

Learning Objective: Following this lab students will construct a rudimentary prescription for a pine plantation.

Introduction

Southern pine plantations, dominated by loblolly pine, are a common forest cover type in the US South. They make economic sense for landowners interested in managing for timber and maximizing financial returns as their primary objectives. Pine plantation silviculture focuses on a relatively simple ecosystem (i.e. a pure, even-aged stand), and yet remains complex due to the wide array of cultural treatments often implemented in intensive silvicultural regimes. A typical rotation on industry land typically includes multiple applications of herbicides to control competition, some sort of mechanical site preparation, the planting of genetically improved tree seedlings, multiple applications of fertilizer, one or more thinning of varying types, and a clearcut method of regeneration. Typically, prescribed fire is not used on industry land, although it is a viable ecological treatment that may be ideal on non-industrial private forest land to help meet landowner objectives. Pruning and other specialized intermediate treatments may be used in some cases, but are not generally widely prescribed. Further tools and details introducing you to pine plantation silviculture here in East Texas follow below.

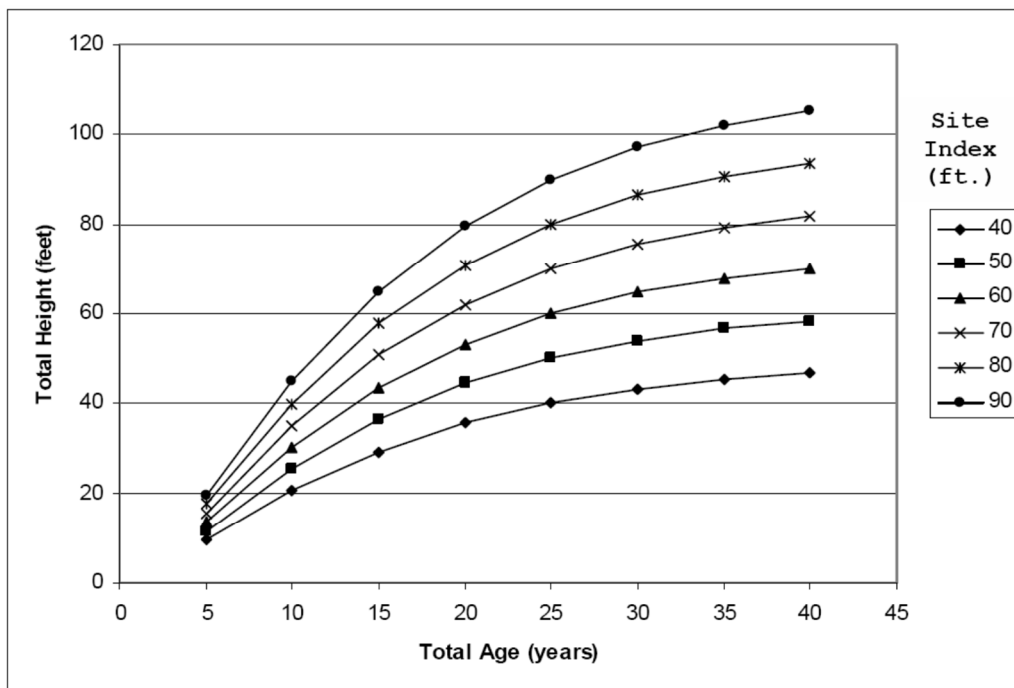


Figure 1--Site index curves (index age = 25 years) for unmanaged loblolly pine plantations in east Texas.

Coble, D. W., and Y.-J. Lee. 2006. Use of a generalized sigmoid growth function to predict site index for unmanaged loblolly and slash pine plantations in east Texas. Pages 291 – 295 in K. F. Connor, editor. Proceedings of the 13th Biennial Southern Silvicultural Research Conference. USDA For. Serv. Gen. Tech. Rep. SRS – 92.

Table 1. A flexible system similar to that previously used by the Campbell Group for selecting rotation lengths and thinning schedules of loblolly pine plantations in East Texas. These guidelines are general and may not work in every situation or on all sites, but offer a guide to experienced foresters based on typical stand dynamics. Options are provided for both single or double thinning schedules.

| Previous Site Index <i>feet</i> | Current Site Index <i>feet</i> | First Thinning* <i>years</i> | Second Thinning* <i>years</i> | Single Thinning <i>years</i> | Harvest <i>years</i> |
|------------------------------------|-----------------------------------|---------------------------------|----------------------------------|---------------------------------|-------------------------|
| 55 | 60 | 17 | 24 | 20 | 30 |
| 60 | 65 | 16 | 23 | 19 | 29 |
| 65 | 70 | 15 | 22 | 18 | 28 |
| 70 | 75 | 14 | 21 | 17 | 27 |
| 75 | 80 | 13 | 20 | 16 | 26 |
| 80 | 85 | 12 | 19 | 15 | 25 |
| 85 | 90 | 11 | 18 | 14 | 24 |
| 90 | 95 | 10 | 17 | 13 | 23 |

*First thinning is row thinning + operator select. This is where either every 3rd, 4th, or 5th row is removed, and the logger selects poorly formed, diseased, or otherwise unhealthy trees in the remaining rows to remove. The second thinning is a low thinning aimed at producing approximately 125 crop trees per acre. Both thinnings are commercial, and the assumed primary management objective is sawtimber production.

Here is some additional information on loblolly pine plantations you may wish to consider relevant to this exercise:

- Poorly-drained sites are often bedded at stand establishment to achieve adequate survival rates; moderately or well drained sites are almost never bedded.
- Herbaceous weed control is most often only maintained for 1 year after stand establishment.
- Chopping and burning or shearing and piling are used to manage slash from the previous harvest, but only if there is so much slash that the site cannot be planted without mitigating it. Most research shows that moving slash around has little effect on growth or survival. However, these treatments do sometimes benefit growth if they result in increased competition control, but herbicide application is a much cheaper and more effective alternative to achieve this goal.
- Disking along with subsoiling is used to break up impermeable soil layers, such as plow pans. Unless the stand is being planted on a recently cultivated field or heavy clay site with pan layers, most studies show little benefit to growth and survival.
- Wet clay flats are often phosphorous and sometimes potassium deficient sites. Phosphorus growth response on these sites can last for longer than a rotation. Phosphorous is not usually a limiting nutrient to growth early in the rotation on most moderately to well drained sites.
- A stand with an average live crown ratio (the percentage of total height with live branches) approaching 30% or less following crown closure often responds to midrotation fertilization.
- Most stands are not nitrogen deficient until around age 5.
- Most midrotation nitrogen applications will only improve growth rates for 6-8 years.
- Typical midrotation fertilizer application rates are 150 lbs. N per acre and 25 lbs. P per acre.

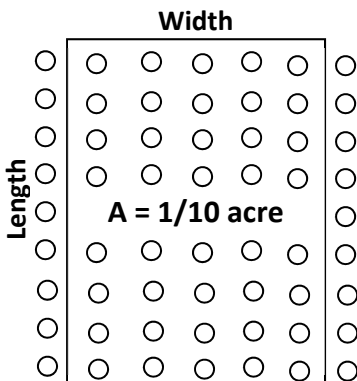
Procedure

Equipment for Each Group

- | | |
|------------------------|-------------------|
| 1. Fiberglass tape (2) | 4. Chain Pins (5) |
| 2. Diameter tape (1) | 5. Flagging |
| 3. Clinometer (1) | |

Methods

You will collect some basic data that will allow you to create a prescription. We will conduct an efficient inventory on this tract using a fixed area, 1/10 acre, rectangular plot sampling design. The length and width of your plots will vary depending upon the spacing of the plantation. Design your plots so that the long sides begin halfway between two rows, and run perpendicular to the rows past 5 rows, ending halfway between the rows again. You will measure this length and use it to calculate the necessary width of each plot. The schematic below should help. Each crew will install one or two of these plots.



Area = (Length) * (width); 43,560 ft² acre⁻¹

You know plot area and you'll measure plot length.

To calculate plot width:

- 1) solve the equation for width algebraically,
- 2) convert area to square feet, and
- 3) solve the resulting equation.

Once you have established each plot, use the attached data sheet to record the following data:

1. Tally each live hardwood and pine tree larger than 0.5 inches dbh using 1 in. centerpoint classes.
 - a. Treat clumps of hardwoods as a single tree possessing the largest diameter of any tree in the clump.
 - b. Ignore shrubs.
2. Choose one dominant canopy tree in each plot and estimate the height with a clinometer. Use the attached site index curve to estimate the site index at base age 25. Age is years since planting.
3. Measure the between and within row spacing in one representative location in each plot, considering potential mortality and volunteer trees as best you can.

The data to be collected are based on the parameterization requirements of PTAEDA 4.0. In a future lab we will learn how to use PTAEDA 4.0 modeling software for loblolly pine plantations, and will use your data to project the growth of this stand and reevaluate your prescriptions.

Crew Names: _____ Date: _____

Plot Number: _____ Plot Width (ft): _____ Plot Length (ft): _____

| DBH(<i>inches</i>) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | | |
|----------------------|---|---|---|---|---|---|---|---|---|----|--|--|
| All Pines | | | | | | | | | | | | |
| Defective Pines | | | | | | | | | | | | |
| All Hardwoods | | | | | | | | | | | | |

Site Index Tree: Height: _____ Age: _____ Site Index 25: _____

Original Spacing: Within Row: _____ Between Row: _____

Plot Number: _____ Plot Width (ft): _____ Plot Length (ft): _____

| DBH(<i>inches</i>) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | | |
|----------------------|---|---|---|---|---|---|---|---|---|----|--|--|
| All Pines | | | | | | | | | | | | |
| Defective Pines | | | | | | | | | | | | |
| All Hardwoods | | | | | | | | | | | | |

Site Index Tree: Height: _____ Age: _____ Site Index 25: _____

Original Spacing: Within Row: _____ Between Row: _____

Silvicultural Prescriptions Grading Key

| Annotation | Explanation |
|------------|--|
| 1 | Terminology is incorrect or imprecise. Be sure to use correct silvicultural terminology in all prescriptions. |
| 2 | Prescribed action is too vague . You need more detail (e.g. marking instructions, removal percentage). |
| 3 | Prescribed action does not meet landowner objectives , or some of the constraints we discussed for this stand. |
| 4 | Prescribed action is incorrectly timed . Is your rotation is too short or long based on growth rates of your species or landowner objectives? Are you applying herbicide too late compared to planting (herbaceous control spring after planting, hardwood control fall before planting)? |
| 5 | Prescribed action is not ecologically feasible. Does your regeneration method match with the shade tolerance of your crop species? Did you prescribe a burn that will likely kill all your crop trees? |
| 6 | Prescribed action is not operationally feasible. Is the stand too small? Are you removing too little volume per acre for a logger to take the contract? Are you operating when the site is too wet? |
| 7 | Prescribed action is unnecessary . Are you fixing something that is not actually a problem (e.g. mechanical site preparation on a site with no soil limitations, herbicide on a site with no competition problems, fertilizer on a droughty site, thinning a stand that's at an appropriate density)? |
| 8 | An additional prescribed action needed . Did you forget to apply herbicides when planting? Was slash management not prescribed on a high-slash site? Was bedding not prescribed on a wet site? |
| 9 | Prescribed action will not achieve the density you state. Did your planting spacing and density match? Did your row thinning intensity and post-thinning density match? |
| 10 | More than one treatments are combined on a single line. Be particularly careful with this for establishment of stands, when multiple treatments may be used in within one or two years. Each should go on its own line. |