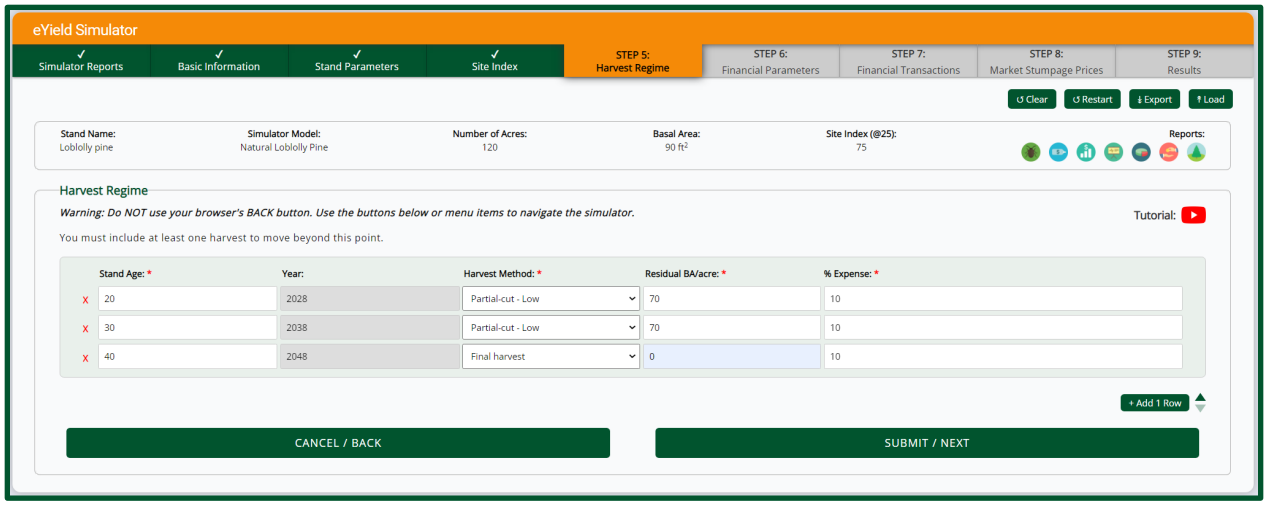


Figure 30. Ty Lee example - Harvest Regime tab in eYield.

For this example, assume that the planning horizon begins with the current year (2023 at the time of the development of this user's guide) to a point 35 years into the future. Further, assume that the marginal federal income tax rate is 25% and that the capital gains tax rate is also 25%. In practice, these should be defined based on the current tax laws. The before-tax discount rate is a choice made by Mr. Lee, and it is assumed to be 5% in this example. The financial parameters tab in eYield might be populated with the information contained in Figure 31.

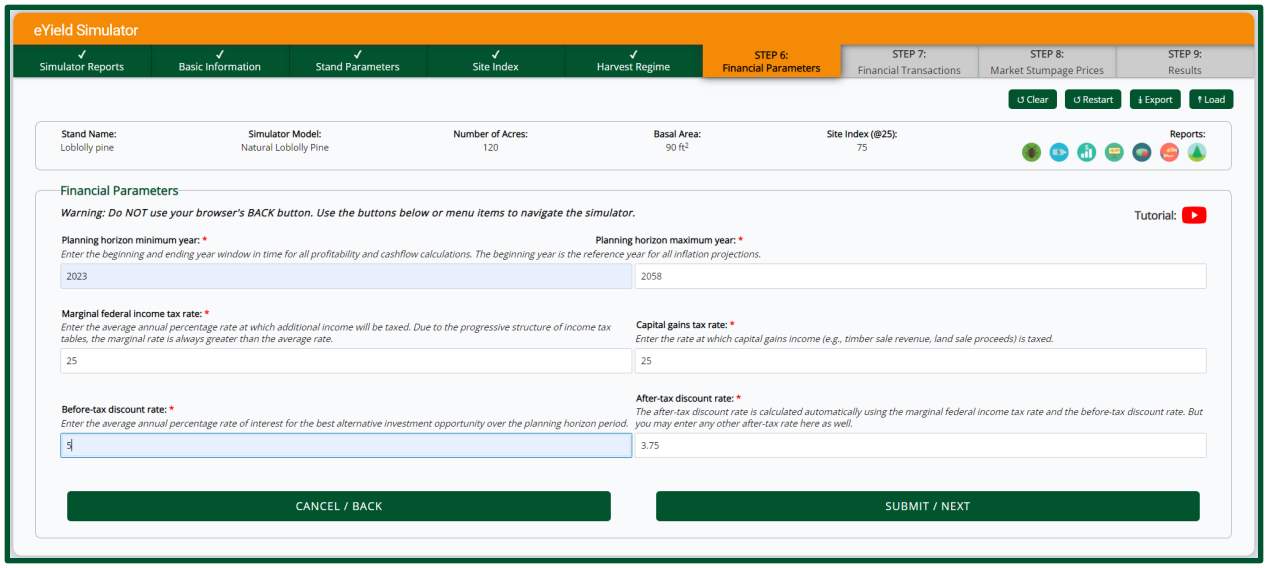


Figure 31. Ty Lee example - Financial Parameters tab in eYield.

In addition to the costs noted above, Mr. Lee is hopeful to enter into a hunting lease with a nearby club and receive income throughout the time horizon of about $15 per acre per year. Even though inflation is a concern at the time of the development of this user's guide, we will assume 1% per year in this example. The financial transactions tab in eYield might be populated with the information contained in Figure 32.

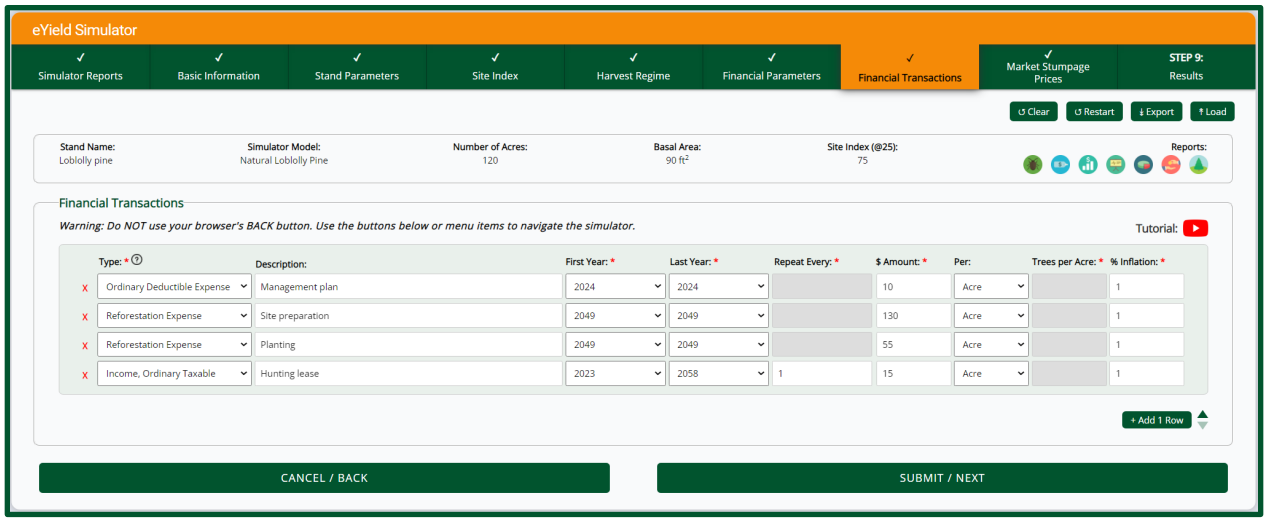


Figure 32. Ty Lee example - Financial Transactions tab in eYield.

The assumed prices for forest products are $27 per ton for sawtimber, $15 per ton for chip-n-saw, and $6 per ton for pulpwood. The range of tree diameters for these products is assumed to be 5-9 inches for pulpwood, 9-11 inches for chip-n-saw, and 11+ inches for sawtimber. Inflation is assumed again to be 1% per year. The market stumpage prices tab in eYield might be populated with the information contained in Figure 33.

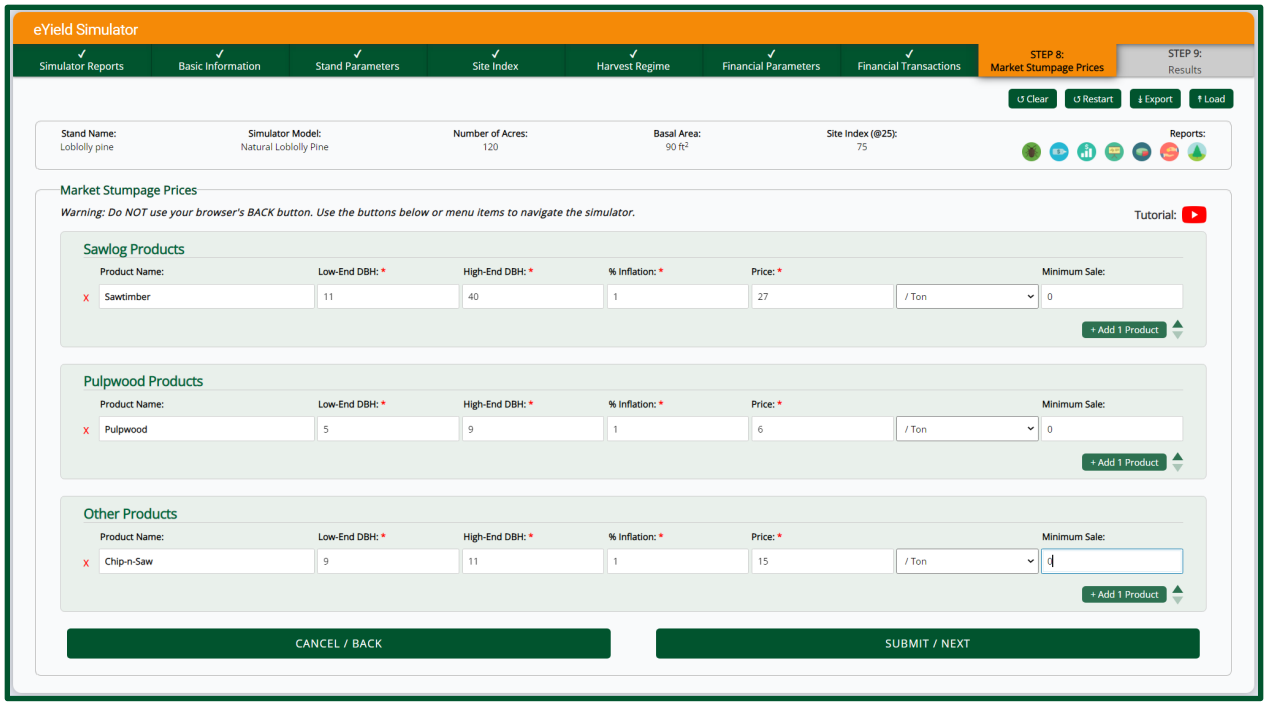


Figure 33. Ty Lee example - Market Stumpage Prices tab in eYield.

In the eYield report that follows, the outcomes of this scenario for Mr. Lee indicate that the before-tax net present value is about $1,956 per acre, the benefit/cost ratio is about 8, the annual equivalent value is about $118 per acre, and the composite internal rate of return is 11.3%. Further, one can see that initially the bark beetle risk may be high, but after the first thinning in the year 2028 (at age 20), the risk was lowered to a "medium" level.

Certainly, there are an infinite number of alternatives that can be compared against this one, simply by changing one or more of the financial (costs and prices, discount rate, inflation rate) or harvest (type, timing, residual amount) assumptions, or by including more planned activities.

Download Ty Lee Simulation File

EYIELD REPORT

STAND NAME: LOBLOLLY PINE
*ACREAGE: 120**

Present year:	**2023**
Site index (base age 25):	**75**
Stand age (years):	**15**
Basal area (ft²/acre):	**90**

Table of Contents

Ty Lee\'s 120-acre loblolly pine stand in southeastern Arkansas.

BARK BEETLE REPORT

STAND NAME: LOBLOLLY PINE
*ACREAGE: 120**

	Standing			10-Year Avg. Growth		Hazard		
	DBH	Basal Area	TPA	DBH	Ring Width	Rating	Class	Score
2023	8.61	94.21	232.94	0.45	0.22	185.33	4	High
2024	9.09	98.21	217.78	0.45	0.22	193.34	4	High
2025	9.51	101.25	205.37	0.45	0.22	199.43	4	High
2026	9.96	104.56	193.37	0.45	0.22	206.05	4	High
2027	10.4	107.58	182.41	0.45	0.22	212.14	4	High
2028	12.34	70	84.34	0.74	0.37	129.92	3	Medium
2029	12.85	72.53	80.52	0.71	0.35	135.88	3	Medium
2030	13.43	75.95	77.18	0.69	0.34	143.15	3	Medium
2031	13.99	79.14	74.09	0.67	0.34	149.9	3	Medium
2032	14.46	80.96	70.99	0.65	0.32	154.08	3	Medium
2033	14.27	83.98	75.59	0.58	0.29	161.65	3	Medium
2034	14.82	87.01	72.67	0.59	0.3	167.58	3	Medium
2035	15.35	89.37	69.58	0.6	0.3	172.04	3	Medium
2036	15.77	90.35	66.6	0.6	0.3	174.06	3	Medium
2037	16.27	92.57	64.14	0.61	0.3	178.37	3	Medium
2038	18.39	70	37.94	0.62	0.31	132.71	3	Medium
2039	18.93	71.61	36.64	0.63	0.31	135.89	3	Medium

** All values are calculated on a per-acre basis.*

BARK BEETLE REPORT

STAND NAME: LOBLOLLY PINE
*ACREAGE: 120**

	Standing			10-Year Avg. Growth		Hazard		
	DBH	Basal Area	TPA	DBH	Ring Width	Rating	Class	Score
2040	19.34	71.83	35.23	0.61	0.3	136.74	3	Medium
2041	19.71	71.77	33.88	0.59	0.3	137.05	3	Medium
2042	20.23	72.56	32.52	0.6	0.3	138.51	3	Medium
2043	20.6	72.95	31.52	0.63	0.32	138.43	3	Medium
2044	20.92	72.57	30.4	0.61	0.31	138.19	3	Medium
2045	21.4	73.11	29.26	0.61	0.3	139.37	3	Medium
2046	21.73	72.99	28.35	0.6	0.3	139.37	3	Medium
2047	22.01	72.32	27.36	0.57	0.29	138.52	3	Medium
2048	-	-	-	0.36	0.18	-1.48	1	Low

** All values are calculated on a per-acre basis.*

CASHFLOW BY TRANSACTION REPORT

STAND NAME: LOBLOLLY PINE
*ACREAGE: 120**

	Type	Description	Amount	Accum	Taxes	Accum Total
2023	Income, ordinary taxable	Hunting lease	$15.00	$15.00	($3.75)	$11.25
2024	Ordinary deductible expense	Management plan	($10.10)	$4.90	$2.53	$3.68
	Income, ordinary taxable	Hunting lease	$15.15	$20.05	($3.79)	$15.04
2025	Income, ordinary taxable	Hunting lease	$15.30	$35.35	($3.83)	$26.51
2026	Income, ordinary taxable	Hunting lease	$15.45	$50.81	($3.86)	$38.10
2027	Income, ordinary taxable	Hunting lease	$15.61	$66.42	($3.90)	$49.81
2028	Harvest #1: Pulpwood	Harvest revenue	$119.14	$185.55	($29.78)	$139.17
	Harvest expense	Computed as 10% of harvest revenue	($11.91)	$173.64	$2.98	$130.23
	Harvest #1: Chip-n-Saw	Harvest revenue	$143.91	$317.55	($35.98)	$238.16
	Harvest expense	Computed as 10% of harvest revenue	($14.39)	$303.16	$3.60	$227.37
	Income, ordinary taxable	Hunting lease	$15.77	$318.93	($3.94)	$239.19
2029	Income, ordinary taxable	Hunting lease	$15.92	$334.85	($3.98)	$251.14
2030	Income, ordinary taxable	Hunting lease	$16.08	$350.93	($4.02)	$263.20
2031	Income, ordinary taxable	Hunting lease	$16.24	$367.17	($4.06)	$275.38
2032	Income, ordinary taxable	Hunting lease	$16.41	$383.58	($4.10)	$287.68
2033	Income, ordinary taxable	Hunting lease	$16.57	$400.15	($4.14)	$300.11
2034	Income, ordinary taxable	Hunting lease	$16.74	$416.88	($4.18)	$312.66
2035	Income, ordinary taxable	Hunting lease	$16.90	$433.79	($4.23)	$325.34

** All values are calculated on a per-acre basis.*

CASHFLOW BY TRANSACTION REPORT

STAND NAME: LOBLOLLY PINE
*ACREAGE: 120**

	Type	Description	Amount	Accum	Taxes	Accum Total
2036	Income, ordinary taxable	Hunting lease	$17.07	$450.86	($4.27)	$338.14
2037	Income, ordinary taxable	Hunting lease	$17.24	$468.10	($4.31)	$351.07
2038	Harvest #2: Pulpwood	Harvest revenue	$22.53	$490.63	($5.63)	$367.97
	Harvest expense	Computed as 10% of harvest revenue	($2.25)	$488.37	$0.56	$366.28
	Harvest #2: Sawtimber	Harvest revenue	$932.64	$1,421.02	($233.16)	$1,065.76
	Harvest expense	Computed as 10% of harvest revenue	($93.26)	$1,327.75	$23.32	$995.81
	Income, ordinary taxable	Hunting lease	$17.41	$1,345.17	($4.35)	$1,008.88
2039	Income, ordinary taxable	Hunting lease	$17.59	$1,362.76	($4.40)	$1,022.07
2040	Income, ordinary taxable	Hunting lease	$17.76	$1,380.52	($4.44)	$1,035.39
2041	Income, ordinary taxable	Hunting lease	$17.94	$1,398.46	($4.49)	$1,048.85
2042	Income, ordinary taxable	Hunting lease	$18.12	$1,416.58	($4.53)	$1,062.44
2043	Income, ordinary taxable	Hunting lease	$18.30	$1,434.89	($4.58)	$1,076.17
2044	Income, ordinary taxable	Hunting lease	$18.49	$1,453.37	($4.62)	$1,090.03
2045	Income, ordinary taxable	Hunting lease	$18.67	$1,472.04	($4.67)	$1,104.03
2046	Income, ordinary taxable	Hunting lease	$18.86	$1,490.90	($4.71)	$1,118.18
2047	Income, ordinary taxable	Hunting lease	$19.05	$1,509.95	($4.76)	$1,132.46
2048	Harvest #3: Pulpwood	Harvest revenue	$14.20	$1,524.14	($3.55)	$1,143.11
	Harvest expense	Computed as 10% of harvest revenue	($1.42)	$1,522.72	$0.35	$1,142.04

** All values are calculated on a per-acre basis.*

CASHFLOW BY TRANSACTION REPORT

STAND NAME: LOBLOLLY PINE
*ACREAGE: 120**

	Type	Description	Amount	Accum	Taxes	Accum Total
	Harvest #3: Sawtimber	Harvest revenue	$4,264.88	$5,787.61	($1,066.22)	$4,340.70
	Harvest expense	Computed as 10% of harvest revenue	($426.49)	$5,361.12	$106.62	$4,020.84
	Income, ordinary taxable	Hunting lease	$19.24	$5,380.35	($4.81)	$4,035.27
2049	Reforestation expense	Site preparation	($168.38)	$5,211.97	-	$3,866.88
	Amortized reforestation expense	Computed as 7.14% of 2049 expense	-	$5,211.97	$12.03	$3,878.91
	Reforestation expense	Planting	($71.24)	$5,140.73	-	$3,807.67
	Amortized reforestation expense	Computed as 7.14% of 2049 expense	-	$5,140.73	$5.09	$3,812.76
	Income, ordinary taxable	Hunting lease	$19.43	$5,160.16	($4.86)	$3,827.33
2050	Amortized reforestation expense	Computed as 14.29% of 2049 expense	-	$5,160.16	$24.05	$3,851.39
	Amortized reforestation expense	Computed as 14.29% of 2049 expense	-	$5,160.16	$10.18	$3,861.56
	Income, ordinary taxable	Hunting lease	$19.62	$5,179.78	($4.91)	$3,876.28
2051	Amortized reforestation expense	Computed as 14.29% of 2049 expense	-	$5,179.78	$24.05	$3,900.33
	Amortized reforestation expense	Computed as 14.29% of 2049 expense	-	$5,179.78	$10.18	$3,910.51
	Income, ordinary taxable	Hunting lease	$19.82	$5,199.60	($4.95)	$3,925.38
2052	Amortized reforestation expense	Computed as 14.29% of 2049 expense	-	$5,199.60	$24.05	$3,949.43
	Amortized reforestation expense	Computed as 14.29% of 2049 expense	-	$5,199.60	$10.18	$3,959.61
	Income, ordinary taxable	Hunting lease	$20.02	$5,219.62	($5.00)	$3,974.62
2053	Amortized reforestation expense	Computed as 14.29% of 2049 expense	-	$5,219.62	$24.05	$3,998.68

** All values are calculated on a per-acre basis.*

CASHFLOW BY TRANSACTION REPORT

STAND NAME: LOBLOLLY PINE
*ACREAGE: 120**

	Type	Description	Amount	Accum	Taxes	Accum Total
	Amortized reforestation expense	Computed as 14.29% of 2049 expense	-	$5,219.62	$10.18	$4,008.85
	Income, ordinary taxable	Hunting lease	$20.22	$5,239.84	($5.05)	$4,024.02
2054	Amortized reforestation expense	Computed as 14.29% of 2049 expense	-	$5,239.84	$24.05	$4,048.07
	Amortized reforestation expense	Computed as 14.29% of 2049 expense	-	$5,239.84	$10.18	$4,058.25
	Income, ordinary taxable	Hunting lease	$20.42	$5,260.26	($5.10)	$4,073.56
2055	Amortized reforestation expense	Computed as 14.29% of 2049 expense	-	$5,260.26	$24.05	$4,097.62
	Amortized reforestation expense	Computed as 14.29% of 2049 expense	-	$5,260.26	$10.18	$4,107.79
	Income, ordinary taxable	Hunting lease	$20.62	$5,280.88	($5.16)	$4,123.26
2056	Amortized reforestation expense	Computed as 7.14% of 2049 expense	-	$5,280.88	$12.03	$4,135.29
	Amortized reforestation expense	Computed as 7.14% of 2049 expense	-	$5,280.88	$5.09	$4,140.38
	Income, ordinary taxable	Hunting lease	$20.83	$5,301.71	($5.21)	$4,156.00
2057	Income, ordinary taxable	Hunting lease	$21.04	$5,322.75	($5.26)	$4,171.78
2058	Income, ordinary taxable	Hunting lease	$21.25	$5,344.00	($5.31)	$4,187.72

** All values are calculated on a per-acre basis.*

CASHFLOW BY YEAR REPORT

STAND NAME: LOBLOLLY PINE
*ACREAGE: 120**

	Before Tax				After Tax			
	Revenue	Expense	Net	Accumulated	Revenue	Expense	Net	Accumulated
2023	$15.00	-	$15.00	$15.00	$15.00	$3.75	$11.25	$11.25
2024	$15.15	$10.10	$5.05	$20.05	$17.68	$13.89	$3.79	$15.04
2025	$15.30	-	$15.30	$35.35	$15.30	$3.83	$11.48	$26.51
2026	$15.45	-	$15.45	$50.81	$15.45	$3.86	$11.59	$38.10
2027	$15.61	-	$15.61	$66.42	$15.61	$3.90	$11.71	$49.81
2028	$278.82	$26.31	$252.51	$318.93	$285.39	$96.01	$189.38	$239.19
2029	$15.92	-	$15.92	$334.85	$15.92	$3.98	$11.94	$251.14
2030	$16.08	-	$16.08	$350.93	$16.08	$4.02	$12.06	$263.20
2031	$16.24	-	$16.24	$367.17	$16.24	$4.06	$12.18	$275.38
2032	$16.41	-	$16.41	$383.58	$16.41	$4.10	$12.30	$287.68
2033	$16.57	-	$16.57	$400.15	$16.57	$4.14	$12.43	$300.11
2034	$16.74	-	$16.74	$416.88	$16.74	$4.18	$12.55	$312.66
2035	$16.90	-	$16.90	$433.79	$16.90	$4.23	$12.68	$325.34
2036	$17.07	-	$17.07	$450.86	$17.07	$4.27	$12.80	$338.14
2037	$17.24	-	$17.24	$468.10	$17.24	$4.31	$12.93	$351.07
2038	$972.58	$95.52	$877.07	$1,345.17	$996.46	$338.66	$657.80	$1,008.88
2039	$17.59	-	$17.59	$1,362.76	$17.59	$4.40	$13.19	$1,022.07

** All values are calculated on a per-acre basis.*

CASHFLOW BY YEAR REPORT

STAND NAME: LOBLOLLY PINE
*ACREAGE: 120**

	Before Tax				After Tax			
	Revenue	Expense	Net	Accumulated	Revenue	Expense	Net	Accumulated
2040	$17.76	-	$17.76	$1,380.52	$17.76	$4.44	$13.32	$1,035.39
2041	$17.94	-	$17.94	$1,398.46	$17.94	$4.49	$13.46	$1,048.85
2042	$18.12	-	$18.12	$1,416.58	$18.12	$4.53	$13.59	$1,062.44
2043	$18.30	-	$18.30	$1,434.89	$18.30	$4.58	$13.73	$1,076.17
2044	$18.49	-	$18.49	$1,453.37	$18.49	$4.62	$13.86	$1,090.03
2045	$18.67	-	$18.67	$1,472.04	$18.67	$4.67	$14.00	$1,104.03
2046	$18.86	-	$18.86	$1,490.90	$18.86	$4.71	$14.14	$1,118.18
2047	$19.05	-	$19.05	$1,509.95	$19.05	$4.76	$14.28	$1,132.46
2048	$4,298.32	$427.91	$3,870.41	$5,380.35	$4,405.29	$1,502.49	$2,902.81	$4,035.27
2049	$19.43	$239.62	($220.19)	$5,160.16	$36.54	$244.48	($207.93)	$3,827.33
2050	$19.62	-	$19.62	$5,179.78	$53.85	$4.91	$48.95	$3,876.28
2051	$19.82	-	$19.82	$5,199.60	$54.05	$4.95	$49.10	$3,925.38
2052	$20.02	-	$20.02	$5,219.62	$54.25	$5.00	$49.24	$3,974.62
2053	$20.22	-	$20.22	$5,239.84	$54.45	$5.05	$49.40	$4,024.02
2054	$20.42	-	$20.42	$5,260.26	$54.65	$5.10	$49.55	$4,073.56
2055	$20.62	-	$20.62	$5,280.88	$54.86	$5.16	$49.70	$4,123.26
2056	$20.83	-	$20.83	$5,301.71	$37.95	$5.21	$32.74	$4,156.00

** All values are calculated on a per-acre basis.*

CASHFLOW BY YEAR REPORT

STAND NAME: LOBLOLLY PINE
ACREAGE: 120*

	Before Tax				After Tax			
	Revenue	Expense	Net	Accumulated	Revenue	Expense	Net	Accumulated
2057	$21.04	-	$21.04	$5,322.75	$21.04	$5.26	$15.78	$4,171.78
2058	$21.25	-	$21.25	$5,344.00	$21.25	$5.31	$15.94	$4,187.72

** All values are calculated on a per-acre basis.*

FINANCIAL PROFITABILITY REPORT

STAND NAME: LOBLOLLY PINE
*ACREAGE: 120**

	Before Tax	After Tax
Nominal discount rate	5%	3.75%
Net present worth	$1,955.74	$1,914.42
Internal rate of return	-	-
Discounted benefit/cost ratio	8.25	2.81
Soil expectation value	-	-
Annual equivalent value	$118.19	$97.77
Composite Internal Rate of Return	11.34%	6.78%

Financial Factors:

Planning Horizon:	**2023 - 2058**
Marginal Federal Tax Bracket:	**25**
Capital Gains Tax Rate:	**25**

** All values are calculated on a per-acre basis.*

GROWTH & HARVEST REPORT

STAND NAME: LOBLOLLY PINE
*ACREAGE: 120**

		Standing			Harvested			Residual		
	DBH	BA	TPA	%	BA	TPA	%	BA	TPA	%
2028	3	0.02	0.41	0.02	0.02	0.41	0.05	-	-	-
	4	0.76	8.71	0.68	0.76	8.71	1.83	-	-	-
	5	2.57	18.85	2.3	2.57	18.85	6.19	-	-	-
	6	5.05	25.72	4.53	5.05	25.72	12.16	-	-	-
	7	8.6	32.18	7.71	8.6	32.18	20.7	-	-	-
	8	12.98	37.19	11.64	12.98	37.19	31.25	-	-	-
	9	13.03	29.49	11.68	11.57	26.19	27.85	1.46	3.3	2.09
	10	13.83	25.36	12.4	-	-	-	13.83	25.36	19.76
	11	14.17	21.47	12.7	-	-	-	14.17	21.47	20.24
	12	12.2	15.53	10.94	-	-	-	12.2	15.53	17.43
	13	9.03	9.8	8.1	-	-	-	9.03	9.8	12.9
	14	7.41	6.93	6.64	-	-	-	7.41	6.93	10.59
	15	5.57	4.54	4.99	-	-	-	5.57	4.54	7.96
	16	3.41	2.44	3.06	-	-	-	3.41	2.44	4.87
	17	1.9	1.21	1.7	-	-	-	1.9	1.21	2.71
	18	1.01	0.57	0.91	-	-	-	1.01	0.57	1.44

** All values are calculated on a per-acre basis.*

GROWTH & HARVEST REPORT

STAND NAME: LOBLOLLY PINE
*ACREAGE: 120**

		Standing			Harvested			Residual		
	DBH	BA	TPA	%	BA	TPA	%	BA	TPA	%
2038	12	0.55	0.7	0.54	0.55	0.7	1.75	-	-	-
	13	1.92	2.08	1.89	1.92	2.08	6.09	-	-	-
	14	15.99	14.96	15.75	15.99	14.96	50.75	-	-	-
	15	15.36	12.52	15.13	13.05	10.63	41.42	2.32	1.89	3.31
	16	15.04	10.77	14.82	-	-	-	15.04	10.77	21.49
	17	14.38	9.12	14.17	-	-	-	14.38	9.12	20.54
	18	9.09	5.14	8.95	-	-	-	9.09	5.14	12.99
	19	8.1	4.11	7.98	-	-	-	8.1	4.11	11.57
	20	7.22	3.31	7.11	-	-	-	7.22	3.31	10.31
	21	5.62	2.34	5.54	-	-	-	5.62	2.34	8.03
	22	3.62	1.37	3.57	-	-	-	3.62	1.37	5.17
	23	2.69	0.93	2.65	-	-	-	2.69	0.93	3.84
	24	1.89	0.6	1.86	-	-	-	1.89	0.6	2.7
	25	0.04	0.01	0.04	-	-	-	0.04	0.01	0.06
2048	19	2.75	1.4	3.03	2.75	1.4	3.03	-	-	-
	20	12.9	5.91	14.22	12.9	5.91	14.22	-	-	-

** All values are calculated on a per-acre basis.*

GROWTH & HARVEST REPORT

STAND NAME: LOBLOLLY PINE
*ACREAGE: 120**

	Standing			Harvested			Residual		
DBH	**BA**	**TPA**	**%**	**BA**	**TPA**	**%**	**BA**	**TPA**	**%**
21	16.01	6.66	17.65	16.01	6.66	17.65	-	-	-
22	14.53	5.5	16.02	14.53	5.5	16.02	-	-	-
23	10.61	3.68	11.7	10.61	3.68	11.7	-	-	-
24	8.25	2.63	9.09	8.25	2.63	9.09	-	-	-
25	7.27	2.13	8.01	7.27	2.13	8.01	-	-	-
26	6.3	1.71	6.94	6.3	1.71	6.94	-	-	-
27	5.13	1.29	5.65	5.13	1.29	5.65	-	-	-
28	3.82	0.89	4.21	3.82	0.89	4.21	-	-	-
29	2.46	0.54	2.71	2.46	0.54	2.71	-	-	-
30	0.71	0.14	0.78	0.71	0.14	0.78	-	-	-

** All values are calculated on a per-acre basis.*

MARKET CONVERSION REPORT

STAND NAME: LOBLOLLY PINE
*ACREAGE: 120**

		Harvested		Dimensions			Product		
	DBH	Basal Area	TPA	Height	Volume	Weight	Name	Price	Total
2028	**5**	2.57	18.81	45.84	0.34 Cords	0.59 Tons	Pulpwood	$6.31 / Ton	$3.69
	6	5.05	25.73	51.3	1.46 Cords	2.95 Tons	Pulpwood	$6.31 / Ton	$18.61
	7	8.6	32.2	55.59	2.62 Cords	5.78 Tons	Pulpwood	$6.31 / Ton	$36.45
	8	12.98	37.19	59.05	4.11 Cords	9.58 Tons	Pulpwood	$6.31 / Ton	$60.39
	9	11.57	26.18	61.88	3.76 Cords	9.13 Tons	Chip-n-Saw	$15.77 / Ton	$143.91
									$263.05
2038	**12**	0.13	0.16	72.04	0.08 Cords	0.12 Tons	Pulpwood	$6.97 / Ton	$0.83
	12	0.43	0.54	72.04	0.06 MBF	0.4 Tons	Sawtimber	$31.35 / Ton	$12.65
	13	0.3	0.33	75.15	0.22 Cords	0.3 Tons	Pulpwood	$6.97 / Ton	$2.10
	13	1.62	1.75	75.15	0.24 MBF	1.61 Tons	Sawtimber	$31.35 / Ton	$50.40
	14	1.66	1.55	77.92	1.38 Cords	1.72 Tons	Pulpwood	$6.97 / Ton	$11.98
	14	14.33	13.41	77.92	2.16 MBF	14.84 Tons	Sawtimber	$31.35 / Ton	$465.33
	15	1.02	0.83	80.41	0.91 Cords	1.09 Tons	Pulpwood	$6.97 / Ton	$7.62
	15	12.03	9.8	80.41	1.87 MBF	12.9 Tons	Sawtimber	$31.35 / Ton	$404.26
									$955.17
2048	**19**	0.08	0.04	92.99	0.1 Cords	0.1 Tons	Pulpwood	$7.69 / Ton	$0.78

** All values are calculated on a per-acre basis.*

MARKET CONVERSION REPORT

STAND NAME: LOBLOLLY PINE
*ACREAGE: 120**

	Harvested		Dimensions			Product		
DBH	Basal Area	TPA	Height	Volume	Weight	Name	Price	Total
19	2.67	1.36	92.99	0.48 MBF	3.34 Tons	Sawtimber	$34.63 / Ton	$115.62
20	0.31	0.14	95.65	0.39 Cords	0.4 Tons	Pulpwood	$7.69 / Ton	$3.05
20	12.59	5.77	95.65	2.35 MBF	16.19 Tons	Sawtimber	$34.63 / Ton	$560.76
21	0.31	0.13	98.13	0.42 Cords	0.41 Tons	Pulpwood	$7.69 / Ton	$3.18
21	15.69	6.52	98.13	3.02 MBF	20.73 Tons	Sawtimber	$34.63 / Ton	$717.88
22	0.23	0.09	100.44	0.33 Cords	0.32 Tons	Pulpwood	$7.69 / Ton	$2.44
22	14.29	5.41	100.44	2.82 MBF	19.34 Tons	Sawtimber	$34.63 / Ton	$669.69
23	0.14	0.05	102.59	0.21 Cords	0.2 Tons	Pulpwood	$7.69 / Ton	$1.52
23	10.47	3.63	102.59	2.11 MBF	14.48 Tons	Sawtimber	$34.63 / Ton	$501.38
24	0.09	0.03	104.61	0.14 Cords	0.13 Tons	Pulpwood	$7.69 / Ton	$1.01
24	8.15	2.59	104.61	1.68 MBF	11.5 Tons	Sawtimber	$34.63 / Ton	$398.29
25	0.07	0.02	106.5	0.11 Cords	0.1 Tons	Pulpwood	$7.69 / Ton	$0.77
25	7.2	2.11	106.5	1.51 MBF	10.35 Tons	Sawtimber	$34.63 / Ton	$358.23
26	0.05	0.01	108.27	0.09 Cords	0.07 Tons	Pulpwood	$7.69 / Ton	$0.58
26	6.25	1.7	108.27	1.34 MBF	9.14 Tons	Sawtimber	$34.63 / Ton	$316.34
27	0.04	0.01	109.94	0.06 Cords	0.05 Tons	Pulpwood	$7.69 / Ton	$0.41
27	5.09	1.28	109.94	1.11 MBF	7.56 Tons	Sawtimber	$34.63 / Ton	$261.74

** All values are calculated on a per-acre basis.*

MARKET CONVERSION REPORT

STAND NAME: LOBLOLLY PINE
*ACREAGE: 120**

	Harvested		Dimensions			Product		
DBH	**Basal Area**	**TPA**	**Height**	**Volume**	**Weight**	**Name**	**Price**	**Total**
28	0.02	0.01	111.52	0.04 Cords	0.03 Tons	Pulpwood	$7.69 / Ton	$0.26
28	3.79	0.89	111.52	0.84 MBF	5.72 Tons	Sawtimber	$34.63 / Ton	$197.91
29	0.01	0	113	0.02 Cords	0.02 Tons	Pulpwood	$7.69 / Ton	$0.15
29	2.44	0.53	113	0.55 MBF	3.73 Tons	Sawtimber	$34.63 / Ton	$129.25
30	0	0	114.4	0.01 Cords	0 Tons	Pulpwood	$7.69 / Ton	$0.04
30	0.71	0.14	114.4	0.16 MBF	1.09 Tons	Sawtimber	$34.63 / Ton	$37.80
								$4,279.08

** All values are calculated on a per-acre basis.*

WOODFLOW SUMMARY REPORT

STAND NAME: LOBLOLLY PINE
*ACREAGE: 120**

Management Plan:

This is a natural loblolly pine stand with a site index of 75 (base age 25).

In 2028 a low-cut harvest is planned, leaving 70 square feet of residual basal area per acre.

In 2038 a low-cut harvest is planned, leaving 70 square feet of residual basal area per acre.

In 2048 a final-cut harvest is planned, leaving 0 square feet of residual basal area per acre.

Present year:	**2023**
Site index (base age 25):	**75**
Stand age (years):	**15**
Basal area (ft²/acre):	**90**

		Standing	Harvested		Marketable				
	Age	Basal Area	Basal Area	TPA	Product	MBF	Cords	Tons	Value
2028	**20**	**70**	29.2	113.93	Pulpwood	-	8.52	18.89	$119.14
			11.57	26.18	Chip-n-Saw	-	3.76	9.13	$143.91
							12.28	**28.02**	**$263.05**
2038	**30**	**70**	31.51	28.38	Sawtimber	4.33	-	29.75	$932.64
			31.51	28.38	Pulpwood	-	2.59	3.23	$22.53
						4.33	**2.59**	**32.99**	**$955.17**
2048	**40**	**0**	90.72	32.47	Sawtimber	17.97	-	123.17	$4,264.88
			90.72	32.47	Pulpwood	-	1.92	1.85	$14.20
						17.97	**1.92**	**125.02**	**$4,279.08**

The eYield website is still in its testing phase. All information in this report is provided "as is" and "as available".

** All values are calculated on a per-acre basis.*