

The image is a composite of two photographs. The top portion shows a clear blue sky with the tops of several tall, green pine trees. A semi-transparent green horizontal band is overlaid on this section, containing the title and subtitle in white text. The bottom portion of the image shows a dense forest of tall, thin pine trees with green needles, viewed from a low angle looking up. In the immediate foreground, there is a large, neat stack of cut logs, showing their circular ends and light brown bark.

THE MANY FACTORS OF FOREST INVESTMENTS

**FROM STAND DENSITY AND TRACT SIZE TO
ACCESSIBILITY, OBJECTIVES, AND OPPORTUNITY COSTS,
A FORESTLAND OUTLAY HAS NUMEROUS VARIABLES.**

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For a forest landowner, a timber harvest is often the culmination of many years of forest stewardship. Landowners manage properties for a wide range of objectives, with a timber harvest often being the main goal to provide a financial return on their investment.

While it might seem like a simple process, multiple factors influence the value of forestland, as well as potential return from a timber harvest. Forest landowners should take time to understand some basic forestry principles, terms, and ideas to assist them with land management decision making.

FOREST CHARACTERISTICS

Site index has a crucial influence on the potential of a forest property to produce timber revenue. Tree height at a specific age is a good indicator of site quality and generally is a useful starting point in forest management decisions.

Foresters use this relationship, called site index, to measure how productive a given area of forestland is for growing timber. In southern loblolly pine plantations, the base age for site index is normally set at 25 for plantations or 50 years for natural stands.

This means that a stand described as site index 80, base age 25, would have dominant and codominant trees that are 80 feet tall at 25 years of age. Sites with a higher site index are more productive and capable of producing more merchantable volume faster than those with a lower site index (Table 1). Thus, a higher site index should equate to higher forestland values. The USDA Web Soil Survey is a good resource to check site index and soil type for your property.

Stand density has a great impact on the average tree diameter in a forest stand, and thus, also impacts the type and quality of timber products produced. Pine plantations, for example, start at some set spacing, and natural mortality decreases tree survival over time. Common measures of stand density are basal area and trees per acre. Foresters use periodic thinning to manipulate stand density, creating healthier stands, and producing timber products that meet the forest owner's objectives. Managed forests will be properly thinned of poor-quality trees and have a higher value. Table 2 illustrates that when just growing wood volume (all pulpwood), stand density doesn't matter, but it does matter if growing higher valued products.

Considering the factors above, the age of a forest also correlates to the size of the trees and the types of forest products

available. For this article, we are mainly considering even-aged plantation stands, but an uneven-aged natural forest will have many of the same value factors. Rotation length seems like a simple decision, but it will also obviously impact the timber products produced and since time is money, it will affect when the final harvest and major cash flow occurs in a timber investment.

A common range for southern pine plantation rotation lengths is 20 to 40 years. Twenty years or shorter will produce pulpwood or wood chips. Sawtimber can take 35-40 years. It comes down to cash flow. Shorter rotations produce smaller cash flows, but they are obtained sooner. Professional foresters are trained to do the math on the optimal rotation to produce the products and cash flow that meets the landowner's objectives.

A typical southern pine forest management regime has establishment cost at the beginning. Small cash flows are produced by thinning, and the large cash flow occurs 35 years in the future. Rotation length is not a simple decision, as it controls the cash flows of the forestry investment.

TRACT CHARACTERISTICS

Hardwood, pine-hardwood mix, and pine plantation forest types can generate different levels of interest and values from buyers. Traditional southern plantation forestry focuses on pine as the single tree species that are present and managed. There is a strong market in many areas for pine products.

Hardwood stands have a much longer rotation and less intensive management. Most will produce a variety of tree species with different uses and markets. Mature hardwood stands can provide some of the highest value specialty forest products. Prime white oaks trees can be milled as staves for whiskey and wine barrel production, generating some of the highest stumpage values available. Local markets and mill availabilities will drive how species affect timber stand value.

Tract size can limit economies of scale opportunities, like efficient timber harvesting operations or silvicultural practices. It is costly to move equipment onto a tract and smaller tracts may be unattractive to some contractors (who may have to charge more for some practices on a per-acre basis). Small tracts that are geographically close can sometimes be combined to gain efficiency in harvesting or silvicultural operations. Many loggers require at least ten acres to consider conducting a timber harvest.

Site Index (base age 50)	Yield in tons/acre	Value at \$12/ton
Low site index (65)	62	\$744
Medium site index (80)	94	\$1,128
High site index (95)	139	\$1,668

TABLE 1 : Loblolly pine pulpwood yield at age 25 years.

Trees Per Acre	All Trees as Pulpwood		Multiple Products		
	tons/acre	\$/acre	Sawtimber (tons/acre)	Pulpwood (tons/acre)	Combined Value (\$/acre)*
500	141	1,692	56	87	2,338
700	141	1,692	31	109	2,052
1,000	139	1,668	12	122	1,752

TABLE 2: The effect of stand density on timber products.
 *Using pulpwood price of \$12 per ton and sawtimber price of \$24 per ton.

Larger tracts will be attractive to loggers and usually generate higher timber prices or can generate cheaper contractor costs on a per-acre basis for forest practices, like thinning or herbicide work.

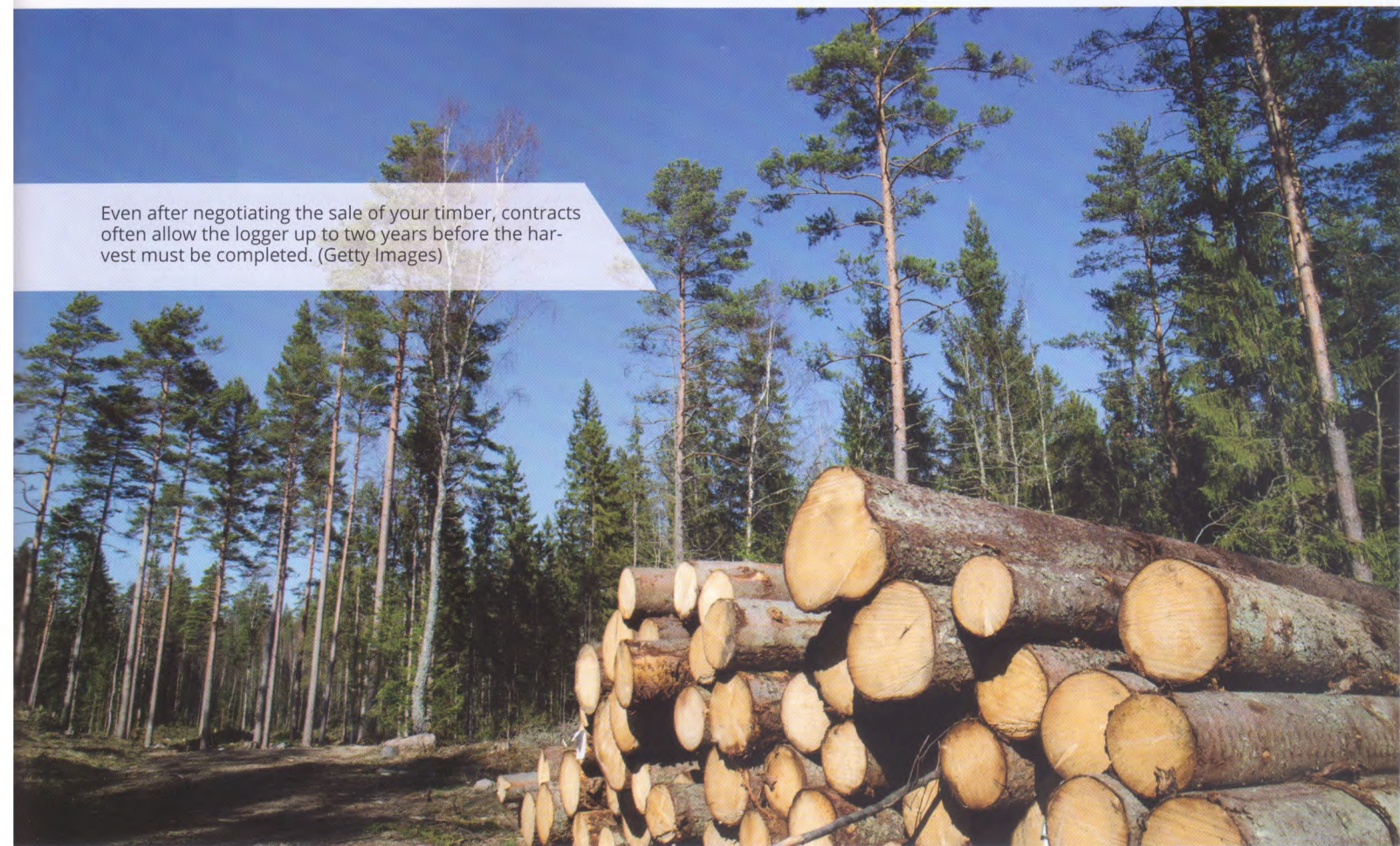
Like tract size allows for economies of scale, timber volume on the tract has the same effect. The size of the trees on the tract and their quality will impact prices offered at timber harvest time. Timber prices will depend on the products that can be harvested from the tract. Typically, sawtimber will have double the per ton value of pulpwood. Thinning harvests normally remove pulpwood and some chip-n-saw with the goal of the final harvest being primarily sawtimber.


Accessibility also impacts the efficiency of operations. A logger needs access to harvest timber and contractors need access to perform tree planting, thinning, and other operations. Procurement foresters and contractors factor access into

timber sale offers or forest practice costs. A property with a well-established road system accessible to log trucks and heavy equipment will be more desirable. Most southern pine timber harvesting is done with large wheeled heavy equipment.

Sites with extreme topography or wet soils may require special crews and equipment to harvest timber, increasing logging costs. Steep slopes make harvesting timber more dangerous for the logger and often come with increased potential of erosion and soil damage. Logging in saturated, wet soils also provides more challenges for the logger while increasing ground disturbance and damage caused by logging equipment. During the winter months or wet season, having a “wet weather” tract that is high and dry and operable, when other areas are not, can bring increased interest and bid values. Procurement foresters love to have a tract like this to hold to keep their mill supplied during wet weather.

Even after negotiating the sale of your timber, contracts often allow the logger up to two years before the harvest must be completed. (Getty Images)





Federal and state-level forestry incentives (cost-sharing programs) support tree planting, management planning, and improvement of forest management practices.

Location to timber markets has a huge impact on revenues generated by a timber sale. Trucking and hauling are significant expenses for a logger or timber buyer. The distance from a forest property to the forest products mill will affect the price paid for standing timber, as well as the interest the tract will receive in a planned harvest. The types of forest product mills in an area are also an important factor. A timber tract may be close to a sawtimber mill, but 100 miles from a pulp mill, making scheduling a profitable thinning harvest difficult.

ECONOMIC CHARACTERISTICS

Forest products and timber are commodity markets that can see highs and lows based on supply and demand. When the economy is strong and construction starts are high, demand for sawtimber can equate to higher prices paid to the landowner. Natural disasters like hurricanes can spike the demand for sawtimber for construction and poles to replace damaged powerlines. Supply and demand work both ways; at times timber gluts decrease prices. When forest product mills become saturated with wood, loggers are often limited on the amount of wood they can deliver. This can delay your timber harvest and include increased costs to haul the wood farther to other mills.

The underlying land value was discussed as an opportunity cost in the July/August 2020 issue. To grow timber, you need land and, unless you have no opportunity to sell or rent out the land you already own, you forego the opportunity to apply that capital invested in land elsewhere.

Consider a simple example, where the forest owner has a 5% interest rate, he or she can earn on alternatives to a forestry investment and land value varies from \$500 to \$2,000 per acre over a 25-year rotation. Table 3 shows how much the net present value of a timber growing investment would decrease due to this opportunity cost. You can't grow timber without land and land is seldom free; that value will reduce your rate of return on the investment.

Nontimber values are often overlooked but can provide value to your forest investment. Some nontimber values generate revenue and can increase the return from the property. Traditional nontimber revenue can be generated from raking pine straw for landscaping use or leasing hunting rights on your property. The sale of carbon offsets is becoming a way to earn nontimber income. Several companies are working on programs to allow small private landowners the opportunity to sell carbon offsets from their forests by modifying their forest management activities over short-term timeframes.

Federal and state-level forestry incentives (cost-sharing programs) support tree planting, management planning, and improvement of forest management practices. Federal programs are available through U.S. Department of Agriculture agencies and the U.S. Fish

Land Value (\$)	Decrease in Net Present Value (\$/acre)
500	352.35
1,000	704.70
1,500	1,057.05
2,000	1,409.39

TABLE 3: Land opportunity cost for various underlying land values.

and Wildlife Service.

Several states have cost-share programs administered by their state forestry commissions. Cost-sharing has an immediate positive impact on financial return. The programs reward landowners for responsibly managing their forests. Likewise, many income tax provisions offer forestry incentives, from long-term capital gains treatment to an amortization deduction that allows reforestation expenses to be immediately expensed, or over 84 months if they exceed \$10,000.

LANDOWNER OBJECTIVES

The forest owner's management objectives will control how a forest property is managed. The focus of this article has been financial factors that affect returns from producing timber crops. Not all landowners want to do that. Other objectives can center on wildlife, aesthetics, recreation, or other values.

The direction the forest owner dictates will ultimately control financial expectations. Along with the management objectives, the existence of a professionally prepared management plan assures there is a defined plan to success. The objectives have little value without a plan to achieve them.

A forest property often provides a sense of pride and accomplishment that traditional investments do not produce. The non-financial returns can outweigh the financial returns for many landowners. In addition to growing timber, forest properties often can be used for hunting, fishing, hiking, bird watching, trail riding, or just enjoying the outdoors.

A hands-on landowner may spend weekends on the tractor making improvements to roads and facilities on the property or setting up new hunting blinds. The land becomes much more than a traditional investment. Forests managed for these nontimber objectives may not maximize financial return, but a forest managed for multiple objectives can still generate revenue for the owner.

Intensive forest management, like herbicide and fertilizer applications, can produce much higher timber yields but can be very costly. The value of fertilizer is site-specific, so the forest owner will likely need professional forester advice on whether or not the investment will increase the rate of return. Herbicide application is used to control competition (weeds) and will allow


the timber to grow faster.

Timing is important, and the application might be at stand establishment or mid-rotation for stands with heavy woody competition. Precommercial thinning, prescribed fire, and timber stand improvement activities all can also be used to maximize growth and value from your property, but they come at a cost. A landowner interested in maximizing values through intensive forest management almost certainly will need professional advice to determine the profitability of the additional costs.

The method used to sell timber can affect the price obtained. The two main options to sell timber are lump sum and pay-as-cut. With a lump sum, the owner gets a fixed sum for all or some of the timber on the tract. The buyer takes the risk that the volume of timber harvested will what is expected. Or, the seller takes the risk the lump sum bid adequately accounts for all the timber on the tract. With pay-as-cut, a per ton price is agreed upon and the seller is paid for the timber cut.

Forestry is a long-term investment. Timber buyers and loggers buy multiple tracts each year to ensure they have a continuous supply of wood. Even after negotiating the sale of your timber, contracts often allow the logger up to two years before the harvest must be completed.

The use of a professional forester will assure the forest owner will have adequate advice in growing the timber and harvesting the timber. Often a consulting forester will be hired. He or she can assure that proper silviculture and planning produce the most valuable harvest and that the forest owner obtains the highest price for the timber products.

A consulting forester can represent the best interests of the landowner without being biased. While there is a cost associated with professional management help, it is often outweighed by the experience and added benefit they provide. Forest management decisions are more complex than most landowners realize. Familiarizing yourself with the ideas provided above and working with a professional forester can help ensure a successful forestry investment. 

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