



TEXAS A&M
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Forest Thinning Scheduler

User's Guide



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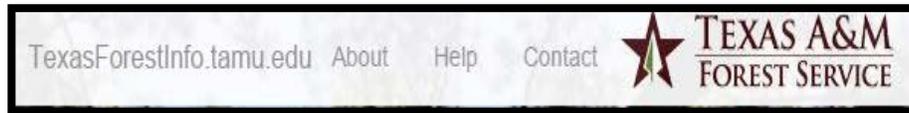
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Table of Contents

Links	5
TexasForestInfo.tamu.edu.....	5
About.....	5
Help.....	5
Contact.....	5
Texas A&M Forest Service Logo.....	5
Tabs	6
Introduction.....	6
Description (Forest Stand Description).....	6
Scenario Name.....	6
Description.....	7
Region.....	7
Stand Type.....	7
Species.....	7
Stand age.....	7
Stand density.....	7
Site Index.....	7
Include Site Index Adjustment for Base Age = 50:.....	7
Set to default.....	8
Clear form.....	8
Activities (Prior Forest Management Activities)	8
Genetic gain.....	8
Stand previously thinned.....	8
Thresholds (Thinning Decision Threshold)	9
Primary management objective.....	9
Tolerance to investment risk.....	9
Age at final harvest.....	10
Increased chance of environmental stressors?.....	10
Maximum SDI.....	10
Adjust SDI for planting density.....	10
Submit Tab	10
Site Index.....	11
Initial diameter.....	11
Genetic gain over base.....	11
QMD where thinning begins.....	11
Average height.....	11
Initial Stand Density Index.....	11
Upper limit SDI and thinning required.....	11
Lower limit SDI thinning target.....	11
Density-dependent upper SDI limit.....	11
Scenario navigation buttons	11
Scenario selection.....	11
Results.....	12



Links



TexasForestInfo.tamu.edu

Clicking the [TexasForestInfo.tamu.edu](http://texasforestinfo.tamu.edu) will take you to the Texas Forest Information Portal.

URL = <http://texasforestinfo.tamu.edu>

About

Click *About* to bring up a brief statement describing the Forest Thinning Scheduler application.

Help

Click the *Help* link available on the main page to access this user guide.

In addition to the PDF user manual provided, “tool tips” for each specific step are provided with a simple mouse rollover on any of the input fields.

Contact

Texas A&M Forest Service invites you to provide feedback on the Forest Thinning Scheduler application. Please provide your questions, comments and suggestions for improvement by clicking the *Contact* link.

Texas A&M Forest Service Logo

Click on the *Texas A&M Forest Service Logo* to go to the Texas A&M Forest Service main page.

URL = <http://texasforestservicetamu.edu>



Tabs



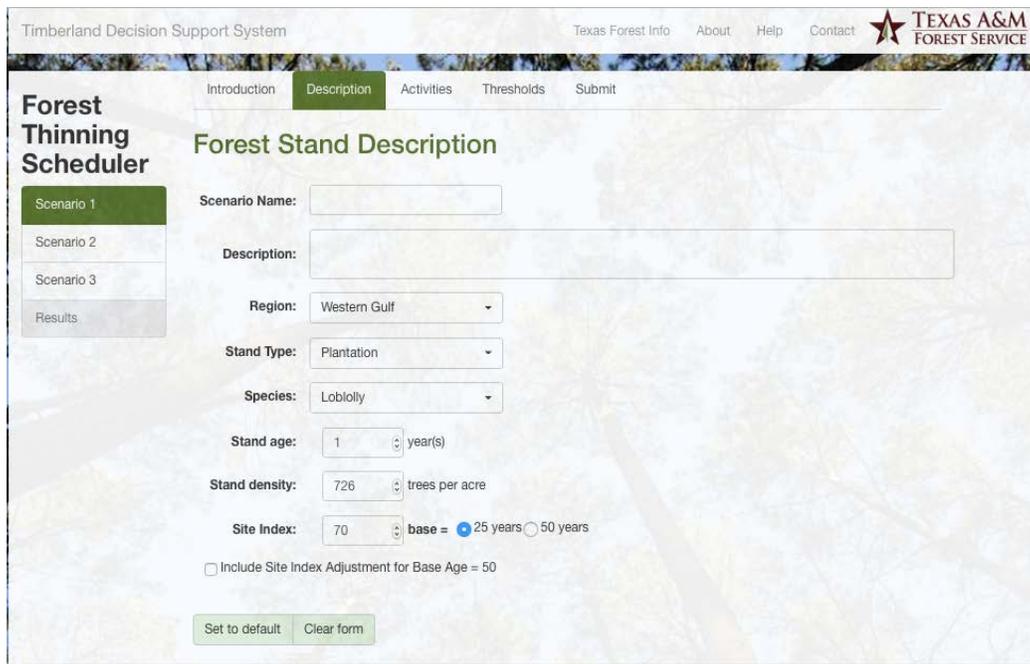
Introduction

This default screen provides the following brief directions to quickly begin a thinning scheduler session.

- Starting with the *Description* tab above, enter the appropriate information in the *Description* tab, *Activities* tab, and *Thresholds* tab for Scenario 1.
- If desired, click on *Scenario 2* button to input different values for a second scenario on each tab. Repeat for *Scenario 3*, if desired.
- Once all inputs have been successfully entered, click on the *Submit* tab. Review inputs, and click the *Submit* button at the bottom of the page to run the analysis.
- Click on the *Results* button in the left, navigation screen to review results. Results can be viewed individually for each scenario or collectively across all scenarios.

Description (Forest Stand Description)

The following descriptive characteristic of the user’s forest stand are entered on this tab.



The screenshot shows the 'Forest Stand Description' form within the 'Timberland Decision Support System'. The form includes the following fields and options:

- Scenario Name:** Text input field.
- Description:** Large text area for detailed description.
- Region:** Dropdown menu (selected: Western Gulf).
- Stand Type:** Dropdown menu (selected: Plantation).
- Species:** Dropdown menu (selected: Loblolly).
- Stand age:** Spin box (selected: 1) with unit 'year(s)'.
- Stand density:** Spin box (selected: 726) with unit 'trees per acre'.
- Site Index:** Spin box (selected: 70) with radio buttons for 'base = 25 years' (selected) and '50 years'.
- Include Site Index Adjustment for Base Age = 50
- Buttons:** 'Set to default' and 'Clear form'.

Scenario Name

This field is optional. This application provides you the opportunity to compare up to three separate scenarios side-by-side. Scenarios may differ by planting density, management objectives, harvest age, adversity to risk, and many other user-defined inputs. Providing a meaningful name may prove useful in keeping track of the various scenarios.



Description

This field is optional. This application provides you the opportunity to compare up to three separate scenarios side-by-side. Scenarios may differ by planting density, management objectives, harvest age, adversity to risk, and many other user-defined inputs. Providing a short description may prove useful in keeping track of the various scenarios.

Region

This field is required. Because the same species grows differently in different regions, the optimum thinning schedule will vary based upon the region. Select the appropriate region of the U.S. using the following image as a guide. *Note: only one region, Western Gulf, is available at this time.*

Stand Type

This field is required. Choose the type of stand from the following options: *Note: only the stand type, Plantation, is available at this time.*

- *Plantation* = Tree plantations are usually easily distinguished from natural forests by the trees being planted in straight line and the site artificially regenerated using seedlings.
- *Natural Single* = A naturally regenerated stand in which at least 80% of the trees in the main canopy are of a single species. These stand do not have trees planted in straight line and the renewal of the forest crop comes from seed fallen from mature trees on or near the site or by sprouting from roots and stumps.
- *Natural Mix* = A naturally regenerated stand in which less than 80% of the trees in the canopy are of a single species.

Species

This field is required. Choose the prominent species in the stand. *Note: only the species, loblolly pine, is available at this time.*

Stand age

This field is required. If plantation, enter the age of the trees or the number of years since the stand was artificially regenerated plus one year. Value must be equal to or greater than 1. If natural stand, approximate the number of years since the major disturbance (e.g., harvest, fire, hurricane) occurred that cause significant regeneration and new cohort of trees.

Stand density

This field is required. Enter the current, average number of trees per acre.

Site Index

This field is required. Site Index (SI) is commonly used to describe the productivity of a forest site. SI reports the expected height of the dominant and co-dominant, "free to grow" trees of a given species growing on the site at some base age. Commonly used base ages include 25 and 50 years. Soil maps commonly use a base age of 50. For many species, such as loblolly pine, most growth and yield models prefer to use base age of 25. For example, loblolly pine growing on an average quality site in the Western Gulf region might reach 65 feet in 25 years. In this example, $SI = 65_{base25}$.

Include Site Index Adjustment for Base Age = 50

This field is for the advanced user. Site Index estimates often report the woods-run or provenancial productivity of a forest site and does not necessarily represents well the height

potential expressed through modern management practices and genetic gain expressed by available seedlings. This features allows the user to include an estimated gain value when entering site index at base age = 50 as reported with soil data sheets.

Set to default

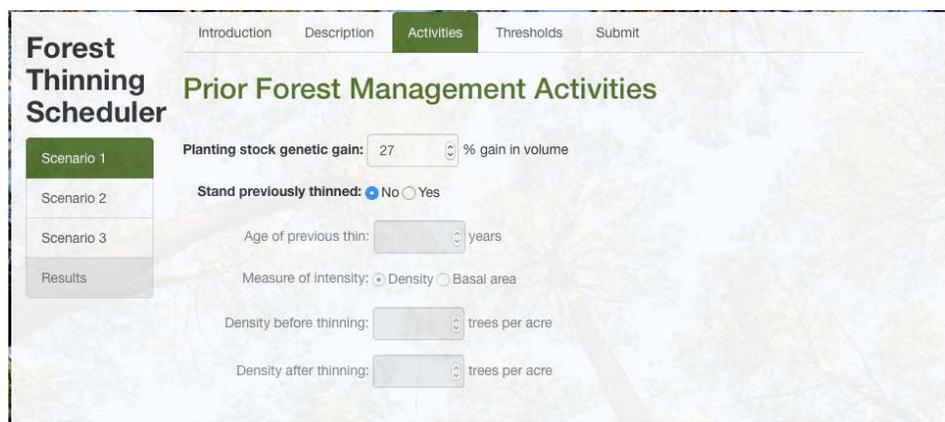
Sets the fields on the Description page to default values

Clear form

Clears the fields on the Description page of any values

Activities (Prior Forest Management Activities)

Prior forest management activities such as any previous thinnings can help with calculating accurate results. This tab provides a place to add this information.



Genetic gain

This field is required. Genetic gain in crop tree comes from a robust selection process whereby progeny (offspring) produced from the selection process express superior performance (gain) in various traits of interest (e.g. growth). These offsprings are often tested across a wide variety of sites over a number of years and their performance gains are recorded. If artificially regenerated, this application allow entry of the reported % gain in volume expected from the family of seedling planted. For example, many of the 2nd generation loblolly pine family express 25 – 30% gain in volume over woods-run loblolly. The default is set to 27% for loblolly pine which is typical of the gain expressed by the least expensive nursery stock available today.

Stand previously thinned

This field is optional. Older stands may have already undergone a thinning of some type. If so for your stand, select *Yes* here. You will need to enter the following additional information to complete this option.

Age of previous thin: Enter the age of the stand when it was last thinned. Note: at this time, the Thinning DSS only allows one previous thin entry. If the stand has been thinned more than once, use the parameters for the most recent thin.

Measure of Intensity: If previous thin is chosen then some determination of the intensity of the thin is required to proceed. These values can either be entered as trees per acre or basal area. If you know the number of trees per acre before and after the thin, then select *Density*. If you

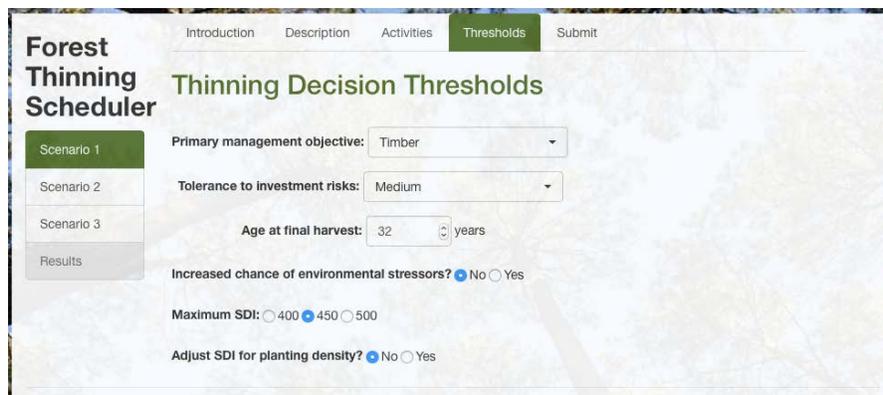
know the Basal Area of the stand before the thinning was conducted and after the thinning, then select *Basal area*.

Density (Basal Area) before thinning: If Density selected above, enter the average number of trees per acre just prior to the thinning operation. If Basal Area select above, enter the basal area of the stand just prior to the thinning operation.

Density (Basal Area) after thinning: This field is an advanced search field. If Density selected above, enter the average number of trees per acre remaining after the thinning operation. If Basal Area select above, enter the basal area of the stand after the thinning operation.

Thresholds (Thinning Decision Threshold)

The Thresholds tab contains the last group of variables needed to calculate a thinning schedule.



Primary management objective

This is a required field. Long-term forest management objectives vary widely by landowners. These objectives, along with the limits of the forest ecosystem and the dynamics of the forest vegetation determine the appropriate silvicultural practices used. Silviculture practices are the actual on-the-ground practices used to achieve the management objectives. This program considers the user-selected management objective in determining the optimum thinning schedules. Income generation focused management, such as timber, is often associated with high capital investment and may warrant delayed and/or more aggressive thinning schedules than those management objectives that are habitat-focused or recreational focused objectives.

Tolerance to investment risk

This is a required field. Many forest stands are held as investments and all investments hold some degree of risk. Some individuals may be more adverse to risk than others. An aggressive investor, or one with a high-risk tolerance, is willing to risk losing money to get potentially better results. A conservative investor, or one with a low risk tolerance, favors investments that maintain his or her original investment. This program will adjust the thinning decision thresholds based upon the selected level of risk. If “low” tolerance is selected, the optimum thinning window is skewed towards maintaining slightly less dense stands than required to meet the biological optimum needs of the stand under average environmental conditions. Risk of catastrophic loss is reduced at the consequence of optimum timber production. If “high” tolerance is select, thinning schedules are skewed to hold higher densities for a longer period of time increasing risk of catastrophic loss while increasing the potential for a greater return on investment (increase production of timber).



Age at final harvest

This is a required field. If preferred, you may enter the age of the stand at which you would like to conduct a final harvest. Although long for production forestry investment, a common age for loblolly pine is 32 years.

Increased chance of environmental stressors?

This field is for the advanced user. Some regions in the U.S. have highly variable climate that may increase the chance and magnitude of environmental stressors impact on forest stands. This may lead to slowed growth, loss of vigor, and decreased resiliency to insects, disease, fire, excessive weather events, etc. If this option is chosen, the Forest Thinning Scheduler application will adjust the thinning decision thresholds accordingly to promote tree vigor, health, resistance, and resilience to environmental stressors.

Maximum SDI

This field is for the advanced user. Stand Density Index (SDI) is a relative measure of stand density. It is based upon the relationship between average tree size and number of trees per acre in a fully stocked even-age stand. Species and the regions for which they are grown express different values for Maximum SDI which is the maximum index that a stand can reach with maximum competition. Typical Maximum SDI value for loblolly pine is 450. Producers in northern portions of the Western Gulf region of the U.S., may benefit by using 400 as the Maximum SDI value.

Adjust SDI for planting density

This field is for the advanced user. Most models usually assumed that the relative value between the stand density index (SDI) threshold where self-thinning is expected to begin is constant regardless of planting density. Modern forest stand establishment practices, however, often recommend significantly lower planting densities (depending upon species, site, objectives), which have shown to alter the point in the stand’s development at which self-thinning, began for some species. Selecting this value will adjust the SDI thresholds according to initial planting density, but may result in non-optimum thinning schedules for most typical stands. In most instances, adjusting for the initial planting density is not necessary for achieving satisfactory results.

Submit

Click on the *Submit* tab to review entered data before running a simulation to determine the optimum thinning schedule. User-entered data is provided in the first three subsections on the screen (*Forest Stand Description, Prior Forest Management Activities, and Thinning Decision Thresholds*). The following additional, calculated values required to run the simulations are listed in the last section labeled as *Calculated Model Inputs*

The screenshot displays the 'Forest Thinning Scheduler' application interface. It features a navigation menu on the left with tabs for 'Introduction', 'Description', 'Activities', 'Thresholds', and 'Submit'. The main content area is divided into four sections:

- Forest Stand Description:** Region: Western Gulf, Age: 1 year, Density: 720 trees/acre, Stand Type: Plantation, Site Index (base=25): 70, Species: Loblolly, Planting stock genetic gain: 27% gain in volume, Include Site Index Adjustment: No.
- Prior Forest Management Activities:** Stand previously thinned: No, Density before thinning: n/a, Age of previous thin: n/a, Density after thinning: n/a.
- Thinning Decision Thresholds:** Primary management objective: Timber, Increased chance of environmental stressors?: No, Tolerance to investment risks: Medium, Maximum SDI: 450, Age at final harvest: 32 years, Adjust SDI for planting density?: No.
- Calculated Model Inputs:** Age: 1 year, Basal area: 0.12 m²/acre, Density: 720 trees/acre, Average height: 3 feet, Site Index (base=25): 70, Initial Stand Density Index (SDI): 1, Initial diameter: 0.2 inches, Upper limit SDI (thinning required): 248, Genetic gain over base: 0.0%, Lower limit SDI (thinning target): 158, OMD where self-thinning begins: 4.84 inches, Density dependent upper SDI limit: 214.

A 'Submit' button is located at the bottom right of the interface.



Site Index

The calculated SI at base age 25 for the described stand

Initial diameter

The average quadratic mean diameter (units = inches) of trees in the described stand. Diameter is the straight line passing from side to side through the center of the tree at 4.5 feet above average ground line. Be careful not to confuse diameter with a tree's circumference.

Genetic gain over base

Depending upon the species, the poorest seedlings provided by most nurseries still provides a significant gain in production over wood-run (provenancial) stock. This is called the base gain. This program determines the difference between the base gain per species and the planting stock genetic gain value entered by the user on the *Forest Stand Description* tab.

QMD where thinning begins

As the forest stand grows, crop trees begin to compete with each other for limited resources. This competition ultimately leads to reduced vigor, growth and tree death by some individual trees...a process call self-thinning. This value estimates the size (as quadratic mean diameter) that the trees will be when the self-thinning process begins.

Average height

This is the calculated average height (in feet) of the tallest (dominant and co-dominant) trees in the stand.

Initial Stand Density Index

The calculated Stand Density Index (SDI) for the described forest stand.

Upper limit SDI and thinning required

This value is determined from the various user inputs including management objective, risk adversity, species, and region. It represents an estimated target SDI value, which once reached as the stand grows, triggers the program to schedule a thinning activity.

Lower limit SDI thinning target

Based upon user inputs, this value represents the target SDI of the residual stand after thinning. This value is used to determine the number of trees to harvest during a thinning operation.

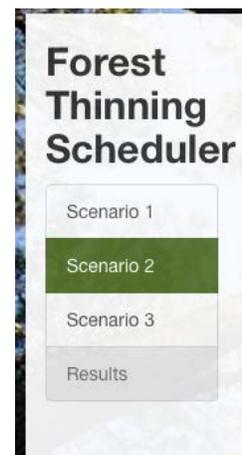
Density-dependent upper SDI limit

The estimated upper limit SDI thresholds adjusted by the initial planting density in which a thinning operation should be scheduled. This value is used only if the user selected "yes" on the "Adjust SDI for planting density" field on the "Thresholds" tab.

Scenario navigation buttons

Scenario selection

This application processes and compares the results for up to three scenarios simultaneously. Each scenario is accessed by clicking on the scenario navigation buttons at the left of the screen. Unique information may be entered on the Description, Activities, and Thresholds tab for each separate scenario.



Results

Once the user clicks on *Submit* at the bottom of the Submit tab to run the simulation, the results can be viewed by clicking on the *Results* navigation button. The user can either look at the results for each scenario separately, or side-by-side by clicking on *All Scenarios* tab.

Forest Thinning Scheduler	Scenario 1		Scenario 2		Scenario 3		All Scenarios		
	First Thin			Second Thin					
	Pre-Thin Value	Post-Thin Value	Removals ¹	Pre-Thin Value	Post-Thin Value	Removals ¹			
Scenario 1	Age (years)	11	11		17	17			
Scenario 2	Density (trees/acre)	706	391	315 (45%)	380	211	169 (45%)		
Scenario 3	Basal Area (sqft/acre)	104	69	36	121	80	41		
Results	Quadratic Mean Diameter (in)	5.2	5.7		7.7	8.3			
	Height of dominant trees (ft)	37.2	37.2		53.2	53.2			
	Stand Density Index	247	158		247	158			
	Total Stand Yield (cuft/acre)	1882	1233	649 (34%)	3097	2029	1067 (34%)		
	Total Stand Yield (tons/acre)	53	35	18	87	57	30		
	Merchantable Yield (cuft/acre)	1401	930	471	2995	1964	1031		
	Merchantable Yield (tons/acre)	39	26	13	84	55	29		
		Third Thin			Final Harvest				
		Pre-Thin Value	Post-Thin Value	Removals ¹	Removals				
	Age (years)	30	30		32				
	Density (trees/acre)	192	106	85 (45%)	105				
	Basal Area (sqft/acre)	144	95	49	97				
	Quadratic Mean Diameter (in)	11.7	12.8		13				
	Height of dominant trees (ft)	78.5	78.5		81.6				
	Stand Density Index	247	158		160				
	Total Stand Yield (cuft/acre)	4889	3134	1755 (36%)	3308				
	Total Stand Yield (tons/acre)	137	88	49	93				
	Merchantable Yield (cuft/acre)	4853	3112	1742	3290				
	Merchantable Yield (tons/acre)	136	87	49	92				

Acknowledgements

The Forest Thinning Scheduler application was developed by **Texas A&M Forest Service** in partnership with



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